RRED USER MANUAL FOR RUNNING GEOWEPP

User Manual for using RRED modeling data with GeoWEPP for ArcGIS 10.2

Prepared for
Forest Service Burned Area Emergency Response Teams & Erosion modelers

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System Requirements

The Rapid Response Erosion Database (RRED) web app provides spatial digital elevation model, land cover and soils data pre-registered and linked with WEPP parameter files. In order to utilize GeoWEPP users will need **ESRI ArcGIS** software with the **Spatial Analyst** extension installed and the appropriate version of GeoWEPP – currently versions are available for ArcMap 9.3, 10.1, 10.2 and 10.3. You also need the .NET Framework and at least 250 MB of hard drive space.

Be sure to install GeoWEPP and test the software before you need to run the model as installation of ESRI software can be difficult. Experience using GIS software is very helpful for preparing, interpreting, and presenting modeling results. For installation software and instructions go to: http://geowepp.geog.buffalo.edu/. You will need to fill out a request form. Be sure to include the * at the end of the GeoWEPP password. The most recent GeoWEPP manual is available: http://geowepp.geog.buffalo.edu/wp-content/uploads/2014/01/GeoWEPP_ArcGIS10_Overview.pdf

Be sure to double click the GeoWEPP Esri Addin File (GeoWEPP.esriAddIn) before launching GeoWEPP and turn on your Spatial Analyst extension!

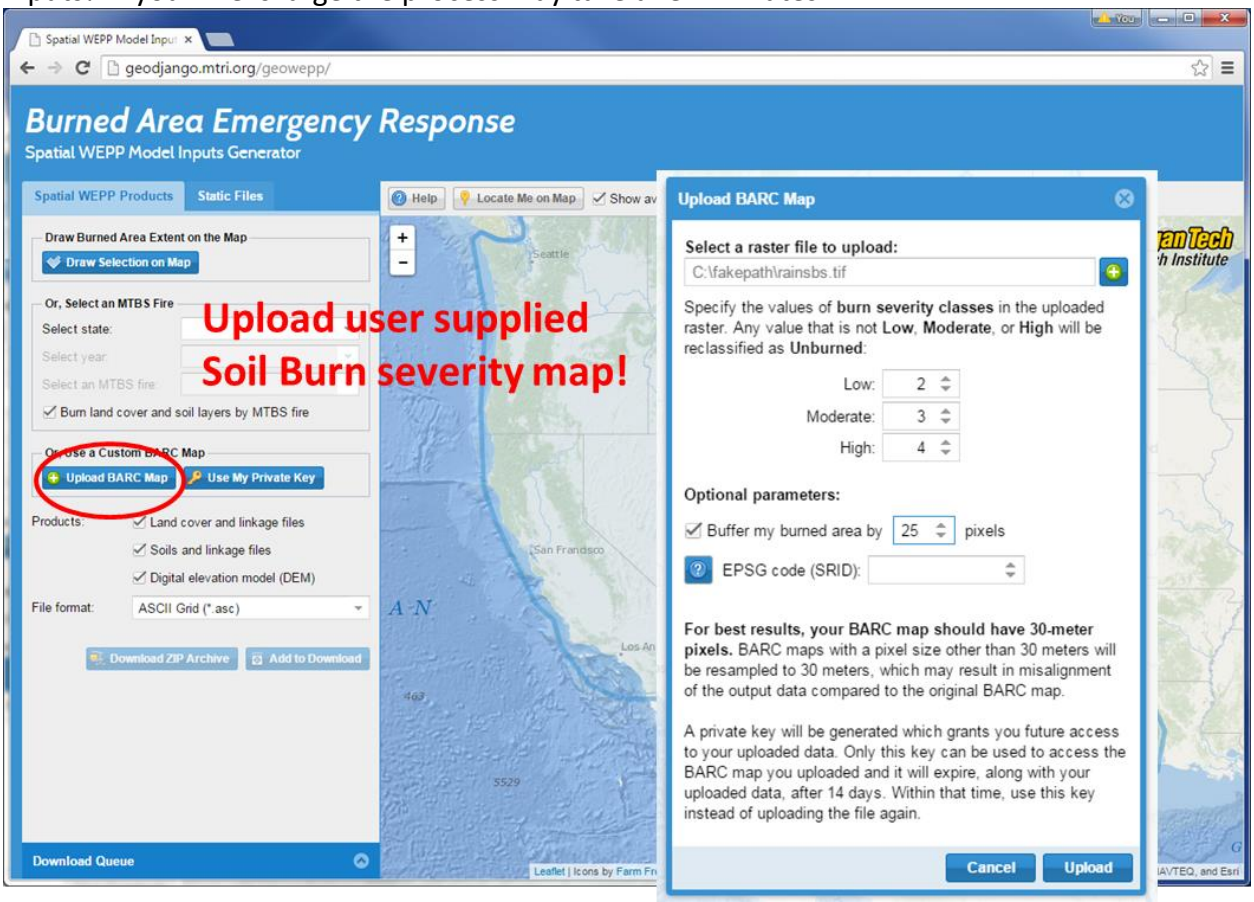
Download spatial modeling data from RRED

RRED is designed to provide spatial model inputs and parameters for modeling in spatial WEPP programs such as GeoWEPP. Currently users have two options for obtaining modeling inputs! **1)** Upload a user supplied burn severity map into the database or **2)** Select a historical fire from pre-formatted MTBS fires, the database currently has MTBS fires through 2013.

1) The database was designed to rapidly merge soil burn severity maps (derived from Forest Service BAER Teams) with spatial land cover and soils data in order to support post fire remediation. The soil burn severity maps need to be in a classified raster format with geospatial information such as a geotiff or img file. The database can handle a number of projections, but it would be best to leave the data in the native projection of the imagery. The classified maps can have up to three burn severity classes – low, moderate and high. Other classes such as unburned\low and enhanced regrowth are set to unburned. Users can always reclassify their map before uploading the data to achieve desired results. Another application for the data base is to upload predicted maps of burn severity to support fuels planning projects.

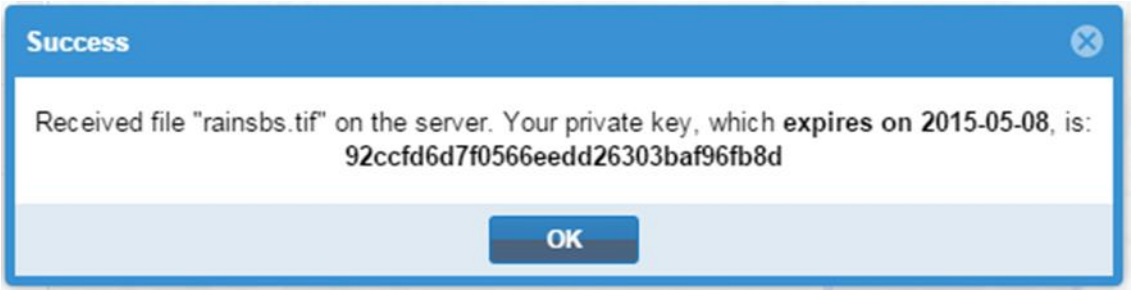
1. Use a web browser to go to http://geodjango.mtri.org/geowepp/
2. Select the Upload BARC Map button

3. Browse to your classified raster file.
4. Specify the integer class values for each burn severity map. Typical values are Low – 2, Moderate – 3, and High – 4.
5. It is a good idea to buffer the burned area in order to capture enough data to model the unburned portions of watersheds.
6. An **optional** feature allows users to upload **EPSG** codes (or **SRID**'s) to identify the spatial reference system of the uploaded raster (e.g. **WGS84** or **UTM 19N**). For geotiffs the system automatically detects the SRID, but manually specifying a known SRID may help to avoid errors when uncommon formats are used.
   A table of common EPSG codes that this application can handle is provided. If you receive an "invalid SRID" error message when trying to upload your raster, try re-projecting it to one of the projections in the list and re-upload:
7. Click the Upload button and wait a few moments while RRED prepares your modeling inputs! If your fire is large the process may take a few minutes.



8. When your raster soil burn severity map is uploaded it does not become publically available, a key is created and the imagery is stored for two weeks. You can share the key with others or use the key to access model inputs at a later date. Store the key in a

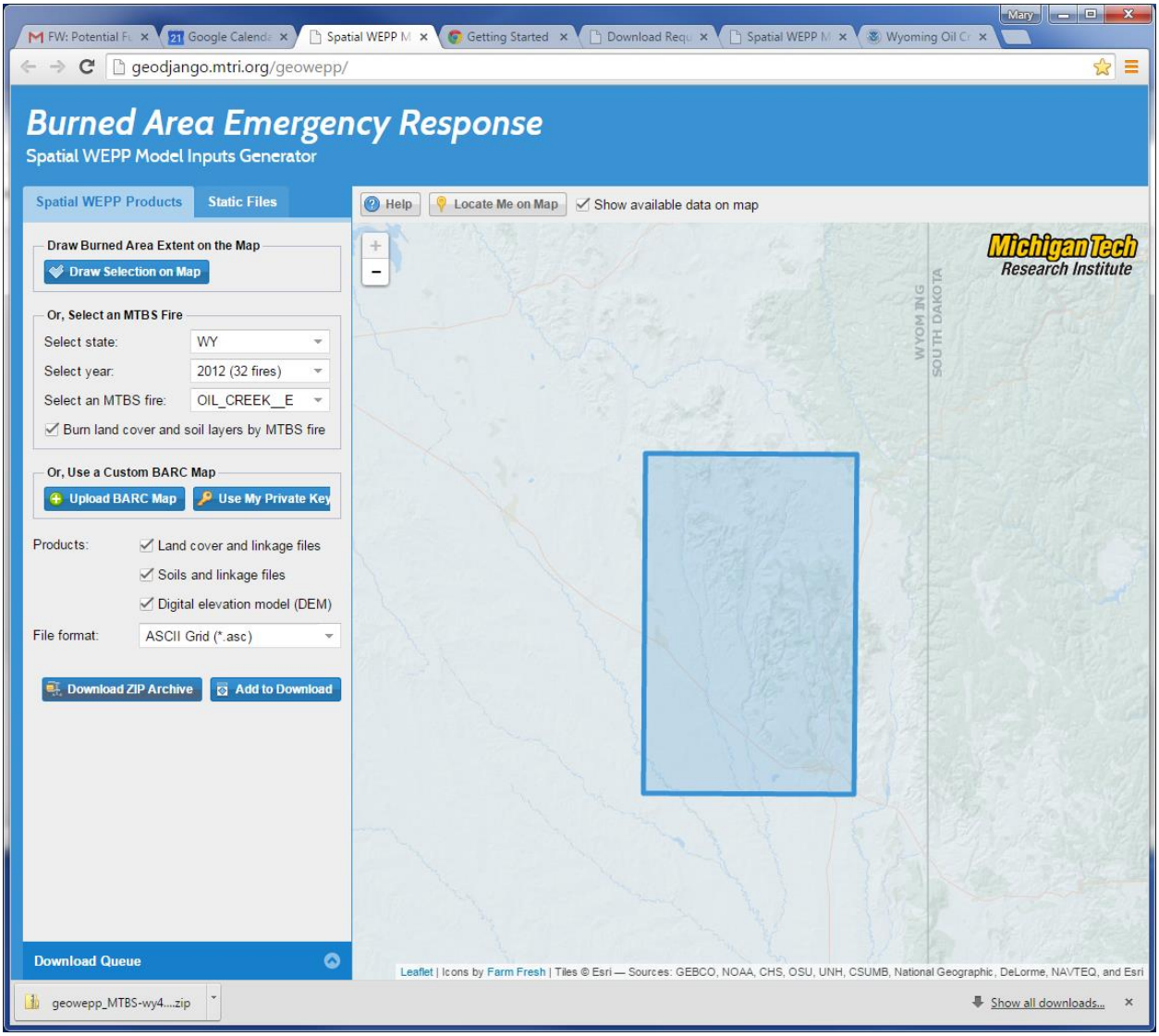
safe place if you want to use it later and Click **OK.**



