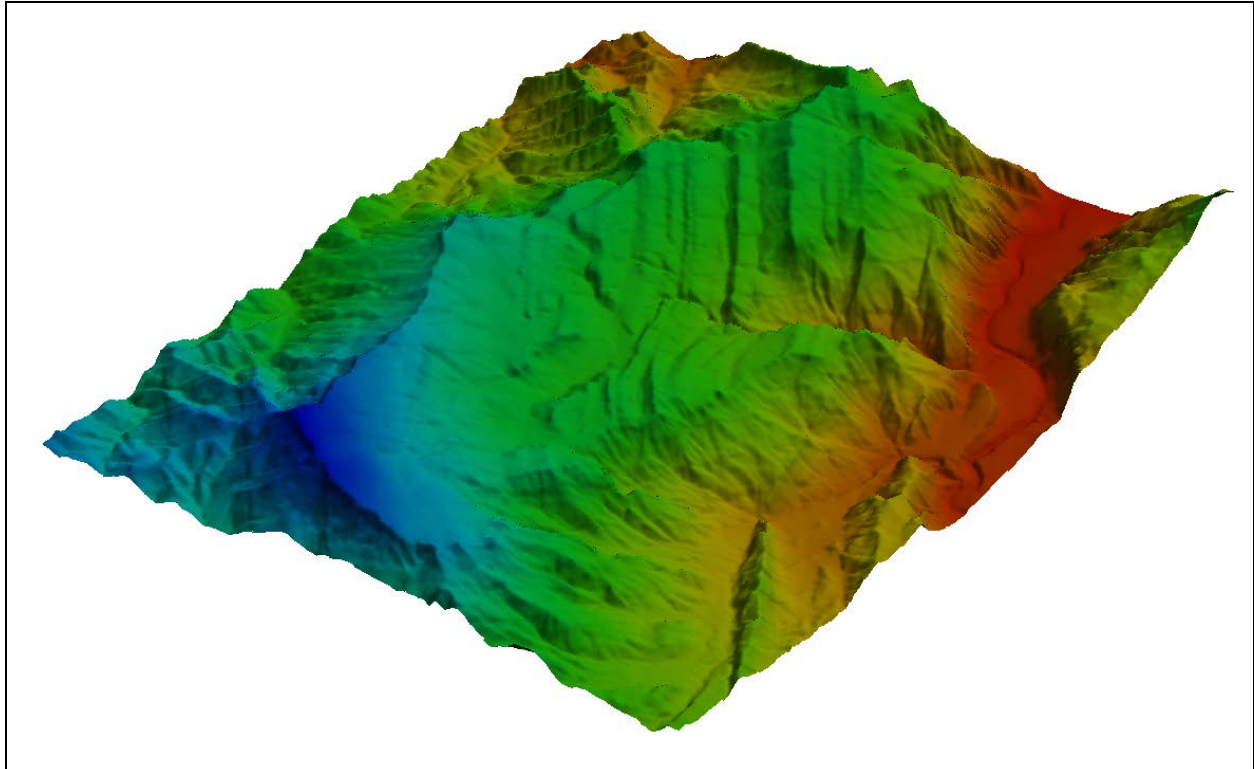


## SMS 11.1 Tutorial

### ***Importing Rasters***



### Objectives

This tutorial teaches how to import a Raster, view elevations at individual points, change display options for multiple views of the data, show the 2D profile plots, and interpolate data to mesh.

### Prerequisites

- Overview Tutorial

### Requirements

- Raster Module
- Map Module
- Mesh Module

### Time

- 30-45 minutes

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## 1 Introduction

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A raster consists of a matrix of pixels or cells stored and displayed in a grid formation (rows and columns). Each cell contains a value representing a type of information such as temperature or elevation. Rasters can be digital aerial photographs, images from satellites, scanned digitized pictures or even scanned maps.

In this case, the raster that we will use is a surface map containing elevation data. However, rasters can also be used as basemaps (usually scanned maps and images or satellite imagery) and thematic maps (usually containing information about land use and soil maps).

## 2 Loading the Raster

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We will now load a Digital Elevation Model (DEM) file as a Raster. This DEM file contains elevation data that can be viewed and processed in SMS.

To open Raster in SMS,

1. Select *File / Open*
2. Browse to the folder named: 'Data Files' of the Raster tutorial. This folder will be in the same location as all the other SMS tutorial folders that were downloaded when you installed SMS on your computer.
3. Select the Raster file named 'glenwood.asc' and click *Open*.
4. You will be asked if the file should be opened as a Raster or as a Scatter. Select Raster to open the file. You may or may not have to wait a few seconds depending on your computer. Once the file is open, the data should look like Figure 1.

