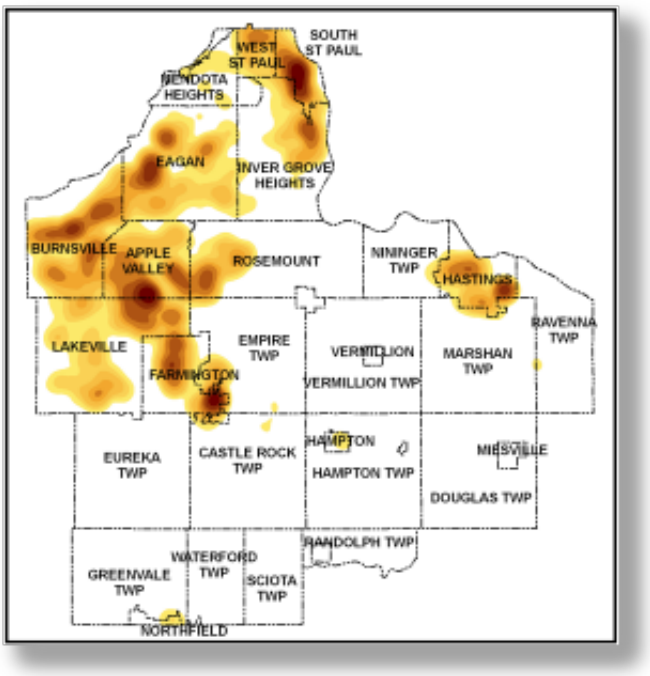
Summer 2010 - GIS 101: Mapping Sensitive Data

By Mary Hagerman

Maps show us where things are and how they relate to other things in the vicinity. Mapping data, such as people, facilities, or events, can help us identify patterns, or trends, that might otherwise be difficult to visualize. A map of client locations, for instance, could be used for answering questions such as, 'Where are there groupings of clients?', or 'What would be the best location for a service provider?' Unfortunately, many people succumb to the belief that certain data cannot be mapped due to its protected or sensitive nature. It is possible, however, to map sensitive data without compromising data privacy. There are techniques that can be used to show the distribution of sensitive data, aside from the old standard pin maps that show dots representing the actual locations.

An extremely basic method might be to map the dots at a scale that would allow the map reader to see the general distribution of the dots, but not determine the actual location of any individual dot. Map scale refers to the area the map covers, or how zoomed in the map is. A small-scale map shows a large area with only a small amount of detail. A large-scale map shows a more zoomed-in, close-up area with a large amount of detail. Mapping sensitive data at a fairly small scale may be sufficient to protect data privacy concerns.

A better technique would be to use a method that does not show the individual dots at all. One such technique is to aggregate the data by some geographic unit, such as municipality, census tract, or patrol area. This is called choropleth mapping, and is a common technique for mapping statistical data like census data. The number of dots per geographic unit is normalized by area or percent of the total, and the units on the map are shaded accordingly. This way the map reader can see the general distribution, i.e. which areas have higher values than others, but the individual dots are not shown. For instance, instead of mapping clients as dots, client counts for each municipality could be mapped as a percentage of the total number of clients.



Another common method for showing trends in sensitive data is to create a density map. These maps are often called hot spot or heat maps and are commonly used in crime mapping. A density map shows counts of dots by area. But unlike choropleth maps, the areas used are not arbitrary, but uniform in size and much smaller, approximating the density at each location on the map. For instance, a density map might show counts per square foot for a 10-foot grid cell. Density maps show more accurate trends in the data as values can change more gradually and naturally, not just at jurisdictional boundaries.

There are other common mapping techniques which are NOT appropriate to use when mapping sensitive data. These include dot density mapping and data shifting. Dot density maps are similar to choropleth maps in that data are aggregated and mapped by some geographic unit, but instead of shading the units, the appropriate number of dots is randomly distributed within the unit. Data shifting involves randomly shifting the location of the individual dots prior to mapping. Both methods are effective in protecting data privacy and in showing the general distribution of the data. However, both also tend to be misleading if the map reader is not familiar with the technique used. Because these methods show dots on the map, they may wrongly imply to the reader that the dots are at the actual locations.

There is no need to shy away from mapping just because the data you work with is sensitive. You can still take advantage of the benefits of mapping and spatial analysis. There are effective methods for illustrating trends in data without compromising data privacy. Contact a GIS specialist today to see how GIS can be used to get more out of your sensitive data.

