GIS III: **GIS Analysis**
Module 2: Spatial Analyst Tools

*** Files needed for exercise: *LA_liquor_stores.dbf, 2009_census_cty_LA.shp*

Goals: To learn how to use the Spatial Analyst toolset, specifically density and zonal tools, to perform GIS analyses.

Skills: After completing this exercise, you should be familiar with raster-based analyses and the Spatial Analyst toolset.

Mapping point level data:

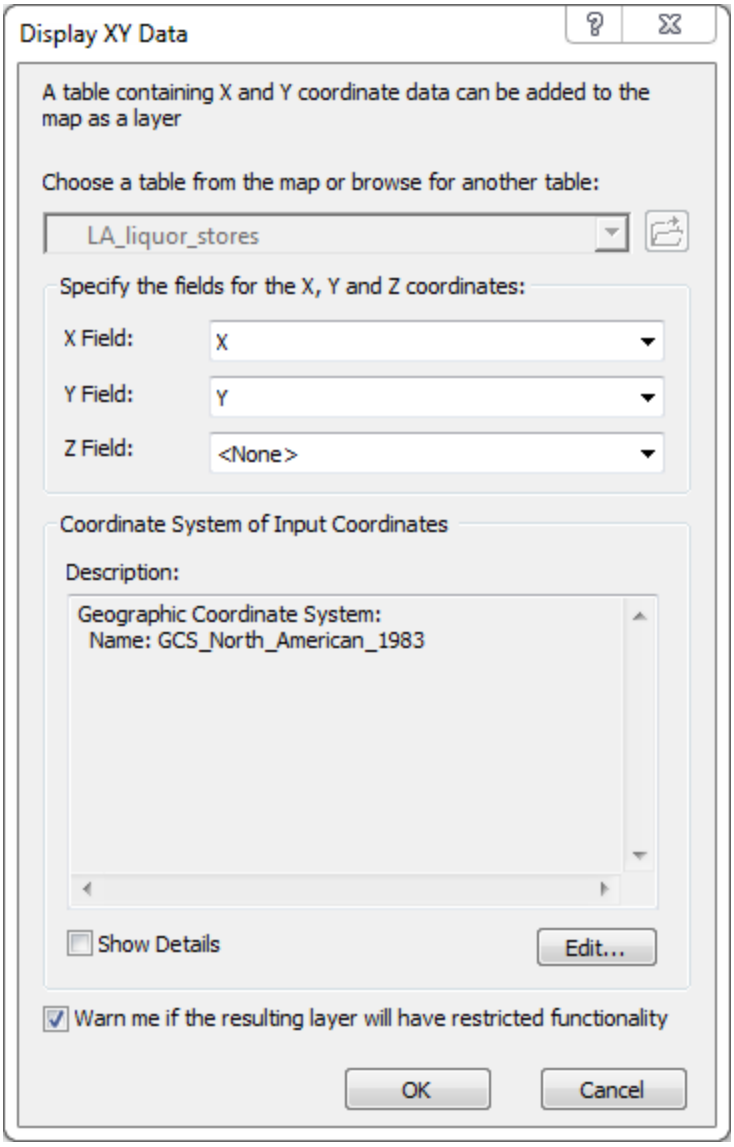
1. Open ArcMap.
2. Add the table *LA_liquor_stores.dbf*.
3. Open the table. We can see that these are liquor stores. They have latitude and longitude, as well as a sales volume.

