QGeoWEPP for QGIS 3.x Version Overview Manual (Draft)

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Revision Date: 06/10/2024.

Please note that this is a draft version and the final version will be released once a QGeoWEPP manuscript is published in a peer reviewed journal.

Please ALWAYS review the GeoWEPP derived model input before running the WEPP model. All information, computer software, and database containing this GeoWEPP release are believed to be accurate and reliable. The USDA-ARS National Soil Erosion Research Laboratory (NSERL), accepts no liability or responsibility of any kind to any user, other person, or entity as a result of installation or operation of this software. GeoWEPP is provided 'AS IS', and you, the user, who assumes all risks, when using GeoWEPP.

If you have any questions, suggestions, or comments regarding GeoWEPP, visit the following web site: https://fargo.nserl.purdue.edu/geowepp/index.html and send email to: chris.renschler@usda.gov

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1. System Requirements

· Windows operating system (Windows 10 or newer)

· QGIS version 3.0 or newer. QGIS is a free and open source program available for download at https://qgis.org/en/site/forusers/download.html.

· Most recent version of WEPP (for application information and download go to http://www.ars.usda.gov/Research/docs.htm?docid=10621)

· .NET Framework (this can be checked in your Control Panel under Programs & Features)

· ~250 MB hard disk space. A larger disk space will be required if example sets are used (approximately 50MB for each set).

2. QGeoWEPP Plug-in Download

Requests for a QGeoWEPP Plug-in download can be submitted at: https://geowepp.geog.buffalo.edu/versions/. Please fill out the password request form and wait to be contacted with the information necessary to begin the download.

Once you have downloaded the application zip file, make note of the file location. You will be installing the plug-in within QGIS directly from the zip file.

Important Note: The location you provide should not contain any spaces in the folder names. For Example, you shouldn't use "C:\My QGeoWEPP", but you should use "C:\MyQGeoWEPP" or "C:\My_QGeoWEPP". This also means you cannot save the GeoWEPP folder on to your desktop, since its location is actually "C:\Documents and Settings\All Users\Desktop". It is also recommended that you limit the folder name to no more than 13 characters. Both of these have to do with the way pathways were used and created in older operating systems and in older versions of ArcGIS.

3. QGeoWEPP Input Data Requirements

Minimum Requirement Files

· Elevation data file in ASCII format (.asc) of the area.

· Soil data files and landcover data files can be added for precise modeling. For details about how to create the data sets, please refer to GeoWEPP for ArcGIS 9.x Full Version Manual (http://geowepp.geog.buffalo.edu/training/arcgis-9-x/documentation/)

Important Notes:

1. Raster files of DEM, soil and landcover have to be ASCII format (.asc). You can convert raster files to ASCII format using the ArcGIS [Raster to ASCII] tool.

2. For a DEM ASCII file: All the elevation values in the DEM should be between 1.0 to 9999.0 meters

3. There must be NO scientific expression in the ASCII files.

4. There should be NO holes in ASCII files, which means that NoData values can be allowed inside the boundary of study area.

5. Values having a comma are not allowed. For example, "1,234" is not allowed but "1234" is permitted.

6. UTM easting of DEM (xllcorner) should be positive value no more than 1,000,000 meters. UTM northing of DEM (yllcorner) should be no more than 10,000,000 meters.

4. Launching QGeoWEPP

Before launching:

· **Make note of the location you download the QGeoWEPP.zip file to.**

· **Please check the UTM zone of the area. You will be prompted to enter the number later.**

· **We recommend that you read the "Product Notes and Known Issues" section in this document before starting QGeoWEPP.**

1. Launch QGIS (Version 3.0 or newer).

2. Go to Plugins->Manage and Install Plugins…
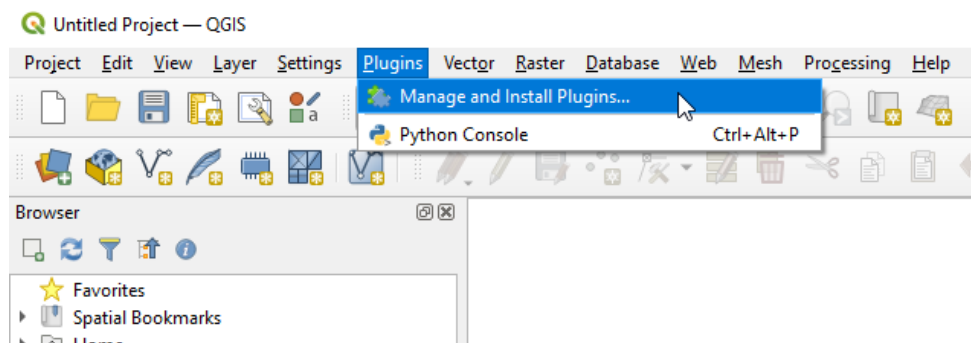
Figure 1: Manage and Install Plugins… Location

3. Once in the plug-in manager, click the ![Install from ZIP] tab.

4. Click the browse [...] button. Navigate to the location where QGeoWEPP.zip was downloaded, and select it.

5. In QGIS, click "Install Plugin". If installation is successful you will see the following message at the top of the plug-in manager:

Figure 2: Plugin installed successfully notification

4. Launching QGeoWEPP (Continued from Previous Page)

4. Installation is complete. You can now use the QGeoWEPP plug-in by clicking on Plugins and selecting the QGeoWEPP tab. Instructions for using the plugin can be found starting on Page _____.
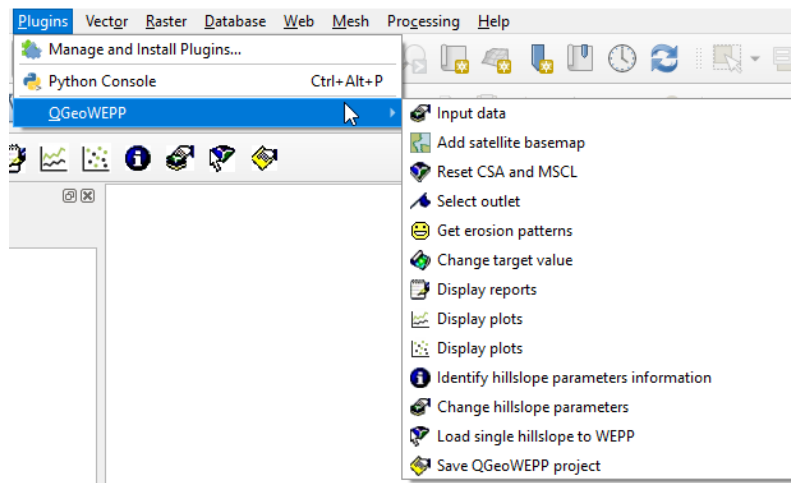
Figure 3: QGeoWEPP Plugin Location

