



# Casimir Vegetation Manual

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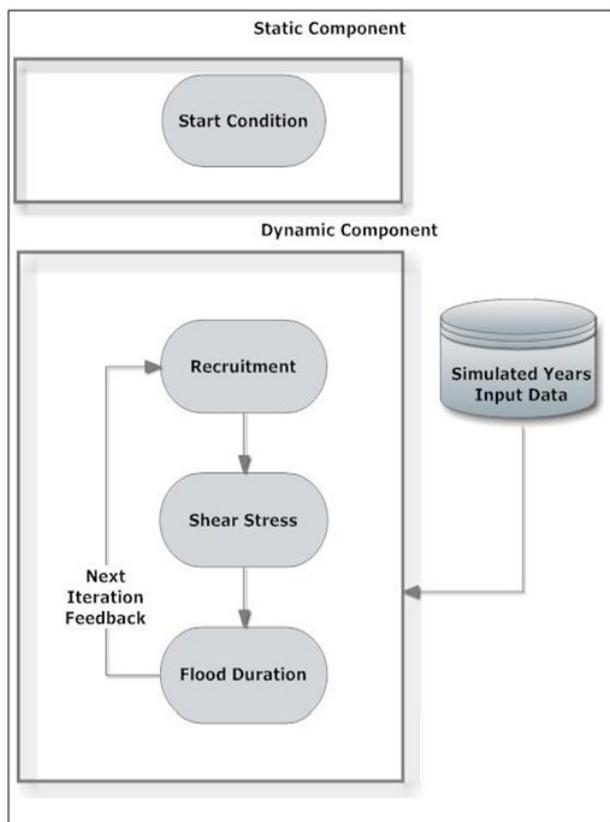
The software is subject to change due to further technical development, and thus this documentation may contain errors and/or omissions which may therefore not reflect the exact condition of the software and/or documentation



# 1 Introduction

Casimir vegetation allows the simulation of floodplain vegetation spatial distribution over time. The model concept assumes that vegetation development depends by the functional relationship among hydrology, physical processes and vegetation communities. In the model conceptualization, physical processes are represented by height over mean water, shear stress as indicator of morphodynamic disturbance and flood duration. These factors allow the successful establishment and development of the vegetation or its retrogression to the initial stage.

The model concept is organized in two parts, the static, start condition component and the dynamic component. This latter is further sub divided in execution modules whose execution flow is depicted in Figure 1. The dynamic part is addressed as dynamic because it takes different inputs for each simulated year and because the outputs of each model run is fed again to the model as input for the next iteration.



**Figure 1** Models and submodels composition and execution order (adapted from Politti 2008). The two black rectangles mark the division between the Start Condition Model and the Dynamic Vegetation Model. The rectangles within the Dynamic Vegetation Model are the submodels. Submodels arrangement reflects their execution order (from top to bottom).

The modules of the dynamic model are executed with a strict order which, for the end user, is immutable. However, to allow some degree of flexibility, in the modeling procedure is

possible to select which components (start and dynamic) and modules (recruitment, shear...) will be executed.

The goal of this manual is to guide the user through the software installation, explain the software functionalities and demonstrate the step required to run a case study.

Further information regarding Casimir vegetation and other software belonging to the Casimir family can be found at the following web address:

[http://www.casimir-software.de/index\\_eng.html](http://www.casimir-software.de/index_eng.html)

Like all the other components of the Casimir family, also the vegetation version is based on scientifically sound practices. Hereinafter are listed several peer-reviewed sources which explain the foundation and of the Casimir vegetation concepts.

R. Benjankar, G. Egger, K. Jorde, P. Goodwin, and N. F. Glenn, “Dynamic floodplain vegetation model development for the Kootenai River, USA.,” *J. Environ. Manage.*, vol. 92, pp. 3058–3070, Aug. 2011.

G. Egger, E. Politti, V. Garófano-Gómez, B. Blamauer, M. T. Ferreira, R. Rivaes, R. Benjankar, and H. Habersack, “Embodying interactions of riparian vegetation and fluvial processes into a dynamic floodplain model: concepts and applications,” in *Ecohydraulics: an integrated approach*, I., I. Maddock, A. Harby, P. Kemp, and P. Wood, Eds. Chichester, UK: John Wiley & Sons Ltd, 2013, pp. 407–427.

Many others publications exists where Casimir is cited but these two ones are the those that best summarize the ecological concepts and paradigms underpinning Casimir vegetation. The full Casimir vegetation reference list can be found in the last section (Reference list) of this manual.

## 1.1 System requirements

The model is built upon the Microsoft .Net framework, version 3.5 and **requires the Visual Studio power pack v version 3 installed**. Most of the computers running windows XP or Windows 7 or 8 operating systems are usually already equipped with these components. **Where missing, these components can be downloaded for free** from the Microsoft official web site:

Table 1 Download links of the system requirements components

Download link	Component
<a href="http://www.microsoft.com/download/en/details.aspx?id=21">http://www.microsoft.com/download/en/details.aspx?id=21</a>	.Net 3.5
<a href="http://www.microsoft.com/download/en/details.aspx?displaylang=en&amp;id=25169">http://www.microsoft.com/download/en/details.aspx?displaylang=en&amp;id=25169</a>	Visual Basic Power Pack 3

Some other Microsoft libraries are automatically download at installation runtime, when proceeding to the installation it is therefore required to have the computer connected to the internet. In addition, when installing the software it is also required to **be logged in as administrator**.

## 1.2 Installation packages content

Software installation comes with three distinct packages (Figure 2 and Table 2) which deploy the application, additional third parties components supporting the application and an optional package which deploys a demo data set to let the user learn how to use the model.

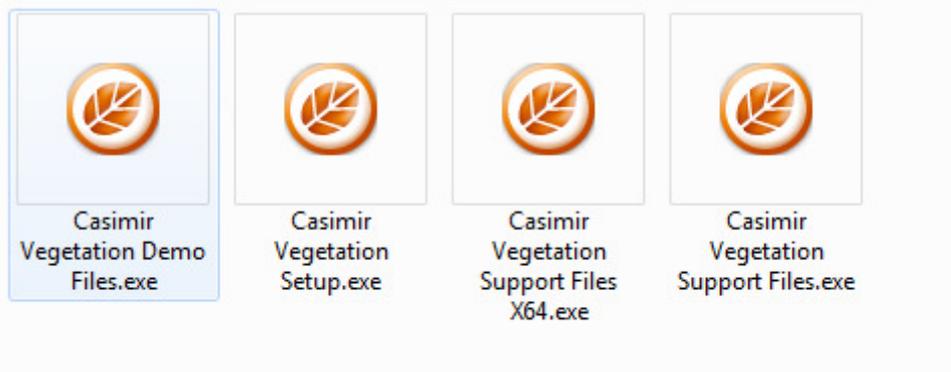


Figure 2 Casimir Vegetation installation packages

First two components (CasimirVegetationSetup and Casimir Vegetation Support Files) are mandatory and must be both deployed; third component (CasimirVegetationDemoFiles) is optional and must be deployed only if the user wants to follow the demo tutorials in this manual.

Table 2 Installation packages checklist

Installation Package	Scope	Mandatory
CasimirVegetationSetup	Deploy the model software	Yes
Casimir Vegetation Support Files	Deploy software supporting files	Yes
CasimirVegetationDemoFiles	Deploy demo and tutorial data	No

**Important:** as it can in Figure 2, there are two exe files for the support files: "Casimir Vegetation Support Files X64" and "Casimir Vegetation Support Files". The first one is meant to be deploy the support files on 64 bit windows operating systems, the latter on 32 bit windows operating systems. If you are not sure of which one applies to your case, please follow the instructions found at the following link:

<http://windows.microsoft.com/en-us/windows/32-bit-and-64-bit-windows#1TC=windows-7>

or type in the command line prompt the following commands:

```
wmic os get osarchitecture
```

### 1.3 Installation of the Software and additional components

The installation consists of two mandatory steps plus a third, optional, one.

First step is the installation of the model software (CasimirVegetationSetup). Double click the CasimirVegetationSetup icon (see Figure 2) and follow the installation steps (Figure 3).

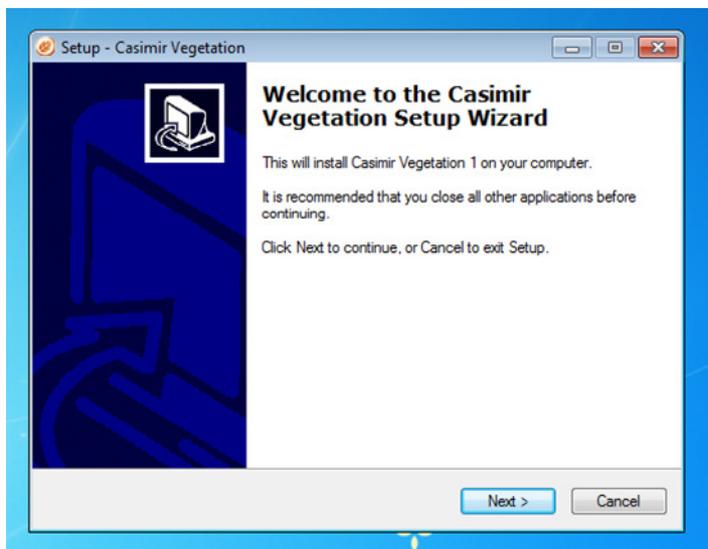


Figure 3 Casimir Vegetation setup wizard start screen

Follow the installation steps until you reach the final installation screen (Figure 4)

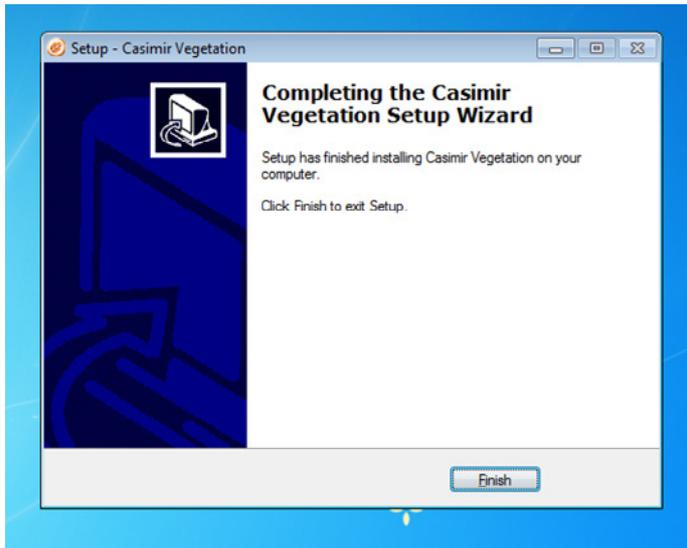
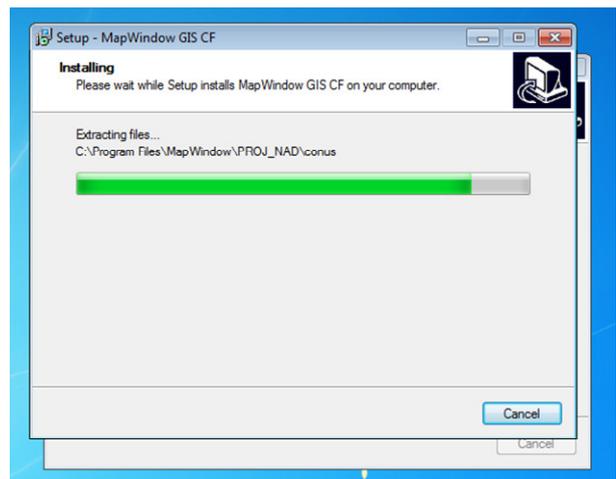
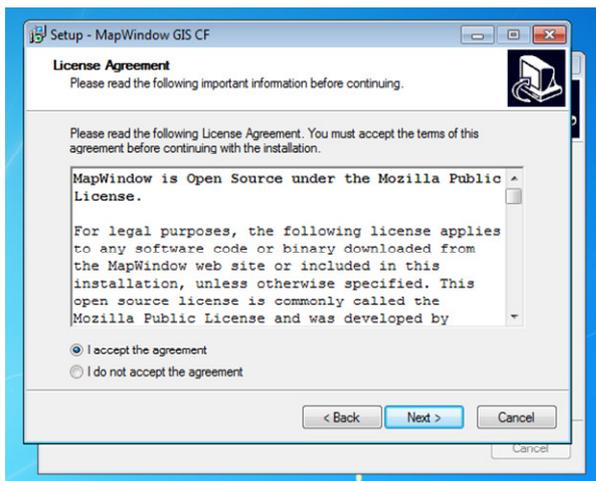
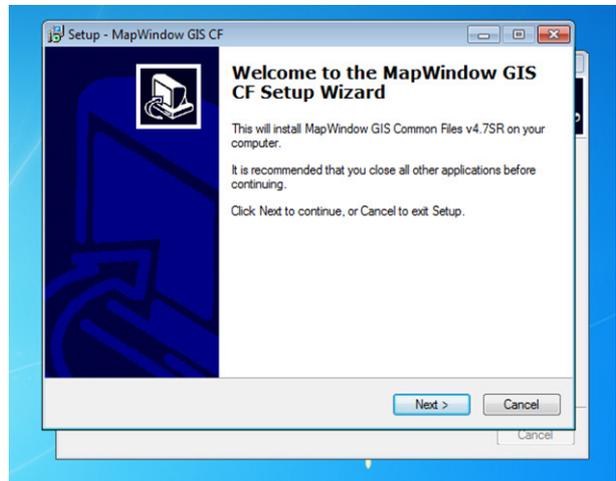
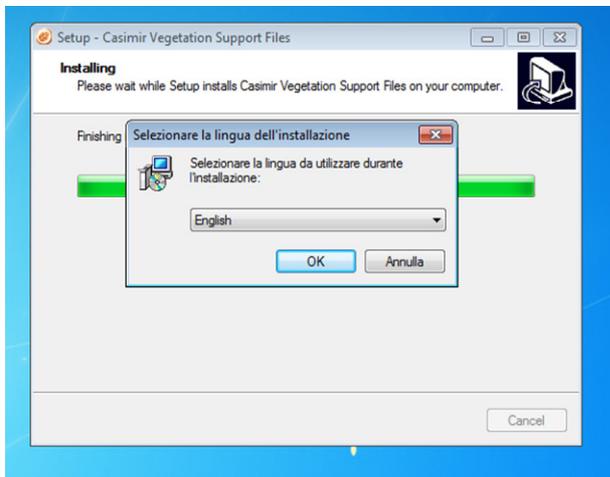
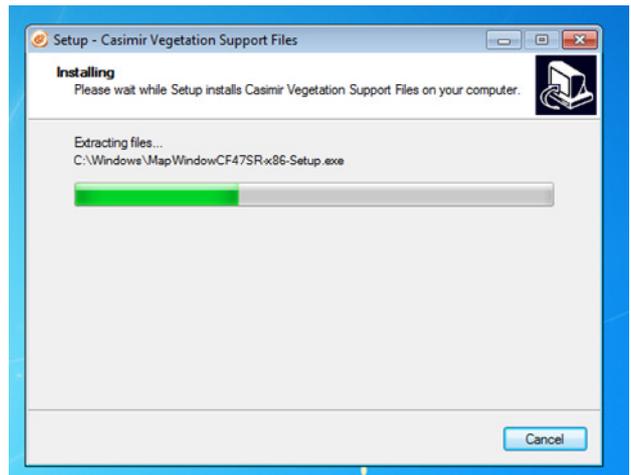
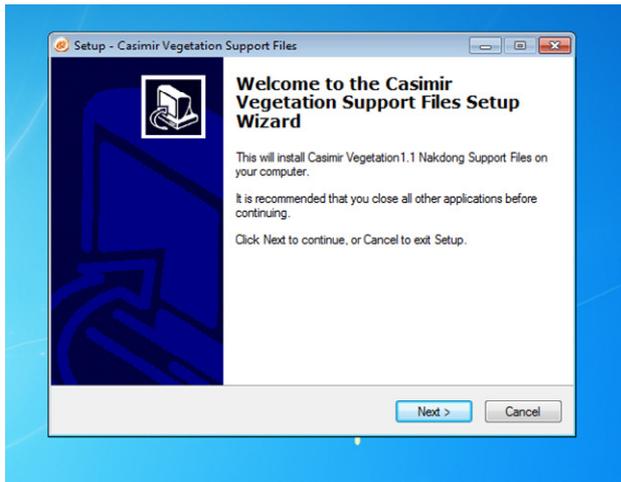


Figure 4 Installation final screen

Second step, encompasses the deployment of Casimir Vegetation Support Files. These files consist of several libraries from MapWindow GIS, an open source GIS software whose components can be freely used and distributed. To install these files, **make sure you verified your Windows operating system installation** (64 or 32 bit, see section 1.2 for details), double click Casimir Vegetation Support Files and let the installation complete its process (Figure 5) when prompted, **do not re-start the machine.**



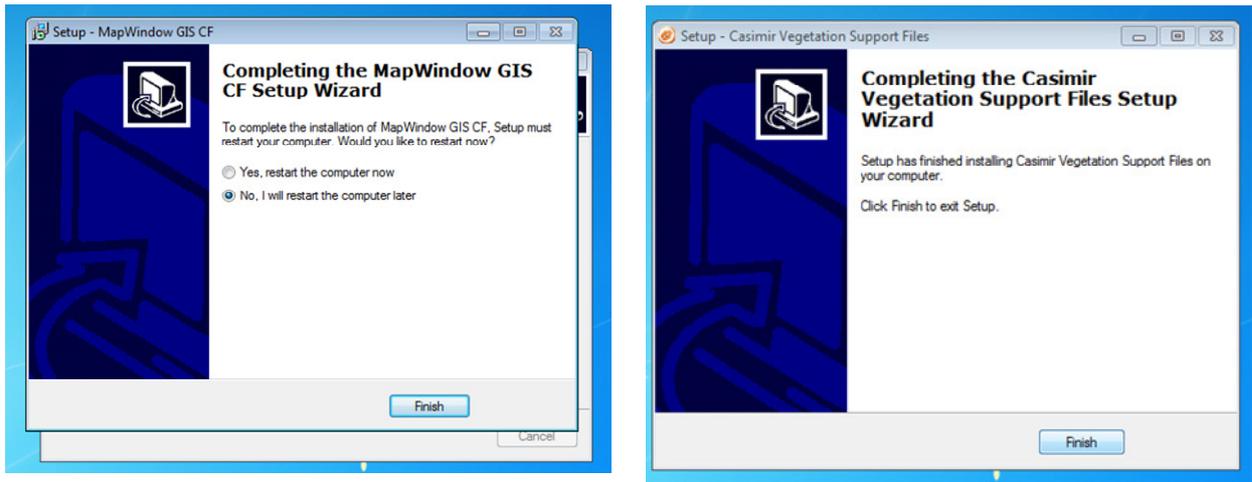


Figure 5 Casimir vegetation support files installation screens

Once the MapWindow components are installed, the essential Casimir Vegetation installation is as well completed, on the desktop you should now see the shortcut in Figure 6.

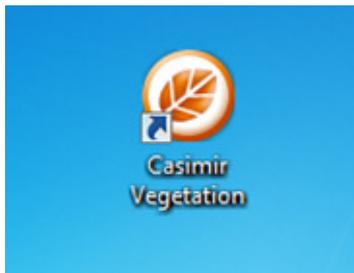


Figure 6 Model desktop shortcut

If you are now interested in deploying the demo files to have an introduction to the model usage, proceed to the third installation step by double clicking (right most icon in Figure 2).

At the end of the demo files installation, the final window in Figure 7 asks if you want to run the post installation tasks. This operation is mandatory and will modify the demo files so that they can be recognized by your local machine settings. After you click finish, you can verify the successful deployment of the demo files by opening your personal documents folder. In there you should find a newly created folder (Figure 8) named "Casimir Vegetation".

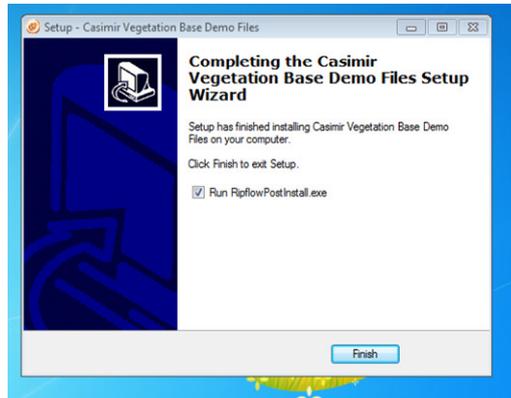
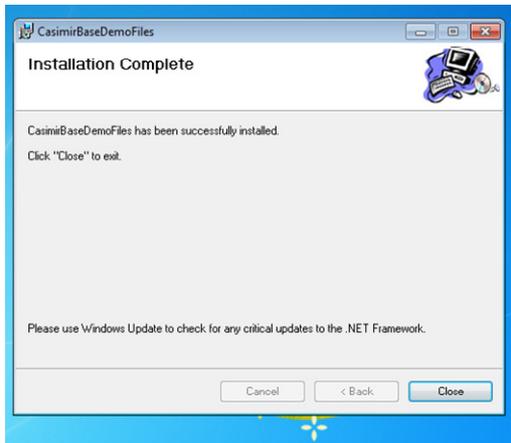
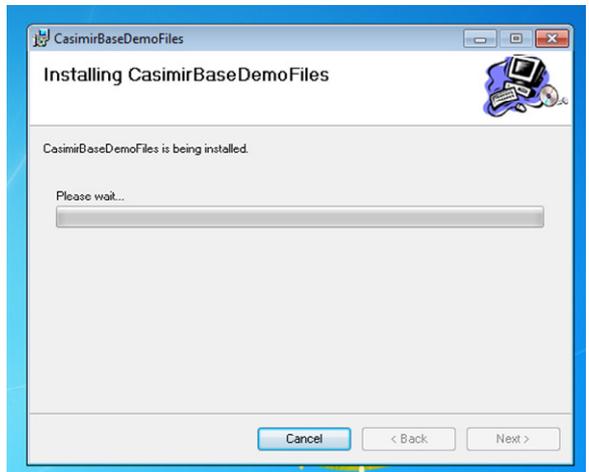
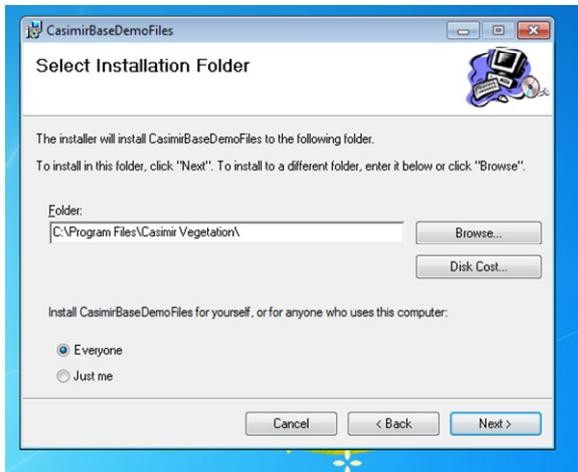
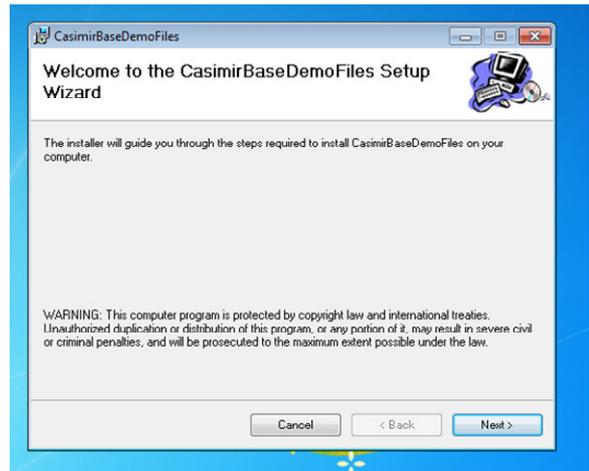
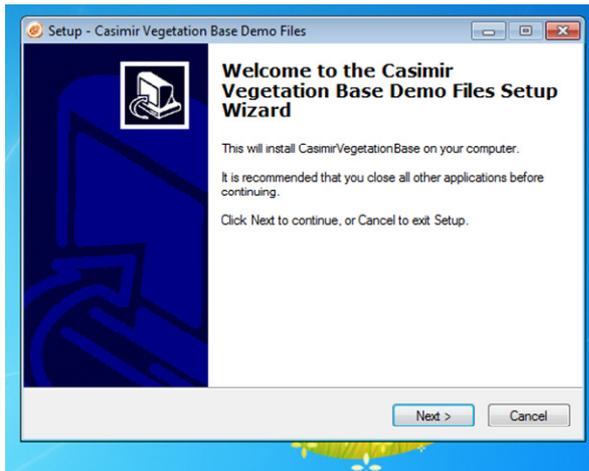
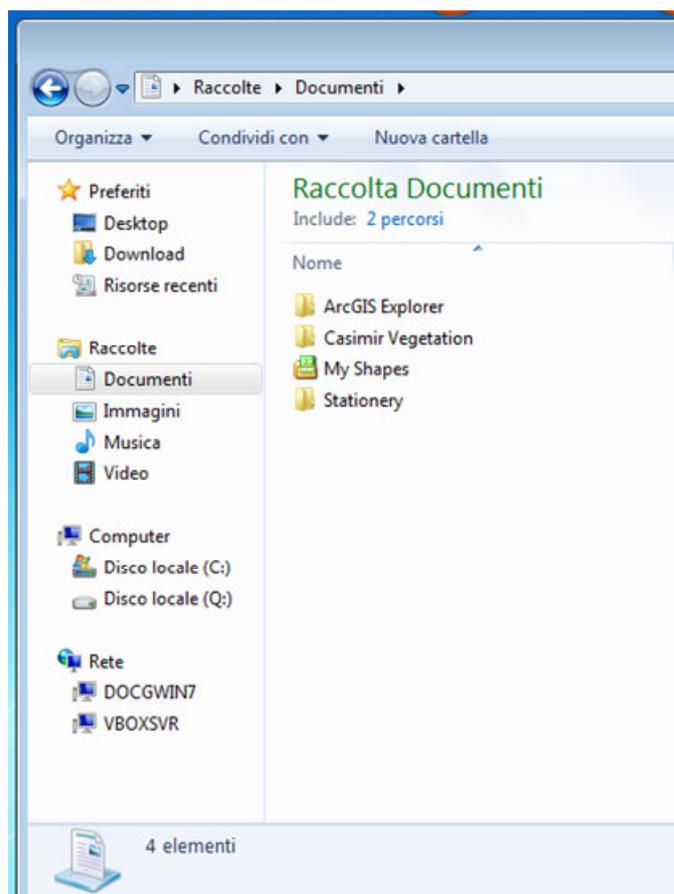


Figure 7 Demo files installation screens



**Figure 8 Casimir vegetation root folder in the file system**

Inside this folder are saved the files required to run the tutorial in the following sections.

