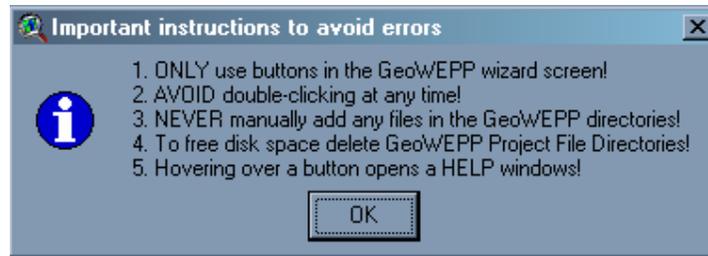


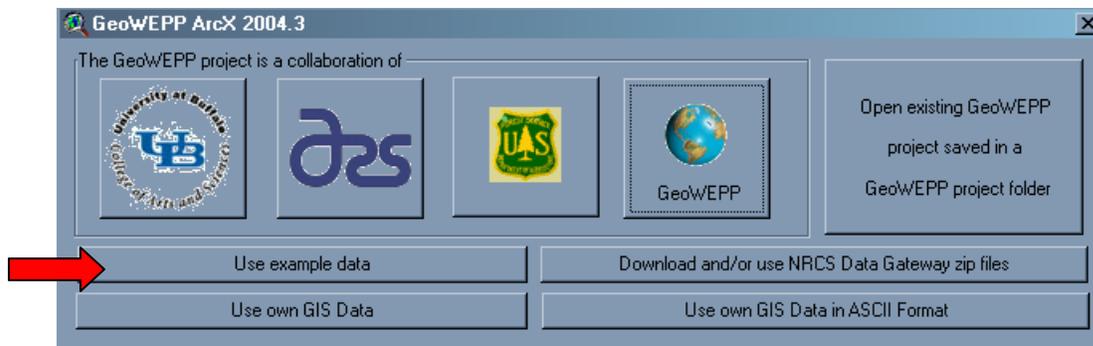
GeoWEPP ArcView Interface – Steps for CWE: (analysis for unburned subwatershed)

PLEASE NOTE: The parameters for the suggested management scenario are very extreme and partially unrealistic. They were chosen only to show the capabilities of GeoWEPP to assess spatial and temporal pattern of erosion, runoff, and sediment yield. We assume that the user after getting the idea will use moderate and realistic input parameters for their management scenarios.

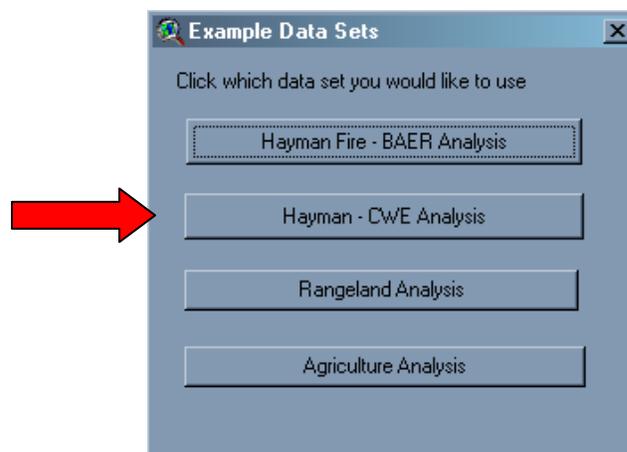
1. Double click on the **startgeowepp icon** or navigate to the geowepp folder and double click on **startgeowepp**. You will immediately get the **Important instructions** window. Read through them and click **OK**.



2. This will bring up the **GEOWEPP** wizard. Click onto the **Use example data** button.



3. In **Example Data Sets**, click on **Hayman – CWE Analysis**.

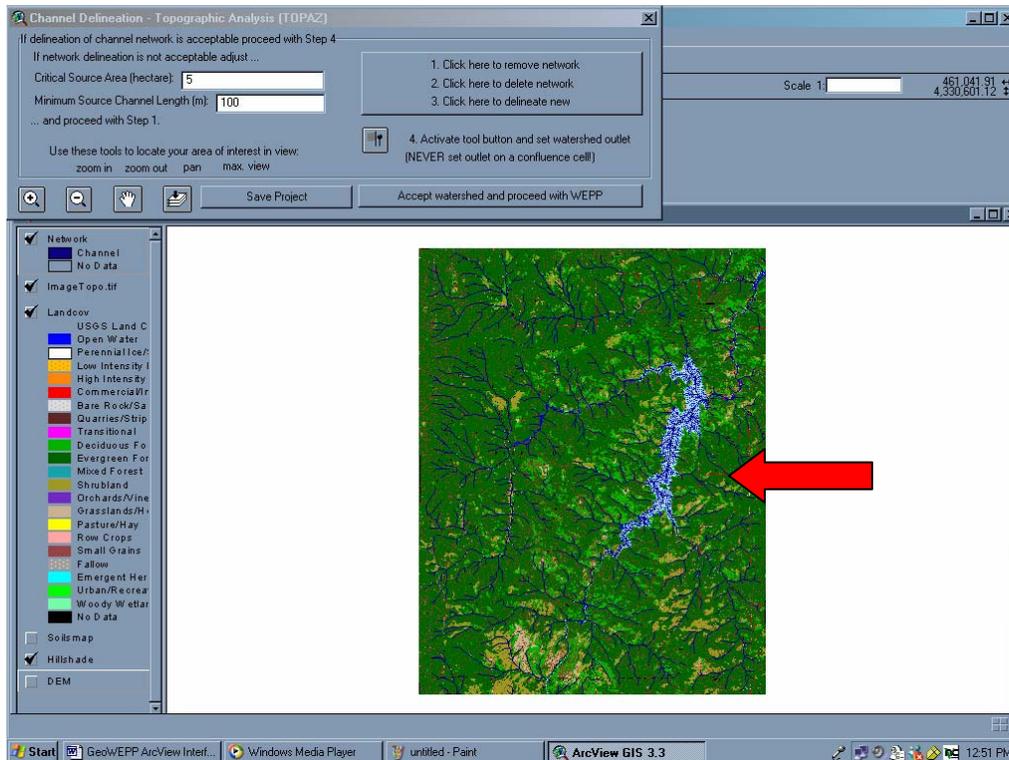


4. In the **Remember To Delete** window, click **OK**. Each time you run this example, delete the directory to start over.

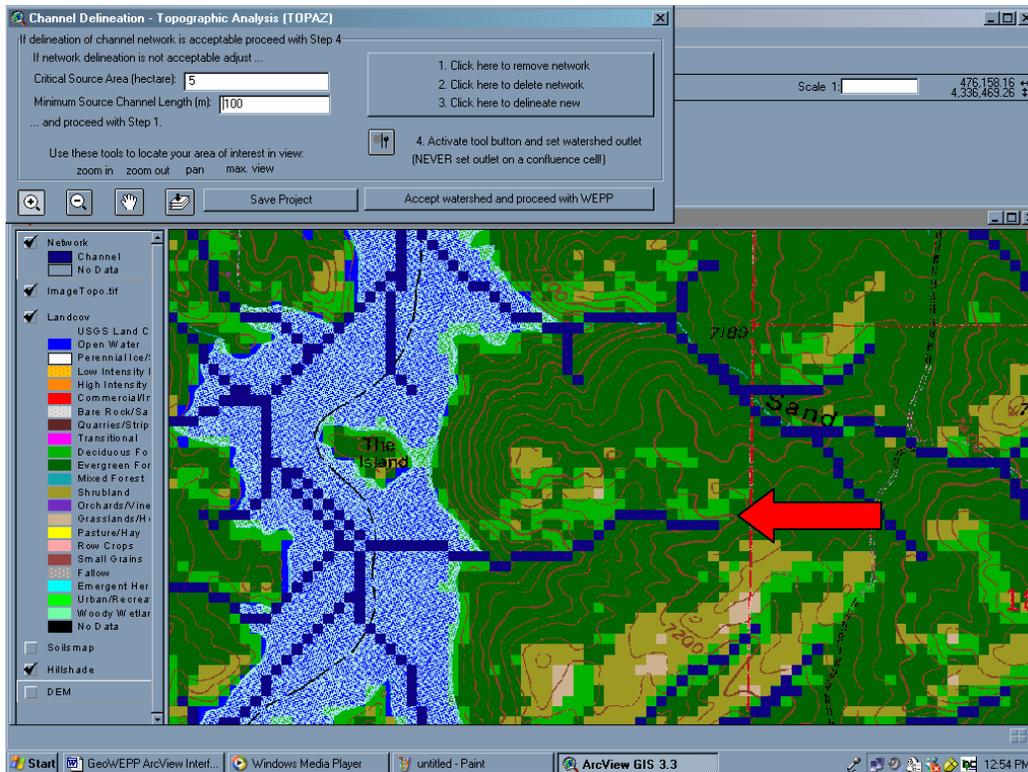


You now see DOS screens and layers being created for about a minute. Let the program run until its completion when you see the following screen. You have a view of the area before a forest fire and the **Channel Delineation – Topographic Analysis (TOPAZ)** window, which we will now work from.

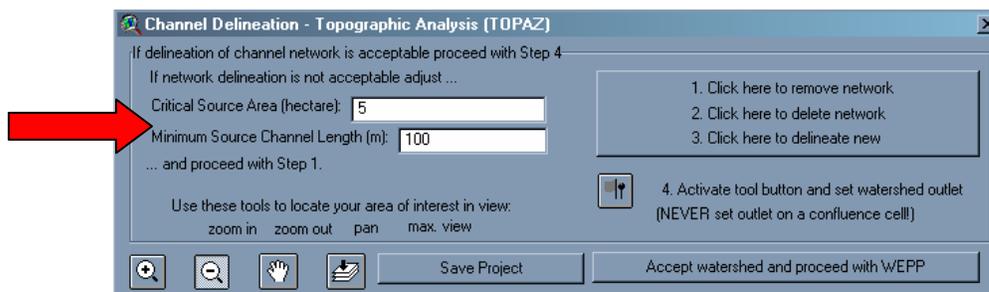
We are interested in the network channels and the watershed that is next to The Island in Cheesman Lake. Using the **Zoom** button  from the **TOPAZ** window, zoom into the area next to the red arrow.



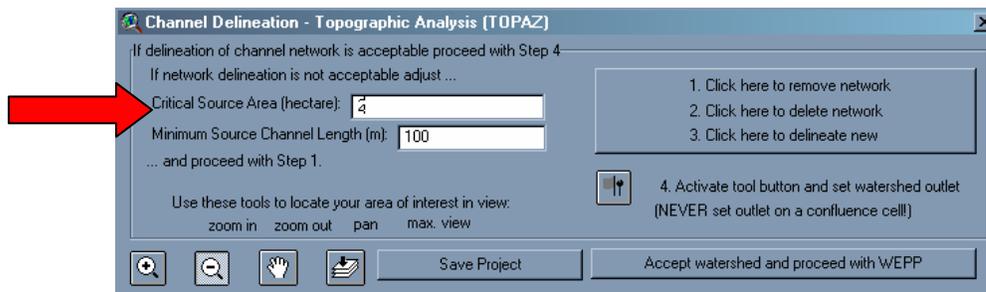
We are interested in the slope that is south east of The Island.



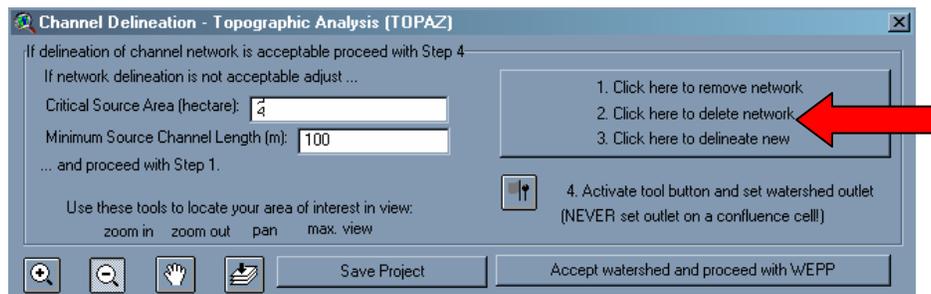
A little explanation is now in order. What we are doing here is delineating channel networks to set watershed outlets. As you can see in the **Channel Delineation** window, you have the normal ArcView icons, such as **zoom in** and **pan**. Also, you can see two options by the left arrow. **Critical Source Area (CSA)** is the area required to initiate a channel [1 hectare = 100 m * 100m = 2.471 acres] (For more information, read 3.1 Fundamental Concepts in OVERVIEW.txt). **Minimum Source Channel Length (MSCL)** is the minimum length of a channel in a drainage pattern (For more information, read 4.4 TOPAZ Input Requirements in the OVERVIEW.txt). We will now remove the channels we have on the screen, set up new ones and map out a watershed.



