

Analysis Products How To

Description

This lesson gives the GIS Specialist (GISS) guidance in executing common GIS analysis and geoprocessing skills in order to answer questions posed during a wildfire incident.

Target Audience: GIS Specialists / GIS Specialist Trainees

Objective:

This module will present analysis techniques commonly used on a wildfire incident. Upon completion, individuals will be able to calculate latitude and longitude of a point, determine fire perimeter length and percent contained, and calculate the total number of acres burned and acres burned by land ownership type.

GSTOP Reference: Chapter 1, *GISS Minimum Expectations* - GISS Knowledge, Skills, and Abilities

How To:

Although there are numerous ways to complete a task using GIS software, this module attempts to provide the simplest way to accomplish the objectives previously described.

Arc Map

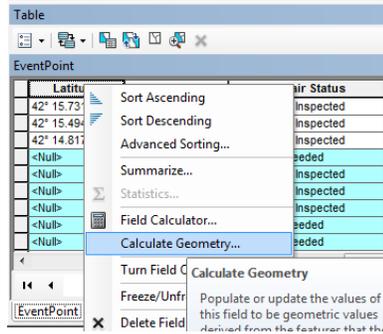
1. Confirm that you have the appropriate incident layers added to the .mxd that you are working with. For this exercise, you will need the event point, line, and polygon feature classes as well as land ownership data to determine acres by owner. County level parcel data is often the most accurate; however, you can use a few other national datasets as well. This includes the “Surface Management Agency” data from the Bureau of Land Management (BLM) (<https://navigator.blm.gov/home>) and the Protected Areas Database of the United States (PAD-US) (<https://gapanalysis.usgs.gov/padus/>).

The Surface Management Agency data is available in both a feature service and as a download for some individual states. The downloadable data can be used in analysis while the feature services are for viewing only. Another benefit of the downloadable Surface Management Agency data is that for some states, it may already be dissolved by owner, so it is easier to calculate acres burned by landowner.

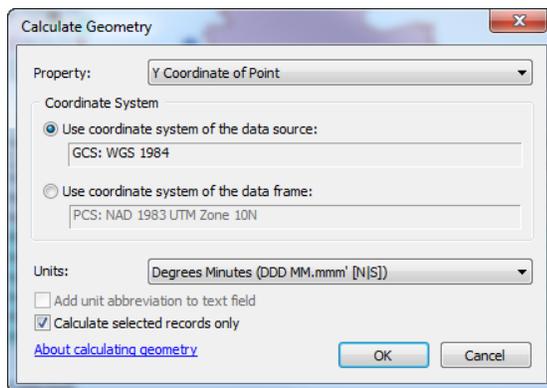
The PAD-US data may also be used for analysis. However, it does not have polygons for private land unless it is designated as an easement and it may have several overlapping polygons, which can create additional steps during analysis.

2. **Calculate Latitude and Longitude for EventPoint Features**
 - a. Right-click on the **EventPoint** layer in the table of contents and select **Open Attribute Table**.
 - b. Select the EventPoint features that will have their coordinates calculated. (If none are selected, then all of them will be calculated.)

- c. Right-click on the **Latitude** field header in the attribute table and select **Calculate Geometry...**



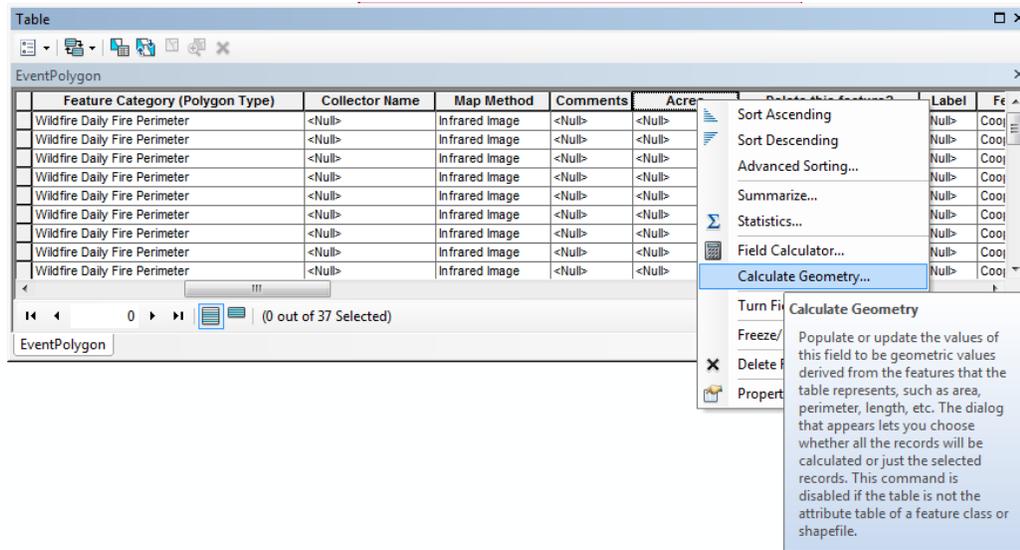
- d. For the Property dropdown, choose **Y Coordinate of Point**. For the Coordinate System, select **Use coordinate system of the data source: GCS: WGS 1984**. Select **Degrees Minutes (DDD MMM.mmm' [N | S])** for the Units and then click **OK**.