[Using your own GIS ASCII Data]

Under the newly installed QGeoWEPP plug-in (available under the *Plugins* tab), select the
 option. This will take you to a dialogue box that allows you to upload your own data files. To upload files, click on the browse button next to each box. Windows Explorer will appear. There is example data included with the QGeoWEPP zip file. The appropriate files needed to run a simulation with the "Agriculture" data are shown in figure 4.
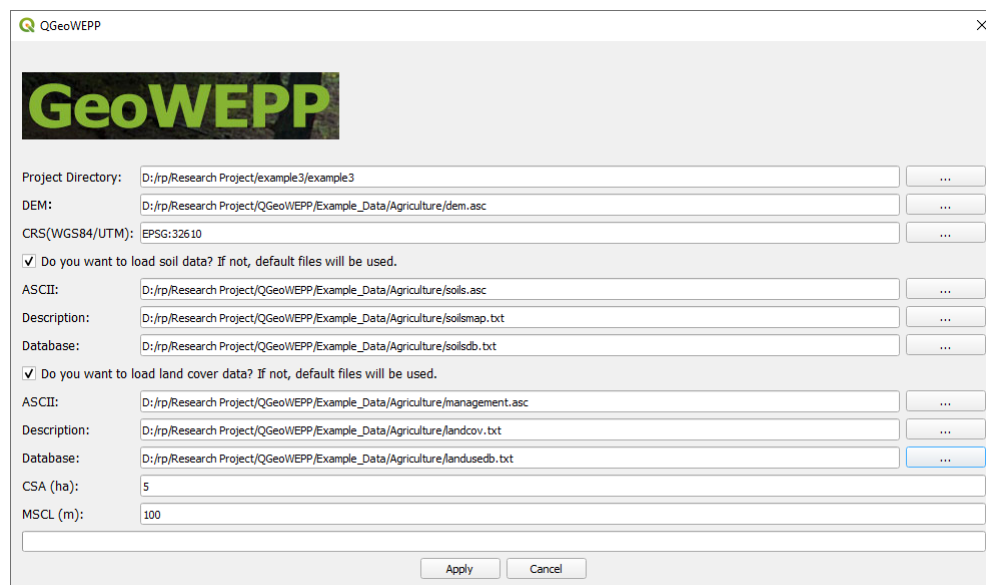
Figure 4: QGeoWEPP Input data

[Using your own GIS ASCII Data] (Continued from Previous Page)

1 – Project Directory (This is the name you will give your project as well as the location where it will be stored.)
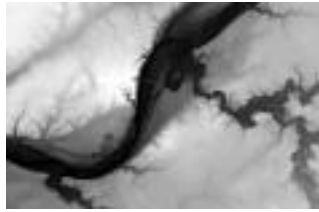
2 - DEM ASCII file

3 – CRS (WGS84/UTM): This is the WGS84/UTM zone location in which you wish to run a simulation for. You can look this information up for your area of interest, or browse the QGIS dialogue box of all zones to find an appropriate zone.

4 - Soil ASCII file
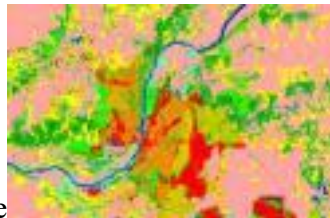
5 - Landcover ASCII file
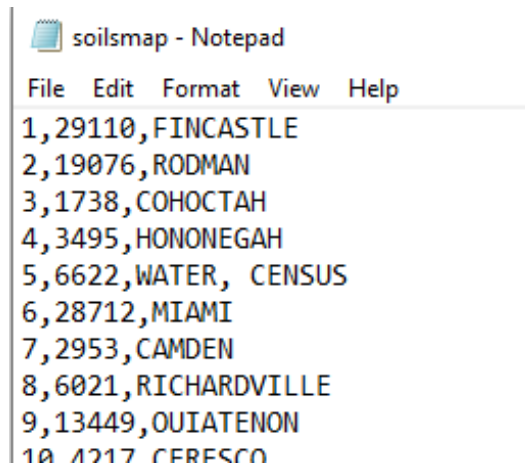
6 - Soil description text file

*Please refer to GeoWEPP for ArcGIS 9.x Full Version Manual about how to create these text files
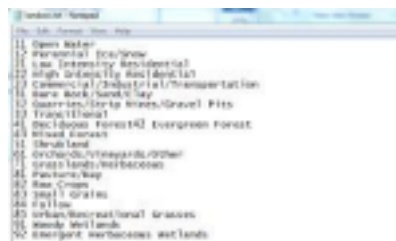
[Using your own GIS ASCII Data] (Continued from Previous Page)


```
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
ALLISON|in\ALLISON(SICL).sol
BATTLEGROUND|in\BATTLEGROUND(SIL).sol
BILLETT|in\BILLETT(SL).sol
BOWES|KEITH.sol
BOWESVARIANT|KEITH.sol
BRENTON|in\BRENTON(SIL).sol
CAMDEN|in\CAMDEN(SIL).sol
CARMI|in\CARMI(SL).sol
CERESCO|in\CERESCO(SL).sol
CHALMERS|in\CHALMERS(SICL).sol
COHOCTAH|in\COHOCTAH(FSL).sol
COLOMA|in\COLOMA(LS).sol
CROSBY|in\CROSBY(SIL).sol
DESKER|KEITH.sol
DRUMMER|in\DRUMMER(SICL).sol
DUPAGE|in\DUPAGE(SIL).sol
ELSTON|in\ELSTON(SL).sol
FINCASTLE|in\FINCASTLE(SIL).sol
HIGHGAPVARIANT|in\HIGH GAP VARIANT(SIL).sol
HONONEGAH|in\HONONEGAH(LCOS).sol
```

7 – Soils database text file (above)

8 - Landcover description text file

[Using your own GIS ASCII Data] (Continued from Previous Page)

9 - Landcover database text file

10 – CSA (Critical Source Area) in hectares. Critical source area is an area of the landscape that is likely to carry high levels of pollutants.