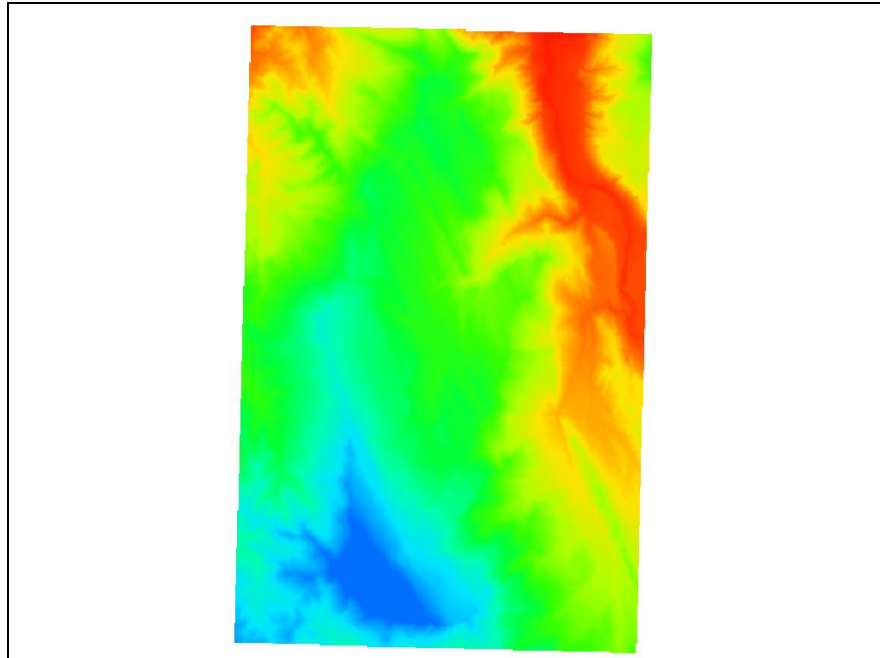



Figure 1 Raster.


5. Zoom in to an area of the Raster using the *Zoom* tool  on the side bar. As you zoom in, notice how the image becomes pixilated. Each pixel will be a cell containing elevation data.

## 2.1 Elevations

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As mentioned previously, a Raster is a set of pixels or cells each containing data. In this case, each cell contains an elevation as data.




In order to view individual elevations at selected cells do the following steps.

1. Select the Raster 'glenwood.asc' in the Project Explorer to make it active.
2. Using the *Select Point* tool , select a random point of the data. Each cell has a location (X and Y) and an elevation (Z). These values are displayed below the menu bar in the X, Y and Z fields.
3. As you select different points, see how those values changes.

### 3 Changing the Display

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As the data is being displayed in planar view, it is hard to see the different elevations. SMS offers two different ways to view raster data. The data can be displayed as a Raster in block-filled contours (which is shown in Figure 1) and as a surface. In order to change the display of the data,

1. Select *Display / Display Options* or Select the *Display Options* icon . This will open the Display Options dialog.
2. If it is not already selected, click on *Raster* in the menu bar on the left side of the dialog.
3. Notice how the data is now being displayed as a raster. Select the toggle *Display as surface*.
4. Toggle on *Contours* and Select the tab *Contours*.
5. Change the Contour Method to *Color Fill*.
6. Click on the *Color Ramp...* button to open the Color Options dialog.
7. Right now, the contours are being displayed in the Hue ramp Palette Method. Select the Intensity ramp. This palette method will make it easier to view the elevations. Notice that you can change the color of this palette if you so wish. We will leave everything as default in this case. Click *OK* in the Color Options dialog.
8. Select *OK* in the Display Options dialog.
9. The data will now be displayed in hues of green. Using the *Rotate* tool , rotate the data. We can change the z magnification in the Display Options dialog.
10. Select *Display / Display Options* once more and this time select *General* from the side menu.
11. Under Drawing Options, toggle off *Auto z-mag*. As you turn off the auto z-magnification, the user defined Z magnification will be displayed. Change this number to 2.0 and click *OK* to apply changes and exit dialog.
12. Using the *Rotate* tool, rotate the data to view in 3D. To return to planar view, select the tool *Plan View* .

- **Editing the Projection**

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In order to create a profile plot as will be done in the next step, we need to set both the display projection and object projection so the object does not have a floating projection. To do this:

1. Click *Display / Projection*. Make sure the horizontal projection is set to *Local Projection*, then click OK.
2. Then right click on the default coverage and select *Projection*. In the Object Projection dialog, click OK to set the object projection.

## **4 2D Profile Plot**

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SMS can show 2D profile plots using the Observation coverage. In this section, we will show how to do so.

1. In the Project Explorer, right click on the Default Coverage under Map Data. Select *Rename* from the menu and change the name to *Observation*.
2. Right click on the coverage and Select *Type | Generic / Observation* from the menu.
3. Click on the coverage once more to make sure it is the active coverage.
4. Using the *Create Feature Arc*  tool, create two arcs as shown in Figure 2.

