MnTOPO Help

REVOLUTIONIZING THE WAY WE LOOK
AT MINNESOTA'S LANDSCAPE

http://arcgis.dnr.state.mn.us/gis/mntopo/

I. Overview

DESCRIPTION:

MnTOPO is a web application for viewing, printing and downloading high-resolution elevation data for Minnesota that was collected using LiDAR technology. It runs on a variety of devices, including desktops, tablets, and mobile phones.

This help document is organized into seven sections, starting with an overview of MnTOPO's features and a description of the interface, followed by more detailed help for navigating the screen, displaying maps, finding elevation information for points and lines, printing maps, and data download.

MAP DISPLAY

The display is fast since the information is "tile-cached" (saved in pieces at predefined scales). MnTOPO can zoom to 12 different scales with more detailed information shown as you zoom in. The area covered includes Minnesota and some adjoining regions that contribute surface water to Minnesota.

MnTOPO lets you choose several layers of information to display over your choice of four background basemaps.

- **Basemaps** include roads, color air photos, and terrain in color and in black-and-white
- **Overlays** include contour lines at 2-foot, 10-foot, and 50-foot intervals, flight lines (click on a line to find out more about the LiDAR data collected in that area), and FEMA floodplain boundaries.

FUNCTIONALITY

Get Elevation Info: Click on a place to get its elevation, or draw a line to create an elevation profile graph.

Create, Save and Print a Map: Choose from several sizes and add a title.

Download Elevation Data: Download data to use in Geographic Information Systems (GIS) software. Data includes the original LAS-format files, digital elevation models, hillshades and contour lines, plus breaklines and building footprints where available. Formats include Esri Geodatabase 10 and open source.

QUALIFICATIONS

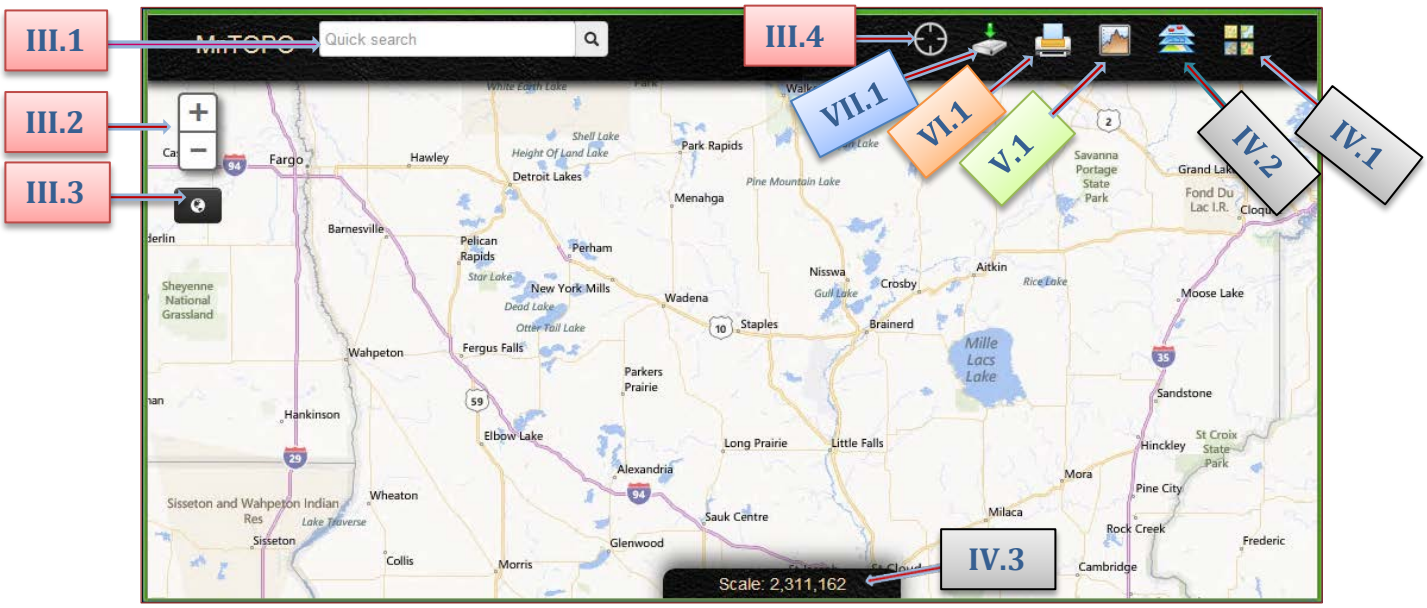
Disclaimer: Data shown and provided is subject to the disclaimers provided in the data documentation. The data was collected in several different phases so accuracy and available products vary; please review metadata for individual LiDAR collection blocks.

