

## Summer 2012 - GIS 101: Elevation Profiles

By Randy Knippel

An elevation profile is a technique used to help visualize the change in terrain along a linear feature, such as a road or trail. This is useful to determine things such as the steep parts of a bike trail, or overall slope changes in a trail, for assessing the level of difficulty or to compare trails to find one best suited to your skill.

Elevations can be depicted in a variety of ways on a map. Contours are lines that follow specific elevations at a specific interval, such as every two feet. Shaded relief uses shading and shadows to simulate a three-dimensional effect. However, an elevation profile (or simply a profile) is a graph, used in conjunction with a map, showing the elevation along a specific line on the map.

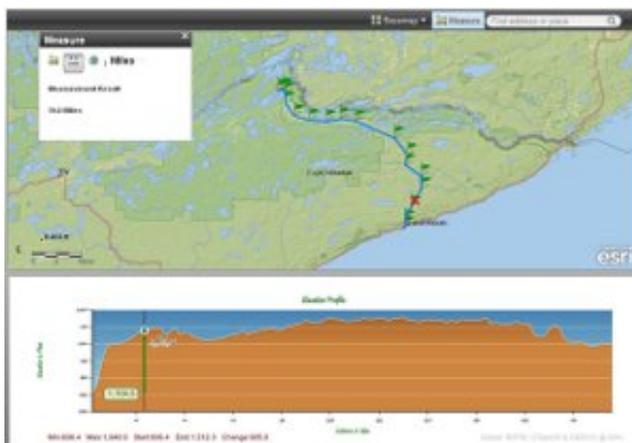


Figure 1 - Gunflint Trail with elevation profile

The graph uses the distance along the line on the X-axis, and the elevation on the Y-axis. Care must be taken in interpreting the graph since the scales the two axes use typically vary wildly and can change from feature to feature.

Figure 1 shows a map of the Gunflint Trail and the corresponding elevation profile. Note how the elevation changes dramatically in the first few miles from Grand Marais.

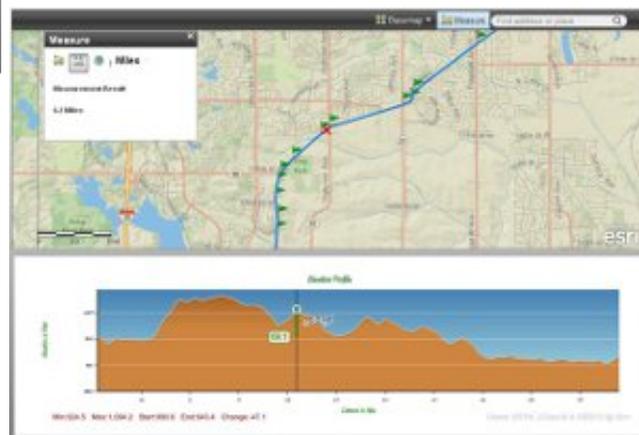


Figure 2 - Profile of Dodd Blvd in Lakeville

A profile can be used on very long features or small features,

depending on the amount of detail desired. Road engineers will use profiles to design roads that meet specific slope standards, or to help analyze existing roads to determine areas that could represent safety concerns.

Figure 2 shows a profile along Dodd Boulevard in Lakeville with the cross hairs on the intersection with Highview Boulevard. Note how that intersection is a high point along that stretch of road.

Bike enthusiasts, especially mountain bikers, will use profiles of bike trails to plan bike routes that match their skill level or desired ride experience. Several professional mapping companies and bike clubs provide bike trail maps for just that purpose. Trail profiles can also be used to determine difficulty levels or during the trail design process to achieve specific trail characteristics. The same applies for sports like hiking and traditional skiing.

Figure 3 shows a section of a traditional ski trail in Lebanon Hills Regional Park. In this interactive GIS application, moving the cursor along the profile moves a corresponding red crosshair in the map. The cursor is set to the highest point on that segment of trail. The segment shown is less than a mile long and the elevation varies as much as 60 feet, likely contributing to the classification of “intermediate” difficulty level. However, although the profile appears to show the trail going up and down mountains and valleys, the elevation changes are exaggerated about 5 times due to the different scales for distance and elevation.

