GEOG 4140/6140 – Fall 2020
Lab 1: Data Acquisition
Due Wednesday, February 03 at the beginning of your lab period.

Overview

The goal of this lab is to gain familiarity with the acquisition of GIS data online, and to practice your GIS skills learned in previous courses. In this lab, you will acquire and organize data to locate land parcels matching a number of criteria. Our fictional client is looking to purchase land that provides an optimum location for a snowmobiling store in Northeastern Utah (ignoring any currently existing stores). Based on the client's provided specifications, detailed below, multiple datasets are used to determine suitable sites.

The following resources may be useful in the completion of this assignment:
What is a geodatabase?
Copy feature datasets, feature classes, and tables to a geodatabase
Import data
Display a subset of features in a layer or a standalone table
Write a query in the query builder
Copy Features
Add Geometry Attributes
How DEM to Raster works
DEM to Raster
Raster To Geodatabase
Select Layer By Location
Select By Location: graphic examples
Basemaps
Layouts in ArcGIS Pro

Required Data (*Potential Sources*)

1. Utah Counties of Duchesne, Morgan, Rich, Summit, and Wasatch (AGRC > GIS Map Data > Boundaries)
2. Census records of 2017 Median Household Incomes for each Utah county (*U.S. Census Bureau*>Explore Census Data)
3. Land parcels (*AGRC*)
4. Municipal boundaries (*AGRC*)
5. Roads and highways (*AGRC*)
6. Annual precipitation (USDA datagateway > Order by State > Utah > Climate Precipitation
7. Elevation from 30-meter DEM (*AGRC or USGS*)
8. Landsat Tree Cover (NASA>*Land-Cover and Land-Use Change (LCLUC) Program*)

Workflow

1. Begin by researching the data sources listed above to identify which data providers might prove most useful. Pay special attention to the year of the dataset and be certain that metadata is attached or available. Record the different data sources that you discover prior to choosing the one with the best fit for this assignment. (See Deliverable 1 below.)

2. Open ArcGIS Pro and create a new project titled *Lab01_YourLastName* in the working directory you are using for this lab.
    a. As each dataset is downloaded, organize the content in your *Lab01_YourLastName* geodatabase (GDB) that was automatically created with the project.

3. After downloading Utah counties, use a **definition query** to select only the five (5) above-mentioned counties. **Copy** this subset to your Lab 1 GDB.
    a. In the steps below, you will be selecting one (1) county out of these five (5) with which to work. As you move forward in the workflow, **clipping** vector features to your county of choice will reduce both file size and processing time.

4. Census data associated with these five (5) counties will be restricted to only Median Household Income in the Past 12 Months (in 2017 Inflation-Adjusted Dollars). Explore the U.S. Census Bureau's website to locate this data at a county level.
    a. Download this data as a CSV file. Note that this file may have more than one heading; we will need to edit this before importing into ArcGIS Pro. Open in Excel and remove the extra row(s) so that only one heading remains and then save.
    b. **Copy/import** the CSV file into your Lab 1 GDB and examine the attribute table.
    c. Based on the available data, identify the county with the highest Median Household Income. Edit your **definition query** to include only this county. (See Deliverable 2 below.)
    d. Save your project (and save often!).

5. Peruse the AGRC website to locate and download parcels for the county that was selected in the previous step.
    a. **Add Geometry Attributes** (see Data Management toolbox) to the parcels feature. Set the Geometry Properties dropdown to Area, and the Area Unit dropdown to Acres.
    b. Create a **definition query** for only privately owned parcels greater than 25 acres.

6. Both roads and municipalities data can be added to the map via the ArcGIS Pro All Portal or downloaded from the AGRC. Be sure to check the details of each feature prior to adding it to make sure it is the most recent version available.
    a. **Clip** these two features to the previously selected county and save these in your Lab 1 GDB.

