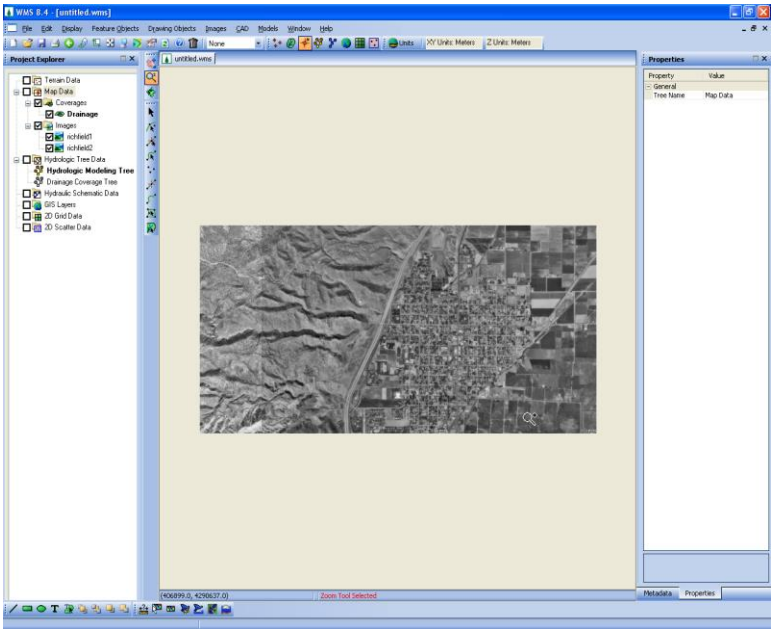
WMS

v. 10.1

WMS 10.1 Tutorial

GSSHA – WMS Basics – Loading DEMs, Contour Options, Images, and Projection Systems

Learn how to work with DEMs and images and to convert between projection systems in the WMS interface



Objectives

Read digital elevation, image, and GIS shape files into WMS, manipulate the files, and download digital data from the internet. Learn how to get background images , convert coordinate projections, and convert data from shapefile to map feature data that can be used for watershed modeling in the WMS GSSHA interface.

Prerequisite Tutorials

- None

Required Components

- Data
- Map

Time

- 45-60 minutes

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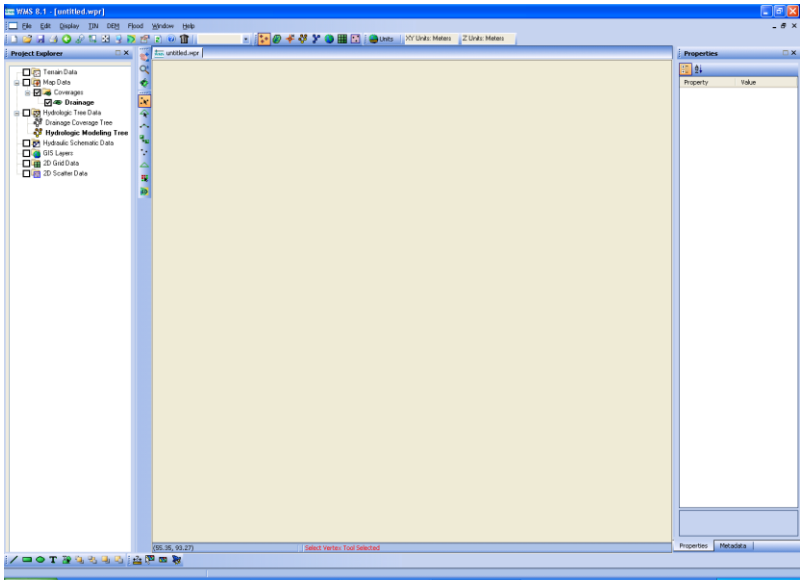
1 Contents

2 Introduction

In this first exercise get familiar with the WMS interface and the help system using data from the Park City, Utah area.

3 Objectives

This tutorial reviews the basic layout of WMS and gets acquainted with the interface.



