Advanced GeoWEPP Tools

Creation and Use of Four Text Files
Linked to Landuse and Soils Layers within GeoWEPP

By Martin Minkowski

Martin Minkowski
Lead GeoWEPP Programmer
LESAM Project Group
Department of Geography
University of Buffalo
Buffalo, New York

This document will provide you, the user, with some advanced information for using your own Landcov.asc (WEPP Management) and Soilsmap.asc (Soils Layer) in GeoWEPP. You will learn how to create files that will allow GeoWEPP to recognize the information within these layers and load them into WEPP. You will also learn to create a simple database in text format that will load the WEPP management and soil files into the WEPP/TOPAZ translator.

How to create a landcov.txt file

The landcov.txt file is used by GeoWEPP and WEPP/TOPAZ Translator to determine the name or description that corresponds with the Landcov layer in GeoWEPP. If this file does not exist when using a Landcov.asc file, GeoWEPP and WEPP/TOPAZ will crash. This section will guide you through the steps needed to create this file.

The example sets provided within GeoWEPP use landuse files that contain values that correspond with the USGS Landuse scheme. This means wherever the value of 41 is located on the Landcov layer, it represents a Deciduous Forest. At the end of this document is a listing of the USGS Landuse scheme used in the example sets. If you are using such a scheme (for example, using landuse data downloaded from the NRCS Datagateway), all you will needed to do to create the landcov.txt file is to copy and paste this information into a word processor and save it as landcov.txt.

The creation of a landcov.txt that will work with your own landcov data is a simple task. First, start up Notepad (or some other word processor). The format that GeoWEPP uses is:

NumberKey Description

The NumberKey is the value within each raster sell of you landcov layer. In the case of the Deciduous Forest above, the NumberKey would be 41. The NumberKey you use does not have to be a 2 digit number. What is important to remember is that the numbers you use have to correspond to the numbers within the landcov layer. You can have more numbers in you landcov.txt file than you have in you landcov layer, but if you have less numbers within the landcov.txt compared to the landcov layer, you will not have an accurate representation of the landcov layer you are using. Any numbers that are not found within the landcov.txt will show up as no data.

Between the NumberKey and the Description is a single space. This is all that is needed to let GeoWEPP "see" the two columns.

Description is any description you wish to use to describe the NumberKey. For NumberKey 41 the description is Deciduous Forest. You can use any description you wish, but you may be limited by space.

Once you have finished entering the data, save the document as a text file; it should have the extension .TXT. You MUST save the file as landcov.txt.

One bit of advice is to create one landcov.txt that contains all the NumberKeys you will use for your study areas. But, do not use multiple descriptions for the same number. This will cause errors. As time progresses and you use different landcov layers, you can add more NumberKeys to you landcov.txt.

An example of what the landcov.txt could look like is:

```
12 Perennial Ice/Snow
<P>
Developed
21 Low Intensity Residential
22 High Intensity Residential
23 Commercial/Industrial/Transportation
<P>
Barren
31 Bare Rock/Sand/Clay
32 Quarries/Strip Mines/Gravel Pits
33 Transitional
<P>
Vegetated; Natural Forested Upland
41 Deciduous Forest
42 Evergreen Forest
43 Mixed Forest
<P>
Shrubland
51 Shrubland
<P>
Non-natural Woody
61 Orchards/Vineyards/Other
<P>
Herbaceous Upland
71 Grasslands/Herbaceous
<P>
Herbaceous Planted/Cultivated
81 Pasture/Hay
82 Row Crops
83 Small Grains
84 Fallow
85 Urban/Recreational Grasses
<P>
Wetlands
91 Woody Wetlands
92 Emergent Herbaceous Wetlands
```
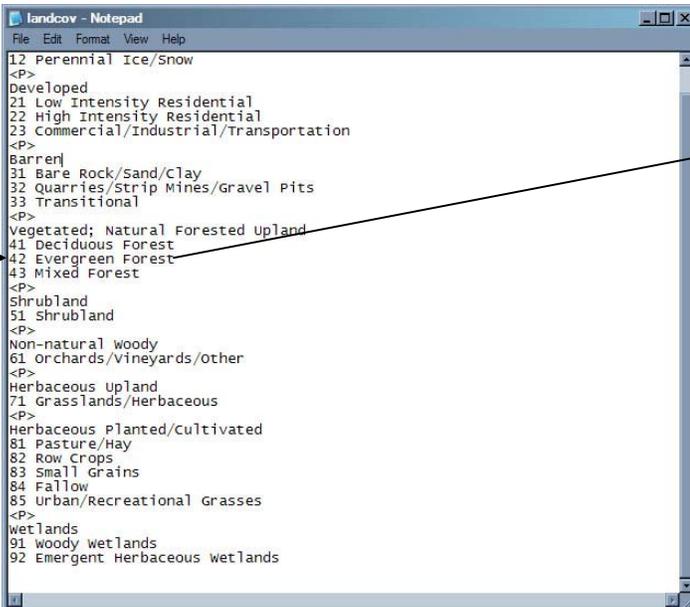
The landcov.txt file can have any description in it the user desires as long as the format is followed. In the above example, anything that is not preceded by a number and a space is ignored (like <p> and the category headings).

