Maps, Mapping, and Geospatial Technologies

Title: Understanding Geospatial Data

Due Date: February 13, 2023 at 11:59 pm

Required Resources:

- An internet enabled computer
- ArcGIS Pro
- Week04_ExerciseData.zip (in myCourses) – UNZIP BEFORE USE!

Purpose:

The purpose of this lab is for you to get hands-on experience with geospatial data, specifically how to select, query, and join tables. This is continuing to build on the foundation of your knowledge of geospatial technology and GIS. Remembering a previous lecture where we discussed the components of GIS and how data can be the biggest barrier to entry. As you complete the lab exercise today, think about how you could use this in future projects, especially joining data tables. You will also get exposed to another geospatial technology – albeit a basic one – in GeoJSON.io. This will be similar to the web experience in ArcGIS Online (AGOL), but in a much simpler and less enterprise environment.

You will also notice that there are fewer cues in the exercise – you can always reach out with any questions (jxsigm@rit.edu), but I would like to challenge you to learn more about the software and the methods, tools, and operations to complete your tasks.

Learning Objectives:

- How to select data in ArcGIS Pro in different ways (interactive, by attribute, and by location)
- How to create a GeoJSON and understand its structure

Deliverables:

A write-up of your response to the instruction questions. Upload your write up to the lab assignment on myCourses. All the tasks below should be included in the same word document (or PDF). Name your write-up using this convention before posting:

[your last name]_Week4_lab.docx

Grading:

This assignment will be graded out of **25** points. The number of points for each task is noted in the description of each task. There are **2** tasks in this assignment:

- Task 1: Querying and Joining Data in ArcGIS Pro (18 points)

- Task 2: Creating a GeoJSON (7 points)

## Task 1: Querying and Joining Data in ArcGIS Pro (18 points)

For this task, you will add data to ArcGIS Pro and conduct different methods of selecting, querying, and joining data. For a hands-on demonstration, refer back to the "Part 2" of this week's lecture.

Subtask 1: File Geodatabase in ArcGIS Pro Catalog View

1. Open ArcGIS Pro and select the Catalog template. In the event you are already in a Map View, simply go to the "View" tab and select "Catalog View".
2. Select "Add Folder" and map to the Week04_ExerciseData folder. **Note – make sure you unzip the folder before starting!**
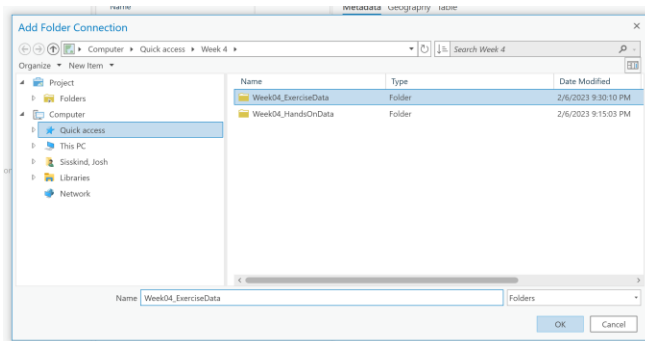
3. You will now be able to access your data in the "Folders" option in the Catalog view and Table of Contents.
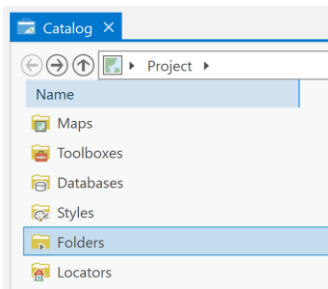
4. Double-click on Folders and navigate to Week04_ExerciseData >> sample_geodatabase >> Montgomery.gdb >> Landbase.

   Question 1: What is the difference between the Landbase *Feature Dataset* and the Parcels *Feature Class?*

5. Select each of the feature classes and select the Geography tab in Catalog View. You will be able to preview the data without loading it into the map. You can also pan and zoom like you would in a map view (hint: holding the Shift key and dragging mouse will zoom into a specific extent).

   Question 2: When you select RoadNames, what do you see in the Geography preview?

You can close the Catalog view.