1. In the CSA, change the 5 to 2 (So, the area needed to create the channel will be reduced and we will see more channels on our view).



2. In the **Click here** window in the upper right, click once and you **remove the channels**.



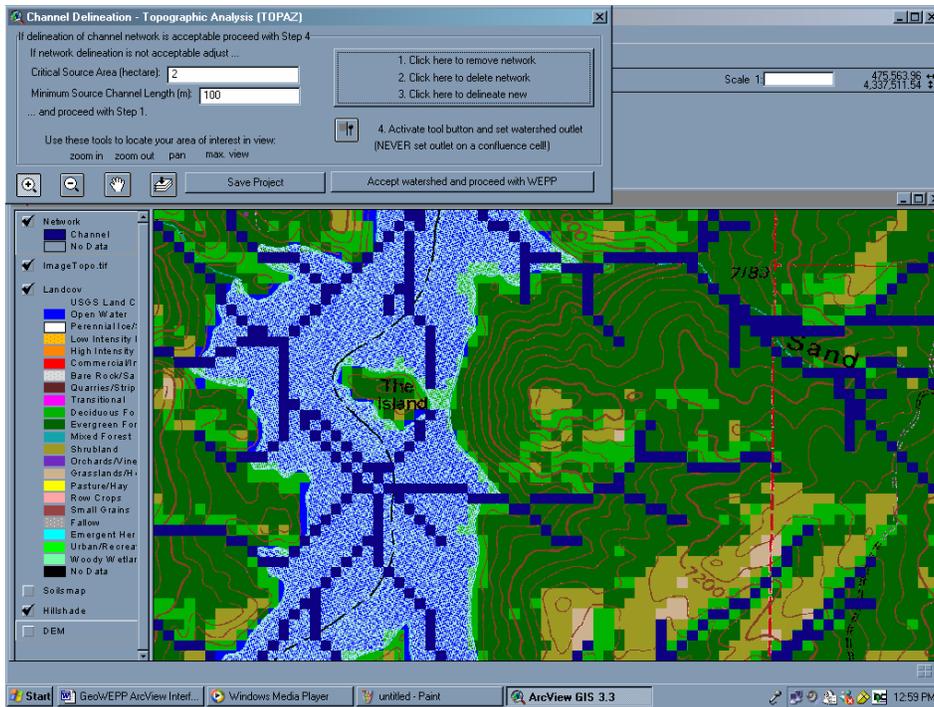
3. The second click **deletes the network**.

4. After the second click, you see the **Directory ownership** window. Simply click **OK**.



5. If you receive an **Error** window, click **OK**.

11. The third click runs **TOPAZ** and **delineates the new network**. You see a number of DOS screens and then the view has the new channel network. As you can see below, our new network has more channels now.

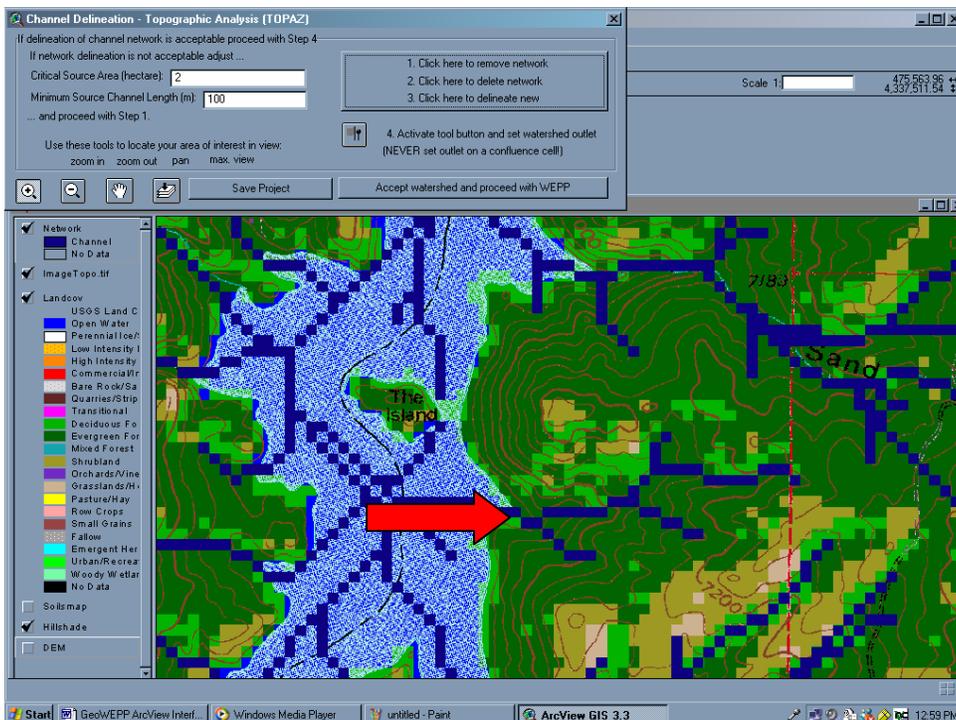


Now you can make the watershed permanent.

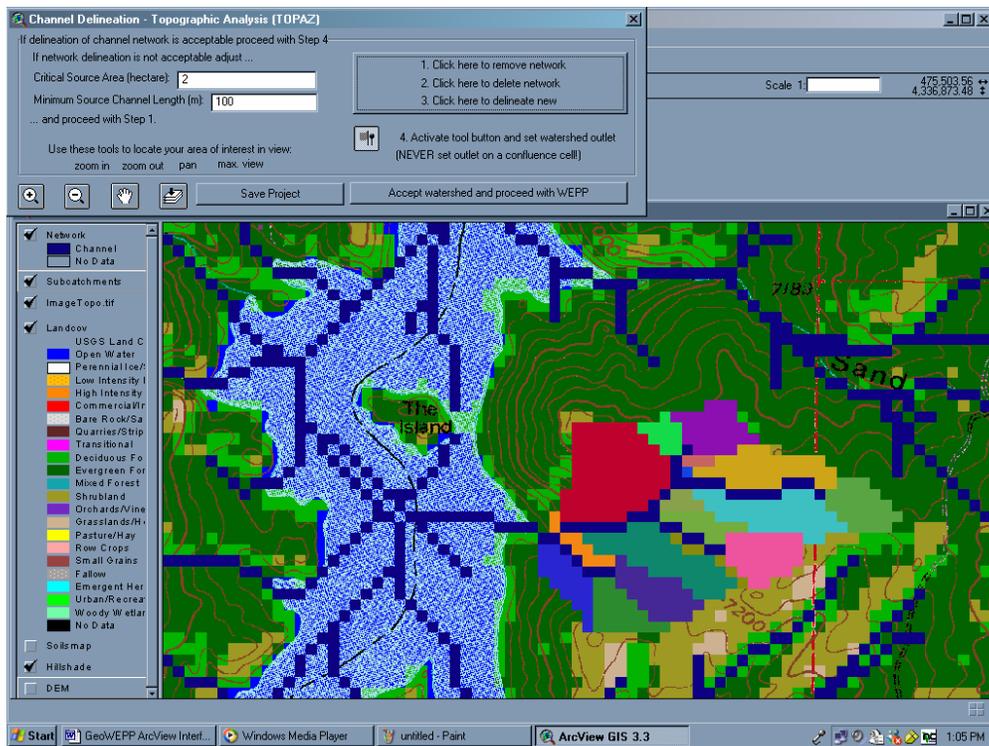
7. Click the **4. Activate tool and set watershed outlet** 

When you move the cursor over the view, you see that it's changed to a **cross in a circle**. We are ready mark off the watershed outlet that we are going to make the watershed for.

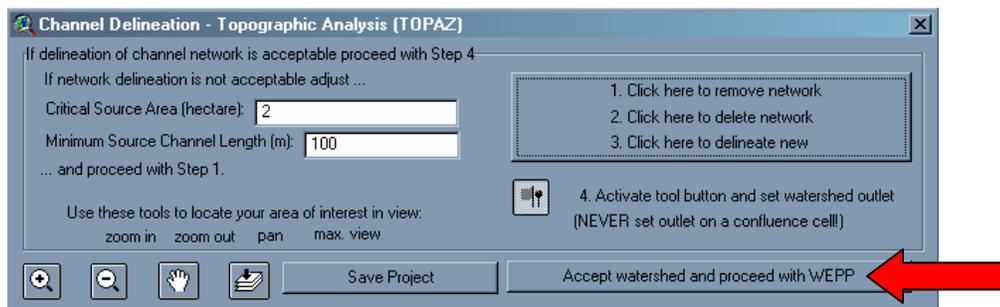
8. Put the cross in a circle cursor at the **end of the channel** (It must be at the end in order to delineate the channel). And click.



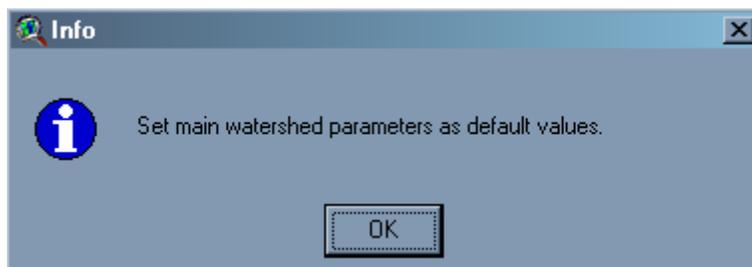
This process takes a couple of minutes and creates a new watershed.



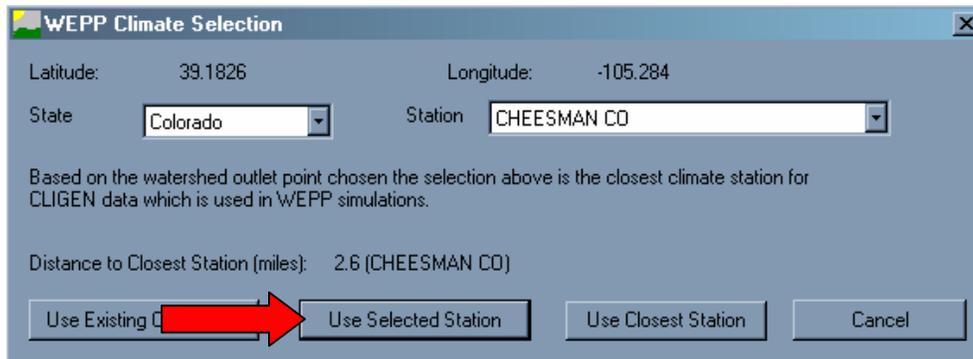
9. Now the final part. If this is the watershed you want, click on **Accept watershed and proceed with WEPP**.



10. In the **Info** window, you are setting the watershed parameters. Click on **OK**.



11. In the **WEPP Climate Selection**, click the **Use Selected Station** to accept the weather station from Cheesman Co.