9. You can know Select the Download ZIP Archive button to obtain all the model inputs to model your watershed in both a burned and unburned state, move your zip file to a convenient location (for example your - GeoWEPP directory) and extract the files. You are ready to have fun modeling!

2) If you do not want to upload a burn severity raster you can select and download spatial WEPP modeling data generated from historical MTBS data. These data sets are a good way to practice modeling before a real fire event occurs. **Remember the burn severity maps in the MTBS data are not adjusted with BAER team field data into soil burn severity maps!**

1. Use a web browser to go to http://geodjango.mtri.org/geowepp/
2. Select state - currently data and fires are available for 17 Western states (OR-Oregon, WA-Washington, CA-California, ID-Idaho, MT-Montana, WY-Wyoming, NV-Nevada, UT-Utah, CO-Colorado, AZ-Arizona, NM-New Mexico, TX-Texas, OK-Oklahoma, KS-Kansas, NE-Nebraska, SD-South Dakota, and ND-North Dakota).
3. Select year of fire – range currently available is 1984-2013.
4. Select fire – name used when available. If the name ends with an E then the imagery used to create the map was not obtained immediately after the fire. Grasses may have recovered rapidly and these areas will show up as unburned.
5. Products needed for modeling in GeoWEPP should be selected
6. **File format**: set to ASCII Grid (*.asc)
7. **Download ZIP Archive simply** click on the Download ZIP Archive button, move your zip file to a convenient location (for example your - GeoWEPP directory) and extract the files. This folder will be referred to as your RRED download folder. You are ready to have fun modeling! Feel free to rename your folder.



Modeling with GeoWEPP and NASABAER data sets

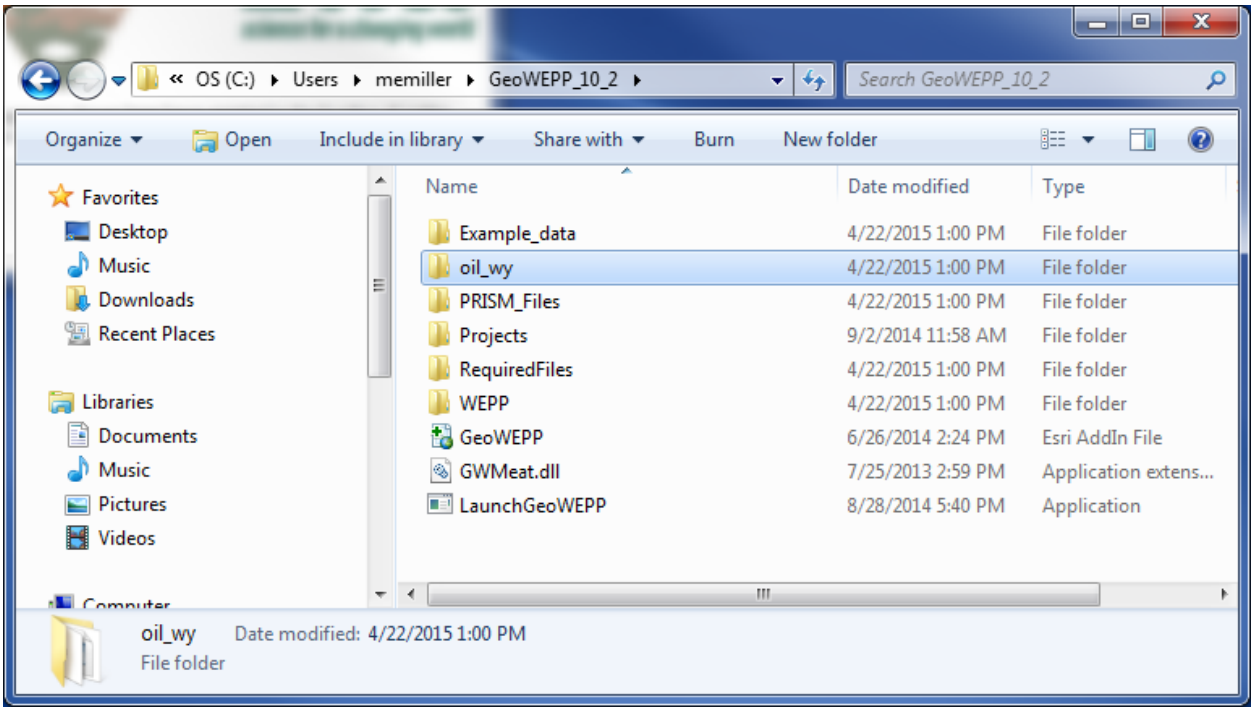
Once you have downloaded the data and installed GeoWEPP you are ready to begin modeling. The spatial ascii files and corresponding projection within your downloaded dataset should include a dem, landcov_burned, landcov_unburned, soil_burned and soil_unburned files. These ascii files also have corresponding projection files that you can use to determine your utm zone. There are four text files that link the values in the ascii soil and land cover grids to actual WEPP parameter files – landcov.txt, landusedb.txt, soilsmap.txt, and soilsdb.txt. There is also a folder in the directory (i.e. - **DisturbedWepp_KEY-92ccfd6d7f0566eedd26303baf96fb8d**) that contains the WEPP soil parameter files needed to model the area you downloaded.

1. Move the folder of soil files found within your RRED download to the WEPP Data directory found in your GeoWEPP installation folder for example:

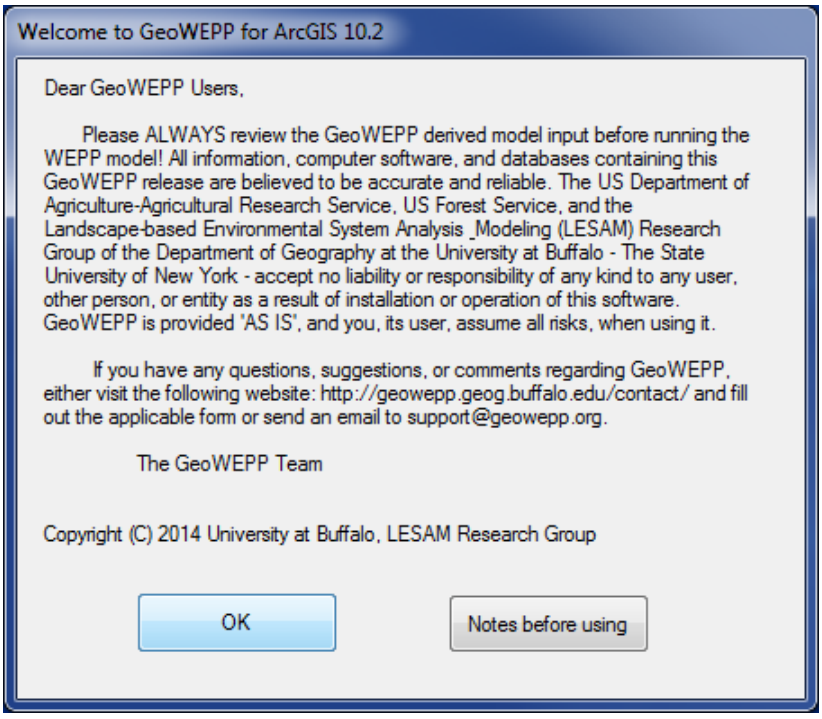
C:\Users\username\GeoWEPP_10_2\WEPP\Data\Soils\DisturbedWepp_KEY-92ccfd6d7f0566eedd26303baf96fb8d.

This step is **important** as it allows the WEPP model to access soil parameter files created for your Area of Interest (AOI).

