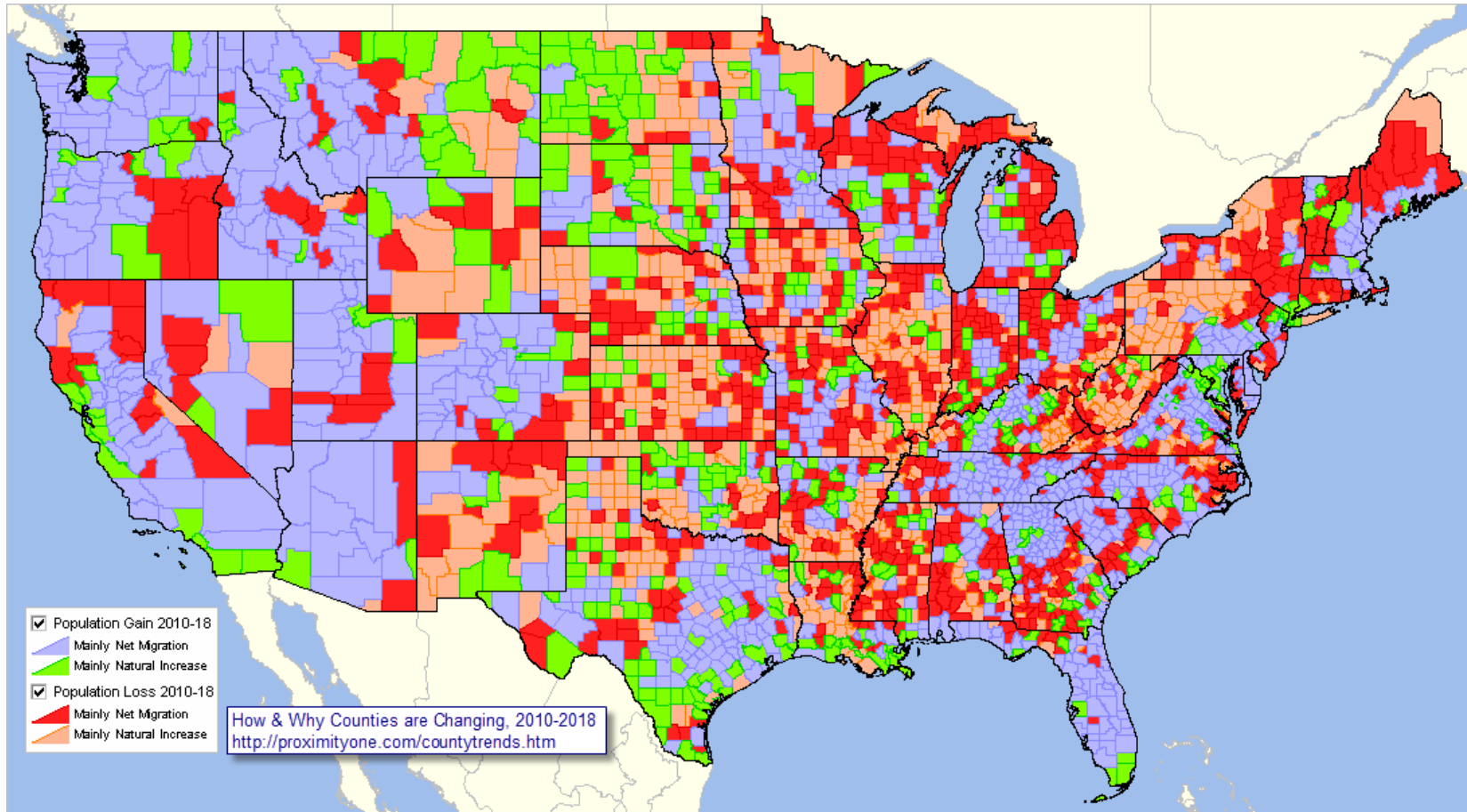# Geographic Information Systems & Decision-Making

How & Why are County Demographics Changing?
… gain insights immediately using maps like this.

Population Gain 2010-18
  Mainly Net Migration
  Mainly Natural Increase
Population Loss 2010-18
  Mainly Net Migration
  Mainly Natural Increase

How & Why Counties are Changing, 2010-2018
http://proximityone.com/countytrends.htm

This document located at http://proximityone.com/aboutgis.pdf
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Geographic Information Systems & Decision-Making

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This document may be viewed with any device that can read a PDF.

Most graphics in this document are clickable and either expand in size or open new related Web pages.

Contact us by Web or call (888)364-7656

Topics

- What is a GIS ?
- Why would you use one?
- What data can you show in a GIS?
- How does a GIS work?
- What do you use a GIS for?
- How decision-making can benefit from using GIS.
- Examples of GIS queries.
- Illustrative GIS & decision-making application.

Viewing changing geography (over time) and geographic relationships (metro to county)

Charlotte-Concord-Gastonia, NC-SC MSA
  - 2013 green boundary
  - 2010 black boundary/hatch pattern
 - state blue boundary; counties labeled
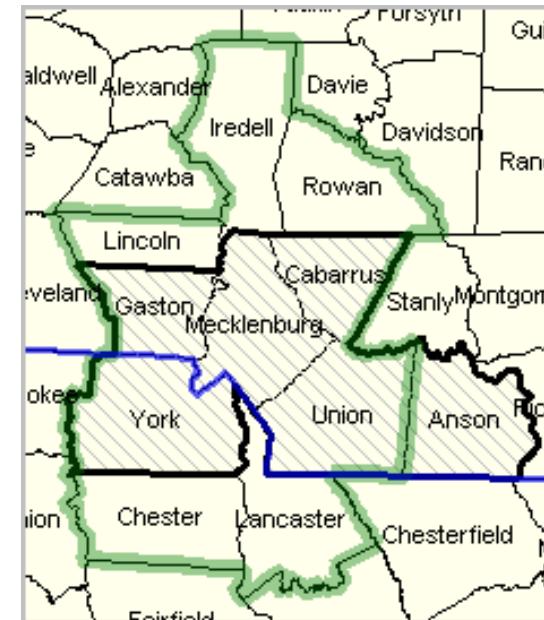
What is a GIS ?

- GIS = Geographic Information System
- A software application that lets you view data in different types of maps.
- GIS applications combine subject matter data with geographic data.
  - Geographic data example: county by census tract boundary file (shapefile; graphic below left)
  - Subject matter example: demographics by census tract (graphic below right)
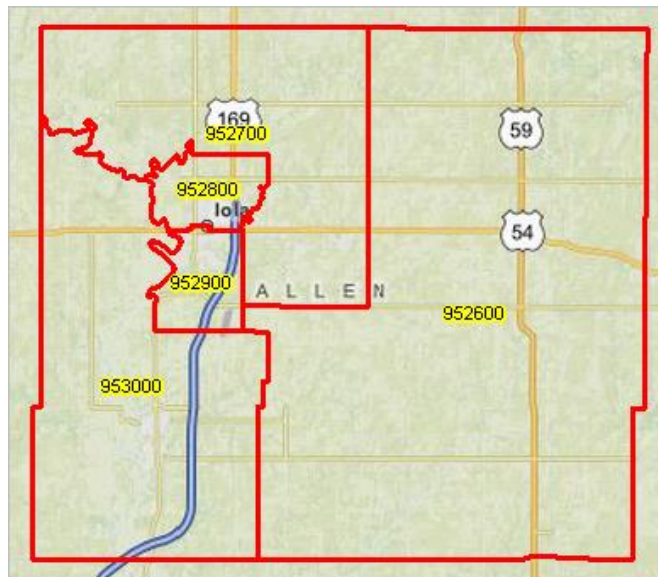
STATE	COUNTY	TRACT	GEOID	STAB	MSAMD	P2010	D0
20	001	952900	20001952900	KS	99999	2367	
20	001	952700	20001952700	KS	99999	2174	
20	001	952800	20001952800	KS	99999	3999	
20	001	953000	20001953000	KS	99999	2820	
20	001	952600	20001952600	KS	99999	2011	

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GIS Software Can Link Subject Matter & Geography

- Once the subject matter data are integrated with the geography (shapefile), the GIS software can show/display a thematic pattern map.

- The map at right shows census tract boundaries (red), census tract label (yellow), the subject matter data as a label (white, total population) and median household income as a color pattern (see color pattern in legend at left of map view).

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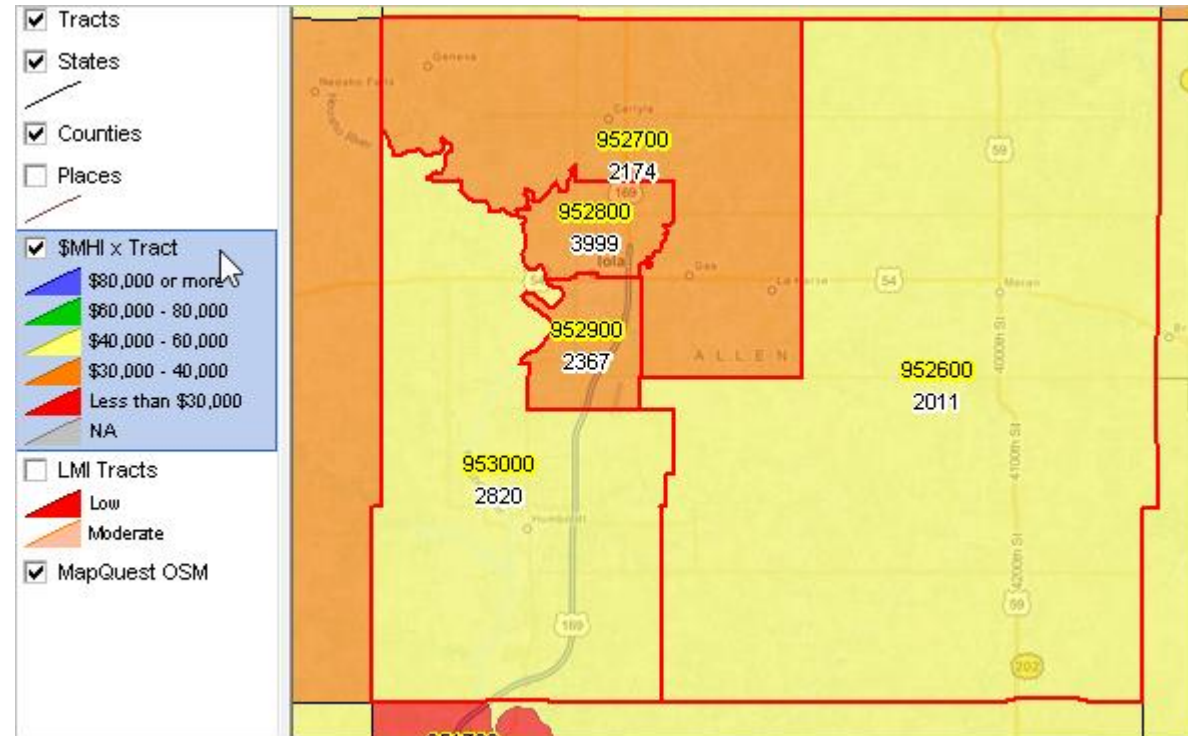
Why would you use a GIS?

