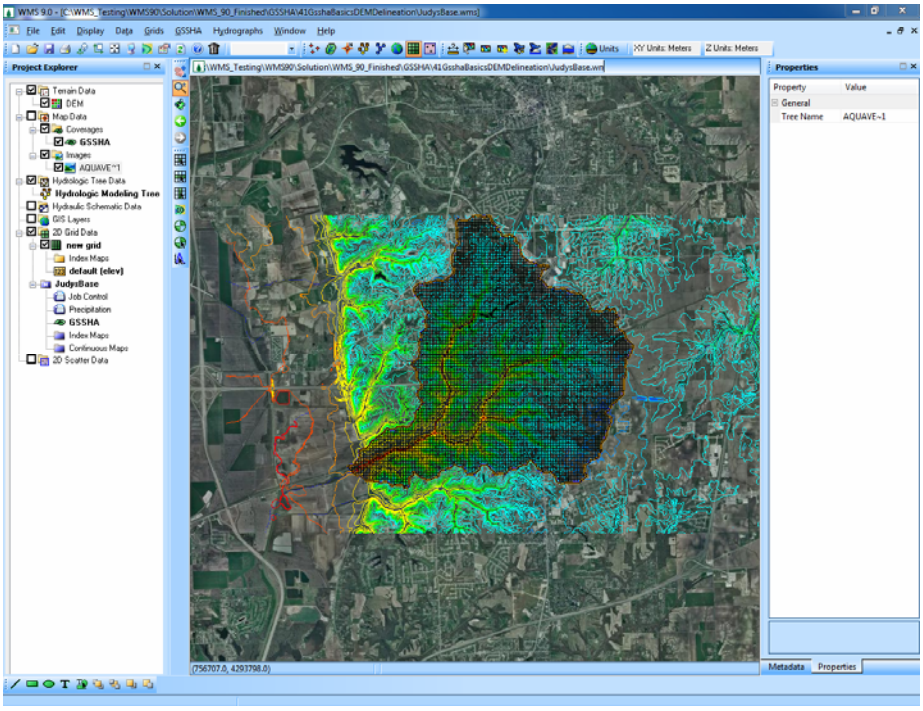
WMS

v. 9.0

WMS 9.0 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

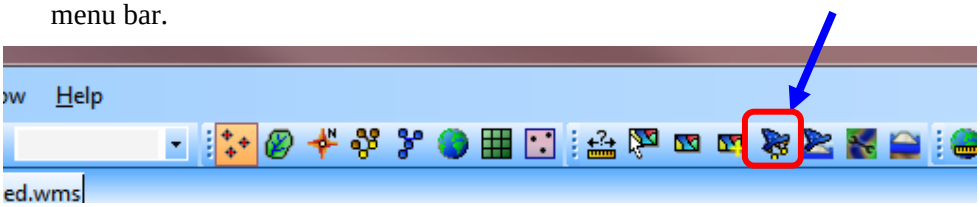
In this exercise you will delineate a watershed using a DEM and generate a 2D grid.

3 Downloading and Importing DEM Data

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

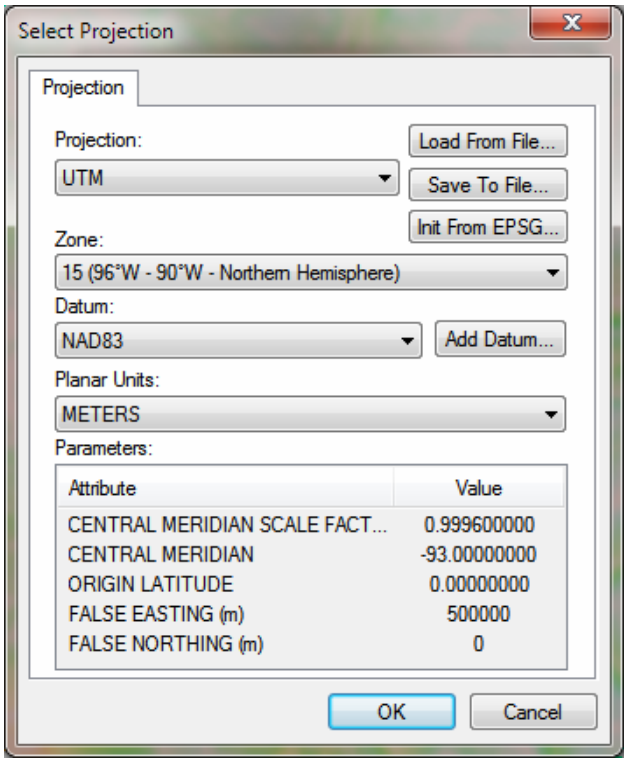
WMS has a web services tool that links directly to the USGS seamless data server. This tool can help you download DEM data. We will use the web services tool in this workshop.