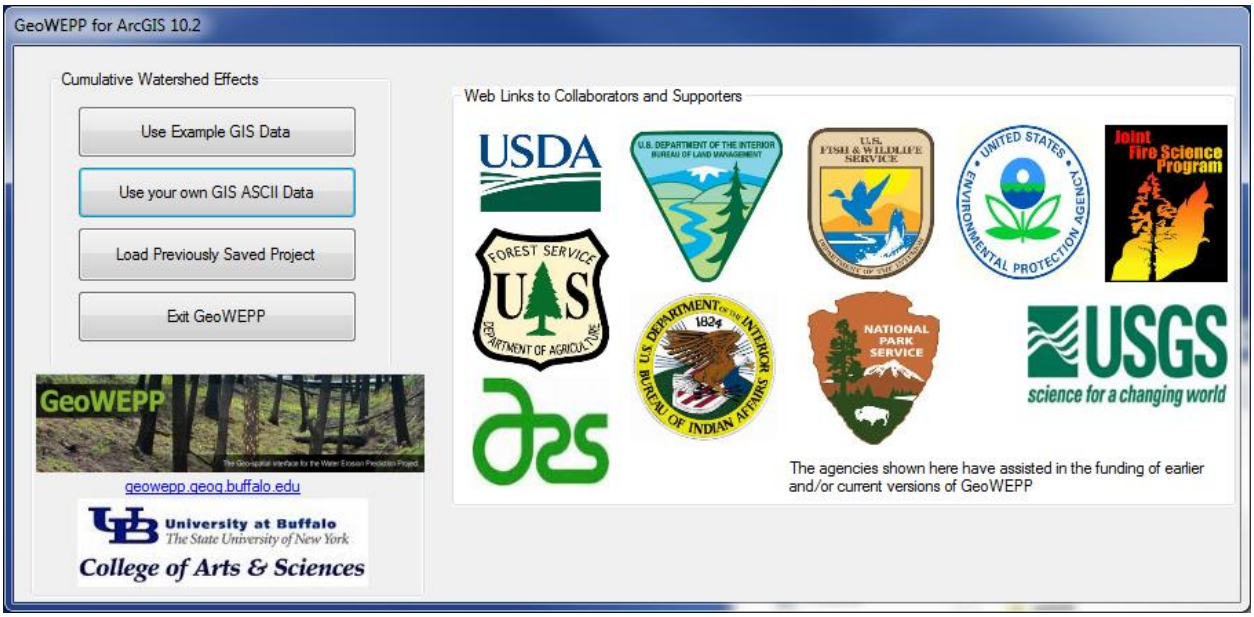
2. **Double click on LaunchGeoWEPP**

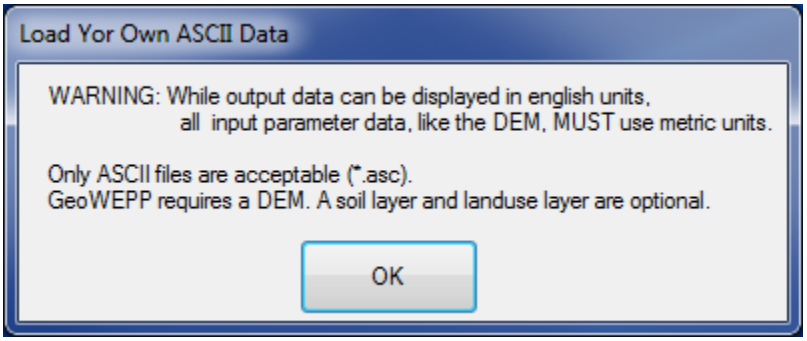


3. **Click OK on the welcome screen**



4. To use RRED inputs select **Use your own GIS ASCII Data** and click **OK** on the message box. The RRED DEM is in metric units.





5. The next step is to load your RRED files into GeoWEPP using the Start new GeoWEPP Project screen. Inputs are as follows:
   i. **Provide a project name. No spaces! (required)** – This is the name that will be given to a new folder created in your GeoWEPP directory (i.e. GeoWEPP_10_2) under **Projects** and it will contain model inputs, intermediate files and your results. i.e. - fire_ST_2012 or Rain_Myers_ID_2014
   ii. **Add a DEM file in ASCII format (required):** - This is the DEM downloaded from RRED, clicking in the box will open a browser. **dem.asc**
   iii. For **Soils Option** click **Yes** under **Do you want to add a soil files?**
   iv. **Soils Option ASCII** box: Click on box and use browser to select either the **soil_burned.asc** or **soil_unburned.asc** from your RRED download folder. BAER teams often find it useful to model the fire area under both burned and not burned conditions.

v. **Soils Option Description Box:** Click on box and use browser to select the **soilsmap.txt** file from your RRED download folder.

vi. **Soils Option Database Box:** Click on box and use browser to select the **soilsdb.txt** file from your RRED download folder.

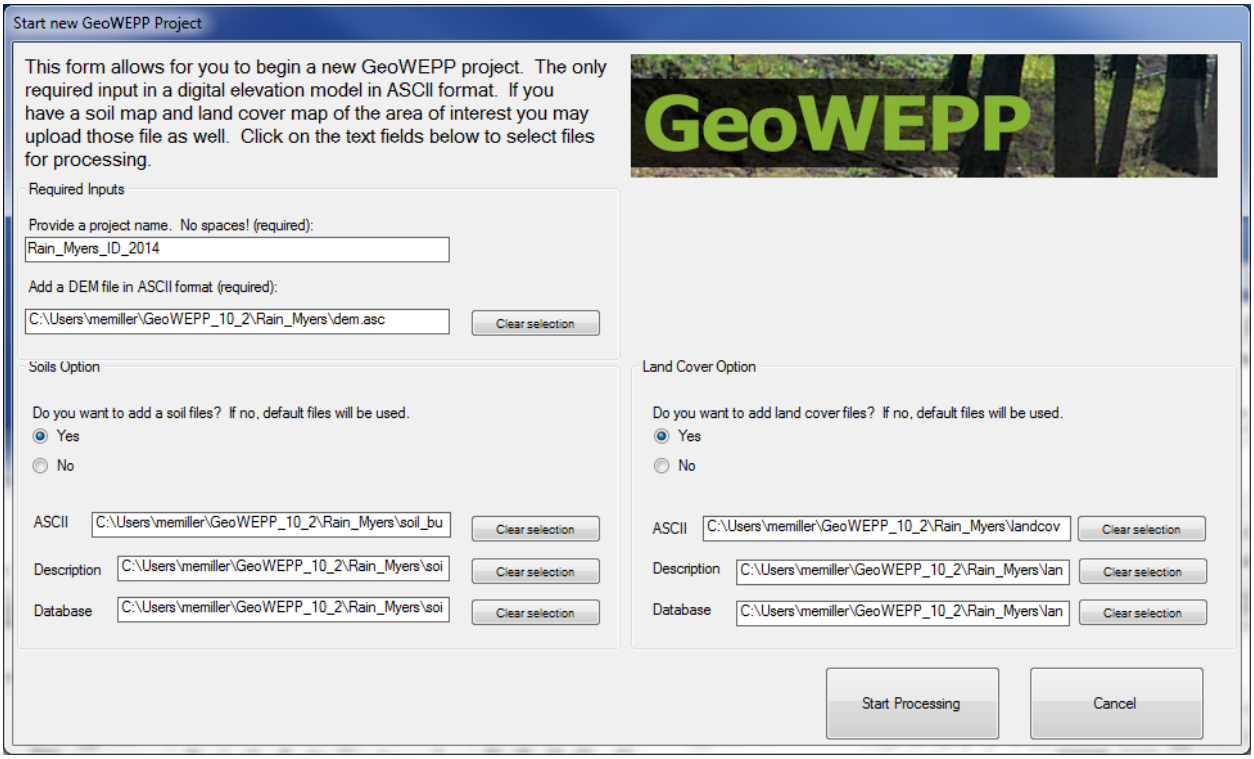
vii. For the **Land Cover Option** click **Yes** under **Do you want to add land cover files?**

viii. **Land Cover Option ASCII** box: Click on box and use browser to select either the **landcov_burned.asc** or **landcov_unburned.asc** from your RRED download folder. Be sure your option matches your soil selection.

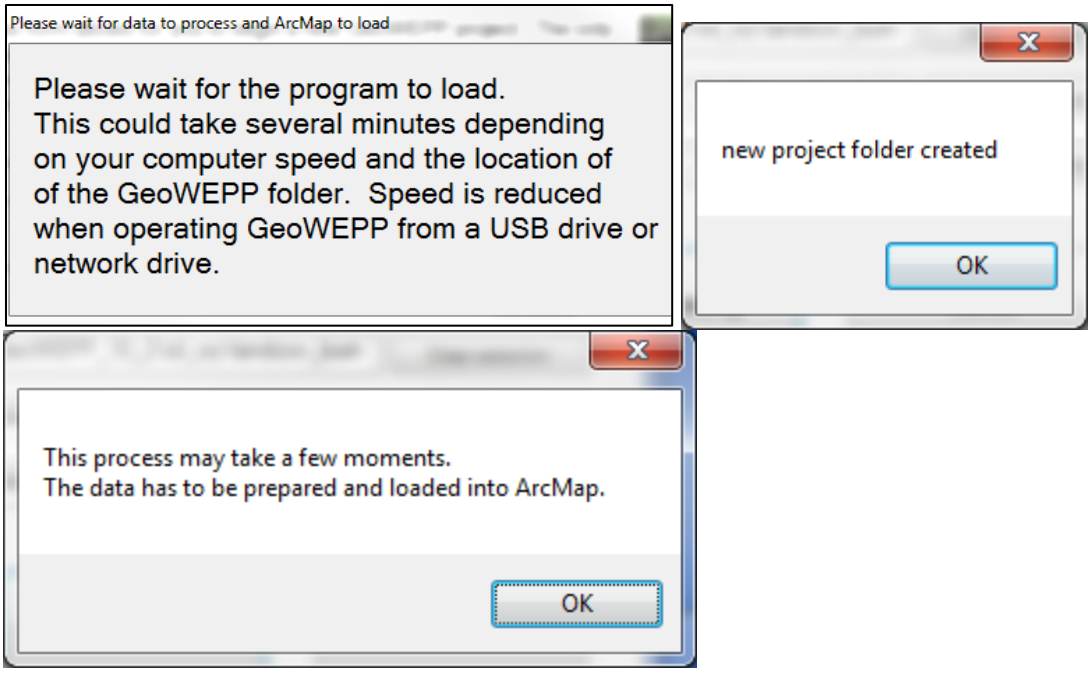
ix. **Land Cover Option Description Box:** Click on box and use browser to select the **landcov.txt** file from your RRED download folder.

x. **Land Cover Option Database Box:** Click on box and use browser to select the **landusedb.txt** file from your RRED download folder.