MnTOPO is not meant to provide high accuracy profiles required by some applications.

Credits: MnTOPO is a collaborative effort between MN.IT Services @ Minnesota Department of Natural Resources and MN.IT Services @ MnGeo. Funding was provided by the Clean Water Fund of the Clean Water, Land and Legacy Amendment.

II. Application Window/Interface

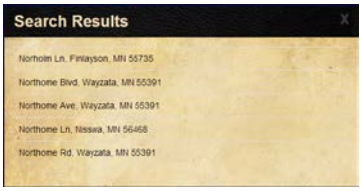
- The MnTOPO user interface provides the user with a standardized and comfortable platform for navigation and tool utilization.



III. Navigation

- Four custom buttons as well as some standard web application functions help the user explore Minnesota's landscape and find locations of interest.
- All "zoom" functions jump to the next higher or lower predefined map display scale.

1. Search



- The application uses the BING search engine for finding places of interest across the state.
  - This search engine has been customized to the extent possible to make sure that only places in Minnesota are searched.
- Search accepts street addresses, place names, and coordinates.
  - It also can use multiple clues. For example, you can add a county name to a lake name search in order to get to the proper lake.
- The **Search Results** will return a list of all options found from which you can make a selection to navigate to.

2. Zoom

- Use this button to zoom in and out to the twelve predefined map scales.
- You can also use your map wheel for zooming.

3. Zoom to Extent

- Zoom out to full extent (a scale of 1:2,311,162).

4. GPS Current Location Button

- The application can use your device's location services (GPS or Network) to center the display on your current location.
- This tool is most useful for mobile "in the field" applications where your location is identified by GPS and then zoomed-to in the viewer window.
  - If used on a desktop PC, it will zoom to the location of your computer's IP address or the ISP IP address location; which may not be your actual location.

5. STANDARD ZOOM TECHNIQUES

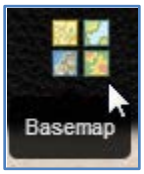
- Several standard web application tools and functions exist to help the user explore Minnesota's landscape and find locations of interest.
- The functionality of these tools will vary depending on the device accessing MnTOPO.

- Pan:
  - Left click your mouse, hold it down and drag.
- Zoom In techniques:
  - Double-click your left mouse button on a point to zoom into the next predefined viewable scale.
  - Move your mouse's scroll wheel away from you.
  - Short-cut keys?
- Zoom Out Techniques:
  - Double-clicking the mouse in a single location will cause the display to be zoomed in
  - Move your mouse's scroll wheel toward you

IV. Map Display

1. Basemap Choices

- The application provides the ability to view several background raster products as individual basemaps for viewing and navigating the landscape.



Roads

- The default display for MnTOPO of base maps.
- An ESRI base map providing roads, cities, water bodies and other features for general navigation and visualization of the landscape infrastructure.

Imagery –

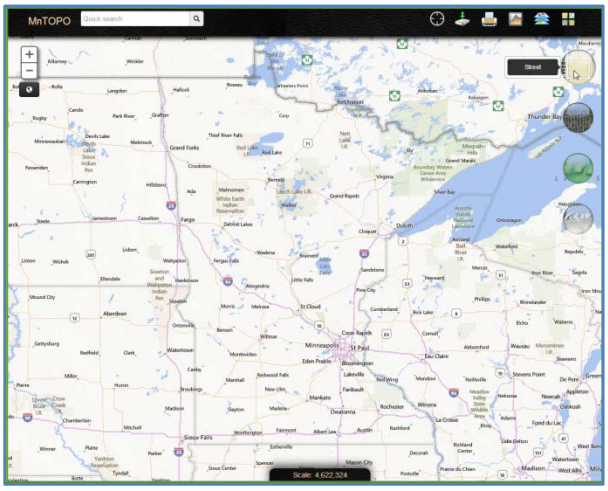
- Base map of air photos for land surface characterization.

