SIMULATION PARAMETERS

VEGETATION—SINGLE OR MULTIPLE LIFE FORMS

The use of multiple life forms is necessary if the system is to be used to address invasive species. If this decision was not made when the vegetation was attributed in the GIS files a utility can change the file without the initial input, select Utility > Change Area to Multiple Lifeform.

SINGLE OR MULTIPLE SIMULATIONS

Single simulations are often used to check system behavior and to gain an understanding of how changes have an interacting effect on many processes. The short time it takes to make an OpenSIMPPLLE simulation makes it easy to use in a team environment to test system knowledge.

Multiple simulations are most often used to help quantify a range of outcomes on management options once they have been designed. A statistical test is provided with the Microsoft Excel spreadsheet template that comes with OpenSIMPPLLE to compare the distribution of outcomes to see if there are any significant differences. Multiple simulations can be used to provide quantification for the concept of a range of variability in both vegetation attributes and disturbance processes. They can be used with long-term simulations to help provide a quantification of historic landscape conditions. When making multiple simulations, you have the option of tracking by ownership and Special Area within the data set. This enables the file using the Excel macro to be stratified by these levels. When making multiple simulations a location and a prefix to go with the files that are created must be identified.

NUMBER OF TIME STEPS

Short-term time step simulations (1–5 decades) are often used to provide a means to compare alternative management scenarios or current trends.

Long-term (greater than 5 decades) time step simulations are most often used to help quantify the interaction and cycling of disturbance processes and vegetation conditions. Long-term simulations (5–10 decades) without fire suppression are one way to help provide a quantification of historic conditions for a specific landscape.

HOW MANY SIMULATIONS TO MAKE

The number of simulations to run depends on both the size and the variability of vegetation within the area. Based on previous work, 30 simulations appear to be adequate to capture the variability created within OpenSIMPPLLE. An Excel spreadsheet with a statistical test is provided to make it possible to test sets of simulations to see if additional simulations increase the variability of specific attributes.

FIRE SUPPRESSION

Simulations to compare management options are usually made with fire suppression. Making simulations without fire suppression is most commonly used with long term simulations to create an
interaction between fire, insect and disease disturbances and the vegetation pattern to quantify a
historic range of variability. If fire suppression costs are incorporated, however, they are very
simplistic. The user can access the dialogue System Knowledge > Vegetative Process > Fire
Suppression Costs. Costs are assigned on a per acre basis, by fire size class, and by fire
management zone.

SIMULATION METHOD

There are three choices for simulation method. Stochastic is the most common simulation method
used. A Monte Carlo approach is used with the probability values for each disturbance process
calculated for each individual plant community to reinforce the concept that our landscapes are not
always shaped by processes that have a high probability of happening on any given acre. The
probability of many events is relatively low, but when these disturbance events happen, they make
significant changes that shape the development of the landscapes. Stochastic, multiple simulations
can be used to create the probability of vegetation attributes existing or disturbances occurring
within a landscape. They are also useful to help add quantification to the concept that there is
variability in the outcome in our landscapes. For some analyses on a very specific location of
treatment choice (e.g., for example fuel management treatments) it may be more useful to lock-in
specific disturbance processes to see how the landscape will vary with or without the treatments.
Highest Probability will utilize the disturbance process that has the highest probability for each
plant community. Choosing Stand Development as a simulation method can be used to eliminate all
disturbance processes. This will create a landscape in which all plant communities will simply grow
older.

DECADE, YEARLY, OR SEASONAL TIME STEPS

The default time step is decades. However, some of the interactions between processes, such as fire,
insects, or the response of grasses to yearly moisture changes, make more sense if the system is run
with yearly time steps. For some geographic areas, such as the grasslands, the interaction between
processes is important on a seasonal basis. For these geographic areas, the default time step is yearly.
For those geographic areas where the user can chose between yearly or decade time steps, most
system knowledge is automatically adjusted. Two system knowledge
components that the user must adjust are:

- Regeneration delay—this has to match the user’s choice of time steps
- Rate of change for tracking species when used for invasives—user has to make this
  match the time step

Both of these changes can be made through the user interface.

PREDICTING INVASIVE SPECIES

This can be used only if the logic is included for the geographic zone / area in use. These areas are the
Colorado Plateau and the Eastside of Region One

LOCKING IN DISTURBANCE PROCESSES

Any disturbance process can be scheduled in a plant community by locking it in for a specified time
step. Without specifying locking-in processes, a simulation begins with the assumption that no
disturbances processes are ongoing. The simulations can be more realistic by accounting for processes that the user knows are currently active, such as mountain pine beetle or root disease. These processes can be scheduled for the first time step by building a file through the
user interface. Processes can also be scheduled to evaluate the impact of possible extreme events—large-scale occurrences of processes such as mountain pine beetles or stand replacing fires. There are a variety of ways that the user can explore “what if” scenarios. Some disturbance processes can be locked in while the system models others stochastic; or, by choosing Stand Development for the simulation type, the only disturbance processes will be those locked-in. The probability screens for each process can be utilized to selectively zero out the occurrence of a process.

**SCHEDULING TREATMENTS**

To represent management scenarios, treatments have to be scheduled. There are a number of ways that this can be accomplished. See more information on treatments under “System Knowledge.”

**TRACKING BY OWNERSHIP OR SPECIAL AREA**

The Special Area field has been used to summarize conditions and processes and to schedule treatments by watershed, management areas, or simply a break between non forest ecological stratification and forested ecological stratification. These assignments must be made during the GIS setup and can be used to stratify results post-simulation (e.g., ownership, forest versus non forest, management areas, and HUCs).