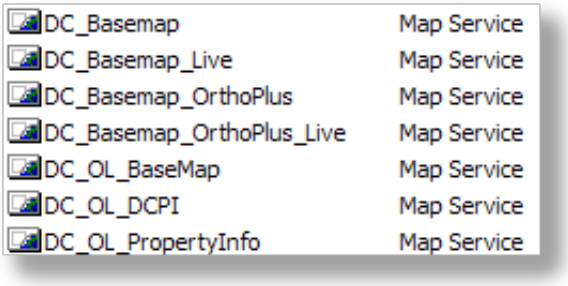
Summer 2010 - Tech Talk: ArcGIS Services

By Joe Sapletal, GISP

As we started to introduce new web applications running on ArcGIS Server, people started asking how they could use the "maps" (basemaps) we made for the web in their ArcMap documents? Being that those basemaps are running on ArcGIS Server, all they and you need to know is the URL for the server. Not only do you get access to the basemaps, but access to other services that are currently available. This is a work in progress, and some things are in their final published form and others are in beta.

The first thing you have to do is connect to the server in ArcCatalog.

1. Open ArcCatalog
2. Click on **GIS Servers**
3. Double click on **Add ArcGIS Server**
4. Select **Use GIS Services** (the default)
5. Click **Next**
6. Under Internet Server URL **http://gis2.co.dakota.mn.us/ArcGIS/Services**
7. Click **Finish**
8. Back in ArcCatalog, right click on the connection name and choose **Rename**
9. Name it **Dakota County**



Once you double click on it to open the connection you can see the available services. Currently, there are only a few available, but more will appear in the coming months and existing ones may go away as we consolidate services. As you can see in this example, there are currently seven Map Services available. Map Services are services that are based on map documents. It is also possible to have Image Services, which publish rasters (aerial photography) directly from the database; Geocoding Services; Geometry Services; and Geoprocessing Services, for spatial analysis. For a list of the available types and their abilities visit the ESRI ArcGIS Server Resource Center. All of the services you find here will begin with DC, for Dakota County. If you are loading basemaps from other organizations, this naming convention will help you as you work with them in ArcMap.

DC_Basemap and DC_Basemap_Live contain identical data layers. The difference is that DC_Basemap is cached map tiles, while DC_Basemap_Live is accessing the data live from the database. There are trade-offs to using one versus the other. Cached Map Services are pre-rendered tiles that are sent to ArcMap or the web map you are using so you don't have to wait for the basemap to draw. If you use this service in ArcMap, you need to use the service's predefined map scales and coordinate system or your map will not print out correctly. If you use the live basemap you will be able to use the map service at any scale and print a quality map, but it will draw a little slower. Both maps are synchronized and display the same data within 24 hours of one another. The live basemap, of course, will show published data immediately, but the cached basemap image tiles need to be updated and that process runs nightly.

OL? OL is short for Operational Layer. An Operational Layer is a layer or group of layers in a map service that are separate from the basemap, but essential to a web map or map product. We

have a few OL's published that have a variety of layers available in them, from USNG grids to property information. DC_OL_DCPI was specifically created for Dakota County Property Information (DCPI). DCPI is the web map that will eventually replace the Real Estate Inquiry application. If you want to use the same map services as DCPI, you can use DC_Basemap, DC_Basemap_OrthoPlus and DC_OL_DCPI. Have you tried DCPI?

Dakota County isn't the only resource for basemaps and operational layers. Try adding these services:

- Metropolitan Council - http://gis.metc.state.mn.us/arcgis/services
- MnDOT - http://gisservices.dot.state.mn.us/ArcGIS/services
- ESRI - http://services.arcgisonline.com/arcgis/services

Many more can be found by visiting ArcGIS Online.

Summer 2010 - Department Spotlight: Understanding Transitioning Transit Services in Dakota County

