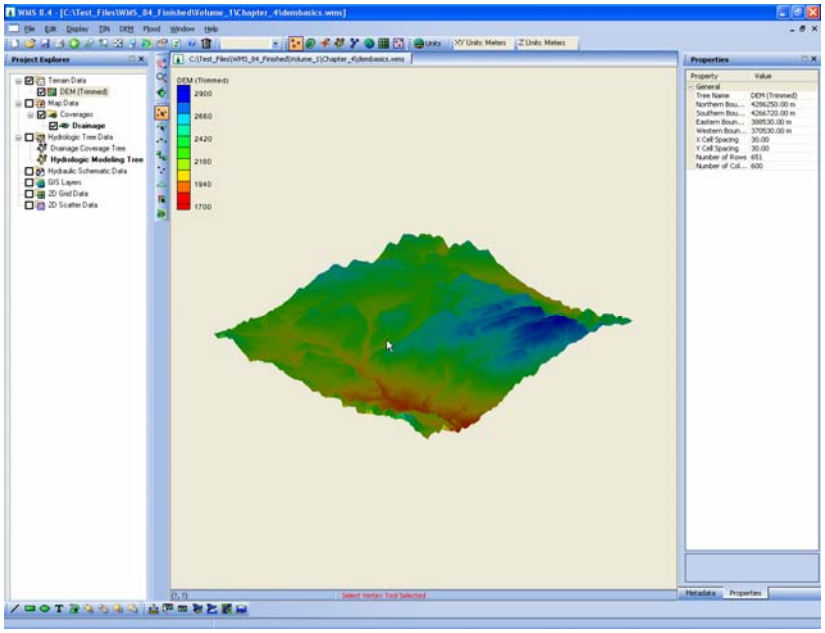
WMS

v. 8.4

WMS 8.4 Tutorial

Editing Elevations – DEM Basics

Import, view, and edit digital elevation models



Objectives

Import DEMs from an online database. Set the display options of an imported DEM and view and edit the DEM attributes.

Prerequisite Tutorials

- None

Required Components

- Data
- Map

Time

- 20-30 minutes

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1 Contents

2 Introduction

Digital Elevation Models (DEMs) are the most commonly available digital elevation source and therefore an important part of using WMS for watershed characterization. A DEM is a rigid data structure that contains a two-dimensional array of elevations where the spacing between elevations is constant in the x and y directions. In the US, DEMs are downloadable from the Internet at 30-meter (1:24,000 map series) and 90-meter (1:250000 map series) resolutions. The USGS has recently deployed the National Elevation Dataset which is a continuous elevation map at 30-meter resolution. Blocks of 100 MB or less can be downloaded for free from the NED website.

The Arc/Info ASCII grid format is common throughout the GIS world and is common outside the US. The basics of downloading, importing, editing, and displaying DEMs will be demonstrated in this exercise. Actually using the DEM for watershed delineation is the subject of the next chapter.

3 Objectives

In this exercise you will learn the basics of importing, viewing and preparing DEMs for automated watershed delineation. This includes the following:

1. Importing USGS DEMs from different formats
2. Tiling multiple DEMs together
3. Editing DEM elevations
4. Setting DEM display options

4 Getting DEMs from the Internet

In this part of the exercise, you will learn how to download DEM data from the National Elevation Dataset website at http://ned.usgs.gov/. Instead of bookmarking this site, you can bookmark the GeoSpatial Data Acquisition (GSDA) homepage: http://xmswiki.com/wiki/GSDA:GSDA. This site contains links to this and many other sites where you can get DEM data.

If you do not have an Internet connection you can still work through this exercise using the files which have been downloaded already and placed in the tutorial directories by skipping ahead to section 5 now.

4.1 USGS National Elevation Dataset

The USGS National Elevation Dataset (NED) provides continuous 1:24,000-scaled DEM data for all of the contiguous US and 1:63,360-scale DEM data for Alaska. To access this data, complete the following steps:

1. Go to http://seamless.usgs.gov, and then click on *View and Download United States Data*. (You could also go to GSDA site and click on *DEM*, then click on *DEM Data from USGS Seamless Map*)
2. Choose the *Find* tool  and type in *"Richfield"*
3. Click the *OK* button
4. Find the Richfield in SEVIER county, UT and click *Goto*
5. On the Display Tab on the right of the screen, click on the arrow next to *Hydrography*
6. Select the check boxes next to *National Atlas and NHD Streams* and *National Atlas and NHD Waterbodies* as shown in Figure 4-1. The map should automatically update.