Table

LA_liquor_stores

CONAME	ADDR	CITY16	STATE	STATE_NAME	ZIP	SIC	NAICS_EXT	SALES_VOL
SILVER LINING	16482 HIGHWAY 71	HOSSTON	LA	Louisiana	7104	592102	44531004	646
RICE CITY LIQUOR STORE	630 N PARKERSON AVE	CROWLEY	LA	Louisiana	7052	592102	44531004	323
FROZEN SUN DAIQUIRIS	1517 AMBASSADOR CAFFERY PKWY	LAFAYETTE	LA	Louisiana	7050	592102	44531004	969
DAQUIRI'S N FOOD INC	944 E SIMCOE ST	LAFAYETTE	LA	Louisiana	7050	592102	44531004	969
MARCELLO'S WINE MARKET	2800 JOHNSTON ST	LAFAYETTE	LA	Louisiana	7050	592103	44531005	3230
RED WHITE & BREW	120 E THOMAS ST	HAMMOND	LA	Louisiana	7040	592103	44531005	1292
FRIENDLY PACKAGE INC	14291 HIGHWAY 175	MANSFIELD	LA	Louisiana	7105	592102	44531004	323
Y NOT LLC	7348 HIGHWAY 167 S	WINNFIELD	LA	Louisiana	7148	592102	44531004	1938
DOUCET'S LIQUOR & GROCERY	13623 HIGHWAY 112	ELIZABETH	LA	Louisiana	7063	592102	44531004	323
DAIQUIARI UNLIMITED	226 W 70TH ST	SHREVEPORT	LA	Louisiana	7110	592102	44531004	969
RITE WAY LIQUOR	1750 DR MARTIN LUTHER KING DR	SHREVEPORT	LA	Louisiana	7110	592102	44531004	646
GET & GO LIQUOR STORE	2601 LAKESHORE DR	SHREVEPORT	LA	Louisiana	7110	592102	44531004	323
ALPINE SPIRITS INC	2437 LAKESHORE DR	SHREVEPORT	LA	Louisiana	7110	592102	44531004	1615
BEST SOURCE LIQUOR INC	117 PACIFIC AVE	BOYCE	LA	Louisiana	7140	592102	44531004	646
MURPHY'S PACKAGE LIQUOR	472 TEXAS HWY	MANY	LA	Louisiana	7144	592102	44531004	3230
JACK'S	6354 COLISEUM BLVD	ALEXANDRIA	LA	Louisiana	7130	592102	44531004	1292
CULOTTA'S LIQUOR & SEAFOOD	2508 4TH ST	HARVEY	LA	Louisiana	7005	592102	44531004	969
AUDUBON PACKAGE LIQUOR	HIGHWAY 61	ST FRANCISVILLE	LA	Louisiana	7077	592102	44531004	1292
EAST BOULEVARD ENTERPRISE INC	1219 THOMAS H DELPIT DR	BATON ROUGE	LA	Louisiana	7080	592102	44531004	969
KIRKMAN STREET DISCOUNT LLC	3016 KIRKMAN ST	LAKE CHARLES	LA	Louisiana	7060	592102	44531004	969
BACCHUS	18291 HIGHLAND RD # 109	BATON ROUGE	LA	Louisiana	7081	592103	44531005	1615
CATERING KEGS	1205 SEABOARD AVE	BATON ROUGE	LA	Louisiana	7081	592104	44531001	646
MARTIN WINE CELLAR	4221 BIENVILLE ST	NEW ORLEANS	LA	Louisiana	7011	592103	44531005	969

4. Map the liquor stores by right clicking on the table and choosing **Display XY Data**. The Latitude and Longitude fields should be filled in for you. For the coordinate system choose **Geographic Coordinate Systems > North America > NAD 1983**. Click **OK** to get a restricted functionality error, and click **OK** to map the data.



5. Now add *2009_census_cty_LA.shp*. Change the coordinate system of the data frame to match that of the shapefile.
6. Export the *LA_liquor_stores Events* layer to a permanent shapefile by right clicking and choosing **Data > Export Data** and saving it to your folder. Make sure to use the same coordinate system as the data frame. Name the permanent shapefile something logical like *LA_liquor_stores.shp*.
7. Point data can be hard to visualize. Let's create a density surface to help with this.

