GIS NEWS

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Geographic Information Systems (GIS) Technology at Dakota County

HIGHLIGHTS

MEETINGS & EVENTS

April 18
Dakota County GIS Users Group meeting. For more information check the GIS website at www.co.dakota.mn.us/survey.

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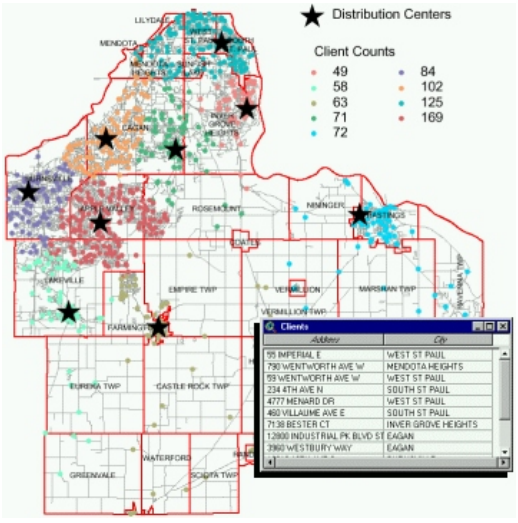
G.I.S.101

Put Your Data On The Map

By Randy Knippel

GIS has many tools to help integrate data from a variety of sources. The only requirement is that the data have some kind of location associated with it. One common kind of location is an address. While an address is not an actual location it describes a location which can be determined through association with a street network.

All data in a GIS must have a location defined using coordinates. Coordinates are simply a system of measuring in two directions as on a graph. Geographic coordinates are usually called X and Y, or Northing and Easting, or Latitude and Longitude. Addresses are converted to coordinates using a process called address geocoding. Following this process, addresses can be displayed as dots on a map and associated information can be used to vary the color, symbol, or symbol size on the map.



Ficticious clients geocoded and assigned to nearest distribution center.

The term geocoding describes the process of creating a location through association. This can include the use of addresses, but also may simply use zip code, zip+4, telephone exchanges, or census blocks. Many retail stores ask their customers for their zip code. This allows them to study how far their customers are traveling to a given store or determine the optimal location for a new store.

Address geocoding is a bit more complex due to variations in street naming conventions and abbreviations. This is further complicated by a variety of data collection methods that typically involve many people recording and entering addresses with minimal verification. This leads to spelling and typographical errors that can be difficult to resolve. Address geocoding software includes allowances for some of these problems and overcomes many of these basic errors; however, the final results depend entirely on the quality of the data.

Addresses are typically associated with things like clients, customers, service centers, and incidents. The ability to see where these things are and how their locations relate to each other is a powerful tool for analyzing and optimizing services. It can also be used to determine groupings of clients for efficient distribution of home services or determining locations for distribution points and service centers. Crimes can be viewed and analyzed for trends based on location or association with other community characteristics such as proximity to schools, parks, or specific neighborhoods.

It is important to understand that while addresses can be used to determine a location, they do not define an absolute location. The results of geocoding depend on the quality of the addresses in your data. In addition, the process is one in which only estimates of a location are produced by associating the addresses with lines representing street segments. Each line includes the name of the street and the intended range of addresses on that segment. Actual house number assignments will conform to this assigned

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range to varying degrees. The location of a specific address on that line is simply computed or interpolated using that range. Due to this, the results of address geocoding are best for generalized analysis and not where a direct association to a specific house is expected. This is typically not a problem when analyzing a city or the entire County. This is also beneficial when exact house numbers are not known and allows things like street intersections to be used as well.

Address geocoding can be performed on a single address or on an entire database. If your data is directly accessible or can be exported to one of several standard formats, it can be processed using GIS to create dots on a map. In cases where the data changes and regular updates of these maps are required, it is best to maintain the coordinates derived from the geocoding process directly in your database. This helps to streamline the process. Otherwise, the same data will need to be continuously reprocessed and the same spelling and typographical errors resolved over and over again.

Visualization is a powerful tool and GIS can help you see patterns in your data that can otherwise be very difficult to determine and analyze. The Survey and Land Information Department can help you put your data on a map. We can then help you analyze that data and create strategies for determining relationships with other locations.

Department Spotlight

GIS and Office of Planning

By John Mertens

Dakota County Farmland and Natural Areas Project

Dakota County received an appropriation of $200,000 in 1999 to inventory farmland and identify remaining natural areas, and to develop a plan to protect these areas.

Citizens identified "growth" as the most serious issue facing Dakota County over the next 20 years. In Dakota County our communities are growing very fast. Another 100,000 people are projected to move into the county by the year 2020.