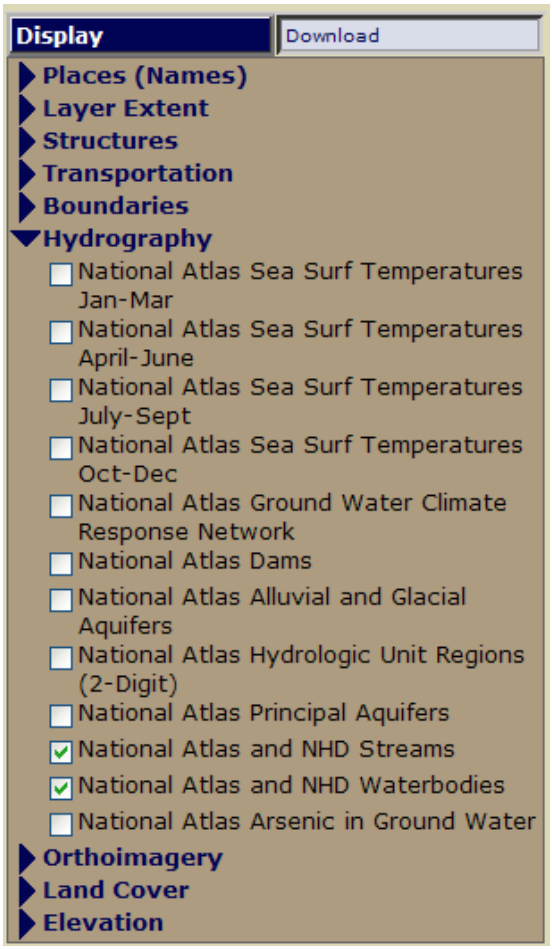

Figure 4-1: Display Layers

7. Use the *Zoom* tool to frame the area shown in Figure 4-2

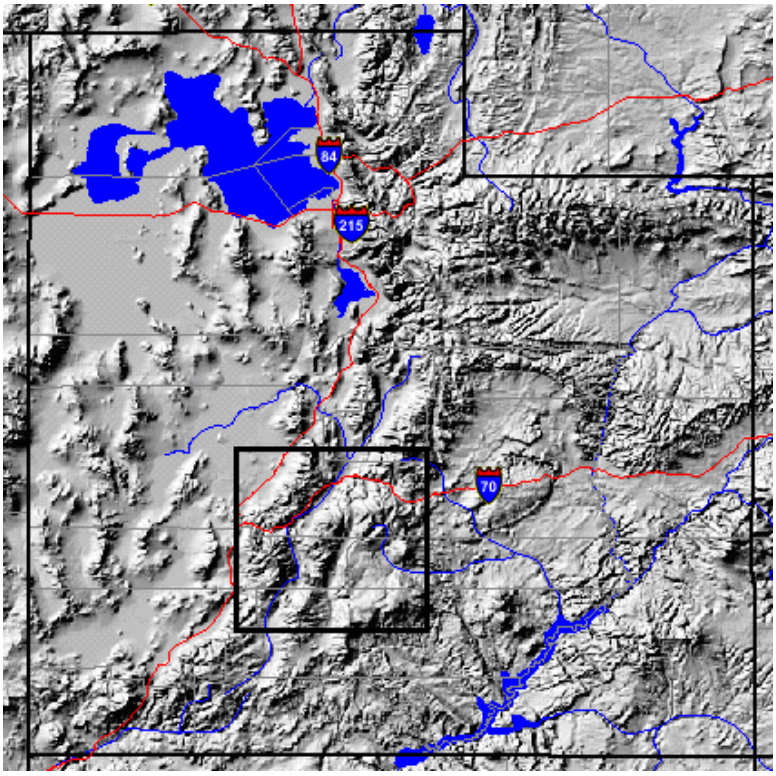

Figure 4-2: Zoom Window

8. Under the Download section, choose the Download Area tool 
9. Make the rectangle shown in Figure 4-3. An order confirmation page should come up