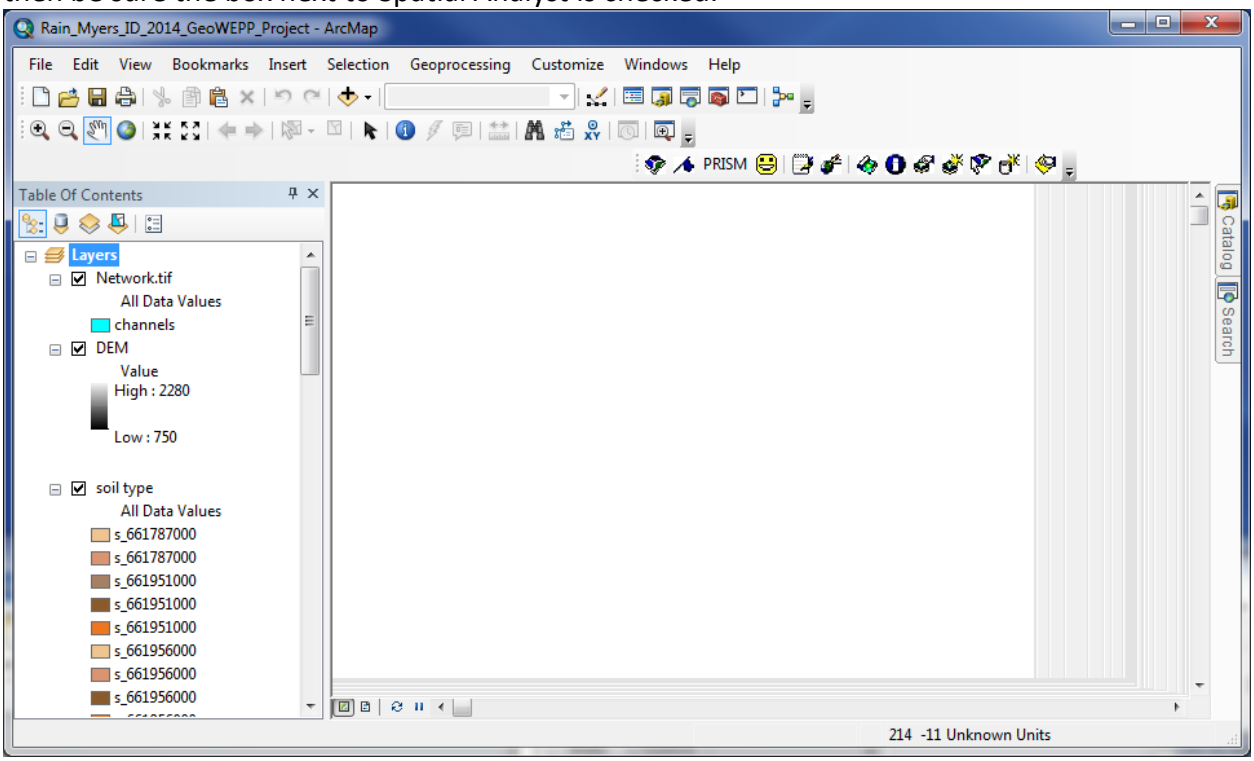
xi. Check your inputs carefully and then select the **Start Processing** box.



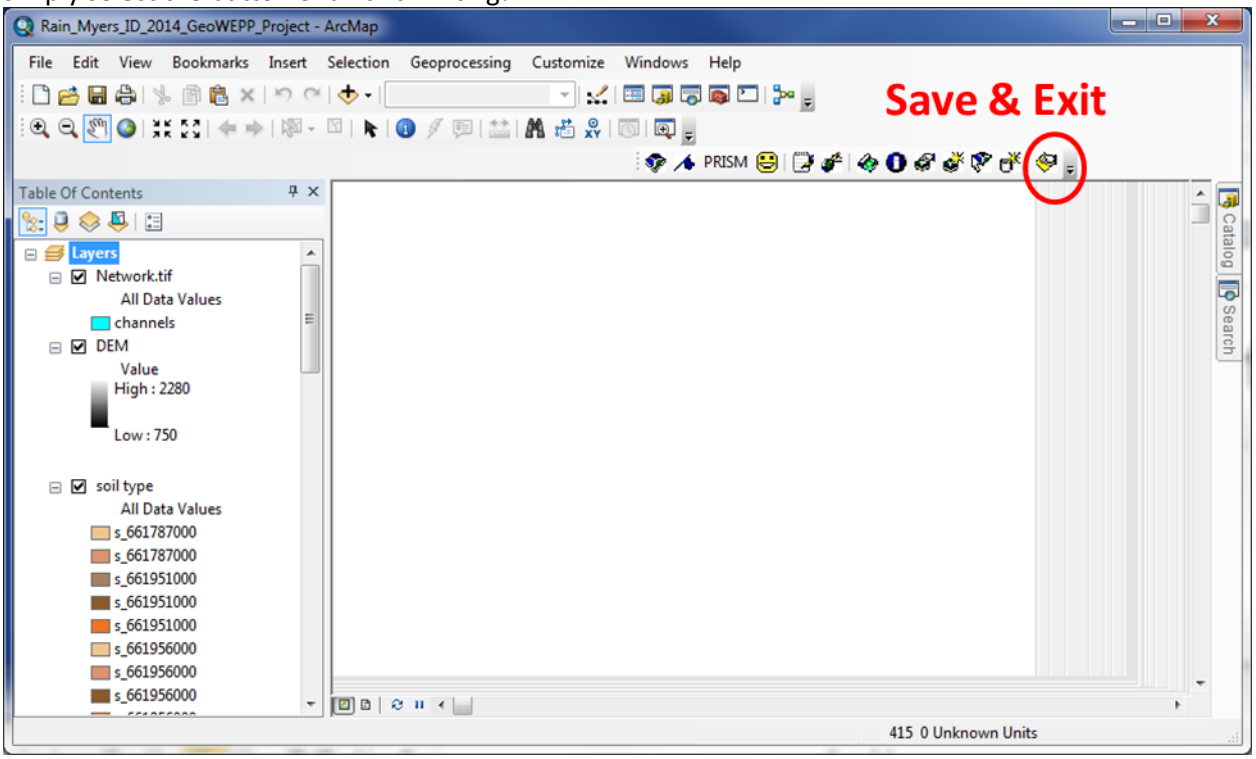
6. GeoWEPP will begin loading your data into an ArcMap project and will provide you with the following message boxes. Click **OK** on the message boxes.



7. Prepare your ArcMap project. Most likely your map is blank, do not worry. The first time you run GeoWEPP you may need to activate the GeoWEPP toolbar: Select Customize > Toolbars > GeoWEPP. This will add GeoWEPP tools to the tool bar. This is also a good opportunity to make sure the spatial analyst in on: Customize > Extensions then be sure the box next to Spatial Analyst is checked.

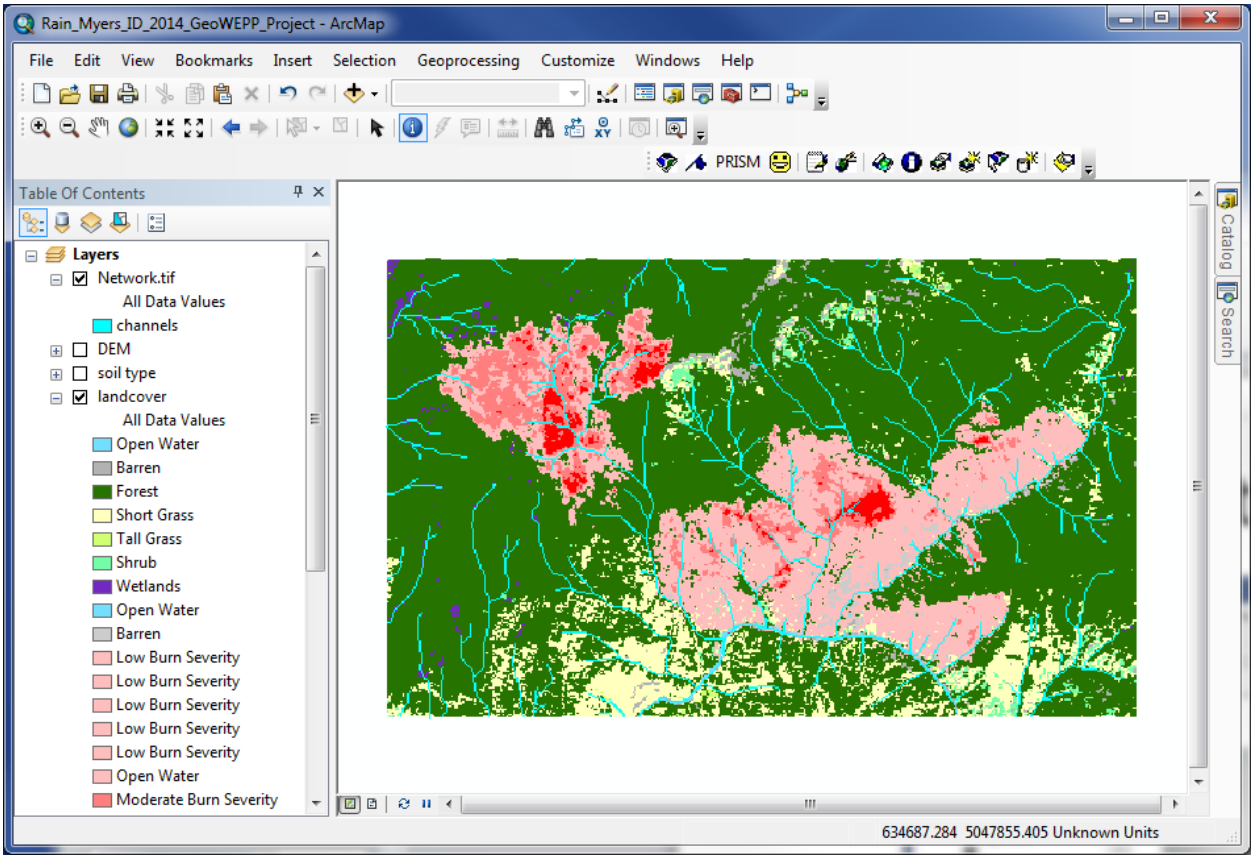


8. An extremely common GeoWEPP bug is for the project to load the files, but the spatial data are not displayed. Simply save the project and exit using the new GeoWEPP toolbar, simply select the button of a hand writing!



9. Browse to you GeoWEPP folder and simply reopen your new GeoWEPP ArcMap project, your data will display properly and you may begin modeling.
C:\Users\username\GeoWEPP_10_2\Projects\Rain_Myers_ID_2014\Rain_Myers_ID_2014_GeoWEPP_Project.mxd

Soil grid values represent map unit key values from the SSURGO or STATSGO soil databases as well as information on land cover. Soil values greater than ~2,147,483,000 will not display properly within ArcMap, but do not worry as GeoWEPP's processing software (TOPAZ – Topographic Parameterization Software) will be able to read the data.



When working with a large fire it can be helpful to clip the burned watersheds into smaller subwatersheds and then have multiple projects. Smaller fires are manageable with one project, but if more than one watershed outlet is needed, be sure to copy the ENTIRE project folder or at least the files of interest between runs in order to save detailed spatial output files. Many output files are written over when WEPP is rerun.

GeoWEPP Tools

This is a TOPAZ button used to delineate streams by setting the CSA – Critical Source Area and MSCL – Minimum Source Channel length.

The flag button allows the user to select the watershed outlet point for a run

PRISM Open up PRISM software for selecting and editing climate files

Start a WEPP run to predict runoff and erosion in the selected watershed – user must first delineate a watershed using the flag button.

