

i-Tree Eco Random Plots Workbook:

Pre - Stratification

These instructions help users of all skill levels create random, pre-stratified UFORE sample points and their associated UFORE-required data within a defined UFORE project area. Pre-stratification of sample plots is performed. ESRI ArcGIS v9.x software is used. For purposes of example, 2001 USGS National Land Cover Database (NLCD) data are employed as strata.

These instructions are composed of four basic steps:

1. Project Area Data Preparation
2. Strata (Land Cover) Preparation
3. Sample Plot Generation
4. Create UFORE-ready Output

These instructions result in these items:

- Projected Area-of-Interest map layer composed of a single (multi-part) POLYGON.
- Projected Land Cover map layer conforming to the AOI boundaries and composed of singular, multi-part land cover POLYGONS with UFORE-required fields added and populated.
- Random Sample Plots POINT map layer with UFORE-required fields added and populated.
- Sample Plot Areas POLYGON map layer.
- UFORE Strata Area report text file.
- UFORE Plot List report text file.
- UFORE PRJ file.

Tips

- These instructions require use of a few simple i-Tree tools within the iTree.mxd ArcMap project file that can be downloaded from the i-Tree website.
- Advanced GIS users: primarily follow the bulleted Overviews with attention given to the Detailed Instructions in areas such as field names and types.
- Obtain projection/coordinate system and map unit information from the map data provider.
- Final map units must be either Feet or Meters.
- Area-of-Interest (AOI) examples are large polygons such as: city boundary, park areas, or a 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 the iTree.mxd project periodically through all steps.
- Temporarily turn off any web browser pop-up blockers.
- Decide in advance the number of plots for each stratum.
- Actions in **red** represent standard ArcGIS operations.
- Actions in **green** represent iTree.mxd toolbar operations.



Project Area Data Preparation

Overview:

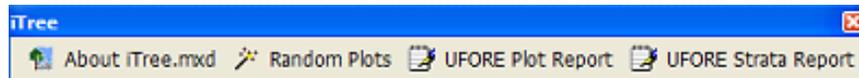
- Obtain a GIS map layer representing the Area-of-Interest (AOI) polygon(s) for your project area.
- Launch the ArcMap application of ArcGIS at the ArcView, ArcEditor, or ArcInfo level.
- Open and 'Save As' the **iTree.mxd** project with a new user-defined name at a user-defined location.
- Load the Area-of-Interest (AOI) map layer into the view.
- **Define the projection**/coordinate system of the AOI.
- **Reproject** the AOI to a system using feet or meters if needed.
- **Dissolve** the AOI into a single polygon (single, multi-part polygon if more than one polygon).

Results:

- Projected AOI map layer composed of a single (possibly multi-part) polygon.
-

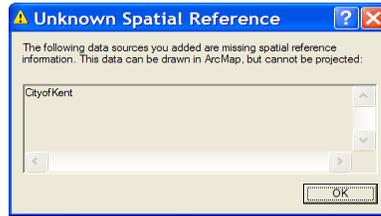
Detailed Instructions:

1. Obtain an Area-of-Interest (AOI) polygon from your GIS Department or an online resource such as ESRI's Geography Network (<http://www.geographynetwork.com/>).
2. Launch ESRI's ArcMap application at the ArcView (or ArcEditor or ArcInfo) level.
3. Use the open button  to browse for the iTree.mxd downloaded from the i-Tree site.
 - a. The **iTree.mxd** project file contains a custom toolbar for random sample generation and UFORE report output:



4. Save a copy of the iTree.mxd project with a new name at a new location via the File>Save As menu.
5. Open ArcToolbox  if necessary.
6. Use the Add Data button  to navigate to and load the AOI polygon map layer to the current view.

- a. An “Unknown Spatial Reference” message may appear; click OK to move past it.

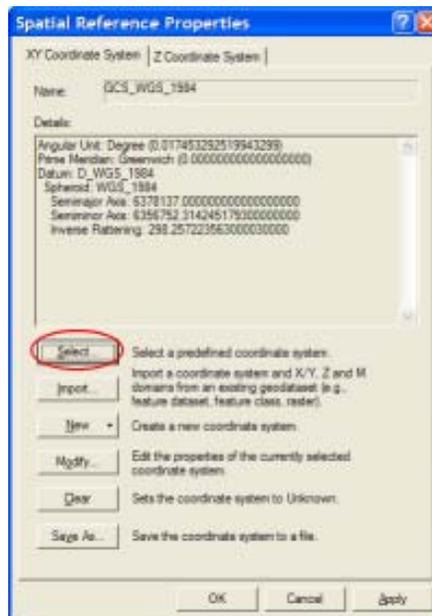


- 7. If needed, use ArcToolbox to **Define the Projection** of the AOI map layer per your data provider's specifications: *(If a projection is already defined, skip to Step 8)*

- a. Navigate to ArcToolbox>Data Management Tools>Projections and Transformations>Define Projection
- b. Fill out the ensuing Define Projection form:

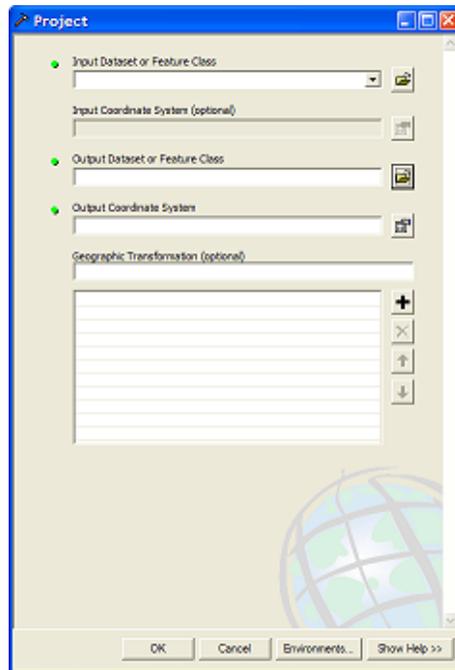


- i. Input Dataset: choose the **AOI map layer** from the drop down.
- ii. Coordinate System: click the properties button  at right and use the ensuing “Spatial Reference Properties” dialog window to navigate to the proper coordinate system via the Select button.