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 ***GSSHA Distributed Hydrologic modeling*** folder in your tutorial files. If you have used default installation settings in WMS, the tutorial files will be located in ***\My documents\WMS 9.0\Tutorials\.***
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*.

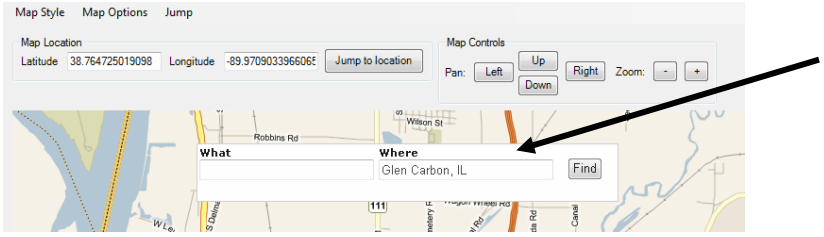


9. Select *NAVD 88(US)* for your vertical projection and *Meters* for your units and then select *OK* again.

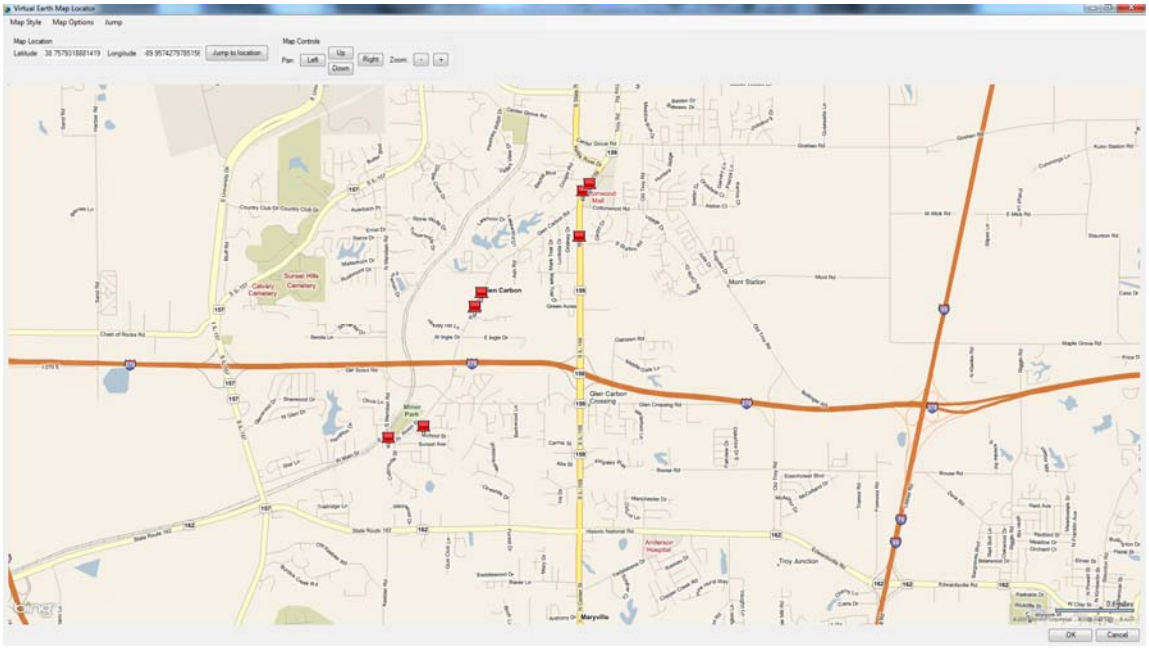
10. Now, select the *Define* button to define the project bounds. This opens a map locator window and lets you navigate to your project area.