 Button for displaying reports

 Saves the GeoWEPP project

 Change the tolerable erosion threshold for mapping the erosion risk

 This is a handy button for checking WEPP settings for individual hillslopes

 Allows user to change land cover and soil type

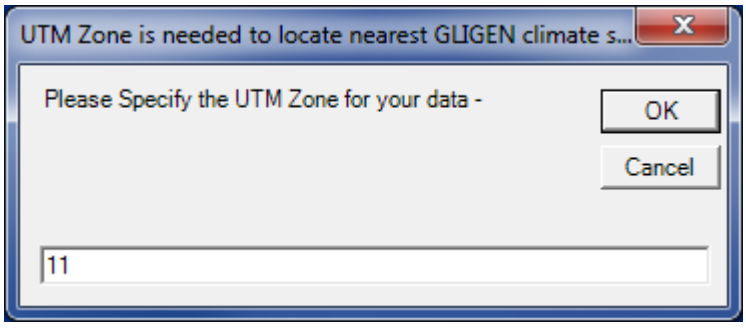
 Rerun WEPP after changing hillslope parameters

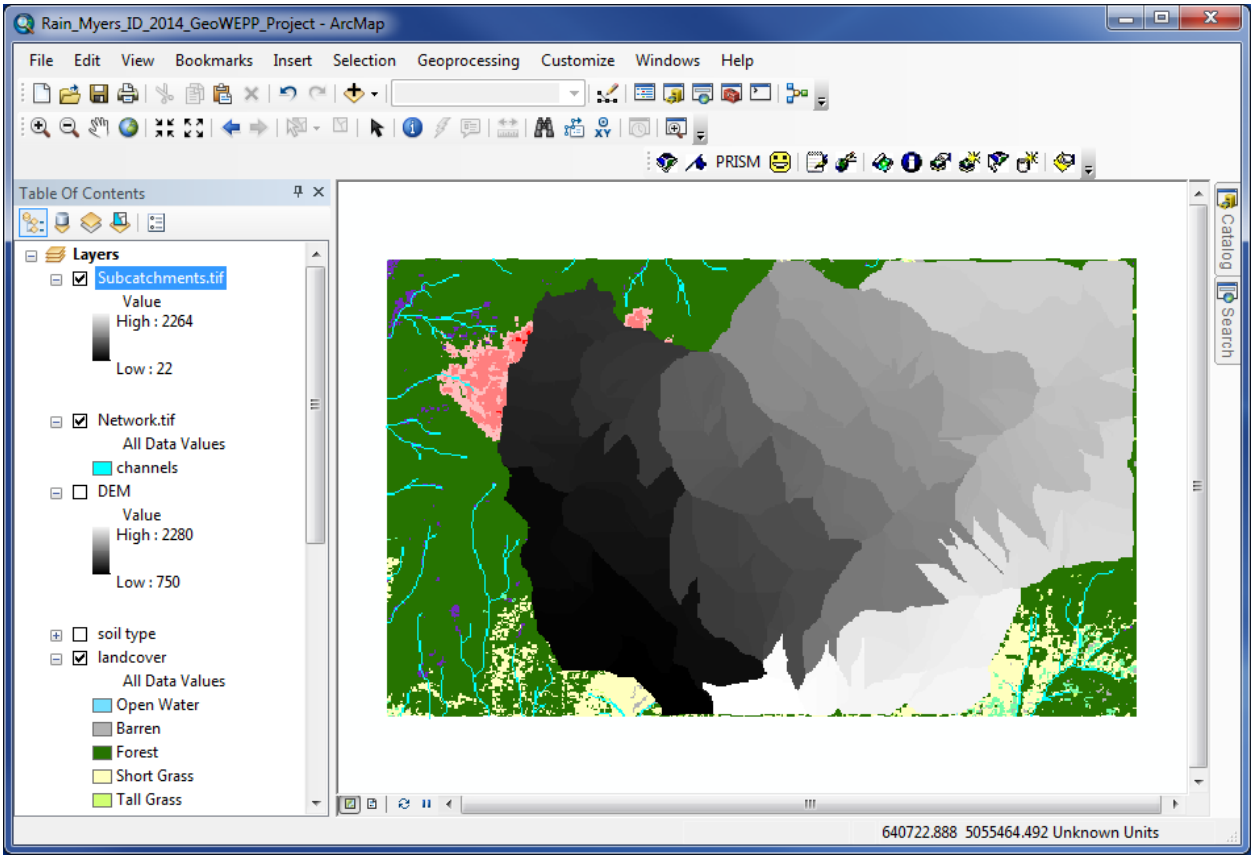
 Load a single hillslope into the WEPP windows interface

 Open the WEPP watershed project within WEPP windows

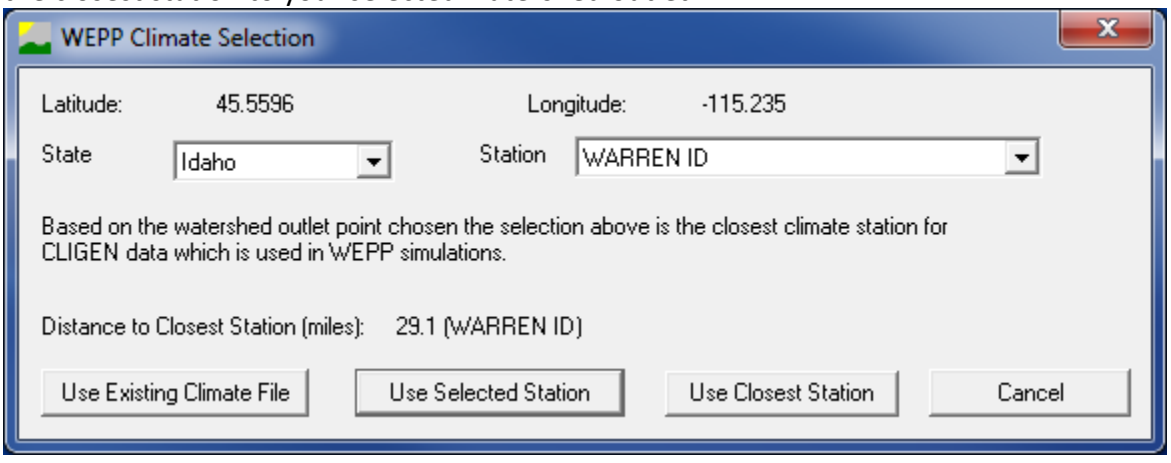
 Save GeoWEPP project and exit

10. To begin modeling use the Flag  button to select a watershed outlet from the stream network. You will need to know the UTM zone of your modeling area – if you do not know your UTM zone you can check one of the ascii projection files in your RRED down load folder (just be sure not to modify it – i.e. **dem.prj**). This tool will create a watershed delineation of hillslopes. You may need to zoom in on the stream network to select an outlet. You will be prompted to select another cell if needed.

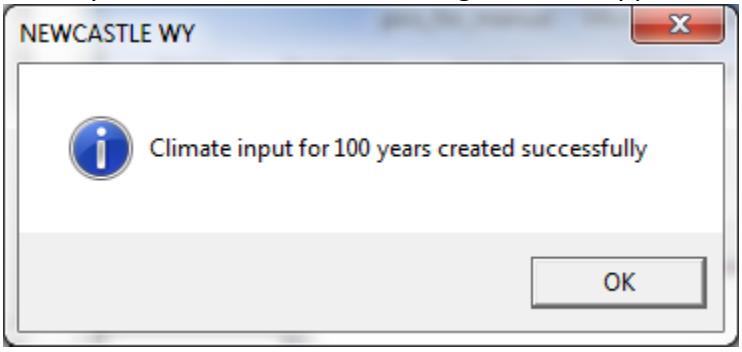




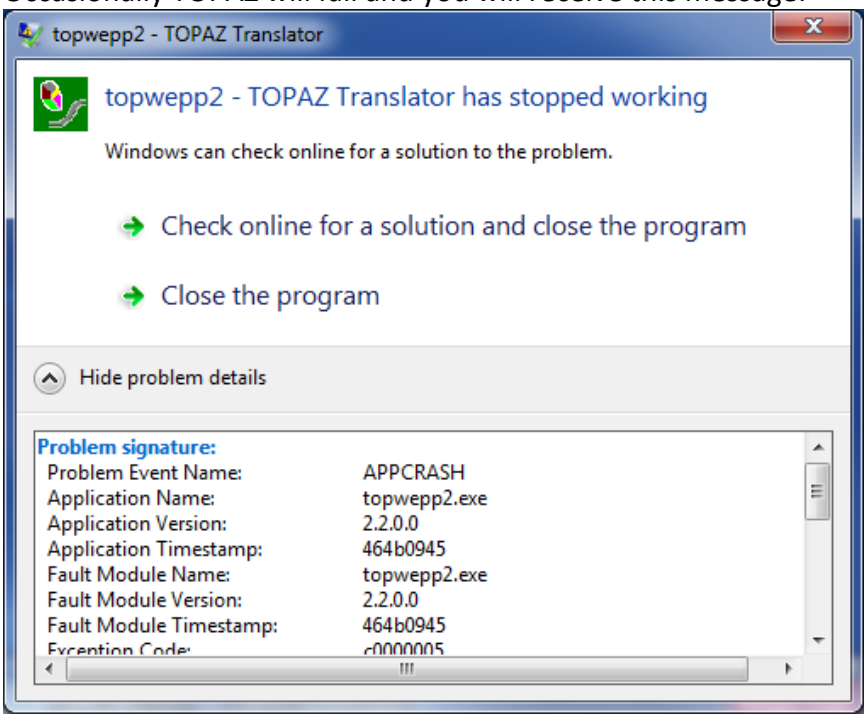
11. Next select the  Happy Face button to run WEPP if you are happy with the delination – you will be asked to select a climate file. If you want you can select a custom WEPP file to simulate a single storm or a multi-year climate file. The default climate should be the closest station to your selected watershed outlet.