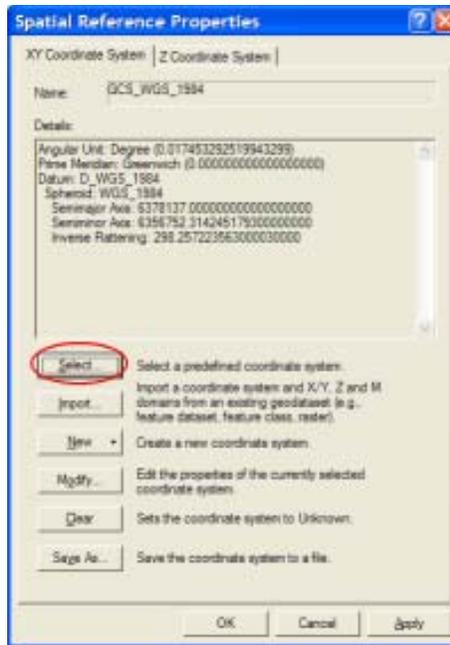


Proper coordinate system is determined by your data provider.

8. If needed, use ArcToolbox to **Reproject** your AOI map layer to a system using feet or meters:
 - a. This system would ideally be one already in use by your organization or a commonly used system such as State Plane or UTM in the United States.
 - b. Navigate to ArcToolbox>Data Management Tools>Projections and Transformations>Feature>Project
 - c. Fill out the ensuing Project form:



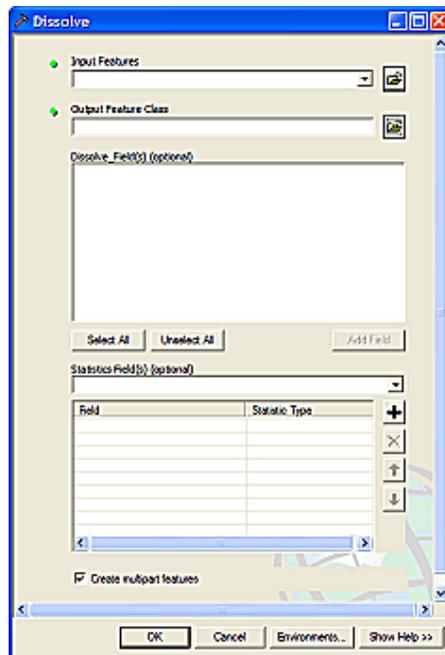
- i. Input Dataset: choose the **AOI map layer** from the drop down.
- ii. Input Coordinate System: Based on Step 7 above, this should be grayed out with the previously defined projection system.
- iii. Output Dataset or Feature Class: use the browse button  to locate a suitable location and filename for the resulting map layer.
- iv. Output Coordinate System: click the properties button  at right and use the ensuing "Spatial Reference Properties" dialog window to navigate to the proper coordinate system via the Select button.



Choose a coordinate system employing either feet or meters.

- v. **Geographic Transformation**: while marked as "Optional", select the first choice in the drop down if prompted with an "Undefined Geographic Transformation" message.
- vi. Click OK.

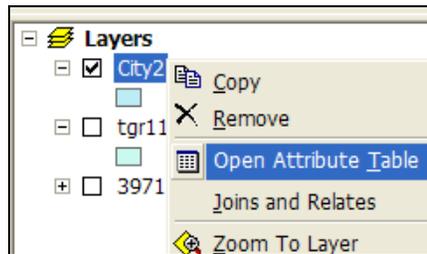
9. If your AOI has more than one polygon, use ArcToolbox to **Dissolve** the them:
 - a. Navigate to ArcToolbox>Data Management Tools>Generalization>Dissolve
 - b. Fill out the ensuing Dissolve form:



- i. Input Features: choose the projected **AOI map layer** from the drop down list.
- ii. Output Feature Class: use the browse button  to locate a suitable location and filename for the resulting map layer.
- iii. Dissolve Field(s): check the data field whose attribute value unifies the AOI. *Example: a "Name" field containing the city name of an AOI, even across physically separate city sections.*
- iv. Statistics Field(s) : Leave blank.
- v. Create Multipart Features: ensure this option is checked.
- vi. Click OK

10. Final results:

- a. Area-of-Interest (AOI) POLYGON map layer
 - i. Verify AOI map layer is loaded into the map view. (It may be necessary to right-click the new AOI layer and select "Zoom to Layer".)
 - ii. It should have one record present in its table. (Right-click the new AOI layer name in the map layers list, and choose "Open Attribute Table")



The AOI polygon map layer is now ready to be used to clip the strata layer.

Instructions continue below.

Strata Preparation

Overview:

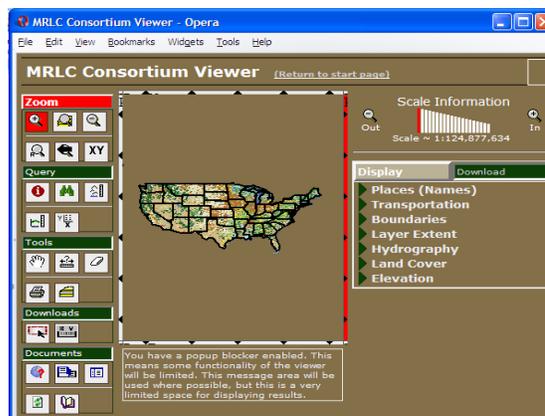
- Obtain a Land Cover GIS map layer encompassing the Area-of-Interest (AOI) polygon(s) for the project area.
- **Convert** the Land Cover data to polygons, if needed.
- **Dissolve** the Land Cover polygons into single, multi-part polygons for each land cover category.
- **Define the projection**/coordinate system of the Land Cover data if needed.
- **Reproject** the Land Cover data to a system using feet or meters if needed.
- **Clip** the Land Cover data to the AOI area.
- **Select** each Land Cover category and **Calculate** the plain text value for it.
- **Add** UFORE-required fields and **Calculate** appropriate values for them

Results:

- Projected, clipped Land Cover map layer composed of multi-part polygons with UFORE-required fields added and populated.
 - NLCD Canopy and Impervious Surface layers for use later with the i-Tree software suite.
-

Detailed Instructions:

1. Obtain an Area-of-Interest (AOI) polygon from your GIS Department or an online resource such as the Multi-Resolution Land Characteristics Consortium (MRLC) (<http://www.mrlc.gov/>).
 - a. To obtain 2001 NLCD data, visit the MRLC website, chose "Access Data" > "Seamless Data Download" . A new window will pop-up with links to both the MRLC Consortium Viewer and User Instructions. After reviewing the User instructions, launch the Viewer:

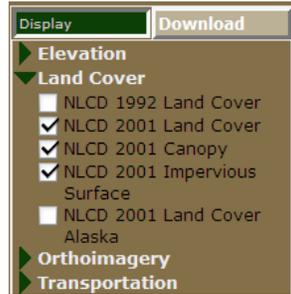


The land class map used to stratify the plots in GIS are used to create the strata for the analysis.