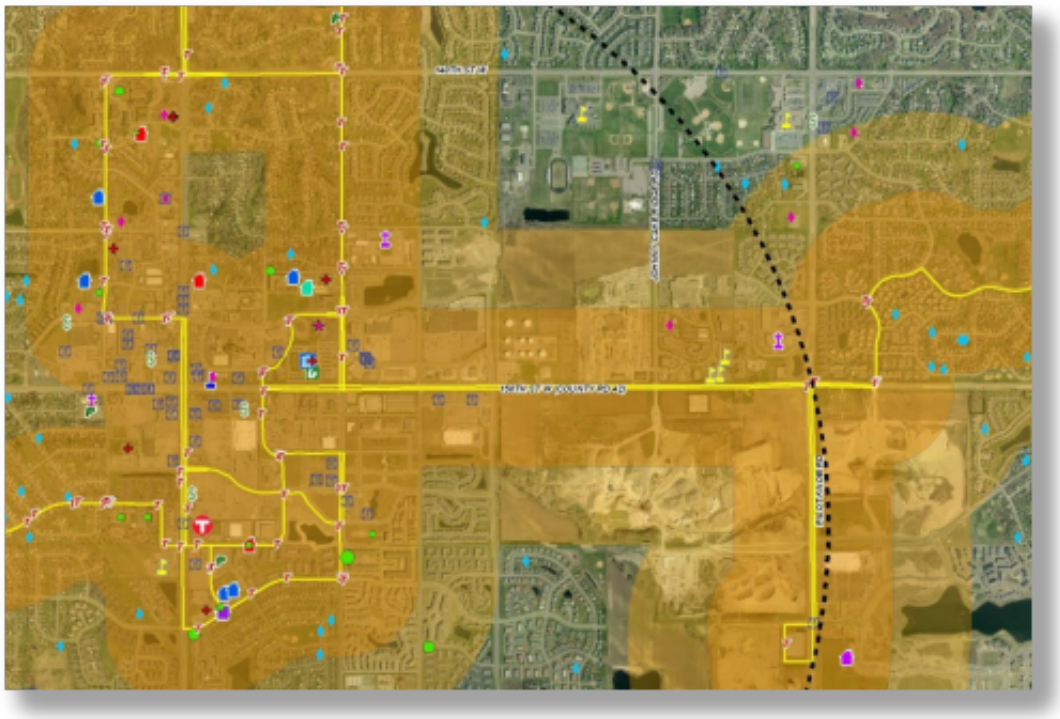
By Sam O'Connell, Dakota County Transit Office; Daren Nyquist, Dakota County Office of Planning and Analysis; and Mary Hagerman, Dakota County Office of GIS

A well-known and heavily-used transportation service, Dial-a-Ride, is changing. Along with a name change to Transit Link, the service area and eligibility for service will also expand. The restructuring effort, which began in 2008 by the Metropolitan Council, aims to deliver Dial-a-Ride transit services that are equally available to all members of the general public throughout the seven-county metropolitan area where regular route transit service is not available. In March 2010, the Metropolitan Council selected DARTS to be Dakota County's Transit Link provider for five years.

The Transit Link program is a minibus or van service that provides point-to-point transportation or transportation to transit hubs for regular bus service. It is different from the Americans with Disabilities certified services provided by Metro Mobility, which serves riders who need additional assistance due to physical, cognitive or psychological limitations. Transit Link services are intended to supplement regular transit routes, rather than duplicate them.

The newly restructured Transit Link service will establish a consistent set of operating parameters – such as a single phone number for reservations, consistent hours of operation and a uniform window for advanced trip reservations – for all providers throughout the seven-county region.

For Dakota County, Transit staff felt that this was an opportunity to begin collecting data and assessing the possible transit needs in the County that could be used to inform the County's Transit Plan. To assist in this effort, the Office of GIS prepared maps to help illustrate which areas are served by regular route service, which areas would likely be served by Transit Link, and how and where the two might interact. The maps were shared with representatives from Dakota County cities to help them assess how the transition from Dial-a-Ride to Transit Link might affect their residents.



The maps show existing regular route service, areas representing reasonable walking distance to regular route service, transit hubs, and Transit Link 'no transfer zones'. Riders whose origin and/or destination are within ½ mile (or ¼ mile in winter) of a regular route may be asked to use regular route service for all or part of the trip. The areas within ¼ mile and ½ mile of regular routes were shaded on the maps to show the areas within walking distance of regular route service. When a trip combines Transit Link service and regular route service, transfers are made at transit hubs. Transit Link trip destinations within 2 miles of a transit hub would not require a transfer. The areas within two miles of transits hubs were highlighted on the maps, revealing that these 2-mile 'no transfer zones' encompass large numbers of activity centers, suggesting that many Transit Link riders may not have to transfer at all. Additionally, the maps were overlaid with a variety of amenities representing possible trip origins and destinations, to attempt to speak to the questions, 'Where are the riders?' and 'Where might they be going?'

In the near term, the purpose of the maps is to understand how the different types of transit services will work together, and to identify areas/riders that may be most affected by the transition. Longer term, the maps could be useful for identifying potential high demand areas as well as for identifying potential improvements to services provided. Efforts are also underway to map county clients and service providers to look for cost-saving opportunities and to get a better overall picture of the county's transit needs.

