

## **Mini-Manual for the Savanna Modeling System (SMS)**

### *I. Quick Start*

After completing installation, the executable programs should be located in the \savanna\bin directory, and the files for the site should be located in the \savanna\sites\SITENAME directory with subdirectories in \SITENAME for parameter files, GIS files, output files, and other file types. (SITENAME is the name of the site working directory).

*I. Startup.* The SMS can be started in three ways.

- 1) If the procedures for installing the program folder and icons given in the INSTALL document were completed, the SMS can be started by clicking on the icons.
- 2) The programs can also be started by running batch files (\*.bat) from the DOS prompt in the SITENAME directory, or with the Windows Start/Run buttons.. The batch files can be invoked from a DOS Prompt, or by double clicking on the batch file and its icon from Windows Explorer (eg. Click on SMS in the d:\savanna\sites\SITENAME folder). A batch file for starting the SMS (sms.bat) might contain the following line:  
\savanna\bin\sms.exe  
A batch file for running the model (run.bat) might contain this line  
\savanna\bin\savanna.exe
- 3) The programs can also be run directly, by using Start/Run and entering the pathname for the .exe file in the bin directory (eg. c:\savanna\bin\sms.exe).

### *II. SMS Submenus*

#### A. Settings

1. Pathnames - Set the pathnames for the directories currently in use. This can be used, for example to use a different parameter set stored in another directory than “parms”, or to store model output in another directory than “output”.
2. Preferences - Set the colors for the SMS menus. Set different window frames.  
Set text font for graphs.

#### B. Input

1. Non-Spatial. The **ParmEdit** subsystem is a way to change parameters on the parameter files using a text editor. The subsystem identifies file types, which include plant production model parameter files, plant population parameter files, etc. The files with default filenames and their groupings

are specified on the file parmedit.dat, in the \savanna\bin directory. This file can be edited as desired. The files which are unique to the site are specified on plfile.prm.

- a. File - Pick file to edit, AFTER picking file Type.
- b. Type. Pick type of file to edit.
- c. Edit. Edit the file using the system editor (Notepad for

Windows)

2. Spatial. The spatial parameters and data are specified here. The spatial input files (GIS files) are grouped into Landscape (eg. soil, elevation), Vegetation, Fire, Force, and Water Sources (for animals). If there is a selection of files to be used, in the GIS directory specified in Settings - PathNames, alternatives can be specified here.

### C. Output.

1. Temporal. This type of output allows examination of model outputs over time, without regard to spatial location. Most of the outputs are system-wide averages, except for the diagnostic location outputs. See the section below (Section III) on setting up the temporal plots.
  - a. 1-Files and 2-Files - Select from 2 lists of model output files. The files are organized into groups of model output types, eg. NPP, tree populations, etc.
  - b. Variables - once the file is selected, select a variable from the file.
  - c. Options
    - i. Graph Type- various types of graphs can be used. The default is a line plot. Other types can be experimented with. More details will have to be given elsewhere.
    - ii. Axis/Labels - specify the axis scaling, labels, plot title
- d. Data - data collected in the field can be used to test model performance. This menu picks which field data file to be used in a comparison of model outputs to field data. The information about which files are on the menu is stored in the SITENAME\graphs\datfiles.dat file. The actual data files (as named on datfiles.dat) are also stored in the Validation Data directory specified in Settings-Pathnames (eg valdata), and in the svpaths.dat file as valpaths= . The format of the data files is a header line followed by lines of data with month,year, and data values.
- e. Plot - shows the plot on the screen, and prints the plot if printing is enabled.
- f. Print - print to the Windows Print Manager (printer) or to a postscript, bitmap, or other output file.
  - i. Print - Print the plot or save to a file . The plot will be shown, and then when exited, printing will start.
  - ii. Config - Configure the printer or output file format

Printer/File - Select the type of output device or file from a list of options. If Windows Print Manager is selected, it will print to the printer that is currently selected in Windows.

Units - Select units to express options in (inches, mm, points)

Options - Displays a menu with options to set for the selected printer or file type (eg. line width, size, colors)

Load/Save - Load Options from a file, or save them to a file for loading later.

iii. File - Select the output file name if printing to a file.

