Water Erosion Prediction Project (WEPP)

Windows Interface Tutorial

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WEPP Windows Quick Start Guide

This version of the Water Erosion Prediction Project (WEPP) model is designed to run on personal computers under the Microsoft Windows 95 and above operating systems.

The WEPP Windows interface software can be either downloaded from the NSERL web site at:

http://topsoil.nserl.purdue.edu

The installation file is **wepp2012install.exe** – double-click on the file and the installation program will begin. Follow the on-screen instructions to install the WEPP model, CLIGEN climate generator, and Windows interface for WEPP.

Disclaimer

All WEPP information, computer software, and databases are believed to be accurate and reliable. The main objective of the Water Erosion Prediction Project model is for it to be used as a soil conservation planning tool by USDA, other federal, state, and local agencies, and private consultants, individuals, and organizations involved in natural resource planning and assessment. The United States Department of Agriculture, the Agricultural Research Service, and Purdue University accept no liability or responsibility of any kind to any user, other person, or entity as a result of installation or operation of this software. The software is provided "AS IS," and you, its user, assume all risks when using it.

WEPP is in the public domain and you are free to use it. ARS would appreciate your comments on the model's capabilities and limitations. Please send comments to WEPP Technical Support at the USDA-ARS National Soil Erosion Research Laboratory (NSERL).

The WEPP programs, databases, and other information were developed with funds from agencies of the United States Government, and legally may not be copyrighted.

If the executable code of the current version is downloaded and used within a larger software package, please acknowledge the source and include this preface.

Requests for additional information should be made to:

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WEPP Windows Interface Tutorial

Introduction

This WEPP software consists of an erosion prediction model (WEPP) written in the FORTRAN programming language, a climate generator program (CLIGEN) also written in the Fortran programming language, and a Windows interface (WEPPWIN) written in the Visual C++ programming language. The interface accesses databases, organizes WEPP and CLIGEN simulations, creates all necessary input files for WEPP and CLIGEN, and executes the science models when necessary. The interface also accesses and processes output information from the models for display and access by the user.

Section 1. WEPP Software Installation

The WEPP model and Windows interface can be installed from the installation program downloaded from the NSERL web site. At the time of this document revision, the installation executable file was **wepp2012install.exe**. This install program includes the August 2012 WEPP model release.

Use Windows Explorer to locate the installation file "wepp2012install.exe" in the directory in which you downloaded it from the NSERL Web site. Use the mouse to double-click on the **wepp2012install.exe** file. This will start the installation process.
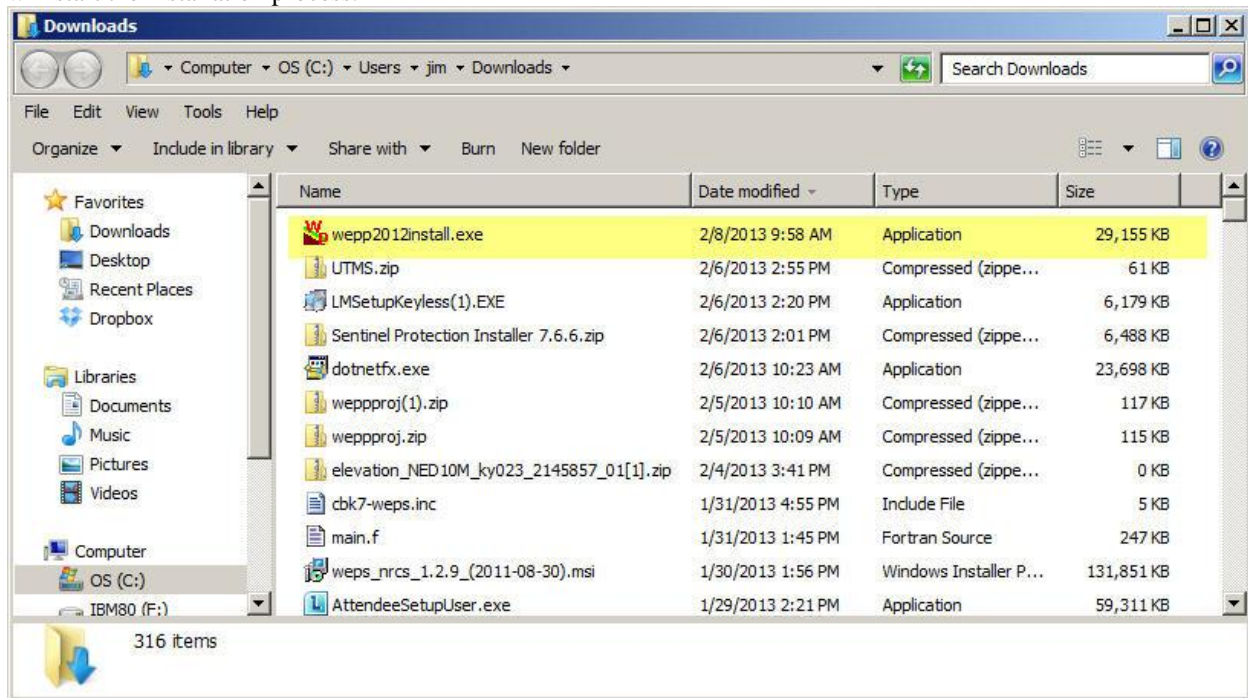
The installation process includes the following screens:

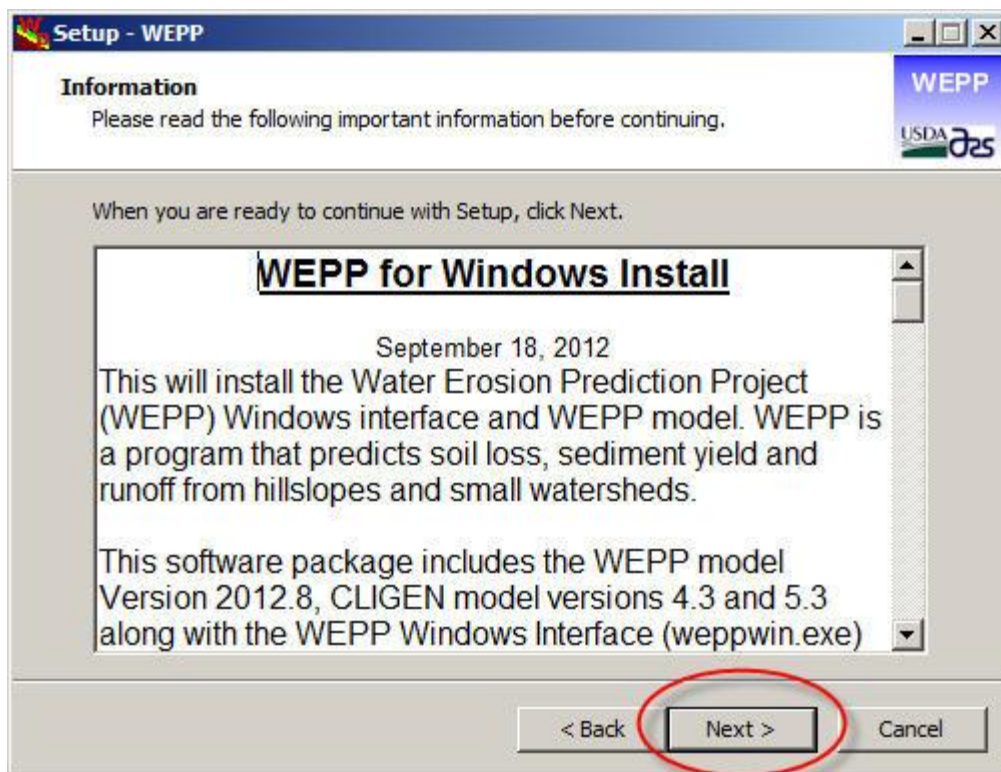**Figure 1 Welcome Screen: Click the Next> button**

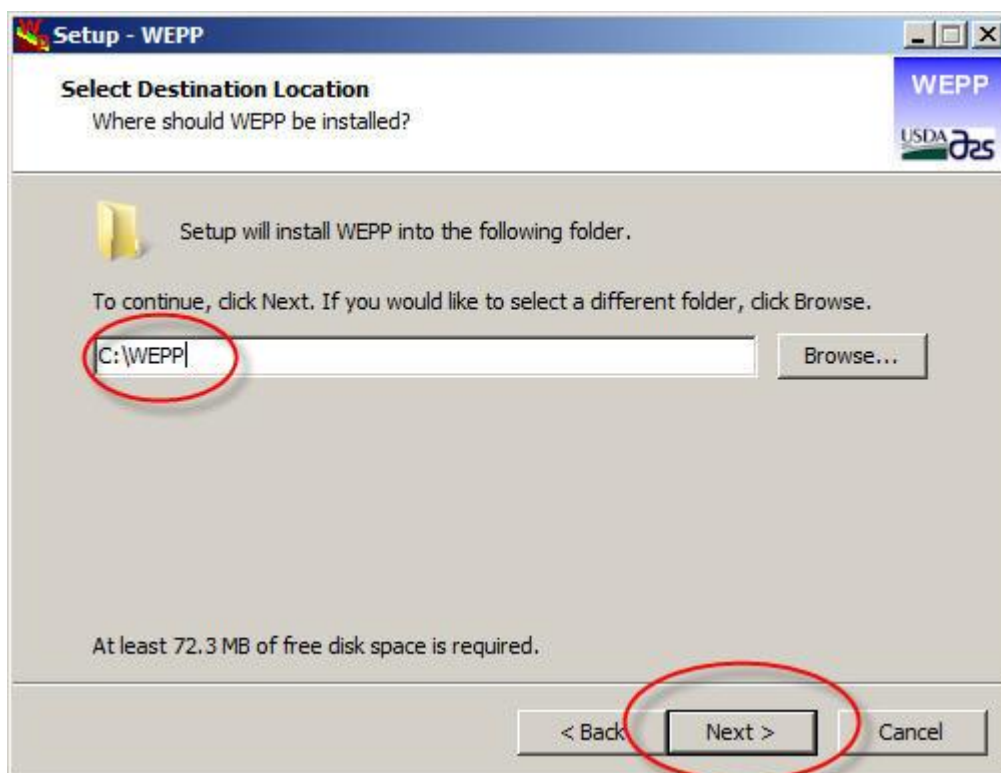**Figure 2 General Information on Release: Click the Next> button**

Figure 3 Choose Install Directory: Click the Next> button.

You can install the WEPP programs to the default directory, which is c:\wepp, or you can choose a directory of your own. Choose the default location by clicking Next.
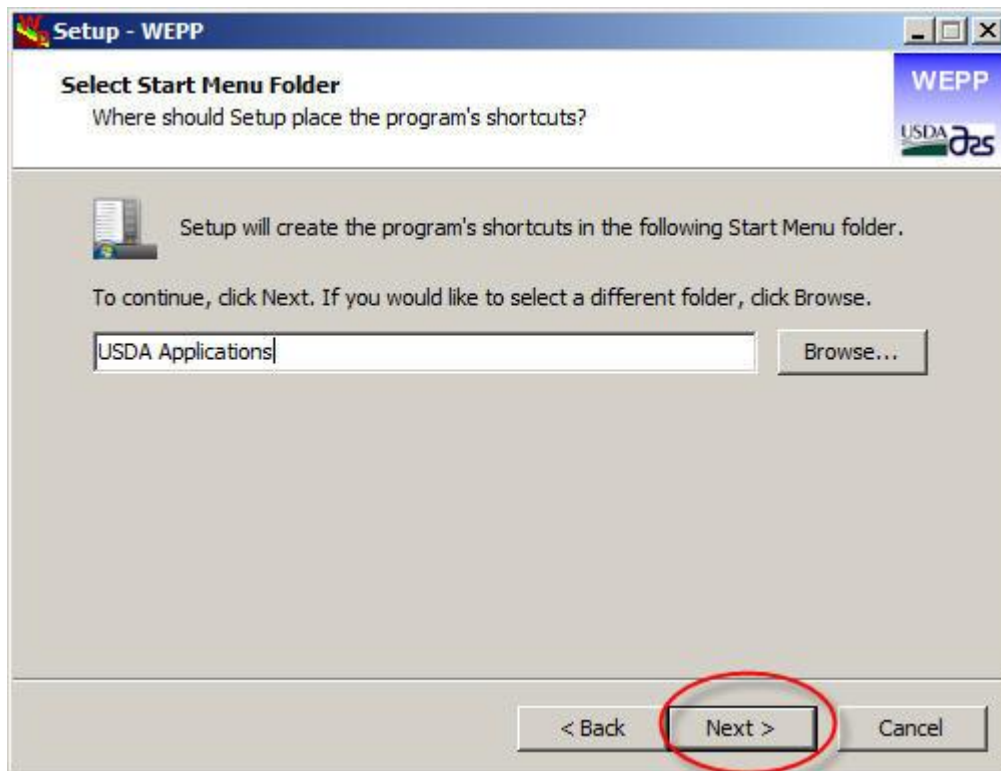

Figure 4Choose Start Folder Name: Click Next> button.

The user can then select the Program Folder in which to locate the program icons. The default USDA Applications is chosen, then the user clicks on the Next button.
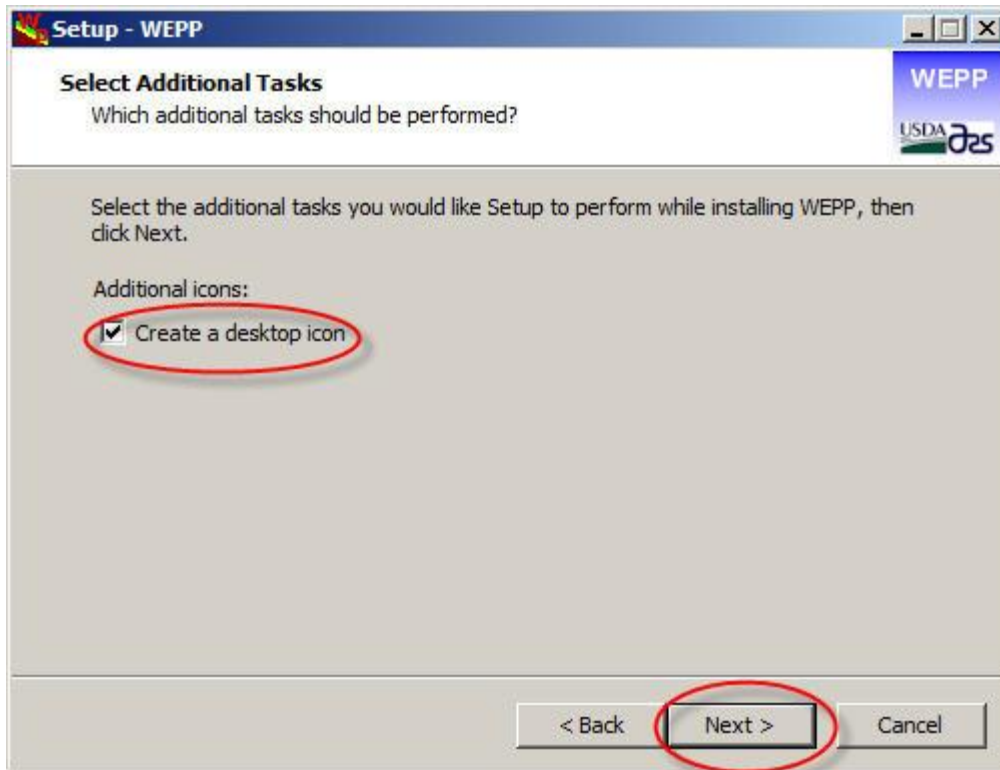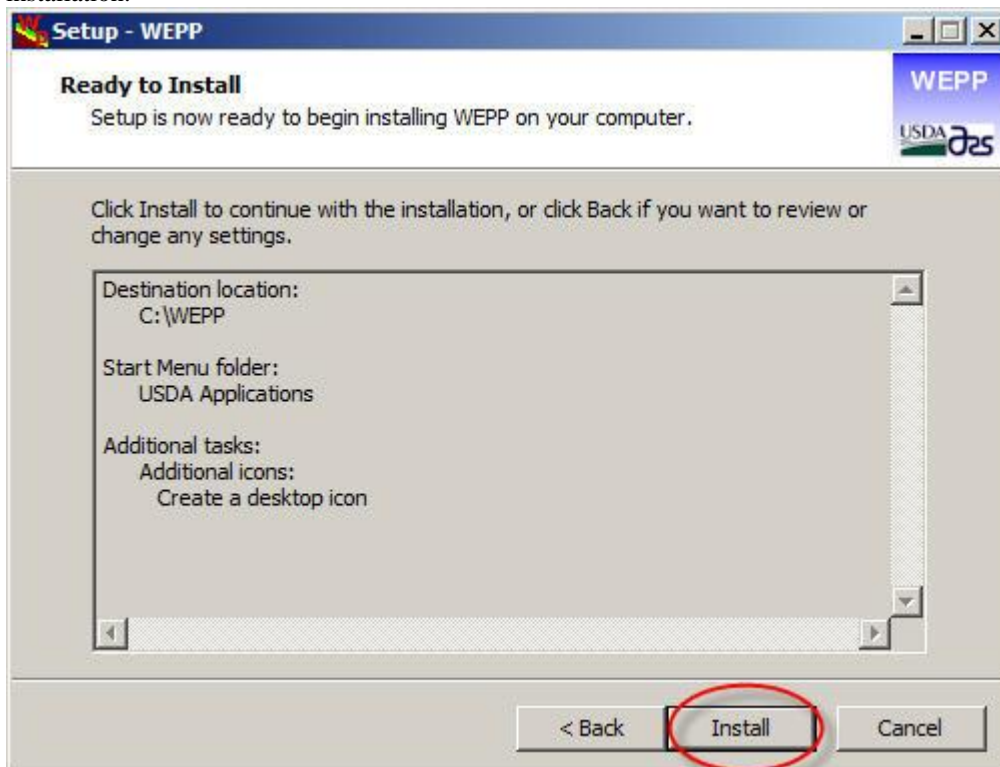
Figure 5 Install Desktop icon: Click Next>

The setup for the installation is now complete, and the information on the current settings are provided in the following screen. If the user is happy with the settings, they will click on the Next button to proceed with the WEPP installation.

The installation now proceeds automatically, installing the WEPP model, CLIGEN model, and WEPP Windows interface to the user's computer, with the screen below visible as the files are copied.
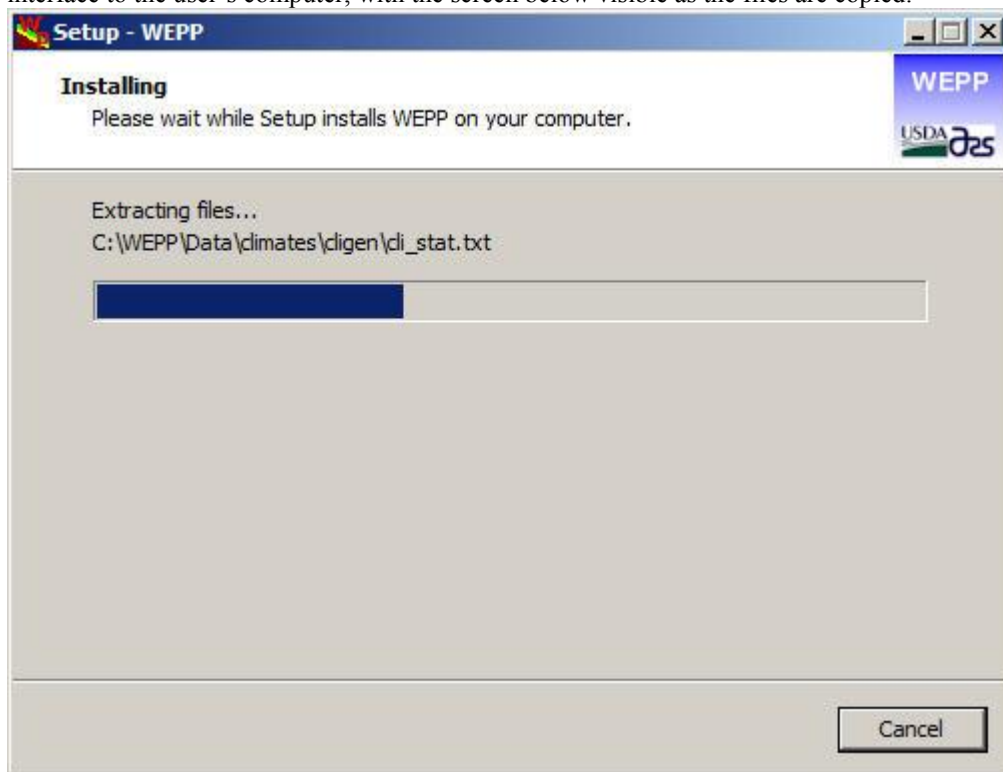

Figure 6 Copying files

Once all of the files have been copied and registries updated, the installation program produces the following final screen. The user clicks the Finish button to end the installation.

Figure 7 Installation Complete

The WEPP Windows program can now be run by clicking on the Start button on the Windows toolbar, then moving the mouse cursor to Programs, then to **USDA Applications** then to **WEPP** Interface, as shown in the screen below and clicking with the left mouse button. This will start the program.
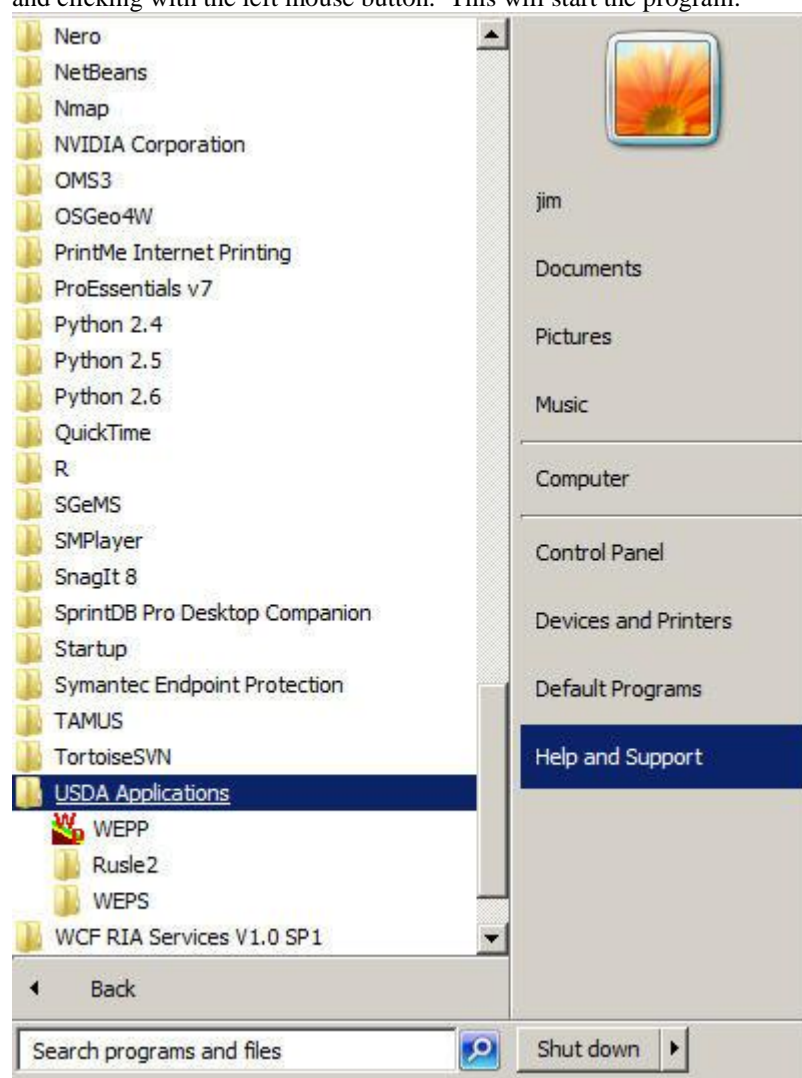

You can also start the program by clicking on the desktop icon.

Section 2. Running WEPP – Basic profile simulation run

### A. <u>Starting the Interface and Running the Default Project</u>

Start the WEPP program by selecting the WEPP Interface under Programs, or clicking a created shortcut icon. The main program startup screen will appear. The interface loads with a default hillslope profile project visible, with all inputs ready to make a WEPP simulation run (the default project can be changed and overwritten by the user).
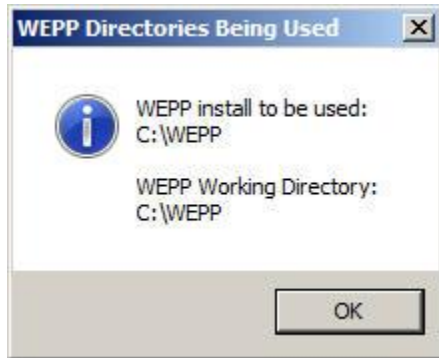
The WEPP Windows interface organizes simulation setups by **projects**. A project is a file that describes how to run a simulation, what model options are used and the data necessary to create the model input files.
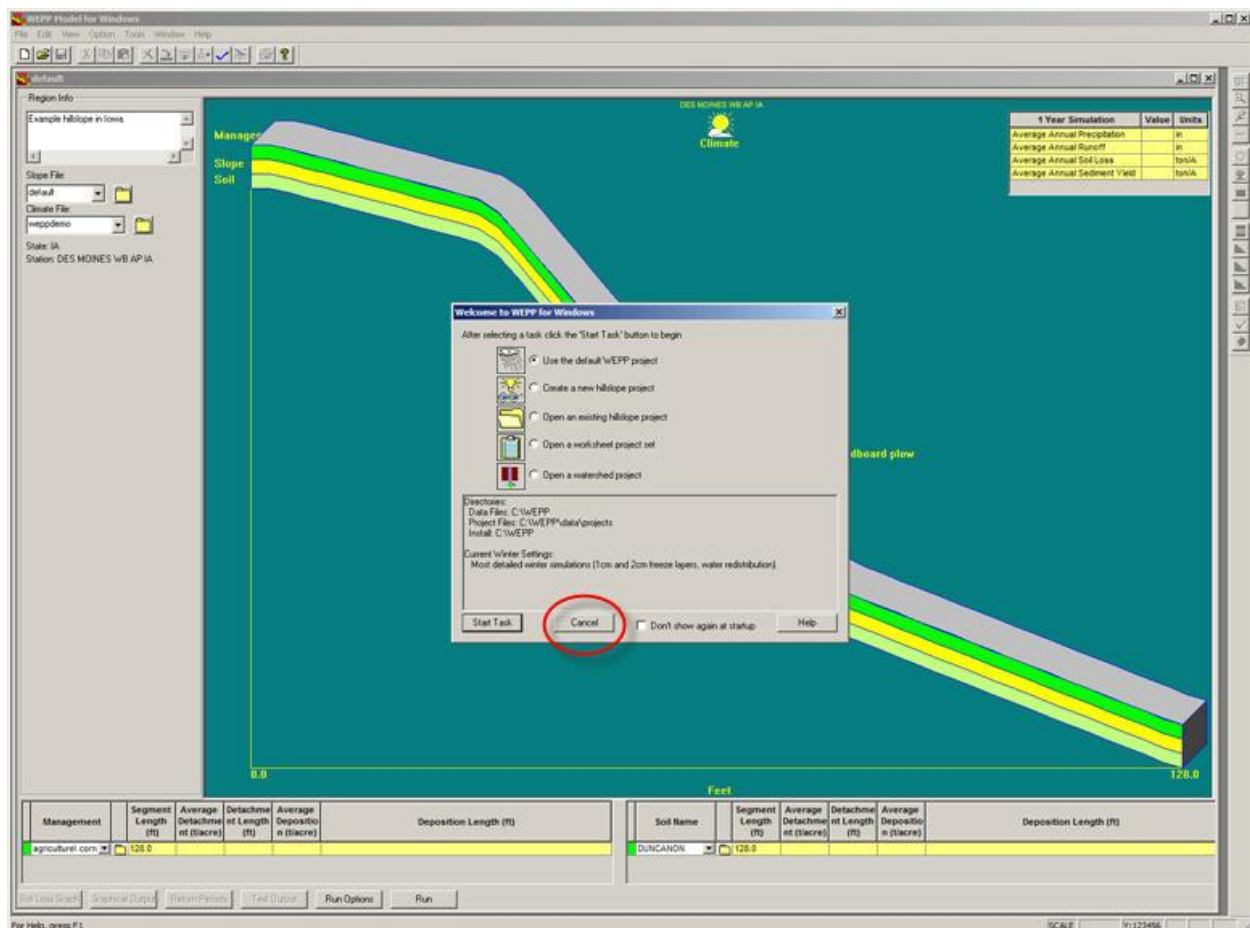
The Start screen allows a user to run the default WEPP project, or to access other types of WEPP projects. The Start screen can also be turned off so that it does not appear when the interface is started again by checking the box at the lower right of the window.
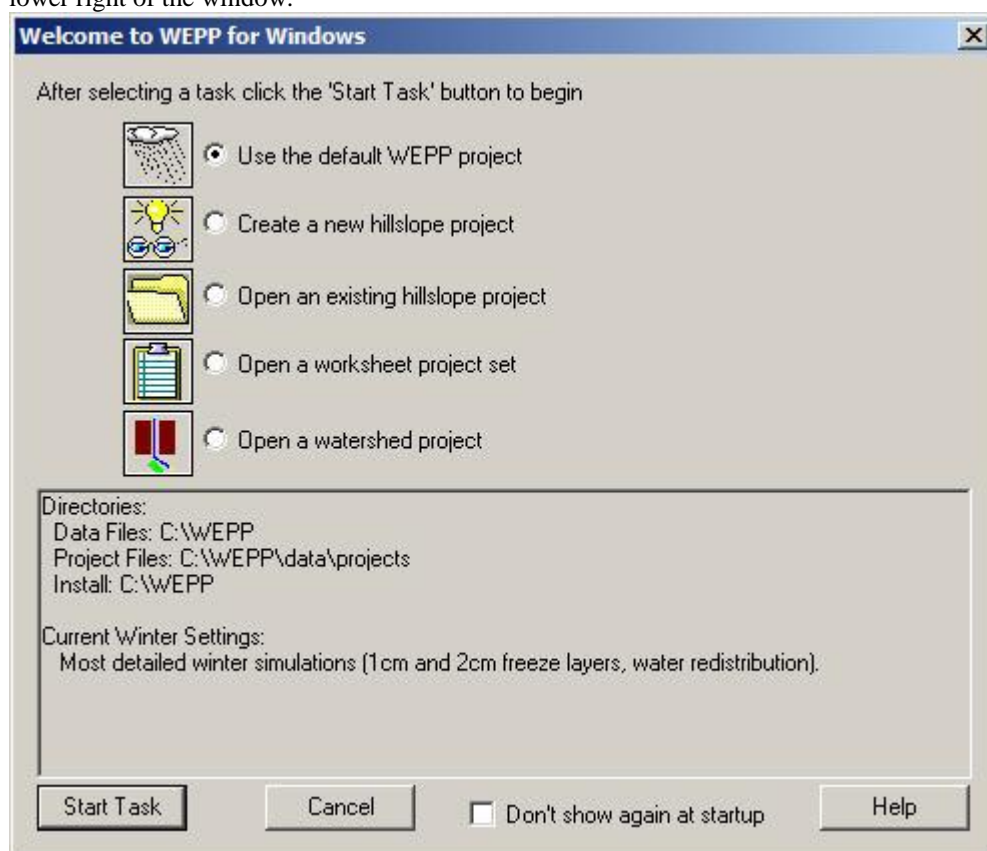
The task selector screen determines what project is initially displayed:

1. **Use the default WEPP Project** – Loads and runs default project
2. **Create a new hillslope project** – Steps for creating a new project
3. **Open an existing hillslope project** – Loads an existing project
4. **Open a worksheet project set** – Loads a spreadsheet of existing projects
5. **Open a watershed project** – Loads a watershed simulation project

If you just select the default to **Use the default WEPP project**, then click on the Start Task button, the interface will run the WEPP model with the default inputs and display the results on the main profile screen, displayed below.
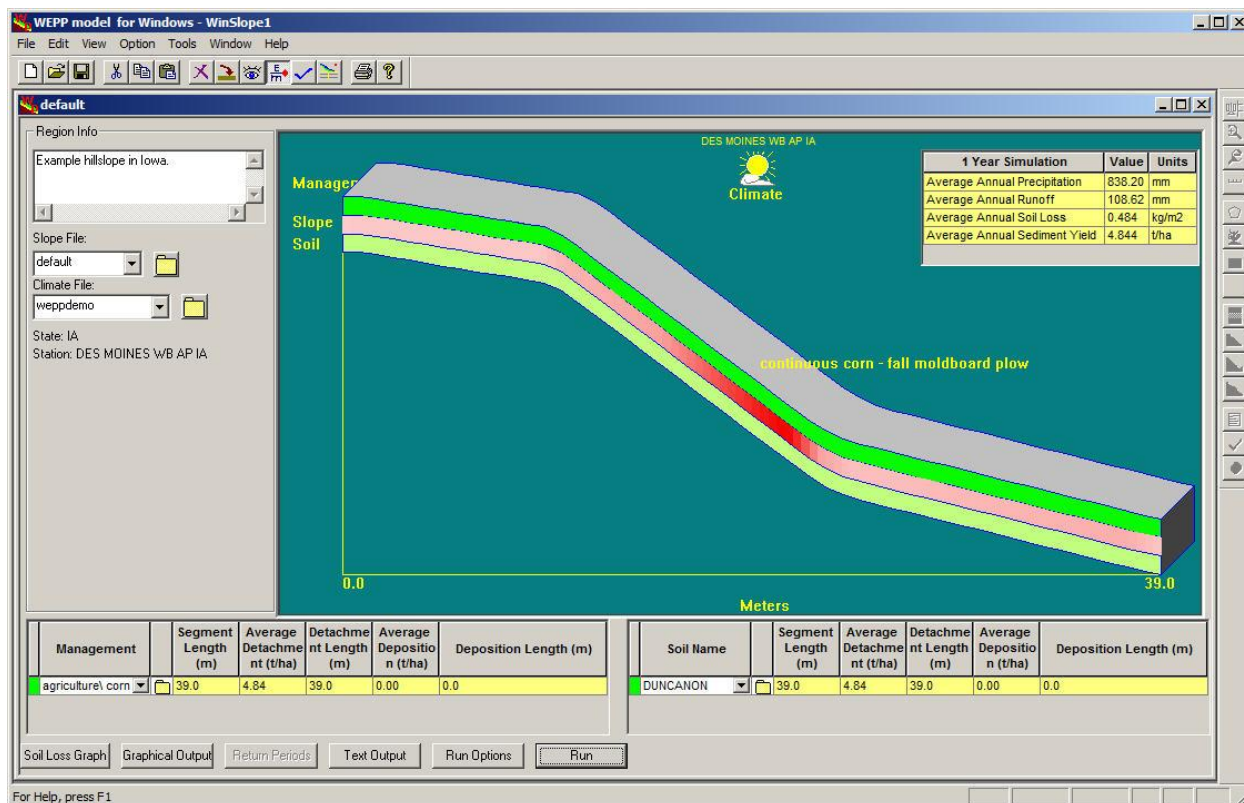
The main Windows interface screen shows a graphical depiction of a hillslope profile, with various areas providing access to input databases and output display. The profile shape is drawn based upon the model slope inputs, which can be accessed through the middle layer on the graphic. Soil information can be accessed through the bottom layer on the graphic, and the cropping/management information through the top profile layer. Climate inputs can be selected or generated through the icon at the top center of the screen. The horizontal profile length dimensions are provided at the bottom of the screen in either metric or English units.

