WMS 11.4 Tutorial
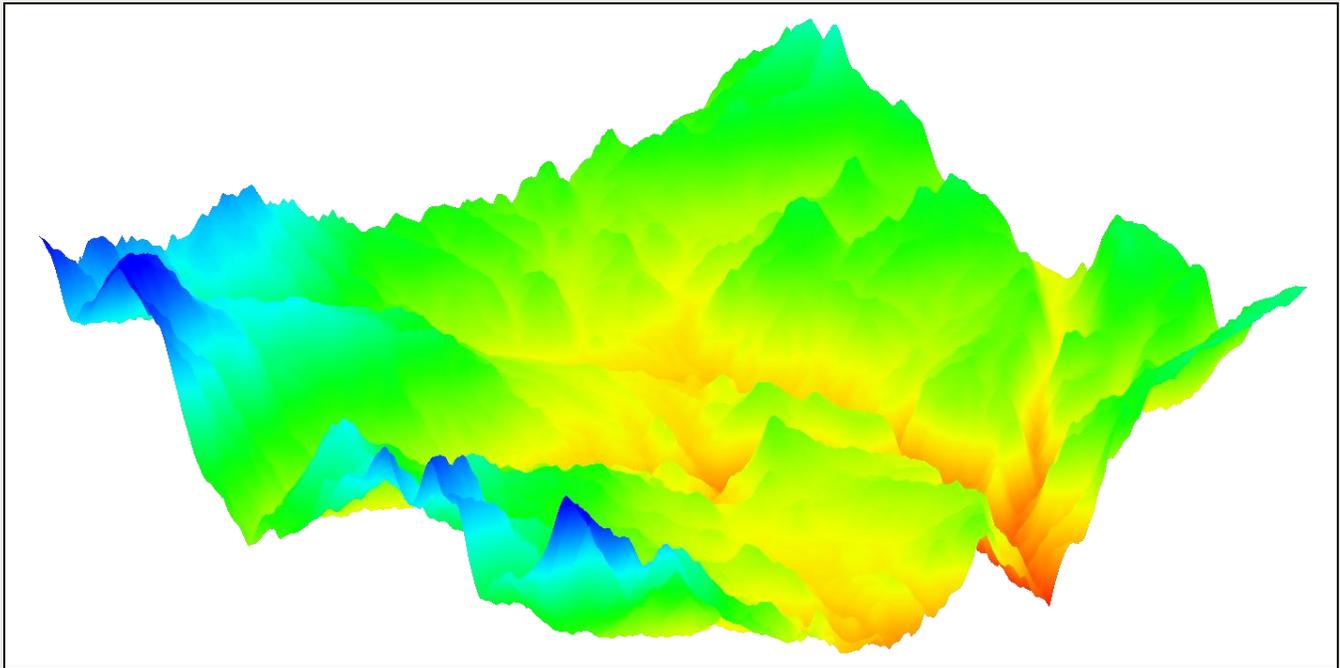
Introduction to WMS

Become familiar with the WMS interface

Objectives

Import files into WMS and change modules and display options to become familiar with the WMS interface.

Prerequisite Tutorials

- None

Required Components

- Data
- Map

Time

- 30–35 minutes

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1   Introduction

This tutorial discusses and demonstrates the WMS interface and help system. Feel free to explore the different menus, modules, and tools to become familiar with the interface.

The following will be covered here:

- Modules, menus, tools, display options, and the help system in WMS.

- Importing a digital elevation map (DEM) and a background image.

Tutorial files needed for these tutorials are found in the WMS Learning Center on the Aquaveo web site.[1]

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[1] http://www.aquaveo.com/software/wms-learning-tutorials

2   Getting Started

Starting WMS new at the beginning of each tutorial is recommended. This resets the data, display options, and other WMS settings to their defaults. To do this:

1. If necessary, launch WMS.

2. If WMS is already running, from the *Menu* bar, select the *File* | **New…** menu item or press *Ctrl-N* to ensure that the program settings are restored to their default state.

3. A dialog may appear asking to save changes. To clear all data, click the **No** button.

The Graphics Window of WMS should refresh to show an empty space.

3   The WMS Screen

The WMS screen is divided into several main sections (Figure 1):

- Main Graphics Window
- Project Explorer (this may also be referred to as the Tree Window)
- Modules
- Menu Bar
- Properties Window
- Toolbars
- Get Data and Units sections
- Cursor Coordinates and Selection Info bar
- Help Strip