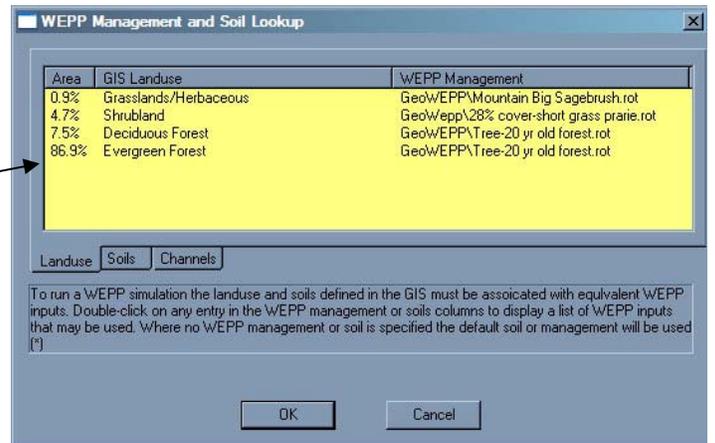How does this file work with GeoWEPP?
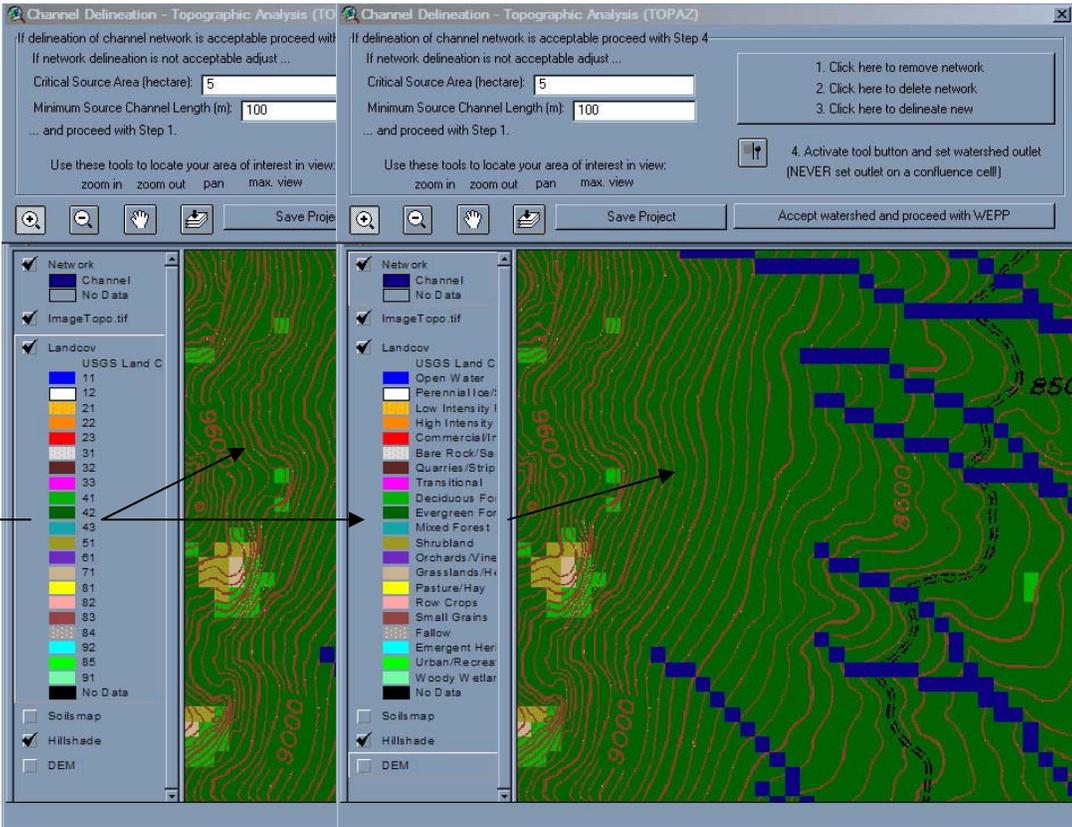
a) GeoWEPP without legend

