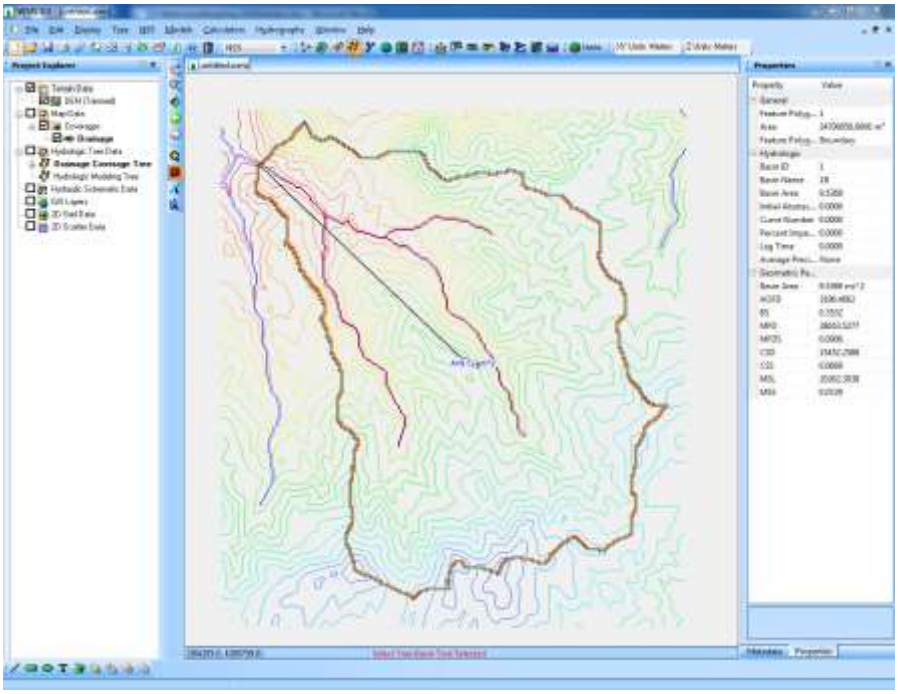
WMS

v. 10.0

WMS 10.0 Tutorial

Watershed Modeling – National Streamflow Statistics Program (NSS) Interface

Use the NSS interface to estimate peak flows at different recurrence intervals



Objectives

Delineate a basin for an area of interest and run NSS to estimate peak flows at different recurrence intervals. Also, learn how to use an NSS region coverage to automatically compute regions for an NSS model.

Prerequisite Tutorials

- Watershed Modeling – DEM Delineation

Required Components

- Data
- Drainage
- Map
- Hydrology

Time

- 15-45 minutes

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1 Introduction

The National Streamflow Statistics program, developed by the USGS, provides a quick and easy way of estimating peak flows for ungaged watersheds. This data can be used in the design of culverts, flood-control structures, and flood-plain management. It utilizes regression equations that have been developed for each state. Most regression equations are functions of parameters such as area, slope, and runoff distance that are automatically computed by WMS when delineating a watershed.

Users were already introduced to this program in a previous chapter discussing overlay and time of travel computations (Volume 2, Chapter 3). In this exercise users will have the chance to review data collection and starting a project from scratch. Users will then run the NSS program for their selected area to compute the peak flows for the different return periods. If the equation ends up needing variables not derived from the DEM alone, then users might consider doing the general overlay in order to compute percentages of land use, soil, or rainfall for different regions.

2 Utilizing an NSS Region Coverage

This portion of the exercise will teach users how to create an NSS region coverage that can be used to map equations for a given state, using Florida as an example.

The NSS Region coverage type allows WMS to automatically determine which regression equations to use for an NSS simulation. Additionally, if a drainage basin overlaps multiple NSS regions, the NSS Region coverage automates the calculations for the percentage of the watershed in each region.

Users will now use an NSS Region coverage to automatically assign the region for an NSS simulation. This coverage was digitized from an image that displays the NSS regions of Florida. This image was obtained from the NSS documentation and users could make a similar map by scanning (or capturing if electronic) a map of the regions to create an image file, registering the image to a recognized projection system, digitizing the polygons (most states have less than 10 regions so it would take only a few minutes to digitize), and assigning the state and region. Details on how to scan images and create polygons by digitizing are given in the chapters on images and feature objects (see Volume 1). The USGS website (http://water.usgs.gov/software/NSS/ for NSS has images available in the state by state documentation of the equations. These images can be saved and then registered in WMS. In this example users will read in an image that has already been registered and polygons that were digitized from the image.

1. Switch to the **Map** module.
2. Select *File* | **Open**.

3. In the *Open* dialog, locate the "nss" folder in the files for this tutorial. If needed, download the tutorial files from www.aquaveo.com.
4. Select "NSSMapFL.jpg" and click **Open**.

