GIS NEWS

MEETINGS & EVENTS

October 29, 2003
Dakota County GIS Users Group Meeting. Dakota County Western Service Center, Conference Room L139 from 1:00 p.m. to 3:00 p.m. View the complete agenda at **http://dakotanet/gis/events/gisusers.htm**. RSVP to **Todd.Lusk@co.dakota.mn.us**

CONTACTS

If you would like to write an article for the Spotlight section of the GIS News newsletter and share how you use GIS in your department, call or email Randy or Joe.

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GIS 101

Location. Location. Location.
by Mary Hagerman

Geographic relationships describe the association between the locations of places or things, whether a place is next to, near by, or some distance away from another. They answer questions like 'Where is it?', 'What is it near?', and 'How far is it?'.

Proximity describes what is in the vicinity of a place. The Mall of America is near the airport. The football field is behind the school. The park is across from the lake. Adjacency is a special kind of proximity relationship. Places that are adjacent have a common boundary. You and your neighbor share a property line, so your yard is adjacent to, or next to, your neighbor's yard.
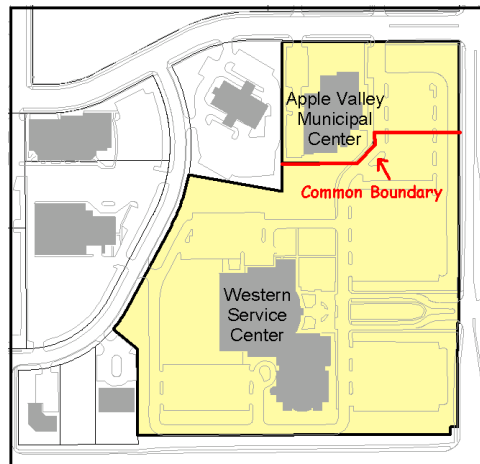
The Western Service Center is adjacent to the Apple Valley Municipal Center.

Geographic relationships can also describe whether one place contains, or is within, another place. The Zoo is within the Vermillion River Watershed. Camp Snoopy is within the Mall of America. Lebanon Hills Regional Park contains Camp Sacajawea.

Distance describes how close together, or far apart, places are. My house is six

Camp Snoopy is within the Mall of America, likewise, the Mall of America contains Camp Snoopy.

miles from the Western Service Center. There are three parks within a mile of my house. The closest theater is about a mile and a half away.

GIS is a very useful tool in identifying and analyzing geographic relationships. You can use GIS to determine whether a given property is adjacent to, near, or within a flood plain. GIS can tell you how many lakes are in a watershed, or which school district a particular park is in. You can use GIS to determine which library is closest to your home, or how far the library is from the Zoo.

Here's an example of using GIS to examine geographic relationships: If I am buying a new house, I need to first know where it is - it's location. I know the address, but that tells me little about where it is. I can use GIS to locate the address on a map. Now I can start to ask questions about what is in close proximity to my new house. Is the property adjacent to a park? Are there any schools nearby? What is the nearest major highway? GIS can tell me which school district, precinct, and watershed the property falls within.

Buffering is a technique that allows you to see what is within a certain distance of a location. If I wanted to

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find all the parks within a mile, I can use GIS to create a one-mile buffer, or ring, around the house. Here is a real life example of buffering: The County Parks Department needs to notify residents adjacent to Lebanon Hills Regional Park that there will be a deer hunt. They use GIS to create a 100-foot buffer around the park, and select all the parcels that fall within the buffer. Mailings regarding the deer hunt are sent to those residents.
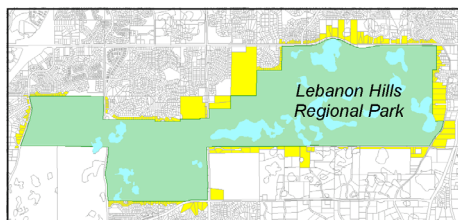
Parcels within a 100-foot buffer of the park.

Geographic relationships help us to see location as more than just an address. They show us how each location is an integral part of a larger neighborhood or community. GIS provides the tools to explore the relationships that exist between locations, allowing us to better understand them.

Department Spotlight

Maintaining the Parcel Database by Todd Tollefson, Dakota County Surveyor's Office and Randy Knippel, Office of GIS

Land parcels are the most commonly used GIS layer. This layer forms a network of lines covering the entire county. These lines also form areas that represent property ownership. County-wide coverage for this layer was completed in 1997 and is now updated on a weekly basis. It is accessed by the public through the Internet Real Estate Inquiry, by county departments and cities through Parcel Query, and by desktop GIS users through ArcGIS. While the usefulness of this parcel layer may be widely known and even taken for

granted, the processes required to maintain it may be a bit of a mystery.

The lines forming parcels are created as a by-product of the plat checking process in the Surveyor's Office. In Minnesota, state law requires each county to be responsible for verifying and approving all subdivision plats as a part of the official filing process. Dakota County streamlined this process over ten years ago by creating specialized GIS tools. These tools not only made a laborious manual process more efficient, but also produced a digital version of each plat that could be joined together to create a county-wide, seamless database of parcel lines.