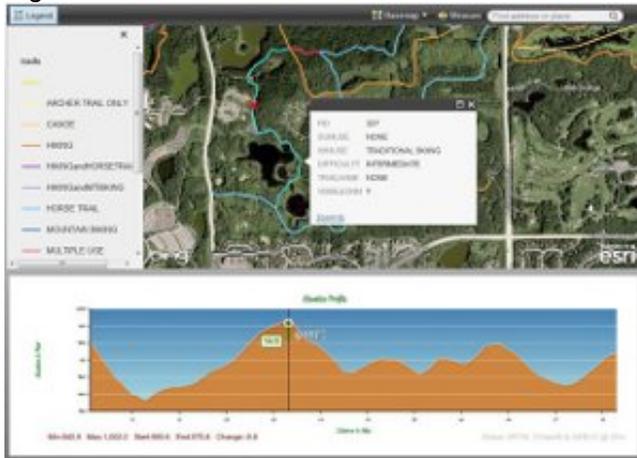


Figure 3 - Traditional Skiing trail in Lebanon Hills Regional Park

These examples were created using a new capability from Esri called ArcGIS Online. You can try it yourself using this link: <http://bit.ly/LZ3JZg>. The elevation data used in that application are derived from the Shuttle Radar Tomography Mission in February, 2000, so the accuracy, currency and precision of this data should also be

considered. Dakota County has much more accurate elevation data, which could be used for providing much more detailed results.

Copyright 2006 Dakota County, Minnesota

## Summer 2012 - Department Spotlight: Web-Based Editing: Easier and Way Cheaper

By Todd Lusk and Mary Hagerman, Dakota County Office of GIS

Long talked about at Dakota County, web-based data editing has finally arrived! The Office of GIS recently deployed several web maps that allow users to edit the data through a web browser. There are several advantages to this approach over the traditional model of editing GIS data on a desktop-based product.

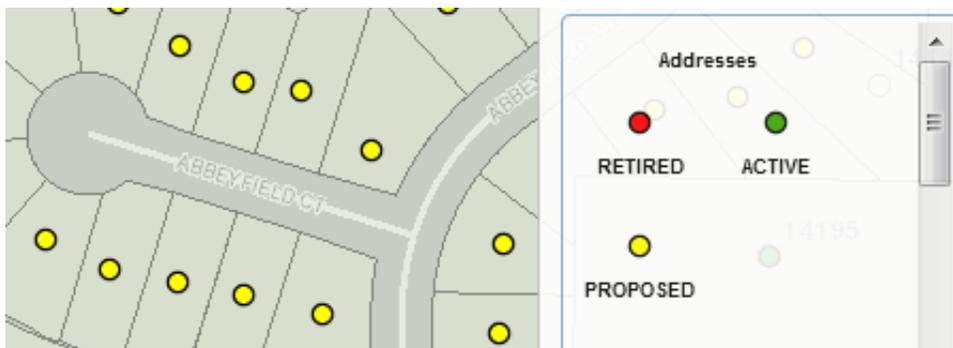
First, because the applications are web-based, a desktop GIS editing package is not required for the data editor to make changes. The editor can simply open a browser, navigate to a website and start editing the data. Because the editing can be done in the browser, one does not need to purchase a desktop-based software package to make the changes, resulting in significant savings.

Second, because web technology is not as sophisticated or powerful as desktop GIS software, the applications are restricted on just how complex they can be. Thus, the interface for editing the information is much simpler, making the application easier to use. There is little to no overhead required as there is for learning all the intricacies of desktop-based GIS software. A data editor does not have to know where the correct button or dialog is located in order to start editing data. They can simply open the browser and start editing.

Third, the easy-to-use, no-license-required nature of web-based applications allows the data owners to edit their own data. This is advantageous, because they are the ones most familiar with the data.

