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USER'S GUIDE FOR THE APPLICATION "Create_InputFiles_ZELIG-CFS.exe"

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1- Introduction

The application "Create_InputFiles_ZELIG-CFS.exe" facilitates the creation of input (or initialization) files for the gap model ZELIG-CFS. Every input file may contain input data for several sample plots. The simulations are run sequentially for each sample plot.

"Create_InputFiles_ZELIG-CFS.exe" was adapted for different provinces, including Quebec, Nova Scotia, New Brunswick, Ontario and Alberta. Thus, users don't have to convert provincial species specific codes into ZELIG-CFS species codes, as the conversion is handled by the application. As Canadian provinces, forest companies or other forestry organizations have different procedures or software applications to manage forest data, it would have been unproductive and impractical to develop an application that would meet every particular need. However, the application was developed in such a way that users can easily "copy and paste" tree and climatic data from common applications, such as Excel or Access, directly into the appropriate edit or data fields of "Create_InputFiles_ZELIG-CFS.exe", as long as each line of data is separated by a "carriage return".

2- Installation of "Create_InputFiles_ZELIG-CFS.exe"

The application "setup_aplx_support_5.exe" must be installed to execute "CreateInputFiles_ZELIG-CFS.exe", which can be downloaded from https://apps-scf-cfs.rncan.gc.ca/calc/en/ecosysmodel. Once "setup_aplx_support_5.exe" is downloaded, just click on the file to install. Then, run "Create_InputFiles_ZELIG-CFS.exe" in any directory (or folder). Appendix 1 is an illustration of the form that appears when it is launched.

3- Procedures to enter data and information

As different types of information and data are required to create ZELIG-CFS input files, the most efficient approach is to have temperature and precipitation and tree data available in a spreadsheet and copy and paste as necessary into the form of "Create_InputFiles_ZELIG-CFS.exe".

Description of required information and data:

1- Name of the file to create

This is the name of the input file that will be created. This file may contain data for several sample plots. A maximum of 30 alphanumeric characters, including the underscore character ("_") if necessary, is allowed. When you click "Create", you may save the file in two formats: ".cvs" or ".txt". The default format is ".cvs". Once the name of the file is entered, it not possible to change it (the button "Create" disappears, but the name can be changed once the user quits the application).

2- Forest area name

This is the name that identifies the area where a sample plot is located. Examples are “Mauricie”, “Edouard_VI_O” or “FallingSnow”. Alphanumeric characters are allowed, as well as the underscore character. Several sample plots can belong to the same forest area. The selection of this name is important because it is used as an attribute (stratification variable) for the identification of a sample plot to perform partial cuts, visualize sample plot results, and execute SVS (Stand Visualization System) or QuantumGIS.

3- Plot number

For a given forest area, this is a number associated with a sample plot. Only integers are allowed. The same plot number can be used more than one time in an input file, but as long as they belong to different forest areas.

4- ID number

This number is specific to each sample plot. Only integers are allowed. It is suggested to have a minimum of 4 digits.

5- Plot area and shape

Plot area is entered in squared meter (m^2). Two choices are possible for shape: rectangular or circular.

6- Longitude, latitude and altitude for sample plots

For minutes and seconds for longitude and latitude, the information must be converted into decimals if the information is not available, just enter “0.0”.

7- Length of simulation (years)

For instance, 150 for 150 years. Decimals are not allowed because the simulation time cycle is one year.

8- Print interval (year)

This information indicates the number of years between which data are stored in output files. For instance, the number “5” indicates that the results will be recorded every 5 years. Even though the simulation time cycle of ZELIG-CFS is annual, setting up a print interval value greater than the

ZELIG-CFS time cycle may save considerable storage space on disk when many plots are simulated over a long time period.

9- QGIS (Quantum GIS) code

Two codes are possible:

A- "0" indicates that there is no spatial information provided. As a consequence, ZELIG-CFS will not expect any input file for Quantum GIS.

B- "1" indicates that UTM coordinates are provided for a sample plot (4 corners for rectangular plots and center for a circular plot). Examples of QGIS files are included in the user's guide of AMSIMOD.

