

Appendix 1: Random Street Segments Workbook

These instructions are designed to help users of all skill levels create random i-Tree Streets (STRATUM) sample street segments for use in field data collection. ESRI ArcGIS software is used; the instructions will need modification depending on the version of ArcGIS employed. For purposes of example, US Census TIGER map data are utilized for an entire city. If zones within a city will be used, follow the basic directions for EACH zone.

These instructions are composed of two basic steps:

- 1 Prepare project area data.
- 2 Generate sample street segments

When you are finished, you will have created the following:

- Area-of-interest *polygon* map layer.
- Random street segments *line* map layer

Tips

- These instructions require use of basic ArcGIS functions at the ArcView level. No extensions are necessary.
- Advanced GIS users can primarily follow the bulleted overviews with attention given to the detailed instructions in areas such as field names and types.
- For advanced GIS users: For a zones-based analysis, after creating a random sample segments layer, intersect it with a zones polygon layer to split the segments by zone borders.
- If desired, obtain projection/coordinate system and map unit information from the map data provider.
- AOI examples are large polygons such as city boundary, park areas, or individual management zone(s).
- ESRI shapefiles, coverages, or geodatabases can be used. Shapefiles are easiest.
- Practice good file management using folders to hold copies of original data, folders to hold output, employ logical file naming, etc.

- Save your work in an ArcGIS *.mxd project periodically through all steps.
- You may need to turn off any pop-up blockers in your web browser when downloading data.

Common tools



Open Project



Select



Add Data

Project Area Data Preparation

Overview

- Obtain a GIS map layer representing the area-of-interest (AOI) polygon(s) for your project area.
- Obtain a GIS map layer representing the street centerlines for your project area.
- Launch the ArcMap application of ArcGIS at the ArcView, ArcEditor, or ArcInfo level.
- Save an *.mxd project file with a name and location of your choice.
- Load the AOI and streets map layers into the view.
- If needed, select the specific AOI polygon(s) from any others present that best represent your project area.
- Export the selected AOI polygon(s).
- If needed, select (or clip) only the street lines that lay within your AOI.
- Export selected street lines.

Results

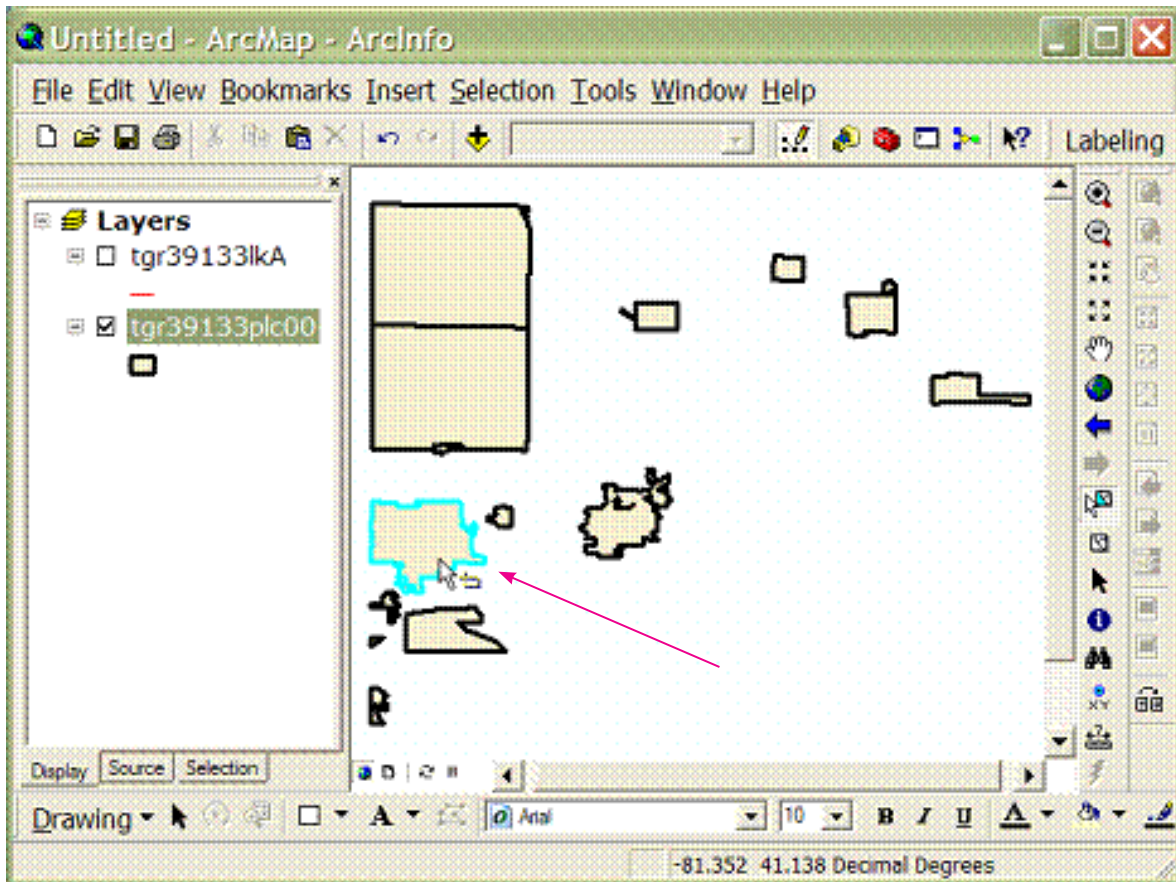
- AOI map layer composed of one or more polygons
 - Associated street lines map layer.
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Detailed instructions