1. Open a map view by selecting "New Map" in the "Insert" tab on the ribbon.
2. Using the "Add Data" button in the "Map" tab, add the **cities.shp** and **countyp020.shp** files from the **select_by_location** folder.
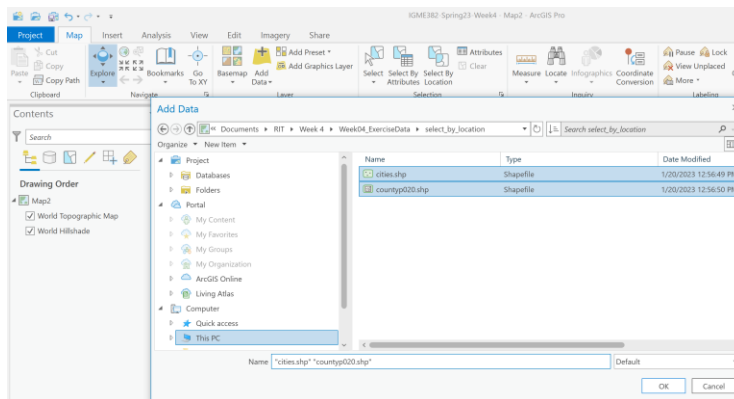
3. As a reminder, here are the different Select tools we will use to select and query the data:
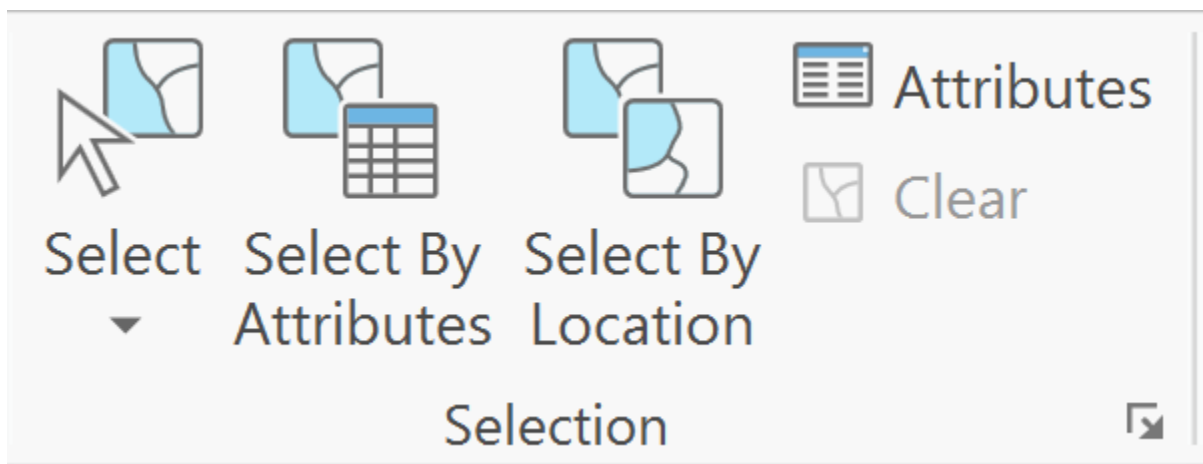
4. In the Table of Contents, right-click the **cities** layer and select **Attribute Table**. The table should appear in the bottom of the window. Using the trick in the lecture, you can only show selected features using the icon in the bottom left.

5. In the Select tool, click the dropdown and choose "Lasso". Find Australia on the map but do not zoom in. While clicking the entire time, draw a lasso (or shape) around Australia (you will see a light, dashed line). You can also use the "Polygon" option, which allows you to click and create lines on at-a-time (double-click to complete the selection polygon).

Question 3: How many cities were selected using the select tool?

6. Clear your selection and choose "Select by Attributes".

7. Using the dialog, query a **new selection** for how many **cities** have the attribute where **COUNTRY is equal** to **Australia**.

   Hint: cities will be the input row option.
   Hint: Hitting apply will keep the dialog box open, while OK will close it. Keep the box open!

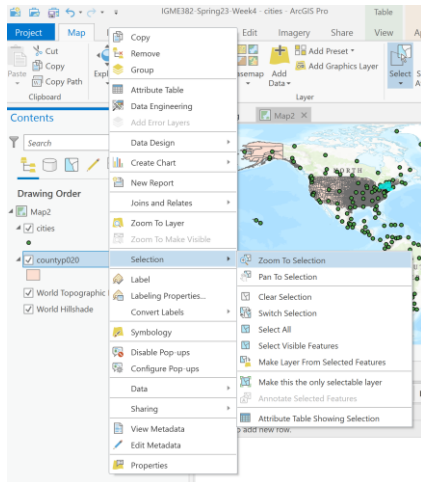**Question 4: How many cities were selected using the Select by Attributes tool?**

8. Now, let's query a **new selection** for how many **cities** in **Australia** have a **POPULATION** that **is greater than 1000000**.

Question 5: Which cities were selected using the Select by Attributes tool?

9. Let's reset the Select by Attributes dialog, as now we want to choose all the counties in New York. Does yours match this? If not, make sure it does, then hit apply.

