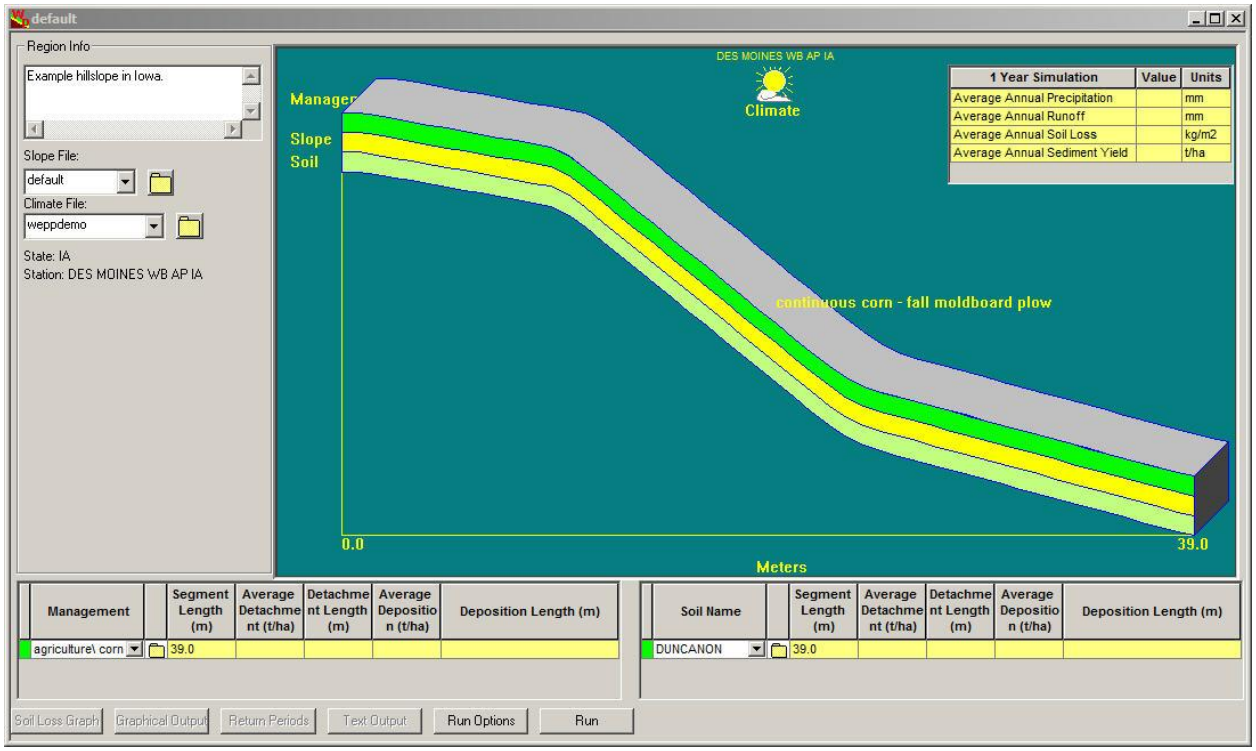
WEPP Soils Tutorial

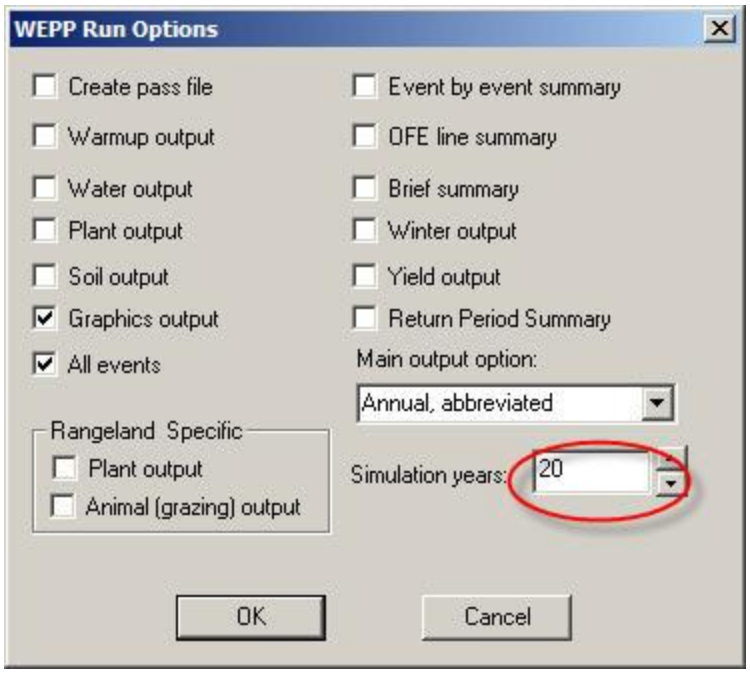
February 28, 2013

This tutorial will show how to work with WEPP soil inputs and look at WEPP soil related outputs.