Prior to European settlement, Dakota County was a mixture of oak savanna, oak forest, prairie, and wetlands. Today, only about 2% of the original land cover still exists. Natural areas provide important functions in our county. They serve as habitat for wildlife, purify runoff before it reaches our rivers and lakes, re-charge groundwater, and provide the scenic beauty that makes the county a great place to live.

Using GIS to Evaluate and Protect Farmland and Natural Areas

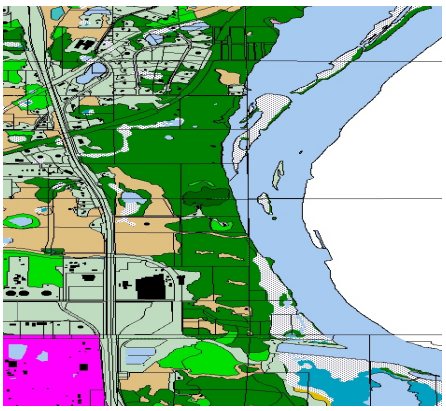
GIS was used to produce a series of maps that identified the resource and showed where urban and rural growth pressure is impacting our farmland and natural areas. These maps were used to engage and inform the public and to prioritize the lands to be protected.

High Priority Natural Resources

A major objective of the Farmland and Natural Areas project was to inventory the remaining natural areas using a detailed land cover classification system developed by the Minnesota DNR. The Dakota

County Soil and Water Conservation District (SWCD) was the primary collection agency and developed a detailed land cover GIS layer. The results identify the location of land resources in the County as well as the quality of the resource.

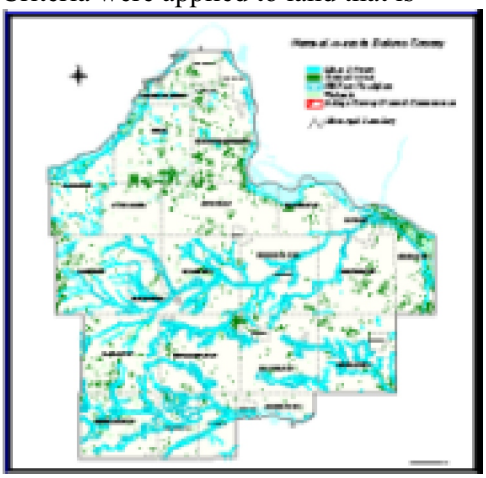
One objective of the project was identification of privately owned natural areas. Privately owned natural areas were identified by overlaying the parcel layer with the landcover database. Once unprotected natural areas were identified,



Dakota County Planning used the landcover GIS layer along with the citizen identified natural areas to create a potential greenway corridor map.

Quality Farmland

To evaluate farmland, County planners developed a point system based on information available in the GIS system. Criteria were applied to land that is



actively farmed and the parcels were rated accordingly: Land within a 1/40 zoning area (Zoning), Land Enrolled in a Ag Program (Assessor), Land with > 75% Prime Soils (Soil Survey), and Farmland within ½ mile of Natural Areas (Shoreland Corridors). The results were tabulated and results were mapped into 5 categories.

This project was unique because planners were able to combine technical GIS information with public input to create priority land protection areas. The GIS allowed an unbiased evaluation of the land resources in Dakota County and provided clear and useful information at public meetings. As the final plan is prepared and a program implemented, GIS will continue to play a role in the protection of farmland and natural areas in Dakota County.

Desktop G.I.S.

Desktop GIS Options at Dakota County

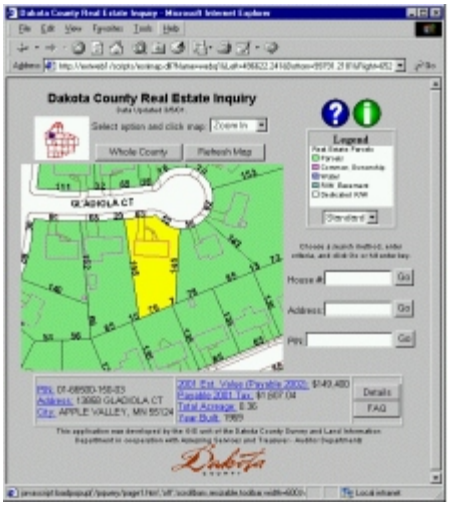
By Randy Knippel

Several options exist to bring GIS to your desktop. The determining factors are cost and required capabilities. Basic GIS capabilities are available to everyone, at no additional cost, using Internet technology or web-based GIS. Additional capabilities are available by installing software on your computer. A County-developed application called Parcel Query provides the ability to view and query property information through an interactive map. ArcView, which is developed by a vendor named ESRI, is another program, which includes full GIS analytical capabilities plus other capabilities available for additional cost. The costs for each program vary. Parcel Query costs about $100 while ArcView costs about $900 for the base system.