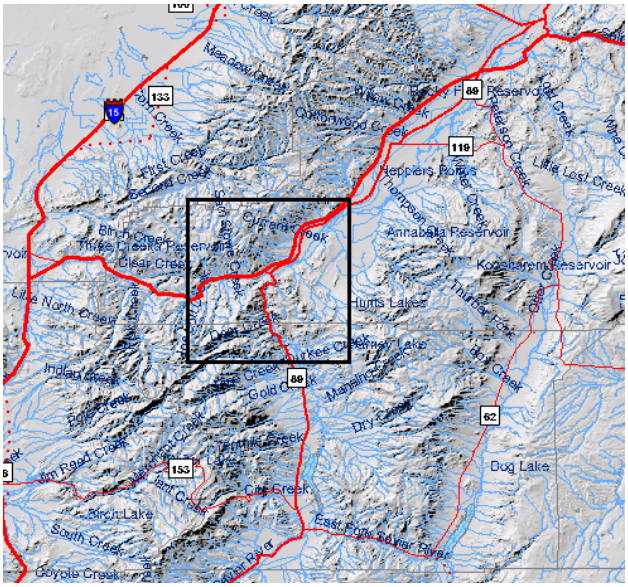

Figure 4-3: Download Selection Window

4.2 Getting the Format Correct

By default the DEMs are downloaded in a format (binary ArcGrid) that WMS cannot read. However there are options for the data like the file format that can be changed. Using the *Modify Data Request* option you can change the file format from ArcGrid to GridFloat. The GridFloat format is recognized by WMS. Here is how you do it:

1. Select the *Modify Data Request* button
2. Select *GridFloat* from the Data Format drop down box next to National Elevation Dataset (NED) 1 Arc Second
3. Select the *Save Changes & Return to Summary* button
4. If you are using Internet Explorer as your browser, hold down the Ctrl key and click the *Download* link when the request summary page displays again. Keep the Ctrl key pressed until after you select the Save button to save your file. Save the .zip file to a location where you can unzip it
5. Use WinZip, or any unzipping utility to unzip the file that you download. If you were not successful downloading the DEM data you can use the DEM file located in the NED directory

If you wish, you can open this DEM in WMS.

6. Close all instances of WMS
7. Open WMS
8. Select ***File | Open*** 
9. Locate the folder ***C:\Program Files\WMS84\tutorial\dembasics*** (or wherever you saved your files)
10. Open *"ned_Richfield.hdr"* (or the *.hdr* file within the NED directory you downloaded and unzipped)
11. Select *OK*
12. Select *No* when prompted to convert coordinates

WMS should read in the DEM, and it should be similar to other DEM files you have read in.

5 Merging DEMs

The area you are studying may lie across two or more DEM quads. WMS is able to merge multiple DEM files that span quad sheets. To see how this works, complete the following steps:

1. Select ***File | New*** 
2. Select ***File | Open*** 
3. Locate the folder ***C:\Program Files\WMS84\tutorial\dembasics***
4. Find and multi-select *"josephpeak.dem"*, *"redridge.dem"*, *"marysvalecanyon.dem"*, and *"trailmountain.dem"*
5. Choose *Open*

You will be taken to the Importing USGS DEMs manager. The area covered by the DEM you have selected will be colored in a box near the center of the dialog. The boundaries of your DEM area will show up in the four edit boxes.

6. Select *OK*

By multi-selecting the DEMs you want, you can read in all the quads you need at the same time. WMS is able to read in an unlimited number of DEMs at a time (unless your computer runs out of memory). You can read in multiple DEMs in the standard USGS format (from the WebGIS site), the SDTS format, or Arc/Info ASCII grid format, but you cannot mix and match formats in WMS (you could export any DEM in the Arc/Info ASCII grid format in order to get them all to a common format, though). You cannot tile multiple DEMs from the NED site (this should not be a problem though since the data from this site is "seamless" in the first place).