They are the ones most capable of making sure data is accurate and up-to-date. It also facilitates more timely updates, as data owners can make changes as they happen, and not have to wait for someone else, such as GIS staff, to make the updates. Power to the people!

Lastly, the web-based editing platform allows the data editing to be widely distributed. Data owners can edit data without being restricted to working at a desk with desktop GIS software installed. It also opens the possibility of deploying mobile-based editing of data "in the field".



One example of one of these new web-based editing applications is the Address Point Editor. The application allows city and county staff to edit and review all address information for the County in one centralized location. It allows users to select and edit existing address information, to add new address locations, or to refine the locations of existing addresses by selecting dots and making the changes.

Web-based editing applications have also been developed for tracking weather-related slips and falls, inventorying park signs, and for maintaining adult care facility data. A number of others are in the works as well. These new web maps will allow data owners to edit their data in an easy, cost-effective, and timely manner. Now that's efficient, effective, responsive government.

Copyright 2006 Dakota County, Minnesota

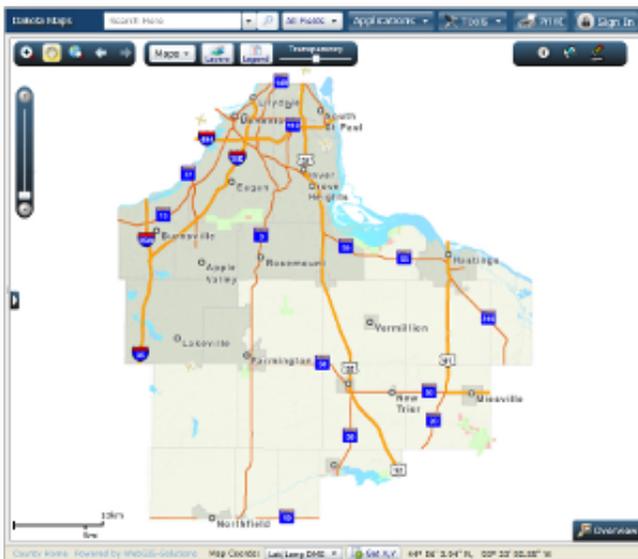
## Summer 2012 - Desktop GIS: DCGIS 4 for DCGIS 2 Users

By Kent Tupper

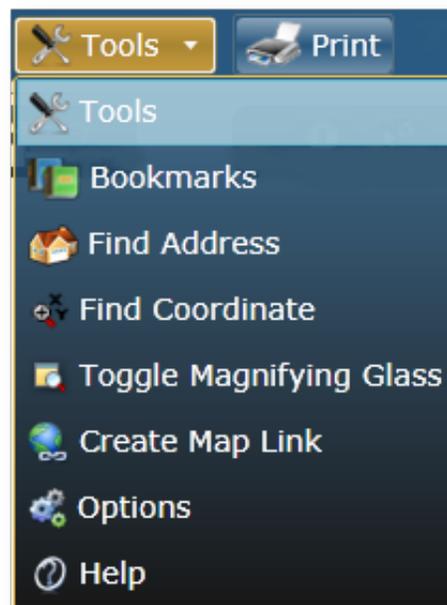
The Dakota County Office of GIS is rolling out the latest version of the Dakota County GIS (DCGIS) web application. This new version is available for preview on the Dakota County website at [DCGIS 4 Preview](#). The first thing you will notice about this new version is the performance! This application is built on Microsoft Silverlight technology and utilizes Esri ArcGIS Server map services. Our new version is supported by more web browsers than our previous version. The Office of GIS is still in the process of adding our GIS layers to the new application, but that will be completed soon. This means users will have the same GIS information available in the new version as they did in our old version of DCGIS.

Silverlight gives this new application a much richer look and functions more like a Windows application. To use this application you need Silverlight installed on your PC. If you don't already have it installed you will be prompted to do so when you first try to run it. Here are a few quick tips for our previous users.