First start the default WEPP project (default).



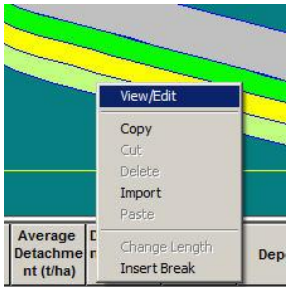
Make an initial baseline run. First change the number of years to run to 20. Click the Run Options button and then fill in the number of years and click OK.



Next , click the Run button:

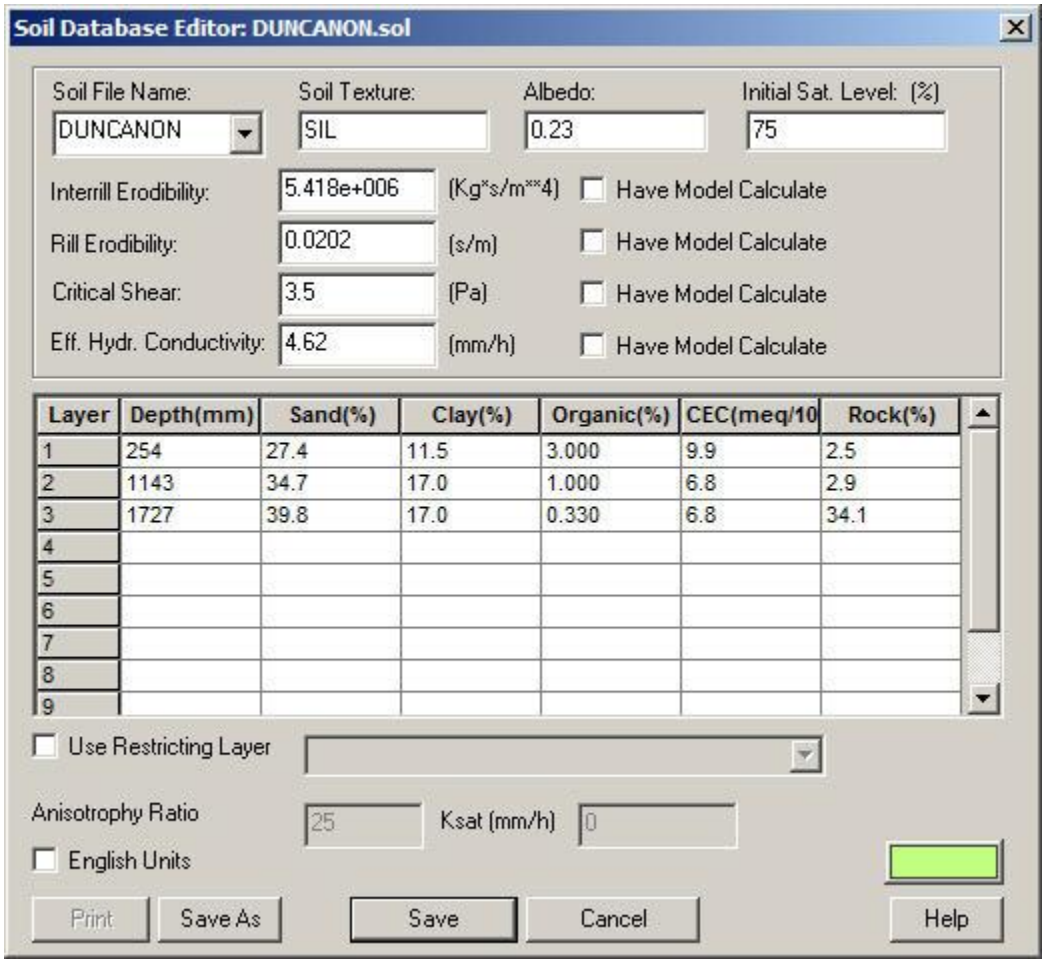
For the baseline condition the runoff was 104.56 mm/yr, soil loss 1.908 kg/m^2 and sediment yield 19.080 t/ha.

This project has a single soil on the hillslope named ‘Duncanon’. There are several ways to see the soil properties. All will open up the soil editor window.