11 – MSCL (_____) in meters.

[Load Previously Saved Project]

Once a project is created on QGeoWEPP, the project is saved as .mxd file. The next time you can click this button and select the .mxd file in the project folder. You won't need to upload the source data files again.

[Exit GeoWEPP]

Closes GeoWEPP.

5. QGeoWEPP Steps & Features

1. **Input data** for your area of interest. Instructions for how to input your own GIS Data (including the given example data) begin on *Page 7* of this manual.
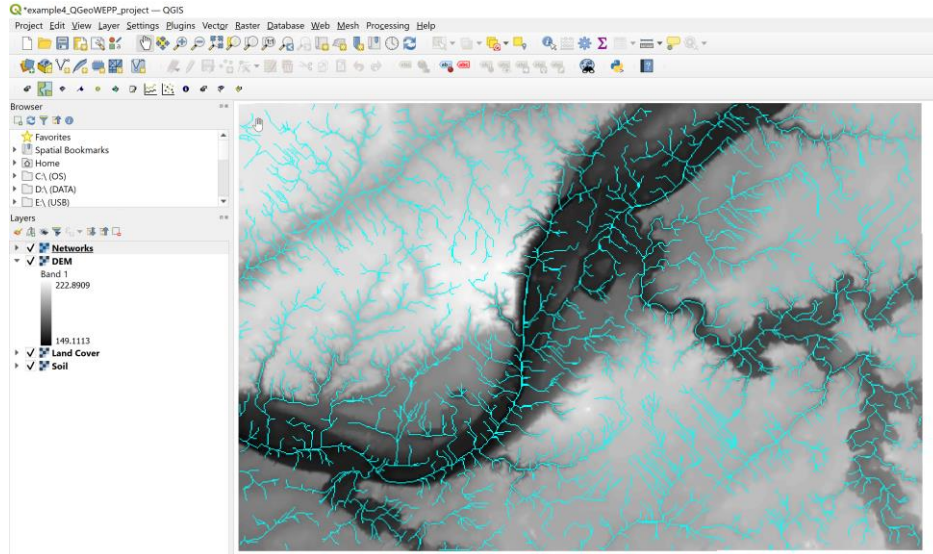
Figure 5: QGIS after Inputting Data

2. **Add satellite basemap** This allows you to generate a Google Satellite Basemap image that corresponds to your area of interest (AOI). While not required, this step is recommended since it will give a better understanding to the geographical surroundings of your AOI.
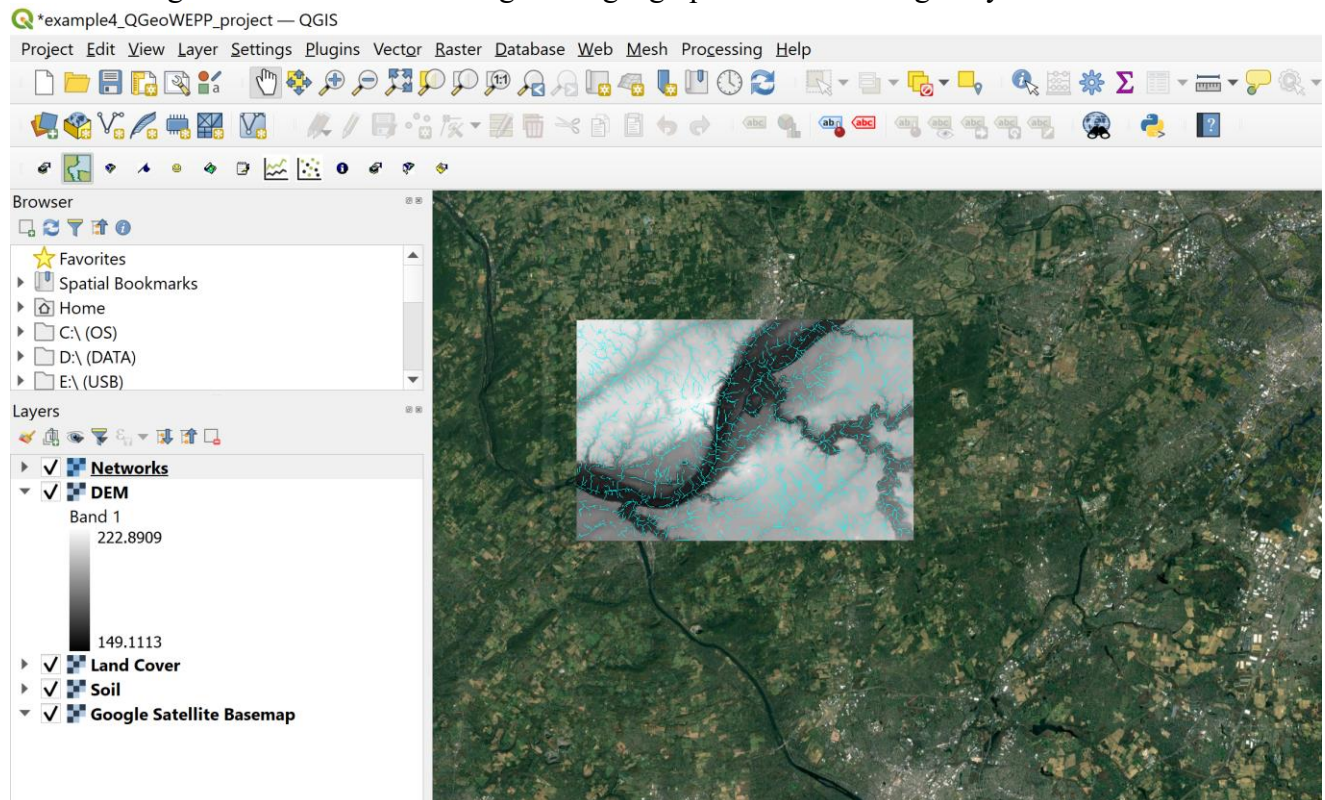
Figure 6: QGIS after adding a satellite basemap (zoomed out to show more of surroundings)