2. Spatial. The outputs that can be displayed as maps, changing over time. This calls the **ImageDis** subsystem.

a. Files - There are four spatial output files now: image1.img, image2.img and image3.img and image4.img. The first contains the standard outputs. The second contains the ANPP and consumer offtake per output interval, and the third contains factors that may affect animal distribution.

b. Variables - Pick a single variable from the selected file to view. The variable names and other information are being read from the header file corresponding to the image-.out file, eg. image1.hdr for image1.img.

c. Options - Shows months that were saved. Select number of monthly images to show on a screen. Select scaling of the color scheme. Select option to show one month per year (with multiple years). Select mouse or arrow keys to advance or reverse images in time.

d. Display - show the plots.

i. If the mouse advance option is on, a menu appears with buttons to advance, reverse, print, or quit. Pressing Print prints the current screen to the currently enabled printer or file.

ii. If the cursor advance option is on, no menu appears. Use the cursor right and left arrow keys. Use the F1 key to print the current screen to the currently enabled printer or file.

e. Print - see the Print section under Temporal Output, above. The Config and File submenus work the same way. Here, however, the command to actually print is from the image display screen.

D. **GIS** - The **Img2GIS** subsystem. Extracts information from a model spatial output file and converts it to one of three GIS formats.

1. File - Pick the model spatial output file to extract from.

2. Variables - Pick one or more variables on the file to extract. Pick the months to

extract (on GIS file will be created for each variable-month). Pick the GIS format (IDRISI binary, ARC grid ascii file, GRASS ascii file). Option to convert model output missing value code (-999) to 0 (may help keep in scale range for IDRISI image displays, for example).

3. Extract - the variables are extracted and the GIS output files are created, in the directory specified for GIS Output files in Settings/PathNames (eg. SITENAME\GISOUT\). There is a file naming convention that is hard-coded in the SMS, with the first 2 letters of the file being as follows (variables in the order as on the image file). The two letters are then followed by the month/year. Eg. precipitation on image1.img for October 1999 would be on a file called pr101999.asc if ARC/GRID was being used..

```
Image1.img - 'pr','tc','sc','gr','hg','sg','tg','sn','rt',
            'wa','cn','np','ht','ca','sl','bl','tm','gp','u1','u2','u3',
            'u4','u5','u6','u7','u8','u9','uA','uB'
Image3.img - 'p1','c1','p2','c2','p3','c3','p4','c4','p5',
            'c5','p6','c6','p7','c7','p8','c8','p9','c9','p0','c0','pA','cA','pB','cB'
Image3.img -
            'tr','th','sn','hg','hd','tm','f1','f2','f3','f4','f5','f6','f7','f8','f9','f0','f
            A','fB'
Image4.img -
            'x1','x2','x3','x4','x5','x6','x7','x8','x9','x0','y1','y2','y3','y4','y5',
            'y6','y7','y8','y9','y0'
```

4. The IDRISI documentation (.doc or .rdc) files are created automatically. For ARC GRID, the files can be read by the “asciigrid” command. For GRASS, use the r.in.ascii command.

#### E. Run - Set run options, and run the model.

1. Domain - set spatial and temporal domains for the run.
  - a. Time - select the start month (must be same as on weather files). Select number of months to run (must not exceed weather file data unless the run is set to begin using stochastic weather at a certain time).
  - c. Window - select a block of grid-cells by specifying starting and ending rows and columns. In the model, row 1 is the bottom row, unlike in a GIS system.
  - d. Diagnostic location and species. A grid-cell, subarea, and facet (veg. Patch), and plant species group is selected for diagnostic (detailed) outputs on diag1-5.out and report.out. The plant group is the index on that location, not the index in the list of all plant species.
2. Weather
  - A. Select weather files and spatial interpolation method. A base-station weather file is mandatory. If elevation-based spatial interpolation is selected, a multi-site weather file must be given, along with a station locations file. If surface-based interpolation is selected, a

surface map must be specified on the Inputs\Spatial\Vegetation form. Random (stochastic) weather can be specified to begin on a certain date, for example at the end of a weather file.

