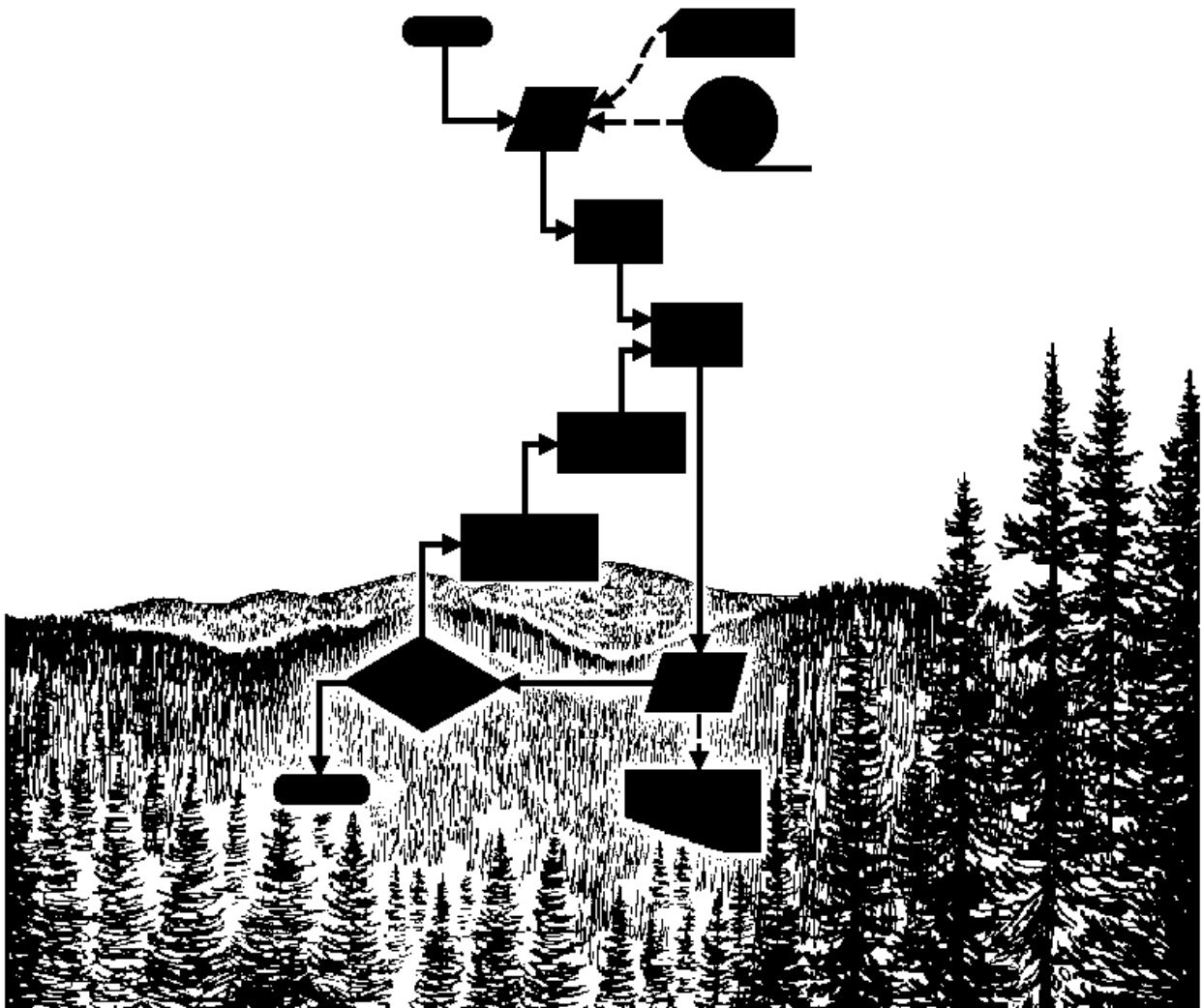# Keyword Reference Guide for the Forest Vegetation Simulator

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Keyword Reference Guide
for the
Forest Vegetation Simulator

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Keyword Introduction

Users communicate much of the information used by the Forest Vegetation Simulator (FVS) through the keyword system. This system consists of a set of mnemonic words (keywords) and associated data. A single keyword and its associated numeric data make up a keyword record.

Keyword Records

A simulation file is comprised of a logical set of keyword records. The keyword always begins in the first column of the keyword record. Depending on the keyword, up to seven additional fields on the record may be used to transmit data. These fields are referred to as parameter fields and the data that they contain are used when the option is implemented. Each parameter field consists of 10 columns. If a decimal point is included in numeric data, the parameter may be entered anywhere within the field. If integer values or alphanumeric data are used, they must be right-justified. The first ten columns of the keyword record are reserved for the keyword name, therefore the first parameter field begins in column 11 (fig. 1)

```
                                   Columns
            1         2         3         4         5         6         7         8
    ....:....0....:....0....:....0....:....0....:....0....:....0....:....0....:....0

    DESIGN           0       1.0       999         5         0       16.       100
    SITECODE         3        82
    THINBTA       2002       8.0      24.0       1.0        PP        50         0
```

Figure 1 — Example of a portion of a simulation file showing keyword records with keywords (columns 1 to 10) and up to 7 parameter fields (10-column fields beginning in column 11). The header with column designations is not part of the file and is included here only to help illustrate the format of the keyword records.

A simplifying feature of the keyword system is that default values exist for almost all program options. Keywords need only be used if the desired action differs from the default action. Similarly, most parameters associated with keywords have default values. If such a field is left blank, the default value will be used.

Many keywords contain a "year or cycle" parameter field. If the value entered in this field is in the range 0-40 it is interpreted as a cycle number. If the value entered is 1000 or greater it is interpreted as a year. No other values are legal for this type of parameter field unless otherwise noted.

Many keywords contain a "species" parameter field. Values entered in this field may be numeric or alpha codes. A numeric entry is interpreted as the species sequence number from the FVS variant that is being used. Alpha entries are interpreted as the alpha species code from the FVS variant that is being used. Refer to Appendix A for a list of species sequence numbers and species alpha codes.

Supplemental Records

The final element of the keyword system is the supplemental data record. These records are required when the information needed does not fit the parameter field format. Supplemental data records are a maximum of 80 characters and occupy the records immediately following the keyword record. The exact format of the supplemental data records is dependent on the keyword selected, and will be described in the keyword description for the keywords that require them (fig. 2).

```
COMMENT
Supplemental records are at most 80 characters wide and begin on the record
that follows the keyword record.  Syntax is unique to the keyword.
END
STDIDENT
0470003  Stand 002047.0003 at Clear Creek
```

Figure 2 — Example of a portion of a simulation file showing
keywords with associated supplemental data records.

PARMS Format

Many of the "activity" keyword records may be coded using the PARMS format. This is a special form of the
keyword record. It is equivalent to the standard form of the keyword record, but it allows expressions in place of
constant parameters. See the individual keyword descriptions to determine whether a particular keyword may use
the PARMS format.

When using the PARMS format for a keyword record, the keyword is coded in the first eight columns, and the
year/cycle (field 1) is coded right justified in column 20 as is done when this feature is not used. The remainder of
the record is coded

$$\text{PARMS (parameter}_2\text{, parameter}_3\text{, parameter}_4\text{, ... , parameter}_n\text{)}$$

where the word PARMS begins somewhere in columns 21 through 30. Each "parameter$_n$" corresponds to the nth
field of the keyword. Its value is represented by an expression that uses constants, variables (Event Monitor pre-
defined or user-defined), and/or Event Monitor functions. Refer to GTR INT-275, *User's Guide to the Event
Monitor: Part of Prognosis Model Version 6* for a discussion of legal uses of variables, operators, and functions. If
the keyword record is long, an ampersand (&) is used to continue the record on the following line. Figure 3 shows
several keyword records that use the PARMS format.

```
                                 Columns
          1         2         3         4         5         6         7         8
....:....0....:....0....:....0....:....0....:....0....:....0....:....0....:....0

THINDBH         2010     PARMS(10.0, 999.0, 1.0, 0.0, 0.0, 0.0)
THINDBH         2010      10.0     999.0      1.0       0.0       0.0       0.0
THINBTA         2020     PARMS(BTPA-SPMCDBH(1,0,3), 1.0, 0.0, 999.0, 0.0, 999.0)
```

Figure 3 — Example of keyword records using the PARMS format.
The two THINDBH keyword records are equivalent. For the
THINBTA keyword the residual stand density (field 2) is calculated
using a pre-defined variable (BTPA) and an Event Monitor function
(SPMCDBH).

When using the PARMS format, supply all of the parameters used by the keyword. Defaults are not used when
parameters are left blank Ensure that all parameter values are within legal limits as FVS does not check for legal
values when the PARMS format is used. Also ensure that variables are defined when the activity is called. If the
PARMS function references a variable that is not defined when the activity is called, the activity is canceled.

Geographic Variants

The different versions of the FVS model have been calibrated to specific geographic areas, and are referred to as
"variants" (fig. 4). Each variant is actually a stand-alone application that contains growth parameters and other
parameters based on data collected in the geographic area represented. The Central Rockies (CR) variant is unique
in that it is comprised of submodels based on major forest type, each of which contains its own set of parameters.
Individual variants may have a different subset of legal keywords, and may use different species codes than other

variants. Refer to individual keyword descriptions for a list of the variants for which use of the keyword is valid. Refer to Appendix A for a list of the valid species codes for each variant.
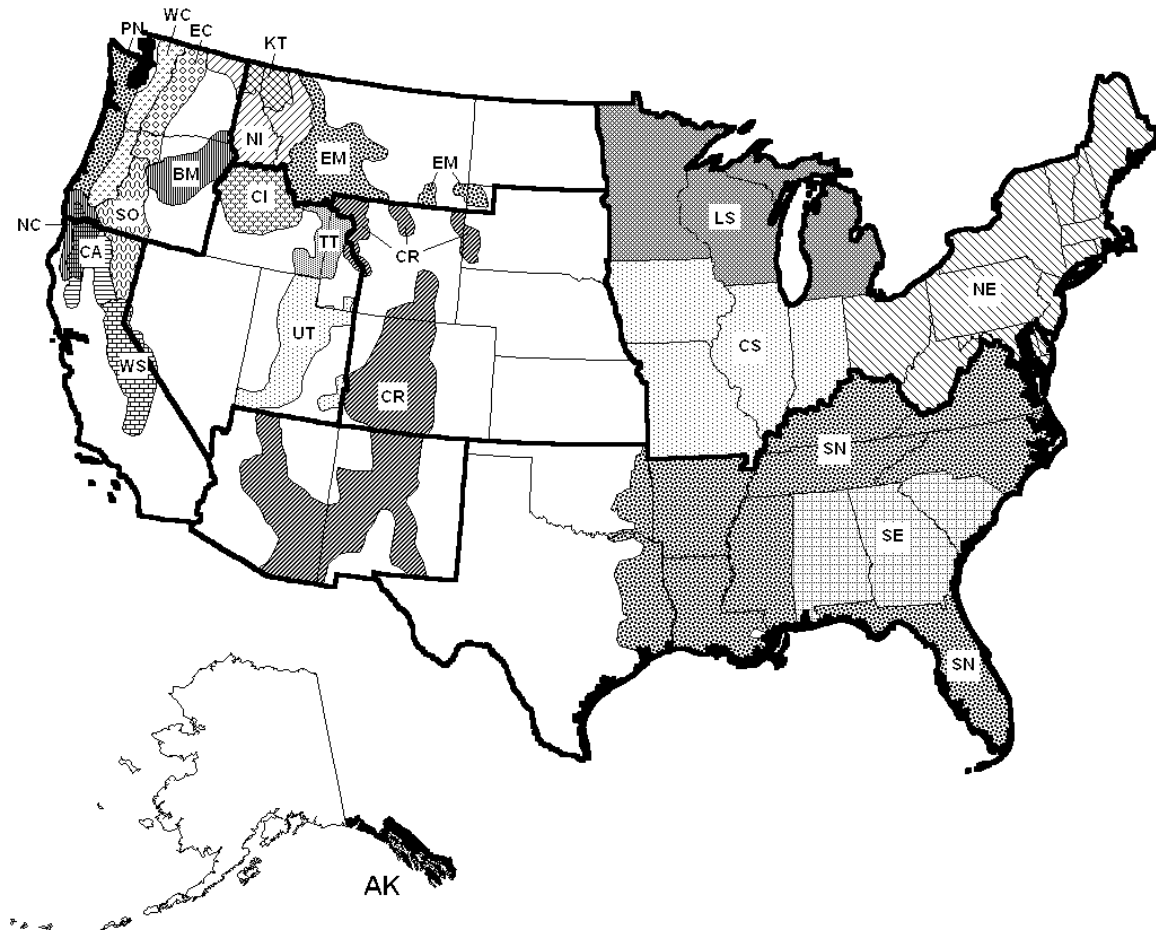
AK	Southeast Alaska, Coastal BC (SEAPROG)	NE	Northeast
BM	Blue Mountains	NI	Northern Idaho - Inland Empire
CA	Inland CA, Southern Cascades (ICASCA)	PN	Pacific Northwest Coast
CI	Central Idaho	SE	Southeast
CR	Central Rockies*	SN	Southern
CS	Central States	SO	South Central OR, Northeast CA (SORNEC)
EC	Eastside Cascades	TT	Tetons
EM	Eastern Montana	UT	Utah
KT	Kootenai/Kaniksu/Tally Lake (KOOKANTL)	WC	Westside Cascades
LS	Lake States	WS	Westside Sierra Nevada (WESSIN)
NC	Northern California (Klamath Mountains)		

*Central Rockies Submodels:

SW	Southwest mixed conifers	SF	Spruce-fir
SP	Southwest ponderosa pine	LP	Lodgepole pine
BP	Black Hills ponderosa pine		

Figure 4 — Map of the geographic variants of the Forest Vegetation Simulator.

ADDFILE   (<u>ADD</u> a keyword <u>FILE</u>)
Variants: All
Related keywords: OPEN, CLOSE

Permits the adding of external keyword files to the simulation file. When FVS encounters an
ADDFILE keyword in a keyword file it opens the auxiliary keyword file (see OPEN keyword) and
reads in the keywords from that file. It then reads in the remaining keywords from the original
file. Any number of ADDFILE requests can be included in a single simulation file (however, each
must be preceded by an OPEN keyword and followed by a CLOSE keyword).

> field 1: File reference number for the auxiliary keyword file (also known as an addfile).
> File reference numbers are a mechanism that FVS uses to keep track of external
> files. Numbers less than 30 are reserved for files that are currently used by FVS.

Note: Any number of ADDFILE keywords can be requested in a simulation file, however each
ADDFILE keyword must be preceded by a corresponding OPEN keyword with the same
file reference number.

Note: The ADDFILE and OPEN keyword combination require that the auxiliary keyword file
(or addfile) be read every time the simulation is run. This differs from using the "Insert
From File" feature of the Suppose interface program. The Suppose program actually
embeds the keywords from the auxiliary file into the current simulation file. Changing
the auxiliary keyword file after it has been embedded into the current simulation file has
no effect on the current simulation file. When using ADDFILE and OPEN keywords,
changing the auxiliary file will cause a change in the simulation when it is run again.

Caution: ADDFILE should not be used within the auxiliary keyword file.

Example:
```
OPEN            40
EXTRA.KEY
ADDFILE         40
CLOSE           40
```

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.2.4

AGPLABEL (<u>A</u>ctivity <u>G</u>roup <u>P</u>olicy <u>LABEL</u>)
Variants: All
Related keywords: SPLABEL, ALSOTRY, IF, THEN, ENDIF

Specifies a subset of stand policy labels (refer to the SPLABEL keyword description) that are to
be used to selectively schedule conditional activities. Only stands having at least one of the
specified labels in their stand policy label set will be considered for the conditional activities. This
capability is useful only when multiple stands are included in a simulation, or when an addfile is
to be applied differently to different stands. For example, three stands are to be managed. The
first has the stand policy label *PineType*, the second has *PineType* and *Overstocked*, and third has
Overstocked. AGPLABEL may be used to conditionally schedule a thinning that is to be applied
only to stands with the label *Overstocked*. Only the second and third stands will be considered
since these are the only stands with the label *Overstocked*. If AGPLABEL is used to conditionally
schedule a second activity that to be applied only to stands with the label *PineType* only the first
and second stands will be considered.

The AGPLABEL keyword record must follow the THEN keyword or ALSOTRY keyword to
which it applies, and must precede the corresponding ENDIF keyword. If the specified condition
is true for a stand and at least one of its stand policy labels matches one of the activity group

policy labels specified, the activities following the THEN or ALSOTRY keyword will be scheduled. If either the condition is not true or there is no match in policy labels for the stand, then the activities will not be scheduled.

Refer to the description for the SPLABEL keyword for an explanation and example of how to specify the stand policy labels. Refer to the description for the ALSOTRY keyword for an explanation and example of its use.

>   No fields are associated with this keyword. Labels are entered on a supplemental record.

>   Supplemental record:
>   >   Specifies the activity group policy labels. These are a subset of the stand policy labels for all the stands in the simulation. Labels are separated by a single comma. The total number of characters in the label set may not exceed 100. An ampersand (&) is used to indicate that the list of labels is continued on the next line. Any character may be used as part of a label except a comma, period, or ampersand.

Example: If the basal area exceeds 150 square feet per acre and the stand has the stand policy label *PineType*, then thin from below to 100 square feet per acre.

```
IF                0
BBA GT 150
THEN
AGPLABEL
PineType
THINBBA           0     100     1.0     0.0     999.0     0     999
ENDIF
```

Note: If no AGPLABEL keyword record is included after a THEN keyword, the default activity group policy label set is used. This default set is the union of all stand policy labels for all stands, so the activities will be scheduled in any stand in which the condition is true. A warning will appear in the main FVS output file stating that no activity group policy labels were specified.

References: GTR INT-275, User's Guide to the Event Monitor..., p. 7
GTR INT-281, User's Guide to the Parallel Processing Extension..., p. 9
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.6.1

ALSOTRY   (ALSO TRY if-then activities)
Variants: All
Related keywords: SPLABEL, AGPLABEL, IF, THEN, ENDIF

Specifies an alternative set of activities that are to be conditionally scheduled when a condition is true, but the activity group policy label set (refer to the AGPLABEL keyword description) of the THEN block excluded some stands. Only stands that had none of the labels specified in the AGPLABEL keyword record in the THEN block, but have at least one label in common with the AGPLABEL keyword record following the ALSOTRY keyword will be considered for the conditional activities that also follow the ALSOTRY keyword. This capability is useful only when multiple stands are included in a simulation.

As an example, assume three stands are to be managed. The first has the stand policy label *PineType*, the second has *PineType* and *Overstocked*, and third has *Overstocked*. An AGPLABEL keyword record is included after the THEN keyword to restrict a thinning to only those stands with the stand policy label *Overstocked*. The second and third stands are considered. An ALSOTRY keyword follows the THEN block, and contains an AGPLABEL keyword record to

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include stands with the stand policy label *PineType*. Only the first stand is considered. Even though the second stand also has the *PineType* label it was considered in the THEN block, and is therefore not available for consideration in the ALSOTRY block.

The ALSOTRY keyword and its associated AGPLABEL keyword record and activities must follow the THEN keyword and its AGPLABEL and activities. The ALSOTRY block must precede the corresponding ENDIF keyword.

Refer to the description for the SPLABEL and AGPLABEL keywords for explanations and examples of the use of policy labels.

No fields are associated with this keyword when used outside of the parallel processing extension.

Example: If the basal area exceeds 150 square feet per acre then, and only then, consider the following options. If the stand has the stand policy label *PineType*, then thin from below to 100 square feet per acre. If the stand does not have the label *PineType* but does have the label *Overstocked*, then thin from above to 95 square feet per acre.

```
IF                0
BBA GT 150
THEN
AGPLABEL
PineType
THINBBA           0       100     1.0     0.0     999.0     0     999
ALSOTRY
AGPLABEL
Overstocked
THINABA           0        95     1.0     0.0     999.0     0     999
ENDIF
```

Note: When ALSOTRY is used without the parallel processing extension (PPE) the activity group policy labels on its AGPLABEL keyword record cannot overlap those on the AGPLABEL keyword record in the THEN block.

References: GTR INT-275, User's Guide to the Event Monitor..., p. 7
               GTR INT-281, User's Guide to the Parallel Processing Extension..., p. 9

ATRTLIST   (After TReatment Tree LIST file)
Variants: All
Related keywords: TREELIST, CUTLIST

Generates an after treatment tree list file.

field 1: Year or cycle in which treelist is to be printed. Enter 0 (zero) to print output for every cycle. *Default = 1*

field 2: File reference number for the output file. File reference numbers are a mechanism that FVS uses to keep track of external files. Numbers less than 30 are reserved for files that are currently used by FVS. *Default = 3*

field 3: Value to determine which header will be printed with the treelist. *Default = 0*
          1   Encoded header record (machine readable, -999)
          0   Header records describing each column (human readable)
          -1   Suppress all headers

Note: By default, the output file name will have a *.tls* extension.

BAIMULT   (Basal Area Increment MULTiplier)
Variants: All
Related keywords: BAMAX, NOCALIB, CALBSTAT, READCORD, REGDMULT, FERTILIZ

Multiplier to change the large tree basal area increment prediction. This modifies the diameter growth rate of trees in the large tree model. The diameter break that separates the large and small tree models varies by variant (Refer to the variant overview).

> field 1: Year or cycle in which the multiplier is applied. Once in effect it remains in effect until replaced by a subsequent multiplier. *Default = 0 (All cycles)*

> field 2: Species code to which the multiplier is applied. *Default = All*

> field 3: Multiplier value. (e.g. a value of 1.1 will increase the predicted basal area growth by 10%) *Default = 1.0 (no change from predicted value)*

Note: For any particular species this keyword remains in effect until a subsequent use of the keyword changes the multiplier for that species.

Note: The multiplier value itself remains constant over time, however this multiplier is applied after the scale factors have been applied. Scale factors may attenuate over time, therefore the modified basal area increment may also attenuate over time.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Caution: Many of the predictions in FVS are based on basal area increment. Changing the large tree basal area increment prediction also changes many of the other predictions made in the model.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 94
                   Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

BAMAX   (Basal Area MAXimum)
Variants: All
Related keywords: BAIMULT, SDIMAX

Modifies the maximum density and the associated mortality pattern for the stand. In the CI variant, crown ratio change is also affected. In all variants other than CI, EM, KT, and NI, BAMAX is used indirectly to set species SDI maximums if the SDIMAX keyword has not been used for that purpose.

> field 1: Maximum basal area (square feet) per acre. *Defaults by variant*

Caution: Use of this keyword can drastically change predicted yields.

Note: When the BAMAX keyword is set, SDIMAX is set based on the BAMAX keyword and the additional SDIMAX keywords are ignored.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

BFDEFECT (Board Foot DEFECT)
Variants: All
Related keywords: MCDEFECT, DEFECT, BFVOLUME, BFFDLN

Specifies species-specific defect corrections for volume estimates. In the western half of the US this keyword specifies the board foot defect. (Cubic foot defect is specified using the MCDEFECT keyword.) In the eastern half of the US this keyword specifies both the board foot and cubic foot defect for the sawlog portion of trees. (Defect for the pulpwood is specified using the MCDEFECT keyword.) Defect percentages are specified by species for the following five dbh's: 5, 10, 15, 20, 25 inches. For example, if the expected defect correction for a five-inch tree is 35 percent, a value of .35 would be entered in the keyword field 3. A linear interpolation function calculates the defect percentage for the specified dbh of the tree. For trees smaller than 5 inches dbh or greater than 25 inches dbh, a constant value for defect correction is applied based on the values in fields 3 and 7 respectively.

>   field 1: Year or cycle in which the defect corrections are to take effect. Once applied it remains in effect until replaced by a subsequent multiplier.
>   *Default = 0 (all cycles)*
>
>   field 2: Species code that will be affected by the defect corrections.
>   *Default = All*
>
>   field 3: Proportion of board foot volume defect for a 5-inch tree. All trees less than 5 inches dbh will be assigned this value. *Range: 0.0 - 1.0, Default = 0.0*
>
>   field 4: Proportion of board foot volume defect for a 10-inch tree.
>   *Range: 0.0 - 1.0, Default = 0.0*
>
>   field 5: Proportion of board foot volume defect for a 15-inch tree.
>   *Range: 0.0 - 1.0, Default = 0.0*
>
>   field 6: Proportion of board foot volume defect for a 20-inch tree.
>   *Range: 0.0 - 1.0, Default = 0.0*
>
>   field 7: Proportion of board foot volume defect for a 25-inch tree. All trees greater than 25 inches dbh will be assigned this value. *Range: 0.0 - 1.0, Default = 0.0*

Note: For any particular species this keyword remains in effect until a subsequent use of the keyword changes the multiplier for that species.

Note: If used inside an IF-THEN-ENDIF sequence, BFDEFECT will not affect cycle 0 volumes.

Note: The PARMS format may be used with this keyword. In the PARMS format, however, 0 (zero) may not be used in the year/cycle field, and hence the defect will not affect cycle 0 volumes. See the introduction for a description of this format.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.3.3

BFFDLN   (Board Foot Form and Defect Log linear equation)
                  Variants: All
                  Related keywords: MCFDLN, BFDEFECT, BFVOLEQU, BFVOLUME

Sets species specific parameters for a log-linear form and defect correction equation for volume estimates. In the western half of the US this affects the calculation of board foot volume. (MCFDLN affects calculation of merchantable cubic foot volume.) In the eastern half of the US this affects the calculation of board foot and cubic foot volumes for the sawlog portion of the trees. (BFFDLN affects calculation of pulpwood volumes.)

$$\ln(V_s) = a_0 + a_1 \ln(V_0)$$

where V_s = volume corrected for form and defect
         V_0 = uncorrected volume
         a_0 = intercept (field 2 value)
         a_1 = slope coefficient (field 3 value)

field 1: Species code whose equation is to be changed. *Default = All*

field 2: Intercept term for log-linear equation (a_0). *Default = 0*

field 3: Slope coefficient for log-linear equation (a_1). *Default = 1*

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 24
                  Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.3.3

BFVOLEQU (Board Foot VOLume EQUation)
                  Variants: All
                  Related keywords: CFVOLEQU, BFVOLUME, BFDEFECT, BFFDLN

Sets species specific parameters for the board foot volume equation. This keyword is only recognized if the BFVOLUME keyword is used and field 7 of the BFVOLUME keyword has a value of 2 or 7.

$$V = b_0 + b_1 D + b_2 DH + b_3 D^2 H + b_4 D^{b_5} H^{b_6}$$

where   V = board foot volume
         D = tree diameter at breast height (dbh)
         H = tree height

field 1: Species code whose equation is to be changed. *Default = All*

field 2: Transition size code. *Default = 0*
                  0 indicates that field 3 is based on DBH
                  1 indicates that field 3 is based on DBH^{2}H

field 3: Transition size. If DBH (or DBH^{2}H, based on the value in field 2) for a particular tree is less than this value, coefficients from the first supplemental record are used in the calculations. If greater than this value, coefficients from the second supplemental record are used.
          Default = 20.5 (For PN and WC: default = 0.0)

Supplemental Records:

Small-tree coefficients b_0 to b_6 are entered in the first seven 10-column fields of the first supplemental record. Large-tree coefficients b_0 to b_6 are entered in the first seven 10-column fields of the second supplemental record.

Note: This keyword is only recognized if the BFVOLUME keyword is used and field 7 of the BFVOLUME keyword has a value of 2 or 7.