5. QGeoWEPP Steps & Features (Continued from Previous Page)

3. ⚘ Reset CSA and MSCL Selecting this will open a dialog box that allows you to adjust your CSA (ha) and MSCL (m).
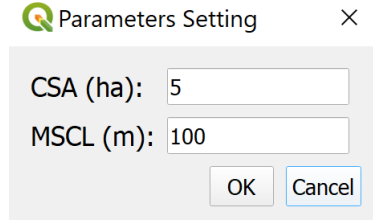
Figure 7: Reset CSA and MSCL dialog box

4. ⚹ Select outlet When selecting an outlet, it is advised to zoom in on the map so that you may see the pixels of each channel. Once zoomed in, click a channel pixel. **NOTE: You cannot select the end of a channel.**
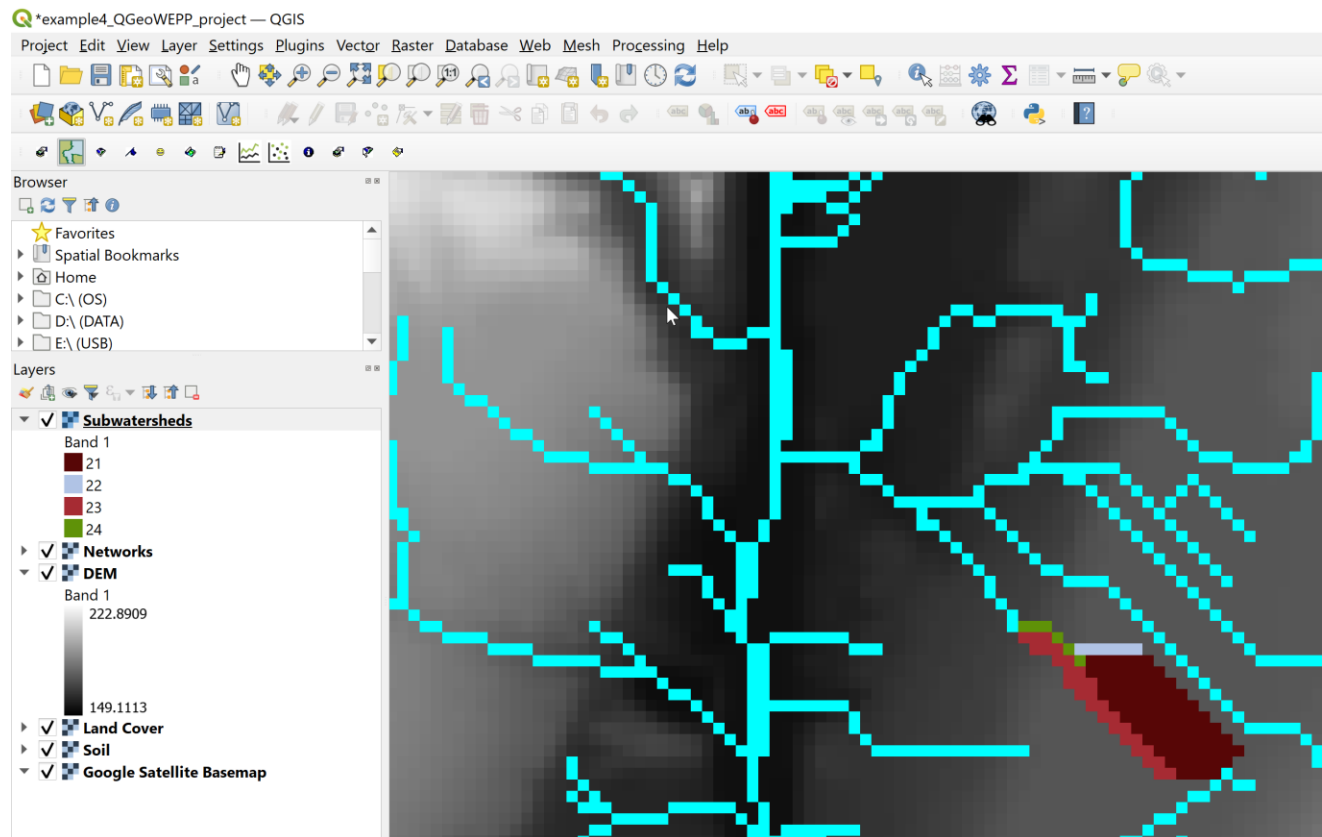
Figure 8: QGIS subwatersheds shown after selecting an outlet

5. QGeoWEPP Steps & Features (Continued from Previous Page)

5a. ☻ Get erosion patterns After selecting an outlet, you can get erosion patterns from the data. Choose a name for your base model:
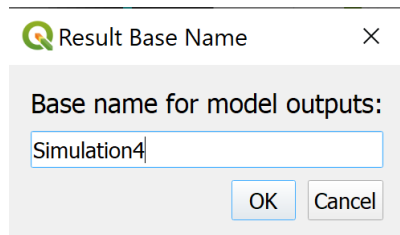
Figure 9: Choosing a base model name

5b. WEPP Climate Selection will open and allow you to choose a climate station for your AOI. By default, the nearest location will be selected:
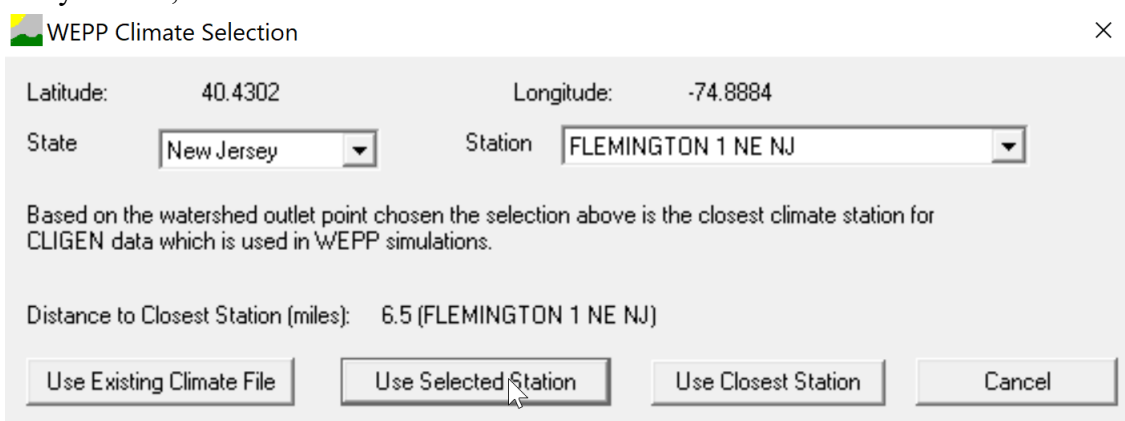
Figure 10: WEPP Climate Selection