### 3. Animals

- A. Specify whether herbivore population dynamics will be simulated. If not, and a the number of herbivore spp. (Nspcon) on simcon is >0, the population data file is used.
- B. Simulate predators or not.
- C. Simulate pastoralists or not. The pastoral model is not included in most model versions.
- D. Specify a population data file to use.
- E. Specify a culling or harvest file, only used if herbivore population dynamics are simulated.

### 4. Output

- A. Temporal
  - i. Specify write interval (months) to most output (\*.out) files.
  - ii. Specify which facet/subarea to leaf.out, stem.out, root.out, cag.out, files, (not plant\*.out as indicated). Thus, one could save only herbs on upland subareas, or herbs on upland herbaceous facets, etc.
  - iii. Specify what type of output on report.out. The diagnostic output for the diagnostic location, report NPP and WUE by vegetation types on the veg. Map, or 2 other options explained elsewhere.
  - iv. Specify units and write interval on herbivore output files.
- B. Spatial
  - i. Specify which of the image\*.img files to save, all can be saved.
  - ii. Specify which facet/subarea and plant species to save. All- will report the area-weighted mean for the grid-cell, across all facets/subareas. A 0 for species will include all species. Otherwise, specify a species index (type index, as ordered on the plfile.prm file).
  - iii. Months to save - select months will be saved only. Spacing between saved months must be regular.

### 5. Run - Begin a model run.

## III. *Setting up graphs in the temporal plots menu*

A. In the graph directory (specified by graphpath in svpaths.dat), are located the file lists for outfile1 and outfile 2 (outfile1.dat and outfile2.dat). These file give the names of the template files for each graph that can be selected from Files-1 or Files-2.

B. Also in the graph directory are the template files for each graph, called \*.tpl files. The template files list the variables that are on the \*.out file, ie. the temporal output file from the model that is written to the output directory. Eg. diag1.tpl corresponds to diag1.out.. The first entry on each line is a 0/1 flag indicating which variables will be selected to plot by default. The

second entry is a short description of the variable, and the third entry is a long description of the variable, all information shown when selecting the variables to plot.

C. Because each site/application is configured differently with respect to what plant types and animal populations are simulated, some of the template files need to be edited when going to a new site. In particular, for plants, the leaf.tpl, stem.tpl, dead.tpl, cag.tpl, root.tpl, plantn.tpl . For plant populations plantpop.tpl, shrubsiz.tpl, treesiz.tpl. For animals, the intake.tpl, forage.tpl, enbudgt.tpl, diet.tpl files need to be changed. A good suggestion is to make a list of the .tpl files, and then examine the corresponding .out file to see what variables are on the file, and then edit the .tpl file as needed.

#### *IV. Changing the color scheme and line and symbols styles used in the temporal plots, and default printer/file options.*

- A. In the bin directory is a file called symbol.dat with the information that sets colors, line types and symbols for 10 variables that can be shown on any one plot. At the bottom of the file are some comments with information about what the color, line, and symbol codes stand for.
- B. There are some alternative symbol.dat files in the bin directory that are pre-configured, called symbol.cl1, symbol.cl2, symbol.b&w, etc. These files can be copied over the symbol.dat file to use them in the SMS. The black and white color option is very useful when the plot is to appear in a black and white only document. The symbol.cl1 is the most commonly used set of options.
- C. In the bin directory is a file called prntopts.dat, which is a file with one line containing the pathname of the default printer/output file options (eg. c:\savanna\bin\winpmgr.opt). These options files (\*.opt files) are the ones that are created by “Load/Save” in the Print/Config submenu, so you can create your own options file, and then use it as the default by specifying that filename on prntopts.dat.

#### *V. Suggestions*

- A. Saving output to .bmp files is useful, since the images can be easily imported into word processing documents, resized and positioned as needed. .bmp files can also be imported into graphics programs such as MS-Paint, and edited (eg. add annotations, erase, etc.).