The field plot land uses are not used for stratification, but are used for verification of map classifications.

- b. Zoom & Pan to your AOI, making sure you cover the entire AOI, plus a bit more.

- c. Click on the Download tab at right, and make sure only Land Cover, Canopy, and Impervious are checked:



Canopy and Impervious can be used later in the i-Tree software for simple mapping of project results. All 3 layers must be downloaded at the same time.

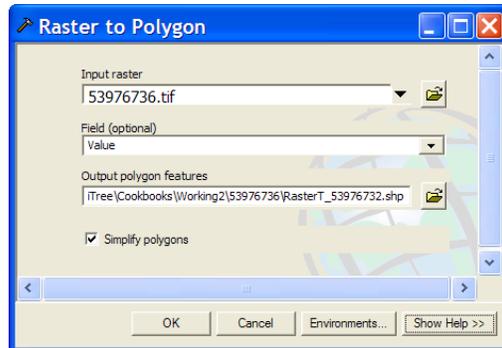
- d. Use the Download tool  to delineate a square area on the map for download and in the resulting pop-up window, download the three layers:



Delineating and downloading all 3 layers during the same online mapping session ensures each layer covers the same exact area and each layer aligns correctly with one another.

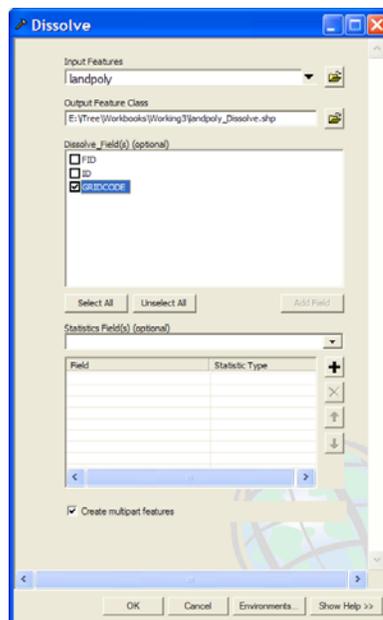
- It will be necessary to 'unzip' the compressed files from the download. Right-click the zip file(s) to "Explore" them; copy/drag the contents to another location.
- The download files consist of raster (image) data. Each file is composed of pixels, and each pixel contains information such as Land Cover type.
- A metadata file describing the layers' Entity and Attribute information is included as well. Specific land cover category names can be found within.
- The download files are named numerically. It is necessary to load each into ArcMap in order to visually determine which file is the Land Cover layer. Canopy and Impervious layers can be removed from the view.
- It will be necessary to right-click the land cover layer and "Zoom to layer" as it is most likely in a different projection/coordinate system.

2. Use ArcToolbox to **Convert** the Land Cover raster data to polygons:
 - a. Navigate to ArcToolbox>Conversion Tools>From Raster>Raster to Polygon
 - b. Fill out the Raster to Polygon form:



- i. Input Raster: choose the **Land Cover map layer** from the drop down.
- ii. Field: Select the field containing the land cover values (refer to metadata documentation if necessary).
- iii. Output Polygon Features: use the browse button  to locate a suitable location and filename for the resulting polygon map layer.
- iv. Simplify Polygons: Ensure this checkbox is UNCHECKED.
- v. Click OK.

3. Use ArcToolbox to **Dissolve** the Land Cover polygon(s):
 - a. Navigate to ArcToolbox>Data Management Tools>Generalization>Dissolve
 - b. Fill out the ensuing Dissolve form:



- i. Input Features: choose the **Land Cover polygon map layer** from the drop down list.
- ii. Output Feature Class: use the browse button  to locate a suitable location and filename for the resulting map layer.
- iii. Dissolve Field(s): check the GRIDCODE data field (whose attribute value holds the Land Cover values).
- iv. Statistics Field(s) : Leave blank.
- v. Create Multipart Features: ensure this option is CHECKED.
- vi. Click OK

4. If needed use ArcToolbox to **Define the Projection** of the dissolved Land Cover polygon map layer per your data provider's specifications:

- a. Downloaded NLCD data have their projection pre-defined by the MRLC:

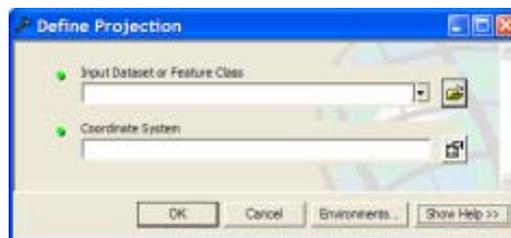
```

Projection: Albers
False_Easting: 0.000000
False_Northing: 0.000000
Central_Meridian: -96.000000
Standard_Parallel_1: 29.500000
Standard_Parallel_2: 45.500000
Latitude_Of_Origin: 37.500000
Linear Unit: Meter (1.000000)

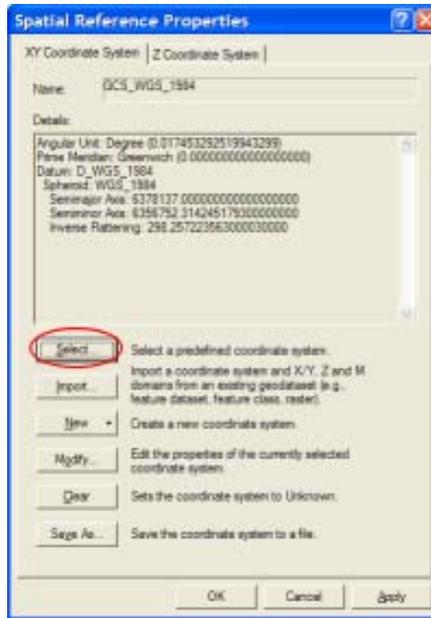
Geographic Coordinate System: GCS_North_American_1983
Angular Unit: Degree (0.017453292519943295)
Prime Meridian: Greenwich (0.000000000000000000)
Datum: D_North_American_1983
Spheroid: GRS_1980
Semimajor Axis: 6378137.000000000000000000
Semiminor Axis: 6356752.314140356100000000
Inverse Flattening: 298.257222101000020000

```

- b. If the projection is NOT pre-defined, Navigate to ArcToolbox>Data Management Tools>Projections and Transformations>Define Projection. Otherwise skip to step 5.
- c. Fill out the Define Projection form:

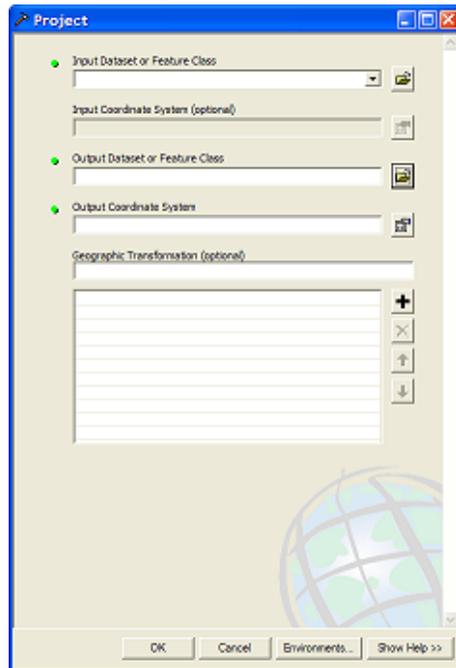


- i. Input Dataset: choose the **Land Cover polygon map layer** from the drop down list.
- ii. Coordinate System: click the properties button  at right and use the ensuing "Spatial Reference Properties" dialog window to navigate to the proper coordinate system via the Select button.