5c. Based on your selection climate station, WEPP will create a 100 year climate simulation for your AOI based on WEPP Management and Soil Lookup:
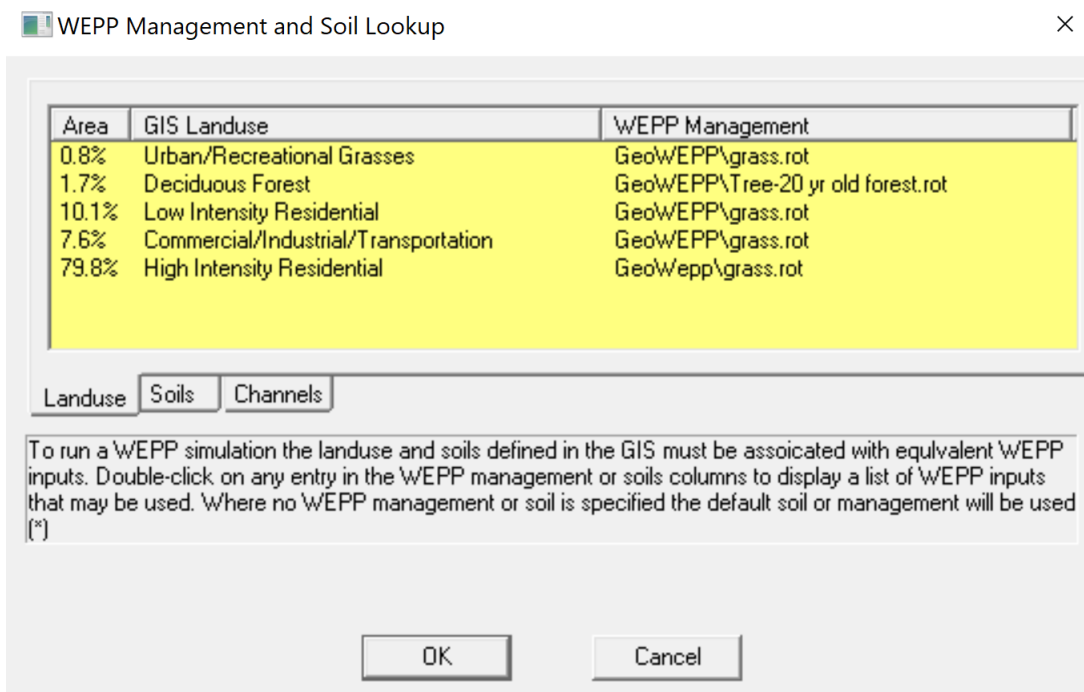
Figure 11: WEPP Management and Soil Lookup

5d. The WEPP/TOPAZ Translator will then allow you to adjust the settings of your watershed. You may also adjust the number of years and simulation method:
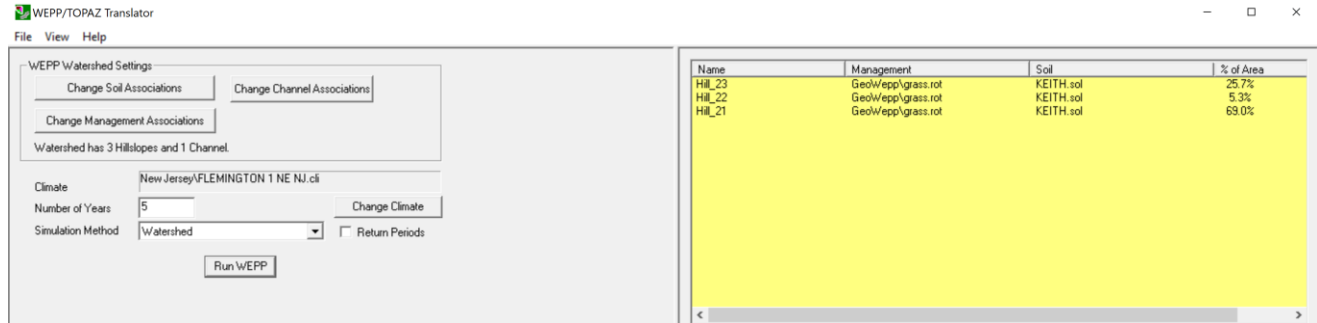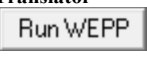
Figure 12: WEPP/Topaz Translator

After adjusting these parameters to your liking press ⟨Run WEPP⟩. After the runs are complete you may return to QGIS.