The switch to the newly revamped Transit Link service is significant as Dakota County will have county-wide transit coverage. Dakota County will be seeking opportunities under the newly restructured program to coordinate more efficient delivery of transit services with all transit providers. To assist in this transit planning and coordination effort, Dakota County will be collecting and analyzing data that identifies the frequency, origins and destinations of Community Service clients through frontline staff. This information could be used to either modify regular bus route services or target certain populations for supplemental transportation services. This information can also be used to leverage additional Transit Link services for County clients, potentially creating savings in transportation costs for the County. This data collection will be an ongoing process through 2010 and 2011.

For more information on this article, contact Sam, Daren, or Mary. For more information on Transit Link, visit http://www.transitlinktc.org or contact the Metropolitan Council.

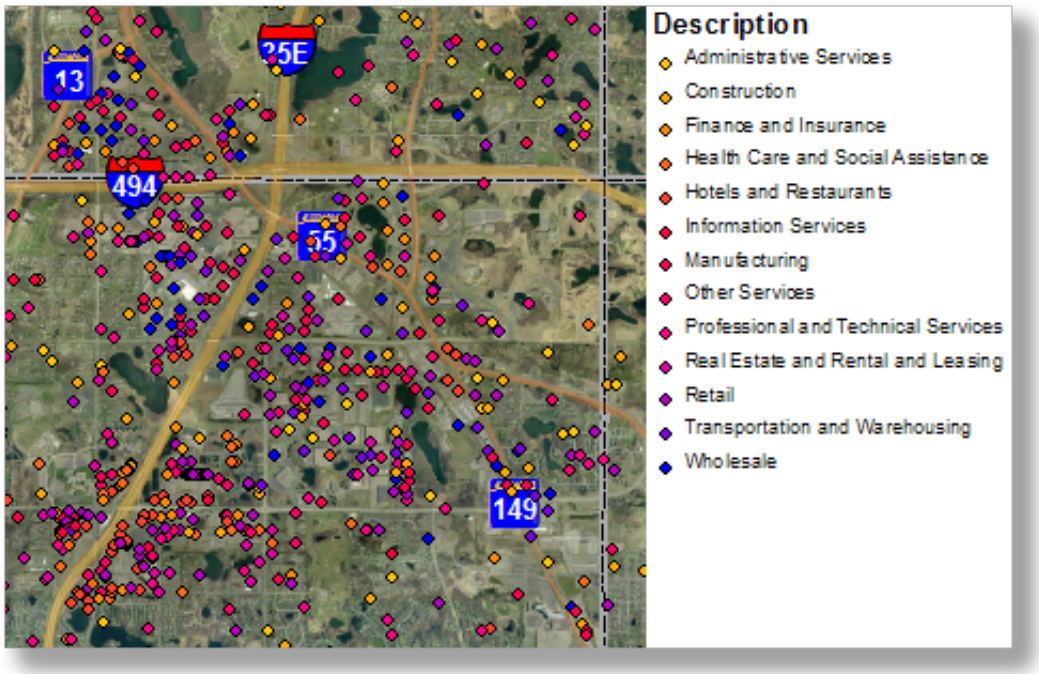
Summer 2010 - Desktop GIS: Dakota County Business / Employer Data

By Randy Knippel

The Dakota County GIS database now includes businesses in Dakota County, with associated information such as business name, type of business, number of employees, and more. This data is available to county and city staff through the Dakota County GIS (DCGIS) online. It was developed using multiple sources to help with things like notifications and analysis.

In the past, it was difficult to determine business names and contact information. Departments have been on their own to maintain this kind of data to support their business processes. In other cases, departments and cities have contracted for mailing lists and analysis of businesses in the community. This can now be done using the County's GIS database.