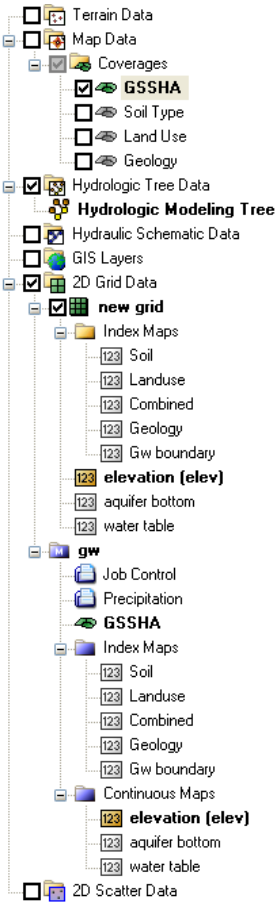
The left most portion of the WMS window is called Project Explorer, the central part is the display window, and the right part is the Properties window. The properties window changes based on the selected item.

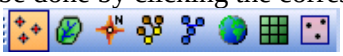
4 Getting Around the WMS Interface

The WMS Help file has a section on some of the basic elements of the WMS graphical user interface (GUI).

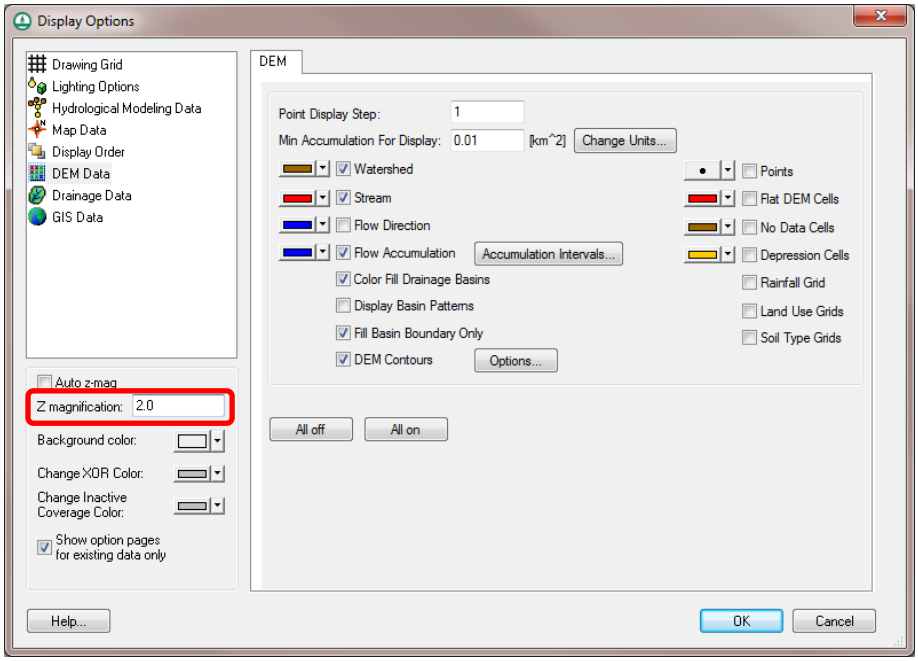
4.1 Self-Guided Tour

The WMS Help file is located on a "wiki" site at http://www.xmswiki.com and documents the important elements of the GUI. This section is practicing to become familiar with the interface, but also refer to the help file on xmswiki.com as needed.



1. Start WMS
2. Select ***Help | WMS Help***
3. Take a couple of minutes to review the WMS Help wiki and then close the help page
4. Different operations like spatial data reading/editing, hydrologic modeling or grid generation etc. are done using different modules. Switching from one module to the other can be done by clicking the corresponding module icons  in the menu bar. While doing so, notice menus and tools change according to the available options. Change the module several times and note how the menus and tools change according to the active module. When done, be sure the Terrain Data module is active (the first one from the left).
5. If looking at the WMS project explorer, notice that there is a folder in the project explorer to contain the data associated with each module (the drainage module shares data from the terrain and map modules).
6. The default behavior of the project explorer window is to switch modules as these folders or data contained in them are selected. For example, clicking on the *GIS Data* folder, the *GIS Module* will be selected. Clicking on the *Coverages* folder, the map module will be selected.
7. WMS projects are saved as *.wms files. When saving the project, all necessary files are saved and the saved project can be reopened. Always save the model as a ***.wms*** file before creating a 2D grid for a GSSHA model so there is a base project to work with. After building a 2D grid and initializing the GSSHA model, save the project as a GSSHA project file (with a .prj extension).
8. Control which objects are displayed by checking and un-checking the data elements in the Project Explorer window. Set the style, color, and size of elements drawn using the ***Display Options***  , ***Contour Options***  , and other macros.
9. Select ***File | Open*** 

