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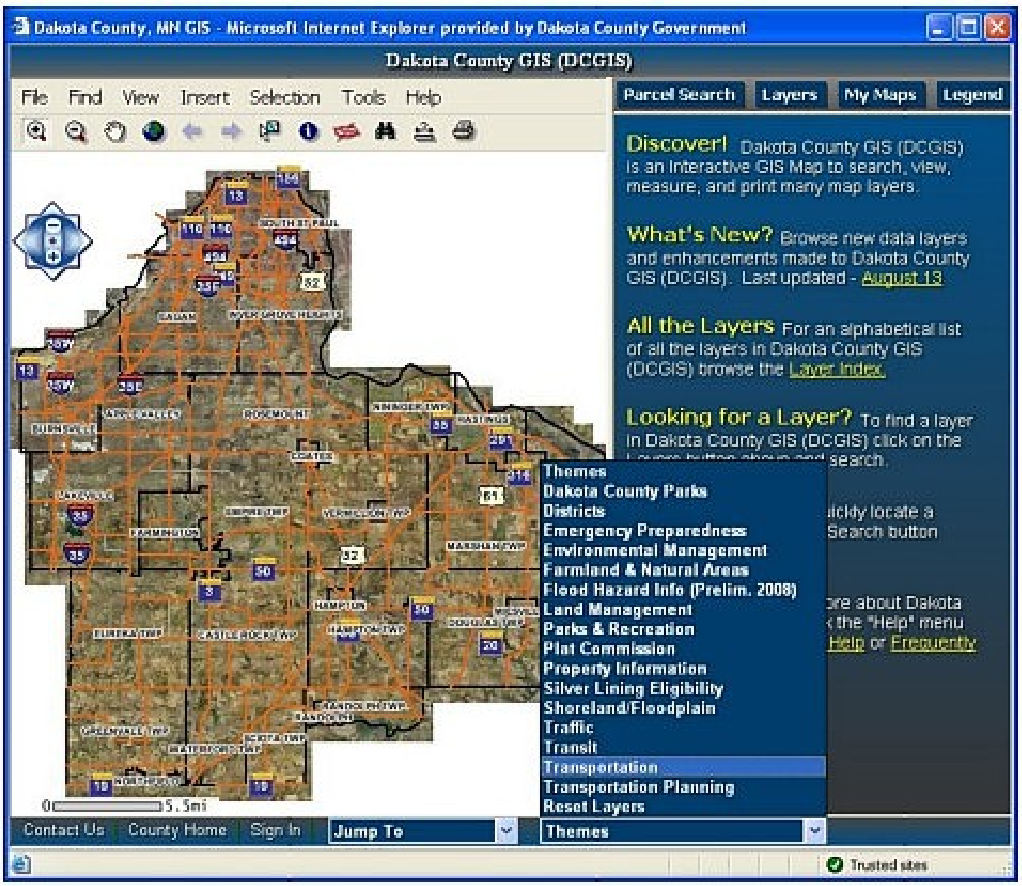
Fall 2009 - Desktop GIS: DCGIS Themes - So Many Layers, So Little Time