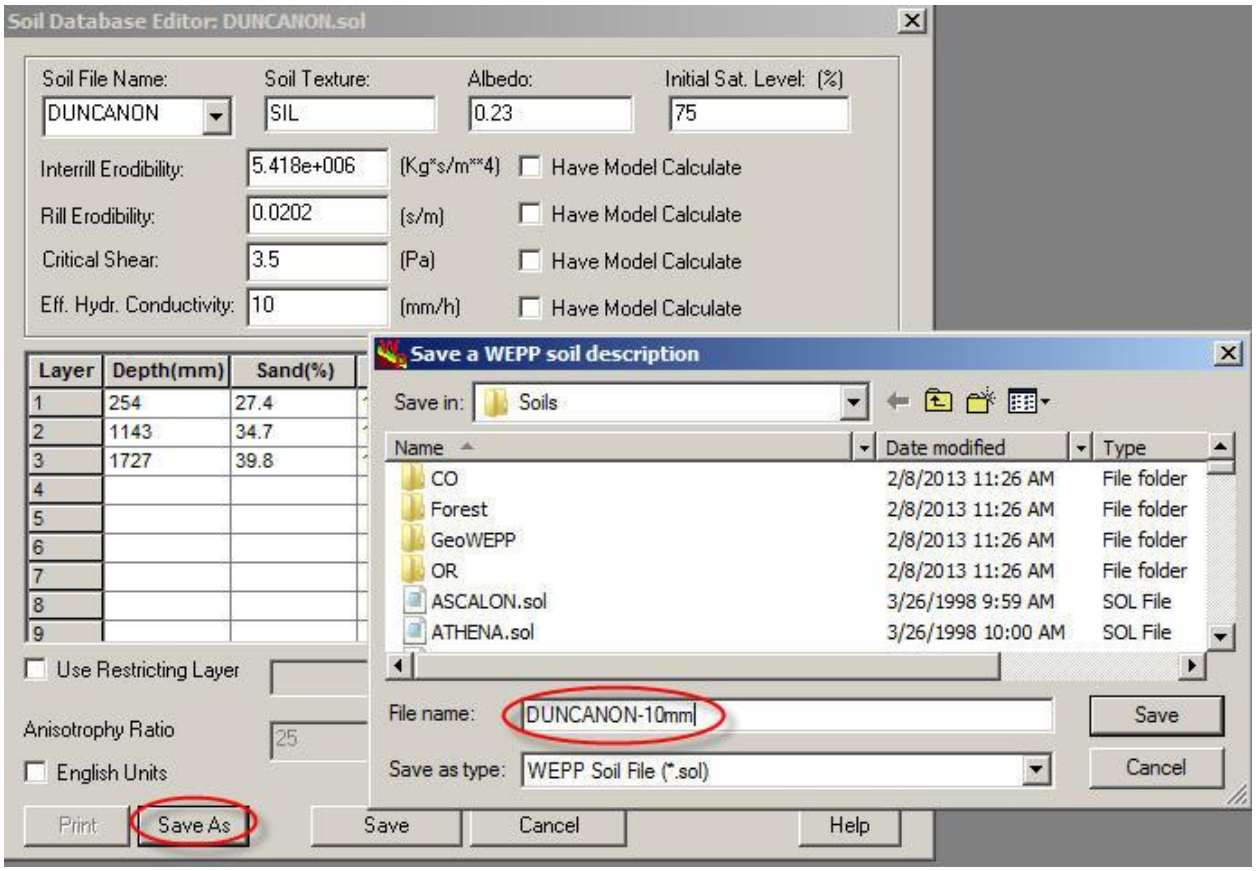


1. Right-click on the light green soil layer and choose View/Edit:
2. Click the folder icon next to the Duncanon soil name in the table at the lower right.
3. Double click the soil layer.
4. Select the soil layer with a left click and then click the view toolbar button:

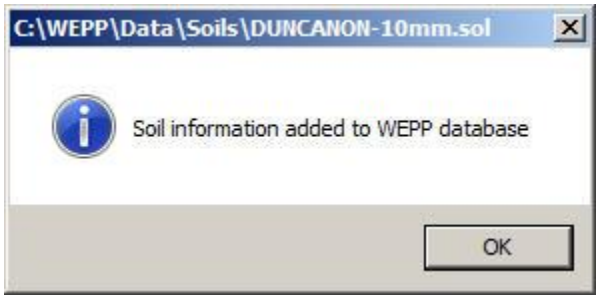
The soil editor window:



