Counties are not local economies: almost all counties have significant economic ties to adjacent counties. The two most widely used methods of aggregating counties into local economies are the Core-based Statistical Area (CBSA) and the Consolidated Statistical Area (CSA). The former method (CBSA) identifies local core counties and then identifies the surrounding counties that are strongly economically tied to the core. Commuting data provides the information used to identify the ties. The latter method (CSA) combines adjacent CBSAs that have significant ties with each other.

CBSAs are intended to represent urban regions – either metropolitan areas or micropolitan areas. But rural counties also have significant ties to other counties, and some economists prefer to work with Commuting Zones (CZ), in which every county in the country is assigned to an economic area.

Open ArcCatolog and ArcMap, as you did last week, and then go to the directory *s:\teff\450\2020\arcview2* and select the following shapefiles:

- cnty49.shp (US counties in lower 48 states + DC)
- jtwmax2.shp (principal outward commuting flow among nearby destination counties)
- commzone.shp (commuting zone derived from above)
- popmax2.shp (principal inward population migration flow among nearby source counties)
- popzone.shp (local area derived from population migration flow)
- tl_2017_us_state.shp (US state boundaries)
- tl_2017_us_csa.shp (Consolidated Statistical Area boundaries)
- tl_2017_us_cbsa.shp (Core-based Statistical Area boundaries)

