



HEXAGON
GEOSPATIAL

GeoMedia

Grid Analysis with GeoMedia 3D

Visual Impact Assessment



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Acknowledgments

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This Tutorial

Tutorial Objective

Viewshed analysis is a fundamental technique in grid-based GIS and has many applications in resource development and tourism. For example, resource extraction companies use viewshed analysis to limit their development to those areas that cannot be viewed from highways or urban areas. The objective of this tutorial is to introduce the concept of viewshed analysis using a real world example.

Tutorial Text Conventions

There are several conventions used throughout the tutorial:

- ❖ Ribbon bar items are shown as: On the **Aaa** tab, in the **Bbb** group, click **Ccc**.
- ❖ Dialog box names, field names, and button names are depicted using **Bolded Text**.
- ❖ Information to be entered, either by selecting from a list or by typing, is depicted using *Italicized Text*.

Tutorial Prerequisites

There are no prerequisites for making use of this tutorial; however, having a basic understanding of the GeoMedia Desktop will be helpful in expediting the execution of certain steps within this tutorial.

Section 1: Visual Impact Assessment

Section Objective

A viewshed is the area that can be "seen" from a given vantage point, in a specified direction. A measurement of a viewshed must take into account the surrounding elevation data, the height of any obstructions, and the height of the vantage point.

Viewshed analysis is a fundamental technique in grid-based GIS and has many applications in resource development and tourism. For example, resource extraction companies use viewshed analysis to limit their development to those areas that cannot be viewed from highways or urban areas.

The objective of the lessons found in this section is to introduce the concept of viewshed analysis. This section is based upon a customer workflow. In the Canadian province of British Columbia, landscape aesthetics are very important to tourism. For example, the forestry industry must obey guidelines established to limit the visual impact of cutting down trees. "Cut blocks" with minimal visual impact on highways and populated areas must be planned and approved. Viewshed calculations are essential to the cut-block planning process.

Tools Used

GeoMedia Advantage or GeoMedia Professional Grid Analysis Tools and GeoMedia 3D.

Exercise 1: Viewshed Analysis

Objective:

Use grid analysis commands to perform a viewshed analysis. You will be introduced to the commands used to create a viewshed scene from a Digital Elevation Model (DEM).

In this exercise, you will learn how to use the Rasterize Legend Entries, Information, Viewshed, and Legend commands.

Task 1: Rasterize Legend Entries

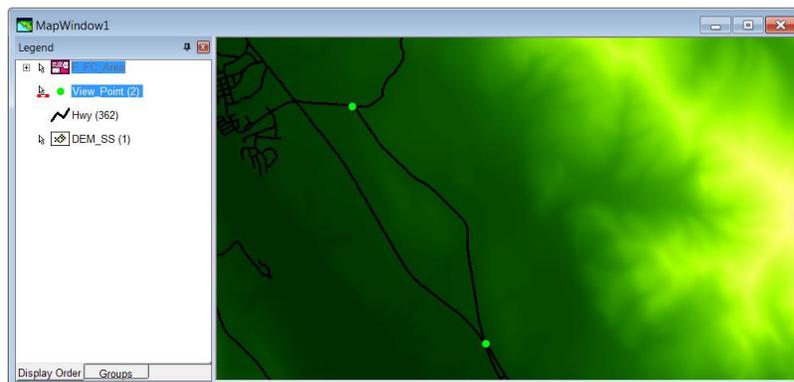
The Rasterize Legend Entries command creates a new grid layer from either vector feature class or query data. This command, like Rasterize Features, can convert point, line, area, and compound feature classes to raster layers.

In this task, you will use the Rasterize Legend Entries command to create two Grid layers in tandem, one that represents the location of the viewer points and one that represents the forest cover.

1. Navigate to **C:\Grid Analysis and 3D Tutorials\Visual Impact Assessment\Lesson 1**.
2. Double-click on **Lesson 1.gws** to open the GeoWorkspace for this lesson.

The GeoMedia map window will contain four legend entries, namely legend entries containing a DEM grid layer, highway locations, viewer points, and forest coverage.

3. Click on **F_FC_Area** in the legend, and then shift-click on **View_Point** in the legend.



4. On the **Grid** tab, in the **Layer** panel, click **Rasterize Legend Entries**.



Two new grid layers will be created and placed into the active Study Area. These new grid layers will be called F_FC_Area and View_Point.

