

REQUIREMENTS FOR PROCESSING UNCHARACTERISTIC INSECT/DISEASE TREE MORTALITY INDEX

NOTE: This documentation contains processing information for projected as well as current information. The projected data can be found in the released dataset SDEIS Landscape Variables Database (DBSLNDSV, #968).

Logic Overview

Uncharacteristic insect/disease tree mortality has effects outside of the normal range of effects that occurred in the historical (natural) system. The normal range is considered to be within the 400 year historic range of variability minimum +25% and maximum -25%. The 400 year period includes the variation that is predicted to occur within the recent and current climate without influence of Euro-American settlement influence. The historical regime accounts in general for influences of native species adaptations and soil development for the past 10-15 thousand years since the last glacial period. Some native species adaptations have evolved over the last 1-3 million years in response to changing paleo-ecological climates and disturbances.

Amount of insect and disease tree mortality are affected by several variables: 1) differences in tree species composition, structure, and density that are more or less vulnerable to insect and disease attack; 2) differences in associated biotic and environmental composition; and 3) interactions with other landscape scale disturbances (e.g. fire, timber harvest and thinning, mechanical disturbance, windthrow).

Insect and disease tree mortality can have combined effects: 1) cause mortality to vulnerable tree species and size classes thus disturbing the community and causing change to another community dominated by less vulnerable tree species or shrubs/herbs with higher standing or down woody fuel accumulation; and 2) reversing succession (retrogression) to an earlier stage dominated by shrubs or herbs.

The uncharacteristic insect/disease tree mortality index is based on a combination of PVTGRP, HDI and Terrestrial Community groups.

Processing

The following process should be used to create the Uncharacteristic Insect/Disease Tree Mortality Probability variable by Alternative and Year.

Logic: Calculated value will be a probability of departure from the characteristic historical insect/disease tree mortality regime. This will be based on relationships to changes from the historical disturbance regime, the terrestrial community group, and management prescription for the potential vegetation group.

The calculated Uidtm values are a probability of uncharacteristic insect/disease tree mortality levels.

- Process 1.0** -- Intermediate Uncharacteristic Insect / Disease Tree Mortality Probability (IUIDTM) to H6AMPH strata using the UIDTM lookup table.
- Process 1.1** -- Assign Intermediate Uncharacteristic Insect / Disease Tree Mortality Probability (IUIDTM) to Current Yr 0 / H6AMPH.
- Process 1.2** -- Assign Intermediate Uncharacteristic Insect / Disease Tree Mortality Probability (IUIDTM) to X1/Xx Yr / H6AMPH.

- Process 2.0** -- Calculate Uncharacteristic Insect / Disease Tree Mortality Probability (UIDTM) for X1/Xx Yr by H6AMPH using the Prescription Management Similarity to HRV lookup table (RxSIM.DBF).

Logic: The look up table probabilities for luistm take into account change in PVG as a result of introduced blister rust in the moist and cold PVGs and changes in tree and community composition and structure that

effect vulnerability to insect/disease tree mortality. The prescription similarity accounts for landscape mosaic conditions that affect contagion processes of insect and disease spread.

Process 2.1 -- Calculate Uncharacteristic Insect / Disease Tree Mortality Probability for X1/Xx Veg Yrs 0, 10, 100 by H6AMPH.

If $UIDTM > 0$ Then,
 $X1Xx_Yr_UIDTM = X1Xx_Yr_UIDTM * (1 + (1 - RxSIM))$

If $X1Xx_Yr_UIDTM > 1.0$ set = to 1.0

Process 2.2 -- Adjust Yr 100 for Cumulative Insect / Disease Probability.

Calculate Final Uncharacteristic Insect / Disease Tree Mortality Probability for X1/Xx Veg Yr 100 by H6AMPH

$Final\ X1Xx100UIDTM = X1Xx100UIDTM + ((1-RxDistLt) * X1Xx100UIDTM)$

If $X1Xx_100_UIDTM > 1.0$ set = to 1.0

Logic: CRBSUM provides a vegetation composition that is stratified by cover type and structural stage. This composition is based on the outcomes of succession and disturbance. The insect and disease mortality was projected from this vegetation composition. However, the general composition of cover types and structural stages as combined into terrestrial community groups does not provide a reflection of the long-term cumulative effects of 2 factors:

- 1) the increasing probability of insect/disease tree mortality in response to increasing changes to a more vulnerable tree species composition within the same cover type/structural stage, as well as increasing continuity of those vulnerable conditions; combined with
- 2) the increasing probability of attack in areas where insect/disease tree mortality has not occurred.

The most sensitive variable for adjusting the 100 year uncharacteristic insect/disease tree mortality index at the H6Amph strata scale is a departure from the management prescription similarity in disturbance amounts to the biophysical disturbance regime (RxDistLt). This is highly correlated (but different) with the departure from the similarity of the management prescription to the historical range of variability for landscape mosaics (1 - RxSim). The use of this variable in the formula adds to the amount of gross area insect/disease disturbance. Since the average insect/disease probability ranges between 0 and .05, and the maximum amount of change because of this adjustment would be less than a .5 multiplier of CRBSUM projected insect/disease probability, the predicted vegetation composition would be similar. This adjustment will improve the prediction of the gross amount of insect/disease tree mortality at the 100 year period.

Look Up Tables

1. Look Up Table for No Action and Action Assignment of Insect/Disease Uncharacteristic Tree Mortality Probability (luidtm).

Look Up Table Variables

PVG = potential vegetation group.

HDI = historical disturbance intensity regime.

TCG = terrestrial community group.

DIR = disturbance intensity regime for no action (X1) and action (x) alternatives all years.

luidtm = intermediate uncharacteristic tree mortality probability.