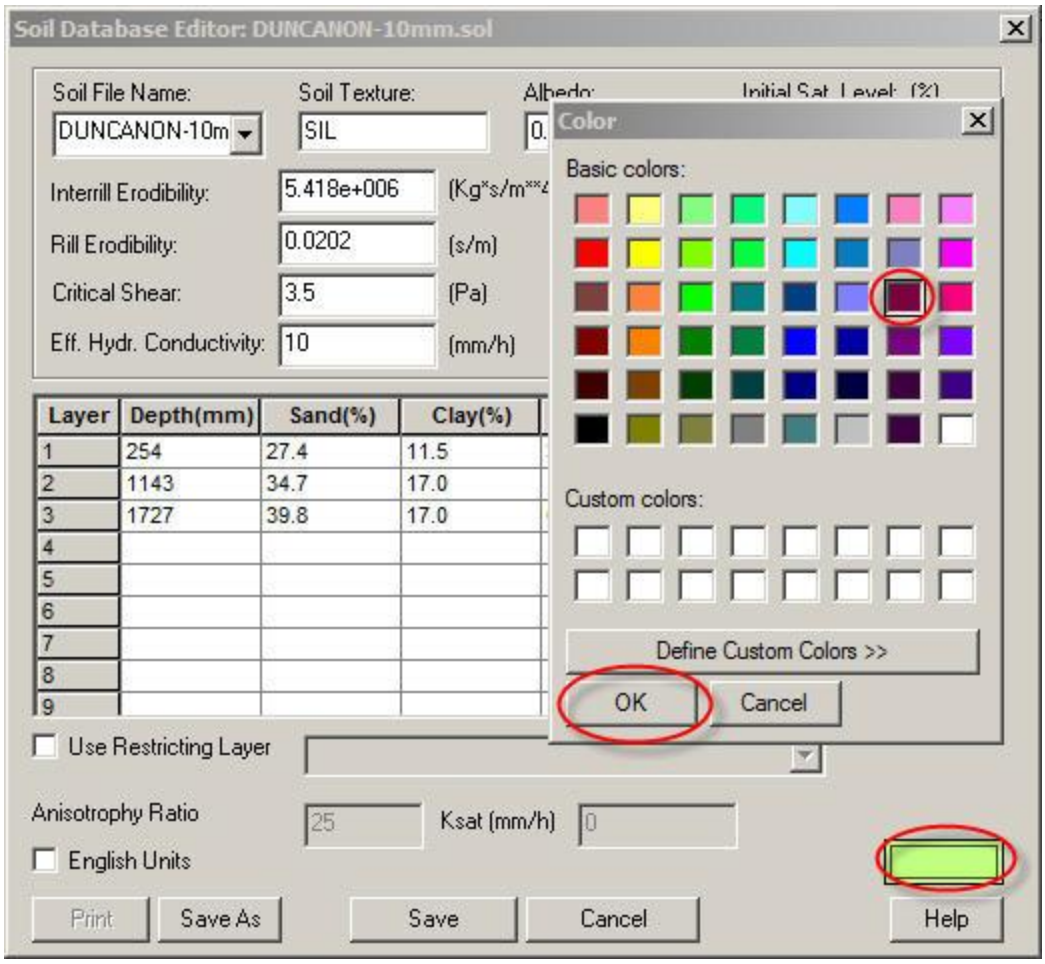
This soil is from the WEPP US soil database, developed about 1995. One of the most sensitive parameters is the effective hydraulic conductivity. Change this parameter to 10 mm/hr and then click the 'Save As' button and name the soil 'duncanon-10mm'. The files distributed with the WEPP install are read-only so any changes will have to be saved to a new file.



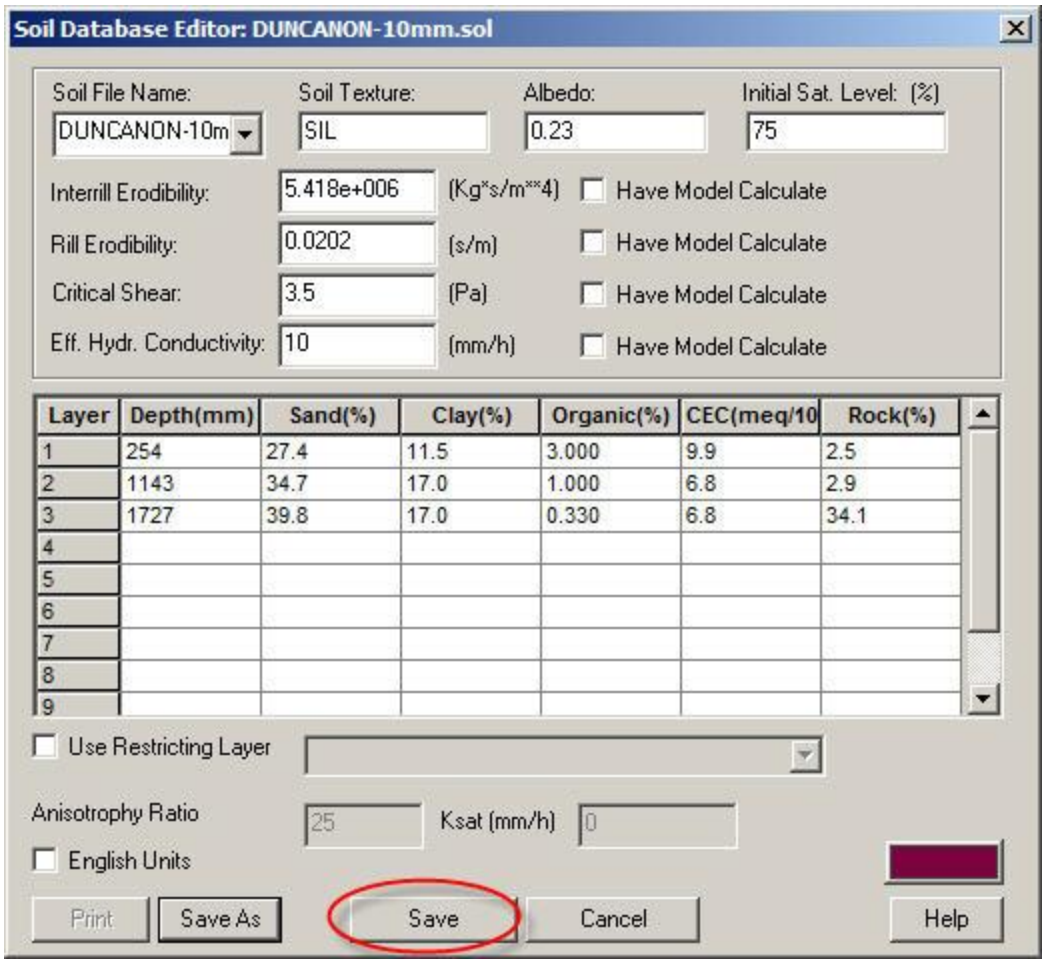
Click OK on the window that is displayed.



