Mountain Pine Beetle Impact Model Keywords:

Program Execution Control:

END
LATITUDE
MPB
MPBECHO
NOMPBGRF
NOPOPDYN
RANNSEED

Inventory Data Entry:

ACTSRF
CURRMORT
INITMORT
INVMORT
PARTIAL

Epidemic Scheduling and Initial Conditions:

BEETLES
EMERINC
GENOTYPE
MANSTART
MAXYEARS
RANSTART
STNDSIZE
STRONG

Modification of Model Assumptions:

AGGHTRES
AMP
BETTER
CRITAD
HABSUIT
NUMCLASS
QVALUES

ACTSRF   This keyword is used to specify the actual basal area killed from the previous epidemic year. One value for basal area is entered for each year, starting with the first epidemic year. This keyword is valid with the POPDYN Model.

Field 1   Number of supplemental records which follow this keyword.
                     [Range: 1 to 4]

Fields 2-7   Not used.

Supplemental   The system allows up to 4 supplemental records which contain a maximum of 30
Record   years of information. The first supplemental record contains the first 8 years of
                     information, the second supplemental record contains 9 through 16, the third
                     supplemental record contains 17 through 24, and the fourth supplemental record
                     contains years 25 through 30. The user enters the actual basal area killed from the
                     previous epidemic for each year. Basal area killed is not used in invoking an
                     epidemic.

                     Col   1 - 10: basal area at first epidemic year
                     Col 11 - 20: basal area at first epidemic year +1
                     Col 21 - 30: basal area at first epidemic year + 2
                     Col 31 - 40: basal area at first epidemic year + 3
                     Col 41 - 50: basal area at first epidemic year + 4
                     Col 51 - 60: basal area at first epidemic year + 5
                     Col 61 - 70: basal area at first epidemic year + 6
                     Col 71 - 80: basal area at first epidemic year + 7

Field Default Values

Field	1	2	3	4	5	6	7
All variants							

AGGTHRES   This keyword is used to modify model parameters concerning the number of beetles per square foot that are needed to make a tree an aggregator. This keyword is valid with the POPDYN Model.

Field 1   Number of beetles per square foot needed to make a tree an aggregator.

Field 2   Threshold maximum number of beetles per square foot.

Field 3   Threshold minimum number of beetles per square foot.

Field 4   Threshold calibration tolerance.

Fields 5-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	1.7	5.0	1.3	.25			

AMP   This keyword is used to make the surface area of lodgepole pine more or less attractive to beetles. The values entered with this keyword are used in the calculation of effective surface area amplification factors. This keyword is valid with the POPDYN Model.

Field 1   First variable amplification factor.

Field 2   Second variable amplification factor.

Fields 3-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	1200	600					

BEETLES This keyword is used to set the number of beetles per acre at the start of an epidemic. If multiple epidemics are scheduled, the number of beetles per acre at the start of each epidemic is set to the value in field 1. Note: A large value here does not guarantee that an epidemic will happen.

This keyword is valid with the POPDYN Model.

Field 1 Starting number of beetles per acre.

Fields 2-7 Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	500						

BETTER This keyword is used to alter the way trees are divided into classes in the Mountain Pine Beetle Model. Class breaks are decided by looking at maximum differences between weighted sums of DBH and phloem. Altering this weighting allows tree grouping which would look different to beetles.

This keyword is valid with the POPDYN Model.

Field 1 Weight given to DBH.

Field 2 Weight given to phloem.

Fields 3-7 Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	1.0	4.0					

CRITAD   This keyword is used to set the number of beetles per square foot needed to cause tree death, critical attack density. This keyword is valid with the POPDYN Model.

Field 1   Number of beetles per square foot that will cause a tree to die.

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	1.5						

CURRMORT This keyword is used to specify the number of trees per acre killed by mountain pine beetles in the year prior to the inventory divided by 2 inch DBH classes.

This keyword is valid with the POPDYN Model.

Field 1 Number of trees/acre in the 2" DBH class killed by MPB in the year prior to inventory.

Field 2 Number of trees/acre in the 4" DBH class killed by MPB in the year prior to inventory.

Field 3 Number of trees/acre in the 6" DBH class killed by MPB in the year prior to inventory.

Field 4 Number of trees/acre in the 8" DBH class killed by MPB in the year prior to inventory.

Field 5 Number of trees/acre in the 10" DBH class killed by MPB in the year prior to inventory.