11. Maximize the *Virtual Earth Map Locator* window and select ***Map Options | Show Locator Tool.*** This will show a search field in the window.

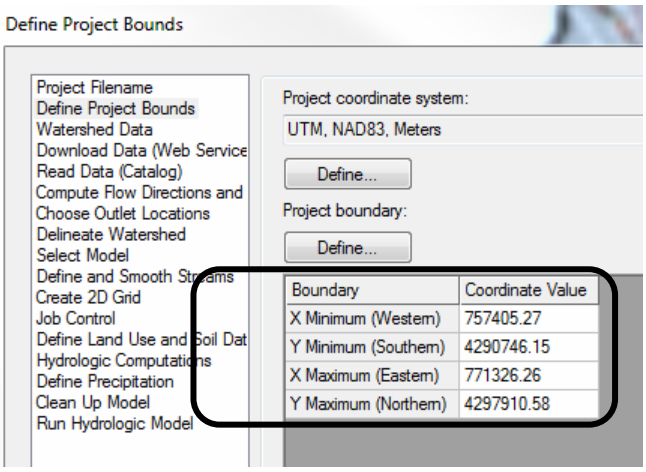
12. In *Where* field, enter ***Glen Carbon, IL*** and click on the *Find* button.



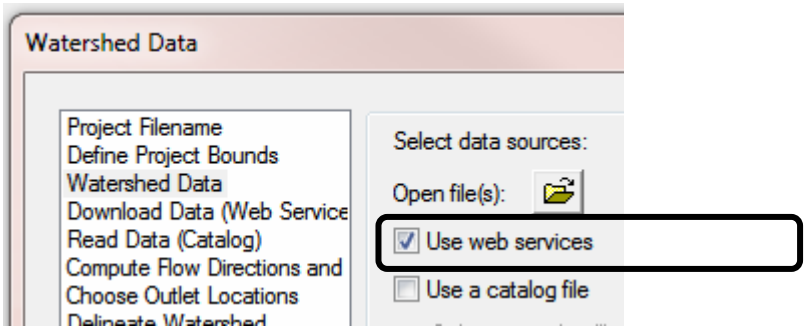
13. The map will show *Glen Carbon* Crossing approximately at the center of the window. Zoom in little more. Compare your display with the following figure.



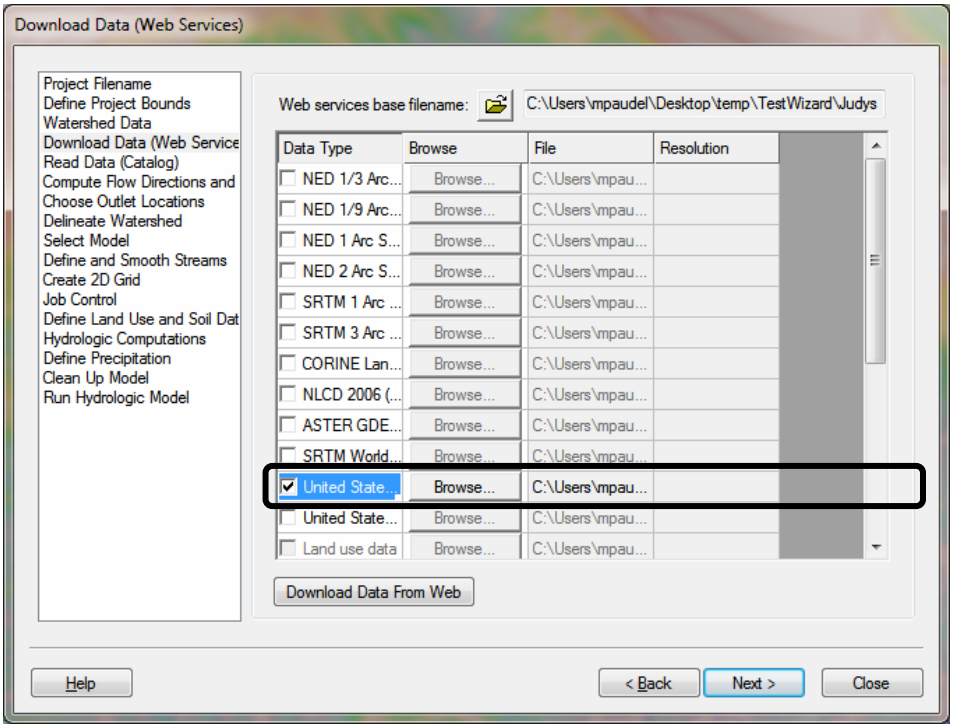
14. Click OK. WMS will now extract the bounding coordinates for the extent of the display of this map. You can see the coordinates listed in the wizard window as shown in the following figure.



