Geog 301 – Exploring Yellowstone lab

Swiped from: <https://serc.carleton.edu/NAGTWorkshops/gis/activities2/48015.html>

modified by Dr. Bob Hickey (mostly converted to ArcGIS Pro)

The goal of this lab is to become familiar with the features of GIS and to develop a set of questions that inform a conservation biologist and that can be answered using a GIS data set.

Note, in this lab and the next, we are moving from simple monkey see, monkey do labs and into ones that you will need to think a bit. And maybe spend a little time on the web looking up information you don’t know. The goal here is to better simulate real-world GIS assignments where an analyst (or even technician) is expected to do more than blindly click on a few buttons.

Copy the full yell2 subdirectory from the data drive to your flash drive. Then open the .aprx file and look at this in Pro (in the yell2/Yellowstone\_pro\_files/ subdirectory.

We will start by becoming familiar with the maps and tools to navigate.

A multicolored map layout titled *Land Use in Yellowstone National Park and the Surrounding Area* should appear. This map is similar to a paper map, with a scale bar, legend and other map elements. Because of the features illustrated on the map, it is called a Land Use-Thematic Map. The screen also shows a Reference Map that sets the overall context for the thematic map. In this case the Reference Map shows the entire outline of Montana and Wyoming and the park so that you can visualize Yellowstone with respect to its surroundings.

Let’s now move over to the regular data view (layers tab) and play around a bit.

ArcGIS has several advantages over paper maps. For example, layers can be turned on & off and the user can zoom in and out to gather specific and generalized observations of the available data. Compare the canned maps you first looked at with the datasets provided. Not everything is on the final maps.

The layers with black checks next to them are on, the others are currently not visible. Explore toggling different layers on & off

* Campsites
* Mines
* Roads
* Water
* Areas burned in 1988
* Bear management areas
* Land use

*Q1: Describe the location of the mines with regard to the National Park. Do the rivers of the watersheds of the mining areas flow into the Park? What does this suggest about the possible impacts of mining on water quality in the Park? Note, to answer this last bit properly, you might want to spend some time with the attribute table – and google if you don’t know what some terms mean.*

*Q2: Simply by looking at the maps, visually estimate the percentage of the following that occur in the extent bounded by the roads layer:*

* + *Yellowstone National Park*
  + *National Forests (including the North Absaroka)*
  + *Other ownership (e.g., private and state lands). These areas are all those that are not federal.*

*Q3: What is the dominant Land Use of the National Forests, the National Park, and the lands that fall into other ownership? Note, there are three answers here, not one.*

*Q4: Turn off the landuse and turn on the areas burned in 1988 (I was supposed to be doing field mapping in the Park that year… but didn’t). Next, explore the location of the fires in 1988 with regard to land ownership. Were the fires constrained to any particular ownership? What might fire patterns indicate about management practices? What other data would be needed to verify differences in management practices? Note, google can be your friend here if you’re not already knowledgeable about this situation.*

*Q5: About what percentage of the park burned? If you wanted an accurate measurement of the percentage of the park that burned in 1988, how would you do it from the data provided? Note, I do NOT want a list of commands, I want the logical set of steps you would use.*

Let’s take a look at a few other tools.

**Identify and select features**

To select objects in Pro, use the select tool in the map tab. The selected object(s) will then be highlighted in light blue. You can also draw a box to select multiple things.

To identify objects, use the explore button (map tab as well). Basically, you can click on any object and get info about it. Note, by clicking the arrow right below the explore button, you can choose which info to ID. Have a go, and check out some of the info about one or more objects in one or more layers.

**Identify features**

In many cases people want to work with a given feature, rather than just gather information about the feature. There are several methods that can be used to select features.

* First, you can use the method above and click on something using the select button. We’ve covered this!
* Then, you can select by attributes (next button to the right)
* Or select by location (next to the right).

**Selecting by attributes**

Often, we are interested in a specific subset of a given feature (mixed tundra as one type of land cover, for example) and selecting each polygon by using the color key can be laborious. An alternate method of selection is to select by an attribute.

* Click the select by attributes button
* Chose the layer you wish to make a selection from (Land use, for example)
* Make sure the method is “Create a new selection”
* Click new expression
* Double click on “LEVEL 2” (the land cover descriptions) in the white box that contains a list of terms (“LEVEL 2” should appear in the lowest white box)
* Is equal to
* select MIXED TUNDRA
* to verify your SQL query is valid, click on the little green check mark.
* Click on the run button at the bottom of this window.

The mixed tundra on the map should be outlined in light blue

Select by location

In this case, we are looking at selecting things based on their relationship to another layer. For example, we could look at those Yellowstone fires which burned at least partially within the Park:

* Hit the select by location button
* Select area burned as your input feature
* The relationship is intersect
* The selecting feature is Yellowstone boundary
* Run
* Now, zoom in to make sure your selection was what you thought it would be.

Clear selection by hitting the clear button (next to the right!)

The power of GIS is in the link between spatial features and information about those features. The map shows the spatial features whereas the information such as land use type is stored in attribute tables.

* Open the bear management area attribute table by right clicking on the words Bear Management area in the left hand window.
* Look at the available data (consider comparing this attribute table with ones from other layers).

Data can be rearranged by right clicking on column headings and using the drop down menu to sort (ascending, descending) data columns. Column order can be changed by unfreezing the columns and then dragging the column to the desired location.

In addition, these data can be summarized using the Summarize tool

* Right click on the column heading RESTRICTIO
* Select Summarize
* Make sure the case field says RESTRICTIO
* Above, make sure the statistics field is area with the statistic type being sum.
* Give your output table a name
* Click run
* This will put a table at the bottom of your table of contents. Right click on it and select open.

*Q6: How many bear management areas are seasonally closed, seasonally closed with restrictions, and seasonally restricted? What is the size of each? What is meant by seasonally closed, seasonally closed with restrictions, and seasonally restricted (closed or restricted to what)? Answering this will require looking at the whole management areas attribute table and then going to google. “bear management yellowstone park seasonal restricted” might be a useful search. Just sayin’.*

*Let’s make a map. Because this is a GIS class, and you gotta have a map. Insert a new layout, etc. Zoom in on the park area. Make me a pretty map showing the relationship between the different bear management areas and the areas burned in 1988. Which means that the bear mgt areas need to be different colors. Include whatever other layers you want and all the usual cartographic necessities. Feel free to change colors of things to make them more readable. You can make a layer partially transparent by using the transparency tool in the appearance tab. Remember EVERY cartographic rule we’ve been over in class.*

*Q7: How many of the bear management areas completely burned in 1988?*

Turn in – the answers to the 7 questions and your final map (in color).