10. Locate the ***GSSHAImages*** and the ***Personal*** folders in the files for this tutorial. If needed, download the tutorial files from www.aquaveo.com.
11. Browse and open file ***\GSSHAImages\BaseProj.wms***
12. Select the ***Contour Options*** macro and experiment with changing some of the contouring options such as the ***Contour Methods***, ***Contour Interval*** and ***Color Ramp.***
13. Controlling what and how objects are visually displayed can be set through the display options. To set the display options, select ***Display | Display options*** or simply click the display options button on the menu bar.
14. In the *Display Options* dialog box, uncheck the *Auto z-mag* box and enter 2.0 for *Z magnification*. Also access the DEM contour options from the display options by selecting the DEM Data object in the upper left corner of the Display Options window. Click the options button next to DEM Contours. Make sure the DEM Contour Method is set to *Color Fill* and click OK twice.



15. Select the *Rotate Tool* and drag the watershed to visualize the watershed relief.
16. Select the ***Contour Options*** macro and set the *Contour Method* to *Normal Linear*. Select OK and then select *Plan View* to reset the drawing of the DEM from the changes made with the rotate tool.

5 Images

Images are an important part of projects developed using WMS. An image is comprised of a number of pixels (picture elements), each with its own color. The resolution, or size,

of the pixels determines the area and detail represented in the image. Images may be used in WMS to derive locations for features such as roads, streams, confluences, land use, soils and so forth. Images also provide a base map for the project.

In order to make use of images they must be georeferenced. Georeferencing an image defines appropriate x and y coordinates so that it can be spatially overlaid with other data. Because images are commonly used in Geographic Information System (GIS) programs like WMS, data developers often store the georeferencing information as either part of the image file (a geotiff file for example), or in a separate file commonly referred to as a "world" file.

In this section, experiment with JPG and TIFF image files. Also see how an image without spatial information can be georeferenced.

6 Geotiff Files

Geotiff images are files that embed the georeferencing information. This means that it's not necessary to specify coordinates when importing the image.

6.1 Scales

In this section, see how the scale of an image affects the display. Use some of the images for Provo, Utah.

1. Select ***File | New*** or click on macro icon to open a new instance of WMS.
2. Select ***File | Open***
3. Browse the folder ***GSSHAImages*** and open the following images:

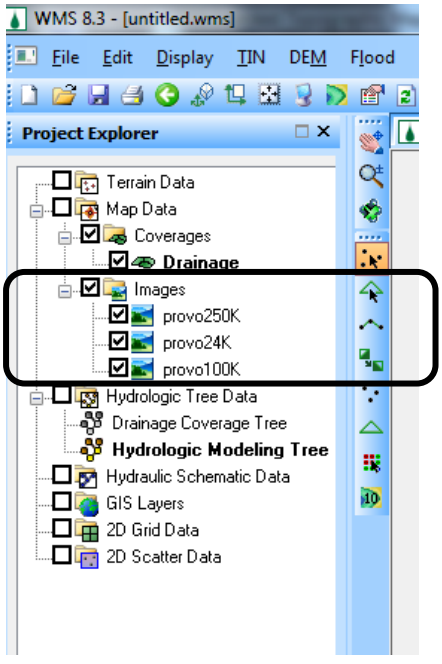
   a) provo24K.tif

   b) provo100K.tif and

   c) provo250K.tif

   Click No if prompted to convert to jpg

   Note: These are the topographic maps of the Provo, UT area. The three images are of different scales (1:24000, 1:100000 and 1:250000 respectively).



4. Once these files are open, they are listed in the project explorer (see the following figure).
5. Turn the display of the images on and off by checking them on and off in the project explorer. Leave them all on when done experimenting.
6. Select the Zoom Tool and draw a rectangle over the image to zoom into an area.