## 2 Model Parameters

This chapter contains tables which will explain the model parameters. The paragraphs are organized following the tab structure of the GUI (presented in section 4.2), in other words, each paragraph corresponds to one tab in the GUI. Each parameter's table has two columns:

**Parameter:** label or column name of the value to be set

**Explanation:** description of the parameter

### 2.1 Succession Series & Phases Parameters

Succession series are well defined plant associations developing in a predictable sequence over time. In the model conceptualization succession series, on the long run, converge toward the climax series (which is unique). The convergence to the climax series occurs when a series reaches the maximum age of its developments stages, at this point, the converging series will converge to a definable development stage of the climax series.

Table 3 Succession Series Parameters

Parameter	Explanation
Succession Series Name	Name of the succession series
Climax	Addresses to which succession series all the other will converge once they reach their maximum age.
Convergence to phase	Addresses to which phase of the climax succession series the other series will converge once they reach their maximum age.

Each Succession Series owns a set of Succession Phases. A Succession Phase is defined by age range, a Phase Code, a water level range and a riverine zone. Riverine Zone is an exclusive parameter (Bank or Floodplain Zone, see Table 5) meaning that, when running the start condition model, a succession phase can be found only in one of the riverine zones.

- Succession series names must be unique (no series names duplicates)
- Climax is unique
- Convergence to phase is unique

Table 4 Succession Phases Parameters

Parameter	Explanation
Phase Name	Name of the Succession Phase
Min Age (Years)	Minimum Age of the succession phase
Max Age (Years)	Maximum Age of the succession phase
Phase Code	Unique numeric identifier for of the succession phase

- Phases’ names are unique except for those phases which are pioneer
- Phases’ age of all succession phases within a series must be continuous (no age gaps)
- Phases’ codes must be unique except for those phases which are pioneer

## 2.2 Start Condition Habitat

The following sets of parameters are required to run the start condition model.

Table 5 Succession Phases Parameters – Start Habitat

Parameter	Explanation	
Start Condition Habitat	Min Water Height (m)	Minimum Water Height in meters
	Max Water Height (m)	Maximum Water Height in meters
	Riverine Zone	Riverine Zone (Bank or Floodplain)

Water height refers to the relative distance of a water table in respect to the topographic elevation (D.E.M.). The water table can be the mean groundwater, the mean discharge, height over base flow or any other water table distance which in your case study is meaningful for defining average habitat conditions.

Water table ranges must be continuous within succession series (no gaps are allowed)

## 2.3 Recruitment Parameters

### 2.3.1 Scour Disturbance Parameters

Scour disturbance is the disturbance action exerted by the river flow on young seedlings. It consists of minor erosion and sedimentation which occurs at the interface between the river channel and the bank zone. This disturbing action, although of little magnitude can be strong enough to impair the establishment of seedlings.

Table 6 Parameters for Succession Series

Parameter	Explanation
Scour Disturbance Water Elevation Limit	Maximal possible height of scour disturbance (meters)

### 2.3.2 Succession Series Recruitment Zones Parameters

For each succession Series there can be a set of Recruitment Zones (where the recruitment takes for the succession series). There can be zero or more recruitment zones. These zones are defined by height ranges above water level (either mean or base flow) and riverine zone. In the area of scour disturbance no recruitment takes place. Scour disturbance occurs only in the Bank Zone.

Table 7 Parameters for Recruitment Zone \* R.H.M.W : Relative Height Over Mean Water

Parameter	Explanation
R.H.M.W* Min(m)	Minimum recruitment elevation
R.H.M.W Max(m)	Maximum recruitment elevation
Riverine Zone	Riverine Zone(Bank or Floodplain) where the recruitment will take place for the selected succession series

The model applies the recruitment rules (scour disruption or recruitment of open soil) only to the succession phases whose age is equal or less than the maximum pioneer age.

Table 8 Maximum pioneer age for all succession series

Parameter	Explanation
Succession Series Max Pioneer Age	Maximal age of the pioneer phase (unique for all succession series)

## 2.4 Morphodynamic Disturbance Parameters

In the model concept, maximum yearly shear stress is taken as indicator of morphodynamic disturbance; the ability of vegetation to withstand to morphodynamic perturbations it is therefore addressed as shear stress resistance.

### 2.4.1 Succession Phases Shear Stress Resistance Parameters

For each succession series and the owned succession phases a shear stress resistance must be defined. The shear stress resistance is defined by  $N/m^2$ . Shear stress resistance defines the ability of vegetation to withstand to morphodynamic disturbance.

Table 9 Shear Stress Parameters - Succession Phase

Parameter	Explanation
Shear Resistance	Shear Resistance ( $N/m^2$ ) of the succession phase

## 2.5 Flood Duration Parameters

### 2.5.1 Flood Impact Entity Definition Parameters

Entity (class) of the flood duration impact is defined by the number of inundation days. The possible class entities are three: Strong, Medium and Low and are defined by ranges of days.

Table 10 Flood Duration Parameters

Parameter	Explanation		
Flood Impacts Entity Definition	Days Min		
	Days Max		
	Strong	Minimum number of days which defines a flood duration impact of strong entity.	Maximum number of days which defines a flood duration impact of strong entity.
	Medium	Minimum number of days which defines a flood duration impact of medium entity.	Maximum number of days which defines a flood duration impact of medium entity.
Low	Minimum number of days which defines a flood duration impact of low entity.	Maximum number of days which defines a flood duration impact of low entity.	

## 2.5.2 Flood Duration Impacts Effects

Each succession phase of the succession series reacts differently to the different impact entity classes. The effect of one of the impacts can lead to total or partial recycling of the impacted succession phase or can yield no effect (the succession phase remains unaltered by the impact).

**Table 11 Flood Duration Parameters – Impact Effects**

Parameter	Explanation
Impacted Phase	Phase which is affected by flood duration impact
Recycled To Phase	Phase to which the impacted phase is recycled to in response to an impact

## 3 Case Studies Project and Folder Structure

In order to help the user organizing its data, the model data storage is organized in projects and scenarios whose inputs, parameters settings and values are stored in (user defined) locations on the file system.

A project is a logical grouping of all the scenarios which are performed for a case study while scenarios are model iterations which differ one another for parameters settings, input values or both of them. Scenarios settings are saved in Xml configuration files which are unique for each scenario.

As example, let's say you need to model a case study of different river management alternatives which are given by different discharge regimes. You likely want to group the results of these simulated alternatives in places of the file system which are contiguous and allow you to quickly fetch the results for ease of comparison. At the same time, you need to keep the values of the different alternatives parameters and inputs separated so that you don't mix up the results.

The case study can be defined as a model project while the alternatives are the scenarios. The model implementation allows you to save all this information in a single file with extension rprj.

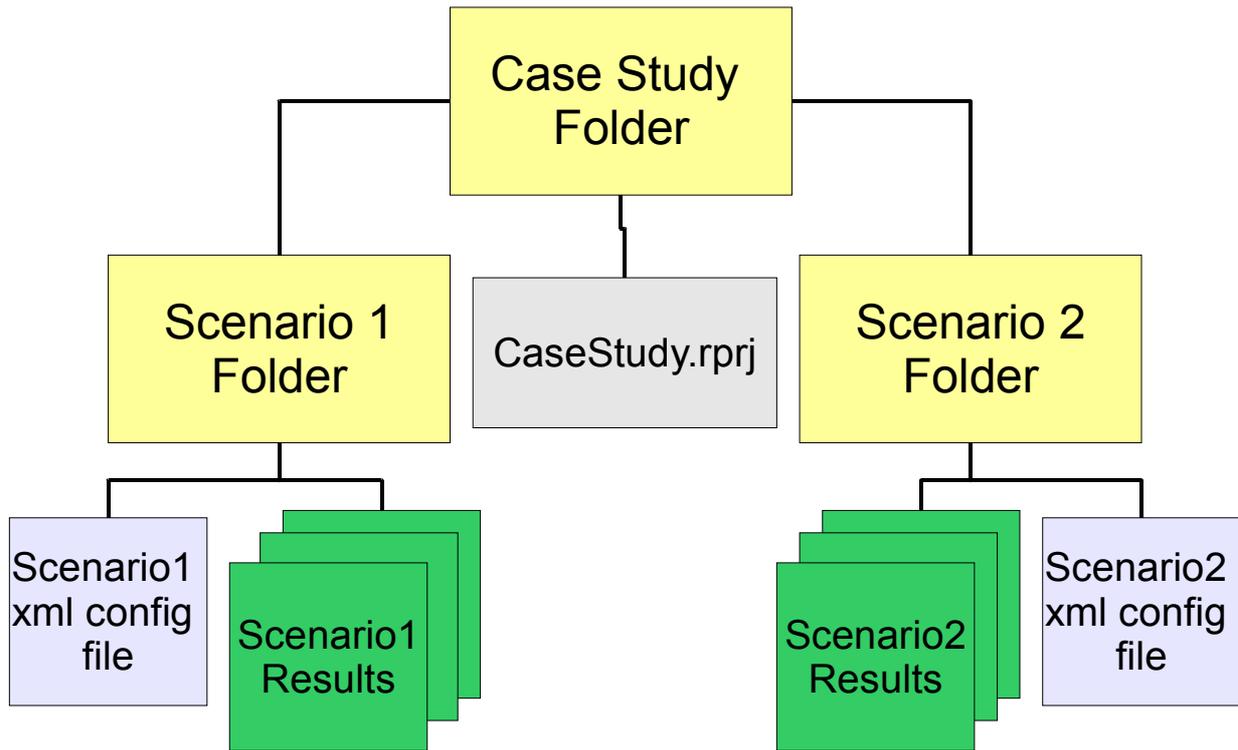


Figure 9 Project management folder system and files organization

When a new project is created, a case study folder and a casestudy.rprj are as well created on the file system in a location selected by the user.

The advantage of using the rprj files is that at every modeling session, you can re-load the rprj file and find again the scenarios you prepare in the previous session without the need of re-typing or entering any value. It is advised to place the inputs for a case study (independently for which scenario) in the same folder, possibly within the Project folder.

## 4 The User Interface

At start up, the model window looks like in Figure 10.

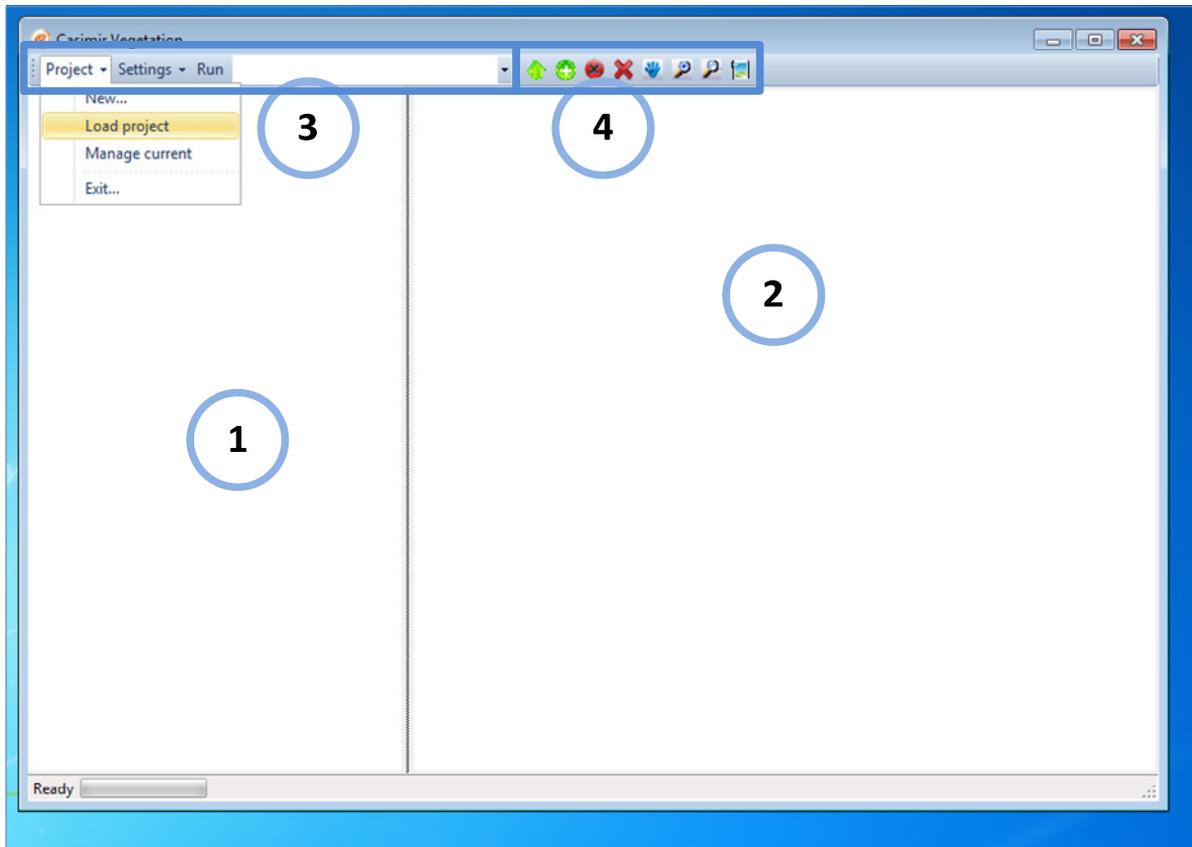


Figure 10 User interface main window

1. Table of contents (TOC). Lists and groups the spatial data displayed in the data window (2)
2. Data Window. Displays the model (spatial) results and the data eventually loaded by the user
3. Project and scenarios commands. Group of commands to manage the modeled cases study and the model parameters, inputs and iterations.
4. GIS viewer commands. Groups the commands to handle (i.e. zoom in, pan, zoom out) the spatial data displayed in the data window (2).

While table of contents and data window will be examined more in detail in the following sections, the project and scenario settings require a more thorough explanation which will be talked in the next paragraphs.

## 4.1 Project and scenarios commands

### 4.1.1 Load a project file

To get started with the demo project, click on the “Project” menu item in the toolbar and select “Load project” from the menu list.

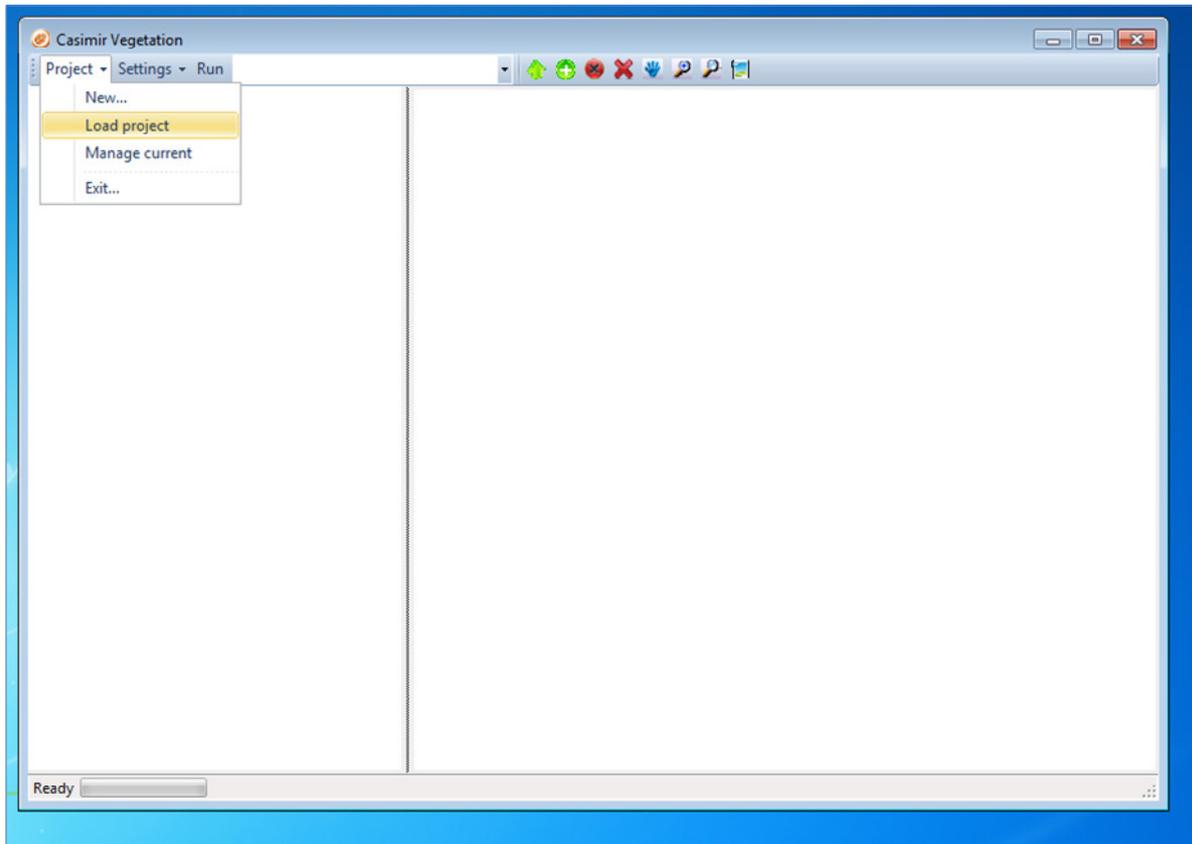


Figure 11 Load project

Navigate to [Your Documents]\Casimir Vegetation\Projects\Demo and select DemoProject.rprj (Figure 12). This file contains all the essential information to run a demo test of Casimir Vegetation. Loading it at this point, will allow us to explore the user interface layout and features.

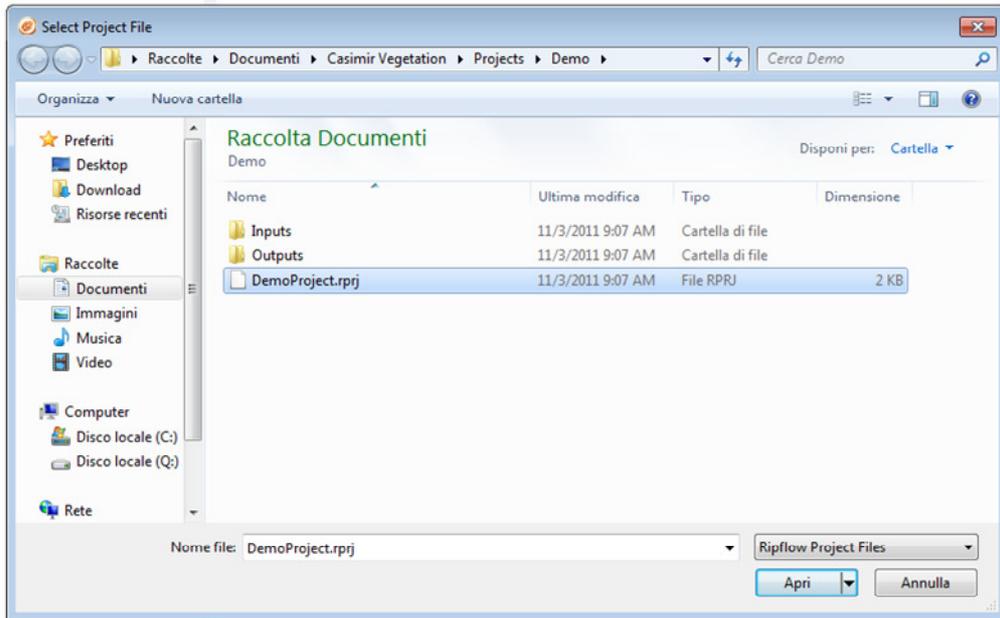


Figure 12 Navigate to demo folder

#### 4.1.2 Project settings

Clicking on the top left button in the model window (Figure 10) on the Project button will display the options in Figure 13.

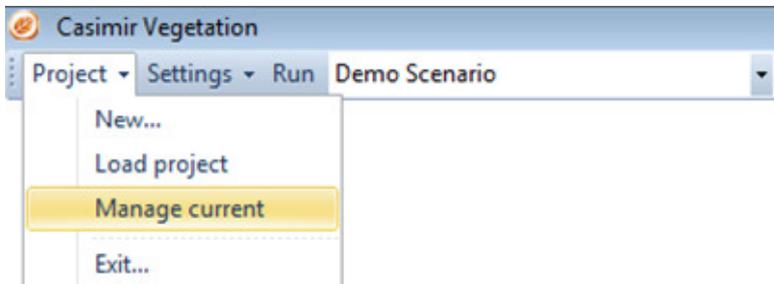


Figure 13 Project settings menu

New... creates a new project

Load project allows to load an existing project file

Manage current allows to edit the current project settings (folder, scenarios etc. etc.)

Exit... will shut down the model window

#### 4.1.3 Run and Current Scenario Combo box

The last two commands of the Project and scenario group are those used to run and select the current scenario (Figure 14).



Figure 14 Run button and select current scenario combo box

1. Run. Fires the command to run the current scenario
2. Combo box listing all the scenarios defined within the project. The scenario name displayed in the combo box is the current one

#### 4.1.4 Scenario settings

Clicking on the second button from the left in the model window (Figure 10) on the Settings button will display the options in Figure 15. Settings refer to the parameters and inputs of the current scenario.

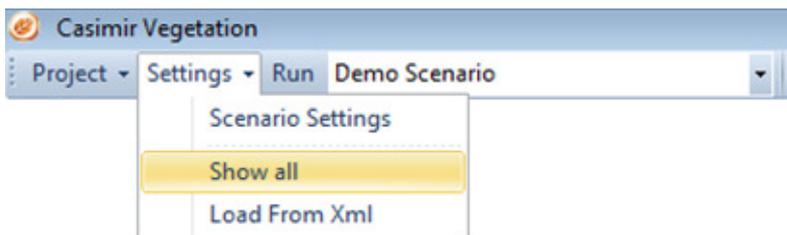


Figure 15 Scenario settings menu

Scenario Settings. Allows to set the number of years that will be simulated, the starting simulation year, what submodels will be executed and whether or not the intermediate data (output from each submodel) will be saved for the current scenario

Show all. Allows to set the scenario inputs and parameters for the succession series and phases

Load From Xml. Allows to load all the settings from an existing scenario xml configuration file

All these menu options give access to other controls which allow some operations, however, for the menu option 1 (Scenario settings) and option 3 (Load from Xml) the use of the controls is quite intuitive and at this point of the tutorial, do not require much discussion. Option number 2 instead, gives access to a quite complex window whose controls are crucial to set up the scenario parameters and inputs. Given the importance and complexity of these controls, they will be presented in the following section.

## 4.2 Model Parameters & Inputs GUI Controls

The paragraphs of this chapter reflect those in section "Model Parameters" so that the reader can recognize where are found, in the GUI, the parameters listed in the tables of the "Model Parameters" section.

The user control in the GUI is organized in a tabbed panel, each paragraph describes the content of one tab.

### 4.2.1 Succession Parameters Tab

This section explains where are found the parameters described in "Succession Series & Phases Parameters".

Succession Series Parameters

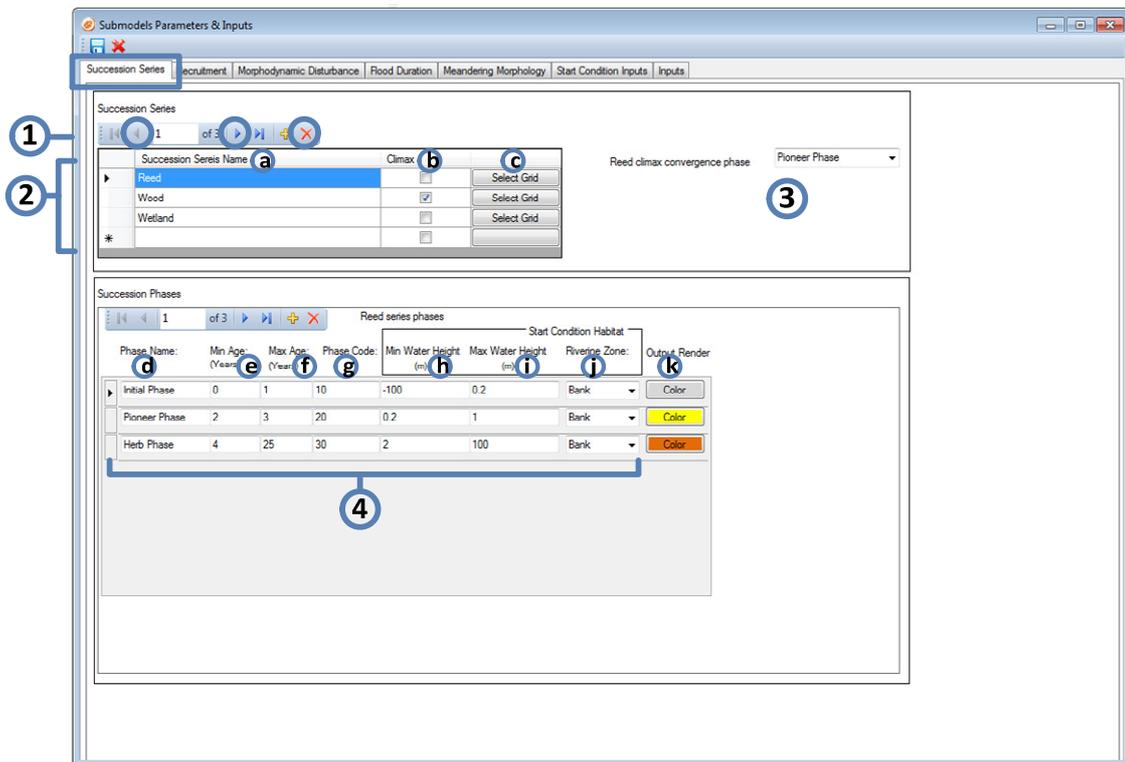


Figure 16 Succession Series parameters tab

1. The blue bar is for deleting, adding and navigation between the lines of the table
- 2 Succession Series Table
  - a. Name of the succession series
  - b. Defines the climax succession (which is unique)
  - c. Selects a starting grid (Esri Ascii) (if available) for the succession series

3. Convergence to phase: selects the (climax) succession phase to which the succession series will turn when it reaches the maximum age of its succession phases. All but the climax series must select a convergence phase.