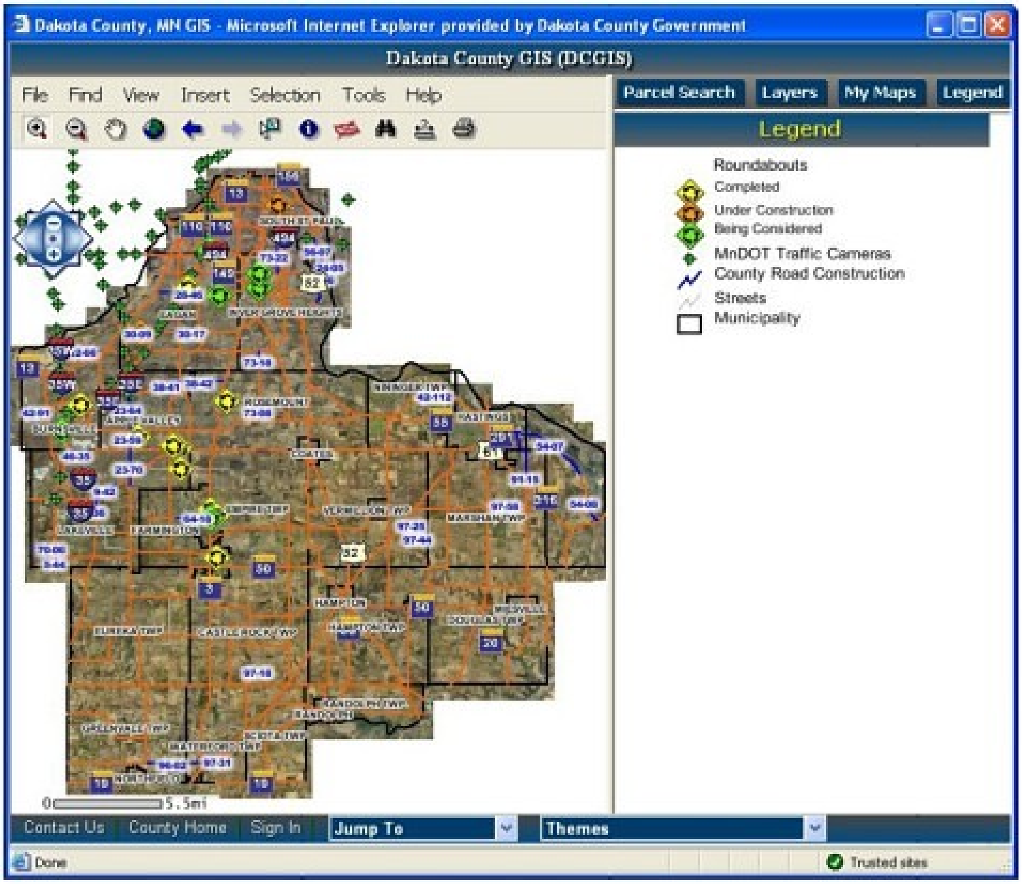
By Kent Tupper

There are presently well over 200 layers of GIS information available in Dakota County's DCGIS interactive map. Because there is such a wealth of information available, it might seem a little overwhelming at times. That is where "Themes" can be a big help and time saver.

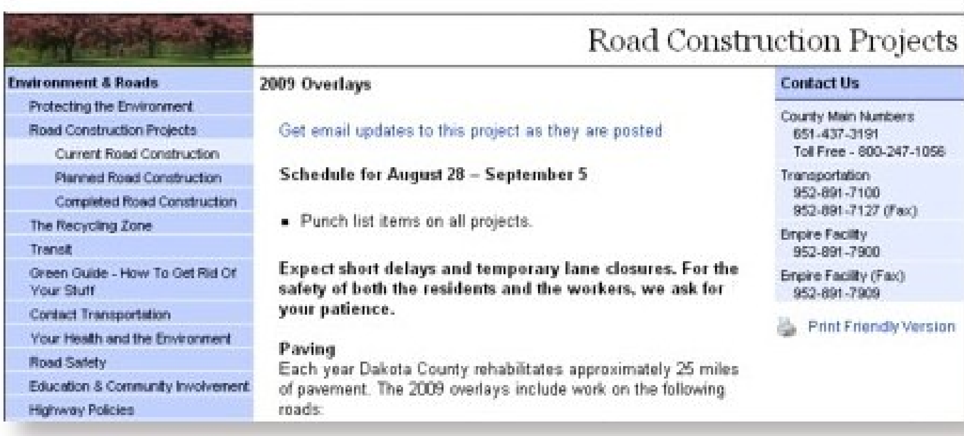
At the bottom right of the DCGIS window is a dropdown box that displays the word "Themes". If you select the arrow to the right of the box you will see a list of predefined GIS themes such as Dakota County Parks, Property Information or Transportation, to mention a few. (See example below.)