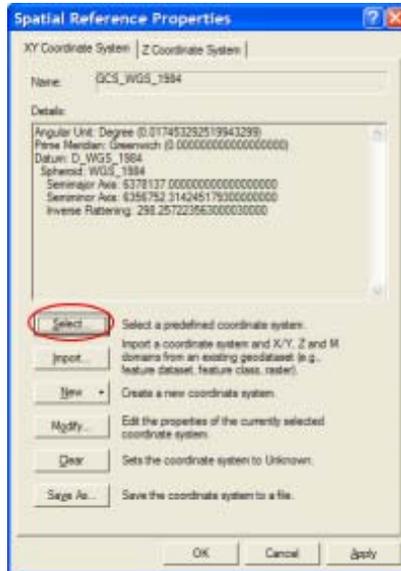
Proper coordinate system is determined by your data provider.

- 5. Use ArcToolbox to **Project** the dissolved Land Cover polygon data:
 - a. For consistency in placing sample plots, project the land cover data to the projection/coordinate system chosen above for the AOI data.
 - b. Navigate to ArcToolbox>Data Management Tools>Projections and Transformations>Feature>Project
 - c. Fill out the ensuing Project form:



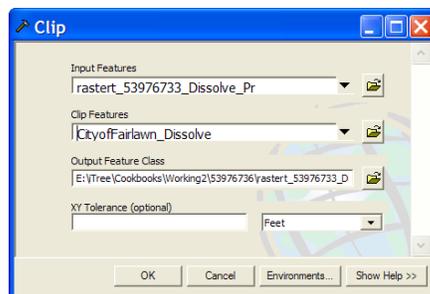
- i. Input Dataset: choose the dissolved **Land Cover polygon map layer** from the drop down list.

- ii. Input Coordinate System: Based on Step 4a above, this should be grayed out with the NLCD Albers projection system.
- iii. Output Dataset or Feature Class: use the browse button  to locate a suitable location and filename for the resulting map layer.
- iv. Output Coordinate System: click the properties button  at right and use the ensuing "Spatial Reference Properties" dialog window to navigate to the proper coordinate system via the Select button.

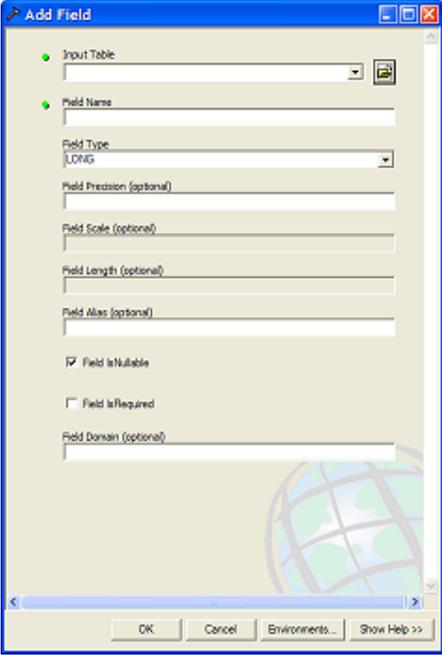


Choose the coordinate system employing either feet or meters previously selected for the AOI.

- v. Geographic Transformation: while marked as "Optional", select the first choice in the drop down if prompted with an "Undefined Geographic Transformation" message.
 - vi. Click OK.
 - vii. Right-click the projected Land Cover map layer and select "Zoom to layer"
6. Use ArcToolbox to **Clip** the dissolved Land Cover polygon map layer by the AOI map layer.
- a. Navigate to ArcToolbox>Analysis Tools>Extract>Clip.
 - b. Fill out the ensuing Clip form:



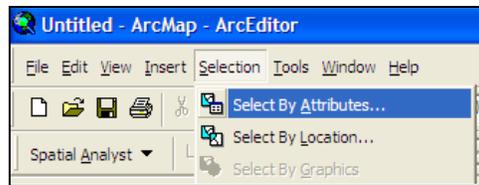
- c. Input Features: select the projected and dissolved **Land Cover polygon map layer** from the drop down list.
 - d. Clip Features: choose the projected and dissolved **AOI map layer** from the drop down list.
 - e. Output Features: use the browse button  to locate a suitable location and filename for the resulting map layer.
 - f. XY Tolerance (optional) and units: Leave blank.
 - g. Click OK.
7. If necessary, use the Add Data button  to navigate to and load the clipped Land Cover polygon map layer to the current view.
- a. The Land Cover map layer should now conform to the project area boundaries.
8. Use ArcToolbox to **Add** UFORE-required fields to the clipped **Land Cover map layer**:
- a. Navigate to ArcToolbox>Data Management Tools>Fields>Add Field
 - b. Fill out the ensuing Add Field form:



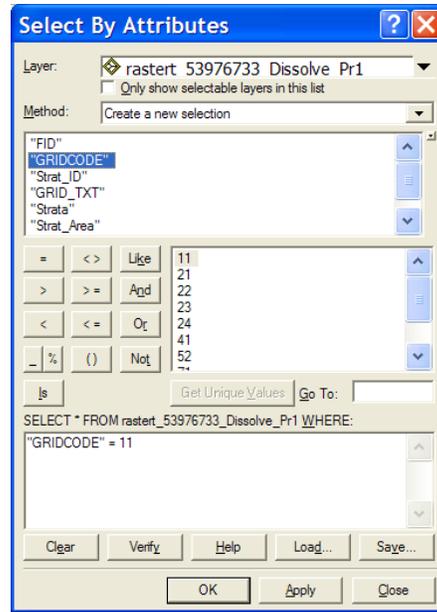
For experienced users, fields could be added via the ArcMap table view as well.

