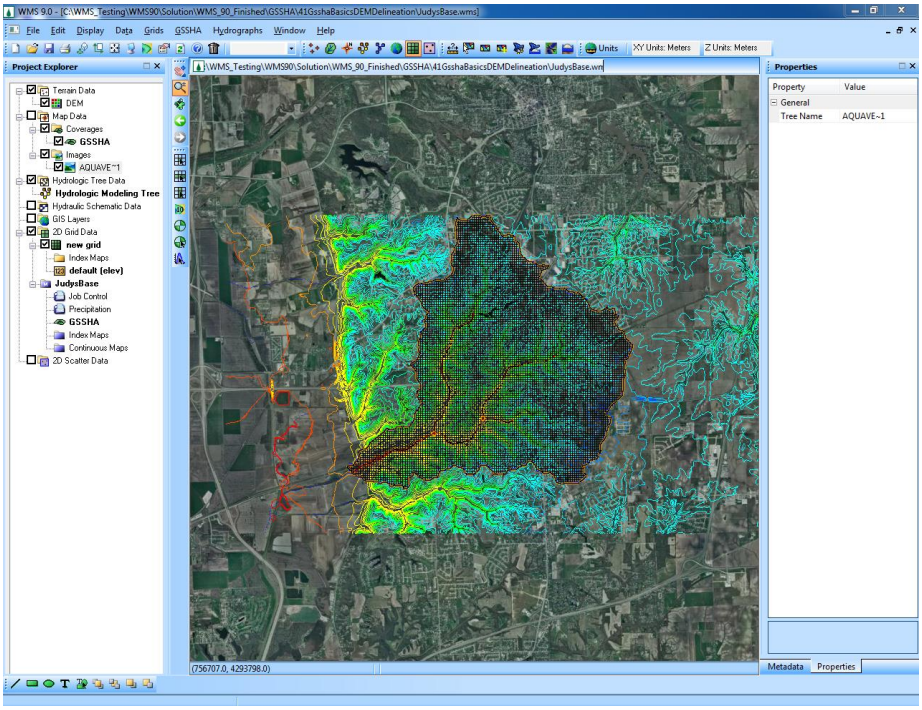
WMS

v. 10.1

WMS 10.1 Tutorial

GSSHA – WMS Basics – Watershed Delineation using DEMs and 2D Grid Generation

Delineate a watershed and create a GSSHA model from a DEM



Objectives

Learn how to delineate a watershed from a DEM using the hydrologic modeling wizard. Then learn how to convert the delineated watershed to a starting GSSHA model and generate a 2D grid in the WMS interface.

Prerequisite Tutorials

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

Required Components

- Data
- Drainage
- Map
- Hydrology
- 2D Grid
- GSSHA

Time

- 30-60 minutes

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1 Contents

2 Introduction

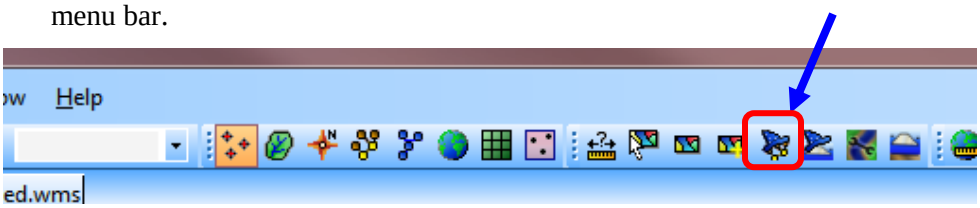
In this exercise, delineate a watershed using a DEM and generate a 2D grid.