NOTE: *If you select a grid for each Succession Series (2.c) it isn't necessary to run the start condition model*

#### Succession Phases Parameters

4. Succession Phases list belonging to the succession series selected in table 2, Figure 16

d. Succession phase name

e. Minimum age of the succession phase

f. Maximum age of the succession phase

g. Phase code

h. Minimum water height (Start condition model parameter)

i. Maximum water height (Start condition model parameter)

j.. Riverine Zone (Bank of Floodplain) (Start condition model parameter)

k. Color for the legend

#### Notes:

*Succession series names must be different.*

*Succession phases names and codes must be all different.*

*Succession phases age ranges must not overlap. (Integer values)*

*Start condition water heights must not overlap. (Negative, positive and values with a decimal positions are possible)*

## 4.2.2 Recruitment Parameters Tab

This section refers to the section “Recruitment Parameters”.

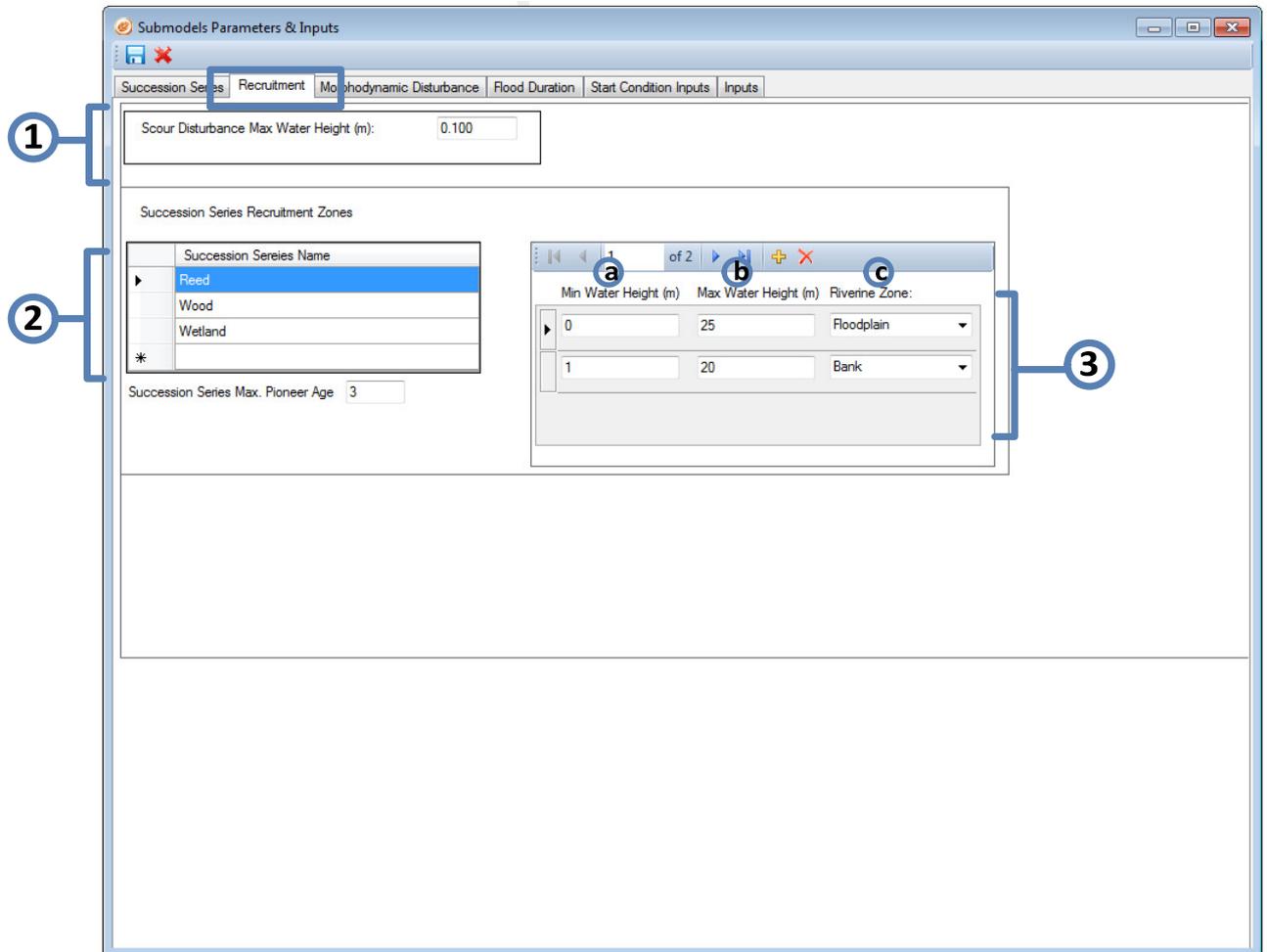


Figure 17 Recruitment parameters tab

### Scour Disturbance Parameters

1. The maximum height above water level at which scour disturbance will occur.

### Succession Series Recruitment Zones Parameters

2. Succession Series (not editable). By clicking on a (succession series) line the recruitment zone (2) owned by the succession series will be displayed on the frame 3.
3. Recruitment Zones owned by the succession Series selected at 2.

Recruitment zones are defined by:

- a. Recruitment zone lower limit
- b. Recruitment zone upper limit
- c. Riverine Zone where the recruitment will take place

### 4.2.3 Morphodynamic Disturbance Parameters Tab

This section refers to Morphodynamic Disturbance Parameters.

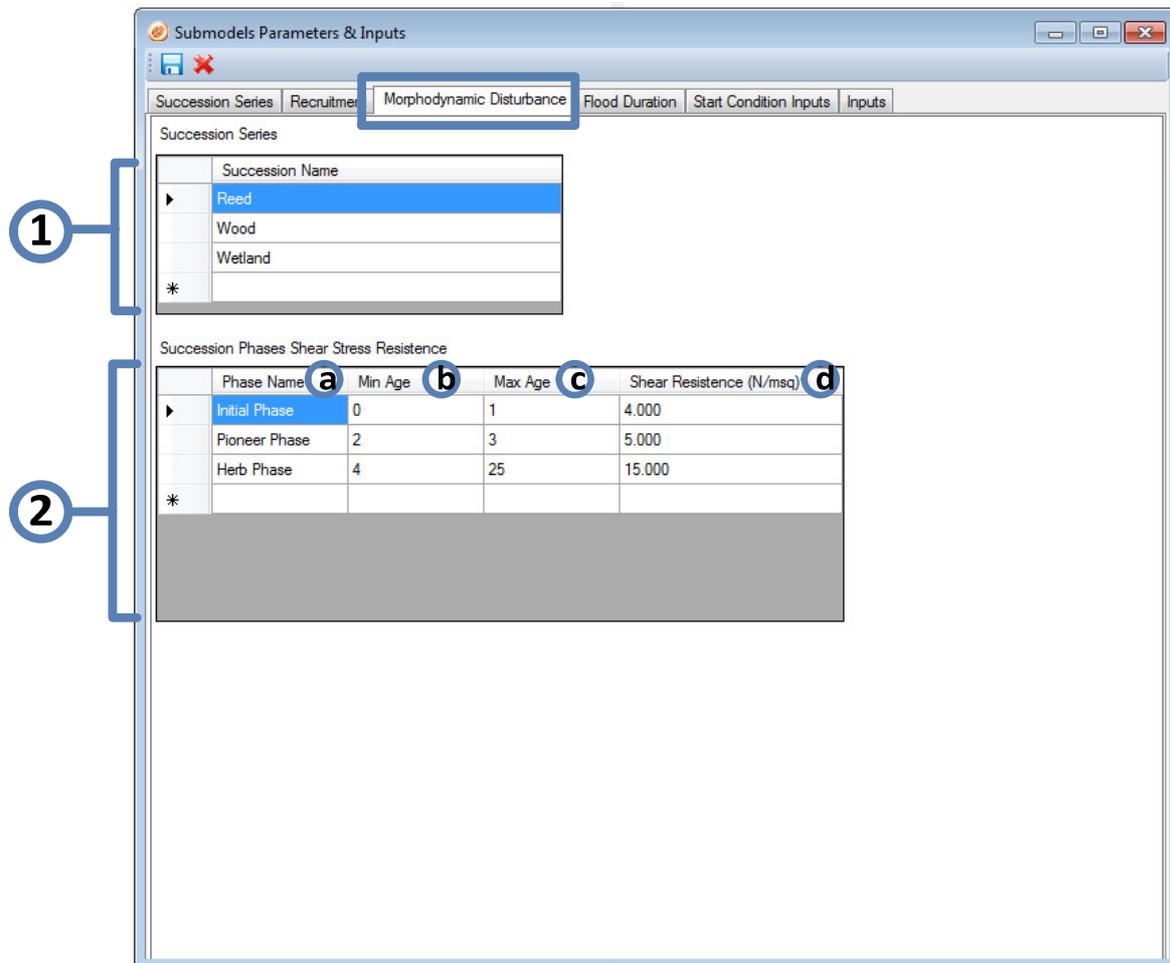


Figure 18 Shear Stress parameters tab

In the Shear Stress tab (Figure 18 ) tab the values for the shear stress resistance of each succession phase can be inserted.

1. Names of Succession Series (not editable).

By clicking on a line in the succession series (1), the succession phase belonging to the succession series will be displayed in 2.

2. Sets the shear stress resistance for each succession phase:

a. Phase name (not editable)

b. Minimum Age (not editable)

c. Maximum Age (not editable)

d. Shear Stress Resistance in  $N/m^2$

## 4.2.4 Flood Duration Parameters Tab

Settings Succession Series Recruitment Shear Stress **Flood Duration** Inputs Inputs

Flood Impacts Entity Definition

Flood Impact Entity	Days Min <b>a</b>	Days Max <b>b</b>
strong	120	366
medium	101	120
low	80	101

Flood Duration Impacts Effects

Succession Series

Succession Series Name
Reed
Wood
Wetland

Flood duration **strong** impact effects on Reed succession phases

von 3

Impacted Phase <b>c</b>	Recycled To Phase <b>d</b>
Initial	Initial Phase
Pioneer Phase	Initial Phase
Herb Phase	Initial Phase

Flood duration **medium** impact effects on Reed succession phases

von 2

Impacted Phase	Recycled To Phase
Initial	Initial
Pioneer	Initial Phase

Flood duration **low** impact effects on Reed succession phases

von 1

Impacted Phase	Recycled To Phase
Initial	Initial

Figure 19 Flood Duration parameters tab

### 1. Flood Impact Entity Definition Parameters

Flood Impact Entities:

strong, (not editable)

medium, (not editable)

low (not editable)

a. Days Minimum

b. Days Maximum

are defined by the range of days in which the vegetation is under water. The values of the days must be integer and they must not overlap.

#### Flood Duration Impact Effects

##### 2. Names of Succession Series (not editable).

By clicking on a (succession series) line(2) the flood duration impact effects(3,4,5) affecting the succession series will be displayed in 3,4,5.

For each Flood Impacts Entity Definition (strong, medium, low) exists an input control.

##### Strong Flood Impacts Entity Definition

- c. Choose the succession phase which is impacted
- d. Choose to which the impacted phase (c) is recycled to d.

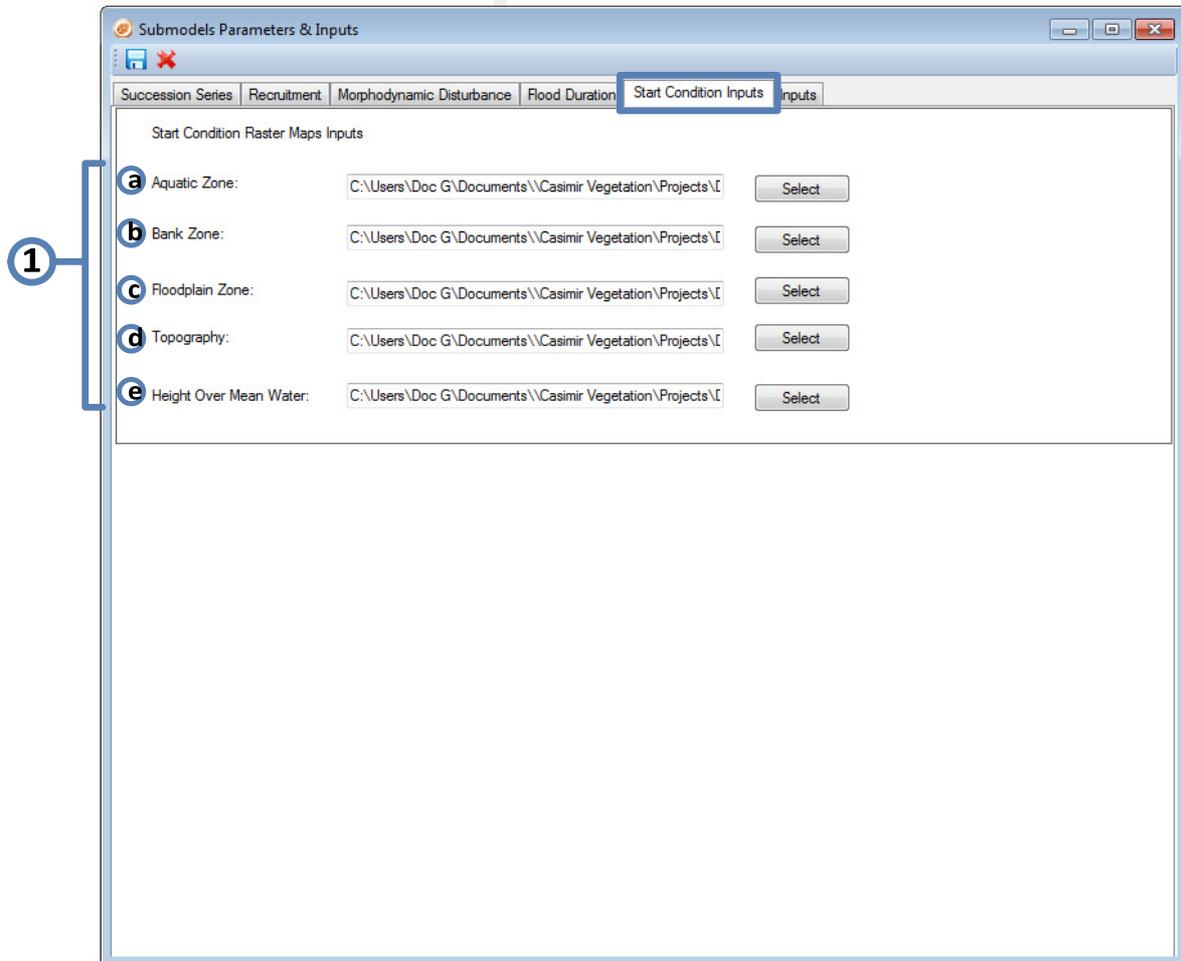
##### 3. Strong Flood Impacts Entity Definition

##### 4. Medium Flood Impacts Entity Definition

##### 5. Low Flood Impacts Entity Definition

## 4.2.5 Inputs Tabs

### Start condition inputs tab



**Figure 20 Start condition inputs tab**

#### 1. Start Condition Model Maps Inputs (Esri Ascii)

The "Select" Button opens a new window to choose the path to the grid.

Select the file to the Raster Maps for the Start Condition Sub Model:

- a. Aquatic Zone: path to the aquatic zone map.
- b. Bank Zone: path to the bank zone map
- c. Floodplain Zone: path to the floodplain zone map
- d. Topography: path to the topography zone map
- e. Height over Mean Water: path to the height over mean water map

## 4.2.6 Dynamic model inputs tab

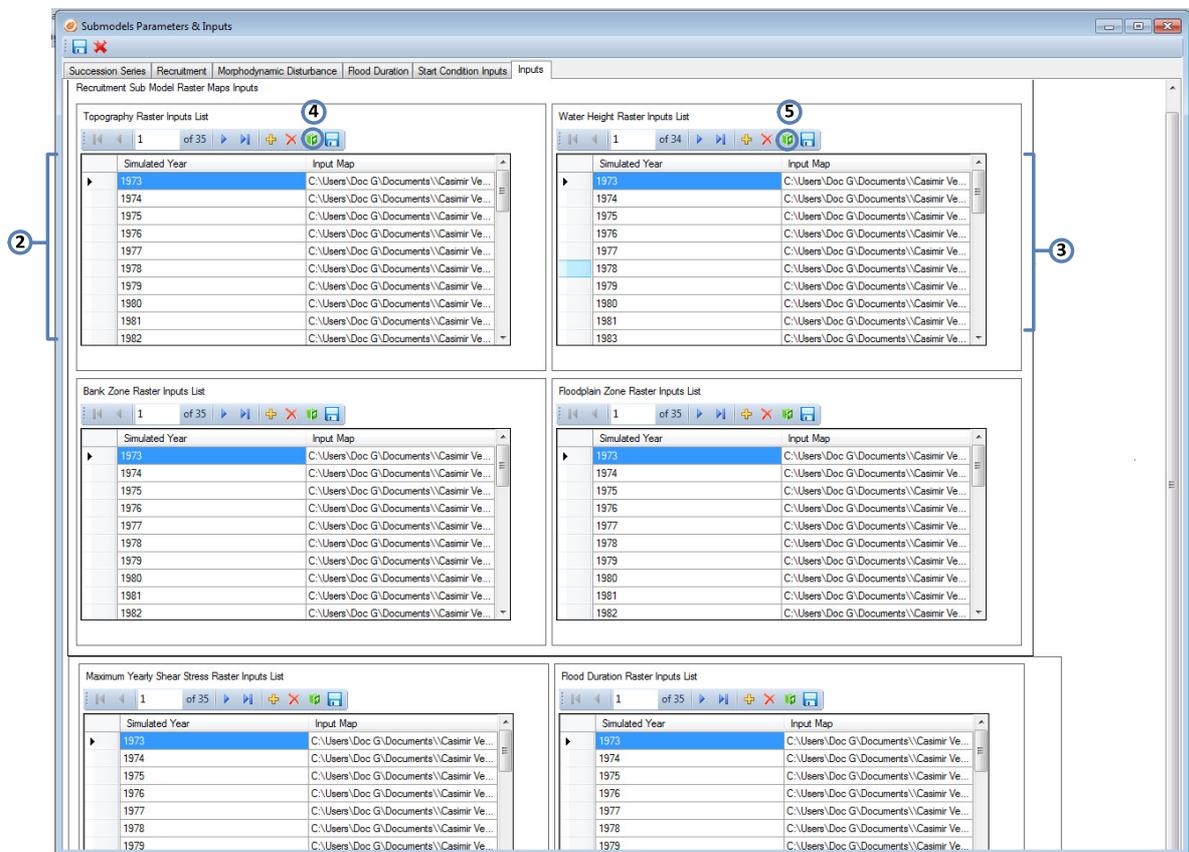


Figure 21 Dynamic inputs tab

List of the input grids for the morphodynamic disturbance submodel

List of the input grids for the for Flood Duration submodel

Imports the input list from c.s.v. file

Saves the input list to a c.s.v. file

## 4.3 Model Execution

### 4.3.1 Run the demo example

Casimir vegetation basic installation comes with a demo dataset which allows novice users to get acquainted with the model data organization, the parameters values and the input settings.

The DemoProject.rprj carries the information for some basic management of the demo project. It is possible to inspect this information by clicking “Manage Current” under the “Project” toolbar menu item (Figure 22).

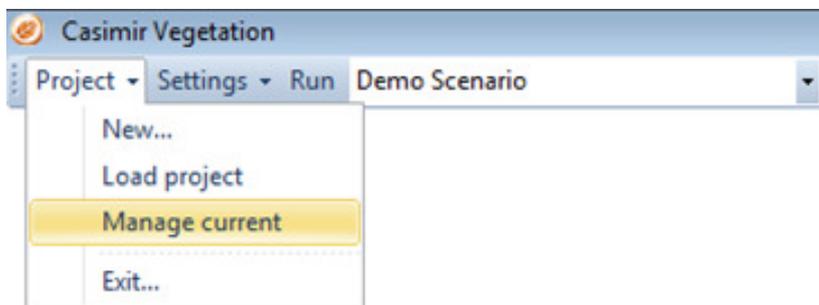


Figure 22 Inspect the loaded project

Clicking the Manage Current menu item will pop up the “Edit Current Project Panel” (Figure 23).

In order to help the user keeping the files and simulations ordered, the application affords the possibility of creating projects to group all the information relevant to a case study. Each project owns a folder and one or more scenarios. The project folder contains the input folder for all scenarios which are basically differentiated one another by the model inputs and parameters settings. Each scenario has an output folder to keep its outputs separated from the output of other scenarios, and an xml config file which carries the information of the parameters and input values for the scenario itself. Output folder and xml config can be selected by the user.

The file with extension rprj (in this tutorial DemoProject.rprj) store all these information so that Projects and scenarios can be loaded, edited and repeatedly used without the need of re-setting each time the complete simulation environment.

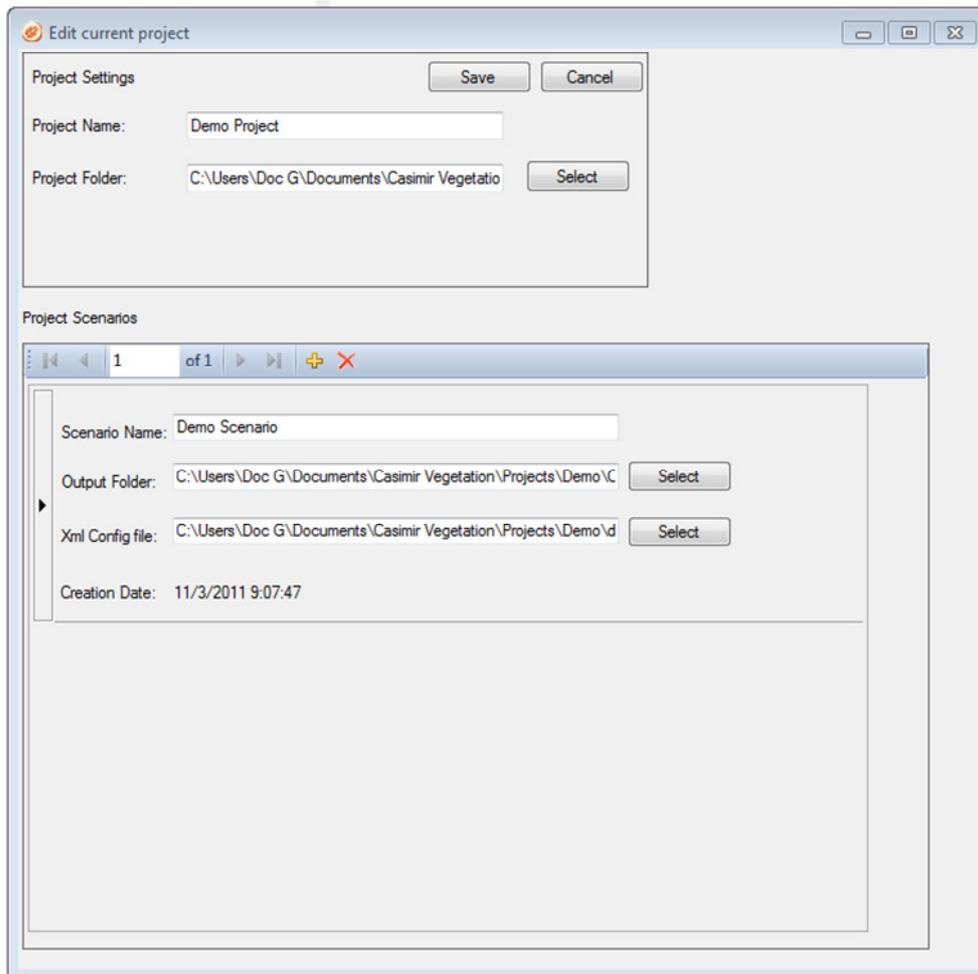


Figure 23 Edit project panel

### Checking the scenario settings

The information to run the model scenario is divided in two. One concerns the settings (Figure 24) of the scenario and includes the submodels to be executed, the number of years to be simulated...(Figure 25).