- i. Input Table: select the clipped Land Cover map layer from the dropdown list.
- ii. Field Name: Enter "Strat_ID" (**no quotes**)
- iii. Field Type: Select LONG from the dropdown list
- iv. Field Precision: Skip this entry

- v. Field Scale: Skip this entry
 - vi. Field Length: Skip this entry
 - vii. Field Alias: Skip this entry
 - viii. Field IsNullable: Skip this entry
 - ix. Field IsRequired: Skip this entry
 - x. Field Domain: Skip this entry
 - xi. Click OK
- c. Repeat as follows for these THREE additional fields:
- i. Field Name: "GRID_TXT" (**no quotes**)
Field Type: TEXT
 - ii. Field Name: "Strata" (**no quotes**)
Field Type: TEXT
 - iii. Field Name: "Strat_Area" (**no quotes**)
Field Type: DOUBLE
 - iv. Field Name: "No_Plots1" (**no quotes**)
Field Type: LONG
9. Use regular **Selection Queries** and ArcToolbox to **Calculate** text values that are equivalent to the land cover categories for the clipped **Land Cover map layer**
- a. Examine the metadata documentation file downloaded with the NLCD Land Cover data.
 - i. Each GRIDCODE value corresponds to one land cover category.
 - ii. Use the GRIDCODEs to decipher the land cover data.
 - iii. Decide how many plots should be placed within each land cover category. Write these down as they will be needed later.
 - b. From the Selection menu, choose "Select by Attributes".

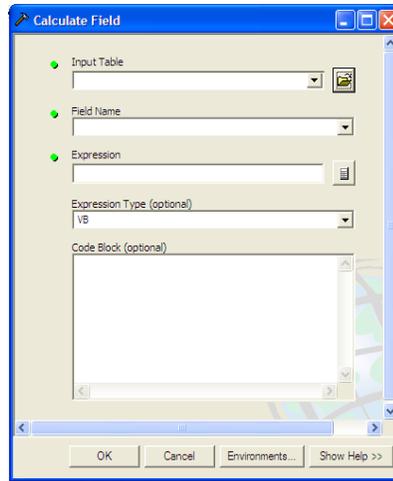


- c. Fill out the ensuing form:



- i. Layer: Ensure that the processed Land Cover map layer is selected.
- ii. Method: Select "Create a new selection"
- iii. SELECT * FROM <<land cover layer name>> WHERE:
 1. Double-click the "GRIDCODE" field name from the list above.
 2. Click the equals button above.
 3. Click the Get Unique Values button
 4. Double-click the first land cover GRIDCODE value in the list.
 5. a properly formatted query will look like this:

$$\text{"GRIDCODE"} = 55$$
 6. Click Apply
- d. With the features in this first land cover category selected, use ArcToolbox to Calculate a text value equivalent for the land cover category.
 - i. Navigate to ArcToolbox>Data Management Tools>Fields>Calculate Field
 - ii. Fill out the ensuing Calculate Field form:

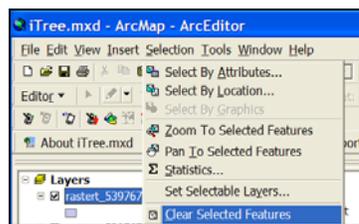


For experienced users, the *Field Calculator* could be used via the ArcMap table view.

- iii. Input Table: select the processed Land Cover polygon map layer from the dropdown list.
- iv. Field Name: Select "GRID_TXT" from the drop down list.
- v. Expression: enter an appropriate expression, **INCLUDING QUOTES**: `<<"name of selected land cover category">>` Ex: "Open Water"
- vi. Expression Type: Skip this entry
- vii. Code Block: Skip the entry
- viii. Click OK.
- ix. Open the table and verify that only the selected feature records were populated with their appropriate land cover category text.

(Right-click the Land Cover polygon map layer in the map layers list and select "Open Attribute Table".)

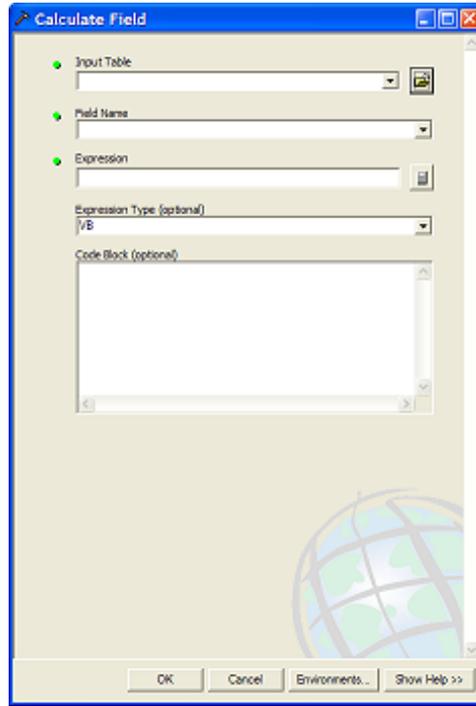
- e. REPEAT step 9, a-d for EACH land cover category present in the Land Cover polygon map layer. Query each GRIDCODE value land cover category and populate the "GRID_TXT" field with the appropriate Metadata plain-text equivalent.
- f. From the Selection menu, choose "Clear Selected Features" to unselect the last land cover features.



10. Use ArcToolbox to **Calculate** values for the UFORE-specific fields added to the clipped **Land Cover map layer**:

- a. Navigate to ArcToolbox>Data Management Tools>Fields>Calculate Field

b. Fill out the ensuing Calculate Field form:



For experienced users, the *Field Calculator* could be used via the ArcMap table view.

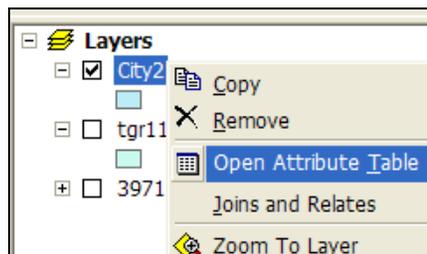
Also, later versions of ArcGIS have a “Calculate Geometry” option available via a right-click on the field name in the table.

