



Geographic Business Solutions

Random Transect Generator Tool (Add-in)

User Guide

VERSION 1.0



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1 Introduction

GBS has developed an ArcGIS for Desktop 10.1 Add-in that allows the user to easily generate random transects within a boundary, based on a number of configurable parameters. The tool consists of a form with different configurable settings and options for generating and storing transects. It is designed to operate against any selected polygon/polygons in ArcMap's Data View, and generates transects based on the following user input:

- Transect Length (randomly within a minimum and maximum)
- Transect Azimuth (each randomly/all randomly or all set within a minimum and maximum)
- Transect Number (the number of transects to try and produce, per selected feature)
- Transect Spacing (the minimum spacing between transects, unless overlapping is allowed)

The Random Transect Tool is capable of storing generated transects in the following formats:

- ESRI Shapefile
- ESRI File Geodatabase
- ESRI Personal Geodatabase

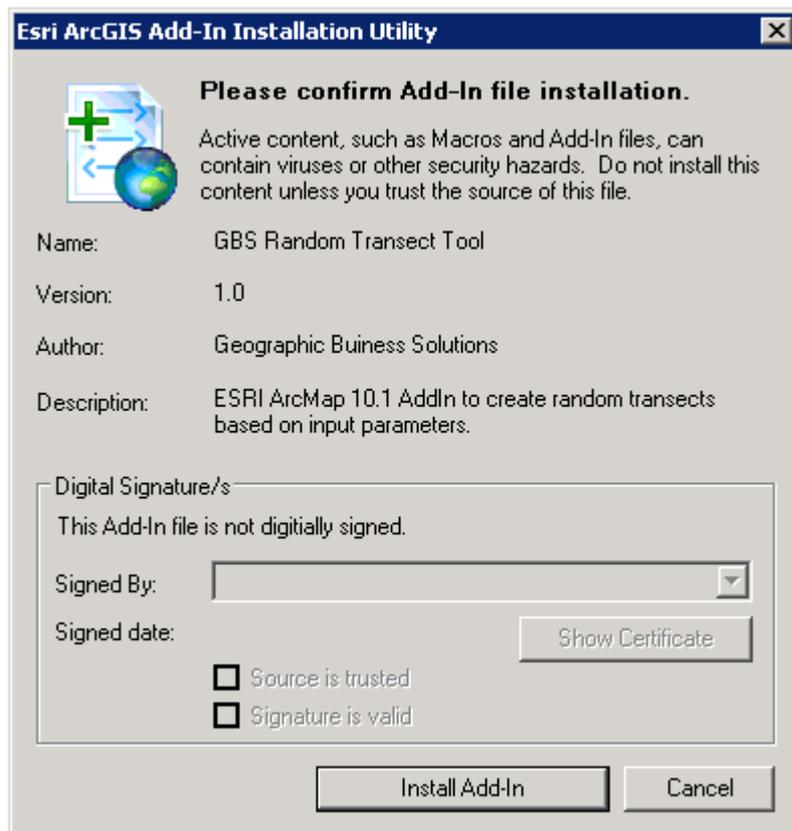
The initial settings used by the tool are configurable via an XML configuration file.

2 Installation

The following instructions detail how to install the GBS Random Transect Generator Tool Add-In on a local PC.

Note: For detailed background and instruction on installing Add-ins either locally on you PC or a Network, please refer to this ESRI article: <http://resources.arcgis.com/en/help/main/10.1/index.html#//014p0000001m000000>

1. Ensure that you have ArcMap 10.1 installed on your PC
2. Obtain the GBS.Tools.RandomTransect.esriAddIn file from GBS
3. Double-click on the GBS.Tools.RandomTransect.esriAddIn to install the Add-In
 - a. Click “Install Add-In”



4. Add the tool into ArcMap

If the GBS Random Transect Generator Tool does not immediately display in ArcMap, you can add the GBS Random Transect Generator Tool to anywhere on the ArcMap interface:

- i. From the menu, choose Customize - Customize Mode
- ii. Choose the Commands Tab
- iii. Choose GBS Tools in the Categories List
- iv. Select and Drag “GBS Random Transect Generator Tool” from the Commands list to your preferred location on one of the Toolbars.

