

Public Safety - Crime Mapping and Spatial Analysis Using ArcGIS Online for Police Officers

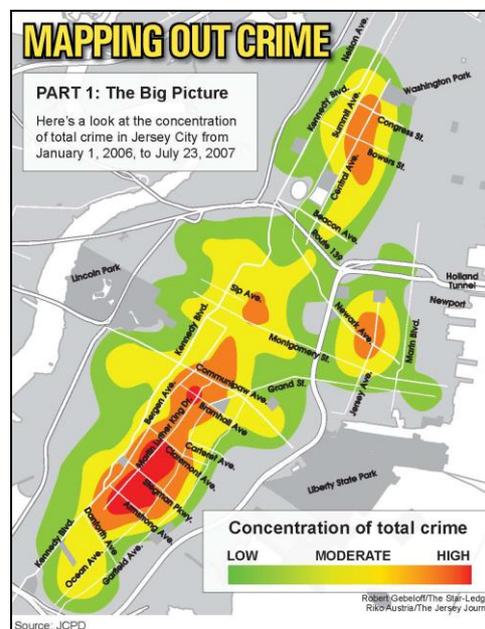
Knowledge, Skills, and Abilities (KSAs) Supported

This training module aids in the development of several KSAs that are fundamental to using GIS for public safety planning and operations. The ability to perform crime mapping using ArcGIS Online is a foundational skill that is relevant to a multitude of GIS applications. In addition, the following training tutorial builds essential knowledge of how to design and use crime data for web mapping.

**** This training tutorial is intended for training, exercise, and preparedness efforts only. It is not intended to support emergency response operations.****

Knowledge Gained:

- ✓ Definition of Crime Mapping: Crime mapping is a sub-discipline of geography that works to answer the question, “What crime is happening where?” It focuses on mapping incidents, identifying where the most crime occurs and analyzing the spatial relationships of targets and these areas.
- ✓ Definition of Heat Mapping: This technique is used to visualize geographic data and show areas where a higher density or cluster of activity occurs. For both types of spatial analysis, a color gradient is used to indicate areas of increasingly higher density. See the following example from Jersey City, NJ:



- ✓ Esri has selected HERE Map Content (www.esri.com/here) as the foundation street data for its cloud-based mapping platform as well as for StreetMap Premium and numerous other Esri products.
- ✓ Esri uses HERE map content and HERE point addressing to build the geocoding locators used in both ArcGIS Online (AGOL) and StreetMap Premium (SMP).

Skills and Abilities Developed:

- ✓ Ability to develop a table with the essential spatial data for crime mapping and how to adjust the address format to be recognized in ArcGIS Online platform.
- ✓ How to add an attribute field and how to populate it in the data table of the crime incident feature service layer.
- ✓ How to download and add correct symbology templates for crime mapping through ArcGIS Server and the Change Style tool.
- ✓ How to overlay features and layers from Esri Web Layers (Adding Broward County boundary) in the map content while maintaining visibility of the current layers created. This includes demonstrating how to find other web map layers and how to add them to ArcGIS Online.
- ✓ How to conduct hotspot analysis to better determine crime incident concentration and geographical distribution of burglaries.
- ✓ How to set a timeline showing the data through several days of the analysis.
- ✓ Designing a web application for showing the analysis result.

Public Safety Geocoding Scenario in ArcGIS Online & Data Sources

This tutorial guides you through the following scenarios:

- **Mapping** the crime incident report data from November 2014 in Broward County, Florida. Processing the data by standardizing the type of crimes according to the National Incident - Based Reporting System (NIBRS) and Uniform Crime Reporting (UCR).
- **Performing a Heat Map Analysis** to define what areas are at more risk and how to develop the following strategies:
 - **Short Term protocol** for taking action in situations that are currently taking place.
 - **Long Term protocol** for taking action during ongoing issues. The focus is often on identifying areas with high crime rates and finding ways to decrease the overall crime rates.
 - **Administrative Analysis** which looks at the administration and deployment of police and resources and asks the questions, “Are there enough police officers at the right time and place? There should be more police departments in the areas with high level of risk and high crime rates?”

Additional Information: Obtaining and Managing the Data for ArcGIS Online

This tutorial explains where to find crime data and how to manipulate the data so it can be used in ArcGIS Online for educational purposes.

It is essential to find crime data for our analysis (Burglary and Burglary Conveyance) from free sources on the internet. For this tutorial, the crime data has been selected from <http://www.crimemapping.com/> because it is easy to visualize and downloads quickly to an Excel Spreadsheet. The street data was sourced from the Streets Basemap in ArcGIS Online, which is primarily HERE Map Content. The Broward County boundary layer came from ArcGIS Online.

In the application Crime Mapping, we selected Broward County, FL in the browser and delimited the specific period of time to November, 2014.

To select the appropriate number of registers, it is critical to zoom to the entire map extent of

Broward County so all the crimes are properly selected on the map and then choose the detailed report option. For our analysis, we obtained 507 records. It is important to note that over 3,000 records of crime incidents in Broward County in November, 2014, were selected but we limited the records to only burglary incidents to facilitate the analysis, leaving 507 records.

Furthermore, we deleted the crime incident case number to protect the anonymity of those arrested. However, we classified our type of crimes according to the National Incident–Based Reporting System (NIBRS) and Uniform Crime Reporting (UCR) of Florida Department for Law Enforcement.

In addition, we have developed the address geocoding according to the US Standard Address for digitizing the streets according to their name, type and number so they can be recognized by ArcGIS Online.

At the same time, we separated the ‘date and time’ field into two different fields (they were originally in the same field) in order to set up a timeline that shows our data throughout a specific period of time.

Finally, when the crime database was homogenized, we converted the Excel file (.xls) into a Comma Separated Values (.csv) file in order to display the information correctly in ArcGIS Online. This step is necessary in order for ArcGIS Online to read the data properly.

Additional data processing included removing the text “BLOCK” from the location or address field, since this text would prevent the addresses from properly geocoding.

Exercise Overview

This is a stand-alone tutorial; however, it builds upon the knowledge acquired in the previous two tutorials. This tutorial will continue to use Broward County data as did the previous educational materials.

Scenario

Mapping crime incident data from November 2104 Broward County, FL

Main Steps:

1. Setting an ArcGIS Online basemap to use in this tutorial
2. Adding crime incident data (burglaries) to the ArcGIS Online map canvas – Adding this data as a feature service so we can later add attribute data
3. Symbology – Finding and adding a predefined set of symbols for public safety and applying these symbols to burglary data
4. Adding Broward County boundary data
5. Conducting hotspot analysis to better determine crime incident concentration and geographical distribution of burglaries
6. Learning about using a time slider widget
7. Adding attribute data to the crime incident feature service layer

Using NIBRS and UCR Codes for representing features in Crime Mapping through ArcGIS Online

[Feel free to skip this section and go directly to Step 1 if you are familiar with crime terminology]

Source: <http://www.fdle.state.fl.us/cms/FSAC/UCR/UCRGuideManualDec2013Revision.aspx>

Historical Background

In 1971, the Florida Legislature established Section 923.089, F.S., mandating the responsibility and authority for Uniform Crime Reports data collection and dissemination to the Florida Department of Law Enforcement (FDLE). This statute has been revised four times since its creation and the program has undergone many changes. As a result of amendments to Florida Statute Section 943.05 in 1995, the FDLE redesigned the Uniform Crime Reports Program.

The new program is a more focused statistical summary reporting system than one containing information on individual offenses. The new reporting system became effective January 1, 1996. The goal is to refocus the UCR program to its original purpose: to provide a barometer of the crime conditions within a geographic jurisdiction. FDLE's goal is to collect the required data with as little impact upon the participating agencies as possible.

Purpose and Objectives

The quantitative statistical data derived from the UCR Program provides assistance in determining the overall scope of the reported criminal activity in Florida and helps make effective management studies possible. The fundamental objectives of the Florida UCR Program are to:

- Collect from all law enforcement agencies in the state accurate summary crime data that meet the minimum requirements of the National Uniform Crime Reports (UCR) Program.
- Maintain agency crime statistics in a statewide database and provide a barometer of the number of index crimes that occur, determine crime and clearance rates, and ascertain how often crime occurs.
- Publish Semiannual and annual reports to inform the Commissioner, Governor, Legislature, other government officials, and the public of the types, magnitude, and trends of crimes in Florida.
- Collect from the UCR Program contributors to the number of offenses known to them in the following categories: murder, manslaughter, forcible sex, robbery, aggravated assault, burglary, larceny, motor vehicle theft, arson and simple assault. The UCR Program also collects data on domestic violence offenses, property stolen and recovered, motor vehicle recovery information and arrest information. Additional offense information concerning homicide circumstances and those in which an officer is killed or assaulted, is collected through supplemental reports.

Burglary

The unlawful entry into a building or other structure with the intent to commit a felony or theft.

General Rule

Report as one offense any unlawful entry or attempted forcible entry to any dwelling, house, attached structure, public building, shop, office, factory, storehouse, apartment, house trailer, warehouse, mill, barn, other building, ship or railroad car.

For UCR purposes, if there is apparent unlawful entry and the offender has not completed an act or the actions or intent of the offender are unknown, it should be reported as a Burglary. As a general

rule, any time there is an uncertainty as to why entry was made to a structure; it should be reported as a Burglary for UCR purposes.

A structure for UCR purposes is defined as a permanently affixed building, which has four walls and a roof and is capable of being closed.

The unlawful entry of a tent, camping trailer, mobile home on a sales lot, etc., should be classified as a Larceny.

This would also apply to a house under construction that is not capable of being closed.

When determining if a theft from a hotel room should be reported as burglary or larceny, the investigating officer's findings are an important part of correctly classifying this offense.

If the officer believes that a hotel employee who had legal access to the room was involved, it can be classified as a larceny. If a hotel employee does not appear to be involved, it can be classified as a burglary.

If the actions or intent of the offender are unknown, it should be reported as a burglary.

Force Categories

1. Forcible Entry

- Burglaries where force of any kind was used to unlawfully enter a locked structure, as defined in the general rule, with intent to steal or commit a felony, should be included in this column. This includes entry by use of a master key, cellular, or other device that left no outward mark but was used to open a lock.
- Concealment inside a building followed by the breaking out of the structure should be counted in this column. The following scenarios illustrate incidents known to law enforcement classified as Burglary—Forcible Entry:
 - A liquor store was broken into on a holiday when the store was closed. The next day, the manager found alcoholic beverages and money were missing and called the police.
 - A burglar used a key to enter four units in a condominium complex and stole numerous articles from each residence.
 - A man hid in a theater. After it closed, he stole money from the cash register and left the premises during the night.

2. Unlawful Entry

It counts in this column all burglaries in which no force is used but unlawful entry into a structure to steal or commit a felony has occurred. This includes incidents where the offender made access through an unlocked door or where no evidence of forcible entry was discovered. The following scenarios illustrate incidents known to law enforcement classified as Burglary—Unlawful Entry:

- While a woman was in the backyard hanging clothes, a 14-year-old boy entered her house through the unlocked front door and took her purse. When the woman realized her purse was missing, she called the police.

- A woman posing as a maintenance employee entered an unlocked office and stole a wallet from a cabinet.
- During the night, someone stole a \$24,000 car out of an unlocked, but closed, private garage. Two days later, police found the car abandoned in a nearby town.

3. Attempted Forcible Entry

Offenses are counted as attempted forcible entry if the investigation determines that someone attempts to forcibly enter a dwelling but not successfully completed. Any time force of a physical nature has been used to gain entrance to some premises, the attempted burglary should be reported and the number of premises at which forcible entry was attempted should be counted. The following scenario illustrates an incident classified by law enforcement as Burglary–Attempted Forcible Entry:

- Police investigation verified an attempted break-in at the local bank. There were no suspects in the incident.

4. Location Categories

Residence: A dwelling used as a home, including an apartment, condominium, or a house. If the dwelling is unoccupied, it is still considered a dwelling.

Non-Residence: A place used for purposes other than dwelling, such as an office, warehouse, industrial building, store, etc.

5. Time of Day

Day: In this column, count all Burglaries that occur approximately one-half hour before sunrise to one-half hour after sunset.

Night: In this column, count all Burglaries that occur approximately one-half hour after sunset to one-half hour before sunrise.

Unknown: In this column, count all Burglaries for which it is not known whether the offense took place during the night or day.

Burglary vs. Larceny

Regardless of whether the structure is attached to a house or it is a separate building, any structure must have four walls, a roof, and be capable of being closed for a crime committed there to be classified as a burglary. Some examples are:

- **Porches:** Porches that have a minimal amount of screen and meet the qualifications for a structure should be reported as a burglary.
- **Carports:** Any thefts from a carport should be reported as a larceny.
- **Pool Enclosures:** Pool enclosures that are made up of a majority of screen should be counted as a larceny. As with porches, if the walls are solid, have a minimal amount of screening and a roof overhead, this would be considered a burglary.

- **Burglary to a conveyance:** There should be no reports of burglary to a conveyance (motor vehicle). These are not burglaries and should be reported as Larceny, Theft from a Motor Vehicle.

Step 1: Sign In to AGOL

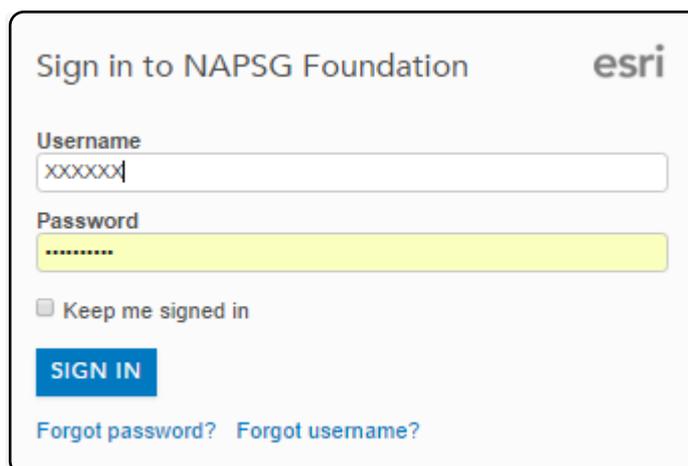
Go to <http://napsg.maps.arcgis.com/home/> and take a moment to familiarize yourself with the mission and resources provided by NAPSG.



If NAPSG provided you with credentials, click **Sign In** and enter them. **If you do not have NAPSG credentials**, navigate to your own organization's ArcGIS Online page, and sign in there with your credentials. Depending on which organization's ArcGIS page your using, the sign in window will look different.

Username: XXXXXX

Password: XXXXXX



Once you have entered your credentials, click **Sign In**.

If you signed into NAPSG's ArcGIS page, then your screen should look like below. If you signed into your own organization's page, the home screen will be different.



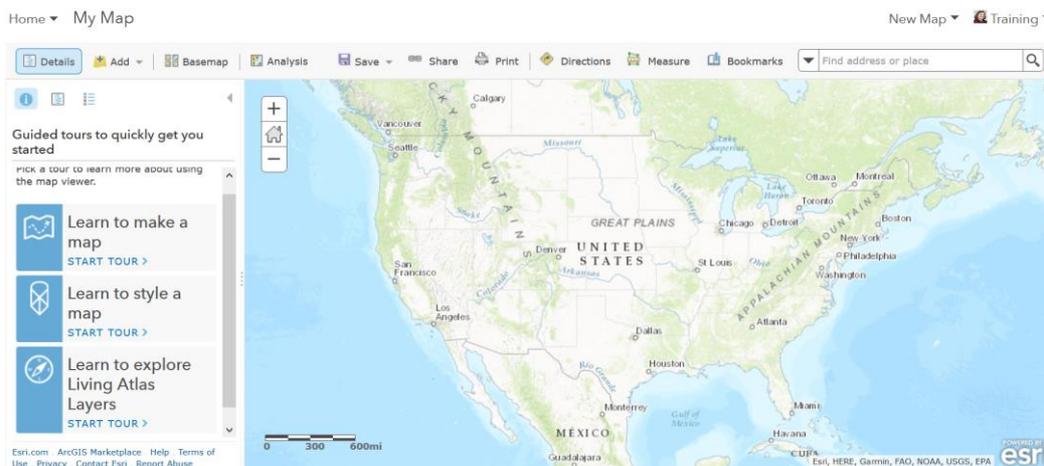
The National Alliance for Public Safety GIS (NAPSG) Foundation is a 501 (C) (3) not-for-profit organization that was formed in

Step 2: Activate the ArcGIS Online (AGOL) Map Canvas

Click on the **MAP** tab to activate the AGOL map canvas.



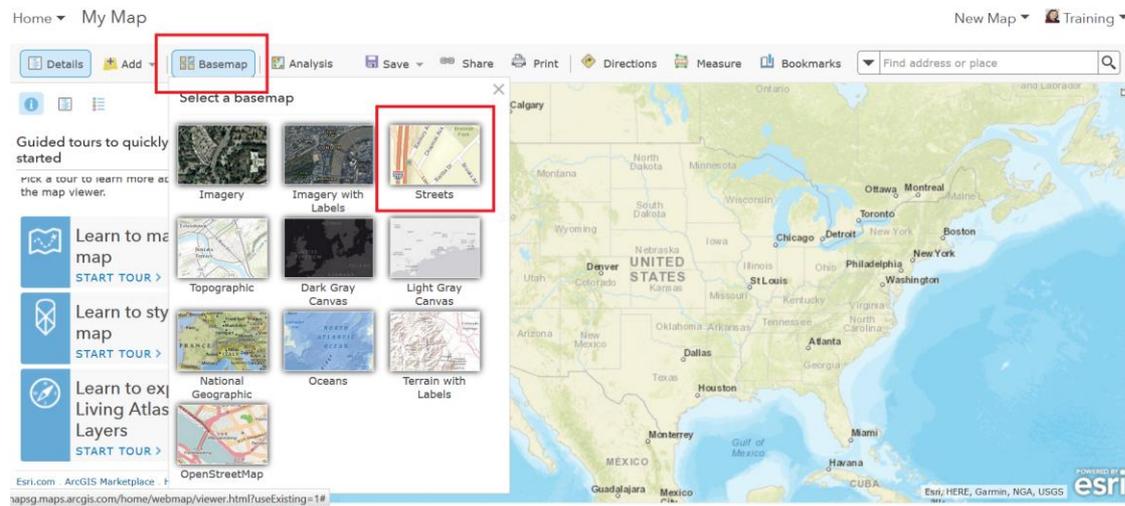
Your screen will look like this after completing Steps 1 and 2:



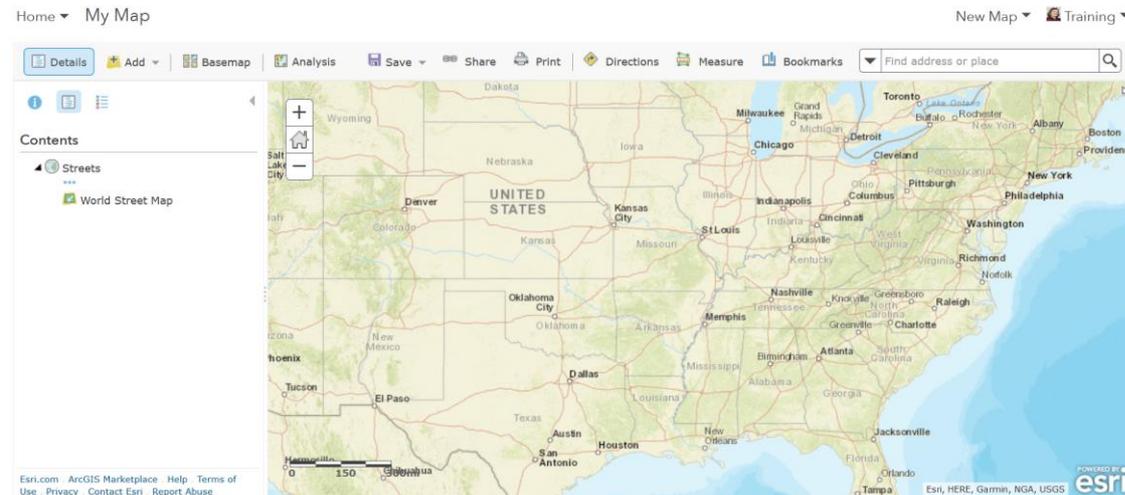
Step 3: Activate the Streets Basemap

This map is mostly HERE Map Content with a few exceptions.

Click on the **Basemap** Tab to choose the **Streets** pallet of basemaps.



The map canvas should now look like this:



Step 4: Add Broward County Crime Data (burglaries) to AGOL and add this data as a Feature Service so we can add attribute data later

In this step, we will add the crime incident data from November 2104 Broward County, FL.

This data originally came from CrimeMapping.com, which allows you to interactively select an area of interest and “save” the data as an Excel spreadsheet.

<https://www.crimemapping.com/map/agency/49>

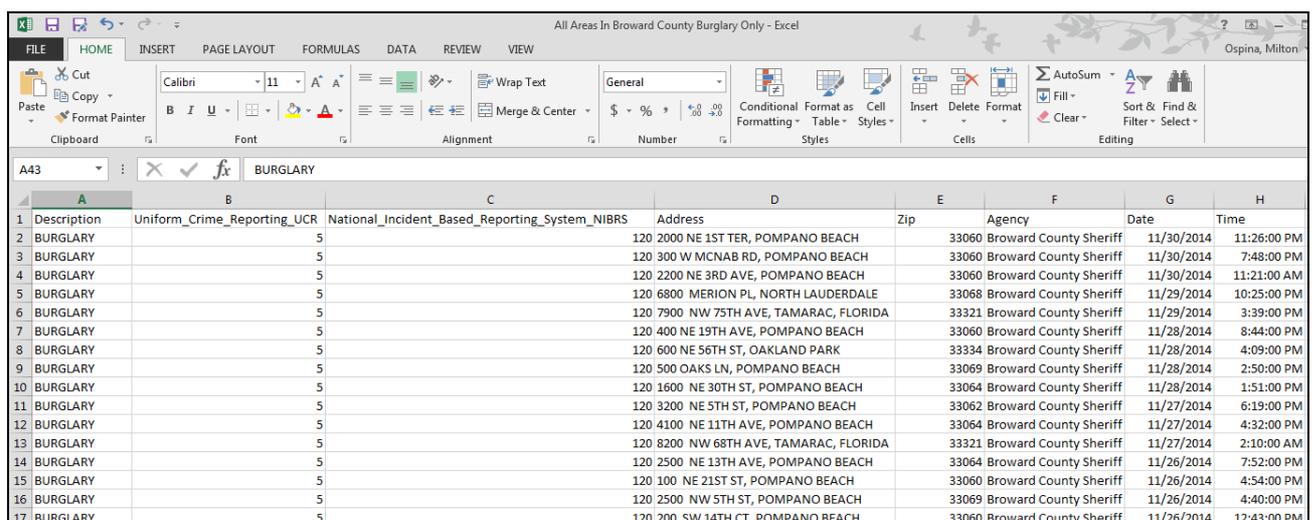
We selected an area roughly the equivalent of Broward County, FL and save the records on a spreadsheet. However we had to “massage” the data because it included more information than necessary for this exercise. We performed the following data cleaning:

- Removed case numbers
- Separated date and time (of crime incident) into two separate fields
- Removed duplicates, cleaned up addresses and file names

Furthermore, it became clear early on that we had too much data. This is not usually a problem, however, for educational purposes and to limit the cost of ArcGIS Online geocoding, we decided to limit the number of crime incident data and the types we were going to use in this GIS tutorial. As a result, we decided to limit the use of number of crime incidents to just *burglary* type incident crime data which appear to be well distributed around the county (key for spatial analysis using ArcGIS Online). It is also a nice and manageable sample size; this limitation produced 505 crime incidents, down from several thousands of incidents.

In your Police Tutorial Training folder you’ll find a .csv file called “*All Areas in Broward County Burglary Only.csv*”

If you open the file, it will look like this:

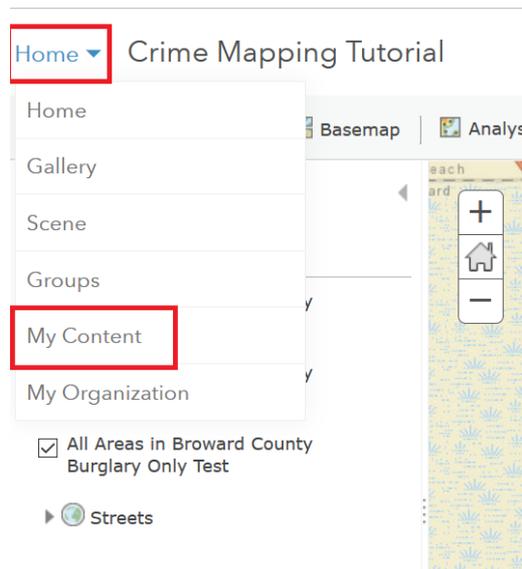


	A	B	C	D	E	F	G	H
	Description	Uniform_Crime_Reporting_UCR	National_Incident_Based_Reporting_System_NIBRS	Address	Zip	Agency	Date	Time
1	BURGLARY	5		120 2000 NE 1ST TER, POMPANO BEACH	33060	Broward County Sheriff	11/30/2014	11:26:00 PM
2	BURGLARY	5		120 300 W MCNAB RD, POMPANO BEACH	33060	Broward County Sheriff	11/30/2014	7:48:00 PM
3	BURGLARY	5		120 2200 NE 3RD AVE, POMPANO BEACH	33060	Broward County Sheriff	11/30/2014	11:21:00 AM
4	BURGLARY	5		120 6800 MERION PL, NORTH LAUDERDALE	33068	Broward County Sheriff	11/29/2014	10:25:00 PM
5	BURGLARY	5		120 7900 NW 75TH AVE, TAMARAC, FLORIDA	33321	Broward County Sheriff	11/29/2014	3:39:00 PM
6	BURGLARY	5		120 400 NE 19TH AVE, POMPANO BEACH	33060	Broward County Sheriff	11/28/2014	8:44:00 PM
7	BURGLARY	5		120 600 NE 56TH ST, OAKLAND PARK	33334	Broward County Sheriff	11/28/2014	4:09:00 PM
8	BURGLARY	5		120 500 OAKS LN, POMPANO BEACH	33069	Broward County Sheriff	11/28/2014	2:50:00 PM
9	BURGLARY	5		120 1600 NE 30TH ST, POMPANO BEACH	33064	Broward County Sheriff	11/28/2014	1:51:00 PM
10	BURGLARY	5		120 3200 NE 5TH ST, POMPANO BEACH	33062	Broward County Sheriff	11/27/2014	6:19:00 PM
11	BURGLARY	5		120 4100 NE 11TH AVE, POMPANO BEACH	33064	Broward County Sheriff	11/27/2014	4:32:00 PM
12	BURGLARY	5		120 8200 NW 68TH AVE, TAMARAC, FLORIDA	33321	Broward County Sheriff	11/27/2014	2:10:00 AM
13	BURGLARY	5		120 2500 NE 13TH AVE, POMPANO BEACH	33064	Broward County Sheriff	11/27/2014	7:52:00 PM
14	BURGLARY	5		120 100 NE 21ST ST, POMPANO BEACH	33060	Broward County Sheriff	11/26/2014	4:54:00 PM
15	BURGLARY	5		120 2500 NW 5TH ST, POMPANO BEACH	33069	Broward County Sheriff	11/26/2014	4:40:00 PM
16	BURGLARY	5		120 200 SW 14TH CT, POMPANO BEACH	33060	Broward County Sheriff	11/26/2014	12:43:00 PM
17	BURGLARY	5						

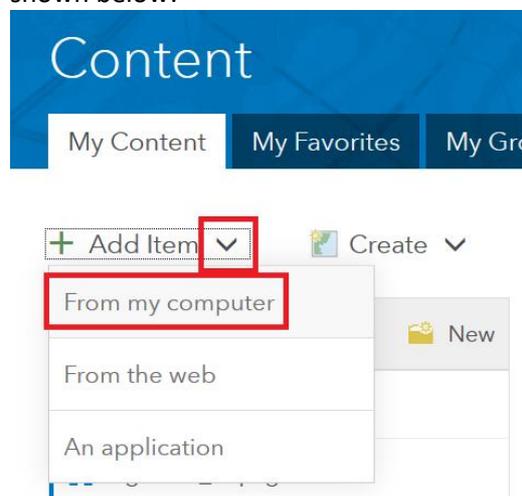
Step 5: Add .csv file into AGOL as a Feature Service so we can add attribute data later

Close the .csv file and add it the AGOL canvas:

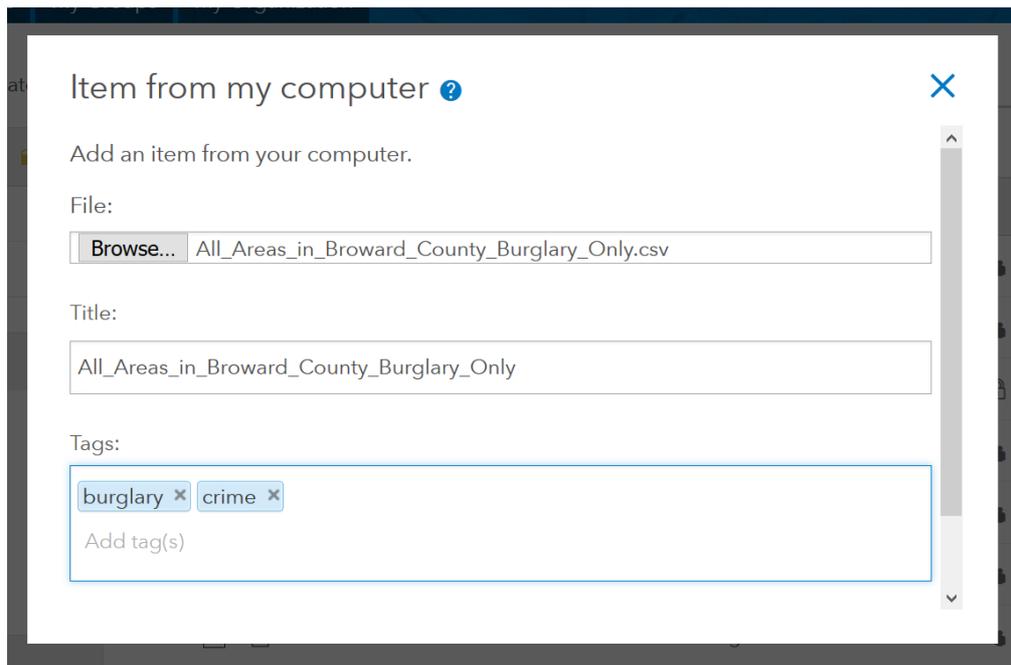
In the Table of Contents, select **Content** by selecting it from the **Home** downward arrow.



In the **Content** window, click on the **Add item** dropdown arrow and select **From my computer** as shown below:

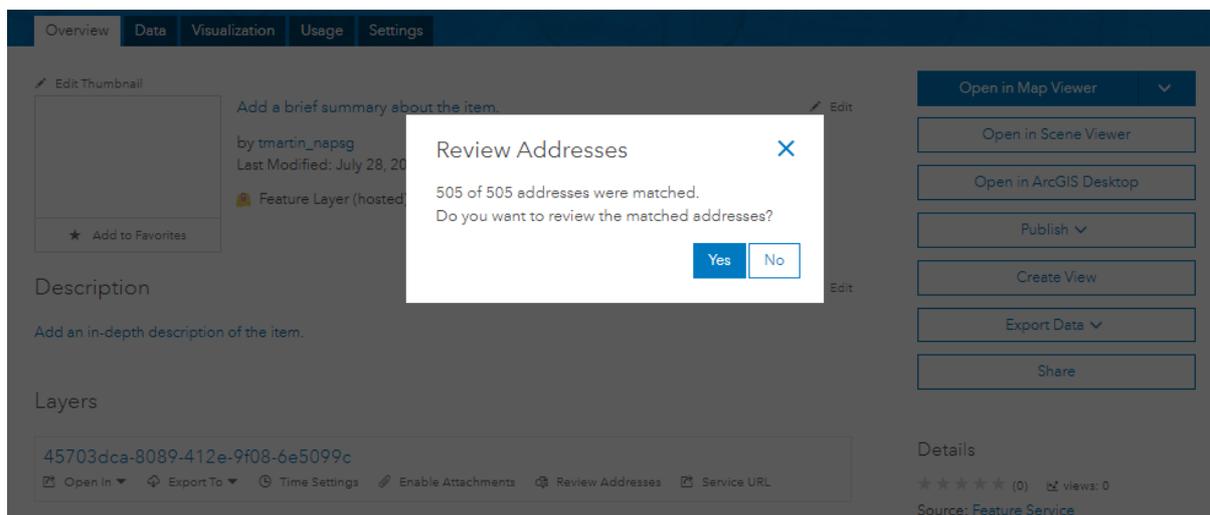


A dialogue box will open asking you to select the file from your computer you wish to add. Click **Choose File** to navigate to the folder in your computer where the .csv file "All Areas in Broward County Burglary Only" is located. AGOL wants users to always add tags to new content. When adding tags, use commas to separate the tags, then click anywhere in the dialog box to continue.



AGOL is smart enough to recognize they are addresses. AGOL will automatically assign each field in the .csv file to the corresponding fields (“Address” and “Zip”) required by the AGOL geocoding locator. This is an important concept if you are designing and building address files.

Finally, click **Add Item** to add the geocoded addresses in the .csv file and to add it as a feature layer to the AGOL map canvas. You will see AGOL processing this information and when geocoding is complete, you will be prompted to review the addresses--click **No**.



AGOL successfully geocoded these 505 addresses (representing burglary crime incidents) at once. There were no unmatched addresses, or AGOL would have told us in this dialog box.

Select the **Open in Map Viewer** tab and then click **Add layer to new map** from the drop-down menu.

Open in Map Viewer
▼

Add layer to new map

Add layer to new map with full editing control

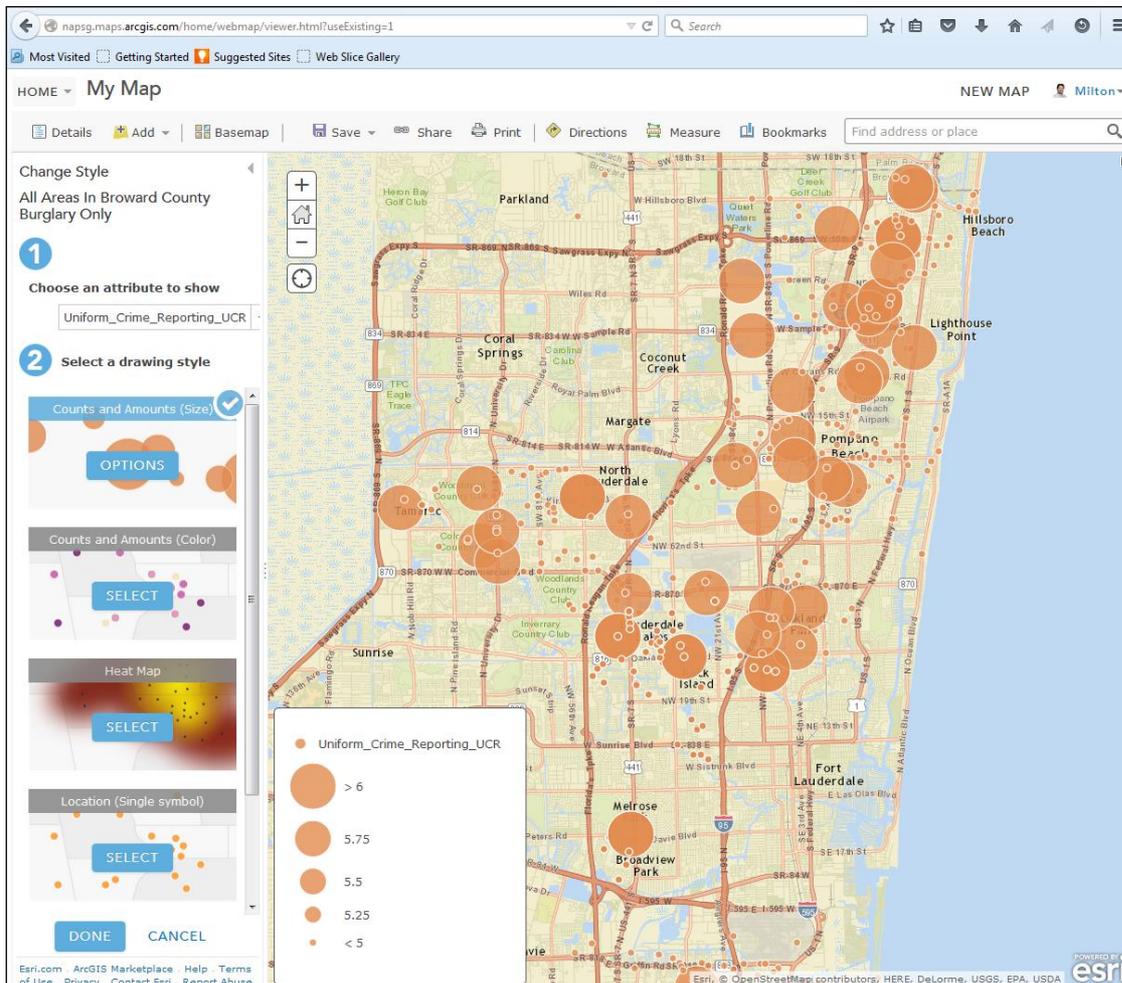
Publish ▼

Create View

Export Data ▼

Share

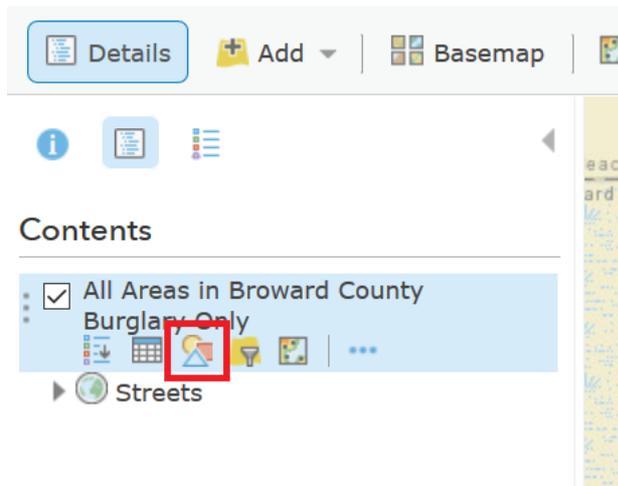
All the addresses are in Broward County, FL, so after step 5 the map canvas should look like below. Note: the latest version of AGOL recognizes the type of data being added and applies “smart mapping.”



Step 6: Find and add a predefined set of symbols for public safety and apply these symbols to burglary data

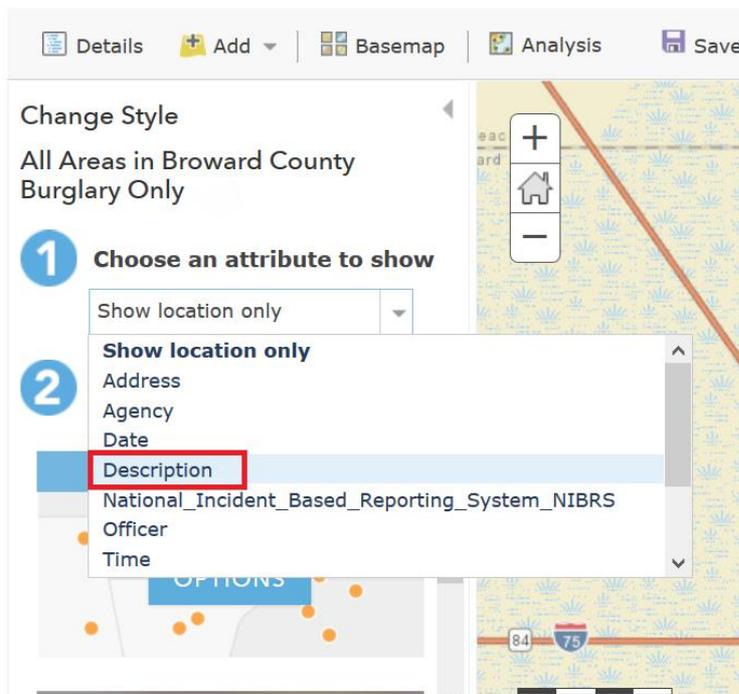
In order to set the correct symbology for mapping the burglary data in Broward County, Florida, follow these steps:

Hover over the Broward County Burglary layer and **select the shapes symbol**, third from the left. As you hover over, it will show you that the icon means “Change Style.”

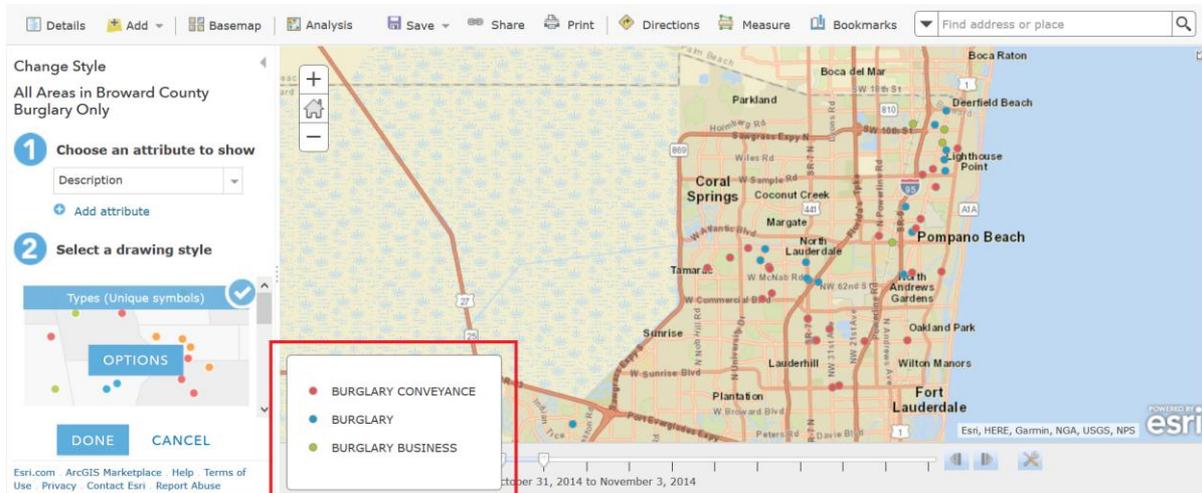


The Change Style menu will pop up.

For step 1, for “Choose an attribute to show,” select **Description** from the pull-down menu.

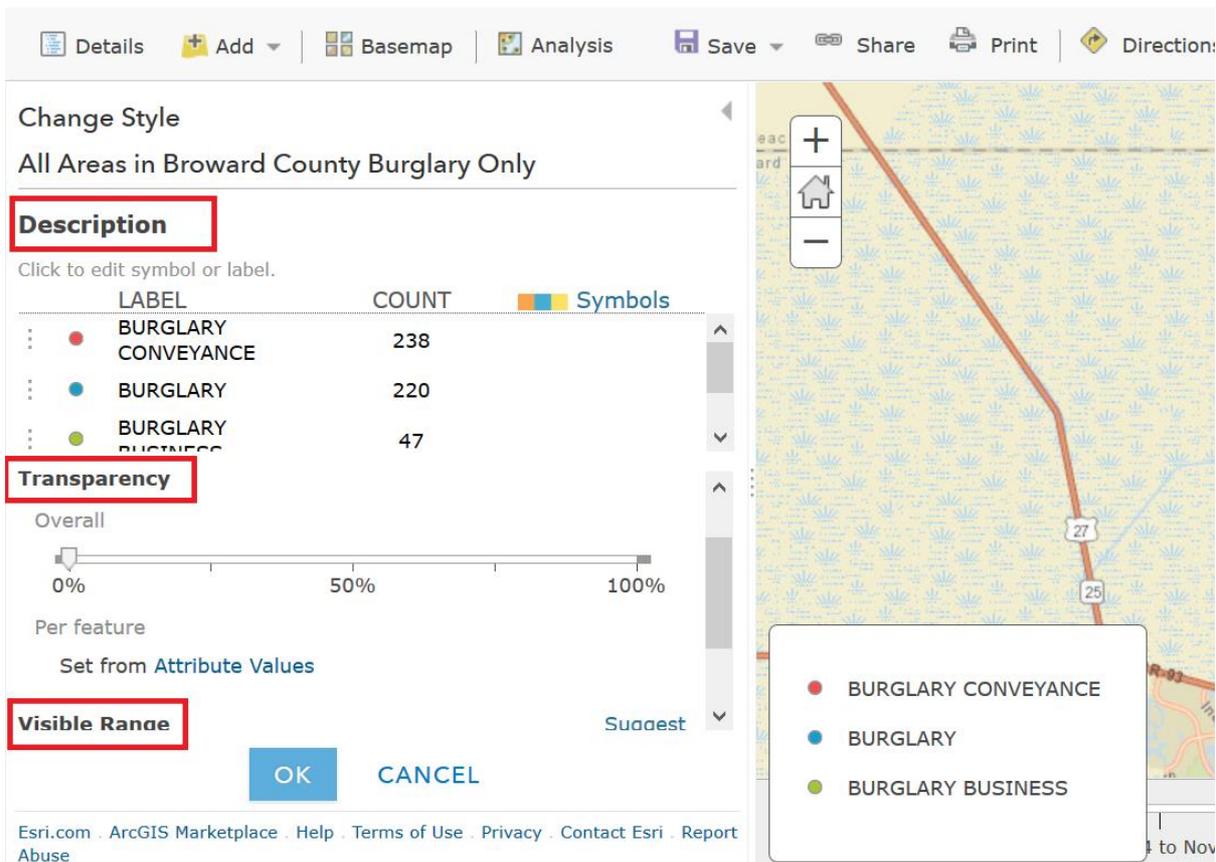


Once you choose “description,” ArcGIS will automatically identify that we have unique types of data and assume we want it to be displayed using the “Unique symbols” drawing style. As you can see below, ArcGIS indicates the three different categories of our data with different colored symbols: burglary conveyance, burglary and burglary business.

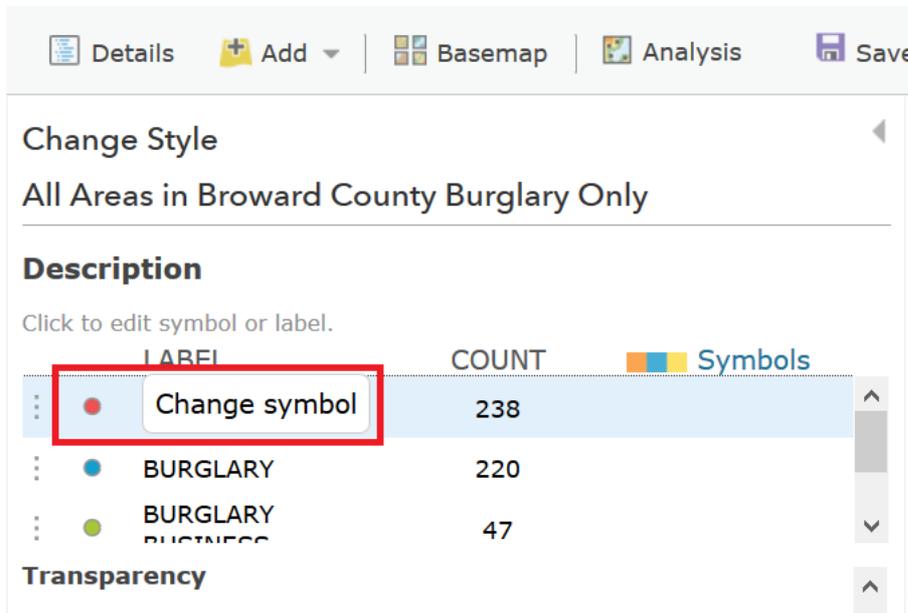


Now we need to change the point symbols into symbols that represent the fields of our data correctly. Click on the **OPTIONS** menu within step 2, “Select a drawing style.”

A menu will pop up with tabs for *description*, *transparency* and *visible range*.

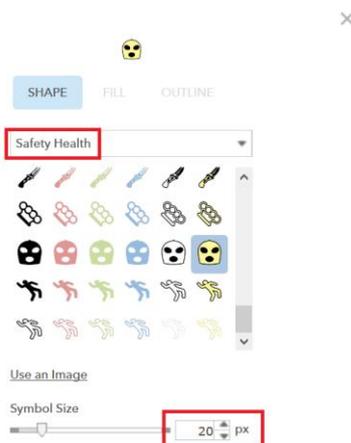


Click on the predetermined point symbol in the “description” section to change it. When you hover over the symbol, an option to “change symbol” will appear.



Click on the symbol and a pop up menu will appear. In the **Shape** tab, choose **Safety Health** symbology from the drop-down menu. You will see a series of burglar masks; we will use these masks to indicate our three categories of burglaries. We are currently choosing the symbol for Burglary Conveyance: choose the yellow one on the right.

In addition, to improve the visualization of the symbol in the map, it is important to select the appropriate symbol size. You can change the size either by changing the number manually or moving the size bar. In this case, it is best to choose a 20 point font size.



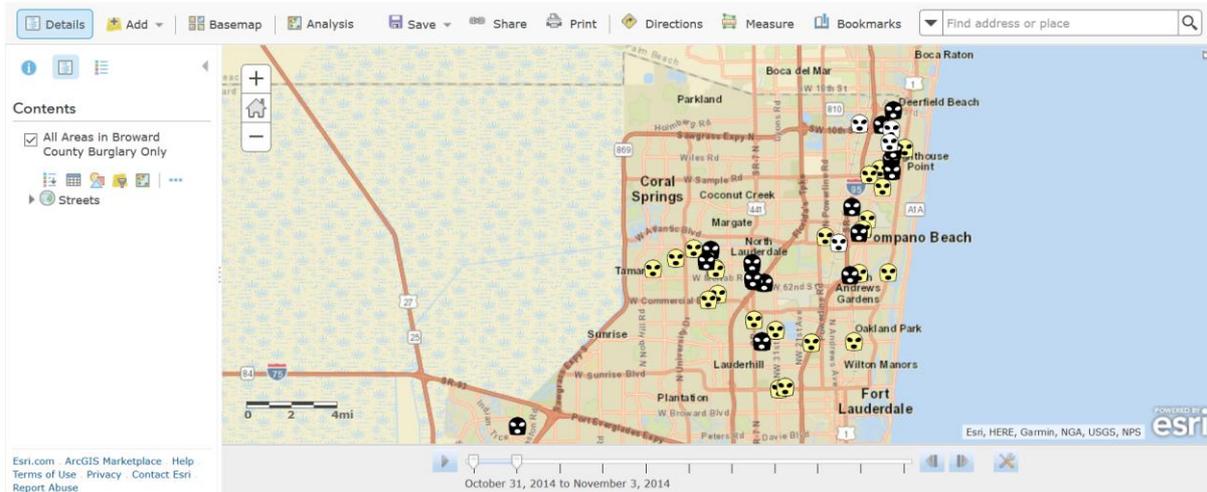
Repeat this step for the other two categories, keeping the font at size 20. For the Burglary category, choose the black burglar mask and for Business Burglary choose the white mask.

The transparency menu—below “description,” where our symbols are—offers the option to change the transparency of our symbols when displayed in the map. We will leave the default option of the menu (0% transparency), since we don’t want them to be transparent.

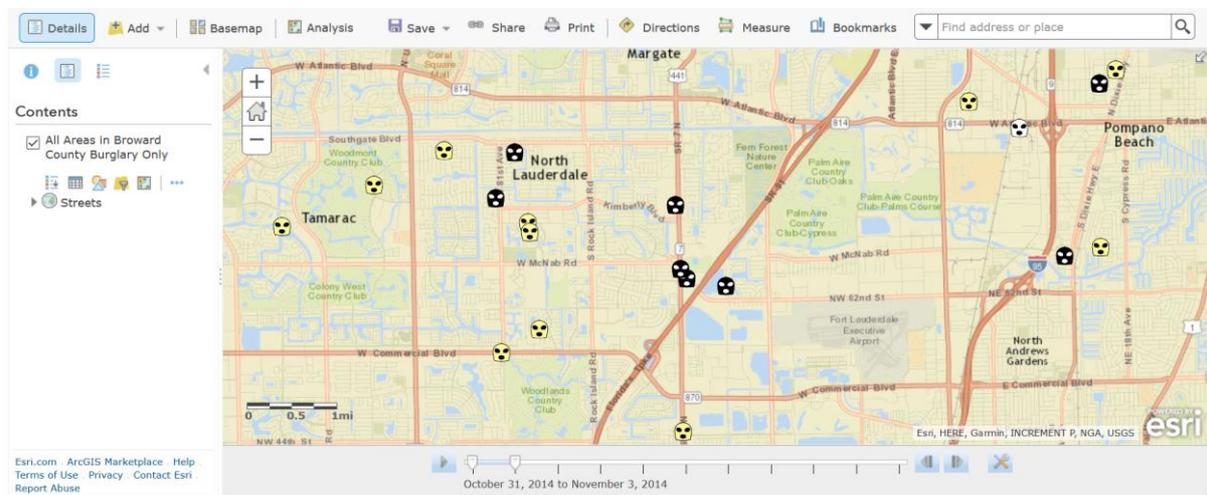
Below the transparency menu is the Visible Range option, which allows us to show our data on different scales. We want to keep the default option, which is “County.”

After changing the color and size of the symbols for the three types of burglaries, click **OK** and then **DONE**.

Below is how your map should now look, representing the three types of burglaries in our data:

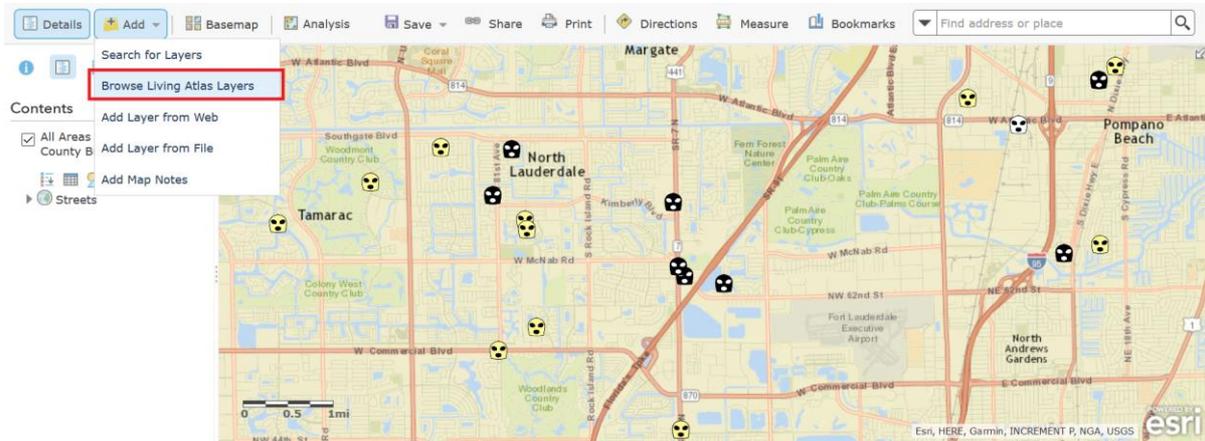


If you zoom in, your map should look like this:

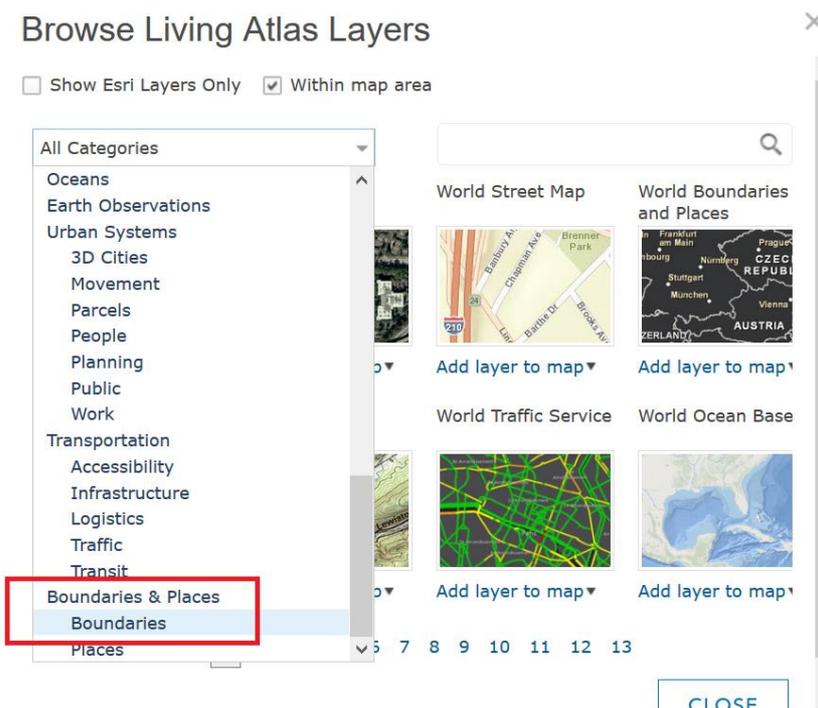


Step 7: Add Broward County boundary data

In order to limit our burglary data it is important to establish the boundaries of the Broward County in Florida. The following steps show how to find and set the boundaries from the Living Atlas Layers for our map as shown below: Click **Add** and select **Browse Living Atlas Layers**.



From the **Browse Living Atlas Layers** menu, scroll down and select **Boundaries**:



After selecting **Boundaries** from the menu, you need to select the **USA Counties (Generalized)** layer. To add the new county boundaries, click on **Add layer to map** and then click **As Layer**, which will pop up.

Browse Living Atlas Layers

Show Esri Layers Only Within map area

Boundaries

World Boundaries and Places

World Topographic Map

USA Counties

USA States (Generalized)

World Boundaries and Places Alternate

World Reference Overlay

USA Major Cities

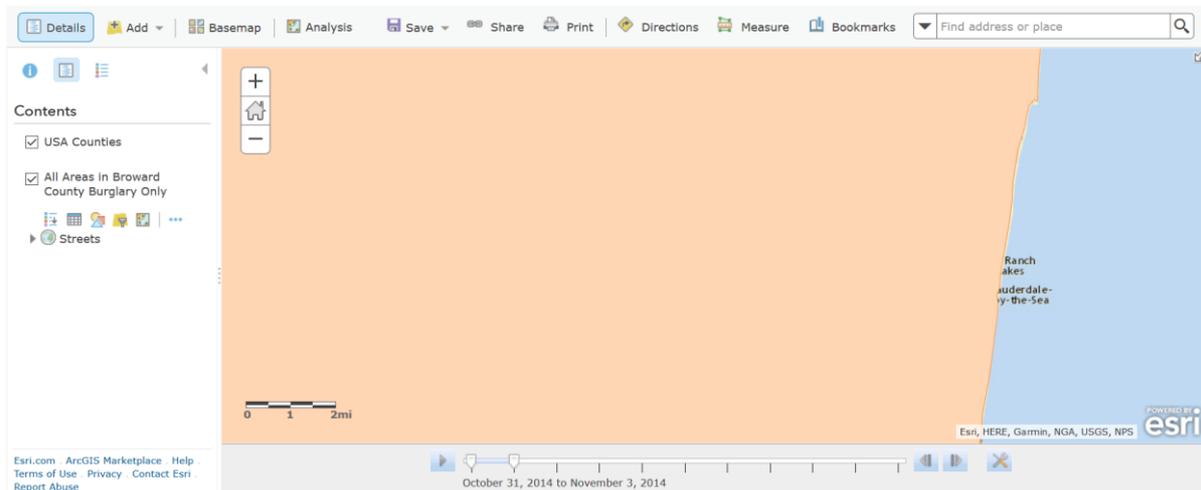
USA Census Populated Places

Add layer to map

1 2 3 4 5 6 7 8

CLOSE

The new Generalized Boundaries Layer for the Broward County has been added. However, the layer is covering our burglary layer.

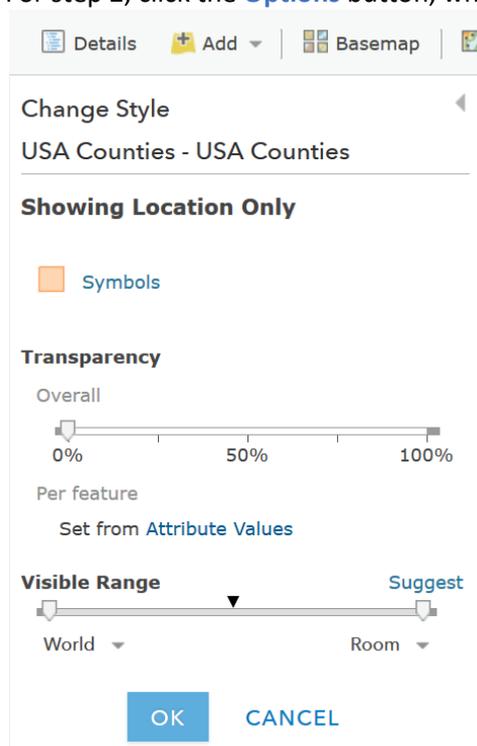


To visualize our new boundaries layer, we will need to make some changes in the outline. In this step we will cover the procedure for visualizing both layers correctly. First, in the main layer menu, you need to click on **the shapes icon** below the USA Counties (Generalized), which stands for **Change Style**. When you do so, a new menu will appear with a series of design options:

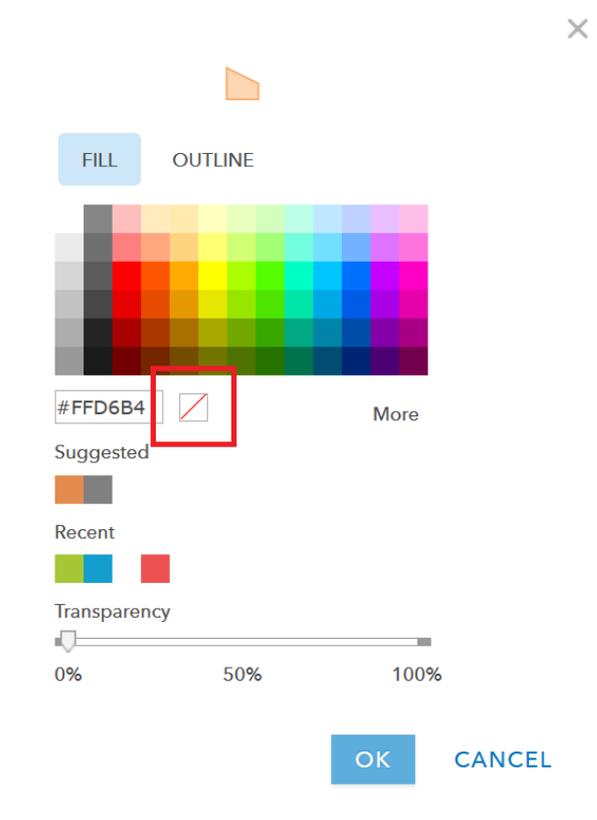


For step 1, keep the default option of “show location only.”

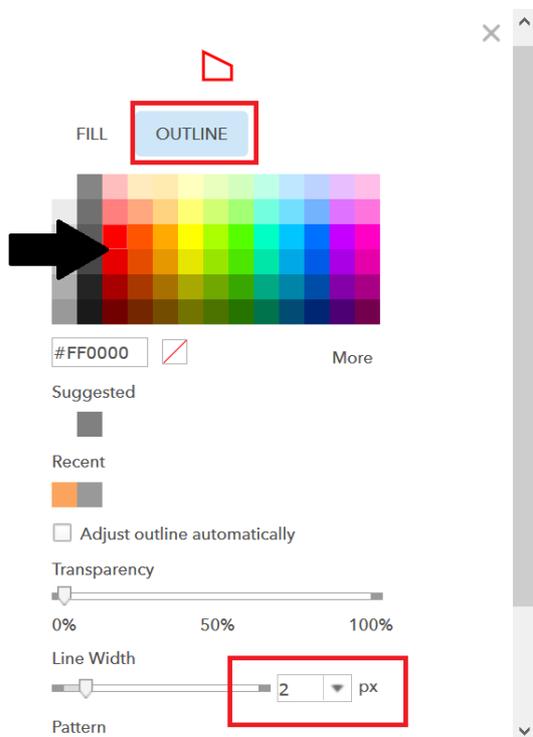
For step 2, click the **Options** button, which will bring you to this menu:



Next, click **Symbols**, which will make the following menu appear. In this properties menu, under the **Fill** tab (which the menu defaults to), select the **No Color** option, as indicated below:

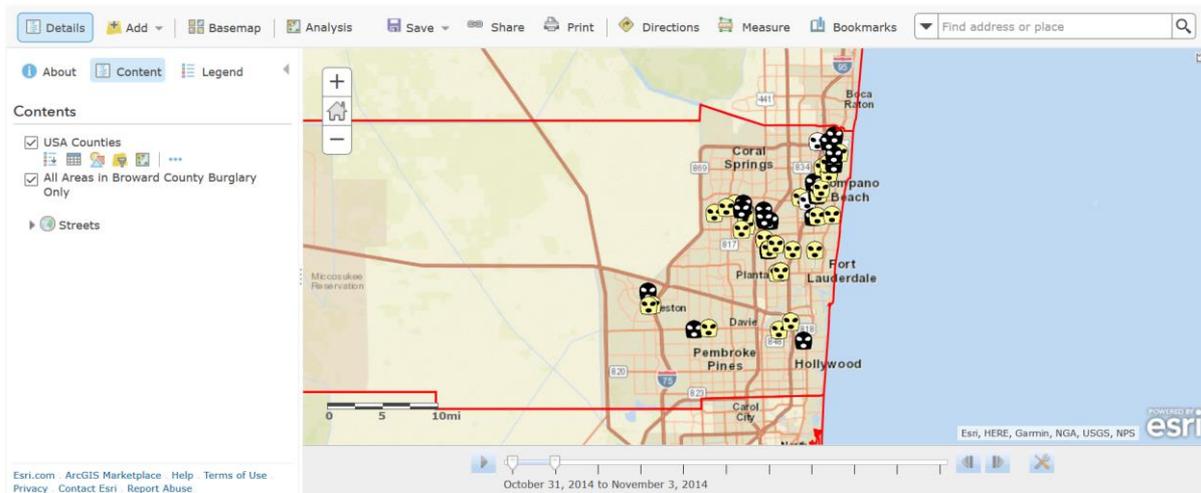


Now click the **Outline** tab to modify the properties of the county boundaries. Select the color red, and change the width of the line to 2 points.



Accept the default transparency and pattern choices and click **Ok** to close the properties menu. Press **Ok** again to close the broader “Change Style” menu. Finally, click **Done** to apply your changes.

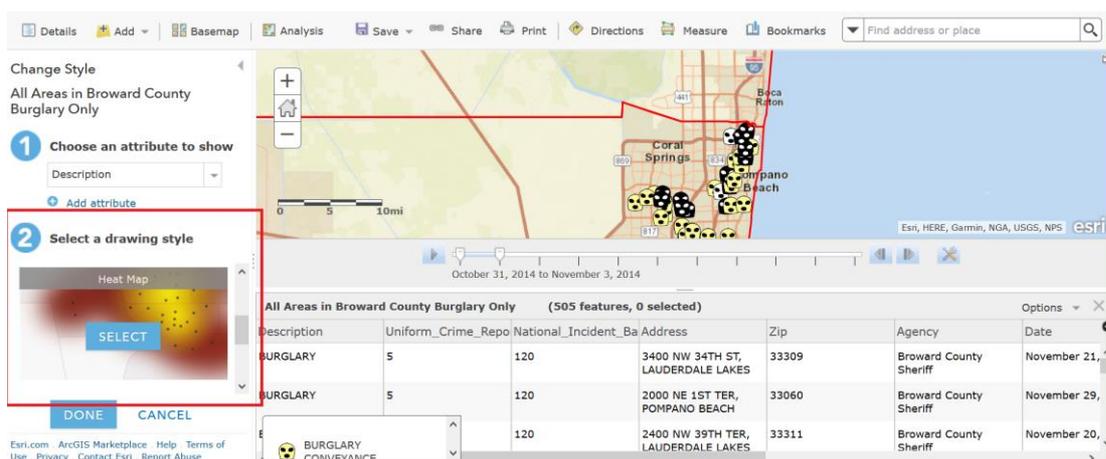
The map canvas should now look like below. You should now be able to see the Broward County boundaries along with our burglary layer.



Step 8: Conduct heat map analysis¹ to better determine crime incident concentration and geographical distribution of burglaries

As you noticed in Step 6, AGOL automatically tries to display your data using *smart mapping* as it tries to find the most appropriate way to display your data. Smart mapping works in most cases, but you may want to map your data using another method provided by AGOL. Depending on your data, another display option may better suit the distribution of your data and your message.

Click on the **shapes icon** below the crime data layer, to get to the “Change Style” screen. Scroll down and select **Heat Map**, then click **Done**. When you scroll over the Heat Map option, a small window will pop up that explains that the heat map will “show areas of high activity with stronger colors that appear to glow hotter.”



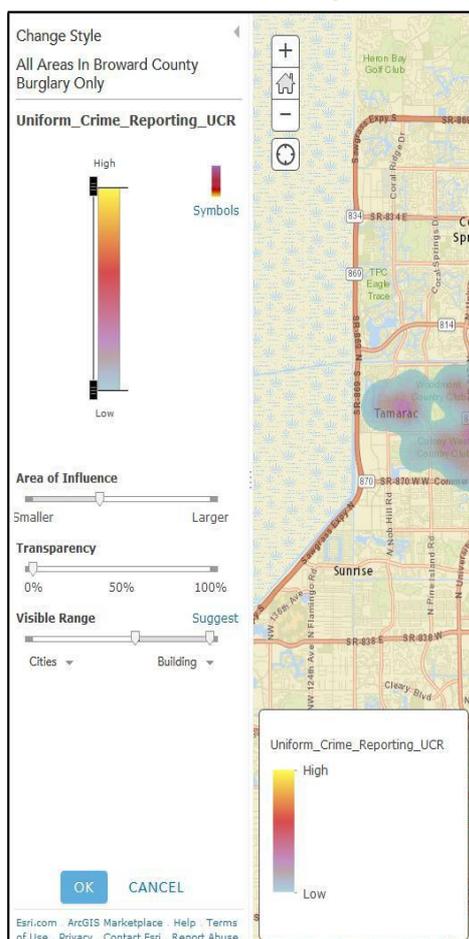
¹ In this exercise, the term “Heat Map Analysis” is used where maps of density are represented as ‘heat’. This can be a very effective way to visualize the density of data. A true hot spot analysis is a spatial statistics test that indicates areas of statistically significant high and low areas. Both methods have strengths and weaknesses that a crime analyst should become familiar with. For more information on this topic, see “Identifying High Crime Areas” by International Association of Crime Analysts (IACA). Download available:

http://iaca.net/Publications/Whitepapers/iacawp_2013_02_high_crime_areas.pdf

Heat mapping is used to visualize geographic data to show areas where a higher density or cluster of activity occurs. A color gradient is used to indicate areas of increasing density. In this case, heat map analysis will highlight in bright yellow the areas with the heaviest concentrations of burglaries in Broward County in November 2014.

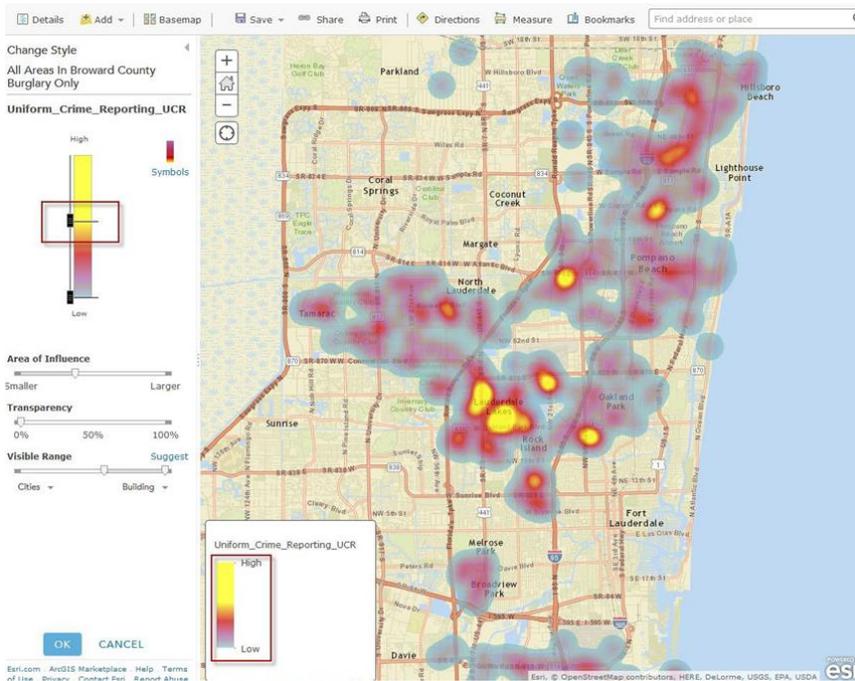
Note that AGOL automatically uses the Uniform Crime Reporting (UCR) methodology to classify crimes attribute data. However, if you prefer, you can change it to the National Incident-Based Reporting System (NIBRS) method.

The Table of Contents changes to show the different ways you can modify your heat map analysis:



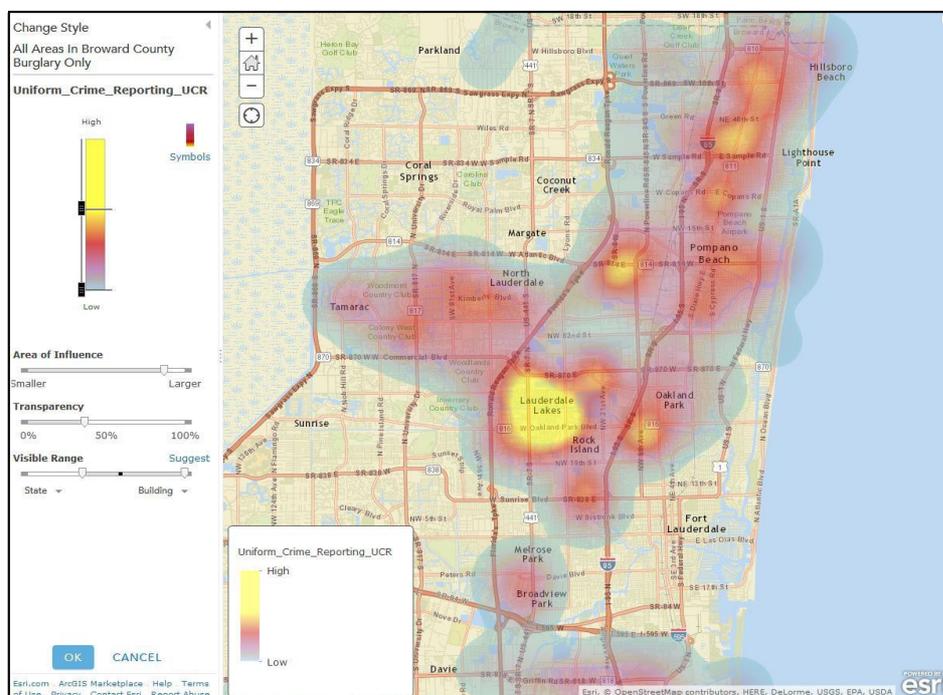
For example, use the slider bar to move the lever to the middle of the crime scale as shown in graphic below and notice how the definition of high crime (burglary) incident data becomes broader and other areas of Broward county becomes highlighted in yellow to show “more areas” of high crime incident areas. Also notice the column chart legend changes to reflect the change you made with the slider bar.

Your map should now look like this, with spots of higher activity highlighted:



Feel free to experiment some more with the slider bar to best portray the message you want to convey to your map readers.

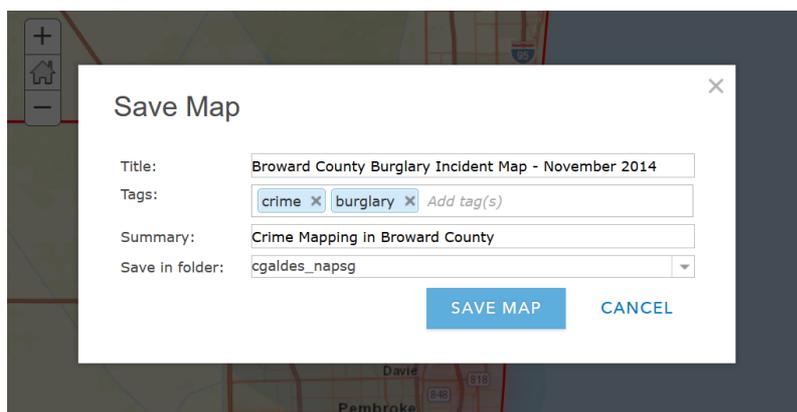
You can also modify the “Area of Influence” and the “Transparency” of the heat map. See what changes when you increase the area of influence; the heat map becomes larger, covering a greater geographical area. When you increase the transparency, you can see more details “underneath” the heat map. The legend will also reflect the changes you make.



Feel free to try out different options. Once you are happy with your messaging click [Save](#) to save your work.



Edit the title and tags to clearly communicate the content of your map.



Click **Save Map** to save your work in your folder.

Step 9: Learn about time lines and how to add a time slider widget to ArcGIS Online

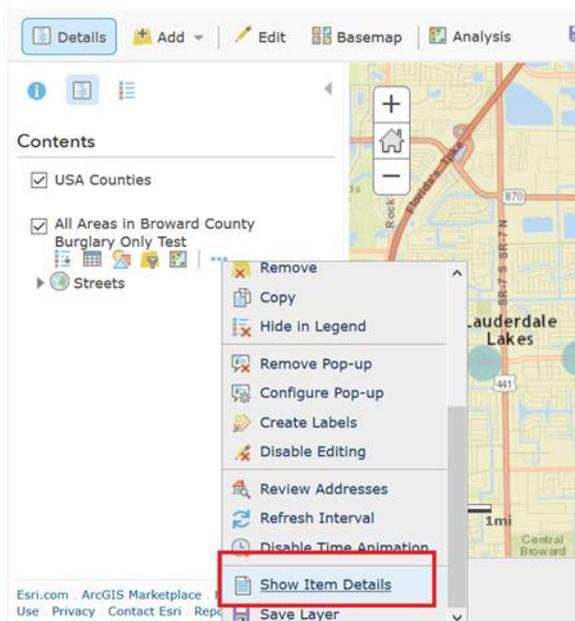
Spatial phenomena collected with time information may allow map users to see what happened at a specific time, or what may happen in the future; by animating time-based data you can visualize it at each step and see patterns or trends emerging over time. Examples of phenomena the data of which is well suited to this purpose includes meteorological events, population shifts, land-use and environment change and the progression of wildfires or flood events.

Some map layers are time-enabled, containing spatial datasets that contain different information for the same location at different times. If a map contains time-enabled layers, it is time-aware and the display can be configured to show the data during a specific period of time, or to animate the data over time.

* Esri: "ArcGIS Online Help <https://doc.arcgis.com/en/arcgis-online/create-maps/configure-time.htm>

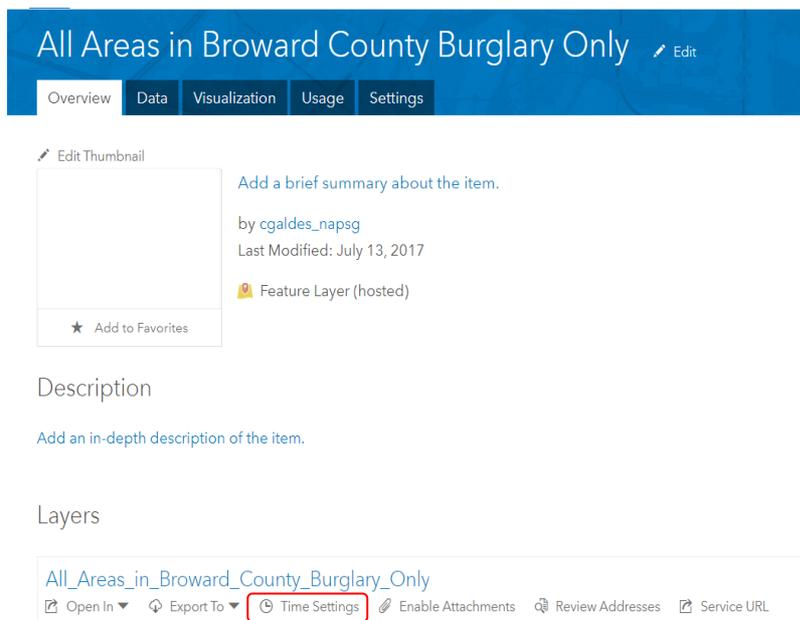
In our example, we will use the burglary data of Broward County to identify and analyze the different crime categories according to date and time when they occurred. The Police Department could use this application as a tool, which maps incidents, to identify hot spots where the most crime occurs and analyze the spatial relationships of targets.

Next, we need to configure our feature which contains the temporal data. In our case, Burglaries in Broward County, Florida. In the **Table of Contents**, select the ellipses next to our Burglary layer, and click **Show Item Details**.



It is important to mention that this data set has been modified in terms of setting up the time line widget correctly. As mentioned before, the data set contains two different fields with the date and time categories separated.

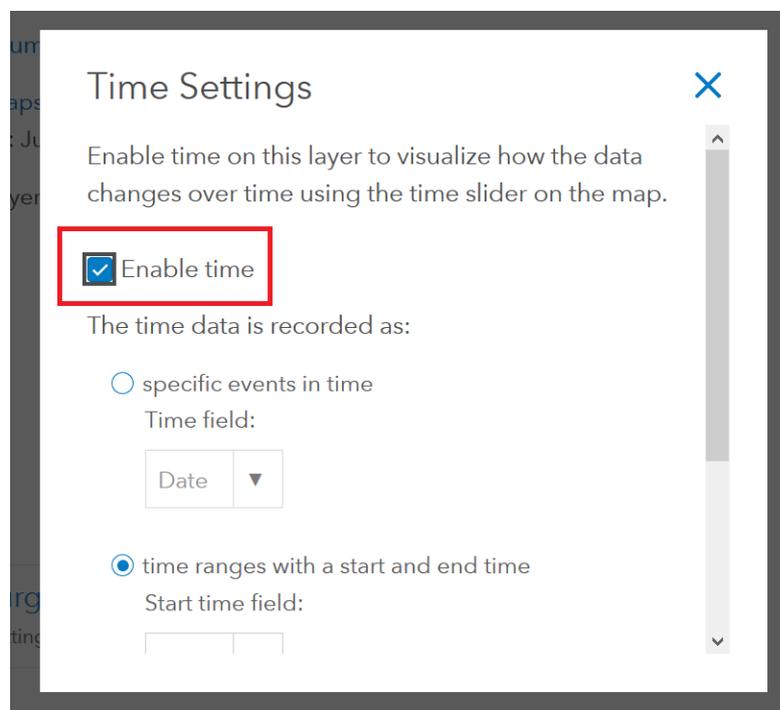
In the **My Content** menu click on the 'All Areas In Broward County Burglary Only' feature layer which contains temporal data that allows us to use in an ArcGIS timeline to view the item's **Details** page.



Under the **Time Settings** menu, we will have the chance to configure our time line according to the parameters and the data that we want to show conforming to a specific date and a particular time. Make the following choices:

Check the box **Enable Time** and the in time **ranges with a start and end time** submenu, select as follows: For the start time field: select **Date** and for end time field: select **Time**. This will allow you to show the cumulative data (all the crimes are going to be added from the first day to the last day, obtaining a mass of total crimes by the end of the study period).

In the pop-up window, make sure the **Enable time** box is checked, as shown below:

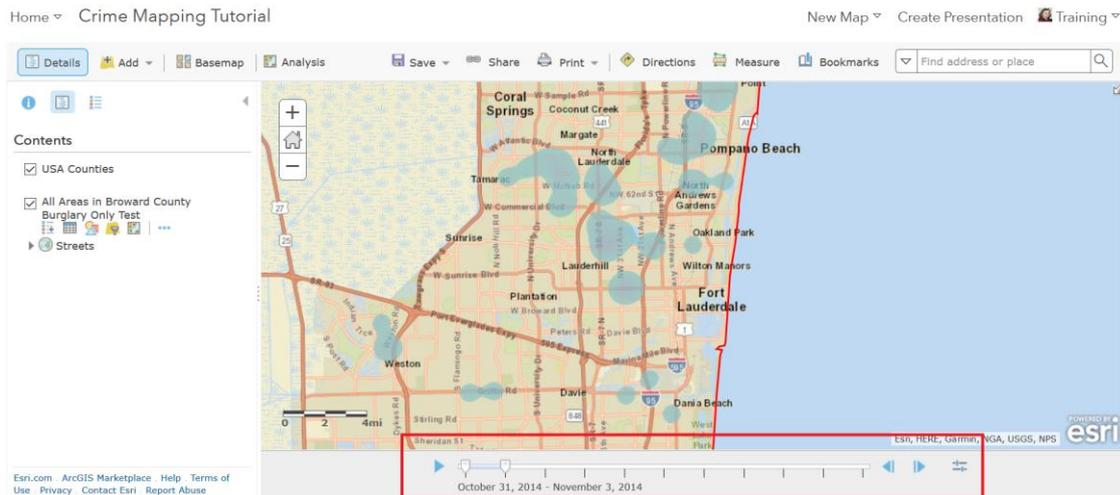


Note: If you want to show the crimes that happened on a specific date and time, you need to select the Specific events in time option.

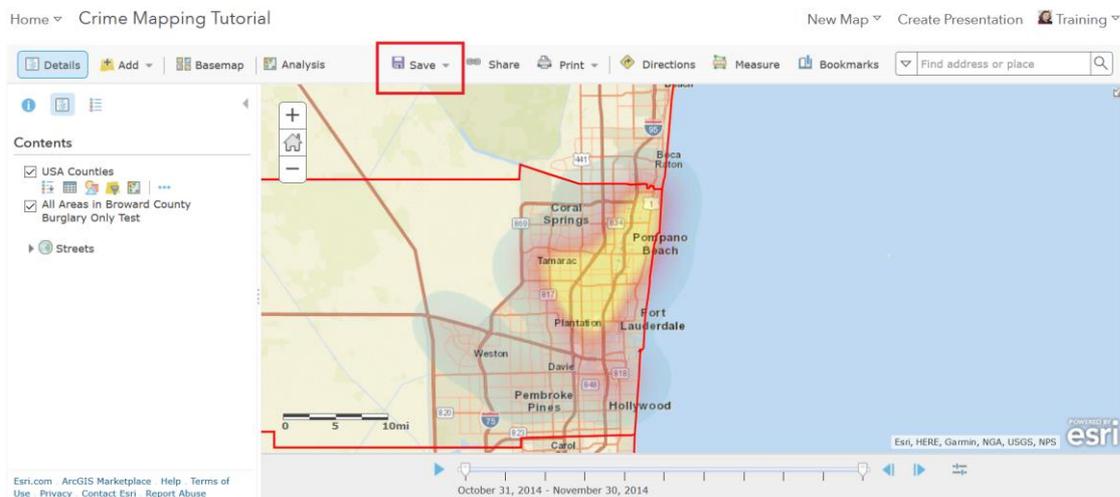
Click **OK** to apply the parameters chosen.

Now Click on **OPEN** and then select **Add layer to the map**.

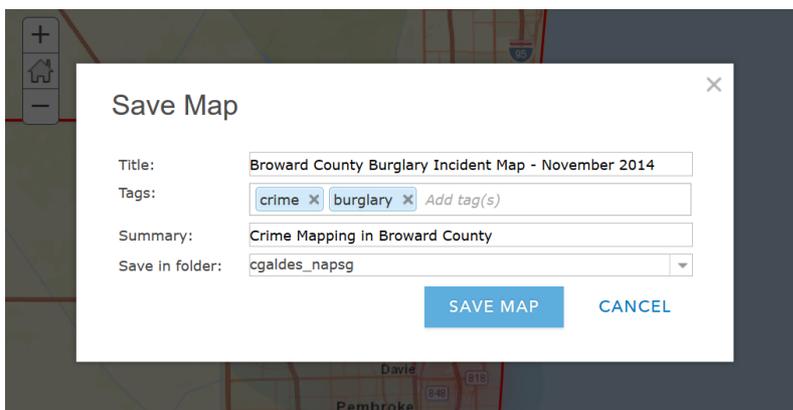
The time line widget will be shown on the bottom of our map frame as shown below:



Click the **Save** tab to save your work.



Edit the title and tags of your map to clearly communicate the data it displays:



Click **Save Map** to save your work.

Step 10: Learn about the time slider widget in ArcGIS Online

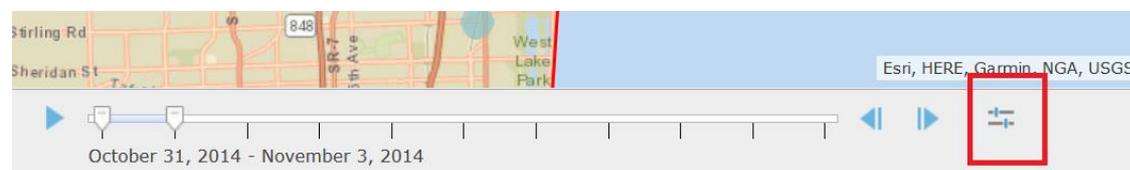
Spatial phenomena collected with time information may allow map users to see what happened at a specific time, or what may happen in the future; by animating time-based data you can visualize it at each step and see patterns or trends emerging over time. Examples of phenomena the data of which is well suited to this purpose includes meteorological events, population shifts, land-use and environment change and the progression of wildfires or flood events.

Some map layers are time-enabled, containing spatial datasets that contain different information for the same location at different times. If a map contains time-enabled layers, it is time-aware and the display can be configured to show the data during a specific period of time, or to animate the data over time.

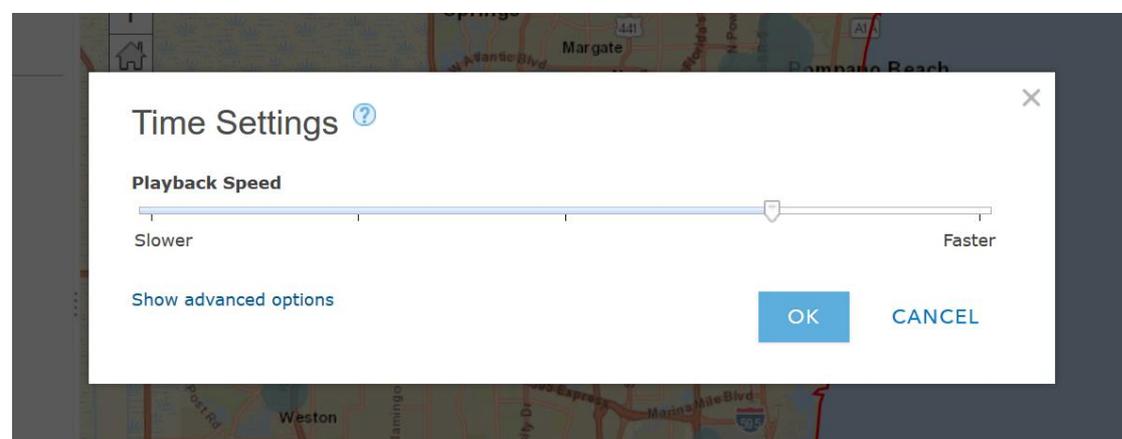
* Esri: "ArcGIS Online Help <https://doc.arcgis.com/en/arcgis-online/create-maps/configure-time.htm>

In our example, AGOL automatically provides a time slider widget that we can use to identify and analyze the different crime categories from the burglary data of Broward County, according to the dates and times when they occurred. In the previous step, we saw that selecting all of the data through the time slider widget helped us to better visualize our heat map. Now we can do more analysis of our data using the time slider widget.

Let's start by configuring the time settings parameters. Click on the time settings icon:



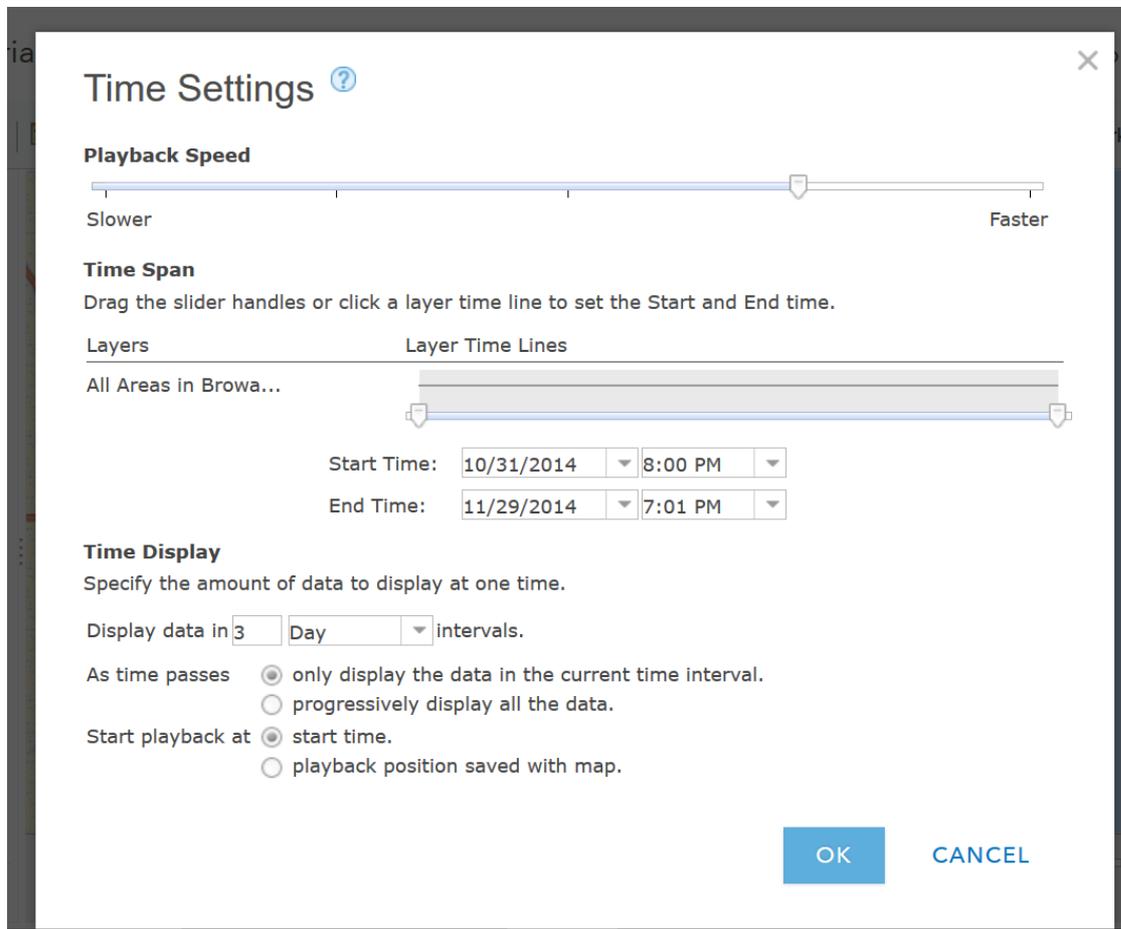
In the time settings menu you can change the speed of the animation by clicking on the specific **Playback Speed** in the bar. We will leave the speed as it is shown in the following image (medium-fast) since we don't want a slow animation for our data because we have only a 30-day period of time and that would cause a long, slow animation for our data.



Now, let's explore configuring advanced options for the time slider widget.

Click on **Show Advanced Options** in order to access the principal menu for the time settings.

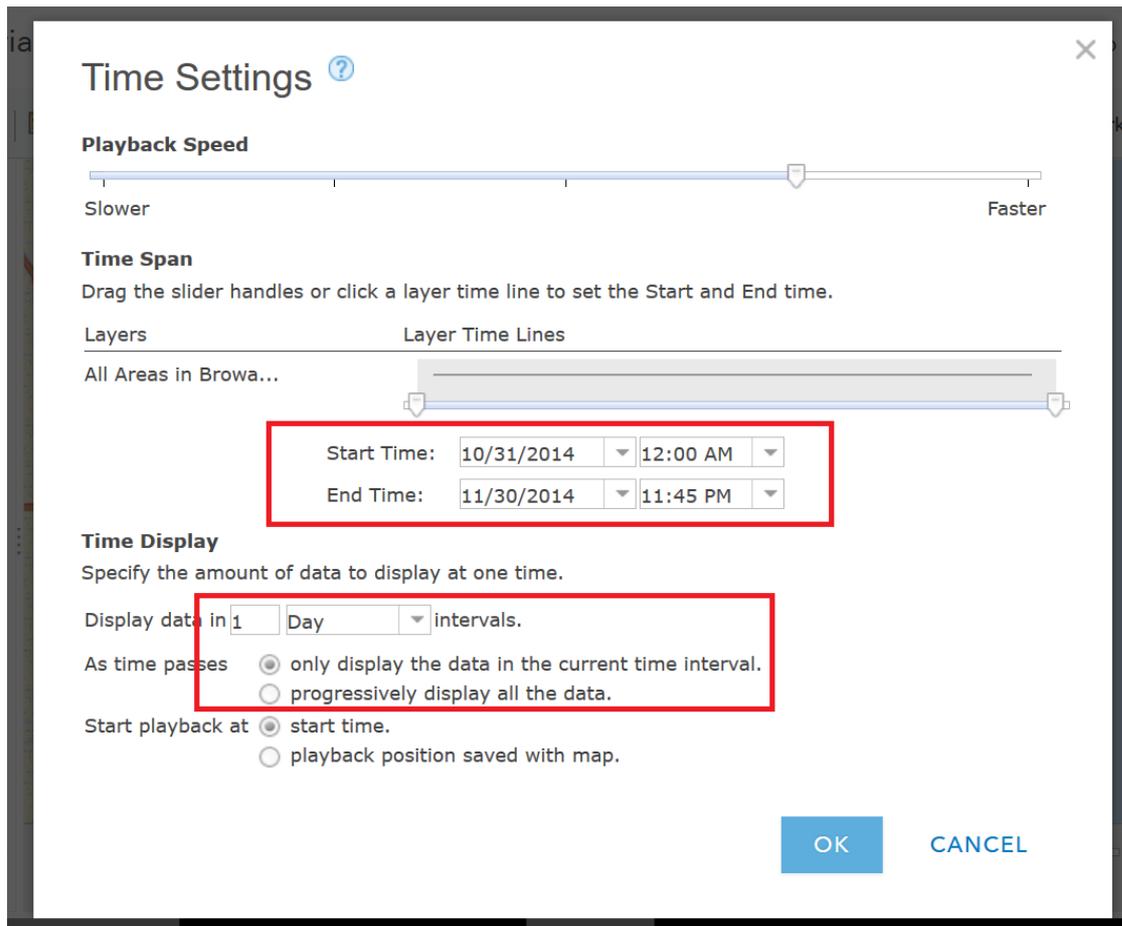
In this menu, we need to make some modifications in order to display our burglary data and show a smooth animation through the 30-day period of time.



First, you need to change the **Start Time** and **End Time** according to the image below by clicking on the specific date to show our data and a particular time to start and end the animation.

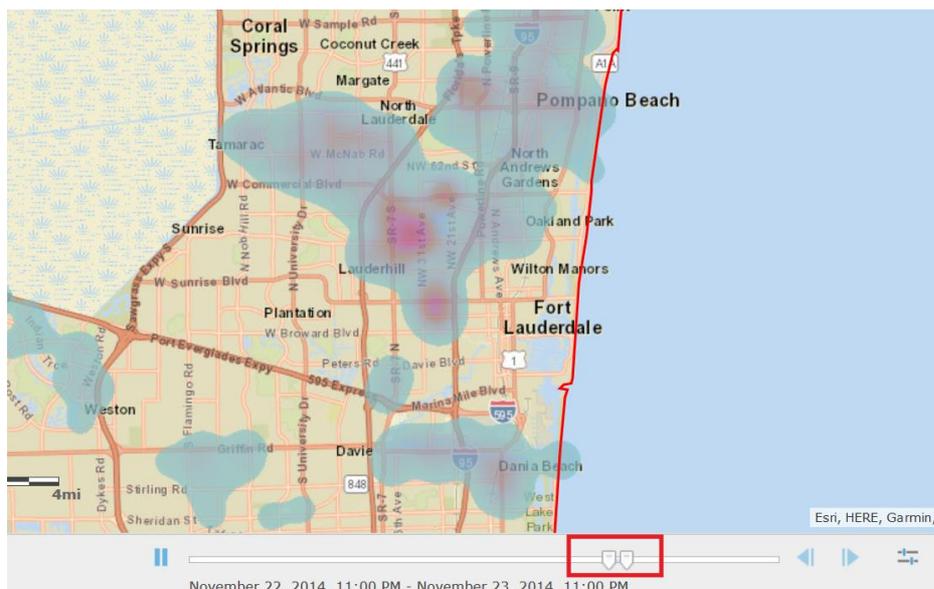
Secondly, in the **Time Display** section we need to **display the data** per 1-day interval, so we can visualize all the crimes that happened in that particular day in a specific time.

Finally, in the **As Time Passes** section, select **only display the data in the current time interval**. Make your choices look like these shown below:



When you're done, click **OK** to apply your changes.

Click on the play button, and as the animation moves forward per the parameters, you will see the crime data display accordingly.

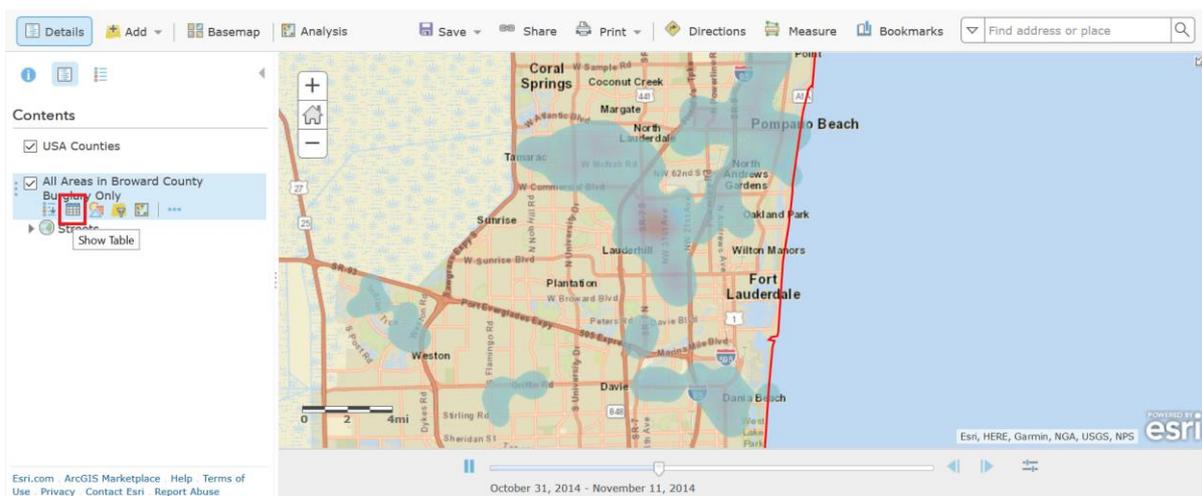


As a crime analyst, you can use the ArcGIS Online time slider to observe and analyze the temporal progression of crimes in time and try to understand why it happens the way it does. Are there patterns? When you're done, click **Save** to save your work.

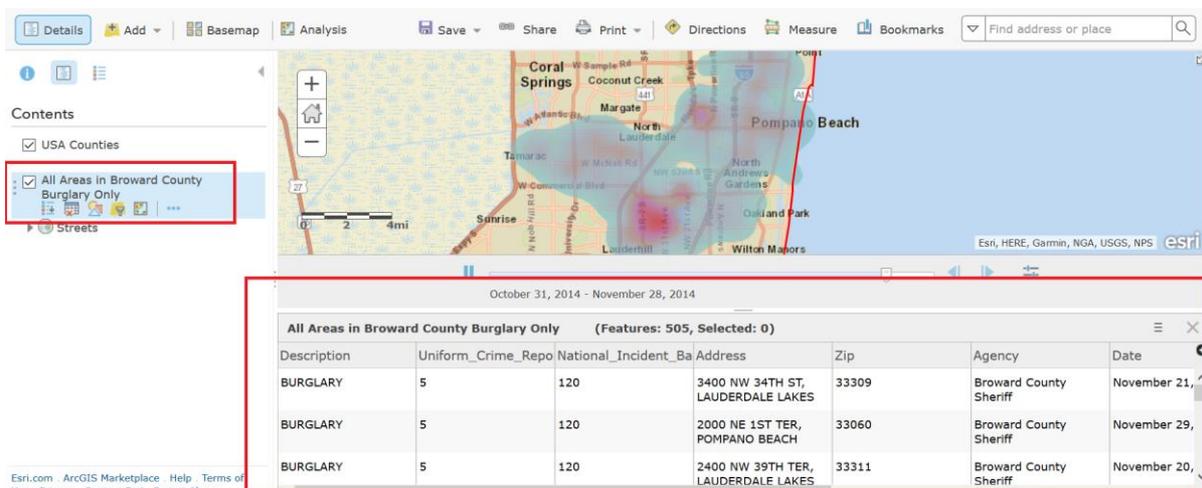
Step 11: Add attribute data to the crime incident feature service layer

The Broward County Sheriff may want to assign different crime burglary incident data to different officers. By adding the "All Areas in Broward County Burglary Only.csv" as a feature layer to AGOL, you will be able to add fields and attributes to this table.

Go to the details tab within the table of contents, where you can see the layers names. Hover over the table icon listed underneath the layer "All Areas in Broward County Burglary Only" and you will see a pop-up message that says "show table."

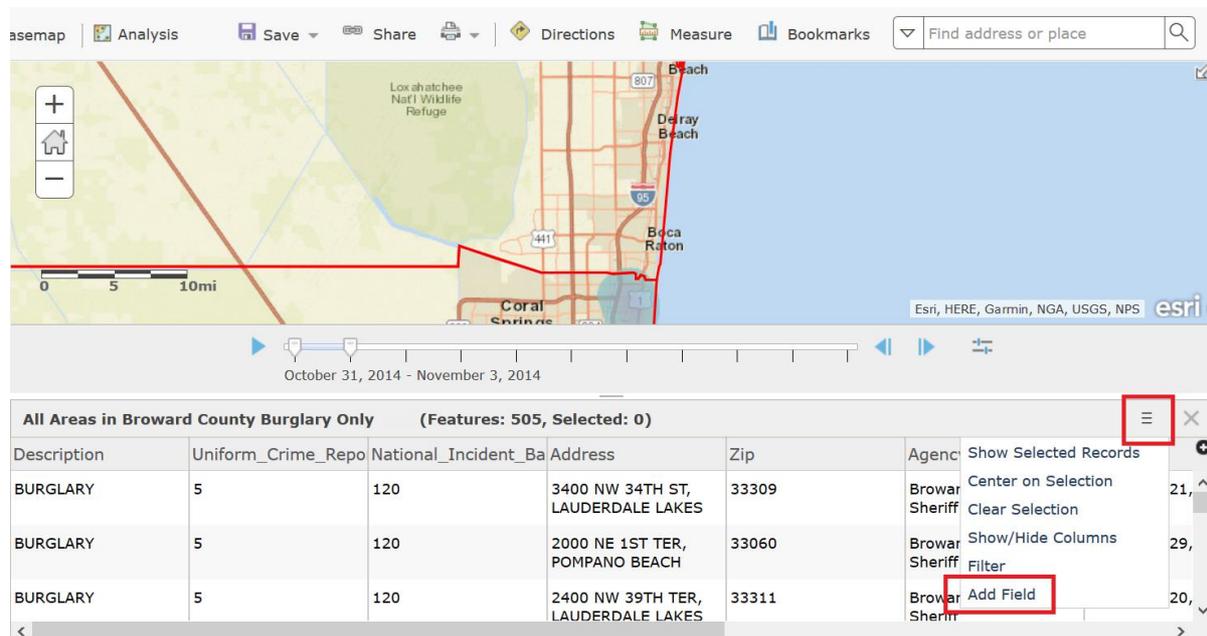


Click the **table icon** and the table will populate the lower part of your map canvas.



Now that you have the table displayed, you can add fields and edit them. Be sure that you own your layer within AGOL, otherwise the data may not be editable.

Click on the **Table Options** menu icon in the upper right corner of the table and select **Add Field** as shown below:



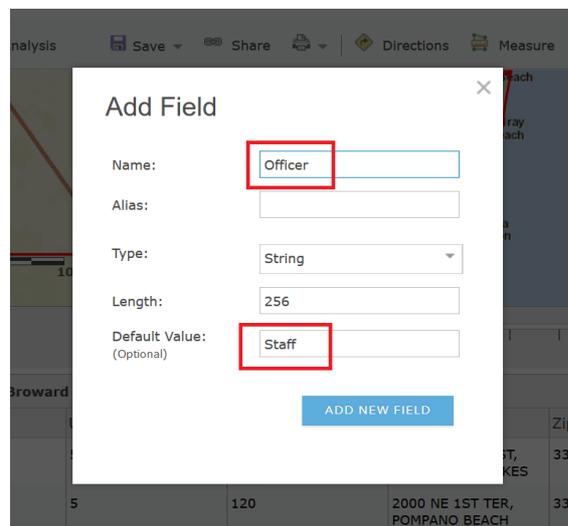
The screenshot shows the ArcGIS Online interface with a map of Broward County, Florida. Below the map is a table titled "All Areas in Broward County Burglary Only (Features: 505, Selected: 0)". The table has columns for Description, Uniform_Crime_Repo, National_Incident_Ba, Address, Zip, and Agency. Three rows of burglary incidents are visible. A red box highlights the 'Table Options' menu icon (three horizontal lines) in the top right corner of the table. A second red box highlights the 'Add Field' option in the dropdown menu that appears when the icon is clicked.

Description	Uniform_Crime_Repo	National_Incident_Ba	Address	Zip	Agency
BURGLARY	5	120	3400 NW 34TH ST, LAUDERDALE LAKES	33309	Browar Sheriff
BURGLARY	5	120	2000 NE 1ST TER, POMPANO BEACH	33060	Browar Sheriff
BURGLARY	5	120	2400 NW 39TH TER, LAUDERDALE LAKES	33311	Browar Sheriff

For Field Name write **“Officer”** and for Default Value write **“Staff.”**

You’ll notice that the default Type is String—leave this as is. String means that you can type a text string, such as an officer’s name. Text is the type of data we will put in this field.

Click **Add New Field** to create the field.



The screenshot shows the 'Add Field' dialog box in ArcGIS Online. The 'Name' field contains the text 'Officer' and the 'Default Value' field contains the text 'Staff'. Both fields are highlighted with red boxes. The 'Type' is set to 'String' and the 'Length' is 256. There is an 'ADD NEW FIELD' button at the bottom of the dialog.

The field is now added to the table. To see it, widen the map canvas so the new field is visible.

Description	Uniform_Crime_Repo	National_Incident_Ba	Address	Zip	Agency	Date	Time	Officer
BURGLARY	5	120	3400 NW 34TH ST, LAUDERDALE LAKES	33309	Broward County Sheriff	November 21, 2014	December 13, 2015	Valesco
BURGLARY	5	120	2000 NE 1ST TER, POMPANO BEACH	33060	Broward County Sheriff	November 29, 2014	December 14, 2015	
BURGLARY	5	120	2400 NW 39TH TER, LAUDERDALE LAKES	33311	Broward County Sheriff	November 20, 2014	December 13, 2015	Valesco

Notice that the table has 505 records (burglary crime incidents) and that none are selected at this time. Now let's populate the table by first adding an officer's name to the Lauderdale Lakes area.

Click on the table menu icon and select **Filter** as shown below:

In the Filter dialog box, choose "Address," "contains," and then type in "Lauderdale Lakes." Then click **Apply Filter**:

Filter: All Areas in Broward County Burglary Only

Create + Add another expression Add a set

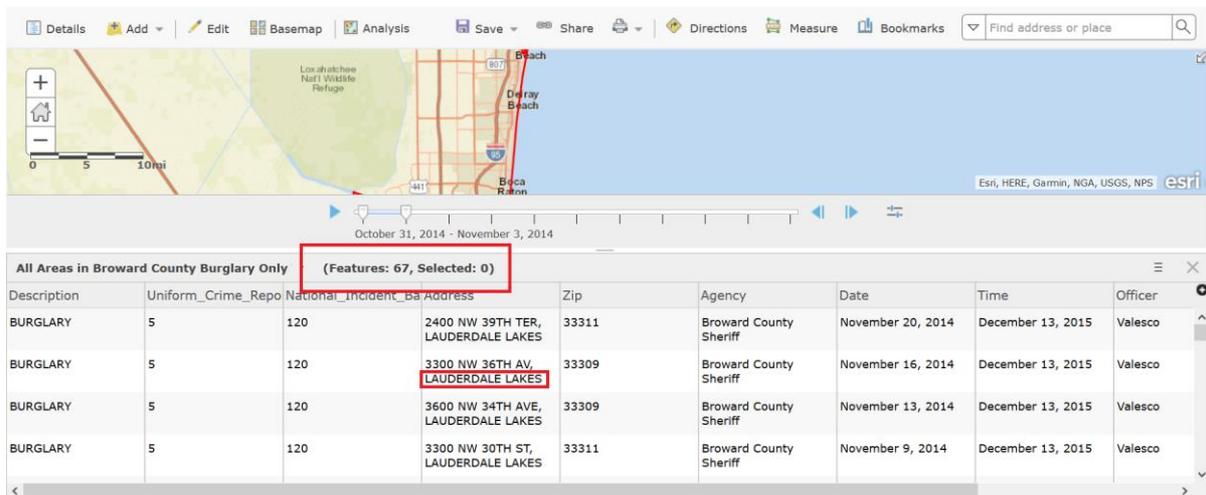
Display features in the layer that match the following expression

Address **contains** **Lauderdale Lakes**

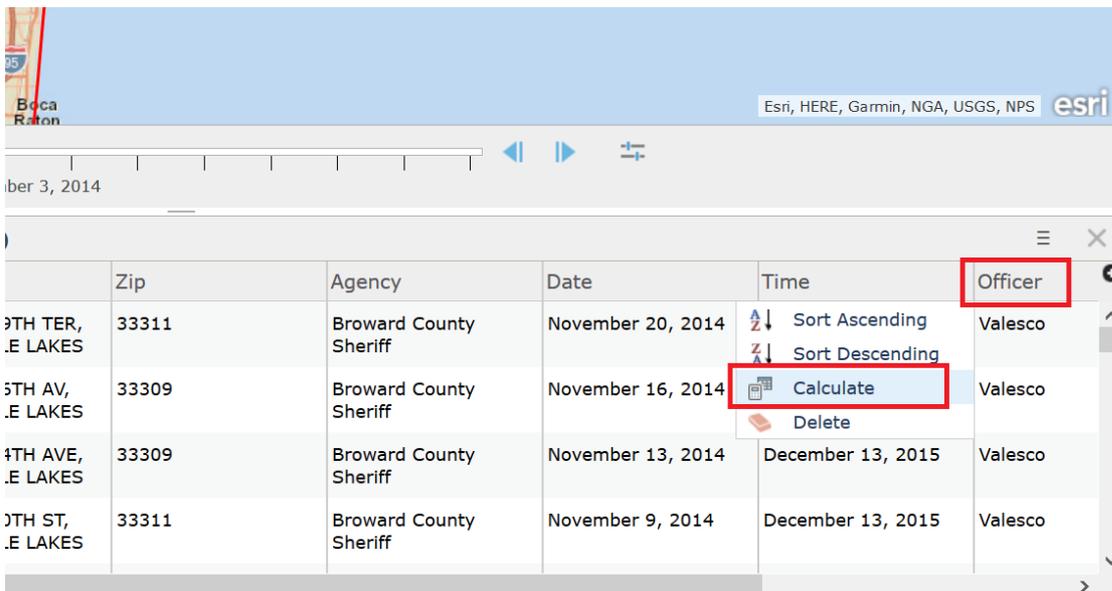
Ask for values

APPLY FILTER **APPLY FILTER AND ZOOM TO** **CLOSE**

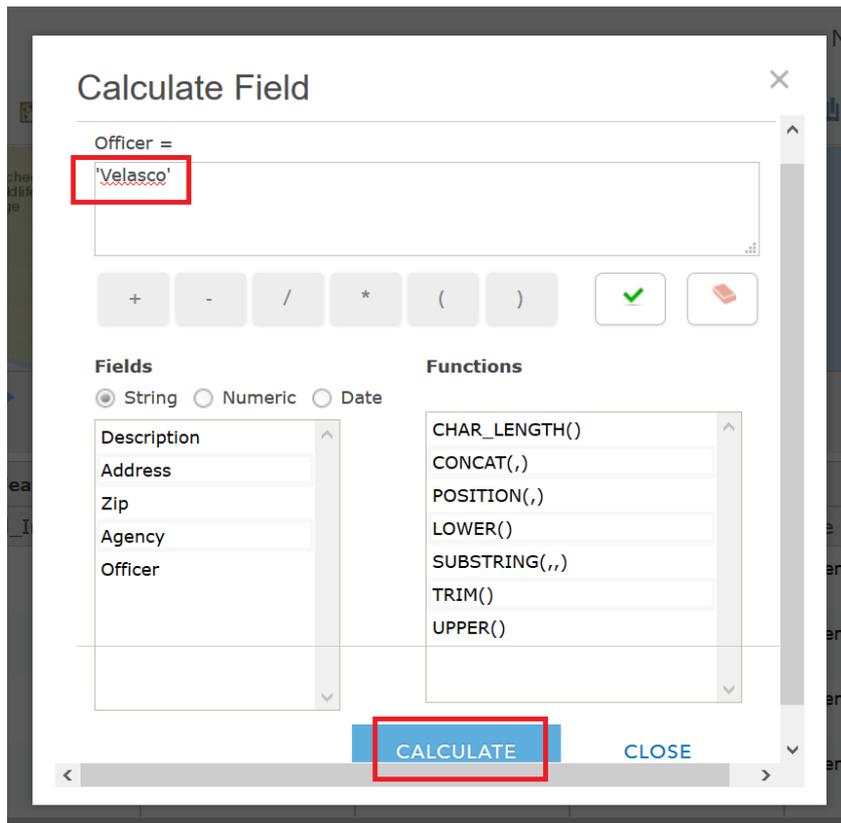
The table is now updated; notice it has been “filtered down” to 67 records. These are the records of burglary incidents that took place only in Lauderdale Lakes. We can now assign an officer’s name to these records.



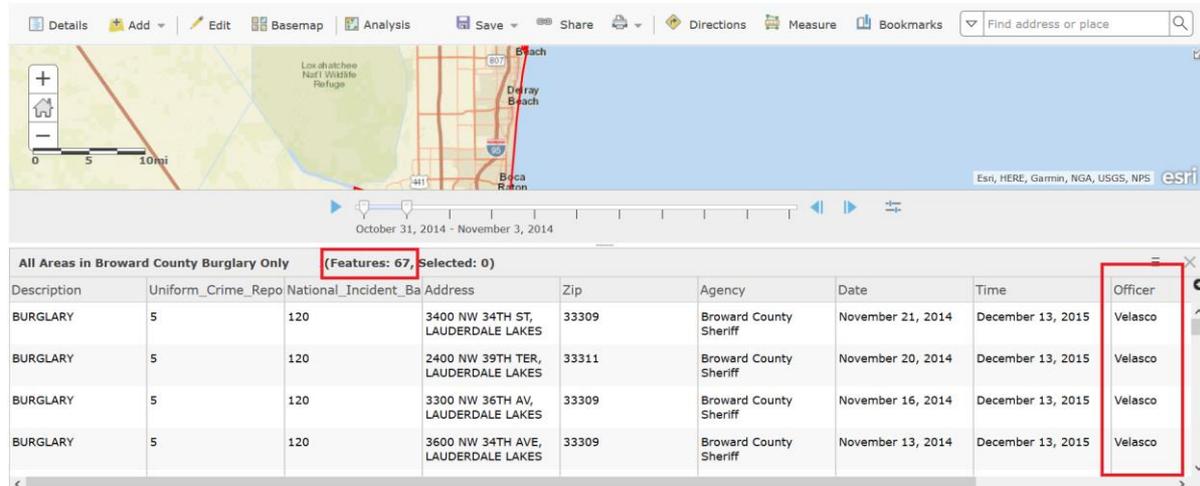
To assign Office Velasco to these records, click the Officer’s field name and in the pop-up window select **Calculate**.



The Expression Builder dialog box will appear. For the field “Officer,” which is highlighted in red, type ‘Velasco’ with single quotes around it as shown below. The expression will read “Officer = Velasco”. Then click **Calculate**.



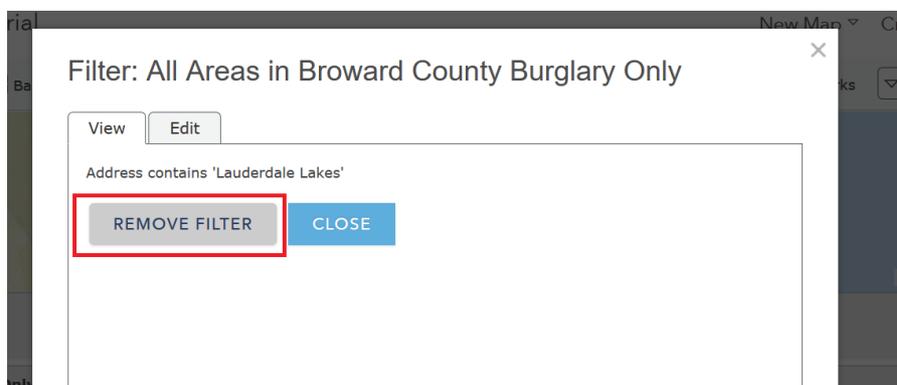
The AGOL “calculate” operation now assigns 67 burglary records to Officer Velasco.



Now let’s assign incidents in a different geographic area to Officer Harned. First, we need to clear the current selection (Lauderdale Lakes). Click on the **Table Options** menu and select **Filter** as shown below.

	Date	Time	
County	November 21, 2014	Decem	
County	November 20, 2014	Decem	
County	November 16, 2014	Decem	
County	November 13, 2014	December 13, 2015	Velasco

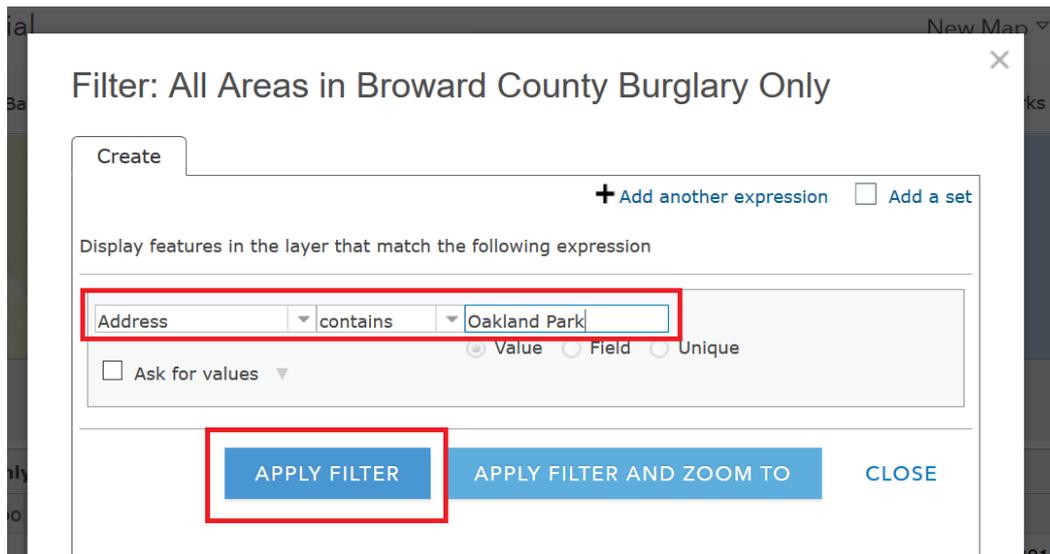
In the Filter dialog box click **Remove Filter**.



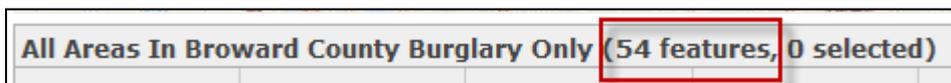
Notice that the table now has 505 records again (burglary crime incidents), with none selected.

Now let's **Filter** again, this time by Oakland Park. We will then assign burglary incidents from that area to Officer Harned.

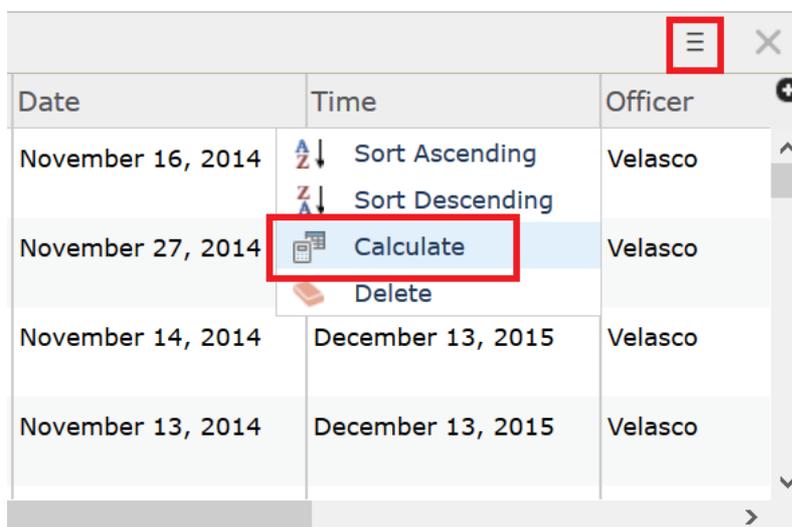
Click on the **Table Options** menu icon and select **Filter**. In the Filter dialogue box, choose "Address," "contains," and then type in "Oakland Park" and click **Apply Filter**.



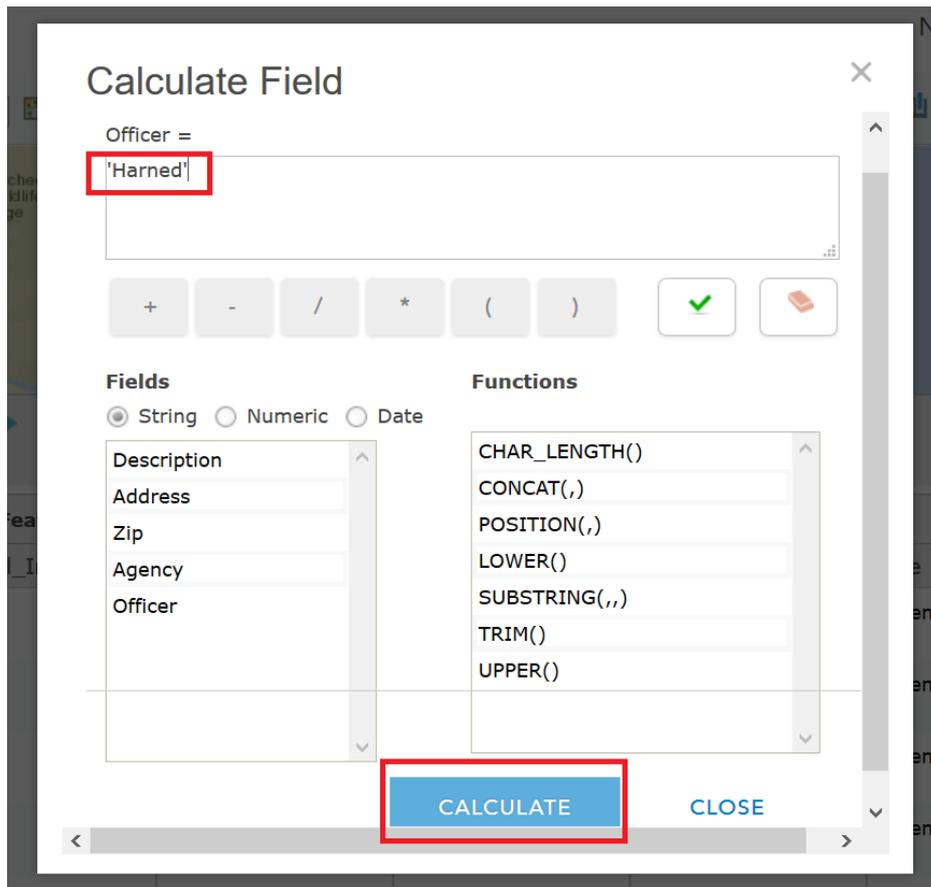
The table is now updated—notice it has been “filtered down” to 54 records. These are the records of burglary incidents that took place in Lauderdale Lakes. Using the calculate function, we can now assign an officer’s name to these records.



Click the Officer’s field name and in the window that pops up, select **Calculate**.



The Expression Builder dialogue box will now appear. Inside the red highlighted box, type ‘Harned’ using single quotes, as shown below. The expression reads “*Officer = Harned*”. Now click **Calculate**.



Notice in the resulting table that AGOL has now assigned those 54 records to an Officer named Harned.

All Areas in Broward County Burglary Only (Features: 54, Selected: 0)									
ation	Uniform_Crime_Repo	National_Incident_Ba	Address	Zip	Agency	Date	Time	Officer	
RY	5	120	2700 NW 18TH TER, OAKLAND PARK	33311	Broward County Sheriff	November 16, 2014	December 13, 2015	Harned	
RY	5	120	600 NE 56TH ST, OAKLAND PARK	33334	Broward County Sheriff	November 27, 2014	December 14, 2015	Harned	
RY	5	120	100 NE 38TH ST, OAKLAND PARK	33334	Broward County Sheriff	November 14, 2014	December 13, 2015	Harned	
RY	5	120	1200 NW 43RD ST, OAKLAND PARK	33309	Broward County Sheriff	November 13, 2014	December 13, 2015	Harned	
RY	5	120	1900 NE 43RD CT, OAKLAND PARK	33308	Broward County Sheriff	November 12, 2014	December 13, 2015	Harned	
RY	5	120	900 NE 38TH ST, OAKLAND PARK	33334	Broward County Sheriff	November 9, 2014	December 13, 2015	Harned	
RY	5	120	5100 NE 3RD TER, OAKLAND PARK	33334	Broward County Sheriff	November 9, 2014	December 14, 2015	Harned	

Feel free to assign (using the calculate function) other incidents to other officers.

When you're finished, click [Save](#) to save your work!