10- Field capacity and wilting point

The two values are expressed in centimeters. If these two values are not available, it is possible to indicate the following classes:

- Sand
- Sandy loam
- Loam
- Silt loam
- Clay loam

Values associated with each class will appear on the left.

11. Fertility factor (Mg/ha/year)

This value is an estimate of maximum above-ground woody biomass productivity and is used to evaluate relative soil fertility. The application "Fertility_Factor.exe" (see Appendix 2) can be used to compute this number, which can be estimated using similar stand data, within the same region, that were not affected by any disturbance.

12- Quantum GIS input file (40 characters maximum)

If the QGIS code provided above (see 9) is 1, enter the name of the corresponding QGIS file that contains the names of the position files for the sample plots. (See user's guide of AMSIMOD for more detailed explanations).

13- Species code (province)

Indicate the province where the sample plot data are located. "Create_InputFiles_ZELIG-CFS.exe" will automatically convert species-specific provincial codes into ZELIG-CFS species codes.

14- Monthly temperature means and standard deviations and monthly precipitations with standard deviations.

Temperature and precipitation data are important for ZELIG-CFS. These data can be obtained from local weather stations or Environment and Climate Change Canada. They can also be obtained from BioSIM (see https://cfs.nrcan.gc.ca/projects/133 and ftp://ftp.cfl.scf.rncan.gc.ca/regniere/software/BioSIM/BioSIM10/Doc/LAU-X-137E.zip). For realistic representation of normal variations in temperature and precipitations, it is suggested to use data for at least a 30 years period to compute means and standard deviations.

Data in a text file or an Excel sheet can be copied and pasted (Figure 1). (If there is an error, it is possible to clear the data and copy and paste them again). If data are copied from a text file, the temperature and precipitation and the standard deviation for each month must be separated by a space.

Copy data from a spreadsheet and paste in "Create_InputFiles_ZELIG-CFS.exe"

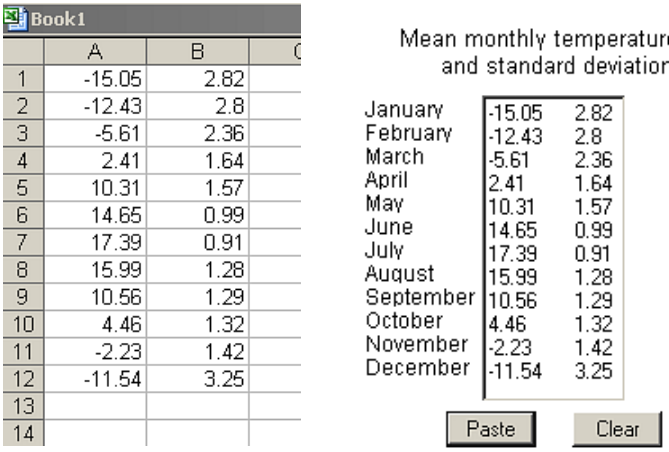


Figure 1: Illustration of the procedure to copy and paste data from a spreadsheet to "Create_InputFiles_ZELIG-CFS.exe".

15- Tree numbers, species codes and DBHs (cm)

The procedure to enter data is the same as the procedure for temperatures and precipitations, except that 3 columns of data must be entered: tree number, species code and dbh (cm). Data are copied and pasted from a text file or a spreadsheet. It is possible to clear the data and copy and paste them again. Tree numbers, species codes and dbhs must be separated by a space if they are copied and pasted from a text file.