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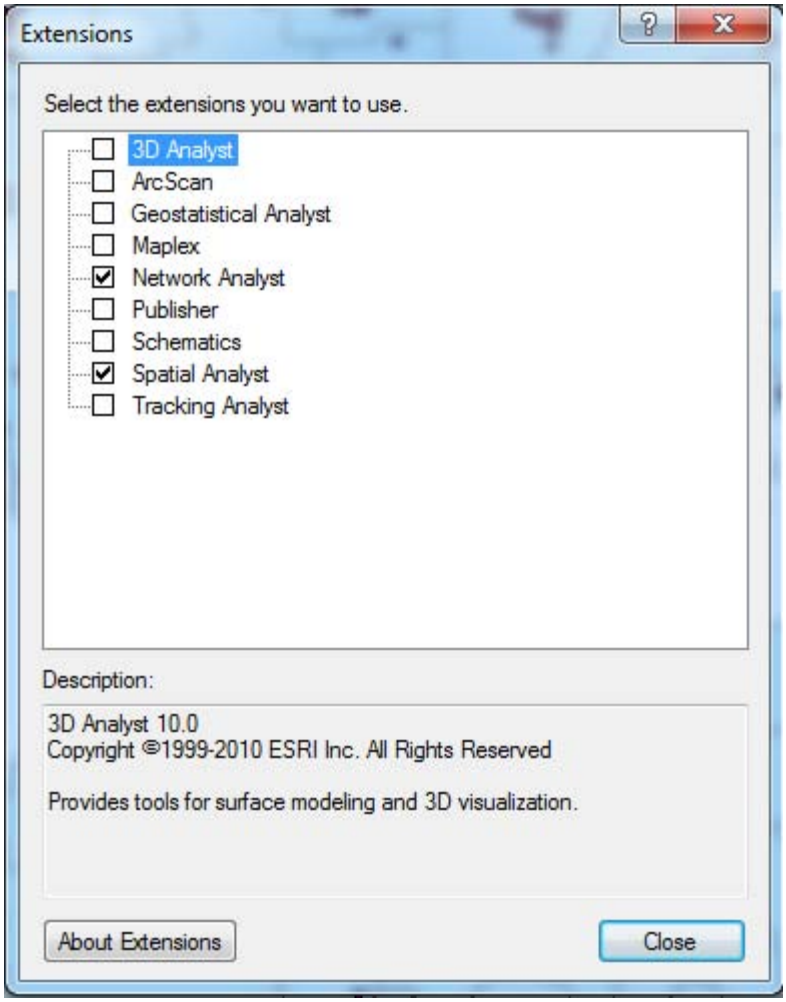
Density Analysis:

1. First, make sure the Spatial Analyst Extension is turned on by going to **Customize > Extensions** and checking **Spatial Analyst**.



2. In **ArcToolbox**, find the **Spatial Analyst Tools** and click **Density**. We are going to use the **Point Density** tool, which measures the number of points in a given area.