Notes associated with the project can be viewed and entered in the note area at the upper left of the screen. The input slope file used in the current project is listed as is the input climate file, and both the **Slope File** and **Climate File** entry fields have drop downs which allow selection of any other existing files in the database. The small file folder icons to the right of the these input areas allow direct access to the slope and climate view/editing screens.

At the bottom of this screen is detailed information on soil detachment and deposition by management and by soil region. In the default project there is only a single management and soil, so only a single line is displayed. The name of the management rotation and the soil information from the databases being used in the current simulation are displayed on the first line of the table, and other managements or soils can be selected from the dropdown lists. Clicking on the small file icons to the right of the management or soil names will access the management rotation editor or the soil editor, respectively.

B. Viewing Model Output from the Default Project Run

Since the model has already run for the default input set, hydrologic and soil loss output is displayed on the screen in both the small table at the upper right corner of the screen, as well as in the slope (middle) layer on the profile. The table provides average annual precipitation, runoff, soil loss (from detachment regions), and sediment yield from the entire profile, with the years of simulation run shown as the table header. The average annual soil loss or deposition is shown in shades of red or green, respectively, in the slope layer. In the screen image above, the maximum erosion is predicted to occur in the center part of the profile, where slope steepness is greatest. Also, erosion rates are lower near the top and bottom of the profile, and no deposition is predicted on the profile. Soil loss or deposition values at

individual points down the profile can be displayed by hovering the mouse cursor over the slope layer at the desired location.

Additional output can be viewed by clicking on the Soil Loss Graph, Graphical Output, or Text Output buttons at the bottom of the main screen. Each of these is discussed below.
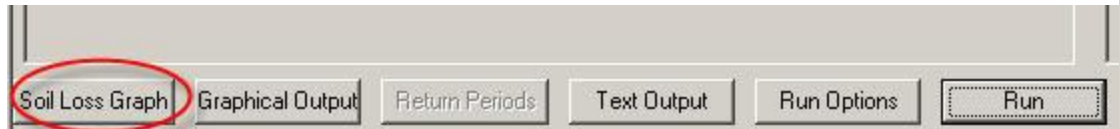

Soil Loss Graph

A graph of soil erosion and deposition for the profile can also be displayed by clicking on the **Soil Loss Graph** button. The following window will appear which depicts the spatial average annual soil loss values down the profile – the information is the same as that in the profile shown on the previous page in shades of red and green.
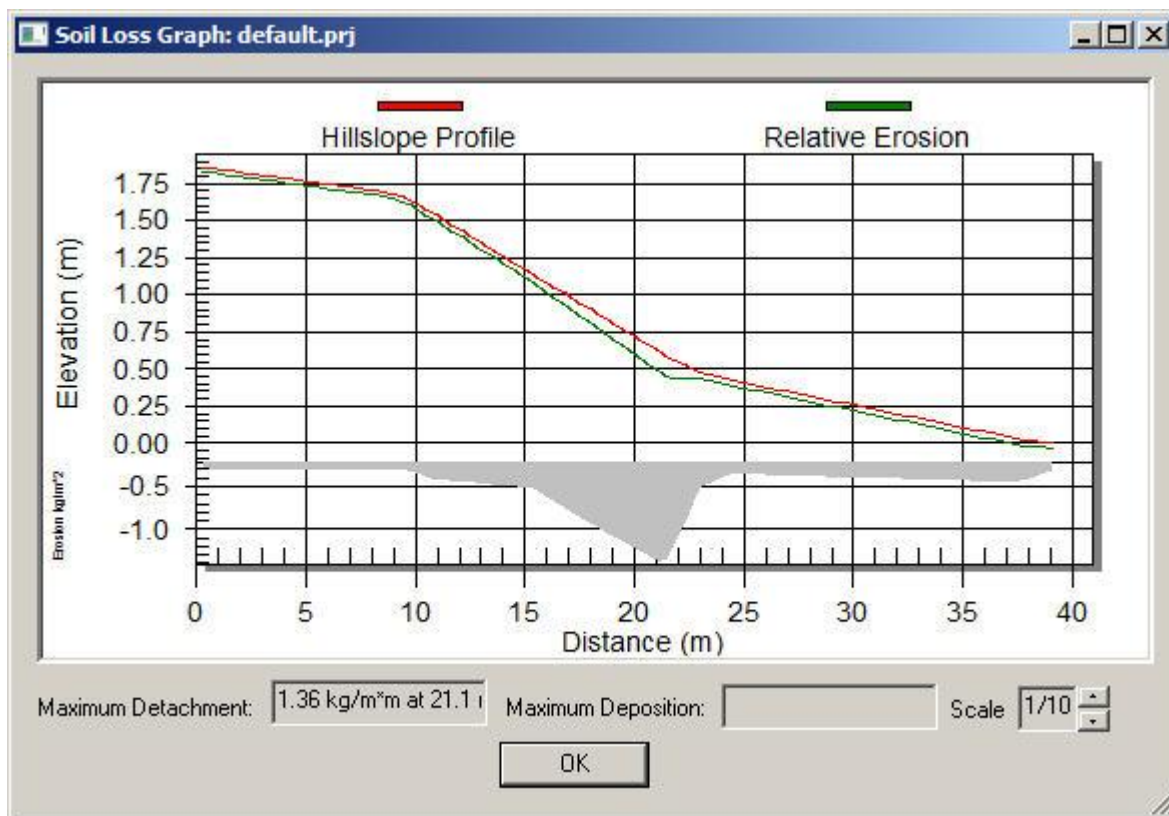
The dark red line represents the slope profile. The green line near the slope profile is a representation of the soil loss or deposition for the corresponding points on the profile. Where the two lines are close together little erosion is occurring, where the lines are further apart more erosion is occurring. In the graph above most soil loss is occurring towards the end of the steeper middle section. The shaded area graph at the bottom is the same information displayed with the actual rates on the Y axis.

Text Output

Text output from the WEPP model can be selected and viewed by clicking on the **Text Output** button at the bottom of the main screen. In addition to the WEPP model output files the model input files can also be viewed.
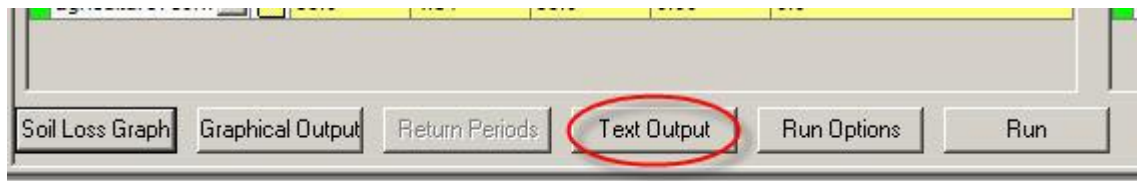
A small window will appear listing the available WEPP text files to view: Either select the desired output and click on the View button, or just double click on the desired output name.
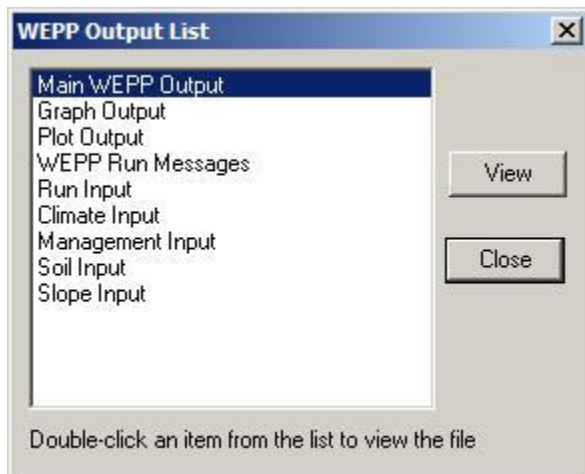
The default text file to view is the Main WEPP Output. This output file contains the detailed hydrologic and erosion results from the simulation, and is displayed in either Notepad or Wordpad.

```
loss_0.txt - Notepad
File  Edit  Format  View  Help

        ANNUAL AVERAGE SUMMARIES
        -----------------------


I.    RAINFALL AND RUNOFF SUMMARY
      -------- --- ------ -------

      total summary:  years    1 -    1

        112 storms produced                     838.20 mm of precipitation
         11 rain storm runoff events produced    67.14 mm of runoff
          5 snow melts and/or
             events during winter produced       41.48 mm of runoff

        annual averages
        ---------------

         Number of years                              1
         Mean annual precipitation                838.20    mm
         Mean annual runoff from rainfall          67.14    mm
         Mean annual runoff from snow melt
            and/or rain storm during winter        41.48    mm


II.   ON SITE EFFECTS   ON SITE EFFECTS   ON SITE EFFECTS
      ---------------   ---------------   ---------------


  A.  AREA OF NET SOIL LOSS

      ** Soil Loss (Avg. of Net Detachment Areas) =    0.484 kg/m2 **
      ** Maximum Soil Loss  =    1.359 kg/m2 at   21.07 meters **


      Area of    Soil Loss   Soil Loss   MAX    MAX Loss   MIN   MIN Loss
      Net Loss    MEAN        STDEV      Loss    Point     Loss   Point
       (m)       (kg/m2)     (kg/m2)   (kg/m2)    (m)     (kg/m2)  (m)
      -----------------------------------------------------------------
      0.00-  39.02    0.484     0.269     1.359   21.07    0.269    0.39
```

Graphical Output

An additional graphical output from the model is available (when selected in the Run Options screen) which displays 90 daily parameter values from the WEPP model. To view the graphical output, click on the Graphical Output button at the bottom of the main screen.
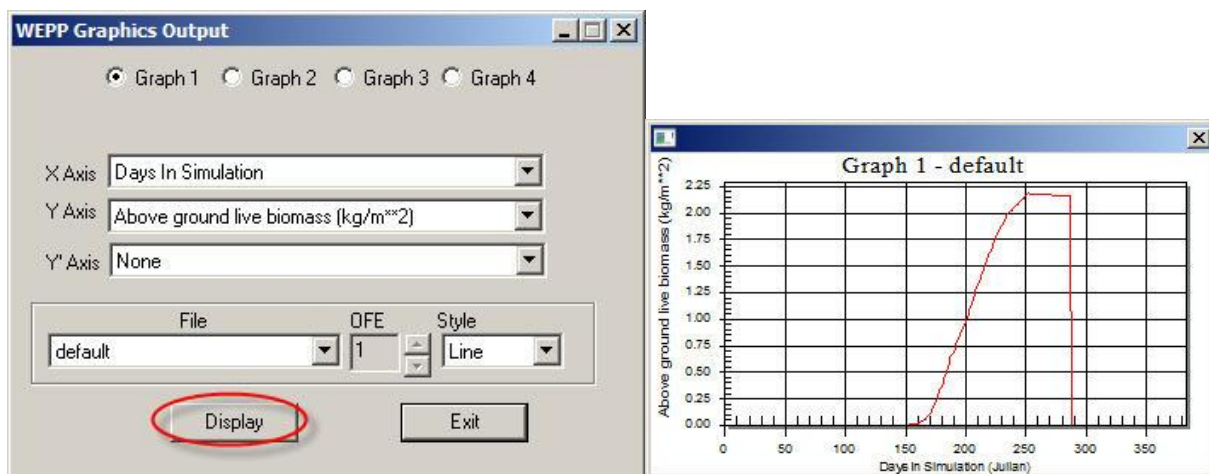
When the graphics output window appears, use the drop-down lists to select variables for the Y, Y'(second axis on right), and X axes. The plotting style can also be changed, and variables which have unique values on individual Overland Flow Elements (OFE – which is a region on a profile of homogeneous soil and cropping/management) can be displayed. Up to four graphs can be displayed at one time. The graphs have many options, such as resizing and printing. Right click with the mouse when the cursor is over a graph to display these options. Zooming is accomplished clicking and holding down the left mouse button on the left edge of the region to be zoomed into, then dragging the mouse cursor to the right edge of the zoom region.

C. Changing WEPP Model Run Options and Running the Current Project

Two additional buttons at the bottom of the main screen allow you to Run the WEPP model for the current project as most recently configured, and to change the Run Options for the project. Click the Run Options button.
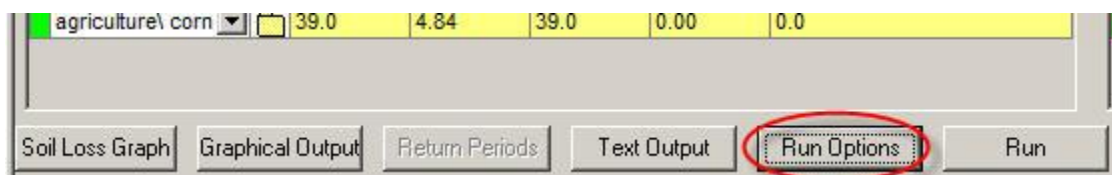
The Run Options screen will appear. This screen allows you to select the types of WEPP output you would like to create, as well as the number of years in a continuous simulation. In normal WEPP applications, a simulation period of 30-100 years is recommended. However, a 30-100 year simulation will generate extremely large model output files. If you run long simulations, select Annual, abbreviated as the output option and do not check most output options.


17
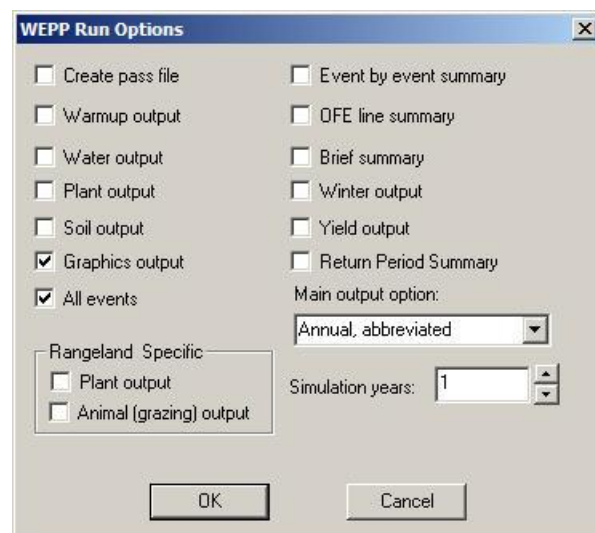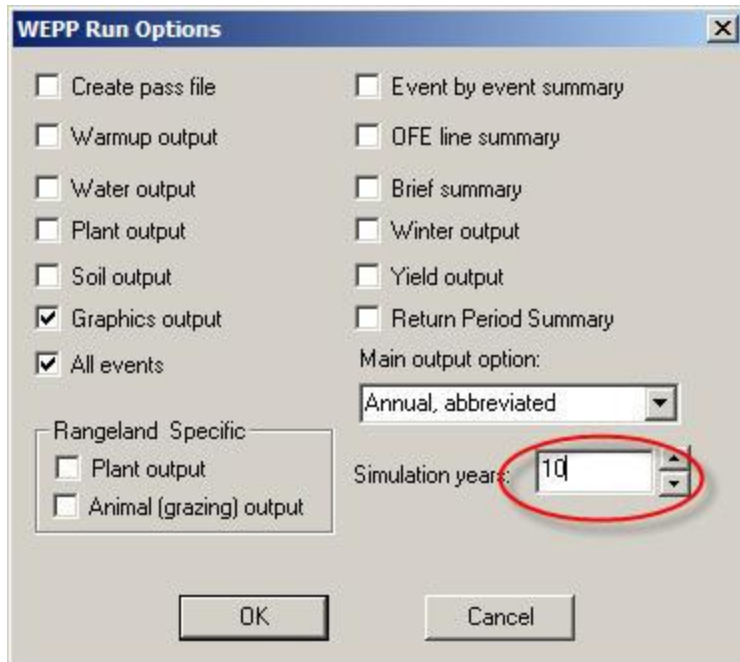
Let's change the Simulation years from 1 to 10, then click the OK button. Once back to the main profile screen, click the Run button to run the WEPP simulation again, this time for 10 years.
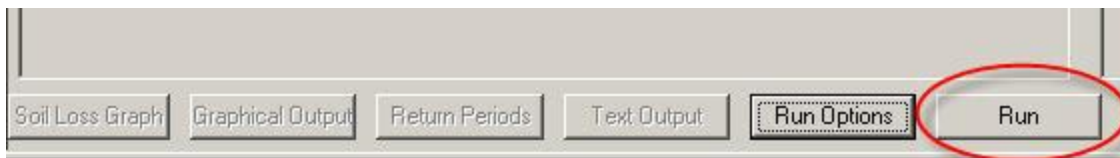
A small window will appear in the center of the screen which displays the progress of the WEPP model simulation.

When the new 10 year simulation is completed, the numbers in the output displays will all be updated.
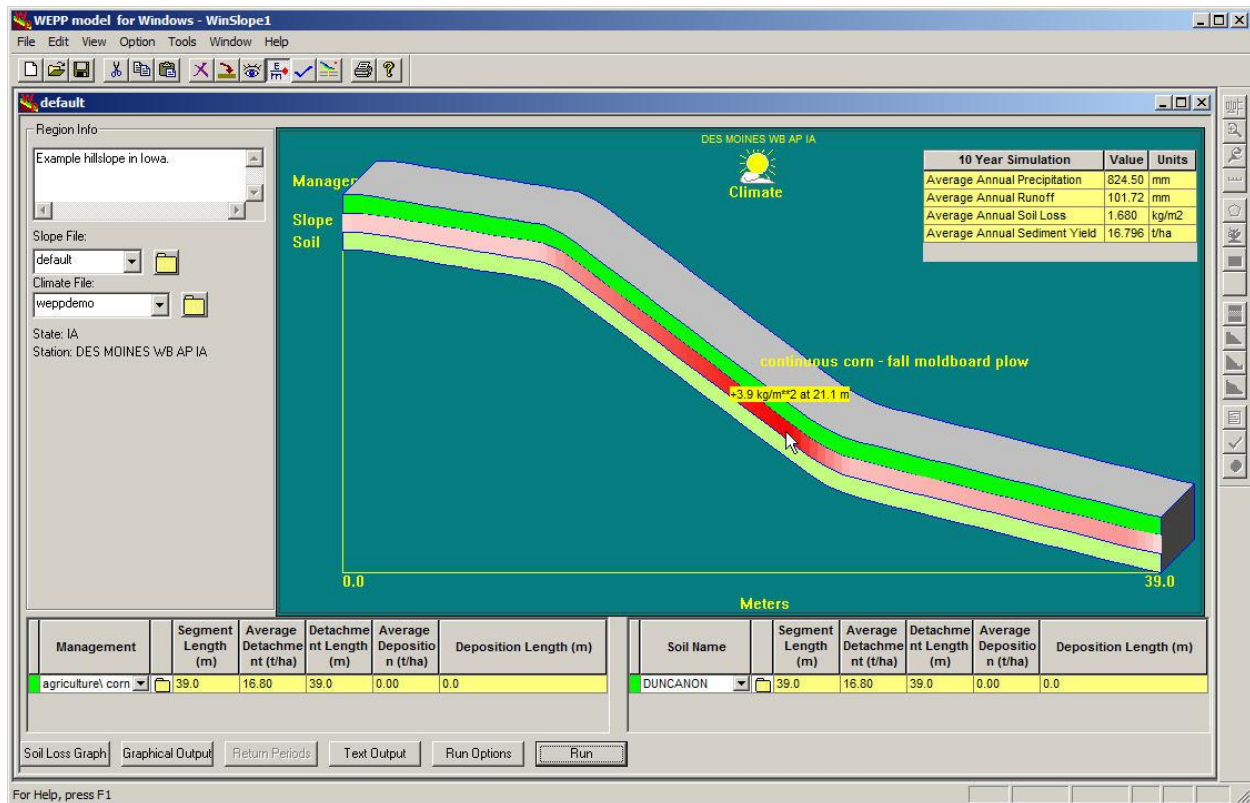
D. Return Period Analysis

Return period (also known as recurrence interval) is the average elapsed time between occurrences of an event with a certain magnitude or greater.

Methodology used: The daily event data are ranked from the smallest to the largest after zero values are removed. Using the Weibull plotting position formula, the return period between occurrences of each event is computed as

$$\text{Return Period} = (N/k)/[1-R/(k+1)]$$

Where N is the number of years of data, k is the number of events, and R is the rank (with 1 being the rank of the smallest value and k being the rank of the largest value).

It is recommended that for return period estimates, a minimum run length be at least twice as long as the longest return period. Results should be carefully scrutinized to ascertain reasonableness, and in some cases where very few events occur, such as for desert or dryland conditions, much longer run lengths may be needed.

To setup return period outputs click on the **Run Options** button and select the Return

Period Summary item. Also change the number of years for the simulation to 100. The graphics output item should not be selected.

Next, click OK to return to the main WEPP window and ten click the run button. This will run a 100 year WEPP simulation. The Return Periods button should now be active at the bottom of the screen.

Click on the **Return Periods** button to display the return period table. The longest return period is ½ of the simulation time. The results show the magnitudes of different events and how often they may occur. For example, every 25 years, one runoff event 47.7 mm in depth could occur.
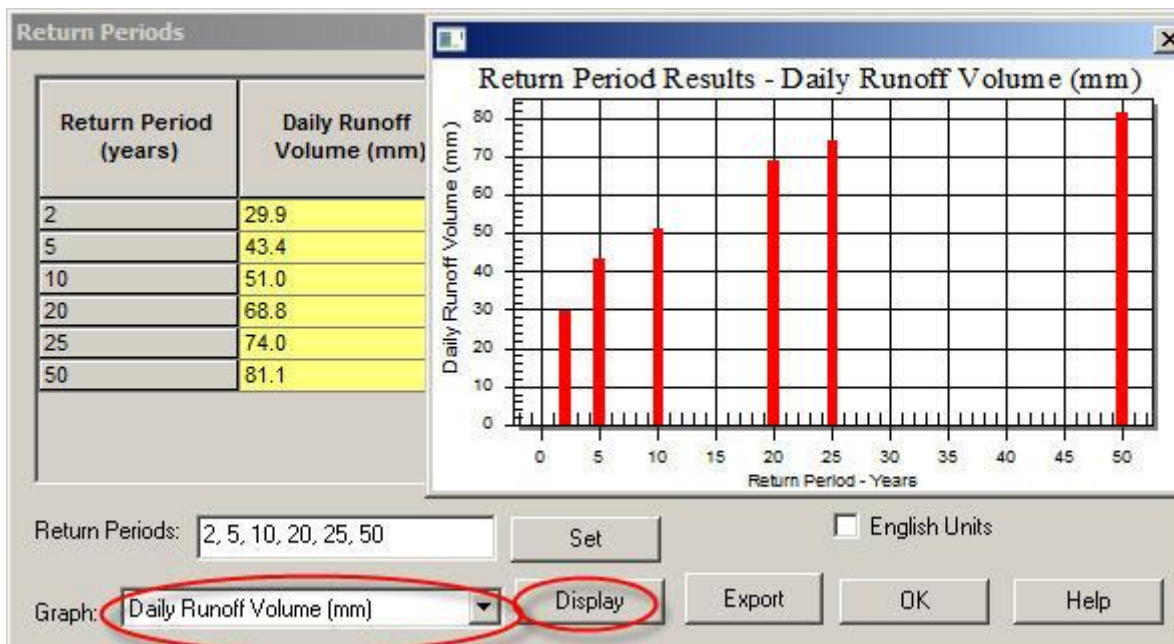
The times for the return period can be adjusted by changing the return period field and then clicking the **Set** button. The results can also be displayed in a graph by selecting the column to graph and then clicking the **Display** button.

E.   The Upper Toolbar Icons for Performing Common Tasks

The toolbar at the upper part of the screen contains 14 icons that allow a user to rapidly accomplish common tasks. Some of these tasks are typical of any Windows program, while others are specific to the WEPP interface. The entire set of buttons looks like this:
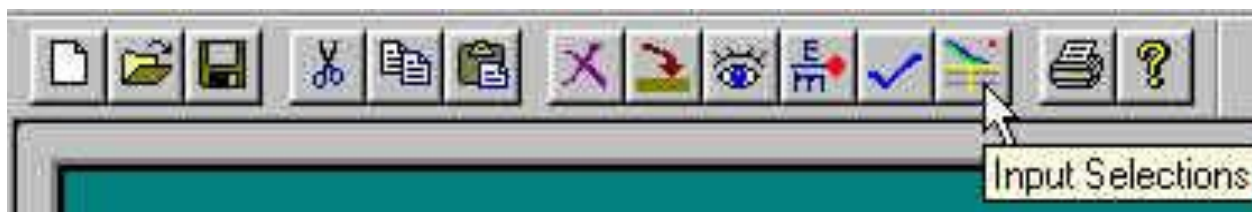
The icons left to right represent opening a new project, opening an existing project, saving the current project; cutting, copying, pasting, and deleting active areas on the screen (when possible); importing and view/editing active layers; toggling between English and metric units; customizing user display preferences; toggling between the standard profile view and one with input choices on the main screen; printing output information for the active project; and accessing the on-line help for the interface.

Changing the main View

If the user clicks on the view toggle as shown in the previous figure, the main project screen will change to:

100 Year Simulation	Value	Units
Average Annual Precipitation	818.40	mm
Average Annual Runoff	95.67	mm
Average Annual Soil Loss	1.853	kg/m2
Average Annual Sediment Yield	18.534	t/ha
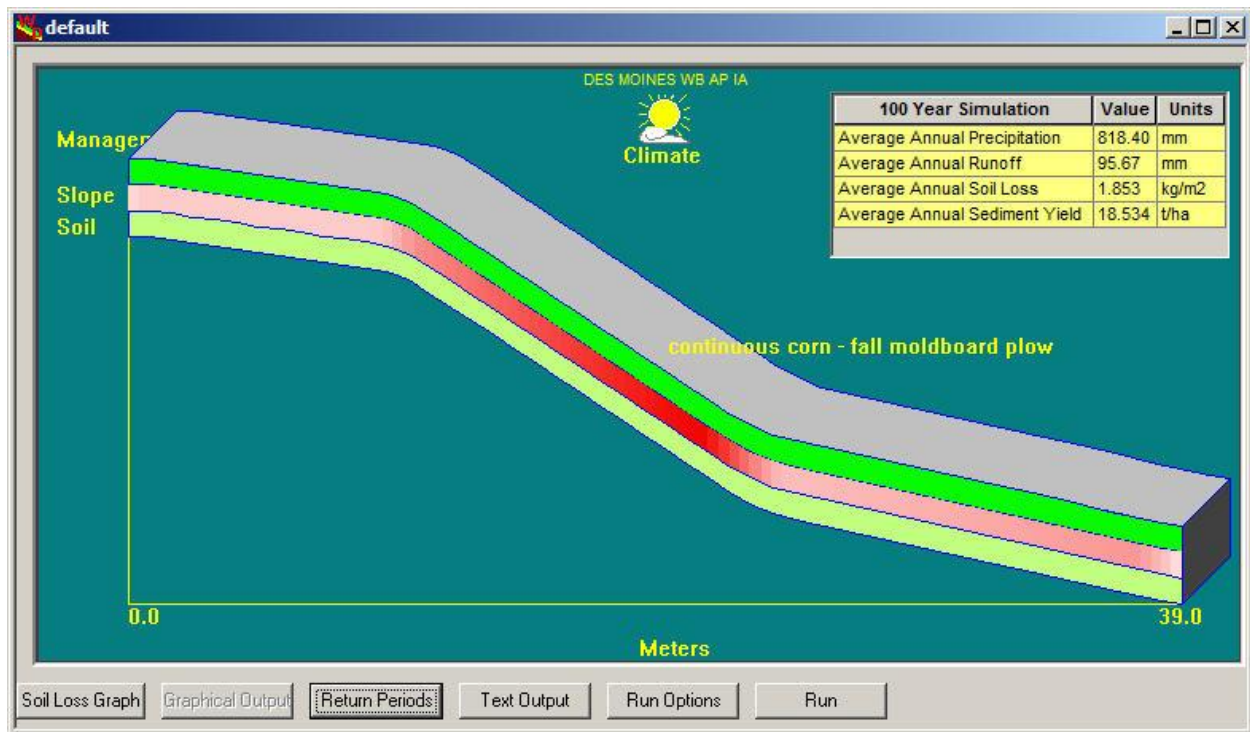
In this view, there is not as much project input and output information displayed on the screen. Moving the mouse over the different layers and the climate icon the right-click menu can be used to display options to view/edit the selection or import a new selection.