3 Downloading and Importing DEM Data

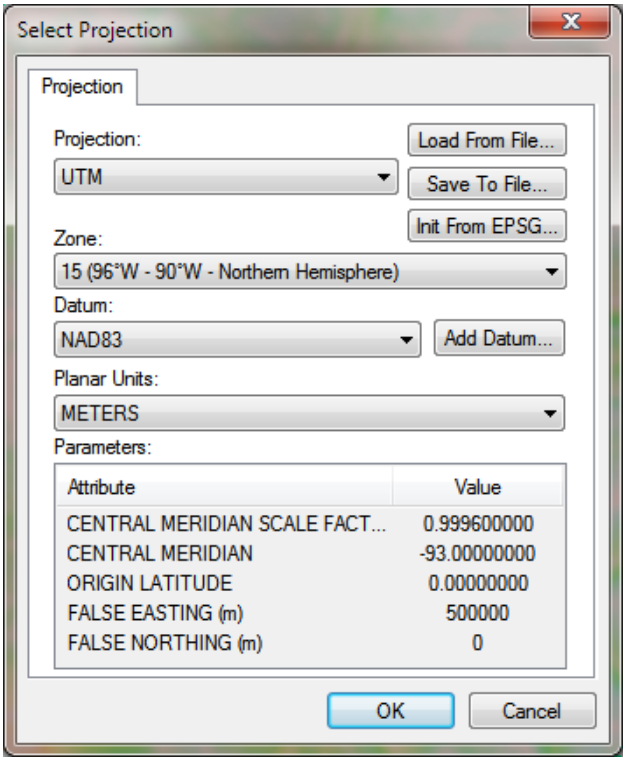
DEM data can be obtained from a variety of sources. If there already is a DEM stored on the computer, open it in WMS using the File | Open command. Alternatively, download DEM data from the USGS seamless server (http://seamless.usgs.gov/)

WMS has a web services tool that links directly to the USGS seamless data server. This tool can help download DEM data. Use the web services tool in this workshop.

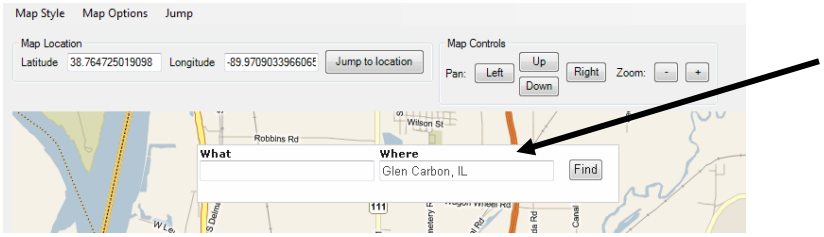
1. Click on the *Hydrologic Modeling Wizard* button located near the menu bar.



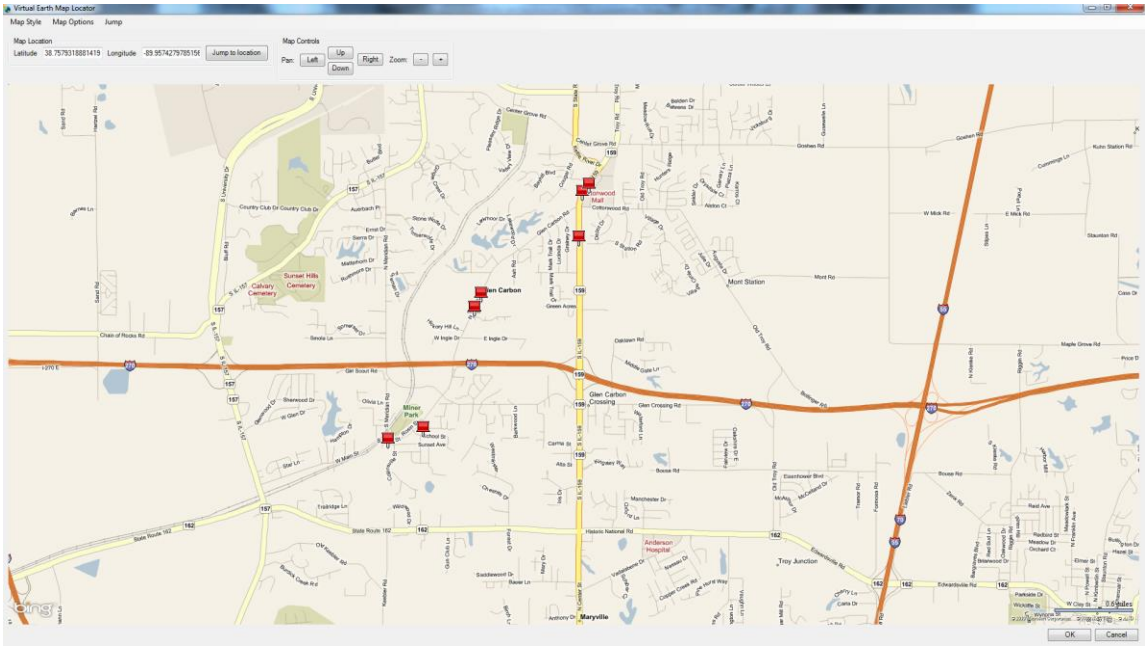
2. In the *Hydrologic Modeling Wizard* dialog, click on the *Browse* button.
3. Locate the ***Personal*** and ***Raw Data*** folders in the files for this tutorial. If needed, download the tutorial files from www.aquaveo.com.
4. Find the folder ***\Personal\WatershedDel*** and enter the project name ***JudysBranch.wms***.
5. Click the *Save* button.
6. Click *Next*
7. Click the *Define* button under the *Project projection.*
8. Select the *Global Projection* option (*Set Projection* if this is already selected) and enter the following information and click *OK*.