16- Data on potential germination rate, stocking, zone of influence and stress mortality

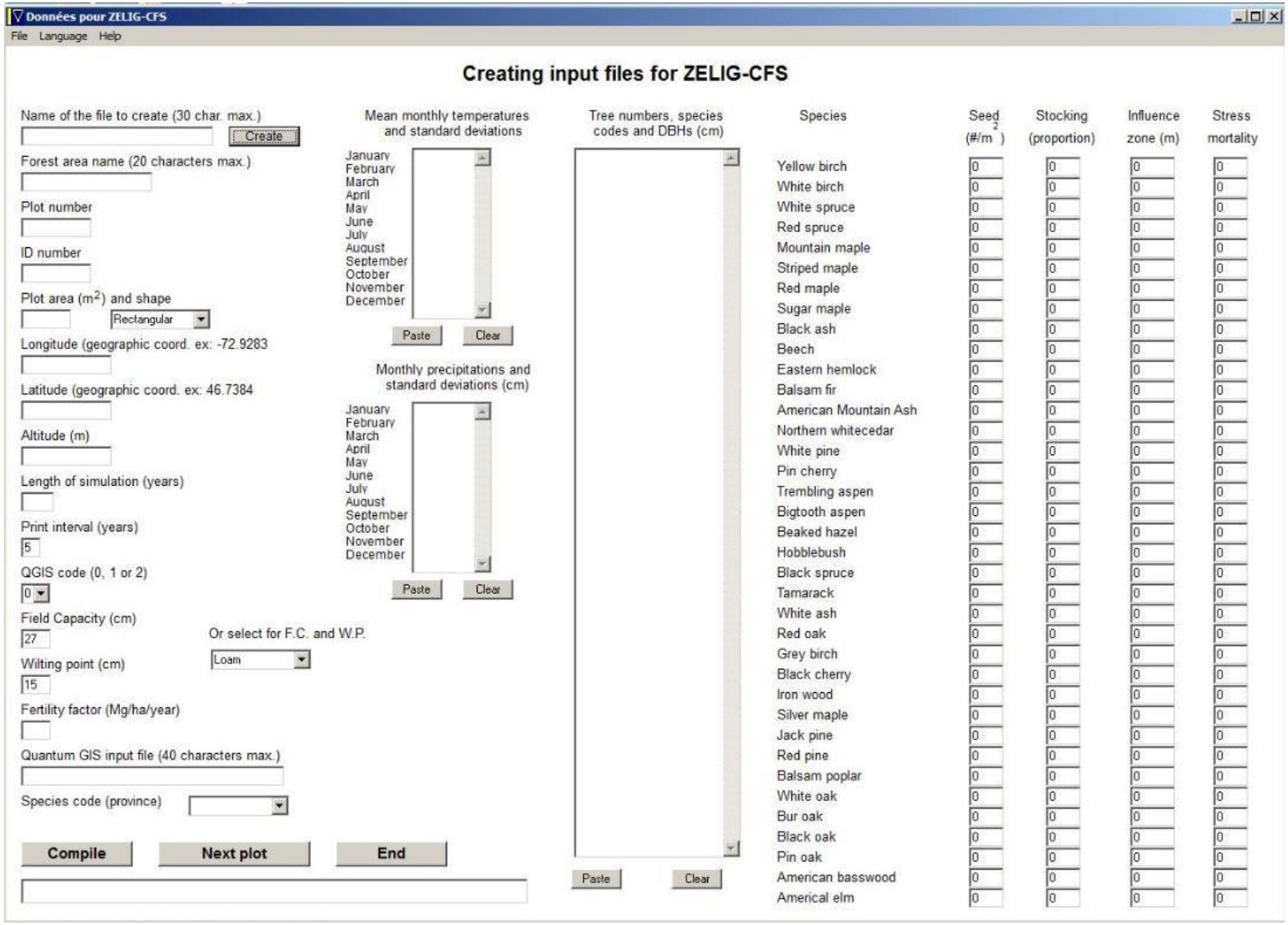
For each species listed on the right hand side of the main form, it is possible to enter data on potential germination rate, stocking, zone of influence and stress mortality. (For now, it is not necessary to enter influence zone and stress mortality data. These two attributes were added for future use). Germination rate is the number of seedlings per m^2 that can be expected in a forest ecosystem. It is a potential number that can be estimated from regeneration data. Examples of realistic numbers are 0.0175, 0.028 or 0.44, which correspond to 175, 280 or 4,400 seedlings per ha. In the simulations, germination rates will be affected by light conditions at the soil level. For instance, in understory shade conditions, a shade tolerant species such as sugar maple can have have a high germination rate. On the other hand, a shade intolerant species, such as trembling aspen, can germinate well on open-fields or in gaps under full sunlight. The number of seedlings generated annually in the simulations eventually join the tree cohort, but the transition rate can be influenced by seedling mortality rate.