- e. Repeat the previous two steps for the **Longitude** field except this time, choose **X Coordinate of Point for Property** and select **Degrees Minutes (DDD MMM.mmm'[W | E])** for the Units.
- f. Calculating the geometry of a point can be done within, or outside of, an editing session. If you are editing, be sure to save your edits.

3. Calculate Acreage

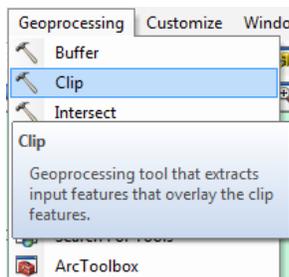
- a. Prior to conducting any distance or area calculations, you need to set the data frame coordinate system to an appropriate projected coordinate system (e.g. NAD 1983 UTM Zone 13N).
- b. Right-click on the **EventPolygon** layer in the table of contents and select **Open Attribute Table**.
- c. Right-click on the **Acres** field and select **Calculate Geometry**.



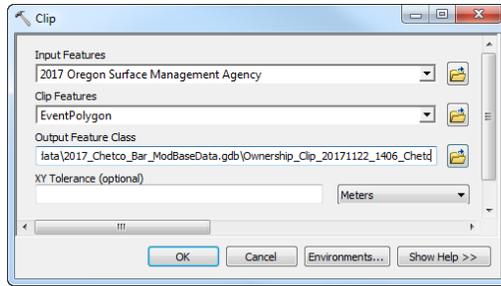
- d. Under Property select **Area**
- e. For the Coordinate System select **Use coordinate system of the data frame.**
- f. Under Units select **Acres US**
- g. Make sure that the checkbox for **Calculate selected records only** is appropriately checked or unchecked.
- h. Click **OK**.
- i. Save your edits.

4. Calculate Acreage Burned by Ownership

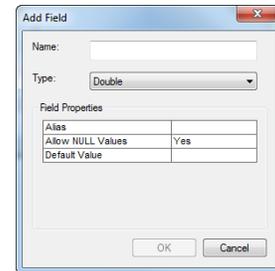
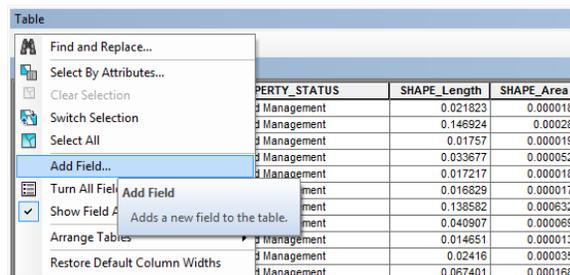
- a. Add an ownership layer (discussed at the beginning of this document) to the dataframe.
- b. Clip the ownership layer using the fire polygon by selecting **Geoprocessing → Clip**.



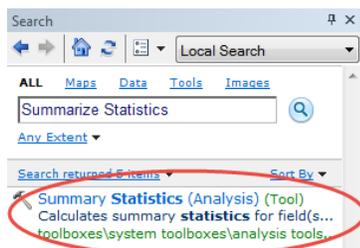
- c. Within the Clip tool interface, the **Input Feature** will be the land ownership layer. The **Clip Features** will be the **Event Polygon** layer. **IMPORTANT:** Ensure that the only features selected within the Event Polygon layer are the most recent **Wildfire Daily Fire Perimeter** features. Save the output file in the appropriate location and name it using the GSTOP naming convention.