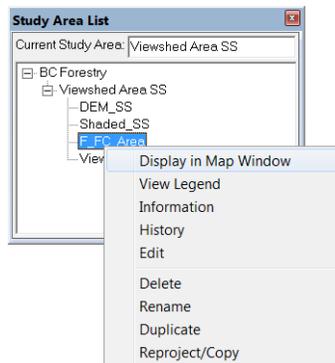
5. The next few steps are not critical to the workflow, but they will help us understand how database connectivity works. We used database connectivity earlier, but additional information provided here should help clarify this functionality.
6. On the **Grid** tab, in the **Study Area** panel, click **List** to display the **Study Area List** palette.



The Study Area List is a tree-form list of the connections, Study Areas, and grid layers belonging to a GeoWorkspace. The current, or active, Study Area is highlighted, and is identified at the top of the window.

This window can be used to access a number of functions related to both Study Areas and Grid layers.

7. Click on the + symbol beside **Viewshed Area SS** to expand the view. You will now see a list of Grid layers within the Study Area called **Viewshed Area SS**.
8. Right-click on the Grid layer named **F_FC_Area** to display the context menu.
9. Choose **Display in Map Window**.



The map window will update and display a raster representation of the feature class called **F_FC_Area**. This Grid layer has been colored using the default black-through-white color sequence.



As noted earlier, when a grid layer is created via a rasterization process such as we did above, the Primary Key (ID), which identifies each record in a feature class is written to the grid layer and this value is used to link the layer to the database. This allows us to specify an attribute in a grid command.

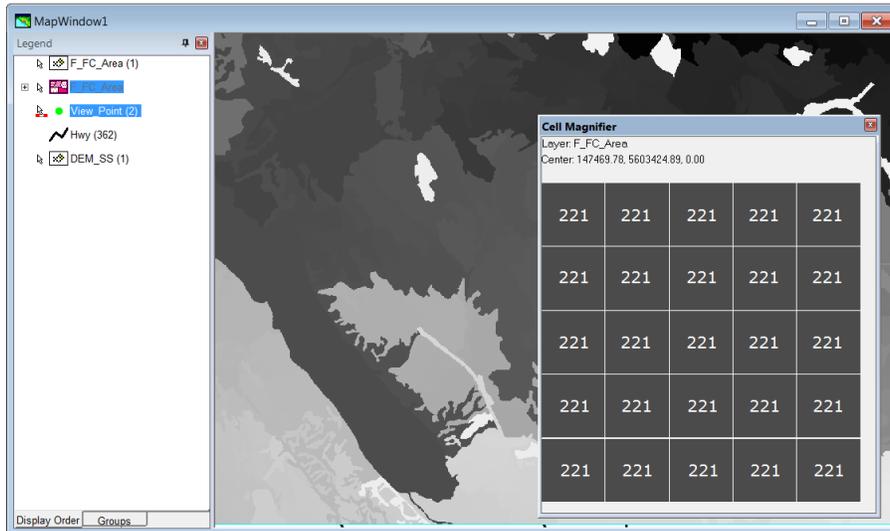
10. On the **Grid** tab, in the **Layer** panel, click **Cell Magnifier**.



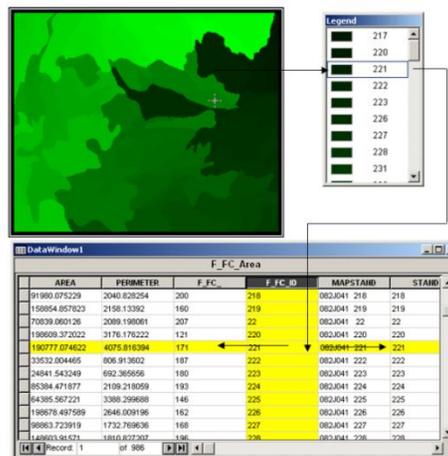
When the Cell Magnifier Tool is turned on, the pointer appears as a crosshair. When the crosshair is positioned over the GeoMedia Map window and the mouse is clicked, a window displaying a matrix of cell values for the topmost visible, locatable grid layer in the GeoMedia Map window opens. The grid layer name is displayed at the top of the window, and the center value in the matrix is that of the cell directly below the crosshair. If there are no grid layers displayed in the GeoMedia Map window, or if none of the grid layers in the GeoMedia Map window are

both visible and locatable, nothing happens.