Customize User Preferences

Clicking on the checkmark icon will bring up the user preference customization screen.
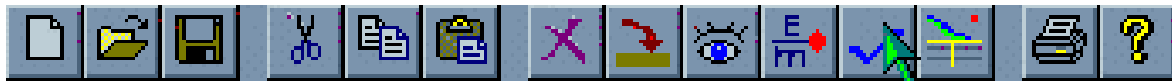
The User Preferences screen allows changes which will apply to the general screen and project appearance. For example in the View window visible below, the current settings are for displaying the slope as a 3-D image, showing the soil loss erosion gradient in the slope layer on the main screen, displaying input areas on the main window, using English units, and displaying the output table grid. The **Set limit for average detachment** option allows you to set a threshold for displaying erosion as red – thus if you entered a hypothetical soil tolerance value of 4 tons/A in this option screen, all values of detachment above 4 would be colored pure red, with scaling from white to red for detachment values from 0 to 4 tons/A.

Under the Graphics tab, the user can select or de-select which of the large graphical outputs are desired to appear in the picklists. Thus if you are only interested in choosing the daily hillslope Soil Loss/Sediment Yield output in the graphics output, you could press the Clear All button, then click to enable the seven outputs in that section.

User Preferences: Default.pro

View | Projects | Graphics | User Profiles | WaterShed

Num	Enable	Name	Units
1		Climate	----
2	☑	Precipitation	mm
3	☑	5 day average mimimum temp.	C
4	☑	5 day average maximum temp.	C
5	☑	daily minimum temp.	C
6	☑	daily maximum temp.	C
7		Soil Loss/Sediment Yield over entire Hillslope	----
8	☑	Average detachment	kg/m**2
9	☑	Maximum detachment	kg/m**2
10	☑	Point of maximum detachment	m
11	☑	Average Deposition	kg/m**2
12	☑	Maximum Deposition	kg/m**2
13	☑	Point of maximum deposition	m
14	☑	Sediment Leaving Profile	kg/m
15		Hydrology and Erosion Parameter Outputs	----
16	☑	Irrigation depth	mm
17	☑	Irrigation_volume_supplied/unit_area	mm
18	☑	Runoff	mm
19	☑	Peak runoff	mm/h
20	☑	Effective runoff duration	h
21	☑	Effective Rainfall intensity	mm/h
22	☑	Enrichment ratio of specific surface area	mm/h
23	☑	Interrill net soil loss	kg/m**2
24	☑	Sediment Leaving OFE	kg/m

Select All

Clear All

OK | Cancel | Apply | Help

To exit the User Preferences screen, click the OK or Cancel button.

Inserting Breaks in the Soil and Management Layers

The WEPP model is very powerful in that it allows simulation of different soils and/or management down a profile. To insert breaks in either the soil or management layers move the mouse pointer to the position where you would like the break to be placed. With the mouse pointer over the correct position right-click and then select the **Insert Break** menu item from the popup menu.

Click on Insert break menu item to add the break.
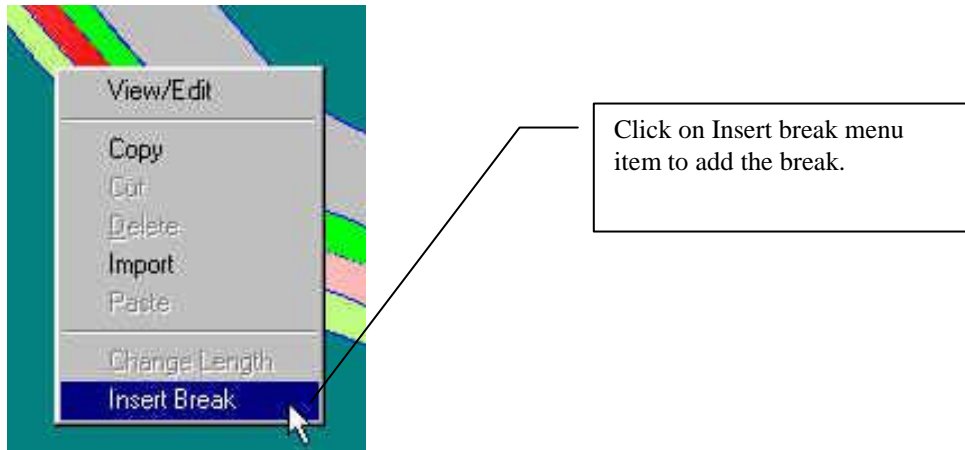
Notice in the figure below the line splitting the layer as well as the two rows of Duncanon soil in the soil table at the bottom right of the screen. The management layer may be split in exactly the same way.

Importing Different Soils, Management, Slope or Climate Information

Any existing soils, management, slope, or climate information may be imported into the current project in a variety of ways. One way in the common view shown in the previous figure is to click on the drop-down list and select another item from the database. For example, if you would like to select a different soil for the new lower soil section that was just created in the previous step, you click on the second Huangmia line in the Soil table at the bottom right of the screen.

If you select the Keith soil from the picklist, the new soil information is accessed and the lower soil section changes color to brown, which is the Keith soil color.
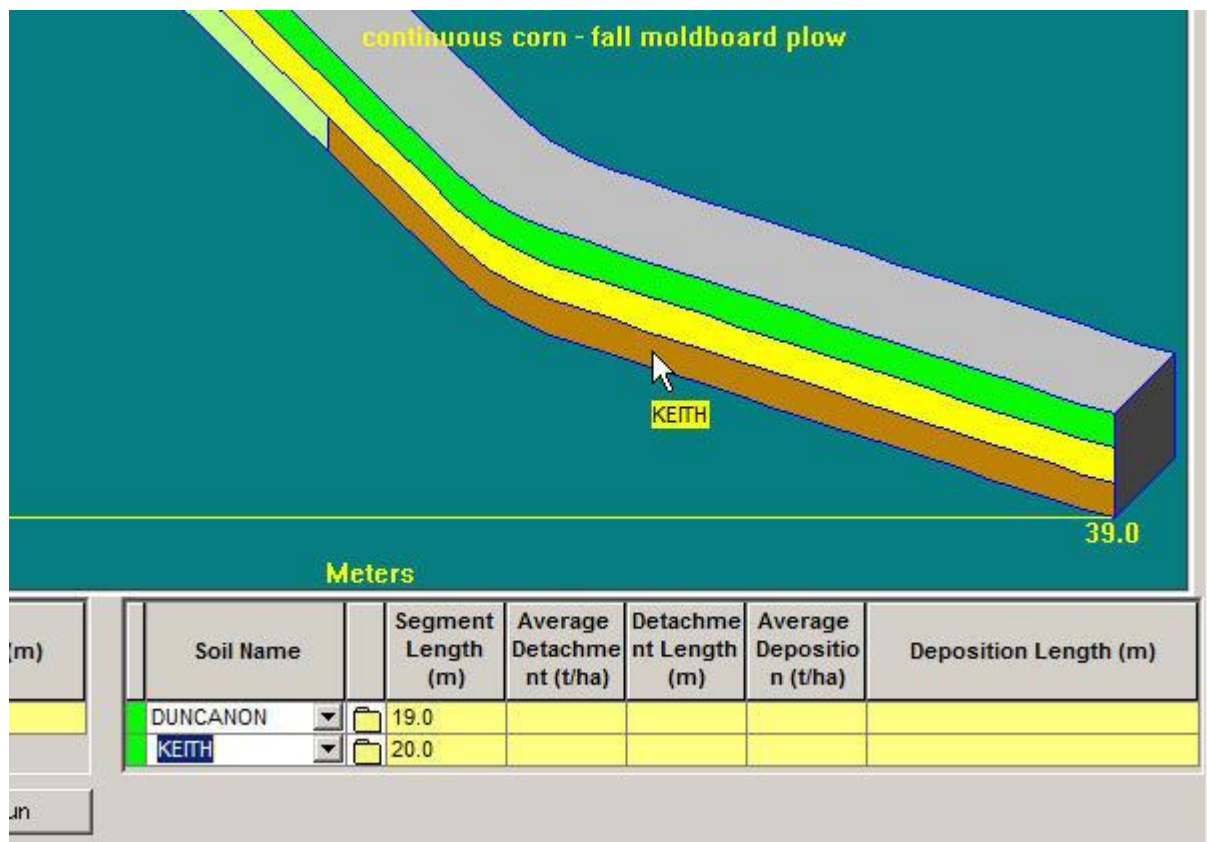
Now, run a 10 year simulation, and look at the results:
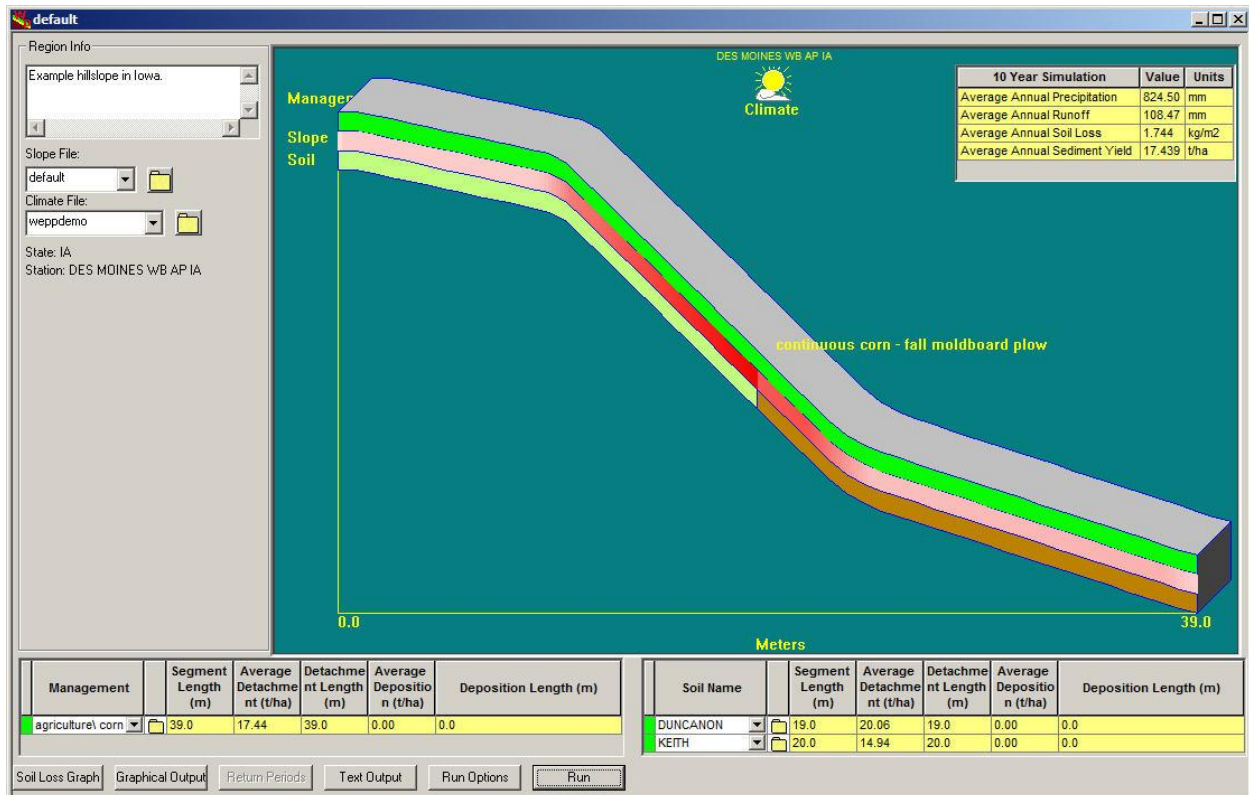
The soil loss values depicted and the table values for Average Detachment show that there is lower soil loss on the Keith soil. Thus the soil properties have impacted the local and total erosion on the profile.

Another method of changing the soil is to right click on the soil section to change and choose Import from the menu:

A window is then displayed and the new soil can be selected.
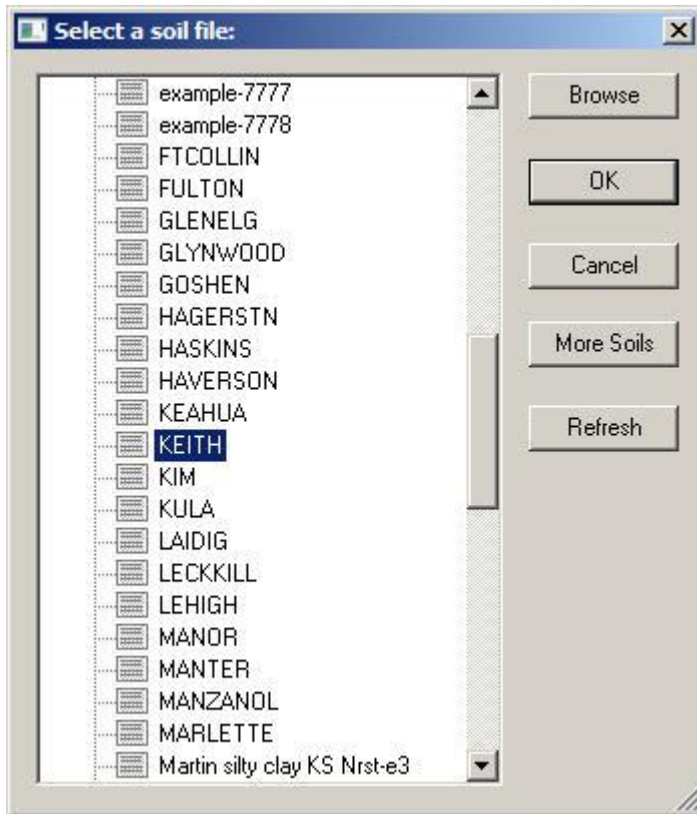
You can also import another selection into a data entry layer by highlighting the layer with a left mouse click, then

pressing the import button on the top icon toolbar.

F. Special Mouse Functions

The mouse has some powerful functionality. The mouse can be used for some of the same functions as the different icon buttons, and it also has some additional functions which are needed to change segment lengths. For example, if you left click with the mouse on the Keith soil section so that it is highlighted (cross-hatched), then right-click with the mouse, the following screen will appear. Here you have the options to edit the Keith soil parameters, copy the Keith soil parameters into the buffer, cut the Keith soil section out of the layer, delete the Keith soil from the soil layer, import a different soil into the section the Keith soil is currently occupying, insert a break point or change the length of the Keith section.

The Change Length option allows entry of an exact distance value for the highlighted section. Here 23 meters has been entered.

After running the simulation again with the new section length, delete the Keith soil region.
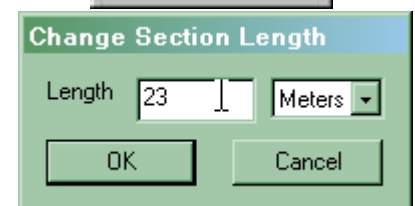
G. Other WEPP Project Options Available from Main Menu

The main menu for the Windows interface appears at the top of the program screen. Main menu options are File, Edit, View, Option, Window, and Help.

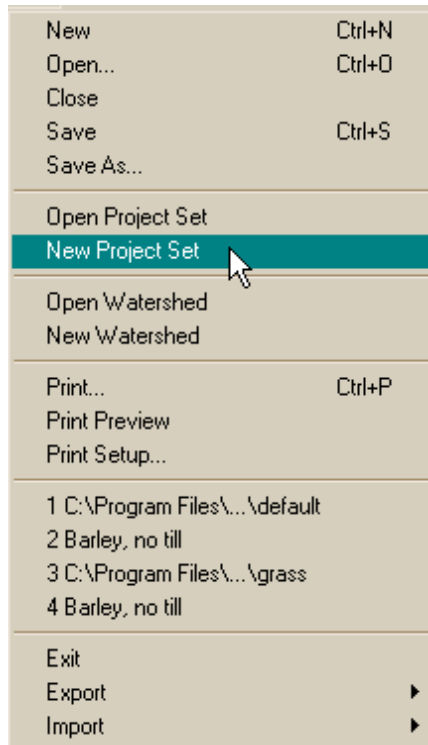By clicking on the File option, a dropdown window will appear:

New	Ctrl+N
Open...	Ctrl+O
Close	
Save	Ctrl+S
Save As...	
Open Project Set	
New Project Set	
Open Watershed	
New Watershed	
Print...	Ctrl+P
Print Preview	
Print Setup...	
1 C:\PROGRAM FILES\...\default	
2 demo-3ofe-contour	
3 alfalfa with cuttings	
4 corn,soybean-fall mulch till	
Exit	
Export	▶
Import	▶
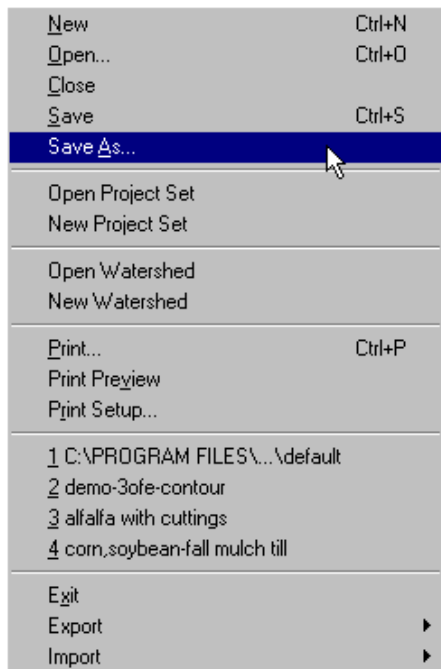
File options include typical Windows functions such as open a New project, Open an existing project, Close the current project, Save the current project, and SaveAs the current project. There is also the ability to Print, Print Preview, and Print Setup the current project. Most recently opened projects are displayed in a list at the bottom of the window.

A very important function is "SaveAs". All of the default projects (and databases) initially installed with the WEPP model are write protected. Thus, a user must save their new information and runs under their own new and unique names. Select "SaveAs" under the File options. Then, save the current project under a new name, as shown in the following figures.
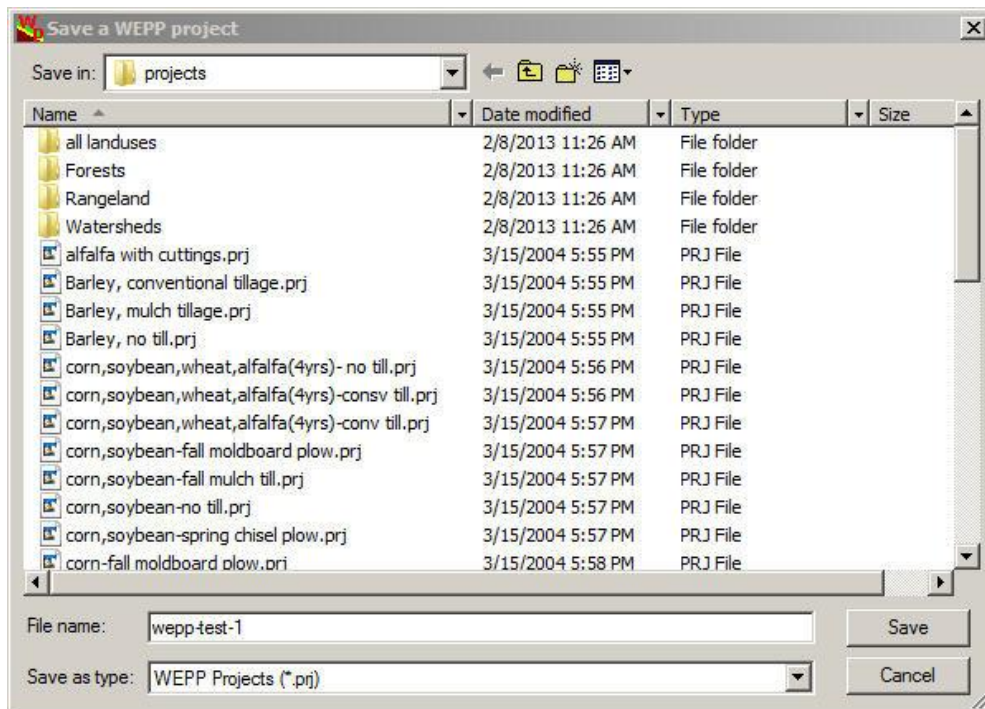
The current project will be saved under the new name (wepp-test-1 in this example), and also the name for the active project on the screen will also change to the new name.

New	Ctrl+N
Open...	Ctrl+O
Close	
Save	Ctrl+S
Save As...	

Open Project Set
New Project Set

Open Watershed
New Watershed

Print...	Ctrl+P
Print Preview	
Print Setup...	

1 C:\Program Files\...\default
2 Barley, no till
3 C:\Program Files\...\grass
4 Barley, no till

Exit
Export ▶
Import ▶

Some unique options also exist in this dropdown window: Open Project Set, New Project Set, and Open Watershed. The Open Watershed option allows the user to open existing watersheds to edit and run WEPP simulations on, and will be discussed later in this tutorial. The Project Set options allow the user to define and run groups of hillslope profile projects of special interest to the user.

Click on New Project Set, as shown in the window here. The following screen will appear:

WEPP Project Set: Unnamed.prs

☐ Common Climate Birmingham AL.cli ▾   ☐ Common Slope 400ft 30%slp.slp ▾   ☐ Common Soil ASCALON.sol ▾   ☐ Years 1
☐ Common Management default.rot ▾   ☐ Keep Output Files   ☐ Keep Input Files

	Run	Name	Description	Run	Edit	Precip (mm/yr)	Runoff (mm/yr)	Soil Loss (kg/m2/yr)	Sed Yield (t/ha/yr)	Years
1	☐				🗁					

| Clear All | Select All | | Run Selected Projects | Add Projects to Set | | Save Set As | OK |
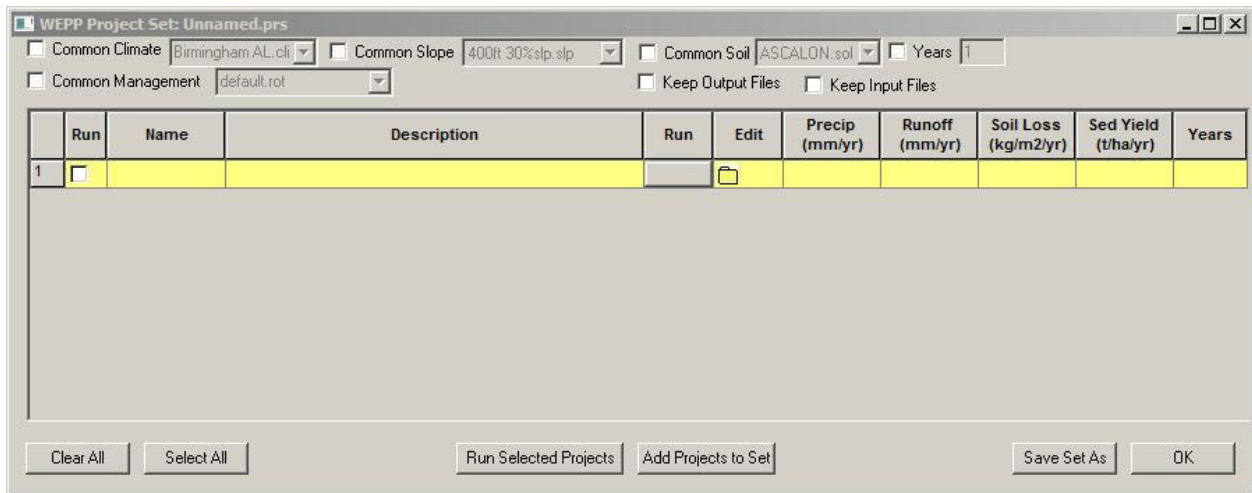
This screen allows you to group existing projects into a table set, and run them at the same time, run all of them with a common climate, slope, soil or management file, and save them as a named set.

Click on **the Add Projects to Set** button as shown above, and create a sample Project Set. The next screen will appear, listing all of the existing hillslope profile projects that currently exist in the default directory. You can select from these or select projects located elsewhere on your PC.
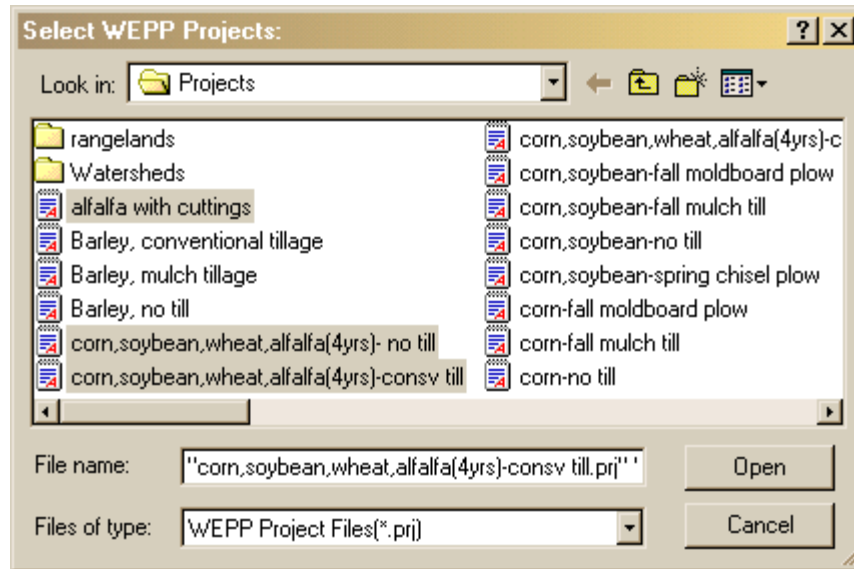
Create a project set containing three of the alfalfa projects. Click on the "alfalfa" project with the left mouse button, hold down on the Shift Key and then click on the "corn,soybean,wheat,alfalfa(4yrs)- no till" and thn the "corn,soybean,wheat,alfalfa(4yrs)- consv till" project.

Click on the Open button, and the selected projects will be entered into the current Project Set table screen, as shown below:
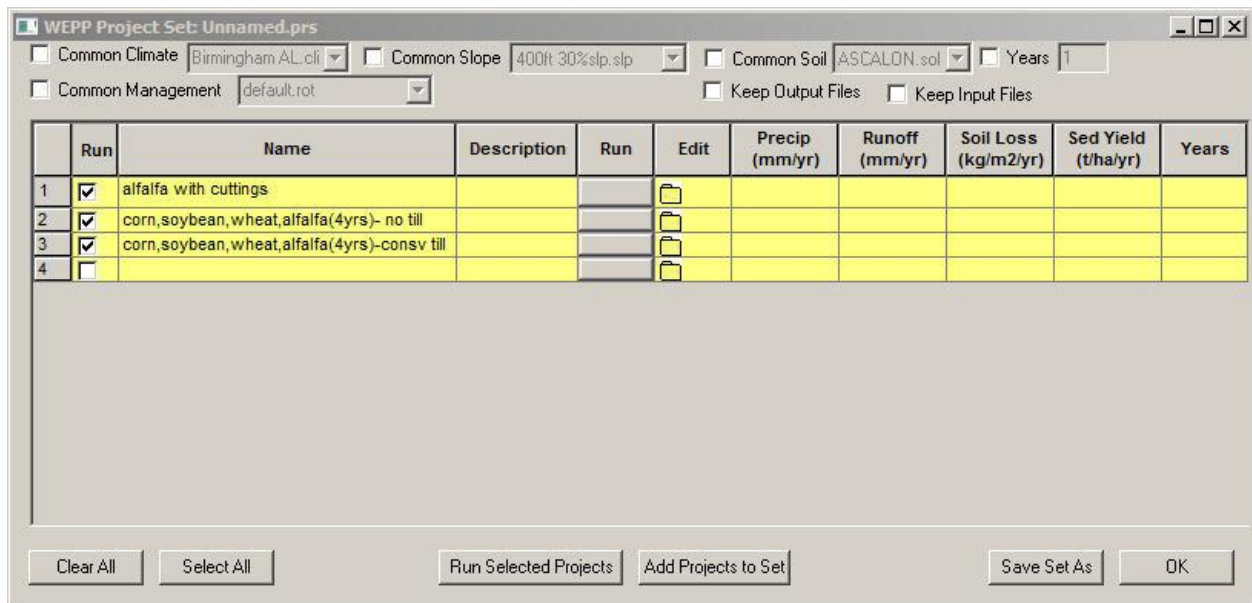
Click on the **Select All** button on the lower left corner of the screen, then press the **Save Set As** button on the lower right corner of the screen. The following window will appear:

Enter a name for the new project set – such as"3-alfalfa-runs", then press the Save button as shown to save the project set. Return to the Project Set table, and click on the
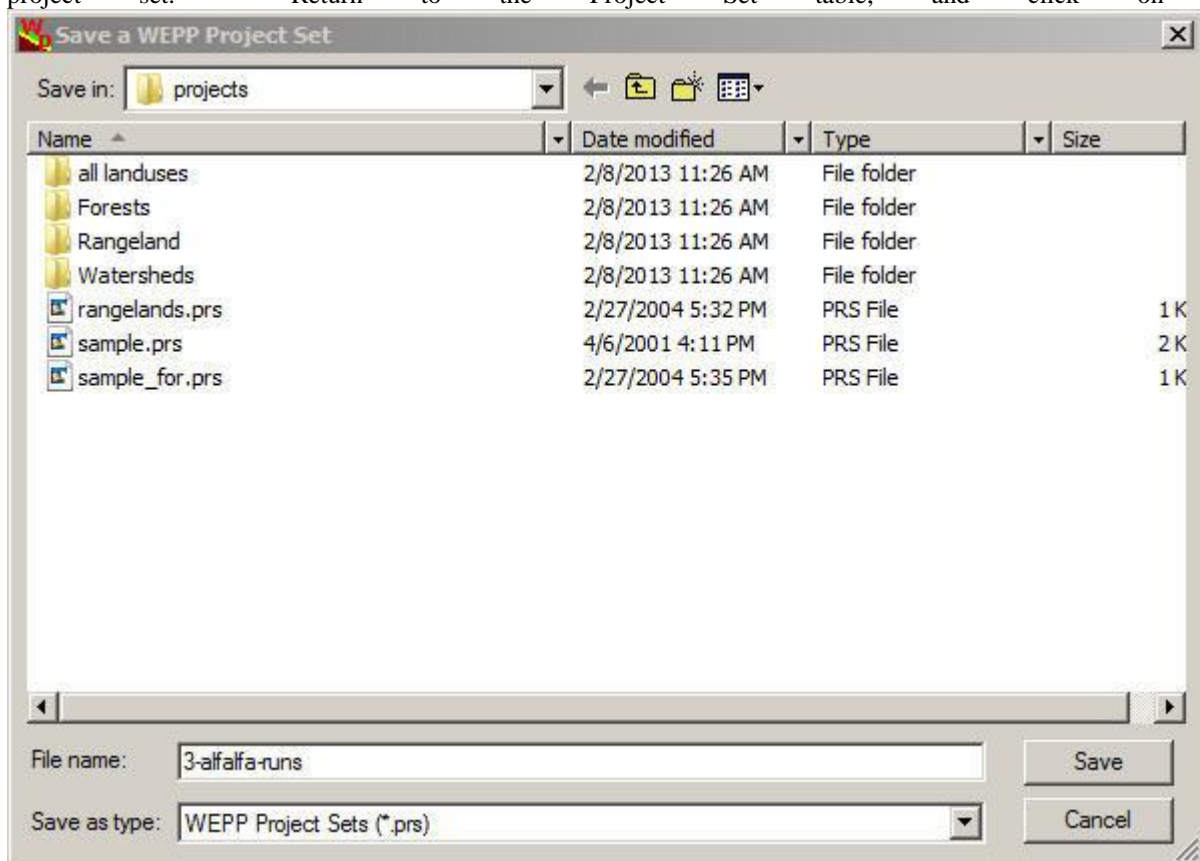
Run Selected Projects button at the bottom center of the screen. Each of the three projects will run, and their main hydrology and erosion output results will be displayed in the table. The results can be viewed and compared here. Results in this screen can also be copied and pasted into other Windows programs (such as Word or Excel).
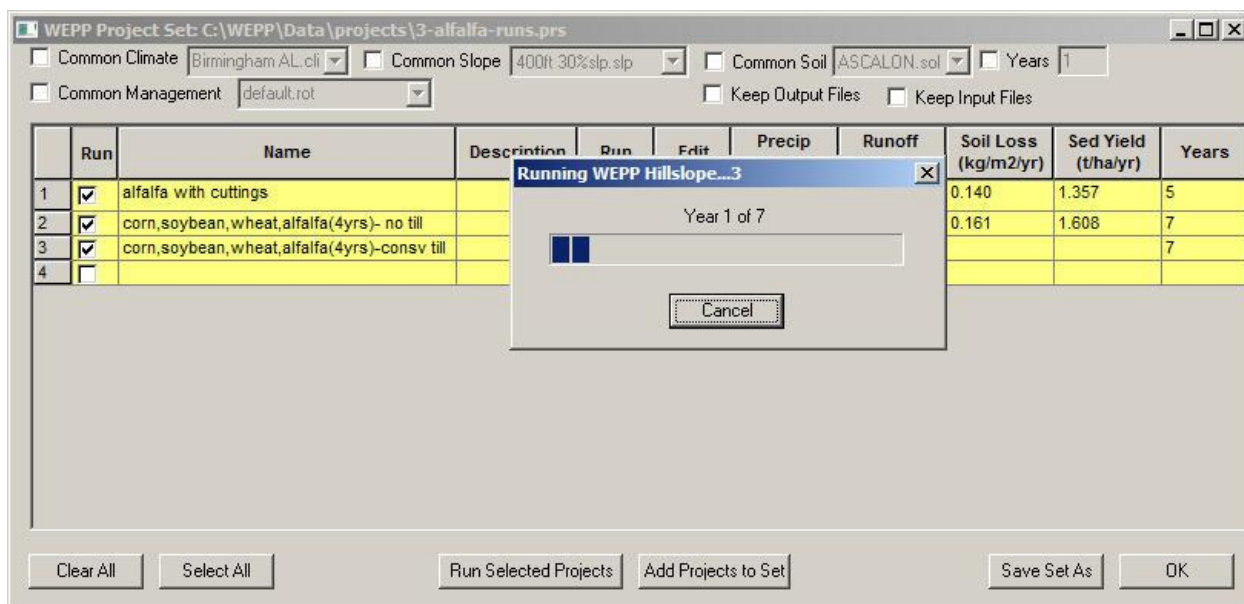
The check boxes at the top of the screen allow you to run all of the projects in the table with the same climate, slope and/or soil files. To exit this screen, click on the OK button.