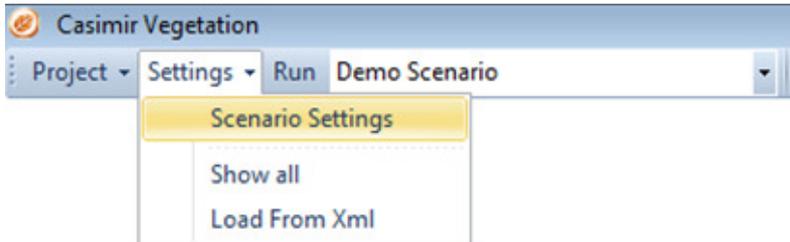


Figure 24 Scenario settings menu item

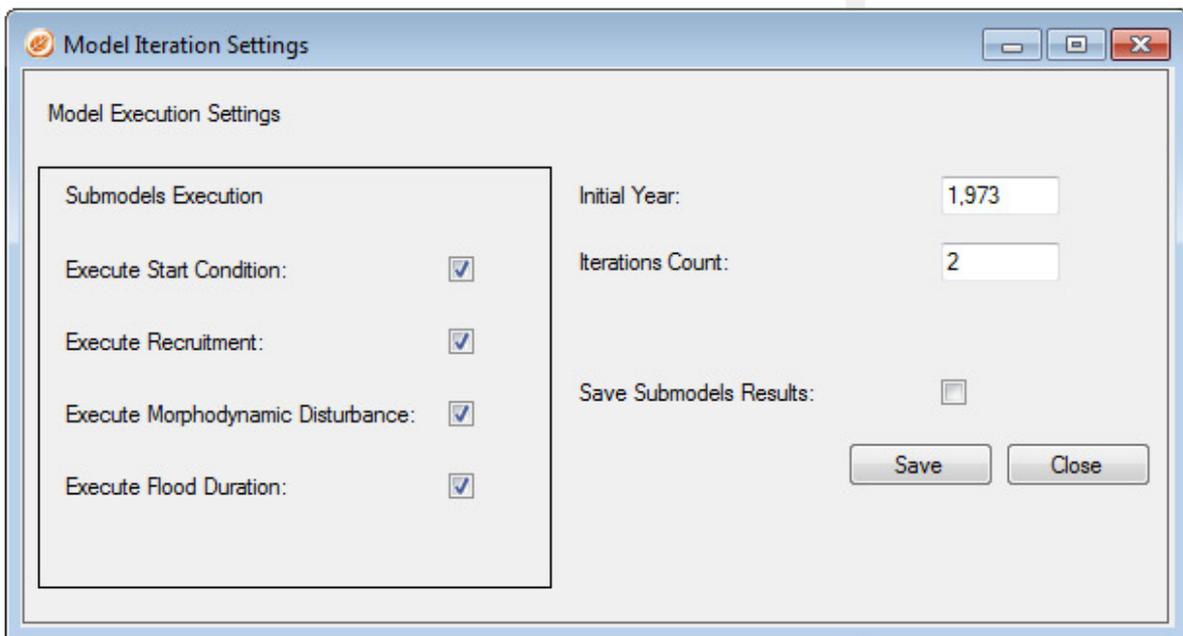


Figure 25 Model iteration settings panel

The second set of settings encloses the submodels parameters and the input list for each submodel and can be accessed by clicking the “Show all” entry in the “Settings” toolbar menu item (Figure 26).

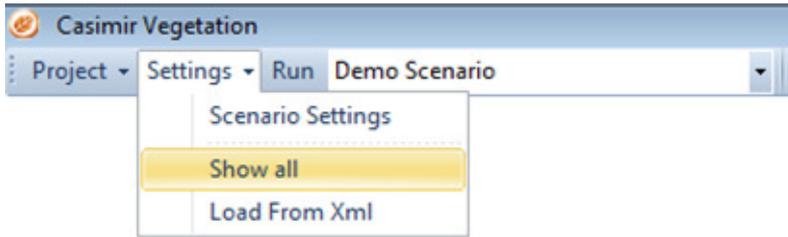


Figure 26 Scenario all parameters and inputs settings menu item

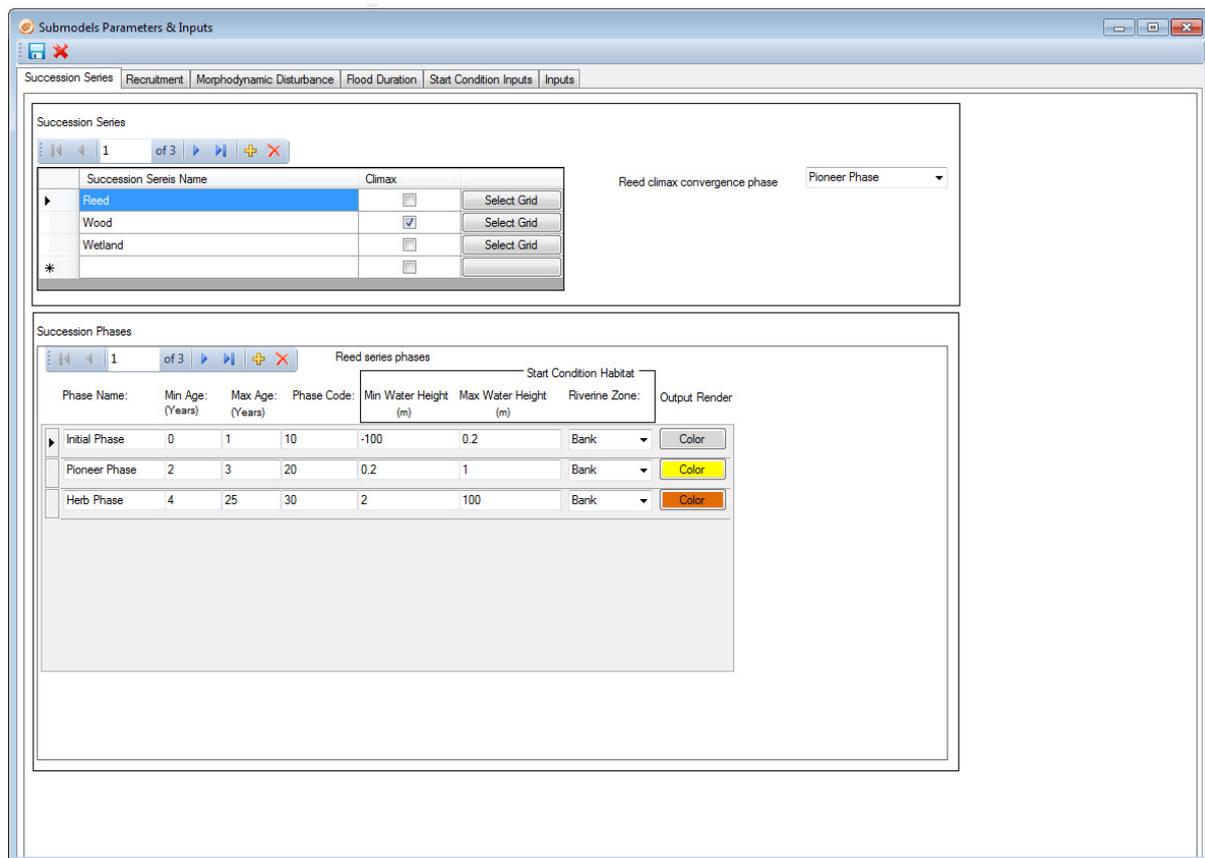


Figure 27 all parameters and inputs panel

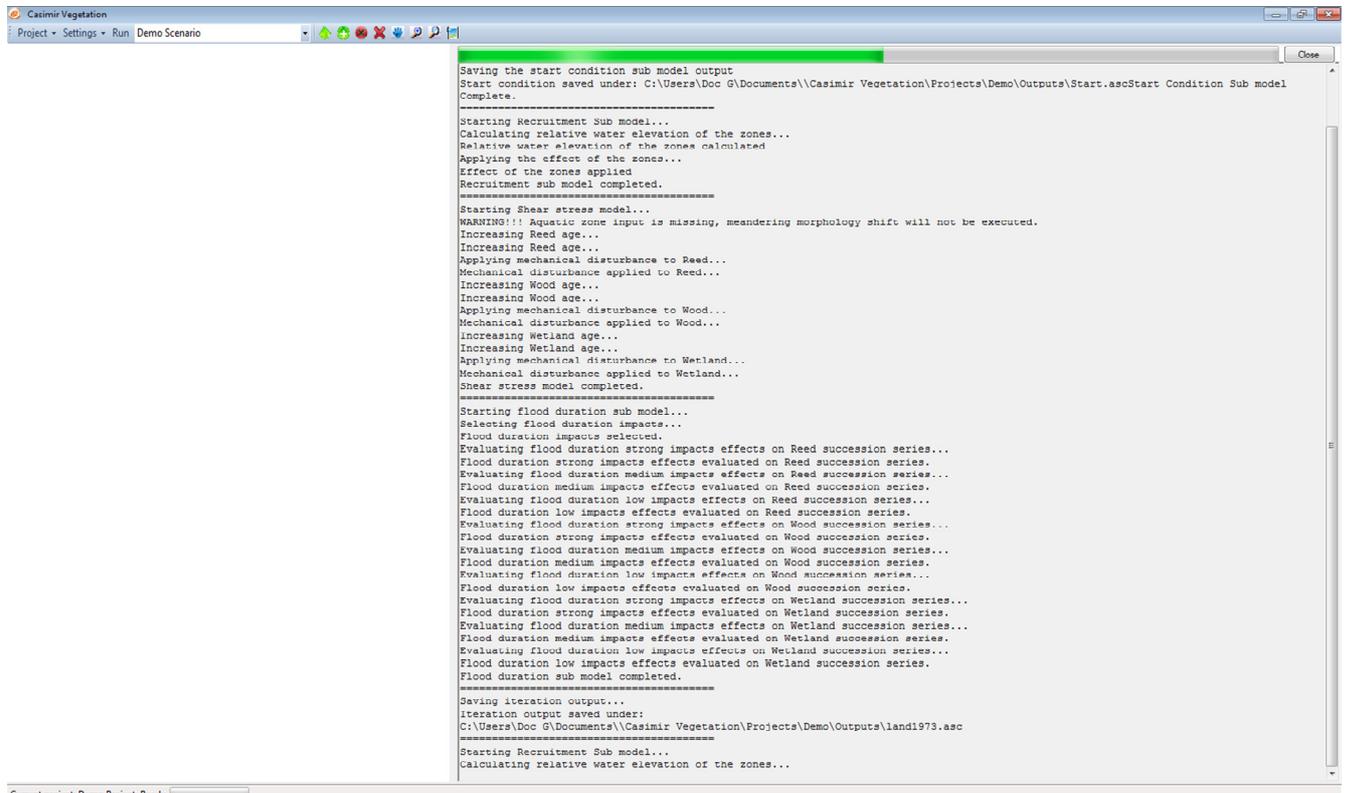
Clicking on the “Show all” entry pops up the Submodels parameters and inputs panel (Figure 27).

For the first run, just browse the parameters and input values. In the different tabs, remark the match between the tabs text fields and the tables in section Model Parameters. Then close it and return to the program main window.

On the toolbar, beside the button run, there is a combo box list which has only one entry. The combo box list contains the names of all the scenarios of the current project (in this case, then, only Demo Scenario). However, in a real world model application it is likely that each project will have several scenarios defined. The combo box list allows the selection of the scenario we want to run.

## Running the demo and inspecting the model results

To run the demo project and scenario, simply click on Run on the main window toolbar and the model will start.



```

Casimir Vegetation
Project - Settings - Run Demo Scenario

Saving the start condition sub model output
Start condition saved under: C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Outputs\Start.ascStart Condition Sub model
Complete.

-----
Starting Recruitment sub model...
Calculating relative water elevation of the zones...
Relative water elevation of the zones calculated
Applying the effect of the zones...
Effect of the zones applied
Recruitment sub model completed.

-----
Starting Shear stress model...
WARNING!! Aquatic zone input is missing, meandering morphology shift will not be executed.
Increasing Reed age...
Increasing Reed age...
Applying mechanical disturbance to Reed...
Mechanical disturbance applied to Reed...
Increasing Wood age...
Increasing Wood age...
Applying mechanical disturbance to Wood...
Mechanical disturbance applied to Wood...
Increasing Wetland age...
Increasing Wetland age...
Applying mechanical disturbance to Wetland...
Mechanical disturbance applied to Wetland...
Shear stress model completed.

-----
Starting flood duration sub model...
Selecting flood duration impacts...
Flood duration impacts selected.
Evaluating flood duration strong impacts effects on Reed succession series...
Flood duration strong impacts effects evaluated on Reed succession series...
Evaluating flood duration medium impacts effects on Reed succession series...
Flood duration medium impacts effects evaluated on Reed succession series...
Evaluating flood duration low impacts effects on Reed succession series...
Flood duration low impacts effects evaluated on Reed succession series...
Evaluating flood duration strong impacts effects on Wood succession series...
Flood duration strong impacts effects evaluated on Wood succession series...
Evaluating flood duration medium impacts effects on Wood succession series...
Flood duration medium impacts effects evaluated on Wood succession series...
Evaluating flood duration low impacts effects on Wood succession series...
Flood duration low impacts effects evaluated on Wood succession series...
Evaluating flood duration strong impacts effects on Wetland succession series...
Flood duration strong impacts effects evaluated on Wetland succession series...
Evaluating flood duration medium impacts effects on Wetland succession series...
Flood duration medium impacts effects evaluated on Wetland succession series...
Evaluating flood duration low impacts effects on Wetland succession series...
Flood duration low impacts effects evaluated on Wetland succession series...
Flood duration sub model completed.

-----
Saving iteration output...
Iteration output saved under:
C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Outputs\land1973.asc
-----
Starting Recruitment Sub model...
calculating relative water elevation of the zones...

```

Current project: Demo Project. Ready

**Figure 28 Model execution window**

While the model is in execution mode, the data window displays feedback information to the user, informing it about the operations that the model is performing (Figure 28).

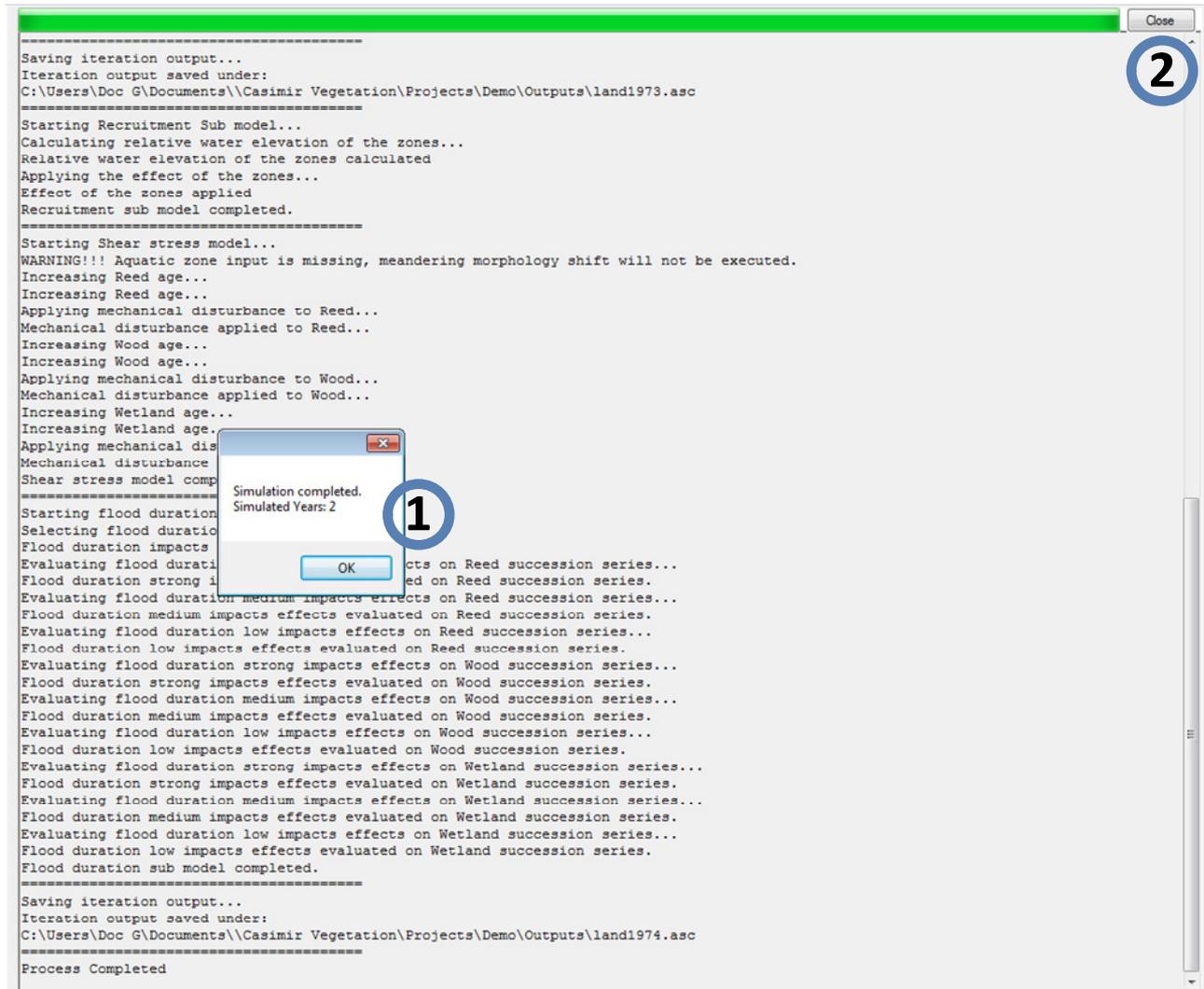


Figure 29 Data window at the end of the scenario run

Once the scenario simulation is completed, a message box is popped up (1 in Figure 29) providing some resume information about the performed simulation. Click ok, wait for some second until the wait cursor (hourglass) does not disappear, then click close (2 in Figure 29).

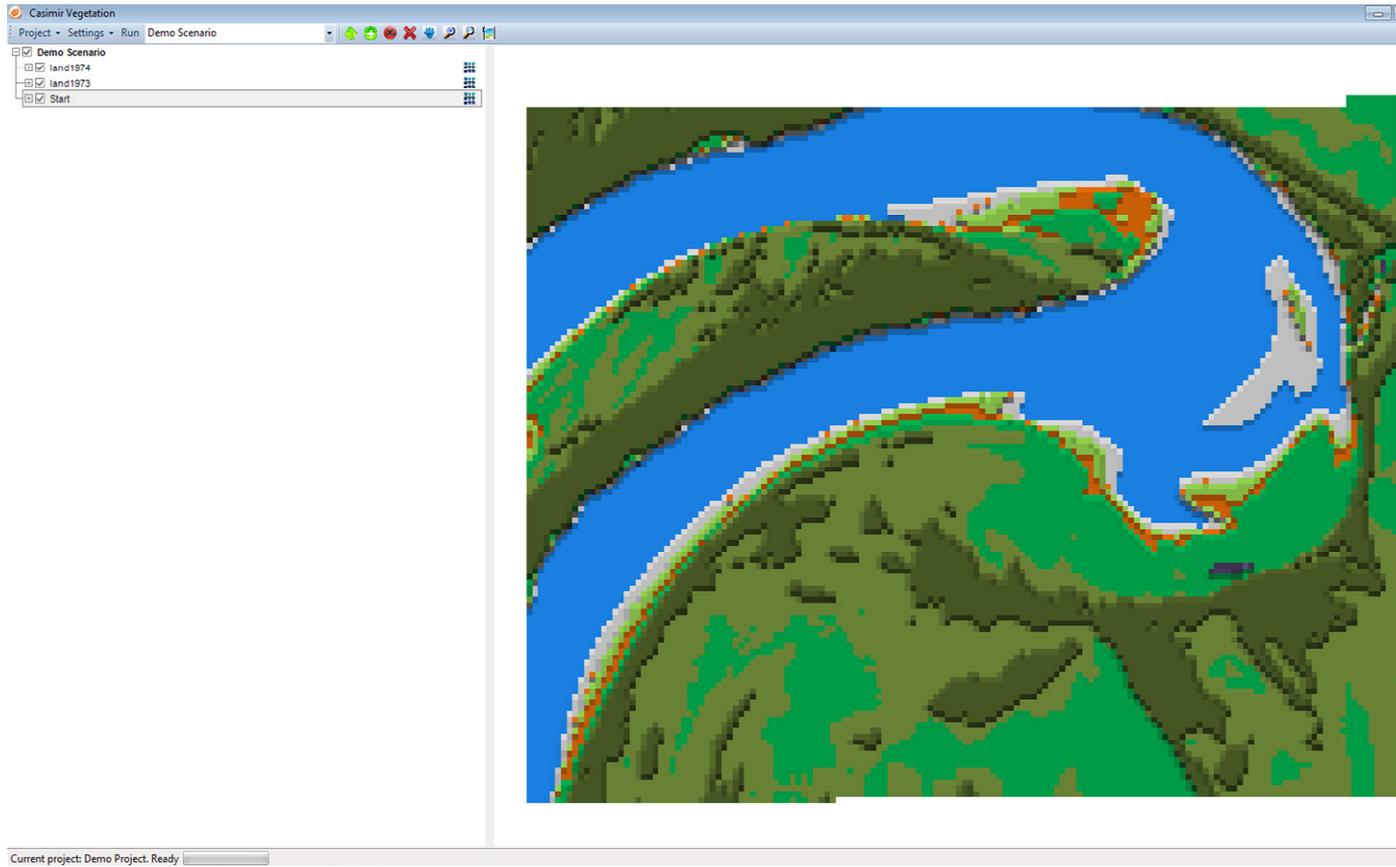


Figure 30 Model main window displaying the model simulation results

In the table of contents (Figure 30, left) are now listed the spatial outputs (raster) simulated by the model while in the (Figure 30, right) data window these outputs are displayed.

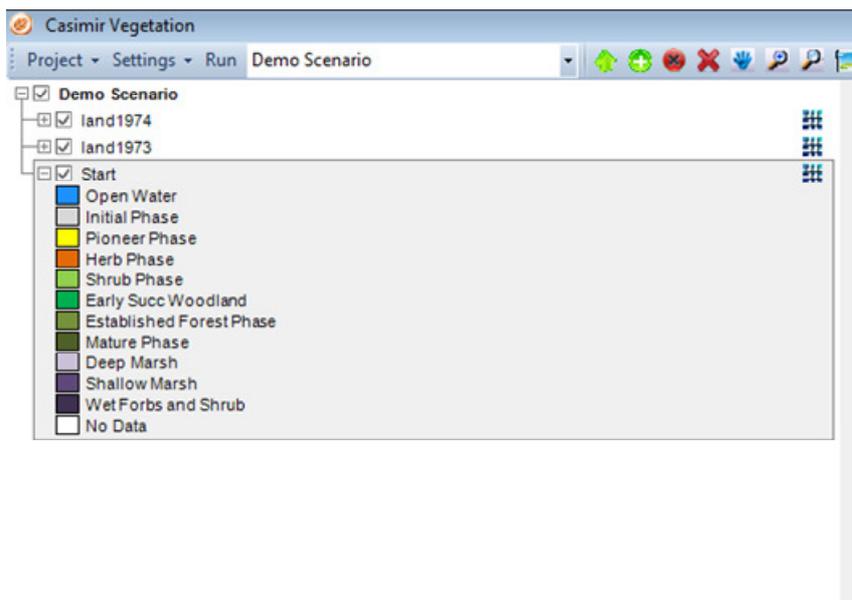


Figure 31 TOC, detail of one simulated output legend

If we explode one of the outputs in the Demo Scenario tree placed in the TOC (Figure 31), we'll see that the legend colors for each succession phase, correspond to those in the Output render color.

Beside the spatial results, the model outputs include also two CVS files which record the area balance and the relative area balance of the simulated scenario. The area balance files are saved in the same folder where the spatial outputs are saved.

Open explorer and go to Documents\ Casimir Vegetation\Projects\Demo\Outputs, you should find the files like those listed in Figure 32.

Nome	Ultima modifica	Tipo	Dimensione
AreaBalance	11/3/2011 9:43 AM	Microsoft Excel C...	1 KB
land1973.asc	11/3/2011 9:42 AM	File ASC	57 KB
land1974.asc	11/3/2011 9:44 AM	File ASC	57 KB
Reed.asc	11/3/2011 9:42 AM	File ASC	112 KB
RelativeAreaBalance	11/3/2011 9:43 AM	Microsoft Excel C...	1 KB
Start.asc	11/3/2011 9:42 AM	File ASC	53 KB
Wetland.asc	11/3/2011 9:42 AM	File ASC	117 KB
Wood.asc	11/3/2011 9:42 AM	File ASC	81 KB

Figure 32 Output files of the simulated scenario

Open RelativeAreaBalance.csv with a spreadsheet program. In the first column, we find the simulated year while the remaining columns store the succession phases names. The succession phases fields contain the percentage of study site area covered by the succession phase in the corresponding simulated year.

Year	Initial Phase	Pioneer Phase	Herb Phase	Shrub Phase	Early Succ Woodla	Established Fores	Deep Marsh	Shallow Marsh	Wet Forbs and Shi	Mature Phase
1973	3.96312	2.126552	2.803182	4.290282	24.80482	34.23303	0	0.03717748	0.07435497	27.66748
1974	7.242174	0	2.981634	2.959328	24.80482	34.23303	0	0.03717748	0.07435497	27.66748

Figure 33 Relative area balance file

For example (Figure 33) in the simulated year 1973, the Initial Phase was covering the 3.7% of the whole study site. In 1974 the same succession phase was instead occupying the 4.6% and so forth.

The interpretation of this file allows you to track the changes in area of the succession phases and understand in favor or spite of which succession phases the increases/decreases in area occur.

## 4.4 Create a new project and run your own case study

### 4.4.1 Create a new project

The following exercise will drive you through the creation and set up of a new project. The new project will be still based on the demo data shipped with the installation.

Click on Project→New... (Figure 34) on the main window menu bar.