- Powerful presentations of data that communicate meaning in visual images

    … a picture is worth a thousand words!

- Gain the ability to physically aggregate data by geographic areas.

- Drill down from geographic displays into more detailed business data.

- Perform geospatial analysis: relating different types of geography.

- Integrate your business specific data.
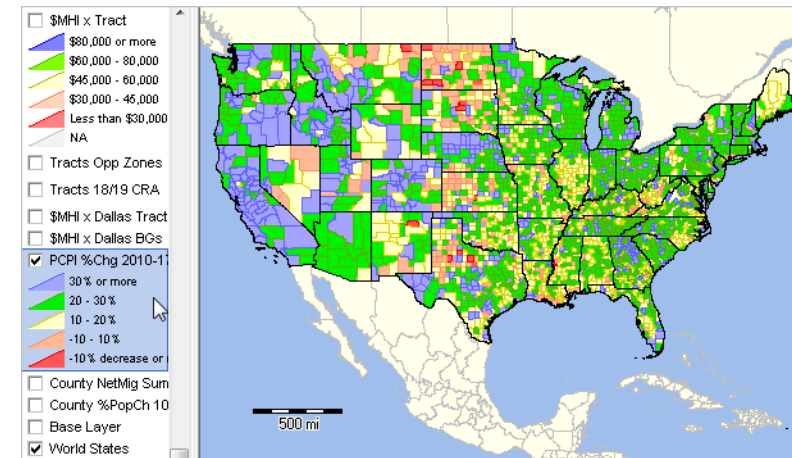
Per capita personal income (PCPI) %change 2010-2017 by county

Above view developed using US1 GIS Project
Create your own variation of this view using CV XE GIS.
Run CV XE GIS installer. No fee Requires User Group ID.
When project opens, navigate to above view in legend panel.

Why Use ... Geospatial Analysis

- Relating [urban areas](#) (UAs) to towns

- View at right shows Connecticut urban areas with red boundary and cross-hatch pattern and UA name (white label: Hartford, CT).

- View also shows Connecticut towns with bold black boundary and town name (yellow labels).

- It is easy to see how these geographies relate.

- For example, the area at pointer shows that part of South Windsor in not in a UA.

View at right can be developed using [US1 GIS Project](#)
Create your own variation of this view using [CV XE GIS](#).
Run [CV XE GIS installer](#). No fee. Requires User Group ID.
Join in a no fee [Data Analytics Web Session](#) to see how to create this view
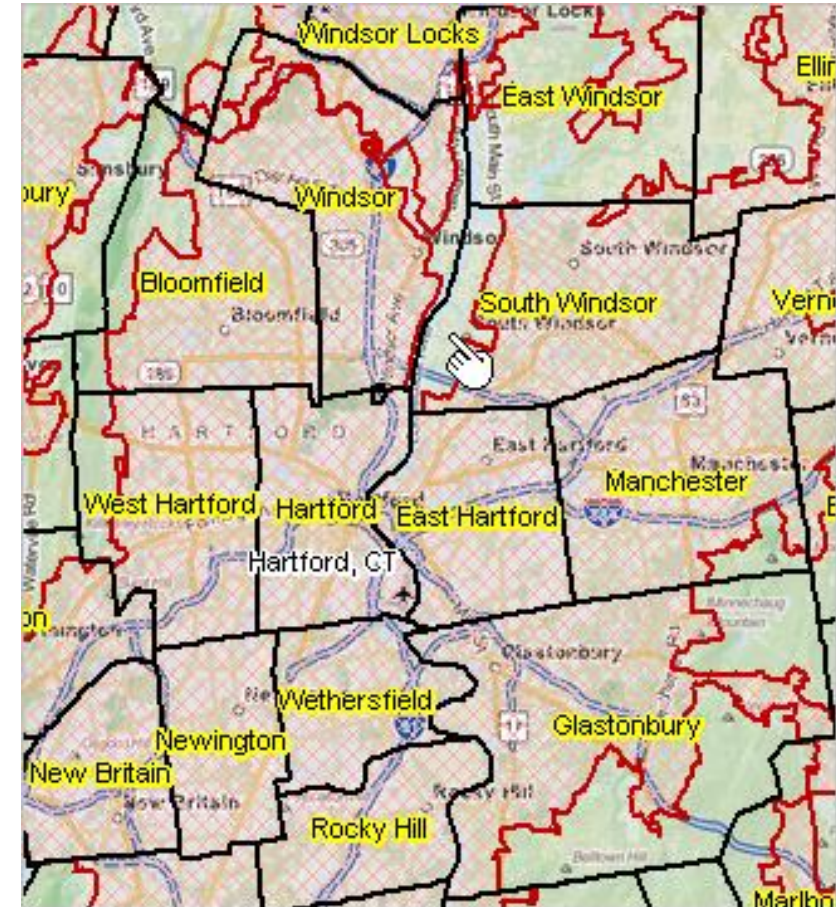
What data can you show in a GIS?

- Virtually any data you can count, measure, or calculate – provided the data is associated with a location

- Dollars – income, rent, expenses, sales

- Business units - buildings, leases, cars, etc.

- Demographics - population counts (people, employees, customers, students, etc.) and related statistics

- Physical dimensions - square footage

- View at right shows ZIP code (85258, bronze fill pattern) intersecting with census tracts (green boundaries and geocode label).
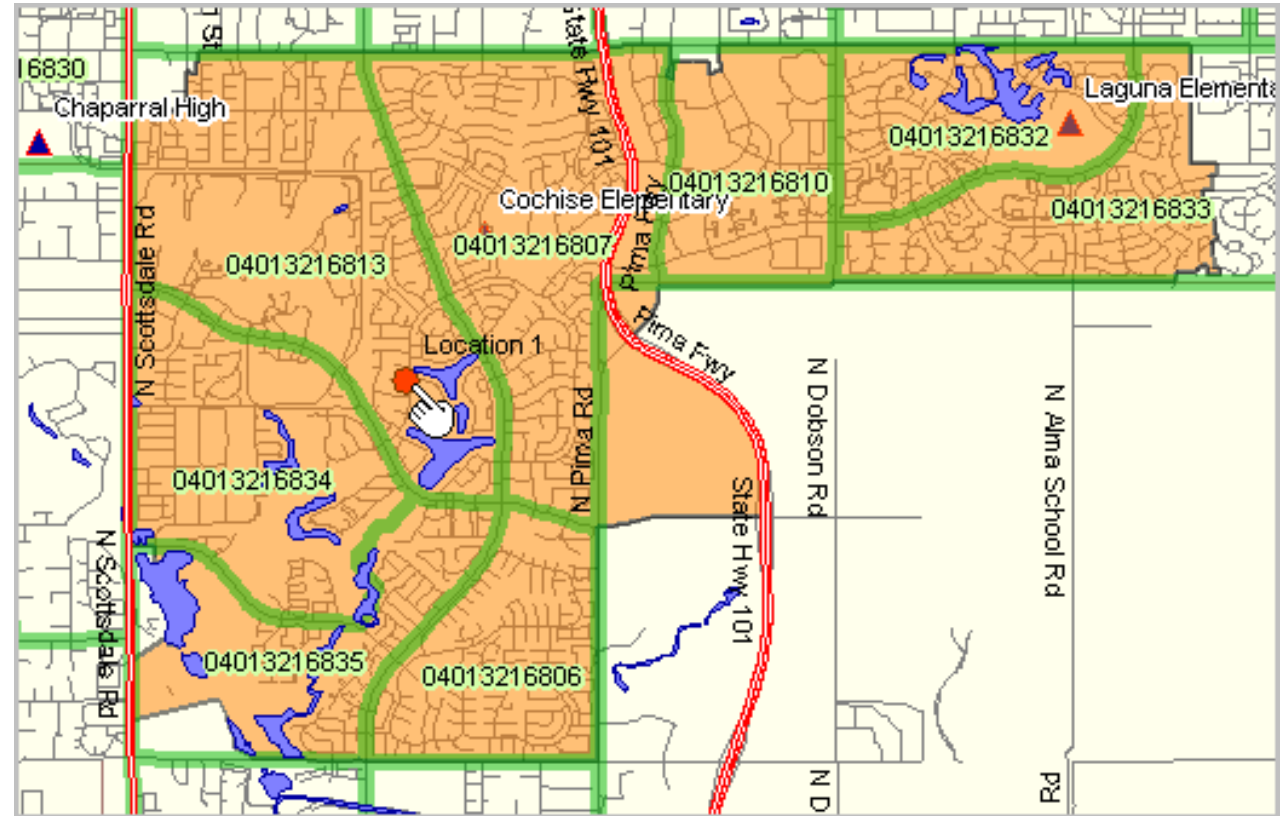
How does a GIS work?