H.   Online Help

Help information can be accessed on the main screen by clicking on the Help option.
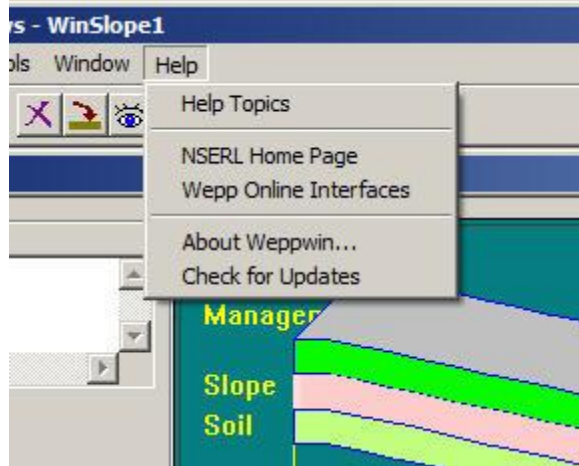
Help Topics follow standard Windows help format and include Contents, Index, and Find.
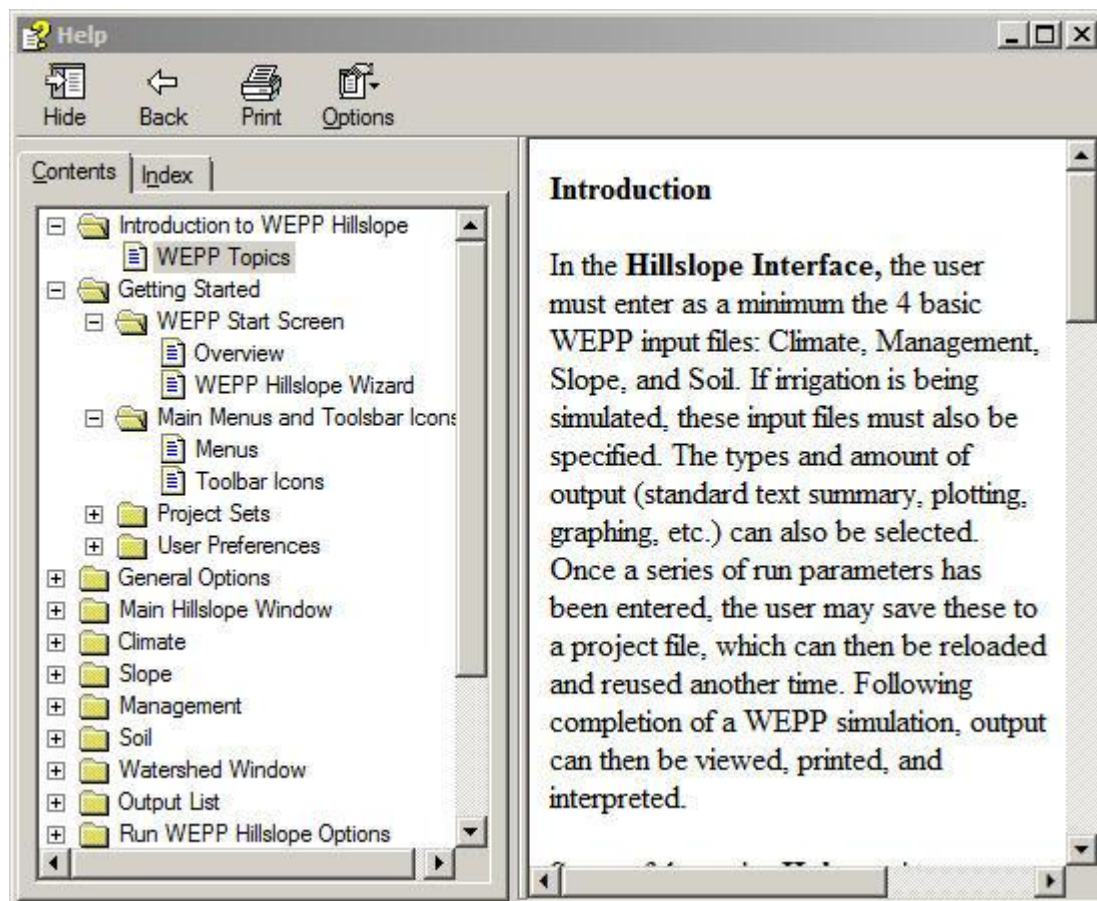
Help can also be accessed on any interface window by clicking the F1 Key.

Section 3. Viewing and Editing input information for Projects

In the previous section you ran WEPP with the default project and changed it using prebuilt data. In this section you will learn how to view more detailed WEPP parameter inputs and create new data elements.

A. Slope Inputs

Start the WEPP program by selecting the WEPP Interface under Programs, or clicking a created shortcut icon. The default project will be loaded. The slope input for the default project is called "default". You can double click on the slope layer, or if in the display with inputs then you can click on the file icon next to the slope input name, as shown below.

The Slope Profile Editor screen will appear, with the information for the "default" slope entry visible. In the screen below, the slope is composed of three segments, shown in tabular form in the table on the right side and in graphical form in the figure to the left. The editor allows entry of up to nine straight segments, then inserts transition curves between the segments. In the advanced options the user has the capability to change the amount of transition as well as the slope conditions at the top and bottom of the profile.
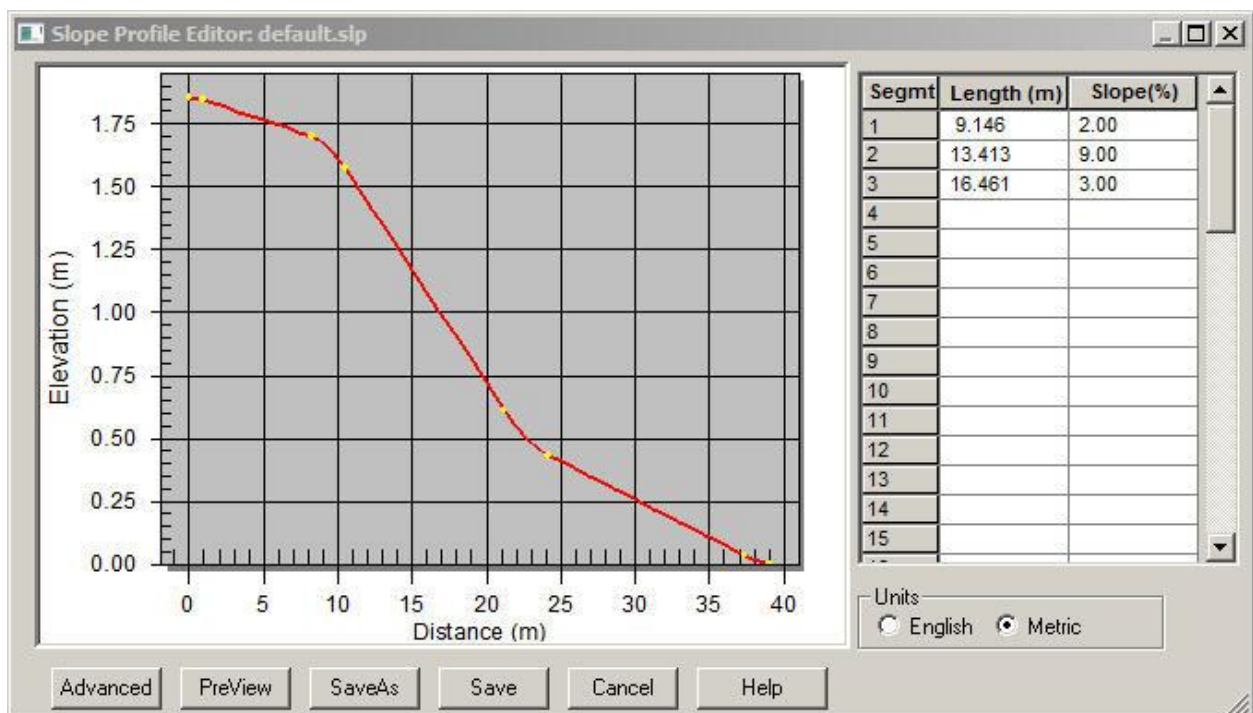
Let's enter some other numbers in the table. Length values represent horizontal distance of the segments. Enter a first segment length of 15 meters with a slope of 3%, a second segment length of 12 meters with a slope of 12%, a third segment length of 18 meters with a slope of 1%, and a fourth segment length of 9 meters with a slope of 10%. Press the PreView button at the bottom left of the screen to update the graphic. The screen will now look like this:

36
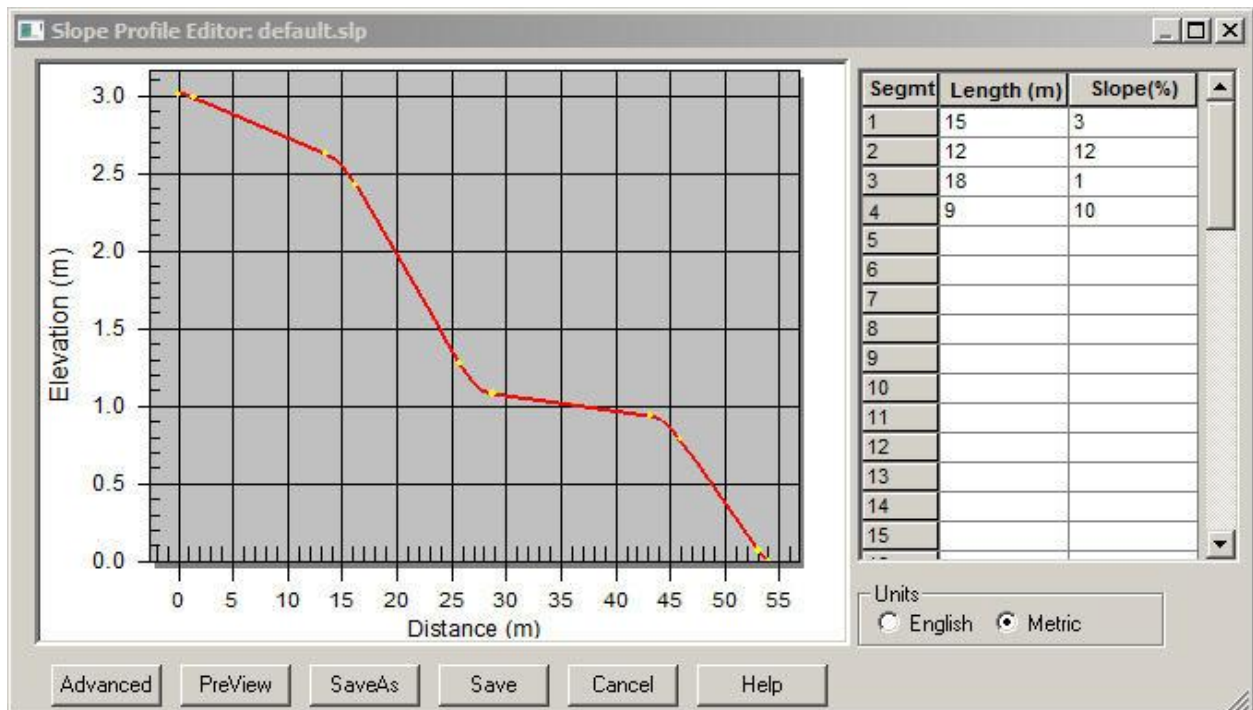
A user can alter the lengths and slope steepnesses, then **Preview** the profile shape until satisfied with the profile slope description.

To set the slope width and direction (aspect) click on the Advanced button. This will display a window with some additional information:
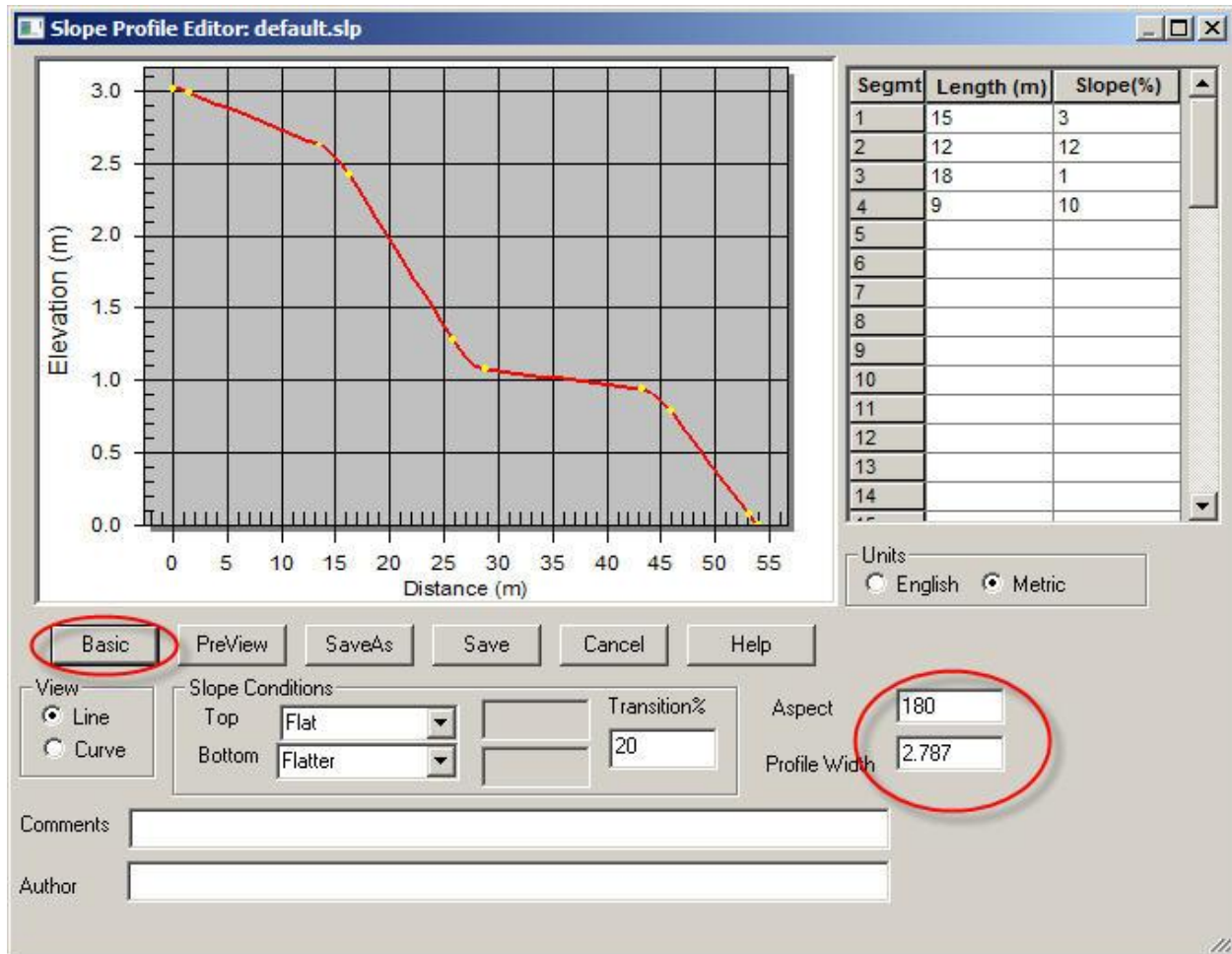
To change the slope width type a new number in the Profile Width box.

To save the current slope inputs to the database, click on the SaveAs button at the bottom of the screen. The following screen will appear, and a file name can be entered or selected. In this example, the name "example-1" was entered for the new slope description. Press the Save button to save the information to the database, then press the OK button on the next screen.

Save a WEPP Slope Description

Save in: slopes

Name	Date modified	Type	Size
Disturbed WEPP Slope	2/8/2013 11:26 AM	File folder	
Road WEPP Slope	2/8/2013 11:26 AM	File folder	
400ft 30%slp.slp	2/25/2005 9:50 AM	SLP File	
concave.slp	11/6/1998 3:01 PM	SLP File	
convex.slp	4/15/1998 12:23 PM	SLP File	
default.slp	12/6/1999 10:16 AM	SLP File	
hill_1181.slp	2/15/2013 3:10 PM	SLP File	
s-shape.slp	12/6/1999 10:17 AM	SLP File	
uniform 300',0.4%.slp	9/14/2012 3:33 PM	SLP File	
uniform 300',40%.slp	3/28/2001 10:20 AM	SLP File	
Uniform.slp	9/9/1999 2:31 PM	SLP File	
uniform_ch05.slp	3/21/2000 12:00 PM	SLP File	
Unit slope-22 m-9%.slp	3/9/2001 2:46 PM	SLP File	

File name: example-1 [Save]

Save as type: WEPP Slope Files (*.slp) [Cancel]

This will return you to the main slope editor screen. To use the slope inputs just entered in the current project, click on the Save button. This will close the slope editor screen and return you to the default project, with the new slope inputs inserted, as shown on the next page.

C:\WEPP\Data\slopes\example-1.slp

WEPP slope file added to database.

OK
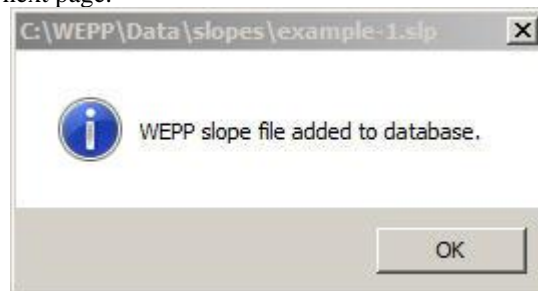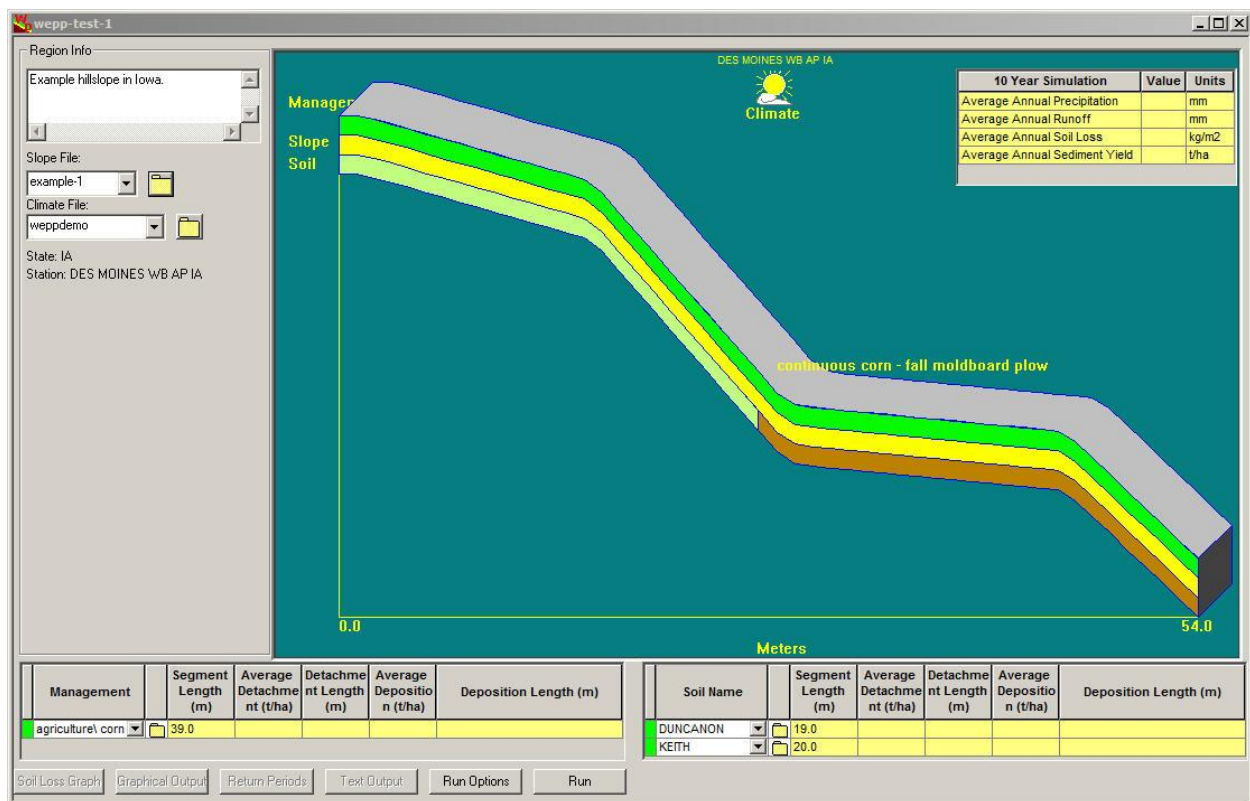
To update the display and the soil loss values, you need to Run the model again, now with the new slope inputs. Click on the Run button at the bottom of the screen, and let's look at the new simulation results.

In the updated screen, the soil loss results displayed have changed dramatically. The greatest amount of soil loss is predicted near the end of the profile. Soil loss on the top flat portion is relatively low and on the steep middle section is higher. On the flat middle section, deposition is predicted, evident by the green shading and the negative values shown when hovering over the area (as shown above).

B. Soil Inputs

Let's now view and edit the soil inputs for the default run (as currently displayed). To bring up the Soil Database Editor, double click with the mouse on the soil layer in the profile graphic, or you can also click on the file icon next to the Duncanon soil name at the bottom right of the screen, as shown below.

The Soil Database Editor screen will appear, with the existing information for the Duncanon soil loaded as shown here.

Other soils in the database can be loaded into the editor by clicking on the dropdown list under the Soil File Name header at the upper left of the screen. The information on the top half of the editor applies to the soil as a whole, while properties related to the soil layers are entered in the table at the bottom of the screen.

Let's assume that we have a soil similar to the Duncanon in terms of erodibility values, but some of the other properties are different. Enter an albedo value of 0.20 and click the Have Model Calculate box for Effective Hydraulic Conductivity. Change the top soil layer to a depth of 200 mm, sand content of 20%, clay content of 20%, CEC of 8, and rock fragments of 1%. The soil will appear as follows.

To change the color that is associated with the soil layer, click on the color button at the lower right side of the window (current color is pale green) as shown above. The color screen below will appear – select a new color (pink has been chosen here), then click on the OK button at the bottom left of the window.

The color window will disappear. To save the current soil information to a new entry in the database, click on the SaveAs button on the lower left of the Soil Editor screen as shown below:

The Save Soil Information screen will appear, and you can type in a name for the new soil data. Here the user has entered the name "example-1", then clicked on the Add to Database button. The second screen appears indicating that the new information has been added to the database under the name "example-1".
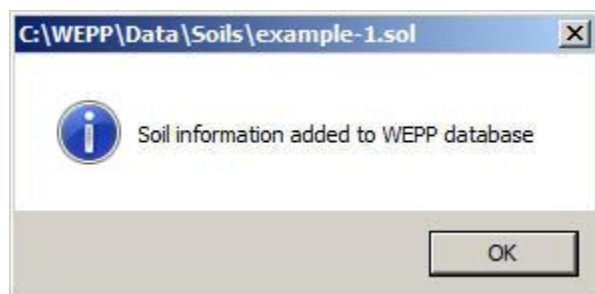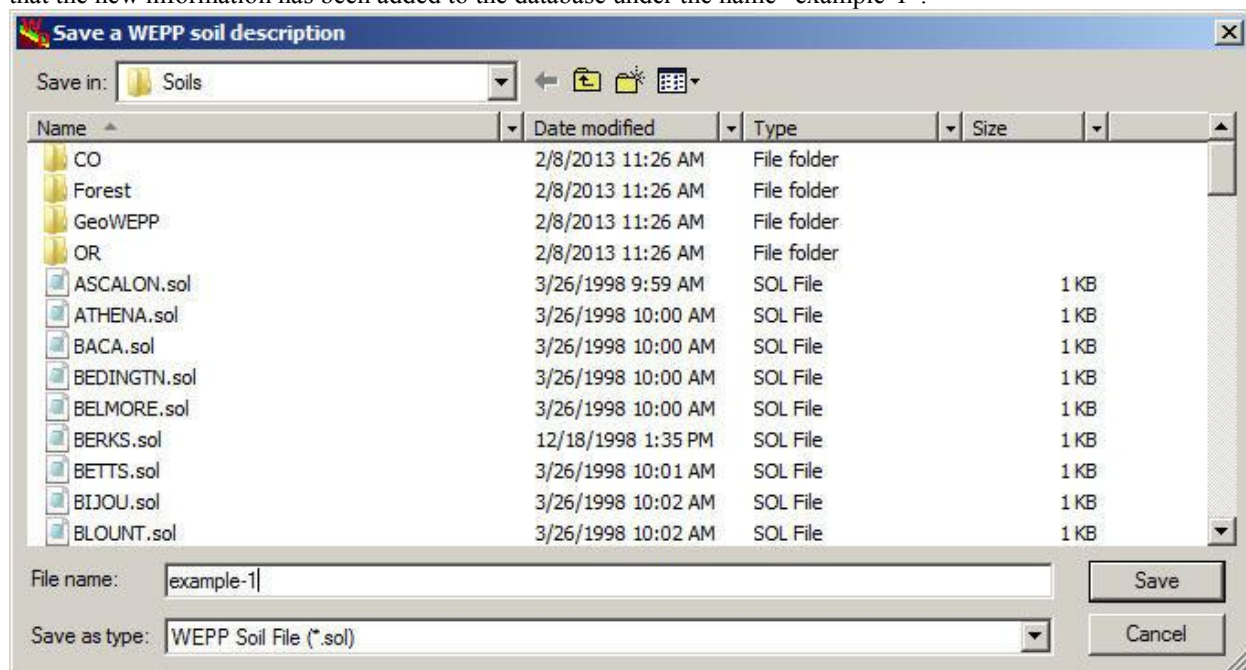
Click the OK button. Once on the Soil Database Editor screen, you can click the Cancel button at the bottom of the screen to exit the editor.
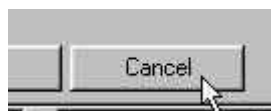
Once back on the main profile screen, hover over the soil layer with the cursor, and right click with the mouse to bring up the mouse options window, and select the Import option as shown in the next figure.
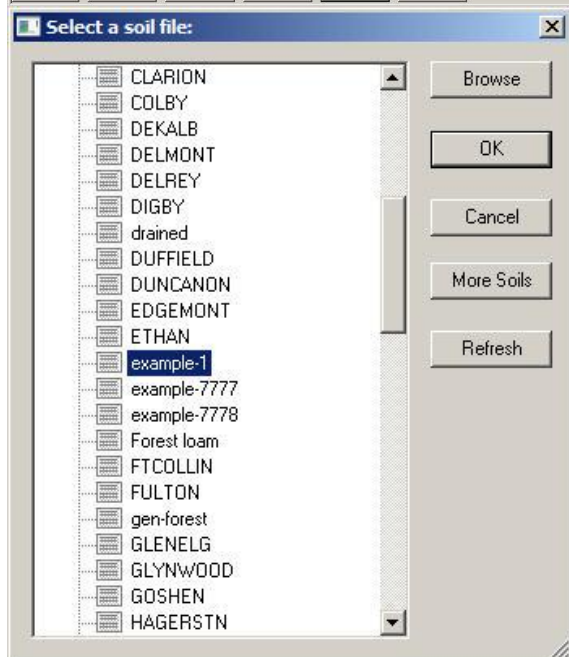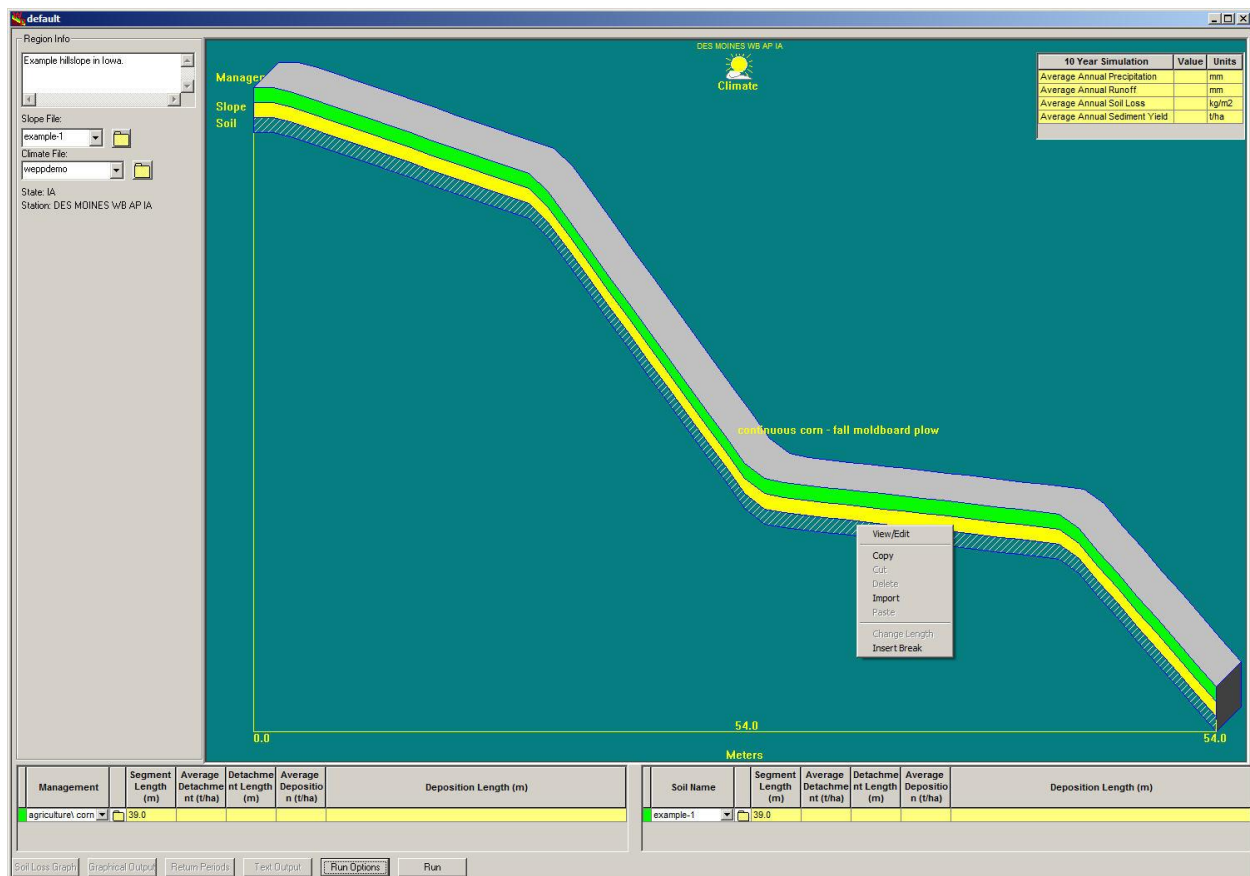
The soil selection window to the right appears – choose the "example-1.sol" and click on the OK button. The small window will disappear and the soil in the current project will be updated to "example-1" – on the screen below notice the new color in the soil layer as well as the new soil name in the soil table at the bottom right of the screen.