Referenece: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.3.2

BFVOLUME (Board Foot VOLUME)
Variants: All
Related keywords: VOLUME, BFDEFECT, BFVOLEQU, BFFDLN

In the western half of the US, this keyword sets the merchantability limits for board foot volume calculation. In the eastern half of the US, this keyword sets the merchantability limits for sawlog volume calculation for both cubic foot and board foot volumes. (The merchantability limits for the pulpwood portion of sawlog trees can be set with the VOLUME keyword.)

field 1:   Year or cycle number in which merchantability limits take effect. Once in effect they remain in effect until replaced. To affect the first cycle you must specify a 0 in field 1. *Default = 0 (all cycles)*

field 2:   Species code for which the limits are to be changed. *Default = All*

field 3:   Minimum merchantable DBH in inches.
Defaults by variant. See variant overview documentation.

field 4:   Minimum top diameter (inside bark (DIB) in the eastern US, outside bark (DOB) in the western US).
Defaults by variant. See variant overview documentation.

field 5:   Stump height in feet. *Default = 1.0*

field 6:   Form class (used only in Region 6). Eastside: This is the diameter inside bark at a height of 17.3 feet as a percentage of outside-bark DBH. Westside: This is the diameter inside bark at a height of 33.6 feet as a percentage of outside-bark DBH. *Default = 80 (Defaults vary by forest, species and diameter class)*

field 7:   Volume calculation method. *Default = 6*
  1   Kemp equations with Allen adjustments.
  2   Kemp equations with Allen adjustments and Brickell small tree and variable top adjustments, or user defined equation if BFVOLEQU keyword is used.
  3   Region 6 Eastside taper equations.
  4   Region 6 Westside taper equations.
  5   Western Sierra log rules.
           CS, LS, NE   Gevorkiantz volume equations
  6   National Volume Estimator Library equations (Scribner).
  7   User defined equation using the BFVOLEQU keyword.
  8   Other volume equations:
           AK   Bruce and Demars (old FVS) equations.
           CR   Hann and Bare equations (region 2 forests use coefficients from the Cibola NF).
           CS, LS, NE   TWIGS volume equations.
           NC, WS   Western Sierra log rules.
  9   International 1/4-inch equations (western variants only).

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Note: For any particular species this keyword remains in effect until a subsequent use of the keyword changes the limits for that species.

Note: Form class for a species is the same regardless of whether cubic foot or board foot volume is being calculated. If both BFVOLUME and VOLUME are specified, the form class (field 6) used for both will be that specified on the keyword entered last.

Caution: If date or cycle are specified (i.e. the date/cycle is not blank and it is not zero) and the species field is either ALL or a species group, then you should be sure to specify all of the remaining parameters. If you do not specify all of the remaining parameters, then the default parameters for the other fields are the default parameters for species 1 (if ALL is selected) or species group 1 (species group is selected).

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 22
GTR INT-208, Supplement to the User's Guide..., p. 18
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.3.1

BGCIN (Bio-Geo-Chemical cycle model INitialization)
Variants: Specialized variants that include the bio-geo-chemical cycle model
Related keywords: END

Signifies the beginning of keywords for the bio-geo-chemical cycle extension. This extension has its own unique set of keywords. The BGCIN keyword sequence must be terminated with an END keyword. All keywords between BGCIN and END are considered bio-geo-chemical cycle extension keywords.

No fields are associated with this keyword.

Caution: At the time of the printing of this document, the BGC extension was experimental in nature, and the procedures were still under development. It had not yet been sanctioned for production use.

References: FVS-BGC: User's Guide to Version 1.0
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 8.9

BMPPIN (westwide pine Beetle Model for the Parallel Processor; INitialization)
Variants: Specialized parallel processor variants that include the westwide beetle model
Related keywords: END

Signifies the beginning of keywords for the westwide pine beetle model extension. This extension has its own unique set of keywords. The BMPPIN keyword sequence must be terminated with an END keyword. All keywords between BMPPIN and END are considered westwide pine beetle model extension keywords. This keyword works only with variants that have been designed to use the parallel processing extension to FVS. The parallel processing extension has its own unique set of specialized keywords.

No fields are associated with this keyword.

Reference: GTR-INT-281, User's Guide to the Parallel Processing Extension ...

BRUST (white pine <u>B</u>lister <u>RUST</u> model initialization)
Variants: Specialized variants that include the blister rust disease model
Related keywords: END

Signifies the beginning of keywords for the blister rust disease extension. This extension has its own unique set of keywords. The BRUST keyword sequence must be terminated with an END keyword. All keywords between BRUST and END are considered blister rust disease extension keywords.

No fields are associated with this keyword.

Note: The Suppose interface program automatically includes BRUST and END keywords whenever any keyword from the blister rust disease extension is included in a simulation through the Use FVS Keywords window.

References: White Pine Blister Rust Impact Model Keyword Reference Guide
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 8.5

CALBSTAT (<u>CALi</u>Bration <u>STAT</u>istics)
Variants: All
Related keywords: BAIMULT, NOCALIB, OPEN

Outputs calibration scale factors computed from the input data to a file for later processing. By default the output will be written to unit 13, which is the same unit used for the CHEAPO output. If desired, however, users can direct the output to a different file using a combination of the CALBSTAT and OPEN keywords.

field 1: File reference number for CALBSTAT output file. File reference numbers are a mechanism that FVS uses to keep track of external files. Numbers less than 30 are reserved for files that are currently used by FVS. *Default = 13*

field 2: Minimum number of diameter growth observations per species to calibrate the large tree diameter increment model. *Default = 5*

field 3: Minimum number of height growth observations per species to calibrate the small tree height increment model. *Default = 5*

Example sending output to new unit:
```
CALBSTAT          50
OPEN              50
CALIBRAT.TXT
```

Note: If using the Suppose interface program the CALBSTAT output file, by default, has the same base name as the simulation file with a *.chp* extension. This is the same file used, by default, for the CHEAPO output.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.3.3

CFVOLEQU (<u>C</u>ubic <u>F</u>oot <u>VOL</u>ume <u>EQU</u>ation)
Variants: All
Related keywords: BFVOLEQU, VOLUME, MCDEFECT, MCFDLN

Sets species specific parameters for the volume equation used for all cubic foot volume calculations (this includes both sawlog and pulpwood volume in the eastern US). This keyword is

only recognized if the VOLUME keyword is used and field 7 of the VOLUME keyword has a value of 1 or 7.

$$V = b_0 + b_1D + b_2DH + b_3D^2H + b_4D^{b_5}H^{b_6}$$

where   V = board foot volume
                D = tree diameter at breast height (dbh)
                H = tree height

field 1:   Species code whose equation is to be changed. *Default = All*

field 2:   Transition size code. *Default = 1 for PP, 0 otherwise (PN and WC: default = 0)*
             0 indicates that field 3 is based on DBH
             1 indicates that field 3 is based on DBH^2H

field 3:   Transition size. If DBH (or DBH^2H, based on the value in field 2) for a particular tree is less than this value, coefficients from the first supplemental record are used in the calculations. If greater than this value, coefficients from the second supplemental record are used.
Default = 6000 for PP, 0 otherwise (PN and WC: default = 0)

Supplemental Records:
      Small-tree coefficients b_0 to b_6 are entered in the first seven 10-column fields of the first supplemental record. Large-tree coefficients b_0 to b_6 are entered in the first seven 10-column fields of the second supplemental record.

Note: This keyword is only recognized if the VOLUME keyword is used and field 7 of the VOLUME keyword has a value of 1 or 7.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.3.2

CHEAPO

(Computer Help for the Economic Analysis of Prognosis Output)
Variants: All
Related keywords: OPEN

Generates an output file required for subsequent execution of the CHEAPO II economic analysis program. By default the output will be written to unit 13, which is the same unit used for the CALBSTAT output. , If desired, however, users can direct the output to a different file using a combination of the CHEAPO and OPEN keywords.

field 1:   File reference number for CHEAPO output file. File reference numbers are a mechanism that FVS uses to keep track of external files. Numbers less than 30 are reserved for files that are currently used by FVS. *Default = 13*

Example sending output to new unit:
```
CHEAPO            40
OPEN              40
CHEAPDAT.TXT
```

Note: If using the Suppose interface program the CHEAPO output file, by default, has the same base name as the simulation file with a *.chp* extension. This is the same file used, by default, for the CALBSTAT output.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 86
                      GTR INT-211, User's Guide to CHEAPO II..., p. 21

CLOSE

(<u>CLOSE</u> a file)
Variants: All
Related keywords: OPEN

Closes a file that was opened using an OPEN keyword.

> field 1: File reference number for the file to be closed. This number must match the file reference number from the appropriate OPEN keyword. File reference numbers are a mechanism that FVS uses to keep track of external files. Numbers less than 30 are reserved for files that are currently used by FVS.

Note: The Suppose interface program automatically includes OPEN and CLOSE keywords for every tree data file included in the simulation.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.2.4

COMMENT

(insert <u>COMMENT</u>s)
Variants: All
Related keywords: END

Enters comments into the sequence of FVS keywords. The comments can be entered on as many supplemental records as desired. Signify the end of the comment with an END keyword. Including this set of keywords will not affect a simulation, however they are printed to the main FVS output file. Keywords contained in a COMMENT block are ignored in the simulation. To test the effects of omitting a keyword, a COMMENT keyword can be placed before it, and an END keyword can be placed after it.

> No fields are associated with this keyword, however supplemental records are used.

> Supplemental Record(s):
> Comments are entered in Columns 1-80 on as many supplemental records as desired. The END keyword must follow the last supplemental record.

Example:
```
COMMENT
This is a comment.  Nothing placed
in here will affect the simulation.
END
```

Note: An alternative method for creating a single-line comment is to place an asterisk (*) as the first character of a record. With few exceptions, that record is then ignored by FVS regardless of its placement in the keyword sequence. Records beginning with an exclamation point (!) are also ignored by FVS, but are not written to the output file. This convention is used by the Suppose interface program to insert the information it needs.

Note: If using the Suppose interface program comments may be added using the "Edit Simulation Notes" feature accessible through the Extras menu.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.3.2

COMPRESS (COMPRESS the treelist)

Variants: All
Related keywords: TREELIST, CUTLIST, NOTRIPLE, NUMTRIP

Reduces the number of tree records stored inside FVS. This is done automatically when room is needed to store new trees created by the Regeneration Establishment process. You can use this keyword manually to schedule the tree compression process. When there are many records in the treelist, the record compression algorithm can reduce the number of records while minimizing loss of within-stand variation in tree attributes that are important for increment prediction. As a result, the number of calculations required for the projection can be reduced without significant bias.

Two methods are used to form new tree records. First, groups are formed by finding the largest differences between trees. Then those groups with the greatest variation are split to form new groups. Field 3 controls the weight given to these methods.

field 1:   Year or cycle in which the treelist will be compressed. *Default = 1*

field 2:   Number of tree records that will remain following compression. *Default = 675*

field 3:   Percentage of new records that will be determined by finding the largest differences between trees. Remainder of records will result from splitting the classes with the greatest variation. *Range: 0 - 100, Default = 50*

field 4:   Debug flag. Any numeric entry in this field will cause (a great deal of) output to be printed for the compression algorithm. *Default = blank (no debug output)*

Note: If COMPRESS is specified for the first or second cycle, the tree records will be subsequently tripled unless NOTRIPLE or NUMTRIP is used to suppress the record tripling feature.

Caution: Compression can cause trees to loose their plot specific identity, as they may be combined with "like" trees from a neighbor plot.

References: GTR INT-208, Supplement to the User's Guide..., p. 19
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 7.6

COMPUTE (COMPUTE variables)

Variants: All
Related keywords: END

The COMPUTE keyword is part of the FVS Event Monitor. It allows the user to define variables expressed as mathematical expressions containing constants, Event Monitor variables, Event Monitor functions, and variables previously defined using the COMPUTE keyword. The value of variables may depend on events such as harvest or mortality. Variables are defined using mathematical equations in supplemental records, which are up to 80 characters long. Each subsequent variable must be defined on a subsequent record. The END keyword must follow the last supplemental record.

field 1:   Year or cycle in which the expressions are to be evaluated. Enter 0 (zero) to have the expressions evaluated for every cycle. *Default = 1*

Supplemental record(s):
Contains mathematical expressions that consist of a user-defined variable name on the left of the equal sign, and a value or expression that is already defined on

the right of the equal sign. An END keyword must be included after the last
supplemental record.

Note: Expressions may contain up to 2000 characters. If an expression is too long to fit on a
single 80-character record, use an ampersand (&) at the end of the record to indicate that
the expression is continued on the next record.

Note: A variable name may no longer than eight characters and may not be a word that is
reserved for use by FVS or the Event Monitor.

Note: A maximum of 200 variables may be computed for any simulation. This is the total
number of all variables computed by all COMPUTE keywords.

Example:
```
COMPUTE            0
PI = 3.1416
REMVD_BA = BBA - ABA
DF_TPA = SPMCDBH(1,DF,0)
END
```

In the above example, BBA and ABA are Event Monitor variables, and SPMCDBH( ) is
an Event Monitor function. (See GTR INT-275, User's Guide to the Event Monitor)

References: GTR INT-275, User's Guide to the Event Monitor..., p. 5
                   Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.6

COVER   (initialize COVER extension)
                 Variants: BM, CI, EC, EM, KT, NC, NI, SO, TT, UT, WS
                 Related keywords: END

Signifies the beginning of keywords for the Cover extension. The Cover extension has its own
unique set of keywords (see GTR INT-190, Cover: A User's Guide...) The COVER keyword
sequence must be terminated with an END keyword. All keywords between COVER and END
are considered Cover extension keywords.

field 1: Year or cycle in which COVER calculations begin. COVER calculations will
also be performed in all cycles after the one specified. *Default = 1*

field 2: File reference number for COVER output file. If this field is left blank the
COVER report will be written to the FVS output file. If the value is any number
other than 16 or blank, then an associated COVER output file needs to be
opened with OPEN keyword. *Default = 16*

Note: When using the Suppose interface program, the END keyword that terminates the cover
keyword sequence is included automatically.

Example sending output to new unit:
```
OPEN              36
COVER.OUT
COVER             0         36
END
```

Note: The Suppose interface program automatically includes COVER and END keywords
whenever any keyword from the Cover extension is included in a simulation through the
Use FVS Keywords window.

References: GTR INT-190, Cover: A User's Guide..., p. 14

CRNMULT   (CRowN change MULTiplier)
Variants: All except CI, KT, and NI
Related keywords: HTGMULT, HTGSTOP, PRUNE

Alters the change in crown ratio by a specified proportion. In the case of crown dubbing (generating values for missing crown ratio data), the dubbed crown ratio is adjusted by the specified proportion. This multiplier may affect diameter and height growth in subsequent cycles.

field 1: Year or cycle in which the multiplier is applied. Once in effect it remains in effect until replaced by a subsequent multiplier. *Default = 1*

field 2: Species code to which the multiplier is applied. *Default = All*

field 3: Multiplier value. For example, a value of 1.1 will make the crown ratio change 10% greater. A tree that had a crown ratio going from 90 to 80 (a 10% change) would now have a crown going from 90 to 79 (an 11% change, or 1.1 times the original change). When applied to dubbed crowns, the initial crown ratio is multiplied by this value. *Default = 1.0*

field 4: Minimum dbh in inches (greater than or equal to) to which the multiplier is applied. *Default = 0.0*

field 5: Maximum dbh in inches (less than) to which the multiplier is applied. Default = 999.0

field 6: Dubbing flag. *Default =0*
  0   Applied to the crown change and dubbed crowns.
  Positive number   Applied to dubbed crowns only.

Note: For any particular species this keyword remains in effect until a subsequent use of the keyword changes the multiplier for that species.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

CRUZFILE   (Cruise file)
Variants: All

Creates a tree list for input into the National Cruise Program.

field 1: Cycle or year in which the output is to be printed. Enter 0 (zero) to print output for all cycles. *Default = 1*

field 2: Printing of treelist information. This field only has effect on the output if field 1 is 1 or the beginning year of the simulation. *Default = 0*
  0   Print cycles 0 and 1
  1   Print only cycle 1, suppress cycle 0
  2   Print only cycle 0, suppress cycle 1

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 47
                GTR INT-208, Supplement to the User's Guide..., p. 14
                Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.3.1

CUTEFF

(<u>CUT</u>ting <u>EFF</u>iciency)
Variants: All
Related keywords: THINxxx

Sets the proportion of trees represented by a tree record that can be removed in any thinning. For example, if a tree record that is designated for removal in a thinning represents 200 trees per acre and the cutting efficiency is set to 0.8, 160 trees per acre (80%) will be removed from that record leaving 40 trees per acre standing. The CUTEFF keyword alone does not remove trees. It must be followed by one or more thinning keywords that, in conjunction with the CUTEFF keyword, determine the number of trees to be removed from each tree record.

field 1: Cutting efficiency. This is the proportion of the sample trees represented by a record that is removed if a tree is designated for removal in a thinning. *Range: 0.01 - 1.0, Default = 1.0*

Note: Keyword order is important. The cutting efficiency specified on a CUTEFF keyword only applies to thinning keywords that follow the CUTEFF keyword.

Note: Multiple CUTEFF keywords can be included in a keyword set.

Note: There is also a cutting efficiency parameter on each thinning request keyword. If a value is specified as part of a thinning request, it only applies to that thinning request. If a value is not supplied with the thinning request, the cutting efficiency parameter associated with the CUTEFF keyword will be used.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 21
                GTR INT-208, Supplement to the User's Guide..., p. 15
                Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.2

CUTLIST

(<u>CUT</u> tree tree<u>LIST</u>)
Variants: All
Related keywords: TREELIST, FVSSTAND, THINxxx, OPEN

Prints a list of all harvested tree records to an output treelist file. CUTLIST output is integrated into the same output file produced using the TREELIST keyword.

field 1: Year or cycle in which cut list is to be printed. Enter 0 (zero) to print output for every cycle in which a thinning occurs. *Default = 1*

field 2: File reference number for the output file. File reference numbers are a mechanism that FVS uses to keep track of external files. Numbers less than 30 are reserved for files that are currently used by FVS. *Default = 3*

field 3: Value to determine which header will be printed with the cut list. *Default = 0*
        1   Encoded header record (machine readable, -999)
        0   Header records describing each column (human readable)
     -1   Suppress all headers

field 4:   *Not used*

field 5:   *Not used*

field 6:   Cutlist format. *Default = 0*
        0   Current format
        1   Old version 6.1 format

Note: If the CUTLIST output is intended for use with post-processing programs, it must contain headers and be in the current format (i.e. field 3 must be 0, 1, or blank, and field 6 must be 0 or blank).

Note: If using the Suppose interface program the CUTLIST output file, by default, has the same base name as the simulation file with a *.trl* extension. This is the same file used, by default, for the TREELIST output.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 21
GTR INT-208, Supplement to the User's Guide..., p. 15
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.3.1

CWEQN

(Crown Width EQuatioN)
Variants: All
Related keywords: FIXCW

Sets species specific parameters for the crown width equations used for the specified species.

$$CW = b_0 + b_1D + b_2D^{b_3}$$

Where CW = crown width
      D = tree diameter at breast height (dbh)

field 1:   Species code whose equations are to be changed. *Default = All*

field 2:   Transition size. If DBH for a particular tree is less than this value, coefficients from the first four fields of the supplemental record are used in the calculations. If greater than this value, coefficients from the last four fields of the supplemental record are used.
Default = 0

Supplemental Records:
Small-tree coefficients b_0 to b_3 are entered in the first four 10-column fields of the supplemental record (fields 1 through 4). Large-tree coefficients b_0 to b_3 are entered in the last four 10-column fields of the second supplemental record (fields 5 through 8).

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator,   s. 5.3.2

CYCLEAT

(CYCLE boundary occurs AT)
Variants: All
Related keywords: TIMEINT, NUMCYLE

Sets a cycle boundary to occur at the year specified in field 1. It is possible to have many CycleAt keywords in the same simulation.

field 1: Year *Default = none*

Note: If the year is prior to the inventory year, beyond the end of the simulation or the year is already a cycle boundary, no action is taken.

DATABASE (<u>DATABASE</u> Initialization)
Variants: All
Related keywords: END

Signifies the beginning of keywords for the Database Extension. This extension has its own unique set of keywords. The DATABASE keyword sequence must be terminated with an END keyword. All keywords between DATABASE and END are considered Database extension keywords.

Note: The Suppose interface program automatically includes DATABASE and END keywords whenever any keyword from the Database Extension is included in a simulation through the Use FVS Keywords window.

No fields are associated with this keyword.

DATASCRN (<u>DATA</u> <u>SCR</u>ee<u>N</u>)
Variants: All
Related keywords: TREEDATA

Allows users to screen out input data by diameter or species.

field 1: Smallest dbh in inches to be considered for input (greater than or equal).
Default = 0.0

field 2: Largest dbh in inches to be considered for input (less than).   *Default = 999.0*

field 3: Species code. All tree records with this species code outside the defined diameter range will be ignored.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator,   s. 4.2.3.1

Note: This keyword cannot be used in the Event Monitor.

Note: This keyword must precede the TREEDATA keyword and can not be used in conjunction with the TREEDATA keyword to screen multiple species. It must also precede the DSNIN, TREESQL and STANDSQL keywords if data is being read in from a database.

DEBUG (print <u>DEBUG</u> output)
Variants: All
Related keywords: OPEN, NODEBUG

Used to request printing of program calculations as they occur. DO NOT use this keyword unless you have a good reason because a tremendous amount of output results.

field 1: Cycle for which full program debug output is requested. If blank or 0, debug output will be printed for all cycles. *Default = 0*

field 2:   If debugs are desired for specific subroutines, a non-zero number is entered and the specific subroutines are listed on the supplemental record. A blank or no entry will result in debugs for all subroutines. *Default = blank*

field 3:   File reference number for DEBUG output file. File reference numbers are a mechanism that FVS uses to keep track of external files. Numbers less than 30 are reserved for files that are currently used by FVS. The default is to send the output to unit 16, which is the main FVS output file. *Default = 16*

Supplemental record:
>   Specify the name of the subroutine to debug. If you list more than one subroutine, they need to be space delimited.

Caution: This keyword generates a tremendous amount of output.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 9.3

DEFECT

(DEFECT)
Variants: All
Related keywords: BFDEFECT, MCDEFECT

Specifies species-specific defect corrections. In the eastern half of the US this keyword specifies defect for pulpwood and/or sawlog volume estimates. In the western half of the US this keyword specifies defect for merchantable cubic and/or board foot volume. Defect percentages are specified by species for the following eight dbh's: 5, 10, 15, 20, 25, 30, 35, 40 inches. For example, if the expected defect correction for a five-inch tree is 35 percent, a value of .35 would be entered in field 1 of the supplemental record. A linear interpolation function calculates the defect percentage for the specified dbh of the tree. For trees smaller than 5 inches dbh or greater than 40 inches dbh, a constant value for defect correction is applied based on the values in fields 1 and 8 respectively of the supplemental record.

field 1:   Type of volume affected. *Default = 0*
>   *Eastern Variants*
>   0   Both pulpwood and sawlog
>   1   Just pulpwood
>   2   Just sawlog
>   *Western Variants*
>   0   Both merchantable cubic and board foot
>   1   Just merchantable cubic
>   2   Just merchantable board foot

field 2:   Species code that will be affected by the defect corrections.
>   *Default = All*

field 3:   Specifies whether the defect read in from the input tree record will be used.
>   0   volume defect percentages read as part of the input data will be used to calculate volume. *Default = 0*
>   1 ≤   volume defect percentatges read as part of the input data will not be used to calculate volume.

Supplemental Records:
>   Defect values are entered in the first eight 10-column fields of the supplemental record (fields 1 through 8). Field 1 of the supplemental record assigns a defect value to the 5 inch dbh class. Field 2 of the supplemental record assigns a defect

value to the 10 inch dbh class. The following fields assign a defect value to their respective dbh class.
Range: 0.0 - 1.0, Default = 0.0

Note: Once applied to a simulation this keyword affects all cycles. To schedule defect for a specific cycle, use the MCDEFECT or BFDEFECT keywords. This keyword may be used multiple times in the same simulation, to specify defect for pulpwood or merchantable cubic foot volume, defect for sawlog or board foot volume, and/or to specify different factors by species.

Note: This keyword cannot be used in the Event Monitor.

DELOTAB   (<u>DEL</u>ete <u>O</u>utput <u>TAB</u>les)
Variants: All

Used to selectively delete tables that are, by default, part of the standard FVS output.

field 1:   Code for table that is to be deleted. *Default = blank (no tables deleted)*
        1 = delete the stand composition table.
        2 = delete the selected sample tree table.
        3 = delete the summary statistics table.
        4 = delete the activity summary table

NOTE: Multiple DELOTAB keywords are required to delete two or more portions of the FVS output.

NOTE: If field one is blank, the Standard FVS output will be produced.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.4

DESIGN   (sampling <u>DESIGN</u>)
Variants: All
Related keywords: STDINFO, STDIDENT, TFIXAREA

Specifies information about the sampling design used to collect tree data.

field 1:   A positive value is interpreted as a basal area factor for horizontal angle gauge (prism). A negative value is interpreted as the inverse of a large-tree fixed area plot. *Default = 40*

field 2:   Inverse of the small-tree fixed area plot (e.g. if the fixed area plot is 1/100 acre, enter 100 in this field). *Default = 300*

field 3:   Break point diameter in inches. Any trees smaller than this diameter were sampled using the small-tree fixed area plots. Trees with diameters greater than or equal to this diameter were sampled using the specified BAF or large-tree fixed area plots. *Default = 5.0*

field 4:   Number of plots in the stand. If blank or 0 (zero), the number of plots in the stand is determined by counting the numbers of unique plot identification codes on the tree record data. *Default = blank (FVS count)*

field 5: Number of nonstockable plots in the stand (e.g. plots fell on a road or rock outcrop). If blank, count nonstockable plots on tree records (value class = 8). *Default = blank (FVS count)*

field 6: Sampling weight (usually acres) for the stand. This weight does not affect the projection, but is used in programs that aggregate projections to produce a composite yield table. *Default = blank (number of plots)*

field 7: Proportion of the stand considered stockable. A value entered in this field will override the calculation based on number of plots stockable versus total number of plots. *Range: 0 - 1.0, Default = 1.0*

Note: The Suppose interface program automatically includes a DESIGN keyword based on the stand and plot data in the stand list file. To override any field of the Suppose-generated DESIGN keyword, only enter values in the fields that are to be overridden.

Note: If small tree data are collected on a cluster of fixed plots instead of a single fixed plot, either the value in field 2 should reflect the total fixed plot area, or the TFIXAREA keyword should be included after the DESIGN keyword to reflect the total fixed plot area.

Note: The value entered in field 5 for sampling weight is available in the event monitor in the variable SAMPWT. Refer to the User's Guide to the Event Monitor.

Note: If the value entered for field 7 is greater than 1 it will be assumed to be a percentage rather than a proportion and the value will be divided by 100.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 10
GTR INT-208, Supplement to the User's Guide..., p. 15
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.2.3

DFB   (Douglas-Fir Beetle model initialization)
Variants: Specialized variants that include the Douglas-fir beetle model
Related keywords: END

Signifies the beginning of keywords for the douglas-fir beetle extension. This extension has its own unique set of keywords. The DFB keyword sequence must be terminated with an END keyword. All keywords between DFB and END are considered Douglas-fir beetle extension keywords.

No fields are associated with this keyword.

Note: The Suppose interface program automatically includes DFB and END keywords whenever any keyword from the Douglas-fir beetle extension is included in a simulation through the Use FVS Keywords window.

References: Douglas-fir Beetle Impact Model Keyword Reference Guide
GTR-RM-000, User's Guide to the Douglas-fir Beetle Impact Model
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 8.6.1

DFTM   (Douglas-Fir Tussock Moth model initialization)
Variants: Specialized variants that include the Douglas-fir tussock moth model
Related keywords: END

Signifies the beginning of keywords for the Douglas-fir tussock moth extension. This extension
has its own unique set of keywords. The DFTM keyword sequence must be terminated with an
END keyword. All keywords between DFTM and END are considered Douglas-fir tussock moth
extension keywords.

No fields are associated with this keyword.

Note: The Suppose interface program automatically includes DFTM and END keywords
whenever any keyword from the Douglas-fir tussock moth extension is included in a
simulation through the Use FVS Keywords window.

References: Douglas-fir Tussock Moth Outbreak Model Keyword Reference Guide
GTR-INT-127, A User's Guide to the Combined Stand Prognosis and Douglas-
fir Tussock Moth Outbreak Model
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 8.7

DGSTDEV   (Diameter Growth STandard DEViation)
Variants: All
Related keywords: NUMTRIP, NOTRIPLE

Changes the limits of the normal distribution from which random errors are drawn for diameter
increment predictions. This region is, by default, bounded by ±2 standard deviations.

field 1:   Number of standard deviations that defines the bounds of distribution. If set to a
value less than 1.0, random error will be completely suppressed. *Default = 2.0*

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 93
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.4.2

ECHO   (ECHO)
Variants: All
Related keywords: NOECHO

Turns the echoing of keyword information, read on input, to the Options Selected by Input table of
the Main Output file, back on, if it was turned off with the NOECHO keyword.