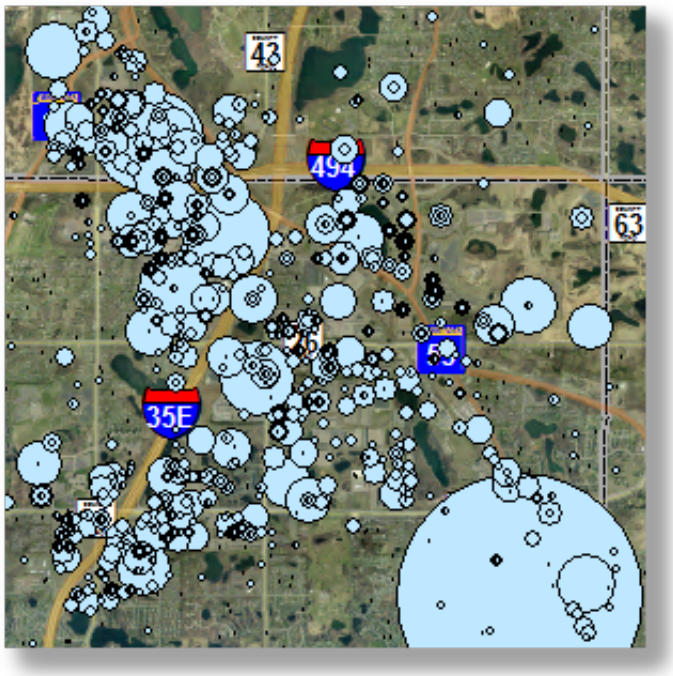
The Dakota County GIS online (DCGIS) allows you to see over 300 layers of GIS data. Much of this data is generated as a byproduct of government business functions in cities, counties, and state and regional agencies. Parcel data, for example, includes property boundaries from the Surveyor's Office, value information from Assessing Services, and ownership information from Property Taxation & Records. Although highly valuable and widely used, one deficiency of this collection of data is that, while we know who owns a piece of property, we don't necessarily know who occupies it. This is especially evident when looking for information about businesses and employers. One parcel representing a strip mall actually hosts multiple businesses that lease space. At the same time, questions regularly arise that can't be answered directly using ownership information, such the size and type of business. There are also times when it may be important to know where specific types of businesses are, such as gas stations, grocery stores, restaurants, or heavy equipment operators.



Business data is available from several commercial sources for developing sales leads and performing market analysis. However, it is quite useful to support government business, too. Along with the specific examples

already cited, this data provides a new perspective on our community for a variety of purposes. Simply seeing the distribution of all 12,000 employers, colored by the business classification code, reveals patterns of commercial centers and home businesses.

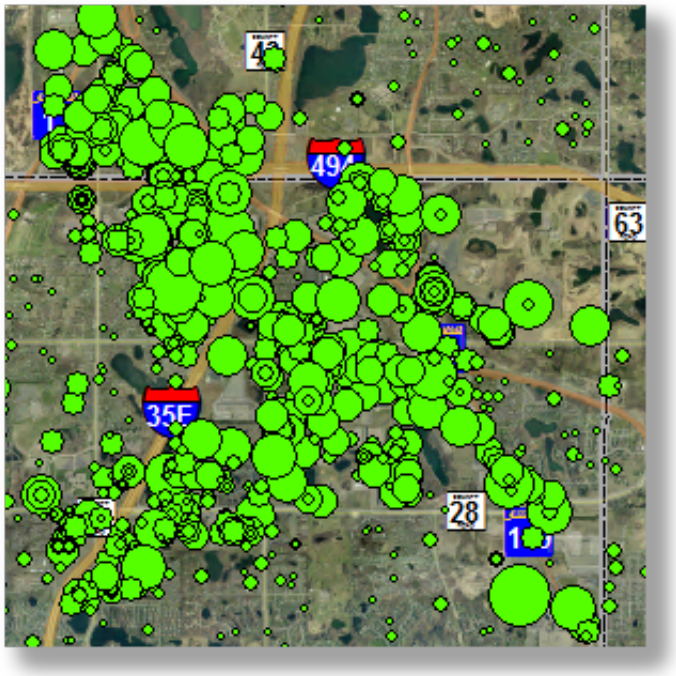
The business classification system employs the North American Industry Classification System (NAICS), with cross-references to the older Standard Industrial Classification (SIC) system. Both systems provide a very detailed classification of every business, which can be generalized to varying degrees. For example, the image above shows 13 major categories. However, one major category, Retail, comprised of 1780 records, can be broken down into 12 subcategories including Food, Gasoline, Building Materials, and Clothing. One of those subcategories, Food, can be further broken down into detail subcategories including Liquor, Convenience, Fruit and Vegetable Markets, Meat Markets, and Supermarkets.



There are many other ways in which the business data could be represented. For example, in other situations, it may be important to have the businesses be represented by the number of employees. Using circles that vary in size proportionately, businesses can be compared visually to clearly see an indication of the relative size of the business. This can serve a variety of purposes, such as modeling daytime population to study transportation infrastructure needs; estimating the potential for customers for transit options; or analyzing potential disaster preparedness and evacuation needs.

Another indication of the size of a business is the volume of annual sales. This data, coupled with other data, such as employee size, property values, and zoning could be useful for analyzing economic development and community redevelopment potential.

This initial database is only the beginning. The locations were determined by matching addresses to the address database. But users of this data will likely find additions and corrections, based on detailed local knowledge, that can make it even better. We need your help to capture those observations and incorporate them in the database for others to use. Working together, we can continue to improve this database and keep it up to date.



The examples represented by the figures in this article represent layers in DCGIS in the Business and Community folder. Note that these layers are available to county and city staff only.