By selecting one of these themes, specific layers will be turned on for display, and a new selectable layer will be chosen (if appropriate). In the sample image below, selecting the Transportation theme has turned on layers showing information about roundabouts in Dakota County, as well as MnDOT traffic camera locations and the County Road Construction projects layer.



If the user selects the Information tool and then clicks on an area of Road Construction, a table is displayed showing information about the project. Users can also click on a link in the table to connect to that project's Road Construction Projects page. These pages contain detailed information about specific projects, as well as general information about large-scale projects (see below).



What this allows you to do is find certain information very quickly. Let's say that the information that you want a majority of the time has to do with property information. You can select the Property Information theme when you first start up DCGIS, and that data is presented to you with one click on the map. This can be a big time saver and can help find the information you are looking for.

Users also have the capability to set up a "Custom Theme" by turning on a theme, going through the Layers list turning on and off layers as they want, and then clicking the "Save" button at the bottom of the "Map Layers" page. The saved "Layer Settings" will remain each time the interactive map page starts and can be reset to the normal startup by clicking the "Clear" button, but in many cases there may already be a theme set up for the information that you want to see.

Keep an eye on "Themes" as they will be updated and added as the need and information becomes available.

Fall 2009 - Tech Talk: Using GIS to Support Active Living

By Scott Oatley, Dakota County Office of Planning and Analysis

Introduction

Active Living is about people including biking, walking, and other physical activity into their daily lives. The hope is if people do more walking and biking to work, to school, or to shop, they'll enter a cycle of improved health and increased desire for physical activity. To promote this idea, Dakota County partnered with four cities to create Active Living Dakota County. The program is sponsored by grants from BlueCross BlueShield of Minnesota.

Unfortunately, if you walk or bike in Dakota County, you'll experience a mix of friendly and not so friendly pedestrian environments. To successfully support Active Living, the built environment must offer the opportunity to be active. Closing gaps and fixing inconsistencies in the pedestrian network is costly. With that in mind, a GIS process was developed to help direct the County's limited resources to improve the highest-priority problems in the system. The overall process included three pieces: gap analysis, pedestrian demand analysis, and scoring analysis.

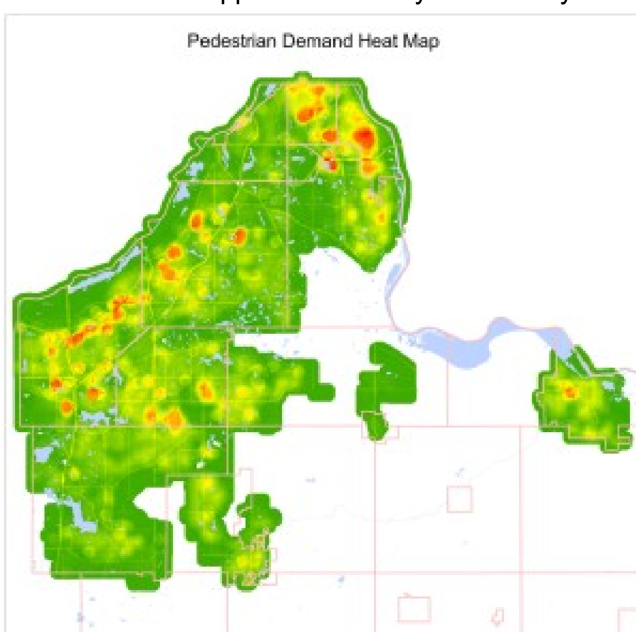
Gap Analysis

As of spring 2008, Dakota County didn't have an accurate account of off-street sidewalks and paths along county roads. A new pedestrian routes GIS layer was created via heads-up digitizing using newly available spring 2008 aerial photography. Normally, only existing facilities are digitized. However, in this process, the entire length of the county roads was included, and an attribute was used to indicate either the existence or the non-existence of sidewalks and paths. Opposite sides of the road were digitized separately.