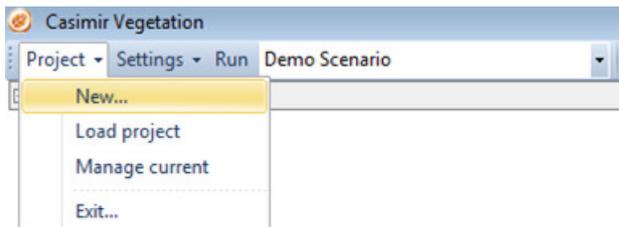


Figure 34 New project menu option

The “Create new project” pop up window will appear (Figure 35). Type a name in the Project Name text box (i.e. MyFirstProject), leave the Site Extent text field empty and then click the select button beside the Project folder text box. This action will allow you the select the project folder that will hold the scenarios and project files.

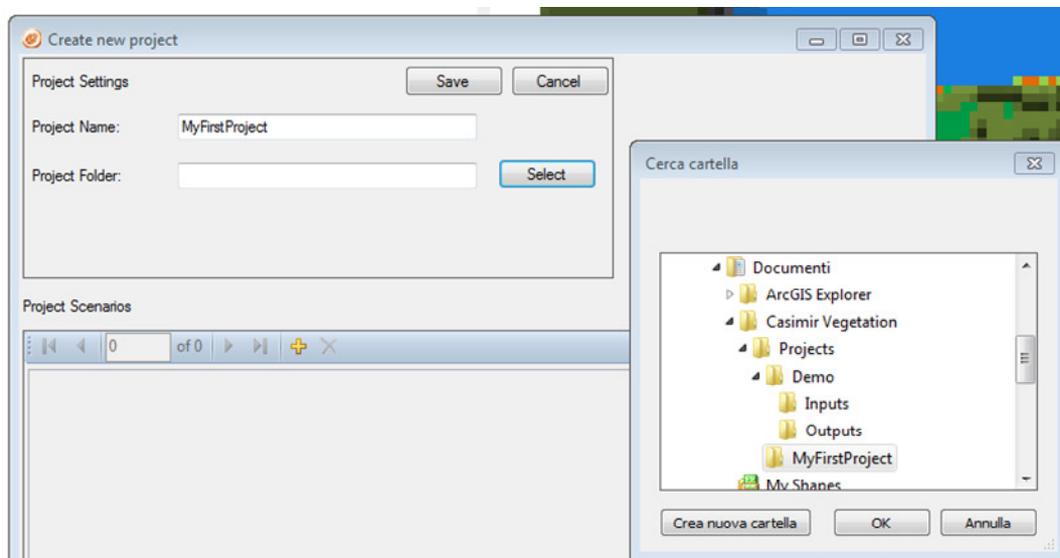


Figure 35 Create new project pop up window

Once you clicked the Select button, a folder browser will pop up. Navigate to the Documents folder, enter in the Casimir Vegetation folder and create a new folder (name it MyFirstProject like in Figure 35).

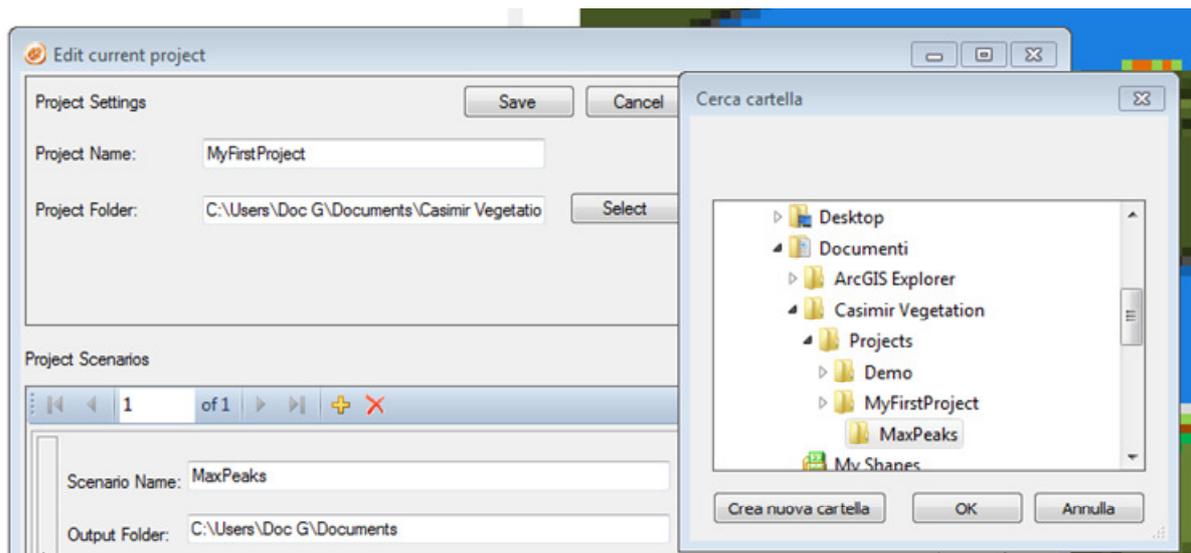
With this action, we created the project file, to check if the operation has been successfully performed, open explorer and navigate to Documents\Casimir

Vegetation\Projects\MyFirstProject, you will find in the folder a file called MyFirstProject.rprj.

However, these actions are not sufficient to set up a model run. Now that we have a project, we would need to create at least one scenario.

#### 4.4.2 Create new scenarios

Click on the yellow cross (number 1 in Figure 36).



**Figure 36** Create a new scenario in MyFirstProject and Create new scenario folder

A new scenario frame will appear. Type MaxPeaks in the Scenario Name text box, and then click the select button beside the Output Folder text box. A folder browser will pop up, navigate to Documents\Casimir Vegetation\Projects\MyFirstProject and create a new folder and name it MaxPeaks, select it and click ok in the folder browser.

Now add a second scenario following the same procedure but this time name it MinPeaks, create the Output Folder as Documents\Casimir Vegetation\Projects\MyFirstProject\MinPeaks. Once you are done with the creation of the scenarios and the output folder, click the Save button in the Create new project window (Figure 36), the project window will close and we are again in front of user interface main window.

With these actions, we created two new scenarios within the MyFirstProject project. To check if the operations have been successfully performed, open explorer and navigate to Documents\Casimir Vegetation\Projects\MyFirstProject\MaxPeaks, there you will find an xml file called MaxPeaks.xml. Repeat the operation for MinPeaks and check if there is a file named MinPeaks.xml. These files will contain all the information to run the model, however, so far are more or less empty. In order to fill it, we have to use the Settings menu.

Before proceeding to the set up of the model run, take a moment to inspect the combo box in the main window toolbar. Now the combo box items are two, namely the two scenarios we just created.

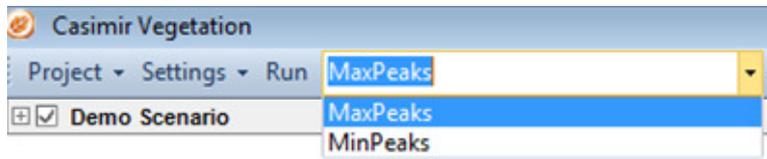


Figure 37 Combo box in the main window toolbar. The combo box lists all the scenarios of the loaded project.

Keep in mind that, each time you will run or make edits on any scenarios setting, the scenarios that you are running or editing is the one selected by the combo box (addressed also as “current scenario”).

Go to the combo box in the main window (Figure 38), if not yet selected, choose MaxPeaks and then go to the Settings menu button (Figure 38), click on Scenario Settings.

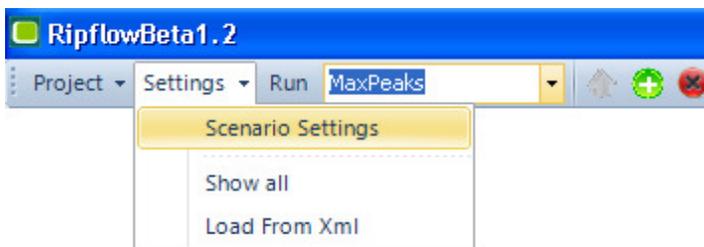


Figure 38 Scenario settings menu option

The Model Iteration Settings window will pop up with some default values. Fill the text boxes like in Figure 39 and check all the Submodels Execution again like in Figure 39.

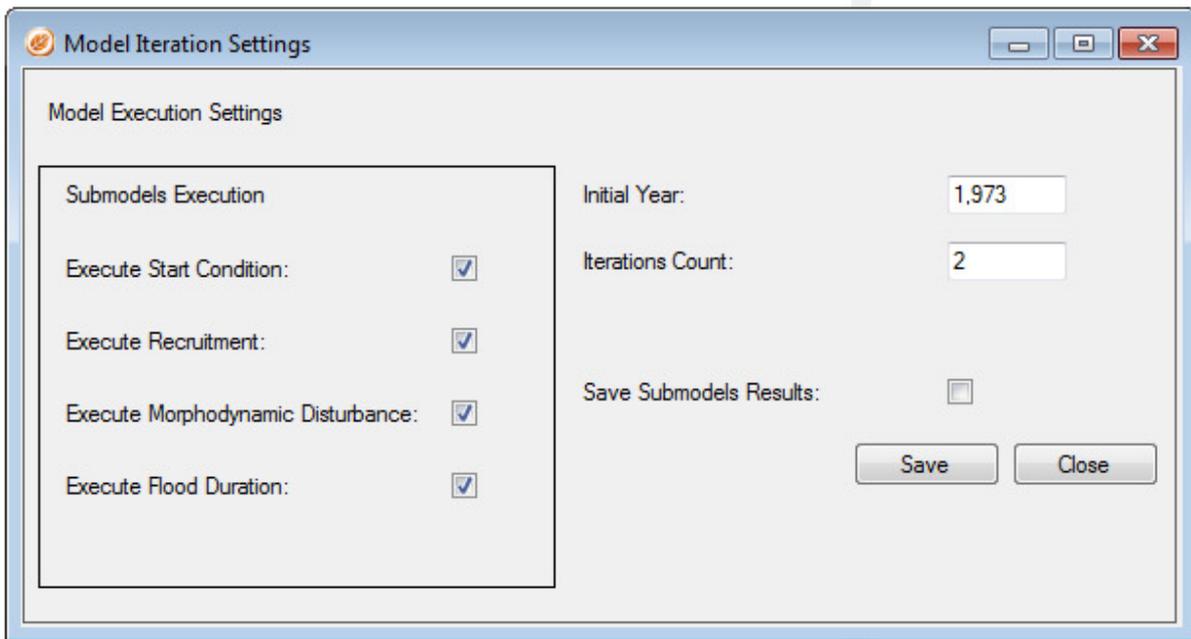


Figure 39 Model iteration settings

The frame Submodels Execution allows you to select which submodels will be executed in the scenarios simulation. This feature is particularly useful when you don't need to run all the submodels in your scenarios (i.e. you know already what is the start condition) or you miss some data (i.e. there are no flood duration maps available).

For the moment leave the Save Intermediate option unchecked. This option allows you to visualize the output of each submodel for each simulated year.

Click Save and then Close.

Now click on Show All menu option in the Settings main window toolbar button (Figure 40).

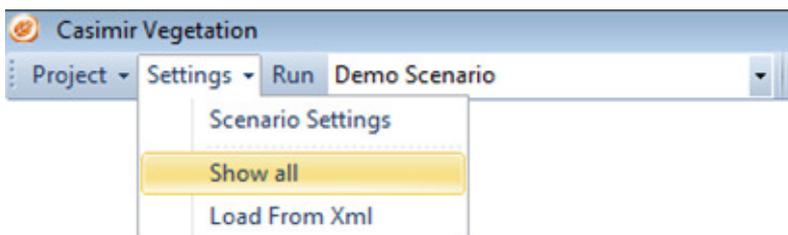


Figure 40 Show all menu option in the Settings main window button

The Submodels Parameters and Inputs window will pop up (Figure 41). As you can see, all the text fields are empty because the scenario we are working on is new and we need to provide all the parameters and inputs to let it run.

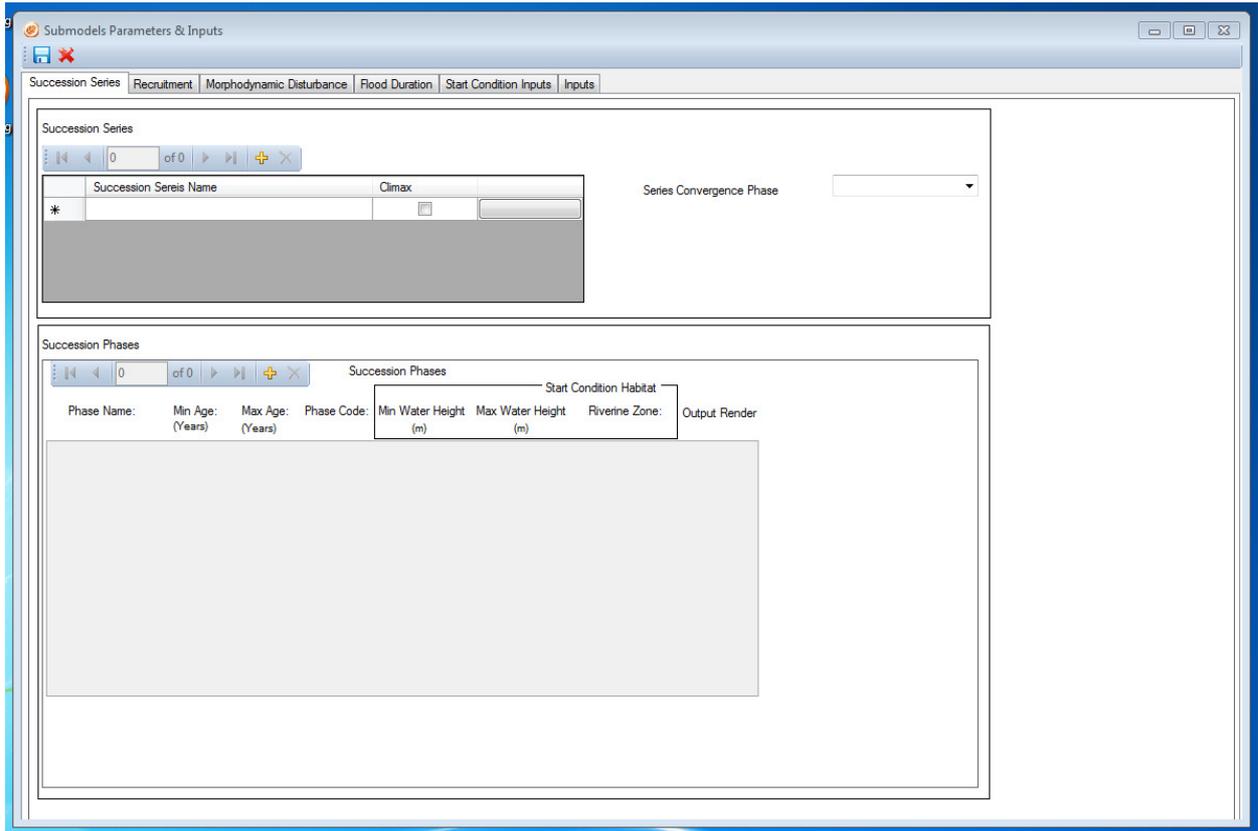


Figure 41 Submodel Parameters and Inputs window

#### 4.4.3 Load scenarios parameters and input values from existing files

The task of typing in all the parameters (succession series names, succession series phases, age ranges etc. etc.) can be a quite tedious and error prone process. For this exercise, we will use a model application feature which can save you a lot of typing time.

When you are modeling within the same project, it is likely that many parameters values (i.e. the succession series and phases) are the same across the different scenarios. The “Load From Xml” menu option allows you to take advantage of this similarities. Click on the red cross at the top left of Submodels Parameters and Inputs window (Figure 41), the window will close and then click Load From Xml option in the Settings button on the main window toolbar (Figure 42).

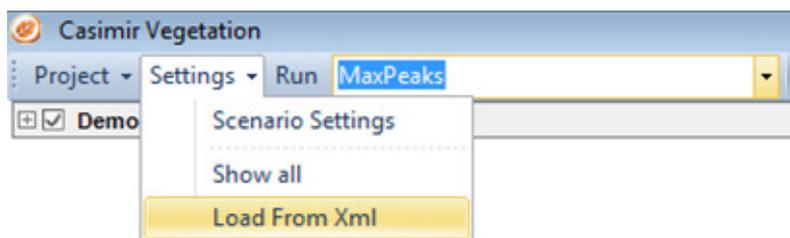


Figure 42 Load From Xml option in the main window toolbar

The Select Xml Config file pop up window will appear like in Figure 43.

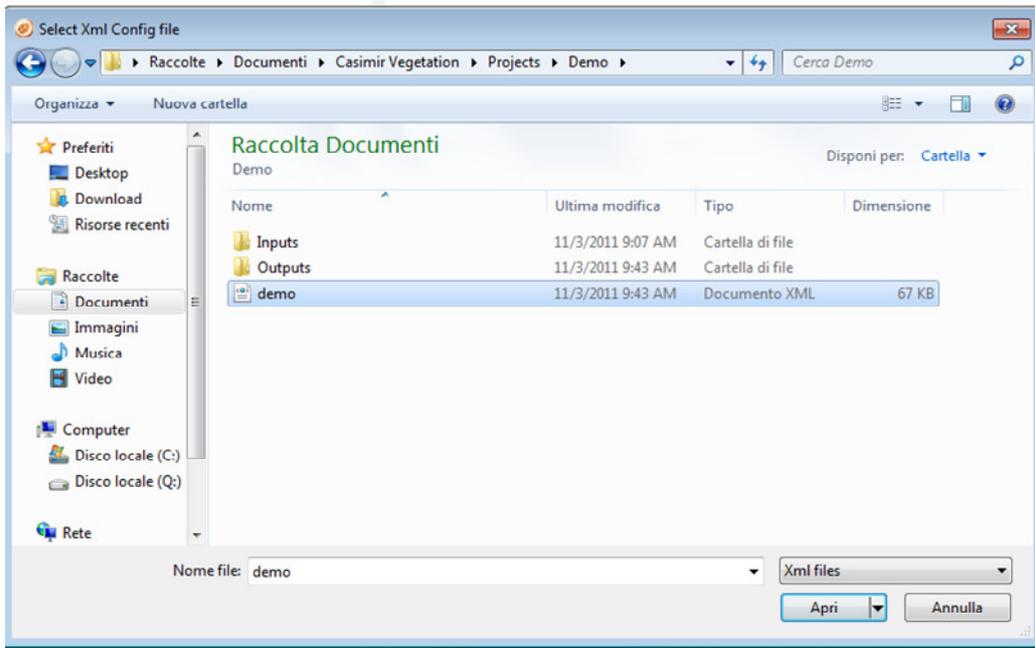


Figure 43 Select xml config file pop up

Navigate to [Your Documents]\Casimir Vegetation\Projects\Demo (Figure 44) and select demo.xml (Figure 45).

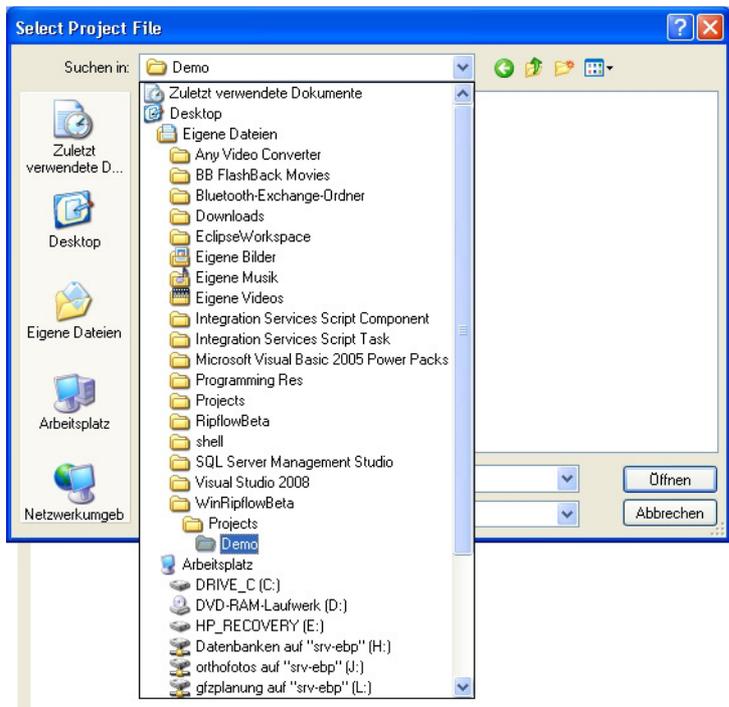


Figure 44 Navigate to Demo folder

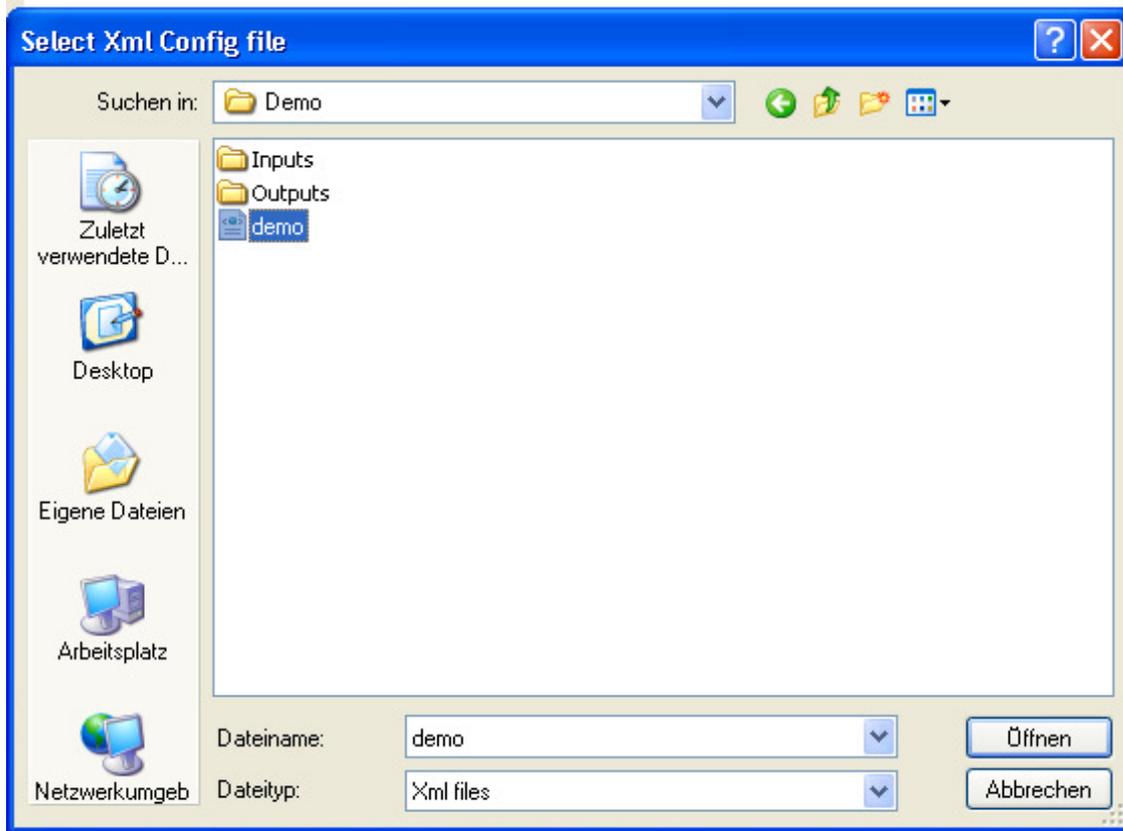


Figure 45 Select demo.xml

Click again on Show All menu option in the Settings main window toolbar button, now all the fields are filled out with the values read from the demo.xml config and these values are automatically copied to MaxPeak.xml.

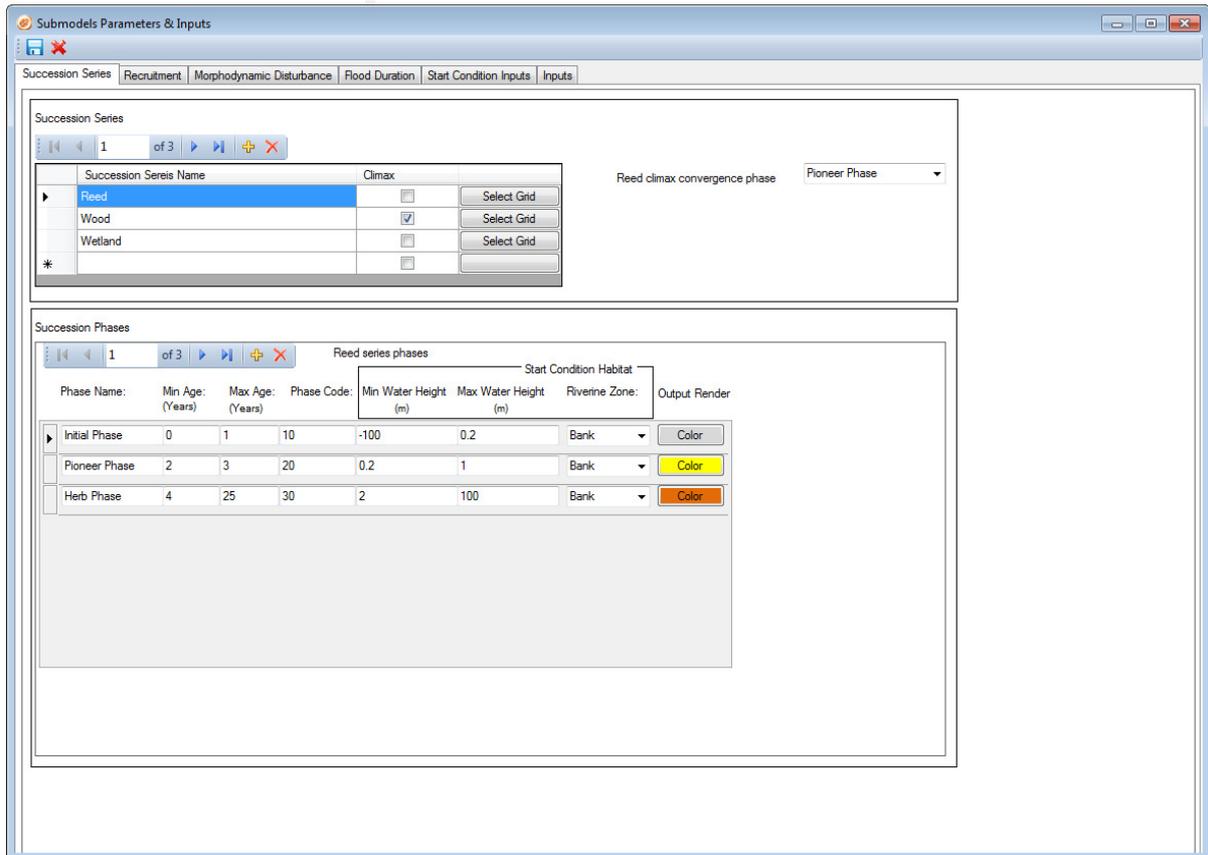


Figure 46 Submodels Parameters & Input settings window after loading the values from demo.xml

Now let's fill the MinPeaks scenario values with the same procedure. Remind that, first we have to set MinPeak as current scenario by using the toolbar combo box.