Currently, maintaining and updating the land parcel system involves two methods of creating new tax parcels. The first method is to plat the property. A plat subdivides property into individual lots and blocks and is created by private surveying companies. Then the plat is reviewed by the Surveyor's Office prior to recording to satisfy state statues and verify the mathematics of the parcels. As part of the review process, the plat boundary and interior parcels are redrawn in a graphic file. ArcINFO Workstation is used to create the file by using coordinate geometry (COGO) tools, which consists of bearing and distance measurements. The result is a group of integrated polygons or parcels.

Plat document

Once the plat has been recorded, the Treasurer/Auditor assigns new property Parcel Identification Numbers (PIN) for each individual tax parcel. The Survey Office then proceeds to

merge the redrawn graphic file into the GIS parcel database and associate the new PIN numbers with corresponding parcel areas.
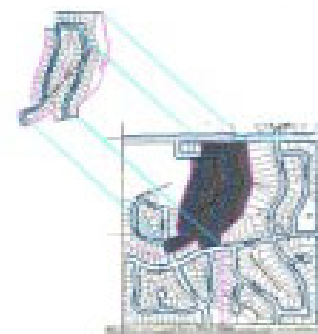
Insert plat into parcel database

The second method in creating tax parcels is lot splits. The Survey Office obtains the new legal descriptions and new PIN numbers from the Treasurer/Auditor Department. The new parcel lines or areas are then directly created in the parcel database using ArcINFO and COGO tools. After the parcel lines and parcel areas have been verified and updated in the database, automated processes perform additional steps to create the data that is actually used in the GIS applications.

These processes use computerized scheduling techniques known as batch processing that allows them to run consistently and efficiently. The only human intervention required is a final verification of successful completion.

The batch process starts by creating countywide ArcView shapefiles of parcel lines, areas, and points. Area and point shapefiles are then combined with value and ownership data extracted from the County Assessor and Auditor/Treasurer databases. Value and ownership data is manipulated and summarized to produce a one to one correspondence with parcels using the PIN.

The resulting shapefiles are then copied to six file servers distributed throughout the major county campuses and on the county website. This provides optimal access for all GIS

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applications and users at each location. It also provides valuable redundancy in the event there are problems with any one of the servers.

A commonly heard question is, "How accurate is the current parcel database?" Dakota County's goal is to attain the most accurate parcel database possible in the most efficient manner. The county-wide basemap utilized the Global Positioning System (GPS) as the foundation of its accuracy. The interior parcel lines in the system were created mostly from abbreviated property tax descriptions and from existing subdivision plats, not from extensive deed research and surveys. Therefore, parcels in the database system are to be used for tax purposes, GIS applications and maps only, and are not intended to be used as a legally recorded map or a survey. Even if a parcel appears to be accurate on paper or a map, what is out on the ground may be different. These differences can be attributed to many factors, such as evidence of previously surveyed monuments found in the field; the location of the monuments placed in the field; laws controlling monuments; and the location of old historical plats.

The GIS parcel layers provide useful information to many different people through convenient GIS applications. The highest volume of use is through the Real Estate Inquiry on the county website where property owners, prospective buyers and sellers, realtors, and people performing deed research can view value, tax, sales and building information. Other uses include zoning, permitting and notification in the cities and county departments, as well as advanced GIS research and analysis. Automation of these processes and the high levels of usage that they see means that Dakota County receives an extremely high return on the investment in the time and resources that are required to produce and maintain this data.

Desktop GIS

Project Management: ArcView 3.x vs. ArcMap
by Kent Tupper

One of the many changes in migrating from ArcView 3.x to ArcMap is the way in which users store their data and maps (project files). ArcView 3.x let you store multiple layouts in a single project, but ArcMap does not. This is actually a good thing, but it takes a little adjustment in your thinking.

With ArcView you could create a layout linked to a view and then generate multiple maps at different scales from it merely by creating new layouts with modified titles and adjusted view extents. Many additional views and layouts could be added to the project to create totally different maps. In fact, it was technically possible for a user to store every single map that they ever made in one single ArcView project file!

There are a number of problems with this approach. For one thing, it can become difficult to reproduce these maps at a later date. Extent and view perspective would need to be preserved, there could be different themes used depending on the scale, attached graphics would have to be derived for each of those scales, etc. These projects could be huge and take up a lot of space on your hard drive. They would be very slow to open and would be prone to corruption if even one thing changed, resulting in the loss of weeks, maybe even months of work.

This is a worst case scenario and most of you would never dream of managing your data this way, but we all have suffered from some of these problems to varying degrees in the past. Because of these and other technical problems, ESRI changed the way the software stores maps and layouts in the new ArcMap software. ArcMap projects, appropriately called "map documents", are map based. Map documents are a single document interface as opposed

to the multiple documents stored in ArcView 3.x projects. As a result, only a single layout view can be defined in a map document. This may mean that you will have considerably more map documents in the future than you had project files in the past, but many of the pitfalls mentioned above will be avoided.

