GEO/EVS 423 EVS 523
Exercise 10: Mapping and Analyzing Quantities

One of the most important things we can do is to map where things are (or might be) and then analyze what their abundance means. This exercise will deal with stores and census blocks, but you should be able to see how it would apply equally well to ecological sample sites and environmental factors such as soils, land cover, etc.

For purposes of this exercise, imagine that you are a venture capitalist in Fort Worth, Texas, and that an entrepreneur has come to you with a scheme to build some specialty stores targeting the Hispanic community. Your client is a chain called PuraVida Market. It already has 5 stores in the area. It competes with BuenaVida Foods, which has 7 stores in the area. You want to see how well your client's stores are doing – what are their sales and are they are in the right places. You also want to see if there are obvious locations for new stores.

Your first step is to map the existing stores. Conveniently, then P: drive includes a geodatabase containing a street map of the Dallas-Fort Worth area, a map of census blocks in the area, and a comma-separated-variable file showing the locations of the PuraVida and BuenaVida stores. It's called FtWorth.gdb. Copy the geodatabase into your X: drive, and load the files into your ArcMap window.

Your first step will be to convert the comma-separated-variable file to a feature. Go to the Data Management Tools -> Layers and Table Views -> Make XY Event Layer tool and open it. The .csv file is your input; the longitude is the X value; the latitude is the Y value. You will need to specify the spatial reference system, even though it is listed as optional. From the drop-down icon, choose Select -> Geographic Coordinate Systems -> World -> WGS1984. The tool will create a point layer showing the locations of the PuraVida and BuenaVida stores. This point layer is temporary and is not automatically saved to your X: drive. You should open the attribute table for the layer and see what it says. The monthly sales column gives a good comparison of the stores' operations. Close the attribute table and right-click on the layer. Go to properties and choose Quantities -> Graduated symbols on the Symbology tab. Set the value to be symbolized as MonthlySales, and choose a suitable color and size set for the symbols. When you click OK, the resulting map will show not only the locations of the stores but also their monthly sales. Can you think of a way to show both the locations of the stores in each chain using a different color as well as their monthly sales? Print the most interesting/useful map you generate showing this information.

Now assume that you are interested in PuraVida's expansion plans. It would be helpful to know where there are large concentrations of Hispanics in the Fort Worth area. You can do this! Open the attribute table of the census-block feature, and move the slider to the right until you find a field called Hispanic. This is the number of Hispanics in each census block. You can classify each census block by the number of Hispanic residents and show this classification with a suitable color ramp. Do the classification, using about 10 classes. Experiment with different definitions of the classes (e.g. Natural Breaks, Quantile, Equal Interval, etc.) Does anything stand out? Print one or two of the most interesting and/or useful maps of the Hispanic population.

Note that the census blocks vary considerably in size, and they contain very different numbers of people. If you were to map concentration of Hispanics on a person-per-unit-area or a percentage basis, would that change things? There are a couple of ways to do this. You could add a "concentration" column and perform the division using the Field Calculator, or you can set a field against which to normalize the numbers using the Normalization drop-down box. Try it. You should be able to create and print a map showing the percentage of Hispanics in each census block (i.e. Number of Hispanics / Number of all ethnicities in the population) and the density of Hispanics in each census block (i.e. Number of Hispanics / area of the census block). Does either suggest a place to locate a new Hispanic grocery store?

Which approach to mapping the Hispanic population best shows the likelihood of people shopping at

PuraVida? As you examine your map, look at the easternmost store. It isn't doing nearly as well as any of the others. Do any of the maps of the Hispanic populations in the various census blocks give you an indication of why?

Let's continue the theme of your being a venture capitalist interested in ethnic grocery stores. The census data contain information about ethnic groups other than Hispanics, and one can make a series of maps showing the range of possible ethnic groups in the area. This isn't as easy as it might seem at first blush, since some ethnic groups are much more prevalent than others. One group might have a maximum number of 2500 in its densest census block, whereas another might have 20,000. If one used the same color ramp for numbers of people in each block, the first group would show up as "rare" throughout the mapped area; if one used minimum and maximum as the basis for the color ramp, the two groups would appear to be equally abundant.

One approach to making a map series is to make a map of the total population first, then use the classification ranges of that dataset to display the other datasets. To do that, open the Census Block feature, and go to Quantities -> Graduated Colors on the Symbology tab. Use population in 2000 as the Value field, and accept the default classification. Choose a good color ramp, and click OK. Print the map, showing the values of the ranges of your classes.

Now use the same ranges to classify the Hispanic population. You could simply (?) change the Value field in the Properties tab to Hispanic and then change the ranges by hand using manual classification, but there's an easier way. Right-click on the Census Block dataset, and choose Copy. Right-click on the data frame header (it looks like 3 pieces of manila paper and is probably labeled "Layers"), and choose Paste. A second dataset is inserted into the table of contents. Right-click on it and choose Properties. Change the dataset name in the General tab to Hispanics, and then go to Symbology. Click on the Import button, and import the 2000 population dataset. Change the Value field to Hispanics. Print your map as you did before.

Now do the same operations with the other ethnic groups. You should end up with a series of maps with precisely the same ranges of numbers being used to compare the density of the various groups. Is this a satisfactory way to compare the abundance of members of various groups in different areas? Can you suggest improvements?

Now let's look at the dataset and show information not with color ramps but rather with charts. You can make pie charts showing the percentage of individuals making up 100% of a total, bar charts showing amounts of things, or stacked bars showing amounts comprising a whole. You should try each of these. Again right-click on the census dataset and go to the Symbology tab. Click on Charts, choose a chart type, and then choose to add a major category to the chart. By "major category" I mean those specific categories that comprise the whole. You have to be more compulsive for some chart types than for other. For example, in the major category "marital status" is isn't enough to specify 'single' and 'married.' There are also widowed and divorced people to consider. With a pie chart, it would be misleading not to include these two categories. On the other hand, it might be OK with a bar chart or a stacked chart. These depend on what you are trying to show. Likewise it would be misleading to consider housing units as consisting of owner-occupied and renter-occupied if the actual number also included a significant number of vacant units as well.

Make some charts from the census dataset. You can choose one or more of the major categories: ethnicity, age distribution, marital status, housing status. Try all of the chart types. Which do you find most effective?

Portfolio

10-1   Map showing the locations of the PuraVida and BuenaVida stores on a background of the census blocks, showing as much information about the stores as you can figure out how to do

10-2   Map showing the *number* of Hispanics in the Dallas-Ft. Worth area showing 1 or 2 of the most useful or interesting classifications of these numbers. Include a brief discussion of why you feel the most interesting classification is the most interesting.

10-3   Map showing the *percentage* and *density* of Hispanics in each census block through the Dallas-Ft. Worth area.

10-4   Map showing the number of Hispanics in the Dallas-Ft. Worth area using the same class brackets you used for map 10-2.

10-5   Maps showing the number of each ethnic group found in the attribute table, using the same class brackets you used for maps 10-2 and 10-4. All of these maps should be on a single sheet of paper.

10-6   Map showing charts of the breakdown of the population in the Dallas-Ft. Worth area. You may wish to show several different ways of showing this breakdown, and you may wish to use only a single county for your map(s).