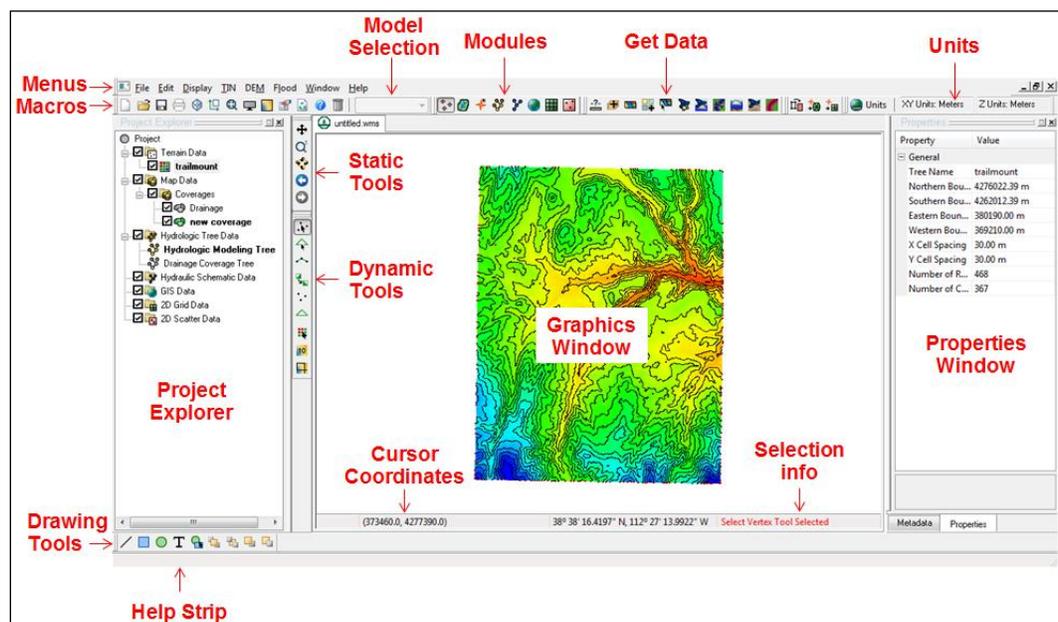The Main Graphics Window generally fills the majority of the screen.

Figure 1:   WMS Interface Layout

3.1 Main Graphics Window

The *Main Graphics Window*—or just *Graphics Window*—is generally the biggest part of the WMS screen. Most of the data manipulation is done in this window. DEMs or other downloaded images appear in this window.

3.2 The Project Explorer

The *Project Explorer* window (Figure 2) allows viewing of all the data that makes up a project. It contains a hierarchical representation of the data. It appears by default on the left side of the screen, but can be docked on either side, or viewed as a separate window.

The main function of the *Project Explorer* window is to manage data. It can do so in multiple ways, including creation of new data objects, deletion of data objects, and control of what appears in the *Graphics Window*.

Turning visibility on and off for an individual entry in the *Project Explorer* is done by clicking on the checkbox to the left of each item.

Figure 2:   Project Explorer Window

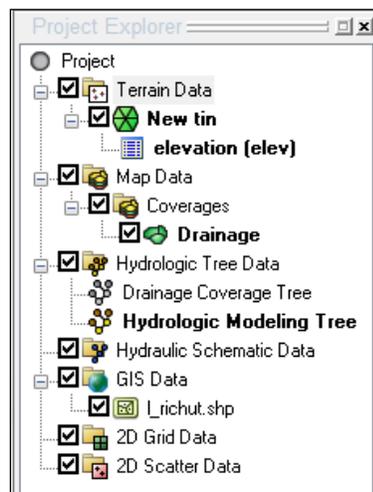### 3.3 The Properties Window

The *Properties* window (Figure 3) defaults to the right side of the WMS window. It is comprised of edit and information fields. The edit fields can be used to edit the coordinates of selected objects (e.g., points, nodes, vertices). Like the *Project Explorer* window, this window can be docked on either side of the WMS window or viewed as a separate window.

Property	Value
General	
Tree Name	l_richut.shp
Layer Name	l_richut.shp
Layer Type	Polygon shapefile
Filename	C:\Temp\l_richut....
Extents	
Left	-7888437.25
Right	-7226041.73
Top	3651066.77
Bottom	3115148.69
Fields	
AREA	
PERIMETER	

Figure 3:   Properties Window

4   Menu Bar and Macros Toolbar

4.1   Menu Bar

The *Menu Bar* contains menus with data manipulation commands. The menus include *File*, *Edit*, *Window* and *Help*. The menus shown in the Menu Bar depend on the active module.

The WMS wiki[2] has more detailed information on the basic elements of the WMS graphical user interface (GUI). To access the WMS wiki, select the *Help | **WMS Help…*** menu item and the WMS wiki will open in an internet browser.

4.2   Macro Toolbar

The *Macro* tool bar appear in a toolbar directly below the *Menu* bar as a set of icons at the top of the tool palette. They are shortcuts to frequently used menu commands.

- **New** – Creates a new project.
- **Open** – Opens an existing project or other file.
- **Save** – Saves the current project.
- **Print** – Prints the visible contents of the Graphics Window.
- **Perspective View** – Displays the data in the Graphics Window in a 3D perspective (also called "Oblique View").
- **Plan View** – Displays data in the Graphics Window from a top-down perspective, like a blueprint.

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[2] http://www.xmswiki.com/wiki/WMS:WMS

- **Frame** ⊕ – Centers the entire project within the Graphics Window with all extents visible.
- **Display Options** ▯ – Brings up the *Display Options* dialog. Used to change how the project is displayed in the Graphics Window, including which elements are displayed, colors, and other settings.
- **Contour options** ▮ – Brings up the *Contour Options* dialog. Used to set options for how contours appear.
- **Properties** 🖆 – Brings up the *Dataset Info* dialog. Used to adjust the properties of the selected object.
- **Refresh** ↻ – Redraws the contents of the Graphics Window.
- **Help** ❓ – Accesses the WMS Help website.
- **Delete** 🗑 – Deletes any selected objects. The *Delete* and *Backspace* keys can be used for this same purpose.
- **Toolbox** 🧰 – The Toolbox contains multiple tools for generating new geometries, rasters, and datasets.