Zooming Tips: With the zoom in tool selected, press and hold the Shift key in the keyboard, the zoom in tool changes to zoom out tool. The zoom in tool performs as zoom out tool if operated with Right mouse button.

Also use the scroll wheel of the mouse to zoom in and out with any tool or module selected. The direction of scroll to zoom in/out can be set in ***Edit\Preferences*** in *General* tab.

Click the scroll wheel of the mouse, it performs as a pan tool without having to select pan tool . This is especially useful when tracing an arc.

7. Zoom into the same location in the three different images and see the difference in resolution, area covered by the images, details captured etc.

7 Overlaying Images

WMS allows overlaying different types of images, provided that the images are in the same projection system.

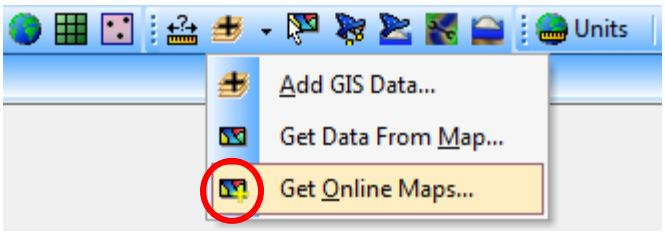
1. Close WMS and open a new instance of WMS. Browse and open image ***GSSHAImages\provoTStopo.jpg.*** This is a topographical map of the Provo area. This image is already georeferenced.

Many of the tools in WMS depend on the currently defined projection system. Some of such features that use the display projection system are the *get data* tool and the *Get Online Maps* tool . Before using these tools, have the display projection defined so that WMS can determine the latitude/longitude coordinates of the required data.

2. Select ***Display | Display projection...*** to set the display projection
3. Select the *Global Projection* option
4. Select *Set Projection*
5. Set *Projection* to *UTM*, *Datum* to *NAD 83*, *Planar Units* to *Meters*, and *Zone* to *12 (114°W - 108°W – Northern Hemisphere)*
6. Select *OK*
7. Set the vertical projection to *Local* and the vertical units to *Meters*
8. Select *OK*

WMS uses an Internet connection to load a background image (Aerial photo or a topo map) for the project site. WMS uses built in web services tool to load such images.

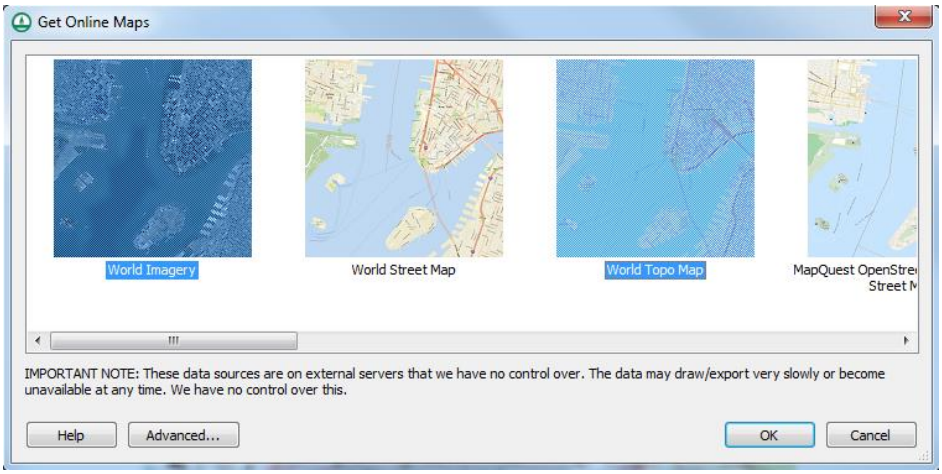
To get online images, use the *Get Online Maps* button , located in the *Add GIS Data* dropdown which is normally located at the top of the WMS window.



This tool uses a web map service to download and view various types of images in the WMS graphics window. These images are pre-registered to the display projection (or if no data exists, the projection is set to the image's native projection) and more than one online image can be read at a time.