- i. Input Table: select the processed Land Cover polygon map layer from the dropdown list.
 - ii. Field Name: Select “Strat_ID”
 - iii. Expression: enter this expression: **[FID]+1**
 - iv. Expression Type: Skip this entry (default is typically VB)
 - v. Code Block: Skip the entry
 - vi. Click OK
- c. Repeat for the “Strata” field:
- i. Field Name: Select “Strata”
 - ii. Expression: enter this expression: **[GRID_TXT]**
- d. Repeat for the “Strat_Area” field:
- i. Field Name: Select “Strat_Area”
 - ii. Expression: enter this expression: **Output**
 - iii. Expression Type: **VB**
 - iv. Code Block: enter this code (*hint – copy and paste from here*):

```
Dim Output as double
Dim pArea as Iarea
Set pArea = [shape]
Output = pArea.area
```

11. Final results:

- a. Converted, dissolved, projected, and clipped POLYGON Land Cover map layer with UFORE-required fields added and populated.
 - i. It should align with and conform to the project area boundaries.
 - ii. It should have ONE record representing EACH land cover category present in its table. (Right-click the Land Cover polygon map layer name in the map layers list, and choose "Open Attribute Table")



The Land Cover polygon map layer is now ready to be used for Plot Generation.

Instructions continue below.

Sample Plot Generation

Overview:

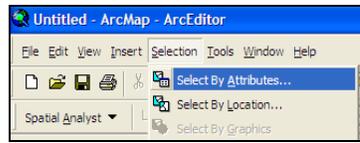
- **Select** each land cover category and **Run** the Random Plots tool from the i-Tree toolbar for each land cover category.
- **Merge** the resulting Random Plots data together
- **Define** the projection of the merged Random Plots data
- **Spatially Join** the Land Cover data to the Random Plots data
- **Add** Fields to the Random Plots data
- **Calculate** field values for Random Plots data
- **Buffer** the Random Plots point data to form plot areas

Results:

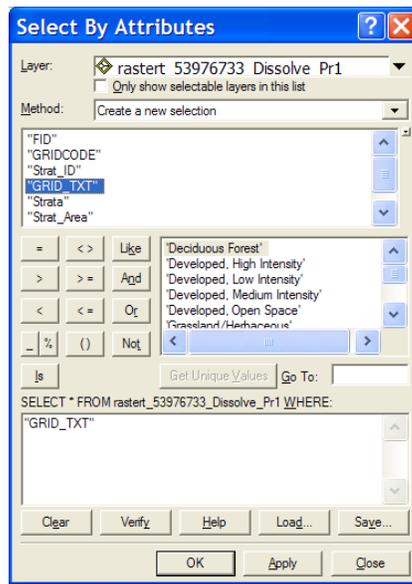
- Random Sample Plots POINT map layer with UFORE-required fields added/populated

Detailed Instructions:

1. Use regular **Selection Queries** and the **Random Plots Tool** to select an individual land cover category and add the number of desired plots to it:
 - a. From the Selection menu, choose "Select by Attributes".



- b. Fill out the ensuing form:

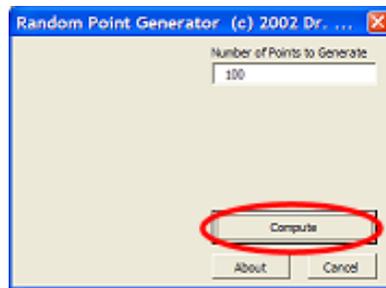


The number of plots per each stratum (land cover) could be based on area of said stratum vs total project area.

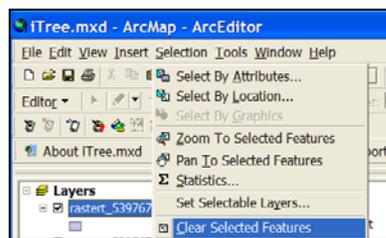
A minimum of 20 plots is recommended per stratum.

For example, if 100 total plots are desired, and 25% of the area is urban, then 25 plots would be chosen for the urban stratum.

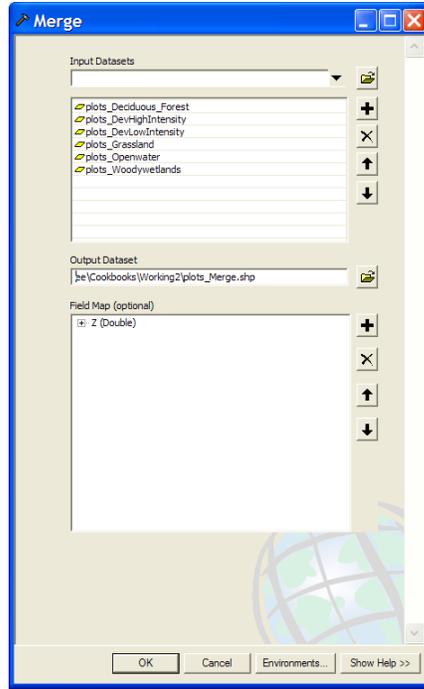
- i. Layer: Ensure that the processed Land Cover map layer is selected.
- ii. Method: Select "Create a new selection"
- iii. SELECT * FROM <<land cover layer name>> WHERE:
 1. Double-click the "GRID_TXT" field name from the list above.
 2. Click the equals button.
 3. Click the Get Unique Values button
 4. Double-click the first land cover GRID_TXT value in the list.
 5. a properly formatted query will look like this:
 'GRID_TXT " = 'Open Water'
 6. Click Apply
- c. Click to select the processed Land Cover map layer in the map layers list and then click the **Random Plots Tool**  in the i-Tree toolbar.
- d. Enter the desired number of sample points in the ensuing Random Point Generator dialog:



- e. Click Compute and then select a location and filename for the sample plots point map layer to be created.
 - i. Sample plots will be created for each land cover category as a separate map layer file. Choose a name for each file that reflects the category as they will be merged together into one sample plots layer.
File name example: plots_Deciduous_Forest
- f. Repeat Step 1, a-e for EACH land cover category.
- g. Click Close to exit the Random Point Generator dialog.
- h. From the Selection menu, choose "Clear Selected Features" to unselect the last land cover features.



2. Use ArcToolBox to **Merge** the individual land cover category plot map layer files together:
 - a. Navigate to ArcToolbox>Data Management Tools>General>Merge and fill out the ensuing Merge form:



- i. Input Datasets: Select each land cover plot layer from the dropdown list, one at a time.

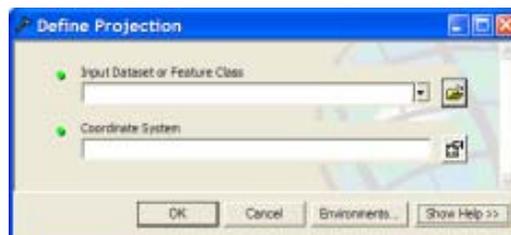
- ii. Output Database: use the browse button  to locate a suitable location and filename for the resulting map layer.