3 Operation

The Random Transect Generator Tool has been designed with both ease of use and flexibility in mind, therefore there are a number of configurable parameters that can be easily set and experimented with to generate most types of transects you may need.

The following steps describe the generate steps required to use the tool:

3.1 Selecting Polygons

To make the Random Transect Generator Tool active, a polygon, or set of polygons, must firstly be selected in the active data view. Transects will be generated for all polygon layers in the MXD that have selected features.

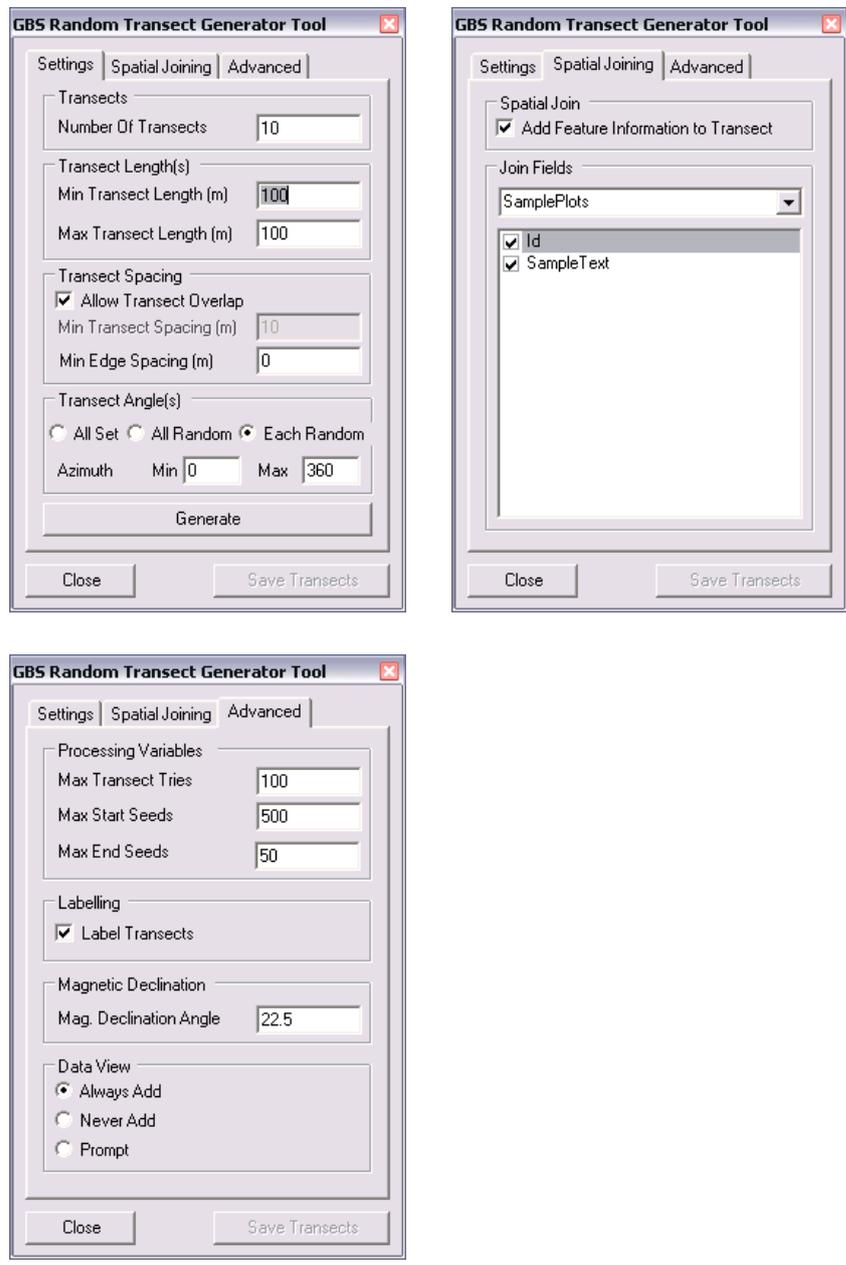
Note: When the Random Transect Generator Tool is operation, you can still interactively select and re-select polygons in any layers you want to generate transects for.

3.2 Starting the Transect Tool



Once a selection has been made, click the “GBS Random Transect Generator Tool” button in ArcMap. This will launch the Random Transect Generator Form that controls transect generation and storage.