- Combines subject matter data and geography
- Business information tagged with locations
  - Typically mailing address or longitude/latitude
- Database of geographic areas (polygons)
  - States, Counties, Cities, Regions, Metros, ZIP Codes, census blocks
  - Boundary details needed to define maps (shapefiles)
- Database of geographic features
- Roads, rivers, lakes, etc.
- View at right shows census blocks (red boundaries) overlayed on OpenStreetMap.
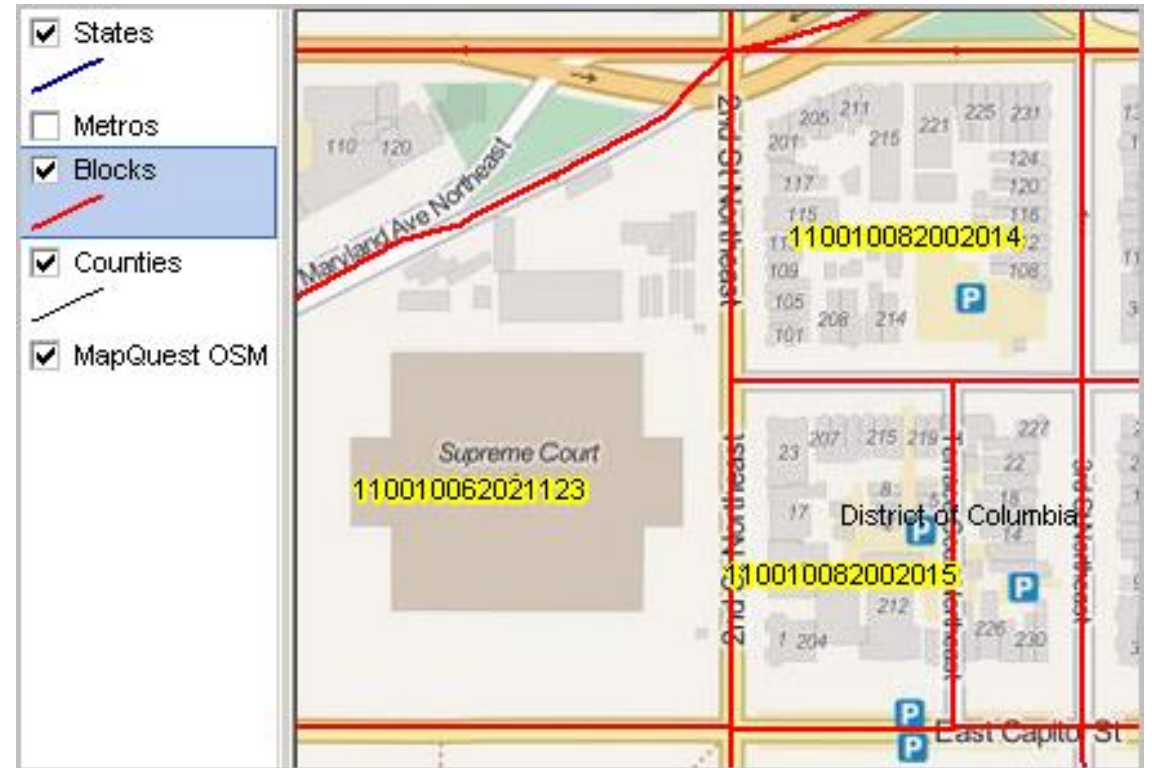
Thematic Pattern Views: Geographic Areas

San Diego, CA vicinity

- How do patterns of economic prosperity vary by neighborhood?

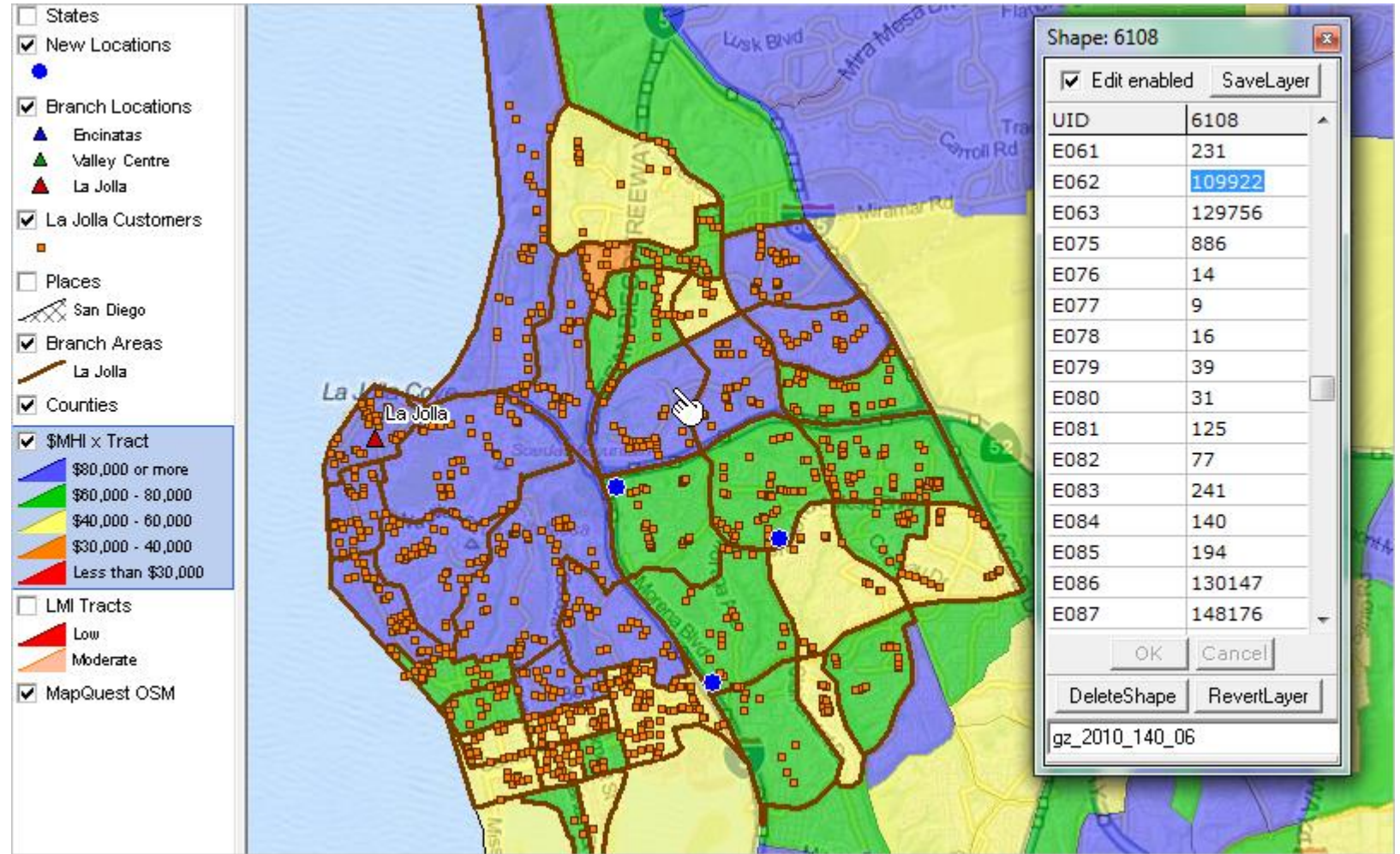- Census tracts by median household income

Use no fee San Diego US1 GIS Project
  to develop view at right.
Create variations using CV XE GIS.
Run CV XE GIS installer. No fee.
  requires User Group ID.
Usage support
  ... join in no fee Data Analytics Web Session

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# Combining Point, Line & Polygon Geography

San Diego, CA vicinity

- GIS application showing illustrative bank branch locations (markers/points), bank branch service areas (solid fill pattern polygons), San Diego city area (cross-hatched fill pattern)

- "Layers" showing in map window that are checked in legend panel

- This view discussed more in applications section in later sections.

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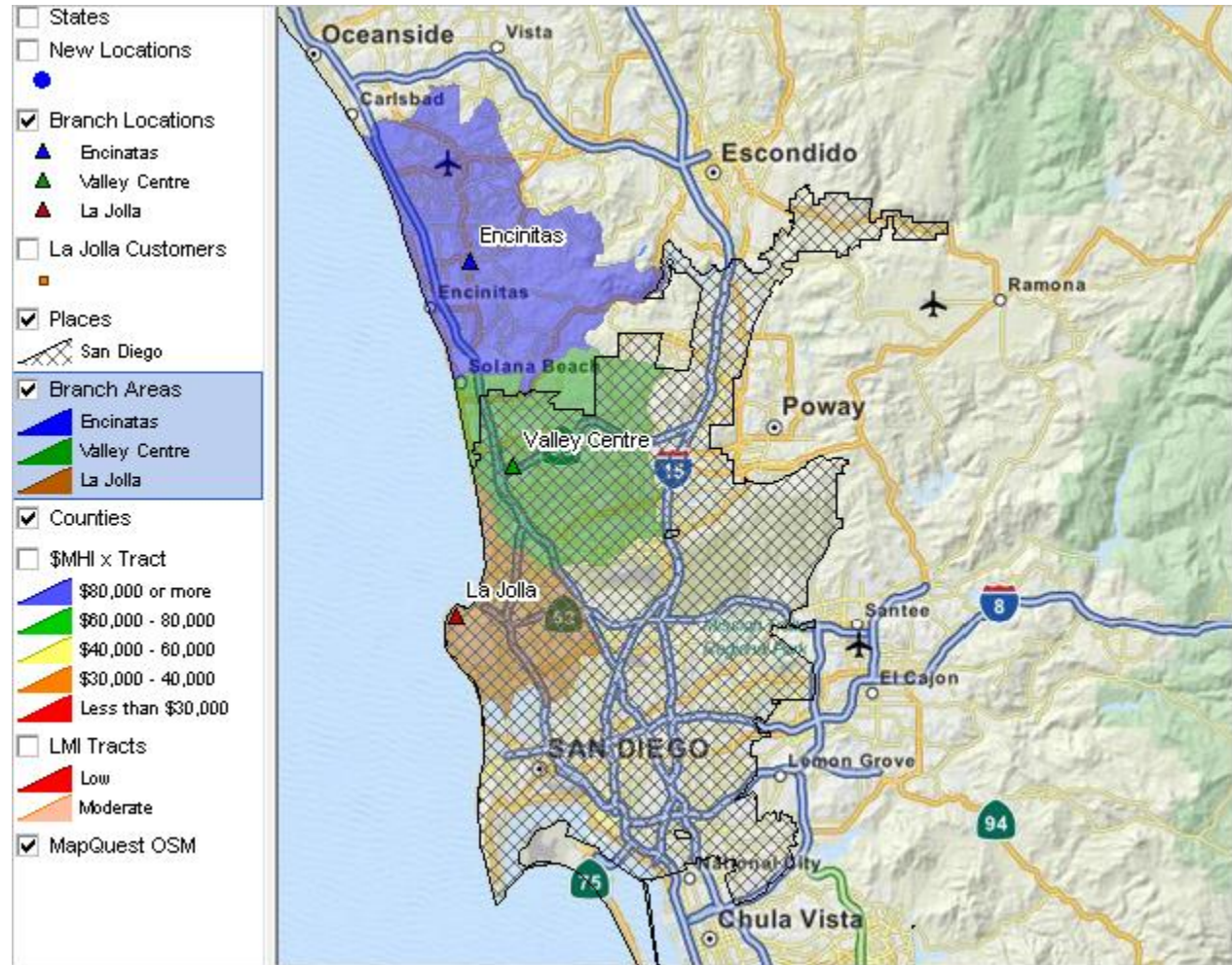
How does a GIS work (cont'd)?

