

Homework Assignment: 7

Land Use Analysis



Date Assigned: Wednesday, 10.09.13, 2:45pm (Week 7)

Date Due: Wednesday, 10.16.13, 12:00pm (Week 8)

Weighted Value: 10 points

Estimated Workload: 4 - 6 hours

OVERVIEW

Land use systems are dynamic. Uses expand and contract, persist and degrade, in response to change from such variables as population, economic growth, public policy, and market forces. These variables may operate on local, regional and even global scales. In order to plan for future change, urban planners need to inventory and assess the current land use system. In preparation for your *Final Report: Community Profile*, students are to begin identifying, inventorying, and analyzing land use specific to their selected community.

ASSIGNMENT

Develop a descriptive inventory and analysis of the land use for your selected community. Your land use inventory and analysis summary report shall include the following;

- A descriptive **overview of land use**.
- A current **land use map** (as opposed to a zoning map). Use your ArcGIS skills to create a land use map, as per the assignment instructions previously provided for *HW-6: ESRI ArcGIS*. GIS data has been uploaded on Blackboard via 'Course Documents > GIS Data Files for Selected Communities'. Each .zip file contains your community's boundary, land use, and road data files (.dbf), shapefiles (.shp) and supporting files.
- A **table** itemized for each land use type and area (acres), and a **pie chart** showing the percentage of each land use type area relative to total land area.
- As part of a brief **SWOT analysis**, identify and describe one strength, one weakness, one opportunity, and one threat in the current **land use** of your selected community, based on your analysis of one or more of the following considerations below;
 - economy (employment creation and retention, sales, cost of living, local tax base, etc.)
 - economic development (growth, development, tourism, etc.)
 - natural environment (climate, soils, vegetation, water features, habitat area, open space, etc.)
 - housing (inventory, condition, tenure, affordability, etc.)
 - population (size, density, characteristics, trends and projections)
 - community services (education, parks and recreation, health, public safety)

- public utility system (water, wastewater, stormwater, electric, gas, solid waste, telecommunications)
- transportation system (traffic capacity / volumes, parking, modes of transit, pedestrian and bicycle, etc.)
- cultural resources (historic buildings and districts, museums, heritage tourism, entertainment, quality of life, etc.)
- other considerations that you deem appropriate.

You are required to aggregate (consolidate) the land use types into a manageable amount for your land use map and legend, as well as for determining the land use types areas needed for your table and pie chart. Refer to **Appendix A: Instructions for Aggregating Land Use Types and Areas** (pages 3-4) for additional instruction.

ITEMS OF CONSIDERATION

Supplemental information on join data issues, road layout on land use map, and referencing data sources is provided by **Appendix B: Supplemental Information** (pages 5-6) for your clarification and reference.

LEARNING OBJECTIVES

- To understand the concept and principles of land use, so as to have the ability to provide a land use inventory and analysis as part of your *Final Project: Community Profile*.
- To gain a basic planning skill set concerning a land use inventory; such as creating land use maps, data graphics, and narrative report.
- To gain an understanding of land use planning analysis, such as SWOT analysis, so as to be able to perform basic, practical and professionally-competent land use analysis.

DELIVERABLES

Students are to submit **two** print copies of their summary report to the instructor at the start of class on assignment's due date, one of which will be returned with grade and review comments.

- *Format: letter report (long version)*, refer to Purdue OWL > Subject Specific Writing > Writing in Engineering > Handbook on Report Formats > [The Report Body](#), and 'Letter Report (long version)' example' posted on Bb. Address the report to your client, which in this case is the appropriate staff member (for example, the village / city planner) of your selected community.
- *Particulars: 2-3 pages*, including table and pie chart (but not including land use map), single or 1½ - line spacing, 8.5" x 11". Land use map to be on a separate full page, color printed, 8.5" x 11".

EVALUATION CRITERIA

- *Comprehension*: student demonstrated ability to complete a land use inventory, as per instructions.
- *Analysis*: student demonstrated ability to provide critical analysis of their land use inventory.
- *Completeness*: deliverables were submitted in a complete and orderly manner.
- *Timeliness*: deliverables were submitted by due date.