Field 6 Number of trees/acre in the 12" DBH class killed by MPB in the year prior to inventory.

Field 7 Number of trees/acre in the 14" DBH class killed by MPB in the year prior to inventory.

Supplemental Record Col 1-10: Number of trees/acre in the 16" DBH class killed by MPB in the year prior to inventory.

Col 11-20: Number of trees/acre in the 18" DBH class killed by MPB in the year prior to inventory.

Col 21-30: Number of trees/acre in the 20" DBH class killed by MPB in the year prior to inventory.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Supplemental Record Field Default Values

Field	Col 1-10	Col 11-20	Col 21-30
All variants	0.0	0.0	0.0

EMERINC   This keyword is used to specify the number of emergence increments for the beetle population. The length of the epidemic, in years, is divided by the number of emergence increments, and an epidemic emergence is scheduled at that time.

This keyword is valid with the POPDYN Model.

Field 1   Number of emergence increments for beetle population.

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	10						

END   This keyword is used to signify the end of a keyword set or the end of a
               COMMENT block within a keyword set as shown in the example below.

               Example:
               MPB
               Mountain Pine Beetle Model keywords here
               .
               .
               .
               COMMENT
               any number of comment lines here
               .
               .
               .
               END
               .
               .
               .
               END

Fields 1-7   Not used.

GENOTYPE   This keyword is used to specify the number of beetle genotypes and the distance each can fly. This keyword is valid with the POPDYN Model.

Field 1   Number of beetle genotypes.

Field 2   Distance genotype 1 can fly, in feet.

Field 3   Distance genotype 2 can fly, in feet.

Field 4   Distance genotype 3 can fly, in feet.

Fields 5-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	2	3000	500	500			

HABSUIT   This keyword is used to adjust the productivity of beetles as a reflection of habitat suitability. The value entered is used as a multiplier so the larger the value, the more beetles are produced. This keyword is valid with the POPDYN Model.

Field 1   Multiplier to adjust the productivity of beetles.

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	1.0						

INITMORT	This keyword is used to specify the initial mortality rates used to determine the initial number of infested trees for each 2" DBH class. This keyword is valid with the NOPOPDYN Model.
Field 1	Initial mortality rate for 2" DBH class.
Field 2	Initial mortality rate for 4" DBH class.
Field 3	Initial mortality rate for 6" DBH class.
Field 4	Initial mortality rate for 8" DBH class.
Field 5	Initial mortality rate for 10" DBH class.
Field 6	Initial mortality rate for 12" DBH class.
Field 7	Initial mortality rate for 14" DBH class.
Supplemental Record	Col 1-10: Initial mortality rate for 16" DBH class.
	Col 11-20: Initial mortality rate for 18" DBH class.
	Col 21-30: Initial mortality rate for 20" DBH class.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	0.0	0.0	0.0038	0.0128	0.0206	0.0353	0.0500

Supplemental Record Field Default Values

Field	Col 1-10	Col 11-20	Col 21-30
All variants	0.1429	0.1500	0.1500

INVMORT　　　This keyword is used to instruct the model to use the inventoried attack data from the tree data records for initialization. The default is that no damage codes are read from the tree data records. This keyword is valid with the POPDYN Model.

There are no fields associated with this keyword.

LATITUDE   This keyword is used to specify the latitude of the forest. This keyword is valid with the POPDYN Model.

Field 1   Latitude of the forest, in degrees.

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	44						

MANSTART   This keyword is used to manually schedule an epidemic. There can be multiple entries of the MANSTART keyword in a model keyword set as long as the date is unique for each entry.

Note: The MANSTART keyword may not be combined with the RANSTART keyword. This keyword is valid with the POPDYN and NOPOPDYN Models.

Field 1   Date (calendar year of cycle number) in which epidemic will begin. Entered as a 4-digit calendar year or 1 to 40 for cycle number.

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	1						

MAXYEARS   This keyword is used to specify the maximum number of years an epidemic is allowed to run. This keyword is valid with the POPDYN and NOPOPDYN Models.

Field 1   Maximum length of epidemic, in years.
                    [Range: 1 to 30]

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	10	3	6	50	90	3	

MPB   This keyword is actually an FVS Model keyword signifying that the Mountain Pine Beetle Model is to be called and that all following keywords, up to the corresponding END keyword, will be Mountain Pine Beetle keywords. This keyword is required. This keyword is valid with the POPDYN and NOPOPDYN Models.