San Diego vicinity

- Locate/show business data on various types of map displays, such as thematic and point density.

- Thematic displays are colored by area

- Colors are used to display the ranges of data values

- Show patterns in data at levels such as region, state, county, metro, zip code

- These topics discussed more in later applications sections.
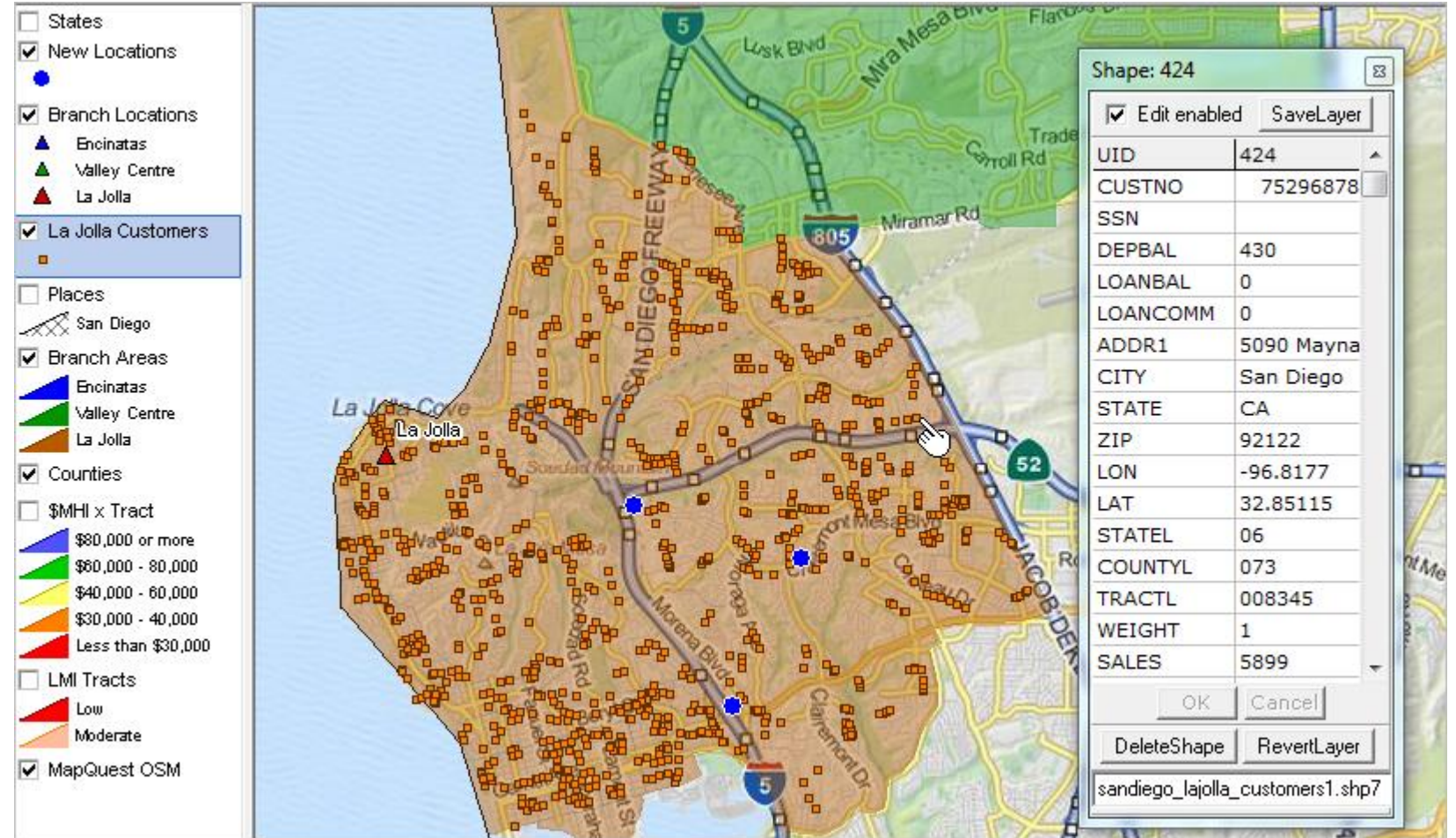
How does a GIS work (cont'd)?

- Point density displays show the actual spatial distributions of data on a map. The view at right shows customers as points/markers.

- Points can be colored or sized according to selected data values

- Points can be shown on maps with geographic features (roads, rivers, boundary lines, etc.)

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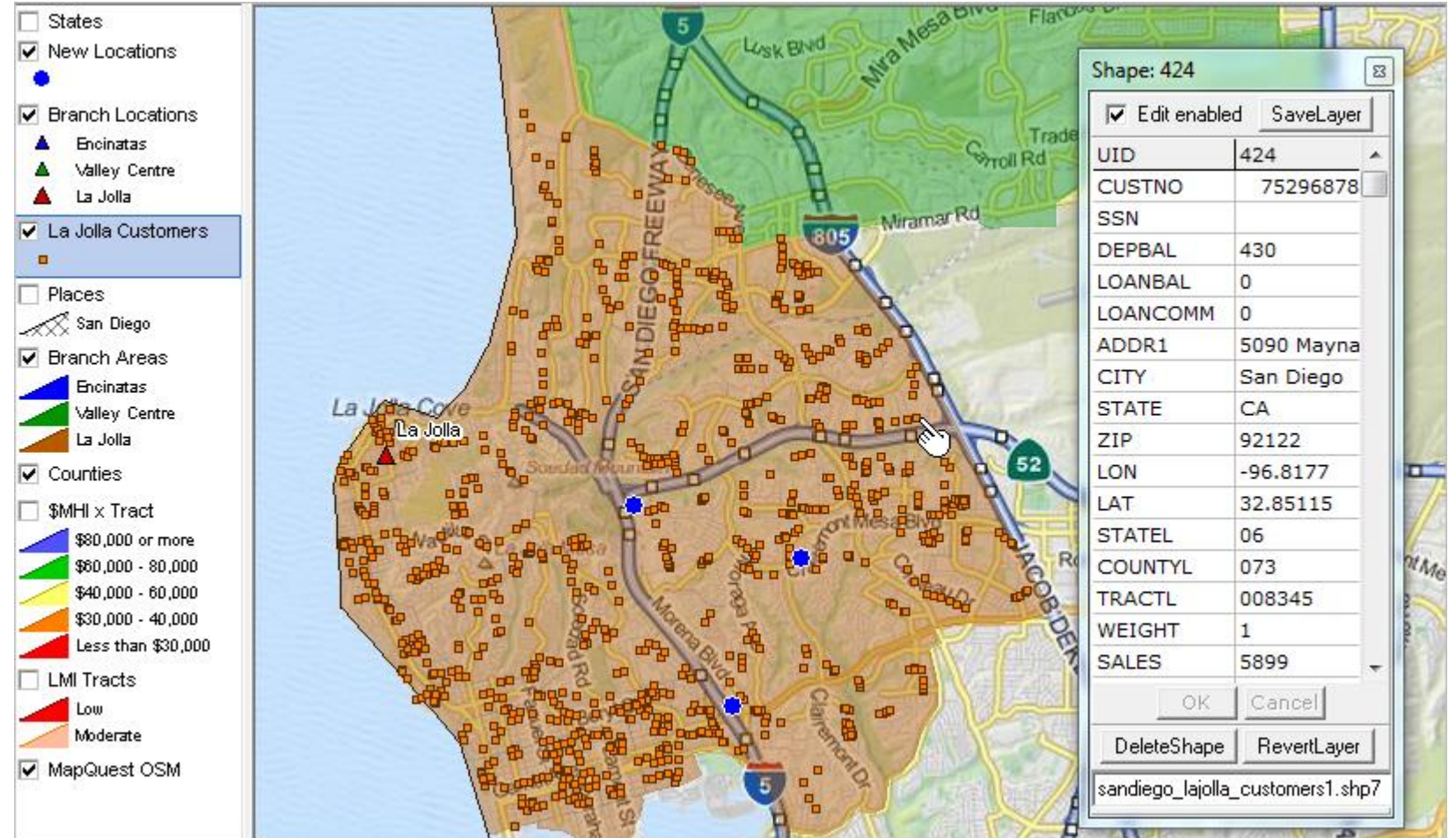
How does a GIS work (cont'd)?

- GIS layers allow users to change displays without revising the data
  - Show any desired boundaries or features
  - Alter data ranges, legends, colors, etc.
  - View at right shown by changing attributes of Branch Areas layer and then "clicking on" $MHI by tract layer (relative to previous slide view).

- Powerful Zoom and Drill Down Features
  - Go from national/regional to individual points
  - Drill down to granular data underlying all points and areas