5   Opening Files

To open a file, do the following:

1. From the *Menu* bar, select the *File | Open…* menu item to bring up the *Open* dialog.
2. Browse to the *Intro\Intro* directory.
3. From the *Files of type* drop-down menu, select the "USGS DEM File (*.dem,*.ddf)" item.
4. Select the "trailmountain.dem" file.
5. Click the **Open** button to exit the *Open* dialog and open the *Importing USGS DEMs* dialog. If the dialog doesn't open, skip to step 8.
6. In the *Files* section, select "Trail Mountain" from the list.
7. Click the **OK** button to accept the defaults and close the *Importing USGS DEMs* dialog.
8. If the *Importing USGS DEMs* dialog doesn't open, in the *Project Explorer*, in the "🌐 GIS Data" folder, right-click on the "🔲 trailmountain.dem" raster data and select the *Convert To | 🔲 DEM* context menu item to open the *Resample and Export Raster* dialog.
9. Click the **OK** button to accept the defaults and close the *Resample and Export Raster* dialog, .

The DEM data should appear in the main graphics window (Figure 4). Notice the item "🔲 trailmountain.dem" is now under "🔳 Terrain Data" in the Project Explorer.
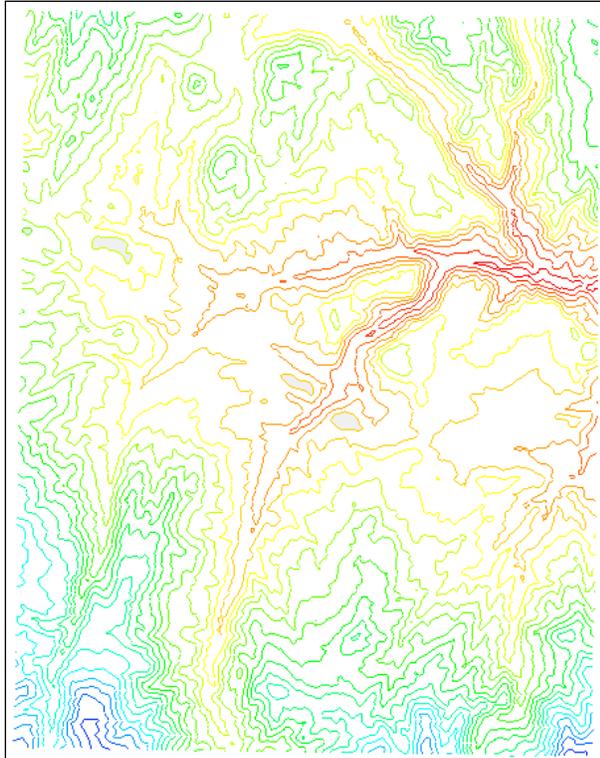
Figure 4:   Opened DEM file

Now import a topographic map in TIFF format:

10. From the *Macro* bar, to bring up the *Open* dialog, select the **Open** 📂 macro.

Using the macro is the same as using the command in the *File* menu.

11. From the *Files of type* drop-down menu, select the "All Files (*.*)" item.

12. Select the file "trailmountain.TIF".

13. Click the **Open** button to import the file and exit the *Open* dialog, .

Notice that " 🖼 trailmountain.TIF" has appeared under " 🌍 GIS Data" in the Project Explorer. The image should appear underneath the DEM contour data (Figure 5).

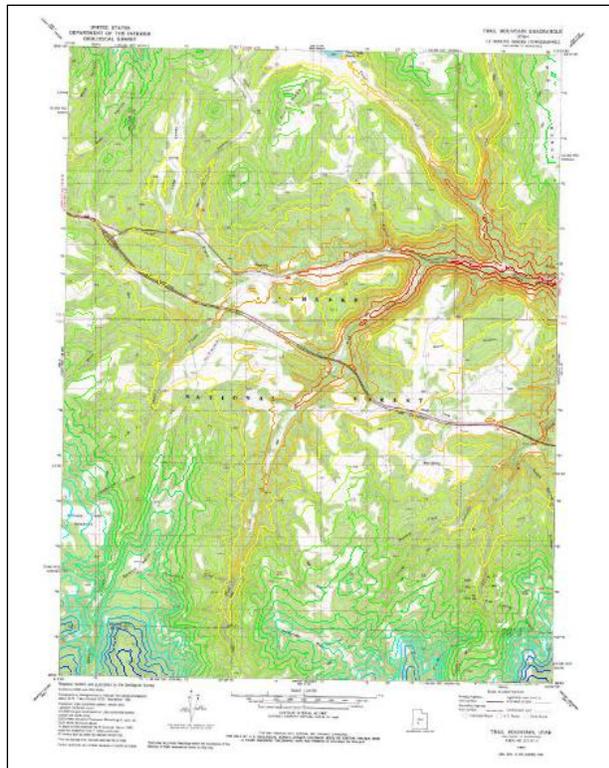*Figure 5:   TIFF image with DEM overlay*

6   Changing the Display

In later projects, it will be necessary to adjust the display of data in the Graphics Window. WMS contains many tools for visualizing data.

6.1   Adjusting Image Transparency

The imported image makes the DEM data difficult to see. Adjusting the transparency of the image will make the DEM more visible.

To do this:

1. In the *Project Explorer,* in the "🌐 GIS Data" folder, right-click on the "🗺️ trailmountain.TIF" raster data and select the **Transparency…** context menu item to bring up the *Layer Transparency* dialog.