b) GeoWEPP with legend

c) landcov.txt

d) WEPP/TOPAZ Translator

The images above show the interaction between GeoWEPP, landcov.txt, and the WEPP/TOPAZ Translator (WEPP Management and Soil Lookup). In the case above (which is from the Hayman – CWE Analysis example set), the user would see image b on their screen with a legend. In reality, GeoWEPP only "sees" number for the different cells of the landuse layer (see image a). To pass on what the user "sees" to the WEPP/TOPAZ Translator, the landcov.txt is used as a bridge. The number value is read from GeoWEPP and the landcov.txt is referenced to determine what the WEPP/TOPAZ Translator should display in the GIS Landuse column of image d.

For example, the user would see that the dark green color is for Evergreen Forest, but GeoWEPP would only "see" 42. WEPP/TOPAZ Translator would "look up" the number 42 in the landcov.txt and would then display Evergreen Forest in its GIS Landuse column.

**Creation of the soilsmap.txt file**

The soilsmap layer has the same issue that the landcov layer has: if the file soilsmap.txt is missing, GeoWEPP and WEPP/TOPAZ will crash. This file can be created the same way we created the landcov.txt file, just with a different format.

Once again, start up any word processor program. The format is:

NumberKey,,Description

The NumberKey corresponds to the raster cell values in the soilsmap layer. This is similar to the NumberKey used above, but it relates to the soilsmap layer. The description describes the NumberKey value used. For example, you may have a NumberKey value of 445 and a Description of Ansol Soil, the line would look like:

445,,Ansol Soil
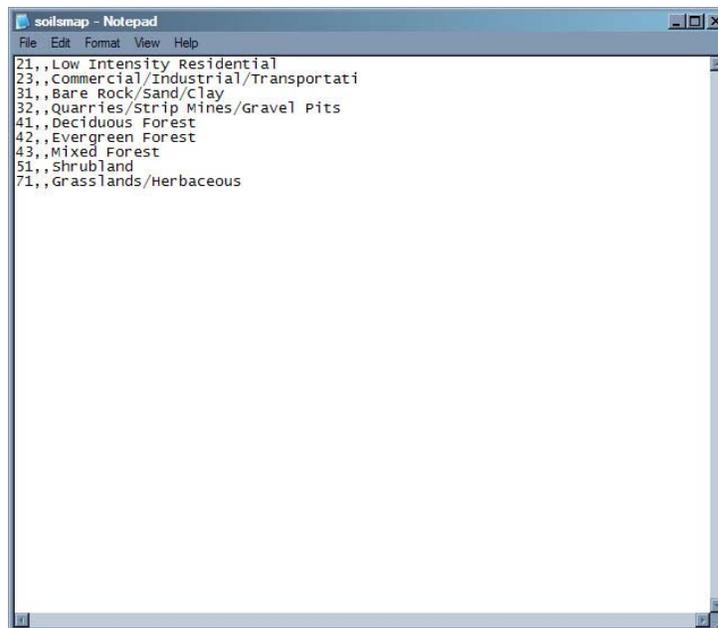
e) soilsmap.txt

Unlike the landcov.txt, you must use two commas between the NumberKey and the Description. GeoWEPP and WEPP/TOPAZ read in the first number (the NumberKey), skips everything from the first comma to the second comma including the commas, and then reads in everything after the second comma (the description) until it reaches a space or the end of the line, which ever is first. You must follow the same format or the program will not work properly. Anything after a space in the description will be ignored (in the example, only Ansol will be displayed).