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. We are downloading only the DEM at this moment.
17. Then click *Download Data From Web.* Click *OK* to accept suggested DEM cell size.

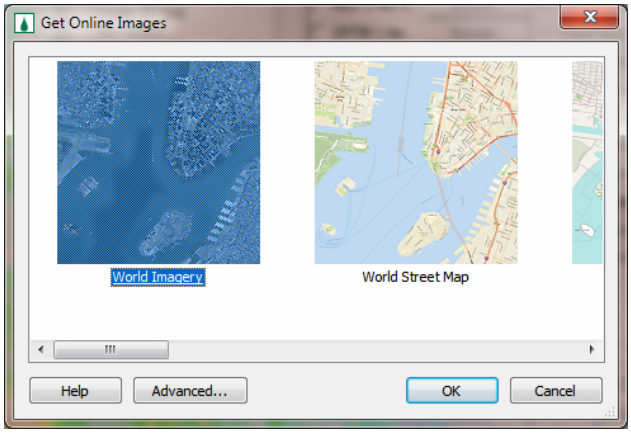


18. WMS will download the DEM data for the watershed (Note: There are times when the web services may be unavailable so if WMS does not download the data directly you could download the data outside of WMS. You can download the DEM data from the USGS at http://seamless.usgs.gov . Alternatively, if you were unable to download the DEM and/or image, you can find a copy in ***\GSSHA Distributed Hydrologic modeling\RawData\JudysBranch\DEM)***.
19. If successfully downloaded, WMS will perform coordinate transformation and plot the elevation contours.

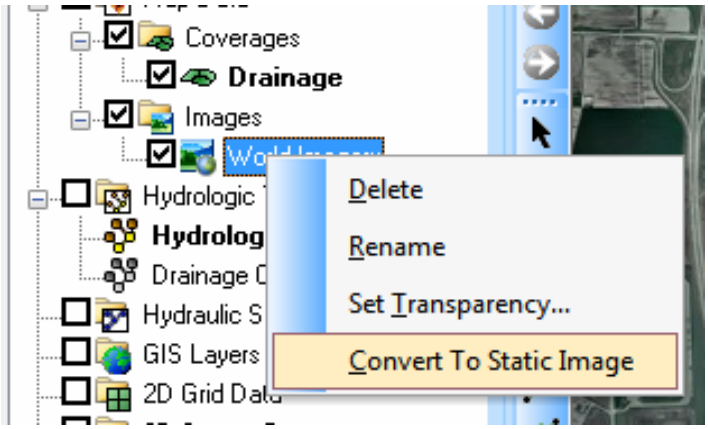
4 Downloading background image

WMS can display background images such as aerial photographs, topo maps etc. There are variety of online sources where these images can be downloaded for free. WMS has an inbuilt tool which connects with an image server and you can display/download such images for the project area.