2. Use the slider to change the transparency to "75%".

3. Click the **OK** button to set the new transparency level and close the *Layer Transparency* dialog.

Notice that the image is now faded out and the DEM data contours are more prominent (Figure 6).
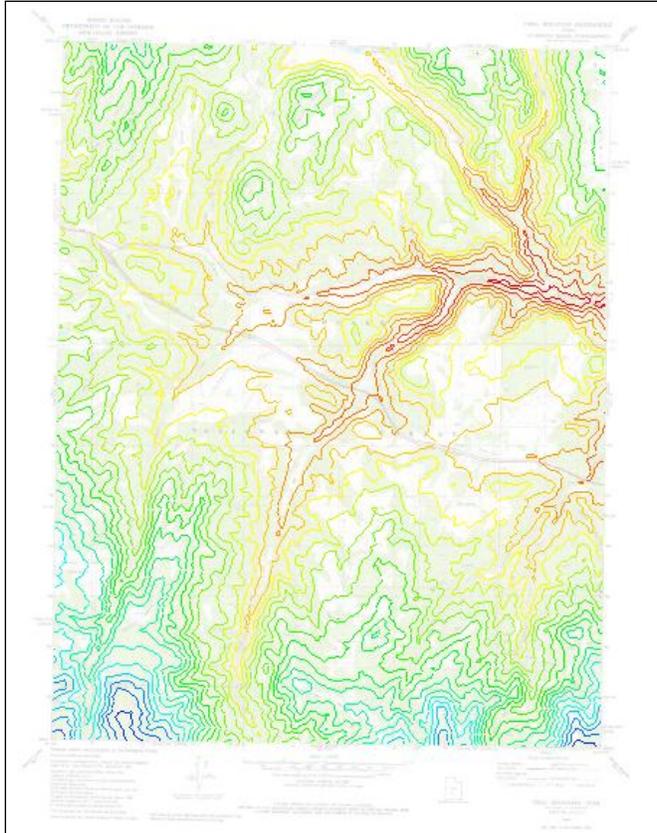
Figure 6:   DEM over a TIFF image with a set transparency

6.2   Changing Display Options

Most of the options for controlling how data is displayed in the Graphics Window are in the *Display Options* dialog.

1. In the *Project Explorer*, turn off the " trailmountain.TIF" raster data checkbox so it no longer appears in the Graphics Window.

2. Under the " Terrain Data" folder, select the " trailmountain.dem" DEM data item to make it active.

3. From the *Macro* bar, click the *Display Options* macro to bring up the *Display Options* dialog.

4. From the list on the left, select the " DEM Data" item.

5. On the DEM tab on the right, turn on the *DEM Contours* checkbox.

6. To bring up the *trailmountain.dem Contour Options* dialog, click the **Options…** button. This dialog can also be reached by clicking on the *Contours* macro.

7. In the *Contour Method* section, from the first drop-down, select the "Color Fill" drop-down item.

8. Click the **OK** button to close the *trailmountain.dem Contour Options* dialog.

9. Click the **OK** button to close the *Display Options* dialog.

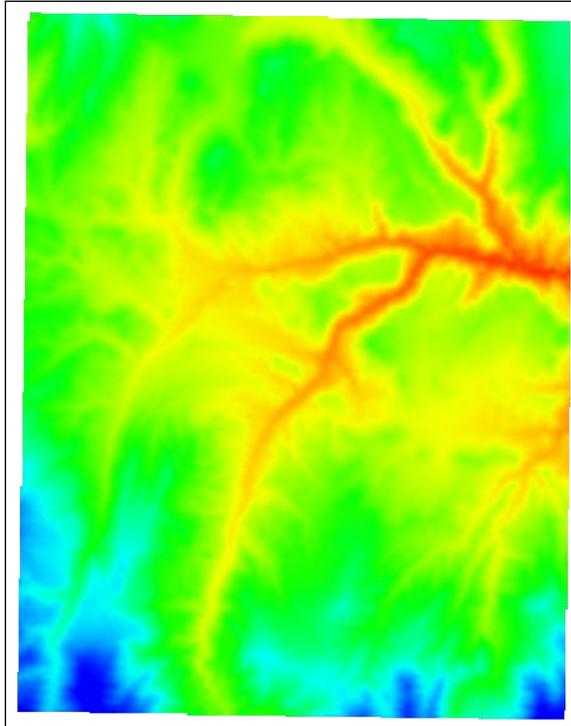The DEM in the Graphics Window should appear as in Figure 7.

Figure 7:   *DEM with the color fill contour option*

7   Static Tools

Static Tools are used for manipulating the display, such as zooming, panning, and 3D rotation. The toolbar is shown horizontally for convenience below, and a description of each of the static tools follows below that.

- **Pan** ✛ – Use to move the contents of the Graphics Window in any direction.

- **Zoom** 🔍 – Use to zoom in on the contents of the Graphics Window.

- **Rotate** ✛ – Use to rotate the image on the *X* and *Z* axes to allow for viewing from different angles.

- **View Previous** ⬅ – Redraws the contents of the Graphics Window to the state prior to the most recent viewing command (zoom, rotate, pan).

- **View Next** ➡ – Redraws the contents of the Graphics Window to the state after to the most recent viewing command. Can only be used after **View Previous** has been used.