3.3 Setting Parameters

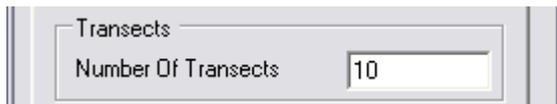


The GBS Transect Tool form is used to set any parameters and processing settings used during the generation of the random transects. The default values seen when the form opens are sourced from the GBS XML Configuration file (gbsConfig.xml) stored in the tools installation directory (or a network location if desired). These default values can be easily changed in a text editor and steps to do so will be described in a later section.

There are three main tabs in the form:

- The “Settings” tab in which parameters for controlling the number, size and orientation of the transects may be set
- The “Spatial Joining” tab in which you can set whether or not to join the fields from the underlying feature class to the output transect shapefile. Which fields to join can also be interactively set. Note: At this stage Spatial Joining is only supported on a single layer basis.
- The “Advanced” tab in which variables for controlling how intense the processing may be (i.e. how hard the tool should try to place a transect), as well as options for automatically labelling the generated transects, defining the magnetic declination for output and setting whether any transects committed to disk should be automatically added to the active data view.

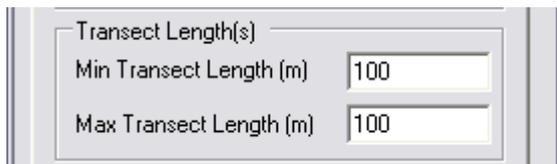
3.3.1 Transect Numbers (Settings Tab)



The screenshot shows a dialog box titled "Transects" with a single input field labeled "Number Of Transects" containing the value "10".

This parameter controls the number of transects generated per selected feature. The program will always try and achieve the number selected, but if the shape is highly irregular or the other parameters mean that spacing for example is too far apart, then the program will only fit in as many as it can under the preset conditions.

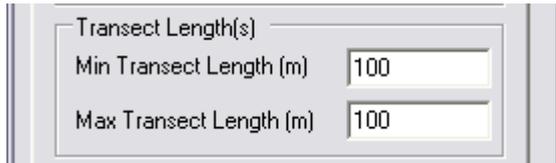
3.3.2 Transect Length (Settings Tab)



The screenshot shows a dialog box titled "Transect Length(s)" with two input fields: "Min Transect Length (m)" and "Max Transect Length (m)", both containing the value "100".

These two parameters control the length of the transects generated in each polygon. If both the minimum and maximum length are exactly the same, the transects generated will always be exactly the set length. If the minimum and maximum are different however, then the length of the each transect will be a randomly generated between these two values.

3.3.3 Transect Overlap and Spacing (Settings Tab)



These two parameters control how the transects are placed within the selected polygon(s). If the “Allow Transect Overlap” option is checked then the transects may overlap each other and the minimum spacing between them is ignored. However, if the “Allow Transect Overlap” option is unchecked and the “Minimum Transect Spacing” is set, then the generator will only place a randomly generated transect if it is further away than the set amount from all other already placed transects.

3.3.4 Transect Azimuth (Settings Tab)



This set of parameters controls the azimuth used to generate each or all of the transects. The term “azimuth” used in this application is described as the direction of the transect as measured clockwise around from north (00 or 3600)

There are three options for setting the way in which the transects are oriented

- All Set (All transects are orientated along the same set azimuth, defined in the Min setting)
- All Random (All transects are orientated along the same randomly generated azimuth, defined between the Min and Max settings)
- Each Random (Individual transects are orientated along the same randomly generated azimuth, defined between the Min and Max settings)

There are also two parameters for controlling the azimuth(s) of the transects generated in each polygon. If both the minimum (Min) and maximum (max) angles are exactly the same, then the transects generated will always have exactly the set azimuth. If the minimum and maximum are different however, then the angle of the each azimuth will be a randomly generated between these two values.

3.3.5 Generating Transects (Settings Tab)



The Generate Button creates a unique set of randomly generated transects. If the program could not generate the defined number of transects for any of the selected polygon features, then a warning will be displayed to inform the user.

The transects generated at this point are only screen graphics, so that you can alter parameters and settings to suit to generate the transect pattern you want without worrying about committing the data to disk.