10. Zoom to the selection by right clicking the layer in the Table of Contents.

11. Now that we have New York selected, we can properly query for the number of cities in the state. In the Select by Location tool, remember that we want to use **countyp020** as our selecting feature, we are looking for the **Intersect** relationship to see which cities intersect with the county polygon, and the **cities** as our input features. Use the "info button" pop-ups in the tool if you need help. **Hit apply** when you are ready!

==Question 6: Which cities were selected?==

12. Now, let's switch the feature classes, so that **countyp020** is the input feature selection, and **cities** is the selecting feature. Remember that we have certain cities selected. What do you think will happen?

==Question 7: What happened when you switched the feature classes? What was now selected?==

13. Close all open dialog boxes and the current map view (click the "x" next to it towards the top of the window).
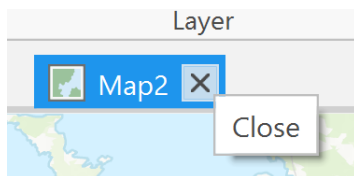

Subtask 3: Joining Data

1. Open a new map view as you did in the previous task.

2. Open the "Catalog Pane" from the "View" tab in the ribbon. Under Folders, navigate to "Week04_ExerciseData".

3. Add both shapefiles (landuse_utm83.shp and us_states.shp) to the Table of Contents by dragging and dropping.

4. Zoom to the landuse_utm83 layer by right clicking on the layer in the Table of Contents and selecting "Zoom to Layer".

5. Now drag and drop **landusecodes.txt** to the Table of Contents. Note how it is added as a "standalone table" as it has no geospatial information.

6. Right click on the table and select "Open table". Review the values – they are coded based on a land cover description.

7. Do the same for landuse_utm83 ("Attribute Table"). Look at both tables.

<mark>Question 8: Which fields do you think match from either table?</mark>

8. Select **landuse_utm83** in the Table of Contents, navigate to the "Feature Layer" tab in the ribbon and then the "Data" subtab. Select Joins, then "Add Join".
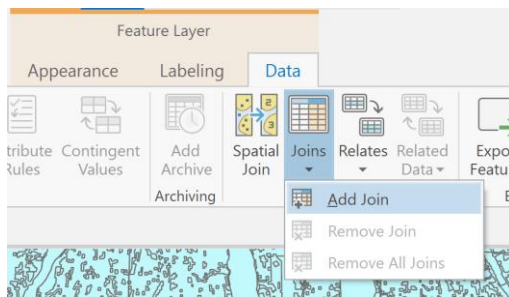
9. To complete this join, select the **landuse_utm83** layer as our "Input Table" and the **landusecodes.txt** as the "Join Table". Choose the fields you selected in Question 8 – but make sure the field from **landuse_utm83** is the Input Join Field and the **landusecodes.txt** field is the Join Table Field. Keep the checkbox checked for *Keep All Target Features* and unchecked for *Index Joined Fields*.

10. Select Validate Join and read the output.

<mark>Question 9: Is this join going to be a one-to-one or a one-to-many?</mark>

<mark>Question 10: How many records were matched?</mark>

11. Close the Validate Join window and select "Ok" on the Join window.

12. Reopen or view the **landuse_utm83** attribute table if you left it open.

<mark>Question 11: What attribute has been added to the table?</mark>

<mark>Question 12: Open the Symbology window using methods from previous labs. Can you symbolize the data using this new attribute (HINT: Unique Values)? Do you find it easier to</mark>

Task 2: Create a GeoJSON (7 points)

For this task, you will create a GeoJSON file using GeoJSON.io.

1. Open a modern web browser (Chrome, Firefox, Edge) and navigate to https://geojson.io/

2. It's a virtual globe! Pan and zoom around for a bit to get comfortable. Once you are settled, zoom in to any location where there will be roads and buildings. You can zoom in by double-clicking or holding the plus sign. You can also use the search bar in the upper right corner (although you may need to clear it to remove the blue pin).

3. Basemaps can be selected in the lower right corner. Make sure you have the **Satellite Streets** selected.

4. First, let's load data to the map. In the Week04_ExerciseData folder, drag and drop the "RIT.csv" file onto the map (alternatively, you can select "Open" in the app and navigate to the file.

   Question 1: How many features are loaded into the map? What are the feature type(s)?

5. Select "New" from the app menu (or refresh the page and select "Cancel" to start with a new map). Repeat above to load the RIT.geojson file from the same directory.

   Question 2: How many features are loaded into the map now? What are the feature type(s)?

   Question 3: What is different between the CSV and GeoJSON? Why do you think there is a difference between the two?