- 1 To begin, you'll need to obtain a shapefile that outlines your area-of-interest (AOI). Possible sources include a local government or school GIS Department or an online resource such as ESRI's Free Data (<http://www.esri.com/data/free-data>):For

example, you can use the US Census TIGER map data to obtain shapefiles of counties:

- a To obtain US Census TIGER map data for counties, scroll to “Downloadable Data” on the web page.
 - b Click the **Census 2010 TIGER/Line Data** link.
 - c On the Census web page, click **Web interface** under Download by Type.
 - d Under “Select a layer type” choose County Subdivisions.
 - e Choose the appropriate state under “County Subdivision 2010”.
 - f Select the appropriate county. Click **Download**.
 - g Save the resulting file when prompted and unzip into your working directory, or another location that you can easily find again.
- 2 You’ll also need a shapefile of road centerlines. To obtain these from the US Census TIGER map data, scroll to “Downloadable Data” on the web page.
 - a Click the **Census 2010 TIGER/Line Data** link.
 - b On the Census web page, click the **Web interface** link under Download by Type.
 - c Under “Select a layer type” choose **Roads**.
 - d Under “All Roads” choose the appropriate state and then the appropriate county.
 - e Save the resulting file when prompted and unzip into your working directory, or another location that you can easily find again.
- 3 Launch ESRI’s ArcMap application.
- 4 Use the **Add Data** button to browse to and load the TIGER **County Subdivisions** and **Line Features – Roads** map layers to the current view. If an “Unknown Spatial Reference” message appears, click **OK** to move past it.
- 5 TIGER County Subdivisions data are typically organized by county and often include multiple place polygons. Use the **Select** tool to select your specific AOI polygon from those on the screen. Peruse the attribute table or use the feature labeling functions to help identify your AOI polygon if necessary.



- 6 Export the selected AOI polygon(s) to a separate map layer and add the exported layer to the view:
 - a Right-click on the **TIGER County Subdivisions** map layer and select **Data > Export Data**.
 - b Verify that the **Export** drop-down list is set to **Selected features**.
 - c Choose an appropriate name for the AOI polygon map layer and save it.
 - d When prompted, click **Yes** to add the exported data as a map layer to the view.

- 7 Query the TIGER Road Lines map layer to select street segments suitable for sampling:
 - a In the **Table of Contents (TOC)** map layer list, click the **Road Lines** map layer to select it (verify the map layer is also checked in the TOC and thus visible in the map view).
 - b From the main menu, choose **Selection > Select by Attributes**.

- c In the resulting dialog window:

Verify that the **Road Lines** map layer is selected from the drop-down list.

Verify the chosen method is set to **Create new selection**.

Copy and paste this query below into the query box at the bottom of the window:

```
"MTFCC" = 'S1200' OR "MTFCC" = 'S1400' OR "MTFCC" = 'C3061' OR  
"MTFCC" = 'C3062'
```

NOTE: These are updated codes for the 2010 Census and differ from previous Census codes. In addition, this query selects for local, county, and state roads but does NOT include Interstates or Interstate ramps, or private roads, alleys, 4WD tracks, etc. Users may of course choose any set of codes they wish to sample.

- 8 Export the subset of selected TIGER Road Lines to a separate map layer and add the layer to the view:
 - a Right-click on the **TIGER Road Lines** map layer and select **Data > Export Data**.
 - b Verify that the **Export** drop-down list is set to **Selected features**.
 - c Choose a name for the selected streets line map layer and save it.
 - d When prompted, click **Yes** to add the exported data as a map layer to the view.
- 9 Clip the Street Segments suitable for sampling to fall within only the AOI boundary.
 - a Launch the Clip tool via **ArcToolbox > Analysis Tools > Extract > Clip**.
 - b Under Input Features, choose your exported Street Segments map layer suitable for sampling.
 - c Under Clip Features, choose your exported AOI map layer.
 - d Under Output Feature Class, browse to your working folder, enter a name for the clipped roads layer with the extension .SHP (example: myStreets_Clip.shp).
 - e Leave the XY Tolerance box empty.