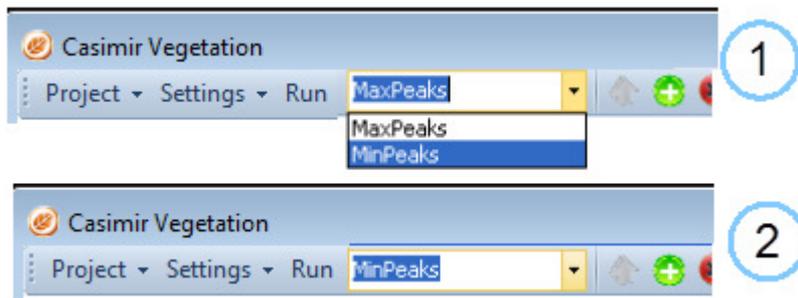


Figure 47 Switch the current scenario from MaxPeaks to MinPeaks

Go to the main window toolbar and click on the combo box (Figure 47, 1), select MinPeaks. Now the combo box must look like in Figure 47 point 2.

Now repeat the load from xml step also for MinPeaks, using again the demo.xml.

To check if the operation has been successfully performed, check the Show All menu option, you should see something like in Figure 46 (leave this window open, we will need for it in a little while).

Remark that, if you run now the scenarios, this would yield results identical to the result of Demo scenario (see section). Therefore, to have some different results, we would need to modify a bit our scenarios dataset.

#### 4.4.4 Edit scenarios parameters and input values

In order to make scenarios differ one to another, we could change the values of the parameters or the value of the inputs or both of them. In this example we will change only the value of the inputs. To achieve this task we will use some features of the model to which you have not yet been exposed. These features allow you to save the inputs list in external CSV files and load them at will.

##### Save inputs lists

Go on the Input tab of the Submodels Parameters & Inputs window (Figure 48) and click on the save icon (Figure 48, 1) of the Shear Stress frame.

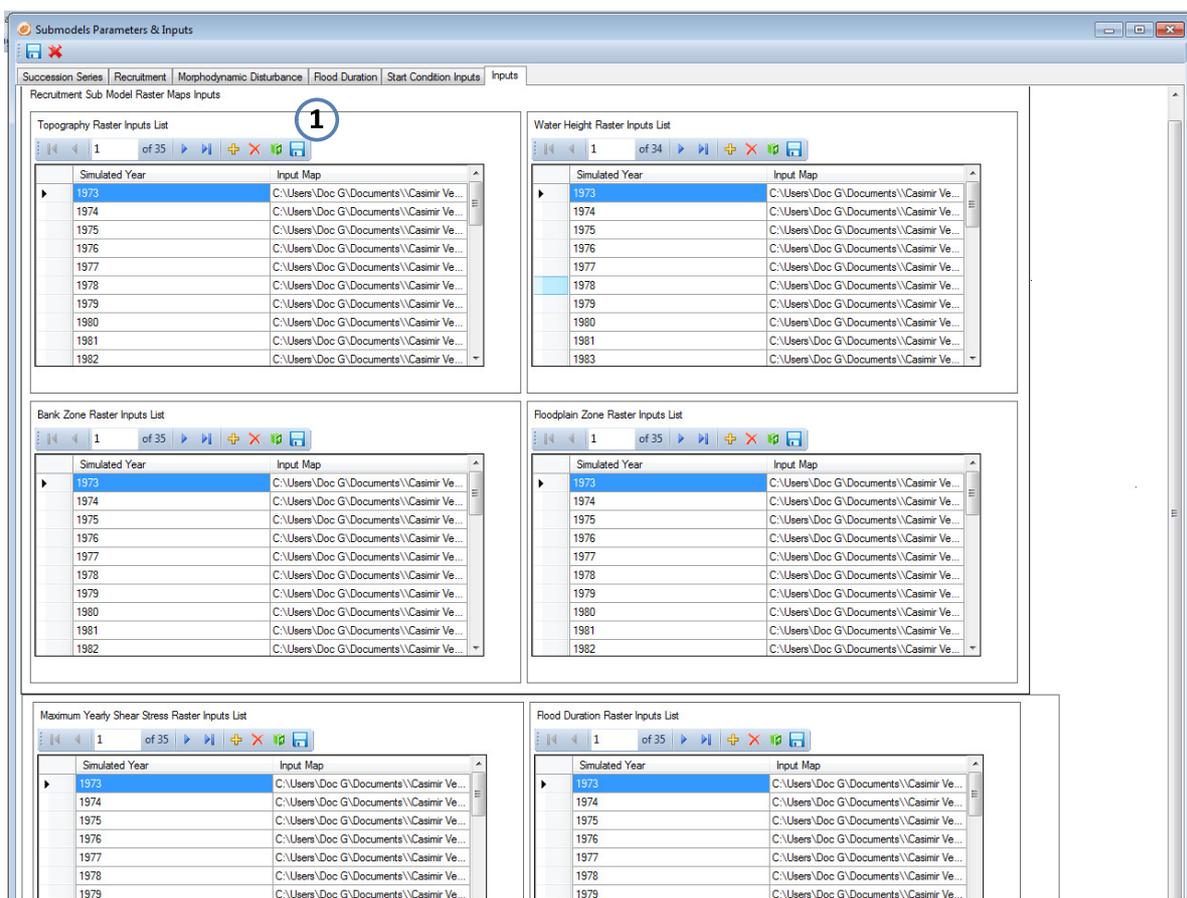


Figure 48 Submodels Parameters & Inputs window-Input tab

The Save CSV Input List pop up will appear. Navigate to Documents\Casimir Vegetation\Projects\MyFirstProject\MaxPeaks folder and save the file as Shear (Figure 49).

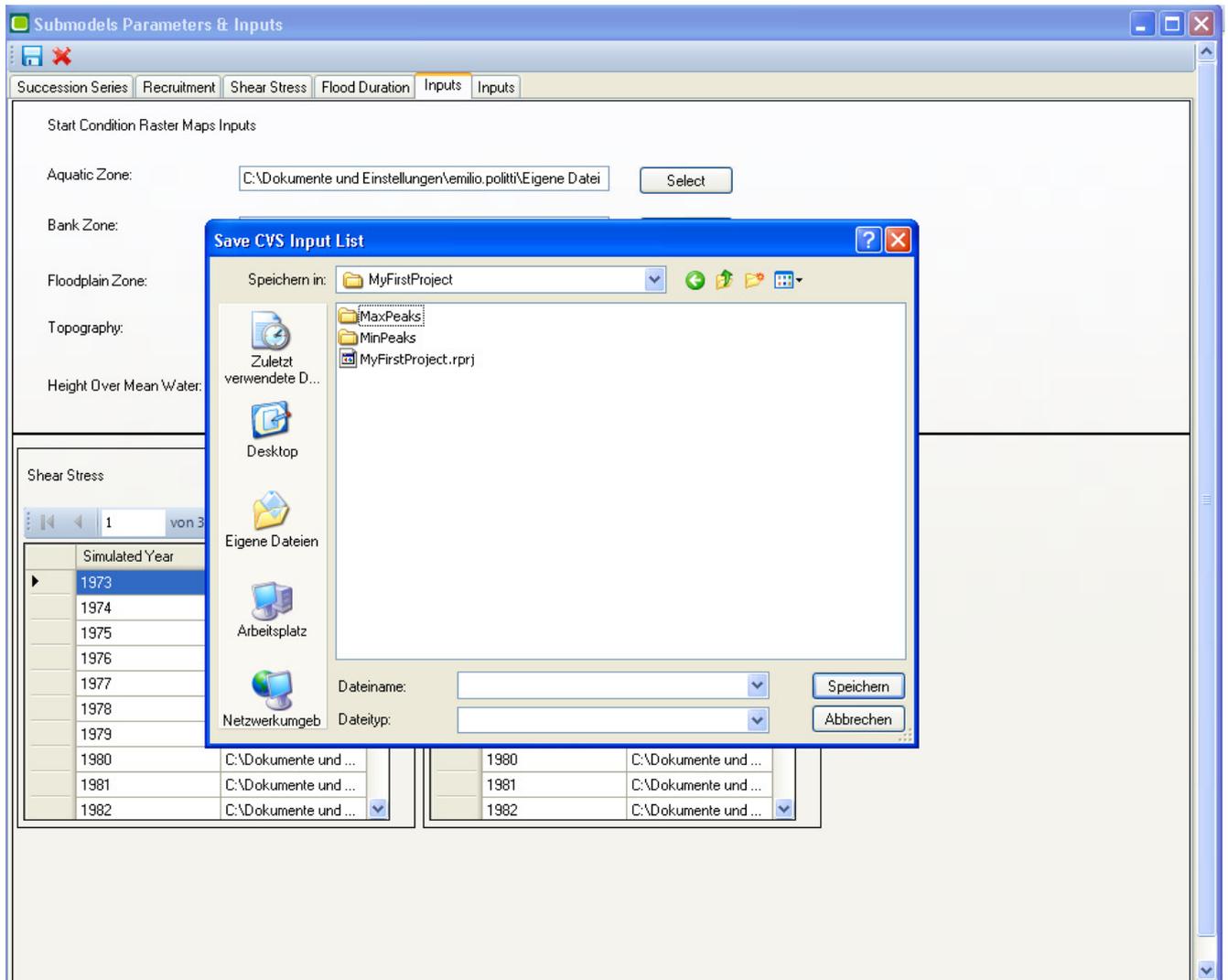


Figure 49 Save CVS inputs list pop up

This action creates a CSV file with the values you can actually see in the Shear Stress frame.

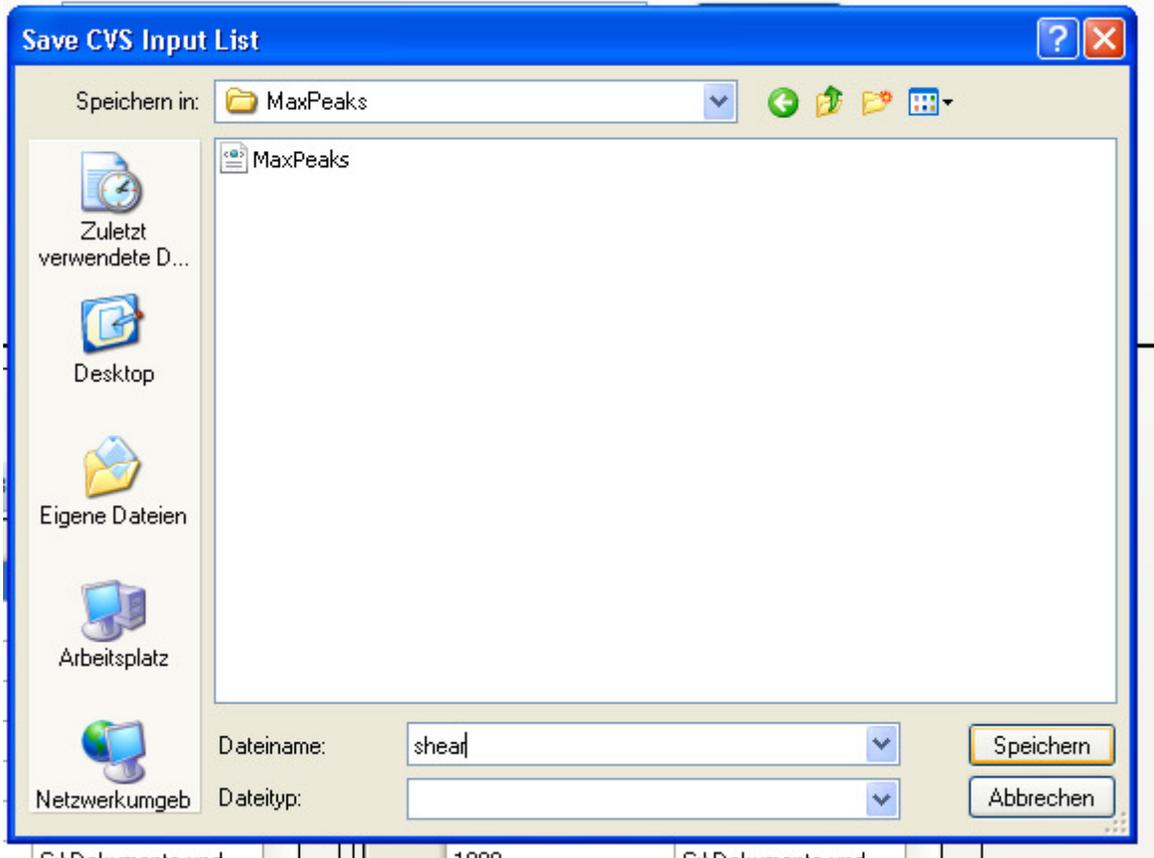


Figure 50 Save the shear input list

#### 4.4.5 Edit inputs lists

Open explorer and go to Documents\Casimir Vegetation\Projects\MyFirstProject\MaxPeaks. There you will find shear.csv, open it with your favorite spreadsheet program and have a look to its content (Figure 51).

	A	B
1	1973	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq2.asc
2	1974	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq25.asc
3	1975	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq1.asc
4	1976	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq5.asc
5	1977	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq2.asc
6	1978	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq1.asc
7	1979	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq1.asc
8	1980	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq2.asc
9	1981	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq5.asc
10	1982	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq2.asc
11	1983	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq1.asc
12	1984	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq1.asc
13	1985	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq1.asc
14	1986	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq2.asc
15	1987	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq2.asc
16	1988	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq1.asc
17	1989	C:\Users\Doc G\Documents\Casimir Vegetation\Projects\Demo\Inputs\ss_hq2.asc

Figure 51 Shear stress input list saved on a csv file

The first column stores the simulation year, the second column is the input corresponding to the simulation year. The input is represented by the path of the input file.

In this case (Figure 50) in the year 1973 there it will be simulated the shear stress associated with an HQ2 flood, in 1974 the shear associated with 1974 and so forth.

This data structure (Year-Input path) is common to the whole inputs lists that you find in a frame like the Shear Stress one.

Save as a CSV also the Flood Duration inputs and the Water Elevation Inputs (in the same folder as Shear.csv).

Open explorer and go to Documents\Casimir Vegetation\Projects\MyFirstProject\MaxPeaks, there you should find four files: one in xml and three in csv format (Figure 52).

Nome	Ultima modifica	Tipo
MaxPeaks	11/3/2011 9:43 AM	Documento XML
flood_dur	11/3/2011 10:00 AM	Microsoft Excel Comma Separated Values File
water_height	11/3/2011 10:01 AM	Microsoft Excel Comma Separated Values File
shearv	11/3/2011 10:01 AM	Microsoft Excel Comma Separated Values File

Figure 52 files in the MaxPeaks scenario folder

Open the CSV files and let's have a look Figure 53. Remark that the inputs corresponding to one year, and always with the same suffix.

For example, for the year 1973 all the inputs (Shear Stress, Flood Duration and Water Elevation) end with hq2. The meaning of this has been already explained, what you have to bear in mind is that your input list must always be mutually consistent. If you edit the shear input list, also water elevation and flood duration must change (if possible) accordingly.

water_tab													
	B	C	D	E	F	G	H	I	J	K	L	M	N
1973	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con_hbf											hq2.asc	
1974	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con_hbf											hq25.asc	
1975	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con_hbf											hq1.asc	
1976	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con_hbf											hq5.asc	
1977	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con_hbf											hq2.asc	

ar													
A	B												
1973	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con_ss											hq2.asc	
1974	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con_ss											hq25.asc	
1975	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con_ss											hq1.asc	
1976	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con_ss											hq5.asc	
1977	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con_ss											hq2.asc	

flood_dur													
A	B												
1973	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con											fd_hq2.asc	
1974	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con											fd_hq25.as	
1975	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con											fd_hq1.asc	
1976	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con											fd_hq5.asc	
1977	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con											fd_hq2.asc	
1978	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con											fd_hq1.asc	
1979	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con											fd_hq1.asc	
1980	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con											fd_hq2.asc	
1981	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con											fd_hq5.asc	
1982	C:\Dokumente und Einstellungen\emilio.politti\Eigene Dateien\WinRipflowBeta\Projects\Demo\Inputs\con											fd_hq2.asc	

Figure 53 Shear stress, flood duration and water elevation input lists

The next exercise will teach you how you can quick change the inputs values in the inputs lists and reload them in the scenario.

With the input list CVS files open, go to Shear and use the function search and replace (available in most spread sheet or text editor software) to replace hq1.asc with hq100.asc. This will replace in your input list all the shear stress raster grids corresponding to HQ1 with shear stress grids corresponding to HQ100. Basically we are replacing small floods effects with very large ones.

Remind that we are editing the MaxPeaks scenario, and now maybe you are guessing why we name it this way and what the next steps are...

Save and close shear.csv and repeat the search and replace action (yet with hq100.asc replacing hq1.asc) also with the flood duration and water elevation lists (don't forget to save your edits!).

Load inputs lists from CSV files

Let's now go back to the Submodels Parameters & Inputs window, go to the input tab and click on the button 1 in Figure 54. The select CSV pop up will appear, select shear.csv in the MaxPeaks scenario folder (Figure 55).

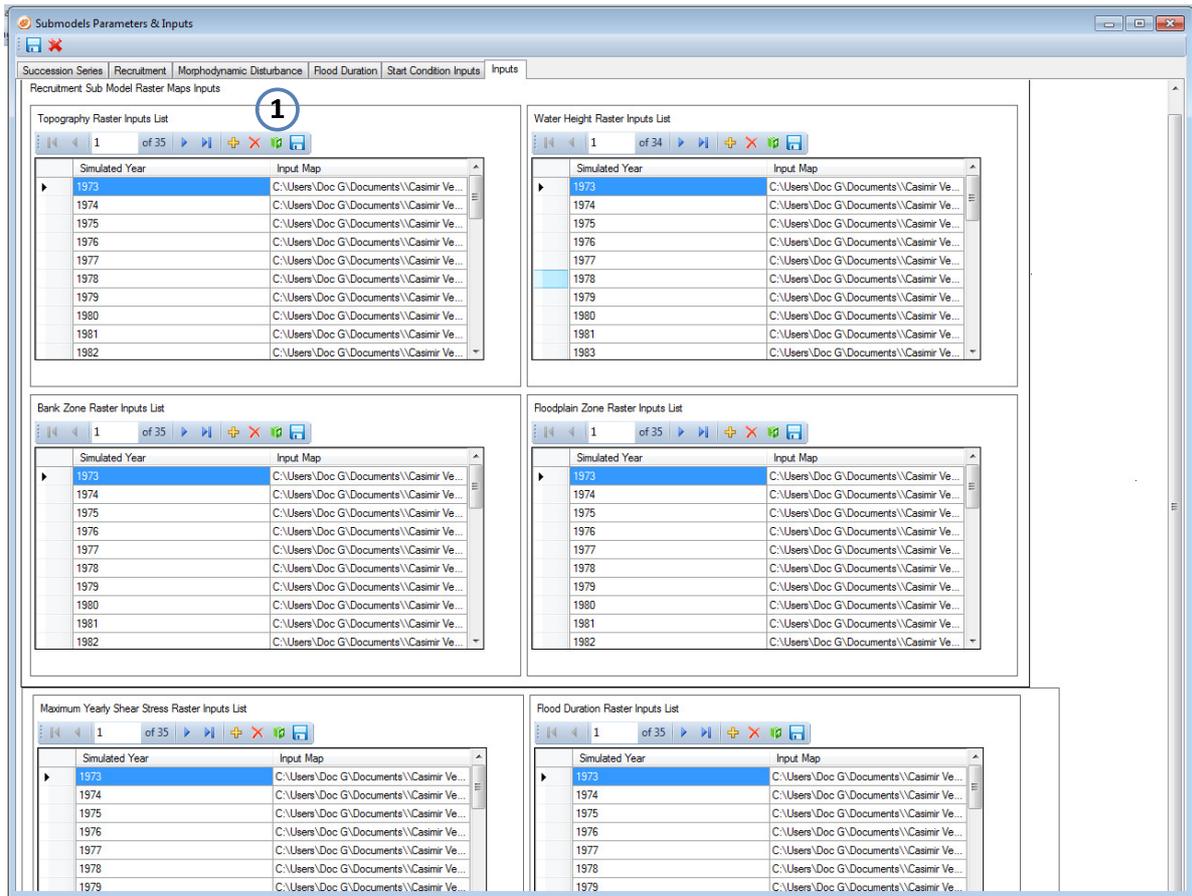


Figure 54 Load data from csv

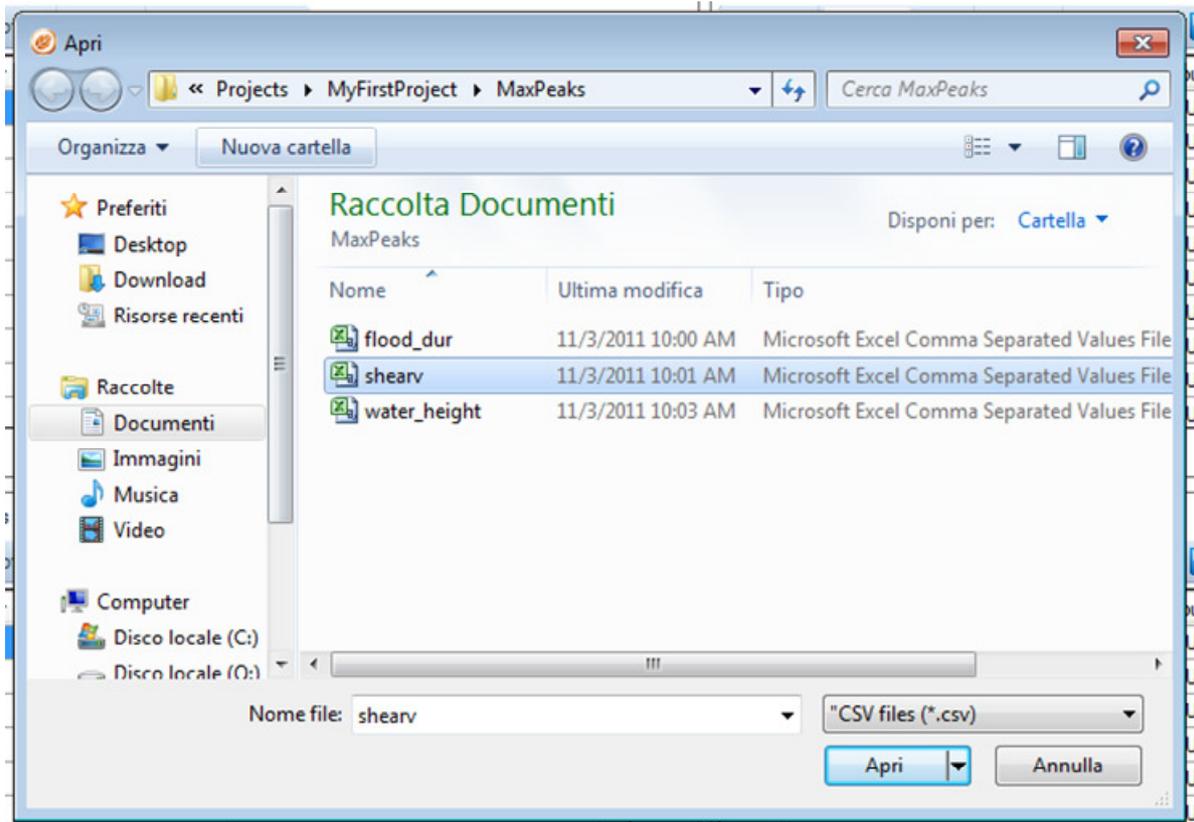


Figure 55 Select input list csv

Repeat the csv load for Flood Duration and Water Elevation. Save the edits by pressing the Save icon button in the top left corner of Submodels Parameters & Inputs (Figure 56) and close the Submodel Parameters & Inputs window.

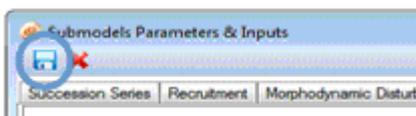


Figure 56 save scenario dataset edits

The main model window is now again fully visible. Select the MinPeaks scenario from the toolbar combo box, click on the Show All menu option in the Settings button and repeat all the operations of the section “Save inputs lists” but this time save the CVS files under Documents\Casimir Vegetation\Projects\MyFirstProject\MinPeaks. Repeat the steps of the section “Edit Scenario” but this time, instead of replacing hq1.asc with hq100.asc, replace hq2.asc, hq5.asc and hq25.asc with hq1.asc. Save and close the CSV files, then load them in the inputs frame like explained in section “Load inputs lists from CSV files” (don’t forget to save the edits!).