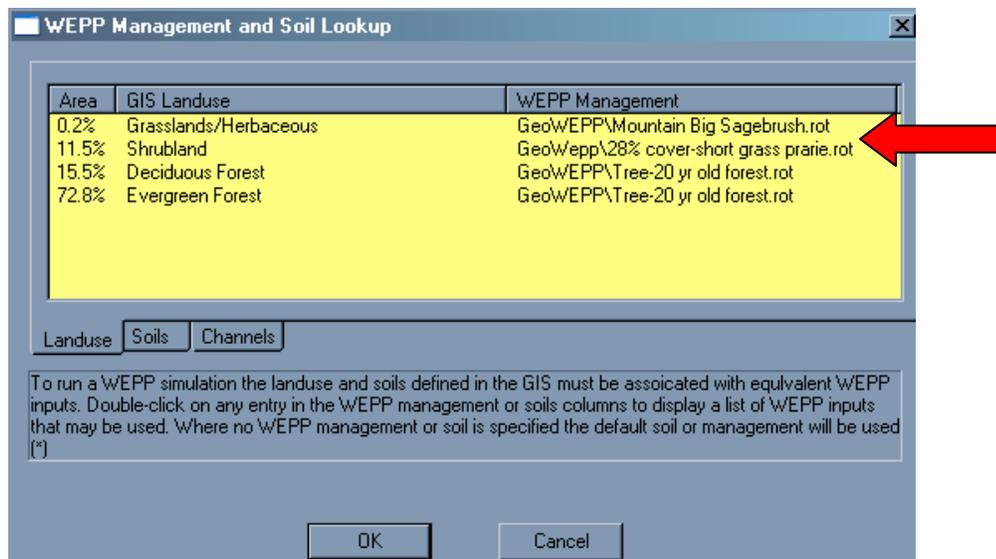


12. In the **Cheesman CO** window, click **OK**. This is setting up the data for 100 years.

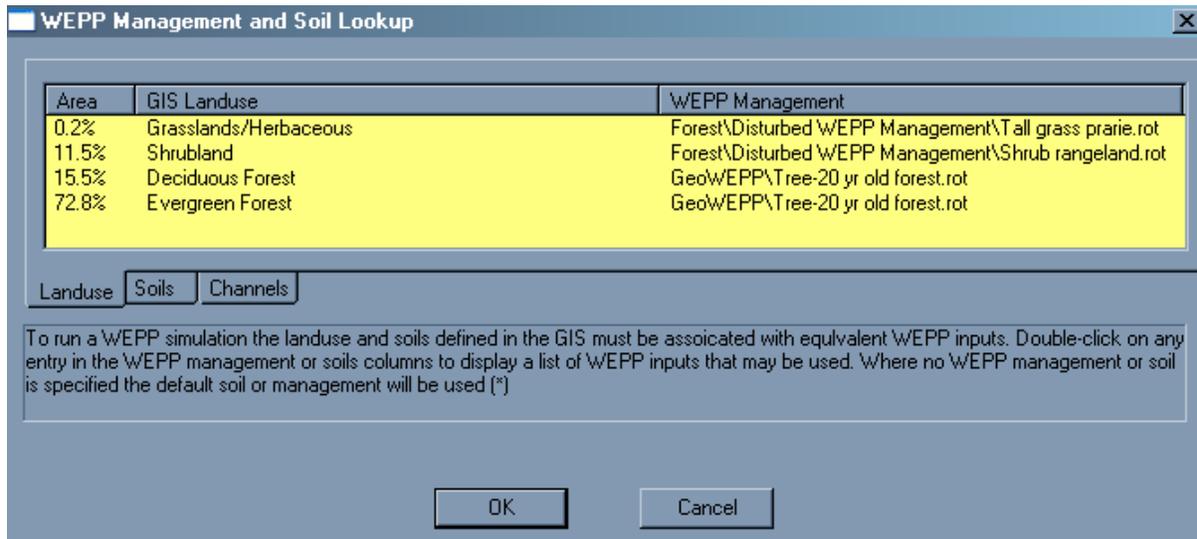


Now, when you get to the **WEPP Management** window, we want to change the landuse of the catchment to undisturbed forest and the soil to 20-y forest sandy loam.

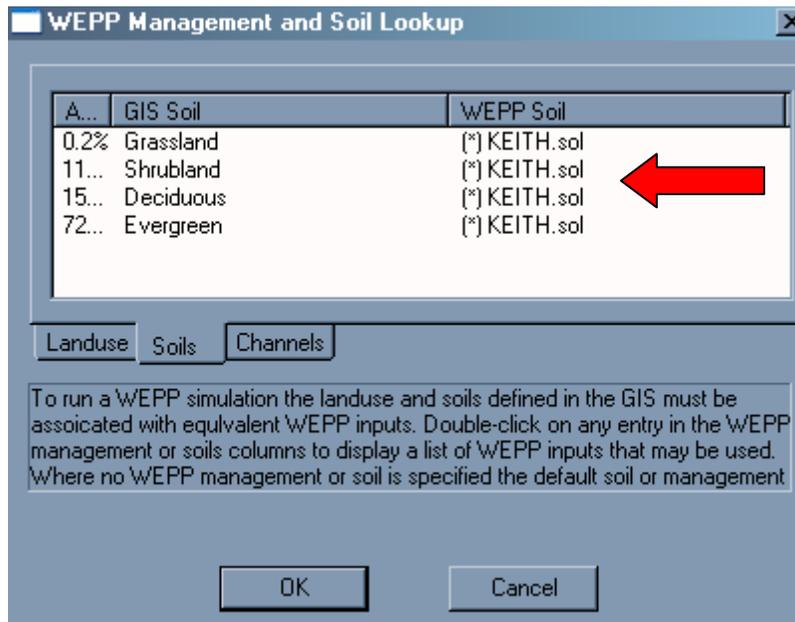
1. First, for landuse, we will change the first two areas in the **WEPP Management** column, **Mountain Big Sagebrush** and **28% cover-short grass prarie**.



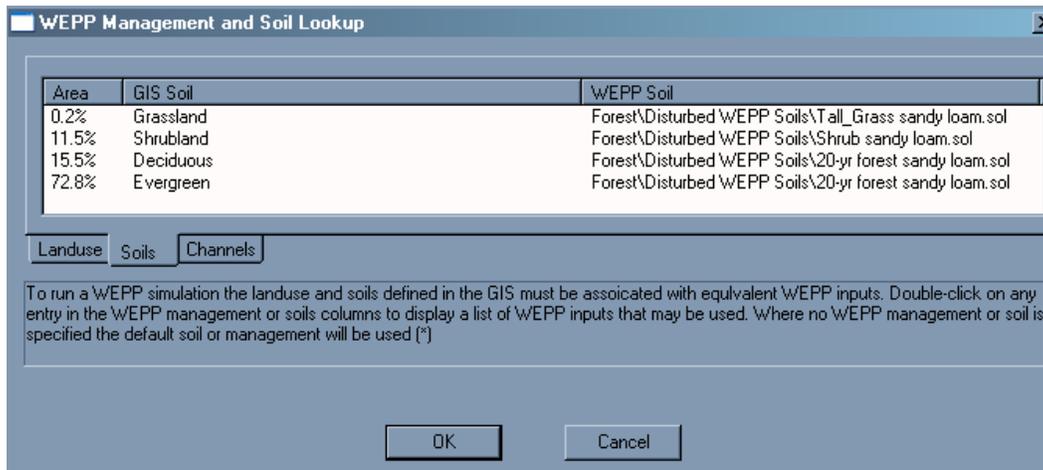
2. Click on the name of the **WEPP Management** area and navigate to **Forest\Disturbed WEPP Management**. Change **Sagebrush** to **Tall grass prarie** and **28% cover-short grass prarie** to **Shrub rangeland**. Click **OK**.



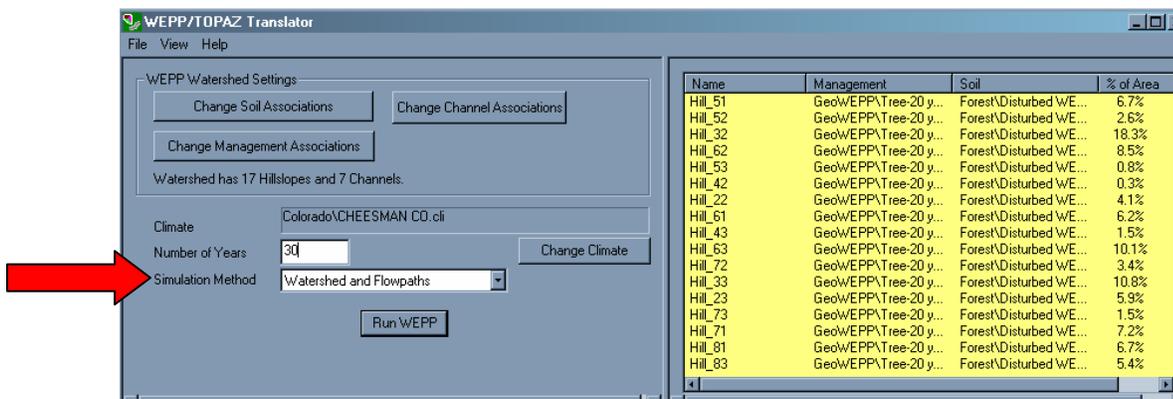
- In **WEPP Management**, click onto the **Soils** tab. You need to click onto each **KEITH.sol** and change the soils. Again, navigate to **Forest\Disturbed WEPP Management**.



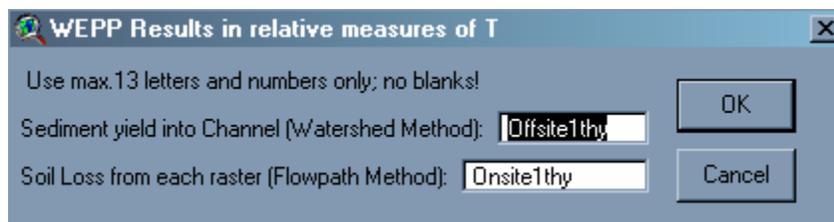
- Change the areas to 1) Tall_Grass sandy loam, 2) Shrub sandy loam, 3) 20-yr forest sandy loam, 4) 20-yr forest sandy loam. Click OK.



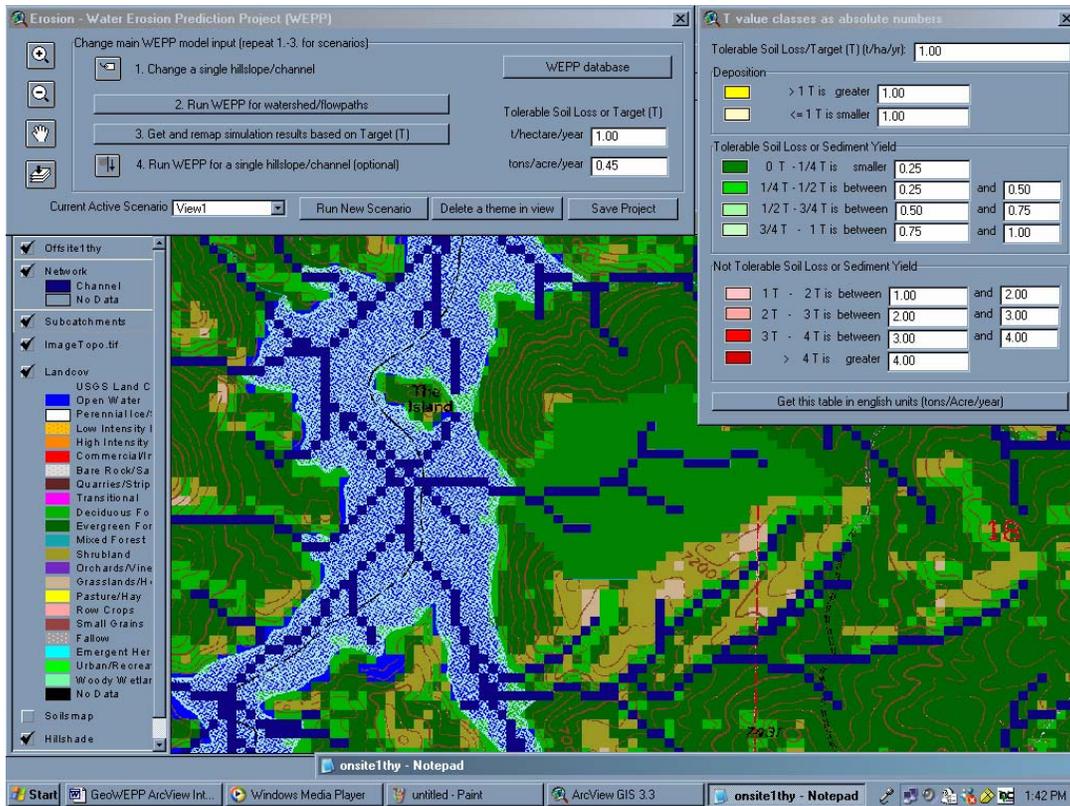
- In the WEPP/TOPAZ Translator, type in 30 years for Number of Years and select Watershed and Flowpaths for Simulation Method. Click Run WEPP.