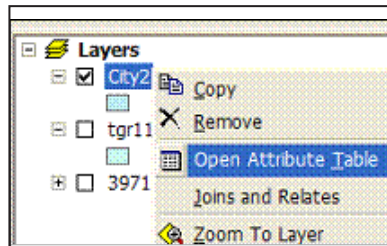
f The clipped roads layer should add automatically to the ArcGIS Table of Contents.

10 From the main menu, choose **Selection > Clear Feature** to unselect the AOI polygon and Streets features.

Results

Area-of-interest (AOI) polygon map layer and associated AOI Streets in a line layer that are suitable for sampling.

- Verify AOI polygon and Streets map layers are loaded into the map view. It may be necessary to **right-click** the new AOI layer and select **Zoom to Layer**.
- Right-click the new AOI layer name in the map layers list, and choose **Open Attribute Table** to verify you have the correct AOI polygon using an attribute field such as “name”.
- Verify the street lines are clipped within the AOI polygon.



The street lines are now ready to be sampled.

Street Segment Sample Generation

Overview

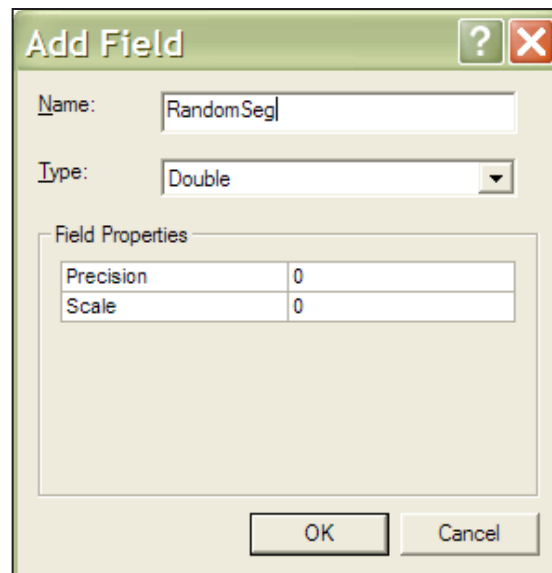
- Add a field to the Streets data.
- Calculate random number values for the Streets data.
- Select the desired number of street segment samples from the attribute table.
- Export the street sample data and map.

Results

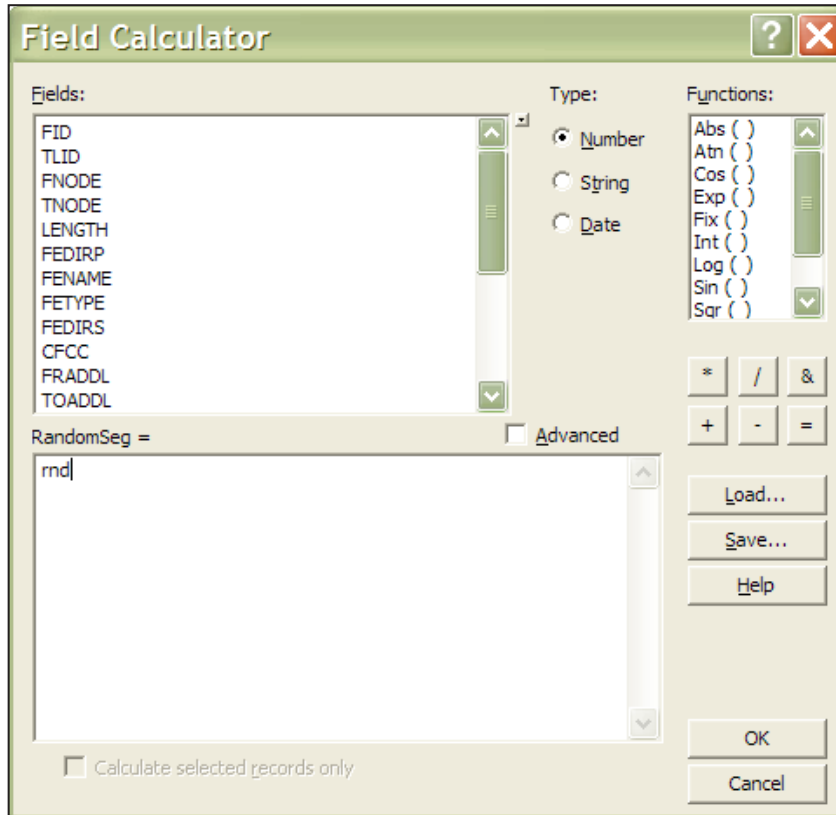
- Random street segments for field sampling
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Detailed instructions

- 1 On the clipped **Streets** map layer, open the table by right-clicking on the **layer name** in the **TOC**.
- 2 Using the **Table Options** button in the upper left of the table window, add a field named **RandomSeg** of type **Double** to the clipped Streets table. Leave the Precision and Scale entries blank.