Check the box next to *jtwmax2* and *commzone* so that they are the only shapefiles displayed (put *jtwmax2* on top).
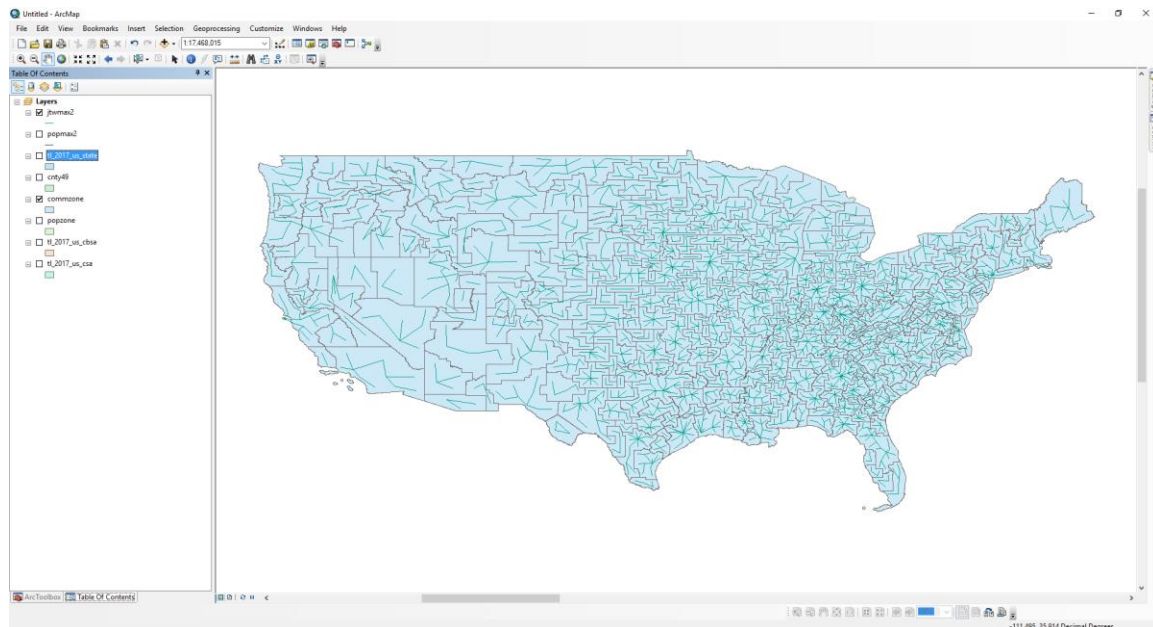
Double click on the *jtwmax2* to open layer properties. This layer is a line shapefile, and one can apply a large number of patterns to lines.
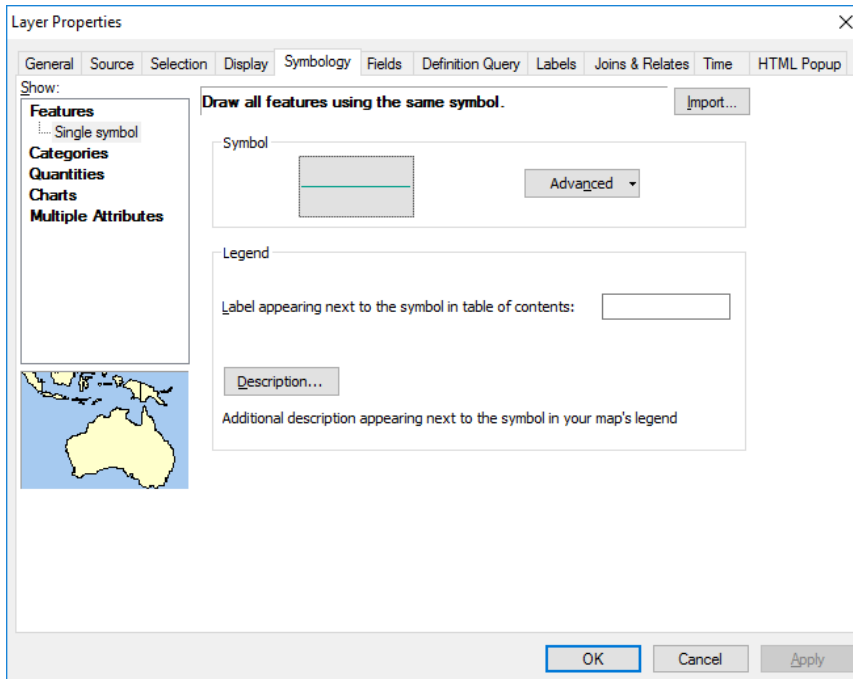
In this case, it would be appropriate to format the lines as arrows, since they represent the flow of commuters from county of residence to county of work. Click on the Symbol box to bring up the Symbol Selector window. Scroll down to the bottom of the set of symbols until you reach the arrows. Selecting one of the arrows that point to the "right" will give the correct direction.
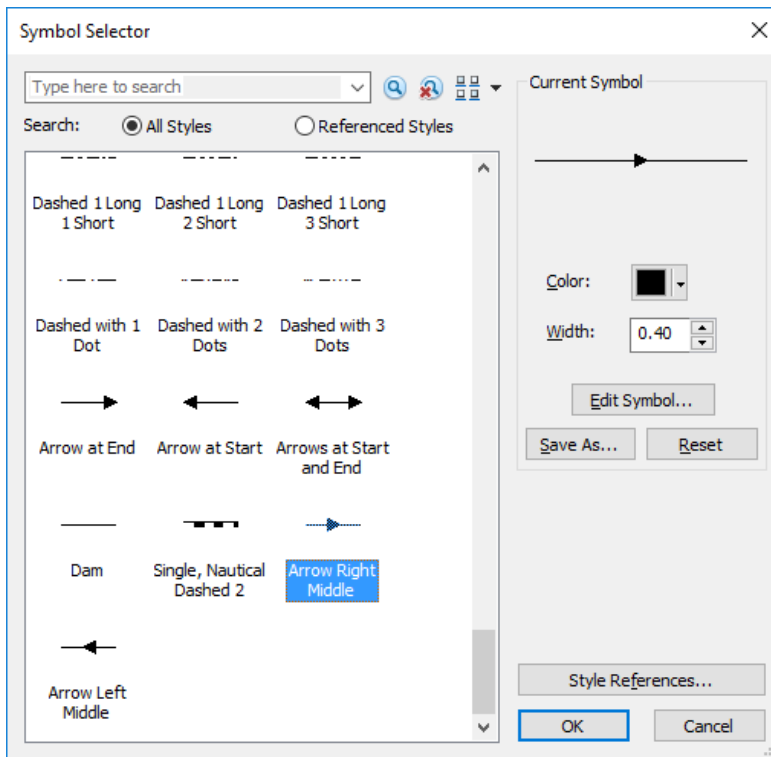
Zoom into our region. Make sure the *cnty49* layer is just below the *commzone* layer, and turn on the labels for the counties. We want to make the *commzone* layer semi-transparent, so that we can see through it to the counties it contains. Follow these steps:

1. On the main menu click Customize > Toolbars > Effects.
2. Click the layer drop-down arrow and select the layer that you want to appear transparent (*commzone*).
3. Click the Adjust Transparency button. and drag the slider bar to adjust the transparency (higher numbers mean greater transparency – about 25% is good).
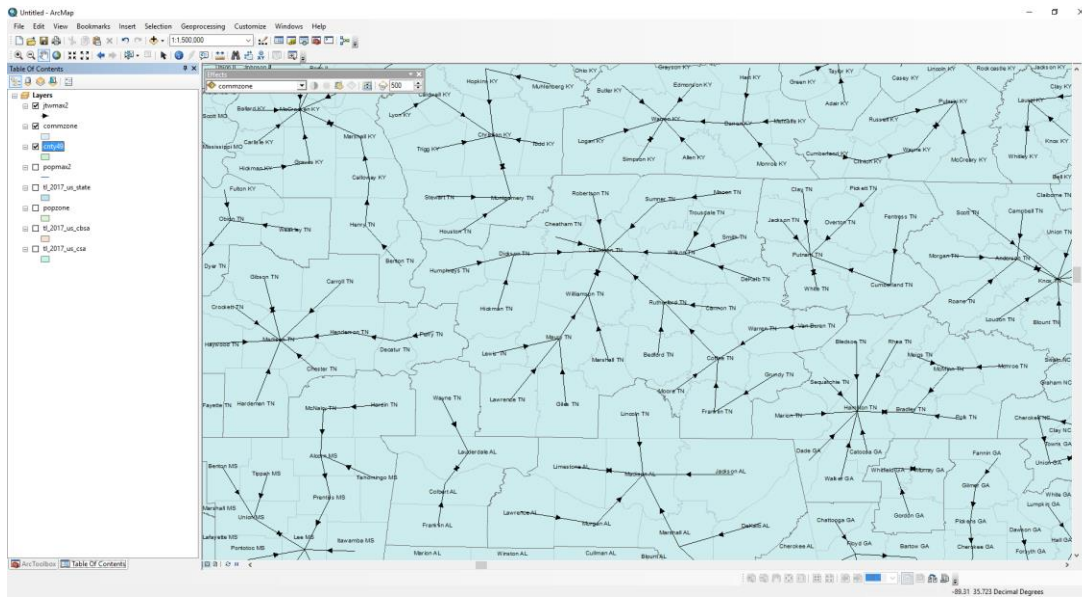
We can also make the commuting zones differ from each other in color. Click on the Table of Contents entry for commzone to open Layer Properties. Select Categories > Unique values, and then select "cols" for the value field. Then click Add All Values.
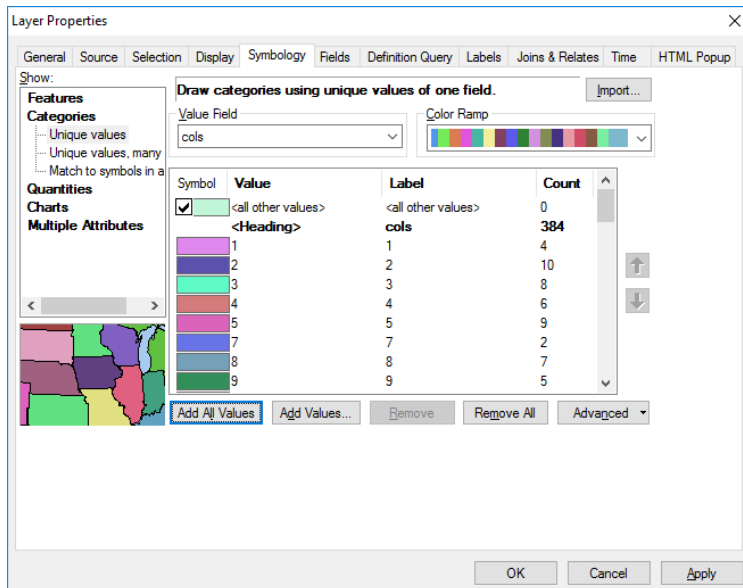
The resulting image should give a clear idea of the commuting zones in our region. Note that we are in a commuting shed where the outward flows ultimately terminate in Davidson TN. But note also that Davidson TN's largest outward flow is to Williamson TN.
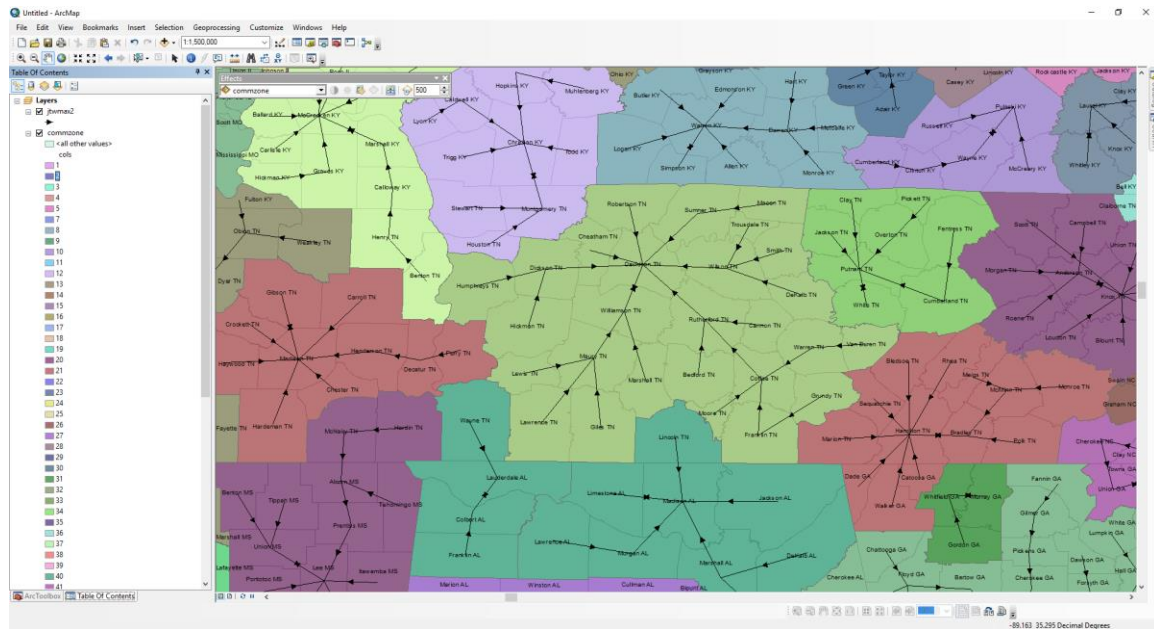
In class exercise: repeat the above sequence of actions to view the major inward population flows (*popmax2*) and the resulting population zones (*popzone*).