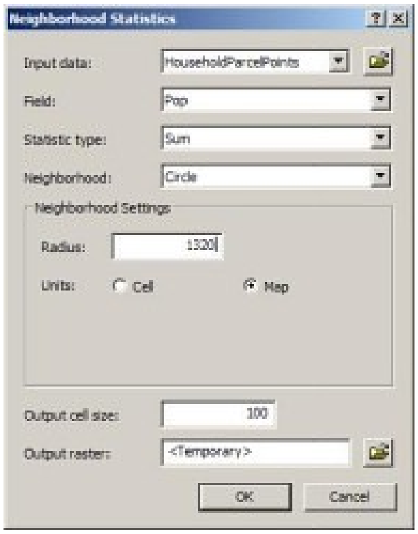
Pedestrian Demand Analysis

To prioritize the gaps in the pedestrian infrastructure, we had to know where need was greatest. We decided on ten criteria to express pedestrian demand. They represented two general themes, population and facilities. The criteria were individually weighted for their effect.

We wanted a flexible process that could easily handle any changes to criteria, their weighting, or the study area. We decided on a raster-based approach that allowed individual criteria to be mapped seamlessly across any area of interest. In our study, mapping was restricted to the Metropolitan Urban Service Area (MUSA). The scoring analysis relates the location of demand to gaps in sidewalks and paths so it was important to represent the criteria with reasonable spatial accuracy. All the data were represented in point shapefiles, and their points were located as close as possible to their physical source. The Spatial Analyst Neighborhood Statistics tool in ArcMap was then used to convert the criteria points into individual rasters with 100-foot grids. The grids were summed using the Raster Calculator, also a part of the Spatial Analyst extension, to generate a pedestrian demand "heat map."



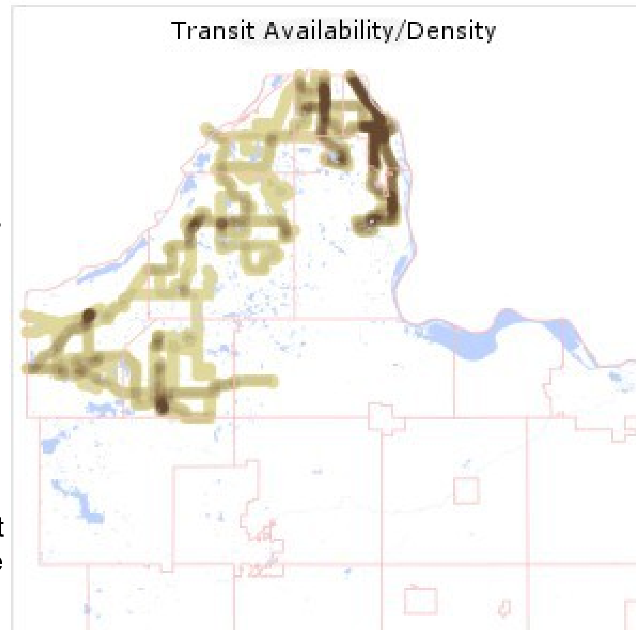
Key settings in the neighborhood statistics tool were the statistic type and the neighborhood radius. Our methodology essentially represented demand as density so the sum type was used. A radius of ¼ mile was used because that's a standard distance considered acceptable to pedestrians. The three road criteria – volume, lanes, speed limit – used



different settings, maximum type and a radius of 150ft because their influence isn't a density and is limited to the immediate vicinity of the road.

Details of processing a few criteria will help illustrate the overall method. Using 2006 population and household estimates, an average of 2.66 persons per household was calculated. Tax assessor building data was joined to parcel points to get a set of household points. The number of units was used to calculate a population for each household point.