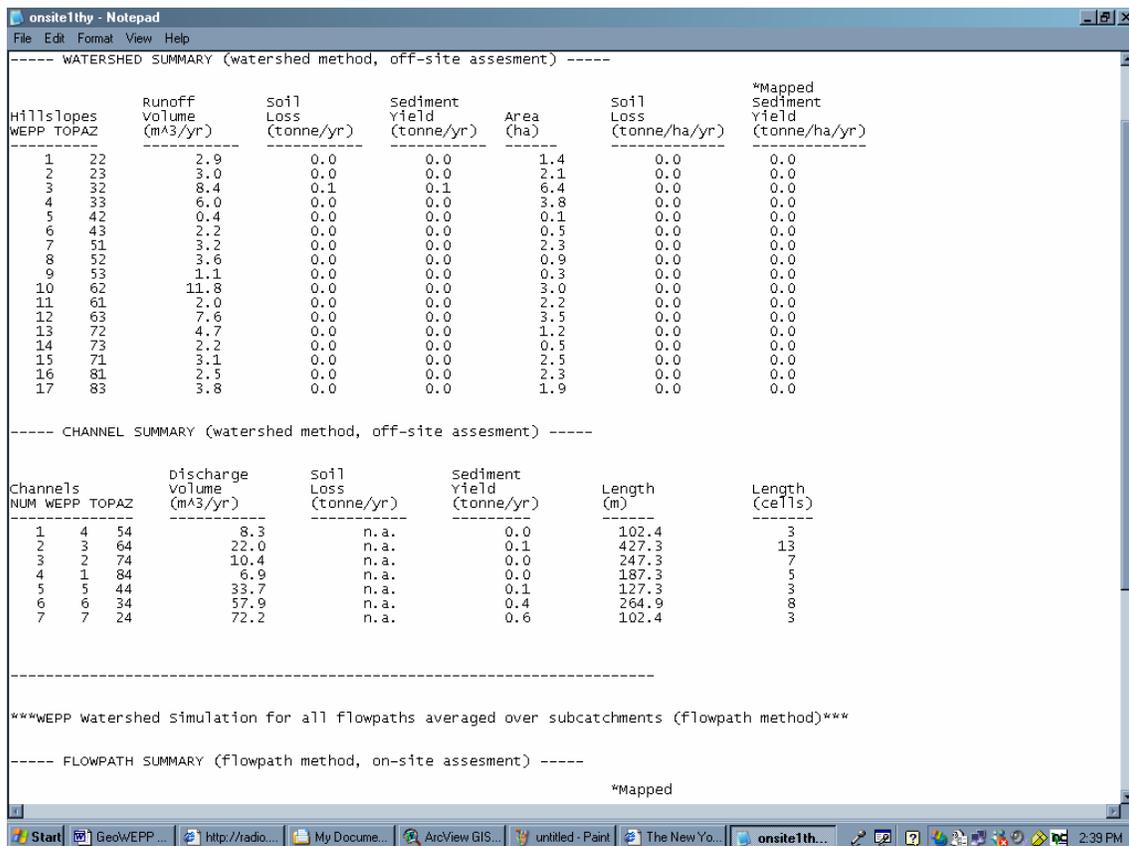
- In WEPP Complete, click OK.
- In WEPP results, leave the names Offsite1thy and Onsite1thy.



From the simulation, you get two results. First, you get a new layers. The **Onsite1thy**, as seen below, shows the erosion for each subcatchment. The entire catchment area is in green, showing tolerable limits.

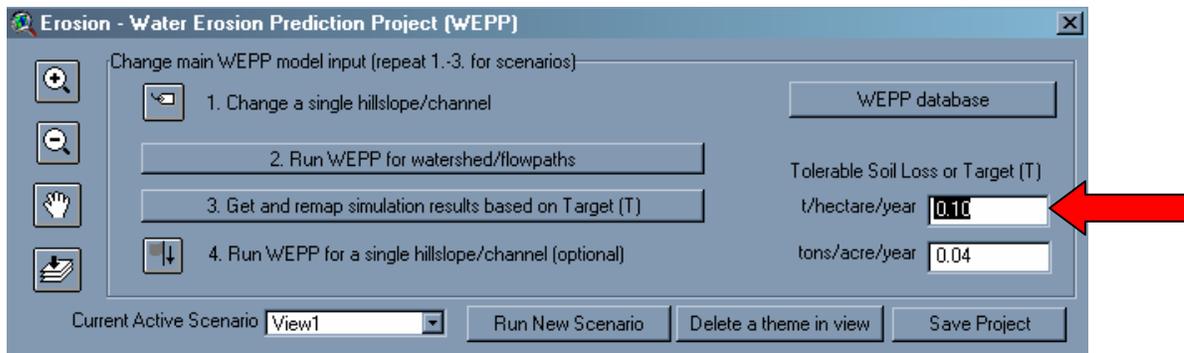


Second, you get a Notepad file with the actual results for the Watershed and the Flowpath. Here you can find the numbers for the Runoff Volume, Soil Loss, Sediment Yield, etc. Please minimize the Notepad window. Do not close it. We'll need it for later.

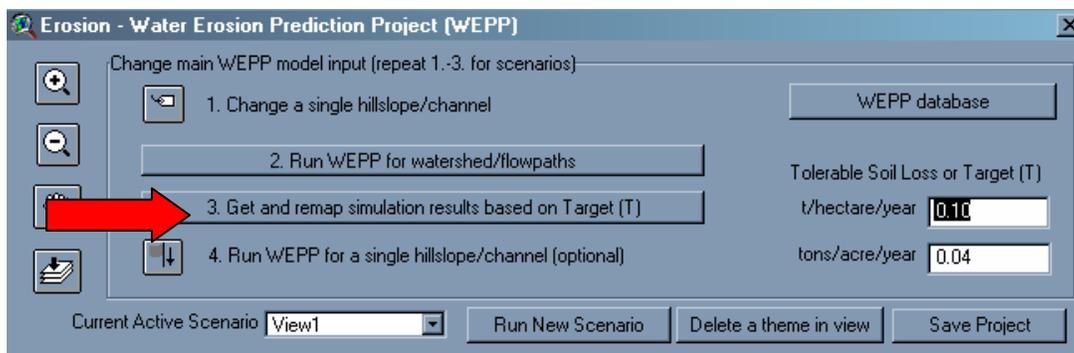


Next, we would like to remap the simulation output for the target value ‘T’ to .1 t/ha soil loss and sediment yield.

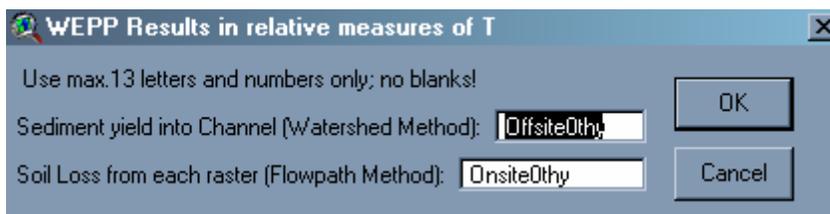
1. In the **Erosion – Water Erosion Prediction Project (WEPP)** window, go to the **Tolerable Soil Loss**. In the **t/hectares/year box**, type in .1 and press enter. Observe how the other numbers in the **T value classes** window change.



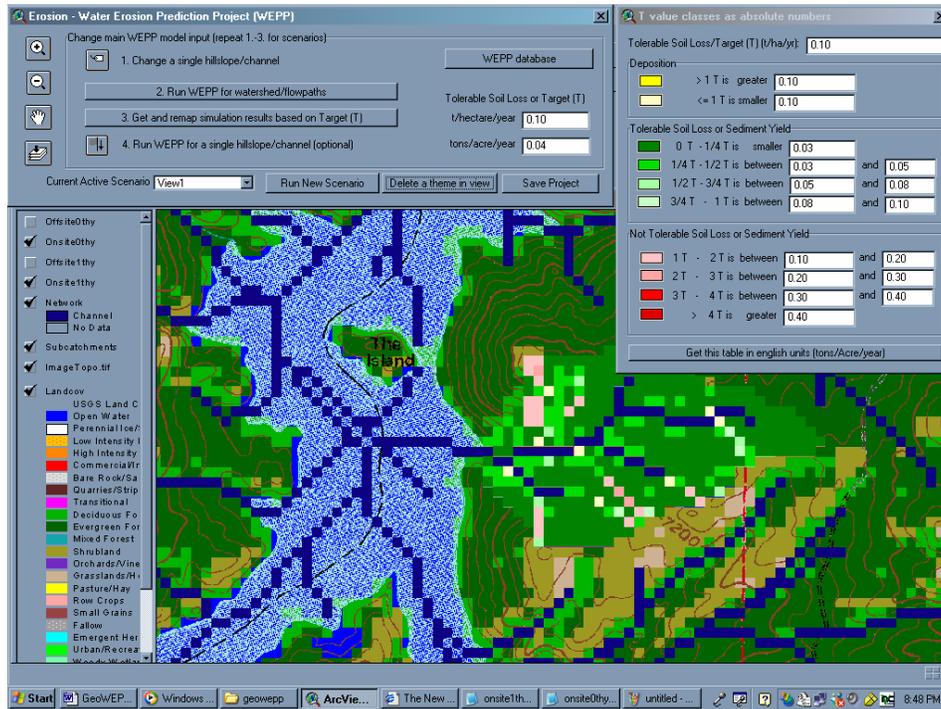
2. In the **Erosion – Water Erosion Prediction Project (WEPP)** window again, click on **Step 3. Get and remap simulation results based on Target (T)**.



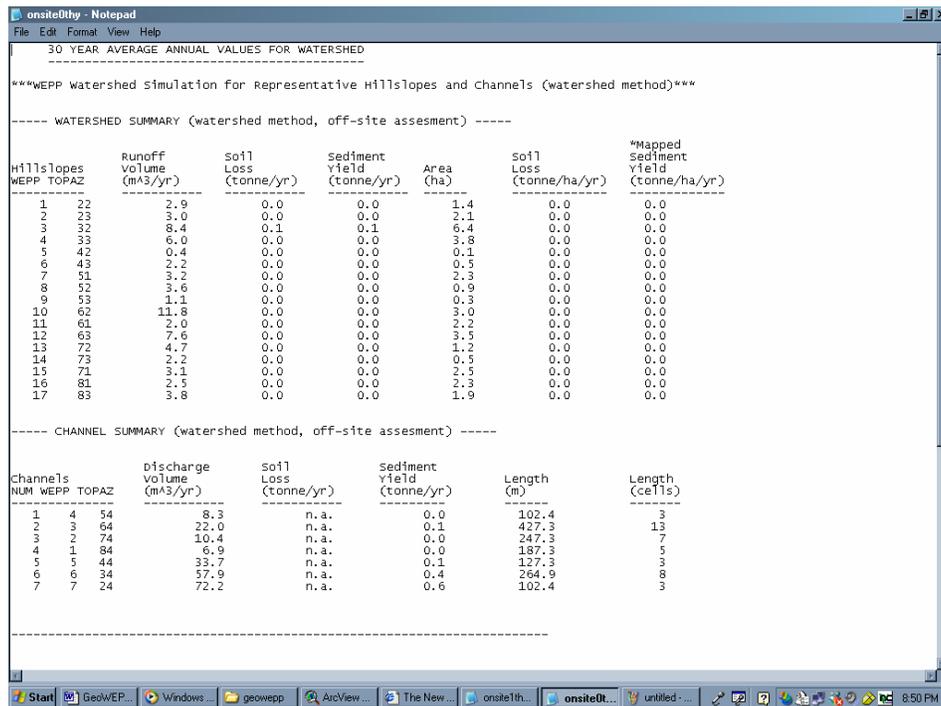
3. In the WEPP Results window, leave the name as **Offsite0thy** and click **OK**.



As you can see below, two new layers with the new soil loss were created. If you compare **Onsite1thy** and **Onsite0thy**, you see that **Onsite0thy** has more red pixels, meaning less tolerable levels of erosion.

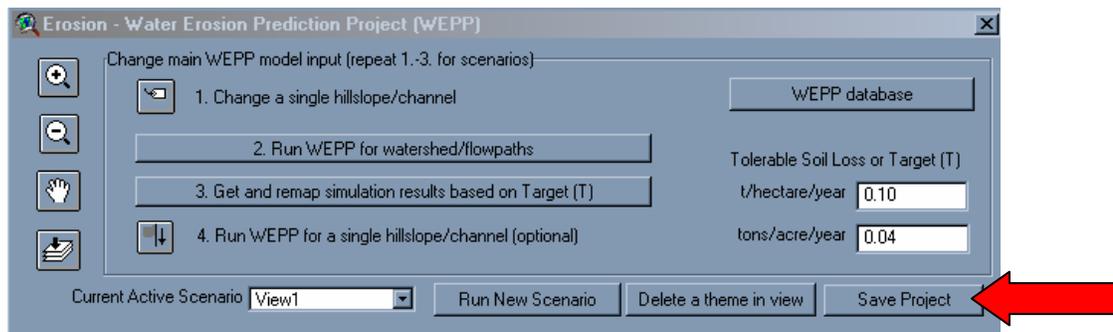


Also, a Notepad file was created. If you compare this new file to the first one that we created, you see the numbers are the same. The amount of erosion is the same, but the amount of what was tolerable was considered different and this was depicted in the view.