Filename example: SamplePlots_Merge

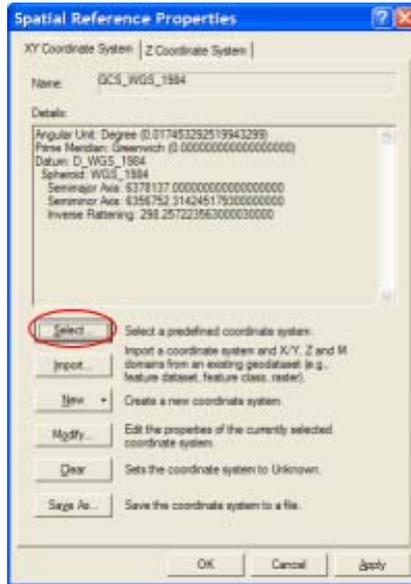
- iii. Field Map: Skip this option.
- iv. Click OK.

3. Use ArcToolbox to **Define the Projection** of the merged **sample plots point map layer** per your data provider's specifications:

- a. Navigate to ArcToolbox>Data Management Tools>Projections and Transformations>Define Projection
- b. Fill out the Define Projection form:

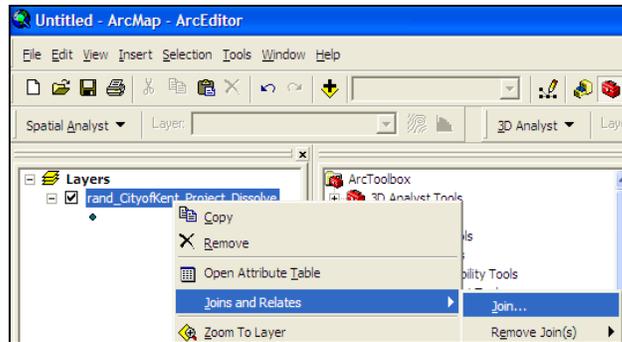


- i. Input Dataset: choose the merged **sample plots point map layer** from the drop down.
- ii. Coordinate System: click the properties button  at right and use the ensuing "Spatial Reference Properties" dialog window to navigate to the proper coordinate system via the Select button.



Proper coordinate system is that chosen for the project's **AOI map layer**.

- 4. Perform a **Spatial Join** between the merged **sample plots point map layer** and the Land Cover polygon map layer.
 - a. This step assigns land cover types to the sample plot points.
 - b. Right-click the merged sample plots layer and select Joins and Relates>Join



c. Fill out the ensuing Join Data form:

- i. What do you want to join to this layer? Select “Join data from another layer based on spatial location”.
 - ii. Choose the layer to join to this layer... Select the land cover polygon layer.
 - iii. Each point will be given all the attributes of the polygon that: “it falls inside”.
 - iv. The result of the join will be saved into a new layer: use the browse button  to locate a suitable location and filename for the resulting map layer.
 - v. Click OK.
5. Use ArcToolbox to **Add** UFORE-required fields to the **spatially joined sample plots point map layer**:
 - a. Navigate to ArcToolbox>Data Management Tools>Fields>Add Field
 - b. Fill out the ensuing Add Field form:

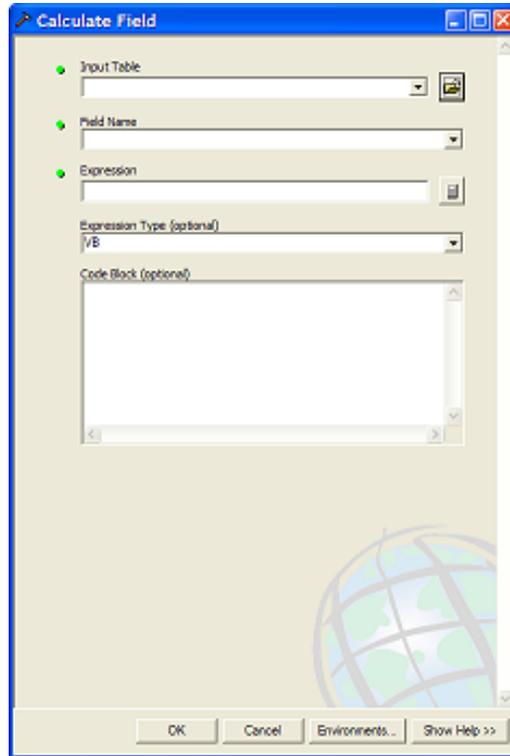


For experienced users, fields could be added via the ArcMap table view as well.

- i. Input Table: select the spatially joined sample plots point map layer from the dropdown list.
 - ii. Field Name: Enter "ID" (no quotes)
 - iii. Field Type: Select LONG from the dropdown list
 - iv. Field Precision: Skip this entry
 - v. Field Scale: Skip this entry
 - vi. Field Length: Skip this entry
 - vii. Field Alias: Skip this entry
 - viii. Field IsNullable: Skip this entry
 - ix. Field IsRequired: Skip this entry
 - x. Field Domain: Skip this entry
 - xi. Click OK
- c. Repeat as follows for these additional FIVE fields:
- i. Field Name: "LCCode" (no quotes)
Field Type: SHORT
 - ii. Field Name: "X_Coord" (no quotes)
Field Type: DOUBLE
 - iii. Field Name: "Y_Coord" (no quotes)
Field Type: DOUBLE
 - iv. Field Name: "LCType" (no quotes)
Field Type: TEXT

- v. Field Name: "MapUnits" (no quotes)
Field Type: TEXT

6. Use ArcToolbox to **Calculate** values for the UFORE-specific fields added to the **spatially joined sample plots point map layer** in step 2:
 - a. Navigate to ArcToolbox>Data Management Tools>Fields>Calculate Field
 - b. Fill out the ensuing Calculate Field form:



For experienced users, the *Field Calculator* could be used via the ArcMap table view.