Note that the sediment yield and runoff have been calculated for your AOI. Adjust the order of the layers as needed to visualize each result.
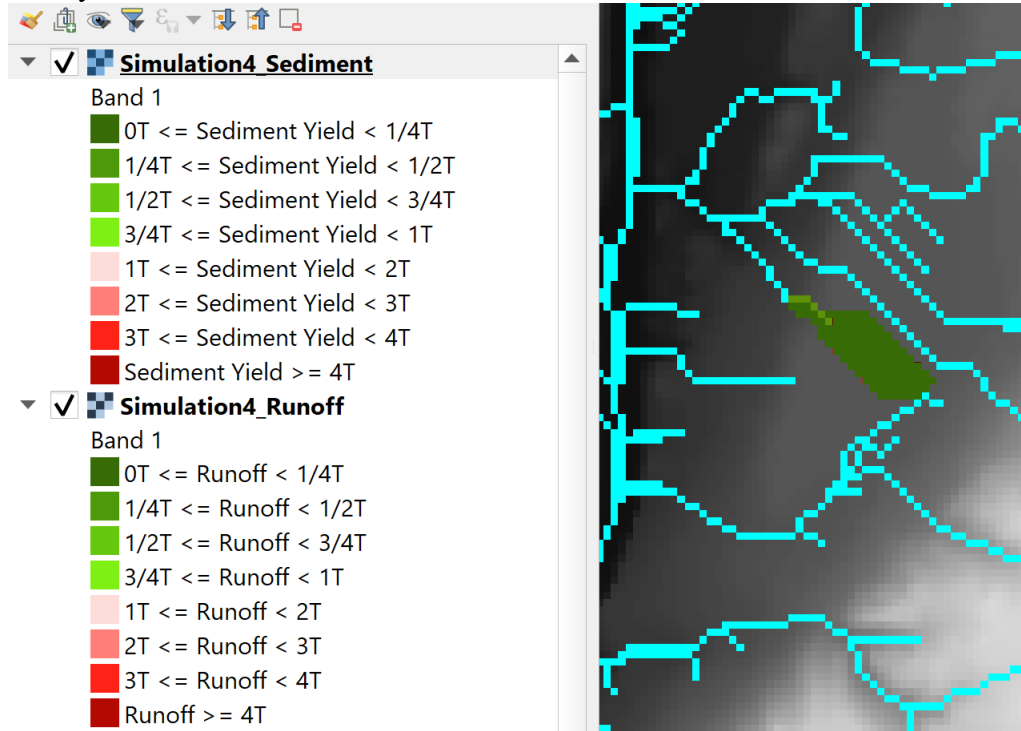

Figure 13: QGIS after obtaining erosion patterns

6. ◆ Change target value This option will allow you to change the WEPP output for Runoff (mm/Year) or Sediment Yield (Tons/Hectare/Year) to a specified target value.
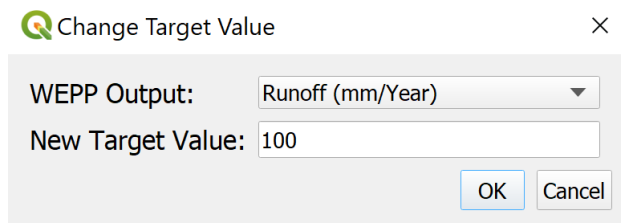
Figure 14: Change target value

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7. 📝 Display reports This option will allow you to generate a tabular report of the data obtained through your simulation. Selecting the dropdown will allow you to view reports of other simulations you have completed as well. **Note: If the report is blank press Display in the bottom right to generate the report.**
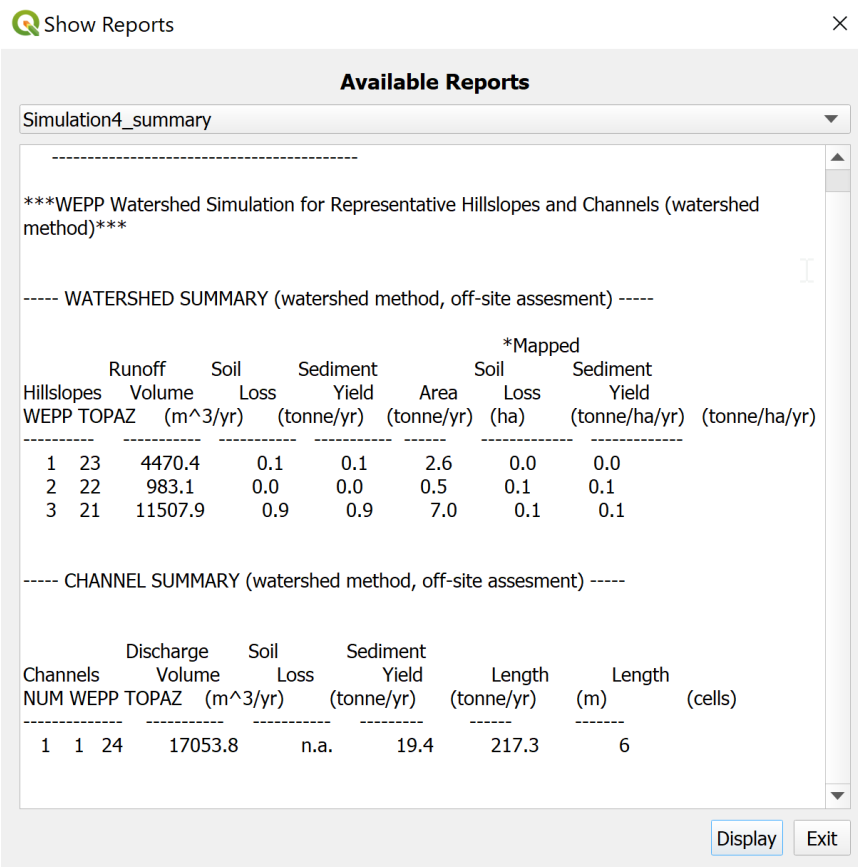

Figure 15: Report of WEPP Watershed Simulation

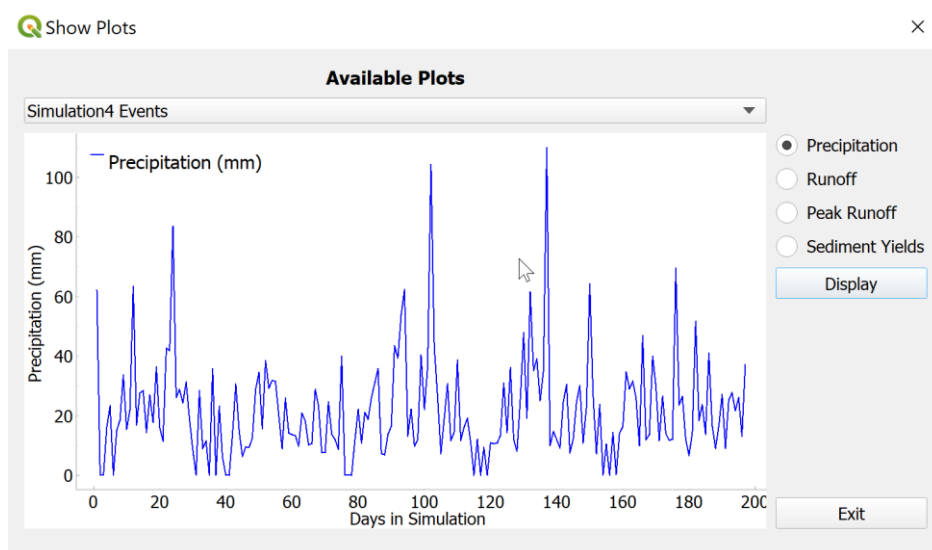8. 📈 Display plots After simulating, you will be able to view a graphic representation of the simulation events in real-time.