It's always a good idea to save your files often in case of crashes.

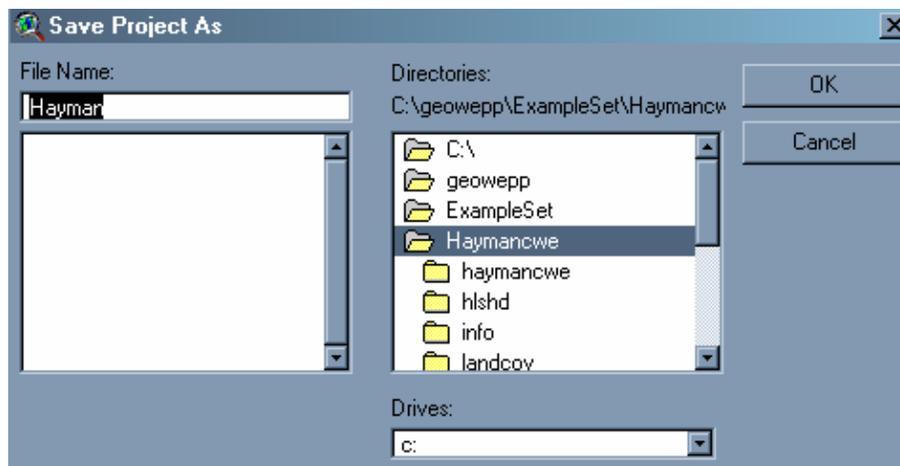
1. In the **Erosion – Water Erosion Prediction Project (WEPP)** window, click on the **Save Project** button.



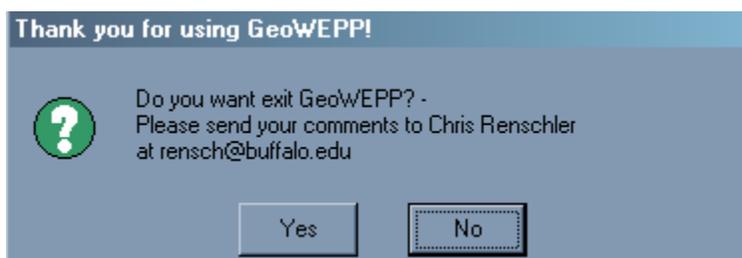
2. In the **GeoWEPP Watershed Directory**, note that you are saving this project in **C:\geowepp\ExampleSet\Haymancwe**. Click **OK**.



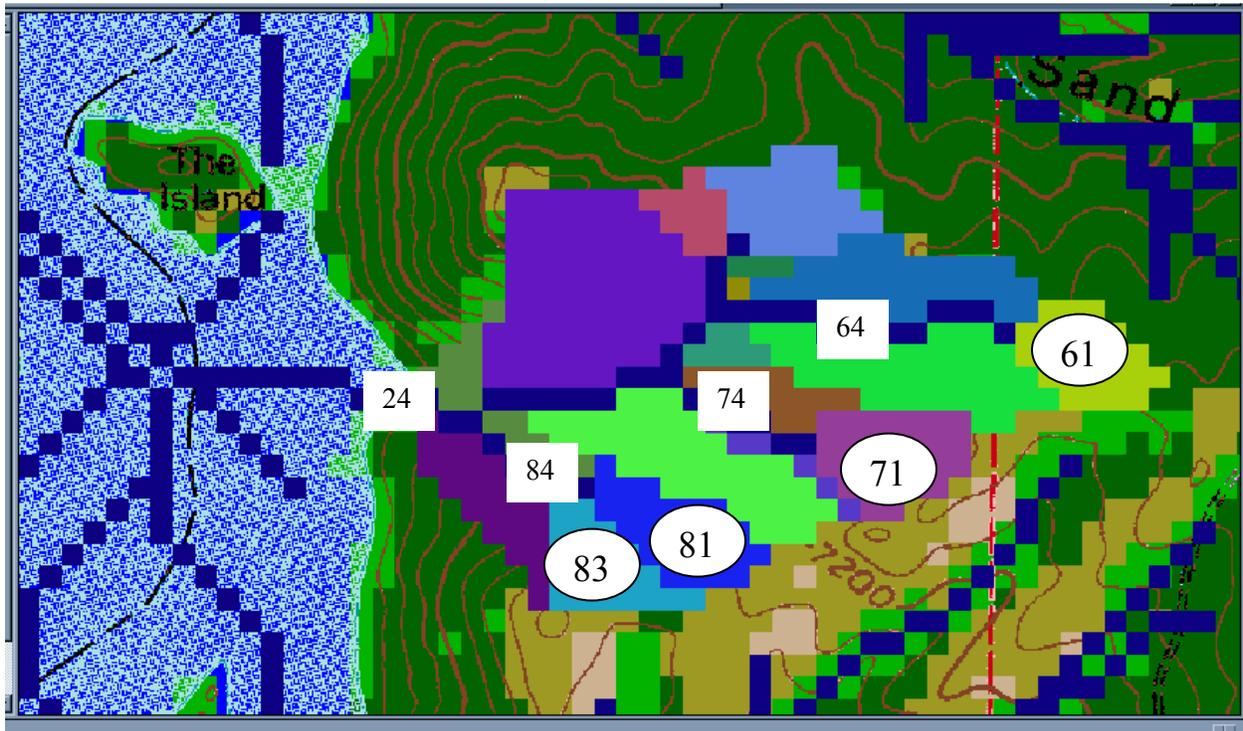
3. In the **Save Project As** window, give the project the name **Hayman**. Click **OK**.



4. In the **Thank you for using GeoWEPP!** window, it prompts you to exit GeoWEPP. Click **No**.

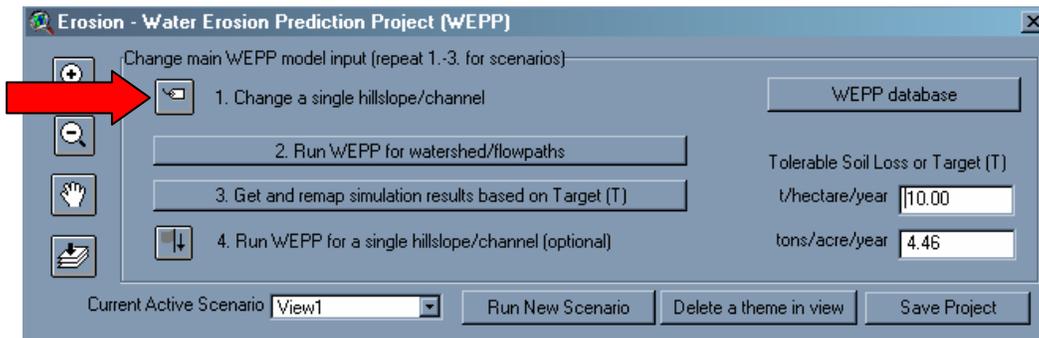


Now, we will work with the Cumulative Watershed Effects (CWE) Analysis worksheet. We will do some prescribed burns in selected areas at different times in our watershed. We perform a sequence of prescribed burns in four subcatchments (hillslopes) and then see how each recovers over time. We specifically will investigate the effect of vegetation coverage on soil loss, runoff and sediment discharges from the hillslopes, subwatersheds (channel outlets) and at the main watershed outlet (main channel segment outlet). We want to manage these hillslopes differently in four consecutive years and do a 20-year simulation for each year. A simulation this long can show us how the burn will affect the area over time. We will work with hillslopes **83, 81, 71** and **61** (Oval text box). You see in the chart below the map how the management and soil is changed in each of the four years. With these prescribed burns, we do not want too much erosion, and this is why we will go from one subcatchment to a different subcatchment each year. Also, we will work with channel networks, specifically the watershed outlet **24** and channels **84, 74,** and **64** (square text box).

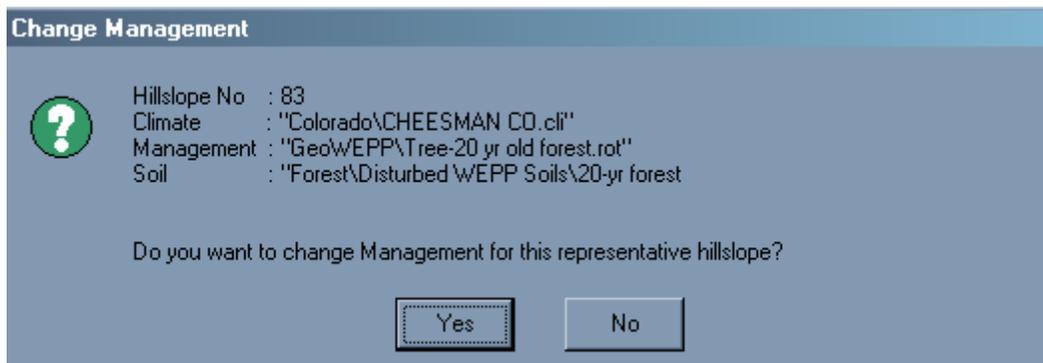


	Hillslope 83		Hillslope 81		Hillslope 71		Hillslope 61	
	Landuse	Soil	Landuse	Soil	Landuse	Soil	Landuse	Soil
Year 1	High	High	-	-	-	-	-	-
Year 2	Medium	High	High	High	-	-	-	-
Year 3	Low	Low	Medium	High	High	High	-	-
Year 4	Forest	Forest	Low	Low	Medium	High	High	High

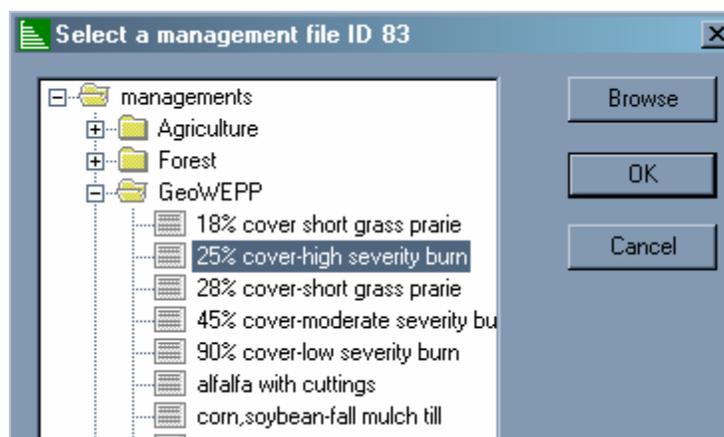
1. In the **Erosion – Water Erosion Prediction Project (WEPP)** window, click on **Step. 1. Change a single hillslope/channel icon** . This will allow you to select the individual subcatchments.



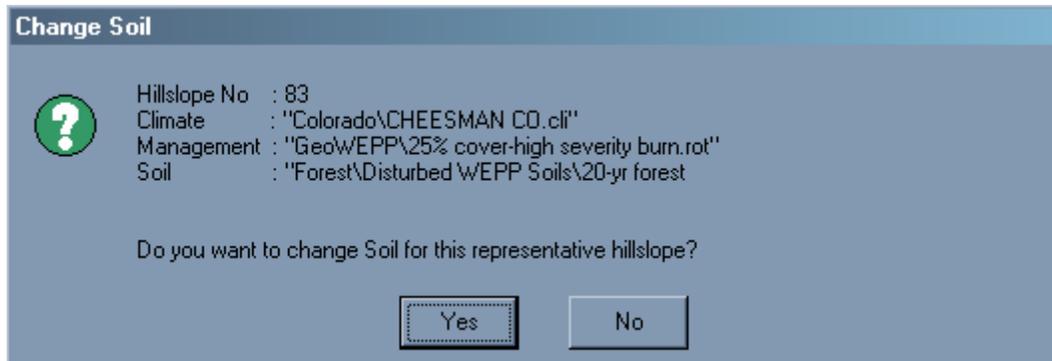
2. You now notice that the cursor has changed into a cross with a label symbol. Click this onto the Hillslope 83, and you get the **Change Management** window. Click **Yes**.