Now click the Run button at the bottom of the screen, and let's examine the effect of the new soil on model output results. The results are shown in the following two tables.
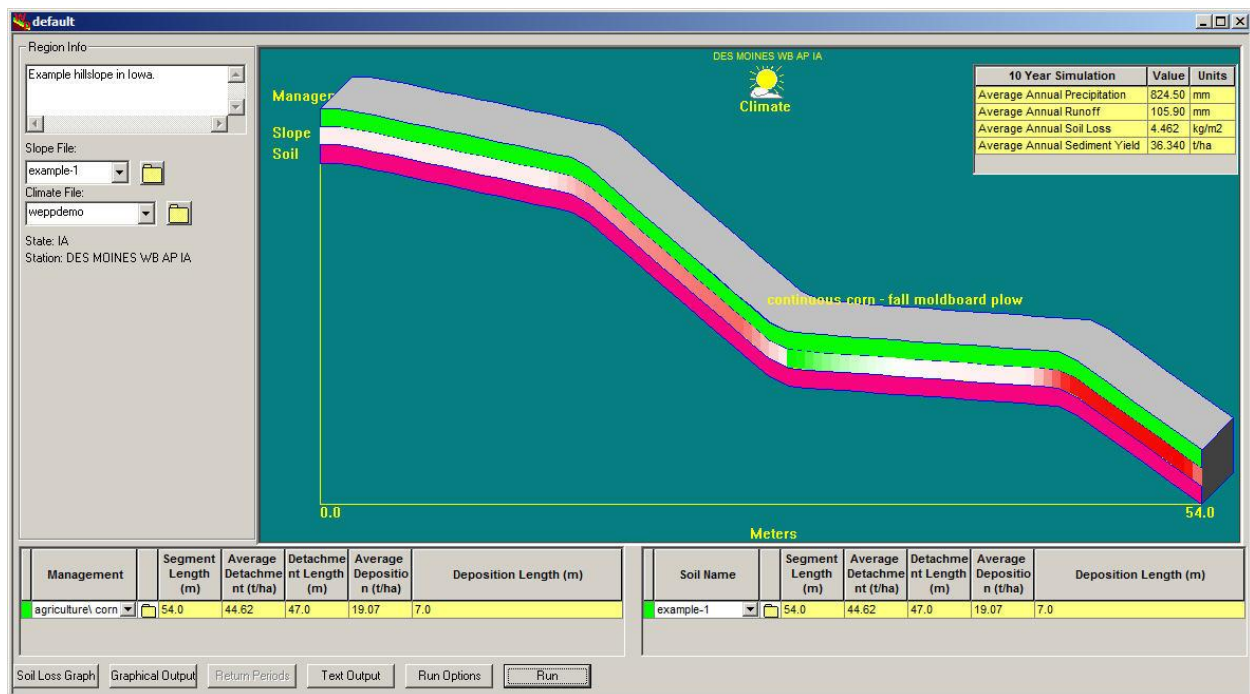
10 Year Simulation	Value	Units
Average Annual Precipitation	824.50	mm
Average Annual Runoff	105.90	mm
Average Annual Soil Loss	4.462	kg/m2
Average Annual Sediment Yield	36.340	t/ha

Soil Name	Segment Length (m)	Average Detachment (t/ha)	Detachment Length (m)	Average Deposition (t/ha)	Deposition Length (m)
example-1	54.0	44.62	47.0	19.07	7.0

10 Year Simulation	Value	Units
Average Annual Precipitation	824.50	mm
Average Annual Runoff	102.41	mm
Average Annual Soil Loss	3.848	kg/m2
Average Annual Sediment Yield	30.687	t/ha
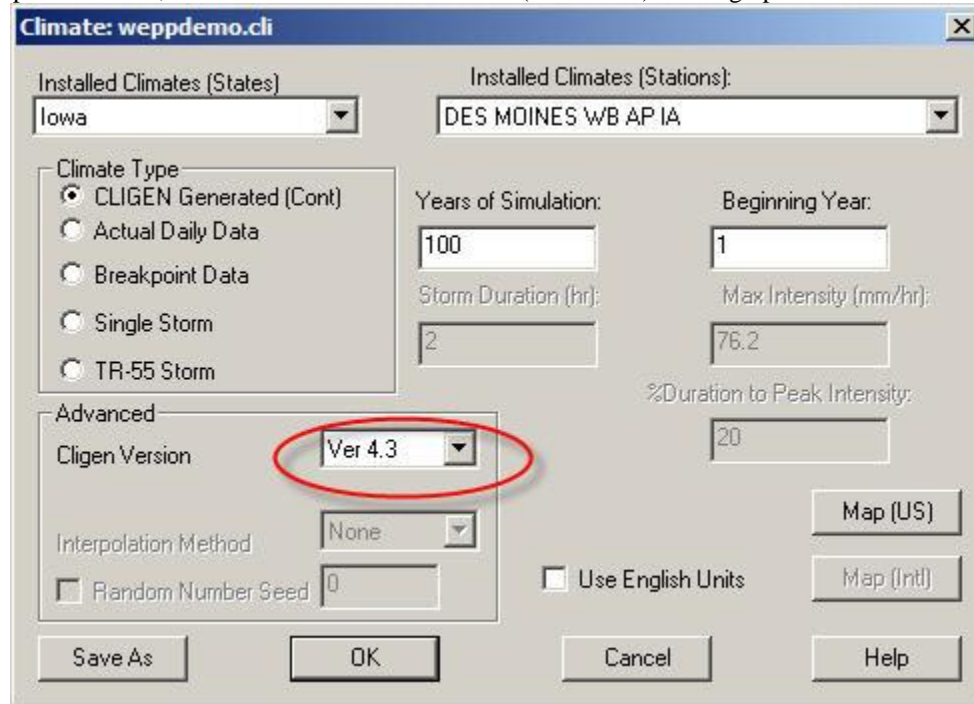
Soil Name	Segment Length (m)	Average Detachment (t/ha)	Detachment Length (m)	Average Deposition (t/ha)	Deposition Len
DUNCANON	54.0	38.48	46.4	17.21	7.6

You can see that the new soil increased the average annual runoff slightly (from 102 to 106mm), increased average annual soil loss on the regions of net detachment from 38 to 44 t/ha, and increased the profile sediment loss from 30.7 to 36.3 t/ha.

Climate Inputs

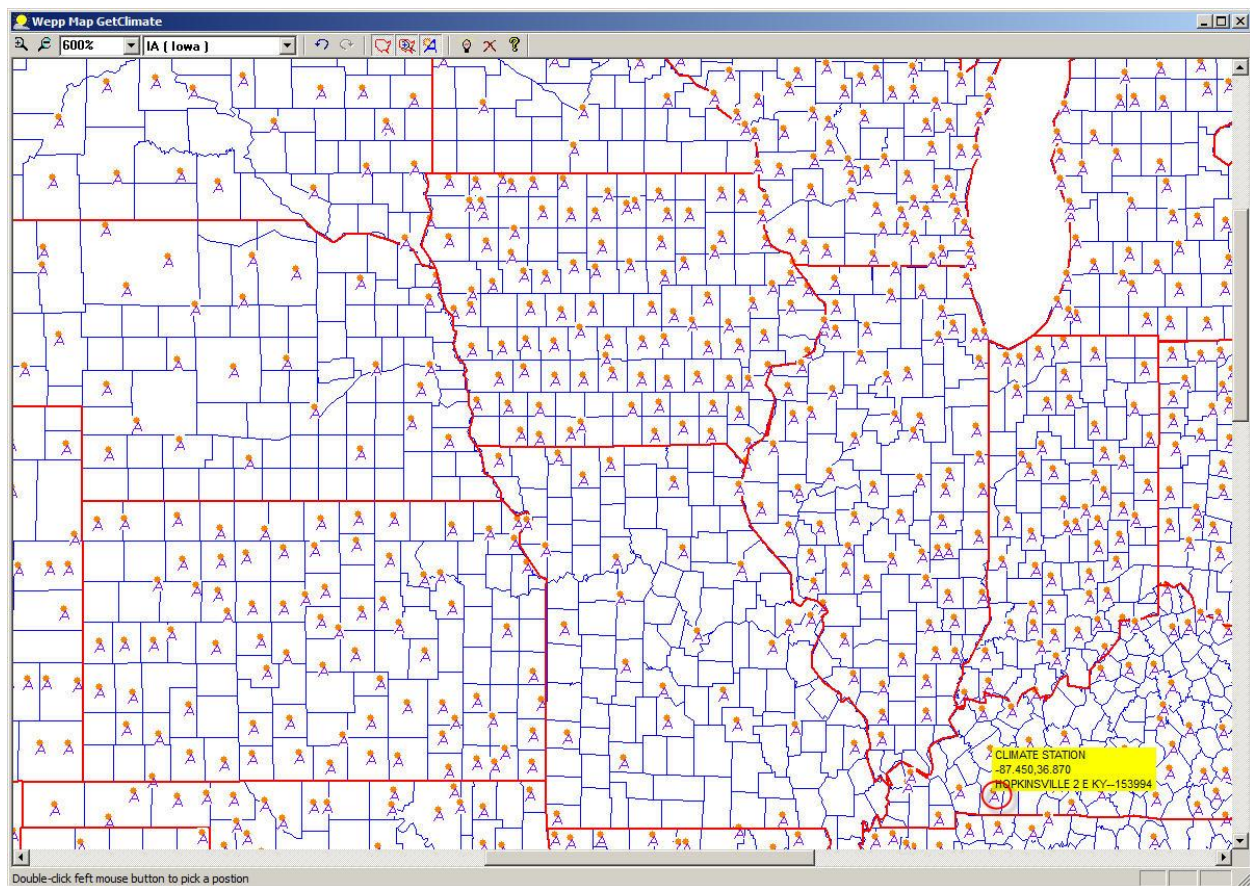On the main profile screen, double click on the climate icon (sun/clouds) to bring up the Climate editor.

The version of the Cligen program that is used is version 4.3. A newer version is available and can be selected by choosing Ver 5.3 from the selection box. Version 5.3 is the recommended version to use.

Clicking on the Installed Climates list on the right will display all the stations for Iowa:
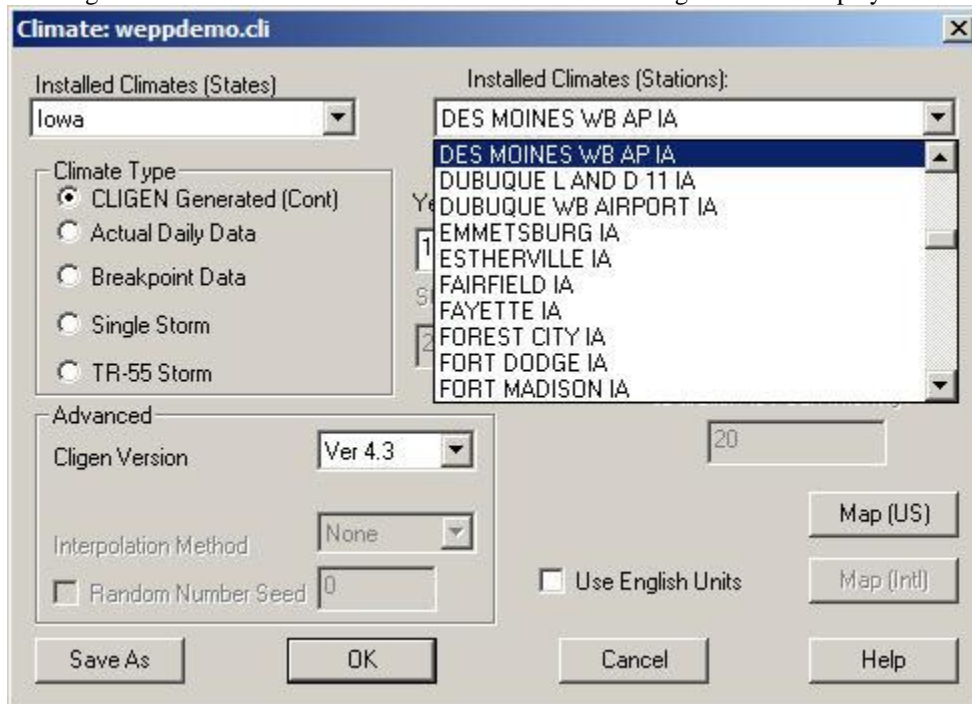
Clicking on the **Map (US)** button will display a map of where the stations are located. A station can be selected by double-clicking the left mouse button. Zoom out and choose the Hopkinsville Kentucky station:
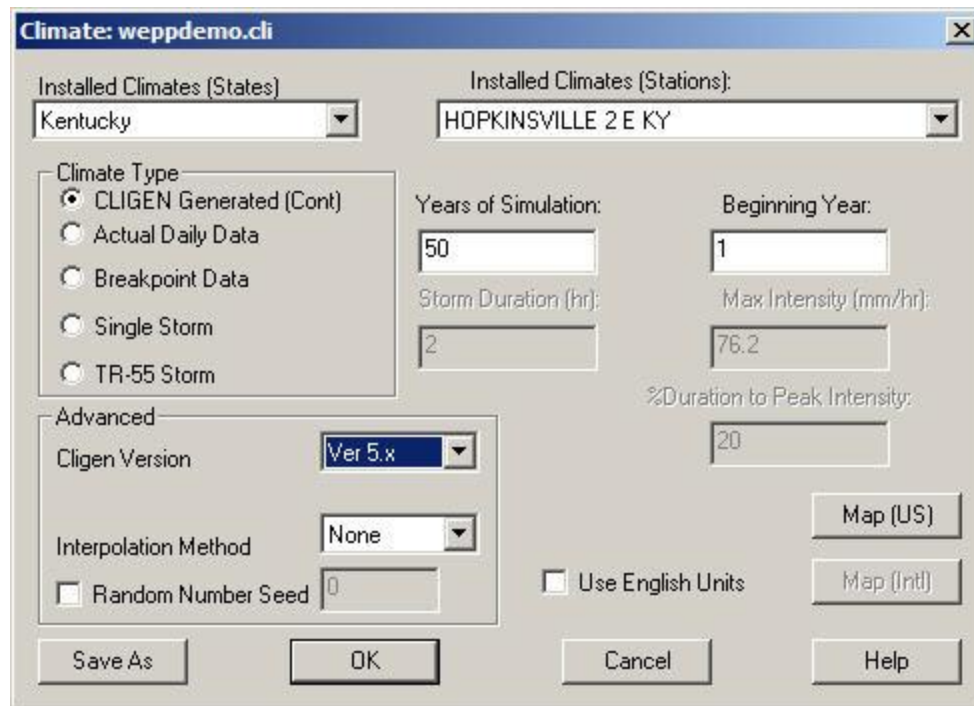
After a station selected the following window is displayed:

Clicking OK will return to the main climate window with that station selected:
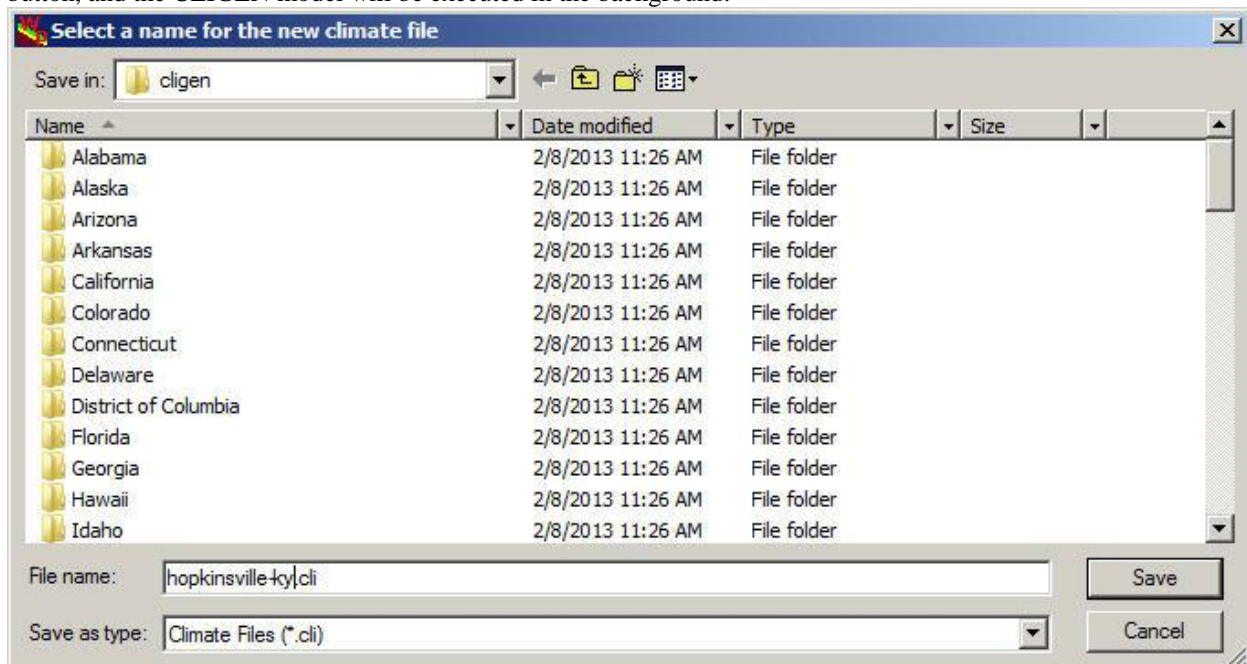
With Hopinsville Kentucky selected, choose to create a 50 year continuous climate file and select the Cligen version 5 program then click on the **SaveAs** button.
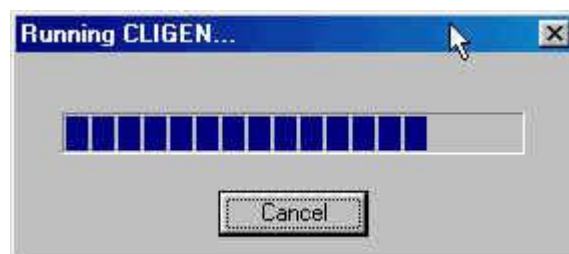

Enter a name for the new climate input file – here the user has entered "example-50years". Click on the Save button, and the CLIGEN model will be executed in the background.

When complete, a message screen will appear. Click Yes, and the new climate information will be used in the current project.
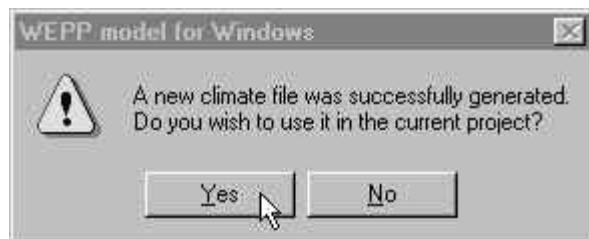
On the main Profile screen, click the Run button, and let's examine the effects of the new climate input on the model outputs. Precipitation has increased from 824 to 1217mm per year, runoff has increased from 102 to 157 mm per year, and soil loss has increased.

10 Year Simulation	Value	Units
Average Annual Precipitation	824.50	mm
Average Annual Runoff	102.41	mm
Average Annual Soil Loss	3.848	kg/m2
Average Annual Sediment Yield	30.687	t/ha

West Lafayette, Indiana

10 Year Simulation	Value	Units
Average Annual Precipitation	1217.2	mm
Average Annual Runoff	157.25	mm
Average Annual Soil Loss	7.735	kg/m2
Average Annual Sediment Yield	52.686	t/ha

Hopkensville, Kentucky

Let's change the Run Options so that we can run a long simulation with our 50 year climate file. Click on the Run Options button at the bottom of the main project screen.
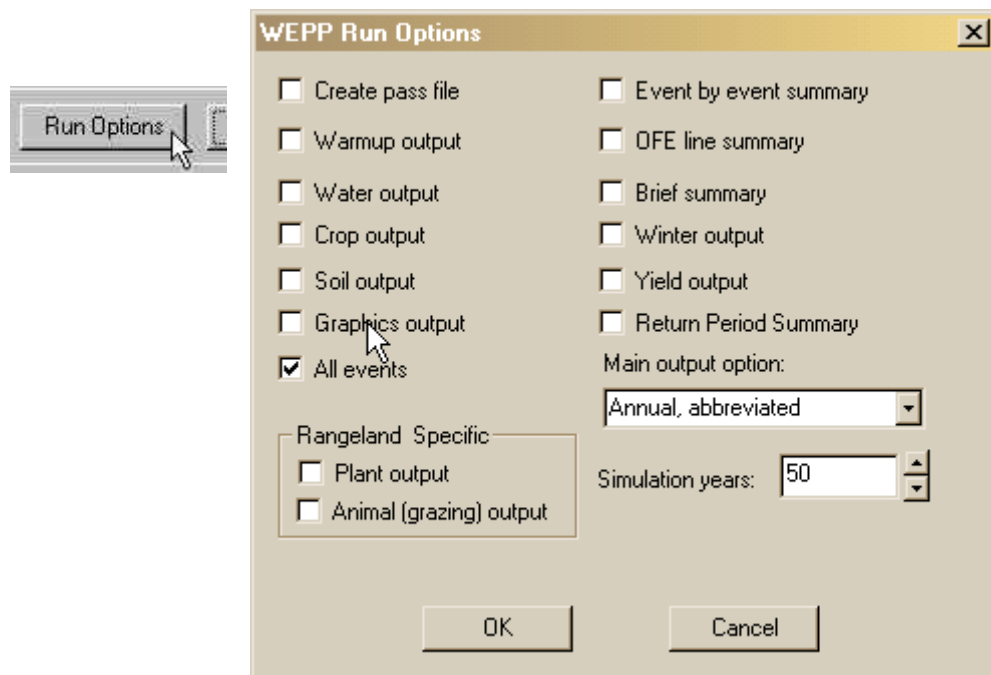
Change the number of simulation years from 1 to 50, and set the Graphics output so that it will not be generated. Then click on the OK button.

Returning to the main project screen, click on the Run button. The interface will run the WEPP model for a 50 year simulation period, then update the results visible on t he screen.

You can see that the average annual precipitation has decreased slightly, average annual runoff has decreased, average annual soil loss has decreased slightly, and average annual sediment delivery has also decreased. If we run the simulation for only 1 year we will see different results from the 10 and 50 year simulations. These results illustrate the importance of running long simulations to obtain better average values for WEPP model predictions.

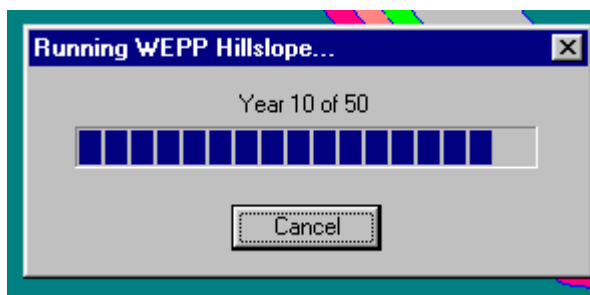| 50 Year Simulation	Value	Units
Average Annual Precipitation	823.95	mm
Average Annual Runoff	98.66	mm
Average Annual Soil Loss	3.846	kg/m2
Average Annual Sediment Yield	30.238	t/ha

10 Year Simulation	Value	Units
Average Annual Precipitation	824.50	mm
Average Annual Runoff	102.41	mm
Average Annual Soil Loss	3.848	kg/m2
Average Annual Sediment Yield	30.687	t/ha

1 Year Simulation	Value	Units
Average Annual Precipitation	838.20	mm
Average Annual Runoff	105.84	mm
Average Annual Soil Loss	1.788	kg/m2
Average Annual Sediment Yield	15.896	t/ha

Let's save the project as currently configured to a new name. Click on the File option on the main menu at the top of the screen.
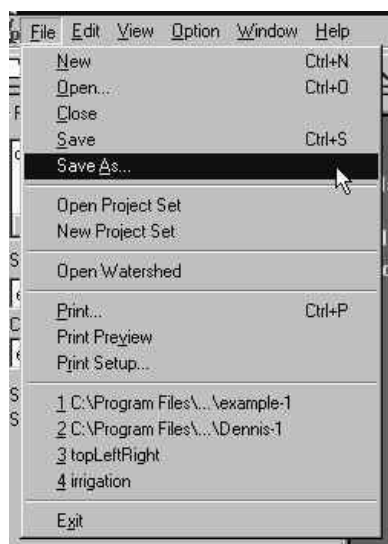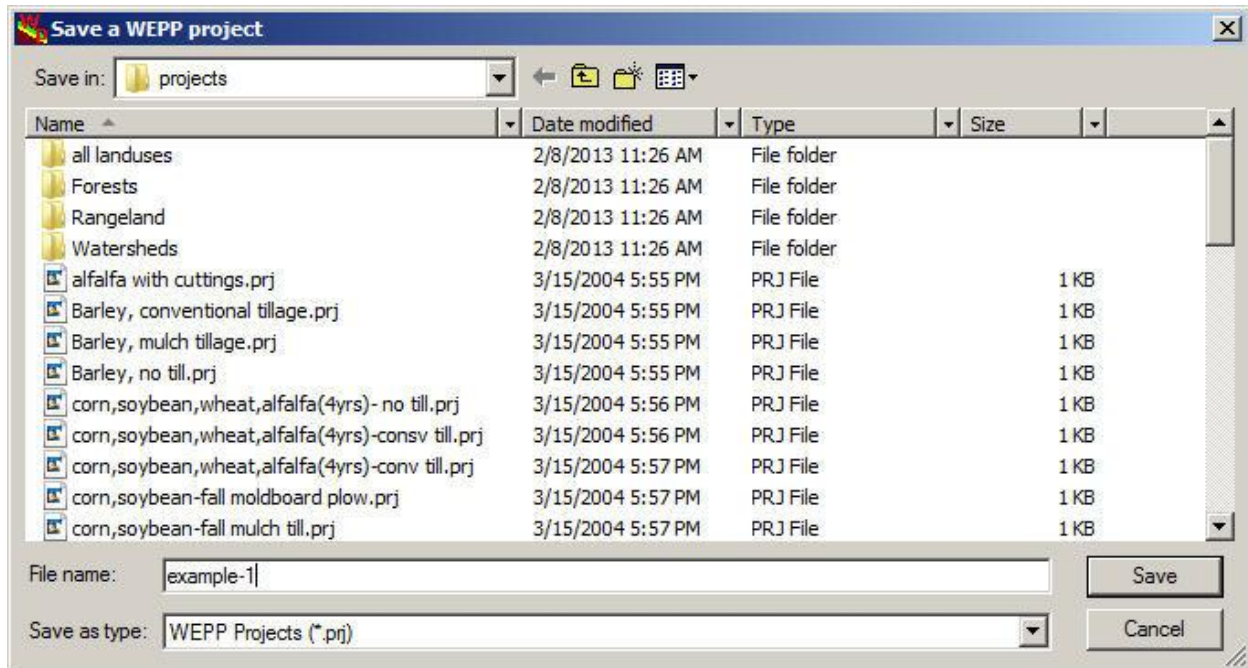
Enter a name "example-1" in the File name entry field, then click on the Save button. The current project which had been "default" has now been renamed as "example-1" and saved permanently. The original "default" project has not been changed.