No fields are associated with this keyword.

ECHOSUM   (ECHO the SUMmary table)
Variants: All
Related keywords: CALBSTAT, NOSUM

Specifies that the summary statistics table from the standard FVS output file be written to a
separate file. The summary statistics table will still be written to the standard FVS output file.

field 1:   File reference number for the output file. File reference numbers are a mechanism that FVS uses to keep track of external files. Numbers less than 30 are reserved for files that are currently used by FVS. *Default = 4*

Note: This keyword is required in order to use the "Average Summary Table" post processor. This post processor uses the ECHOSUM output file as input.

Note: If using the Suppose interface program the ECHOSUM output file, by default, has the same base name as the simulation file with a *.sum* extension.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 48
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.3.2

END

(<u>END</u> special sequence)
Variants: All
Related keywords: COMMENT, COMPUTE, COVER, ESTAB, FMIN

Signifies the end of a special keyword sequence. Essentially, the END keyword returns control of the simulation to the base FVS system after an extension (such as the Establishment Model) has been called.

No fields are associated with this keyword.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 85
Essential FVS: A User's Guide to the Forest Vegetation Simulator, ss. 4.1.3.2, 5.4.3, 5.6

ENDIF

(<u>END</u> an <u>IF</u>-then block)
Variants: All
Related keywords: IF, THEN, ALSOTRY

Signifies the end of an Event Monitor IF-THEN block. Activities that follow the ENDIF keyword are scheduled normally.

No fields are associated with this keyword.

Note: When using the Suppose interface program, the ENDIF keyword will be added automatically whenever the keyword is correctly scheduled "by condition" using a keyword window.

References: GTR INT-275, User's Guide to the Event Monitor..., p. 2
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.5.1

ENDFILE

(<u>END</u> of <u>FILE</u>)
Variants: All
Related keywords: OPEN

Issues an end-of-file command for the specified file.

field 1:   File reference number for the file to be terminated. This number must match the file reference number from the appropriate OPEN keyword. File reference

numbers are a mechanism that FVS uses to keep track of external files. Numbers less than 30 are reserved for files that are currently used by FVS.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.2.4

ESTAB

(ESTABlishment model)
Variants: All
Related keywords: END

Signifies the beginning of keywords for the Regeneration Establishment extension. This extension has its own unique set of keywords (see the Establishment keyword descriptions at the end of this guide, and GTR INT-279, User's Guide to the Regeneration Establishment Model...) The ESTAB keyword sequence must be terminated with an END keyword. All keywords between ESTAB and END are considered Establishment extension keywords.

> field 1: Year or cycle of disturbance or beginning of regeneration. The seedling tally sequence will begin in this year. *Default = 0 (all cycles)*

Caution: Some care is necessary when entering a disturbance date to insure that the regeneration establishment model is called at the correct time. Pay close attention to cycle boundaries when entering disturbance date.

Caution: If the ESTAB keyword is embedded in an IF-THEN-ENDIF sequence, year of disturbance (field 1) is interpreted as years from the time the condition is true until establishment, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to establish the stand.)

Note: The Regeneration Establishment extension keyword sequence must begin with an ESTAB keyword and end with an END keyword; all keywords contained within this sequence are considered Regeneration Establishment keywords.

Note: The Suppose interface program automatically includes ESTAB and END keywords whenever any keyword from the Regeneration Establishment extension is included in a simulation through the Use FVS Keywords window, or when the Planting and Natural Regeneration management action is used.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 86
                  GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 11
                  Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3

FERTILIZ

(FERTILIZe)
Variants: All
Related keywords: HTGMULT, BAIMULT

Simulates application of fertilizer to the stand. Rates of application can be entered for nitrogen, phosphorus, and potassium. Currently, however, only applications of 200 pounds of nitrogen per acre are represented by the model. User supplied rates for all three nutrients are ignored. The effects of fertilization are accounted for after growth and mortality have been predicted, so only subsequent cycles are affected.

> field 1: Year or cycle of fertilizer application. *Default = 1*

> field 2: Rate of application for nitrogen in pounds per acre. *Currently fixed at 200*

field 3: Rate of application for phosphorus in pounds per acre. *Currently fixed at 0*

field 4: Rate of application for potassium in pounds per acre. *Currently fixed at 0*

field 5: Multiplier for modifying the predicted response to fertilizer application (e.g. 1.1 results in a 10% increase over the predicted fertilization response). *Default = 1.0*

Note: The effects are based on data from northern Idaho.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Caution: If this keyword is embedded in an IF-THEN-ENDIF sequence, field 1 is interpreted as years from the time the event is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after event is true to fertilize the stand.)

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

FIXCW

(FIXed Crown Width)
Variants: All
Related keywords: CWEQN

Multiplier used to modify the crown width estimates for trees of the specified species within the specified diameter range.

field 1: Year or cycle in which the multiplier is applied. Enter 0 (zero) to affect all cycles. *Default = 1*

field 2: Species code to which the multiplier will be applied. *Default = All*

field 3: Multiplier value. (e.g. a value of 1.1 will increase the predicted crown width by 10%) *Range: 0.0 - 999.0, Default = 1.0 (no change from predicted value)*

field 4: Minimum dbh in inches (greater than or equal to) to which the multiplier will be applied. *Default = 0.0*

field 5: Maximum dbh in inches (less than) to which the multiplier will be applied. *Default = 999.0*

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Caution: If this keyword is embedded in an IF-THEN-ENDIF sequence, field 1 is interpreted as years from the time the event is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after event is true to apply the multiplier.)

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator,   s. 6.5.2.4

FIXDG

(FIXed Diameter Growth)
Variants: All
Related keywords: BAIMULT, DGSTDEV, READCORD, REGDMULT

Multiplier used to modify the diameter growth rate of the specified species within the specified diameter range. This modifier is applied after growth prediction calculations, therefore adjusting

the diameter growth will not affect height growth for that cycle. However, the changed diameter growth and resulting change in basal area will affect mortality that cycle.

> field 1: Year or cycle in which the multiplier is applied. Enter 0 (zero) to affect all cycles. *Default = 1*
>
> field 2: Species code to which the multiplier will be applied. *Default = All*
>
> field 3: Multiplier value. (e.g. a value of 1.1 will increase the predicted diameter growth by 10%) *Range: 0.0 - 999.0, Default = 1.0 (no change from predicted value)*
>
> field 4: Minimum dbh in inches (greater than or equal to) to which the multiplier will be applied. *Default = 0.0*
>
> field 5: Maximum dbh in inches (less than) to which the multiplier will be applied. *Default = 999.0*

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Caution: Many of the predictions in FVS are based on diameter increment. Changing the diameter increment prediction also changes many of the other predictions made in the model.

Caution: If this keyword is embedded in an IF-THEN-ENDIF sequence, field 1 is interpreted as years from the time the event is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after event is true to apply the multiplier.)

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

FIXHTG

(FIXed HeighT Growth)
Variants: All
Related keywords: HTGMULT, HTGSTOP, READCORH, READCORR, REGHMULT

Multiplier used to modify the height growth rate of the specified species within the specified diameter range. This modifier is applied after growth prediction calculations, therefore adjusting the height growth will not affect diameter growth for that cycle.

> field 1: Year or cycle in which the multiplier is applied. Enter 0 (zero) to affect all cycles. *Default = 1*
>
> field 2: Species code to which the multiplier will be applied. *Default = All*
>
> field 3: Multiplier value. (e.g. a value of 1.1 will increase the predicted height growth by 10%) *Range: 0.0 - 999.0, Default = 1.0 (no change from predicted value)*
>
> field 4: Minimum dbh in inches (greater than or equal to) to which the multiplier will be applied. *Default = 0.0*
>
> field 5: Maximum dbh in inches (less than) to which the multiplier will be applied. *Default = 999.0*

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Caution: If this keyword is embedded in an IF-THEN-ENDIF sequence, field 1 is interpreted as years from the time the event is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after event is true to apply the multiplier.)

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

FIXMORT   (FIXed MORTality)
Variants: All
Related keywords: MORTMULT, BAMAX, SDIMAX

Induces mortality of a fixed proportion of the trees per acre represented by tree record of the specified species and within the specified diameter range. This can replace the predicted mortality or be in addition to the predicted mortality, or the effective mortality can be the larger of the two. For example, if a tree record represents 200 trees per acre of the designated species and within the specified diameter range, and the mortality rate is set to 0.3 and set to replace predicted mortality, 60 trees per acre (30%) from that record will die strictly due to this keyword.

field 1:   Year or cycle in which specified mortality rate is to take effect. Enter 0 (zero) to affect all cycles. *Default = 1*

field 2:   Species code to which mortality rate will be applied. *Default = All*

field 3:   Proportion of the tree record that will be killed. *If field 6 is 0, 1 or 2, Range: 0.0 - 1.0. If field 6 is 3, then field 3 can be greater than or equal to 0. Default = 0.0, for all options.*

field 4:   Minimum dbh in inches (greater than or equal to) to which the mortality rate will be applied. *Default = 0.0*

field 5:   Maximum dbh in inches (less than) to which the mortality rate will be applied. *Default = 999.0*

field 6:   Effective mortality. *Default = 0*
- 0   Replaces the mortality rate calculated in the model.
- 1   Added to the mortality rate calculated in the model.
- 2   Compared to the mortality rate calculated in the model and the larger value is used.
- 3   Multiply model calculated mortality by the proportion specified in field 3.

field 7:   Distribution of the mortality caused by this keyword. *Default = 0*
- 0   Mortality applied uniformly to the specified species in the specified dbh range.
- 1   Mortality applied to the specified species in the specified dbh range on a point basis, first on point 1, then on point 2, etc.
- 10   Mortality applied to the specified species in the specified dbh range by tree diameter, smallest to largest.
- 11   Mortality applied to the specified species in the specified dbh range on a point basis and by size, smallest to largest on point 1, then smallest to largest on point 2, etc.
- 20   Mortality applied to the specified species in the specified dbh range by tree diameter, largest to smallest.
- 21   Mortality applied to the specified species in the specified dbh range on a point basis and by size, largest to smallest on point 1, then largest to smallest on point 2, etc.

Note: If option 1 or 2 is entered into Field 6, then Field 7 only applies to the mortality resulting from the specific FIXMORT request; it does not redistribute the model-calculated base model mortality. However, if option 0 or 3 is entered into Field 6, then it can redistribute the model-calculated mortality. Insect and pathogen or fire model mortality is not affected by this keyword.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Caution: This keyword may override BAMAX and SDIMAX related mortality.

Caution: If the value for field 6 is 1 the effect of multiple FIXMORT keywords is cumulative.

Caution: If this keyword is embedded in an IF-THEN-ENDIF sequence, field 1 is interpreted as years from the time the event is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after event is true to apply the mortality.)

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

FMIN (Fire Model INitialization)
Variants: All
Related keywords: END

Signifies the beginning of keywords for the Fire and Fuels Extension. This extension has its own unique set of keywords. The FMIN keyword sequence must be terminated with an END keyword. All keywords between FMIN and END are considered Fire extension keywords.

Note: The Suppose interface program automatically includes FMIN and END keywords whenever any keyword from the Fire and Fuels extension is included in a simulation through the Use FVS Keywords window.

No fields are associated with this keyword.

Reference: Fire and Fuels Extension to the Forest Vegetation Simulator [draft]
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 8.2

FVSSTAND (FVS STAND tables)
Variants: All
Related keywords: TREELIST, CUTLIST

Generates an output file specifically for running the FvsStand post processor. The post processor generates stand and stock tables in a variety of formats. The output file format is similar to that of the TREELIST and CUTLIST keywords. In addition FVSSTAND output files contain stand structure and age data, as well as past tree measurement data.

field 1: Cycle or year in which the output is to be printed. Enter 0 (zero) to print output for all cycles. *Default = 1*

field 2: Printing of treelist information. This field only has effect on the output if field 1 is 1 or the beginning year of the simulation. *Default = 0*
        0   Print cycles 0 and 1
        1   Print only cycle 1, suppress cycle 0

	2	Print only cycle 0, suppress cycle 1

Note: Use of this keyword does not automatically start the FvsStand post processor program.

Note: The FVSSTAND output file has the same base name as the simulation file with a *.fst* extension.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.3.5

GROWTH   (GROWTH measurement method)
Variants: All

Specifies the methods used to measure and input diameter growth, height growth and mortality data. This information is used by FVS to determine how to interpret the diameter increment, height increment, and tree history fields of the input tree data. Growth estimates can be either directly measured or computed as the difference between two successive diameter or height measurements. Furthermore, the values for diameter and height can describe the tree at either the start or the end of the growth period.

field 1: Method used to measure diameter growth. *Default = 0*

	0	Measured directly (e.g. increment core). Current diameter represents an outside-bark measurement at the end of growth measurement period, and diameter increment represents inside-bark previous growth.
	1	Subsequent measurement. Current diameter represents an outside-bark measurement at the end of the growth measurement period, and diameter increment represents a total outside-bark diameter measurement at the beginning of the growth measurement period.
	2	Measured directly (e.g. increment core). Current diameter represents an outside-bark measurement at the beginning of growth measurement period, and diameter increment represents inside-bark subsequent growth.
	3	Subsequent measurement. Current diameter represents an outside-bark measurement at the beginning of the growth measurement period, and diameter increment represents a total outside-bark diameter measurement at the end of the growth measurement period.

field 2: Length of diameter growth measurement period. This is the number of years that the diameter increments in the tree data file represent. *Default = 10 (NC and SN default = 5)*

field 3: Method used to measure height growth. *Default = 0*

	0	Measured directly. Current height represents a measurement at the end of growth measurement period, and height increment represents previous growth.
	1	Subsequent measurement. Current height represents a measurement at the end of the growth measurement period, and height increment represents a total height measurement at the beginning of the growth measurement period.
	2	Measured directly. Current height represents a measurement at the beginning of growth measurement period, and height increment represents subsequent growth.

3   Subsequent measurement. Current height represents a measurement at the beginning of the growth measurement period, and height increment represents a total height measurement at the end of the growth measurement period.

field 4: Length of height growth measurement period. This is the number of years that the height increments in the tree data file represent. *Default = 5*

field 5: Length of the mortality observation period in years. Trees that have been dead for this amount of time or less when inventoried are coded as recent mortality in the tree data file. Trees that have been dead for longer than this amount of time are coded as older dead. *Default = 5*

Note: When diameter or height growth is to be computed as the difference between two successive measurements, the values recorded in the tree data file for diameter growth and/or height growth should be total heights and/or total outside bark diameters, not the difference between the two measurements.

Note: The Suppose interface program automatically includes a GROWTH keyword based on the appropriate fields in the stand list file if those values are other than the defaults.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 20
                Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.2.3.4

HTGMULT   (HeighT Growth MULTiplier)
Variants: All
Related keywords: HTGSTOP, CRNMULT, READCORH, READCORR, NOTHDREG

Multiplier to change the large tree height increment prediction. This modifies the height growth rate of trees in the large tree model. The diameter breaks that separate the large and small tree models vary by variant (Refer to the variant overview).

field 1: Year or cycle in which the multiplier is applied. Once in effect it remains in effect until replaced by a subsequent multiplier. *Default = 1*

field 2: Species code to which multiplier is applied. *Default = All*

field 3: Multiplier value (e.g. 0.9 will decrease the predicted height growth to 90% of the predicted value). *Default = 1.0 (no change from predicted value)*

Note: For any particular species this keyword remains in effect until a subsequent use of the keyword changes the multiplier for that species.

Note: Large tree height growth is weighted with small tree height growth for a portion of the diameter range, so both HTGMULT and REGHMULT could affect some trees.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 94
                Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

HTGSTOP   (HeighT Growth STOP)
Variants: All
Related keywords: TOPKILL, HTGMULT, CRNMULT

Stops or reduces height growth for randomly selected tree records that fall within the user-specified parameters for species and height.

field 1:   Year or cycle in which height growth is to be stopped. *Default = 1*

field 2:   Species code for which height growth is to be stopped. *Default = All*

field 3:   Shortest tree in feet (greater than or equal) that will be affected. *Default = 0*

field 4:   Tallest tree in feet (less than) that will be affected. *Default = 0*

field 5:   Probability that a tree will not grow in height. *Range: 0.0 - 1.0, Default = 0.0*

field 6:   Mean proportion of height growth retained (e.g. 0.8 will retain an average of 80% of the height growth on selected trees). *Value must be greater than 0.0. Default = 1.0*

field 7:   Standard deviation of the distribution of the proportion of height growth retained. This allows for variability in height growth reduction among the selected trees. *Default = 0.0*

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-208, Supplement to the User's Guide..., p. 20
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

IF   (begin IF-then block)
Variants: All
Related keywords: THEN, ENDIF, ALSOTRY

Signifies the beginning of an Event Monitor IF-THEN block (also called scheduling by condition). The Event Monitor keyword sequence must begin with an IF keyword. The next record must be a condition statement that evaluates to true or false. The next record is a THEN keyword. The sequence ends with an ENDIF keyword. All keywords contained between the THEN and ENDIF keywords will be executed whenever the condition is true. The condition is checked every cycle, unless that cycle falls within the minimum waiting time since the last time the condition was true.

field 1:   Minimum waiting time in years after the condition was found true before the condition will be evaluated again. Nothing in the IF-THEN block will occur until after this period of time has passed since the condition was last found true, and at that point the condition will again begin to be evaluated.

Syntax: IF   Minimum waiting time
Condition is true
THEN
Perform Activity
ENDIF

Example: If stand basal area exceeds 100 square feet per acre, thin the stand according to the THINDBH parameters. Once this condition is true, wait 30 years before checking the condition again:

```
IF              30
BBA GT 100
THEN
THINDBH          0        0       99      1.0       0        0        0
ENDIF
```

Caution: The year/cycle field on activity keywords changes meaning to become a delay period when the keywords are included in an Event Monitor IF-THEN block. Entering 2010 in the date field of an activity keyword that is in an IF-THEN block will cause a delay period of 2010 years.

Note: When using the Suppose interface program, scheduling by condition is accomplished by clicking the "Schedule by Condition" button in individual keyword windows, and then clicking the "Condition" button and selecting "Free Form" to set up the condition statement. The activity keyword that follows the THEN statement (the THINDBH keyword as shown in the example above) is not typed in explicitly, but is rather set up using the keyword window. When the condition statement has been typed in, the "OK" button is clicked to return to the keyword window to fill in the appropriate field values. The ENDIF keyword will be added automatically.

References: GTR INT-275, User's Guide to the Event Monitor..., p. 2
                  Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.5.1

INVYEAR

(INVentory YEAR)
Variants: All
Related keywords: NUMCYCLE, TIMEINT

Specifies the starting year for a projection. The year entered is assumed to be the year that the stand was inventoried.

field 1: Starting year (4-digits) for the simulation (e.g. 1987). *Default = 0*

Caution: Any starting year may be used. Care must be taken to assure that the years for which options are requested fall within the range of dates defined by the parameters on the NUMCYCLE, TIMEINT and INVYEAR keywords.

Note: The Suppose interface program automatically includes an INVYEAR keyword based on the inventory year field in the stand list file. If this field is blank, Suppose will use the current year as the inventory year.

Note: The inventory year is available in the event monitor in the variable INVYEAR. This variable is different than the INVYEAR keyword. Refer to the User's Guide to the Event Monitor.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 8
                  Essential FVS: A User's Guide to the Forest Vegetation Simulator, ss. 4.1.2.3, 5.5.1

LOCATE

(<u>LOCATE</u> the stand)
Variants: All
Related keywords: STDINFO

Specifies the location of the stand in terms of latitude, longitude, state and county. These values are then available as event monitor variables that can be included in a custom output file for use in a GIS system or elsewhere. If latitude and longitude are to be used, then both of those fields should be supplied or a default value will remain.

> field 1: Latitude in decimal degrees. *Default = latitude of centroid of variant area*
>
> field 2: Longitude in decimal degrees. *Default = lonitude of centroid of variant area*
>
> field 3: State
>
> field 4: County

Note: When the LOCATE keyword is used the Event Monitor variables that contain the specified values are respectively LAT, LONG, STATE, and COUNTY.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.2.2

MANAGED

(<u>MANAGED</u> stand)
Variants: EM, KT, PN, SE, SN, WC

Acts as a flag to signify that the stand is managed (e.g. a plantation) or unmanaged. Once set to "managed", it remains in effect until a subsequent use of the keyword sets it to "unmanaged". When the flag is set to "managed" (field 2 = 1), growth rates are modified in the particular model(s) listed below by variant.

Eastern Montana (EM)	Large tree diameter growth
Kookantl (KT)	Large tree diameter growth and small tree height growth
Pacific Northwest Coast (PN)	Small tree diameter growth
Southeast (SE)	Large tree diameter growth for shortleaf pine, longleaf pine, and loblolly pine
Southern (SN)	Large tree diameter growth for sand pine, slash pine, longleaf pine, eastern white pine, and loblolly pine
Westside Cascades (WC)	Small tree diameter growth

> field 1: Year or cycle. *Default = 0 (all cycles)*
>
> field 2: Management flag. *Default = 1*
> | | |
> |---|---|
> | 0 | Unmanaged |
> | 1 | Managed |

Note: If the MANAGED keyword is not present in the simulation, the stand is considered unmanaged.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.2.2

MCDEFECT (<u>M</u>erchantable <u>C</u>ubic foot <u>DEFECT</u>)
Variants: All
Related keywords: BFDEFECT, DEFECT, MCFDLN, VOLUME

Specifies species-specific defect corrections for cubic-foot volume estimates. In the western half of the US this keyword specifies the merchantable cubic foot defect. (Board foot defect is specified using the BFDEFECT keyword.) In the eastern half of the US this keyword specifies defect only for the pulpwood that is smaller than the merchantable limits for sawlogs. (Defect for the sawlog portion of trees is specified using the BFDEFECT keyword.) Defect percentages are specified by species for the following five dbh's: 5, 10, 15, 20, 25+ inches. For example, if the expected defect correction for a five-inch tree is 35 percent, a value of .35 would be entered in field 3. A linear interpolation function calculates the defect percentage for the specified dbh of the tree. For trees smaller than 5 inches dbh or greater than 25 inches dbh, a constant value for defect correction is applied based on the values in fields 3 and 7 respectively.

field 1: Year or cycle in which the defect corrections are to take affect. Once in applied it remains in effect until replaced by a subsequent multiplier.
Default = 0 (all cycles)

field 2: Species code for which the defect corrections are to be applied.
Default = All

field 3: Proportion of cubic foot volume defect for a 5-inch tree. All trees less than 5 inches dbh will be assigned this value. *Range: 0.0 - 1.0, Default = 0.0*

field 4: Proportion of cubic foot volume defect for a 10-inch tree.
Range: 0.0 - 1.0, Default = 0.0

field 5: Proportion of cubic foot volume defect for a 15-inch tree.
Range: 0.0 - 1.0, Default = 0.0

field 6: Proportion of cubic foot volume defect for a 20-inch tree.
Range: 0.0 - 1.0, Default = 0.0

field 7: Proportion of cubic foot volume defect for a 25-inch tree. All trees greater than 25 inches dbh will be assigned this value. *Range: 0.0 - 1.0, Default = 0.0*

Note: For any particular species this keyword remains in effect until a subsequent use of the keyword changes the multiplier for that species.

Note: If used inside an IF-THEN-ENDIF sequence, BFDEFECT will not affect cycle 0 volumes.

Note: The PARMS format may be used with this keyword. In the PARMS format, however, 0 (zero) may not be used in the year/cycle field, and hence the defect will not affect cycle 0 volumes. See the introduction for a description of this format.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.3.3

MCFDLN   (<u>M</u>erchantable <u>C</u>ubic foot <u>F</u>orm and <u>D</u>efect <u>L</u>og linear equation)
Variants: All
Related keywords: BFFDLN, MCDEFECT, CFVOLEQU, VOLUME

Sets species specific parameters for a log-linear form and defect correction equation for cubic foot volume estimates. In the western half of the US this affects the calculation of merchantable cubic foot volume. (BFFDLN affects calculation of board foot volume.) In the eastern half of the US this affects the calculation of cubic foot volume only for the pulpwood that is smaller than the merchantable limits for sawlogs. (BFFDLN affects calculation of sawlog volumes.)

$$\ln(V_s) = a_0 + a_1 \ln(V_0)$$

where V_s = cubic foot volume corrected for form and defect
V_0 = uncorrected cubic foot volume
a_0 = intercept (field 2 value)
a_1 = slope coefficient (field 3 value)

field 1: Species code whose equation is to be changed. *Default = all*

field 2: Intercept term for log-linear equation (a_0). *Default = 0*

field 3: Slope coefficient for log-linear equation (a_1). *Default = 1*

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 24
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.3.3

MGMTID   (<u>M</u>ana<u>Ge</u>Men<u>T</u> ID<u>D</u>entification)
Variants: All

Specifies a 4-character alphanumeric code to identify the silvicultural treatment simulated in a projection. The code does NOT affect the projection, but is printed with each output table. When this keyword is not used, the code "NONE" is used.

No fields are associated with this keyword, however a supplemental record that contains the code entered in Columns 1-4 is required. When the supplemental record is blank, no code is printed.

Example:
```
MGMTID
ALT2
```

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 11
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.2.1

MINHARV   (<u>MIN</u>imum <u>HARV</u>est)
Variants: All
Related keywords: THINxxx

Specifies minimum acceptable harvest standards for board-foot volume, merchantable cubic-foot volume, basal area per acre, or total cubic foot volume. The accumulated removals across all thinnings in a cycle must exceed the standards for all the units of measure (fields 2, 3, 4, and 5), or none of the thinnings in that cycle will be implemented.

field 1:   Year or cycle in which minimum harvest standards will be applied. Once in effect, it remains in effect until a subsequent MINHARV keyword changes the standards. *Default = 1*

field 2:   The minimum acceptable harvest volume in merchantable cubic-feet per acre. (Sawlog CF volume in eastern US variants) *Default = 0*

field 3:   The minimum acceptable harvest volume in board-feet per acre. (Sawlog BF volume in eastern US variants) *Default = 0*

field 4:   The minimum acceptable harvest in square feet of basal area per acre. *Default = 0*

field 5:   The minimum acceptable harvest in total cubic feet per acre. (Merchantable cubic foot volume in eastern US variants) *Default = 0*

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 22
                 Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.1

MISTOE

(MISTleTOE model initialization)
Variants: All in the western half of the US
Related keywords: END

Signifies the beginning of keywords for the dwarf mistletoe extension. This extension has its own unique set of keywords. The MISTOE keyword sequence must be terminated with an END keyword. All keywords between MISTOE and END are considered dwarf mistletoe extension keywords.

No fields are associated with this keyword.

Note: In western variants, whenever the tree data input to FVS contains dwarf mistletoe damage codes (30-34) and associated severity (Hawksworth rating of 1-6), the dwarf mistletoe extension will run by default. The effects of the dwarf mistletoe are not summarized and displayed in the main output file unless requested through the appropriate dwarf mistletoe extension keywords.

Note: The Suppose interface program automatically includes MISTOE and END keywords whenever any keyword from the dwarf mistletoe extension is included in a simulation through the Use FVS Keywords window.

References: Dwarf Mistletoe Impact Model Keyword Reference Guide
                 MAG-95-2, Dwarf Mistletoe Impact Modeling System User's Guide
                 Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 8.3

MODTYPE

(MODel TYPE)
Variants: CR, SE, SN
Related keywords: STDINFO

Specifies the variant's model type, the physiographic region and the forest type. This information allows FVS to use the appropriate model type, which is a sub-model built into the variant.

field 1: Model type.