6 Trimming DEMs

WMS allows you to select the portion of the DEM you need and eliminate all of the surrounding elevation points. This can be done either with an existing polygon or with a polygon entered interactively.

6.1 Trimming DEMs

1. Right-click on *DEM* in the Project Explorer and select ***Trim* | *Polygon***
2. Choose the *Enter a polygon interactively* option
3. Select *OK*
4. Click each of the four vertices of the polygon shown in Figure 6-1, double-clicking on the last to close the polygon

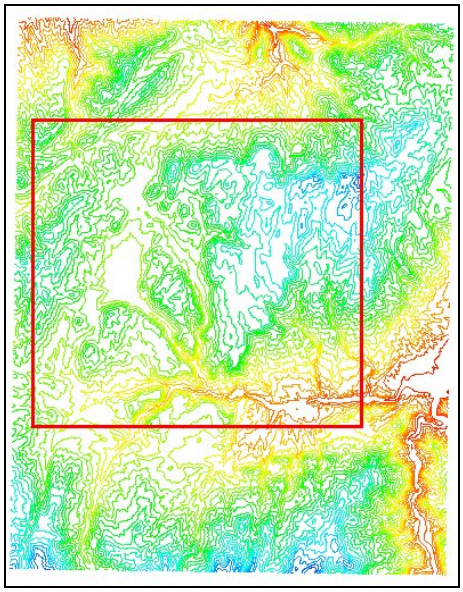

Figure 6-1: DEM Trim Area

7 Displaying DEMs

7.1 Contour Options

WMS has several options for displaying DEMs. You can change the contour display options by following these steps:

1. Right-click on *DEM* in the Project Explorer and select ***Contour Options…***  in the pop-up menu
2. Under Contour Interval, select *Number of Contours* and set the edit box value to **10**
3. Select *OK*

You can see that there are fewer contours and they are spread farther out now.

4. Right-click on *DEM* in the Project Explorer and select ***Contour Options…***  in the pop-up menu
5. Under Contour Method, select *Color Fill*

This option will "color in" the contours.

6. Choose the *Legend* button
7. Under Legend Specifications, check the *Display Legend* check box
8. Select *OK* twice

You can go back into the Contour options dialog and explore more of the contour display options if you wish.

7.2 Point Display Step

Next you will explore the point display step option:

1. Right-click on *DEM* in the Project Explorer and select ***Display Options***  in the pop-up menu.
2. Change the number in the Point Display Step edit box to **4**
3. Select *OK*

You can see that the display is not as smooth now.

4. Right-click on *DEM* in the Project Explorer and select ***Display Options***  in the pop-up menu.
5. Change the Point Display Step to **12**
6. Select *OK*
7. Change the Point Display Step back to **2**

Raising the point display step will allow your DEM display to refresh noticeably faster, especially if your computer is slow. Although WMS is not drawing every DEM point, each point that was read in is still there, so changing the point display step does not change the accuracy.

7.3 Shading Options

Now you will explore the shading options:

1. Select ***Display | Display Options*** 
2. Select *Lighting Options*
3. Toggle on *Use light source*
4. Click on the globe to move the light source and adjust the slide bar to change the amount of ambient light
5. Select *OK*

Changing the position of the light source and the ambient light alters the display of the DEM. You can experiment with these options to accentuate the elevations that are most important for you to see.

7.4 Views

Many times it is easier to see the DEM elevations from a view other than the plan view.

1. Select ***Display | View | Oblique View***. (Alternatively, you can also select the *Perspective View* macro )

It is now much easier to see the changes in elevation on the DEM. If the elevation relief cannot be seen clearly, you can change the Z-magnification to accentuate the elevation relief.

2. Select ***Display | View-Z Magnification***
3. Enter **3** in the edit box.
4. Select *OK*

The image will redraw on its own. You will see the elevation relief better now.

8 Conclusion

DEM data for the United States is found in several places on the Internet. Data is available for most areas of the US and some parts of other countries. DEM data is very useful for delineating watersheds in WMS.

In this exercise you should have learned how to do the following:

1. Import USGS DEMs in different formats
2. Tile multiple DEMs together and edit DEM elevations
3. Set DEM display options