Searching has been simplified. Instead of multiple search boxes for Parcel ID (PIN), House # or Address, there is



a single search box at the top of the map that allows you to search for most of the commonly searched values in our GIS layers, not just Tax Parcels. The default is to search "All Fields", but you can narrow the search to specific fields by clicking the "All Fields" button and selecting the specific field you want to search. Then start typing in the search box. The next new thing you'll notice is an autocomplete feature that gives you actual values from our database, helping to eliminate typos and return more accurate search results.



Another improvement is with address geocoding, found under the "Tools" button by selecting "Find Address". It also has an autocomplete function and takes advantage of an ArcGIS Server composite geocoding

service that first matches against the County's Address Point database and then our Street Centerlines, finding our best location for an address. There is also a new Magnifying Glass tool to try out. Also under the Tools menu a user can set some "Options" on how the application works for that user. "Create Map Link" generates URL's that the user can send in an email or embed in a web page, displaying an area of interest on the map. "Bookmarks" and "Find Coordinate" tools work similar to our old version.

Check out the "Help" documentation to give you more detailed information on use and functionality of this application. It includes animations to walk you through the use of the main tools.

The "Maps" toolbar is where you control what you want to see on the map. There are Layer groupings, the same as you saw in DCGIS 2, available. Also, by clicking the "Maps" button, the user can select either Street View or Aerial View basemaps to display behind their layers.

Clicking the "Layers" button gives users the ability to customize their maps in the same manner as the Layer



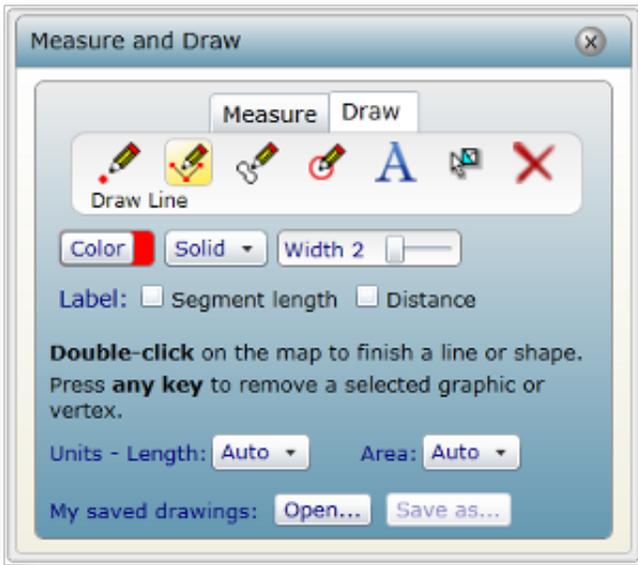
tab in our old application, by turning on and off feature layers, but now the user can move Layer groups to help the map display properly and can even adjust the transparency of the layer groups. A major enhancement is that the user can "Add Content" from other ArcGIS Server map services that are available for display in their map. An example is adding Layers from Esri's ArcGIS Online map services.

The user can save their "Custom Map" to recall at some later date, or, under "Layer Settings", click Save and the users' map will always open with their custom layer settings displayed.

Another enhancement involves adding graphics to your map. Select the "Measure and Draw" tool, then click the "Draw" tab, where you can select from a number of different Graphic types, symbols and fonts to add to your map. There is now a Select tool that allows you to reposition your graphic or delete just the selected graphic rather than having to delete all and start over. You can also save your Drawing for later use.