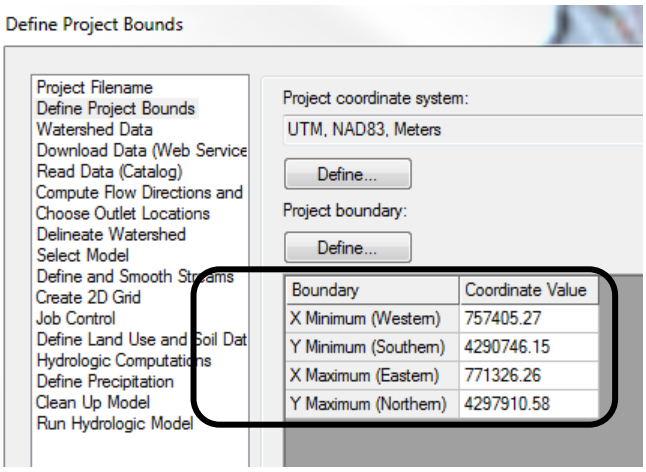
9. Select *NAVD 88(US)* for the vertical projection and *Meters* for the units and then select *OK* again.
10. Now, select the *Define* button to define the project bounds. This opens a map locator window and allows navigating to the project area.
11. Maximize the *Virtual Earth Map Locator* window and select the ***Locator Tool*** option. This will show a search field in the window.
12. In *Where* field, enter ***Glen Carbon, IL*** and click on the *Find* button.



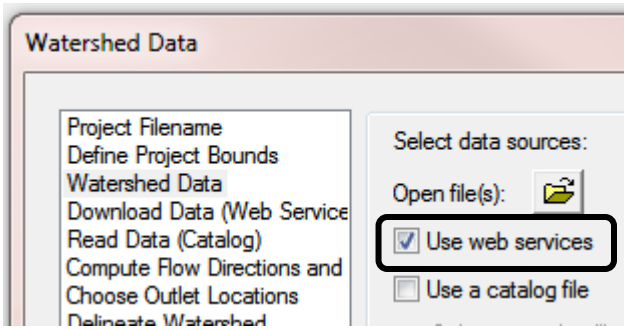
13. The map will show *Glen Carbon* Crossing approximately at the center of the window. Zoom in little more. Compare the display with the following figure.