There are no fields associated with this keyword.

MPBECHO   This keyword is used to write the Mountain Pine Beetle Model summary tables to a system file. This keyword is valid with the NOPOPDYN Model.

There are no fields associated with this keyword.

Supplemental   Name of the file to be opened, including a pathname if desired, up to 40 characters
Record   in length.
                [Default: MPBOUT]

NOMBPGRF This keyword is used to suppress the graphic output of epidemic variables. The default is generation of graphic output. This keyword is valid with the POPDYN Model.

There are no fields associated with this keyword.

NOPOPDYN   This keyword is used to activate the Mountain Pine Beetle Rate of Loss Model or no population dynamics (Cole Model). If neither the POPDYN keyword nor the NOPOPDYN keyword are present in a Mountain Pine Beetle Model keyword set then the model defaults to no population dynamics (NOPOPDYN) and no Bousfield's adjustments.

Field 1   Bousfield's adjustments. Valid codes are as follows:

        0 = Cole Model used without Bousfield's adjustments
        1 = Cole Model used with Bousfield's adjustments

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	0						

NUMCLASS   This keyword is used to specify the number of classes for tree population. This keyword is valid with the POPDYN Model.

Field 1   Number of classes for tree population.
                  [Range: 1 to 30]

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	10						

PARTIAL This keyword is used to simulate a beetle epidemic already in progress. This keyword is valid with the POPDYN Model.

Field 1 Number of years the epidemic has been in progress.

Field 2 Basal area (square feet) of lodgepole pine killed to date.

Fields 3-7 Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	0	0					

POPDYN   This keyword is used to activate the Mountain Pine Beetle Dynamics Model (Burnell Model). If neither the POPDYN keyword nor the NOPOPDYN keyword are present in a Mountain Pine Beetle keyword set then the model defaults to no population dynamics (NOPOPDYN) and no Bousfield's adjustments.

There are no fields associated with this keyword.

QVALUES   This keyword is used to specify the probability that a tree will NOT be infested with beetles, divided by 2" DBH classes. This keyword is valid with the NOPOPDYN Model.

Field 1   Probability that a 2" DBH class tree will NOT be infested.

Field 2   Probability that a 4" DBH class tree will NOT be infested.

Field 3   Probability that a 6" DBH class tree will NOT be infested.

Field 4   Probability that an 8" DBH class tree will NOT be infested.

Field 5   Probability that a 10" DBH class tree will NOT be infested.

Field 6   Probability that a 12" DBH class tree will NOT be infested.

Field 7   Probability that a 14" DBH class tree will NOT be infested.

Supplemental Record   Col 1-10: Probability that a 16" DBH class tree will NOT be infested.

Col 11-20: Probability that an 18" DBH class tree will NOT be infested.

Col 21-30: Probability that a 20" DBH class tree will NOT be infested.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	1.0	1.0	0.9935	0.982	0.965	0.909	0.743

Supplemental Record Field Default Values

Field	Col 1-10	Col 11-20	Col 21-30
All variants	0.309	0.285	0.285

RANNSEED   This keyword is used to specify the seed value for the random number generator. This keyword is valid with the POPDYN and NOPOPDYN Models.

Field 1   New random number generator seed value.
[Range: Any large, non-negative, odd integer]

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	55329						

RANSTART   This keyword is used to schedule beetle epidemics if the probability of an outbreak is greater than a drawn random number. Note: The RANSTART keyword may not be combined with the MANSTART keyword. This keyword is valid with the POPDYN and NOPOPDYN Models.

Field 1   Phase of the outbreak when chemical control will be applied.
                      [Range: 1-4]

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	1						

STNDSIZE   This keyword is used to specify the size of the stand, which, in turn, is used internally by the Mountains Pine Beetle Model to control the number of exodus beetles. This keyword is intended for use when simulating adjacent models. This keyword is valid with the POPDYN Model.

Field 1   Stand size, in acres.

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	640						

STRONG   This keyword is used to set the proportion of beetles in genotype 1. This keyword is valid with the POPDYN Model.

Field 1   Proportion of beetles in genotype 1.
[Range: 0.0 to 1.0]

Fields 2-7   Not used.

Field Default Values

Field	1	2	3	4	5	6	7
All variants	0.95						