- 3 Right-click the newly created **RandomSeg** field title and use the **Field Calculator** to populate the field using the **rnd** function:



- 4 Once the field is populated, right-click the **RandomSeg** field title to sort the field in ascending order.
- 5 Scroll down the attribute table to reach the desired number of street segments and select them:
 - a Click one of the cells in the table to see which record number it is in the **Record count box**.
 - b When the desired number of records is found, hold down **Shift** while selecting the records using the gray buttons to the left of the records.
- 6 Close the table window and return to the map view to export the selected Streets map layer samples and add them to the view:
 - a Right-click on the clipped **Streets** map layer and select **Data > Export Data**.
 - b Verify that the **Export** drop-down list is set to **Selected features**.
 - c Choose an appropriate name for the selected street samples map layer and save it.

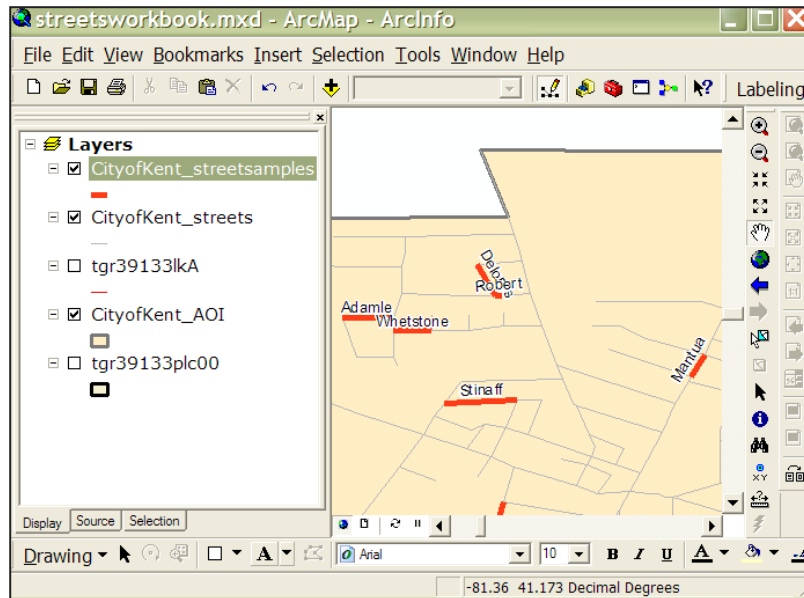
- d When prompted, click **Yes** to add the exported data as a map layer to the view.
- 7 From the main toolbar, choose **Selection > Clear Selected Features** to unselect deisgnatthe Streets features.
 - 8 If desired, open the newly created street samples attribute table and export the records for use in Microsoft Excel (for printing, etc.):



- a From the **Attribute table > Options button > Export > All records**
- b Choose to export as a dBase file, which can be read by MS Excel

1335	1352	0.06106	N	Mantua	St	A31
2448	2457	0.04195		Summit	Rd	A41
2104	2082	0.07055		Petrarca	Dr	A41
1023	986	0.09051		Delores	Ave	A41
2104	2190	0.14685		Petrarca	Dr	A41

- 9 If desired, print a map of the segments for planning and field use:



- a Label the street segments with a name field in the map view.
- b Recolor the map layers for better visibility by right-clicking on their symbology in the TOC.

- c Switch to the Layout view and add map elements such as north arrow and scale bar via the **Insert** menu at top.



- d From the main toolbar, choose **File > Print** and select appropriate printer and paper.
 - e Optional: choose **File > Export Map** to save an electronic copy of the map.
- 10 Optional: For zones within an AOI, add in a zones polygon layer. Intersect the zone polygons with the street sample segments in order to “break” them across zones and to assign appropriate zone attributes to the segments.
- a Use the Intersect tool via **ArcToolbox > Analysis Tools > Overlay > Intersect**.
 - b The output Intersect street segment layer will have zone attributes assigned to the street segments.
 - c Use the **Select by location** function for each zone in order to tally street sample counts within each zone.

Results

Desired number of random Street Segment Samples in a LINE map layer.

MS Excel file of Street Segment Samples attribute data.

Hardcopy or electronic maps of Sample Segments.