APPENDIX A: INSTRUCTIONS FOR AGGREGATING LAND USE TYPES AND AREAS

Data sets are not always in exactly the condition you need for a project. Sometimes, as in the case of *HW-7: Land Use Analysis*, the problem is having too much data. The provided land use data set for *HW-7* may have too many land use types for practical use for your map and data graphics. For example, when reviewing the Attribute Table for the Village of Oak Park land use shapefile, there are 282 land use records (rows) and 19 of the possible 50 land use types. The intent of this assignment is to aggregate (consolidate) the land use types into a manageable amount for your land use map and legend, as well as for determining the land use types areas needed for your table and pie chart.

First, you need to consolidate the land use types for your community by reviewing the Attribute Table for the land use shapefile. The aim is to consolidate the multitude of land use types into just the primary ones for your community, which will likely be in the 8-12 range (similar to the land use map for the Village of Oak Park created for *HW-6: ESRI ArcGIS*). For more explanation of the land use types, refer to NIPC's (CMAP's) *2005 Land Use Inventory Classification Scheme*, provided with your GIS Data on Bb, in the Documentation folder under 'LU05_scheme.doc'. For each series, the primary land use type is usually listed first, followed by secondary land use types. As each community is different, use your own judgment on how to go about consolidating land use types.

After consolidating your land use types, you need to represent this graphically on your land use map (and legend), as well as quantitatively for each land use type area on your table and pie chart. There are several ways to go about these two tasks. The ESRI ArcGIS-preferred format method uses geoprocessing to manipulate the data with use of the Dissolve tool from ArcToolbox. This method is elegant, but requires some expertise. An alternative informal method achieves the same results without geoprocessing. This method is crude, but effective. The following are the instructions for the informal method.

Aggregating Land Use Types (informal method)

Right click on your community's shapefile (ex.: Oak ParkLU2005), and select 'Properties'.

This will bring up the 'Layer Properties' dialog box.

- Select the 'Symbology' tab.
- In the 'Show' section, select 'Categories' > 'Unique values'.
- In the 'Value Field' section, select 'LANDUSE'.
- Finally, click on 'Add All Values'.

This will add and display all land use types for your community (ex.: 19 for the Village of Oak Park), each with a 4-digit CMAP land use classification code, and a randomly assigned color.

Review your land use types for consolidation into 8-12 primary land use types, as appropriate.

Toggle off the check mark for <all other values>.

While still in the 'Layer Properties' dialog box, select the land use types to be consolidated into an individual primary land use, by clicking on each one while holding down the 'Shift' key. Once all are selected, right-click on the highlighted selections in blue and select 'Group Values'.

You will notice the selected land uses are now consolidated, with the Value, Label and Count headings adjusted accordingly.

Continue consolidating all other land use types into your primary land use types.

Upon completion, revise land use colors as necessary, by double-clicking on 'Symbol' color. You may use the land use colors provided by *HW-6*, or use the *APA Land Based Classification Standards (LBCS)* as a general guide for color selection, at <http://www.planning.org/lbcs/standards/pdf/InOneFile.pdf>. LBCS classifies land uses in the following dimensions: activity, function, structure type, site development character, and ownership. Choose 'Activity', but be aware that LBCS classifies land use somewhat differently than CMAP.

As such, use the LBCS as a guide only, and don't worry about the provided RGB color values, as they tend to be too bold.

Upon completing your land use color selection, click on 'Apply', then 'OK'.

You will notice your land use map has been consolidated graphically.

Go to 'Layout View' and 'Insert' a 'Legend'. You will need to revise the Legend so it only provides land use type names (not 4-digit land use classification codes). After locating the Legend on your map, right-click on the Legend and use the 'Convert to Graphics' and 'Ungroup' commands to revise accordingly (same as you previously did in *HW-6: ESRI ArcGIS*).