Figure 16: Display of plot for simulation

9. ⬚ Display plots Unsure if this option is used for comparison between multiple plots? It asks for a file to be input. *********************************

10. ⓘ Identify hillslope parameters information After selecting this option, click on any of your hillslopes to open a dialog box containing all of the information about the selection.
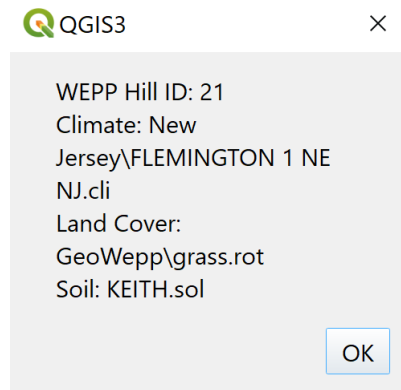
Figure 17: Identify hillslope parameters information dialog box

11. ✐ Change hillslope parameters This will allow you change the soil ID and land cover parameters for a single hillslope. Select a hillslope the same way as in *Step 10.* Dialog boxes for each option will open one at a time.
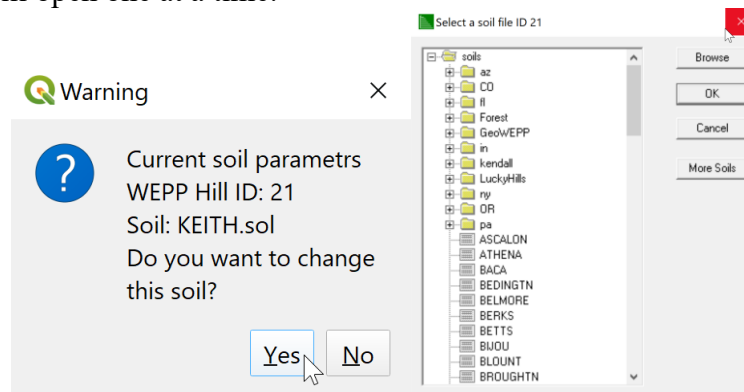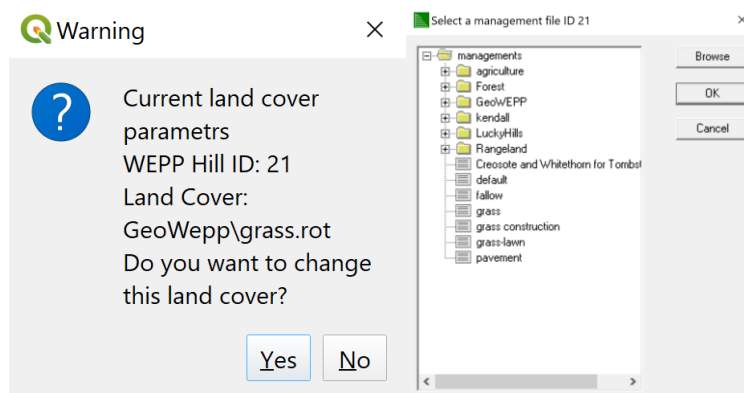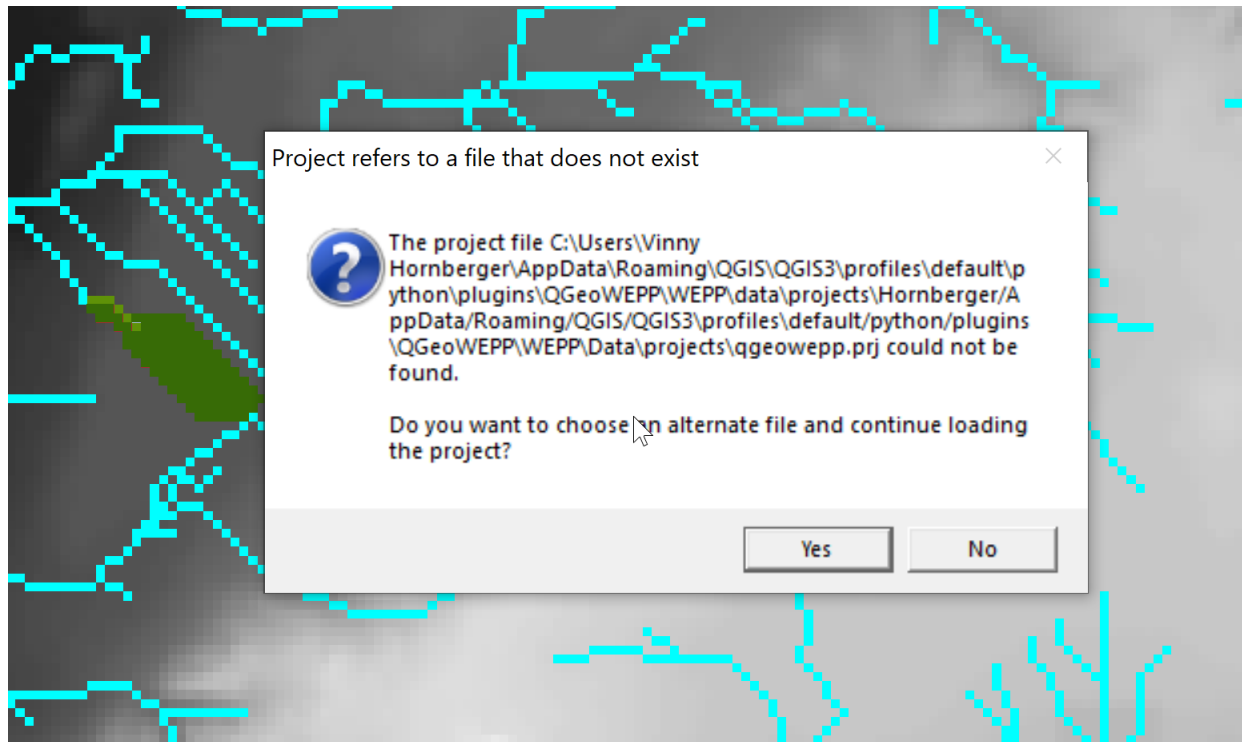
Figure 18: Changing soil ID

Figure 19: Changing land cover

You will then be shown a dialog box of the new (or same) parameters. Finally you will be asked if you want to rerun the simulation based on the new parameters selected.