11. Move your mouse over the Map Window and click. As soon as you click, the Cell Magnifier window will appear, each subsequent click will update the matrix of values to reflect the underlying cell values.



Notice the values in the Cell Magnifier. These values represent Primary Key (ID) values, and hence link back to the attributes within the original record set.

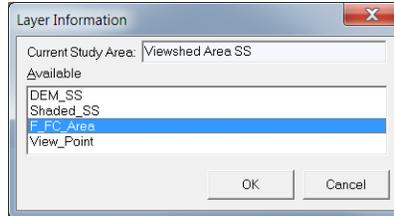


12. Press the **Esc** key on your keyboard to exit the Cell Magnifier command.
13. Click the **X** button on **Cell Magnifier** window to close it.
14. Right-click on the **F_FC_Area** legend entry and then select **Delete** from the context menu to remove F_FC_Area from the map window as it is no longer needed.

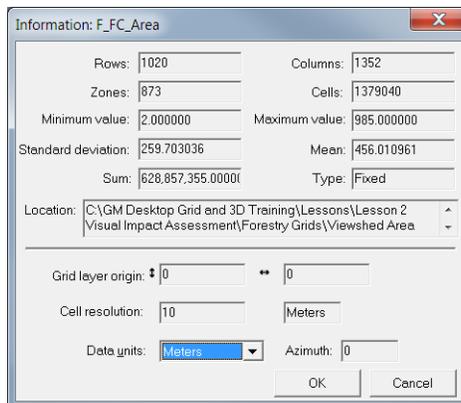
Setting the Data Units for Analysis

As noted in an earlier exercise, the Information window displays information about a layer. In this task you will use the Information window to set the data units of the F_FC_Area layer to Meters (since this layer will be used as an obstruction layer in the viewshed command, it needs to have the units set).

15. On the **Grid** tab, in the **Layer** panel, click **Layer > Information**.
16. Once the Layer Information dialog displays, click on the **F_FC_Area** entry to select it.



17. Click the **OK** button.
18. Once the Information dialog displays, use the **Data units** drop-down list to specify **Meters**.



19. Click the **OK** button to apply this change and to close the **Information** Window.

Task 2: Running Viewshed

The Viewshed command creates a Result layer identifying cells that can be "viewed" from specified vantage points (i.e. viewing locations).

Viewshed requires a minimum of two input layers: a Source layer and a Surface layer. Input layers can contain fixed-point or floating-point values; the Result layer will contain fixed-point values only. The Source layer defines the viewing locations — single cells representing points, lines of cells representing roads, or polygons representing parcels of land. Any non-VOID cell in the Source layer is treated as a viewing-location cell.

The cell values in the Surface layer are elevations. A Digital Elevation Model (DEM) or other elevation layer is suitable. VOID cells in the Surface layer are treated as bottomless pits.

In this task you will use the Viewshed command to create a viewshed from the two viewer points you rasterized earlier in this exercise.

1. On the **Grid** tab, in the **Analysis** panel, click **Surface > Viewshed**.
2. Set **Source Layer > Name** to **View_Point**.
3. Set **Surface Layer > Name** to **DEM_SS**.
4. Set **Obstruction layer > Name** to **F_FC_Area**.
5. Set **Obstruction layer > Attribute** to **STAND_HEIGHT**.
6. Set **Details > Viewing distance** to **7.5 Kilometers**.
7. Set **Details > Viewing height** to **2 Meters**.
8. Leave the remainder of options as defaults. Your dialog should look like the example provided below.

Viewshed

Source layer
Name: View_Point
Attribute:

Surface layer
Name: DEM_SS
Attribute:

Obstruction layer
Name: F_FC_Area
Attribute: STAND_HEIGHT

Details
Viewing distance: 7.5 Kilometers
Viewing height: 2 Meters
Vertical exposure: 0 degrees
View bearing from: 0 to 360