What we just did for the MinPeaks scenario is to replace all the medium floods inputs with the low flood ones. This explains the name of the scenario MinPeaks and will give us a result which is different from the MaxPeaks scenario.

#### 4.4.6 Edit the scenario settings

In order to see the differences between the two scenarios, we would need to simulate a number of years large enough to let us appreciate the differences in the results.

Click on Scenario Settings menu option in the Settings button of the main window (like we did in section "Checking the scenarios settings". Leave everything unchanged but the entry "Iterations Count", type in 20.

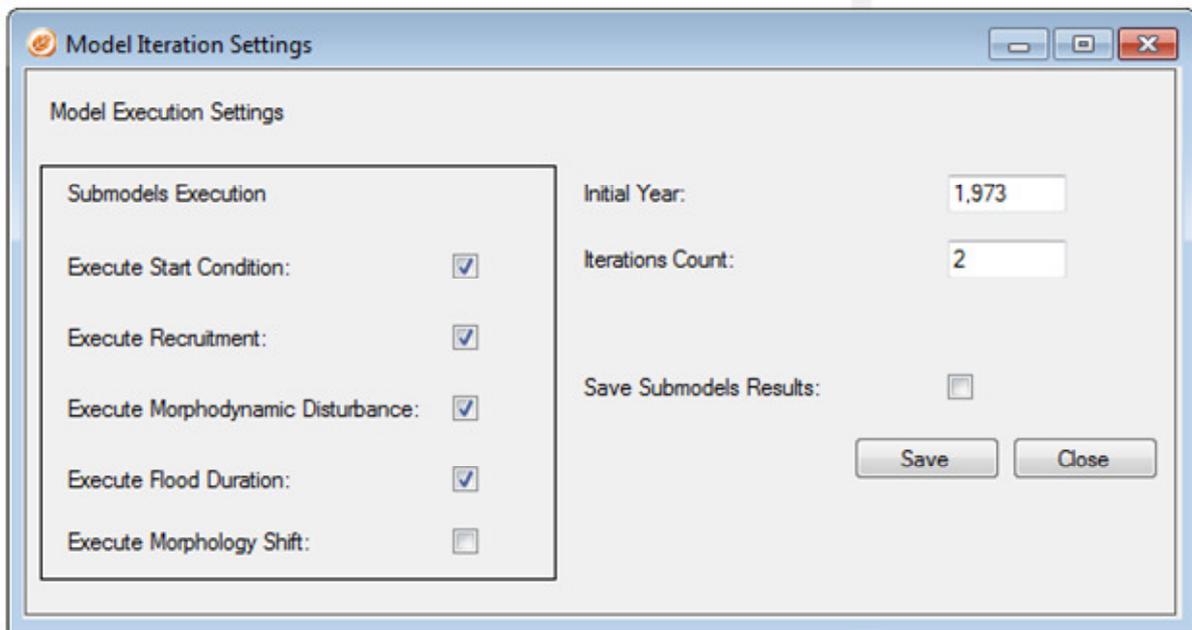


Figure 57 Model iteration window after the edit

Now your Model Iteration Window must look like in Figure 57. Click save and repeat the operation for MaxPeaks scenario. Remind that, to edit this scenario you must first select it in the scenarios combo box (Figure 37).

Both scenarios are now ready! Run both of them like in section "Running the demo and inspecting the model results". You will be then able of visually appreciating the differences in the two scenarios directly in the model main window.

Run start condition model

The exercises so far completed did not take into consideration how to set up and run the start condition model. In fact the scenarios simulated up to now, provided you with pre-compiled inputs and parameters to run the start condition model. This model provides an initial landscape from which your scenarios can be modeled. It turns particularly useful when simulating historical conditions and there are not data available for the historic period you want to simulate.

The parameters required to run the start condition are listed in section "Start Condition Habitat" and the GUI controls where these parameters have to be entered is the section "Succession Phases Parameters". This paragraph will cover only how to enter the inputs for the Start condition model.

#### 4.4.7 Select the start condition inputs

On the main window toolbar, click on "Settings" and select "Show all" (Figure 58).

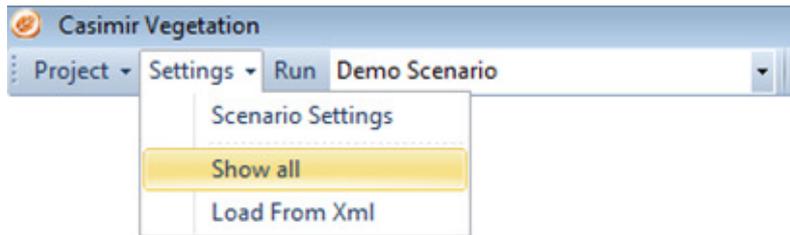


Figure 58 Show all Submodels Parameters & Inputs Panel

The „Submodel Parameters & Inputs“ panel pops up; if you have been following the tutorial or you have loaded the settings from a previous case study, the „Succession Series“ tab should be already filled.

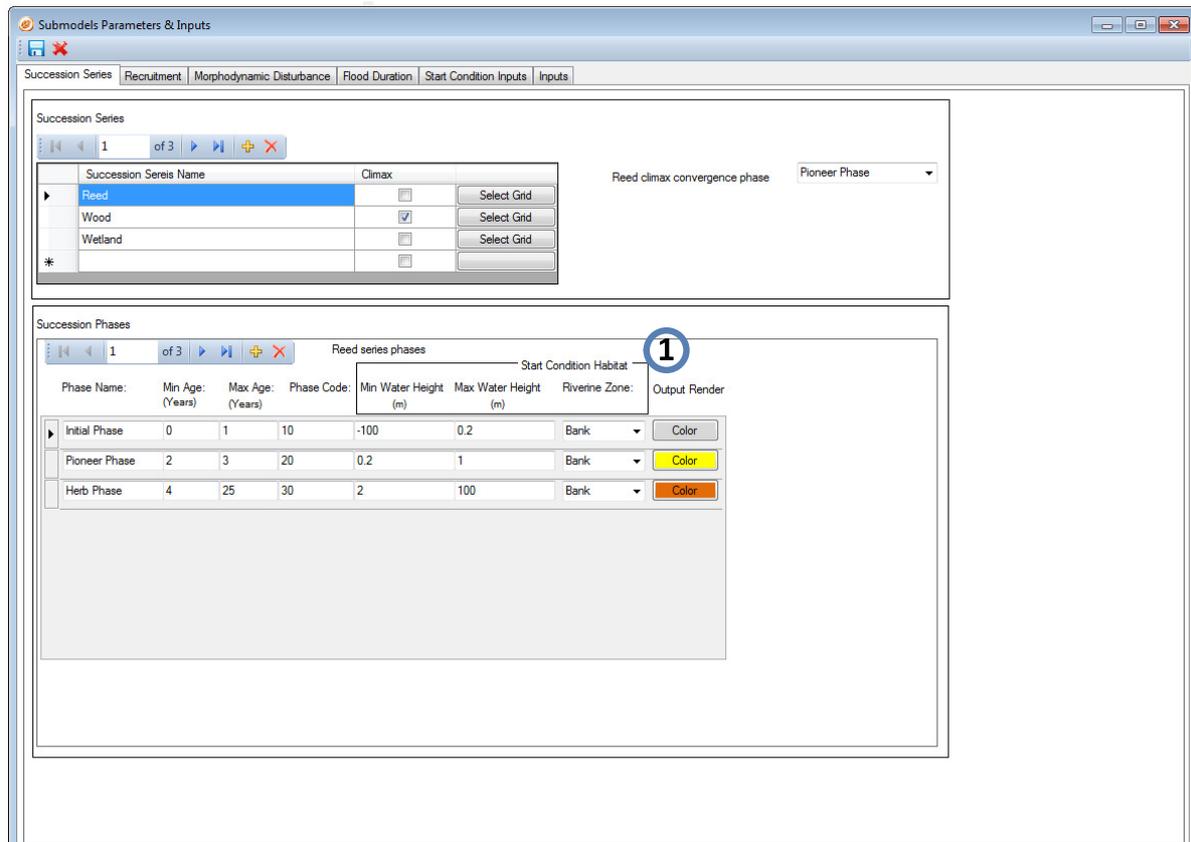


Figure 59 Succession series tab, start condition parameters

The parameters here defined which are particularly relevant for the start condition are the „Start Condition Panel“ panel (1). The explanation of the parameters can be found in section

"Start Condition Habitat". If instead you find yourself in from of a picture like in Figure 41, you will have to type in all the succession series names and succession phases characteristics (unless you don't have an xml config file from which you can load this information). Please refer to section „scenarios“ for further details.

Secondly, navigate to the „Start Condition Inputs“ tab (Figure 60).

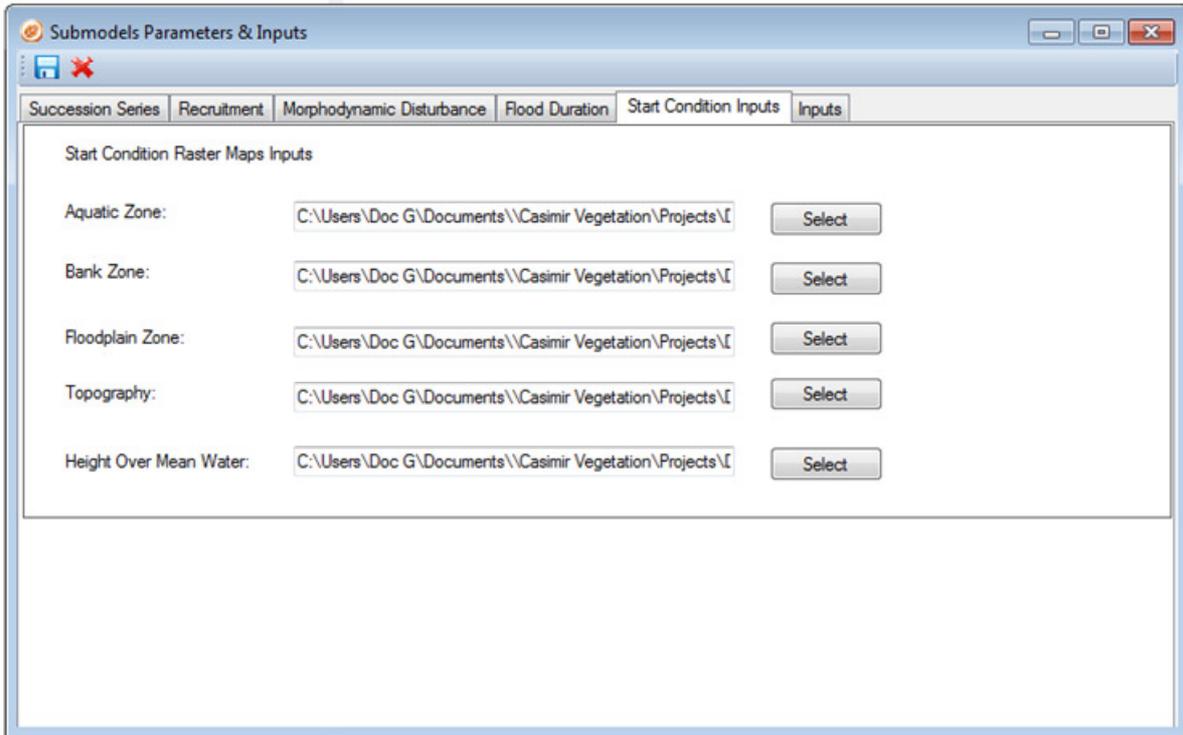


Figure 60 Start condition inputs tab

The textbox entries are the filepath to the input files required by the start condition. Click on the „Select“ button on the „Aquatic Zone“ text box line, a file chooser will pop up (Figure 61).

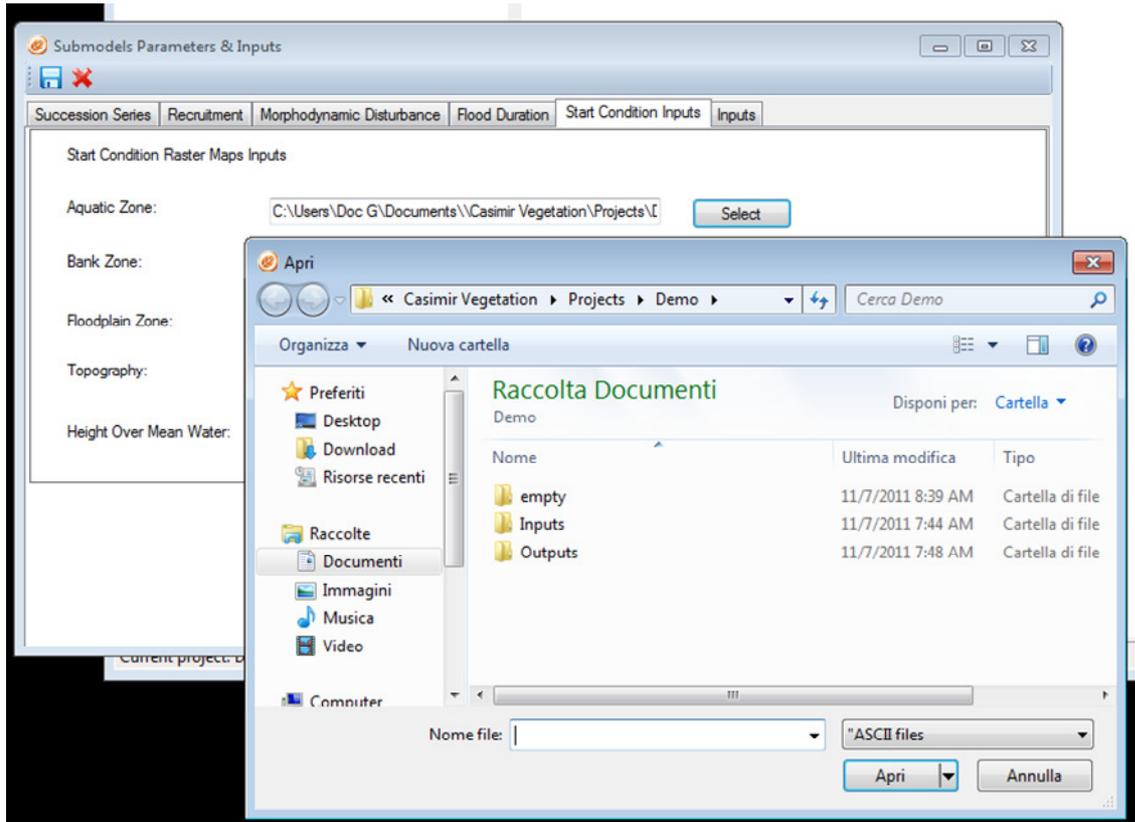


Figure 61 Start condition inputs file chooser pop up

Select the aquatic zone (ESRI Ascii file) and repeat the operation for the other inputs.

**Note:** to set up and execute the start condition, the “Execute Start Condition” checkbox (Figure 62) must be checked, otherwise the Start Condition Panel will be inactive and so will be also the “Start Condition Inputs” tab (Figure 63).

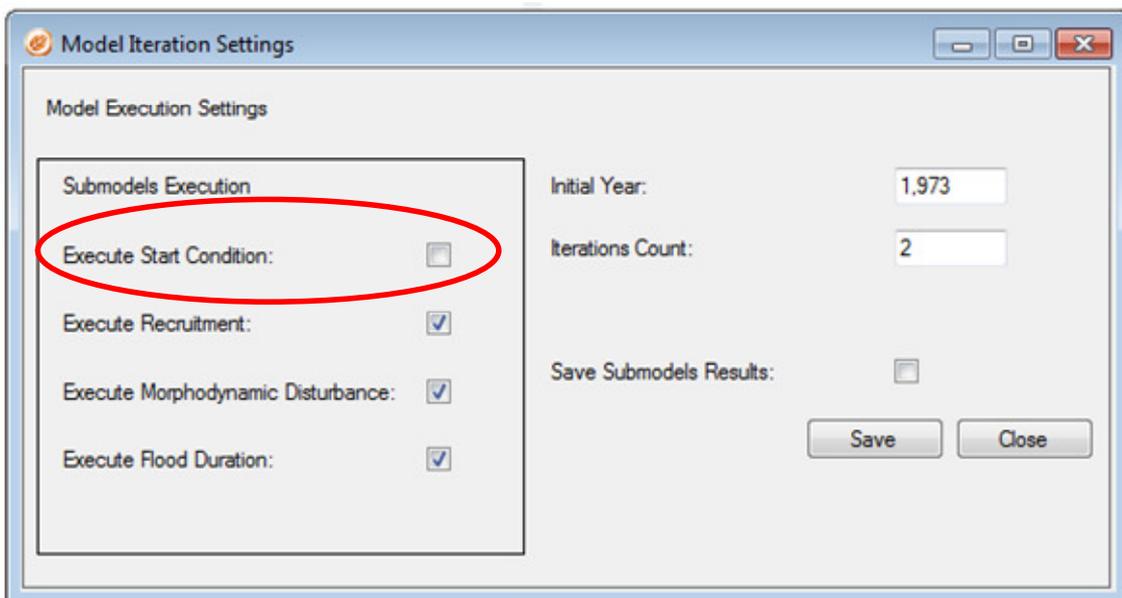


Figure 62 Execute Start Condition checkbox

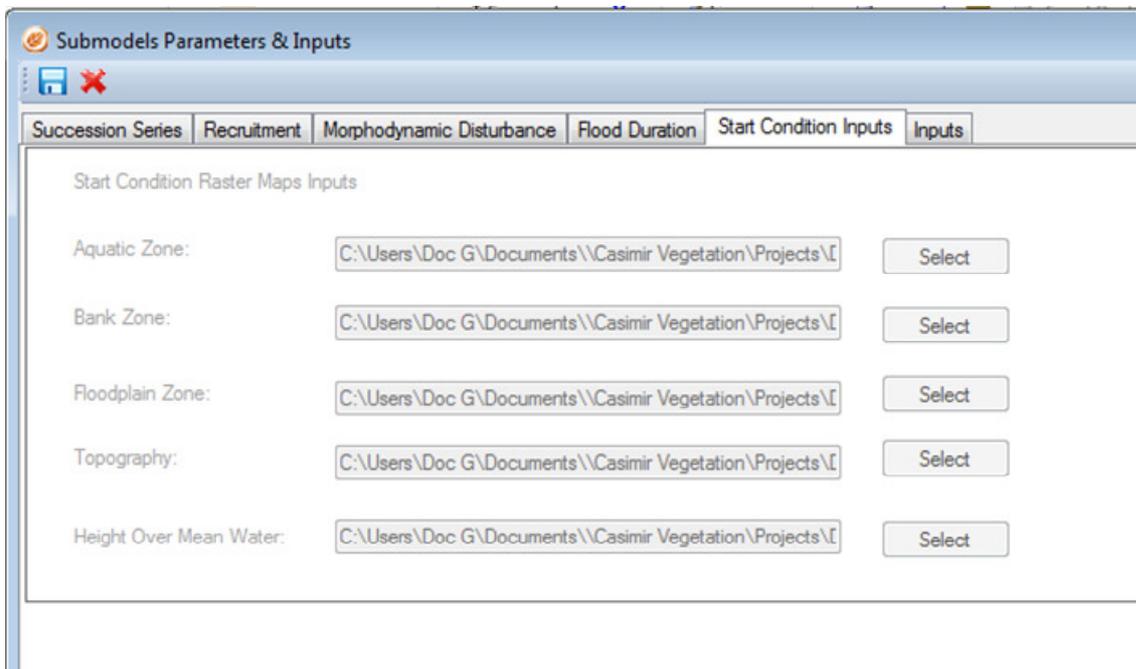
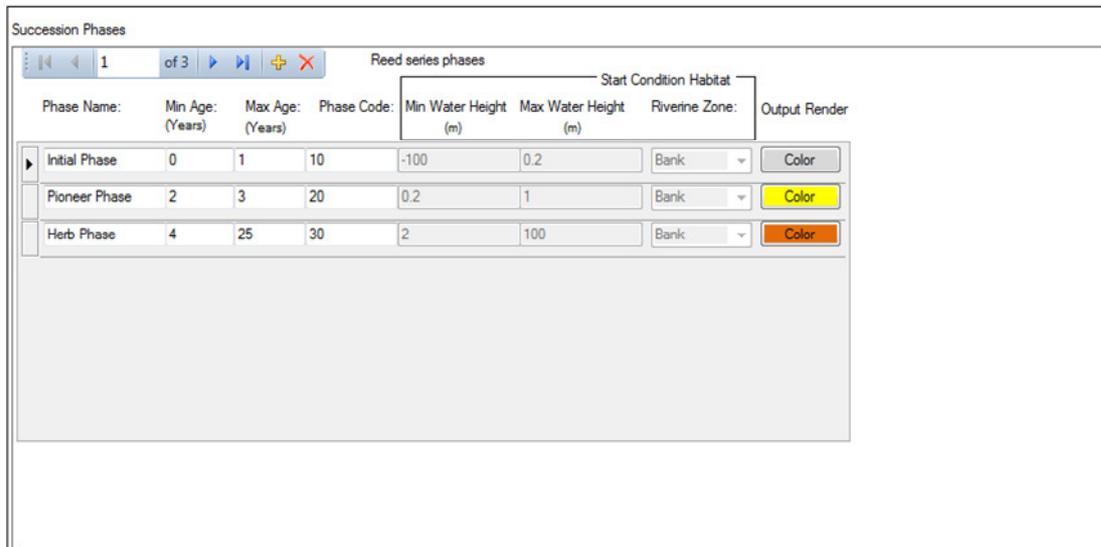


Figure 63 Start condition parameters and inputs inactive panels

#### 4.4.8 Set the initial succession series raster

Whenever you run into a cases study where the starting condition of your succession series is known, you can avoid running the Start condition model and pass the succession series raster grids as initial input for the Dynamic model. To set these initial inputs, go to the “Succession Series” tab, and click to the “Select Grid” button (see point 2.c in Figure 16, section “Succession Parameters Tab” or red circled button in the following Figure 64).





**Figure 66 Starting landscape (left) grids vs. initial series (right)**

In Figure 66, the left side shows a start condition map yield from regular modeling: in this map the grid codes values (pixel values) correspond to the phases codes. Such codes must be set using the textbox controls (red polygon in Figure 67). On the other hand, the pixel values in the right most map of Figure 66 is an example of initial series input raster (i.e. wood serried). The blank pixels in the initial series map indicate that those areas are occupied by a different succession series (i.e. reed). Pixel values in the initial series input raster are the minimum ages of the succession phases.

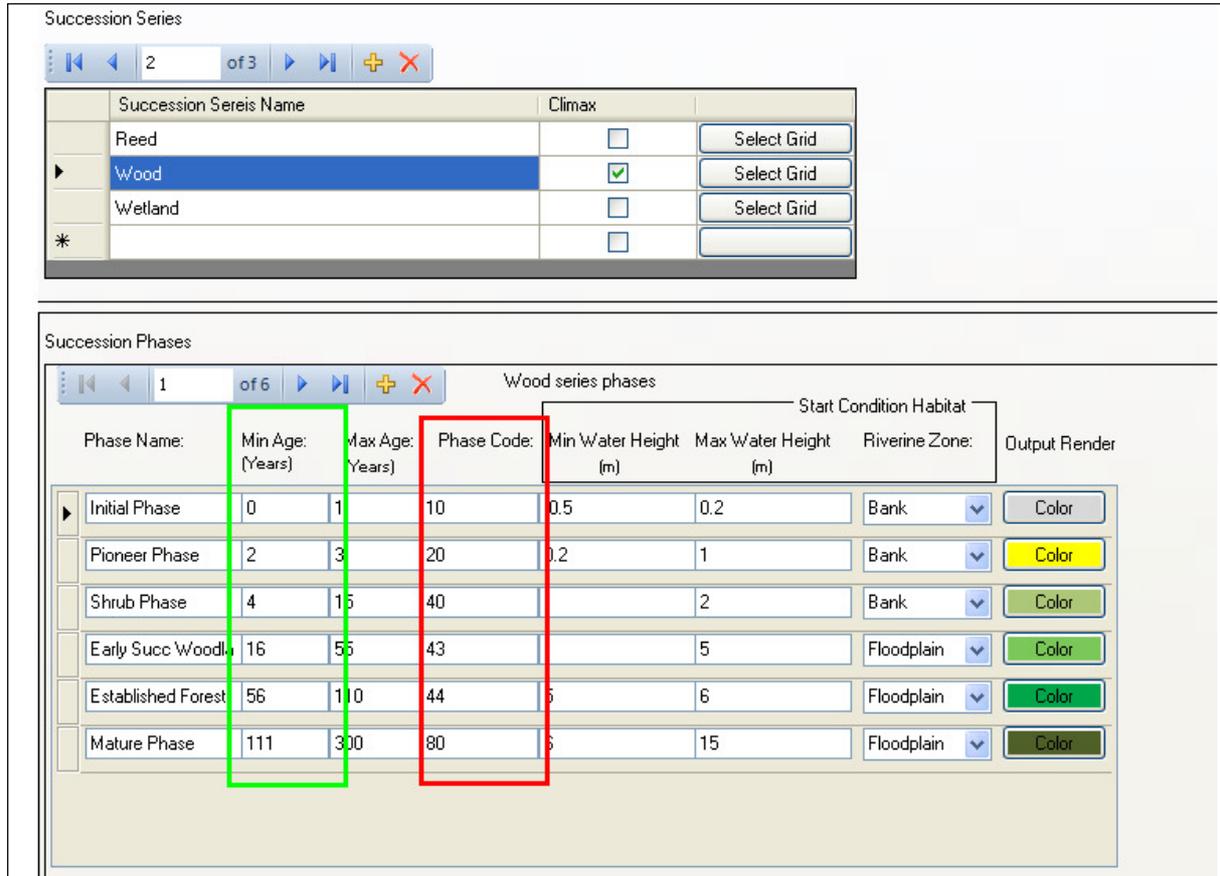


Figure 67 Phases codes settings control

Combining the information of Figure 66 and Figure 67, the start condition map shall be interpreted as follow: where the color is yellow, the succession phase is Pioneer Phase and the pixel value is 20. In the initial series map, the same yellow colored pixels are as well Pioneer Phase but the pixel value is 2 (which are equal to the pioneer minimum age, see green polygon in Figure 67).