D. Management Inputs

In the current example click on the management layer to select it and then right click and choose the Import menu item. From the list of available managements choose "corn-spring chisel plow" and click OK
.
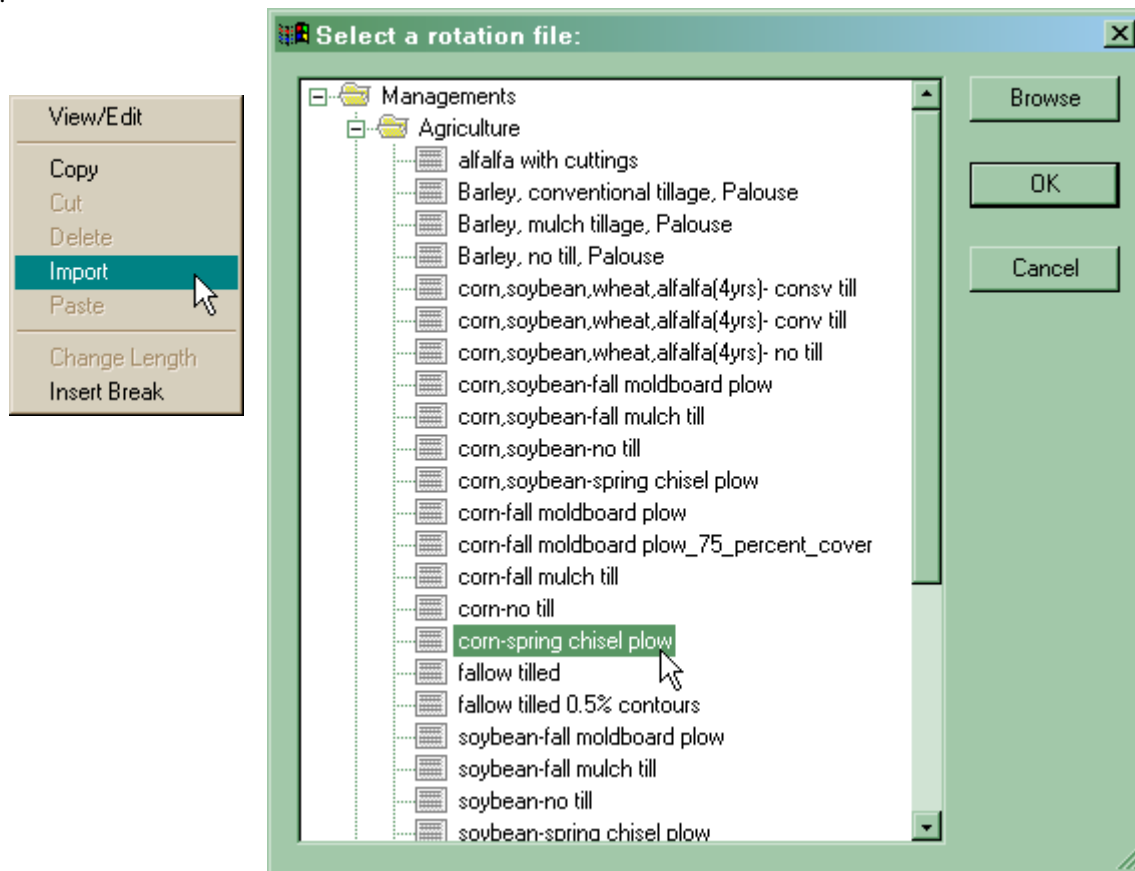
In the current "example-1" project, double click on the management layer. The Cropland Management Editor will appear with the "corn-spring chisel.rot" rotation information loaded. This rotation describes the management operations for a continuous spring chisel plow corn system. Information on the rotation is entered in the table on the bottom portion of the screen. The graphic on the top of the screen is meant to depict individual operations and growing periods through single or multiple rotation years.

Note: If the WEPP Windows interface is set to display metric units the management input screens will have different values in many fields.
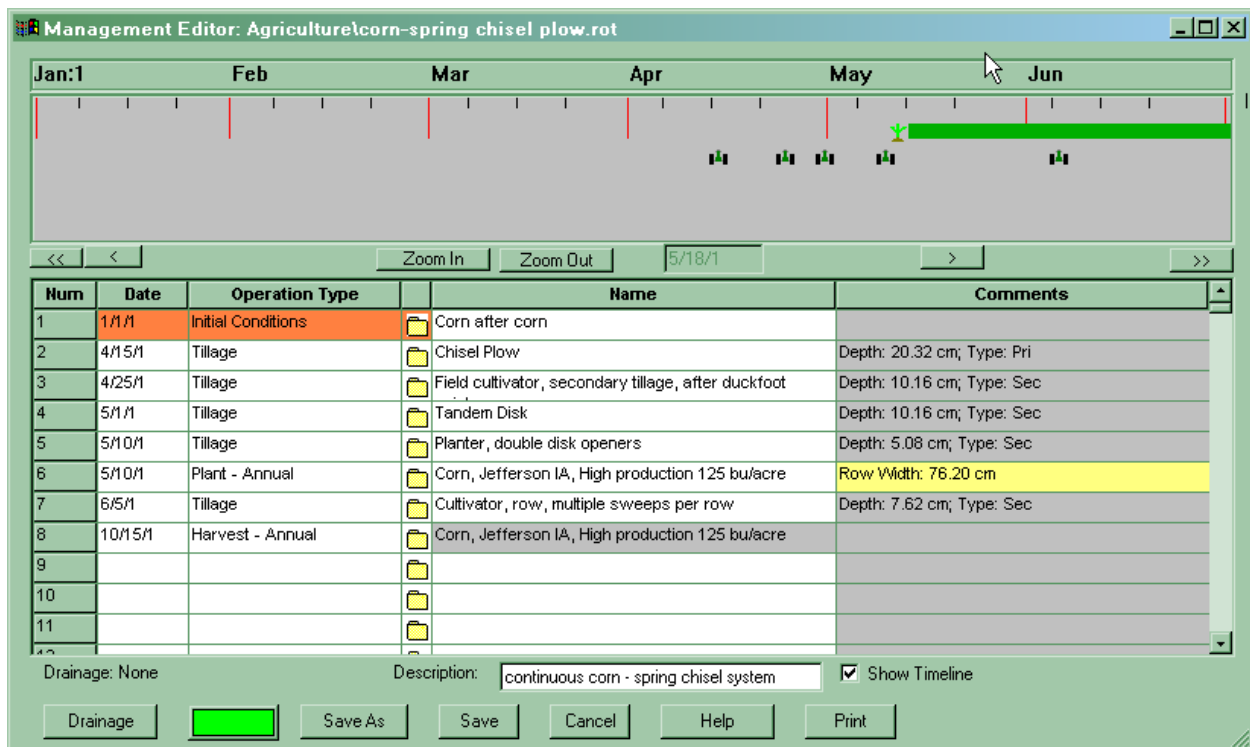
Since the point of this exercise is to create a new rotation, first save the existing "corn-spring chisel plow.rot" information to a new name, and work from with this new one. Click on the **SaveAs** button as shown above. The following window will appear. Enter a name for the new rotation that we will build "example-1", then press the Save button.
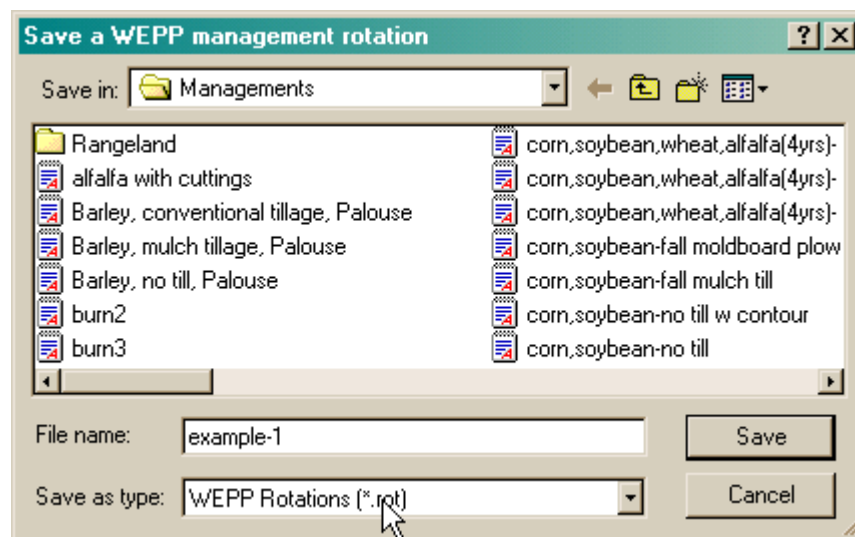

The current rotation file displayed is now named "example-1".

Let's add operations for a soybean crop to be grown in a second year of the rotation. We will initially use a no-till system. Click on the 9th row of the table with the left mouse button to highlight it as shown below, then right click with the mouse to bring up the mouse options screen.

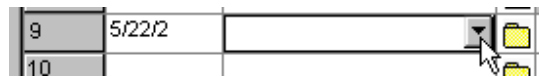| Num	Date	Operation Type		Name	✛	Comments
1	1/1/1	Initial Conditions	🗀	Corn after corn		
2	4/15/1	Tillage	🗀	Chisel Plow		Depth: 8.00 in; Type: Pri
3	4/25/1	Tillage	🗀	Field cultivator, secondary tillage, after duckfoot		Depth: 4.00 in; Type: Sec
4	5/1/1	Tillage	🗀	Tandem Disk		Depth: 4.00 in; Type: Sec
5	5/10/1	Tillage	🗀	Planter, double disk openers		Depth: 2.00 in; Type: Sec
6	5/10/1	Plant - Annual	🗀	Corn, Jefferson IA, High production 125 bu/acre		Row Width: 30.00 in
7	6/5/1	Tillage	🗀	Cultivator, row, multiple sweeps per row		Depth: 3.00 in; Type: Sec
8	10/15/1	Harvest - Annual	🗀	Corn, Jefferson IA, High production 125 bu/acre		
9			🗀			
10			🗀			
11			🗀			

The mouse options allow you to perform many functions in the rotation table. You can edit the date for the current row, edit the operation parameters for the current row, copy, cut, delete, paste, and insert a row, insert an existing rotation from the database at some point in the current rotation, save highlighted rows from the table as a new rotation, and change the year date for a group of highlighted rows. In this example we need to change the date to May 22 of year 2 of the rotation. Select Edit Date from the list, and a calendar screen will appear. On the month field, click on the dropdown arrow and scroll to select May as shown in the figure.
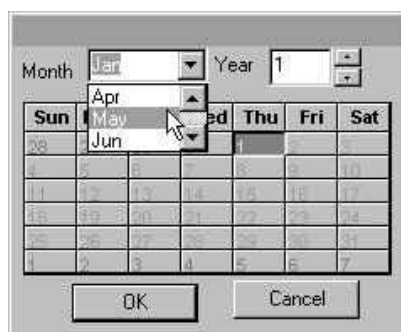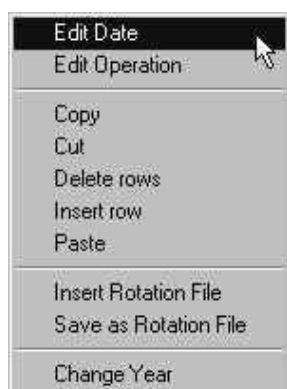
Next, click on the year up arrow button, and increase the value to 2. Then select the 22nd with a left mouse click as shown, then click on the OK button. The calendar screen will disappear and the date 5/22/2 will be entered in row 9.
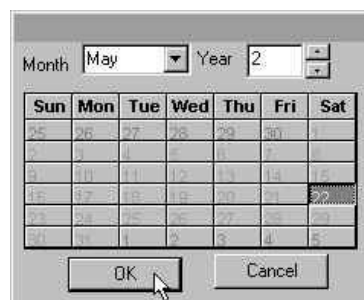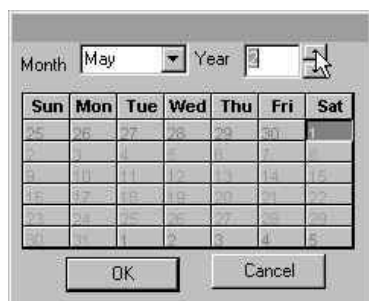
On line 9 in the rotation table go to Operation column and click on the cell.

9	5/22/2		▼
10			

A dropdown list icon will appear at the right of the cell. Click on the dropdown arrow button, and a list of available cropland operations will appear. Select Tillage from the list with a left mouse click.

Num	Date	Operation Type		Name	Comments
1	1/1/1	Initial Conditions		Corn after corn	
2	4/15/1	Tillage		Chisel Plow	Depth: 8.00 in; Type: Pri
3	4/25/1	Tillage		Field cultivator, secondary tillage, after duckfoot	Depth: 4.00 in; Type: Sec
4	5/1/1	Tillage		Tandem Disk	Depth: 4.00 in; Type: Sec
5	5/10/1	Tillage		Planter, double disk openers	Depth: 2.00 in; Type: Sec
6	5/10/1	Plant - Annual		Corn, Jefferson IA, High production 125 bu/acre	Row Width: 30.00 in
7	6/5/1	Tillage		Cultivator, row, multiple sweeps per row	Depth: 3.00 in; Type: Sec
8	10/15/1	Harvest - Annual		Corn, Jefferson IA, High production 125 bu/acre	
9	5/22/2		▼		
10		Tillage			
11		Plant - Annual			
		Plant - Perennial			

The Name cell will be filled with "Anhydrous applicator" as shown below.

7	9/30/1	Harvest - Annual		Corn, Jefferson IA, High production 125 bu/acre		
8	5/22/2	Tillage		Anhydrous applicator	Depth: 1.97 in	Type: Secondary

Click on the name cell to make another dropdown arrow button appear, then click on the dropdown list button.

Num	Date	Operation Type		Name	Comments
1	1/1/1	Initial Conditions		Corn after corn	
2	4/15/1	Tillage		Chisel Plow	Depth: 8.00 in; Type: Pri
3	4/25/1	Tillage		Field cultivator, secondary tillage, after duckfoot	Depth: 4.00 in; Type: Sec
4	5/1/1	Tillage		Tandem Disk	Depth: 4.00 in; Type: Sec
5	5/10/1	Tillage		Planter, double disk openers	Depth: 2.00 in; Type: Sec
6	5/10/1	Plant - Annual		Corn, Jefferson IA, High production 125 bu/acre	Row Width: 30.00 in
7	6/5/1	Tillage		Cultivator, row, multiple sweeps per row	Depth: 3.00 in; Type: Sec
8	10/15/1	Harvest - Annual		Corn, Jefferson IA, High production 125 bu/acre	
9	5/22/2	Tillage		Drill, no-till in standing stubble-fluted coulters ▼	Depth: 1.97 in; Type: Sec
10				Drill, no-till in standing stubble-fluted coulters	
11				Drill, no-till in standing stubble-ripple or bubble co	
				Drill, no-till in standing stubble-smooth coulters	

In the list of tillage operations, scroll down to the Drill section, then select "Drill, no-till in standing stubble – fluted coulter" with a left-mouse click. The new information for the no-till drill should now be displayed in row 9 of the table. (Table column and row widths can be resized if long text wrapping makes some entries hard to read.)

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Next, let's insert a new row with the same information as is now in row 9. Click on row 9 column 1 with a left mouse click, then right click to bring up the option menu.
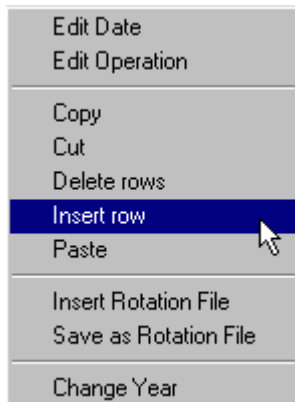
| 8 | 10/15/1 | Harvest - Annual | 📁 Corn, Jefferson IA, High production 125 bu/acre | |
| 9 | 5/22/2 | Tillage | 📁 Anhydrous applicator | Depth: 1.97 in; Type: Sec |

Edit Date
Edit Operation

Copy
Cut
Delete rows
Insert row
Paste

Insert Rotation File
Save as Rotation File

Change Year

A new row 10 will appear, with the same date and operation type as in row 9 information.

| 9 | 5/22/2 | Tillage | 📁 Drill, no-till in standing stubble-fluted coulters | Depth: 1.97 in; Type: Sec |
| 10 | 5/22/2 | Tillage | ▼ 📁 Anhydrous applicator | Depth: 1.97 in; Type: Sec |

The tillage operations address soil disturbance activities. To actually plant and start the growth of our new soybean crop, we need to go to the Operations column in line 10, click on the dropdown list, and select Plant-Annual, since we will be growing soybeans as an annual crop.

10	5/22/2	Plant - Annual	▼📁
11		Tillage	▲
12		Plant - Annual	
		Plant - Perennial	

📁 Alfalfa ▼

The remainder of the row will then be filled in, with Alfalfa listed in the Name cell. Go to the Name cell and click on the dropdown list to select a soybean crop. We want to choose medium fertility level soybeans.

Select "Soybeans – Medium Fertilization Level" from the list as shown with a left mouse click.

Sorghum-Low Fertilization Level
Sorghum-Medium Fertilization Level
Soybean, Medium production, 35 bu/a
Soybean, SD, Medium 35 bu/acre
Soybeans - High Fertilization Level
Soybeans - Low Fertilization Level
Soybeans - Medium Fertilization Leve
Sugarbeet for Michigan
Sunflower, CO
Sweet corn
Sweet potato
Tobacco

Row 10 will now be filled in as shown below. However the row width for the soybeans is not typical of a drill, so we will need to edit the soybean parameters. To do this, click on the small folder icon to the left of the Name column.

| 10 | 5/22/2 | Plant - Annual | 📁 Soybeans - Medium Fertilization Level | ▼ Rows Width 31.50 in |

The plant database window will appear. This screen contains 32 parameters associated with a plant type. We will only change the Row width in the entry field at the bottom left of the screen, from 30 inches (76cm) to 10 inches (25.4cm)

Num	Parameter	Value	Units
1	*Plant Growth and Harvest Parameters*		
2	Biomass energy ratio	0.0535	lbs/btu
3	Growing degree days to emergence	140	Degrees F.days
4	Growing degree days for growing season	2102	Degrees F.days
5	In-row plant spacing	0.9842	inches
6	Plant stem diameter at maturity	0.374	inches
7	Height of post-harvest standing residue; cutting height	5.984	inches
8	Harvest index (dry crop yield/total above ground dry biom	50	%
9	*Temperature and Radiation Parameters*		
10	Base daily air temperature	50	Degrees F
11	Optimal temperature for plant growth	77	Degrees F
12	Maximum temperature that stops the growth of a perenni	32	Degrees F
13	Critical freezing temperature for a perennial crop	32	Degrees F
14	Radiation extinction coefficient	0.31	
15	*Canopy, LAI and Root Parameters*		
16	Canopy cover coefficient	14	
17	Parameter value for canopy height equation	3	

Row Width(in): 30   ☑ English Units

Save As   Save   Cancel   Help

Enter a value of 10 inches (25.4 cm) here, and click on the Save button. Returning to the table, line 10 now appears with the correct row spacing. Next, click on line 11 column 1 with the left mouse button, then right click to bring up the mouse options. Select insert row again, and the information on line 10 will be copied to line 11.

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On line 11, go to the Operation column, and select Harvest Annual from the drop-down pick-list.

Next, click with the left mouse button into the date column, and directly enter the harvest date of September 30, year 2.

The rotation table now contains all of the operations necessary for a two year corn-soybean rotation, as shown in the next figure.

Num	Date	Operation Type		Name	Comments
1	1/1/1	Initial Conditions		Corn after corn	
2	4/15/1	Tillage		Chisel Plow	Depth: 8.00 in; Type: Pri
3	4/25/1	Tillage		Field cultivator, secondary tillage, after duckfoot	Depth: 4.00 in; Type: Sec
4	5/1/1	Tillage		Tandem Disk	Depth: 4.00 in; Type: Sec
5	5/10/1	Tillage		Planter, double disk openers	Depth: 2.00 in; Type: Sec
6	5/10/1	Plant - Annual		Corn, Jefferson IA, High production 125 bu/acre	Row Width: 30.00 in
7	6/5/1	Tillage		Cultivator, row, multiple sweeps per row	Depth: 3.00 in; Type: Sec
8	10/15/1	Harvest - Annual		Corn, Jefferson IA, High production 125 bu/acre	
9	5/22/2	Tillage		Drill, no-till in standing stubble-fluted coulters	Depth: 1.97 in; Type: Sec
10	5/22/2	Plant - Annual		Soybeans - Medium Fertilization Level	Row Width: 10.00 in
11	9/30/2	Harvest - Annual		Soybeans - Medium Fertilization Level	
12					

However, the Initial Conditions were from the original continuous corn spring chisel system, and likely do not contain correct information. Click on the file icon in the Initial Conditions on line 1 of the rotation table.

The Initial Conditions Database screen will appear. It contains 21 parameter values related to initial conditions for a rotation. Here we need to change the Initial Plant/Residue type in row 1 of the table. Click on the Value cell for row 1, then scroll down the drop-down list and select Soybeans-Medium Fertilization with a left mouse click.

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The initial residue cover values (interrill cover and rill cover) are at 90%, which is reasonable following harvest of soybeans and no tillage. If there are no other changes, click on the SaveAs button at the lower left of the screen.

In the **Create a new database record** window, change the name to "Initial conditions for crop following no-till soybeans – example 1", and also change the description line as shown in the figure below. Then click on the OK button.

Name	Initial conditions for crop following no-till soybeans - example 1
Description	Example initial conditions following harvest of no-till soybeans
Source	90 percent cover, approximately 200 days since last tillage
Comments	500 mm of rain since last tillage in summer prior

Create a new database record

OK   Cancel

Returning to the Initial Conditions Database screen, the values have now changed to the new ones we entered. Click on the Save or Cancel button to exit the screen.

Initial Conditions Database

Initial	Initial conditions for crop following no-till soybeans - example 1
Description:	Example initial conditions following harvest of no-till soybeans
Data Source:	90 percent cover, approximately 200 days since last tillage
Comment:	500 mm of rain since last tillage in summer prior

Num	Parameter	Value	Units
1	Initial Plant	Soybeans - Medium Fertilization Level	
2	Bulk density after last tillage	1.1	(g/cub. cm
3	Initial canopy cover (0-100%)	0	%
4	Days since last tillage	200	days
5	Days since last harvest	92	days
6	Initial frost depth	0	inches
7	Initial interrill cover (0-100%)	90	%
8	Initial residue cropping system	Annual	

Save As   Save   Cancel   ☑ English Units   Help

Once back in the main rotation screen, the initial conditions set selected is still "Corn after corn" (this is an interface bug that needs to be corrected). Click on the dropdown list, and choose the new initial conditions set just created.

1	1/1/1	Initial Conditions		Corn after corn

Name

fallow initial conditions - corn residu
grass strip
grass strip - permanent - no planting
Initial conditions for crop following n
Live winter wheat in a continuous w
Live winter wheat planted into soyb
peanut
watermelon
Winter wheat harvest in fall prior, no
Winter wheat harvest in summer 1 y
Winter wheat harvest, straw baling,

At the bottom of the management editor screen, type in a new description for the new rotation as shown here.

Description: | spring chisel corn - no-till soybeans

Now our final rotation table looks like this:

Num	Date	Operation Type		Name	Comments
1	1/1/1	Initial Conditions		Initial conditions for crop following no-till soybeans - example-1	
2	4/15/1	Tillage		Chisel Plow	Depth: 8.00 in; Type: Pri
3	4/25/1	Tillage		Field cultivator, secondary tillage, after duckfoot points	Depth: 4.00 in; Type: Sec
4	5/1/1	Tillage		Tandem Disk	Depth: 4.00 in; Type: Sec
5	5/10/1	Tillage		Planter, double disk openers	Depth: 2.00 in; Type: Sec
6	5/10/1	Plant - Annual		Corn, Jefferson IA, High production 125 bu/acre	Row Width: 30.00 in
7	6/5/1	Tillage		Cultivator, row, multiple sweeps per row	Depth: 3.00 in; Type: Sec
8	10/15/1	Harvest - Annual		Corn, Jefferson IA, High production 125 bu/acre	
9	5/22/2	Tillage		Drill, no-till in standing stubble-fluted coulters	Depth: 1.97 in; Type: Sec
10	5/22/2	Plant - Annual		Soybeans - Medium Fertilization Level	Row Width: 10.00 in
11	9/30/2	Harvest - Annual		Soybeans - Medium Fertilization Level	
12					
13					
14					

Click on the Save button to save the rotation information to the database and return to the main interface project screen.

Run
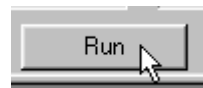
Click on the Run button to run the WEPP model with the new corn and soybean rotation. The results will be displayed for the new 50 year simulation.

Use the File Save option to save the current example-1 project as finally configured.
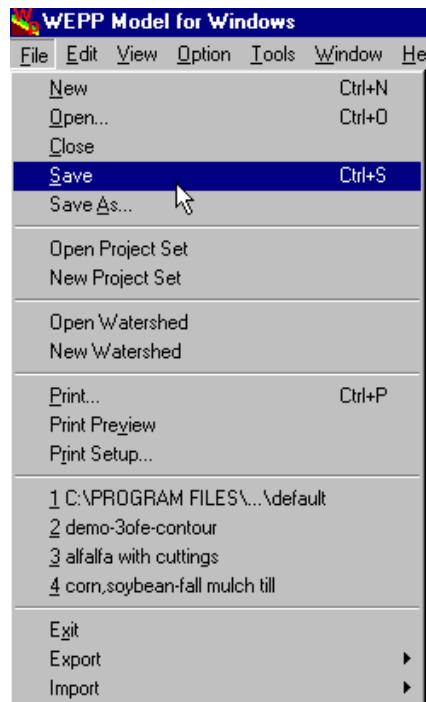
You might also want to print a summary sheet of your final simulation run (if your PC is connected to a printer). To do this, click on the Print button or pick Print from the File options.

You will get a print-out sheet summarizing the inputs for the simulation run as well as the erosion prediction results.

Section 4. WEPP watershed simulations

The previous sections explained how to use the WEPP hillslope interface. The WEPP watershed interface allows multiple hillslopes, channels and impoundments to be setup. This section assumes you have already used the WEPP hillslope interface. In this watershed section, the tutorial will be working in metric units, so if you would like to follow along with the screen images shown here, toggle to metric units using the units button.

A. Getting Started

To open existing watershed projects, go to the File menu at the top of the main interface screen, and click on Open Watershed.

A window will appear listing the existing watershed projects. Select the "default_ag" watershed project, then click on the Open button.
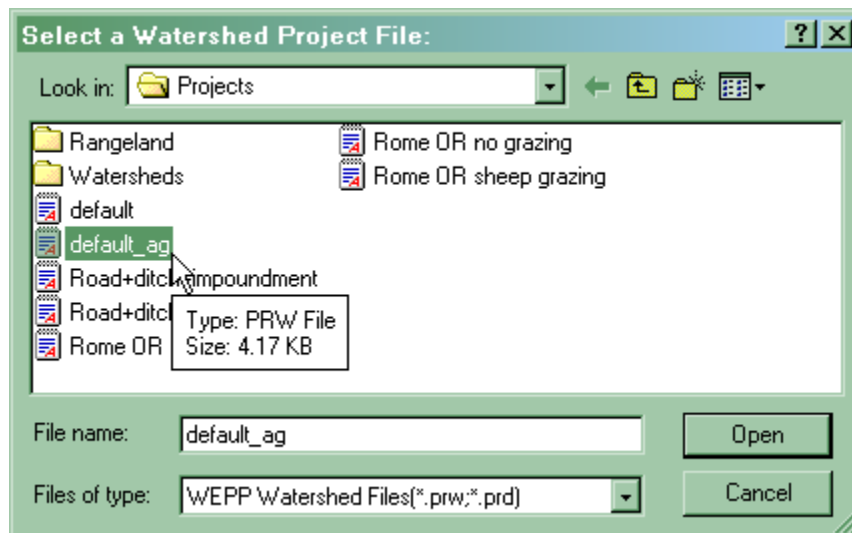
The watershed view window will open with the "default" watershed project loaded.

This watershed has 3 hillslopes (H1,H2 and H3) feeding a channel (C1). The screen graphically depicts the watershed as rectangular regions for the hillslopes and a single line for the channel. The watershed outlet point is indicated by the yellow circle at the bottom of channel C1. The red arrows on the hillslopes and channel indicate the direction water will flow.
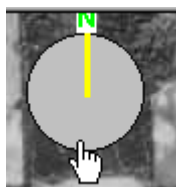
The watershed has an orientation which is indicated by the direction arrow in the upper left corner of the screen.

The climate used for the simulation is indicated on the window title and also above the climate icon in the middle of the image. In this example, climate data from Xian China is being used.

Move the mouse pointer over the image. The cursor shape will change to a hand to indicate that an object can be selected with the mouse. In addition, when the mouse pointer is over a hillslope, channel or impoundment, the name will be displayed next to the cursor. Many operations in the watershed interface start with selecting a hillslope, channel or impoundment by left clicking and displaying a menu of operations by right clicking.

The toolbar on the right side of the window contains many functions that change the way information is displayed in the watershed view. The top button is displays an additional panel of information to the right of the watershed view. Click on the top (legend) button.


The watershed view will change to the following:

Depending on the size of your screen you may have to resize the right panel. This can be done by clicking on the border on the right side of the image and then dragging the cursor. To hide the legend window and have more room for diagramming, click on the legend button again.

The top area of the legend panel contains 5 sections that can be displayed.

Click on the **Site Description** and **Selected Component Details** checkboxes. This will display comments about the watershed which can be edited and also a table that can display more information about selected watershed objects.

Any comments about the watershed project

Table to display selected component details
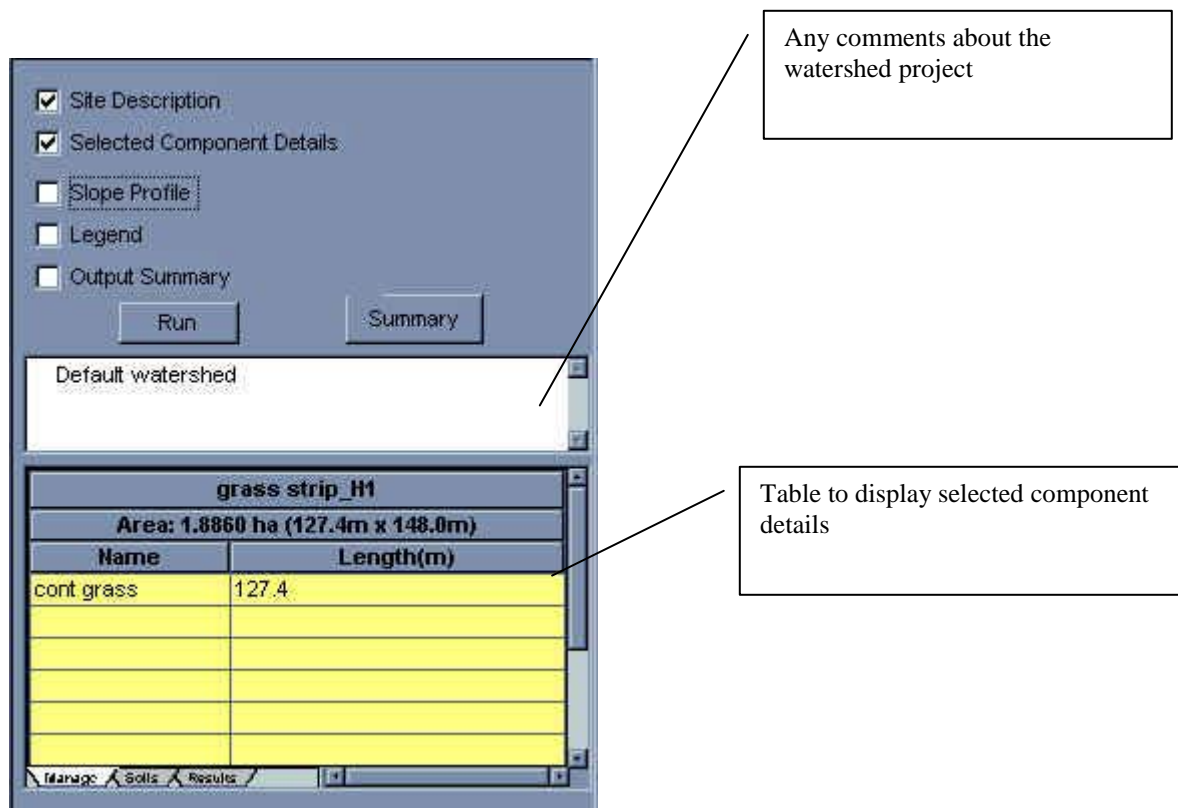
Move the cursor to the watershed diagram and left click on the H1 hillslope. The table should be filled in with information about the soil and management and the dimensions of hillslope H1. Since the WEPP model has not been run, the results area contains zeros. If the hillslope has several soil or management sections then each line will contain the name and length of the section. To change the table to view soils, management or results information click on the tabs below the table.