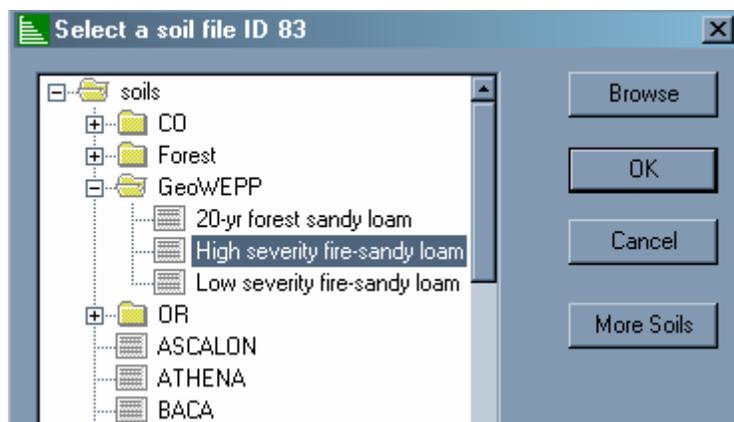
3. In **Select a management file**, navigate to **GeoWEPP** and choose **25% cover-high severity burn**. Click **OK**.



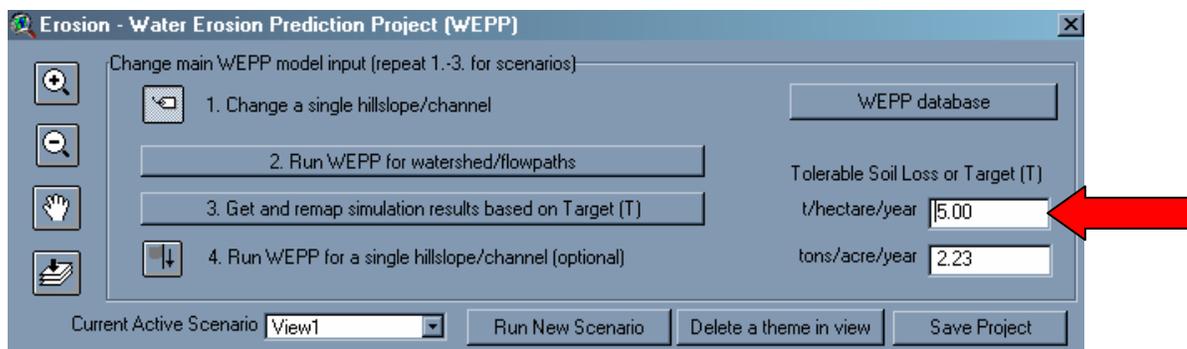
4. We now want to change the soil. In the **Change Soil** window, click **Yes**.



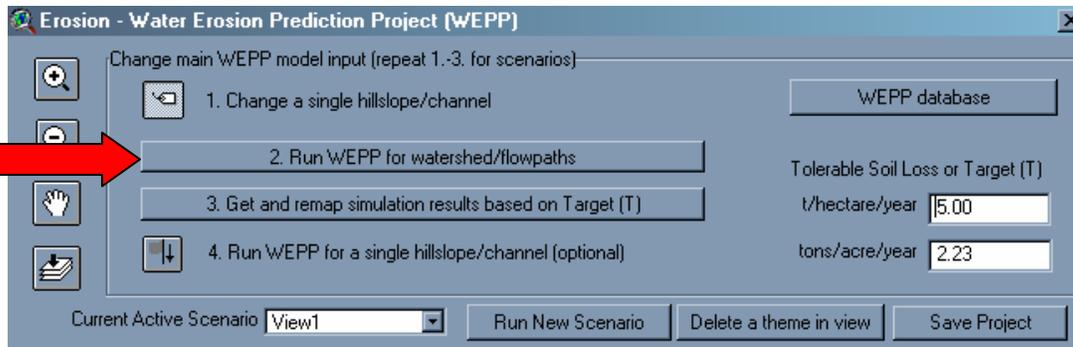
5. In the **Select a soil file**, navigate to **GeoWEPP** and choose **High severity fire-sandy loam**. Click **OK**.



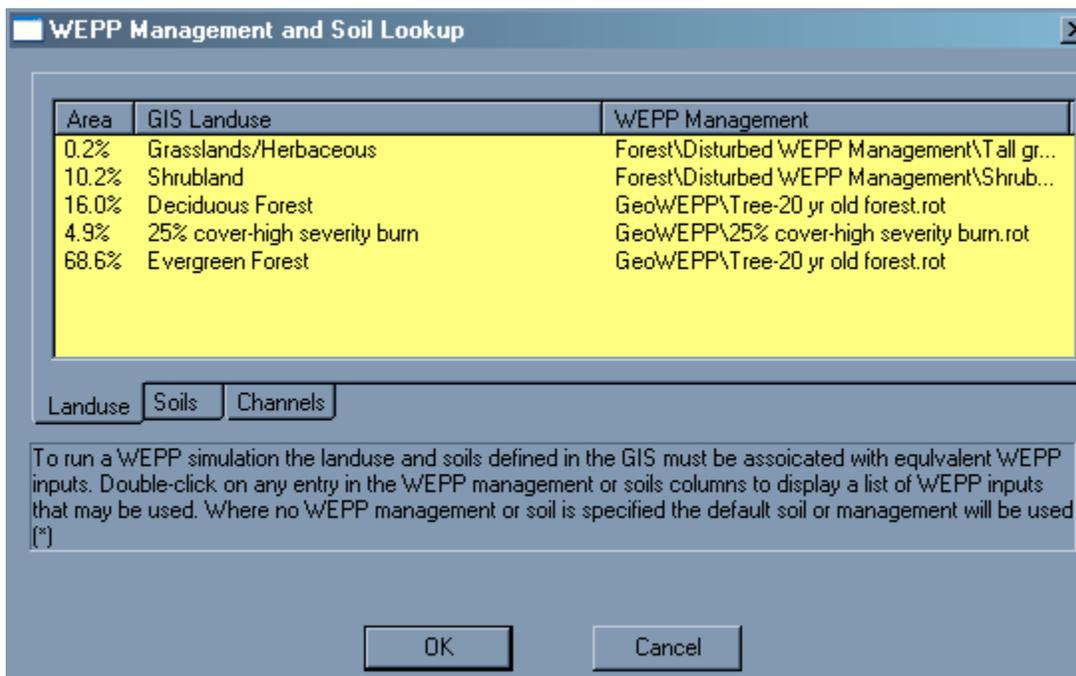
6. Now, we want to run the simulation. For the Tolerable Soil Loss, type in 5 for the t/hectare.



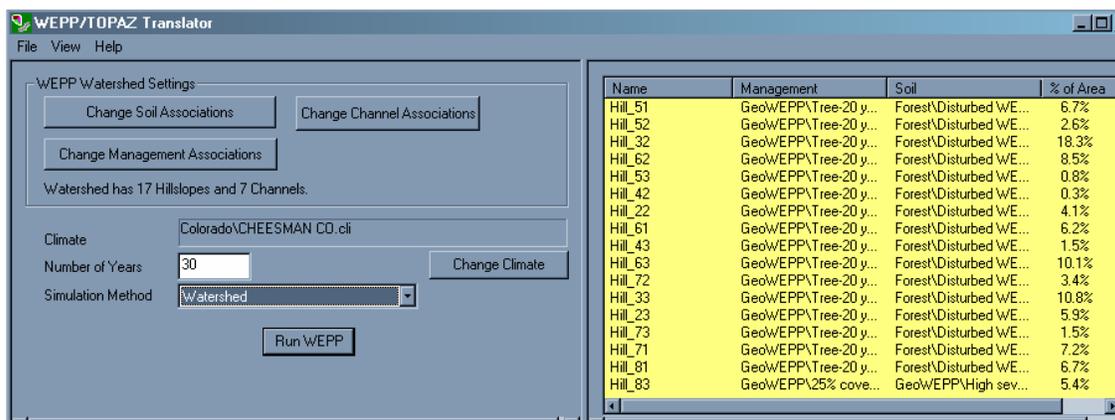
7. Click on **2. Run WEPP for watershed/flowpaths.**



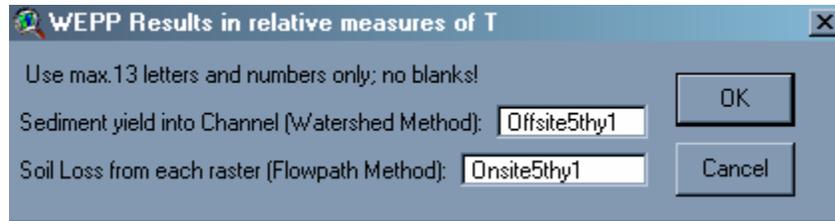
8. In **WEPP Management and Soil Lookup**, click **Cancel**.



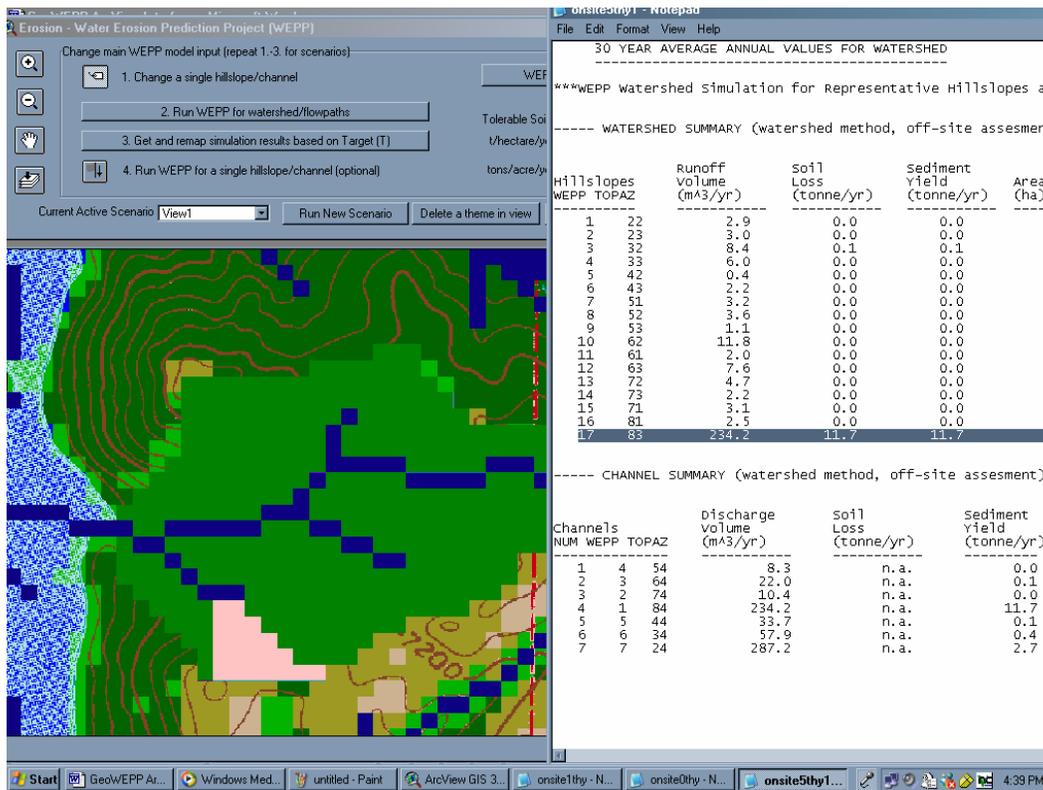
11. In **WEPP/TOPAZ Translator**, type **30** for **Number of Years** and select **Watershed** for **Simulation Method**. Click **Run WEPP**.