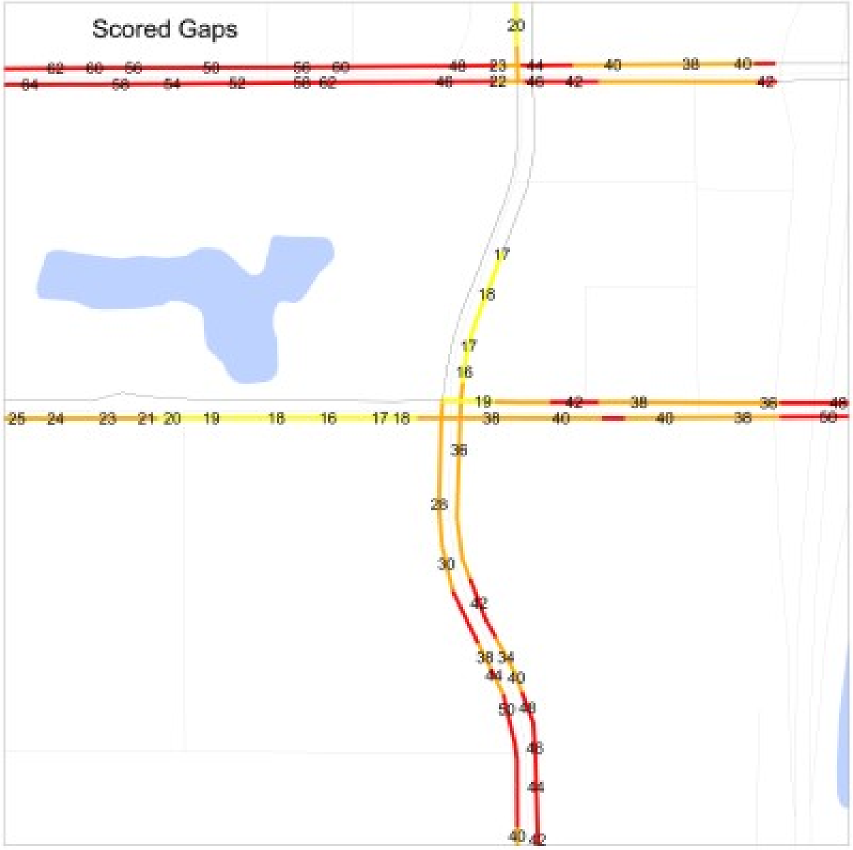
To find employment density, we used the Census Bureau's OnTheMap LED (Local Employment Dynamics) web application (http://lehdmap3.did.census.gov/) to get job counts by industry. By cross-referencing those categories to tax assessor building types, an estimate was found for employees per square foot for three general employer categories: office, retail, and warehouse & manufacturing. The employee count per employment point was calculated using those values and the primary square footage value in the tax assessor table.



Transit route data was initially a line shapefile. It was converted to points at 100-foot intervals using the ET Geo Wizards Create Station Points tool. The data included the number of trips per day which was treated as equivalent to population or employee count in the previous examples. Thus the transit points were used in a similar fashion to create a transit density raster.

Scoring Analysis

For the scoring analysis, the raster calculator was used to sum all the individual criteria rasters. The criteria weightings were designed to sum to 100. The rasters were reclassified so their number of classes matched their weighting value. That allowed simple addition in the raster calculator. The next step was to transfer the demand scores onto the gaps. Since vector and raster data can't be directly intersected or spatially joined in ArcGIS, the final raster was converted to a polygon and intersected with the new pedestrian routes. The resulting segments had a unique score. The final step in scoring was to double any gap segments where a gap existed on both sides of the road.



Conclusion

The final scored gap map was used by the Transportation Department to direct CIP funding for internal projects, and to choose among municipal CIP requests. The final demand raster can be used with any set of pedestrian routes in the county to generate scores. By changing the criteria, the same process can be applied to score other types of routes, for example, safe routes to school, or recreational routes. And finally, the techniques used to create the demand raster may be useful in generating a variety of population maps for use in emergency preparedness.

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Fall 2009 - Department Spotlight: Protecting the Vermillion River with an Integrated Corridor Plan

By Mary Jackson, Dakota County Office of Planning and Analysis

Photo: Brendon Slotterback

Our society depends on a network of built infrastructure for many aspects of our daily lives – communication lines, power utilities, sewers, roads, bridges and buildings. Although it may be less obvious, we also depend on a natural infrastructure network of lakes, rivers, shoreland, woods, prairie, and open spaces for essential natural processes such as stormwater infiltration, air purification, and flood storage. Protecting and reinforcing this natural network allows natural processes to occur efficiently and address problems that otherwise require costly engineered solutions. Protected and visibly healthy natural infrastructure builds a strong framework for future development that offers a high quality of life and sustains its value over time.