Homework: Copy the file *s:\teff\450\2020\arcview2\bea30.xlsx* to your own directory and save it in Excel 97-2003 Workbook format (so that it has extension *xls*). Join the *data* worksheet in the file to the *cnty49* layer, using *geoid* as the name of the join field in both files. The data come from the Bureau of Economic Analysis (BEA), and constitute the best annual estimates of income for states and counties. The *description* worksheet gives the "line numbers" for the variable names, which take the form x[line number]_[year]. The two years given in the data are 1998 and 2018.

Focusing on some subregion of the country, show how some of these variables are distributed geographically, within commuting zones or population zones or CBSAs. Try to find interesting patterns, and try to make maps that transmit a clear message. Each group should produce five maps for presentation, in a Power Point, next week.

Hierarchical Relationship of Geographic Entities

AIANNH: American Indian, Alaska Native, and Native Hawaiian area
AITS: American Indian Tribal Subdivision
ANRC: Alaska Native Regional Corporation
BG: Block Group
CD: Congressional District
CBSA: Core Based Statistical Area (Metropolitan and Micropolitan Statistical Areas)
SLD: State Legislative District
TAZ: Traffic Analysis Zone
UA: Urban Area
UGA: Urban Growth Area
VTD: Voting District
ZCTA™: ZIP Code Tabulation Area