Terrain: Color

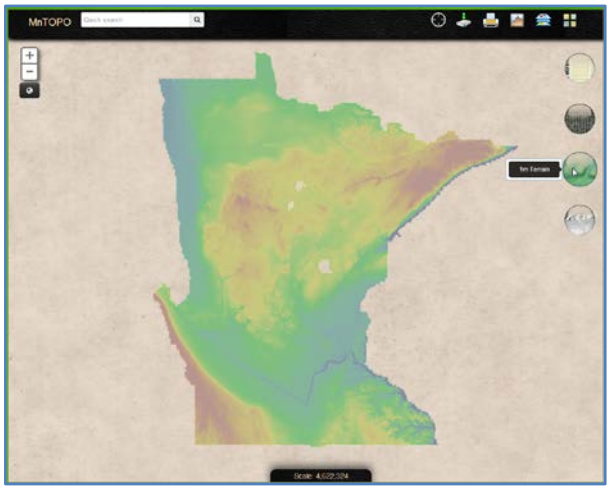
- An image formatted DEM representing the combination of a colored one-meter DEM and a one-meter hill shaded DEM.
- Green (low elevation) to white (high elevation)

Terrain: Black & White

- A black-and-white one-meter hill shade built from the DEM.



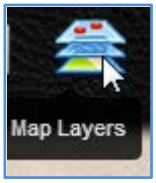
Roads Display (Default Basemap)



Color Terrain Display

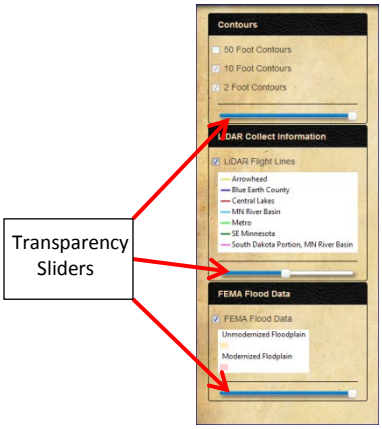
2. MAP LAYERS

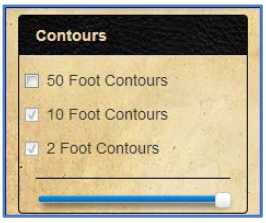
- The application provides the ability to view several overlay products in conjunction with the basemaps.
- The transparency of each of the overlay groups can be adjusted to user's preference using the ***Transparency Sliders***.



- Clicking on the Map Layers button drops down the available layers.
  1. Click on the categories to expand.
  2. Make your choices
     a. Transparency Sliders allow for creative viewing options.

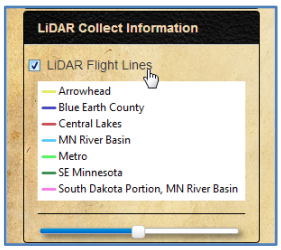
- Map Layers Expanded

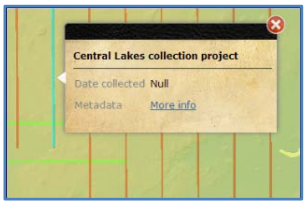




Contours

- ***50' Contours*** – Contours available at scales larger than 72,224.
- ***10' Contours*** – Contours available at scales larger than 18,056.
- ***2' Contours*** – Contours available at scales larger than 9,028.

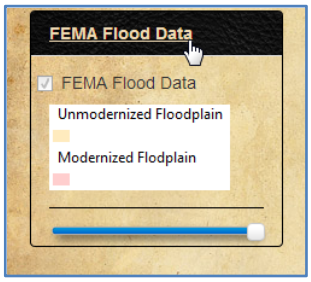




LiDAR Collection Information

- ***LiDAR Flight Lines*** –
  1. Click box to draw flight lines in the view window.
     - Not all LiDAR collects have flight lines available (i.e. some of the individual County collections).
  2. Click on the category title to expand a legend.

- ***Flight Line Information*** –
  1. Click on an individual flight line to obtain information unique to that specific LiDAR collect.



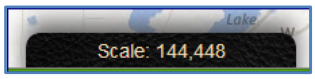
FEMA Flood Data

- ***FEMA floodplain data d***
    1. Click box to draw mapped floodplains.
    - Not all LiDAR collects have flight lines available (i.e. some of the individual County collections).