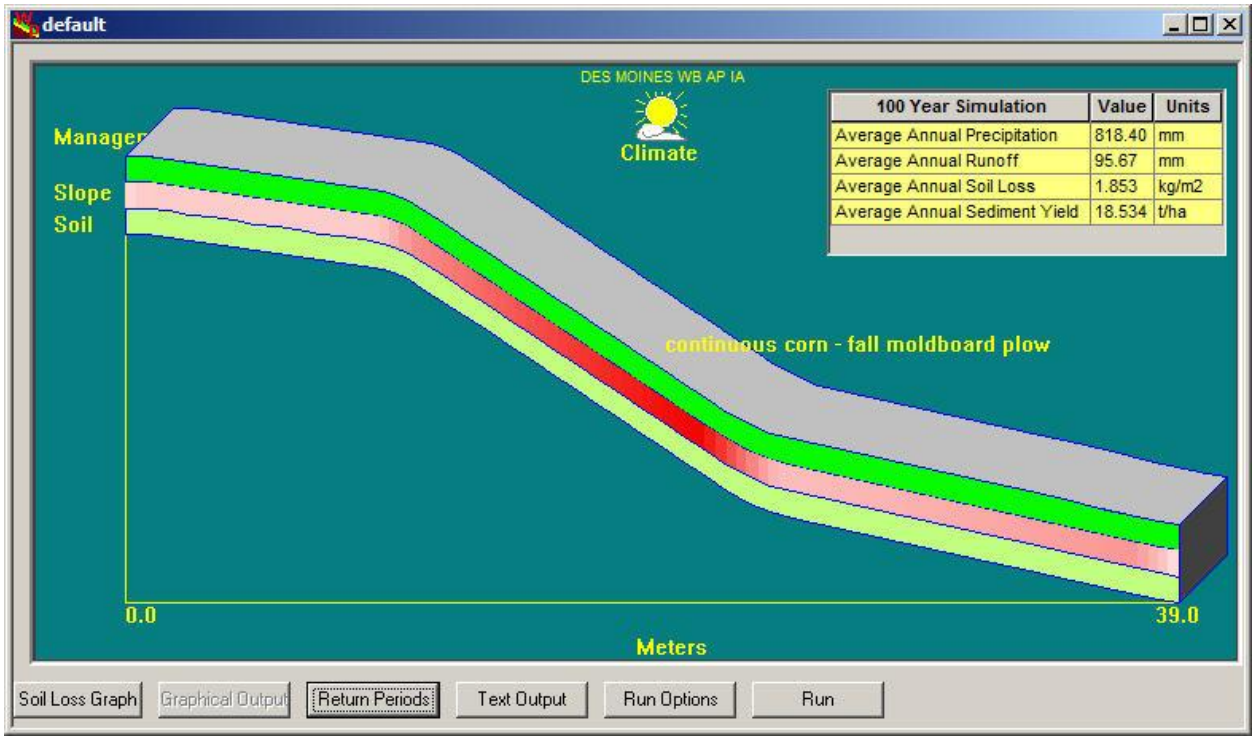
When the main soil editor window is displayed again the color of the soil layer can be changed. Click the green button on the right side of the window. In the new window select a color and then click OK.