The interaction between GeoWEPP, soilsmap.txt, and WEPP/TOPAZ Translator is the same as with landcov.txt.
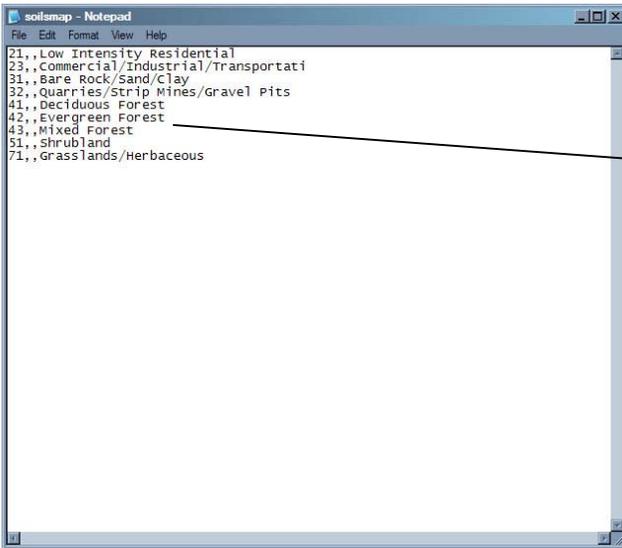
f) soilsmap.txt
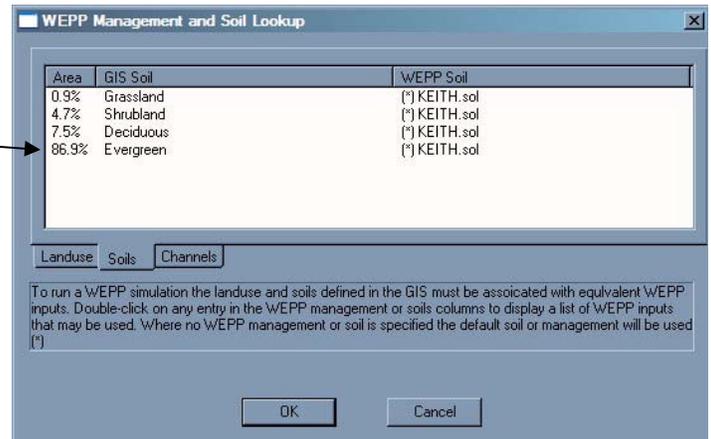
g) WEPP/TOPAZ Translator

How to use these files

There are two ways to use these files so that GeoWEPP and WEPP/TOPAZ will work properly. The first method is to make sure that both files are in the directory where all your study area data is located. When you use the "Use own GIS Data in ASCII Format" button, these files will be copied over to the directory you created during the processing steps and you will be worry free.

The other way to do this can be done with any button you choose to use. You can copy these files within the directory you are using within GeoWEPP. This can only be done after you have finished your channel creation and before you accept the watershed and proceed to WEPP. Minimize GeoWEPP and copy the files to you working directory from your data directory. Then Maximize GeoWEPP. Now you should be set to continue on.