CR variant:

1 = Southwest mixed conifers	4 = Spruce-fir
2 = Southwest ponderosa pine	5 = Lodgepole pine
3 = Black Hills ponderosa pine	

Defaults in CR variant are by forest: *Default*

All region 3 forests	*2*
Black Hills, Nebraska	*3*
Grand Mesa, Uncompahgre, Gunnison	*4*
Pike, San Isabel, White River	*4*
Rio Grande, San Juan	*4*
Bighorn, Medicine Bow, Routt	*5*
Arapaho, Roosevelt, Shoshone	*5*

SE Variant:
1 = SE TWIGS model type. *Default = 1*

SN Variant:
1 = Southwide model type. *Default = 1*

field 2: Physiographic Region (SE variant only). Either the 3-character alpha code or the numeric code may be used. *Default = 7*

1 = BLU (Blue Ridge Mountains)	5 = LPL (Limestone Plateau)
2 = CMP (Cumberland Plateau)	6 = MCP (Middle Coastal Plain)
3 = FCP (Flatlands Coastal Plain)	7 = PIE (Piedmont)
4 = HCP (Hilly Coastal Plain)	8 = VAL (Valley and Ridge)

field 3: Forest Type.

SE variant: *Default = 31*

4 = white pine	35 = redcedar
5 = loblolly pine plantation	36 = pond pine
6 = shortleaf pine plantation	38 = pitch pine
7 = longleaf pine plantation	40 = oak-pine
21 = longleaf pine	50 = oak-hickory
22 = slash pine	52 = chestnut oak
31 = loblolly pine	57 = southern scrub oak
32 = shortleaf pine	60 = oak-gum-cypress
33 = Virginia pine	70 = elm-ash-cottonwood

SN variant: Using any of the 3-digit codes shown below will specify the forest type at the time of inventory. For all subsequent points in time, FVS will determine the forest type based on the predominance of the different species in the stand. For example, using the code 103 specifies an eastern white pine forest type at the time of the inventory, but FVS will determine the forest type thereafter. Using a 4-digit code, created by prepending any non-zero digit before a 3-digit code, will specify the forest type to be used throughout the simulation. FVS will not determine the forest type at any point in time. For example, using the code 9103 specifies an eastern white pine forest type for the entire simulation. *The default is for FVS to determine the forest type at all points in time*.

103 = Eastern white pine	506 = Yellow-poplar/White/Red oak
104 = Eastern white pine/Hemlock	508 = Sweetgum/Yellow-poplar
105 = Eastern hemlock	510 = Scarlet oak
121 = Balsam fir	511 = Yellow-poplar
124 = Red spruce/Balsam fir	512 = Black walnut
141 = Longleaf pine	513 = Black locust
142 = Slash pine	514 = Southern scrub oak
161 = Loblolly pine	515 = Chestnut oak/Black/Scarlet oak
162 = Shortleaf pine	519 = Red maple/Oak
163 = Virginia pine	520 = Mixed upland hardwoods
164 = Sand pine	601 = Swamp chestnut/Cherrybark oak
165 = Table-mountain pine	602 = Sweetgum/Nuttall, Willow oak
166 = Pond pine	605 = Overcup oak/Water hickory
167 = Pitch pine	606 = Atlantic white-cedar
168 = Spruce pine	607 = Bald cypress/Water tupelo
181 = Eastern redcedar	608 = Sweetbay/Swp.tupelo/Red maple
401 = E.white pine/Red oak/Wht.ash	701 = Black ash/Am.elm/Red maple
402 = Eastern redcedar/Hardwood	702 = River birch/Sycamore
403 = Longleaf pine/Oak	703 = Cottonwood
404 = Shortleaf pine/Oak	704 = Willow
405 = Virginia pine/Southern red oak	705 = Sycamore/Pecan/American elm
406 = Loblolly pine/Hardwood	706 = Sgrberry/Hckberry/Elm/Grn.ash
407 = Slash pine/Hardwood	708 = Red maple/Lowland species
409 = Other pine/Hardwood	801 = Sgr.maple/Beech/Yellow birch
501 = Post oak/Blackjack oak	802 = Black cherry
502 = Chestnut oak	805 = Hard maple/Basswood
503 = White oak/Red oak/Hickory	807 = Elm/Ash/Locust
504 = White oak	809 = Red maple/Upland species
505 = Northern red oak	

Note: In the CR variant this keyword has the same effect as field 2 of the STDINFO keyword. If both keywords are included in a simulation, the one that appears later in the simulation file will determine the model type.

Note: When using the CR or SE variants with the Suppose interface program, Suppose automatically includes a MODTYPE keyword. The field values are based on the model type, physiographic region, and forest type fields in the stand list file. If any of these fields are blank, the default values are used.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.2.2

MORTMULT (MORTality MULTiplier)
Variants: All
Related keywords: FIXMORT, SDIMAX, BAMAX

Multiplier used to alter predicted mortality rate. In variants AK, BM, CA, CR, EC, EM, KT, NC, NI, PN, SO, TT, UT, and WS, the multiplier is applied to the predicted background mortality only, and density related mortality is unaffected. (Use SDIMAX to modify density related mortality.) In the other variants the multiplier is applied to all predicted mortality.

field 1: Year or cycle in which multiplier is applied. Once in effect, it remains in effect until replaced by a subsequent multiplier. *Default = 1*

field 2: Species code to which multiplier is applied. *Default = All*

field 3: Multiplier value. (e.g. a value of 1.1 will increase the predicted background mortality by 10%) *Default = 1.0 (no change from predicted value)*

field 4: Minimum dbh in inches (greater than or equal to) to which the mortality multiplier is applied. *Default = 0.0*

field 5: Maximum dbh in inches (less than) to which the mortality multiplier is applied. *Default = 999.0*

field 6: *No longer used.*

Note: Only one MORTMULT keyword can be specified for each species in any cycle.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 94
GTR INT-208, Supplement to the User's Guide..., p. 17
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

MORTMSB (<u>MORT</u>ality associated with a <u>M</u>ature <u>S</u>tand <u>B</u>oundary)
Variants: AK, AN, BM, CA, CR, CS_NEW, EC, EM, LS_NEW, NC, NE_NEW,
SN, SO, TT, UT, WS
Related keywords: SDIMAX, MORTMULT, FIXMORT

This keyword simulates the breakup of old large diameter stands of trees in variants using an SDI-based mortality model. An SDI relationship, when plotted with ln(qmd) on the x-axis and ln(tpa) on the y-axis where qmd = stand quadratic mean diameter and tpa = stand trees per acre, has a theoretical maximum line that slopes down and to the right with a -1.605 slope. Stands at maximum density will track down the specified upper percentage of theoretical maximum density (default 85% of theoretical maximum; see SDIMAX keyword field 6). This keyword allows users to specify a second line with a slope steeper than -1.605 and a quadratic mean diameter at which it intersects the upper percentage line. When stand qmd exceeds the specified diameter, stands track down the user-specified line instead of down the SDI line. The result is an increase in tree mortality for that projection cycle. Users can also specify whether the increased mortality should be concentrated in small trees, large trees, or throughout a diameter range.

field 1: Quadratic mean diameter at which the Mature Stand Boundary will be invoked. *Default = 999 (not invoked)*

field 2: Slope of the alternate mortality line in a relationship where x = ln(qmd) and y = ln(tpa). *Range: -10.0 to -1.605, Default = -1.605*

field 3: Proportion of the tree record that will be killed. *Range: 0.0 - 1.0, Default = 0.90*

field 4: Minimum dbh in inches (greater than or equal) to which the increased mortality will be applied. *Default = 0.0*

field 5: Maximum dbh in inches (less than) to which the increased mortality will be applied. *Default = 999.0*

field 6: Distribution of the increased mortality caused by this keyword. *Default = 1*
1   Start with the largest diameter tree and continue downward in the diameter range

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2   Start with the smallest diameter tree and work upward in the diameter range

3   Apply the increased mortality in an equal proportion to all tree records in the diameter range (this option ignores the proportion specified in field 3 and computes the required proportion).

Note: If the proportion of each tree record that will be killed is set too low to achieve the additional mortality level in the specified diameter range, the proportion will be automatically adjusted to the level required to reach the additional mortality level (the same effect as having a value of 3 in field 6)

Note: If the diameter range is set so narrow that the additional mortality level cannot be reached, the keyword will be cancelled.

Note: This keyeword only works in variants that use SDI-based mortaility logic.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 7.3.2.3

MPB

(Mountain Pine Beetle model initialization)
Variants: Specialized variants that include the mountain pine beetle model
Related keywords: END

Signifies the beginning of keywords for the mountain pine beetle extension. This extension has its own unique set of keywords. The MPB keyword sequence must be terminated with an END keyword. All keywords between MPB and END are considered annosus root disease extension keywords.

No fields are associated with this keyword.

Note: The Suppose interface program automatically includes MPB and END keywords whenever any keyword from the mountain pine beetle extension is included in a simulation through the Use FVS Keywords window.

References: Mountain Pine Beetle Impact Model Keyword Reference Guide
                 Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 8.6.2

NOAUTOES (NO AUTOmatic EStablishment)

Variants: All
Related keywords: ESTAB

Suppresses all natural regeneration and ingrowth features of the Regeneration Establishment model, including stump and root sprouting.

No fields are associated with this keyword.

Note: In the AK, CI, EM, KT, and NI variants, natural regeneration is automatically scheduled in a simulation after "significant" thinning events or in the absence of disturbance for a period of twenty years if the user schedules no regeneration. The NOAUTOES keyword

cancels both types of automatic natural regeneration. The probability of stocking is set to zero, so if later in the simulation automatic regeneration is to be turned back on, the STOCKADJ Establishment Model keyword must be usd in addition to the INGROW, AUTALLY, and/or SPROUT Establishment Model keywords.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.2.4

NOCALIB   (NO CALIBration scale factors)
Variants: All
Related keywords: BAIMULT

Suppresses calculation of scale factors for large-tree diameter increment model and small-tree height increment model. Calibration is the default mode of the system and each species is calibrated independently. For a particular species, if there are at least five large-tree diameter increment measurements or three small-tree height increment measurements, a scale factor will be calculated for that species and growth will be adjusted accordingly.   This keyword suppresses all calibration for a species (or for all species), therefore tree growth will be exactly as predicted by the model in the absence of growth information.

field 1: Species code for which calculation of scale factors is to be suppressed.

Note: Non-calibration is appropriate when growth measured in the sample is not typical. This might be the case during insect epidemics or prolonged drought, which would tend to show artificially low growth rates. This might also be the case if only site trees were measured for growth, which would tend to show artificially high growth rates.

References: GTR INT-208, Supplement to the User's Guide..., p. 11
                  Essential FVS: A User's Guide to the Forest Vegetation Simulator, ss. 6.4.1, 6.5.2.1

NODEBUG   (NO DEBUG output)
Variants: All
Related keywords: DEBUG

Suppresses the printing of program calculations as they occur. In other words, cancels the effect of the DEBUG keyword.

No fields are associated with this keyword.

Note: Whenever the NODEBUG and DEBUG keywords are both present in a simulation file, the one that is placed later in the keyword sequence will take precedence.

Example: If using the Suppose interface program with a multiple stand simulation the DEBUG keyword might be specified for all stands and the NODEBUG keyword might be used to omit particular stands from having information written to the debug file.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 9.3

NOECHO (NO ECHO)
Variants: All
Related keywords: ECHO

Suppresses the echoed keyword information, read on input, to the Options Selected by Input table of the Main Output file. By default keyword echo is on.

No fields are associated with this keyword.

Note: In a serial run, keyword echo returns to the default condition after processing each stand. The number of keyword records processed, and not echoed to the main output file, is reported. Warning and error messages and the Parallel Processing Extension (PPE) keywords are not affected by the NOECHO keyword.

NOHTDREG (NO HeighT-Diameter REGression)
Variants: All
Related keywords: HTGMULT, READCORH

Suppresses the calibration of coefficients for height-diameter equations based on input tree data. Height-diameter equations are used in dubbing the heights of trees that have missing recorded heights. When the calibration of coefficients for the height dubbing process is suppressed, heights are dubbed using region-wide default coefficients. Calibration of coefficients for a species is automatically suppressed if less than three non-top-damaged trees of that species are available for the calculations.

field 1:   Species code for which calibration of the coefficients for the height-diameter relationship will be suppressed. *Default = All*

field 2:   Suppression flag. *Defaults: BM, EC, KT, NC, PN, SO, WC, SN, CA = 0*
              others = 1
              0   Suppress calibration of coefficients (i.e. use defaults).
              1 or greater   No suppression of calibration of coefficients.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 7.1.3.1

NOSCREEN (NO output to SCREEN)
Variants: All
Related keywords: SCREEN

Suppresses printing of an abbreviated copy of the summary statistics table to the terminal screen or a file during program execution. In other words, cancels the effect of the SCREEN keyword.

No fields are associated with this keyword.

Note: Whenever the NOSCREEN and SCREEN keywords are both present in a simulation file, the one that is placed later in the keyword sequence will take precedence.

Note: The Suppose interface program automatically includes a SCREEN keyword that sends the output to the terminal screen. Including a NOSCREEN keyword will cancel the effect of the SCREEN keyword.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.4

NOSUM   (<u>NO</u> <u>SUM</u>mary table)
Variants: All
Related keywords: ECHOSUM, CALBSTAT

Suppresses the summary statistics table from the standard FVS output file from being written to a separate file. In other words, cancels the effect of the ECHOSUM keyword. The summary statistics table will still be written to the standard FVS output file.

     No fields are associated with this keyword.

Note: Whenever the NOSUM and ECHOSUM keywords are both present in a simulation file, the one that is placed later in the keyword sequence will take precedence.

Example: If using the Suppose interface program with a multiple stand simulation the ECHOSUM keyword might be specified for all stands and the NOSUM keyword might be used to omit particular stands from having information written to the ECHOSUM file.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 48
                 Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.4

NOTREES   (<u>NO</u> <u>TREE</u> record<u>S</u>)
Variants: All
Related keywords: ESTAB

Specifies that no projectable tree records will be used as input, which permits "bare ground" simulations. The Regeneration Establishment Model can then be used to generate a list of seedlings to be projected. If the NOTREES keyword is not used, at least two live-tree records must be present in the input tree data.

References: GTR INT-208, Supplement to the User's Guide..., p. 19
                 Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.2

NOTRIPLE (<u>NO</u> tree record <u>TRIPLE</u>)
Variants: All
Related keywords: NUMTRIP, DGSTDEV

Suppresses record tripling. When a stand is represented by relatively few records (less than approximately 100) tripling is a mechanism to increase the number of replications to help stabilize the random effects (see DGSTDEV). Each tree record is split into three records such that the three records together represent the same number of trees per acre as the original record. The new records are similar except for diameter growth, and the weighted average of the new records is equal to the original record. Unless otherwise specified, records are tripled twice), once in the first cycle and once in the second cycle. If the total number of records would exceed 1350 tripling is not done.

     No fields are associated with this keyword.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 92
                 Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.4.2

NUMCYCLE (NUMber of CYCLEs)
Variants: All
Related keywords: TIMEINT, INVYEAR

Specifies the number of cycles to run the projection. A cycle is the period of time for which tree characteristics are predicted, and for which inventories are reported (see TIMEINT). The maximum number of cycles in a projection is 40.

>	field 1: Number of cycles to be projected.

Note:	The Suppose interface program automatically includes a NUMCYCLE keyword (with a default of ten cycles). This may be overridden by using the "Set Time Scale" option, or by including an additional NUMCYCLE keyword. Use of a NUMCYCLE keyword will override the entries from the "Set Time Scale" option.

References:	GTR INT-133, User's Guide to the Stand Prognosis Model, p. 8
Essential FVS: A User's Guide to the Forest Vegetation Simulator, ss. 4.1.3.1, 5.1.2

NUMTRIP (NUMber of times TRIPled)
Variants: All
Related keywords: NOTRIPLE, DGSTDEV

Specifies the number of times tree records will be tripled. Tripling will be attempted once in the first cycle and once in each subsequent cycle for the number of times specified. If the total number of records would exceed 1350 tripling is not done. When a stand is represented by relatively few records (less than approximately 100) tripling is a mechanism to increase the number of replications to help stabilize the random effects (see DGSTDEV). Each tree record is split into three records such that the three records together represent the same number of trees per acre as the original record. The new records are similar except for diameter growth, and the weighted average of the new records is equal to the original record. Unless otherwise specified, records are tripled twice), once in the first cycle and once in the second cycle.

>	field 1: Number of times tripling will be attempted. *Default = 2*

Note:	In a bare ground projection, the number of times that records will be tripled is one less than the number specified because tripling occurs before the addition of regeneration records to the treelist. For example, if you want the tree records to be tripled twice in a bare ground projection, set the value in field 1 to 3.

References:	GTR INT-133, User's Guide to the Stand Prognosis Model, p. 92
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.4.2

OPEN (OPEN a file)
Variants: All
Related keywords: ADDFILE, CLOSE

Requests that an external file be opened for input (e.g. an addfile) or output (e.g. a treelist file). A supplemental record is required to specify a filename for the unit that is to be opened.

>	field 1: File reference number for the input or output file. File reference numbers are a mechanism that FVS uses to keep track of external files. Numbers less than 30 are reserved for files that are currently used by FVS.

field 2: Code for specifying the meaning of blanks in numeric fields. *Default = 0*
> 0   Treat blanks as zeros
> non-zero   Treat blanks as null characters

field 3: File status code. *Default = 0*
> 0   Unknown (file may or may not currently exist)
> 1   New (file does not currently exist)
> 2   Old (file currently exists)

field 4: Maximum record length in the file (number of characters per line). *Default=150*

field 5: File format switch. Choose unformatted only when the sole purpose of creating this file is for use as input to another program that requires unformatted input.
> 1   Formatted
> 2   Unformatted

Supplemental record:
> Specify a filename for the input or output file that is to be opened. The maximum permitted length of the filename is 40 characters, and there can be no leading blanks.

Note: There is no default value for the file reference number (field 1). If this field is left blank the OPEN request is ignored.

Note: The Suppose interface program automatically includes OPEN and CLOSE keywords for every tree data file included in the simulation.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.2.3.1

POINTREF (POINT REFerence)
Variants: All
Related keywords: THINPOINT, SETPTHIN, COMPUTE

Specifies whether the point number entered on a keyword or Event Monitor function refers to the inventory point number or FVS sequential point number.

field 1: Point number reference
> 1 = Point number will be as entered in the input data
> 2 = Point number will be the FVS sequential point number

PROCESS (PROCESS the keywords)
Variants: All

Signifies the end of a set of keywords that define a single projection and triggers the beginning of the simulation. The PROCESS keyword must be present or the projection will not run. Multiple PROCESS keywords (i.e. multiple projections) are possible within a single simulation file.

No fields are associated with this keyword.

Note: The Suppose interface program automatically includes a PROCESS keyword. If multiple stands are selected, multiple PROCESS keywords will be included and multiple projections will result.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 8
               Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.3.3

PRUNE

(<u>PRUNE</u> trees)
Variants: All
Related keywords: CRNMULT

Schedules pruning of a specified component of the stand. Removes portions of a trees crown ratio as part of a stand treatment scenario.

field 1: Year or cycle pruning is to be done. *Default = 1*

field 2: Method of pruning. *Default = 2*
   1   Prune to a specified height to base of live crown (field 3) without regard to the proportion of live crown this would remove
   2   Prune to a specified height to base of live crown (field 3). If this would result in removing more than a specified proportion (field 4) of the live crown ratio, only remove enough crown to reach the specified proportion, instead of the specified height.
   3   Prune to a specified height to base of live crown (field 3). If this would result in removing more than a specified proportion (field 4) of the live crown ratio, do not prune the tree.
   4   Remove a specified proportion (field 4) of the live crown.
   5   Remove a specified length (field 3) of the live crown without regard to the proportion of live crown this would remove.
   6   Remove a specified length (field 3) of the live crown. If this would result in removing more than a specified proportion (field 4) of the live crown ratio, only remove enough to reach the specified proportion, rather than removing the specified length.
   7   Remove a specified length (field 3) of the live crown. If this would result in removing more than a specified proportion (field 4) of the live crown ratio, do not prune the tree.

field 3: Height in feet. *Default = 0*
          If field 2 = 1, 2, or 3, this is the height to the base of live crown.
          If field 2 = 5, 6, or 7, this is the length of crown to be removed.

field 4: Maximum proportion. *Range: 0.0 - 1.0, Default = 0.5*
          If field 2 = 2 or 6, this is the maximum proportion of live crown that can be removed.
          If field 2 = 3 or 7, this is the threshold that determines whether the tree will be pruned or not.
          If field 2 = 4, this is the proportion of live crown to be removed.

field 5: Species code to be pruned. *Default = All*

field 6: Minimum dbh in inches (greater than or equal to) that will be considered for pruning. *Default = 0.0*

field 7: Maximum dbh in inches (less than) that will be considered for pruning. *Default = 99.0*

Note: All prunings are considered in the same context as thinnings, and are done at the beginning of the cycle in which they are scheduled.

Note: All thinnings scheduled within a cycle are done before any pruning requests are processed. (i.e. the only trees that will be pruned are those left after the thinning)

Note: If no trees remain after thinning, all pruning requests will be cancelled.

Note: If the combination of parameters on a pruning keyword results in no trees being pruned, the pruning request is cancelled.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Caution: If this keyword is embedded in an IF-THEN-ENDIF sequence, field 1 is interpreted as years from the time the event is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after event is true to prune the stand.)

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.6

RANNSEED (RANdom Number SEED)
Variants: All

Reseeds the pseudorandom number generators used in the FVS model. If a 0 (zero) is used as the replacement value for the seed, the model will run stochastically (i.e. results will vary for multiple runs of the same simulation file). With any non-zero seed value the results will always be the same for multiple runs of the same simulation file.

field 1: Replacement value for the pseudorandom number seed (should be an odd integer). *Default = 55329*

Note: The FVS base model and the Regeneration Establishment extension use separate pseudorandom number generators. Each one can be reseeded independently. Using a RANNSEED keyword inside an ESTAB-END sequence affects the Regeneration Establishment extension.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 94
GTR INT-208, Supplement to the User's Guide..., p. 14
GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 32
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.4.2

Refer to GTR INT-394, Implications of Random Variation in the Stand Prognosis Model, for a discussion of the stochastic nature of the model.

RDIN (Root Disease model INitialization)
Variants: Specialized variants that include the root disease model
Related keywords: END

Signifies the beginning of keywords for the western root disease extension. This extension has its own unique set of keywords. The RDIN keyword sequence must be terminated with an END keyword. All keywords between RDIN and END are considered western root disease extension keywords.

No fields are associated with this keyword.

Note: The Suppose interface program automatically includes RDIN and END keywords whenever any keyword from the western root disease extension is included in a simulation through the Use FVS Keywords window.

References: Root Disease Impact Model Keyword Reference Guide
PSW-GTR-165, User's Guide to the Western Root Disease Model, Ver 3.0
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 8.4

READCORD (READjust CORrection for Diameter)
Variants: All
Related keywords: READCORH, READCORR, REUSCORD, BAIMULT, NOCALIB

Readjusts the baseline estimate for the large-tree diameter growth model. For any particular species, the original baseline estimate is multiplied by the value from this keyword, and the result becomes the new baseline estimate. These adjustments are done prior to model calibration. Calculated scale factors will still attenuate toward a value midway between the calculated scale factor and the new baseline estimate.

No fields are associated with this keyword. Multipliers are entered on two or more supplemental records

Supplemental records:
Each supplemental record consists of eight 10-character fields, each of which contains a multiplier value for a species. Decimal points should be explicitly typed. The fields are in order of the species sequence number in the variant (see Appendix A). Multiple supplemental records are required. *The default value for all species in all variants is 1.0.* A blank or 0 (zero) is interpreted as a 1.0.

Example for a variant with 11 species:
```
READCORD
        1.2        1.0       1.05       0.8       0.85       1.0       1.25       1.0
        1.0       0.85       1.0
```

Note: If a significant number of previous FVS runs have shown that there is a consistent bias in the scale factors for any species, the average scale factor for that species can be entered using this keyword.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 90
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.2

READCORH (READjust CORrection for Height)
Variants: All
Related keywords: READCORD, READCORR, HTGMULT, REUSCORH, NOCALIB

Readjusts the baseline estimate for the large-tree height growth model. For any particular species, the original baseline estimate is multiplied by the value from this keyword, and the result becomes the new baseline estimate. These adjustments are done prior to model calibration.

No fields are associated with this keyword. Multipliers are entered on two or more supplemental records

Supplemental records:

Each supplemental record consists of eight 10-character fields, each of which contains a multiplier value for a species. Decimal points should be explicitly typed. The fields are in order of the species sequence number in the variant (see Appendix A). Multiple supplemental records are required. *The default value for all species in all variants is 1.0.* A blank or 0 (zero) is interpreted as a 1.0.

Example for a variant with 11 species:
```
READCORH
      1.3      1.0      1.15      0.7      0.75      1.0      1.25      1.0
      1.0      0.95     1.0
```

Note: If a significant number of previous FVS runs have shown that there is a consistent bias in the large tree height growth for any species, an average multiplier value for that species can be entered using this keyword.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 90
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.2

READCORR (READjust CORrection for Regeneration)
Variants: All
Related keywords: READCORH, READCORD, REUSCORR, NOCALIB

Readjusts the baseline estimate for the small-tree height growth model. For any particular species, the original baseline estimate is multiplied by the value from this keyword, and the result becomes the new baseline estimate. These adjustments are done prior to model calibration. Calculated scale factors will still attenuate toward a value midway between the calculated scale factor and the new baseline estimate.

No fields are associated with this keyword. Multipliers are entered on two or more supplemental records

Supplemental records:

Each supplemental record consists of eight 10-character fields, each of which contains a multiplier value for a species. Decimal points should be explicitly typed. The fields are in order of the species sequence number in the variant (see Appendix A). Multiple supplemental records are required. A blank or 0 (zero) is interpreted as a 1.0. *The default value for all species in all variants is 1.0.*

Example for a variant with 11 species:
```
READCORR
      1.1      1.0      1.25      0.85      0.8      1.0      1.05      1.0
      1.0      0.65     1.0
```

Note: If a significant number of previous FVS runs have shown that there is a consistent bias in the scale factors for any species, the average scale factor for that species can be entered using this keyword.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 90
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.2

REGDMULT (<u>REG</u>eneration <u>D</u>iameter growth <u>MULT</u>iplier)
Variants: All
Related keywords: REGHMULT, BAIMULT

Specifies a growth multiplier for the small-tree diameter growth model.

field 1:   Year or cycle in which multiplier is applied. Once in effect, it remains in effect until replaced by a subsequent multiplier. *Default = 1*

field 2:   Species code to which multiplier is applied. *Default = All*

field 3:   Multiplier value (e.g. a value of 1.2 will increase the predicted small tree diameter growth by 20%). *Default = 1.0*

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Note: Small tree height growth is weighted with large tree height growth for a portion of the diameter range, so both REGHMULT and HTGMULT could affect some trees.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 94
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

REGHMULT (<u>REG</u>eneration <u>H</u>eight growth <u>MULT</u>iplier)
Variants: All
Related keywords: REGDMULT, HTGMULT, READCORR

Specifies a growth multiplier for the small-tree height growth model.

field 1:   Year or cycle in which multiplier is applied. Once in effect, it remains in effect until replaced by a subsequent multiplier. *Default = 1*

field 2:   Species code to which multiplier is applied. *Default = All*

field 3:   Multiplier value (e.g. a value of 1.2 will increase the predicted small tree height growth by 20%). *Default = 1.0*

Note: Changing the small-tree height increment also changes the small-tree diameter growth increment, and may have other cascading effects throughout the model.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 94
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

RESETAGE (<u>RESET</u> stand <u>AGE</u>)
Variants: All

Sets the stand age to zero to make FVS model output correspond to the actual age of the stand. Age is strictly for reporting purposes and has no effect on growth or survival prediction. Its only effect is on the calculation of mean annual increment. This keyword is useful when average stand age has changed due to thinnings and plantings.

field 1: Year or cycle that stand age is to be changed (usually the year of disturbance).

field 2: New stand age. *Default = 0*

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.3

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

REUSCORD (REUSe CORrection for Diameter)
REUSCORH (REUSe CORrection for Height)
REUSCORR (REUSe CORrection for Regeneration)
Variants: All
Related keywords: READCORD, READCORH, READCORR

In a multiple stand simulation, requests that the parameters specified for the previous stand on the READCORD, READCORH, or READCORR keyword record be reused for the current stand.