Aggregating Land Use Areas (informal method)

While you have aggregated the land use types graphically for your land use map, you have not aggregated the data for land use type areas. For your table and pie chart, you will need to determine the area for each of your consolidated land use types. There are several informal ways to accomplish this, one of which follows.

Right click on your community's shapefile (ex.: Oak ParkLU2005), and select 'Open Attribute Table'.

Find the 'LANDUSE' field (column) and right-click on its heading, and select 'Sort Ascending'.

For each land use type, select all the records (rows) so as to determine the sum total land use area. One way is to click on 'Table Options', and select 'Select By Attributes'. From the 'Select by Attributes' dialog box, select from the 'Method' pull-down menu 'Create a new selection', and then create the expression (double-click) 'LANDUSE', '=', 'Get Unique Values', and then select your 4-digit land use code (ex.: "LANDUSE"='1231'). Click on 'Apply'. Now all the rows for the selected land use code are highlighted in blue, and highlighted in blue outline on your land use map.

Since you consolidated your land use types on your map, you will have to add the other land use type(s). With the 'Select By Attributes' dialog box ('Table') still open, repeat the same process for each consolidated land use type (delete the previous expression if remaining), except select from the 'Method' pull-down menu 'Add to current selection'.

Upon completion, and with your selected records (rows) highlighted in blue, right-click on the 'Shape_Area' field heading, and select 'Statistics'. This will provide a 'Selection Statistics' summary box for the selected land use type(s), including the 'Sum' (total land area in sq. ft.) for the selected land use types. Since the unit of measurement (U.S.) for land use is acres, convert this sum to acres for use in your table and pie chart (1 acre = 43,560 sq. ft.)

Repeat accordingly for each of your consolidated primary land use types.

Add all land use types for the total community land use area.

You now have determined the areas for each land use type and total community for use in creating your table and pie chart.

Dissolve tool

As previously noted, the preferred GIS method uses geoprocessing to manipulate the data with use of the Dissolve tool from ArcToolbox. When you perform an operation on spatial data that creates a new data set (modified version of the original), you are doing geoprocessing. Geoprocessing tasks are accomplished with ArcToolbox (the red toolbox icon in the menu). To aggregate land use data (area), one can use the Dissolve tool in ArcToolbox via Data Management Tools > Generalization > Dissolve. The idea is for each set of land use polygons with the same land use 4-digit code to be dissolved into a single feature. Since the required written instructions are a bit too complicated, and the ArcGIS Help is of little use, we will go over this in class instead.

APPENDIX B: SUPPLEMENTAL INSTRUCTIONS

The following information is provided to supplement HW-7 assignment instructions, concerning join data issues, road layout on land use map, and data sources.

JOIN DATA

When using the 'Join Data' procedure to join the **lusummary** data table to the **(community name)LU2005** shapefile, the following two issues surfaced for some community data sets.

Issue: Lack of common field for both files

If you lack a common field in both files, simply rename the 'LANDUSE' field in **(community name)LU2005** to 'FIRST_LAND'.

- right-click on **(community name)LU2005** and select 'Open Attribute Table'.
- In the 'Table' dialog box, right-click on the field 'LANDUSE' and select 'Properties'.
- In the 'Field Properties' dialog box for 'Alias', change 'LANDUSE' to 'FIRST_LAND', and select 'OK'.
- When you join data, in the 'Join Data' dialog box, select 'FIRST_LAND' for both files (Fig. 1).

Issue: Joined fields display null values in the records of attribute table for (community name)LU2005.

This likely occurred if there were 4-digit land use codes that were included only in **(community name)LU2005** and not **lusummary**.

When you join data in the 'Join Data' dialog box, select 'Validate Join' to review how many records will not match if the join is created (Fig. 2). Hopefully, the amount of unmatched records resulting in null values will be low relative to successful matches.