The Vermillion River is at the heart of a unique natural resource system within Scott and Dakota Counties. It is a cold-water prairie river, highly regarded as one of the best urban trout streams in the United States. To protect the natural systems of the Vermillion River, the Legislative Citizen Commission on Minnesota Resources (LCCMR), the Vermillion River Watershed Joint Powers Organization (VRWJPO), and Active Living Dakota County are jointly sponsoring a corridor planning project for the Vermillion River and sensitive shoreland along its main stem and major tributaries. The project seeks to integrate multiple benefits and will prioritize water quality and habitat benefits, evaluate recreation opportunities, and help shape future growth around the River. Because much of the land along the River is privately owned, the Corridor can be envisioned as a patchwork quilt of restored public land and voluntary private land protection practices. Dakota and Scott counties and the VRWJPO are leading the project and will develop a draft plan by early 2010.

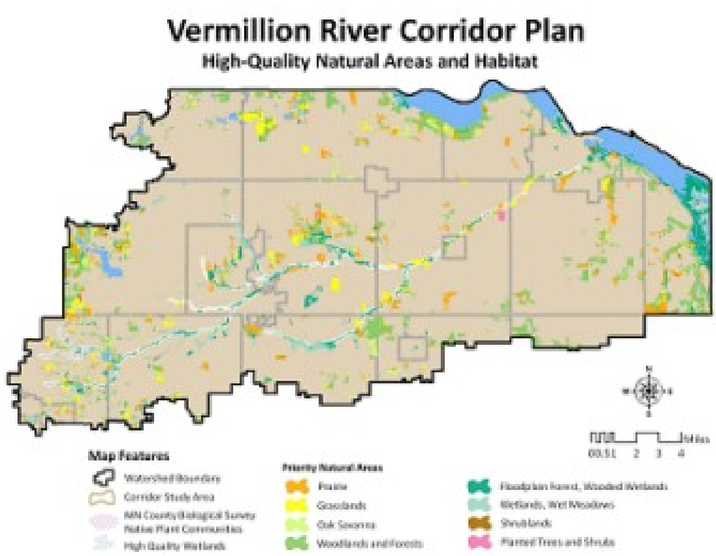

Figure 2: High Quality Natural Areas in the Vermillion Watershed

The project began last year with a research phase: precedent research on protected river corridors, an inventory of existing and brand-new science and studies on the Vermillion River, and a survey of the extensive body of GIS data that characterizes the Vermillion River. GIS studies for the project produced a series of maps on land use, water quality, natural resources, and recreation opportunities for the Vermillion Corridor.