- d. Right-click on the newly created feature class in the table of contents and **Open Attribute Table**. Look over the table. You should see records for each property ownership type (BLM, Forest Service, Private, etc.).
- e. Click **Table Options** and select **Add Field...** Name the field “Acres” and select the **Type** as **Double**

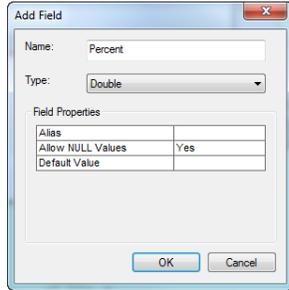


- f. Right-click on the **Acres** field and select **Calculate Geometry**. Under Property select **Area**. For the Coordinate System select **Use coordinate system of the data frame**. Under Units select **Acres US**. Make sure that the checkbox for **Calculate selected records only** is appropriately checked or unchecked. Click **OK**.
- g. Next, use the Search function in ArcMap to search for the Summary Statistics (Analysis) Tool. We are going to use this tool to create a table that shows each landowner type within the fire perimeter and how many acres of each type.

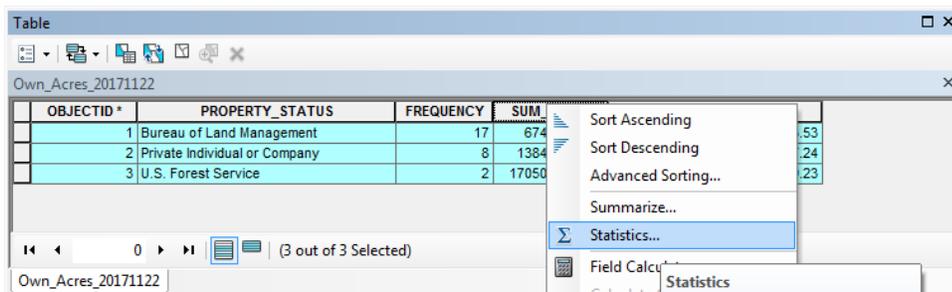


- h. For the **Input Table**, choose the feature class with the clipped landownership data and Acres field that you created in the previous step. Place the **Output table** in the appropriate location and name it using the GSTOP naming convention. In the **Statistics Field(s)** select the **Acres** field. Then under **Statistic Type** choose **SUM**. For the **Case field (optional)** select the field that denotes the property owner. In this case, it is **PROPERTY_STATUS**. Click **OK**.
- i. Open the new table that you just created. This table shows the number of acres by

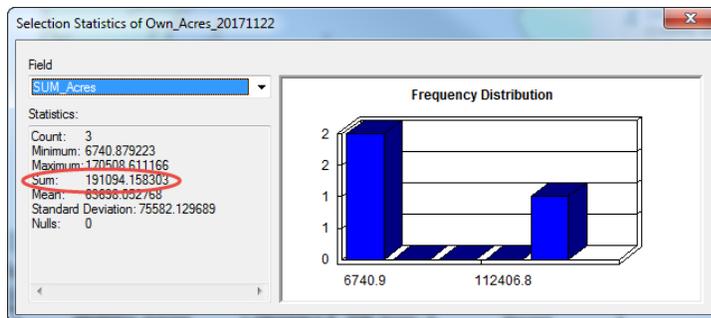
landowner type. Add a field. Name it “Percent” and the Type is Double.



- j. Now you will create a field calculation for percent of land burned by type on the newly created field. Before we do that though, we need to know the total number of acres burned. Right click on the field heading for the SUM_Acres field and select **Statistics**.

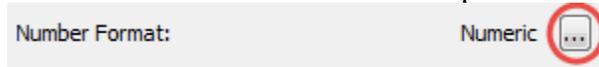


- k. The resulting table will show the total number of acres burned. Highlight that number with the cursor and copy it (either Ctrl + C or Right click → Copy). Close the Statistics window.