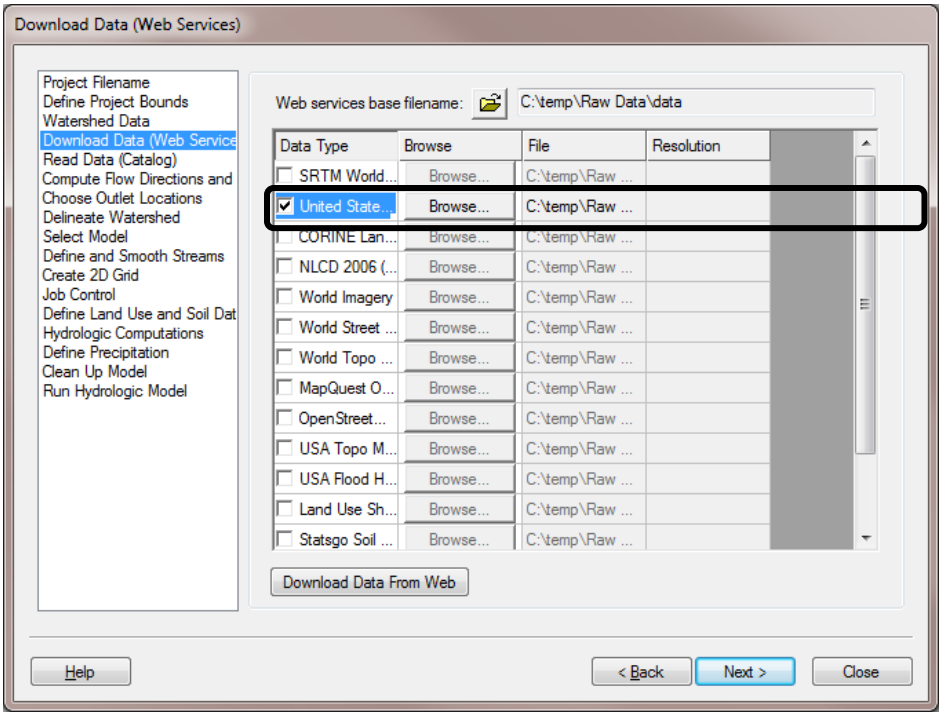
14. Click OK. WMS will now extract the bounding coordinates for the extent of the display of this map. Notice the coordinates listed in the wizard window as shown in the following figure.



15. Click *Next* and make sure that the *Use web services* option is toggled on. Click *Next.*



16. Select *United States Elevation Data (NED 10m resolution) option.* Scroll down and uncheck any other data that might be left toggled on. Only download the DEM at this moment.
17. Then click *Download Data From Web.* Click *OK* to accept suggested DEM cell size.

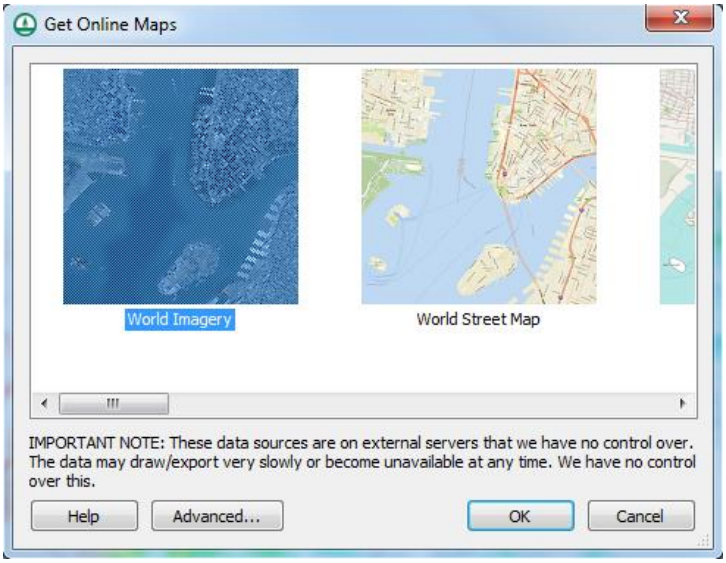


18. WMS will download the DEM data for the watershed (Note: There are times when the web services may be unavailable so if WMS does not download the data directly, download the data outside of WMS. Download the DEM data from the USGS at http://nationalmap.gov/viewer.html. Alternatively, if unable to download the DEM and/or image, a copy can be found in ***RawData\ JudysBranch\DEM)***.
19. If successfully downloaded, WMS will perform coordinate transformation and plot the elevation contours.

4 Downloading background image

WMS can display background images such as aerial photographs, topo maps etc. There are a variety of online sources where these images can be downloaded for free. WMS has tools that allow displaying and downloading images for a project area.