Move the cursor around the watershed view and left click on the different hillslopes and channel. The table will be updated with information each time you left-click.
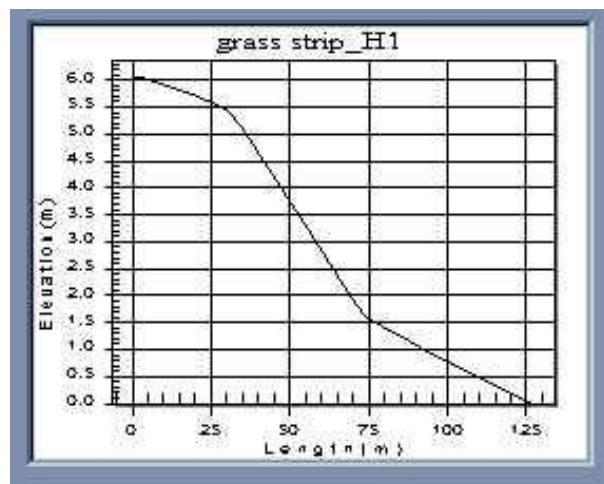
One piece of information that is not displayed in the table is the slope shapes of the hillslopes and channel. Click on the **Slope Profile** checkbox and then left click on the H1 hillslope. The slope shape will be displayed below the table:

Click on the other hillslopes and channel to see the profile shapes. The slope graph can be customized or exported to the Windows clipboard. To see all the graph customizations right click on the slope graph window to display the menu:

Viewing Style ▶
Font Size ▶
Numeric Precision ▶
Plotting Method ▶
Data Shadows ▶
Grid Lines ▶
Grid in Front
Include Data Labels
Mark Data Points
Undo Zoom

Maximize...
Customization Dialog...
Export Dialog...
Help
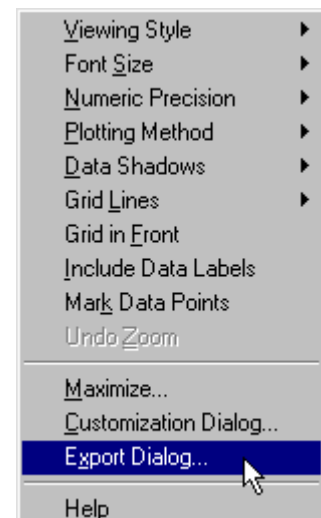
To see all the managements used on the hillslopes displayed click on the management layer button on the watershed toolbar. In addition, click on the **Legend** checkbox. The view window will show all hillslopes in different colors. The legend table in right window indicates this is grass, corn and fallow. You can also hover the mouse pointer over the hillslopes to display the management names.
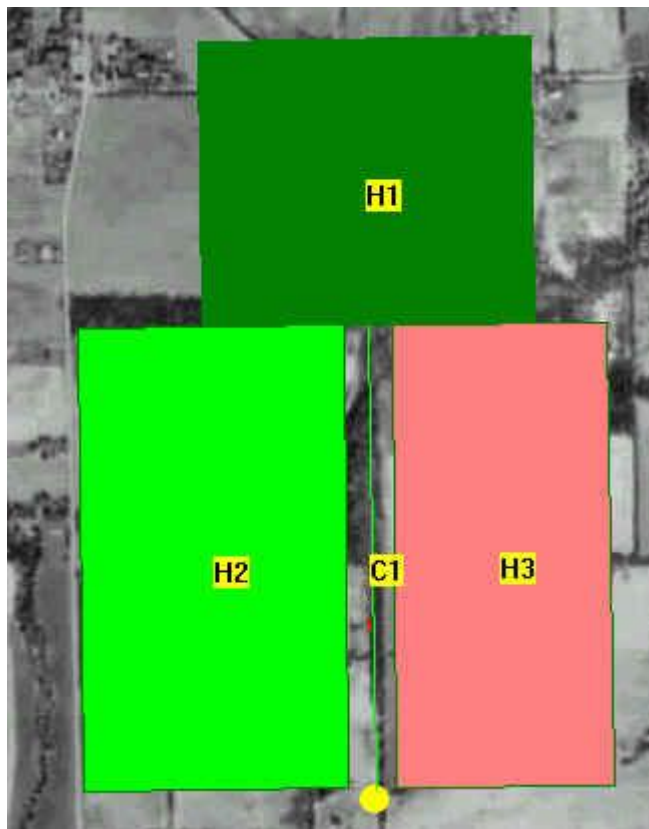
Legend	Managements
	cont grass
	continuous corn - spring chisel system
	fallow

Next, view the soil information. Click on the soil layer toolbar button . The watershed view will display the soils for the 3 hillslopes. This example shows that the watershed setup contains 2 soil types. The legend table indicates what soil types the colors represent. You can also view the soil or management names by moving the mouse pointer over the hillslopes.
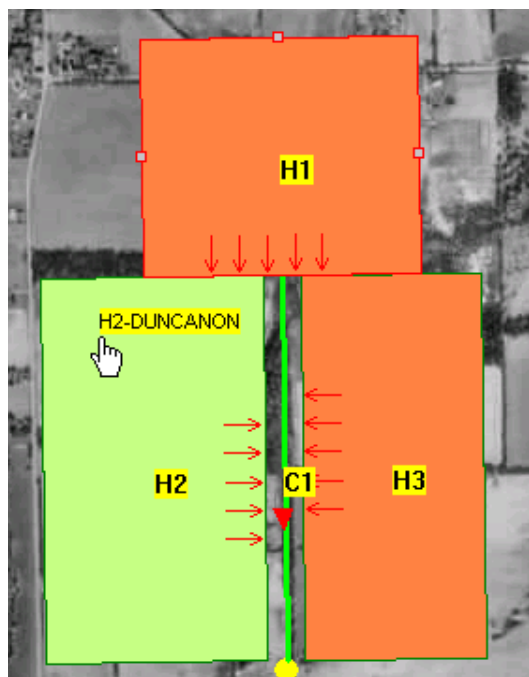
Legend	Soils
	belmore
	Duncanon

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B. Running a Simulation

To run a watershed simulation click on the green circle toolbar button at the bottom of the watershed toolbar. (The **Run** button in the legend panel can also be used to start a simulation.) The WEPP model runs a simulation for each hillslope in the watershed and then does a final simulation to merge the results and simulate channels and any impoundments. The following windows will be displayed after starting a run:
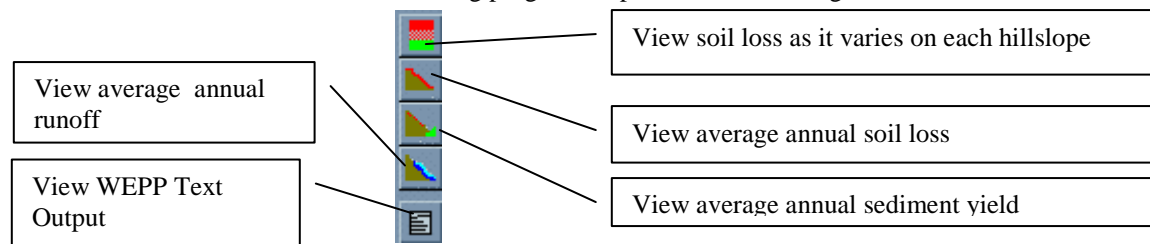
Running WEPP Hillslope...

Year 1 of 2

Cancel

Running WEPP, merging Hillslopes results...

Year 1 of 2

Cancel
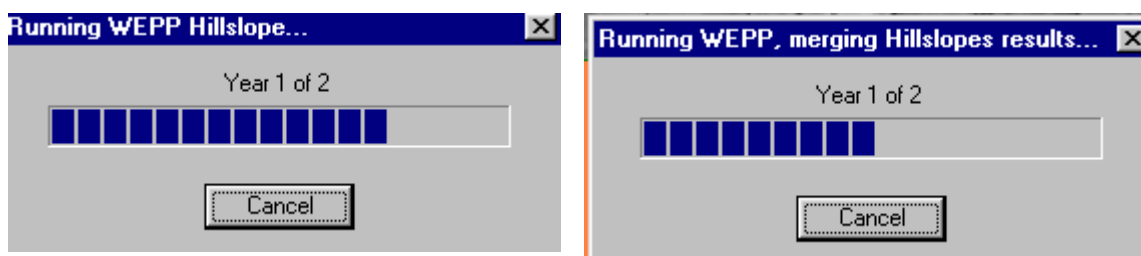
After a run is completed a summary table will be displayed that contains an overview of the simulation results.

Watershed Summary

Watershed Summary for 2 Year Simulation

	Contributing Area (ha)	Discharge Vol (m^3/yr)	Sediment Yield (tonne/yr)	Sediment Yield (T/ha/yr)	Sediment Delivery Ratio	Precip vol in Contributing Area (m^3/yr)		
1								
2	6.37	2159	162.4	25.5	0.872	36876		
3								
4	**HillSlopes**	**Runoff Vol (m^3/yr)**	**Soil Loss (kg/yr)**	**Sediment Dep. (kg/yr)**	**Sediment Yield (kg/yr)**	**Field Area (ha)**	**Length (m)**	**Width (m)**
5	H1-grass strip_H1	20.8	73.0	8.5	64.5	1.89	127.42	148.01
6	H2-corn_H2	664.4	63115.6	16380.0	46735.0	2.44	118.65	206.02
7	H3-fallow tilled_H3	1414.1	120954.2	11371.2	109583.2	1.98	96.35	206.02
8								
9	**Channels**	**Discharge Vol (m^3/yr)**	**Sediment Yield (tonne/yr)**	**Length (m)**	**Width (m)**			
10	C1-WATERWAY	2159.3	162.4	206.02	2.79			
11								
12	**Impoundments**	**Discharge Vol (m^3/yr)**	**Sediment Yield (tonne/yr)**					
13								
14								

The first section shows results for the entire watershed and the following sections display results for the individual elements (hillslopes, channels, impoundments). The interface can also display results directly on the watershed diagram or let the user view detailed text file outputs from the WEPP model.

The toolbars buttons associated with viewing program output are the following:

View soil loss as it varies on each hillslope

View average annual runoff

View average annual soil loss

View WEPP Text Output

View average annual sediment yield

Click on the first soil loss toolbar button   . The watershed view will be shaded, a darker red indicates more erosion, while a bright green indicates deposition.
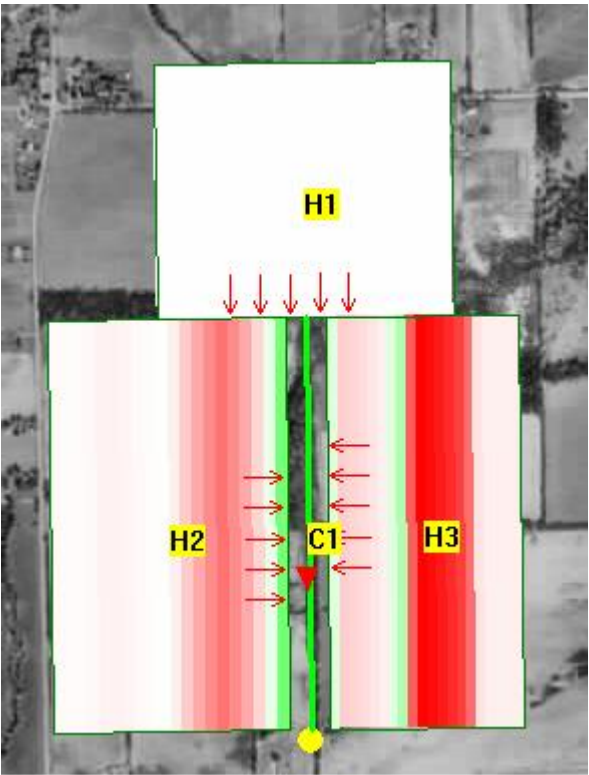
Next click on the runoff output toolbar button [icon]. This will show the runoff amounts from the 3 hillslopes along with the legend indicating the ranges assigned to each shading group.

Legend	Runoff (m^3/yr)
	0.00 - 1000.00
	1000.00 - 2000.00
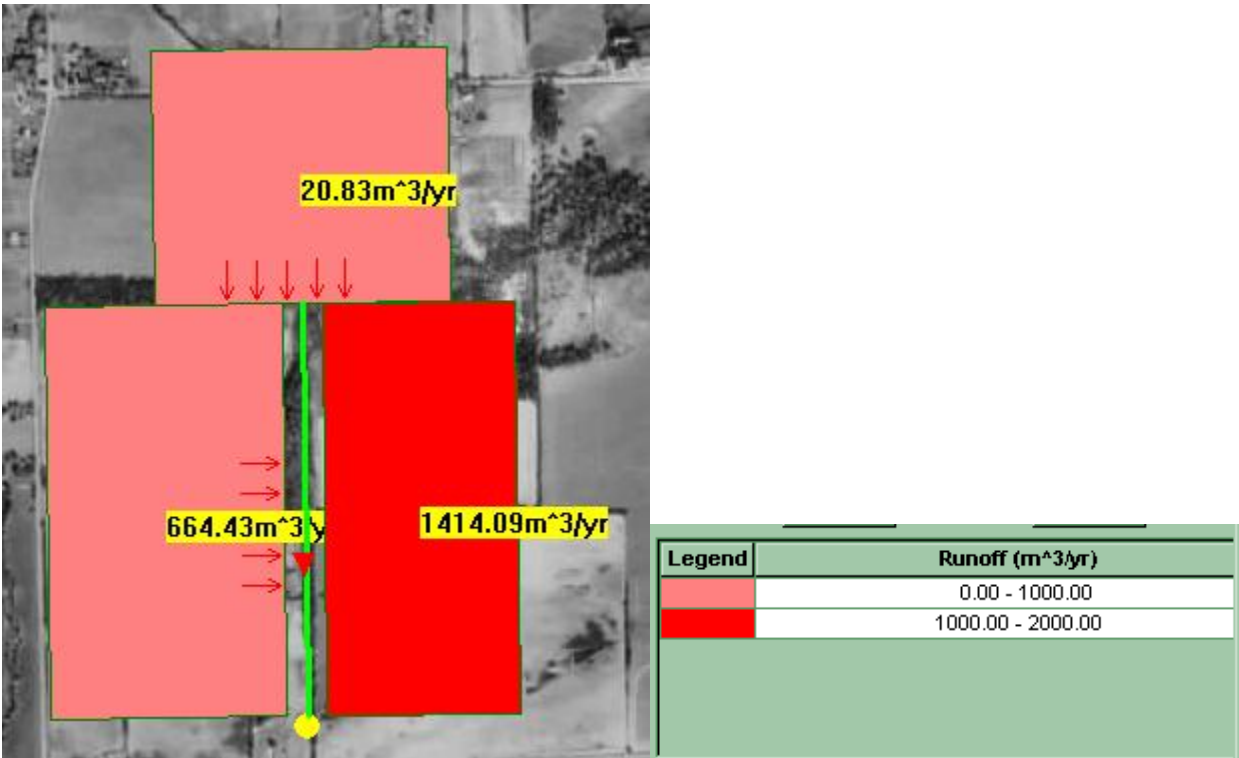
Text file produced from the WEPP model can be viewed by clicking on the text output toolbar button. Click on the text output button and then select the Main Wepp Output file from the list by double-clicking on the name.
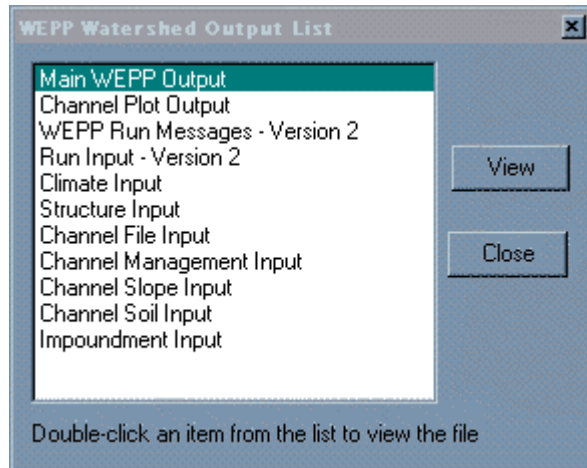
This will display the WEPP summary output file in the Windows Notepad program. You can also view other output files produced by the model along with the input files used to setup the watershed simulation.

C. Zoom in , Zoom out and Measuring

The toolbar icons with the magnifying glass and plus and minus signs can be used to zoom in and make the watershed diagram larger, or to zoom out and make it smaller.

The scale at the bottom of the window will change when the image zoom in or zoom out buttons are used.

To measure distances between points in the watershed view the **measure button** can be used. Click on this button and then left click at any place in the watershed window, move the mouse and then double-click on a second point. The distance between the two points will be displayed. As the mouse is being moved the distance from the first point is displayed in the lower right corner of the window. You can also measure polygon areas by clicking on the measure button and then clicking on each point with the last point clicked being on top of the first point. To indicate when the cursor is over the first point it will change to a cross with arrows. Double clicking at this point will display the area.
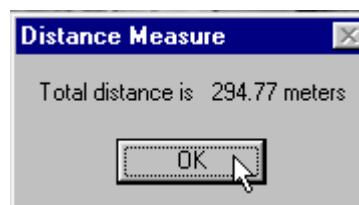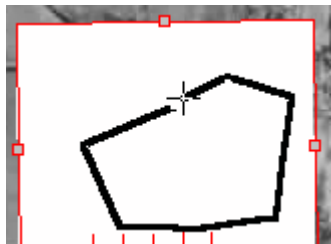
D. Modifying the Watershed

To change the management on an existing hillslope, double-click on the hillslope. For example, in the default project reduce the soil loss on the fallow hillslope by planting alfalfa. Double click on hillslope H3, which will display another window showing the hillslope details. This window functions the same way as the hillslope project interface.

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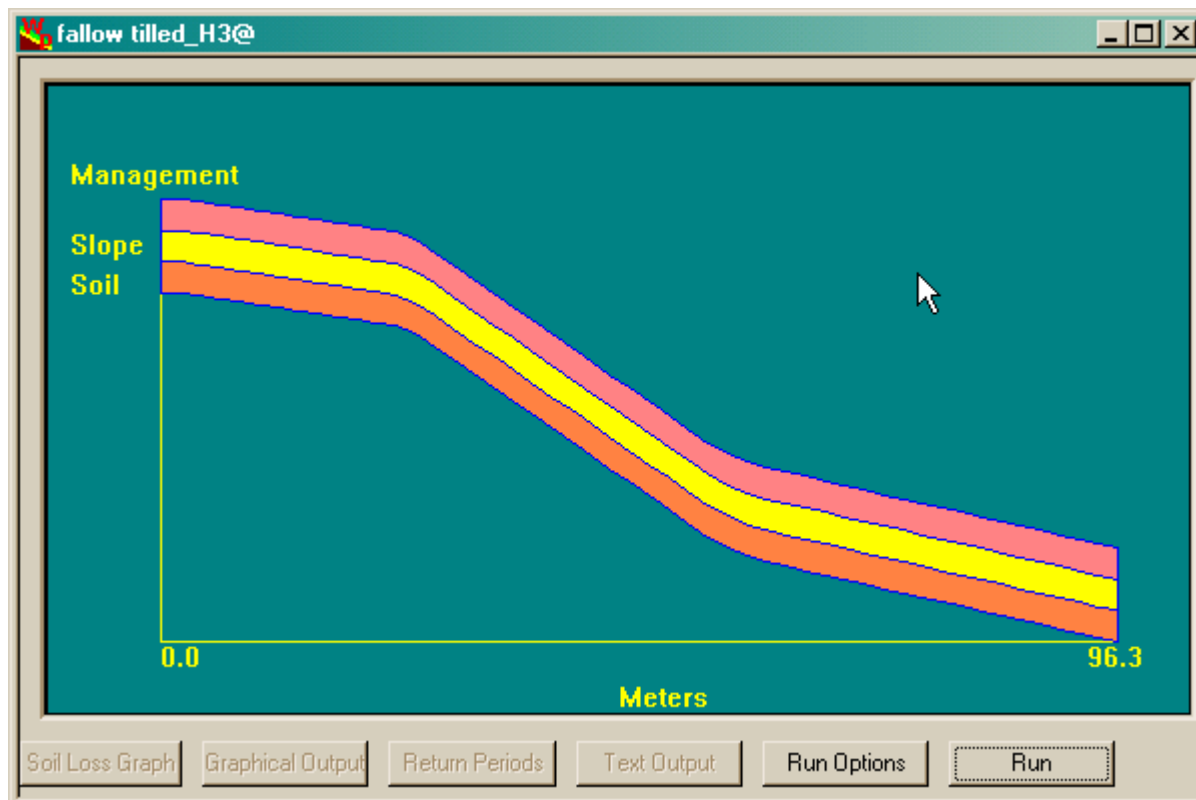
Right click on the top management layer and then select the **Import** menu option. When the window displaying all the available management files is displayed, double click on the **alfalfa with cutting** file. This will change the management to alfalfa which is indicated by the green color displayed in the management layer. After changing the management, close the hillslope window by clicking on the X in the upper right corner. Answer **Yes** when asked if you want to save the changes. Rerun the simulation and the results will show lower erosion due to the new management.
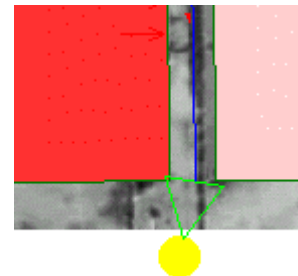
E. Adding an Impoundment

Now add an impoundment object at the end of the channel. This can be done by left-clicking on channel C1 to select it. When a channel is selected it is displayed as a red line. After the channel is selected, right-click to display a menu of options.


Select the last menu option **Add Impoundment** and from the sub-menu choose **On Bottom.** Move the mouse pointer around near the channel outlet. An outline of a triangle will be drawn as the mouse is moved. The outline represents how the impoundment will be represented in the diagram. When you have a small triangle, left-click to display the impoundment icon.

The terminating point of the watershed is now the impoundment that was added. Rerun the simulation and notice that the discharge volume for the watershed has gone down.

**F.** <u>**Adding a Channel**</u>
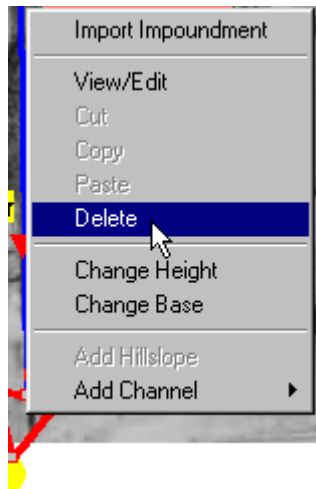
Next, delete the impoundment by selecting it (left-click) and then pressing the Delete key. You can also right-click and choose the Delete menu option to remove an object.

Select channel C1 by left clicking and then right-click and choose the **Add Channel** menu option. From the sub-menu choose **On Bottom.** Move the mouse pointer around, an outline of where the channel will be placed is drawn. When the desired position is found, left-click to place the channel and then choose Yes from the window that is displayed.
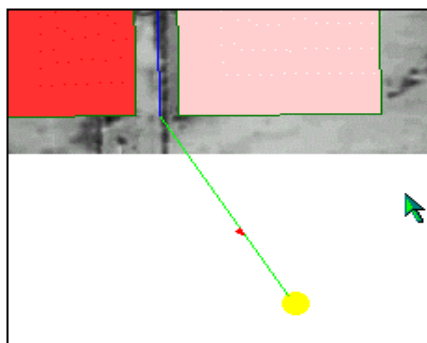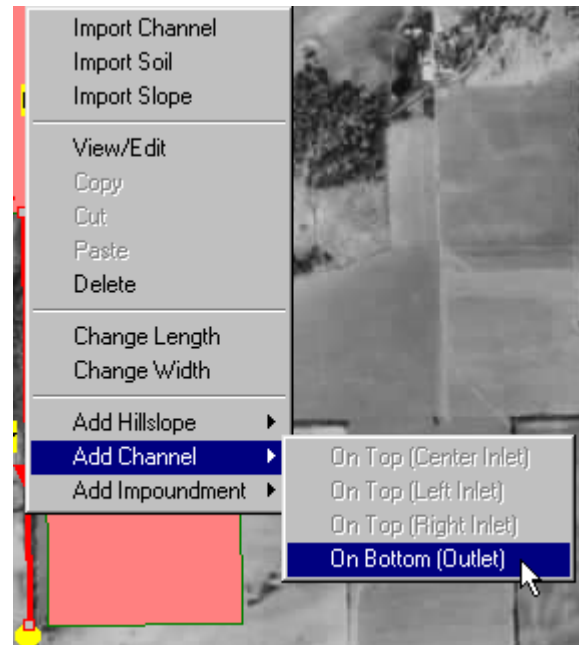
If the channel and hillslope names are not displayed click on the **Options** menu at the top of the program window and select the **Element Names** item. The new channel added is named C2. A channel in WEPP can have elements feeding it from the top, left and right sides. Currently C2 is being fed by C1.
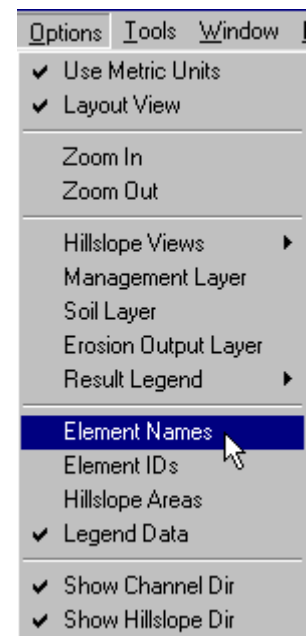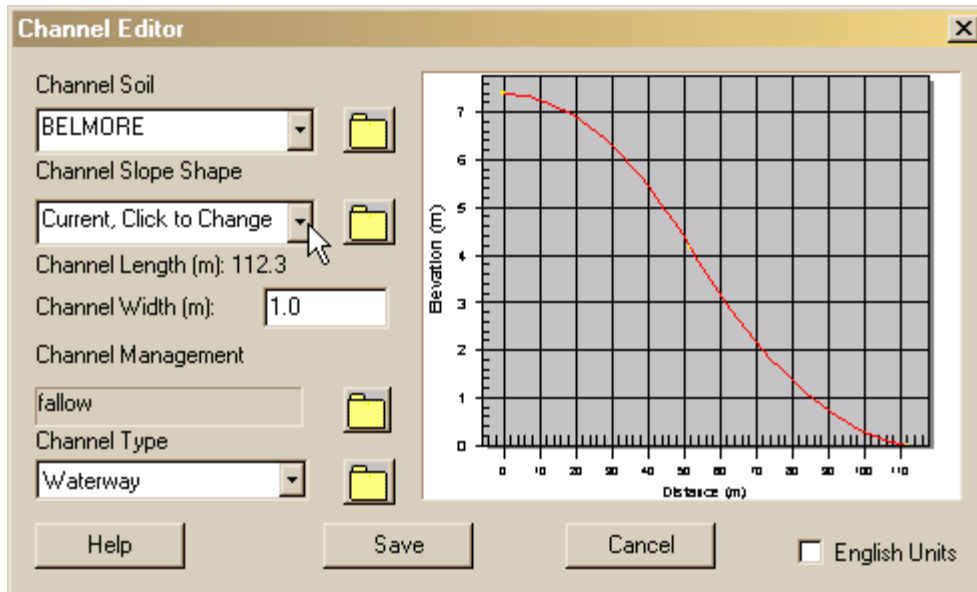
After Clicking Yes to place the channel a window will be displayed that allows the parameters for the channel to be set. Change the soil type to Belmore and the slope shape to s-shape and then click save. The channel management is changed by clicking on the folder next to the channel type that contains additional channel parameters. New slope shapes can be created with the slope editor by clicking on the folder next to slope shape list.

G. Adding a Hillslope

Hillslopes can be added to the sides of the channel by first right-clicking on the channel to display the channel menu and then selecting **Add Hillslope**, from the sub-menu select **On Downstream Left**. This will display a window to allow a hillslope project be loaded and assigned to side of the channel.
Click OK to load the alfalfa hillslope.
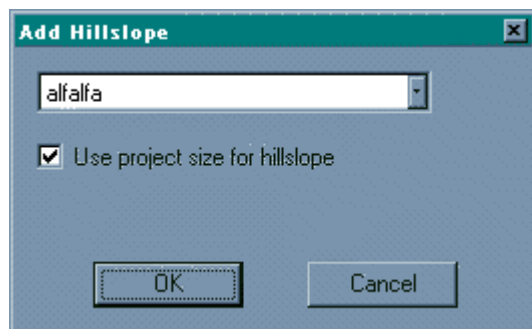
The default is for the new hillslope width to be equal to the channel length and the hillslope length to be defined by the alfalfa project. The dimensions, soil, management and slope can be changed on a hillslope after it is loaded. After adding a hillslope to the downstream left of C1, repeat the process and add another hillslope to the downstream right side. After adding the hillslopes the watershed should look something like this:

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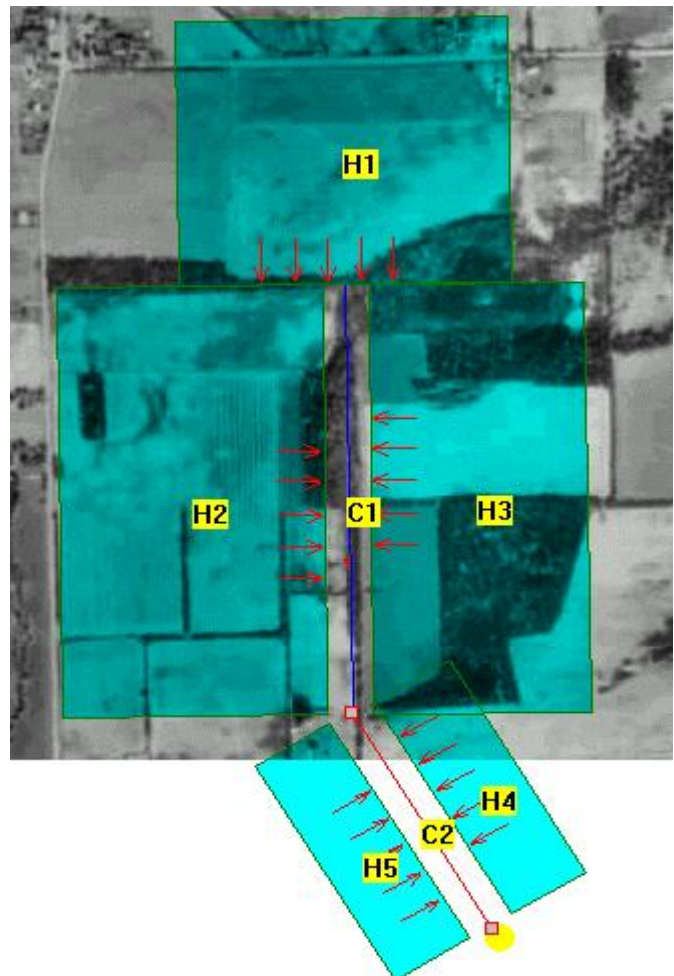
The background image can also be turned off and a solid color used instead. To change the background to a solid color click on the **Tools** menu at the top of the program window and select **Change Background.** From the sub-menu choose **Color**. From the color chooser window click on a new color to use as the background

The watershed diagram will probably now extend beyond the image. At this point the whole watershed can be moved around on the screen by clicking on the C2 channel with the left mouse button, holding the mouse down and dragging the watershed around the screen. Releasing the mouse button will drop the watershed.