20. Select *Get Online maps* tool  located near the menu bar.
21. Select *World Imagery* in *Get Online* Images dialog and click *OK.*



22. WMS will now download the aerial photo and zoom in the area where you have your DEM downloaded in previous step.
23. The background image is displayed as soon as WMS read the image from the server. But, this image will take little longer to zoom and pan around as it is still being read from the server. It is advisable to get a local copy of the image.
24. In the project explorer, right click *World Imagery* under *Images* folder and select *Convert to Static Image*.



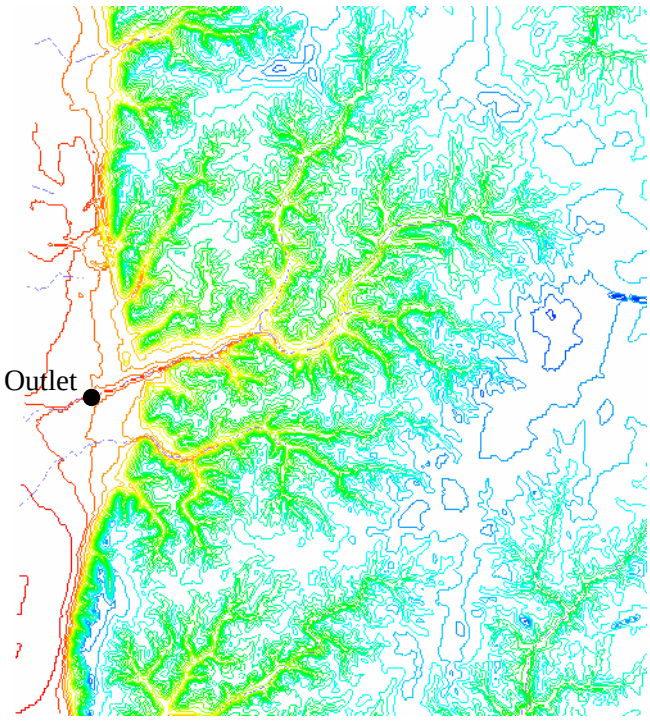
25. Enter *Resample magnification* value of 3 which tells WMS to download three times as higher resolution of the image as it is being displayed on the screen.
26. After it completes, you can remove *World Imagery* under the *Images* folder in the project explorer.

5 Computing the Flow Directions and Flow Accumulations

1. To delineate a watershed you should be in the *Drainage Module*. Click  to select the drainage module.
2. Select ***DEM | Compute Flow Direction/Accumulation*** and Click *OK* twice. TOPAZ will compute the flow direction and accumulation and infer the streams based on the DEM data.

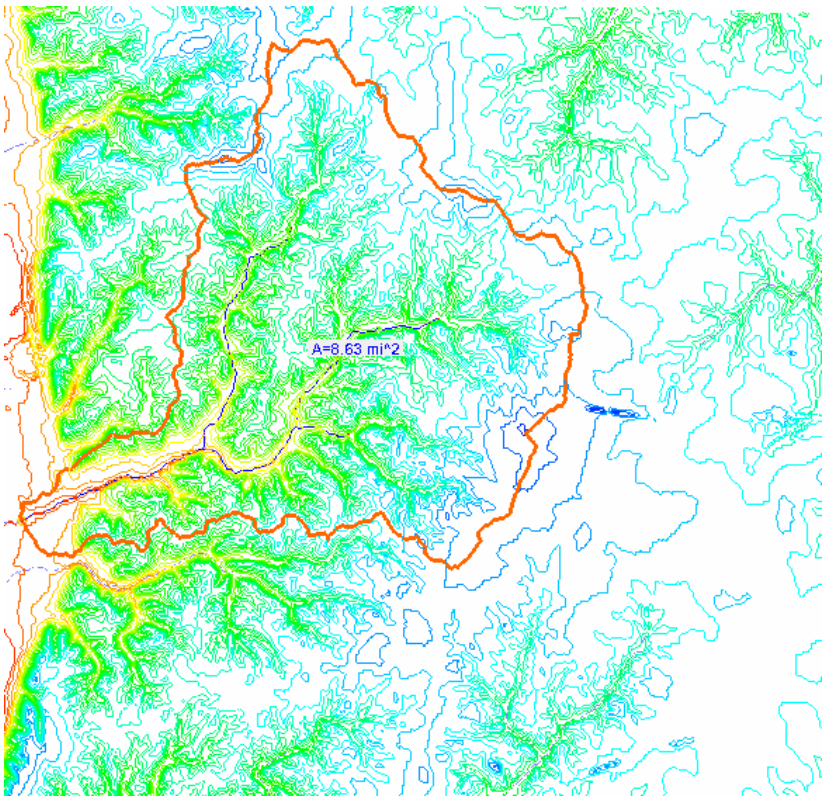
3. Click on "Close" after computations are complete. It will probably take a few seconds to finish, but you can know it is done when the last line of text in the model wrapper reads "Normal Program Termination".
4. You can now see lines representing areas of flow accumulation above a threshold value on the display. These are the areas where flow accumulates on the DEM, and these areas may represent stream channels.