12. When you select a climate a message box will appear – select **OK**



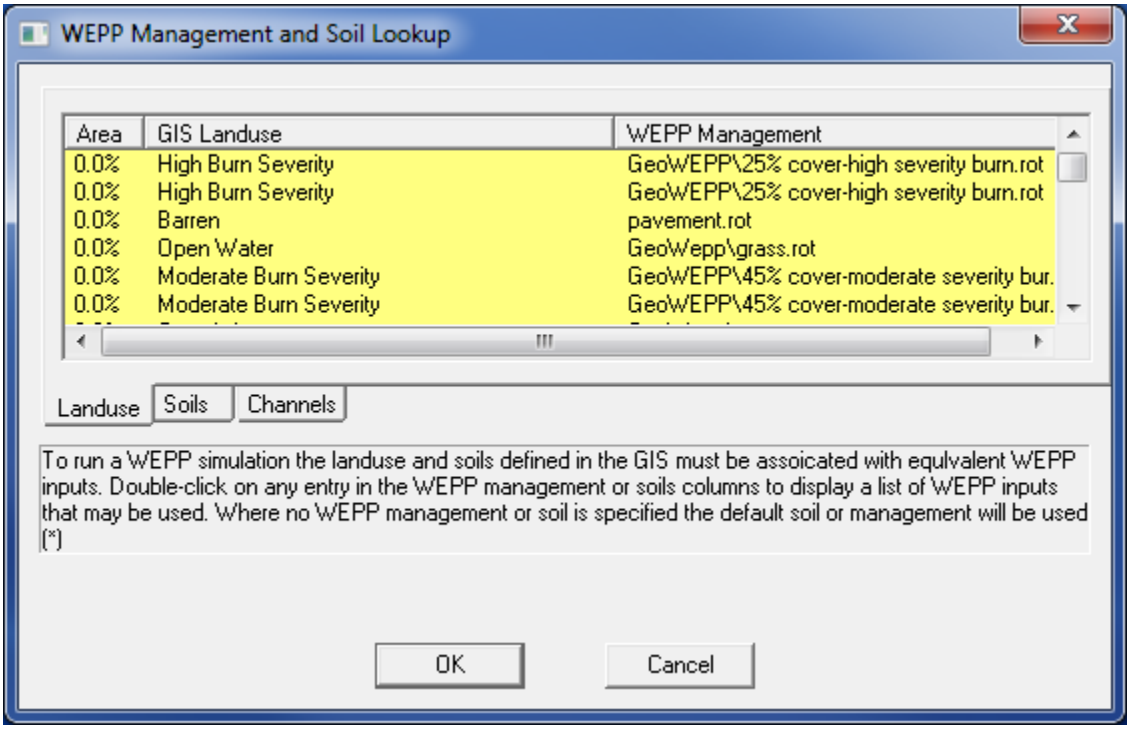
13. Occasionally TOPAZ will fail and you will receive this message:



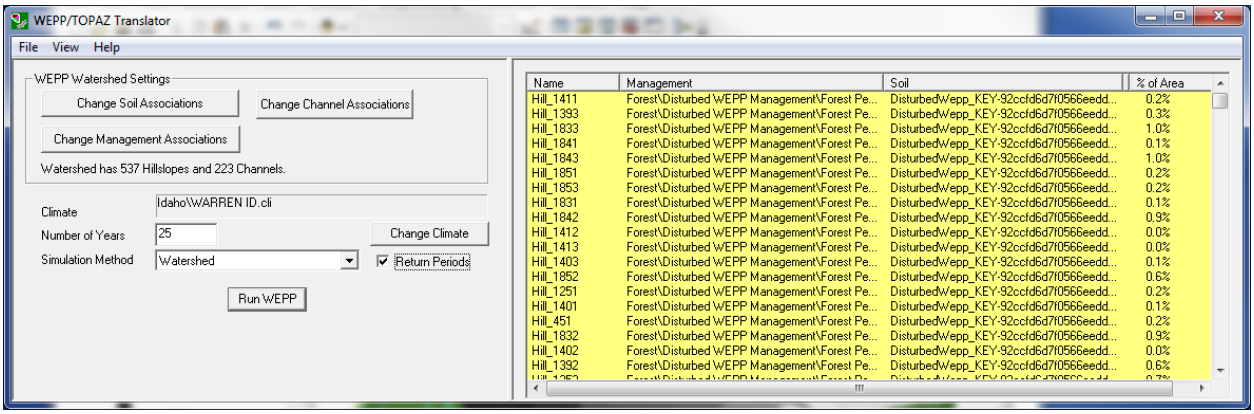
When this happens redelineate the watershed with a smaller area! Just use the Flag button to select another outlet.

14. When TOPAZ is able to parameterize the watershed the WEPP Management and Soil Lookup box will appear. You can change soil and land cover parameters if needed and check to make sure the grid data is matched up with WEPP parameter files. Select **Ok** to

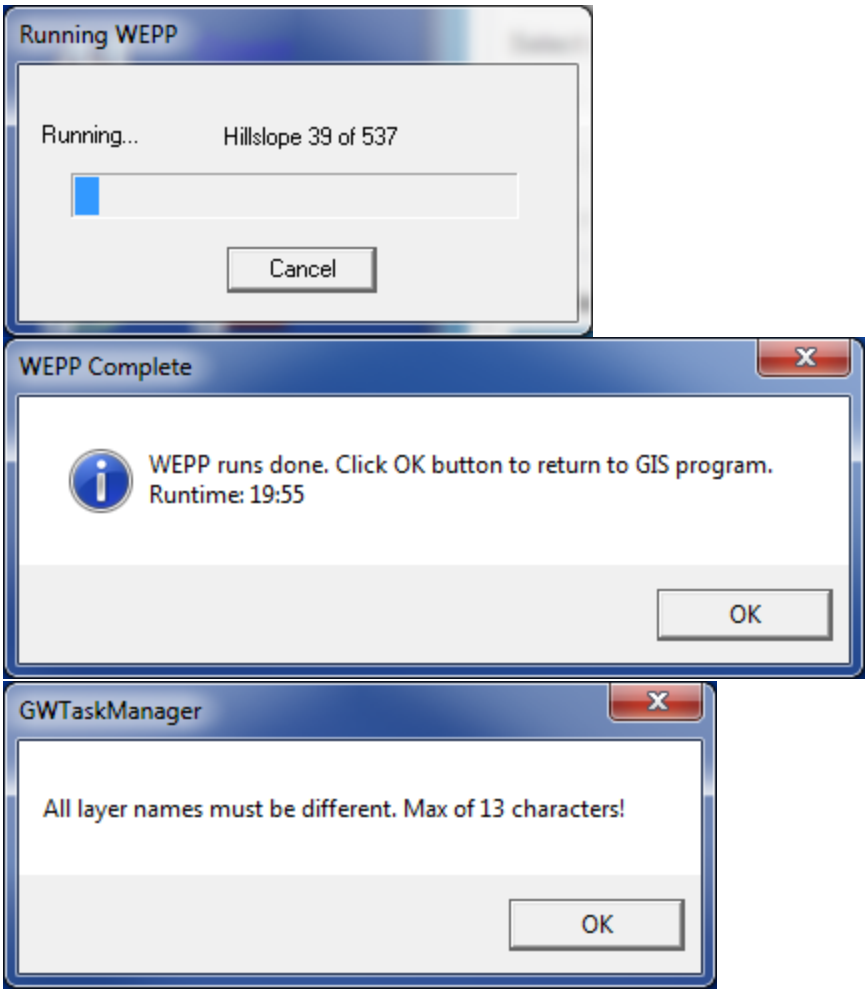
continue.



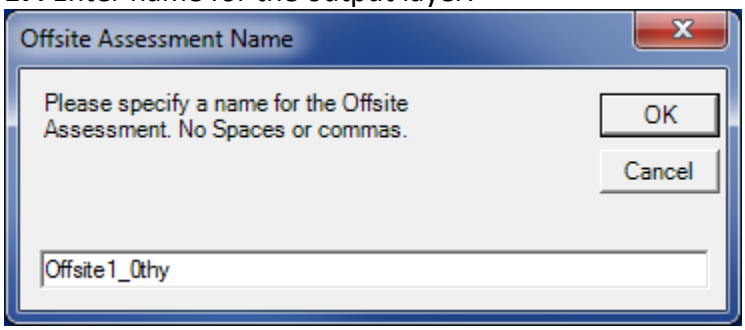
15. The WEPP/TOPAZ Translator window gives you another oppurtunity to change the WEPP parameter files, the climate file and number of years to model and allows you to select Watershed and/or Flowpath simulations. Watershed simulations usually give more reasonable results and run times are much quicker, but the flowpath method can provide finer details on erosion and deposition on individual hillslopes. If you select multiple years (5+) you can elect to have a return period analysis. Hit Run WEPP when you are ready. Running multiple years is more time consuming than running individual storms.



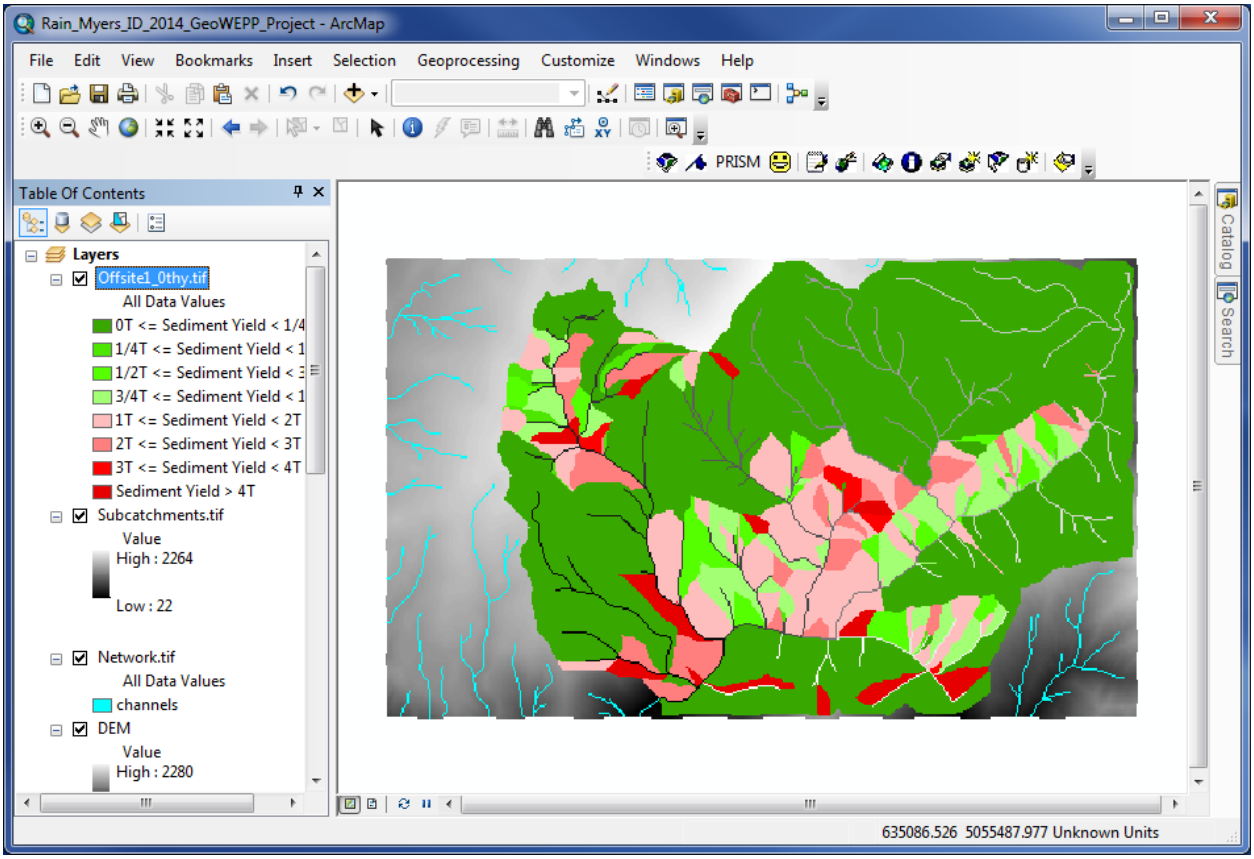
16. A series of message boxes will appear to let you know the status of your WEPP runs. When the runs are complete – hit OK – Sometimes these little message boxes are hidden under other windows – you may have to look for them!