Next click the Save button to close the window:



Next run the simulation again to see what the effect was of changing the conductivity:



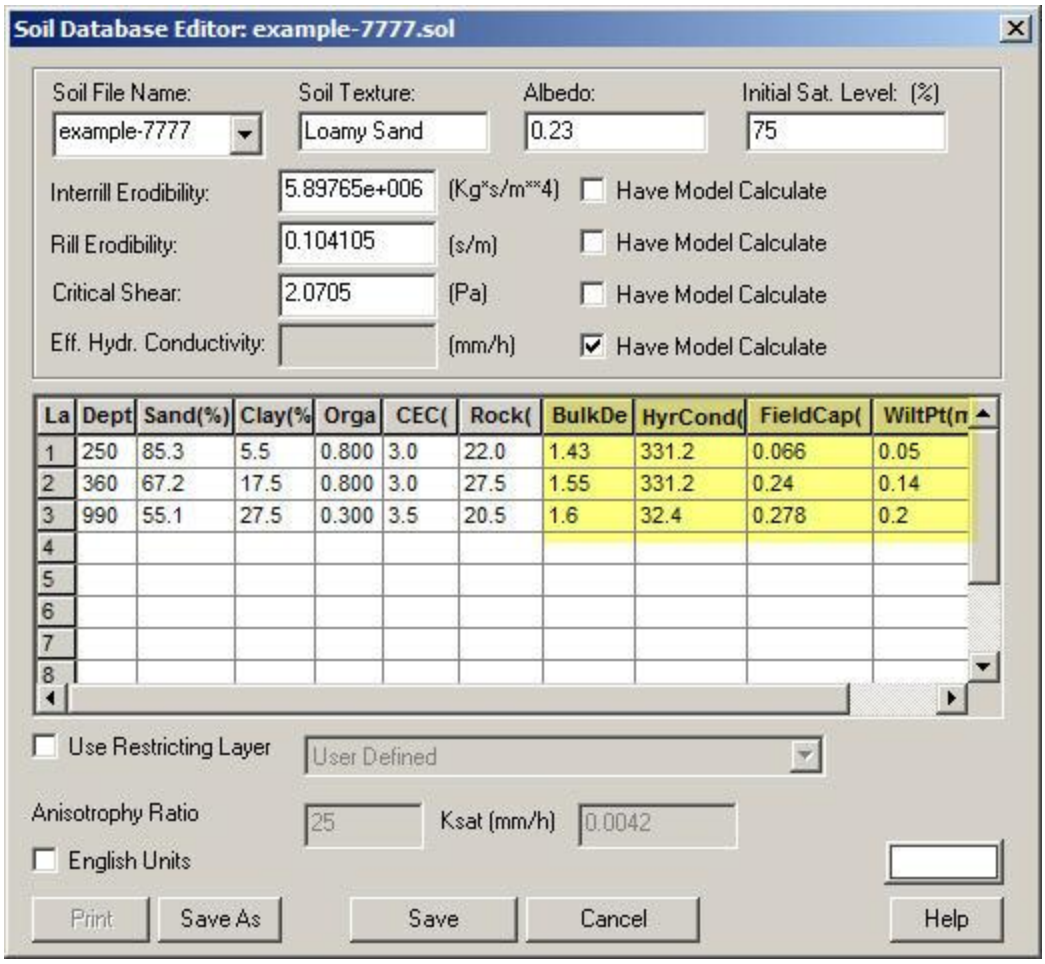
Output Values	Baseline	10 mm/hr conductivity
Runoff (mm/yr)	104.56	69.67
Soil Loss (kg/m^2)	1.908	1.046
Sediment Yield (t/ha)	19.08	0.458

The increased infiltration rate causes more water to move from the soil profile to deep seepage, resulting in less runoff, soil loss and sediment yield.

Extended Format (7777) Soil Files

In addition to the regular format soil file for WEPP there is an extended format that provides more parameters for the layers. To see this format soil file right-click the soil layer and choose Import then select the ‘example-7777’ file.

The new columns are for bulk density (g/cc), hydraulic conductivity (mm/h), field capacity (mm/mm) and wilting point (mm/mm).