7.1   Pan and Zoom

To practice using the **Pan** ✛ and **Zoom** 🔍 tools, follow the steps below:

1. From the *Static* tool bar, select the **Zoom** 🔍 tool.

2. In the *Graphics Window*, click on the center of the DEM to zoom in.

3. Hold down the **Shift** key and click on the DEM again to zoom out.

4. From the *Static* tool bar, select the **Pan** ✛ tool.

5. In the *Graphics Window*, click and drag the DEM to center it.

6. From the *Static* tool bar, select the **Zoom** 🔍 tool again.

7. In the *Graphics Window*, click and drag over the area in Figure 8.

Note that if a mouse with a scroll wheel is available, the display can be panned by holding down the scroll while moving the mouse. The display can also be zoomed in and out by scrolling up and down with the scroll wheel.

Figure 8:   Zoom area

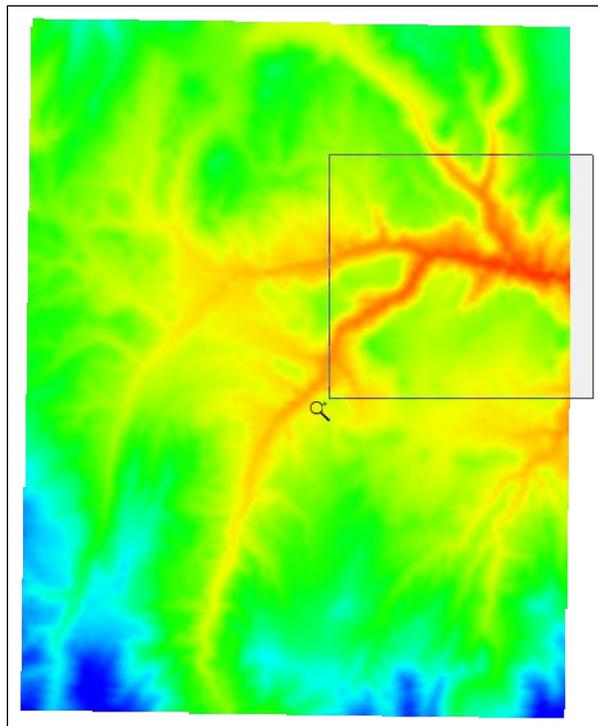8. To resize and center the DEM in the *Graphics Window*, from the *Macro* bar, click on the **Frame** 🔍 macro.

7.2   Rotating a DEM

The DEM can be rotated to different angles using a variety of tools:

1. From the *Menu* bar, select the *Display | View |* **Oblique View** menu item.

This command updates the display to show data at an oblique view. The DEM should now resemble Figure 9.
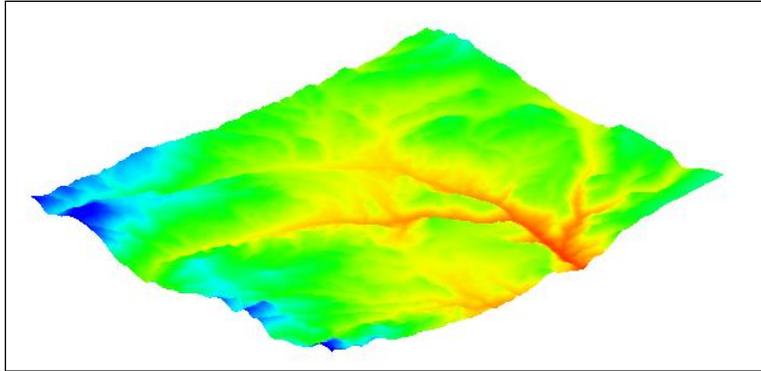
Figure 9:   Oblique view

2.   From the *Menu* bar, select the *Display | View | **Side View*** menu item.

This shows the side elevation of the DEM data.

3.   From the *Static* tool bar, click the **View Previous** button to return to the oblique view.

Note that the **View Next** button appears once the **View Previous** button has been clicked. Now exaggerate the elevation values and make them more visible:

4.   From the *Macro* bar, click the **Display Options** macro to bring up the *Display Options* dialog.

5.   In the lower left section, turn off the *Auto z-mag* checkbox.

6.   For the *Z magnification*, enter "5".

7.   Click the **OK** button to close the *Display Options* dialog.

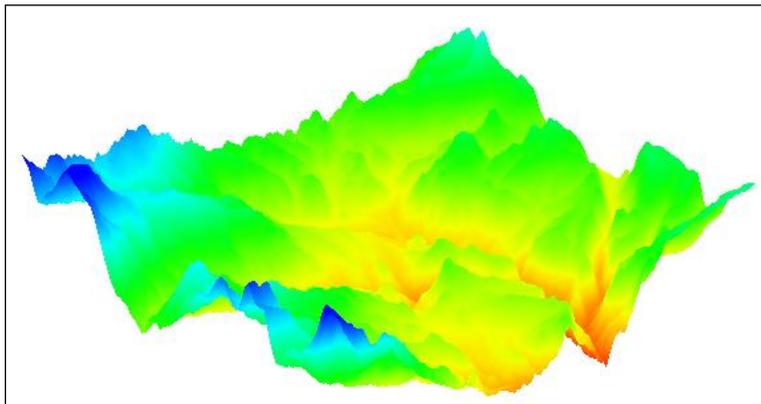The DEM data should now look like Figure 10.

Figure 10:   Z magnification

8.   From the *Static* tool bar, select the **Rotate** tool, then in the main *Graphics Window*, click and drag several times. Notice how the view rotates.

9.   From the *Macro* bar, click the **Plan View** macro to return to an overhead view of the data.

8   Modules and Dynamic Tools

WMS is organized into eight Modules; each associated with a particular object type. Only one module is active at any given time. When switching modules, the menus and tools unique to the active module are displayed.