## 5 Data requirements and specifications

**All input and output data are in ESRI ASCII format** which is a raster data format specification. Any other raster type will not be recognized by the model. For further information regarding the ESRI ASCII format, please refer to the ESRI website:

[http://resources.esri.com/help/9.3/arcgisengine/java/GP\\_ToolRef/spatial\\_analyst\\_tools/esri\\_ascii\\_raster\\_format.htm](http://resources.esri.com/help/9.3/arcgisengine/java/GP_ToolRef/spatial_analyst_tools/esri_ascii_raster_format.htm)

Conversion from common raster formats to ESRI ASCII grids can be performed in ArcMap, using the raster conversion toolbox, or for more GIS savvy users, exploiting the GDAL library through python scripting or other freeware software. Here are listed some resources you might find useful to convert among different raster formats (in case ArcMap is not available).

<http://www.gdal.org/index.html> GDAL home page

[http://www.gdal.org/gdal\\_tutorial.html](http://www.gdal.org/gdal_tutorial.html) GDAL API tutorial

<http://trac.osgeo.org/gdal/wiki/GdalOgrInPython> Python-GDAL reference page

Please remark that to exploit the above cited web resources a minimum understanding of GIS technologies and programming skills are required.

Input grids spatial requirements

All dynamic inputs grids and height over mean water grid (Start condition module input) must have the same spatial extent, cell size and columns-rows size. If these conditions are not true the model will return **wrong results or fail**. In order to fit all grids to the same size perform a mask extraction on all your input data. Use the grid with the minimum extent as input mask.

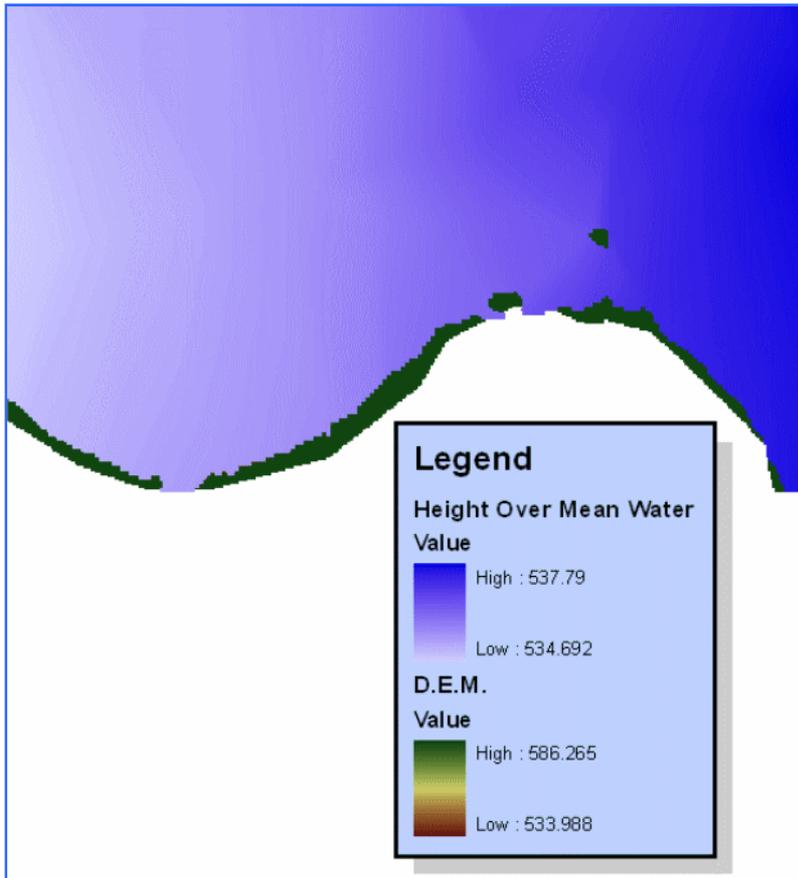


Figure 68 Spatial extent mismatch of input data. The figure shows two input grids that don't have the same spatial extent. In dark green, in the lower part of the map, the exceeding extent. This condition must be removed prior starting the simulations.

For spatial extent is not only meant the area covered by the grids but also their spatial reference. It's possible to check spatial extent by viewing the properties of the grids, either in ArcMap or ArcCatalog (or again using GDAL specification). The top, left, right and bottom values of all grids must be the same. A further and probably most important requirement is the size, **ALL INPUTS MUST HAVE THE SAME NUMBER OF ROWS AND COLUMNS!** It is possible to check also the inputs sizes in ArcMap-ArcCatalog (Figure 69) or using GDAL (Figure 70) or simply looking at the header of the ESRI ASCII files (Figure 71).

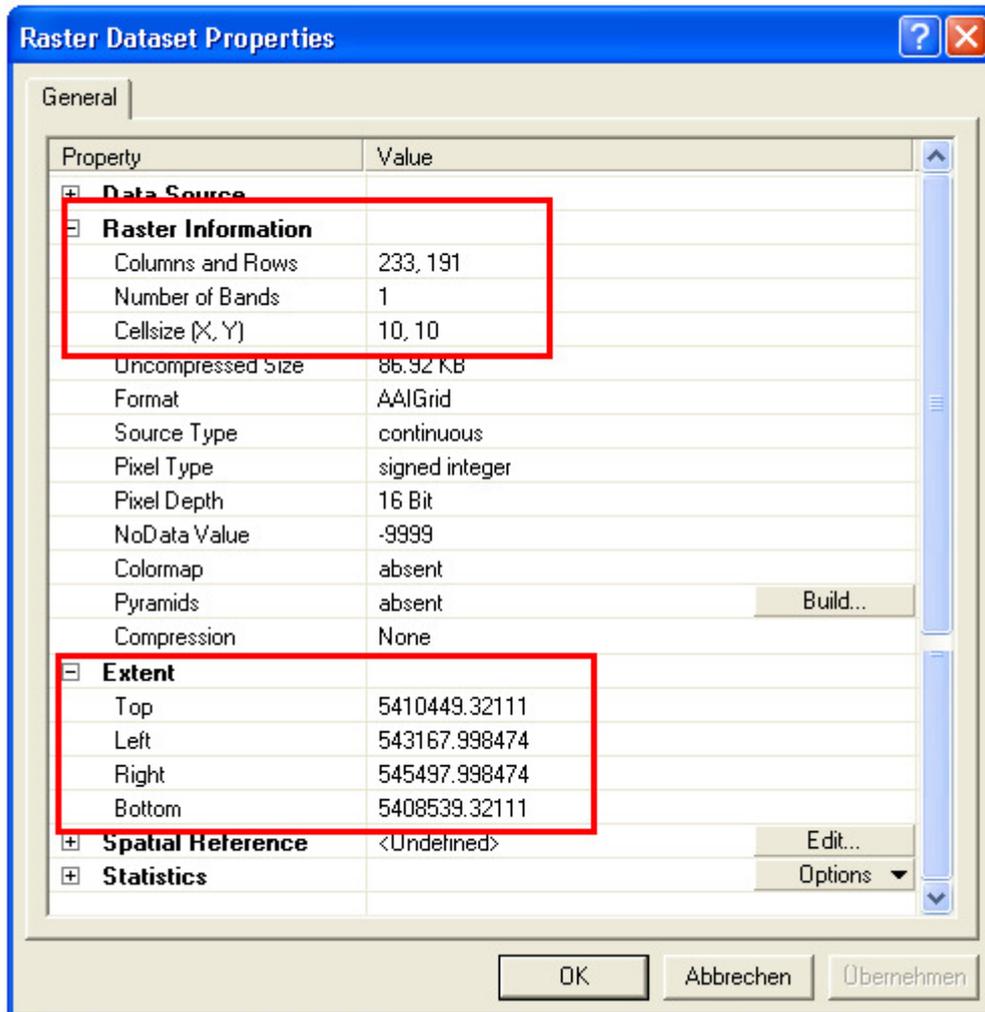


Figure 69 Raster property window in ArcCatalog. Red polygons mark the properties THAT MUST BE EQUAL FOR ALL INPUT DATA

In Figure 69, the raster dataset properties window which pops up in ArcCatalog when the right clicking on a raster dataset and selecting “properties” from the context menu.

```
class      : RasterLayer
dimensions : 191, 233, 44503 (nrow, ncol, ncell)
resolution : 10, 10 (x, y)
extent     : 543168, 545498, 5408539, 5410449 (xmin, xmax, ymin, ymax)
```

Figure 70 Console output when using GDAL to read a raster file. The lines dimension, resolution and extent MUST BE EQUAL FOR ALL INPUT DATA

ESRI ASCII layers can be opened using the GDAL library, (in Figure 70 using the python from the command line). GDAL is the funding technology of most of the raster data types (including ESRI grids and ESRI Raster Grids). GDAL affords a wide array of API and can be used from C++, pearl, python, R and other programming languages.

```

ncols      233
nrows      191
xllcorner  543167.99847412
yllcorner  5408539.321106
cellsize   10
NODATA_value -9999
-9999 -9999 -9999 -9999 -9999 -9999 -9999
-9999 -9999 -9999 -9999 -9999 -9999 -9999
-9999 -9999 -9999 -9999 -9999 -9999 -9999
-9999 -9999 -9999 -9999 -9999 -9999 -9999

```

Figure 71 ESRI ASCII grid opened with a text editor. THE FIRST 5 LINES MUST BE EQUAL FOR ALL INPUT FILES.

ESRI ASCII files can be also opened with a regular text editor (i.e. notepad), in Figure 71 is pictured the header section of the file; such section must be the same for all input files.

## 5.1 Preparation and Data Requirements

Input data in order to be used in the models must fulfill specific requirements. Requirements can be either involve spatial or attribute properties. Input data can be originated from hydraulic modeling or acquired from third party sources, in both cases it's unlikely that the grids are ready to be used in the models. Before proceeding to the simulations, make sure your data fulfill all the requirements described here in after. Further data descriptions are provided in the model documentation and model help files.

### 5.1.1 Digital elevation model

Digital elevation models (Topography input name) must have value NoData in the river bed Figure 72. If this condition is not satisfied, recruitment submodel will assume that the river is uncolonized land and will apply to it the recruitment rules. This would result in wrong results in the Vegetation model outputs.

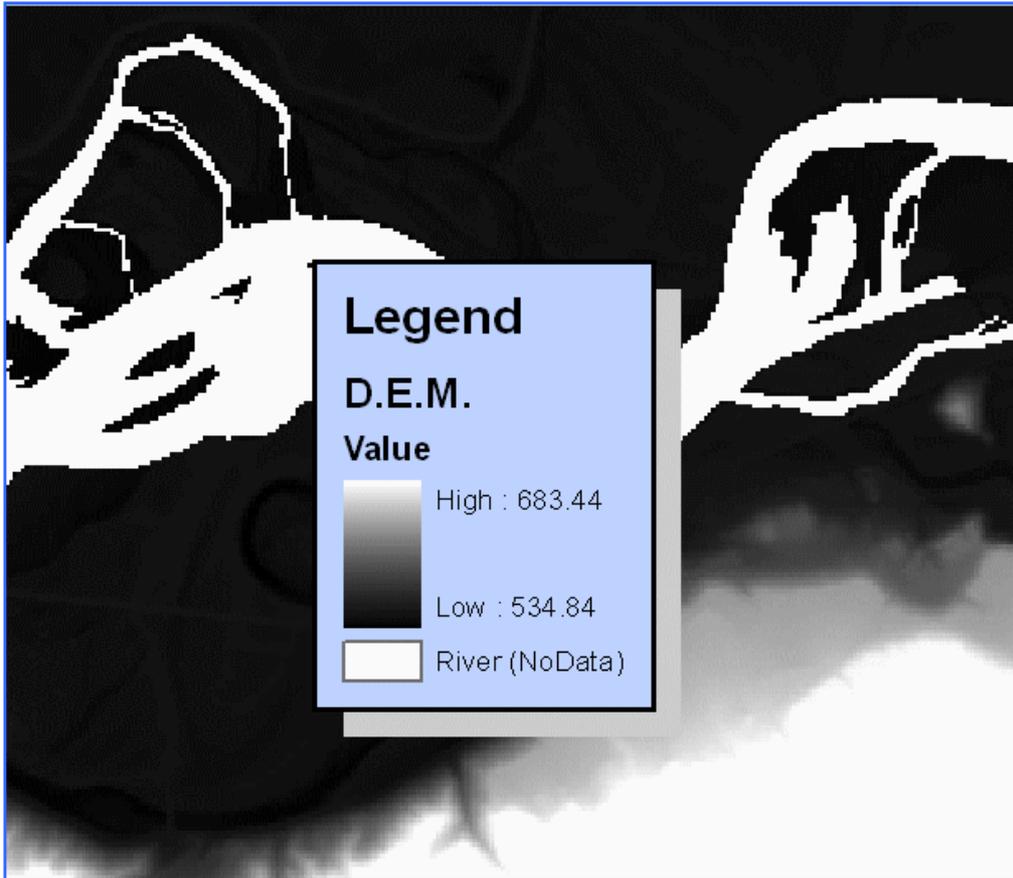


Figure 72 River bed data requirement in a D.E.M. grid

Aquatic, bank and floodplain zone requirements

Aquatic, bank zone and floodplain zone inputs must have value 1 in the zone area and NoData in the study site area not covered by the considered zone. In following figure is shown an example on how bank zone grid should look like. Pixel data type must be integer.

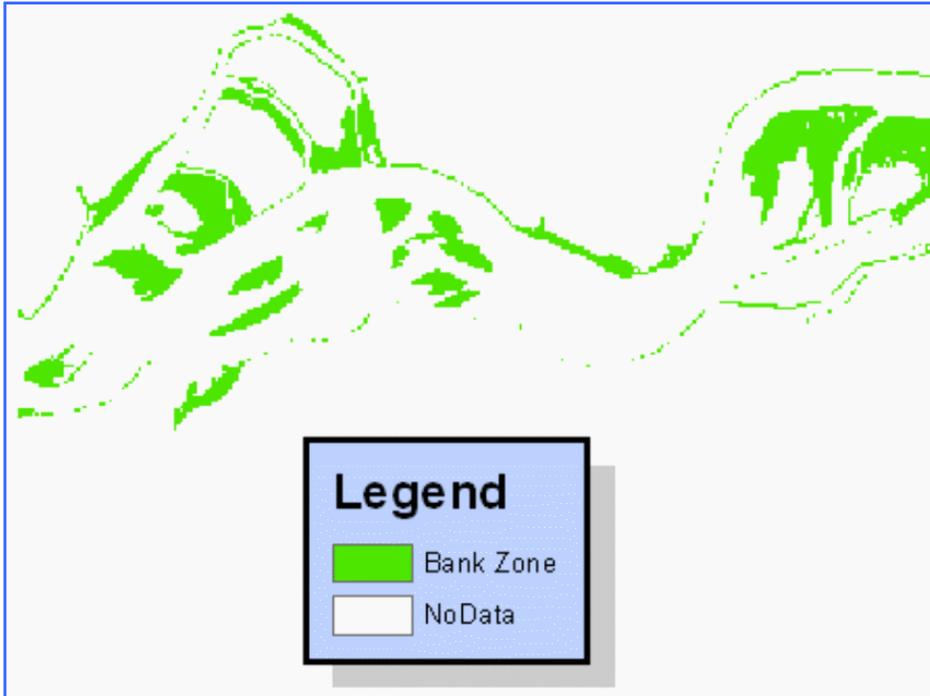


Figure 73 Example of bank zone grid

The map example in Figure 73 shows how a bank zone input could look like. The pixels green colored have value 1 while the white pixels have value NoData. The same pattern, 1 vs NoData must be applied also to aquatic, bank and floodplain zone.

## Reference list

- Benjankar, R. (2009) Quantification of Reservoir Operation-Based Losses to Floodplain Physical Processes and Impact on the Floodplain Vegetation at Kootenai River, USA. , 289pp, University of Idaho.
- Benjankar, R., Egger, G., Jorde, K., Goodwin, P. & Glenn, N.F. (2011) Dynamic floodplain vegetation model development for the Kootenai River, USA. *Journal of environmental management*, **92**, 3058-3070.
- Benjankar, R., Glenn, N.F., Egger, G., Jorde, K. & Goodwin, P. (2010) Comparison of Field-Observed and Simulated Map Output from a Dynamic Floodplain Vegetation Model Using Remote Sensing and GIS Techniques. *GIScience & Remote Sensing*, **47**, 480-497.
- E. Politti, G. Egger, K. Angermann, B. Blamauer, M. Klösch, M. Tritthart, H. Habersack (2011): Evaluating Climate Change Impacts on Alpine Floodplain Vegetation. Euromech Colloquium 523 "Ecohydraulics".15 -17 June 2011, Clermont Ferrand, France.
- Egger, G., Politti, E., Park, M., Woo, H., Cho, K.H. & Cho, H.J. (2010): Application of a Dynamic Vegetation Model to Asses River Management Strategies. 8th International Symposium on Ecohydraulics 2010, September 12 - 16, Seoul, Korea, 16-24
- Egger, G., Politti, E., Park, M., Woo, H., Cho, K.H., Cho, H.J. & Benjankar, R. (2010): A Dynamic Vegetation Model as a Tool for Ecological Impact Assessments of Dam Operation. 8th International Symposium on Ecohydraulics 2010, September 12 - 16, Seoul, Korea, 87-95
- G. Egger, E. Politti, H. Habersack, M. Kloesch, T. Ferreira (2011): Using a Dynamic Vegetation Model as Follow-Up for River Restoration. European Geosciences Union General Assembly 2011. 03-08 April 2011, Vienna, Austria.
- Politti, E. (2008): Riparian Ecosystems Dynamic Model. Master Thesis, Villach (Fachhochschule Technikum Kärnten), 102 pp.
- Francés, F. (2009). RIPFLOW project description. Second Trans-European Water Research Management Conference, Bridging the Sci-Pol gap. Bruselas (Bélgica), 2009.
- Garófano Gómez, V.; Martínez Capel, F.; Delgado Artés, R. (2009). Les riberes del Serpis. Gestió de l'aigua per a la seua conservació. CEIC Alfons el Vell. Gandia. Valencia. 226 pp. (ISBN: 978-84-96839-18-2)
- Francés, F. (2010). Riparian vegetation modelling for the assessment of environmental flow regimes and climate change impacts within the WFD. IWRM-Net Final Conference "Improving Cooperation in Fresh Water Research across Europe", Bruselas (Bélgica), December 2010. Brussels (Belgium)
- García-Arias, A.; Real, J.; Francés, F. (2010). Evaluation of direct anthropic effects over riparian vegetation zonation in five stretches of Mediterranean rivers in Spain. VII European Geosciences Union General Assembly. Viena (Austria), 2010. Ed. Geophysical Research Abstracts, Vol.12 EGU2010-12488, ISSN.1029-7006

Garófano-Gómez, V.; Martínez-Capel, F.; Muñoz-Mas, R.; Costa, R.; Villanueva-García, J. F.; Francés, F. (2010). Response curves of hydrological variables for riparian woody species, oriented to water management of Mediterranean rivers in Spain. Proceedings of the 8th International Symposium on Ecohydraulics. 8th International Symposium on Ecohydraulics. Seoul (Korea). (ISBN: 978-89-87898-40-7 93530)

Real, J.; Morales, M.; García-Arias, A.; Garófano, V.; Martínez-Capel, F.; Francés, F. (2010). Mathematical modeling riparian vegetation zonation in semiarid conditions based on a transpiration index. VII European Geosciences Union General Assembly. Viena (Austria), 2010. Ed. Geophysical Research Abstracts, Vol.12 EGU2010-5482, ISSN.1029-7006

Rivaes, R.; Rodríguez-González, P.; Albuquerque, A.; Ferreira, M.T.; Pinheiro, A. (2010). Uma nova ferramenta de restauro: aplicação de um modelo preditivo da evolução da vegetação ripícola em função das alterações hidrológicas. 2º Seminário sobre Gestão de Bacias Hidrográficas "Reabilitação de Utilização da Rede Hidrográfica". 20 - 21 de Maio, Braga, Portugal.

Rivaes, R.; Rodríguez-González, P.; Albuquerque, A.; Ferreira, M.T.; Pinheiro, A. (2010). Modeling mediterranean riparian vegetation dynamics from hydrologic changes conducted by climate change. 2010 AGU Fall Meeting. 13 - 17 December, San Francisco, USA.

Félix Francés (2011).A definição de caudais ambientais em sistemas fluviais: desenvolvimento do modelo RIPFLOW e as suas aplicações. Oral contribution in II Jornadas de Restauro Fluvial. Associação Portuguesa Dos Recursos Hídricos, Universidade Técnica de Lisboa. March, 14-15. Lisboa 2011.

Emilio Polliti (2011).RIPFLOW Model Application to River Restoration, Kleblach Case Study. Oral contribution in II Jornadas de Restauro Fluvial. Associação Portuguesa Dos Recursos Hídricos, Universidade Técnica de Lisboa. March, 14-15. Lisboa 2011.

Félix Francés, Gregory Egger, Teresa Ferreira, Karoline Angermann, Francisco Martínez-Capel, and Emilio Politti (2011). Riparian vegetation dynamic modelling using the succession-retrogression concept: the RIPFLOW project. Geophysical Research Abstracts Vol. 13, EGU2011-11851, 2011., ISSN.1029-7006. VIII European Geosciences Union General Assembly 2011. Vienna, Austria. April, 2011.

Alicia García-Arias, Félix Francés, Francisco Martínez-Capel, Rui Rivaes, Patricia Rodríguez-González, Antonio Albuquerque, and Teresa Ferreira (2011). Analysis of the riparian vegetation dynamics through the RIPFLOW model. Disturbed flow scenarios in Mediterranean rivers. Geophysical Research Abstracts Vol. 13, EGU2011-13084, 2011., ISSN.1029-7006. VIII European Geosciences Union General Assembly 2011. Vienna, Austria. April, 2011.

Garófano-Gómez, V.; Martínez-Capel, F.; Rodríguez-González, P.; Rivaes, R.; Albuquerque, A.; Ferreira, T.; Egger, G.; Politti, E.; Vallés, F.; Andrés, I. (2011). Analyses of succession-retrogression for dynamic modelling of riparian vegetation in the RIPFLOW project. VIII European Geosciences Union General Assembly 2011. Vienna, Austria. April, 2011. Geophysical Research Abstracts Vol. 13, EGU2011-13094, ISSN.1029-7006.

García-Arias, A.; Francés, F.; Rivaes, R.; Rodríguez-González, P.; Albuquerque, A.; Ferreira, T.; Egger, G.; Politti, E. (2011). Analysis of the riparian vegetation dynamics through the RIPFLOW model. Climate change scenarios in three European countries. HydroEco 2011 3rd Int. Conference on Hydrology and Ecology: Ecosystems, Groundwater and Surface water. Pressures and Options. Volume of abstracts p. 141-142 (H. P. Nachtnebel & K. Kovar, Eds.). ISBN: 978-3-900962-95-1. Viena (Austria), 2011.

A. García-Arias, F. Francés, I. Andrés-Doménech, F. Vallés, V. Garófano-Gómez, F. Martínez-Capel. (2011). Modelling the spatial distribution and temporal dynamics of Mediterranean riparian vegetation in a reach of the Mijares River (Spain). EUROMECH Colloquium 523 Clermont-Ferrand, France, 15-17 June, 2011. Volume of extended abstracts, p. 153-157 (C. Chomette & J. Steiger, Eds.). ISBN 9-782845-165298.

A. García-Arias, F. Francés. (2011). Climate change scenarios effects analyses over the riparian vegetation dynamics in a Mediterranean reach (Mijares River, Spain).SEFS 2011 - 7th Symposium for European Freshwater Sciences "Freshwater ecosystems - Challenges between conservation and management under global change". Girona, Spain. June 27th - July 1st, 2011. Book of abstracts, p. 80 (Asociación Ibérica de Limnología Ed., L. Zamora & S. Sabater, Comp.). ISBN: 978-84-937882-2-3

G. Egger, E. Politti, V. Garófano-Gómez, B. Blamauer, M. T. Ferreira, R. Rivaes, R. Benjankar, and H. Habersack, "Embodying interactions of riparian vegetation and fluvial processes into a dynamic floodplain model: concepts and applications," in Ecohydraulics: an integrated approach, I., I. Maddock, A. Harby, P. Kemp, and P. Wood, Eds. Chichester, UK: John Wiley & Sons Ltd, 2013, pp. 407–427.

R. Benjankar, K. Jorde, E. M. Yager, G. Egger, P. Goodwin, and N. F. Glenn, "The impact of river modification and dam operation on floodplain vegetation succession trends in the Kootenai River , USA," Ecol. Eng., vol. 46, pp. 88–97, 2012.

A. García-Arias et al., "Implementing a dynamic riparian vegetation model in three European river systems," Ecohydrology, vol. 6, no. 4, pp. 635–651, Oct. 2012.

E. Politti, G. Egger, K. Angermann, R. Rivaes, B. Blamauer, M. Klösch, M. Tritthart, and H. Habersack, "Evaluating climate change impacts on Alpine floodplain vegetation," Hydrobiologia, vol. In press, 2014. DOI: 10.1007/s10750-013-1801-5