- i. Input Table: select the sample plots point map layer from the dropdown list.
 - ii. Field Name: Select "ID"
 - iii. Expression: enter this expression: **[FID]+1**
 - iv. Expression Type: Skip this entry
 - v. Code Block: Skip the entry
 - vi. Click OK
- c. Repeat for the "LCCode" field:
 - i. Field Name: Select "LCCode"
 - ii. Expression: enter this expression: **[Strat_ID]**

d. Repeat for the "X_Coord" field:

- i. Field Name: Select "X_Coord"
- ii. Expression: enter this expression: **Output**
- iii. Expression Type: **VB**
- iv. Code Block: enter this code (*hint – copy and paste from here*):

```
Dim Output As Double
Dim pPoint As IPoint
Set pPoint = [Shape]
Output = pPoint.X
```

e. Repeat for the "Y_Coord" field:

- i. Field Name: Select "Y_Coord"
- ii. Expression: enter this expression: **Output**
- iii. Expression Type: **VB**
- iv. Code Block: enter this code (*hint – copy and paste from here*):

```
Dim Output As Double
Dim pPoint As IPoint
Set pPoint = [Shape]
Output = pPoint.Y
```

f. Repeat for the "MapUnits" field:

- i. Field Name: Select "MapUnits"
- ii. Expression: enter one of these expressions, INCLUDING quotes:

"Foot_US" if map units are feet or
"Meters" if map units are meters

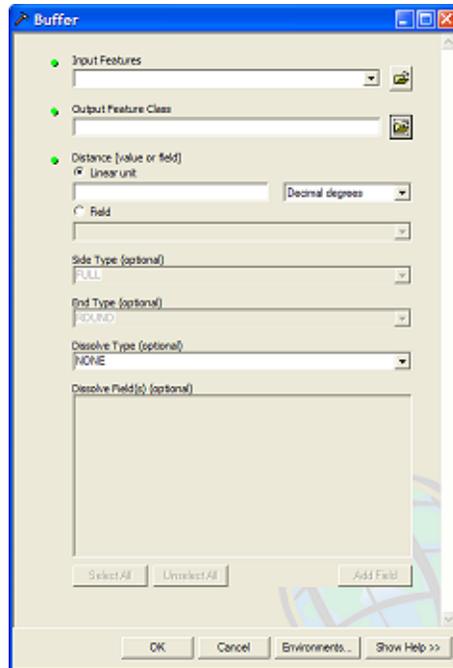
| |
|---|
| Map units are determined by your data provider. |
|---|

g. Verify the attributes have been correctly modified in the sample plots point map layer:

- i. Right-click the new, sample plots point map layer in the map layers list, and choose "Open Attribute Table".
- ii. Scan through the fields and their values to verify they are correct.
- iii. Note that no projection system is assigned to the plots layer. If desired, it can be defined using steps similar to those for defining the AOI projection system above.

7. Use ArcToolbox to **Buffer** the **spatially joined sample plots point map layer**:

- a. Navigate to ArcToolbox>Analysis Tools> Proximity>Buffer
- b. Fill out the ensuing Buffer form:



- i. Input Features: select the spatially joined sample plots point map layer from the dropdown list.
- ii. Output Feature Class: use the browse button  to locate a suitable location and filename for the resulting map layer.
- iii. Distance: Ensure that "Linear unit" is selected and the appropriate units are chosen. Enter the desired Distance value from this list:

Map units in FEET:

- | | |
|---------------------|--------------|
| 1. 1/5 acre plot: | Enter: 52.66 |
| 2. 1/10 acre plot: | Enter: 37.24 |
| 3. 1/20 acre plot: | Enter: 26.33 |
| 4. 1/100 acre plot: | Enter: 11.78 |

Map units in METERS:

- | | |
|------------------------|--------------|
| 1. 1/5 hectare plot: | Enter: 25.23 |
| 2. 1/10 hectare plot: | Enter: 17.84 |
| 3. 1/20 hectare plot: | Enter: 12.62 |
| 4. 1/100 hectare plot: | Enter: 5.64 |

- iv. Side Type: Skip this entry
 - v. End Type: Skip this entry
 - vi. Dissolve Type: Skip this entry
 - vii. Dissolve Field(s): Skip this entry
 - viii. Click OK
- c. The buffered sample points layer is added to the map view automatically; zoom in to examine individual plot areas.

8. Final Results

- a. Sample Plots POINT map layer
 - i. User-defined number of plots randomly spread throughout each stratum (land cover).
 - ii. Plot points assigned with land cover categories
 - iii. UFORE-required fields added and populated
- b. Sample Plot Areas POLYGON map layer

Create UFORE-ready Output

Overview:

- **Run** the UFORE Plot List Report tool
- **Run** the UFORE Strata Area Report tool

Results:

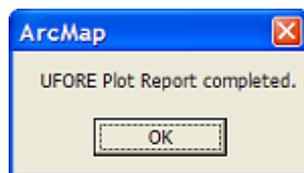
- UFORE Plot List report text file
 - UFORE Strata Area report text file
 - UFORE PRJ file
-

1. Select the **spatially joined sample plots point map layer** in the map layers list and click the UFORE Plot Report tool  **UFORE Plot Report** in the i-Tree toolbar to create the UFORE Plot Report:

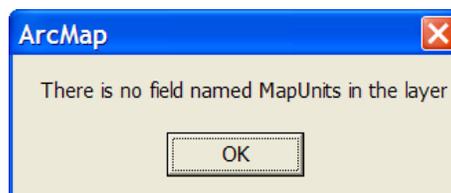
- a. Answer the following question to confirm the map units of the sample plots point map layer.



- b. In the ensuing dialog window, select a location and filename for the UFORE Plot Report.
 - i. Report is finished with the following prompt:



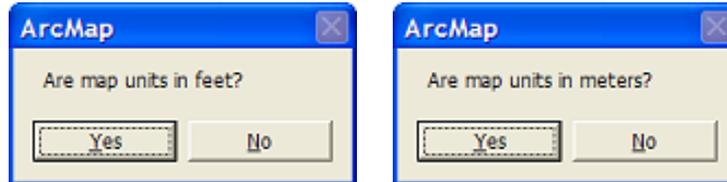
- c. If a field is missing, or incorrectly named, an error message will appear:



- i. Even though the output will be completed, it is necessary to revisit the preceding instructions to correct the mistake.
- ii. Repeat this step to output a new, corrected UFORE Plot Report.

2. Select the processed **Land Cover polygon layer** in the map layers list and click the UFORE Strata Report tool  UFORE Strata Report in the i-Tree toolbar to create the UFORE Strata Report:

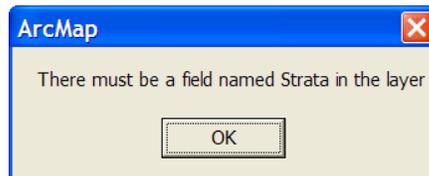
- a. Answer the following question to confirm the map units of the sample plots point map layer.



- b. In the ensuing dialog window, select a location and filename for the UFORE Strata Report.
- c. Report is finished with the following prompt:



- d. If a field is missing, or mis-named, an error message will appear:



- i. Even though the output will be completed, it is necessary to revisit the preceding instructions to correct the mistake.
- ii. Repeat this step to output a new, corrected UFORE Strata Report.
3. Final Results:
- a. UFORE Reports
- i. Plot Listing
 - ii. Strata Listing
 - iii. PRJ file (automatically created in the Define Projection/Reprojection steps above as part of the AOI Shapefile)