The advantages of online images are that they are seamless, data is available throughout the world, and that they can be reprojected to the display projection without needing to georeference the image. The disadvantage of online images is that the image can take a long time to refresh when zooming or panning the display in the graphics window.

9. Locate and select the *Get Online Maps* button in the *Add GIS Data* drop down at the top of the WMS window near the menu.
10. Drag a box or select the *Ctrl* button and click to select both the *World Imagery* and the *World Topo Map* options and select *OK*.



11. Notice that the online images are read and displayed based on the current screen coordinates. Notice that two new layers symbolizing online images are created for the *World Imagery* and the *World Topo Map* in the *Project Explorer*. In the *Project Explorer*, turn off the *World Imagery* online image. Zoom into various areas of the online image and compare the online image with the topographic maps read earlier in this tutorial by turning the online image off and on after zooming or panning. Notice that the display takes some time to update when moving the display. This display slow-down can be fixed by converting the online image to a static image.
12. Select the *Frame* macro .
13. Online images can be exported and added back to the project immediately or used in another project. To export an image, right-click on the *World Imagery* online image and select the ***Export*** menu option. Enter a

resampling ratio of 4.0, select the option to *add the image to the project after saving*, and select *OK*. It will take some time for WMS to download the higher-resolution image. After the image is downloaded and loaded into WMS, turn the image off or use it in place of an online image.

14. Zoom into various areas and compare the online images with the topographic maps read earlier in this tutorial.
15. Right-click on the ***World Imagery*** item in the project explorer and select *Set Transparency*.
16. Move the slider to 50% and click *OK*. Notice the aerial photo on top of the topo map.

8 GIS Shapefiles

GIS shapefiles are another data source frequently used in developing models with WMS. This section shows how commonly used shape files for land use and soil data can be obtained and used in WMS.

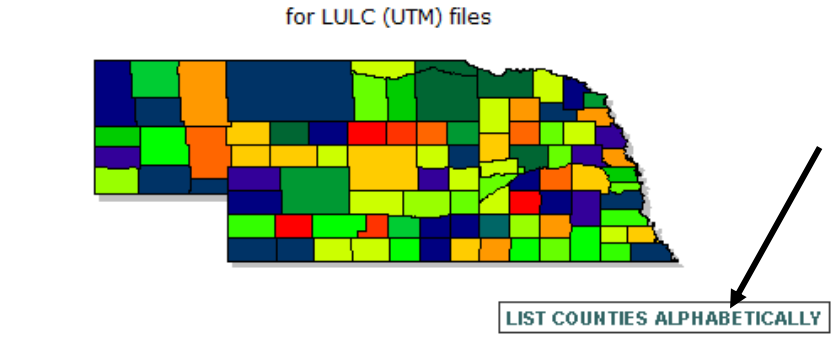
8.1 Geospatial data acquisition

There are several locations where various types of geospatial data can be obtained. The XMS wiki at http://www.xmswiki.com has a special geospatial data acquisition page which has tutorials and tips on downloading these data from the most convenient sources for use in WMS, SMS or GMS. In this section, download a shapefile with land use data and open it in WMS.

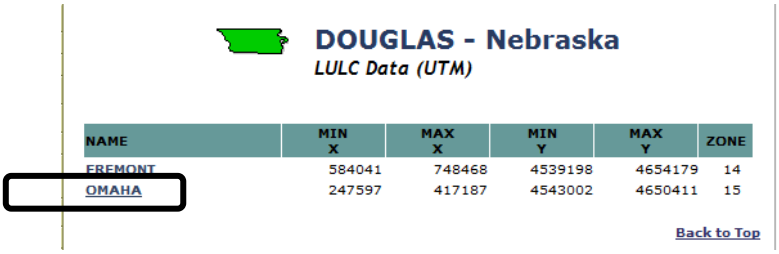
1. Start a web browser and type the following link into the address bar: `http://www.xmswiki.com/xms/GSDA:GSDA`. This will go to the Geo-Spatial Data Acquisition Home page.
2. Under *Surface Characteristics*, select *Land Use*.
3. Select the *WebGIS* link.