7. Precipitation data vary substantially by type and period, depending on the source. This project is looking for annual statewide precipitation to give an estimate of snowfall. When searching suggested sources for this data, aim for a polygon feature rather than point data or a raster.
    a. If the downloaded dataset is national or statewide, **clip** to the county boundary.
    b. Create a **definition query** to select only polygons representing 500 mm (~20 inches) of precipitation or greater.

8. Download the most recent 30-meter DEM for the general study area.
    a. The downloaded file may include several tiles. Use the **Mosaic** tool to create a single raster. Save this file to your Lab 1 GDB.
    b. Turn off the elevation data for now.

9. Finally, add Landsat tree cover data to your project.
    a. On the LCLUC website, utilize the FTP server download link (https://e4ftl01.cr.usgs.gov/MEASURES/GFCC30TC.003/) and navigate to the path and row of the tile(s) covering the county selected in step 4. Be sure to download the most recent version.
        i. This WRS-2 Path/Row converter will help you determine the Landsat path and row that intersect your county of interest.
    b. Load the tree cover data into ArcGIS Pro. These data will allow for a percentage-based estimate of tree cover in a given parcel. Note we are only using the original file and not the file ending in "err.tif"
    c. Save your project and turn off the tree cover data for now.

10. The final selection criteria include a private parcel that is:
    a. In the county with the highest average household income
    b. Minimum size of 25 acres
    c. Near a major road or highway
    d. Within or near a municipality boundary
    e. Intersect a precipitation polygon of at least 508 mm (20 inches) per year
    f. Above 1525 m (~5000 ft) in elevation
    g. The majority of the parcel's tree cover is less than 25%.

11. Make sure all required criteria are accounted for and conduct a visual search to locate a parcel that fits the desired conditions. (Note: there may be more than one possible solution that fulfills the criteria but just select one.)
    a. This does not necessarily require any additional geoprocessing tools; rather, it is more of a visual scan to observe the downloaded data concurrently and find a parcel of interest.

12. Create a map of your selected parcel showing the parcel boundary and roads with an underlying imagery basemap. In the margin on the bottom of the map, insert the approximate acreage, elevation, distance to nearest municipality, and average precipitation of the parcel.
    a. The map should be cartographically pleasing and adhere to cartographic standards you learned in the prerequisites for this course (Deliverable 3).

Deliverables

1. Create a table listing the URLs of available sources for each data set. Include a column for associated metadata, such as year of creation and next planned update. Also, when multiple sources are available, include a brief comparison of the quality of the data sets, and how the decision to use one data set over another was made.

2. The CSV with Median Household Income attributes for the five counties originally listed in the required data section.

3. A map of the chosen parcel detailing criteria of the selection as mentioned in Step 12.

4. If you were to look into other criteria that might affect the geographic location for a store of this type, or other recreational activities (hiking, mountain biking, cross country skiing, etc.), what might be some other types of geographic data that you could incorporate into your analysis? Give an example of two criteria, and research the availability of publicly available geographic data, including the year of creation, and the geographic extent of the datasets.

Scoring Rubric (12 points total)

D1: 3 points

1 point - A table listing the data sources for each dataset and its associated metadata
1 point - Brief comparison of the quality of the datasets
1 point - How the decision to use one data set over another was made

D2: 2 points

2 points - The CSV file with Median Household Income attributes for the five counties originally listed in the required data section

D3: 5 points

3 points - A map of a chosen parcel detailing criteria of the selection as mentioned in Step 12
0.5 point - Legend
0.5 point - Title
0.5 point - North arrow
0.5 point - Scale

D4: 2 points

0.5 point - Describes 1st criteria that may affect location of a store
0.5 point - Describes 2nd criteria that may affect location of a store
0.5 point - For 1st criteria: Source (URL) of publicly availability geographic data, the year of creation, and the geographic extent of the dataset
0.5 point - For 2nd criteria: Source (URL) of publicly availability geographic data, the year of creation, and the geographic extent of the dataset