Stocking is the proportion of space occupied by the seedlings of a species. It varies between 0 and 1. When all the species are considered within a forest, stocking differences can be substantial. For instance, sugar maple sometimes occupy large areas within a forest. So, its stocking value may be very high, close to 1. Other species, such as yellow birch, occupy a small proportion of space, with a stocking that can be as low as 0.1

4- Final steps

Once all the data and information are entered, click on “Compile”. “Create_InputFiles_ZELIG-CFS.exe” will process the sample plot data. It is important to read the messages at the bottom left of the main window. If there are errors, specific error messages are displayed. If there are no error messages, click on “Next Plot”. All the edit and data fields will be initialized for another sample plot data entry session. When the data for all sample plots are entered, click on “End”. The file name with the extension (“.cvs” or “.txt”) provided when “Create_InputFiles_ZELIG-CFS.exe” was launched is created.

Appendix 1: Main form that appears when "Create_InputFiles_ZELIG-CFS.exe" is executed.



Appendix 2: Estimating a fertility factor using “Fertility_Factor.exe”

1- Introduction

One of the inputs required by ZELIG-CFS is a fertility factor (Mg/ha/year). This value is an estimate of maximum above-ground woody biomass productivity that is used to evaluate relative soil fertility.

The application “Fertility_Factor.exe” can be used to compute this value. For each forest type, stand data from undisturbed forests located in the same region can be used.

“Fertility_Factor.exe” was adapted for different provinces, including Quebec, Nova Scotia, New Brunswick, Ontario and Alberta. Thus, users don’t have to convert provincial species specific codes into ZELIG-CFS species codes, as the conversion is handled by the application.

2- Installation of “Fertility_Factor.exe”

The application “setup_aplx_support_5.exe” must be installed to run “Fertility_Factor.exe”, which can be downloaded from this web site. Once “setup_aplx_support_5.exe” is downloaded, just click on the file icone to install. Then, run “Fertility_Factor.exe” in any directory (folder).

3- Procedures to enter data and information

1- Name of the file to create
   Maximum above-ground woody biomass productivity estimates will be saved in this file. This file may contain results for several sample plots. A maximum of 30 alphanumeric characters, including the underscore character, is allowed. When you click “Create”, you may save the file in two formats: “cvs or .txt”. Once the name of the file is entered, it not possible to change it (the button “Create” disappears, but the name can be changed once the user quits the application).

2- Forest area name
   This is the name that identifies the area where a sample plot is located. Examples are “Mauricie”, “Edouard_VI_O” or “FallingSnow”. Alphanumeric characters are allowed, as well as the underscore character. Several sample plots can belong to the same forest area.

3- Plot number
   For a given forest area, this is a number associated with a sample plot. Only integers are allowed. The same plot number can be used more than one time in an input file, but as long as sample plots belong to different forest areas.

4- Plot area
   Plot area is entered in squared meter (m^2).

5- Species code (province)
   Indicate the province where the data come from.

6- Tree numbers, species codes and DBHs (cm)
   Data can be copied and pasted from a text file or a spreadsheet (see Figure 1 above). It is possible to clear the data and copy and paste again. If data are copied from a text file, tree numbers, species codes and dbh on the same line must be separated by a space (e.g., no comma or any other character).

4- Final steps

Once tree data are entered, click on “Compute” to estimate the fertility factor. It is important to read the messages in the text field located in the middle of the main window. If there are errors, specific messages will be displayed. If there is no error message, click on “Next data” to process another sample plot. All the edit and data fields will be initialized for another sample plot data acquisition.

When the data for all sample plots are entered, click on “End”. The file whose name was provided at the beginning of the session is created