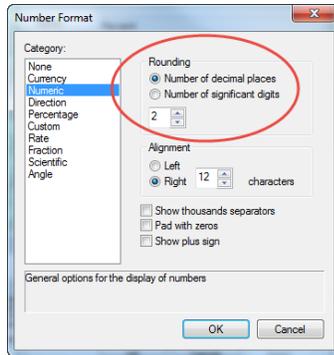


- l. To calculate the percentage, right-click on the heading for the Percent field and select **Field Calculator...** In the “Percent =” window, type **([SUM_Acres]/191094.158303)*100** . In this formula, the [SUM_Acres] is the field that shows the number of acres by ownership type and 191094.158303 is the total number of acres within the perimeter (the number you copied in the previous step). Click **OK**.
- m. If you would like to simplify the field to make it easier to read, you can right-click on the Percent field header and choose **Properties**. Next to **Number Format**:

Numeric... click button with three periods



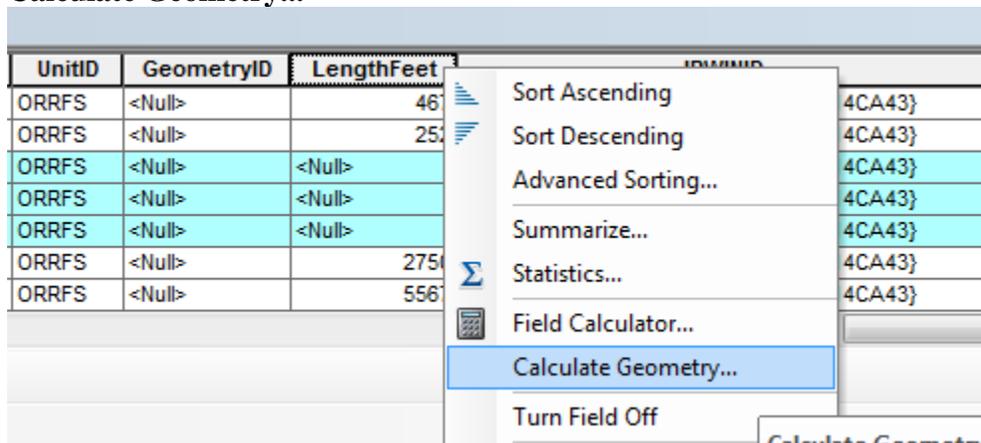
- n. You can now adjust the number of decimal places to make the numbers easier to work with. Click OK and OK again. Your table will then accurately display how many acres of each land ownership type have been burned and what that percentage is.



OBJECTID*	PROPERTY_STATUS	FREQUENCY	SUM_Acres	Percent
1	Bureau of Land Management	17	6740.879223	3.53
2	Private Individual or Company	8	13844.667915	7.24
3	U.S. Forest Service	2	170508.611166	89.23

5. Calculate Length of a Line Feature

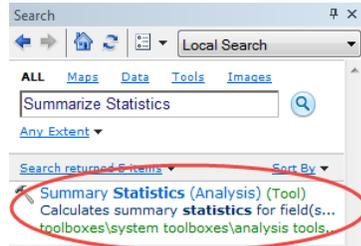
- a. Prior to conducting any distance or area calculations, you need to set the data frame coordinate system to an appropriate projected coordinate system (e.g. NAD 1983 UTM Zone 13N).
- b. Right-click on the **EventLine** layer in the table of contents and select **Open Attribute Table**.
- c. Select the EventLine features that will have their lengths calculated. (If none are selected, then all of them will be calculated.)
- d. Right-click on the **LengthFeet** field header in the attribute table and select **Calculate Geometry...**



- e. For Property, select **Length** and for the Coordinate System, select **Use coordinate system of the data frame**. Finally, select **Feet US [ft]** as the Units and click **OK**.

6. Summarize Line length by Feature Class (and calculate % contained)

- a. Follow the directions outlined in step 5 to calculate the length of all line features.
- b. Next, use the Search function in ArcMap to search for the Summary Statistics (Analysis) Tool. We are going to use this tool to create a table that shows how many total feet of line by Feature Category (Line Type).



- c. Click on the tool to open it. For the **Input Table**, choose the EventLine feature class Place the **Output table** in the appropriate location and name it appropriately. In the **Statistics Field(s)** select the **LengthFeet** field. Then under **Statistic Type** choose **SUM**. For the **Case field (optional)** select the **FeatureCategory** field. Click **OK**.
- d. The resulting table gives the total length in feet for each line type. On most simple fires, you can then calculate the percent of containment by dividing the length of Completed Line by the sum of the Completed Line and Uncontrolled Fire Edge. However, for some fires you will need a more intimate knowledge of the fire line. Line types such as Road as Completed Line or Completed Hand Line may be off the fire perimeter and may not count towards the total containment line calculations. Working closely with the Situation Unit Leader (SITL) you can make those determinations and adjust the line lengths (completed vs uncontrolled) as necessary. Note: it may be beneficial to highlight the table and then copy and paste it into Microsoft Excel to set up calculations.