2.1 Assigning Regions to Feature Polygons

Users see from the image that Florida has three regions: A, B, and C. Users will now open a WMS .map file that contains these three polygons in an NSS Region coverage. In the interest of time the polygons have already been digitized (see the tutorial on feature objects in "3 Introduction-BasicFeatureObjects" for more information about digitizing/building polygons), but the assignment of attributes (state/region) has been left for users to do.

1. Select *File* | **Open**.
2. Open *"NSSMapFL.map"*

This file was digitized directly from the image. If users wish to use an image of their own later on, they can refer to the earlier tutorial "3 Introduction-BasicFeatureObjects" to review information on how to digitize features from images.

3. Make sure the Map module is still active and select the **Select Feature Polygon** tool.

Figure 1 Map broken into regions

4. Double-click in the polygon corresponding to the region labeled 1, as shown in Figure 1.
5. The *NSS Region Polygon Attributes* dialog will appear. Choose "Florida" from the *State* list.
6. Choose "Rural Region 1" from the *NSS Region* list.
7. Select **OK**.
8. Assign NSS Regions for the remaining polygons in the same manner, repeating steps 4-7.

2.2 Opening the Watershed

1. Select *File* | **Open** .
2. In the *Open* dialog, locate and open "NSS_FL.wms".

At this point, the study area appears as a small polygon. Users will zoom in to better distinguish the area.

3. Right-click on the "Drainage" coverage in the Project Explorer and select the **Zoom to Layer** menu item. This will zoom in on the region indicated in Figure 2. After zooming the Main Graphic Window should look like Figure 3 below.

Figure 2 Zoom area

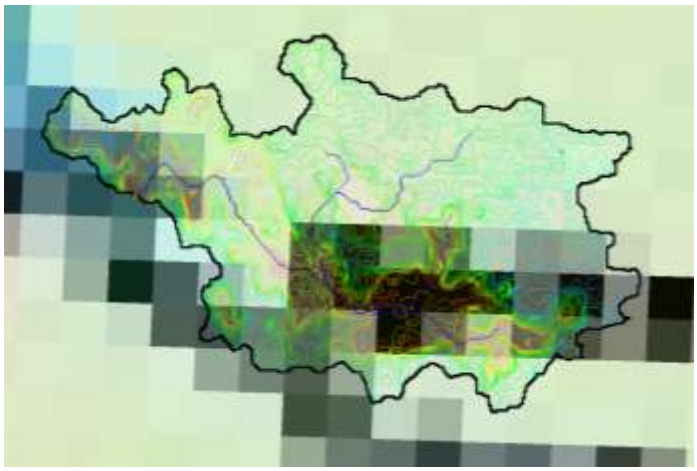

Figure 3 Zoomed in area

4. Right-click on "DEM" in the Project Explorer and select **Display Options** to open the *Display Options* dialog.

5. Choose the *DEM Data* option in the window on the left of the dialog if it is not already selected.
6. Toggle off the check box for displaying *DEM Contours*.
7. Select **OK**.
8. Right-click on the "Drainage" coverage in the Project Explorer and select **Compute Basin Data**.
9. In the *Units* dialog, select the **Current Projection** button.
10. In the *Display Projection* dialog, make sure *Global Projection* is selected.
11. Click the **Set Projection** button.
12. In the *Select Projection* dialog, ensure "Meters" are selected in the *Planar Units* drop down box.
13. Select **OK** to close the *Select Projection* dialog.
14. Back in the *Display Projection* dialog, ensure "Meters" are selected as the *Vertical units*.
15. Select **OK** twice to close the dialogs.
16. Because users changed the projection, the full extents of the data may be shown. If this happens, right-click on the "Drainage" coverage and select the **Zoom to Layer** menu item to zoom back in.

2.3 Running NSS

1. Switch to the **Hydrologic Modeling** module.
2. Make sure Model combo box is set to "NSS".
3. Choose the **Select Basin** tool.
4. Double-click on the icon for Basin 1B.
5. When prompted to use polygons, select **Yes**. The *National Streamflow Statistics Method* dialog will appear.

Notice that the regression equation is automatically selected. Also, if the basin had overlapped with another NSS region, the areas and percentages of overlap for each region would also have been calculated.

6. Enter "10.8" for the *Percent Storage from NLCD1992* variable. This is found in the middle of the dialog box, under the *Variable values* heading.
7. Select the **Compute Results** button. Information should appear in a table below.
8. Select **Done**.

The NSS Region coverage allows WMS to automatically load the appropriate regression equation(s) when users open the NSS dialog. This might not save users a great deal of time if they are only running the simulation once for a single basin. Nevertheless, if users plan to study many different basins on a regular basis, then creating an NSS Region coverage for their state would prove to be very efficient.

3 Conclusion

In this exercise, users have discussed the following concepts in conjunction with setting up an NSS simulation:

1. How to calculate important parameters with the Compute Basin Data command
2. How to use an NSS Region coverage to automatically determine which equations should be used and to compute any areas of NSS region overlap