Result layer
Name: Viewshed Result Layer
 Place results in map window

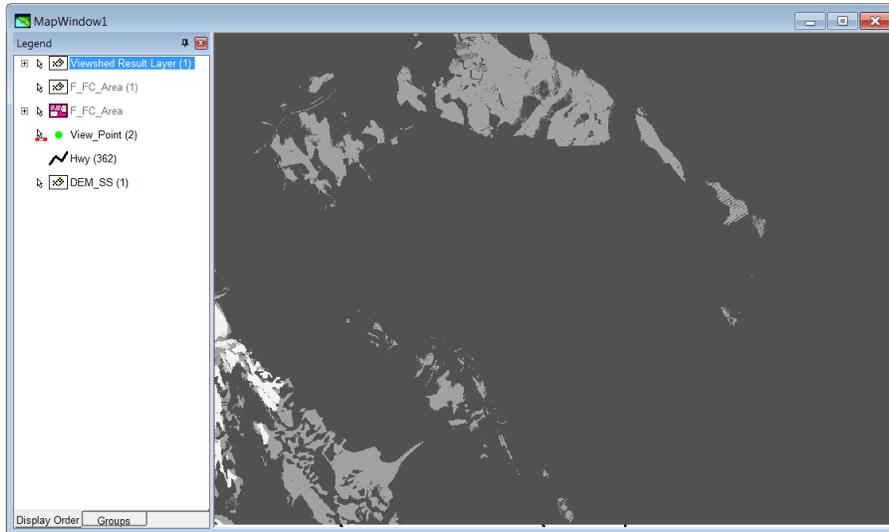
OK Cancel

9. Click the **OK** button.



For additional information about the Viewshed command please refer to the on-line help. The on-line help explains each of the controls within this dialog.

10. Once the Viewshed command has completed, the GeoMedia map window will update. Namely a legend entry called **Viewshed Result Layer** will have been added.



11. Click on the **+** symbol beside the legend entry entitled **Viewshed Result Layer** to expand the entries and reveal the values that make up this grid layer. Your legend entry should contain four zones, namely **(-1, 0, 1, and 2)**.

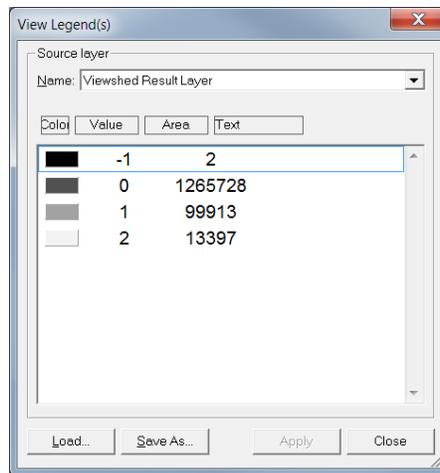


*-1 signifies the location of the original viewer points.
0 signifies the cells that cannot be seen from either of the viewer locations.
1 signifies the cells that be seen from one of the viewer points.
2 signifies the cells that be seen from both of the viewer points.*

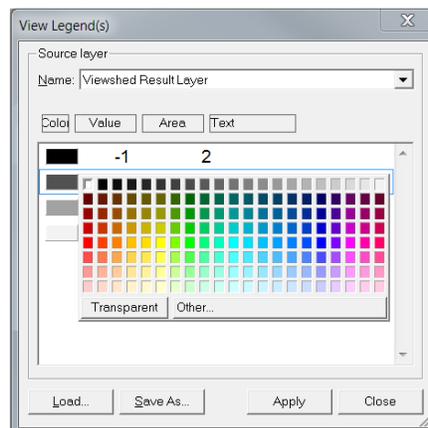
Task 3: Coloring the Results

In this task, you will use the View Legend command to color the results and hence better understand them.

1. On the **Grid** tab, in the **Layer** panel, click **Layer > View Legend**.
2. Set the **Source Layer > Name** to **Viewshed Result Layer**.



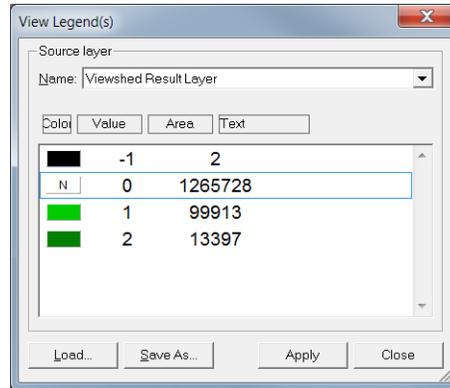
3. Click on the 0 Color box to display the default color palette and then click the **Transparent** button.