Each of the three options should be considered a progression where increasing user ability and knowledge is required. Web-based GIS is the easiest to use while ArcView is the hardest and requires the most knowledge. Web-based GIS, such as the Internet Real Estate Inquiry, provides basic capabilities and requires little or no training or documentation. ArcView, on the other hand, may require several classes and many hours of hands-on experience to become proficient in its use. Between these two is Parcel Query. This application provides an option that increases performance and capabilities over a web-based GIS while maintaining ease-of-use and remaining quite economical.

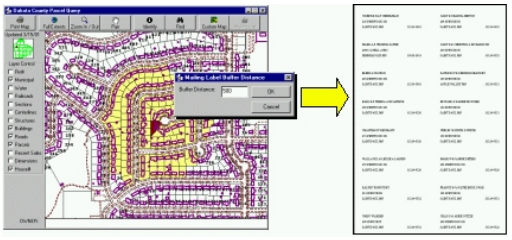
Currently, there are approximately 50 copies of ArcView and about 300 copies of Parcel Query within Dakota County and the cities. The web-based GIS, the Internet Real Estate Inquiry, generates approximately 75,000 hits per week on the County web site. The range in use of these applications demonstrates the role each plays in providing GIS capabilities. These applications can also be characterized by the way people are using them. ArcView is typically used to create, analyze, and map geographic data on a regular basis. Parcel Query is used for efficient and frequent access to property information and maps. Web based applications are used by the general public who typically have much slower Internet connections than found within the County network.

The Dakota County Internet Real Estate Inquiry(http://www.co.dakota.mn.us/assessor/real_estate_inquiry.htm) provides the ability to see property lines, search for parcels, and view taxation information associated with property in the County. These tasks are accomplished through an interactive map dialog. The Internet Real Estate Inquiry application also allows specific themes, including property values, recent sales, year of construction, and aerial photography, to be displayed on the map. A variation of the application on DakotaNet allows the additional capabilities of searching by owner name (http://dakotanet/admin/main/Applications/applications.htm).



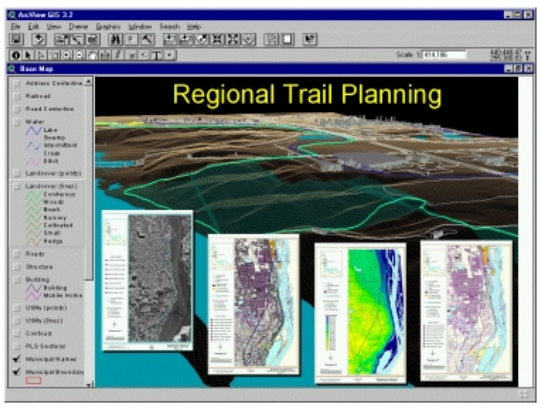
Internet Real Estate Inquiry

Parcel Query provides many of the same capabilities but runs much more efficiently than the Internet application. It also supports some additional features including searching by intersection, creating custom maps, and creating mailing labels. The application provides a more interactive dialog which allows the user to turn on and off features, such as water, buildings, and lot dimensions, as desired. This program runs on Microsoft Windows and must be installed on your computer; however, this provides very high performance for those who need rapid access to property information and basic maps.



Create mailing labels of all parcels within 500' of a selected parcel

ArcView has many GIS capabilities including creating and analyzing geographic data, as well as creating detailed maps. While it can be used productively for general browsing of GIS data, its power lies in strong analytical and mapping tools that must be clearly understood and applied by the user as they see fit in each situation. There are also add-on products called extensions, which provide additional functionality such as 3D terrain modeling and vehicle routing.



ArcView GIS

GIS technology has developed from awkward software running on expensive and exclusive computers to user-friendly, expandable software running on common personal computers. Also available are several options to accommodate different price / capability requirements. GIS Specialists in the Survey and Land Information Department can help you determine the solution that is best for you and help you implement it.

Dakota COUNTY

Tech Talk

Address Geocoding in ArcView

By Todd Lusk

Address geocoding, or address matching, in ArcView is a fairly straightforward, yet very powerful, technique for creating spatial data. This article is intended for the ArcView user and will attempt to explain how to set up ArcView for address geocoding.