No fields are associated with this keyword.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.4

REWIND (REWIND an open file)
Variants: All
Related keywords: OPEN, ADDFILE

In a multiple stand simulation, allows values from a file opened with the OPEN keyword record for the previous stand to be re-entered without closing the file and then re-opening it in the current stand.

field 1: File reference number of the file to be rewound. *Default = 2 (tree record file)*

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.2.4

SCREEN (output to SCREEN)
Variants: All
Related keywords: NOSCREEN

Requests printing of an abbreviated copy of the summary statistics table to the terminal screen or a file during program execution.

field 1: File reference number where the Screen output to be directed. The default is to direct output to unit 6, which is the terminal screen. If the value is any number other than 6 or blank, then an associated SCREEN output file needs to be opened with OPEN keyword. *Default = 6 (screen)*

Note: The Suppose interface program automatically includes a SCREEN keyword that sends the output to the terminal screen.

Example sending output to new unit:
```
SCREEN            50
OPEN              50
SCREEN.OUT
```

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.4

SDICALC   (Stand Density Index Calculation)
Variants: All
Related keywords: SDIMAX, THINSDI

Allows the selection of either Reineke SDI (Reineke 1933) using Stage's Summation Method
(Stage, 1968) or Zeide's SDI (Zeide 1983) using the Long and Daniel, Shaw Summation Method
(Long and Daniel 1990, Shaw 2000).

> field 1: Minimum DBH for including in Reineke SDI calculation (greater than or equal to).
> *Default = 0*
> field 2: Minimum DBH for including in Zeide SDI calculation (greater than or equal to).
> *Default = 0*
> field 3: SDI Calculation Method *Default = 0*
>> 1 > Reineke
>> 1 ≤ Zeide

Note: For variants that use SDI-based mortality selecting Zeide and/or modifying Fields 1 or 2
will affect mortality. In all variants the SDICALC keyword affects, SDI thinning targets,
stand SDIMAX reset calculations at the beginning of a simulation, SDI values reported in
the Summary Statistics Table, and the Event Monitor variables BSDI, ASDI, BSDI2, and
ASDI2.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 7.3.4

SDIMAX   (Stand Density Index MAXimum)
Variants: All
Related keywords: BAMAX, MORTMULT

Specifies the maximum stand density index by species. The value of the maximum stand density
index is an important variable in determining stand mortality and normal stocking for automatic
thinnings. Also, in some variants, maximum SDI is used to model crown ratio change for
individual tree records.

Maximum SDI for a stand is computed as a weighted average of the SDI maximums for each
species in the stand. The weight for a species is calculated as the total basal area for that species
divided by the total basal area in the stand. Maximum stand SDI is used in all variants to
determine normal stocking for automatic thinnings. In addition, it is used to calculate density
related mortality in many variants. If no SDIMAX keyword is present, one will be assigned,
based on the species in the stand or by plant community type (see specific variant overview for
details).

> field 1: Species code for which the maximum stand density index applies. *Default = All*
> field 2: Maximum stand density index value.
> field 3: *No longer used.*
> field 4: *No longer used.*
> field 5: Percentage of theoretical maximum density at which density-related mortality is
> invoked. *Default = 55, Lower limit = 10*

field 6: Percentage of theoretical maximum density at which the stand reaches actual maximum density. *Default = 85, Upper limit = 95*

field 7: Stagnation indicator (CR variant only). *Default = 0*

      0   No stagnation effect

      1   Include stagnation effect when stand SDI is above 70% of maximum SDI

SDI is computed using the following equation:

$$\text{Stand SDI} = 0.00490419 * (\text{SUMQ} / \text{TPA}_{total})^{0.8025} * \text{TPA}_{total}$$
$$+ 0.01992714 * (\text{SUMQ} / \text{TPA}_{total})^{-0.1975} * \text{SUMQ}$$

where: $\text{SUMQ} = \sum(\text{DBH}_i^2 * \text{TPA}_i)$

DBH_i = diameter at breast height of the ith tree record

TPA_i = trees per acre represented by the ith tree record

TPA_{total} = total trees per acre in the stand

Caution: Use of this keyword can drastically change predicted yields.

Caution: If multiple SDIMAX keywords are used, fields 5, 6, and 7 should only be specified once.

Note: This keyword is processed before any tree data is read. If after reading the tree data it is found that the stand is above the upper limit of maximum density, the maximum SDI will be automatically recalculated without regard to the value set with this keyword.

Note: When the BAMAX keyword is set, SDIMAX is set based on the BAMAX keyword and the additional of SDIMAX keywords are ignored.

Note: The overall stand maximum SDI is available in the event monitor in the variable BSDIMAX at the beginning of a cycle, and in the variable ASDIMAX after a thinning has occured. Refer to the User's Guide to the Event Monitor.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

SERLCORR (SERiaL CORRelation)
Variants: All

Replaces parameters for the serial correlation function of the autoregressive moving-average model, ARMA(1,1), which produces serial correlation between errors for successive diameter increment predictions. To some degree, diameter growths in one cycle can be made to correlate with diameter growths from the previous cycle. That is to say a tree growing well in one cycle will tend to keep growing well, relative to other trees, in the next cycle. The primary use of this keyword is to turn off the autocorrelation by setting both parameters to 0 (zero). Use of other values is strongly discouraged unless the user understands well the implications on the model.

field 1: Autoregressive operator φ for the ARMA(1,1) model. *Default = 0.74*

field 2: Moving-average operator θ for the ARMA(1,1) model. *Default = 0.42*

Note: Setting the value of both fields to 0 (zero) turns off the autocorrelation.

Caution: Many of the predictions in FVS are based on diameter increment. Changing the diameter increment prediction also changes many of the other predictions made in the model.

SETPTHIN   (<u>SET</u>s <u>P</u>oint <u>THIN</u>ning)
Variants: All
Related keywords: THINPT, POINTREF, THINRDSL

Sets the parameters for a thinning by point, used in conjunction with the THINPT keyword.

> field 1: Year or cycle that thinning is scheduled. *Default = 1*

> field 2: Point number to be thinned. A value of 0 will thin all plots.

> field 3: Point thinning (THINPT) residual attribute.
> > 1 = Trees per acre
> > 2 = Basal area
> > 3 = Stand Density Index
> > 4 = Percent Canopy Cover
> > 5 = Relative Density (Curtis)
> > 6 = Relative Density (SILVAH model)

Caution: This keyword must precede the THINPT keyword for it to affect the thinning.

SETSITE   (<u>SET</u> <u>SITE</u> related parameters)
Variants: All
Related keywords: STDINFO, SITECODE

For the initial inventory, stand habitat type, plant association, or ecological unit is entered using field 2 of the STDINFO keyword record; a basal area maximum for the stand is entered using the BAMAX keyword; site index values for individual species are entered using the SITECODE keyword; and Stand Density Index (SDI) maximums for individual species are entered using the SDIMAX keyword. These values are usually regarded as constants throughout a projection. Climate change research suggests these values might change over time. This keyword allows users to change these values during a projection to facilitate simulating climate change effects.

> field 1: Year or cycle in which the parameter will be changed. Enter 0 (zero) to affect all cycles. *Default = 1*

> field 2: Habitat type, plant association, or ecological unit. This field must be numeric, so if designating a plant association or ecological unit, use the numeric sequence number of the plant association or ecological unit code from the variant overview document. *Default = blank (no change)*

> field 3: Basal area maximum. *Default = blank (no change)*

> field 4: Species code or species group name. *Default = All*

> field 5: Site index, or percent change in site index, for the species indicated in field 4. *Default = blank (no change)*

> field 6: Enter a 0 (zero) or leave blank if the value in field 5 is a site index value; enter a 1 if the value in field 5 is a percent change value.   *Default = blank (site index value)*

field 7:   Stand Density Index value for the species indicated in field 4.   *Default = blank (no change)*

Note: To specify the habitat type, plant association, ecological code, basal area maximum, site index, or stand density index for the stand at the time of inventory, users should use the STDINFO, BAMAX, SITECODE, or SDIMAX keywords. The SETSITE keyword cannot be used to set these values at the time of inventory; it can only be used to change these values during the projection.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.2.2

SITECODE   (<u>SITE</u> index <u>CODE</u>)
Variants: All except CI, KT, and NI

Sets species-specific site index values. If a SITECODE keyword is present, all species for which site index values were not explicitly set will be assigned site index values derived from the site index of the specified site species. If no SITECODE keyword is present, site index values are assigned, refer to the variant overview for these defaults.

field 1:   Species code. If blank, all species will be assigned the value in field 2.
Default = blank (all species)

field 2:   Site index in feet. For the NC, SO, CA, and WS variants, a value less than 8 is interpreted as a Dunning site code and is converted to a site index for each species as described in the technical documentation for those variants.

field 3:   Site species override code. A non-zero value designates the species in field 1 as the site species for the stand. *Default = 0*

Caution: The value entered in field 2 should be based on the site curves and base ages used to build the variant relationships. Refer to the variant overview for this information.

Note: Field 3 is ignored if field 1 contains a species group. If field 1 contains a species group and the site species has not been set, site species gets set to the first species in the species group.

Note: If field 3 is 0 (zero) or blank in each of the SITECODE keywords used, the species from the first SITECODE keyword with a non-zero, non-blank species code becomes the site species for the stand.

Note: The Suppose interface program automatically includes a SITECODE keyword based on the site index and site species fields of the stand list file if those fields are not blank.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.2.2

SPCODES   (<u>SP</u>ecies <u>CODES</u>)
Variants: All
Related keywords: TREEFMT

Identifies species codes used on the input tree records. This keyword is used when the species codes in the input tree records do not match the standard FVS species codes for the variant being used (see Appendix A). One or more supplemental records are required that contain the species codes from the input tree records.

field 1:   FVS species sequence number (integer) whose alpha code is to be overridden.
Do not enter the 2-character alpha species code. If blank, all species codes are
to be replaced.

Supplemental record(s):
Species codes from the input tree records are left justified in 4-character fields.
If field 1 identifies a specific species, the supplemental record consists simply of
one 4-character field. If field 1 is blank, then all species codes are to be
overridden and each supplemental record consists of up to twenty consecutive 4-
character fields. In this case, the species codes are entered sequentially in the
order of the species sequence numbers (see Appendix A). If there are blanks in
the sequence numbers, then those 4-character fields are left blank. Each species
in FVS can be represented by only *one* code from the input tree records.

Example 1, single species:
```
SPCODES            7
LPP
```

Example 2, all species in a variant with 24 species:
```
SPCODES
SAF CF3 DF  217 WF2 MTH  68 WL5 BC  LP5 LPP PY  PP1 WBP WWP J   BS2 93  WTS ASP
CW  A99 990 999
```

Note: The codes in the supplemental records are interpreted literally and blanks are not
equivalent to zeros. For example, "WP " is different than " WP" (trailing spaces vs.
leading spaces). Also " 3" is different than " 03".

Note: If all tree records are ultimately reported by FVS as "other species" or something similar,
an error has probably been made in the preparation of either the SPCODES or TREEFMT
keywords.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.2.3.3

SPECPREF   (SPECies removal PREFerence)
Variants: All
Related keywords: TCONDMLT, THINxxx

Sets the removal preference for a species. This affects the order in which trees are selected for
removal when a harvest is implemented. When a thinning is implemented, tree records with the
highest removal priority are selected first, and selection continues based on removal priority until
the parameters of the thinning have been met, or until all records have been selected. The removal
priority is determined by the equation below:

$$P = (F_d \cdot DBH) + SP + (F_t \cdot IMC) + F_m + (F_s \cdot STS) + (F_{pba} \cdot PBA_i) + (F_{pccf} \cdot PCCF_i) + (F_{ptpa} \cdot PTPA_i)$$

where:
F_d is equal to 1 if thinning from above, or -1 if thinning from below
DBH   is tree diameter at breast height
SP   is a user-specified species preference
F_t is a user-specified multiplier for the tree value class code
IMC   is tree value class code
F_m is a user-specified dwarf mistletoe preference
F_s is a user-specified multiplier for the tree special status code
STS   is tree special status code

F_{pba} is a user-specified multiplier for the point estimate of stand basal area

PBA_i is stand basal area estimate for the inventory point where the tree is located

F_{pccf} is a user specified multiplier for the point estimate of stand crown competition factor

$PCCF_i$ is the estimate of the stand crown competition factor for the inventory point where the tree is located

F_{ptpa} is a user-specified multiplier for the point estimate of stand trees per acre

$PTPA_i$ is stand trees per acre estimate for the inventory point where the tree is located

All terms after the first default to zero. (See TCONDMLT and refer to the Dwarf Mistletoe Impact Model keyword documentation for MISTPREF for a discussion of the other terms). The relevant part of the equation for this keyword is:

$$P = (F_d \cdot DBH) + SP$$

For the species designated in field 2 of the SPECPREF keyword, the SP (species preference) term has the value assigned in field 3. Species preference for other species are set with additional SPECPREF keywords, otherwise they have a default value of 0 (zero). The SPECPREF keyword alone does not remove trees. It must be followed by one or more thinning keywords, which, in conjunction with the SPECPREF keyword, determine the order of tree records selected.

field 1:   Year or cycle the preference is to be applied. Once in effect it remains in effect until replaced by a subsequent multiplier. *Default = 1*

field 2:   Species code whose removal priority is to be changed. A valid code is required or the keyword is ignored.

field 3:   Preference value for removal of species identified in field 2. A positive value increases the chance for tree removal and a negative value increases the chance for tree retention. *Default = 0*

Example: In a thinning from above, a 15-inch PP is selected for harvest before a 12-inch WF. If a SPECPREF keyword is used to assign a preference of 5 to WF, then the WF (whose removal priority is now 12*1 + 5, or 17) is selected before the PP, even though the PP is larger.

Note: For any particular species this keyword remains in effect until a subsequent use of the keyword changes the priority for that species.

Note: Keyword order may be important. If a SPECPREF keyword is specified for the *same year* that a thinning keyword is specified, the species preference will affect the thinning only if the SPECPREF keyword appears in the keyword sequence before the thinning keyword.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Caution: The SPECPREF keyword has no effect on thinning done with the THINDBH or THINHT keywords.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 26
                  Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.4.1

SPGROUP   (SPecies Group)
Variants: All

Related keywords: None

Defines a group of species that can be referenced by a single name, or FVS sequence number, and will be treated as a group in management actions or event monitor functions. Users may define up to 10 species groups with each group containing up to 50 species codes. If the species group name is entered in the species field of a keyword, the keyword action will apply to all species in the group. One or more supplemental records are required that contain the FVS species codes or FVS species sequence numbers.

When using keywords in FVS, species can be referenced by their 2-character alpha designation or numeric sequence number. Similarly, species groups can be referenced by their group name, defined in field 1, or by their FVS sequence number. FVS sequence numbers for species groups are assigned by FVS and are contained in the range (-1 to -10). When referencing species groups on keywords, users are encouraged to use the group name instead of the FVS group sequence number.

> field 1: Species Group name. *Default = GroupXX   where XX=01 for the first defined species group,02 for the second, …, 10 for the 10th defined species group. (e.g. Group01, Group02, …, Group10)*

> Supplemental record(s):
> > FVS species codes or species sequence numbers. A supplemental record can be up to 150 characters long, therefore up to 50 species can be placed on one supplemetal record. The record is free form in format with each species code separated by one or many blanks. Species can be continued onto an additional supplental record by putting an "&" at the end of the line.

Example: For the NI variant, define two species groups, one group named BIGFOOT containing Douglas-fir, lodgepole pine, and ponderosa pine; the other using the FVS default naming convention containing grand fir, lodgepole pine, and western hemlock.

```
SPGROUP        BIGFOOT
DF 7 PP

SPGROUP
GF &
LP &
WH
```

The first group contains a mixture of the alpha species codes and FVS species sequence numbers (7 being Lodgepole in the NI variant). Also the species are left justified in fields on the supplemental record. This group could be referenced by the group name BIGFOOT or the FVS sequence number -1 since it is the first defined group.

The second group contains all alpha species codes with each code located on its own line with a "&" coninueing the list onto the following line. This group could be referenced by the group name GROUP02 (i.e. the default group name) or the FVS sequence number -2 since it is the second defined group.

The keyword

```
    THINDBH        2020.        5.        10.        1.    BIGFOOT
```

would remove all Douglas-fir, lodgepole pine, and ponderosa pine in the diameter range $5.0 \leq dbh < 10.0$ in the year 2020.

The keywords

```
COMPUTE          0.
TPAG2 = SPMCDBH(1,GROUP2,0)
END
```

would compute the total trees per acre of grand fir, lodgepole pine, and western hemlock and store the result in the event monitor variable TPAG2.

Note: The SPGROUP keyword must precede any other keyword that references the species group

Note: The species group name must be between 3 and 10 characters long, cannot be "ALL" or any pre-defined event monitor variable name, and cannot contain any blanks. A species group may contain up to 50 species. An individual species may be included in more than one group.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.2.5

SPLABEL   (Stand Policy LABEL)
Variants: All
Related keywords: AGPLABEL, ALSOTRY, IF, THEN, ENDIF

Specifies a set of labels for the stand that may be used to selectively schedule conditional activities. This capability is useful only when multiple stands are included in a simulation. The stand policy labels are assigned to stands based on common meaningful characteristics. These labels are then used to conditionally schedule similar activities in the stands with common policy labels using the AGPLABEL keyword. For example, three stands are to be managed. The first two are assigned a stand policy label *PineType*, and the second and third are assigned a stand policy label *Overstocked*. The second stand, therefore, has two stand policy labels in its set, *PineType* and *Overstocked*, whereas each of the other two stands has a single label. If an activity is conditionally scheduled, using AGPLABEL, to be applied only to stands with the label *PineType* only the first two stands will be considered since these are the only stands with the label *PineType*. If a second activity is conditionally scheduled to be applied only to stands with the label *Overstocked* only the second and third stands will be considered.

Refer to the description for the AGPLABEL keyword for an explanation and example of how to use the stand policy labels in conditionally scheduling activities.

No fields are associated with this keyword. Labels are entered on a supplemental record.

Supplemental record:
          Specifies the stand policy labels. Labels are separated by a single comma. The total number of characters in the label set may not exceed 100. An ampersand (&) is used to indicate that the list of labels is continued on the next line. Any character may be used as part of a label except a comma, period, or ampersand.

Example:
```
SPLABEL
PineType, Overstocked, &
Age50-80
```

Note: If more than one SPLABEL keyword is used for a stand, the set specified latest in the sequence of keywords will be used and the others will be ignored.

References: GTR INT-275, User's Guide to the Event Monitor..., p. 7
              GTR INT-281, User's Guide to the Parallel Processing Extension..., p. 9
              Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.6.2

STANDCN (<u>STAND</u> <u>C</u>ontrol <u>N</u>umber)
Variants: All
Related keywords: DATABASE

STANDCN allows you to a use a variable called STAND_CN, which is stored as a 40-character string. A stand-level CN is used in FSVeg as a primary key in the database. Relating the input from a database and output from FVS can be achieved using the database extension. STAND_CN is a column in the database extension, FVS_Cases table and FVS_StandInit table. STAND_CN can also be used in SQL preprocessing in the Database Extension.

No fields are associated with this keyword, however a supplemental record that contains the Stand Control Number (up to 40 characters) is required.

STATS (<u>STAT</u>istic<u>S</u>)
Variants: All

Requests that optional output tables that show a statistical description of the input (inventory) data for a projection be written to the standard FVS output file. Statistics reported include board-foot volume, cubic-foot volume, trees per acre, and basal area per acre for each species present in the stand. Also included are the mean, standard deviation, coefficient of variation, and confidence limits across sample plots for stand totals of these volume and density measures. The user-defined significance level defines the corresponding Student's t-value computed by the program.

field 1: Significance level for computing confidence limits. *Default = 0.05*

Caution: No corrections are made to account for non-stockability if the stand contains non-stockable plots. These plots are included in the calculations.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.2.1

STDIDENT (<u>STa</u>n<u>D</u> <u>IDENT</u>ification)
Variants: All

Specifies a stand identification code and optional descriptive title to label output tables.

No fields are associated with this keyword. Stand identification information is entered on a supplemental record.

Supplemental record:
Contains a stand identification code of up to 26 characters. This stand ID will appear with every output table. A blank character indicates the end of the stand identification code. Anything entered after the blank, up to column 80, is read as an optional "Title" that will appear with some of the output tables.

Example:
```
STDIDENT
C24S112  Stand 112 in Clear Creek drainage
```

This example uses "C24S112" as the stand ID. This appears along with "Stand 112 in Clear Creek drainage" in the headings of tables in the main FVS output file.

STDINFO (STanD INFOrmation)
Variants: All
Related keywords: MODTYPE, LOCATE

Describes the characteristics of the site where the stand is located. Default values for the different fields vary by variant and are listed in the table below the field descriptions.

field 1: Numeric Region and National Forest code where stand is located.
RFF where R = region, FF = 2-digit forest code

For KT variant, RFFDDCCC where R = region, FF = forest, DD = district, CCC = compartment (used in growth equations)

For SE and SN variants, RFFDD where R = region, FF = forest, DD = district (used in volumes)

field 2: Stand habitat type code or plant community code (ecological unit code in SN.)

field 3: Stand age in years.

field 4: Stand aspect in degrees (0 = No meaningful aspect, 360 = North).

field 5: Stand slope percent.

field 6: Stand elevation in 100's of feet (10's of feet in AK variant). For example, a code of 52 would mean elevation is 5200 feet (520 feet in AK).

field 7: Potential Vegetation (field 2) Reference code. For list of reference codes see FSVEG documentation.

Note: Any field on the STDINFO keyword that is left blank will retain the value assigned by a previous STDINFO keyword. If no value was previously assigned, the default is used.

Note: The values entered in fields 2-6 are available in the event monitor in variables HABTYPE, AGE, ASPECT, SLOPE, and ELEV respectively.

Note: The Suppose interface program automatically includes a STDINFO keyword based on the corresponding fields in the stand list file.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 12
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.2.2

STOP   (STOP processing)
Variants: All

Marks the end of the keyword record file. When the STOP keyword is encountered, program execution ends.

No fields are associated with this keyword.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 8
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.3.3

STRCLASS (STRuctural CLASS)
Variants: All

Requests that structural class calculations are done by FVS. A table of structural statistics can be written to the main FVS output file. The structural class computation results are made available to the Event Monitor. The STRCLASS keyword must be present if the user is going to use Event Monitor structural stage variables (refer to the list in the Note that follows this description).

field 1:   A nonzero entry causes FVS to print the table of structural statistics in the main FVS output file. 0 (zero) suppresses printing of the tables. *Default = 1*

field 2:   The percentage of a tree's height that is used to define the minimum gap size. *Range: 0-100,   Default = 30*

field 3:   The dbh boundary (in inches) separating seedling/sapling-sized trees from pole sized trees. *Default = 5.0*

field 4:   The dbh boundary (in inches) separating pole-sized trees from large trees that may be considered old. *Default = 25.0*

field 5:   The minimum percent cover that must be exceeded for a potential stratum to qualify as an actual stratum. *Range: 0-100, Default = 5*

field 6:   Minimum trees per acre that must be exceeded for a stand that has less than 5 percent cover to be classified stand initiation rather than bare ground. *Default = 200*

field 7:   Percentage of the maximum stand density index that must be exceeded for a stand to be classified stem exclusion rather than stand initiation. *Range: 0-100, Default = 30*

Note: When the STRCLASS keyword is used the structural classification logic is triggered. Then, and only then, the following Event Monitor variables are automatically defined by FVS:

BSCLASS   Before-thinning structural class code
ASCLASS   After-thinning structural class code
BSTRDBH   Before-thinning weighted average dbh of the uppermost stratum
ASTRDBH   After-thinning weighted average dbh of the uppermost stratum
BCANCOV   Before-thinning percent canopy cover for the stand
ACANCOV   After-thinning percent canopy cover for the stand
BMAXHS   Before-thinning height of tallest tree in uppermost stratum
AMAXHS   After-thinning height of tallest tree in uppermost stratum

BMINHS	Before-thinning height of shortest tree in uppermost stratum
AMINHS	After-thinning height of shortest tree in uppermost stratum
BNUMSS	Before-thinning total number of valid strata
ANUMSS	After-thinning total number of valid strata

Reference: RMRS-GTR-24, Percent Canopy Cover and Stand Structure Statistics ...
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.2.2

SVS

(Stand Visualization System input)
Variants: All

Generates output files specifically for running the Stand Visualization System (SVS) post processor. The SVS software is not a part of the FVS software. It is maintained by the Pacific Northwest Research Station. It generates 3D drawings of the stand based on information produced by FVS.

field 1: Plot geometry and tree placement. *Default = 1*

0	Square SVS layout, ignore FVS plot designations
1	Square SVS layout, position trees by FVS plot designation
2	Round SVS layout, ignore FVS plot designations
3	Round SVS layout, position trees by FVS plot designation

field 2: Grid size for ground surface definition file. This is the number of cells along each side of the square grid of colors used to cover the ground in the SVS images. A value of 0 (zero) indicates no ground surface definition file is to be used. *Range = 0-256, Default = 100*

field 3: Draw range poles. *Default = 0*

0	No range poles
1	Range poles are drawn at the edges of the SVS layout

field 4: Draw subplot boundaries. *Default = 0*

0	No FVS plot boundaries drawn
1	FVS plot boundaries are drawn as lines in the SVS layout

field 5: Ground grid color scheme for ground surface definition file. *Default = 2*

1	Reds/oranges	11	Khakis/browns
2	Tans	12	Light greens
3	Reddish browns	13	Dark bluegreens
4	Light greys	14	Chocolate browns
5	Lime greens	15	Dark tans
6	Dark greens	16	Yellows
7	Medium bluegreens	17	Medium greys
8	Dark greens	18	Browns
9	Dark greys	19	Greens
10	Light browns	20	Dark browns

field 6: Render SVS output in imperial or metric units . *Default = 0*

0	Output is generated in imperial units
1	Output is generated in metric units

Note: Use of this keyword does not automatically start the SVS post processor program.

Note: There are several output files created by the SVS keyword. An index file is produced which has the same base name as the simulation file with a *_index.svs* appended. The

image files associated with the index file are placed in a directory with the base name of the simulation file. The first image file is named with the simulation base name with _001.svs appended, and subsequent files are named similarly using subsequent numbers in the names (e.g. simulation file *testrun.key* produces index file *testrun_index.svs*, and image files *testrun_001.svs*, *testrun_002.svs*, etc.).

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.7

SYSTEM   (<u>SYSTEM</u>)
Variants: All
Related keywords:

A command that is processed by the operating system at the end off the scheduled cycle.

> field 1:   Year or cycle in which command is to be processed. If field is left blank then command will be processed as soon as it is read.