8.1   Modules

The names and basic functions of each module are as follows:

- **Terrain Data** ✛ – Used for working with elevation data such as Triangulated Irregular Networks (TINs) and Digital Elevation Models (DEMs).

- **Drainage** – Used for basin delineation with gridded Digital Elevation Models (DEMs).

- **Map** – Used to create and edit points, arcs, and polygons.

- **Hydrologic Modeling** – Contains interfaces to hydrologic models.

- **Hydraulic Modeling (River)** – Contains interfaces for 1D hydraulic models.

- **GIS** – Used to open vector and raster GIS data such as shapefiles and images. Shapefiles can be converted to feature objects using the GIS module.

- **2D Grid** – Used to setup and run finite difference.

- **2D Scatter** – Contains 2D scatter point interpolation tools.

8.2   Dynamic Tools

The *Dynamic Tools* are module-specific tools used for creating and editing objects in the Graphics Window. The tools vary depending on the selected module. Each toolbar is shown below, along with brief descriptions of the tools they contain.

Terrain Data

- **Select Vertices** – Select one or more vertices.

- **Select Triangles** – Select one or more triangles.

- **Create breakline** – Create breaklines.

- **Swap triangle edges** – Change the direction of triangles within a polygon.

- **Add Vertices** – Create new vertices.

- **Create Triangle** – Create a new triangle.

- **Select DEM points** – Select one or more DEM points.

- **Place contour label** – Set the location of a contour label.

- **Set contour min/max** ⬚ – Set the range for the contours.

Drainage

- **Select Vertices** 🀇 – Select one or more vertices.
- **Select Feature Point/Node** 🀇 – Select one or more points or nodes.
- **Select Feature Vertex** 🀇 – Select one or more vertices.
- **Create outlet point** ⬤ – Create an outlet point for a drainage basin or unit.
- **Select drainage unit or basin** 🀇 – Select one or more drainage basins or units.
- **Move basin label** 🀇 – Move the label for a particular basin or drainage unit.
- **Flow path** 🜄 – Draw the flow path for a specified point.

Map

- **Select Feature Objects** 🀇 – Select one or more feature objects.
- **Select Feature Point/Node** 🀇 – Select one or more points or nodes.
- **Select Feature Vertex** 🀇 – Select one or more vertices.
- **Select feature Arc** 🀇 – Select one or more feature arcs.
- **Create Feature Point** 🀇 – Create a feature point.
- **Create Feature Vertex** 🀇 – Create a feature vertex on an arc.
- **Create Feature Arc** 🀇 – Create a feature arc.
- **Select Feature Polygon** 🀇 – Select one or more feature polygons.
- **Select feature line branch** 🀇 – Select all arcs on a specific branch of a river or stream.

Hydrologic Modeling

- **Select outlet** 🀇 – Select one or more basin outlets.
- **Select basin** 🀇 – Select one or more basins or drainage units.
- **Select diversion** 🀇 – Select one or more diversions.
- **Select hydrograph** 🀇 – Select a hydrograph for display in the Hydrograph Window.

Hydraulic Modeling

- **Select River Cross Section** 🔍 – Select and edit parameters for a river cross section.
- **Select River Reach** ◆ – Select and edit parameters for a river reach.
- **Select Hydraulic Node** 🟥 – Select and edit parameters for a hydraulic node.
- **Select Hydraulic Link** 🔺 – Select and edit parameters for a hydraulic link.

GIS

- **Identify** ⓘ – View attributes of selected features.
- **Select shapes** ▸ – Select shapes when ArcObjects® are not enabled.

2D Grid

- **Select grid cell** ⊞ – Select one or more grid cells or grid nodes.
- **Select grid row** ⊞ – Select an entire row of grid cells.
- **Select grid column** ⊞ – Select an entire column of grid cells.
- **Place contour labels** 10 – Set the location of a contour label.
- **Create monitoring gage** ⊕ – Interactively create defined gages.
- **Select monitoring gage** ⊕ – Select one or more previously defined gages.
- **Select hydrographs** 🅰 – Select a hydrograph for display in the Hydrograph Window.

2D Scatter Point

- **Select scatter point** ⋮▸ – Select one or more scatter points.
- **Create scatter point** ⋮ – Create new scatter points.

Drawing Tools

The Drawing Tools—or Annotation Tools—allow adding graphical information (such as text labels and drawing objects) to the Main Graphics Window.

- **Create Line** ╱ – Create a single line segment or polyline.

- **Create Rectangle** ▢ – Create a wire frame or filled rectangle.

- **Create Oval** ◯ – Create a wire frame or a filled oval.

- **Create Text** T – Create a single line text string.

- **Select Drawing Objects** – Select previously-created text, ovals, rectangles, and lines.

- **Move to Front** – Move the selected object to the front (or top) of the layers.

- **Move to Back** – Move the selected object to the back (or bottom) of the layers.

- **Shuffle Up** – Move the selected object up one layer.

- **Shuffle Down** – Move the selected object down one layer.

9   Using the Map Module

The *Map* module is used to create points, arcs, and polygons to represent various types of data. Different coverage types are available for storing these data, including watershed features such as streams and outlets. The coverages can have varying properties depending on their type.

9.1   Creating a New Coverage

New coverages can be created to store a particular type of data in the Map module. To do so, follow the steps below:

1. In the *Project Explorer*, in the "🗺 Map Data" folder, right-click on the "🗺 Coverages" folder and select the **New Coverage** context menu item to bring up the *Properties* dialog.