12. 🏴 Load single hillslope to WEPP ****************having issues loading a single hill slope. Unsure which file to select.

13. 🏴 Save QGeoWEPP project Allows you to save your project progress so you may pick up where you left off at a later time. Projects are saved in a .qgs format.
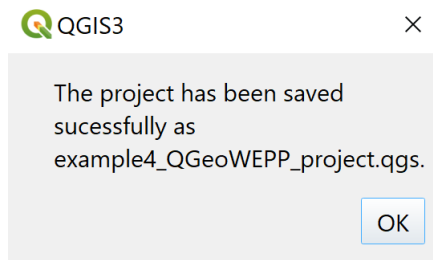

Figure 20: Saving QGeoWEPP Project

6. QGeoWEPP Basics

Folder Structure

Please review the folder structure to be familiarized with GeoWEPP.

.qt_for_python	3/24/2022 11:30 AM	File folder	
Example_Data	3/24/2022 11:30 AM	File folder	
Functions	3/24/2022 11:30 AM	File folder	
help	3/24/2022 11:30 AM	File folder	
i18n	3/24/2022 11:30 AM	File folder	
icons	3/24/2022 11:30 AM	File folder	
RequiredFiles	3/24/2022 11:30 AM	File folder	
scripts	3/24/2022 11:30 AM	File folder	
WEPP	3/24/2022 11:31 AM	File folder	
__init__	2/19/2022 12:14 PM	Python File	
logo	2/19/2022 12:14 PM	PNG File	
Makefile	3/7/2022 12:27 AM	File	
metadata	3/7/2022 12:31 AM	Text Document	
pb_tool.cfg	2/19/2022 12:14 PM	CFG File	
plugin_upload	2/19/2022 12:14 PM	Python File	
pylintrc	2/19/2022 12:14 PM	File	
qgeowepp	3/22/2022 10:10 PM	Python File	
qgeowepp_dialog	3/8/2022 11:40 PM	Python File	
resources	2/9/2022 12:22 AM	Python File	
resources.qrc	3/7/2022 12:29 AM	QRC File	
WEPP_windows	2/19/2022 12:14 PM	WinMount archiver	

Example_data folder contains example project data sets.

PRISM_Files folder contains PRISM climate data files.

Projects folder contains projects you created.

  - Generated raster files are stored in Projects > RasterDataset subfolder.

  - WEPP reports are stored in Projects > Reports subfolder.

RequiredFiles folder contains necessary files to run GeoWEPP.

WEPP folder contains soil and land management data, climate data generated by cligen, slope data, etc. in **Data** sub folder.

Core Functions

QGeoWEPP combines three different functions to calculate soil erosion.

1. TOPAZ (Topographic Parameterization) for topographic evaluation, drainage identification, watershed identification, watershed segmentation, and subcatchment parameterization

2. PRISM (Parameter-elevation Regressions on Independent Slopes Model) for editing existing climate data.

3. WEPP (Water Erosion Prediction Project) for soil erosion calculation

<TOPAZ part>

1 - Defines CSA (Critical Source Area) and MSCL (Minimum Source Channel Length) to delineate streams

2 - Specifies the outlet point of watershed

<PRISM part>

3 - Opens PRISM to select/edit existing climate data

<WEPP part>

4 - Obtains the erosion pattern in the watershed

5 - Displays reports

6 - Saves GeoWEPP project

7 - Changes tolerable value of erosion

8 - Shows the information of hillslope in the watershed area (click on hillslope)

9 - Changes the associated landuse and soil type

10 - Returns WEPP after changing hillslope parameter

11 - Loads a single hillslope on WEPP

12 - Goes to WEPP

13 - Saves project and exit

7. Product Note and Known Issues

Note:

1) You cannot select the end of a channel when selecting an outlet.

2) A standard area for QGeoWEPP is about 5 hectors. When you process a large area, please consider decreasing the DEM resolution such as from 10m to 30m, 30m to 50m, etc.

3) If a user does not upload soil or landover ASCII files, a default file (uniform) will be generated.

4) If a user does not upload soil or landcover ASCII files, a description file will be created with an entry for each unique value. All landcover and soil values will be set to a default value if the user doesn't offer a database file. Users may change these settings when modeling a subcatchment area.

5) If users are unfamiliar with how to create a description and database file for GeoWEPP ArcGIS 9.x version, they may create them by referring to the ArcGIS 9.x manual.

6) Please use the .qgs file that was saved by the program to reopen your work. If you move your whole QGeoWEPP folder to a different place make sure all necessary directory files inside are correct.

Known Issues:

1) If you do not have WEPP installed before attempting to install the QGeoWEPP plugin in QGIS, you may receive an error message.

2) PRISM may report an error the first time you attempt to use it during a project. Re-running PRISM often fixes the problem.

3) A large DEM files (over 200,000 cells) may fail to process. If QGeoWEPP freezes while running DEDNM.exe, try resampling your input.

8. Support

Email: support@geowepp.org

For detailed instructions about GeoWEPP functions and how to set up data sets:
https://fargo.nserl.purdue.edu/geowepp/train_9x.html

For general inquires:to be determined

For bug report: to be determined

For suggestions: to be determined

Reference

Cligen

http://hydrolab.arsusda.gov/nicks/nicks.htm

Glossary of Hydrologic Terms

http://www.nws.noaa.gov/om/hod/SHManual/SHMan014_glossary.htm

PRISM

http://oldprism.nacse.org/

PRISM Generator

http://prism.oregonstate.edu/

http://forest.moscowfsl.wsu.edu/cgi-bin/fswepp/rc/rockclim.pl

Soil Series Description

https://soilseries.sc.egov.usda.gov/osdquery.aspx

TOPAZ

http://homepage.usask.ca/~lwm885/topaz/overview.ht

Web Soil Survey

http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

WEPP

https://www.ars.usda.gov/midwest-area/west-lafayette-in/national-soil-erosion-research/docs/wepp/research/