> Supplemental record:
> System command. *Default = echo system command*

TCONDMLT (<u>T</u>ree <u>C</u>ondition <u>MULT</u>iplier)
Variants: All
Related keywords: SPECPREF, THINxxx

Sets the tree value class multiplier, special tree status multiplier and or plot density multiplier in the harvest priority algorithm. This affects the order in which trees are selected for removal when a harvest is implemented. When a thinning is implemented, tree records with the highest removal priority are selected first, and selection continues based on removal priority until the parameters of the thinning have been met, or until all records have been selected. The removal priority is determined by the equation below:

$$P = (F_d \cdot DBH) + SP + (F_t \cdot IMC) + F_m + (F_s \cdot STS) + (F_{pba} \cdot PBA_i) + (F_{pccf} \cdot PCCF_i) + (F_{ptpa} \cdot PTPA_i)$$

where:
F_d	is equal to 1 if thinning from above, or -1 if thinning from below
DBH	is tree diameter at breast height
SP	is a user-specified species preference
F_t	is a user-specified multiplier for the tree value class code
IMC	is tree value class code
F_m	is a user-specified dwarf mistletoe preference
F_s	is a user-specified multiplier for the tree special status code
STS	is tree special status code
F_{pba}	is a user-specified multiplier for the point estimate of stand basal area
PBA_i	is stand basal area estimate for the inventory point where the tree is located
F_{pccf}	is a user specified multiplier for the point estimate of stand crown competition factor
$PCCF_i$	is the estimate of the stand crown competition factor for the inventory point where the tree is located
F_{ptpa}	is a user-specified multiplier for the point estimate of stand trees per acre
$PTPA_i$	is stand trees per acre estimate for the inventory point where the tree is located

The relevant part of the equation for this keyword is:

$$P = (F_d \cdot DBH) + (F_t \cdot IMC) + (F_s \cdot STS) + (F_{pba} \cdot PBA_i) + (F_{pccf} \cdot PCCF_i) + (F_{ptpa} \cdot PTPA_i)$$

The tree value class multiplier F_t is applied to the value class of all tree records. A value of 0 (zero) causes value class to be ignored in determining removal priority. The special tree status multiplier F_s is applied to the special tree status of any records that were given a special tree status (a special tree status code is the severity code associated with a damage code of 55). Special tree status codes are arbitrary. They were incorporated as a mechanism to allow modification of the removal priority based on user-defined attributes that would be otherwise unavailable to the user. A value of 0 (zero) causes special tree status to be ignored in determining removal priority. F_{pba}, F_{pccf} and F_{ptpa} are all multiplier that are applied based on point (or plot) density. Allowing users to increase (or decrease) the likelihood a tree will be removed based on the density of the tree's point (or plot). The TCONDMLT keyword alone does not remove trees. It must be followed by one or more thinning keywords, which, in conjunction with the TCONDMLT keyword, determine the order of tree records selected.

field 1: Year or cycle in which the change is to be implemented. Once in effect it remains in effect until replaced by a subsequent multiplier. *Default = 1*

field 2: Tree value class multiplier. A positive value increases the chance for removal of lower value class trees. A negative value increases the chance for removal of higher value class trees. *Default = 0*

field 3: Special tree status multiplier. A positive value increases the chance of removal of trees with a high special tree status code. A negative value increases the chance of retention of trees with a high special tree status code. *Default = 0*

field 4: Point basal area multiplier. A positive value increases the chance of removal of trees on the densest plots. A negative value increases the chance of retention of trees on dense plots. *Default = 0*

field 5: Point crown competition factor multiplier. A positive value increases the chance of removal of trees on the densest plots. A negative value increases the chance of retention of trees on dense plots. *Default =0*

field 6: Point trees per acre multiplier. A positive value increases the chance of removal of trees on the densest plots. A negative value increases the chance of retention of trees on dense plots. *Default =0*

Note: This keyword remains in effect until a subsequent use of the keyword changes the multipliers.

Note: Keyword order may be important. If a TCONDMLT keyword is specified for the *same year* that a thinning keyword is specified, the multipliers will affect the thinning only if the TCONDMLT keyword appears in the keyword sequence before the thinning keyword.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Caution: The TCONDMLT keyword has no effect on thinning done with the THINDBH or THINHT keywords.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 26
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.4.1

TFIXAREA   (Total FIXed plot AREA)
Variants: All
Related keywords: DESIGN

Specifies the total fixed-plot area for small-tree plots. This ensures that the trees per acre expansions are representative of the sampling design. This is useful when multiple small-tree plots are used at each of the plots specified in the tree data. For example, if at every point in a survey three 1/300-acre plots are installed for small trees, the total fixed area for the small-tree plots is 3/300 acre, which reduces to 1/100 acre. The value entered on this keyword is then is 100 (the inverse of 1/100). Trees per acre expansions for small trees will use a factor of 100 instead of 300.

> field 1: Inverse of total small-tree fixed plot area (e.g. if there are 2 fixed area plots each of 1/100 acre on every plot, enter 50 in this field). *Default = 300*

Caution: Do not confuse multiple small-tree plots with a sampling design where different size small trees are recorded using different size fixed-plots. In the latter case the areas should NOT be added together. Instead, the tree counts for all small trees in the tree data will need to be modified to represent a single plot size, and the DESIGN keyword will specify the size of the new representative plot size used for the modified tree counts.

Note: The breakpoint diameter that determines the dbh below which trees were recorded using the small-tree fixed plots is specified on the DESIGN keyword.

Note: If a small-tree fixed plot area is specified on both the DESIGN and TFIXAREA keyword records, the value on the record occurring later in the keyword sequence will be used.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.1.2.3

THEN   (schedule if-THEN activities)
Variants: All
Related keywords: IF, ENDIF, AGPLABEL, ALSOTRY

Signifies the scheduling portion of an Event Monitor IF-THEN block. The Event Monitor keyword sequence must begin with an IF keyword. The next record must be a condition statement that evaluates to true or false. The next record is a THEN keyword. The sequence ends with an ENDIF keyword. All keywords contained between the THEN and ENDIF keywords will be executed whenever the condition is true. Any activity that can be normally scheduled can be alternatively scheduled within the Event Monitor IF-THEN block. The scheduling date (field 1) on the activity is then interpreted as a delay period. If the date entered is 10, the activity will be scheduled 10 years following the each date that the logical expression is true. Multiple activities can be scheduled in a single IF-THEN block, and all will be triggered by the same condition.

> No fields are associated with this keyword when used outside the parallel processing extension.

Example: If stand basal area exceeds 100 square feet per acre, wait 10 years (first parameter of the THINDBH keyword is now a delay period) and then thin the stand according to the THINDBH parameters. Once this condition is true, wait 30 years (parameter on the IF keyword) before checking the condition again:

```
IF                30
BBA GT 100
THEN
THINDBH           10        0        99       1.0        0        0        0
ENDIF
```

Caution: The year/cycle field on activity keywords changes meaning to become a delay period when the keywords are included in an Event Monitor IF-THEN-ENDIF block. Entering 2010 in the date field of an activity keyword that is in an IF-THEN-ENDIF block will cause a delay period of 2010 years between the time the condition is true and the time the activity will be scheduled.

Note: When using the Suppose interface program, scheduling by condition is accomplished by clicking the "Schedule by Condition" button in individual keyword windows, and then clicking the "Condition" button and selecting "Free Form" to set up the condition statement. The activity keyword that follows the THEN statement (the THINDBH keyword as shown in the example above) is not typed in explicitly, but is rather set up using the keyword window. When the condition statement has been typed in, the "OK" button is clicked to return to the keyword window to fill in the appropriate field values. The ENDIF keyword will be added automatically.

References: GTR INT-275, User's Guide to the Event Monitor..., p. 2
               Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.5.1

THINABA

(<u>THIN</u> from <u>A</u>bove to <u>B</u>asal <u>A</u>rea target)
Variants: All
Related keywords: THINxxx, SPECPREF, TCONDMLT, CUTEFF

Schedules a thinning from above to a basal-area-per-acre target. Only trees with dbh's and heights within the user-defined ranges are considered for removal. The tree record with the largest diameter within the specified range is considered for removal first, and the proportion of that tree record specified in field 3 is removed. The tree record with the next largest diameter is considered next, then the next largest and so on until the residual basal area target is met or all records in the specified range have been considered. The residual target basal area is specified only for the user-defined range of dbh and height, and does *not* represent the total residual unless the range of dbh's and heights includes all trees in the stand.

field 1: Year or cycle that thinning is scheduled. *Default = 1*

field 2: Target basal area in square feet per acre for the segment of the dbh and height distribution defined in fields 4-7. *An entry is required*

field 3: Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword for description). *Range: 0.01-1.0, Default = 1.0*

field 4: Smallest dbh in inches to be considered for removal (greater than or equal). *Default = 0.0*

field 5: Largest dbh in inches to be considered for removal (less than). *Default = 999.0*

field 6: Shortest tree in feet to be considered for removal (greater than or equal). *Default = 0*

field 7: Tallest tree in feet to be considered for removal (less than). *Default = 999*

Caution: The specified residual target is for the user-defined range of dbh and height. The total residual will also include all trees that do not fall within this range.

Caution: If the cutting efficiency is set too low, the model may not be able to attain the residual target specified. The thinning request will be completed, but the residual stand condition will be greater than the specified target.

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: If field 2 is blank the keyword is ignored.

Note: If the initial stand condition is already less than the target specified, the thinning will be cancelled. Look at the "Activity Summary" portion of the standard FVS output to see which requests were implemented and which were cancelled.

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 27
GTR INT-208, Supplement to the User's Guide..., p. 16
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.4.2

THINATA (THIN from Above to Trees per Acre target)
Variants: All
Related keywords: THINxxx, SPECPREF, TCONDMLT, CUTEFF

Schedules a thinning from above to a trees-per-acre target. Only trees with dbh's and heights within the user-defined ranges are considered for removal. The tree record with the largest diameter within the specified range is considered for removal first, and the proportion of that tree record specified in field 3 is removed. The tree record with the next largest diameter is considered next, then the next largest and so on until the residual trees-per-acre target is met or all records in the specified range have been considered. The residual target trees per acre is specified only for the user-defined range of dbh and height, and does *not* represent the total residual unless the range of dbh's and heights includes all trees in the stand.

field 1: Year or cycle that thinning is scheduled. *Default = 1*

field 2: Target trees per acre for the segment of the dbh and height distribution defined in fields 4-7. *An entry is required*

field 3: Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword for description). *Range: 0.01-1.0, Default = 1.0*

field 4: Smallest dbh in inches to be considered for removal (greater than or equal). *Default = 0.0*

field 5: Largest dbh in inches to be considered for removal (less than). *Default = 999.0*

field 6: Shortest tree in feet to be considered for removal (greater than or equal). *Default = 0*

field 7: Tallest tree in feet to be considered for removal (less than). *Default = 999*

Caution: The specified residual target is for the user-defined range of dbh and height. The total residual will also include all trees that do not fall within this range.

Caution: If the cutting efficiency is set too low, the model may not be able to attain the residual target specified. The thinning request will be completed, but the residual stand condition will be greater than the specified target.

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: If field 2 is blank the keyword is ignored.

Note: If the initial stand condition is already less than the target specified, the thinning will be cancelled. Look at the "Activity Summary" portion of the standard FVS output to see which requests were implemented and which were cancelled.

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 27
GTR INT-208, Supplement to the User's Guide..., p. 16
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.4.2

THINAUTO (THIN AUTOmatically)
Variants: All
Related keywords: THINxxx, SPECPREF, TCONDMLT, CUTEFF

Schedules automatic stocking control. Thinning from below is automatically scheduled whenever the stand density exceeds the user-defined upper limit management threshold. The thinning reduces stand density to the user-defined lower limit management threshold. Thresholds are defined as percentages of maximum stand density index.

field 1: Year or cycle that automatic stocking control is to begin. The need for thinning will be evaluated in that cycle, and in all subsequent cycles. *Default = 1*

field 2: Percentage of maximum SDI that defines the lower management limit for stand density. *Default = 45*

field 3: Percentage of maximum SDI that defines the upper management limit for stand density. *Default = 60*

field 4: Cutting efficiency parameter specific to automatic stocking control request (refer to the CUTEFF keyword for description). *Range: 0.01-1.0, Default = 1*

Caution: Check the stocking guide used by the growth model to be sure lower and upper limits are appropriate for your area.

Caution: When using the KT or NI variant, an SDIMAX keyword must be included in the simulation file and the SDI maximums must be set for all species, otherwise this keyword will result in a clearcut.

Caution: If the cutting efficiency is set too low, the model may not be able to attain the lower limit specified. The thinning request will be completed, but the residual stand condition will be denser than the lower limit specifies.

Note: If field 2 is blank the keyword is ignored.

Note: This keyword can create management scenarios that are impractical to implement on the ground. Using the Event Monitor, other sets of keywords can be created that achieve automatic stand density control using other thinning keywords. In this way the deficiencies of this keyword can be overcome.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 28
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.4.3

THINBBA (THIN from Below to Basal Area target)
Variants: All
Related keywords: THINxxx, SPECPREF, TCONDMLT, CUTEFF

Schedules a thinning from below to a basal-area-per-acre target. Only trees with dbh's and heights within the user-defined ranges are considered for removal. The tree record with the smallest diameter within the specified range is considered for removal first, and the proportion of that tree record specified in field 3 is removed. The tree record with the next smallest diameter is considered next, then the next smallest and so on until the residual basal area target is met or all records in the specified range have been considered. The residual target basal area is specified only for the user-defined range of dbh and height, and does *not* represent the total residual unless the range of dbh's and heights includes all trees in the stand.

field 1: Year or cycle that thinning is scheduled. *Default = 1*

field 2: Target basal area in square feet per acre for the segment of the dbh and height distribution defined in fields 4-7. *An entry is required*

field 3: Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword for description). *Range: 0.01-1.0, Default = 1.0*

field 4: Smallest dbh in inches to be considered for removal (greater than or equal). *Default = 0.0*

field 5: Largest dbh in inches to be considered for removal (less than). *Default = 999.0*

field 6: Shortest tree in feet to be considered for removal (greater than or equal). *Default = 0*

field 7: Tallest tree in feet to be considered for removal (less than). *Default = 999*

Caution: The specified residual target is for the user-defined range of dbh and height. The total residual will also include all trees that do not fall within this range.

Caution: If the cutting efficiency is set too low, the model may not be able to attain the residual target specified. The thinning request will be completed, but the residual stand condition will be greater than the specified target.

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: If field 2 is blank the keyword is ignored.

Note: If the initial stand condition is already less than the target specified, the thinning will be cancelled. Look at the "Activity Summary" portion of the standard FVS output to see which requests were implemented and which were cancelled.

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 27
GTR INT-208, Supplement to the User's Guide..., p. 16
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.4.2

THINBTA   (THIN from Below to Trees per Acre target)
Variants: All
Related keywords: THINxxx, SPECPREF, TCONDMLT, CUTEFF

Schedules a thinning from below to a trees-per-acre target. Only trees with dbh's and heights within the user-defined ranges are considered for removal. The tree record with the smallest diameter within the specified range is considered for removal first, and the proportion of that tree

record specified in field 3 is removed. The tree record with the next smallest diameter is considered next, then the next smallest and so on until the residual trees-per-acre target is met or all records in the specified range have been considered. The residual target trees per acre is specified only for the user-defined range of dbh and height, and does *not* represent the total residual unless the range of dbh's and heights includes all trees in the stand.

field 1: Year or cycle that thinning is scheduled. *Default = 1*

field 2: Target trees per acre for the segment of the dbh and height distribution defined in fields 4-7. *An entry is required*

field 3: Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword for description). *Range: 0.01-1.0, Default = 1.0*

field 4: Smallest dbh in inches to be considered for removal (greater than or equal). *Default = 0.0*

field 5: Largest dbh in inches to be considered for removal (less than). *Default = 999.0*

field 6: Shortest tree in feet to be considered for removal (greater than or equal). *Default = 0*

field 7: Tallest tree in feet to be considered for removal (less than). *Default = 999*

Caution: The specified residual target is for the user-defined range of dbh and height. The total residual will also include all trees that do not fall within this range.

Caution: If the cutting efficiency is set too low, the model may not be able to attain the residual target specified. The thinning request will be completed, but the residual stand condition will be greater than the specified target.

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: If field 2 is blank the keyword is ignored.

Note: If the initial stand condition is already less than the target specified, the thinning will be cancelled. Look at the "Activity Summary" portion of the standard FVS output to see which requests were implemented and which were cancelled.

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 27

THINCC   (<u>THIN</u> to <u>C</u>anopy <u>C</u>over target)
Variants: All
Related keywords: THINxxx, SPECPREF, TCONDMLT, CUTEFF

Schedules a thinning from a specified dbh range for any, or all, species to a percent canopy cover target. Canopy cover is corrected for crown overlap. If the target canopy cover is nonzero and the cutting control flag is zero, thinning occurs uniformly throughout the specified dbh range until the target is met (the cutting efficiency parameter is ignored and the cutting efficiency needed to complete the thinning is automatically computed by the program). If the target canopy cover is nonzero and the cutting control flag is nonzero, then the cutting efficiency parameter is used, along with the Removal Priority Algorithm. If the cutting efficiency parameter is set so low that the target cannot be reached, the cutting efficiency is recalculated so that the target is met. Only trees of the user-specified species that are within the user-defined dbh range are considered for removal. The residual target canopy cover is specified only for that species and dbh range, and does *not* represent the total residual unless the dbh range includes all trees of all species in the stand.

   field 1:   Year or cycle that thinning is scheduled. *Default = 1*

   field 2:   Residual Canopy Cover (percent). *Default = 0*

   field 3:   Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword). *Range: 0.01-1.0, Default = model computed*

   field 4:   Species code for trees to be removed in this cut. *Default = 0 (All)*

   field 5:   Smallest dbh in inches to be considered for removal (greater than or equal). *Default = 0.0*

   field 6:   Largest dbh in inches to be considered for removal (less than). *Default = 999.0*

   field 7:   Cutting control flag. *Default = 0*
               0 = thin throughout the specified diameter range
               1 = thin from below in the specified diameter range
               2 = thin from above in the specified diameter range.

Canopy cover is computed using the following equation:

$$C_1 = 100 \left(\sum [TPA_i * A_i] \right) / 43560$$

   where: C_1 = percent canopy cover without accounting for overlap
              TPA_i = trees per acre represented by the ith tree record
              A_i = projected crown area of the ith tree record in ft^2/acre

$$C_2 = 100 \left[1 - \exp(-.01C_1) \right]$$

   where: C_2 = percent canopy cover that accounts for overlap
              C_1 = percent canopy cover without accounting for overlap

Caution: The overlap correction only applies to the canopy cover percentage contained on an individual thinning request; the overlap correction does not account for overlap between multiple THINCC requests with different diameter ranges.

Caution: The specified residual target is for the user-specified species and user-defined range of dbh only. The total residual will also include all trees that do not fall within this range.

Caution: The Removal Priority Algorithm is only used when the cutting control flag is nonzero, (reference: SPECPREF and TCONDMLT keywords)

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: If the initial stand condition is already less than the target specified, the thinning will be cancelled. Look at the "Activity Summary" portion of the standard FVS output to see which requests were implemented and which were cancelled.

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR RMRS-24, Percent Canopy Cover and Stand Structure Statistics from the Forest Vegetation Simulator. pp 1-2.
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.4.2.3

THINDBH   (THIN from a DBH range)
Variants: All
Related keywords: THINxxx, CUTEFF

Schedules a thinning from throughout a specified dbh range for any or all species to a basal area per acre or trees per acre target. If the target trees per acre or target basal area is nonzero, thinning occurs uniformly throughout the specified dbh range until the target is met (cutting efficiency is ignored). In other words, a calculated proportion of each of the eligible tree records is removed such that the target trees per acre or target basal area is exactly met. If both residual targets are 0 (zero), the cutting efficiency determines the proportion of trees represented by each eligible tree record that will be removed (residual targets are ignored). Only trees of the user-specified species that are within the user-defined dbh range are considered for removal. The residual target basal area per acre or trees per acre is specified only for that species and dbh range, and does *not* represent the total residual unless the dbh range includes all trees of all species in the stand.

field 1: Year or cycle that thinning is scheduled. *Default = 1*

field 2: Smallest dbh in inches to be considered for removal (greater than or equal).
          Default = 0.0

field 3: Largest dbh in inches to be considered for removal (less than). *Default = 999.0*

field 4: Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword for description). *Range: 0.01-1.0, Default = 1*

field 5: Species code for trees to be removed in this cut. *Default = All*

field 6: Target trees per acre for the segment of the dbh distribution of the species defined in fields 2, 3, and 5. *Default = 0*

field 7: Target basal area in square feet per acre for the segment of the dbh distribution of the species defined in fields 2, 3, and 5. *Default = 0*

Caution: The specified residual target is for the user-specified species and user-defined range of dbh only. The total residual will also include all trees that do not fall within this range.

Caution: The Removal Priority Algorithm is not invoked with this keyword, therefore SPECPREF TCONDMLT and MISTPREF keywords have no effect on thinnings that use THINDBH.

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: If the initial stand condition is already less than the target specified, the thinning will be cancelled. Look at the "Activity Summary" portion of the standard FVS output to see which requests were implemented and which were cancelled.

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: If both the basal area per acre target and the trees per acre target are specified on the same keyword, the trees per acre target is used.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 24
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.3.2

THINHT   (THIN from a HeighT range)
Variants: All
Related keywords: THINxxx, CUTEFF

Schedules a thinning from throughout a specified height range for any or all species to a basal area per acre or trees per acre target. If the target trees per acre or target basal area is nonzero, thinning occurs uniformly throughout the specified height range until one of the targets is met (cutting

efficiency is ignored). In other words, a calculated proportion of each of the eligible tree records is removed such that the target trees per acre or target basal area is exactly met. If both residual targets are 0 (zero), the cutting efficiency determines the proportion of trees represented by each eligible tree record that will be removed (residual targets are ignored). Only trees of the user-specified species that are within the user-defined height range are considered for removal. The residual target basal area or trees per acre is specified only for that species and height range, and does *not* represent the total residual unless the height range includes all trees of all species in the stand.

>   field 1:   Year or cycle that thinning is scheduled. *Default = 1*
>
>   field 2:   Shortest tree in feet to be considered for removal (greater than or equal). *Default = 0*
>
>   field 3:   Tallest tree in feet to be considered for removal (less than). *Default = 999*
>
>   field 4:   Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword for description). *Range: 0.01-1.0, Default = 1*
>
>   field 5:   Species code for trees to be removed in this cut. *Default = All*
>
>   field 6:   Target trees per acre for the segment of the height distribution of the species defined in fields 2, 3, and 5. *Default = 0*
>
>   field 7:   Target basal area in square feet per acre for the segment of the height distribution of the species defined in fields 2, 3, and 5. *Default = 0*

Caution: The specified residual target is for the user-specified species and user-defined range of height only. The total residual will also include all trees that do not fall within this range.

Caution: The Removal Priority Algorithm is not invoked with this keyword, therefore SPECPREF TCONDMLT and MISTPREF keywords have no effect on thinnings that use THINHT.

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: If the initial stand condition is already less than the target specified, the thinning will be cancelled. Look at the "Activity Summary" portion of the standard FVS output to see which requests were implemented and which were cancelled.

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: If both the basal area per acre target and the trees per acre target are specified on the same keyword, the trees per acre target is used.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.3.3

THINMIST

(THIN trees with dwarf MISTletoe)
Variants: All
Related keywords: THINxxx

Schedules a thinning based on Dwarf Mistletoe rating (DMR). Trees can be removed based on their Dwarf Mistletoe Rating and diameter.

field 1: Year or cycle that thinning is scheduled. *Default = 1*

field2: Dwarf Mistletoe Rating (DMR) code for trees that are to be removed in this thinning. *Default = 0, which means rating of 1-6, (i.e. all infected trees)*

field 3: Smallest dbh in inches to be considered for removal (greater than or equal). *Default = 0.0*

field 4: Largest dbh in inches to be considered for removal (less than). *Default = 999.0*

field 5: Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword for description). *Range: 0.01-1.0, Default = 1*

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.3.4.

THINPRSC

(THIN by PReSCription)
Variants: All
Related keywords: THINxxx, CUTEFF

Schedules a thinning based on prescription code. Prescription codes are numeric codes that are found in the input tree records (column 49). Prescription codes are user-defined, and have no inherent meaning in FVS. They are only useful in conjunction with this keyword. For example, if

tree records that are to be removed have prescription code 2, and those that are to be left have prescription code 1, then field 3 of the THINPRSC keyword will be 2 and trees with that prescription code will be removed. The cutting efficiency determines the proportion of trees represented by a tree record that will be removed if that tree record contains the specified prescription code.

> field 1: Year or cycle that prescription thinning is scheduled. *Default = 1*

> field 2: Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword for description). *Range: 0.01-1.0, Default = 1*

> field 3: Prescription code for trees that are to be removed in this thinning. *Range: 2-9*

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: It may help to think of the prescription code in the input tree records (column 49) as a number painted on the live trees in the stand. Then think of the prescription code identified in this keyword (field 3) as instructing the harvest crew to cut trees with the identified number painted on them. The cutting efficiency determines the proportion of these trees to be cut.

Note: Prescription codes in the input tree records can be edited in a text editor. There is also an editing feature available through the Suppose interface program that displays the tree data in a template form that contains field descriptions. This feature is accessible through the "Edit FVS Tree Data" item in the "Options" menu.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.3.1

THINPT

(THIN by Point)
Variants: All
Related keywords: THINxxx, POINTREF, SETPTHIN

Schedules a thinning from a specified dbh range for any, or all, species to a density target, specified using the the SETPTHIN keyword.. If the target relative density is nonzero and the cutting control flag is zero, thinning occurs uniformly throughout the specified dbh range until the target is met (the cutting efficiency parameter is ignored and the cutting efficiency needed to complete the thinning is automatically computed by the program). If the target relative density is nonzero and the cutting control flag is nonzero, then the cutting efficiency parameter is used, along with the Removal Priority Algorithm. If the cutting efficiency parameter is set so low that the target cannot be reached, the cutting efficiency is recalculated so that the target is met. Only trees of the user-specified species that are within the user-defined dbh range are considered for removal. The residual target relative density is specified only for that species and dbh range, and does *not* represent the total residual unless the dbh range includes all trees of all species in the stand.

> field 1: Year or cycle that thinning is scheduled. *Default = 1*

> field 2: Residual Target for attribute specified on the SETPThin keyword . *Default = 0*

field 3: Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword). *Range: 0.01-1.0, Default = model computed*

field 4: Species code for trees to be removed in this cut. *Default = 0 (All)*

field 5: Smallest dbh in inches to be considered for removal (greater than or equal). *Default = 0.0*

field 6: Largest dbh in inches to be considered for removal (less than). *Default = 999.0*

field 7: Cutting control flag. *Default = 0*
        0 = thin throughout the specified diameter range
        1 = thin from below in the specified diameter range
        2 = thin from above in the specified diameter range.

Caution: The specified residual target is for the user-specified species and user-defined range of dbh only. The total residual will also include all trees that do not fall within this range.

Caution: The Removal Priority Algorithm is only used when the cutting control flag is nonzero, (reference: SPECPREF and TCONDMLT keywords)

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: If the initial stand condition is already less than the target specified, the thinning will be cancelled. Look at the "Activity Summary" portion of the standard FVS output to see which requests were implemented and which were cancelled.

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

THINRDEN (THIN to Relative DENsity target)
Variants: All
Related keywords: THINxxx, SPECPREF, TCONDMLT, CUTEFF

Schedules a thinning from a specified dbh range for any, or all, species to a relative density target. If the target relative density is nonzero and the cutting control flag is zero, thinning occurs uniformly throughout the specified dbh range until the target is met (the cutting efficiency parameter is ignored and the cutting efficiency needed to complete the thinning is automatically computed by the program). If the target relative density is nonzero and the cutting control flag is nonzero, then the cutting efficiency parameter is used, along with the Removal Priority Algorithm. If the cutting efficiency parameter is set so low that the target cannot be reached, the cutting

efficiency is recalculated so that the target is met. Only trees of the user-specified species that are within the user-defined dbh range are considered for removal. The residual target relative density is specified only for that species and dbh range, and does *not* represent the total residual unless the dbh range includes all trees of all species in the stand.

       field 1: Year or cycle that thinning is scheduled. *Default = 1*

       field 2: Residual Relative Density. *Default = 0*

       field 3: Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword). *Range: 0.01-1.0, Default = model computed*

       field 4: Species code for trees to be removed in this cut. *Default = 0 (All)*

       field 5: Smallest dbh in inches to be considered for removal (greater than or equal). *Default = 0.0*

       field 6: Largest dbh in inches to be considered for removal (less than). *Default = 999.0*

       field 7: Cutting control flag. *Default = 0*
                0 = thin throughout the specified diameter range
                1 = thin from below in the specified diameter range
                2 = thin from above in the specified diameter range.

Relative Density is computed using the following equation:

$$RD = BA_{cls} / (QMD_{cls})^{0.5}$$

    where: BA_{cls} = basal area for the specified species in the specified diameter range
             QMD_{cls} = quadratic mean diameter at breast height of the specified Species in the specified diameter range

Caution: The specified residual target is for the user-specified species and user-defined range of dbh only. The total residual will also include all trees that do not fall within this range.

Caution: The Removal Priority Algorithm is only used when the cutting control flag is nonzero, (reference: SPECPREF and TCONDMLT keywords)

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: If the initial stand condition is already less than the target specified, the thinning will be cancelled. Look at the "Activity Summary" portion of the standard FVS output to see which requests were implemented and which were cancelled.