4. Under *Land Use* select *Shapefile (UTM)*

5. For this exercise, get the land use data for Omaha. In the US map, select Nebraska.
6. Click on *List Counties Alphabetically*

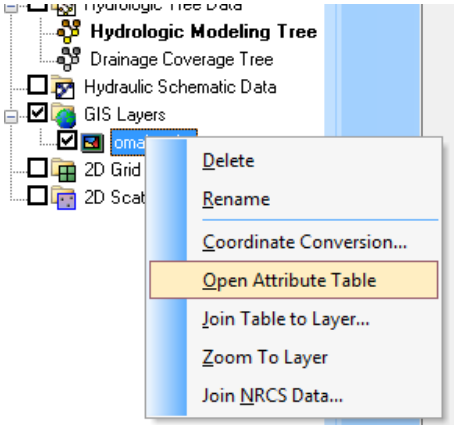


7. In the list that displays, select *Douglas County*
8. Select *Omaha* on the top of the list.



9. Save ZIP file archive on the computer.
10. Outside of WMS, browse to the folder where the Omaha.zip file was saved and extract the files to ***Personal\Images***.
11. In WMS, delete data by selecting ***File | New***.
12. Before reading any data, set the projection system. Select ***Display | Display projection...*** to set the display projection.
13. Select the *Global Projection* option.
14. Select *Set Projection.*
15. Set *Projection* to *UTM*, *Datum* to *NAD 83*, *Planar Units* to *Meters*, and *Zone* to *15 (96°W - 90°W – Northern Hemisphere)*.
16. Select *OK.*
17. Set the vertical projection to *NAVD 88(US)* and the vertical units to *Meters.*
18. Select *OK.*
19. Open the aerial photo covering the region surrounding Omaha at the following location: ***GSSHAImages\omaha\AerialPhoto.jpg***. Select ***Yes*** if asked to generate image pyramids.
20. In the project explorer, right-click on *GIS Data* and select *Add Shapefile Data…*
21. Browse and open the land use shapefile that were downloaded ***(Personal\Images\omaha\omaha.shp)***

22. Notice the land use shape file overlaying the aerial photo for the city of Omaha.
23. Right-click *omaha.shp* on the project explorer and select *Open Attribute Table*. This will open the attribute table for the land use shape file. Notice *LUCODE* is one of the attributes. **LUCODE** is the USGS land use code. Using this attribute to define overland flow roughness values and other surface characteristics in later tutorials.



24. This shapefile is in the GIS module of WMS. To use this shapefile for hydrologic and hydraulic calculations, convert it to data in the map module of WMS. This will be done in a later section.
25. Do not close WMS, keep working with this data in the following section.

8.2 Geospatial data processing

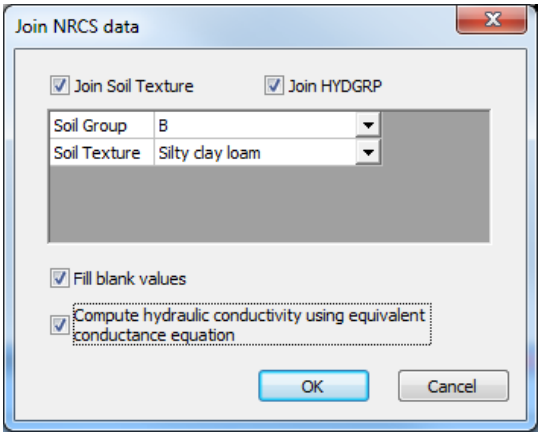
Some of the GIS data are not ready to use, like the land use shapefile used in the previous section. Process these data before they can be used. In this section, see how some of these tools can be used in WMS with a soils shapefile.

Open a SSURGO soil shapefile for Omaha and process it so that it can be used for defining infiltration and other soil-derived properties required for GSSHA models.

1. Right-click on *GIS Data* in the project explorer and select ***Add Shapefile Data…***. Browse to and open the file ***GSSHAImages\omaha\Soil\Spatial\ soilmu_a_ne055.shp.***
2. When the soil shapefile is read into WMS, the projection file associated with the file is read and WMS reprojects the data from Geographic (Lat/Lon) to the current coordinate system (UTM Zone 15).
3. Right-click on *soilmu_a_ne055.shp* and open its attribute table. In the attribute table, notice that there are only a few properties associated with each soil polygon, but there are no recognizable soil attributes. To get the soil properties associated with each soil polygon, read these properties from tables included with the SSURGO data.
4. To read the properties, close the attribute table and right-click on *soilmu_a_ne055.shp* in the project explorer. Select *Join NRCS Data.*

The soil attributes associated with the soil polygons are stored as separate tables. Selecting the **Join NRCS Data** command allows linking these tables to the shapefile for use.