Also, rest assured that this does not mean that you have to recreate every single map that you make from scratch. Standard layout templates exist and custom ones can be created so that your end products are consistent looking and work need not be redone when you want to generate maps at different scales or with slightly modified layouts. The Dakota County Extensions that were created for use in ArcView 3.x have also been made available to ArcMap users. After adding these sets of tools, basemap data can be accessed, categorized and symbolized in a standard way, the same way that it was in ArcView 3.x.

Switching from ArcView to ArcMap requires changing at a basic level the way we think about creating maps. ArcView 3.x allowed users to combine multiple groups of maps and map layouts into one project. ArcMap only allows users to create one map layout per map document and requires the use of templates to reproduce existing maps. While this may seem in the short run to cause problems for the user, in the long run users will have fewer frustrating problems when dealing with their projects and will have fewer catastrophes. For further information, contact a GIS Specialist.

Tech Talk

### A Geo-what? An Introduction to Geodatabases
by Todd Lusk

If you attended the ArcGIS training

offered by the Office of GIS you may have heard the term "geodatabase" used. But exactly what is a geodatabase? What does it do? How can it be applied in your day-to-day work needs? This article will attempt to offer some insight into this new technology from ESRI.

Geodatabases first became available with the release of ArcGIS 8.02. According to ESRI, "a geodatabase is a physical store of geographic information inside a database management system (DBMS)…" The term geodatabase is actually short for "geographic database". The ability to store geographic information in a true DBMS offers an entirely new set of enhancements that are not available with the coverage or shapefile data formats. One such enhancement is the ability to add "behavior" to features. In a water utility network, for instance, you have the ability to make water hydrants only attach to water mains. If this rule is broken, the geodatabase will notify the user of the error.
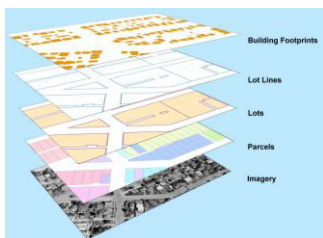
Geodatabases allow users to store multiple types of geographic data

Geodatabases come in two "flavors". The first is called a "personal" geodatabase. A personal geodatabase allows a user to store all types of geographic data (points, lines, polygons, measures, CAD, etc.) in one common repository. The information is stored as a Microsoft Access database. The downside of the personal geodatabase is that only one user can edit the data contained within it at any given time.

A "multi-user" geodatabase avoids this issue by allowing multiple users to edit geographical data at any given time. Specialized software is utilized with a multi-user geodatabase which tracks the discrepancies between the various edit sessions and makes sure the integrity of the data is maintained while it is being edited. Multi-user geodatabases use a true database management system (like Oracle or SQL Server) to store the information. This also allows the geodatabase to leverage the added functionality of the DBMS. Whichever "flavor" of geodatabase you use you will notice many similarities between them.

The most basic piece of geography in a geodatabase is called a "feature". A feature can represent anything found in the real world. It could be a street, a house, a building or an address. In a geodatabase, related features are stored together as "feature classes". Feature classes contain features that have something in common (such as parcels). Typically, you will have a feature class for each type of feature (i.e., parcel, hydrant, valve, etc) rather than each type of geometry (point, line, or polygon). This is a slight change from how data is organized with shapefiles. This change allows users to easily maintain the integrity of the data and the relationships that features have with one another.

Finally, each feature class is stored in a "feature dataset". Feature datasets store feature classes that have their geographical locations in common. For example, in a water network geodatabase there are several types of geographic features. You might have points that represent features like fire hydrants, water towers or valves, and linear features that represent water mains and laterals. In this example each type of point feature would be defined as a feature class. Each linear feature type would be defined as a separate feature class. Together, all of these feature classes could then be stored collectively in a feature dataset. In our example this allows us to control the behavior of

the water distribution network because our geodatabase allows us to define how the various features connect to one another and thus control the entire network.

Keep an eye out for this emerging technology. You will probably being seeing it referred to more often in the near future. Please contact a GIS Specialist if you have questions.

Did You Know?

The Office of GIS and the Physical Development Division publish a Map of the Month on DakotaNet. The Map of the Month features a recent map created by County staff using GIS. Recent maps include downloadable street maps of the cities and historical aerial photos of Thompson Park. If you have a map that you would like highlighted on Map of the Month feel free to contact us with your submission.
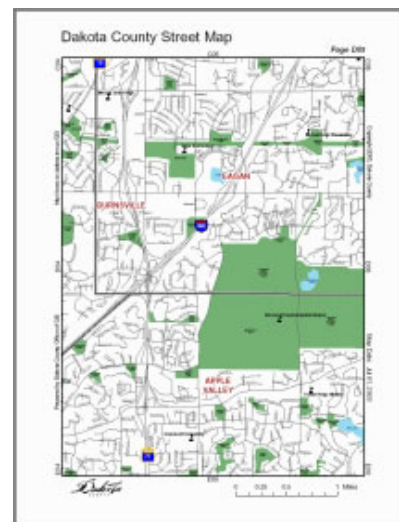
The Office of GIS also maintains a map gallery on DakotaNet and the external County website.

Links:
Map of the Month
DakotaNet Map Gallery
Dakota County Website Map Gallery