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges

do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: Curtis, Robert O. 1982. A Simple Index of Stand Density for Douglas-fir. Forest Sci., 28(1):92-94.
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.4.2.4

THINRDSL   (THIN to Relative Density SiLvah target)
Variants: NE
Related keywords: THINxxx, SPECPREF, TCONDMLT, CUTEFF

This keyword only works in the Northeast variant. The thinning will be cancelled unless the stand is one of the following five SILVAH forest types:
Northern Hardwood – stands that have at least 65% of total stand basal area in sugar maple, red maple, American beech, yellow birch, sweet birch, eastern hemlock, American basswood, cucumbertree, black cherry, white ash, or yellow-poplar.
Northern hardwood-hemlock – stands meeting the requirements for the northern hardwood type which also have at least 50% of their basal area in eastern hemlock.
Allegheny hardwood – stands meeting the requirements for the northern hardwood type that also have at least 25% of their basal area in black cherry, white ash, and yellow-poplar, and less than 50% of their basal area in eastern hemlock.
Oak-hickory – stands that have at least part of their basal area in any oak or hickory species.
Transition – stands that have at least 65% of their basal area in species of either the northern hardwood or oak-hickory types, but do not qualify for any of the other forest types alone.

This keyword schedules a thinning from a specified dbh range for any, or all, species to a relative density target. If the target relative density is nonzero and the cutting control flag is zero, thinning occurs uniformly throughout the specified dbh range until the target is met (the cutting efficiency parameter is ignored and the cutting efficiency needed to complete the thinning is automatically computed by the program). If the target relative density is nonzero and the cutting control flag is nonzero, then the cutting efficiency parameter is used, along with the Removal Priority Algorithm. If the cutting efficiency parameter is set so low that the target cannot be reached, the cutting efficiency is recalculated so that the target is met. Only trees of the user-specified species that are within the user-defined dbh range are considered for removal. The residual target relative density is specified only for that species and dbh range, and does *not* represent the total residual unless the dbh range includes all trees of all species in the stand.

field 1:   Year or cycle that thinning is scheduled. *Default = 1*

field 2:   Residual Relative Density. *Default = 0*

field 3:   Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword). *Range: 0.01-1.0, Default = model computed*

field 4:   Species code for trees to be removed in this cut. *Default = 0 (All)*

field 5:   Smallest dbh in inches to be considered for removal (greater than or equal). *Default = 0.0*

field 6:   Largest dbh in inches to be considered for removal (less than). *Default = 999.0*

field 7:   Cutting control flag. *Default = 0*

0 = thin throughout the specified diameter range
1 = thin from below in the specified diameter range
2 = thin from above in the specified diameter range.

Relative Density is computed using the following equation:

$$RD = \sum_i \sum_j \{(a_i + b_i * DBH_j + c_i * DBH_j^2) * TPA_j\}$$

where: DBH = diameter at breast height of the jth tree of the specified species in the specified diameter range
TPA = trees per acre represented by the jth tree of the specified species in the specified diameter range
i = species subscript
j = tree record subscript
a,b,c = species group coefficients

Species Group 1: a = 0.0033033,   b = 0.020426,   c = 0.0006776

Species Group 2: a = -0.027142 ,   b = 0.024257,   c = 0.0015225

Species Group 3: a = -0.0027935,   b = 0.0058959,   c = 0.0047289

For the Northeast variant (provided by Susan Stout and Todd Ristau, USFS, NRS):
Species Group 1: ash species, white ash, yellow-poplar, black cherry, pin cherry

Species Group 2: eastern white pine, eastern hemlock, red maple, yellow birch sweet birch, sweetgum, cucumbertree, quaking aspen, balsam poplar, eastern cottonwood, bigtooth aspen, northern red oak, other hardwood species, hackberry, common persimmon, American holly, magnolia species, blackgum, sourwood, black locust, sassafras, American basswood, white basswood, other elm species, American elm, slippery elm, boxelder, serviceberry, American hornbeam, flowering dogwood, hawthorn species, eastern hophornbeam

Species Group 3: sugar maple, hickory species, pignut hickory, shellbark hickory, shagbark hickory, mockernut hickory, American beech, white oak, bur oak, chinkapin oak, post oak, other oak species, scarlet oak, shingle oak, water oak, pin oak, chestnut oak, swamp white oak, swamp chestnut oak, black oak, cherrybark oak, willow oak, non-commercial hardwood species, striped maple

Northeast variant species not specifically assigned to a group use the coefficients for species group 2.

Caution: The specified residual target is for the user-specified species and user-defined range of dbh only. The total residual will also include all trees that do not fall within this range

Caution: The Removal Priority Algorithm is only used when the cutting control flag is nonzero, (reference: SPECPREF and TCONDMLT keywords)

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: If the initial stand condition is already less than the target specified, the thinning will be

cancelled. Look at the "Activity Summary" portion of the standard FVS output to see which requests were implemented and which were cancelled.

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: Stout, Susan, L., Nyland, Ralph D. 1986. Role of species composition in relative density measurement in Allegheny hardwoods. Can. J. For. Res. 16:574-579.
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.4.2.4
Marquis, D. A.; Ernst, R. L.; 1992. User's guide to SILVAH. Gen. Tech. Rep. NE-162. Warren, PA: U. S. Department of Agriculture, Forest Service, Northeastern Research Station. 130p.

THINSDI   (<u>THIN</u> to <u>S</u>tand <u>D</u>ensity <u>I</u>ndex target)
Variants: All
Related keywords: THINxxx, SPECPREF, TCONDMLT, CUTEFF

Schedules a thinning from a specified dbh range for any, or all, species to a stand density index target. If the target stand density index is nonzero and the cutting control flag is zero, thinning occurs uniformly throughout the specified dbh range until the target is met (the cutting efficiency parameter is ignored and the cutting efficiency needed to complete the thinning is automatically computed by the program). If the target stand density index is nonzero and the cutting control flag is nonzero, then the cutting efficiency parameter is used, along with the Removal Priority Algorithm. If the cutting efficiency parameter is set so low that the target cannot be reached, the cutting efficiency is recalculated so that the target is met. Only trees of the user-specified species that are within the user-defined dbh range are considered for removal. The residual target stand density index is specified only for that species and dbh range, and does *not* represent the total residual unless the dbh range includes all trees of all species in the stand.

field 1:   Year or cycle that thinning is scheduled. *Default = 1*

field 2:   Residual Stand Density Index (SDI). *Default = 0*

field 3:   Cutting efficiency parameter specific to this thinning request (refer to the CUTEFF keyword). *Range: 0.01-1.0, Default = model computed*

field 4:   Species code for trees to be removed in this cut. *Default = 0 (All)*

field 5:   Smallest dbh in inches to be considered for removal (greater than or equal). *Default = 0.0*

field 6:   Largest dbh in inches to be considered for removal (less than). *Default = 999.0*

field 7:   Cutting control flag. *Default = 0*
                 0 = thin throughout the specified diameter range
                 1 = thin from below in the specified diameter range

2 = thin from above in the specified diameter range.

SDI is computed using the following equation:

$$\text{Stand SDI} = 0.00490419 * (SUMQ / TPA_{total})^{0.8025} * TPA_{total}$$
$$+ 0.01992714 * (SUMQ / TPA_{total})^{-0.1975} * SUMQ$$

where: $SUMQ = \sum(DBH_i^2 * TPA_i)$
DBH_i = diameter at breast height of the ith tree record
TPA_i = trees per acre represented by the ith tree record
TPA_{total} = total trees per acre in the stand

Caution: The specified residual target is for the user-specified species and user-defined range of dbh only. The total residual will also include all trees that do not fall within this range.

Caution: The Removal Priority Algorithm is only used when the cutting control flag is nonzero, (reference: SPECPREF and TCONDMLT keywords)

Caution: If a thinning keyword is embedded in an IF-THEN-ENDIF sequence, year (field 1) is interpreted as years from the time the condition is true until implementation, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to thin the stand.)

Note: If the initial stand condition is already less than the target specified, the thinning will be cancelled. Look at the "Activity Summary" portion of the standard FVS output to see which requests were implemented and which were cancelled.

Note: A thinning is always done in the first year of the cycle in which it is scheduled, even if the year entered in field 1 is not the first year of the cycle. If a thinning must occur in a particular year, a TIMEINT keyword may be needed to change the length of a cycle so that the desired year for the thinning becomes the first year of a cycle.

Note: Multiple thinning keywords can be scheduled for the same year to simulate different aspects of a single harvest. Care must be taken to ensure that the dbh and height ranges do not unintentionally overlap, or the residual may not be what was expected. Total residuals must be calculated carefully.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 24
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.4.2.2

TIMEINT (TIME INTerval)
Variants: All
Related keywords: NUMCYCLE, INVYEAR

Specifies the length, in years, of any or all projection cycles. Many actions (e.g. thinnings) in FVS are implemented in the first year of the cycle in which they are scheduled, regardless of the actual year in the cycle that the action was scheduled. The only way to ensure that an action can be implemented in the same year that it is scheduled is to schedule the action in the first year of a cycle. This may not be possible if the cycles are left at their default length of ten years. A TIMEINT keyword can be used to change the length of a cycle so that the desired year for a particular action becomes the first year of a cycle.

field 1: Cycle number whose length is to be changed. Enter 0 (zero) to change the length of all projection cycles. *Default = 1*

field 2: Cycle length in years for the cycle(s) referenced in field 1. *Default = 10 (NC default = 5)*

Note: This keyword affects only the specified cycle(s). The cycle immediately following does *not* represent the remainder of a cycle to return the simulation to the same cycle break years. Instead, subsequent cycles are affected by other TIMEINT keywords, or are assigned default lengths.

Note: Multiple TIMEINT keywords can be scheduled for a simulation. If multiple TIMEINT keywords are scheduled to affect any particular cycle, the last encountered use of the keyword will override the effects of all the previous.

Note: The Suppose interface program automatically includes a TIMEINT keyword whenever there are stands in a simulation that have different inventory years. The TIMEINT keyword is used to change the first cycle for stands that were inventoried earlier to bring all the simulations so a common year. Simulations for these stands will contain one additional cycle. From that point the simulations run with default cycle length.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 8
Essential FVS: A User's Guide to the Forest Vegetation Simulator, ss. 4.1.3.1, 5.1.2

TOPKILL

(TOPKILL trees)
Variants: All
Related keywords: HTGSTOP, CRNMULT

Kills a portion of the top of trees for randomly selected tree records that fall within the user-specified parameters for species and height. This can be used to simulate damage from insects or logging.

field 1: Year or cycle in which topkill is to be applied. *Default = 1*

field 2: Species code for which topkill is to be applied. *Default = All*

field 3: Shortest tree in feet (greater than or equal) that will be affected. *Default = 0*

field 4: Tallest tree in feet (less than) that will be affected. *Default = 0*

field 5: Probability that a tree will sustain topkill. *Range: 0.0 - 1.0, Default = 0.0*

field 6: Mean proportion of total tree height lost to topkill (e.g. 0.2 will kill an average of 20% of the total height on selected trees). *Default = 1.0*

field 7: Standard deviation of the distribution of the proportion of total tree height killed. This allows for variability in topkill proportion among the selected trees. *Default = 0.0*

Note: Once a tree record has been affected by a TOPKILL keyword it will not get taller for the remainder of the simulation. Truncated height will be reported to the point of topkill. Reported volumes are calculated using the truncated height, however the old total tree height is used to determine stem form.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-208, Supplement to the User's Guide..., p. 20
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.2.4

TREEDATA (TREE DATA file)
Variants: All
Related keywords: TREEFMT, SPCODES, OPEN

Specifies a file reference number for reading in tree data records. If this references an external file, a corresponding OPEN keyword must also be included. If the file reference number is 15, then tree data records are inserted directly into the keyword file as supplemental records to this keyword (the last supplemental record must be -999 to signify the end of the tree data records). Refer to TREEFMT for a description of the input format.

field 1: File reference number for the input tree data file. File reference numbers are a mechanism that FVS uses to keep track of external files. Numbers less than 30 are reserved for files that are currently used by FVS. If this field has a value of 15 then tree data records are entered as supplemental records. *Default = 2*

field 2: Flag to include plot specific site descriptors. Any numeric entry causes FVS to read plot descriptors from the tree data (columns 50-59). This information can be used by the Regeneration Establishment model.

field 3: Smallest dbh in inches to be considered for input (greater than or equal). All tree records with dbh less than this value will be ignored. *Default = 0.0*

field 4: Largest dbh in inches to be considered for input (less than). All tree records with dbh greater than or equal to this value will be ignored. *Default = 999.0*

field 5: Species code. All tree records with this species code will be ignored.

Caution: If a TREEFMT keyword is used, it must precede the TREEDATA keyword.

Note: The Suppose interface program automatically includes a TREEDATA keyword to read tree records from the file identified in the stand list file. The corresponding OPEN and CLOSE keywords are also included automatically.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 18
GTR INT-208, Supplement to the User's Guide..., p. 17
GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 24
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.2.3.1

TREEFMT (TREE data ForMaT)
Variants: All
Related keywords: SPCODES, TREEDATA

Provides a FORTRAN format statement that describes the layout of the tree data record. The following is the default tree format used to read the input tree variables

(I4,T1,I7,F6.0,I1,A3,F4.1,F3.1,2F3.0,F4.1,I1,6I2,2I1,I2,2I3,2I1,F3.0)

Where: I indicates "read as an integer" and the trailing number indicates the number of columns to read (e.g. I4 indicates 4 columns are to be read as integer input).

F indicates "read as decimal input" and the trailing numeric code indicates the total number of columns and number of decimal places (e.g. F4.1 indicates 4 columns are to be read as decimal input and 1 decimal place will be kept. If no decimal point is present, the last digit is assumed to be tenths).

A indicates "read as alpha characters" and the trailing number indicates the number of columns to read (e.g. A3 indicates 3 columns are to be read, and letters or other characters may be present. Blanks are read in as well).

T indicates a tab to a specific column. The trailing number indicates the column of the first character to be read using the next format listed.

Commas (,) separate individual format specifications.

Numbers that precede a letter indicate that the format specification is repeated that number of times (e.g. 2I3 is equivalent to I3,I3).

No fields are associated with this keyword. The format statement is entered on two supplemental records.

Supplemental records:
Two supplemental records are required, each a maximum of 80 characters long. The supplemental records comprise a FORTRAN format statement of the type described above. If the entire format statement is included in a single supplemental record, the second supplemental record will be blank, but it must still be included.

Example:
```
TREEFMT
(I2,T1,I6,T10,F7.1,I1,T8,A2,T16,F5.2,F3.1,
2F3.0,F4.1,I1,T80,6I2,2I1,I2,2I3,2I1,F3.0)
```

Default Tree Data Input Format

VARIABLE	FORMAT	COLUMNS
Plot ID	I4	1-4
Tree Number	I7	1-7
Tree Count	F6.0	8-13
Tree History	I1	14
Species	A3	15-17
Diameter at Breast Height	F4.1	18-21
DBH Increment	F3.1	22-24
Live Height	F3.0	25-27
Height to Top Kill	F3.0	28-30
Height Increment	F4.1	31-34
Crown Ratio Code	I1	35
Damage Code 1	I2	36-37
Severity Code 1	I2	38-39
Damage Code 2	I2	40-41
Severity Code 2	I2	42-43
Damage Code 3	I2	44-45
Severity Code 3	I2	46-47
Tree Value Class Code	I1	48

Cut/Leave Prescription Code	I1	49
Plot slope percent	I2	50-51
Plot aspect in degrees	I3	52-54
Plot habitat type code	I3	55-57
Plot topographic position code	I1	58
Plot site preparation code	I1	59
Tree Age	F3.0	60-62

Caution: If a TREEDATA keyword is used, it must follow the TREEFMT keyword.

Caution: If decimal input was specified in the format statement but no decimal point appears in the input, the decimal point will be assumed and its placement will be determined by the format statement. For example, the format statement F4.1 will cause input of 1234 to be read as 123.4.

Caution: Tree count is used in conjunction with the plot design information in the DESIGN keyword to determine the number of trees per acre each record represents. For example, a single seedling (tree count = 1) on one of five 1/100 acre fixed plots represents 20 seedlings per acre in the stand.

Note: Species and dbh are required fields. It is also suggested that minimally plot ID, tree count, tree history, and live height are included. In the absence of corresponding data, each tree record will be assumed to represent one live tree, all will be assumed to have been recorded on a single plot.

Note: If fields were not included in the tree data records tab to blank data columns and read blank data for those fields.

Note: If all tree records are ultimately reported by FVS as "other species" or something similar, an error has probably been made in the preparation of either the TREEFMT or SPCODES keywords.

Note: The Suppose interface program automatically includes a TREEFMT keyword with the default format. If the tree data records are in a different format, an additional TREEFMT keyword must be added with the proper format statement.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 19
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.2.3.2

TREELIST (TREELIST file)
Variants: All
Related keywords: CUTLIST, OPEN

Prints a list of tree records to an output treelist file.

field 1: Year or cycle in which treelist is to be printed. Enter 0 (zero) to print output for every cycle. *Default = 1*

field 2: File reference number for the output file. File reference numbers are a mechanism that FVS uses to keep track of external files. Numbers less than 30 are reserved for files that are currently used by FVS. *Default = 3*

field 3: Value to determine which header will be printed with the treelist. *Default = 0*
  1 Encoded header record (machine readable, -999)
  0 Header records describing each column (human readable)

-1   Suppress all headers

field 4: Cycle 0/1 treelist printing flag. This field is ignored unless field 1 represents the first cycle of the simulation (i.e. field 1 = 1, or field 1 = first year of simulation). *Default = 0*

        0   Print both cycle 0 and cycle 1
        1   Print only cycle 1
        2   Print only cycle 0 (beginning of simulation)

field 5: Live/dead treelist flag. *Default = 0*

        0   Requests the normal live and recent mortaility tree list
        ≠0 (any value not equal to zero)   Requests a dead tree list

field 6: *Not used*

field 7: Diameter increment printing for cycle 0. *Default = 0*

        0   Print only cycle 0 dbh increments that were read from the input tree data
        1   Print both cycle 0 input and cycle 0 estimated dbh increments

Note: If the TREELIST output is intended for use with post-processing programs, it must contain headers and be in the current format (i.e. field 3 must be 0, 1, or blank, and field 6 must be 0 or blank).

Note: If using the Suppose interface program the TREELIST output file, by default, has the same base name as the simulation file with a *.trl* extension. This is the same file used, by default, for the CUTLIST output.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 47
                  GTR INT-208, Supplement to the User's Guide..., p. 14
                  Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 4.3.3.1

TREESZCP (TREE SiZe CaP)
Variants: All
Related keywords: MORTMULT, FIXMORT, BAIMULT, HTGSTOP

Sets morphological limits for maximum tree diameter and height for a given species, and specifies a minimum mortality rate to be used when tree diameter exceeds the specified limit. Diameter growth or height growth will be greatly reduced for individual trees that exceed the specified diameter or height, respectively. Also, the specified diameter can be used as a surrogate for age to invoke senescence mortality. For example, if a tree record represents 10 trees per acre of the designated species and exceeds the specified maximum diameter, and the minimum mortality rate is set to 0.5, 5 trees per acre (50%) from that record will die due to this keyword if the normally predicted mortality rate for this tree record was less than 5 trees; if the normally predicted mortality rate for this tree record exceeded 5 trees, then that rate would be used and there would be no effect of this keyword on that tree record. These values are set once for the projection; they cannot be changed within a projection.

field 1: Species code to which the limits apply. *Default = All*

field 2: Morphological maximum diameter for this species. *Default = 999.0*

field 3: Minimum proportion of the tree record that will be killed. *Range: 0.0-1.0, Default = 1.0*

field 4: Maximum diameter use code. *Default = 0*

	0	Use diameter for affecting both diameter growth and tree mortality.
	1	Use diameter for affecting diameter growth only.
	2	Use diameter for affecting mortality only.

field 5: Morphological maximum height for this species. *Default = 999.0*

Caution: This keyword may override BAMAX and SDIMAX related mortality..

Note: The PARMS format may not be used with this keyword.

References: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 6.5.5

VOLEQNUM (VOLUME EQuation NUMber)
Variants: All
Related keywords: BFVOLUME, VOLUME, BFVOLEQU, CFVOLEQU

Sets the volume equation number used to calculate volume. Equation numbers are from the Forest Service National Volume Estimator Library. If you do not set the equation number, by default FVS will use the volume equation numbers designated to be used by the Forest Service Regional Offices. If you are unsure what equation number is used FVS will write out the equation number for each species in the Options Selected by Default Section of the Main Output file (*.out).

field 1: Species code for which volume equation number is applied. *Default = All*

field 2: Cubic Foot Volume Equation Number. *Default = Blank*

field 3: Boardfoot Volume Equation Number. *Default = Blank*

Note: Form class for a species is the same regardless of whether cubic foot or board foot volume is being calculated. If both BFVOLUME and VOLUME are specified, the form class (field 6) used for both will be that specified on the keyword entered last.

Caution: If you are using a Region 6 variant, you can not change to a different length Behres Hyperbola. If you are on the east side of the Cascades you have to use 616 Behres or a different model form (such as Flewelling) you can not switch to a 632 Behres. If you are on the west side of the Cascades you can not switch from a 632 Behres to a Behres 616.This is because FVS uses an internal form class based on the specified log length which can not be switched.

References: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.3.1

VOLUME   (cubic foot VOLUME)
Variants: All
Related keywords: BFVOLUME, MCDEFECT, CFVOLEQU, MCFDLN

Sets the merchantability limits for cubic foot volume calculation. In the western half of the US, this keyword sets the merchantability limits for merchantable cubic foot volume. In the eastern half of the US, this keyword sets the merchantability limits only for pulpwood that is smaller than the merchantable limits for sawlogs. (The merchantability limits for the sawlog portion can be set with the BFVOLUME keyword.)

field 1: Year or cycle number in which merchantability limits take effect. Once in effect they remain in effect until replaced. To affect the first cycle you must specify a 0 in field 1. *Default = 0 (all cycles)*

field 2: Species code for which the limits are to be changed. *Default = All*

field 3: Minimum merchantable DBH in inches.
Defaults by variant. See variant overview documentation.

field 4: Minimum top diameter (inside bark (DIB) in the eastern US, outside bark (DOB) in the western US).
Defaults by variant. See variant overview documentation.

field 5: Stump height in feet. *Default = 1.0*

field 6: Form class (used only in Region 6). Eastside: This is the diameter inside bark at a height of 17.3 feet as a percentage of outside-bark DBH. Westside: This is the diameter inside bark at a height of 33.6 feet as a percentage of outside-bark DBH. *Default = 80 (Defaults vary by forest, species and diameter class)*

field 7: Volume calculation method. *Default = 6*

1	Wykoff, Allen, et. al. , or user defined equation if CFVOLEQU keyword is used.	
2	Region 6 Eastside taper equations.	
3	Region 6 Westside taper equations.	
5	Gevorkiantz volume equations (CS, LS, NE)	
6	National Volume Estimator Library equations.	
7	Wykoff, Allen, et. al. , or user defined equation if CFVOLEQU keyword is used (same as option 1).	
8	Other volume equations:	
	AK	*Bruce and Demars equations formerly in FVS.*
	CR	*Hann and Bare equations (region 2 forests use coefficients from the Cibola NF).*
	CS,LS,NE	*TWIGS volume equations.*
	NC	*Western Sierra log rules.*

Note: For any particular species this keyword remains in effect until a subsequent use of the keyword changes the limits for that species.

Note: Form class for a species is the same regardless of whether cubic foot or board foot volume is being calculated. If both BFVOLUME and VOLUME are specified, the form class (field 6) used for both will be that specified on the keyword entered last.

Caution: If date or cycle are specified (i.e. the date/cycle is not blank and it is not zero) and the species field is either ALL or a species group, then you should be sure to specify all of the remaining parameters. If you do not specify all of the remaining parameters, then the default parameters for the other fields are the default parameters for species 1 (if ALL is selected) or species group 1 (species group is selected).

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 22
GTR INT-208, Supplement to the User's Guide..., p. 18
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.3.1

WSBW (Western Spruce BudWorm model initialization)
Variants: Specialized variants that include the western spruce budworm model
Related keywords: END

Signifies the beginning of keywords for the western spruce budworm extension. This extension has its own unique set of keywords. The WSBW keyword sequence must be terminated with an END keyword. All keywords between WSBW and END are considered western spruce budworm extension keywords.

No fields are associated with this keyword.

References: GTR INT-274, User's Guide to the Western Spruce Budworm Modeling System
                Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 8.8

YARDLOSS (YARDing LOSS)
Variants: All
Related keywords: THINxxx

Designates a portion of a harvest to be left in the woods. This may reduce harvest volumes and is also used in determining fuel loading for the fire extension model.

field 1:   Year or cycle in which harvesting is to incur yarding loss. *Default = 1*

field 2:   Proportion of cut stems left in the stand. *Range: 0.0-1.0, Default = 0*

field 3:   Proportion of left stems that are down. *Range: 0.0-1.0, Default = 0*

field 4:   Proportion of branch wood left from removed stems. (If using the SN variant then it is the proportion of unmerchantable wood left from removed stems.) *Range: 0.0-1.0, Default = 1*

Note: This keyword works in conjunction with the thinning keywords. A thinning that is scheduled for the same cycle as the YARDLOSS keyword is in effect will reflect the losses specified.