5. You need to create an outlet point to delineate a watershed. Select the *Create Outlet Point Button*  . Locate the point where you want the outlet for the watershed to be. See the following figure for the approximate location of the outlet (you can 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  . Your watershed should look somewhat like the following figure.



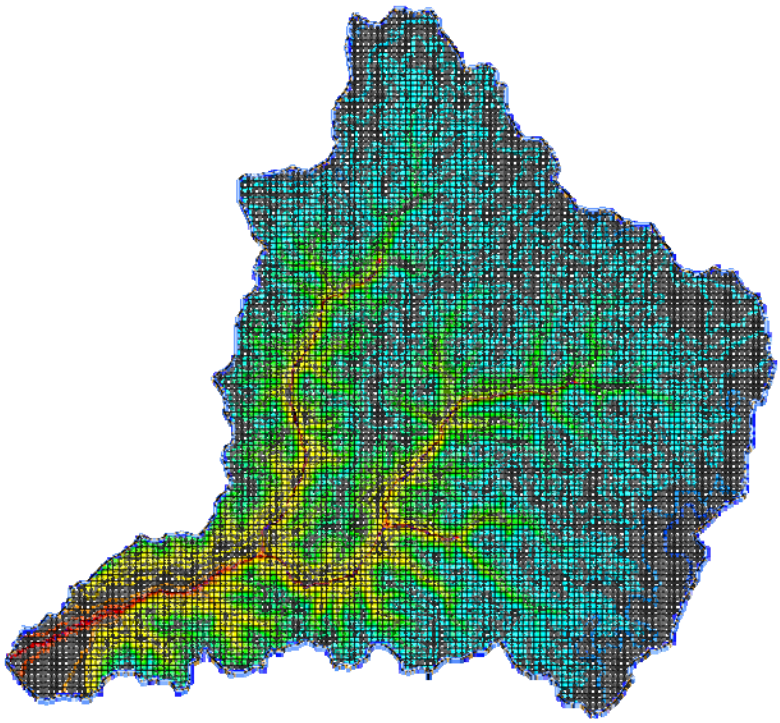
6. Save your WMS project by selecting ***File | Save.***
7. Save it as ***\GSSHA Distributed Hydrologic modeling\Personal\WatershedDel\JudysBase.wms***.
8. Click *Yes* to save the image files in the project directory. Note that at this point you have a completed watershed and you can always open this saved project and start over with the following steps for creating your GSSHA model if you make a mistake.

7 2D grid generation

To develop a GSSHA model, you will need to 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 that you are 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 you want to delete the DEM data.

6. You can now see grid cells 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 ***\GSSHA Distributed Hydrologic modeling\Personal\ WatershedDel\JudysBase.wms***.



8 Workshop Tasks

1. You can delineate a watershed in your area of interest by following the steps described in this tutorial.
2. If you already have a DEM for your area, open it in WMS (you can skip the section on downloading and importing DEM data).