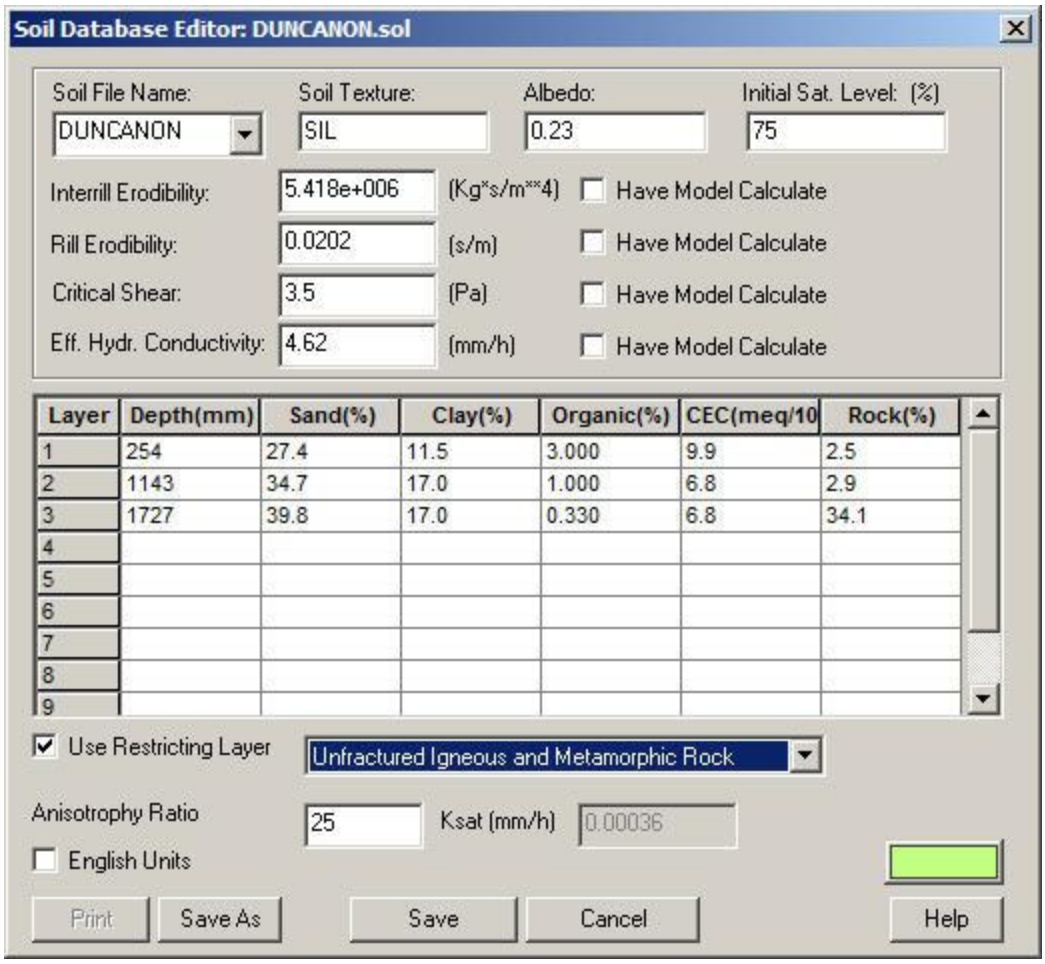


Using Restricting Layers in Soil Files

A restricting layer can be added below all the soil layers. The restricting layer has a separate conductivity in mm/h that defines the deep seepage rate and also an anisotrophy ratio that partitions the flow between horizontal and vertical.

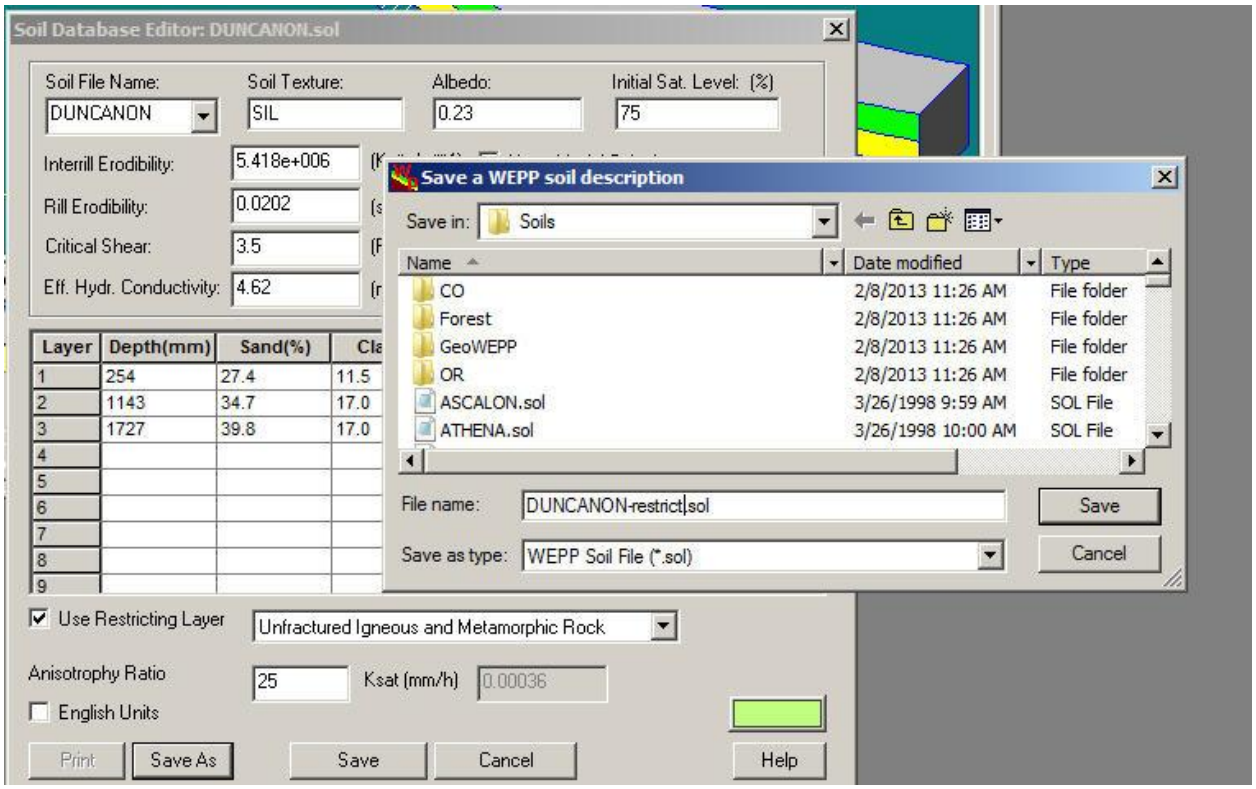
With a restricting layer subsurface lateral flow is then predicted by WEPP in addition to surface runoff.