Note: Keyword order may be important. If a YARDLOSS keyword is specified for the *same year* that a thinning keyword is specified, the losses will be applied to the thinning only if the YARDLOSS keyword appears in the keyword sequence before the thinning keyword

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.2.5

Appendix A: Species Codes

Species Codes - All Western Variants

AF	subalpine fir	GA	green ash	PL	cherry and plum species
AJ	alligator juniper	GB	Great Basin bristlecone	PM	singleleaf pinyon
AS	quaking aspen		pine	PP	ponderosa pine
AW	Arizona white oak	GC	giant chinquapin	PW	plains cottonwood
AZ	Arizona pinyon pine	GF	grand fir	PY	Pacific yew
BA	balsam poplar	GO	Gambel oak	RA	red alder
BC	bristlecone pine	GP	California foothill pine	RC	western red cedar
BD	bigcone Douglas-fir	GS	giant sequoia	RF	California red fir
BI	bigtooth maple	HT	hawthorn species	RM	Rocky Mountain juniper
BK	bur oak	IC	incense cedar	RW	redwood
BL	blue oak	IO	interior live oak	SF	Pacific silver fir
BM	bigleaf maple	JP	Jeffrey pine	SH	Shasta red fir
BO	California black oak	KP	knobcone pine	SO	silverleaf oak
BR	Brewer spruce	LL	subalpine larch	SP	sugar pine
BS	blue spruce	LM	limber pine	SS	Sitka spruce
BU	California buckeye	LO	California live oak	SW	southwestern white pine
CB	corkbark fir	LP	lodgepole pine	SY	California sycamore
CH	bitter cherry	MA	Pacific madrone	TO	tanoak
CI	Chihuahuan pine	MB	birchleaf mountain	UJ	Utah juniper
CJ	California juniper		mahogany	VN	vine maple
CL	California laurel	MC	curl-leaf mountain	VO	valley oak
CN	California nutmeg		mahogany	WA	white alder
CO	cottonwood species	MH	mountain hemlock	WB	whitebark pine
CP	Coulter pine	MM	Rocky Mountain maple	WE	Washoe pine
CW	black cottonwood	MP	Monterey pine	WF	white fir
CY	canyon live oak	NC	narrowleaf cottonwood	WH	western hemlock
DF	Douglas-fir	NF	noble fir	WI	willow species
DG	Pacific dogwood	OH	tree, deciduous species	WJ	western juniper
EM	Emory oak	OJ	oneseed juniper	WL	western larch
EO	Engelmann oak	OS	tree, evergreen species	WN	walnut species
ER	eastern redcedar	OT	Unknown species	WO	Oregon white oak
ES	Engelmann spruce	PB	paper birch	WP	western white pine
FC	Fremont cottonwood	PC	Port Orford cedar	WS	white spruce
FL	Oregon ash	PD	border pinyon	YC	Alaska cedar
FP	foxtail pine	PI	common pinyon		

Species Codes - All Eastern Variants

AB	American Beech	BG	Blackgum	BW	American Basswood
AC	American Chestnut	BH	Bitternut Hickory	BY	Baldcypress
AE	American Elm	BI	Black Hickory	CA	Catalpa Spp.
AH	Am Hornbeam,	BJ	Blackjack Oak	CB	Cherrybark Oak
	Musclewood	BK	Black Locust	CC	Chokecherry
AI	Ailanthus	BL	Black Willow	CH	Other Commercial
AP	Apple Spp.	BM	Black Maple		Hardwoods
AS	Ash Spp.	BN	Butternut	CK	Chinkapin Oak
AW	Atlantic White-Cedar	BO	Black Oak	CM	Chalk Maple
BA	Black Ash	BP	Balsam Poplar	CO	Chestnut Oak
BB	Birch Spp.	BR	Bur Oak	CT	Cucumbertree
BC	Black Cherry	BS	Black Spruce	CW	Cottonwood/Poplar Spp.
BE	Boxelder	BT	Bigtooth Aspen	DM	Diamond Willow
BF	Balsam Fir	BU	Buckeye, Horsechestnut	DO	Delta Post Oak

DP Dwarf Post Oak	OK Oak-Deciduous Spp.	SE Serviceberry Spp.
DW Flowering Dogwood	OL Other lowland species	SG Sugarberry
EC Eastern Cottonwood	OO Osage-Orange	SH Shagbark Hickory
EH Eastern Hemlock	OP Pine Spp.	SI Siberian Elm
EL Elm Spp.	OS Other Softwood	SK Southern Red Oak
FM Florida Maple	OT Other	SL Shellbark Hickory
FR Fir Spp.	OV Overcup Oak	SM Sugar Maple
GA Green Ash	PA Pumpkin Ash	SN Swamp Chestnut Oak
GB Gray Birch	PB Paper Birch	SO Scarlet Oak
HA Silverbell Spp.	PC Pondcypress	SP Shortleaf Pine
HB Hackberry Spp.	PD Pond Pine	SR Spruce Pine
HH E. Hophornbeam	PE Pecan	SS Sassafras
HI Hickory Spp.	PH Pignut Hickory	ST Striped Maple
HK Hackberry	PI Spruce Spp.	SU Sweetgum
HL Honeylocust	PL Cherry/Plum Spp.	SV Silver Maple
HM Hemlock Spp.	PN Pin Oak	SW Swamp White Oak
HS Select hickory	PO Post Oak	SY Sycamore
HT Hawthorn	PP Pitch Pine	TA Tamarack
HY American Holly	PR Pin Cherry	TL Tupelo Spp.
JP Jack Pine	PS Common Persimmon	TM Table Mtn Pine
JU Redcedar/Juniper Spp.	PU Sand Pine	TO Turkey Oak
KC Kentucky Coffeetree	PW Paulownia, Empresstree	TS Swamp Tupelo
LB Loblolly-Bay	PY Swamp Cottonwood	UA Blue Ash
LK Laurel Oak	PZ Ponderosa Pine	UH Other upland hardwoods
LL Longleaf Pine	QA Quaking Aspen	VP Virginia Pine
LO Live Oak	QI Shingle Oak	WA White Ash
LP Loblolly Pine	QN Bluejack Oak	WB White Basswood
MA American Mtn-Ash	QS Shumard Oak	WC Northern White-Cedar
MB Mulberry Spp.	RA Redbay	WE Winged Elm
MG Magnolia Spp.	RB River Birch	WH Water Hickory
MH Mockernut Hickory	RC Eastern Redcedar	WI Willow Spp.
ML Bigleaf Magnolia	RD Eastern Redbud	WK Water Oak
MM Mountain Maple	RE Rock Elm	WL Willow Oak
MP Maple Spp.	RL Slippery Elm	WM White Mulberry
MS Southern Magnolia	RM Red Maple	WN Black Walnut
MV Sweetbay	RN Red Pine	WO White Oak
NC Non-commercial species	RO Northern Red Oak	WP Eastern White Pine
NK Nutall Oak	RP Red pine	WR Water Birch
NP Northern Pin Oak	RS Red Spruce	WS White Spruce
NS Norway Spruce	RY Red Mulberry	WT Water Tupelo
OB Ohio Buckeye	SA Slash Pine	YB Yellow Birch
OG Ogeechee Tupelo	SB Sweet Birch	YP Yellow-Poplar
OH Other Live/Dead	SC Scotch Pine	YY Yellow Buckeye
Hardwood	SD Sourwood	

Regeneration Establishment Model Keywords

This section provides descriptions of the keywords that are used with the Regeneration Establishment extension to the Forest Vegetation Simulator. With only a few exceptions, the keywords in this section are only recognized by FVS when they are contained in a sequence that begins with the keyword ESTAB and ends with the keyword END. Base model keywords are not recognized when they appear inside this sequence.

The following is a list of all the Regeneration Establishment model keywords. For a full description of the Regeneration Establishment model refer to GTR INT-279, *User's Guide to Version 2 of the Regeneration Establishment Model: Part of the Prognosis Model*.

AUTALLY
BUDWORM
BURNPREP
END
ESTAB
EZCRUISE
HABGROUP
HTADJ
INGROW
MECHPREP
MINPLOTS
NATURAL
NOAUTALY
NOINGROW
NOSPROUT
OUTPUT
PASSALL
PLANT
PLOTINFO
RANNSEED
RESETAGE
SPECMULT
SPROUT
STOCKADJ
TALLY
TALLYONE
TALLYTWO
THRSHOLD

AUTALLY (AUtomatic seedling TALLY)
Full Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI
Related keywords: THRESHOLD, NOAUTALY, TALLY, TALLYONE, TALLYTWO

Requests automatic scheduling of regeneration following thinnings in which certain thresholds are exceeded. When 10 to 30 percent of the trees per acre or total cubic foot volume is removed, a single regeneration tally is scheduled. When more than 30 percent of the trees per acre or total cubic foot volume is removed, a tally sequence is scheduled. These percentages can be modified using the THRESHOLD keyword.

No fields are associated with this keyword.

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

Caution: The base model keyword NOAUTOES invokes the NOAUTALY, NOINGROW and NOSPROUT keywords.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 8
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.2.4

BUDWORM (spruce BUDWORM)
Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI

Specifies defoliation histories for western spruce budworm and the effects of budworm defoliation on regeneration success.

field 1:   Year or cycle that defoliation began. A 0 (zero) or blank results in an error message.

field 2:   Last year of defoliation. A 0 (zero) or blank is replaced with the value in field 1 resulting in one year of defoliation.

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

Note: Up to 20 BUDWORM keyword records can be present in a projection.

Note: If budworm effects are represented by the Budworm Model then this keyword is not necessary.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 11
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.5

BURNPREP (BURNing site PREParation)
Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI
Related keywords: MECHPREP

Specifies the percentage of regeneration plots receiving site preparation by burning. When site preparation treatments have not been specified or assigned with BURNPREP or MECHPREP

keywords, default equations are invoked. These equations predict the proportion of the stand receiving each of the three treatments (burning, mechanical scarification, and no disturbance) based on site characteristics such as slope, aspect, habitat type, residual basal area, elevation, and topographic position.

>field 1: Year or cycle of site preparation. *Default = 0 (all cycles)*

>field 2: Percentage of plots to be treated. *Range: 0-100, Default = 0*

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

Note: The sum of mechanical and burn treatments must be less than, or equal to, 100 percent. If the sum is less than 100 percent, the difference is the percentage of undisturbed plots.

Note: Site preparations can be assigned to individual plots if desired. See PLOTINFO keyword.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 11
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.1

END

(<u>END</u> of regeneration sequence)
Regeneration Establishment Extension
Variants: ALL
Related keywords: ESTAB

Signifies the end of the Regeneration Establishment sequence of keywords that was begun with the ESTAB keyword. Essentially, the END keyword returns control of the simulation to the base FVS system after the Regeneration Establishment extension has been called.

>No fields are associated with this keyword.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 12
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3

ESTAB

(<u>ESTAB</u>lishment model)
Regeneration Establishment Extension
Variants: All
Related keywords: END

Signifies the beginning of keywords for the Regeneration Establishment extension. The ESTAB keyword sequence must be terminated with an END keyword. All keywords between ESTAB and END are considered Establishment extension keywords.

>field 1: Year or cycle of disturbance or beginning of regeneration. The seedling tally sequence will begin in this year. *Default = 0 (all cycles)*

Caution: Some care is necessary when entering a disturbance date to insure that the regeneration establishment model is called at the correct time. Pay close attention to cycle boundaries when entering disturbance date.

Caution: If the ESTAB keyword is embedded in an IF-THEN-ENDIF sequence, year of disturbance (field 1) is interpreted as years from the time the condition is true until establishment, or in other words, a lag time. (e.g. a 5 in field 1 means wait 5 years after condition is true to establish the stand.)

Note: The Regeneration Establishment extension keyword sequence must begin with an ESTAB keyword and end with an END keyword; all keywords contained within this sequence are considered Regeneration Establishment keywords.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 11
               GTR INT-133, User's Guide to the Stand Prognosis Model, p. 86
               Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3

EZCRUISE (Easy CRUISE)
Full Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI

Requests prediction of the small tree component at the time of the inventory. This keyword is used if the stand inventory did not include regeneration less than 3 inches dbh.

No fields are associated with this keyword.

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 12
               Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.8

HABGROUP (HABitat type GROUP)
Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI

Requests that an optional output table that shows habitat types within the habitat type groups shown in the regeneration summary output table be written to the standard FVS output file.

No fields are associated with this keyword.

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 12
               Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.3

HTADJ

(regeneration HeighT ADJustment)
Regeneration Establishment Extension
Variants: All

Specifies a species-specific initial height adjustment for newly established trees before the tree records are passed to the base FVS model.

>field 1: Year or cycle the adjustment is to be applied. Once in effect it remains in effect until replaced by a subsequent multiplier. *Default = 1*

>field 2: Species code for trees to be adjusted. *Default = All*

>field 3: Height in feet to be added to the seedling height assigned by the Regeneration Establishment extension. A negative value results in a reduction in height. *Default = 0*

Note: The HTADJ keyword should not be confused with the FVS base model keyword REGHMULT, which is a multiplier.

Note: The value entered in field 3 can be positive or negative, but resulting heights will not be shorter than a preset minimum (usually 0.5 or 1.0 feet), nor taller than the height of a tree 3 inches dbh.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 13
Essential FVS: A User's Guide to the Forest Vegetation Simulator, ss. 5.4.3.2.1, 6.5.2.3

INGROW

(INGROWth)
Full Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI
Related keywords: NOINGROW

Requests addition of new trees in the absence of disturbance in recent cycles. Ingrowth will occur every 20 years after the completion of a regeneration period if there are no regeneration activities scheduled for the next cycle. The objective is to account for regeneration that continues to become established in sparsely stocked stands or under the canopy of the overstory. Tree records that are created for ingrowth tallies can include trees up to 20 years old, so an assortment of tree sizes is added to the simulation.

>No fields are associated with this keyword.

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

Caution: The base model keyword NOAUTOES invokes the NOAUTALY and NOINGROW keywords.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 8
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.2.4

MECHPREP (MECHanical site PREParation)
Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI
Related keywords: BURNPREP

Specifies the percentage of regeneration plots receiving site preparation by mechanical means. When site preparation treatments have not been specified or assigned with MECHPREP or BURNPREP keywords, default equations are invoked. These equations predict the proportion of the stand receiving each of the three treatments (burning, mechanical scarification, and no disturbance) based on site characteristics such as slope, aspect, habitat type, residual basal area, elevation, and topographic position.

> field 1: Year or cycle of site preparation. *Default = 0 (all cycles)*

> field 2: Percentage of plots to be treated. *Range: 0-100, Default = 0*

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

Note: The sum of mechanical and burn treatments must be less than, or equal to, 100 percent. If the sum is less than 100 percent, the difference is the percentage of undisturbed plots.

Note: Site preparations can be assigned to individual plots if desired. See PLOTINFO keyword.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 11
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.1

MINPLOTS (MINimum number of PLOTS)
Regeneration Establishment Extension
Variants: All

Specifies the minimum number of regeneration plots to process. The regeneration model produces plot-to-plot variation in the number of trees per plot, species composition, and initial tree heights. Stand statistics are averages of plot predictions, so a large number of plots reduces the random variation for the stand. Plots are repeatedly doubled until the user-specified minimum number is reached.

> field 1: Minimum number of plots to process. *Minimum = 20, Default = 50*

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 13
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.2.7

NATURAL   (NATURAL regeneration)
Regeneration Establishment Extension
Variants: All
Related keywords: PLANT

Specifies natural regeneration that will be added to the stand.

> field 1: Year or cycle of regeneration. An entry is required, and must be equal to, or greater than, the disturbance date specified on the ESTAB keyword.

> field 2: Species code for trees to be naturally regenerated. *Entry required*

> field 3: Number of trees per acre of the species designated in field 2 to be regenerated. *Default = 0*

> field 4: Percent survival expected for this species at the end of the current cycle. *Range: 0-100, Default = 100*

> field 5: Average seedling age in years for the year specified in field 1. *Default = 2*

> field 6: Average seedling height in feet five years from the time of seedling appearance or at the end of the cycle, whichever is earlier.

> field 7: Shade code. *Default = 0*
> | | |
> |---|---|
> | 0 | Seedlings occur uniformly on plots throughout the stand. |
> | 1 | Seedlings occur more frequently on plots with more overstory basal area. |
> | 2 | Seedlings occur more frequently on plots with less overstory basal area. |

Note: A separate NATURAL keyword is necessary for each species.

Note: Use of this keyword sets STOCKADJ to 0.0 and activates the NOINGROW and NOAUTALY keywords.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Caution: Seedling age does not have an effect in some variants on seedling height. For those variants that seedling age does have an effect on the regenerated trees, fill in seedling age or seedling height. Seedling age is used to estimate the height of the seedling at 5 years (or end of cycle whichever is earlier). If you enter a height it will ignore the seedling age entered, and will use the specified height as the height of the tree at 5 years (or end of cycle which ever comes first).

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 11
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.2

NOAUTALY (<u>NO</u> <u>AUT</u>omatic seedling <u>TALLY</u>)
Full Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI
Related keywords: AUTALLY, NOINGROW, NOSPROUT

Suppresses the automatic scheduling of regeneration following thinnings (see AUTALLY).

No fields are associated with this keyword.

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

Note: The base model keyword NOAUTOES invokes the NOAUTALY and NOINGROW keywords.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 13
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.2.4

NOINGROW (<u>NO</u> automatic <u>INGROW</u>th)
Full Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI
Related keywords: INGROW, NOAUTALY, NOSPROUT

Suppresses the automatic scheduling of ingrowth (see INGROW).

No fields are associated with this keyword.

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

Note: The base model keyword NOAUTOES invokes the NOAUTALY and NOINGROW keywords.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 13
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.2.4

NOSPROUT (<u>NO</u> stump or root <u>SPROUT</u>ing)
Regeneration Establishment Extension
Variants: All
Related keywords: SPROUT, NOINGROW, NOAUTALY

Suppresses the automatic scheduling of root and stump sprouting following thinning (see SPROUT).

No fields are associated with this keyword.

Note: The base model keyword NOAUTOES does not invoke the NOSPROUT keyword.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.2.4

OUTPUT

(<u>OUTPUT</u> tables)
Regeneration Establishment Extension
Variants: All

Specifies printing of regeneration summary tables.

> field 1: Summary table output flag. *Default = 1*
>> 0   Suppress all output (tree records still passed to FVS model)
>> 1   Print standard regeneration summary table

> field 2: File reference number for output. If this field is left blank output will be written to the FVS output file. If the value is any number other than 16 or blank, then an associated output file needs to be opened with OPEN keyword. *Default = 17*

Caution: The debug option produces a great deal of output that is not useful to most users.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 12
                     Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.3

PASSALL

(<u>PASS</u> <u>ALL</u> seedling records)
Full Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI

Specifies the maximum number of "acceptable" (value class 2) predicted seedlings per species per plot to be passed from the Regeneration Establishment model to the FVS tree list during the tally. The Regeneration Establishment model automatically passes all of the "best" or "desirable" (value class 1) predicted seedlings, which includes all planted seedlings, to the FVS tree list during the tally. It also passes all sprouts as "acceptable" (value class 2). In addition, in the full establishment model, up to five "acceptable" (value class 2) naturally regenerating seedlings of each species per regeneration plot are passed by default. PASSALL specifies a new maximum number of "acceptable" naturally regenerating seedlings of each species per plot to be passed. This does not affect the number of "best" seedlings passed or the number of sprouts passed.

> field 1: Maximum number of "acceptable" (value class 2) naturally regenerating seedlings of each species per plot to pass to the base model. *Default = 1*

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 4
                     Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.7

PLANT

(<u>PLANT</u> seedlings)
Regeneration Establishment Extension
Variants: All
Related keywords: NATURAL

Specifies planting of seedlings that will be added to the stand.

> field 1: Year or cycle of regeneration. An entry is required, and must be equal to, or greater than, the disturbance date specified on the ESTAB keyword.

> field 2: Species code for trees to be naturally regenerated. *Entry required*

> field 3: Number of trees per acre of the species designated in field 2 to be planted. *Default = 0*

field 4: Percent survival expected for this species at the end of the current cycle.
Range: 0-100, Default = 100

field 5: Average seedling age in years for the year specified in field 1. *Default = 2*

field 6: Average seedling height in feet five years from the time of planting or at the end of the cycle, whichever is earlier.

field 7: Shade code. *Default = 0*
         0   Seedlings occur uniformly on plots throughout the stand.
         1   Seedlings occur more frequently on plots with more overstory basal area.
         2   Seedlings occur more frequently on plots with less overstory basal area.

Note: A separate PLANT keyword is necessary for each species.

Note: Planted trees are in addition to natural regeneration and do compete with naturals in the best tree selection process.

Note: The STOCKADJ keyword can be used in conjunction with planting to suppress natural regeneration so that only planted trees are passed to the FVS model.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Caution: Seedling age does not have an effect in some variants on seedling height. For those variants that seedling age does have an effect on the regenerated trees, fill in seedling age or seedling height. Seedling age is used to estimate the height of the seedling at 5 years (or end of cycle whichever is earlier). If you enter a height it will ignore the seedling age entered, and will use the specified height as the height of the tree at 5 years (or end of cycle which ever comes first).

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 11
                         Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.2

PLOTINFO   (PLOT INFOrmation)
Regeneration Establishment Extension
Variants: All
Related keywords: NATURAL

Specifies plot specific values for slope, aspect, habitat type, topographic position, and site preparation. This keyword is used when plot information is not contained on the tree data records. A separate record is required for each plot (either as a supplemental record or as a record in the file designated in field 1 and opened with an OPEN keyword).

field 1: File reference number for input. If this field is left blank supplemental data records are assumed to follow immediately after the PLOTINFO keyword in the keyword file.

Supplemental record format:
     Columns 1-10:   Plot identification number coded the same as in the FVS model. A record with a negative number in these columns

must be present to signify the end of PLOTINFO supplemental data records.

Columns 11-12: Plot slope percent.

Column 13-15: Plot aspect in degrees.

Column 16-18: Plot numeric habitat type code.

Column 19: Plot topographic position code.
1   Bottom
2   Lower slope
3   Mid-slope
4   Upper slope
5   Ridge top

Column 20: Plot site preparation code.
1   None
2   Mechanical
3   Burn
4   Road cut, road fill, or stockable road bed

References: GTR INT-279, User's Guide to the Regeneration Establishment Model, p.24,33
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.4

RANNSEED (RANdom Number SEED)
Regeneration Establishment Extension
Variants: All

Reseeds the pseudorandom number generators used in the Regeneration Establishment model. If a 0 (zero) is used as the replacement value for the seed, the model will run stochastically (i.e. results will vary for multiple runs of the same simulation file). With any non-zero seed value the results will always be the same for multiple runs of the same simulation file.

field 1: Replacement value for the pseudorandom number seed (should be an odd integer). *Default = 55329*

Note: The FVS base model and the Regeneration Establishment extension use separate pseudorandom number generators. Each one can be reseeded independently. Using a RANNSEED keyword inside an ESTAB-END sequence affects the Regeneration Establishment extension.

References: GTR INT-133, User's Guide to the Stand Prognosis Model, p. 94
GTR INT-208, Supplement to the User's Guide..., p. 14
GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 32
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.2.6

Refer to GTR INT-394, Implications of Random Variation in the Stand Prognosis Model, for a discussion of the stochastic nature of the model.

RESETAGE (<u>RESET</u> stand <u>AGE</u>)
Regeneration Establishment Extension
Variants: All

Sets the stand age to zero to make FVS model output correspond to the actual age of the stand. Age is strictly for reporting purposes and has no effect on growth or survival prediction. Its only effect is on the calculation of mean annual increment. This keyword is useful when average stand age has changed due to thinnings and plantings.

> field 1: Year or cycle that stand age is to be changed (usually the year of disturbance).

> field 2: New stand age. *Default = 0*

Note: This is also a base model keyword. Both have exactly the same effect.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.3

SPECMULT (<u>SPEC</u>ies occurrence <u>MULT</u>iplier)
Full Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI

Specifies a species-specific multiplier that increases or decreases the probability of a species' occurrence in natural regeneration. The multiplier does not set the probability of a species' occurrence; it is multiplied by the default probability to increase or decrease the probability of occurrence. Thus, a multiplier of 1.0 has no effect on the default probability for that species.

> field 1: Year or cycle the multiplier takes effect. *Default = 1*

> field 2: Species code to which the multiplier will be applied. *Entry required*

> field 3: Multiplier value. *Range: 0.0-1.0, Default = 1.0*

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

Note: A separate SPECMULT keyword record is needed for each species to be modified.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 13
Essential FVS: A User's Guide to the Forest Vegetation Simulator, ss. 5.4.3.2.3, 6.5.2.3

SPROUT   (stump or root <u>SPROUT</u>ing)
Regeneration Establishment Extension
Variants: All
Related keywords: NOSPROUT, INGROW, AUTALLY

Requests the automatic scheduling of root and stump sprouts after a thinning and allows users to change the number of regenerated sprouts and initial sprout heights. A value of less than 1.0 decreases the number and/or height of sprouts, and a value greater than 1.0 increases the number and/or height of sprouts. Only those species that are prone to stump or root sprouting will have this type of regeneration scheduled. This keyword has no effect on species that do not sprout. For most sprouting species this keyword is on by default.

> field 1: Year or cycle the multiplier takes effect. Enter 0 (zero) to effect every cycle. *Default = 1*
>
> field 2: Species to apply sprouting multipliers. *Default = all*
>
> field 3: Number of sprouts multiplier. *Default = 1.0*
>
> field 4: Sprout height multiplier. *Default = 1.0*
>
> field 5: Smallest dbh in inches for application of multipliers (greater than or equal). *Default = 0*
>
> field 6: Largest dbh in inches for application of multipliers (less than). *Default = 999*

Caution: The base model keyword NOAUTOES invokes the NOAUTALY, NOINGROW and NOSPROUT keywords.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

Reference: Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.2.4

STOCKADJ (<u>STOCK</u>ing <u>ADJ</u>ustment)
Full Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI

Adjusts the probability of natural regeneration stocking upward or downward. The probability of stocking will be multiplied by the value entered in field 2, but the product will be bounded within the interval [0,1]. The multiplier is calculated by dividing the desired probability of stocking by the predicted probability of stocking. As an example, suppose the regeneration model predicts the probability of stocking 10 years after a harvest is 0.40 and it is desired to raise this figure to 0.50 in a subsequent run. The value to enter in field 2 is 1.25 (0.50/0.40 = 1.25). In other words, the desired probability is 1.25 times the predicted probability.

> field 1: Year or cycle the multiplier takes effect. *Default = 1*
>
> field 2: Multiplier for the probability of stocking. *Default = 1.0 (CI default = 0.0)*

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

Note: If field 2 is blank or 0 (zero) natural regeneration is cancelled so that only planted trees regenerate. This is useful in simulating growth of plantations or to input a list of trees on a habitat type for which the Regeneration Establishment extension is not presently calibrated.

Note: The PARMS format may be used with this keyword. See the introduction for a description of this format.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 15
Essential FVS: A User's Guide to the Forest Vegetation Simulator, ss. 5.4.3.2.2, 6.5.2.3

TALLY

(seedling <u>TALLY</u>)
Regeneration Establishment Extension
Variants: All
Related keywords: TALLYONE, TALLYTWO, AUTALLY

Schedules a tally sequence for prediction of regeneration, and optionally supplies a disturbance year. Regeneration is reported in a summary called a tally. At each tally, new regeneration is added to the FVS Model tree list and a regeneration summary output table is printed. A tally will be predicted for every cycle boundary for 20 years following the beginning of the sequence. For example, if cycle lengths were 5 years, four tallies would result.

field 1:   Year or cycle the tally sequence is to begin. *Entry required*

field 2:   Optional field to supply the year of disturbance. This value takes precedence over the value in field 1 of the ESTAB keyword record. If blank, the year of disturbance is determined from field 1 of the ESTAB keyword record.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p. 13
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.6

TALLYONE

(seedling <u>TALLY</u> <u>ONE</u>)
Regeneration Establishment Extension
Variants: All
Related keywords: TALLYTWO, TALLY, AUTALLY

Specifies the year in which the first regeneration tally is to occur, and optionally supplies a disturbance year. New seedlings as well as advanced regeneration (those trees that germinated and became established prior to the disturbance date) are passed to the base model. Regeneration is predicted at the end of the cycle, so the specified tally year should be one year prior to the end of the cycle. For example, if, in a simulation using 5-year cycles, a regeneration harvest is scheduled for 2010 and the first tally is desired 10 years later, the tally year specified in the TALLYONE keyword should be 2019 (one year prior to the 2020 cycle boundary). The TALLYONE keyword takes precedence over the tally sequence scheduled by the ESTAB keyword or the TALLY keyword.

field 1:   Year the first regeneration tally is to be reported. *Entry required*

field 2:   Optional field to supply the year of disturbance. This value takes precedence over the value in field 1 of the ESTAB keyword record. If blank, the year of disturbance is determined from field 1 of the ESTAB keyword record.

Note: At the first regeneration tally (TALLYONE), both planted trees and natural regeneration are passed to the FVS model.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p.7,12
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.6

TALLYTWO (seedling <u>TALLY</u> <u>TWO</u>)
Regeneration Establishment Extension
Variants: All
Related keywords: TALLYONE, TALLY, AUTALLY

Specifies the year in which a subsequent regeneration tally is to occur, and optionally supplies a disturbance year (see TALLYONE). A TALLYTWO may be scheduled any time after a TALLYONE and within 20 years of the disturbance date. Multiple TALLYTWO keyword records may be scheduled. If a TALLYTWO is scheduled without a TALLYONE being scheduled, the TALLYTWO is changed to a TALLYONE. Only new seedlings (those that germinated and became established subsequent to the previous tally) are passed to the base model. Regeneration is predicted at the end of the cycle, so the specified tally year should be one year prior to the end of the cycle. The TALLYTWO keyword takes precedence over the tally sequence scheduled by the ESTAB keyword or the TALLY keyword.

field 1:   Year the second regeneration tally is to be reported. *Entry required*

field 2:   Optional field to supply the year of disturbance. This value takes precedence over the value in field 1 of the ESTAB keyword record. If blank, the year of disturbance is determined from field 1 of the ESTAB keyword record.

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p.7,12
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.1.6

THRSHOLD (automatic regeneration <u>THReSHOLD</u>s)
Full Regeneration Establishment Extension
Variants: AK, CI, EM, KT, NI
Related keywords: AUTALLY

Changes the threshold values that schedule automatic regeneration tallies following thinnings. Values refer to the percentage of either trees per acre or total cubic foot volume removed in the thinnings. A single regeneration tally is scheduled if the percentage removed falls between the lower and upper percentages specified on this keyword. An entire tally sequence is scheduled if the percentage removed is greater than the upper percentage specified on this keyword. If this keyword is not used the lower percentage is 10 and the upper percentage is 30.

field 1:   Lower removal percentage. *Range: 2.5-95.0, Default = 10*

field 2:   Upper removal percentage. *Range: 5.0-97.5, Default = 30*

Note: The value in field 1 must be lower than the value in field 2.

Note: This keyword is only used in FVS variants that have the capability for automatic prediction of natural regeneration (AK, CI, EM, KT, and NI).

References: GTR INT-279, User's Guide to the Regeneration Establishment Model..., p.8,13
Essential FVS: A User's Guide to the Forest Vegetation Simulator, s. 5.4.3.2.5