GeoWEPP Soil and Landcover Database Creation

It would not appear to be very time consuming when you change the soil and the management information in the WEPP Management and Soils Lookup (images d and g) for only a few soils and managements. But, what if you study area had 65 different soils and 25 different managements and you were not sure which combinations would occur in what amounts. You would have to change the soils and management information every time you selected a new watershed or if you had to redo your current watershed. You could lose a lot of time, but we have a solution.
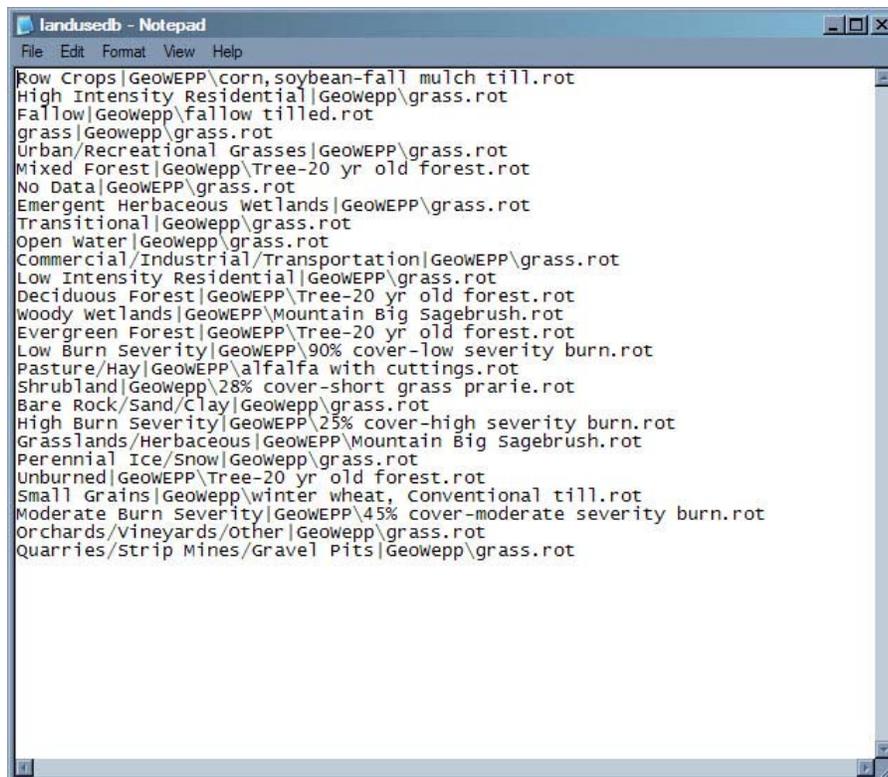
GeoWEPP uses two simple text database files to overcome this problem. The way these files work is similar to the way the landcov.txt and soilsmap.txt files work above. In the process above, the WEPP/TOPAZ Translator has completed the GIS Landuse column using the information found in landcov.txt. If landusedb.txt exists, WEPP/TOPAZ Translator will complete the second column, WEPP management. The same is done for soils if soilsmapdb.txt exists.

How to create landusedb.txt

The first and most important step is to delete landusedb.txt from you GeoWEPP directory. If you do not delete this file, GeoWEPP will copy the file into your working directory and possibly overwrite the one you created. This bug will be fixed shortly so that this does not occur.

The next step is to open any word processor program. The format for this file is:

DescriptionsUsedInLandcovTXTFile|WEPP management path (determine via WEPP)

```
landusedb - Notepad
File  Edit  Format  View  Help
Row Crops|GeoWEPP\corn,soybean-fall mulch till.rot
High Intensity Residential|Geowepp\grass.rot
Fallow|Geowepp\fallow tilled.rot
grass|Geowepp\grass.rot
Urban/Recreational Grasses|GeoWEPP\grass.rot
Mixed Forest|Geowepp\Tree-20 yr old forest.rot
No Data|GeoWEPP\grass.rot
Emergent Herbaceous Wetlands|GeoWEPP\grass.rot
Transitional|Geowepp\grass.rot
Open Water|Geowepp\grass.rot
Commercial/Industrial/Transportation|GeoWEPP\grass.rot
Low Intensity Residential|GeoWEPP\grass.rot
Deciduous Forest|GeoWEPP\Tree-20 yr old forest.rot
Woody Wetlands|GeoWEPP\Mountain Big Sagebrush.rot
Evergreen Forest|GeoWEPP\Tree-20 yr old forest.rot
Low Burn Severity|GeoWEPP\90% cover-low severity burn.rot
Pasture/Hay|GeoWEPP\alfalfa with cuttings.rot
Shrubland|Geowepp\28% cover-short grass prarie.rot
Bare Rock/Sand/Clay|Geowepp\grass.rot
High Burn Severity|GeoWEPP\25% cover-high severity burn.rot
Grasslands/Herbaceous|GeoWEPP\Mountain Big Sagebrush.rot
Perennial Ice/Snow|Geowepp\grass.rot
Unburned|GeoWEPP\Tree-20 yr old forest.rot
Small Grains|Geowepp\winter wheat, Conventional till.rot
Moderate Burn Severity|GeoWEPP\45% cover-moderate severity burn.rot
Orchards/Vineyards/Other|Geowepp\grass.rot
Quarries/Strip Mines/Gravel Pits|Geowepp\grass.rot
```

h) landusedb.txt

The first portion of the line is the description you used in the landcov.txt file. You must record this exactly as you did in landcov.txt or this will not work. The description is followed by | (the key above your enter key). This signals to the WEPP/TOPAZ Translator that the description has ended.

The final portion is the pathway and the management name you wish to associate with that description.