You can generate as many transect patterns as you like by simply clicking the "Generate" button repeatedly

3.3.6 Save Transects (Settings Tab)



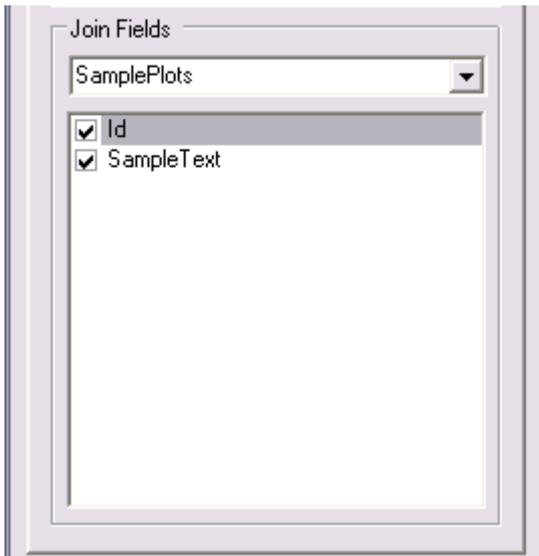
This button allows you to save the latest set of randomly generated transects to Shapefile format. A dialog box will prompt you for the location to save the transects to, as well as a name for the Shapefile. The Shapefile saved to disk will always inherit the Spatial Reference of the Data View the transects were generated in.

3.3.7 Spatial Join (Spatial Joining)



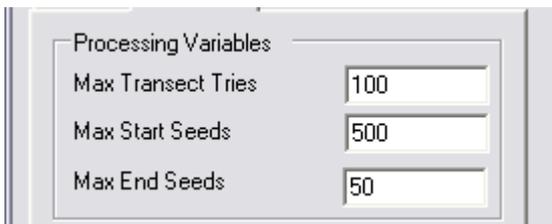
This setting allows you to indicate whether the output transect shapefile should contain information from the underlying selected polygon that the transect was generated in.

3.3.8 Join Fields (Spatial Joining)



The drop down list allows you to select the layer from which fields should be copied across to the output transect shapefile. The checked list underneath allows you to interactively choose which fields should be copied across or not.

3.3.9 Processing Variables (Advanced Tab)



There are three sets of variables that the program uses to decide how intensively to search for a location to place a transect. The higher each of these values, the more intense the processing will be and the longer it will take. A balance should be struck between the time taken to generate the transects, the number that are to be generated, and how hard that program tries to create the best fit for the transects.

There are three options for setting the way in which the transects are positioned

- Max Transect Tries (How many attempts are made to place a transect per feature)
- Max Start Tries (How many attempts are made to find a starting point within the selected feature's boundary, per Transect Try)

- Max End Seeds (How many attempts are made to find a end point within the selected feature's boundary, per Start Try)

3.3.10 Transect Labelling (Advanced Tab)



If this option is ticked then any transects generated by the program will be automatically labelled on screen. The font type and size are stored in the GBS XML Configuration file (gbsConfig.xml) stored in the tool's installation directory. And again, these default values can be easily changed in a text editor and steps to do so will be described in a later section.

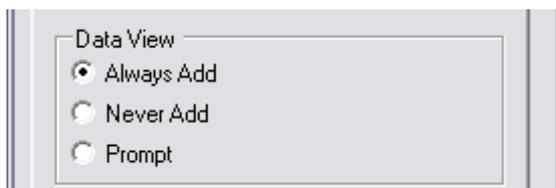
In addition, if this option is ticked, then when a set of transects is committed to disk and automatically added to the data view, the newly added layer's labels will also automatically be enabled.

3.3.11 Magnetic Declination (Advanced Tab)



This setting provides the default magnetic declination angle used to populate the Magnetic Bearing field in the output shapefile(s).

3.3.12 Adding Transects to the Data View (Advanced Tab).



These three settings let you choose where the transect file committed to disk as a shapefile should be either:

- Always Add (Always added to the active data view automatically)
- Never Add (Never added to the active data view)
- Prompt (Always prompted whether or not to add to the active data view)

3.4 XML Configuration File

The GBS Random Transect Generator Tool Configuration file (GBS.Tools.RandomTransect.config) is stored within the add-in archive of the Add-in, in the Add-Ins installation directory.