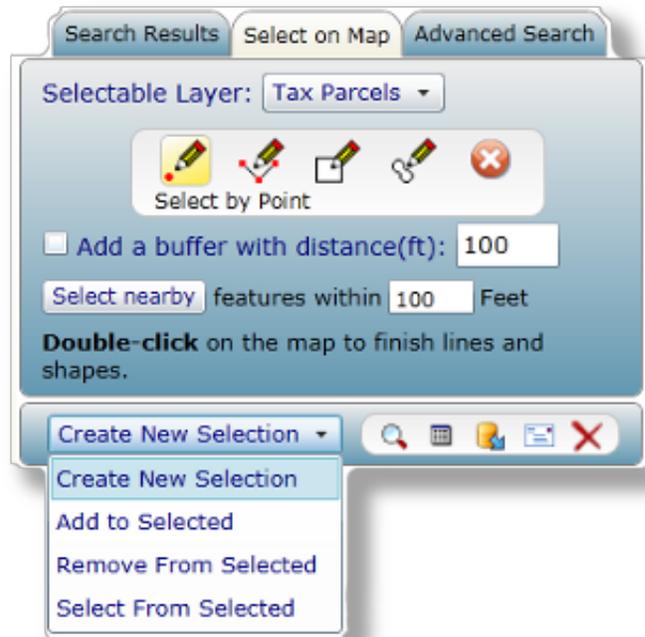
The last improvement that I'm going to talk about deals with creating selection sets. Searching is accessed by selecting the "Search and Select" button at the top of the map. Our new application gives you capabilities similar to ArcMap. You can create new selection sets, add or remove from the current selection set, or select from a subset of previously selected features. This can be done interactively on the map or by using the Advanced Search and querying attributes. There are also options for buffering graphics or selected features. The results of these selections can now be exported to multiple formats such as PDF, XLS, RTF and CSV.

A Pictometry tool will be added very soon, and there are other advanced tools coming in the future so keep checking. There are more new features so please poke around. This new version of DCGIS should make you more productive and help you get the GIS information you are looking for. We will be notifying our government users about upcoming training over the next few months.



There is a link to send us feedback on the Intro page, so please let us know what you think.

Copyright 2006 Dakota County, Minnesota



---

## Summer 2012 - Tech Talk: Cached Maps

By Dan Castaneda

In the past couple of years, the Dakota County Office of GIS has implemented several web mapping applications that use cached maps. Cached maps have been around for several years, and offer many advantages to previous web-based mapping technologies. They provide the user with a fast, cartographically rich experience and have become the industry standard for web-based mapping applications. Dakota County Property Information Online is one application that takes advantage of the benefits of a cached map.

Many of you have already used a cached map. Popular mapping sites such as Google Maps, Bing Maps, and Open Street Map all use cached maps. A map cache is a series of static map images created at different scales. These static images are called tiles, and as you zoom in, each tile displays a smaller geographic area, typically with greater detail. As you can see in the images, the tiles display major features at a countywide scale, such as major roads, county parks and municipal boundaries. When you zoom into a neighborhood level, more information begins to appear. Local roads, libraries, schools, fire stations and other features become visible. The tiles are the primary reason the application responds so quickly.



*click each image to see tile at actual size*

In older web maps, the application would often have to request new data from the geodatabase server any time a user panned or zoomed. This caused a delay for the user, especially when multiple layers or aerial photography was turned on. With a cached map, the rendering has been done ahead of time and stored as image files on the server. These image files are very small in size. Now, when a user pans and zooms, the application no longer needs to request any information from the geodatabase server and most requests can be returned within a fraction of second. This saves an incredible amount of time, especially when looking at aerial photography.

By using pre-rendered static images, the web map author is also able to present the user with a high quality cartographic product. Previously, the map creator would often need to balance the level of cartographic detail with drawing performance. This meant using simple symbology, labels, and a limited number of layers. A cached map allows you to create a highly detailed cartographic product, with complex symbology, elaborate labels, transparencies, and multiple layers. This allows the creator to present the user with all of the information necessary, in a visually appealing way, without sacrificing performance. This attention to detail is evident when looking at the [streets](#) in the cached maps. All bridges have been accounted for and you can see when a specific street is elevated over another.



Dakota County has several cached maps available for use in web applications. DCGIS, Property Information Online, and Pictometry Online all have their own cached basemaps, with different features. All of the cached maps come in both a street and an aerial view. The Property Information Online cached map serves as a general basemap, and the Pictometry Online map includes more detailed address information and has a different set of scales. Cached maps can be used in ArcMap, ArcGIS Explorer, and ArcGIS Online.

Copyright 2006 Dakota County, Minnesota