Most *Project Explorer* items have a right-click menu.

The properties dialog contains a spreadsheet of values that define the coverage.

2. From the *Coverage type* row, from the *Value* column drop-down, *s*elect "Drainage".

3. For the *Coverage name,* enter "New Drainage".

4. To close the *Properties* dialog, click the **OK** button.

The "🌐 New Drainage" coverage will appear under the "🗺 Coverages" folder in the *Project Explorer*. The default coverage in the Map module is the Drainage coverage.

9.2   Deleting A Coverage

Since there was already a Drainage coverage when a new one was created, the previous drainage coverage should be deleted.

1. In the *Project Explorer*, select the "🟢 Drainage" coverage to make it active.

2. Right-click on the "🟢 Drainage" coverage and select the **Delete** context menu item to remove the old drainage coverage from the Project Explorer.

9.3   Using the Drainage Coverage and Map Tools

Explore the drainage coverage and Map module tools by doing the following:

1. In the *Project Explorer*, select the "🟢 New Drainage" coverage to make it active.

2. From the *Dynamic* tool bar, using the **Create Feature Arc** 🖊 tool, click on the far right of the DEM where the main channel would likely be on the DEM.

This creates a node which indicates the end of the feature arc. See Figure 11, and note that red = low elevations and blue = high elevations for this contour scheme.

3. Continue clicking at each point where the channel turns, following the areas of low elevation.

Each click creates a vertex along the arc. Stream and drainage arcs should be created from downstream to upstream.

4. When the left side of the DEM is reached, double-click or press the *Enter* key to terminate the arc.

This creates another node and ends the arc. The arc should appear similar to Figure 11.
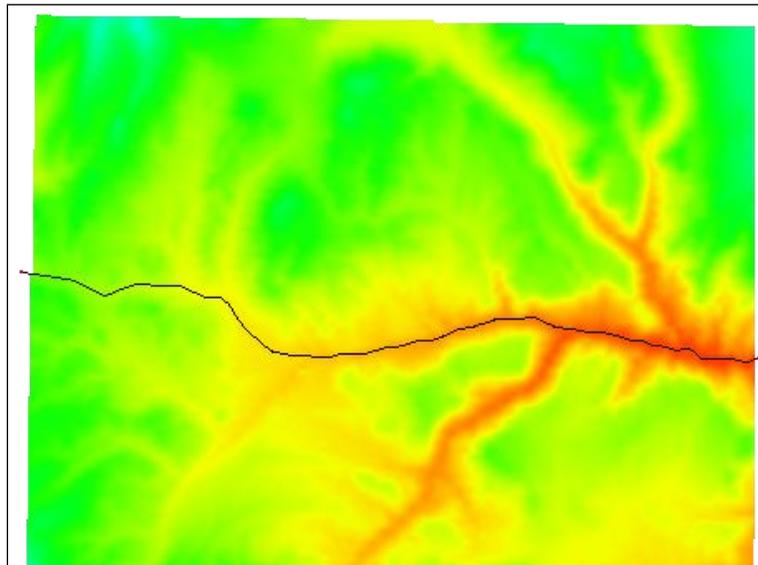

Figure 11:   An arc created in WMS

5. From the *Dynamic* tool bar, select the **Select feature Arc** 🖊 tool.

6. Select the new feature arc.

7. Right-click on the arc and select the **Attributes…** context menu item to bring up the *Feature Arc Type* dialog.

Most of the selection tools in WMS have a right-click menu accessible by right-clicking on an active feature object.

8. In the *Type* section, select the *Stream* radio button.

This designates the arc as a stream arc. This allows for stream properties and data to be specified for the arc. This tutorial does not explore in detail the properties that can be associated with an arc.

9. To close the *Feature Arc Type* dialog, click the **OK** button.

The arc is now designated as a stream arc.

10   The Hydrologic Modeling Module

This module is used for setting up and running hydrologic models. The Hydrologic Modeling module is linked to hydrologic models such as HEC-1, which is selected by default.

An item named "New Drainage Coverage Tree" was automatically created in the Hydrologic Modeling module when the "New Drainage" coverage was created in the Map module. The Hydrologic Modeling module is linked to other modules and coverages. It updates when changes are made in those modules or coverages.

Explore the Hydrologic Modeling module by doing the following:

1. In the *Project Explorer*, in the " Hydrologic Tree Data" Folder, click on the " New Drainage Coverage Tree" item.

This switches to the Hydrologic Modeling module. Notice that WMS has already created an outlet and basin based on where the arc was created (Figure 12).
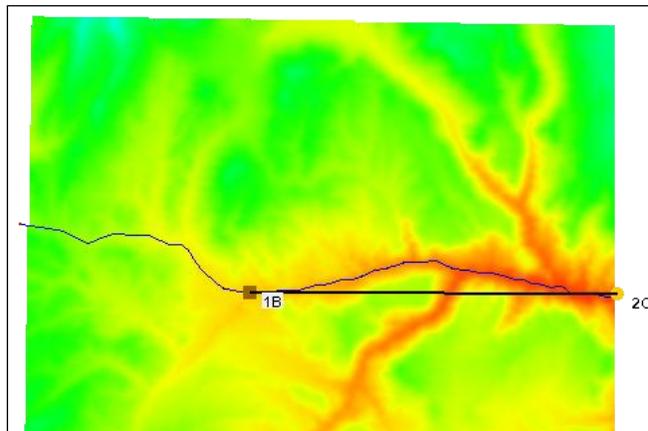

Figure 12:   Example of an outlet (yellow dot, right) and a basin (brown square, left)

2. From the *Dynamic* tool bar, select the **Select Outlet** tool.

3. In the *Graphic Window,* select the outlet node (the yellow icon at the right end of the stream arc, labeled 2C in Figure 12).