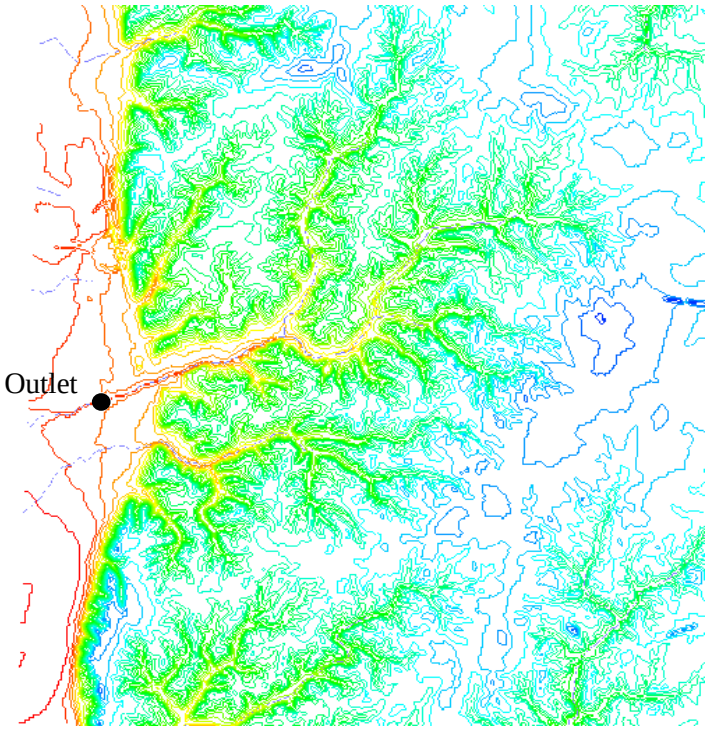
1. Select the *Get Online Maps* tool located in the *Add GIS Data* drop-down menu in the Get Data menu bar. The *Get Online Maps* dialog will appear.
2. Select *World Imagery* in the *Get Online Maps* dialog and click *OK*.



3. WMS will load the background image file. It will take a few moments depending upon the internet connection. Once done, an aerial photo is added to the background.

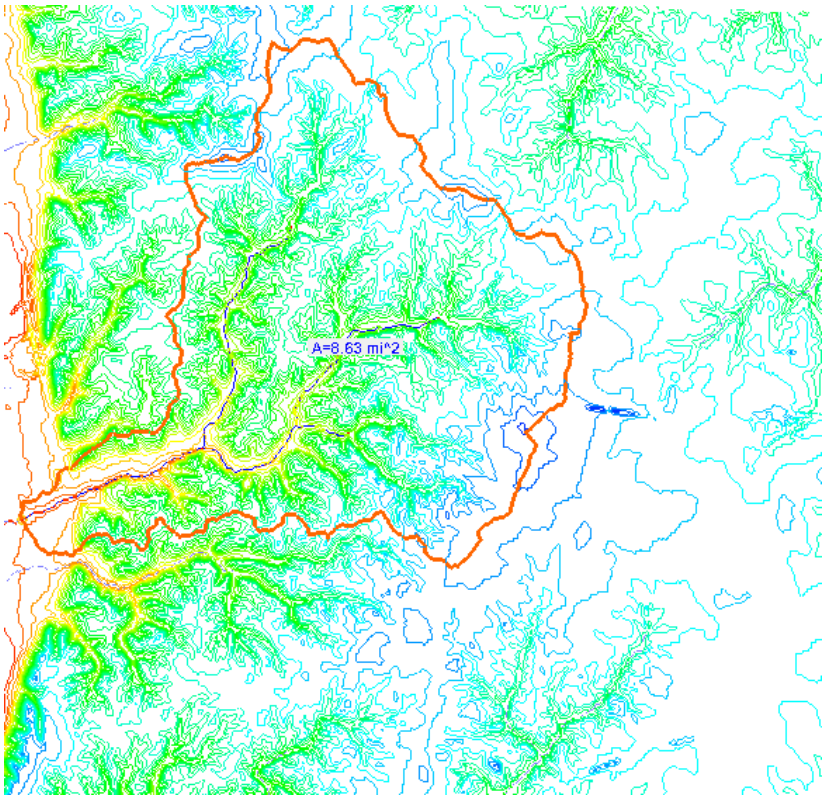
5 Computing the Flow Directions and Flow Accumulations

1. To delineate a watershed, be in the *Drainage Module*. Click  to select the drainage module.
2. Select ***DEM | Compute Flow Direction/Accumulation*** and Click *OK*. When the Units dialog appears, change *Basin Areas* to *Square Miles* and *Distances* to *Feet* and click *OK*. TOPAZ will compute the flow direction and accumulation and infer the streams based on the DEM data.
3. Click on "Close" after computations are complete. It will probably take a few seconds to finish, but it is done when the last line of text in the model wrapper reads "Normal Program Termination".
4. Now there are lines representing areas of flow accumulation above a threshold value on the display. These are the areas where flow accumulates on the DEM, and these areas may represent stream channels.
5. Create an outlet point to delineate a watershed. Select the *Create Outlet Point Button*  . Locate the point where the outlet for the watershed should be. See the following figure for the approximate location of the outlet (use the middle scroll button of the mouse to zoom in or out).