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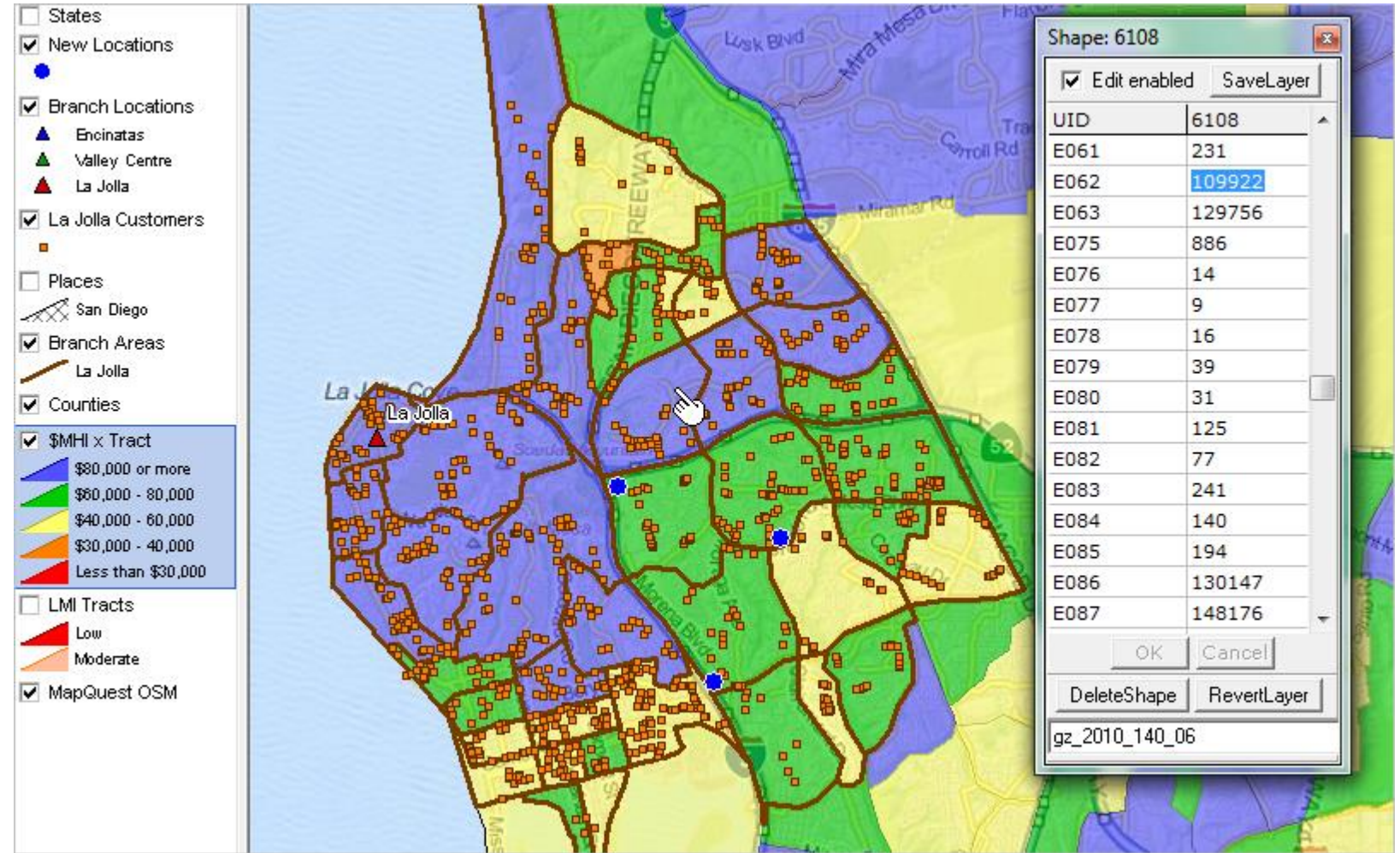
What can you use a GIS for?

- Making visual comparisons of data among geographic areas

- Identifying and analyzing trends in data

- Creating powerful business presentations that can rapidly convey complex ideas

- Developing business graphics for reports, manuals, etc.

- View at right shows patterns of linguistic isolation by block group geography
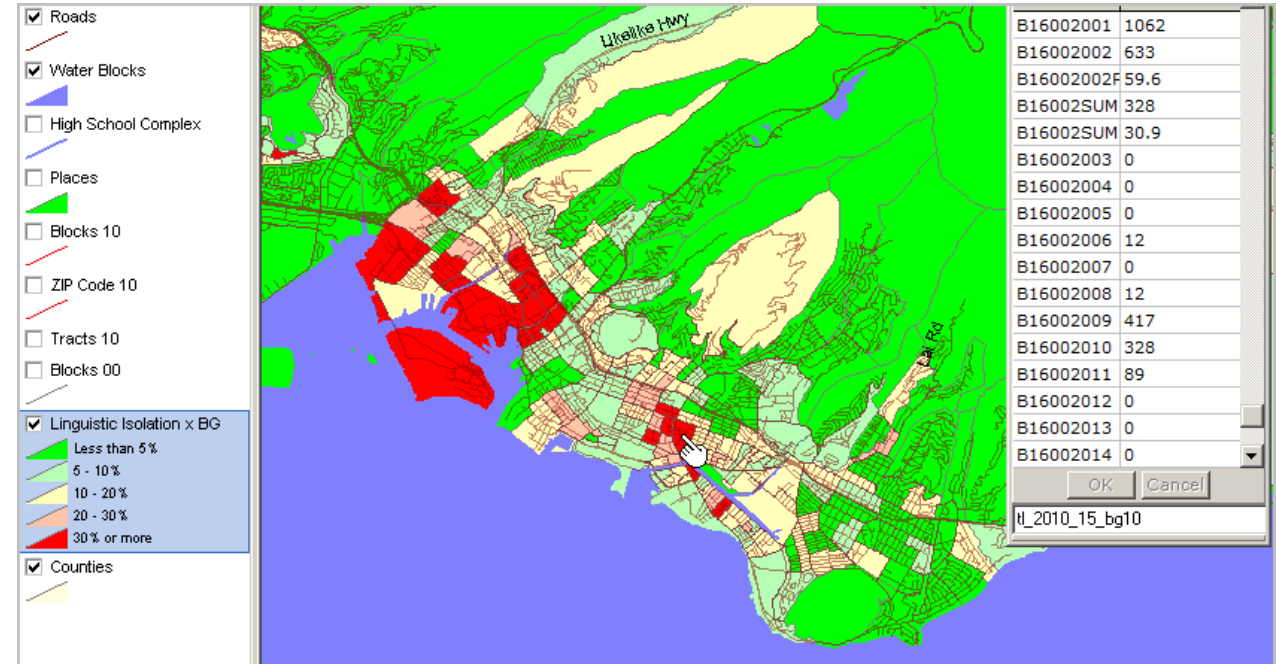
How decision-making can benefit from GIS

- Program staff are better empowered to perform market research and analysis

- Sales and marketing staffs can examine customer information by location

- Regional management can more easily assess business operations, trend analysis

- National management can better perform program oversight and undertake comparative analysis

- View at right shows patterns of economic prosperity by census tract within congressional districts – depicting constituent composition and needs

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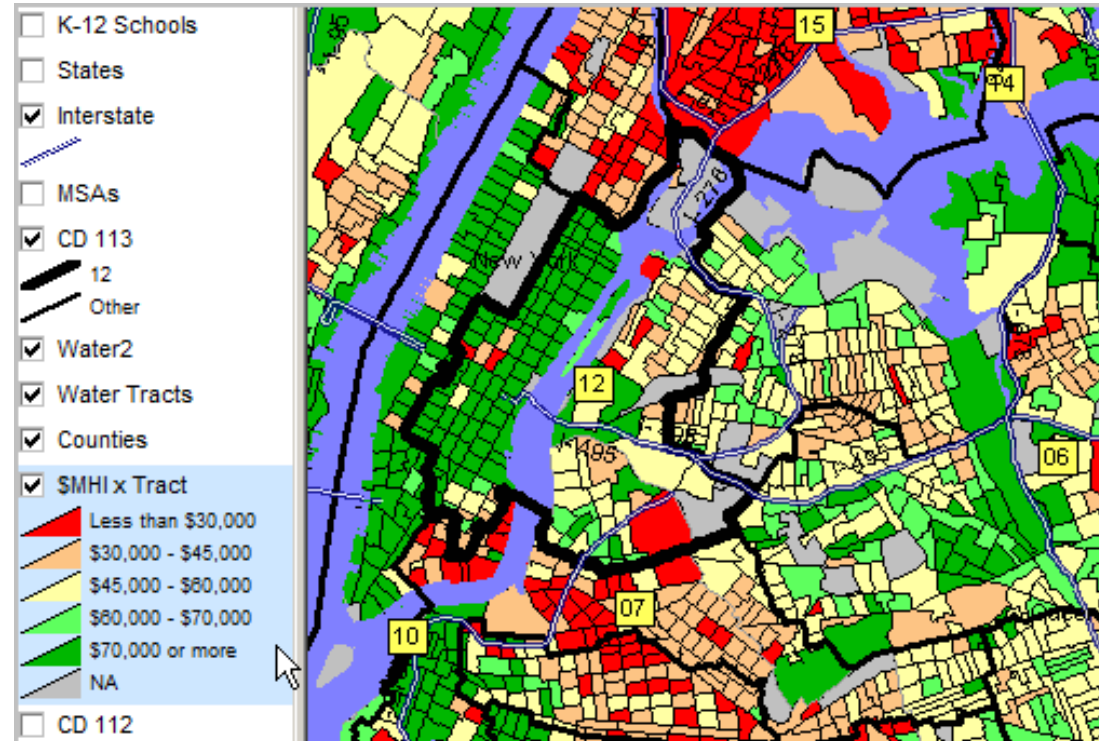
Examples of GIS queries

- Identifying areas with high densities of customers

- Searching for high and low revenue areas

- Finding locations with decreasing or increasing revenues

- Pinpointing "soon to expire" contracts or purchasing arrangements

- Examine revenue contribution by source

- Examine expenditure pattern by use

- Assess geographic data distribution for a specific customer or application

- View at right shows layer editor queries used to set median household income intervals

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http://proximityone.com
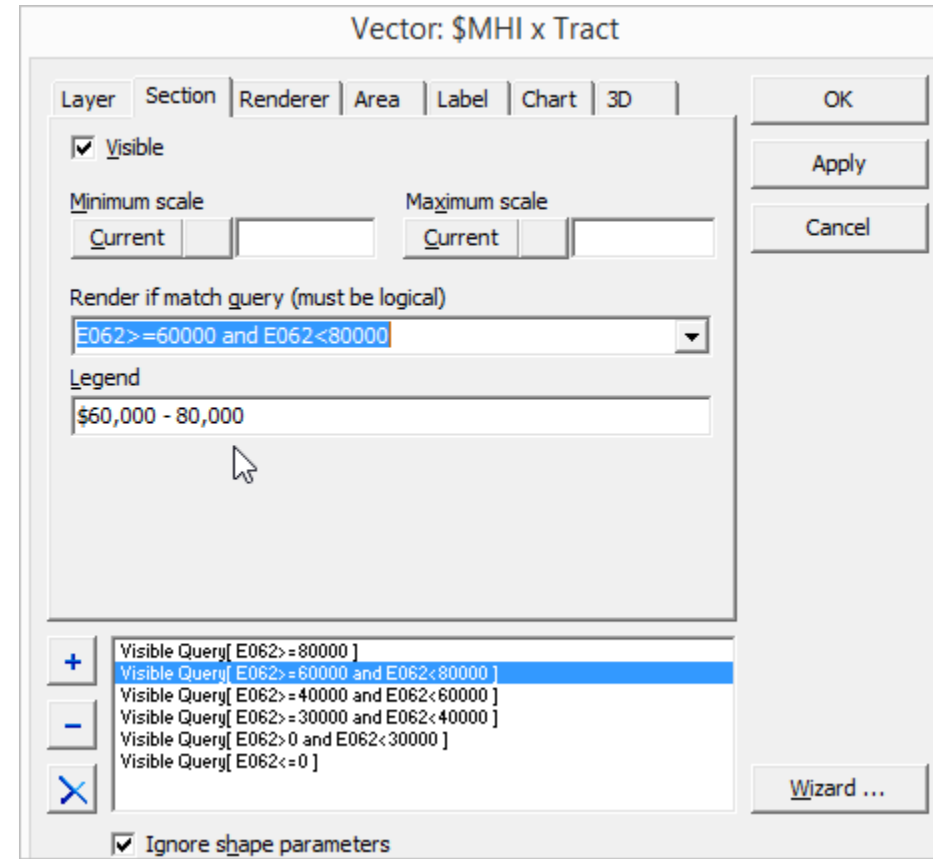
Illustrative GIS Decision-Making Application