4. Right-click on the outlet node and select the **Edit Parameters…** context menu item to bring up the *National Streamflow Statistics Method* dialog.

This dialog appears because National Streamflow Statistics Method is the currently active model. Different parameter dialogs will appear for other models. Other tutorials will explore the National Streamflow Statistics Method parameters that can be set in WMS.

5. To close the *National Streamflow Statistics Method* dialog, click the **Done** button.

11   Using Annotations

The annotation—or drawing—tools are located in the lower left of the WMS window by default. These tools can be used to create notes or annotations in the project.

1. From the *Drawing Tools* bar, select the **Create Line** ╱ tool.

2. In the *Graphics Window,* click near the outlet for the channel.

3. Create a two-segment line similar to that in Figure 13, double-clicking (or pressing *Enter*) to end the line.

4. From the *Drawing Tools* bar, using the **Select Drawing Objects** 🔲 tool, select the line.

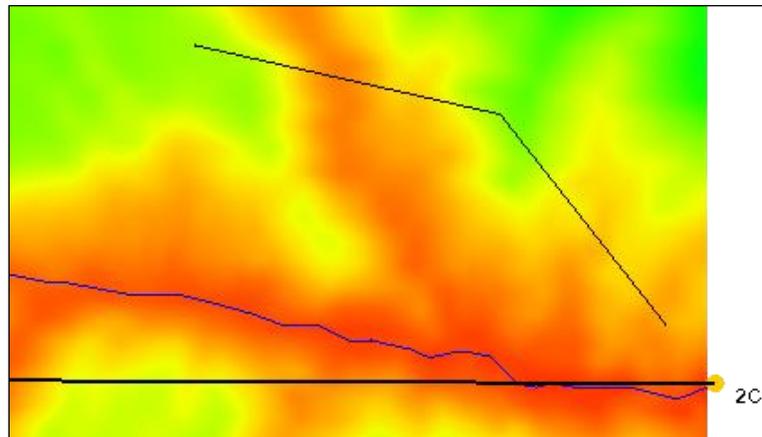This tool can be used to adjust or move the object if desired.

Figure 13:   Annotation line example

5. From the *Drawing Tools* bar, select the **Create Text** T tool.

6. In the *Graphics Window,* click to the left and above the left end of the line to bring up the *Text Attributes* dialog.

7. In the *Enter text* field, enter "Outlet 1".

8. Click the **OK** button to close the *Text Attributes* dialog and create the text annotation object (Figure 14).
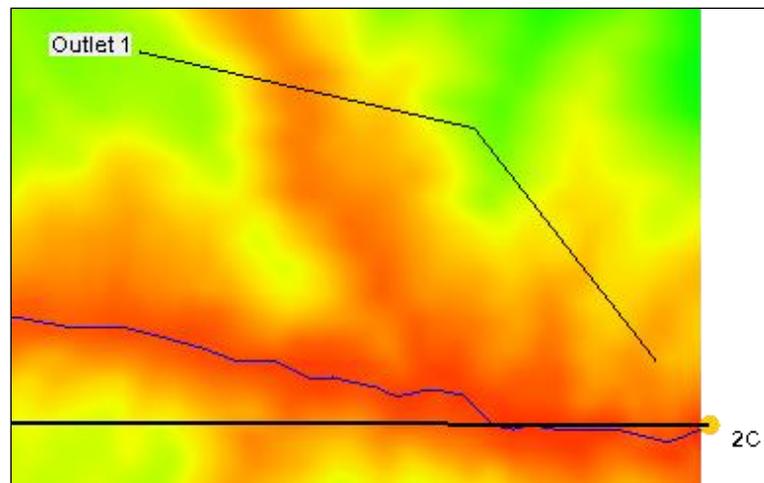
Figure 14:   Annotation text object at the end of a line

Feel free to continue exploring the annotation tools, if desired.

12   Saving a Project

This tutorial does not go through an actual project from start to finish. Instead, it introduces the basic concepts of using the WMS interface. It can still be saved and used later as a practice model.

WMS saves projects as a WMS project file. This file contains a list of all the files in the project. Each of the referenced files is opened when a WMS project file is opened.

To save the current project:

1. From the *Macro* bar, click on the **Save** 💾 macro, or from the *Menu* bar select *File* | **Save As ….** to bring up the *Save As* dialog.

2. Browse to the directory where the file will be saved. In this case, WMS should already be in the *Intro\Intro* directory.

3. From the *Save as type* drop-down, select "WMS XMDF Project File (*.wms)".

4. For the *File name,* enter "Practice_1.wms".

5. Click the **Save** button to close the dialog and create the project file.

6. If asked whether to save the image files in the project directory, click the **No** button.

When working on a real project, it is recommended to save the image files in the project directory in order to keep everything in one location. It is also recommended that a project be saved frequently while being constructed.

13   Conclusion

This concludes the "Introduction to WMS" tutorial. WMS was introduced with an overview of the layout. Some of the modules, tools, and options available in the program were also introduced.

Feel free to continue exploring the different elements of the interface discussed in this tutorial.