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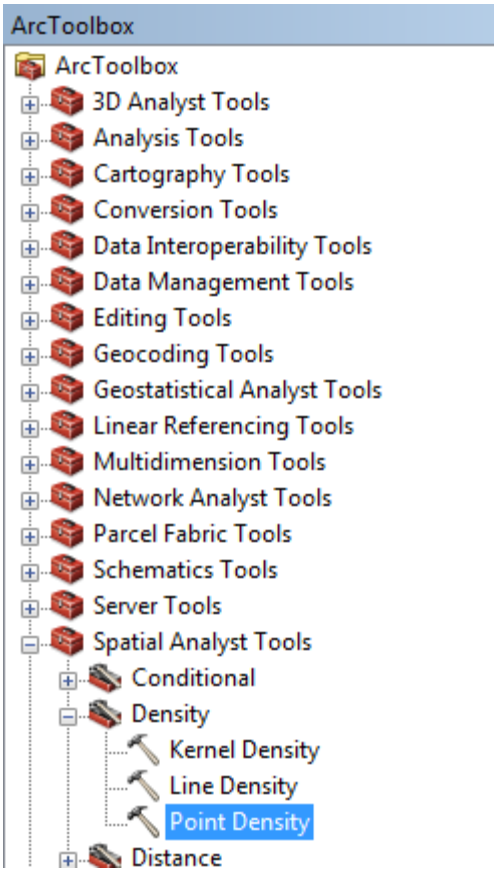
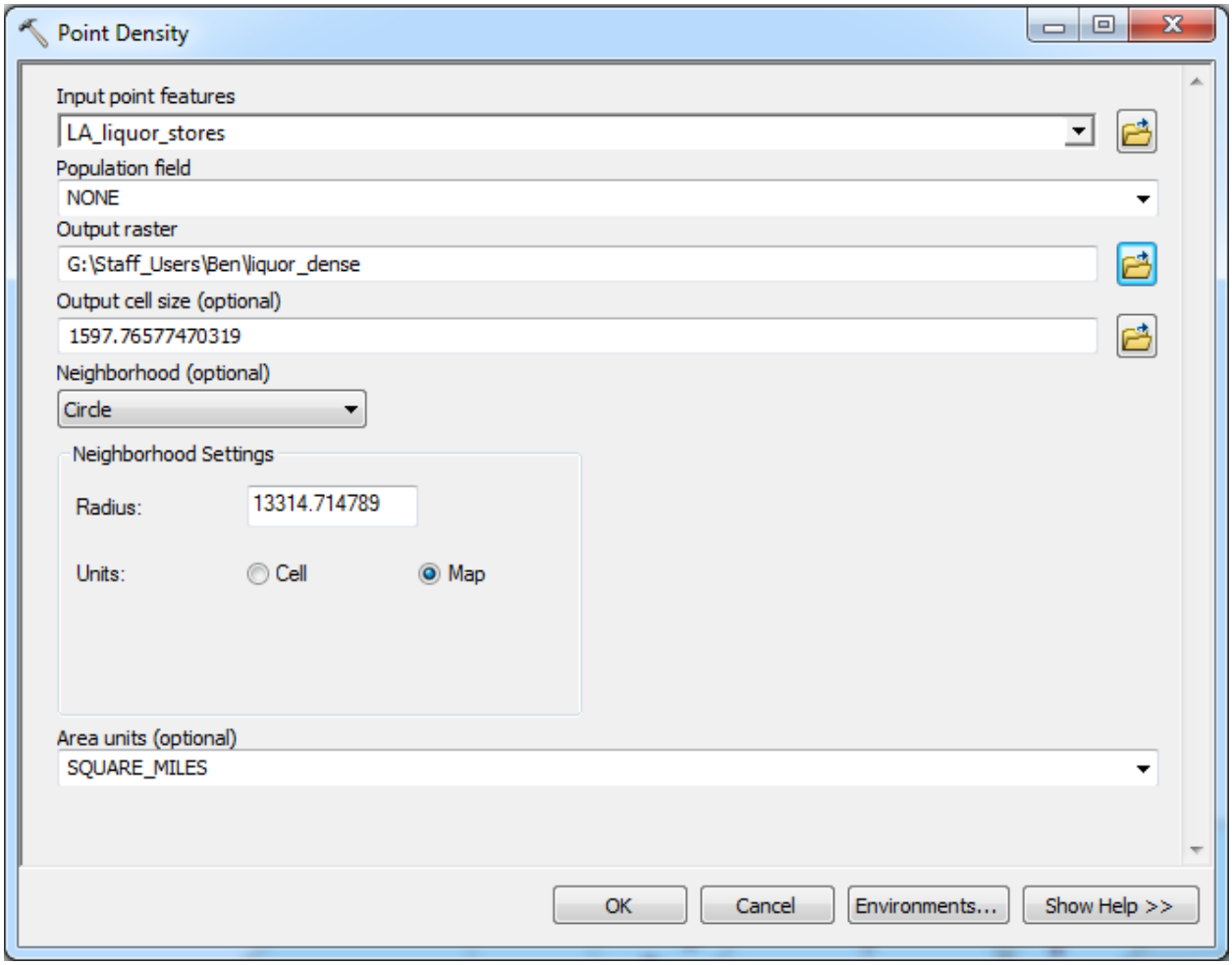
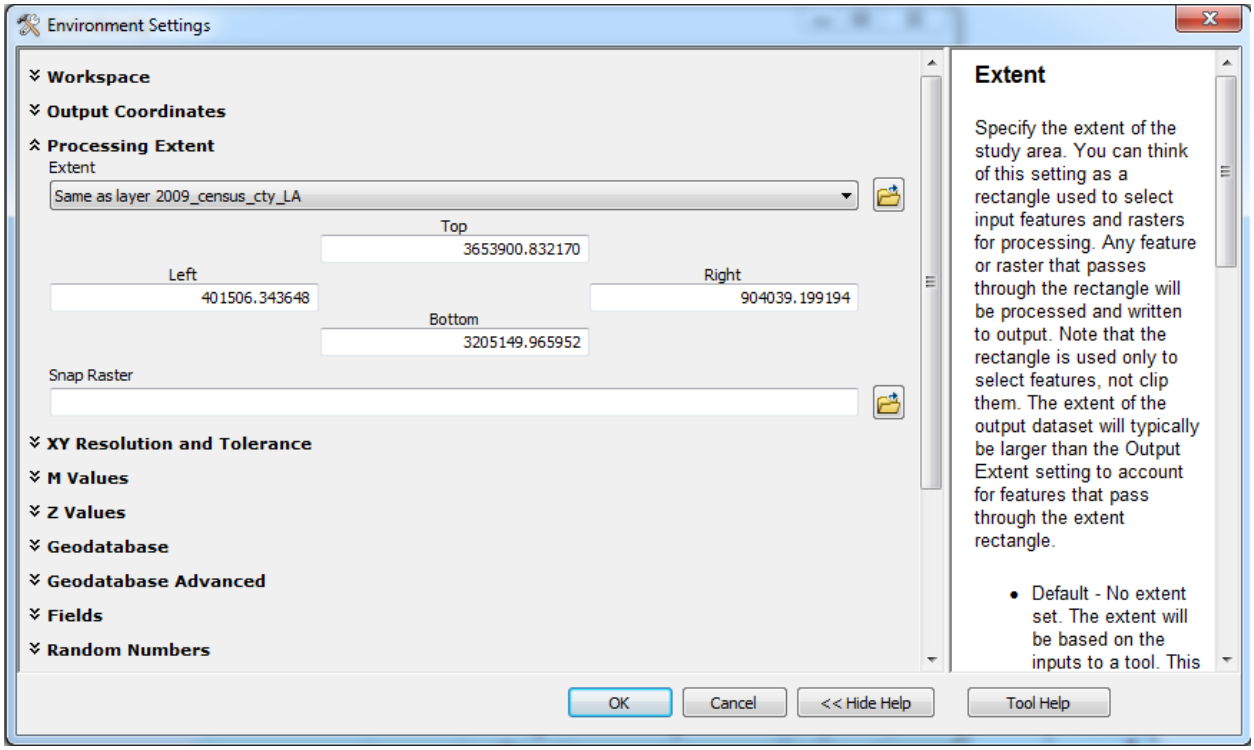