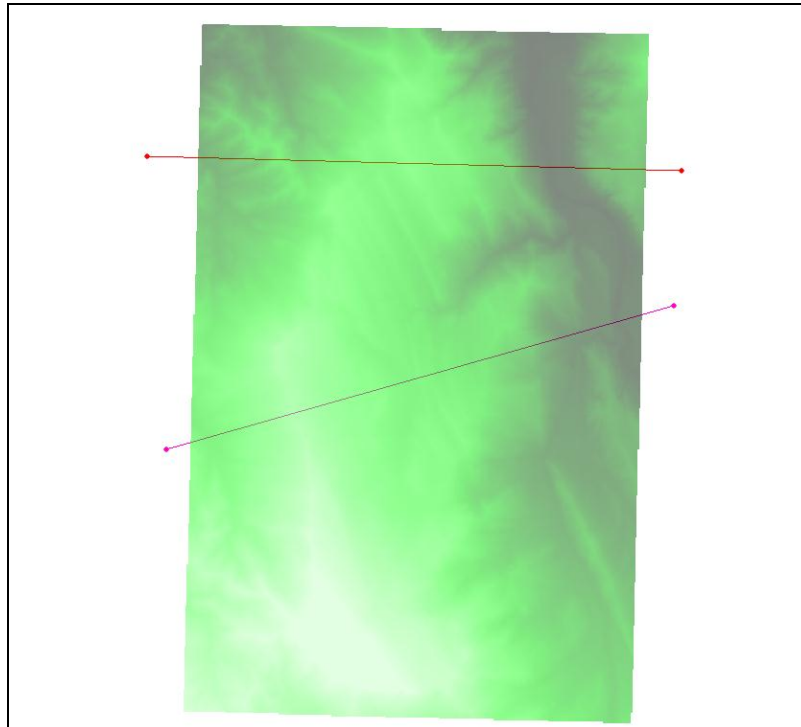
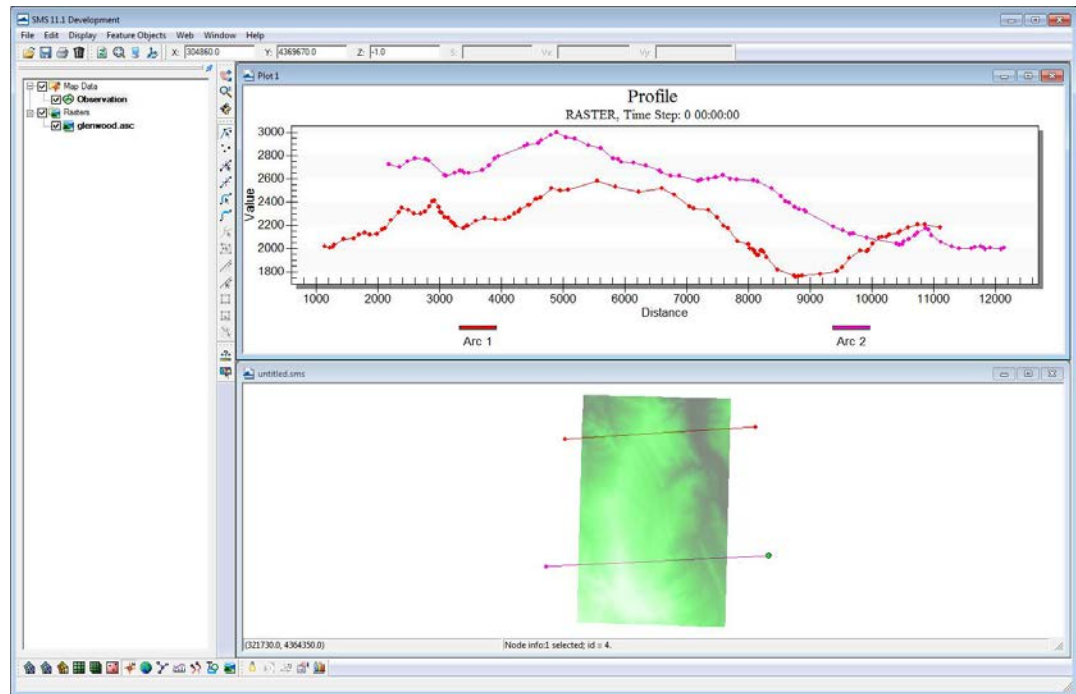




Figure 2 Observation Arcs.

5. Once you have created the arcs, select *Display / Plot Wizard*.
6. This will open up the Plot Wizard. Choose 'Observation Profile' as the Plot Type. Click on the *Next* button to proceed to step 2 of the wizard.
7. Under the section 'Coverage', you may choose to select which observation arcs you want to display in the plot. In this case, we will leave both arcs turned on.
8. Change the plot tolerance to 5.0 m. The plot tolerance allows for points to become clearer in the plot as it puts a tolerance on how many points can be displayed.
9. Click *Finish* to display the profile plots. Notice the two different plots one for each arc. The plots window will be displayed at the top and the graphics window on the bottom. You may choose to maximize one window and minimize another one to better view either window.