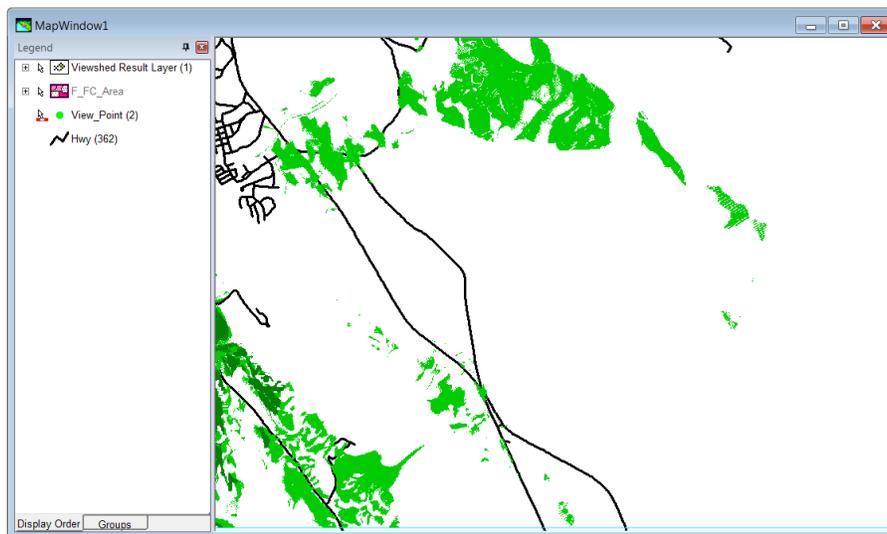
4. Click on the 1 Color box to display the default color palette and then specify a light green color.
5. Click on the 2 Color box to display the default color palette and then specify a dark green color.



You can use any color combination you want. The intent is to use color that will help the map reader understand the results. Your legend should look similar to the example shown below.



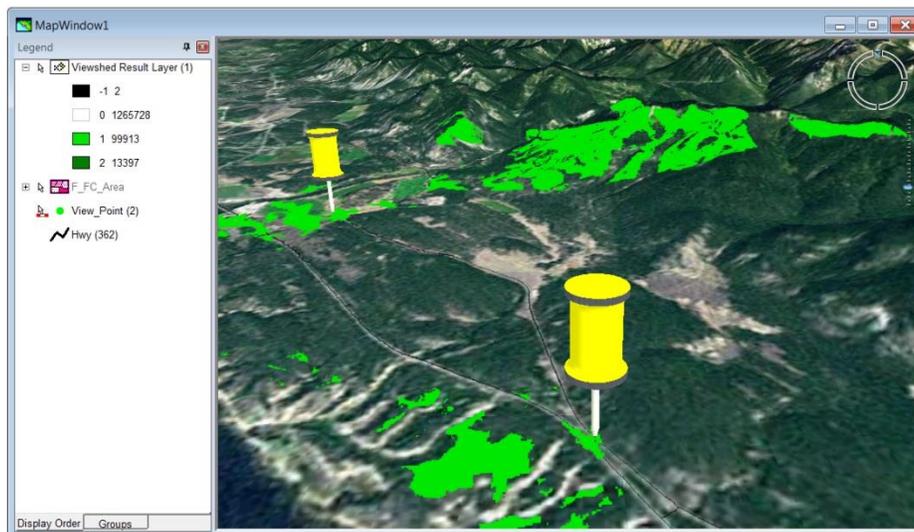
6. Click **Apply** button to apply these changes to the grid layer. Your map window will update to reflect your changes.
7. Click the **Close** button to close the **View Legend(s)** dialog.
8. Right-click on the **DEM_SS** legend entry and then select **Delete** from the context menu to remove DEM_SS from the map window.
9. Your map window should look similar to the example found below.



Task 4: Viewing the Results in 3D

The results of this analysis look fine in the map window, however having them displayed in a 3D context would help with understanding the results. In this task you will simply toggle to 3D and visualize the results.

1. On the **3D** tab, in the **View** panel, click **Toggle 3D**.
2. Your 2D GeoMedia Map Window will now toggle to a 3D window. Notice the new navigation control in the upper right corner of the map window.



3. Please note that your map window may be very dark given the current light source settings. Go ahead and update this to lighten the scene a little.
4. If you want to explore this map, feel free to use the navigation tools.
5. This exercise is now complete; you can exit GeoMedia and save the changes.