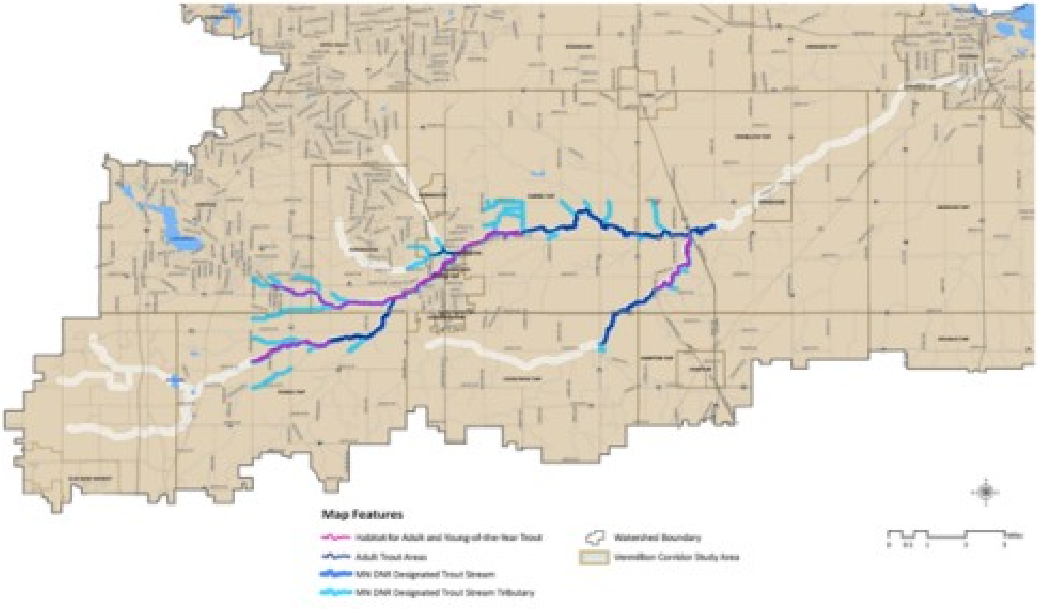

Figure 3: Adult and Young-of-the-Year Trout Areas

Research information was shared at public workshops held in June and July. ***Workshop 1, A River Worth Protecting***, was held in five locations to provide participants an opportunity to learn more about the river and participate in exercises to build a shared vision for their portion of the river corridor. Armed with electronic Audience Participation keypads provided by Wilder Research, workshop participants responded to a series of questions on their interest in the river, their hopes for its future, and their greatest priorities for protection. Next, participants selected photos representing their preferences from a collection of 24 different images showing approaches that improve water quality, enhance habitat, provide recreation opportunities, or shape development in the corridor's major land use contexts (agricultural, residential, open space, and commercial). Participants also placed icons representing these approaches on a map to indicate where they would be desirable.

Figure 4: Which Approaches Did People Prefer?

Figure 5: Where Do These Approaches Belong?

Results from the workshop are being synthesized with scientific data, GIS studies, and precedent research findings to prepare initial draft concepts of the Vermillion River Corridor. These concepts will be previewed and refined at a series of public workshops this fall, ***Workshop 2: Working Together*** (dates/locations to be determined). As concepts and approaches are refined, the plan document will be assembled for the project's final workshop, ***Workshop 3: Putting the Plan into Action***, planned for early 2010. Participants will review a draft Corridor Plan with an implementation toolbox and approaches for public-private collaboration.

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Fall 2009 - GIS 101: Saving Money With GIS

By Dan Castaneda

With a simple map made using GIS, the Dakota County Operations Department is able to save hundreds of dollars on deliveries. The Dakota County Government Center complex in Hastings is a large four-building campus covering several acres. The four buildings are the Administrative Center, the Judicial Center, the Juvenile Center, and the Jail and Sheriff's offices. Each one of these buildings has its own unique address, and accepts several deliveries throughout the year, which can cause problems when ordering products.

Typically, when someone like you or I orders something and has it delivered to our house, it ships to one location, to a single building with a single address. This, however, is not the case at the Government Center in Hastings. Often, one delivery will contain several items that need to be shipped to two or more buildings. By combining several items on one order, the Operations Department can save money on shipping. But because each building has its own address, the person coordinating the delivery has no idea that all four buildings belong to the same campus, which can lead to higher shipping charges, usually one fee per address.

In order to help solve this problem, the Office of GIS was asked to create a simple map of the Government Center. The map contains the 2008 aerial photo, and has labels for the surrounding roads and for each building. Also incorporated into the map were the oblique aerial views that were provided from the Pictometry imagery. The oblique images were included to help vendors recognize what the front of each building looks like, since the aerial photo only shows the buildings from above.

Now, when someone in the Operations Department places an order that includes shipping to various buildings, they can provide the map to the vendor to show them that all of the buildings are on the same campus, avoiding what would otherwise have been extra charges for shipping to multiple addresses. In fact, this was proven valuable during a recent delivery of office furniture, where the County saved $175 in shipping charges.

Even though this was a simple map to create, its usefulness will continue to pay off long into the future. This type of map demonstrates a basic example of what GIS can be used for, and how it can help save money by showing the geographic location of buildings.