- Examining alternative new bank branch locations

- Add layers separately developed
  - Branch locations (point shapefile)
  - Branch service areas (polygon shapefile)
  - Customers for La Jolla branch service area (point shapefile)
  - Possible new bank branch locations

- Graphic at right shows start-up view; three bank branch service areas, bank branch locations, OpenStreetMap base layer
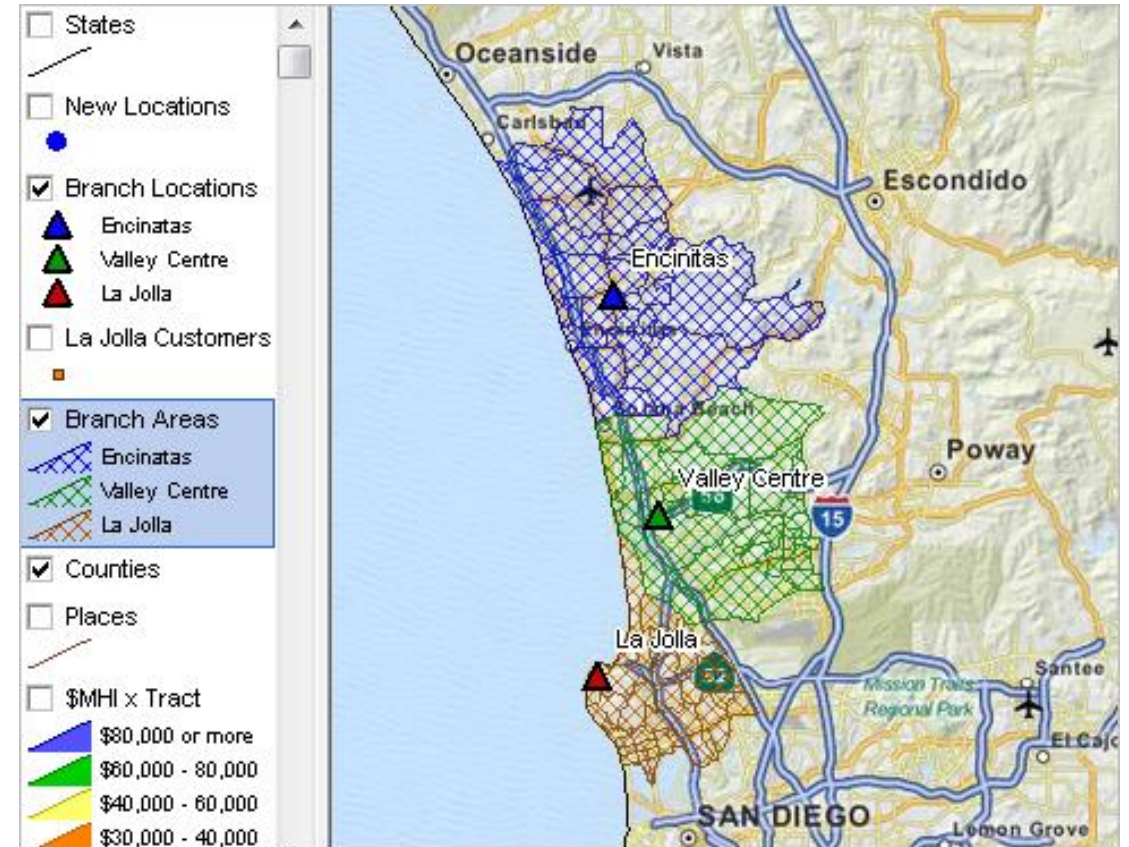
Examining ... viewing lay of the land

Layers added

- Branch locations (point shapefile)

- Branch service areas (polygon shapefile)

- Customers for La Jolla branch service area (point shapefile)
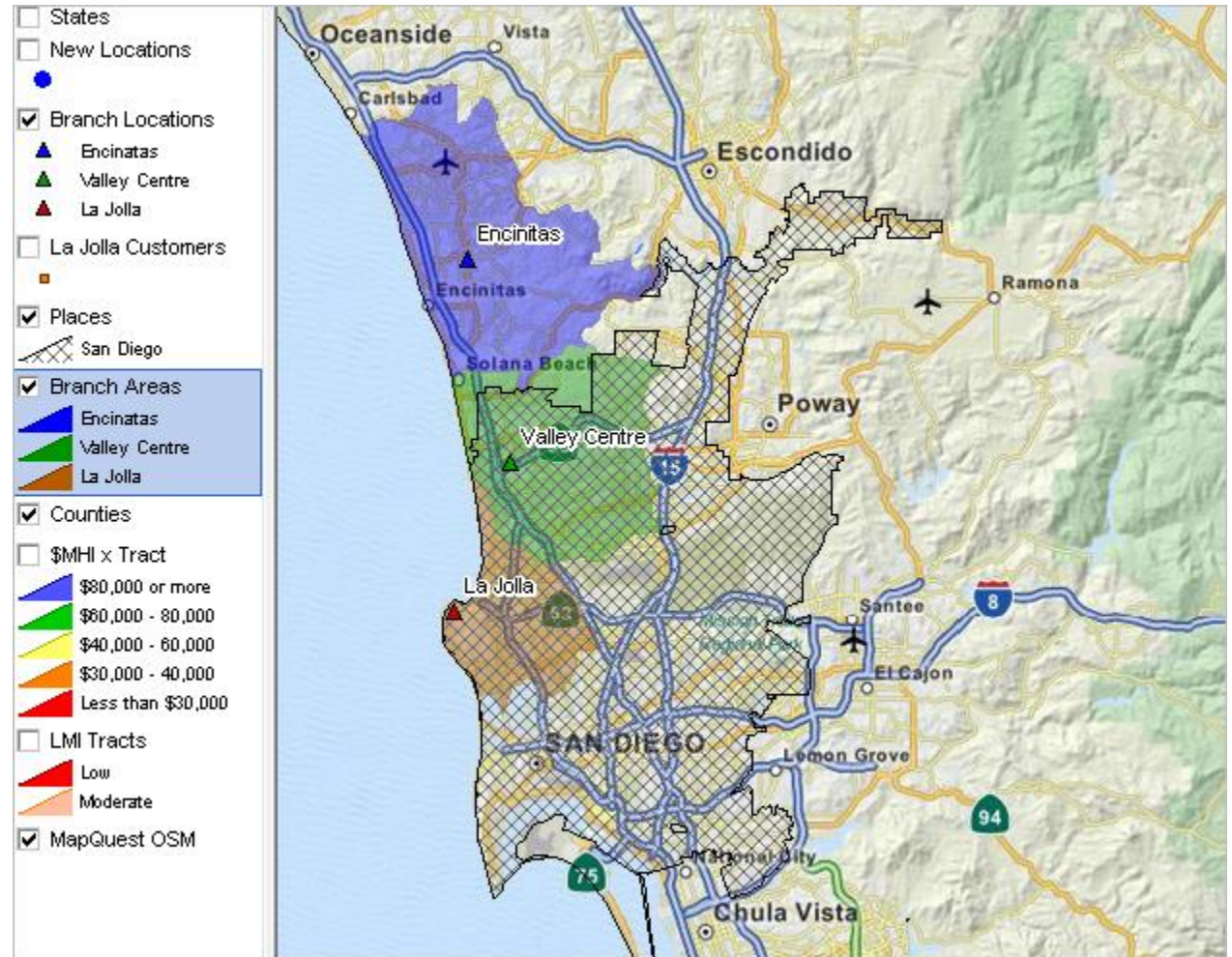
- Possible new bank branch locations

Use no fee San Diego US1 GIS Project
 to develop view at right.
Create variations using CV XE GIS.
Run CV XE GIS installer. No fee.
 requires User Group ID.
Usage support
 ... join in no fee Data Analytics Web Session

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# Examining … how are customers distributed?

Zoom-in View

- Shows customers for La Jolla branch service area (orange/brown fill pattern)

- Use of select/identify tool to view mini-profile for one customer (see pointer)

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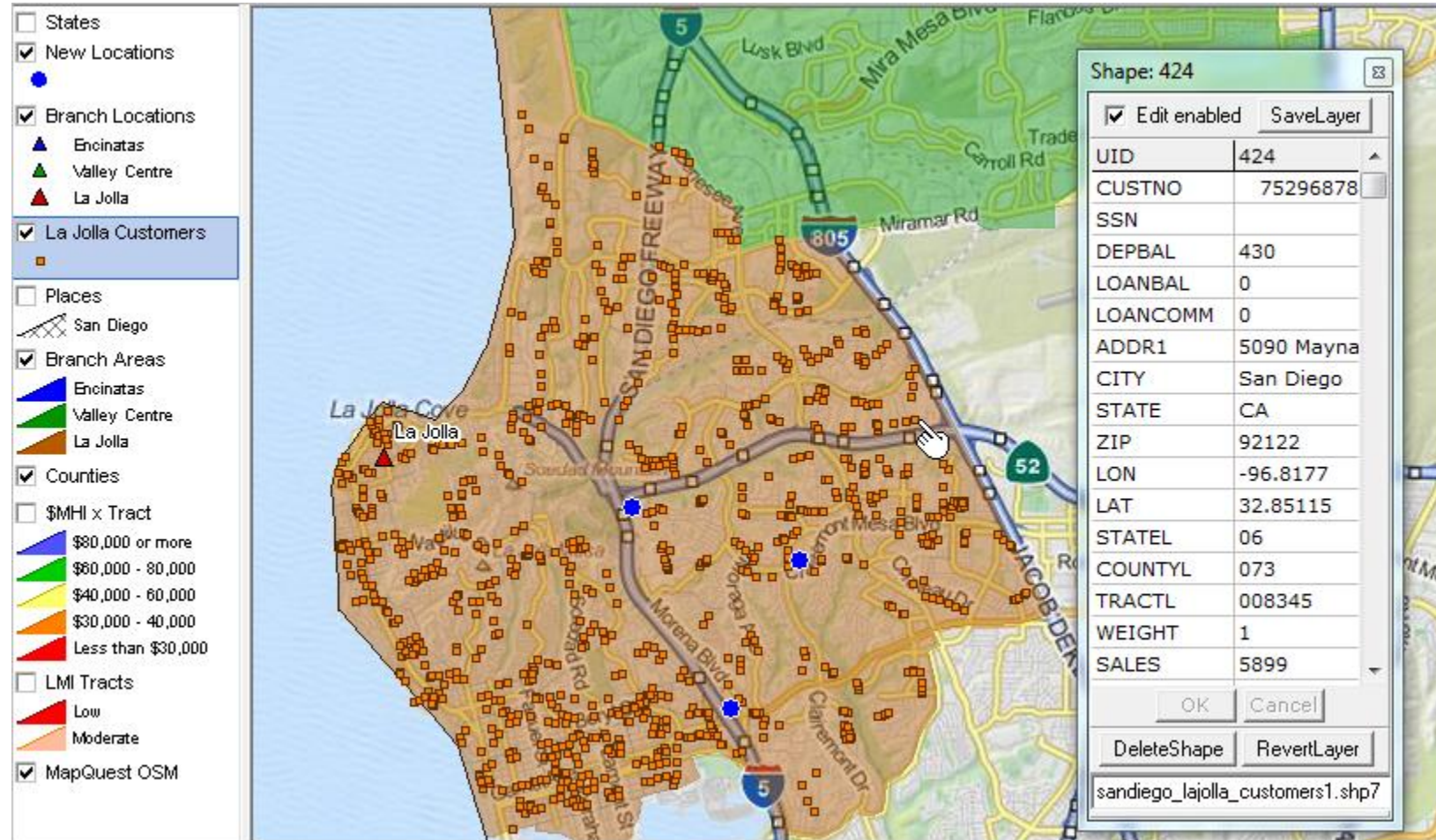
# Examining … what are economic characteristics by tract?