10. In WEPP Results, name this **Offsite5thy1**. Click **OK**.



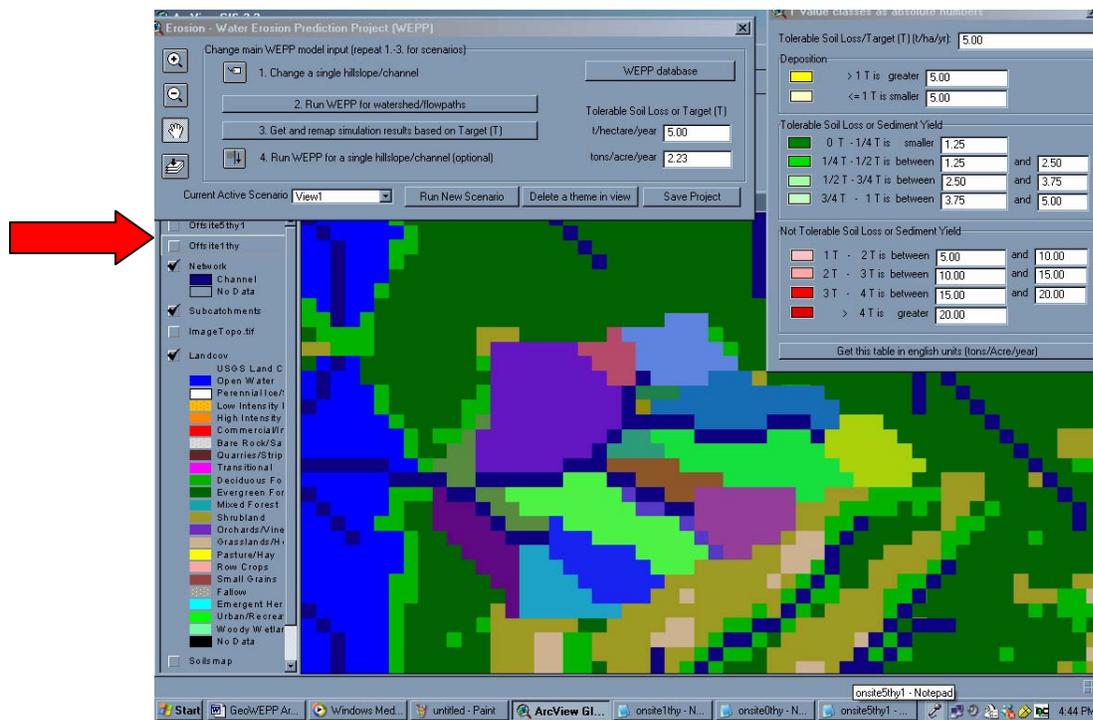
As we can see from the view below, Hillslope 83 is now redder than the other hillslopes due to erosion. Also, if you look at the bottom of the results sheet, you see the numbers for the channels.



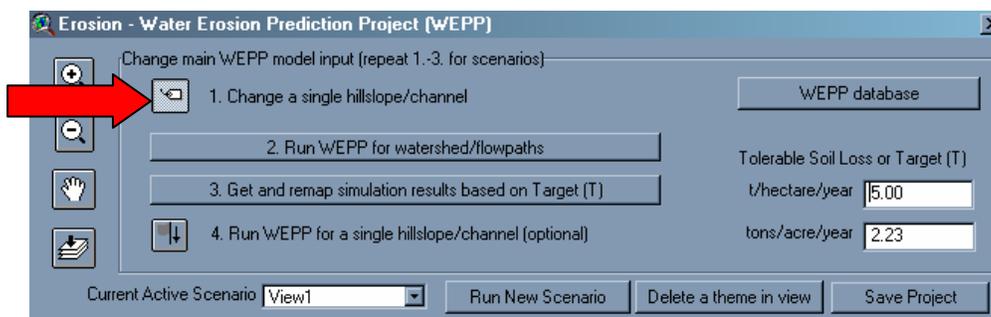
Now, we want to change Hillslope 83 and 81.

	Hillslope 83		Hillslope 81	
	Landuse	Soil	Landuse	Soil
Year 1	High	High	-	-
Year 2	Medium	High	High	High

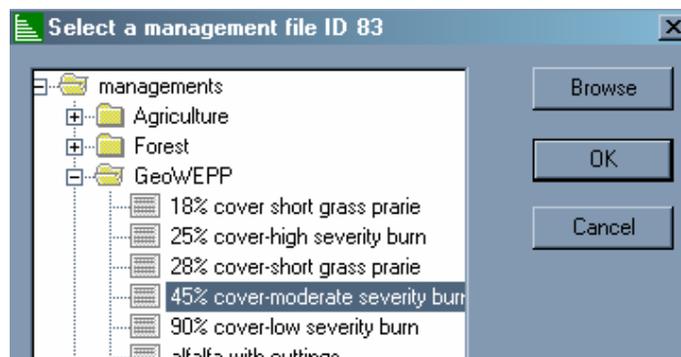
1. In the **Table of Contents** of the view on the left, turn off the checkmark for **Offsite5thy1** to display the subcatchments.



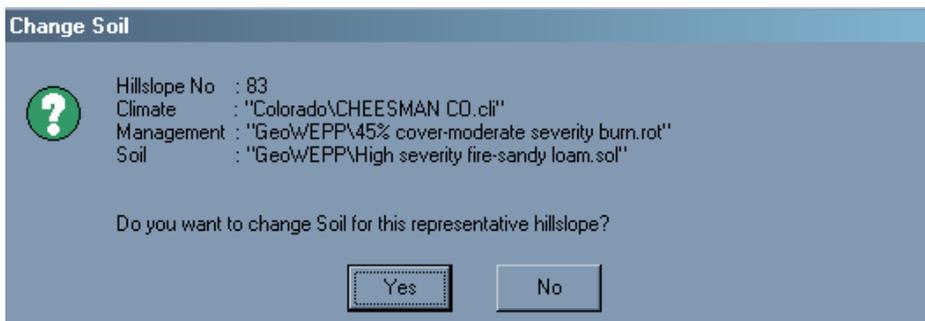
2. In the **Erosion – Water Erosion Prediction Project (WEPP)** window, click on **Step. 1. Change a single hillslope/channel** icon .



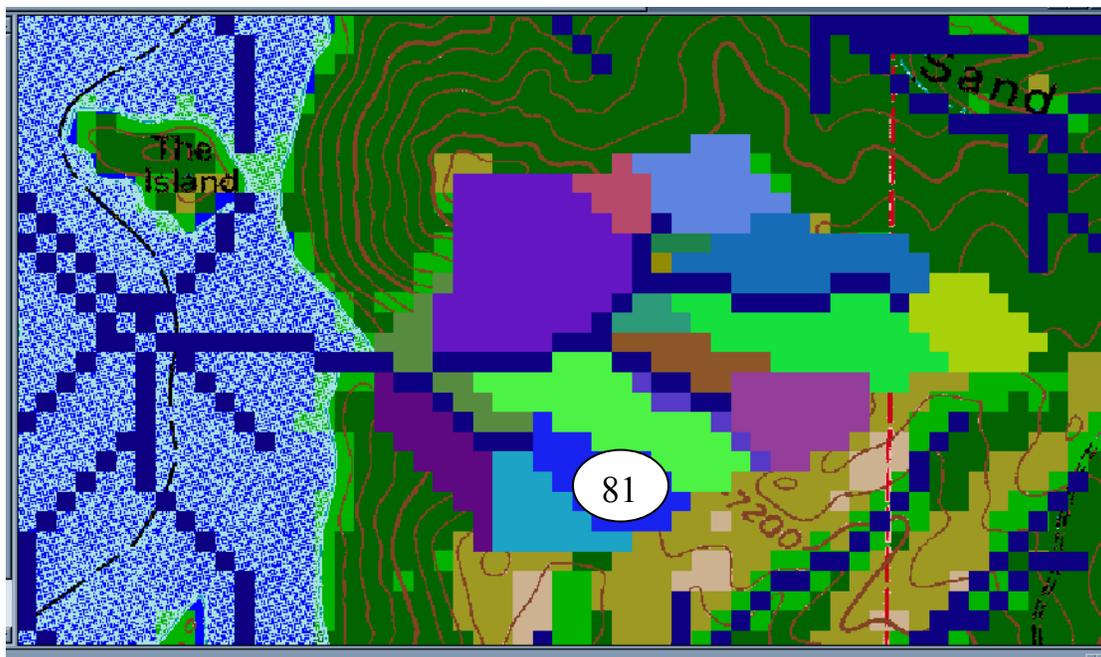
3. Click onto Hillslope 83. When prompted in the **Change Management** window to change the landuse, navigate to the **GeoWEPP** folder and select **45% cover-moderate severity burn**. Click **OK**.



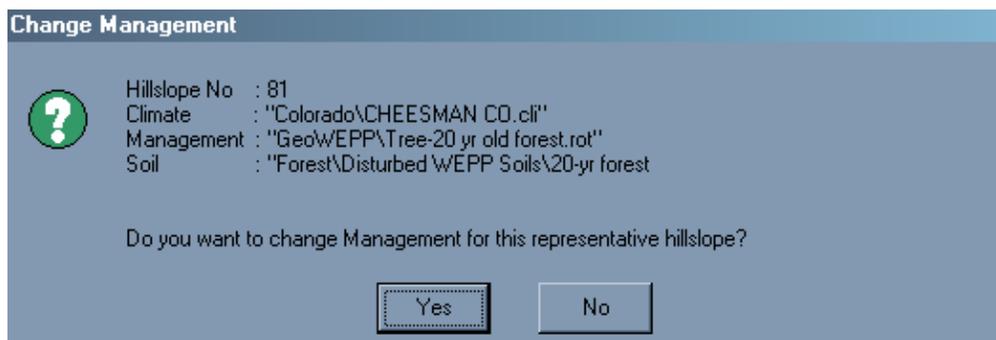
4. In the **Change Soil**, click **No**. We want to leave it at high.



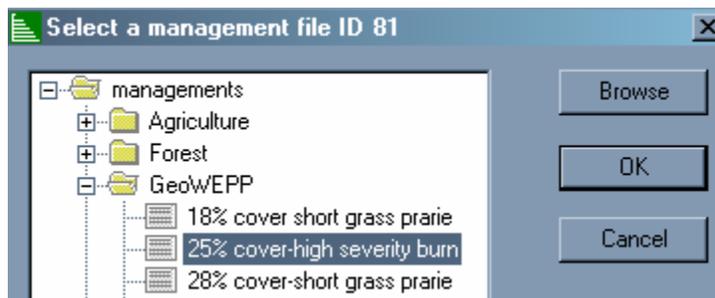
5. Now we want to change Hillslope 81. In the **Erosion – Water Erosion Prediction Project (WEPP)** window, click on **Step. 1. Change a single hillslope/channel** icon  and click on to the hillslope.



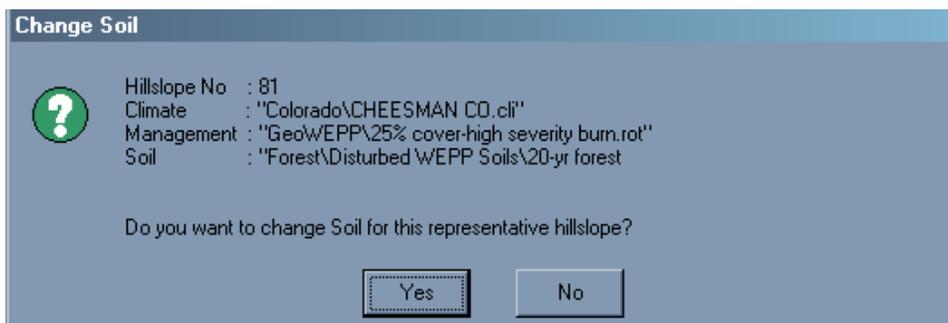
6. In **Change Management**, you are prompted to change the landuse. Click **Yes**.



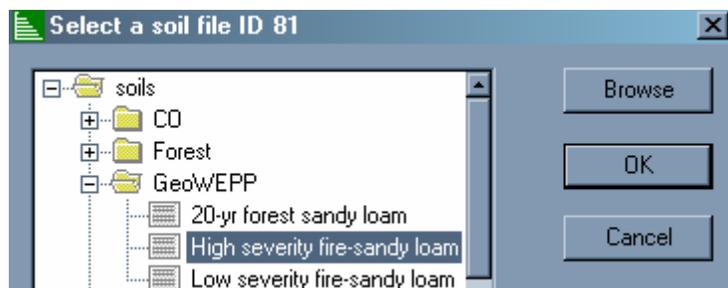
7. In **Select a management file**, navigate to **GeoWEPP** and select **25% cover-high severity burn**. Click **OK**.