Change the background to a solid color. The resulting watershed diagram should look something like the following after changing the background and then clicking on the management layer toolbar button: (the background may be different depending of what color you chose).
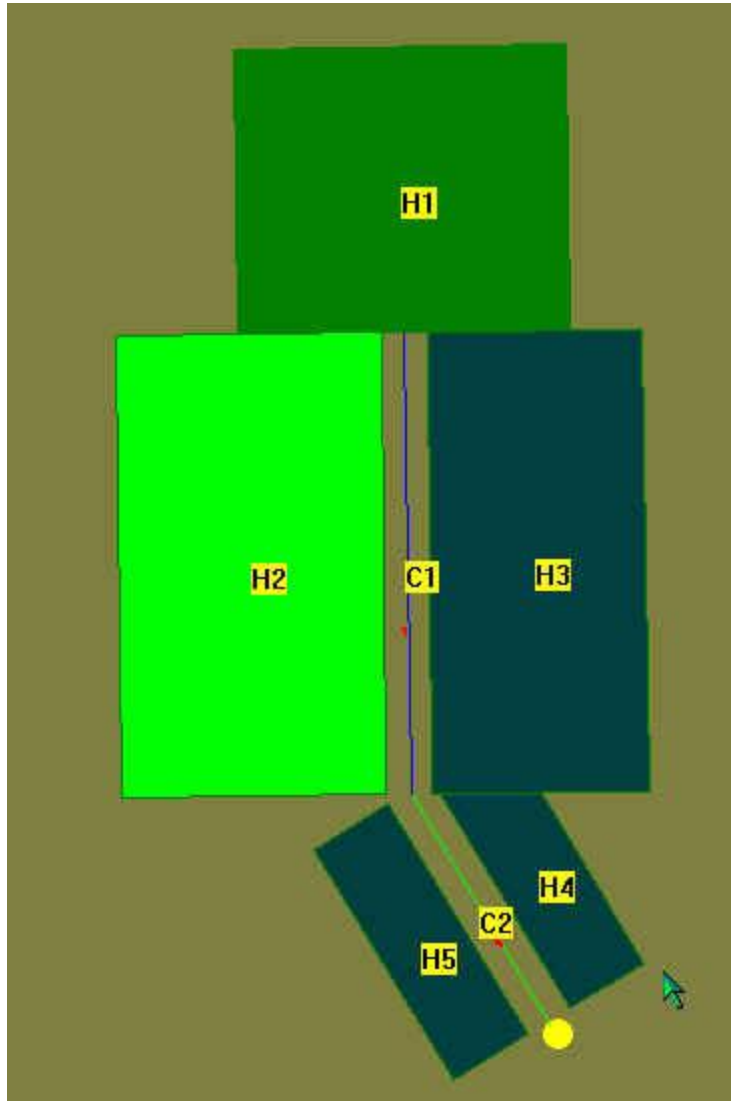

The WEPP model can be run at this point to view what effect adding a channel and two hillslopes has on the simulation.

H. Watershed Configuration

Using the same procedure, additional channels, hillslopes and impoundments can be added to the watershed. When building watershed configurations for simulations the WEPP model imposes some rules about how elements are connected. Any channel or impoundment must have at least one input that drains into it. The interface will gray-out menu items that are not valid for the current element selected. For example, for channel C1 no additional elements can be added because it already has elements connected to the top, left and right (H1,H2,H3) and bottom C2. If C2 is selected additional elements can be added. Select channel C2 and then right-click and select **Add Channel** from the sub-menu choose **On Downstream Right** Move the cursor around to draw the channel as being an input for C2.
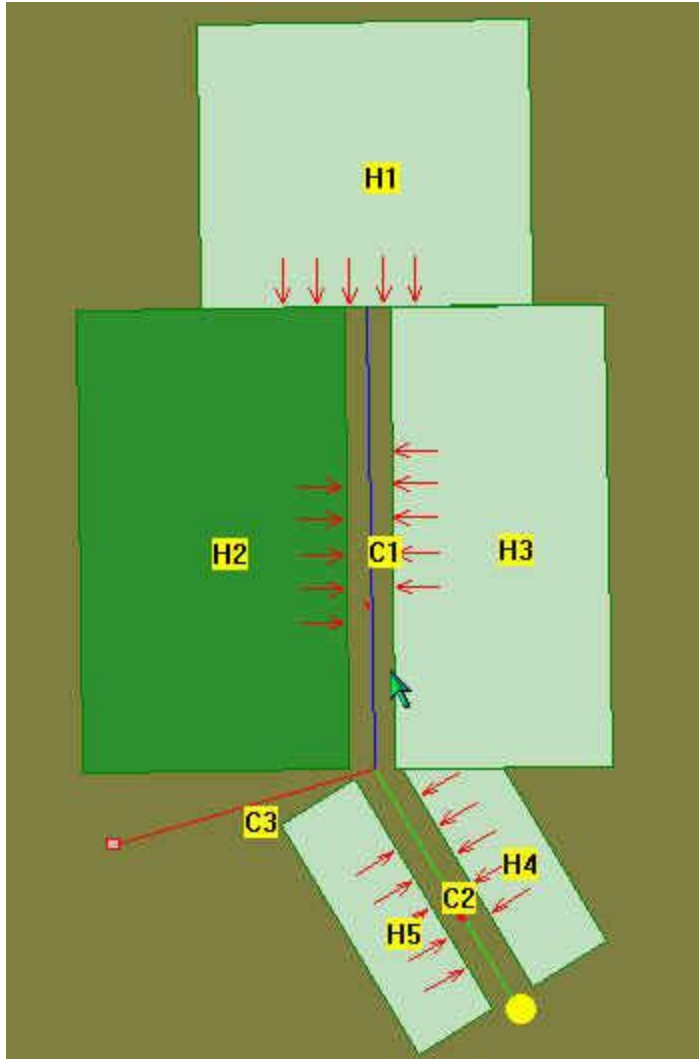

At this point the new channel is C3 and it has no input element draining into it. Before a simulation can be run, an imput must be defined for C3. To do this, select C3, right click and choose the **Add Hillslope** menu item and then **On Top**. Select the alfalfa project and choose OK. The hillslope will be assigned to the top of C3 but will be very narrow. To increase the size, left click on the new hillslope and drag a side to a new position. As the side is being dragged an outline will be displayed indicating the new hillslope shape. The new hillslope has the identifier H6.
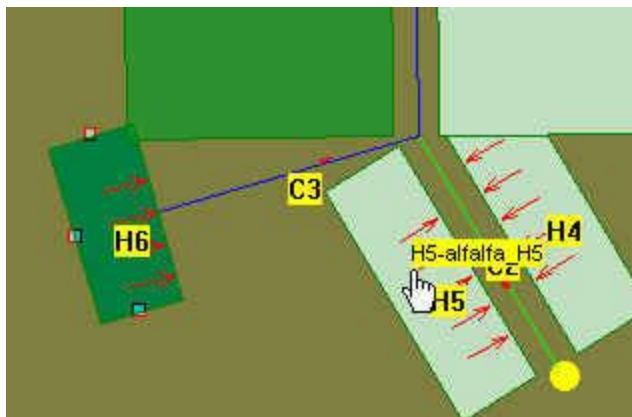
Channel lengths can be changed by selecting the channel and then moving the cursor over the end of the channel until it changes to a cross. Clicking and dragging the end of the channel at this point will change its length.

Sometimes it is necessary to set an exact length or width to a channel or hillslope. This can be done by selecting the channel or hillslope and then right-clicking and choosing the **Change Length** or **Change Width** menu items. Change the length of the new channel C3 to be a little longer:
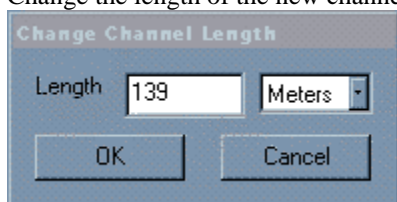
Type in a new length about 5 meters longer and click OK.

After configuring the watershed the new setup can be saved to a watershed project. To save your changes click on the **File** menu and select the **Save As** menu item.
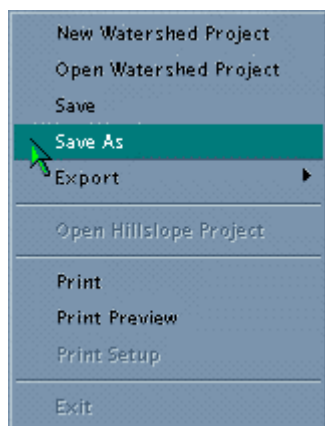

When the **File Save** window is displayed, type in a new name where the project information will be saved.

The watershed diagram and summary results can be sent to the printer. From the **File** menu select **Print Preview** or **Print.**

Changing Channel Properties

Each channel in the watershed configuration has a set of properties that can be changed. This includes the length, width, slope shape, soil, management and other parameters.

To view all the details associated with a channel, double click on a channel to display the channel editor window. The following is displayed if you double click on the C1 channel.
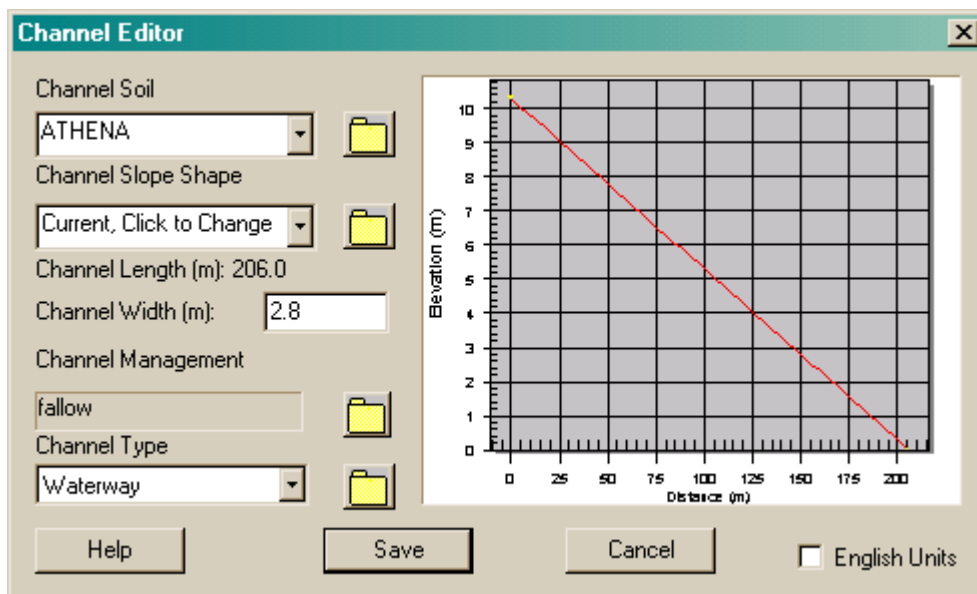
The soil associated with the channel can be changed by selecting a new soil from the list. The detailed soil parameters can be viewed or changed by clicking on the folder next to the soil list.

The default slope assigned to channels is a uniform 5%. The slope shape for the channel can be changed by selecting a new shape from the list or clicking on the folder and using the slope editor to create a new slope profile.

The **Channel Type** selection contains parameters that define the channel, click on the folder button next to the selection box to display the channel editor window:

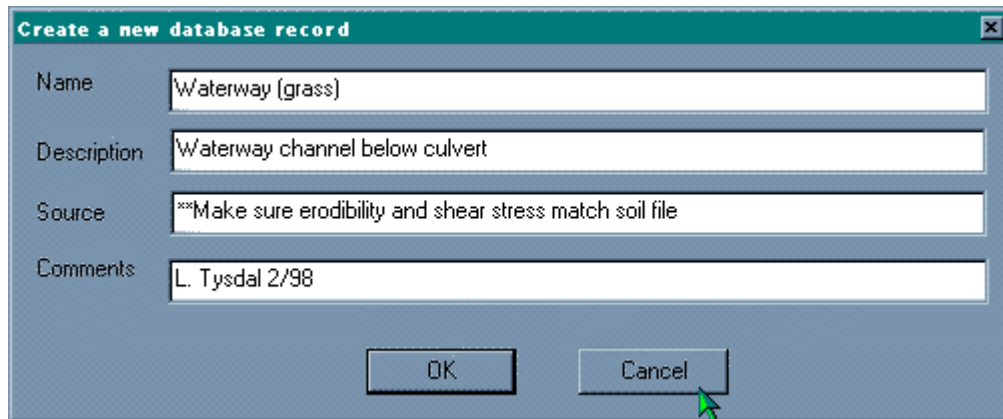| Num	Parameter	Value	Units
1	Channel Shape	Naturally Eroded	
2	Control Section at Outlet	Critical Flow	
3	Friction Slope Calculation Method	CREAMS	
4	Inverse Slope of the channel banks	1999.0000	%
5	Manning roughness coefficient for bare soil in channel	0.0400	
6	Total Manning roughness coefficient allowing for veg	0.3000	
7	Channel erodibility factor	0.001312	s/ft
8	Channel critical shear stress	0.0418	lbs/sq.ft
9	Depth to nonerodibile layer in mid-channel	1.6404	feet
10	Depth to nonerodibile layer on sides	0.3281	feet
11	Control structure slope	2.0000	%
12	Control structure average inverse side slope	400.0000	%
13	Control structure Manning roughness coefficient	0.0400	
14	Rating curve coefficient	0.0000	
15	Rating curve exponent	0.0000	
16	Minimum depth required for discharge	0.0000	feet
17	Management	fallow	

Channel: Waterway
Description: Waterway channel below culvert
Data Source: **Make sure erodibility and shear stress match soil file
Comment: L. Tysdal 2/98

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For information on the parameter definitions, consult the online help or the WEPP Users Guide. One of the most important parameters is the channel management. The last line indicates this channel has a fallow management.
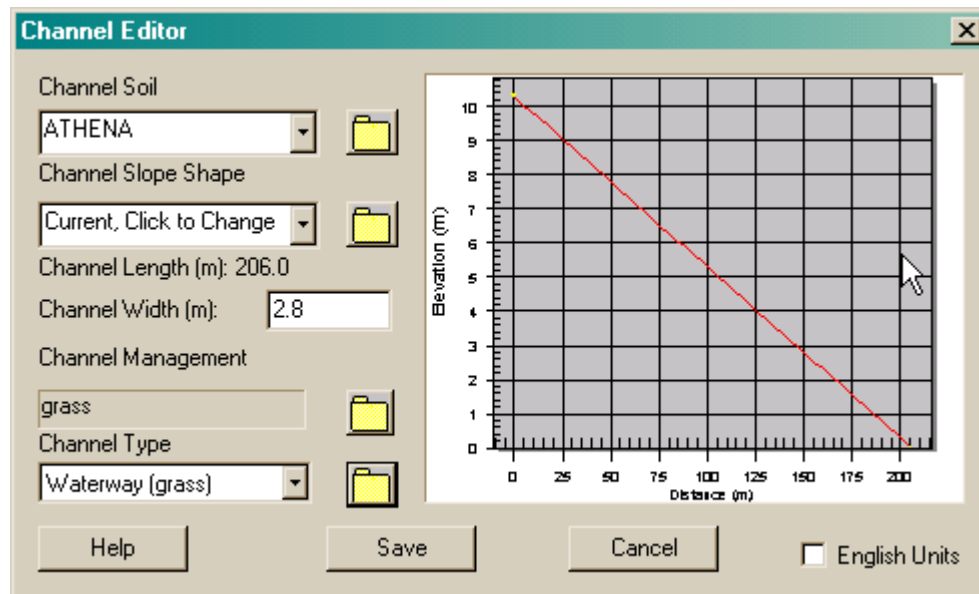
Next create a new channel definition with all the same properties as the Waterway definition, except that the channel management will be set to a continuous grass. From the management parameter dropdown list select the **contGrass** definition. Since the channel parameters have changed, the new parameter set should be saved to a different name. Click on the **Save As** button and then change the name to "Waterway (grass)":

Click **OK** to close the window.

From the channel parameter window click **Cancel** to return to the main channel editor window. From the channel type dropdown select the new channel definition you just created. The management line will display the management used (continuous grass). After selecting the new channel definition, click **Save**.


If the WEPP simulation is rerun, you should see slightly different results for the discharge volume and sediment yield for C1 based on the changed parameters.

In addition to changing channel parameters from the channel editor, the right-click menu from a channel selection has options to import a soil, slope, or to change the length and width.

I. Changing Impoundment Properties

Return to the original watershed configuration with a single channel and 3 hillslopes. Close the current watershed window by clicking on the X in the upper right corner. When asked if you want to save changes, click No. To reload the default watershed click on the **File** menu and choose **Open Watershed.** From the window that is displayed click on the file "default".

When the watershed window is displayed, add an impoundment on the end of channel C1 by left-clicking to select the channel and then right click to display the channel menu and select **Add Impoundment**. The only position at which an impoundment can be attached to C1 is at the bottom, so select **On Bottom** from the sub-menu that is shown. Move the cursor so that impoundment triangle icon is small enough and then left-click.
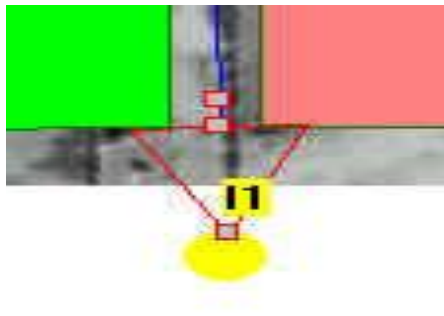
The impoundment is added with a default set of parameters. The default configuration is for a culvert. To view or edit the parameters associated with an impoundment, double click on the selected impoundment. The following window is displayed:

The diagram in the upper right can be expanded to show a representation of different model parameters associated with a culvert definition. Left-click on the diagram to show a larger image. An impoundment definition for the WEPP model can be composed of several different impoundment types. The **Present** checkbox column on the left indicates if that type of impoundment structure is present in this definition. The impoundment name contains a list

of prebuilt impoundenment definitions. The folder icons next to each impoundment type will show more detailed parameters associated with each impoundment type. Clicking on the folder next to culvert will display the parameters associated with the impoundment:


New impoundment definitions are created in a manner similar to other parameter definitions in the WEPP interface. Use the **Save As** button to create a new record type and then customize the parameters. The impoundment setups contain many parameters, consult the online help and WEPP Users Guide and Technical Summary for all the definitions.

Click on the **Cancel** button to exit the impoundment editor and return to the watershed view window.

The WEPP install comes with some prebuilt impoundment definitions. To use a different definition select the impoundment in the diagram and then right click to display the impoundment menu.
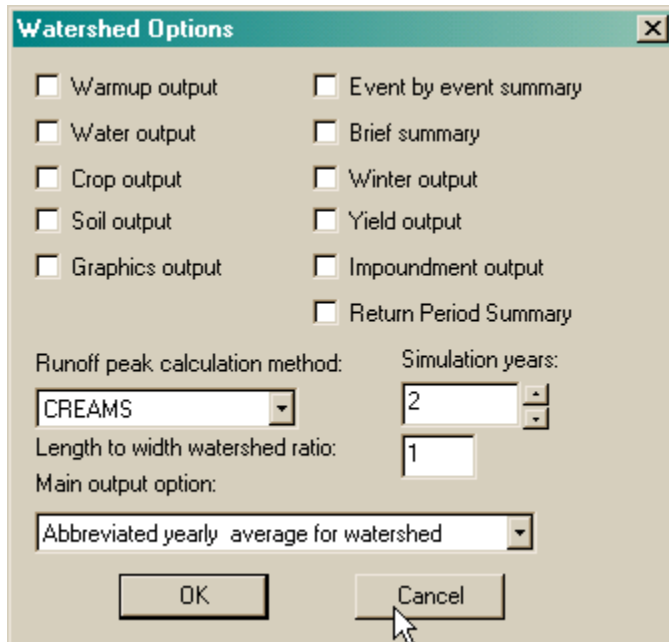
Select Import Impoundment and then **Perforated Riser** from the import window.
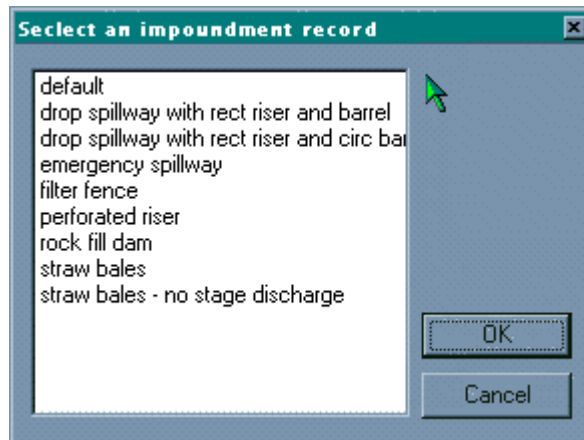
Click the run button to rerun the simulation and you should see different results for the discharge volume and sediment yield for the watershed because of the different impoundment.

J.   Changing the Run Options

To change what output files WEPP will produce and how many years the simulation will run for, click on the **Run Options** toolbar button [✓] which will display a list of options.
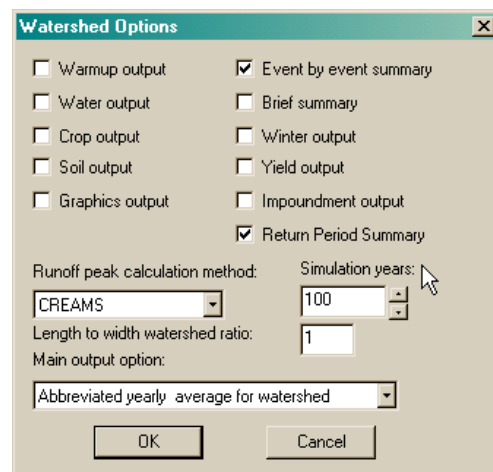

Change the simulation length from 2 years to 5 years and then click OK. Then click the run button to re-run the simulation. You should see slightly different results due to the longer simulation.

In most cases, the runoff peak calculation method should be the modified EPIC, and not the CREAMS option. For details on the other run options consult the online help.
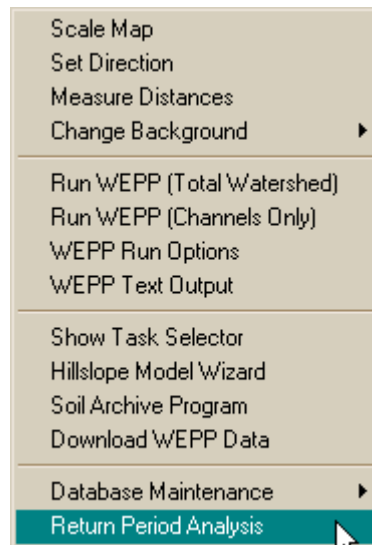
Return Period Analysis

To look at watershed recurrence intervals or return periods click on the run options button and select the Return Period Summary item and also set the number of years to simulate to be 100.

After returning to the main watershed view click the run button (green dot on right toolbar). To view the return period outputs click on the tools menu and select **Return Period Analysis**

Scale Map
Set Direction
Measure Distances
Change Background   ▶

Run WEPP (Total Watershed)
Run WEPP (Channels Only)
WEPP Run Options
WEPP Text Output

Show Task Selector
Hillslope Model Wizard
Soil Archive Program
Download WEPP Data

Database Maintenance   ▶
Return Period Analysis

This will display a table of the return period results. The columns can also be graphed by clicking on the **Display** button.

Return Periods

Return Period (years)	Runoff Volume (m^3)	Sediment Leaving (t)	Peak Runoff Rate (m^3/sec)	Daily Precipitation (mm
2	1252.2	106.1	0.8	63.9
5	1864.3	190.2	1.2	80.1
10	2283.7	243.3	1.4	91.6
20	3033.5	349.8	1.8	111.4
25	3725.5	378.1	2.1	115.4
50	4213.9	586.4	2.4	122.0

Return Periods: 2, 5, 10, 20, 25, 50   Set   ☐ English Units

Graph: Runoff Volume (m^3) ▼   Display   Export   OK   Help

Setting up a New Watershed

The steps to setting up a completely new watershed are essentially to start with an existing watershed and customize it.

1. Save the current default watershed under a new name by selecting **File|Save As**

2. Delete all watershed elements by selecting each element and then using the Delete key. The interface places some restrictions on the order in which elements can be removed. For example, a channel can not be deleted if it is in the middle of the disgram and has other channels and hillslopes attached to it. The outer elements must be deleted first.

3. Select a new background image by clicking on the **Tools** menu item and then **Change Background** and then **Import Image** on the sub-menu. The current interface supports using .BMP and JPG files as the background. A good source of JPG images is www.terraserver.com

4. Scale the image so that any diagramming done will have the correct lengths and widths for the watershed elements. To scale the image click on the Tools menu item and select **Scale Map.** This requires that 2 points be picked on the image where the real world distance between them is known.
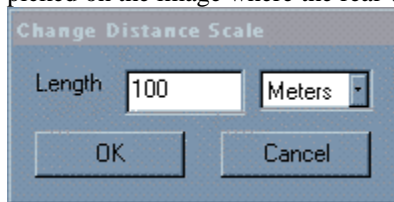
Type in the correct distance between the 2 selected points.

5. Set the orientation for the North direction. This can be done by double-clicking on the direction circle in the upper left corner of the window or clicking the **Tools** menu and selecting **Set Direction.** The compass window will be displayed. Click in the white center to indicate in which direction North should be set to. To save the setting click the **Set** button.
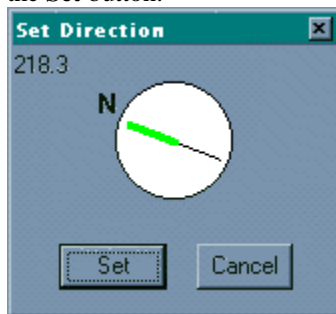
6. Next the climate can be set. This is done by right clicking on the climate icon in the center of the image and then selecting **Import** to load a prebuilt climate file. To create a new climate file double click on the climate icon or choose View/Edit from the right-click menu. How to build new climate files is explained in the hillslope section of this tutorial.

7. After setting up the image, scale, orientation and climate you are ready to begin building a new watershed configuration. To begin right-click anyplace in the image background and select **Add Channel** from the menu.

The cursor will change to a cross hair. Click on a point on the image where you want the channel outlet to be placed. Move the cursor to a new point where the start of the channel is found and click again. The display will show the starting channel C1 and the outlet as a yellow circle.
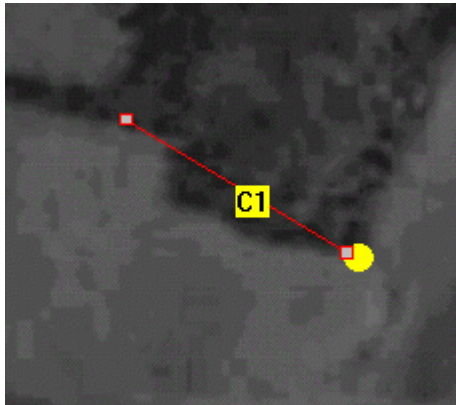
After the first channel is added more hillslopes, channels and impoundments can be added by right clicking on any element and then choosing the approiate Add menu option.

Hillslope Polygon View

The watershed view can display hillslopes as polygons. The polygons can be reshaped to match field boundaries on an image. The WEPP simulation will use a representative hillslope rectangle. A representative hillslope is one that has the same area as the polygon.

Reopen the default project, then click on the polygon view toggle button to display the following view:

You'll notice that hillslope H1 is actually shaped as a polygon here, not a rectangle.

To reshape a hillslope left click on hillslope, this will display the vertex points.

Click on a vertex and drag to change the shape. New points can be added by double-clicking on the hillslope border.


To delete a vertex point right click while over the point and select the **View As Polygon** menu item and then select **Delete Vertex.**

To return to rectangle view click on the polygon view toolbar button. The representative rectangle area will always match the polygon area.

Watershed View Preferences

To set preferences for the watershed interface click on the **Options** menu and then click on the **Preferences** item. When the preferences window is displayed click on the **Watershed** tab.
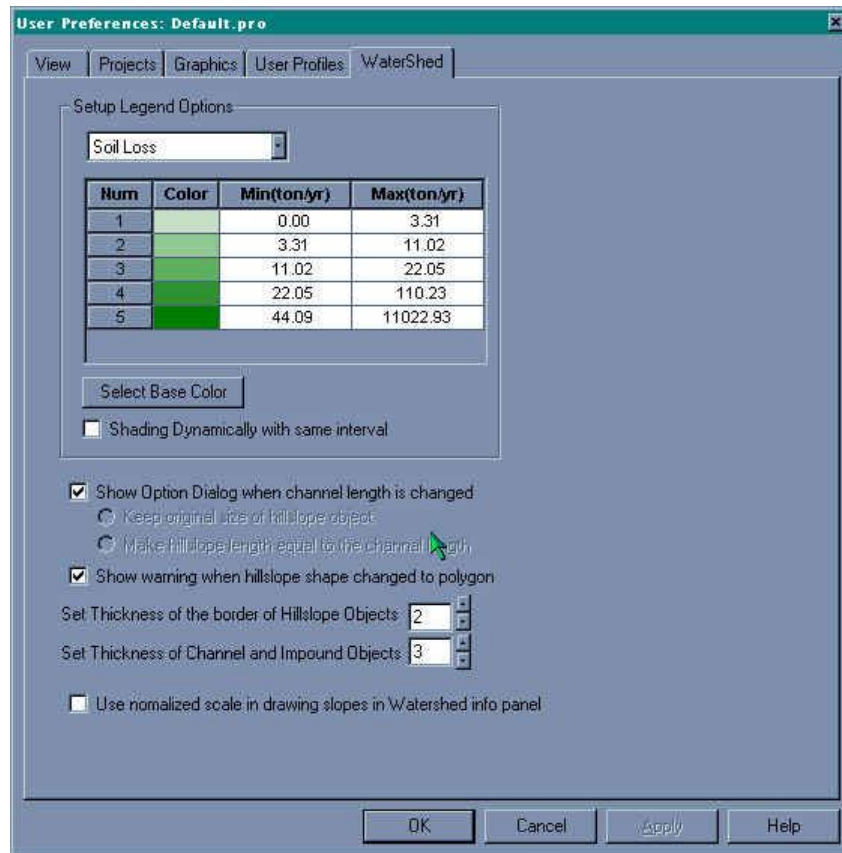
The **Setup Legend Options** determines how shading will be done for soil loss, sediment yield and runoff. For each color setting a minimum and maximum range can be set. To use less than the 5 color divisions leave any unused setting blank. All possible ranges for a particular shading type should be specified. In the watershed view if a value does not map into a color range then white is used as the color. To change the color for a particular shading type click on the **Select Base Color** and choose a new color from the window displayed.

The watershed view can also determine the shading divisions automatically by using the minium and maximum values from the WEPP output and then dividing the range into 5 equal segments. To have the interface compute the equal divisions based on the program output click on the **Shading Dynamically** checkbox.

The width of the hillslopes on the left and right sides of a channel can be set to always have the same length of the channel they border. This can be done by clearing the **Show Option Dialog** checkbox and checking the **Make Hillslope length equal to the channel length.**

When the watershed view is changed from rectangle to polygons some shading operations can not be done. Clicking on the **Show warning when hillslope changed to polygon** will enable the interface to inform the user that some operations will not be available in the polygon view.

The thickness of the hillslope borders and channel lines can be set. A value of 0 will always draw a line, increasing values will draw thicker lines.

The last selection, **Use normalized scale in drawing slopes,** determines the scale of the slope profile graph in the legend window. To display all profiles using the same X and Y scales this checkbox should be selected. If the checkbox is cleared then each graph will be drawn so the selected slope profile fills the entire graph.