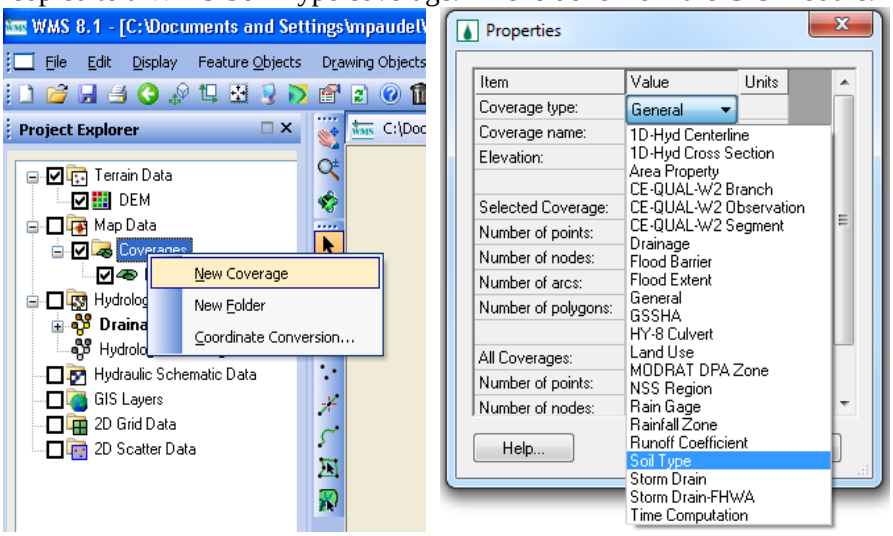
5. In the *Join NRCS Data* dialog select all the check boxes and leave the Soil Group and Soil Texture fields as they are. See the following figure:



6. Click OK.
7. Right-click on the soils shape file under GIS Data and open the attribute table again. This time notice that several soils properties have been added as attributes.

9 Mapping Shapefiles to WMS coverages

The SSURGO shapefile that was processed in the previous step is still in a GIS format that WMS cannot use directly. In order to use it the polygons overlapping our watershed need to be copied to a WMS Soil Type coverage. This is done from the GIS module.



1. In the project explorer (left side of WMS main window), right-click on "*Coverages*" and select "*New Coverage*"
2. Select the coverage type to be *Soil Type* and click *OK*. This will create a new soil type coverage in the project explorer. Note that WMS creates a

Drainage coverage automatically as soon as WMS is opened. When creating a GSSHA grid, the drainage coverage is converted to a GSSHA coverage.

3. Click on the new soil type coverage in the Explorer window to make it active.
4. Click on the *soilmu_a_ne055.shp* (under GIS data) to make it active and change to the GIS module. Next map the data from the soil shapefile to the soil type coverage.
5. Turn off the check box next to the **omaha.shp** shapefile read in a previous section. This is the land use shapefile. Do not include the data in this shapefile in the soil type coverage.
6. Click on the "*Select shapes tool*"  and drag a rectangle around a watershed an area to select all land use polygons that overlap the watershed. Do not worry about selecting polygons that are outside the watershed boundary, WMS will use the watershed boundary to clip the land use polygons.
7. Select ***Mapping | Shapes −> Feature objects***, click "*Nex*t" and make sure that the fields are mapped properly. For example, the TEXTURE field should be mapped to Texture, HYDGRP should be mapped to SCS soil type, and so on. Click "*Next*" and click "*Finish*".
8. The selected soil polygons are now converted to a coverage in the WMS map module and saved in the WMS map file format. The GIS data is no longer needed once it is mapped to a coverage. Delete the soil shape file under GIS data (Right-click on *soilmu_a_ne055.shp* and select delete).