Tract Patterns $MHI

- $MHI: median household income (field E062 in profile … $109,922)

- Shows customers for La Jolla branch service area

- Use of select/identify tool to view mini-profile for one tract (see pointer)

- In selected tract, median household income (field E062 in profile … $109,922)

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http://proximityone.com
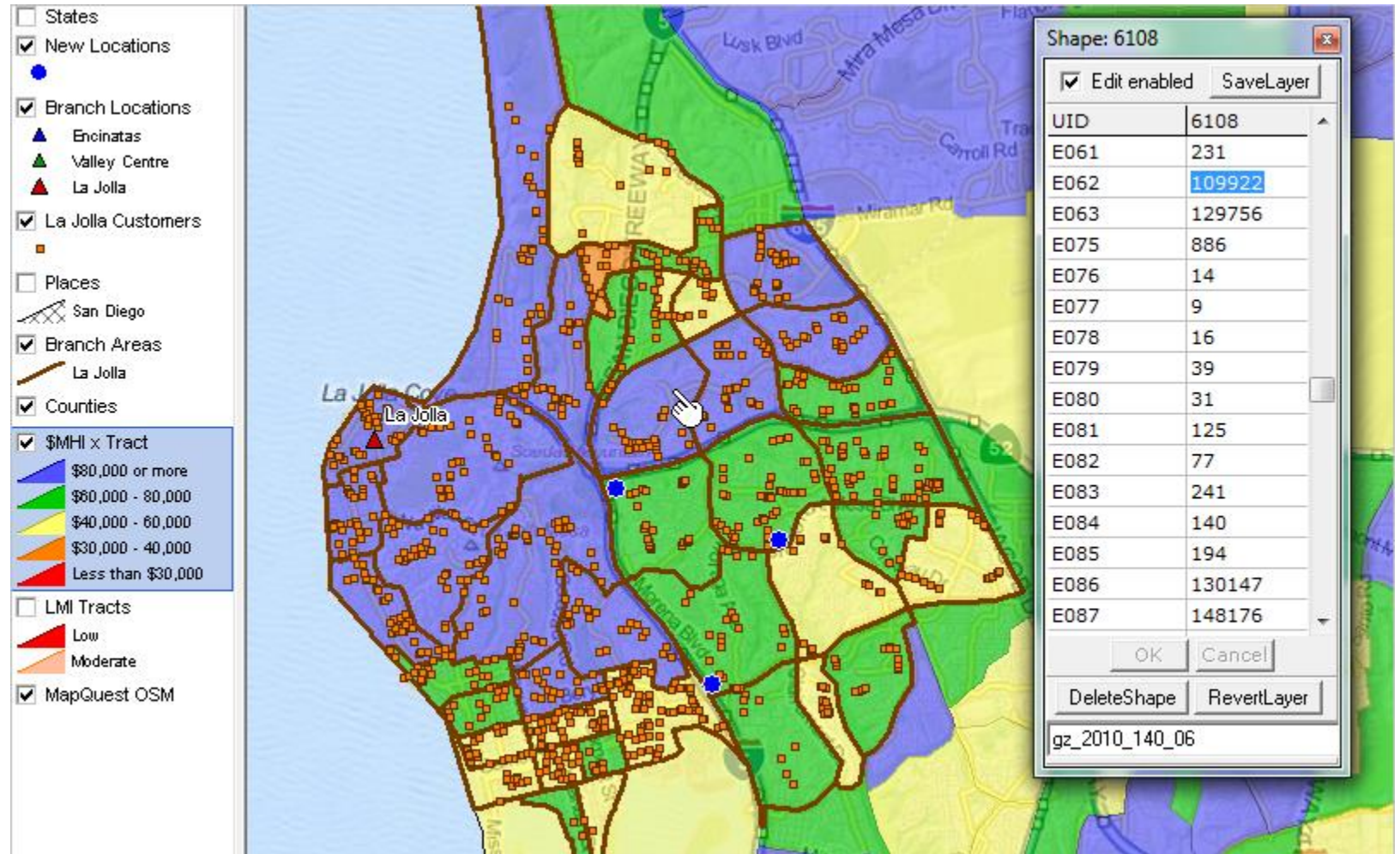
# Examining … using site analysis tools: customers

How many customers?

- View shows new bank branch location options (blue dots)

- How many customers are within 1 mile of a location (see circle)?

- There are 58 customers of a selected customer type (see count at right) Selected customers shown with cross-hatch in map view.

- More about Site Analysis.

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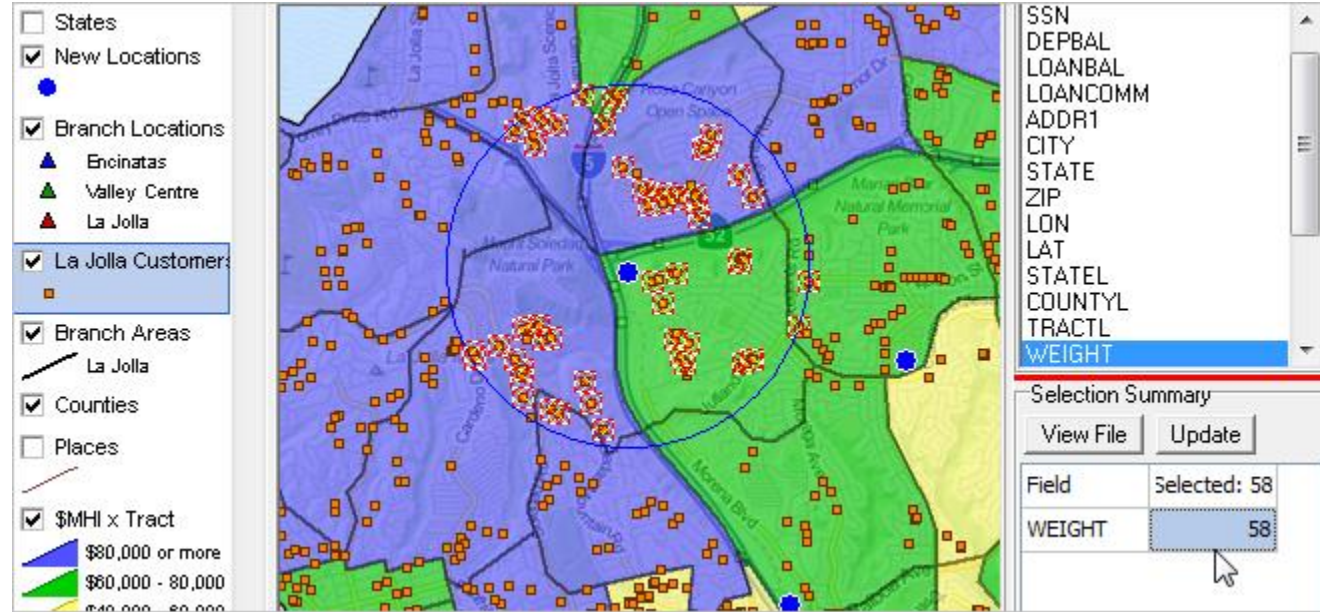
Examining ... using site analysis tools: customer potential

How many potential customers at new locations; sales/income potential?

- View shows new location options (blue dots)

- What is the population in tracts within 1 mile of a location (see circle)?

- 50,000+ total population in this area (see count at right) Selected tracts shown with cross-hatch.

- More about Site Analysis.