To use table:

If PVG = x and HDI = x and TCG = x and X1XxYxDI = x, then X1XxYxluidtm = x

2. Departure from management prescription similarity in disturbance amounts to the biophysical disturbance regimes look up table (RxDistLt).

Rx	RxSim	RxDistLt
A1	.95	1.0
A2	.75	.95
A3	.8	1.0
C1	.7	.80
C2	.4	.70
C3	.3	.75
N1	.9	.90
N2	.6	.70
N3	.5	.70
N4	.7	.90
N5	.6	.75
N6	.75	.80
N7	.6	.70
N8	.5	.70
P1	.65	.50
P2	.3	.50
P3	.2	.75

Input Files

H6AMPH grid.

HDI lookup table.

Uncharacteristic Insect/Disease Tree Mortality Probability lookup table.

S1Vg0.

X1XxH6AMPH.

TCG lookup table.

PVG lookup table.

Prescription Management Similarity to HRV lookup table (same as for HRVDep).

Departure from management prescription similarity in disturbance amounts to the biophysical disturbance regimes look up table (RxDistLt).

CLASS INTERPRETATIONS -UNCHARACTERISTIC FOREST INSECT AND DISEASE DISTURBANCE DEFINITION AND CLASSIFICATION

For modeling purposes it may be necessary to classify the weighted average coefficients in the deliverable dbf files. The following suggestions are provided for determining class breaks for each coefficient for this particular variable.

Time Period Definitions

Current (CUR) - Current time period generally reflects the current year (1999) plus or minus five years (i.e., 1994 - 2004). Developed from data and models using administrative unit data from the past 10 years as one input. Reflects the disturbance from 1988 to 1997 (10-year average).

Future Decade (10) - Short-term future, projected 10 years into the future (2009) from the current year (1999) plus or minus five years (i.e., 2004-2014). Developed from data and models using the slope from the 10-year administrative unit data and probabilities of activity and disturbance occurrence that are associated with the mapping of different management prescriptions to reflect the alternatives.

Long-term (100) - Long-term future, projected as an average of the 10 future decade projections from the current year. The average over this period represents average conditions over the total 100-year period. Developed from data and models using the current year as the starting point and probabilities of activity and disturbance occurrence that are associated with the mapping of different management prescriptions to reflect the alternatives.

Uncharacteristic Forest Insects and Disease Disturbance, Variable 29, Unplanned Disturbance

Subwatershed current year statistics:

Average current year non-zero values:

Standard deviation current year non-zero values:

Minimum current year non-zero values:

Maximum current year non-zero values:

Number current year zeros:

Current year distribution shape: j-shape with tail

Notes on 10-year and 100-year distribution: class breaks set at points in the distribution that are generally associated with severity of forest insect and disease disturbance effects. **N, VL, L, M, and H classes set using current distribution so that S1, S2 and S3 futures will be relative.**

Definition: annual area coefficient for relative probability of forest tree vulnerability to insects and diseases that can cause uncharacteristic mortality within the subwatershed.

Current levels of uncharacteristic forest insect and disease disturbance are based on administrative unit 10-year average (1988 to 1997) of disturbance activities as one input and correlation of broad-scale proxy variables with plot level data on insect and disease effects.

Uncharacteristic forest insect and disease effects have a probability of causing a change of more than 20 percent dissimilarity compared to native (historical) effects of forest insect and disease disturbance to. These effects are outside the normal range of the historical (natural) system. The normal range is considered to be within the 400-year historic range of variability minimum plus 25 percent and maximum minus 25 percent. Uncharacteristic effects of these types could result in extensive tree mortality or stress. The use of management prescriptions as an input accounts for general differences in effects resulting from interactions with other disturbances, such as fire, and management activities, such as thinning and timber harvest.

The cumulative effects of forest insect and disease disturbance over time vary depending on frequency and intensity of infestations and epidemics. For this broad-scale variable the breakpoints for classes were applied at levels that generally correlate with the cumulative effects of frequency and severity of forest insect and disease effects.

Classification method: j-shape distribution with long tail and spike split into classes of very low, low, moderate, and high excluding the zeros (none class).

Class	Low	High	Interpretation
None	0	.000000001	Almost no probability of uncharacteristic forest insect and disease effects in the subwatershed. Spatial distribution is correlated with non-forest/woodland areas in current.
Very Low	.00000000 02	< .095	Very Low probability of uncharacteristic forest insect and disease in the subwatershed - This class is generally associated with infrequent, low mortality effects resulting from scattered individual tree or small patch attacks. Primarily correlated with the savannah forests or woodlands in the dry forest or woodland PVGs in current.
Low	>= .095	< .285	Low probability of concentrated uncharacteristic forest insect and disease in the future decade in the subwatershed. <u>High probability that substantial mortality has already occurred.</u> - This class is generally associated with frequent mortality to remaining susceptible live individual trees or small patches. Many susceptible trees have already been attacked and died over the past decades. Primarily correlated with the dry forest and dry end of the moist forest and encroachment on rangelands in the current.
Moderate	>= .285	< .495	Moderate probability of uncharacteristic forest insect and disease in the future decade in the subwatershed. <u>High probability that some mortality has already occurred.</u> - This class is generally associated with frequent, extensive mortality to susceptible live individual trees with some large patches. Some susceptible trees have already been attacked and died over the past decades. Primarily correlated with the moist end of the dry forest, the moist forest, and the warmer end of the cold forest in the current.
High	>= .495		High probability of future epidemics of extensive uncharacteristic forest insect and disease in the future decades in the subwatershed. This class is generally associated with infrequent, but extensive mortality to susceptible live individual trees that expand into large patches. Some susceptible trees or patches have already been attacked and died over the past decades. Primarily correlated with the moist and cold forest PVGs in the current.