How to determine the WEPP paths
1. Open any hillslope in WEPP.
2. Left click on Management layer of hillslope.
3. Then right-click on management layer and choose import
4. Navigate to the management you desire. This hierarchy will be the path you need for the database file.
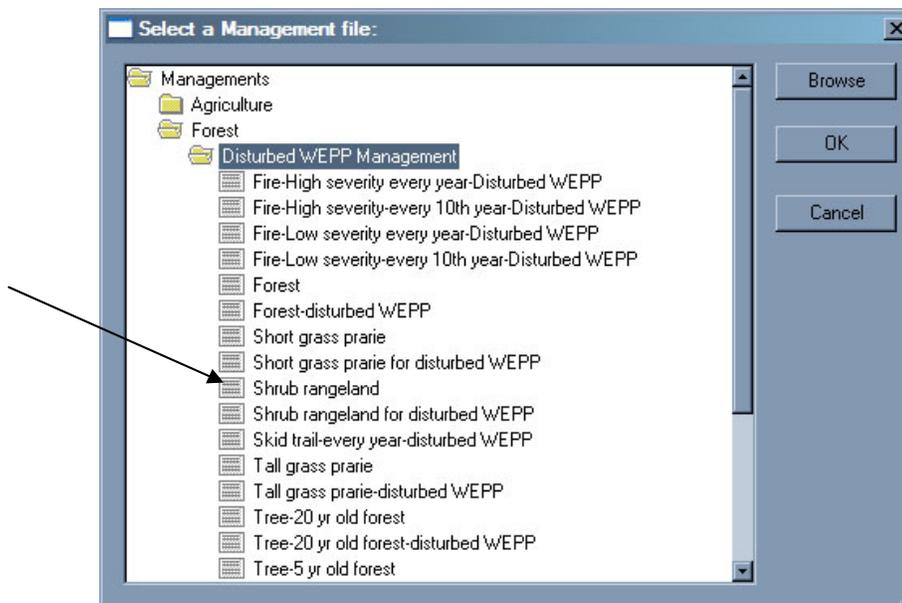
i) WEPP Management pathway hierarchy

For example, if you needed to determine the Shrub rangeland management pathway, it would be Forest/Disturbed WEPP Management/Shrub rangeland

5. Remember to use the ending .rot for managements

For example, you have this line in your landcov.txt file:
    23 Shrub Rangeland

and you want to make sure that the WEPP/TOPAZ Translator loads up the description of the GIS Landuse as well as Shrub rangeland from the WEPP Management from the data base, you would include the following in you landusedb.txt file:
    Shrub Rangeland|Forest/Disturbed WEPP Management/Shrub rangeland.rot

How does this file interact with landcov.txt, GeoWEPP, and WEPP/TOPAZ Translator?

j) landcov.txt

```
landcov - Notepad
File Edit Format View Help
12 Perennial Ice/Snow
<P>
Developed
21 Low Intensity Residential
22 High Intensity Residential
23 Commercial/Industrial/Transportation
<P>
Barren
31 Bare Rock/Sand/Clay
32 Quarries/Strip Mines/Gravel Pits
33 Transitional
<P>
Vegetated; Natural Forested Upland
41 Deciduous Forest
42 Evergreen Forest
43 Mixed Forest
<P>
Shrubland
51 Shrubland
<P>
Non-natural woody
61 Orchards/Vineyards/other
<P>
Herbaceous Upland
71 Grasslands/Herbaceous
<P>
Herbaceous Planted/Cultivated
81 Pasture/Hay
82 Row Crops
83 Small Grains
84 Fallow
85 Urban/Recreational Grasses
<P>
Wetlands
91 Woody Wetlands
92 Emergent Herbaceous Wetlands
```

k) WEPP/TOPAZ Translator

WEPP Management and Soil Lookup

Area	GIS Landuse	WEPP Management
0.9%	Grasslands/Herbaceous	GeoWEPP\Mountain Big Sagebrush.rot
4.7%	Shrubland	GeoWepp\28% cover-short grass prarie.rot
7.5%	Deciduous Forest	GeoWEPP\Tree-20 yr old forest.rot
86.9%	Evergreen Forest	GeoWEPP\Tree-20 yr old forest.rot

Landuse | Soils | Channels

To run a WEPP simulation the landuse and soils defined in the GIS must be associated with equivlent WEPP inputs. Double-click on any entry in the WEPP management or soils columns to display a list of WEPP inputs that may be used. Where no WEPP management or soil is specified the default soil or management will be used (*).