3. In the Point Density dialog box, the Input point features should be our *LA_liquor_stores*. For now, we are going to keep the population field at None. In the Output raster box, choose a location and name for your raster. Keep in mind that raster names can only be 13 characters long. We are also going to keep the defaults for cell size and search radius. These are automatically calculated by ArcMap to give us a reasonable density surface. You may change them if you like to see the effect.
4. Change the area units to SQUARE_MILES.



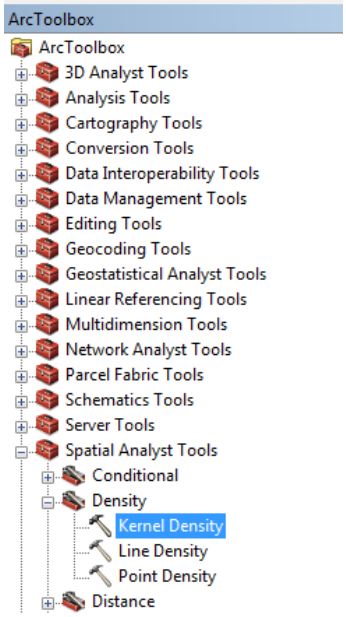
5. Leave the other fields alone for now and click the **Environments** button on the bottom of the dialog box. Click on **Processing Extent** and change the Extent to be the same as the *2009_census_cty_LA.shp*. This ensures that the whole state will be covered.



