**Project Viewshed**

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# Summary

The **Project Viewshed** tool quickly computes the areas of the landscape that are visible from a given project. The tool systematizes the entire viewshed analysis, including buffering the input feature(s), preparing the digital elevation model, creating the viewshed observer points, executing the actual viewshed analysis, and reclassifying and managing the outputs. The tool accepts an input feature class representing the project feature(s) (points, lines, or polygons), an output location and naming convention, the maximum distance for viewshed analysis, and the number of observer points to use for computing visible areas. The tool returns a point feature class of the computed observer points, the raw viewshed raster, and a Visible/Not Visible viewshed polygon feature class.

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| Figure : Example input | Figure : Example output |

# Location

The tool is available as a ready-to-use Python Toolbox, located here:

[\\blm\dfs\loc\EGIS\CO\GIS\gistools\tools\Cultural\ArcGIS Project Viewshed](file:///\\blm\dfs\loc\EGIS\CO\GIS\gistools\tools\Cultural\ArcGIS_Project_Viewshed)

The tool is also open-source, and freely available here:

[https://github.com/MichaelTroyer/ArcGIS Project Viewshed](https://github.com/MichaelTroyer/ArcGIS_Project_Viewshed)

# Inputs

The tool has four required inputs (Table 1), and three optional inputs (Table 2).

The required inputs are: **Input Project Feature(s)**, **Output Name**, **Output Workspace**, and **Maximum Analysis Distance**.

* **Input Project Feature(s)** is the point, line, or polygon representation of the project of interest. The input must be a geodatabase feature class or shapefile.
* **Output Name** is a unique text ID to use to name the tool outputs.
* **Output Workspace** is a full path to a geodatabase where the tool outputs will be written.
* **Maximum Analysis Distance** is the maximum distance (in miles) for viewshed analysis. The input can be whole (integer) numbers or decimal numbers.

Table 1

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| Parameter | Type | Input |
| Input Project Feature(s) | Feature Class | Geodatabase feature class, shapefile |
| Output Name | Text | A unique name |
| Output Workspace | Geodatabase | e.g. T:\CO\GIS\gisuser\rgfo\mtroyer\View.gdb |
| Maximum Analysis Distance | Number (miles) | e.g. 1.0, 2.5, 5, 10, etc.. |

The optional inputs are: **Number of Project Boundary Observer Points**, **Number of Project Interior Observer Points**, and **Keep Interim Data**. These parameters are optional and can be left blank or unchecked.

* **Number of Project Boundary Observer Points** is the number of viewshed observer points to randomly scatter along the boundary of the input feature(s) (lines and polygons only).
* **Number of Project Interior Observer Points** is the number of viewshed observer points to randomly scatter within the interior of the input feature(s) (polygons only).
* **Keep Interim Data** indicates whether or not the interim data (the input feature(s) buffer, DEM clip, and boundary/interior observer points) will also be written to the workspace; if left unchecked, these data will be discarded.

Table 2

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| Parameter | Type | Input |
| Number of Boundary Observer Points | Number (integer) | e.g. 10, 100, 250 |
| Number of Interior Observer Points | Number (integer) | e.g. 10, 100, 250 |
| Keep Interim Data | Boolean | Checked / Unchecked |

Depending on the input feature(s) type, either or both of **Number of Project Boundary Observer Points** and **Number of Project Interior Observer Points** may be unavailable. The exact configuration of optional parameters depends on the input feature type (Point, Line, or Polygon).

## Input Feature Type: Point

First, when the input feature(s) type is Point, the input point(s) *are* the observer point(s) and no additional observer point creation is necessary. In this case, the **Number of Project Boundary Observer Points** and **Number of Project Interior Observer Points** parameters are both unavailable (Figure 3). The input feature point(s) will be used as the viewshed observer point(s) for calculating visible areas (Figure 4 and Figure 5).

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| Figure 3: Input point feature(s) |

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| Figure 4: Point input | Figure 5: Example point input viewshed |

## Input Feature Type: Line

Second, when the input feature(s) type is Line, the **Number of Project Boundary Observer Points** parameter becomes available (Figure 6). The user can then specify a number of boundary observer points or can leave the parameter blank. If the user supplies a number, that many points will be randomly scattered along the length of the line and these will be used as the viewshed observer point locations (Figure 7). If the user does not supply a number, the tool will extract the line feature vertices and use them as the observer point locations instead (Figure 8).

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| Figure 6: Input line feature(s) |

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| Figure : Line input with boundary points | Figure : Line input defaulting to feature vertices |

## Input Feature Type: Polygon

Lastly, when the input feature(s) type is Polygon, the **Number of Project Boundary Observer Points** and **Number of Project Interior Observer Points** parameters both become available (Figure 9). The user can then specify a number of boundary observer points, a number of interior observer points, supply numbers for both, or leave both parameters blank. If the user supplies a number for **Number of Project Boundary Observer Points**, that many points will be randomly scattered *along the boundary* of the input polygon(s), and these will be used as the viewshed observer point locations (Figure 10). If the user supplies a number for **Number of Project Interior Observer Points**, that many points will be randomly scattered *within the interior* of the polygon, and these will be used as the viewshed observer point locations (Figure 11). If the user supplies values for both the boundary and interior point parameters, the two datasets will be combined and the *entire collection* of points will be used as the viewshed observer points (Figure 12). If the user does not supply a number for either parameter, the tool will extract the feature(s) vertices and use them as the observer point locations instead (Figure 13); use this option with caution, as complex polygons may have many vertices, and the tool execution time increases with the number observer points.

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| Figure 9: Input polygon feature(s) |

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| Figure : Polygon input with boundary points | Figure : Polygon input with interior points |
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| Figure : Polygon input with interior and boundary points | Figure : Polygon input defaulting to feature vertices |

# Execution and Output

The tool is executed like any other ArcGIS tool. Click to expand the toolbox, and double-click the script tool, input the needed parameters, and select ‘OK’. If Background Geoprocessing is enabled in ArcMap, the tool will run in the background and the operational data will be written to the Results dialog window; otherwise the tool will run in the foreground and the operational details will be written to the pop-up geoprocessing window.

The tool outputs are written to the **Output Workspace** geodatabase, using the **Output Name** naming convention (Figure 14). The tool generates, at minimum, three outputs – a point feature class of the final viewshed observer point locations, a raw viewshed raster, and a Visible/Not Visible viewshed polygon feature class. If the **Keep Interim Data** parameter is checked, the tool will also save the interim data and write them to the output workspace, using the user-specified output naming convention – see below. The outputs all follow the naming convention: **<Output Name>**\_Description.

There are seven possible outputs, depending upon input and selections: (interim data in blue):

* **<Output Name>**\_Buffer
  + **Polygon Feature Class**: Input feature(s) buffered by **Maximum Analysis Distance**
* **<Output Name>**\_DEM
  + **Raster**: DEM clipped to input feature buffer
* **<Output Name>**\_Observer\_Points
  + **Point Feature Class**: The final observer points used for the viewshed analysis
* **<Output Name>**\_Observer\_Points\_boundary
  + **Point Feature Class**: The computed feature(s) boundary points (polygons and lines only)
* **<Output Name>**\_Observer\_Points\_interior
  + **Point Feature Class**: The computed feature(s) interior points (polygons only)
* **<Output Name>**\_Viewshed
  + **Raster**: The calculated viewshed raster for the input feature(s)
* **<Output Name>**\_Viewshed\_Polygons
  + **Polygon Feature Class**: The reclassified Visible / Not Visible polygon layer

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| Figure : Example output for polygon input |