In the 'Join Options' section (Fig. 1), if you select 'Keep all records', unmatched records will appear as null values. Review the land use description for these null values (using the provided *CMAF 2005 Land Use Inventory Classification Scheme*), and aggregate these null values with the closest matched land use description, as per the HW-7 assignment instructions for aggregating land use types and areas. Land use names may be changed accordingly with the resulting map legend.

If you select 'Keep only matching records', unmatched records will be removed from your resulting **(community name)LU2005**, and not be included in your land use map. This is acceptable for very low amount of null values and associated land area.

Select 'About Joining Data' to learn more about unmatched records (Fig. 1).

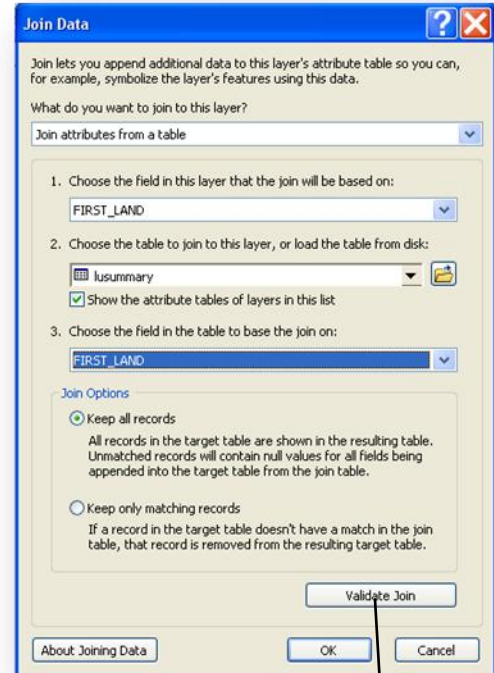


Figure 1. Join Data dialog box

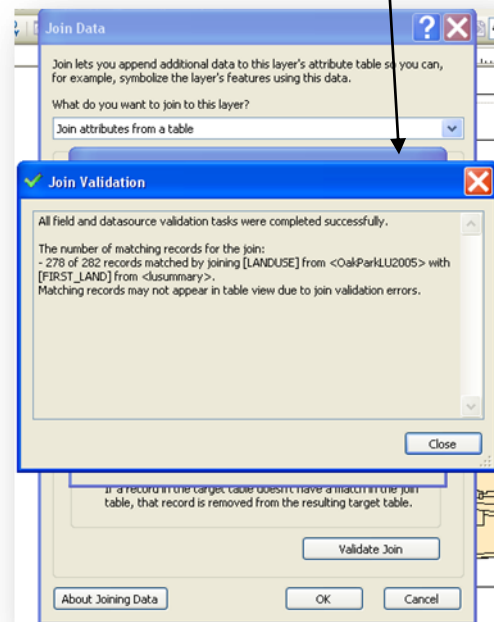


Figure 2. Join Validation results

ROAD LAYOUT ON LAND USE MAP

As you have likely found out, the provided GIS data files for your community includes all roads (and many road names) in the **(community name)TL2005** shape file. As this will likely result in a visually congested land use map, the goal is to provide clarity and distinction between primary roads and secondary roads, while not interfering with land use graphics.

Primary roads may be displayed with distinctive features (line color, weight) along with name labels, while secondary roads are displayed with less distinctive graphics and no name labels, or eliminated entirely.

There are several ways to accomplish this goal. One way is by converting road name text labels to annotation, and road line features to graphics. Right click on **(community name)TL2005** and review using 'Convert Labels to Annotation' and 'Convert Features to Graphics'. This will likely require investigation by repeated trial and error. The idea is to convert all road lines and labels to individual text and graphics (similar to the map legend in HW-6), and then revise, move, and delete accordingly.

DATA SOURCES

In your provided GIS data files, there should be a data source file included in the 'Documentation' folder. Please review for referencing data sources on your land use map. The year chosen for your map title is to be 2005, the date of the land use data.

Also included is the Projected Coordinate System, which may also be included on your land use map (optional). For future reference, the Projected Coordinate System is also provided in **(community name)LU2005**, via Properties > Source tab.