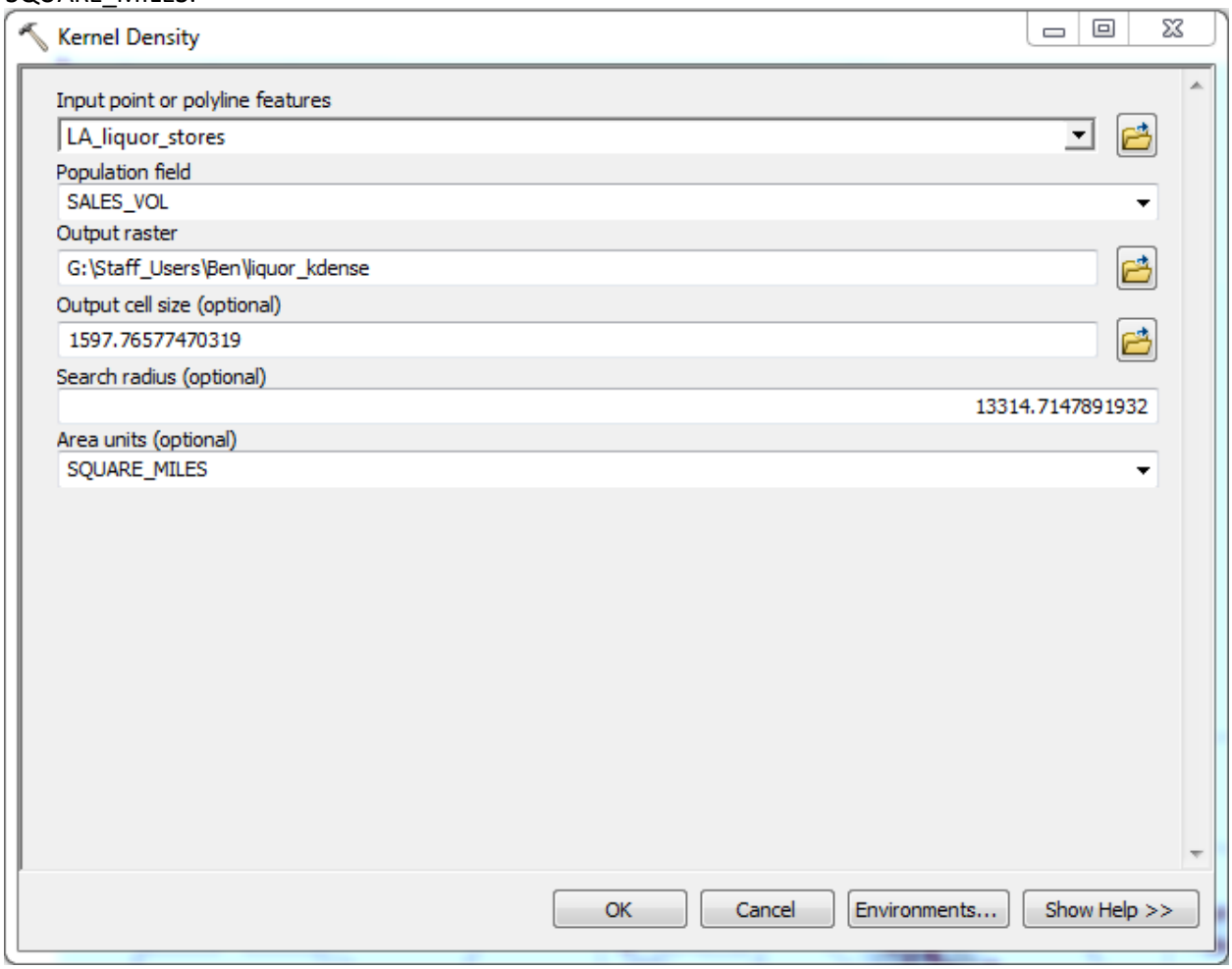
6. Click **OK** twice to run the tool. A surface is produced. You can change the look and color of this surface in the Symbology tab of the raster. You can find the value at any point by using the Query tool and clicking to find the pixel value.

Using Kernel Density:

1. Now let's run a similar analysis using kernel density. Find the Kernel Density tool.



2. In the Kernel Density dialog box, the Input point features should be our *LA_liquor_stores*. Change the Population Field to SALES_VOL. In the Output raster box, choose a location and name for your raster. Keep in mind that raster names can only be 13 characters long. We are also going to keep the defaults for cell size and search radius. Change the area units to SQUARE_MILES.