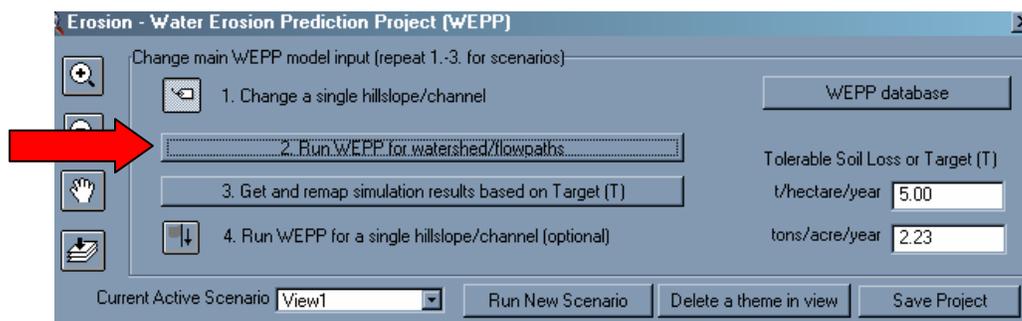
8. In **Change Soil**, click **Yes**.



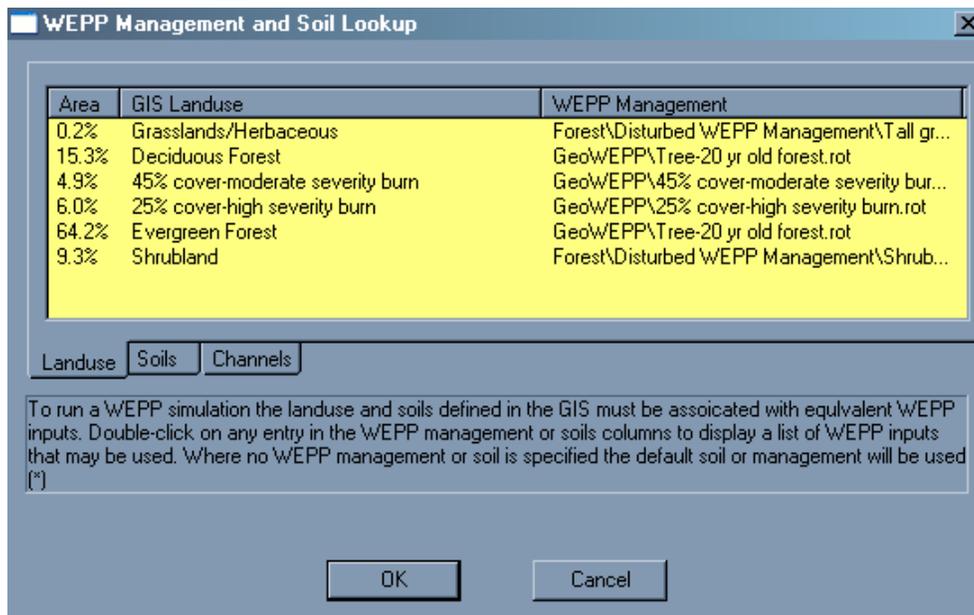
9. In **Select a soil file**, navigate to **GeoWEPP** and select **High severity fire-sandy loam**. Click **OK**.



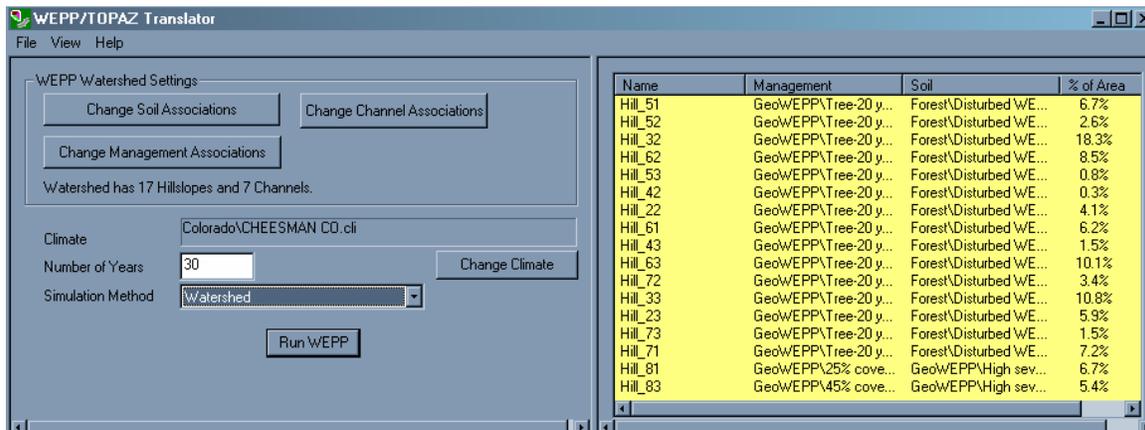
10. In **Erosion – Water Erosion Prediction Project (WEPP)**, click on **2. Run WEPP for watershed/flowpaths**.



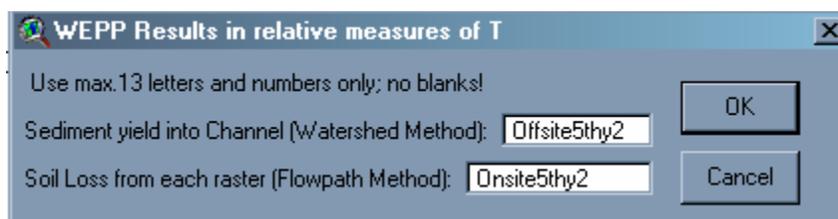
11. Again, in **WEPP Management and Soil Lookup**, you don't need to change anything. Click **Cancel**.



12. In **WEPP/TOPAZ Translator**, type **30** for **Number of Years** and select **Watershed** for **Simulation Method**. Click **Run WEPP**.



13. In **WEPP Results**, name this **Offsite5thy2**. Click **OK**.



As you can see, the **Runoff** for Hillslope 83 has gone down, while it has gone up for Hillslope 81

30 YEAR AVERAGE ANNUAL

***WEPP watershed simulation

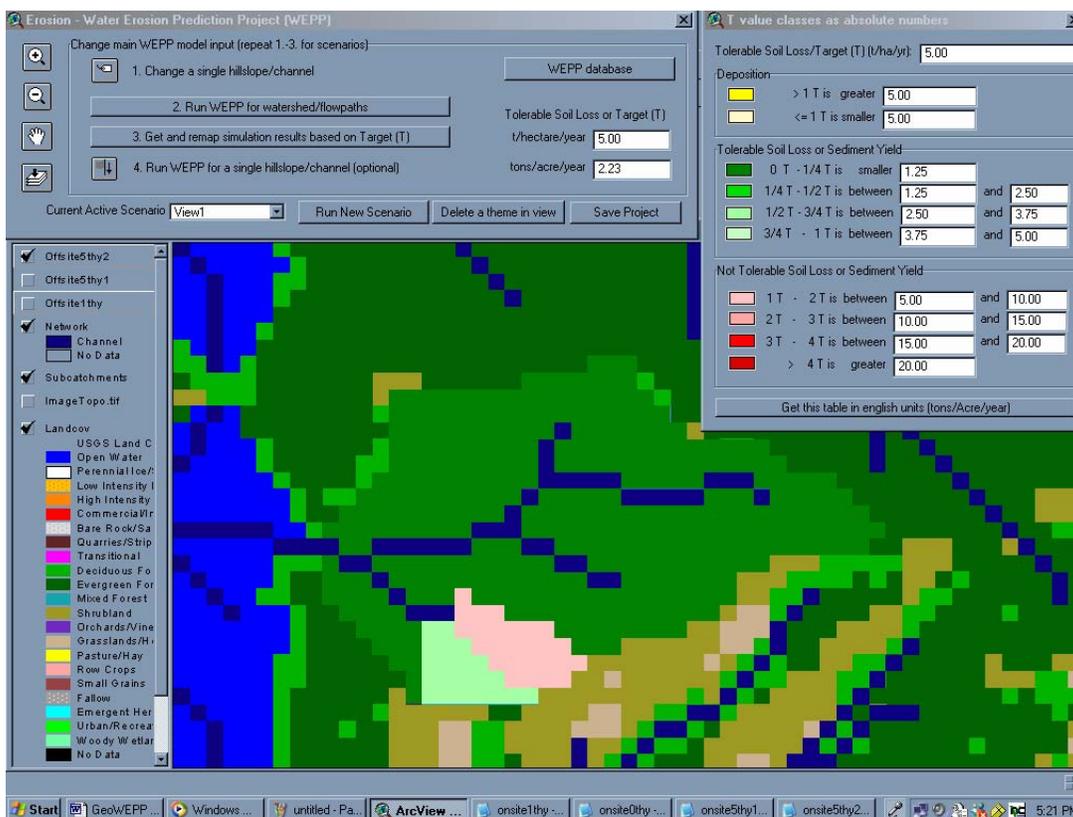
----- WATERSHED SUMMARY (watershed method, off-site assesment) -----

Hillslopes WEPP	TOPAZ	Runoff volume (m³/yr)	Hillslopes WEPP	TOPAZ	Runoff volume (m³/yr)	Soil Loss (tonne/yr)	Sediment yield (tonne/yr)	Area (ha)	Soil Loss (tonne/ha/yr)	*Mapped Sediment Yield (tonne/ha/yr)
1	22	2.9	1	22	2.9	0.0	0.0	1.4	0.0	0.0
2	23	3.0	2	23	3.0	0.0	0.0	2.1	0.0	0.0
3	32	8.4	3	32	8.4	0.1	0.1	6.4	0.0	0.0
4	33	6.0	4	33	6.0	0.0	0.0	3.8	0.0	0.0
5	42	0.4	5	42	0.4	0.0	0.0	0.1	0.0	0.0
6	43	2.2	6	43	2.2	0.0	0.0	0.5	0.0	0.0
7	51	3.2	7	51	3.2	0.0	0.0	2.3	0.0	0.0
8	52	3.6	8	52	3.6	0.0	0.0	0.9	0.0	0.0
9	53	1.1	9	53	1.1	0.0	0.0	0.3	0.0	0.0
10	62	11.8	10	62	11.8	0.0	0.0	3.0	0.0	0.0
11	61	2.0	11	61	2.0	0.0	0.0	2.2	0.0	0.0
12	63	7.6	12	63	7.6	0.0	0.0	3.5	0.0	0.0
13	72	4.7	13	72	4.7	0.0	0.0	1.2	0.0	0.0
14	73	2.2	14	73	2.2	0.0	0.0	0.5	0.0	0.0
15	71	3.1	15	71	3.1	0.0	0.0	2.5	0.0	0.0
16	81	2.5	16	81	2.045	18.1	18.1	2.3	7.7	7.7
17	83	2.342	17	83	2.029	6.5	6.5	1.9	3.5	3.5

----- CHANNEL SUMMARY (watershed method, off-site assesment) -----

Channels NUM WEPP	TOPAZ	Discharge volume (m³/yr)	Channels NUM WEPP	TOPAZ	Discharge volume (m³/yr)	Soil Loss (tonne/yr)	Sediment Yield (tonne/yr)	Length (m)	Length (cells)
1	4	54	1	4	54	8.3	n.a.	102.4	3
2	3	64	2	3	64	22.0	n.a.	427.3	13
3	2	74	3	2	74	10.4	n.a.	247.3	7
4	1	84	4	1	84	405.1	n.a.	187.3	5
5	5	44	5	5	44	33.7	n.a.	127.3	3
6	6	34	6	6	34	57.9	n.a.	264.9	8
7	7	24	7	7	24	459.8	n.a.	102.4	3

You can also see in this visualized in the views.



	Hillslope 83		Hillslope 81		Hillslope 71		Hillslope 61	
	Landuse	Soil	Landuse	Soil	Landuse	Soil	Landuse	Soil
Year 1	High	High	-	-	-	-	-	-
Year 2	Medium	High	High	High	-	-	-	-
Year 3	Low	Low	Medium	High	High	High	-	-
Year 4	Forest	Forest	Low	Low	Medium	High	High	High

Now, your job is to finish the simulation for the Year 3 and Year 4. The paths for the files are given below.

Management
High: GeoWEPP\25% cover-high severity burn
Medium:GeoWEPP\45% cover-moderate severity burn
Low:GeoWEPP\90% cover-low severity burn
Forest: GeoWEPP\Tree-20 yr old forest

Soil
High: GeoWEPP\High severity fire-sandy loam
Low: GeoWEPP\Low severity fire-sandy loam
Forest: GeoWEPP\20-yr forest sandy loam

Name the results for year 3 **Offsite5thy3** and year 4 **Offsite5thy4**

Write down all the results on CWE worksheet.

If you wish, you can go farther and do the following:

1. Make the catchment area all forest and do the simulation.
2. Make the catchment area all burned and do the simulation.