17. Enter name for the output layer:



18. The output layer is a classified map showing ranges of soil loss based on a tolerable threshold. This threshold T can be changed and the risk map recreated using the change threshold tool  .

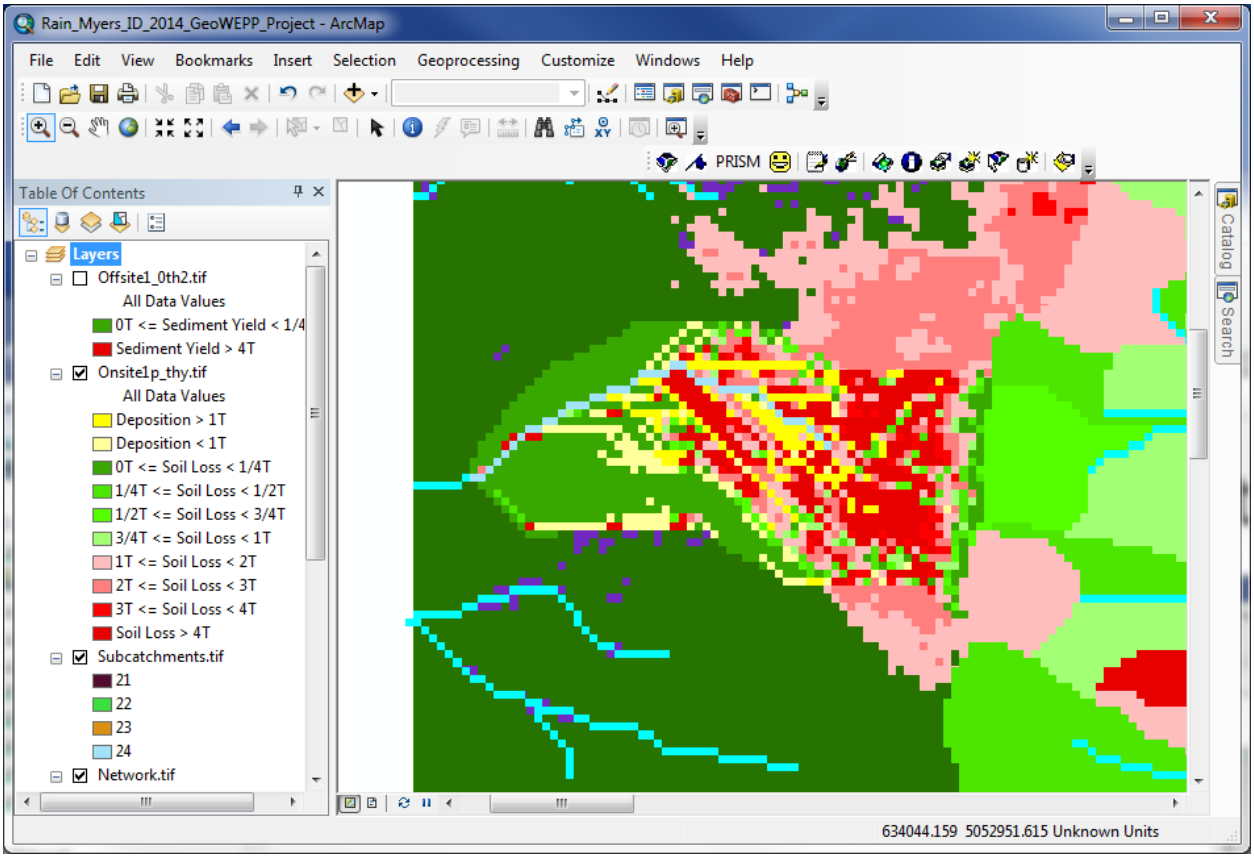


Accessing more detailed maps from your GeoWEPP runs!

GeoWEPP reclassifies WEPP hillslope erosion predictions into classes based on the T – tolerable erosion threshold. The default T value is 1 Mg/ha/year. These classified maps (default name: Offsite1_0thy.tif) are saved between WEPP runs from the same project. The ascii grids these maps are based on are not saved between WEPP runs, so if you want to utilize this data it is best to save the files or only carry out one run per project. One technique is to save the entire project folder and rerun the project to avoid re-parameterizing GeoWEPP.

The spatial data used to create these classified maps are found in an ascii grid file: weppSediment.arc – units are Mg/ha/year and results are on a hillslope scale. These files are found in the GeoWEPP project directory (i.e. **C:\Users\username\GeoWEPP_10_2\Projects\Rain_Myers_ID_2014\).** An easy way to display these results are to rename the file (i.e. weppSediment.arc to Rain_Myers_run1.asc) and then copy one of the original RRED projection files and rename it to match your new ascii file (dem.prj copy to Rain_Myers_run1.prj) to retain the geo-referencing.

If you select the option to run in Flowpath mode, your results will be per pixel and the classified maps are called Onsite1p_thy.tif. Flowpath runs are **very time consuming** and the overall magnitudes of the results can be unreasonable. Still these maps provide more spatial detail and include information on hillslope deposition. The following screen shot depicts a small region (area 140 ha) of our example run with the flow path option. Processing time was ~half an hour, the same area run in watershed mode ran ~10 seconds.

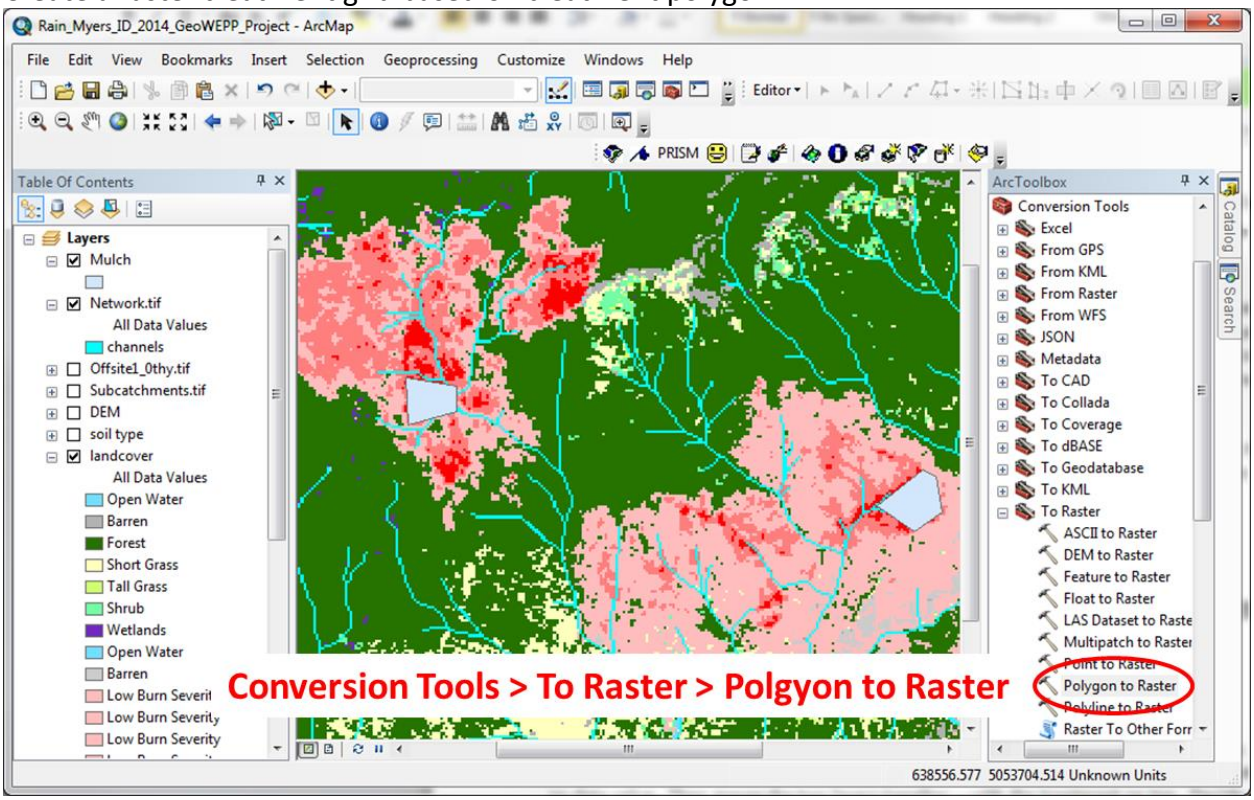


Modeling treatment areas and determining additional erosion due to the burn scar. These require more advanced GIS and WEPP modeling skills. Best to practice before you need to use these techniques.