10. Using the *Select Feature Point* tool , select one of the nodes of either arc and drag the node around over the raster data. Notice how the plot will change as you move and release the nodes.
11. You may open the Data Options (step 2) of the Plot Wizard again by right clicking on the plots and selecting Plot Data from the menu.
12. Change the plot tolerance to 1.0 m and Click *OK*. Notice how the points displayed on the plots are now denser because the tolerance was reduced.
13. Close the Plot window and maximize the graphics window.
14. Click on the *Frame* macro  to frame the data.

## 5 Raster to Mesh Interpolation


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The Raster data can also be interpolated to mesh. Meshes are used in SMS for modeling.

### 5.1 Creating Mesh

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The first step to creating the mesh is to create a mesh coverage and providing mesh boundaries.

1. Right-click on *Map Data* in the Project Explorer and select *New Coverage* from the drop down menu.
2. In the New Coverage window, select *Models / Generic 2D Mesh* as Coverage type.
3. Name the coverage as 'Gen2DMesh' and click *OK* to create the coverage.
4. Click on the newly created coverage to make it active.
5. Using the *Create Feature Arc* tool  click out an arc as shown in Figure 3 making a loop enclosing most of the Raster data.

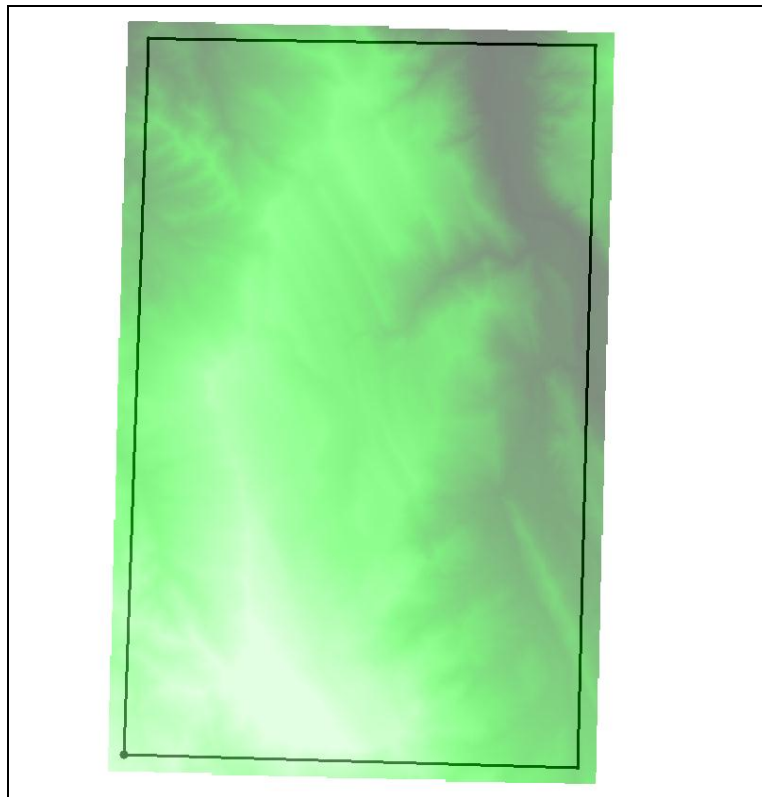



Figure 3      *Mesh Boundaries*

6. Once the arc has been created, select *Feature Objects / Build Polygons*. This command will look for any enclosed arc loop and assign the enclosed area as a polygon.



7. Once the polygon has been made, click on the *Select Feature Polygon*  tool. This tool will not be highlighted to use if no polygon exists.
8. Double click in the polygon to open up the 2D Mesh Polygon Properties. Leave everything as defaulted and click *OK*.
9. Right click on the coverage 'Gen2D Mesh' and *Convert / Map -> 2D Mesh* from the menu to create mesh.
10. Click *OK* in the 2D Mesh Options dialog.

## 5.2 Interpolating Raster elevations to Mesh

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Now that we have a mesh created, we can interpolate elevations to that mesh using the elevations stored as Raster data.

1. Right click on the Raster folder in the project explorer titled 'glenwood' and select *Interpolate / Interpolate to Mesh* from the menu.
2. This will open up the Raster Interpolation dialog. At this point you may change the name of the New Data Set if you wish. In this case we will leave it as 'raster\_interp'.
3. Toggle on *Map Z* and click *OK* in the dialog.

## 6 Conclusion

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This concludes the Raster tutorial. You may wish to experiment some more of the features in SMS or you may close SMS at this point.