From the main project import the defaut ‘Duncanon’ soil and then double click the soil layer to open the soil editor window.

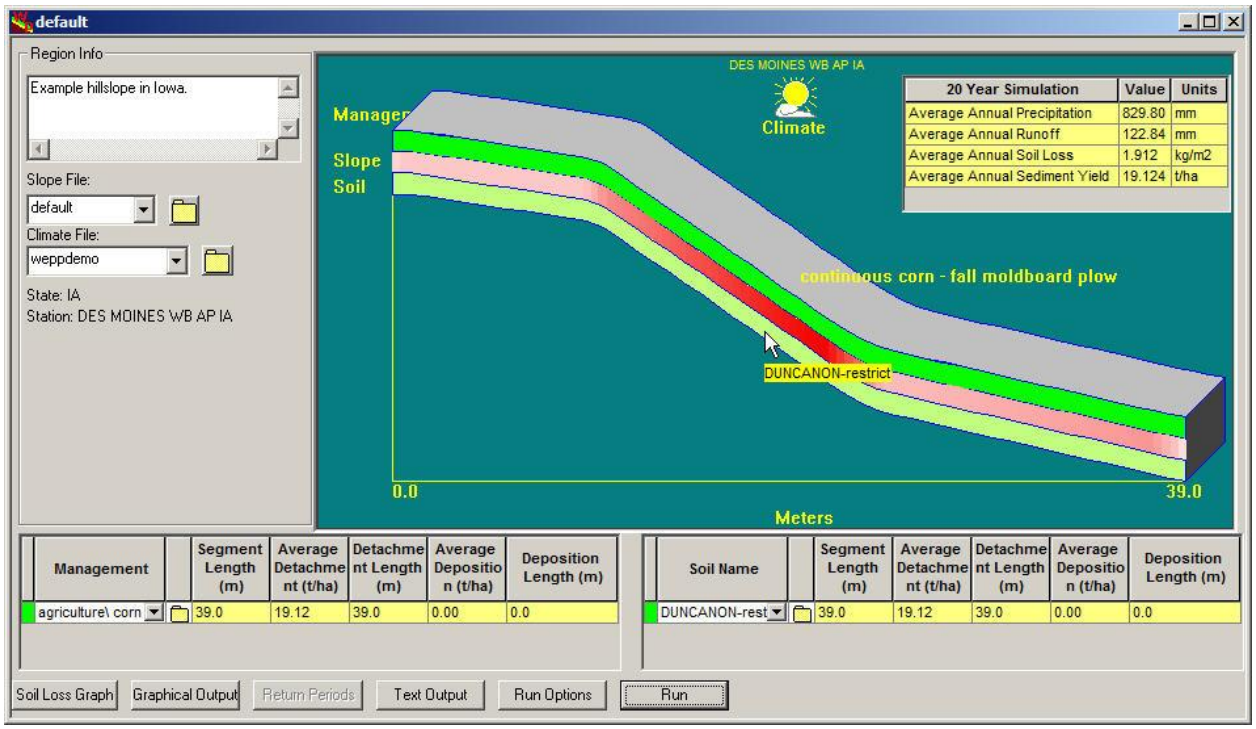


Enable the restricting layer by clicking the checkbox for 'Use Restricting Layer' and then select the 'Unfracture Igneous and Metamorphic Rock' type. This has a defined conductivity of 0.00036 mm/hr.

Next, click the Save As button and name the soil 'Duncanon-restrict'.



Next, make a WEPP run with the new soil for 20 years:



The results compared to the baseline run:

Output Values	Baseline	10 mm/hr conductivity
Runoff (mm/yr)	104.56	122.84
Soil Loss (kg/m^2)	1.908	1.912
Sediment Yield (t/ha)	19.08	19.124

Since there is a restricting layer moving water slowly from the soil profile to deep seepage more water is available and more runoff occurs.

Consideration for Forest Soils

There are forest soils distributed with the WEPP model which were developed by Bill Elliot of the US Forest Service. The soil files are for typical forest conditions in the US, these are generally characterized by higher conductivity and a bedrock restricting layer. Below is one forest soil file: