

Exercise 16. Examining the Demographics of a Service Area

You might want to review the first *ArcMap* exercise if you are not yet familiar with the product.

Purpose: This exercise will give you an idea of how spatial queries may be made with census data. In this example you will perform a common type of marketing query to determine what the demographic characteristics are within a service area. Normally a distance of a one to three mile radius from a specified location is used. Then, socio-economic data is aggregated from those census units that fall within the specified distance.

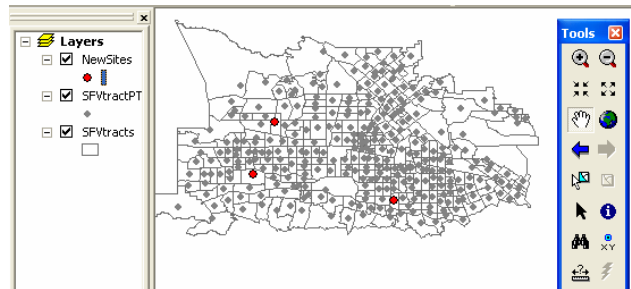
For this exercise there are three possible locations in the San Fernando Valley, California. One is in the northwest part of the valley in an area called Chatsworth. To the south is the second location in Woodland Hills. Farther to the east is a third site in an area called Encino. The sites are visible on the *NewSites* layer.

The second map layer, *SFVtractPT*, contains the centroids of census tracts along with a series of census variables deemed useful to help select a site. These include the populations of Non-Hispanic Whites, Blacks, Asians, and Hispanics; the number of males and females, the number of persons less than age 18, from 18 to 64, and over age 64; the number of households for Non-Hispanic Whites, Blacks, Asians, and Hispanics; and the aggregate household income in each tract for each of the same four groups. Depending on what group we want to target, we can selectively tabulate demographic statistics for an area (a buffer) that surrounds a site.

The third map layer of tract outlines is to provide a locational background for the points.

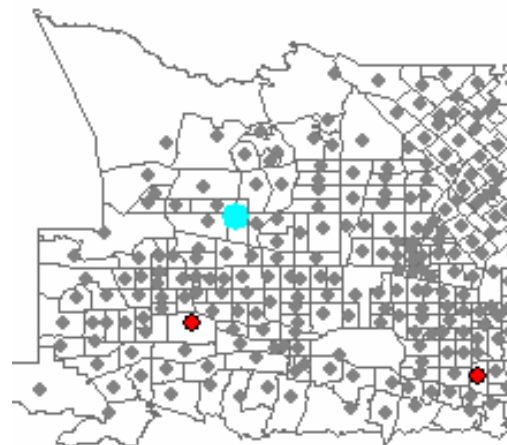
1. Start *ArcMap*, select the *Add Data* button, and load the following three files from the *Mapping* directory: *NewSites*, *SFVtractPT*, and *SFVtracts*.

A dataframe called *Layers* will appear that contains the three map layers. Right-click on the *Layers* dataframe and set a projection if you can. *UTM Zone 11* works.

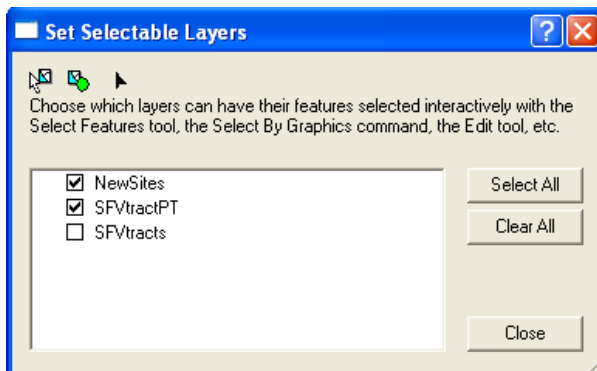


2. Right-click on the *NewSites* layer and select the *Open Attribute Table* option. Click to the left of the *Chatsworth* site to select its row. Then close the *Attribute Table*. The site should be highlighted in blue.

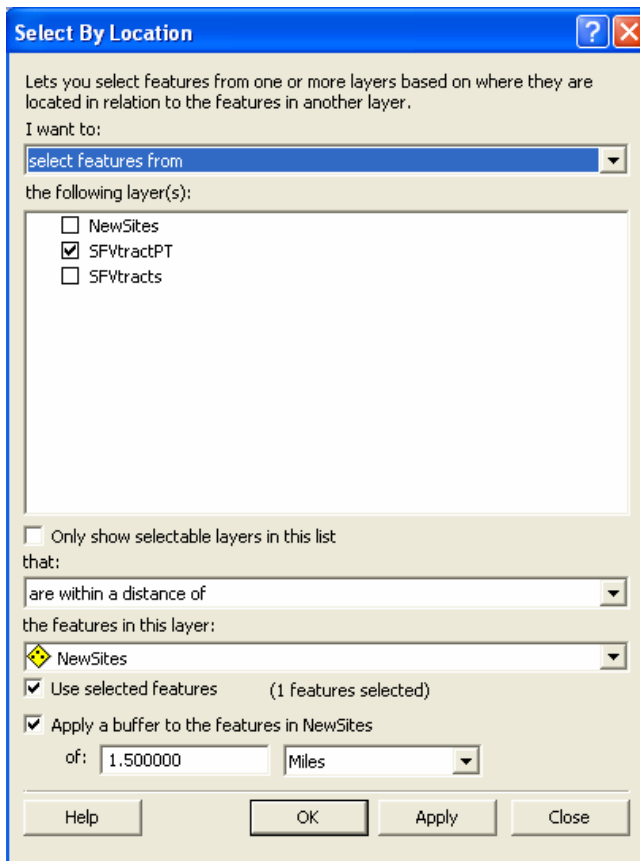
Attributes of NewSites									
FID	Shape *	TRACT2KID	SQMILES	LAT	LONG	OID	GEOID		
0	Point	06037113301	0.8757	34.247453	-118.558528	83	06037113301	Chatsworth	
1	Point	06037124600	0.5954	34.160156	-118.426516	169	06037124600	Woodland Hills	
2	Point	06037134902	1.5937	34.188771	-118.582780	242	06037134902	Encino	



3. Select **Selection > Set Selectable Layers** and make sure the **SFVtracts** layer is not checked. Then click **Close**.



4. Click on the **NewSites** layer in the **Table of Contents**. Then select **Selection > Select by Location**.



5. In the **Select by Location** window...

Choose the **select features from** option at the top.

Under the **the following layer(s)** window check the **SFVtractPT** layer.

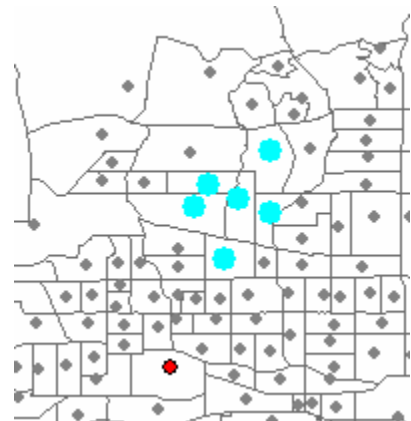
Under **that choose are within a distance of**.

Under **the features in this layer** window choose **NewSites**.

Make sure **Use selected features** is checked.

Make sure **Apply a buffer to the features in NewSites of 1.5 miles** is chosen.

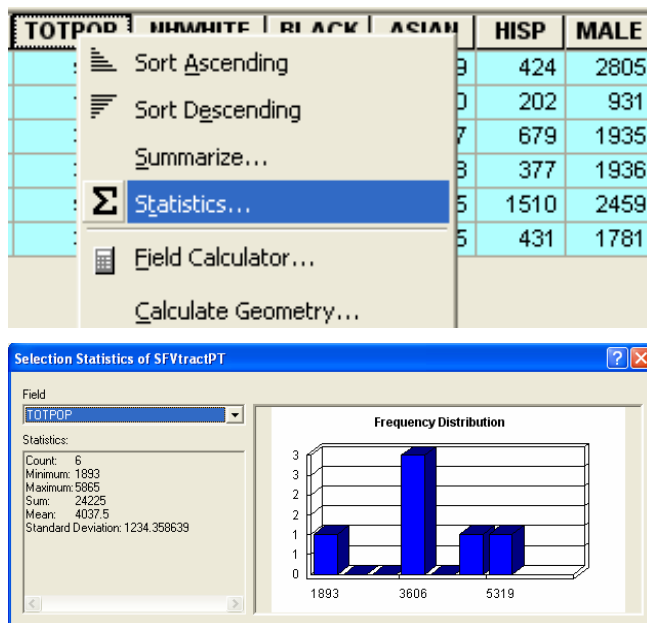
Then click **OK**. Six tracts within a radius of the Chatsworth site will be selected.



6. Right-click on the **SFVtractPT** layer in the **Table of Contents** and select the **Open Attribute Table** option. At the bottom of the spreadsheet click on the **Selected** button to see only the six selected tracts.

Selected Attributes of SFVtractPT							
FID	Shape *	TRACT2KID	SOMILES	LAT	LONG	OID	GEOGID
87	Point	06037111204	1.3073	34.264402	-118.548373	70	06037111204
80	Point	06037113301	0.8757	34.247453	-118.559528	83	06037113301
81	Point	06037113303	1.5793	34.244903	-118.575044	84	06037113303
83	Point	06037113322	0.7058	34.252960	-118.569841	86	06037113322
84	Point	06037113401	0.9494	34.226439	-118.564130	87	06037113401
91	Point	06037115301	0.6366	34.242954	-118.547868	94	06037115301

7. Right-click on the top of the *Totpop* attribute in the table and from the popup menu select the *Statistics* option.



8. A table that summarizes various qualities of the *Totpop* variable will appear. Note the *Count* of tracts is 6 and the *Sum* of the *Totpop* is 24,225.

9. Add this number to the table above and then select the *Field* window and select the next variable in the *Attribute Table*, and the *Sum* of *NHWhite* which is 15,195. Add this to the table above and proceed through the other variables.

10. When the *Sum* for all attributes have been recorded for Chatsworth, close the *Attribute Table*. Choose *Selection > Clear Selected Features*.

11. Return to Step 2 above and select the second site, Woodland Hills. Then follow the steps to buffer it at 1.5 miles, select the tract centers within the buffer, and then sum the attributes of the selected tracts. Write the result for each variable in the table above.

	Chatsworth	Woodland Hills	Encino
Total Pop			
NH-White			
Black			
Asian			
Hispanic			
Males			
Females			
<18 yrs			
18-64 yrs			
>64 yrs			
Black HH			
Asian HH			
Hisp. HH			
NHWh HH			
Agg Inc Blk			
Agg Inc Asian			
Agg Inc Hisp			
Agg Inc NHW			
Blk Inc p HH			
Asian Inc p HH			
Hisp Inc p HH			
NHW Inc p HH			

12. Again repeat the selection process for Encino.

13. Calculate the *Aggregate Income per Household* for each ethnic group by dividing the *Aggregate Income* by the count of households.

14. Note the ethnic make up of each site's service area. Compute the percent if you wish.

15. Which site has the highest percent of females?

16. Which site has the greatest number of persons under 18 and which site has the greatest number over 64?

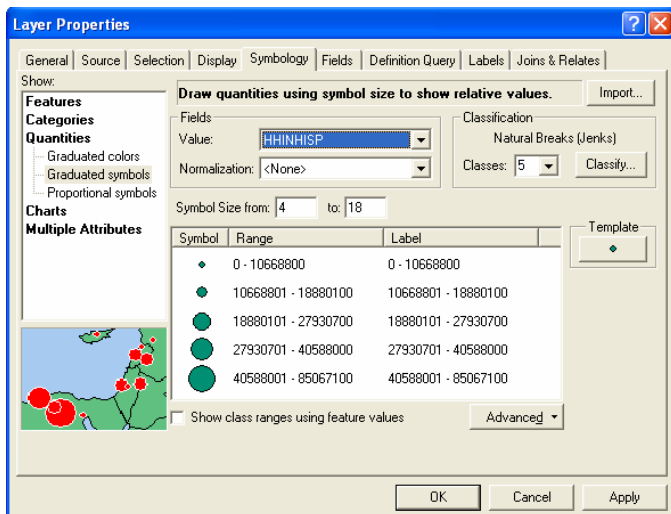
17. Which site seems to have the most people with the highest per household income?

Mapping Census Centroids

It is usually helpful to look at the patterns of data values over a larger area to get some sense of where higher values of interest occur. This might be done initially to focus on potential sites for more detailed analysis.

Since the data are associated with points we will use graduated symbols to examine the quantities in each tract. Graduated symbols are preferred for displaying raw counts.

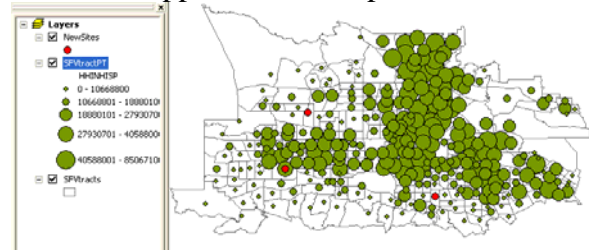
1. Right-click on the *SFVtractPT* layer and select the *Properties* option and *Symbology* tab.



2. From the *Show* window on the left select the *Quantities* option and the *Graduated symbols* option. A set of five circles will appear representing ranges of dollar categories of the sum of Hispanic income at each point.

3. In the *Value* window select the *HHINHISP* variable (Hispanic Aggregate Income). Click *OK*.

A map showing the amount of Hispanic income will appear. Note the pattern of tracts.

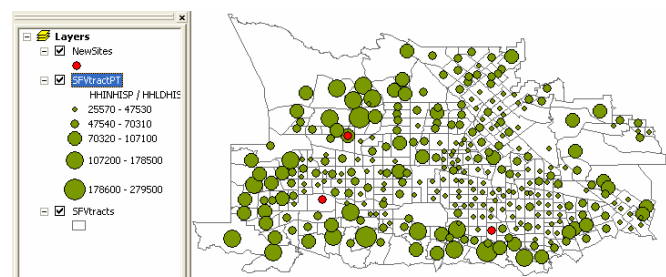


If you were interested in just dollars you might look at the areas of large numbers of large circles. However, many of these areas also have a greater number of Hispanic households.

For marketing purposes we are really interested in locations where the per household income is high since these people are more likely to purchase a more expensive product. In this case you can compute this “on the fly” by dividing the aggregate income by the number of Hispanic households. This is called *Normalization* in ArcGIS.

4. Again right-click on the *SFVtractPT* layer and from the *Properties* option select the *Symbology* tab. Click on the *Normalization* window and select the *HHldHisp* variable (Hispanic households). Then click *OK*.

On the new map note the locations of well-to-do Hispanic households. Compare this pattern to that of the previous map.



Map some of the other variables and consider where you might want to locate a marketing site based on greater potential for customers.