6 Delineating the Watershed

1. Select ***DEM* | *DEM* → *Stream Arcs…***. Make sure the stream threshold value is set to ***1 sq. mile***. Click *OK*.
2. Select ***DEM* | *Define Basins***
3. Select ***DEM* | *Basins* → *Polygons***
4. Select ***DEM* | *Compute Basin Data***. Click *OK*.
5. Click on the "*Frame*" button  . The watershed should look somewhat like the following figure.



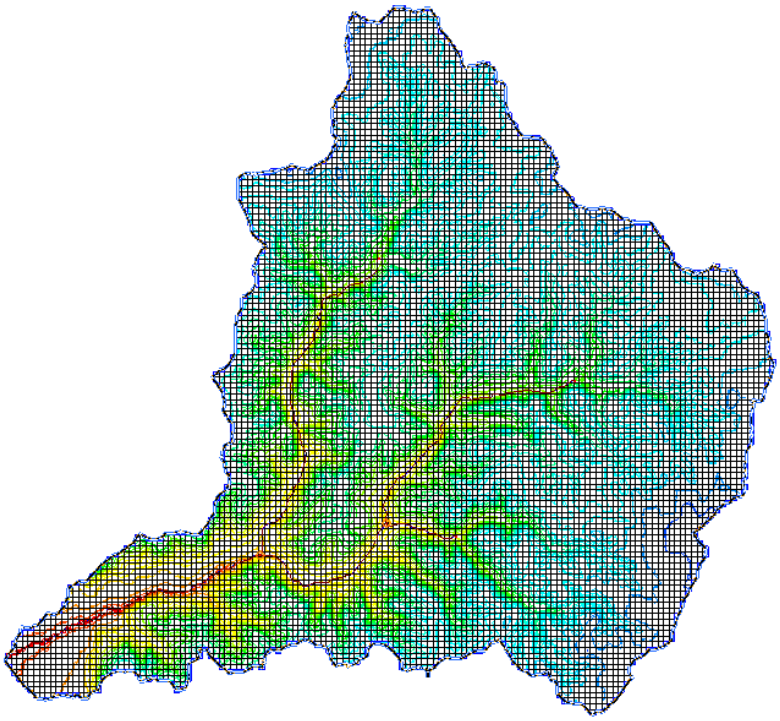
6. Save the WMS project by selecting ***File | Save.***
7. Save it as ***Personal\WatershedDel\JudysBase.wms***.
8. Click *Yes* to save the image files in the project directory. Note that at this point a watershed has been completed. The saved project can be opened and started over with the following steps for creating the GSSHA model if a mistake was made.

7 2D grid generation

To develop a GSSHA model, generate a two-dimensional finite difference grid.

1. Switch to the *Map Module*.
2. Click on the *Select Feature Polygon Tool* and right-click anywhere within the watershed polygon. Then select *Create Grid* in the popup menu that appears.
3. Select *Yes* to confirm creating a GSSHA grid.
4. Make sure the *Base Cell Size* option is checked on and enter **50m** as the cell size and click *OK*.
5. Click *OK* to interpolate grid cell elevations from the DEM, and select *NO* when prompted if wanting to delete the DEM data.
6. Grid cells are now covering the watershed. Notice that under the *Coverages* in the data tree, the *Drainage* coverage has been now changed to *GSSHA*.

7. Do NOT save the WMS project because the GSSHA grid information and model are saved to a GSSHA project file instead of to a WMS project.
8. Switch to the *2D grid Module* and select ***GSSHA|Save Project file...***
9. Save the project as ***\Personal\WatershedDel\JudysBase.wms***.



8 Workshop Tasks

1. Delineate a watershed in an area of interest by following the steps described in this tutorial.
2. If there is already a DEM for the area, open it in WMS (skip the section on downloading and importing DEM data).