OK   Cancel

l) landusedb.txt

```
landusedb - Notepad
File Edit Format View Help
Row Crops|GeoWEPP\corn,soybean-fall mulch till.rot
High Intensity Residential|GeoWepp\grass.rot
Fallow|GeoWepp\fallow tilled.rot
grass|Geowepp\grass.rot
Urban/Recreational Grasses|GeoWEPP\grass.rot
Mixed Forest|GeoWepp\Tree-20 yr old forest.rot
No Data|GeoWEPP\grass.rot
Emergent Herbaceous Wetlands|GeoWEPP\grass.rot
Transitional|Geowepp\grass.rot
Open Water|GeoWepp\grass.rot
Commercial/Industrial/Transportation|GeoWEPP\grass.rot
Low Intensity Residential|GeoWEPP\grass.rot
Deciduous Forest|GeoWEPP\Tree-20 yr old forest.rot
Woody Wetlands|GeoWEPP\Mountain Big Sagebrush.rot
Evergreen Forest|GeoWEPP\Tree-20 yr old forest.rot
Low Burn Severity|GeoWEPP\90% cover-low severity burn.rot
Pasture/Hay|GeoWEPP\alfalfa with cuttings.rot
Shrubland|Geowepp\28% cover-short grass prarie.rot
Bare Rock/Sand/Clay|GeoWepp\grass.rot
High Burn Severity|GeoWEPP\25% cover-high severity burn.rot
Grasslands/Herbaceous|GeoWEPP\Mountain Big Sagebrush.rot
Perennial Ice/Snow|GeoWepp\grass.rot
Unburned|GeoWEPP\Tree-20 yr old forest.rot
Small Grains|Geowepp\winter wheat, Conventional till.rot
Moderate Burn Severity|GeoWEPP\45% cover-moderate severity burn.rot
Orchards/Vineyards/Other|Geowepp\grass.rot
Quarries/Strip Mines/Gravel Pits|Geowepp\grass.rot
```

Landusedb.txt is referenced in a similar fashion as landcov.txt. The program searches landusedb.txt for a description it has found in landcov.txt. When a matching description is found, the program will load the management listed after "|" into the WEPP Management column.

By using this method, you can save yourself and your research team some time by creating one landusedb.txt file that includes all landuse description and their corresponding WEPP managements in one file.

How to create the soilsdb.txt file

You follow the same procedures for creating the soilsdb.txt file as you did with the landusedb.txt file except:

How to determine the WEPP paths
1. Open any hillslope in WEPP.
2. Left click on soil layer of hillslope.
3. Then right-click on soil layer and choose import.
4. Navigate to the soil you desire. This hierarchy will be the path you need for the database file.
5. Remember to use the ending .sol at the end of the pathway.
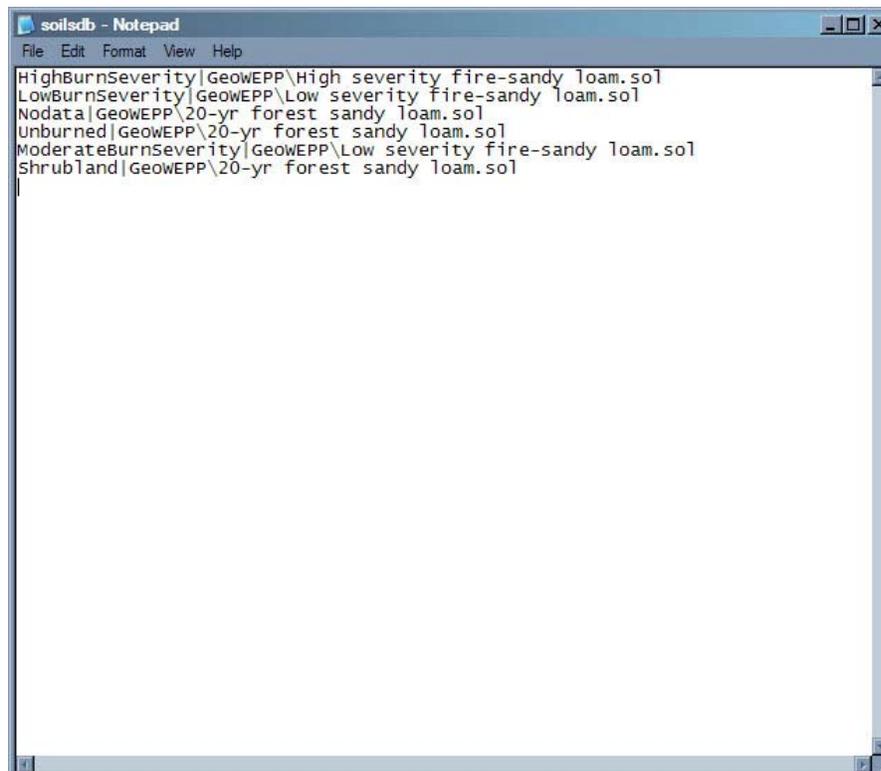

```
soilsdb - Notepad
File  Edit  Format  View  Help
HighBurnSeverity|GeoWEPP\High severity fire-sandy loam.sol
LowBurnSeverity|GeoWEPP\Low severity fire-sandy loam.sol
Nodata|GeoWEPP\20-yr forest sandy loam.sol
Unburned|GeoWEPP\20-yr forest sandy loam.sol
ModerateBurnSeverity|GeoWEPP\Low severity fire-sandy loam.sol
Shrubland|GeoWEPP\20-yr forest sandy loam.sol
```