By using an Zip Archive Tool like WinZip or 7-Zip, it is possible to alter the configuration file to change the default settings of the Tool.

Note: This should be approached with caution. Please contact GBS via support@qbs.co.nz if you would like advice and guidance on this process.

The configuration file contains the default settings for the Transect Generator Form. The defaults can be edited via any text or xml editor using the following options:

Default Option Settings

- transectnumber (the default number of transects to produce per feature)
Valid values: Integers
- transectminlength (the default minimum length of a individual transect)
Valid values: Any Number above 0
- transectmaxlength (the default maximum length of a individual transect)
Valid values: Any Number above 0
- transectoverlap (the default overlap option)
Valid Values: true or false
- transectspacing (the default minimum distance between transects, if overlap is false)
Valid Values: Any Number above 0
- transectazimuthtype (the default option for the way in which transects are orientated.)
Valid Values:
 - AllSame (All transects are orientated along the same set azimuth, defined in the Min setting)
 - AllSameRandom (All transects are orientated along the same randomly generated azimuth, defined between the Min and Max settings)

- AllRandom (Individual transects are orientated along the same randomly generated azimuth, defined between the Min and Max settings)
- transectminazimuth (the default minimum angle for the transect)
Valid Values: Any Number between 0 and 360
- transectmaxazimuth (the default maximum angle for the transect)
Valid Values: Any Number between 0 and 360
- magneticdeclination: (the default Magnetic Bearing)
Valid Values: Any Number
- transectlabelling (the default automatic labelling option)
Valid Values: true or false
- transectaddtodataview (the default option for whether or not to add a newly created shapefile to the data view)
Valid Values:
 - Auto (Always added to the active data view automatically)
 - Never (Never added to the active data view)
 - Prompt (Always prompted whether or not to add to the active data view)

Spatial Joining Settings

- transectspatialjoin (the default automatic spatial joining option)
Valid Values: true or false

Processing Option Settings

- maxseedstartpoints (the default number of attempts made to place a transect per feature)
Valid values: Integers
- maxseedendpoints (the default number of attempts made to find a starting point within the selected feature's boundary, per maxseedstartpoints)
Valid values: Integers

- maxtransecttries (the default number of attempts made to find a end point within the selected feature's boundary, per maxseedendpoints)
Valid values: Integers

Labelling Option Settings

Use the various xml elements to define the text properties for the labels generated on-the-fly by the transect generator

Featureclass Option Settings

Use this xml element to set the default name for the shapefile when saved to disk.

The editable parts of the XML file look like:

```
<configuration>
  <transect>
    <transectnumber>10</transectnumber>
    <transectminlength>100</transectminlength>
    <transectmaxlength>100</transectmaxlength>
    <transectoverlap>>true</transectoverlap>
    <transectspacing>10</transectspacing>
    <transectedgespacing>0</transectedgespacing>
    <transectazimuthtype>AllRandom</transectazimuthtype>
    <transectminazimuth>0</transectminazimuth>
    <transectmaxazimuth>360</transectmaxazimuth>
    <magneticdeclination>22.5</magneticdeclination>
    <transectlabelling>>true</transectlabelling>
    <transectaddtodataview>AutoAdd</transectaddtodataview>
    <transectspatialjoin>>false</transectspatialjoin>
  </transect>
  <labelling>
    <font>arial</font>
    <bold>>false</bold>
    <italic>>false</italic>
    <underline>>false</underline>
    <size>8</size>
    <colour>blue</colour>
    <masksize>1</masksize>
    <maskcolour>white</maskcolour>
  </labelling>
  <processing>
    <maxseedstartpoints>500</maxseedstartpoints>
    <maxseedendpoints>50</maxseedendpoints>
    <maxtransecttries>100</maxtransecttries>
  </processing>
  <storage>
    <defaultfeatureclassname>Transect</defaultfeatureclassname>
  </storage>
</configuration>
```

4 Un-Installation

The following instructions detail how to uninstall the GBS Random Transect Tool Add-In:

1. Using ArcMap, choose Customize - Add-In Manager from the menu bar
2. In the My Add-Ins section, select the “GBS Random Transect Tool”
3. Click “Delete this Add-In
4. Restart ArcMap.