6. Let's create some data! Create points, lines, polygons on the map. You can drop points on buildings, trees, or other single features. Lines can be roads, sidewalks, or trails. Polygons can be buildings, water bodies, and so on.

Your features should have at least one attribute each. You can add it by selecting the feature and typing in the property and value into each row. Selecting the "Add simplestyle properties" will let you change the color, outline, and transparency of the feature.
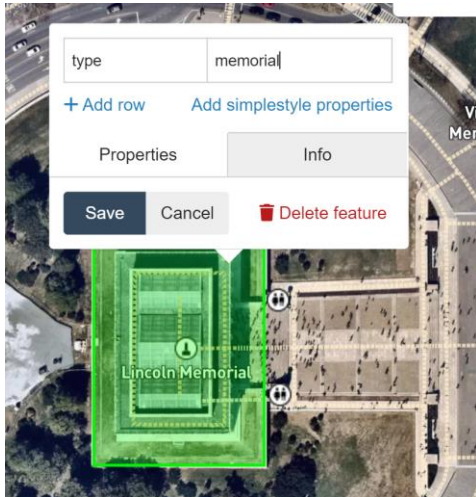

The pencil allows you to edit your geometry of the feature or to move it completely. Only do this if you need to or want to experiment.
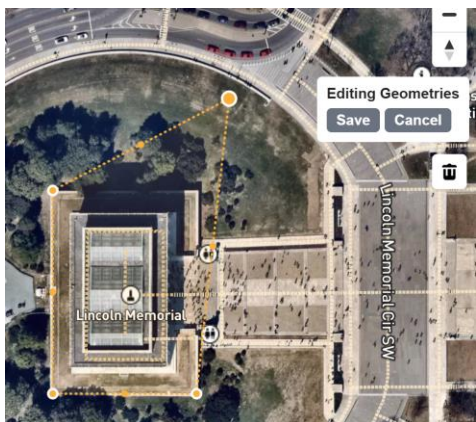
Create at least 5 features of each type (15 features total).

7. As you create features or edit properties, pay attention to the </> JSON window in the right-hand side (if hidden, select the arrow at bottom – see below). What is happening as you collect data? Do you see it updating in real time?

8. Try editing one of the metadata tags, then select the feature. Did it update?
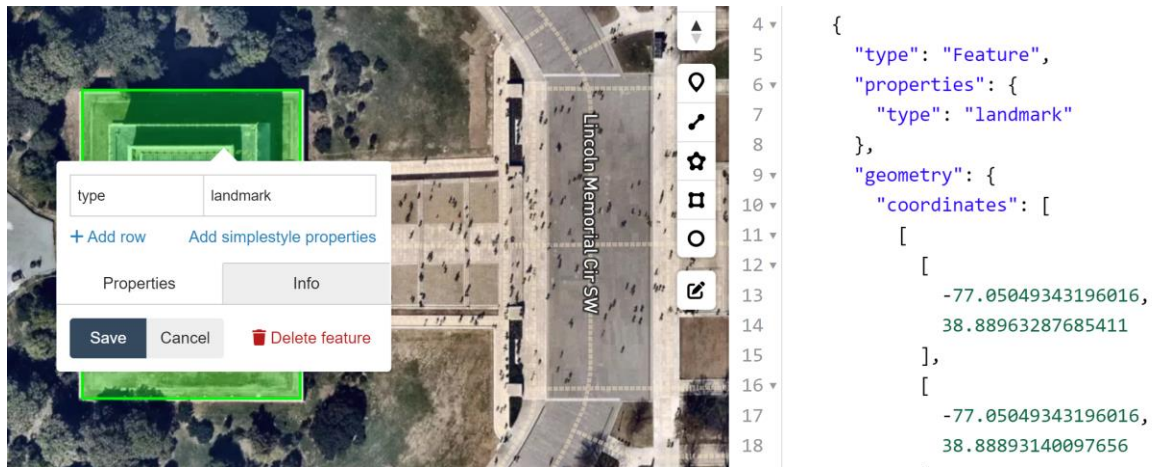
Question 4: Write a short response (~50 words) to the following statement/questions: *The GeoJSON is a basic file type and is quite easy to create; the file is especially popular among web applications for its ease to render in web maps and edit using JavaScript and other modern languages. The GeoJSON, though, does not natively load in ArcPro and requires some light-touch geoprocessing to convert to an acceptable format. What are your observations of the GeoJSON file format, what applications do you think it would be best suited for, and when do you think you would use it?*

9. **When you are done, take a screenshot making sure all features are visible and paste in your deliverable.**

10. **Then, in the upper left menu bar, select Save >> GeoJSON. Upload your map.geojson file with your assignment to myCourses.**