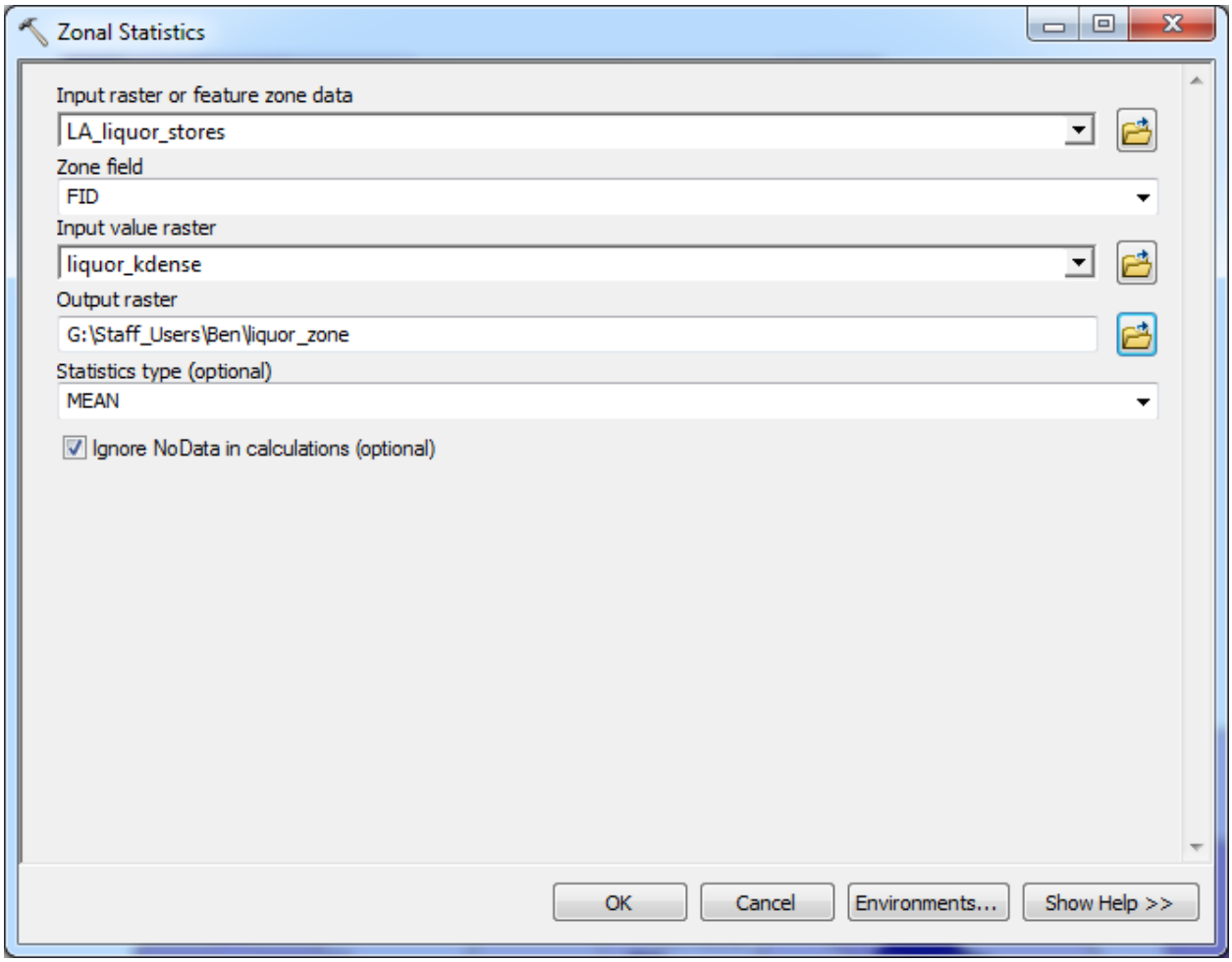
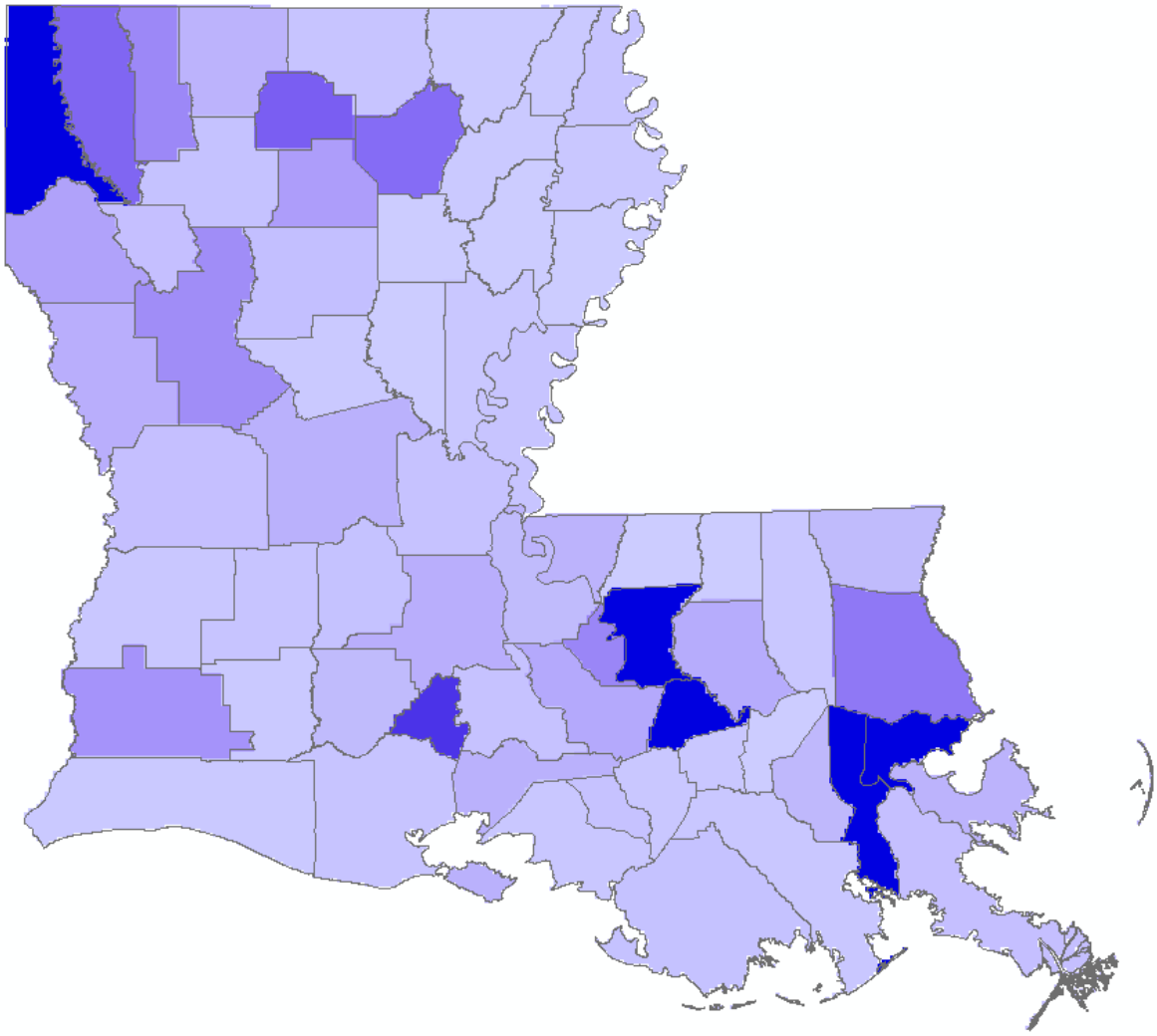


3. Set your processing extent the same way we did for the point density analysis.
4. Click Ok to run the analysis. You now have a density surface showing the density of liquor sales volume across the state. Compare this to your previous point density layer.

Using Zonal Statistics:

1. Now let's find the mean liquor store volume density for each parish in Louisiana. In the **Zonal** tab of the **Spatial Analyst** tools, find the **Zonal Statistics** tool.
2. The Input raster or feature zone data is the layer that contains the zones we want to use. In this case, it is our counties.
3. The Zone field needs to be a unique ID for each zone we want to use. Since we want each tract to be its own zone, use the FID, which is unique for every tract.
4. The Input value raster is our kernel density surface. Choose an output path and name.

5. Make sure the Extent is set to the same as your Louisiana counties in the **Environments** window.
6. Finally, choose **MEAN** for the statistics type (or another type if you prefer).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