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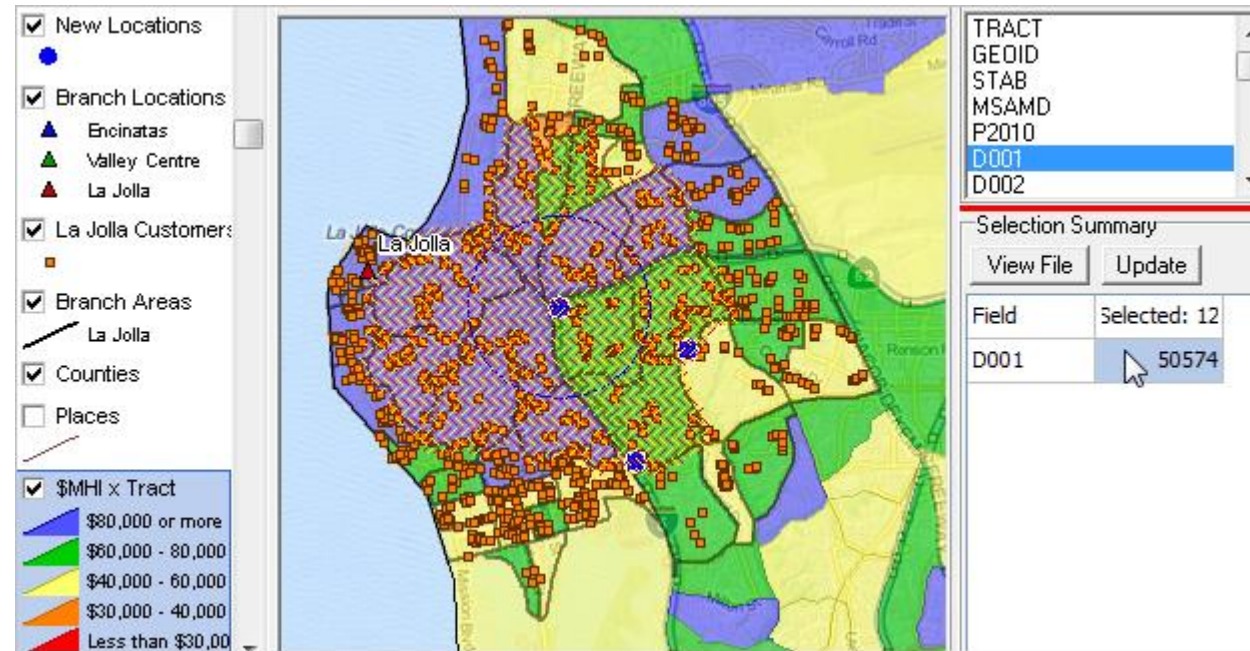
Develop wide-ranging GIS applications

Create maps like the one at right

Wichita, KS Elem School Attendance Zones (SAZ)

- A query is applied to show only Wichita school district (bold black boundary)

- Patterns of median household income by SAZ; see $MHI intervals by color in legend left of map

- Elementary schools shown as blue markers; school district: black boundary

- A query is used to show only elementary SAZs; all SAZ boundaries (eg, ES, MS, HS) are maintained.

- More about this application

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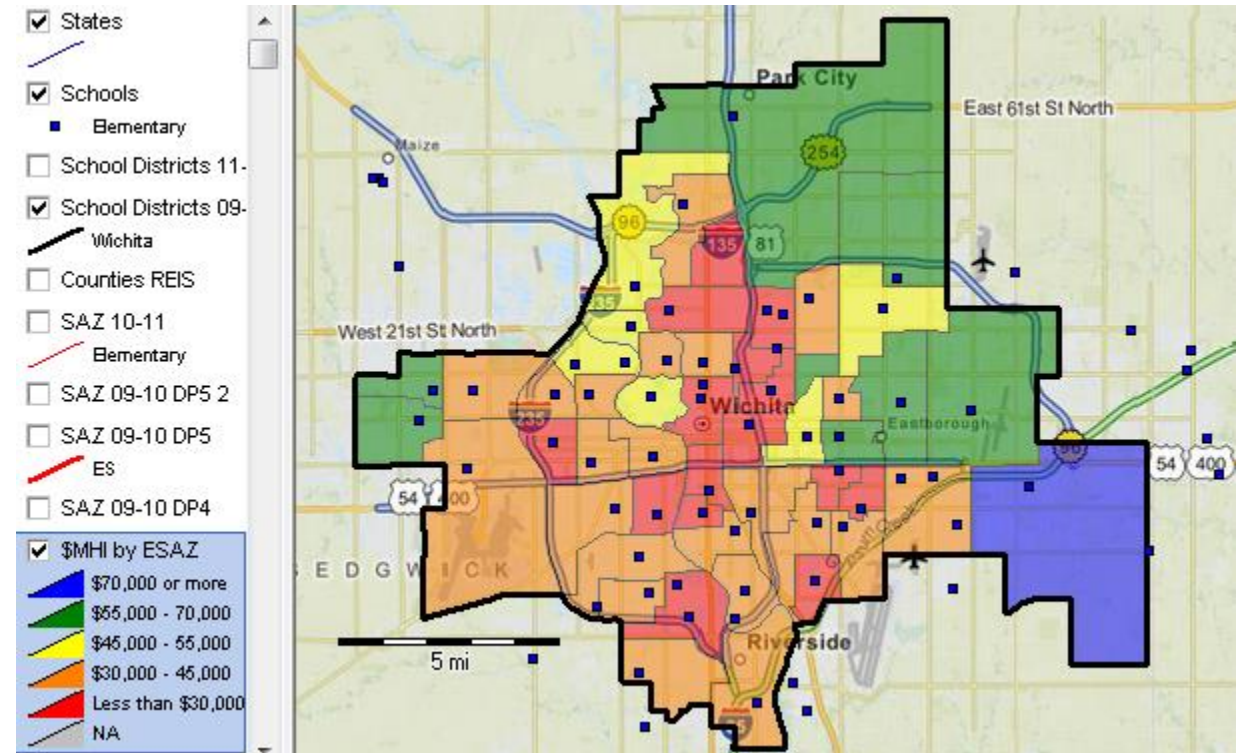
Related Topics

- ## Geocoding
  - Enables assigning latitude-longitude to customer addresses
  - Geocoding used to develop customer shapefile & locations shapefiles

- ## GPS
  - Enables setting points (latitude-longitude) that can define a line or service area

- ## TIGER/Line & Digital Map Database
  - Enables viewing boundaries of cities and census tracts
 - Road detail; base for geocoding

- ## Site Analysis
  - Enables selection of geographic objects for aggregation
  - Used to count customer in an area selected visually
  - Used to aggregate population by tract for tracts selected visually

GIS Resources You Can Use

- ## Mapping Neighborhood Patterns
  … visual analysis of geographic-demographic-economic patterns by census tract; add your own data

- ## Choose any state …
  http://proximityone.com/neighborhood_patterns.htm

- ## Example: Missouri GIS project start-up view shown at right

  - Getting started here:
    http://proximityone.com/dmi/modmi.htm

  - Follow easy step-by-step instructions
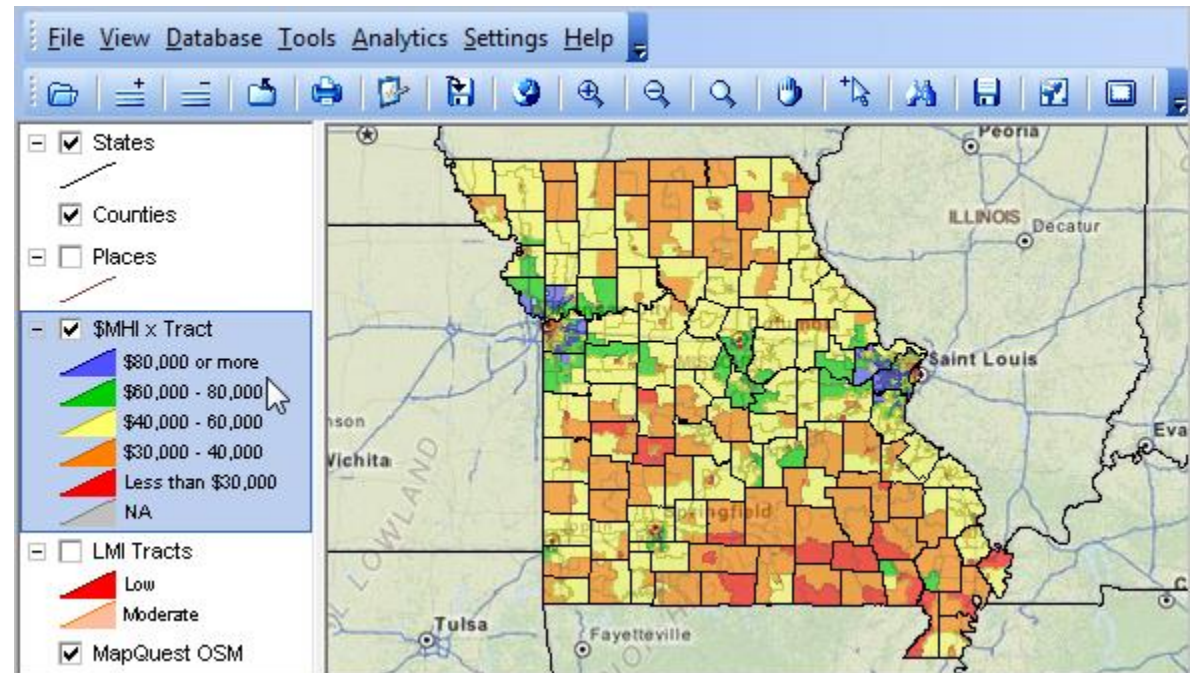
ProximityOne – resources to create & apply insight
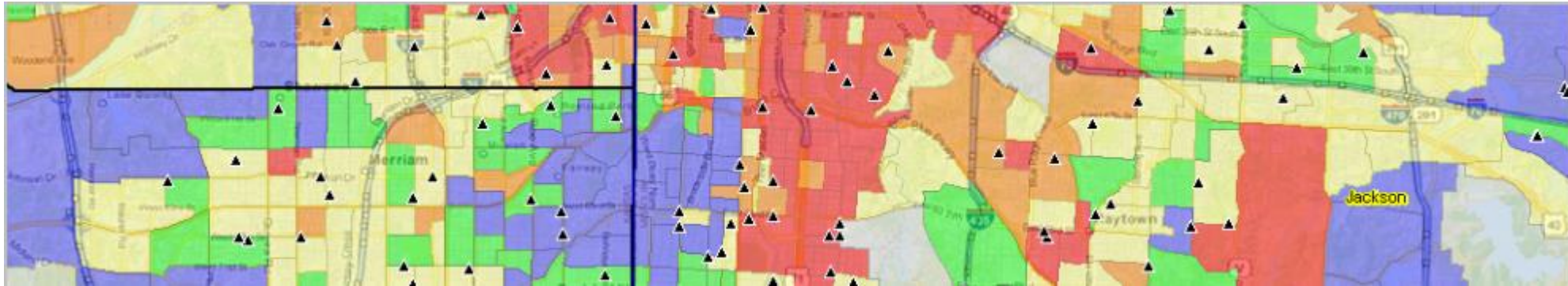
… a visual example of a thematic pattern view of median household income ($MHI) by Census 2010 block group developed using GIS software … subject matter data integrated into block group shapefile.

… view is located in the Kansas City metro but could be anywhere in the world.

… $MHI block group thematic pattern layer superimposed on a MapQuest OpenStreetMap layer used as a base layer … schools shown as triangular markers … add other wide-ranging geography and subject matter to the view.

… ProximityOne specializes in developing and integrating diverse independent geographic-demographic-economic-business data into dynamic GIS applications for collaboration and decision-making.

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