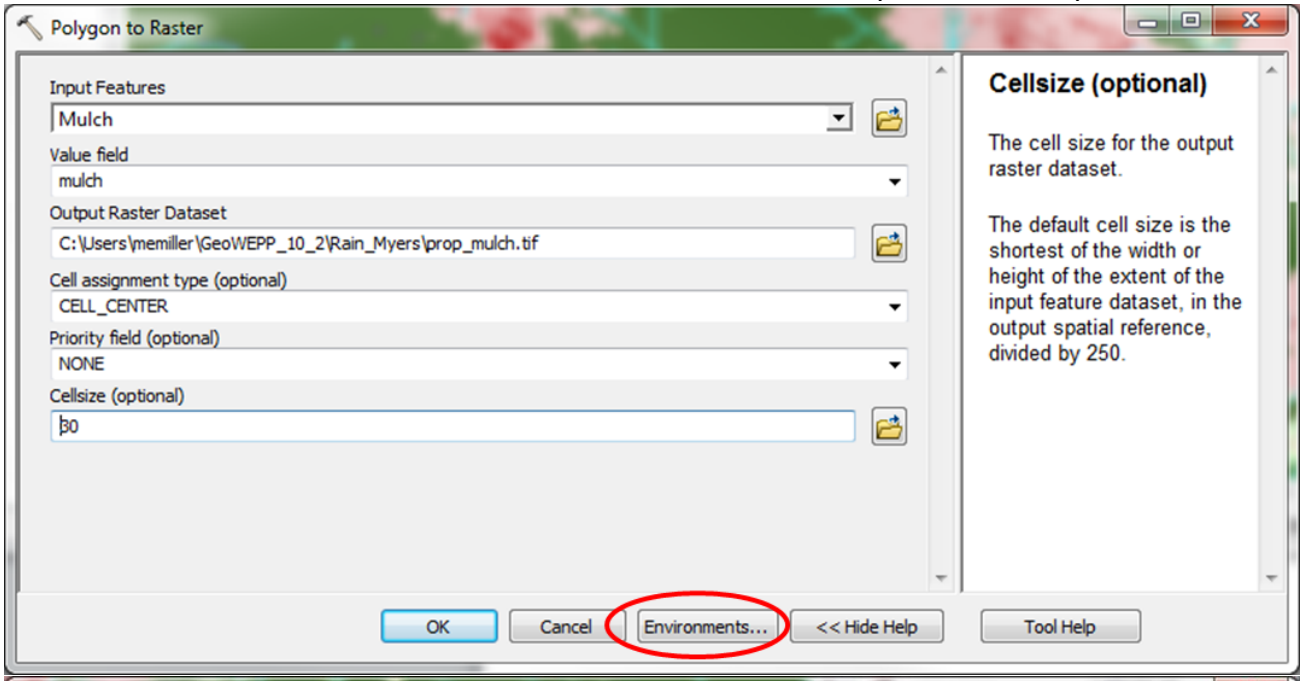
The RRED data automatically create spatial soil and land cover inputs of your burned area prior to the fire. By modeling your burned area in both the unburned and burned state you can create a map of additional erosion due to the fire. This is useful as barren areas are typically highly erosive and can dominate your erosion predictions, but by creating a difference map the effect due to the fire itself can be highlighted.

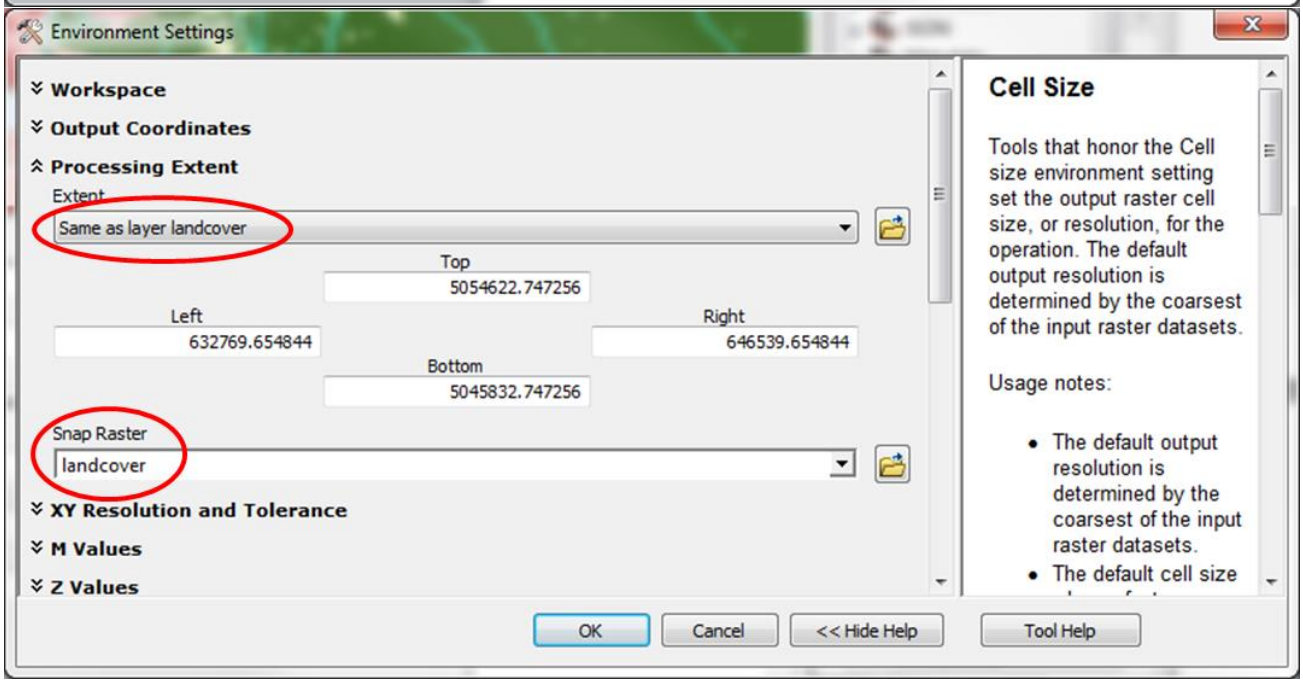
The effects of mulching treatments can be incorporated into your modeling by adjusting the land cover inputs. Convert your treatment shapefile into a raster layer with environment settings set to your burned land cover layer. Make sure the treatment layer has a unique integer classification that differs from land cover values and that non treated areas are set to a no data value. Then merge the two layers together – with the treatment on top. Decide on a cover value appropriate for your mulch rate (1 ton-acre mulch resulting in a cover of 72%) and then edit your landcov.txt and landusedb.txt files to link your new land cover (mulched) to the appropriate WEPP management file.

1. Create a raster treatment grid based on treatment polygon:



2. Parameterize the tool box and set environment variables to match your landcov layer.





3. Merge the new treatment raster: prop_mulch.tif with the landcov layer to create a new treated landcover. An easy way to do this is with the Image Analysis tool under the Windows folder. Be sure the proposed mulching raster replaces the burned values in your land cover layer. Then export your new mosaiced land cover raster to an ascii file for use in your next GeoWEPP run! The ascii conversion tool is found in the ArcToolbox > Conversion Tools > From Raster > Raster to ASCII

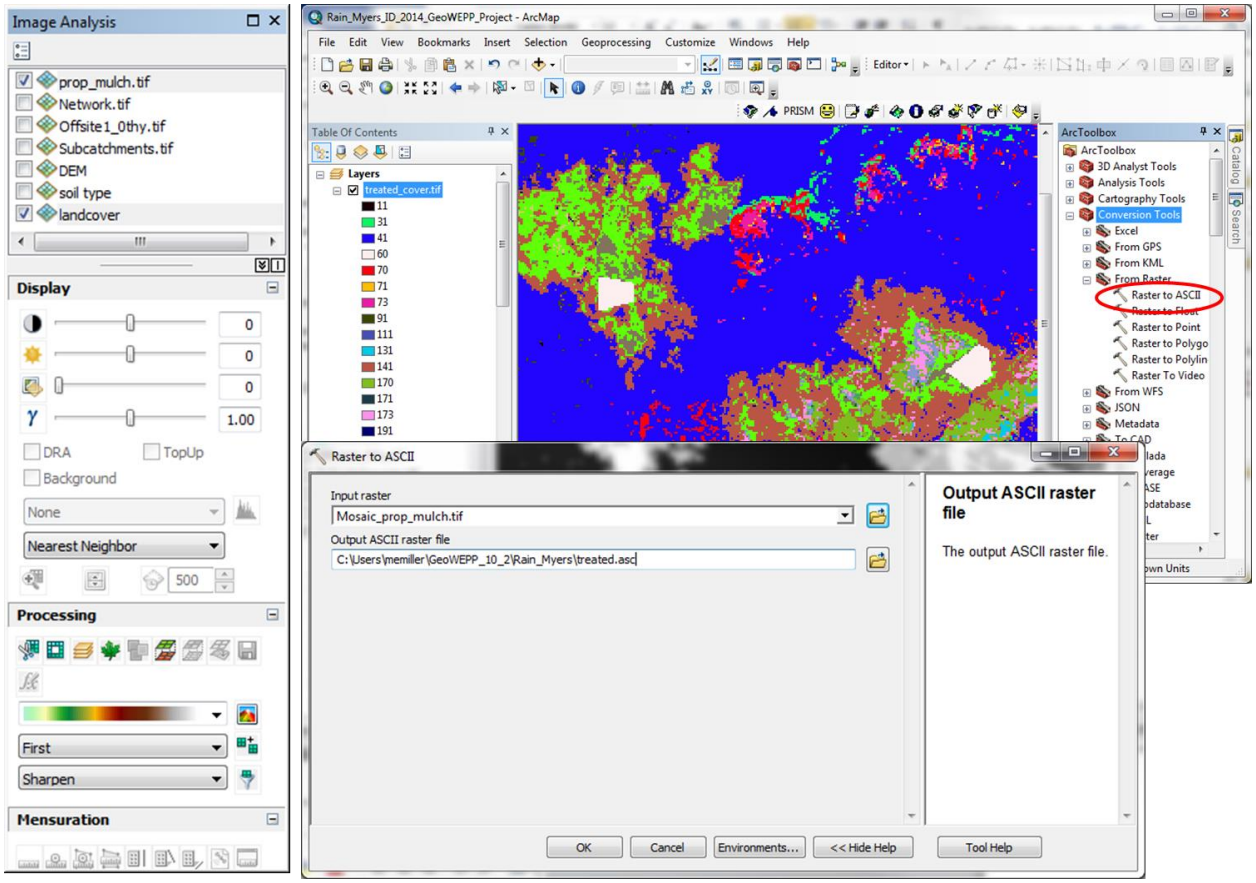


Image Analysis
prop_mulch.tif
Network.tif
Offsite1_0thy.tif
Subcatchments.tif
DEM
soil type
landcover
Display
DRA
TopUp
Background
None
Nearest Neighbor
Processing
First
Sharpen
Mensuration
Rain_Myers_ID_2014_GeoWEPP_Project - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Table Of Contents
Layers
treated_cover.tif
ArcToolbox
3D Analyst Tools
Analysis Tools
Cartography Tools
Conversion Tools
Excel
From GPS
From KML
From Raster
Raster to ASCII
Raster to Point
Raster to Polygo
Raster to Polylin
Raster To Video
From WFS
JSON
Metadata
Raster to ASCII
Input raster
Mosaic_prop_mulch.tif
Output ASCII raster file
C:\Users\memiller\GeoWEPP_10_2\Rain_Myers\treated.asc
Output ASCII raster file
The output ASCII raster file.
OK
Cancel
Environments...
<< Hide Help
Tool Help