m) soilsdb.txt

Both landusedb.txt and soilsdb.txt should be placed in the same directory as landcov.txt and soilsmap.txt. Copy landusedb.txt and soilsdb.txt and move them the same time you copy and move landcov.txt and soilsmap.txt.

Creating a utmzone.txt file

In the example sets provided in GeoWEPP, there is a file called utmzone.txt. This file contains the zone number in which the study area is in. The WEPP/TOPAZ Translator uses this file to load up the nearest climate station. Unlike landcov.txt and soilsmap.txt, this file's absence will not cause the program to crash. If the file does not exist, GeoWEPP will ask you what the UTM zone of your study area is. If you don't know what it is, you can accept the default and just change the weather station when the Climate Window appears.

If you want to create this file, just open any word processor and type in the UTM zone number. Save the file in text format as utmzone.txt in you data directory.
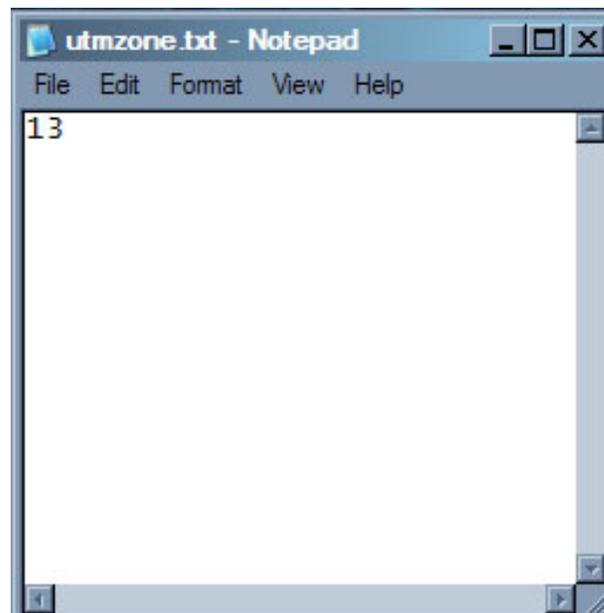
n) utmzone.txt

IMPORTANT

The files presented in this document must be named as they appear or GeoWEPP will not work properly. To sum up:

landcov.txt   - links the landuse layer with a GIS Landuse description
soilsmap.txt   - links the soils layer with a GIS Soils description
landusedb.txt - links the GIS Landuse description with a
                                   WEPP Management database file
soilsdb.txt   - links the GIS Soils description with a WEPP Soils database file

APPENDIX

USGS Landuse numbering system

11 Open Water
12 Perennial Ice/Snow
21 Low Intensity Residential
22 High Intensity Residential
23 Commercial/Industrial/Transportation
31 Bare Rock/Sand/Clay
32 Quarries/Strip Mines/Gravel Pits
33 Transitional
41 Deciduous Forest
42 Evergreen Forest
43 Mixed Forest
51 Shrubland
61 Orchards/Vineyards/Other
71 Grasslands/Herbaceous
81 Pasture/Hay
82 Row Crops
83 Small Grains
84 Fallow
85 Urban/Recreational Grasses
91 Woody Wetlands
92 Emergent Herbaceous Wetlands