The Survey and Land Information Department has set up an ArcView Extension which contains a street centerline theme that is ready to be used for geocoding. To begin geocoding, first load the “Dakota County Base Map” Extension for ArcView. Create a new view for the project, copy the theme called "Address Centerline" from the "Base Map" view, and paste it to the newly created view. Next, load the tabular file containing the information you want to geocode. It is important to remember that this file must contain one field with street address information and another field with the city name.

By using the "Dakota County Base Map" Extension the geocoding properties for the address centerline theme have already been defined. These settings can be confirmed by making the address centerline theme active, clicking on Theme > Properties, and choosing the "Geocoding" icon on the left side of the "Theme Properties" window (Figure 1).

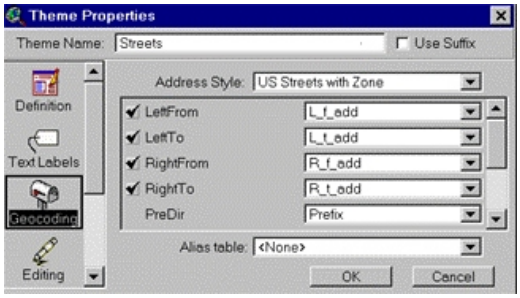


Figure 1. Geocoding Properties in the Theme Properties window.

To begin geocoding, make sure the new "View" is the active window. Next, go to View > Geocode Addresses... This will bring up the "Geocode Addresses" window.

The "Geocode Addresses" window has a series of drop-down menus which allow you to select various fields from your tabular data. In the "Address Field" menu choose the field from your tabular data which contains your addresses. The address should consist of a house number, street prefix (optional), street name, and street suffix (also optional). In the "Zone Field" menu choose the City field from your tabular data. The "Display Field" menu is an alternate field which allows you to display additional location information such as business name or some other field. The "Offset Field" can be used to set the geocoded points back away from the street centerlines by the specified distance. The "Alias Table" menu is another optional field which can be used as an additional reference. For instance, if you had an address that was listed as "Fire Station #1" you could make use of an alias table. An alias table contains two fields. One field contains the name of the location, such as "Fire Station #1", while the second field contains the actual street address of that location. During the geocoding process, if ArcView comes across a location you have defined in an alias table it will substitute the street address for that location. Lastly, the "Geocoded Theme" lets you navigate to the location where you want to store the newly gecoded file. You should now actually be ready to begin geocoding.

ArcView provides two geocoding methods. The "Batch Match" method will do a one-time pass through the tabular address data and geocode the addresses based on the default preference settings. The "Interactive Match" will allow you to choose from a list of possible addresses for unmatched, or partially matched locations, which fall outside the default settings. This method is most useful for the "second pass" of geocoding. The "Interactive Match" method is useful for correcting addresses that contain spelling errors, or for addresses with multiple possible matches.

Once ArcView has completed either the "Batch" or "Interactive" process a window will be displayed to show you the results (Figure 2). This figure shows percentage of ”Good” and “Partial” hits as well as addresses that did not match at all. A “hit” is registered for each address that has been successfully geocoded.

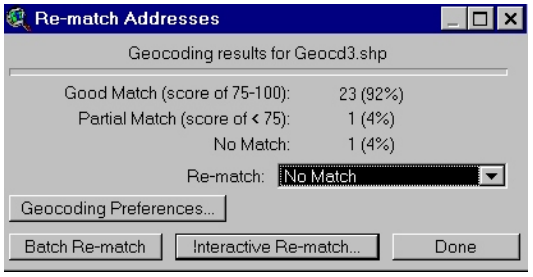


Figure 2. The geocoding results window

The "Re-match Addresses" window will also allow you to modify the Geocoding Preferences and attempt to rematch addresses which were not matched in previous attempts. To re-match unmatched addresses simply select "No Match" in the "Re-Match" drop-down menu.

A typical geocoding session in ArcView would go something like the following. First, you would allow ArcView to geocode addresses in "Batch Match" mode. Next, you would go back and attempt to re-match the "No Match" addresses by using the "Interactive Re-Match" method. Lastly, the user may wish to modify the Geocoding Preferences in an attempt to get a high "Good Match" percentage. Be careful when modifying the Geocoding Preferences, however, because modifying these numbers can cause ArcView to incorrectly match addresses if the preferences are set too low.

Once you are satisfied that you have correctly matched as many addresses as possible simply click on the "Done" button and ArcView will close the geocoding session.

The last step of a geocoding session is viewing the results. To view your geocoded addresses make the view containing the address centerlines active. You should see a new theme in the Table of Contents. Check the box to make the theme visible and your newly geocoded address information should appear. Congratulations! You have successfully completed an address geocoding session using ArcView.

Dakota COUNTY