Click on the category title to expand a legend

3. Map Scales

- MnTOPO basemaps are presented in the Web Mercator projection.
- Information is displayed at twelve predefined map scales to facilitate the tile-cache structure of base information exclusive to Minnesota:

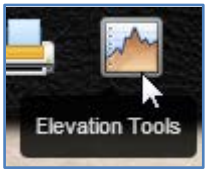


1:2,257	1:18,056	1:144,448	1:1,155,581
1:4,514	1:36,112	1:288,895	1:2,311,162
1:9,028	1:72,224	1:577,791	1:4,622,324

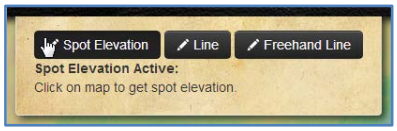
V. Elevation Information

1. Elevation Tools

- Clicking on this button opens the tool bar for obtaining elevation information specific to a point or a profile line for specific locations of interest.

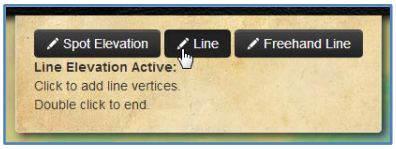


- You can choose from the three options of the tool bar to obtain elevation information.



Spot Elevation

- Selecting ***Spot Elevation*** gives the user the ability to click on the map and retrieve the elevation value for a particular grid cell.
  1. Click on the location of interest.
     - The Elevation Data window is returned containing:
       a. The elevation value in both feet and meters.
       b. Coordinate location in WGS 84.
       c. Coordinate location in NAD83 UTM Zone 15.

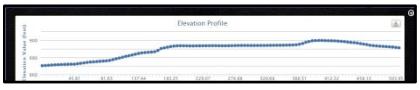


Line

- Selecting ***Line*** gives the user the ability to draw a reference line from which a profile line and graph will be generated.
  1. Left mouse click once on screen to start the line.
  2. Left click for each vertex on the line in the direction you want the profile to be created.
  3. Double Click to end the profile line.

Freehand Line

- Selecting ***Freehand Line*** allows the user to draw a continuous line with automatic vertex placement.
  1. Place the cursor where you want to start the line.
  2. Click and hold the left mouse button and drag in the direction of the profile line.
  3. End by releasing the left mouse button.



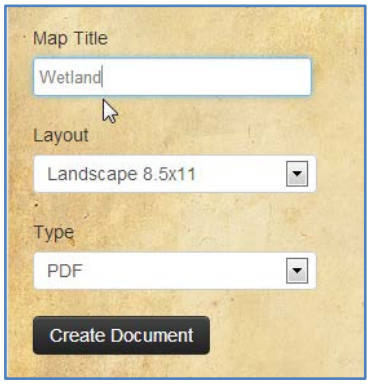
Profile Example

- Example of resulting graph generated from the Line options.
- To print your profile see Appendix B

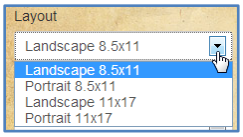
VI. Printing

1. Create the Map for Printing

- The application supports the creation of maps for the current display in four sizes and five formats that are saved to the user's device.

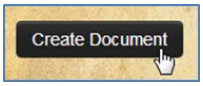


1. Enter the Map Title of your choice.
2. Select the ***Layout*** size of the map.
   a. 8.5 x 11 Landscape
   b. 8.5 x 11 Portrait
   c. 11 x 17 Landscape
   d. 11 x 17 Portrait



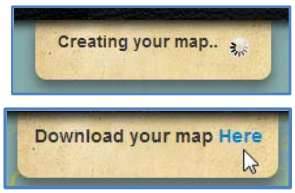
3. Select the format ***Type*** of the map.
   a. JPEG
   b. PDF
   c. PNG8
   d. PNG32
   e. GIF

4. Select ***Create Map***.

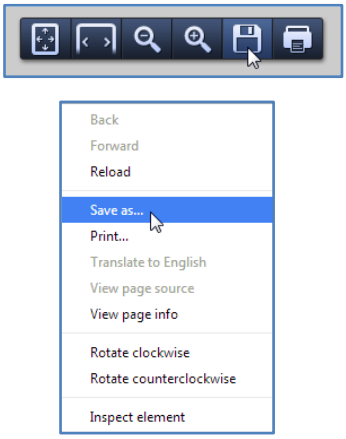


2. Download and Save the Map

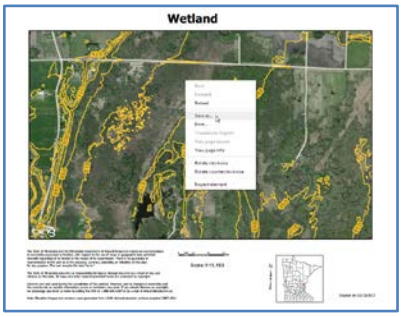
- Once the map is created, the user should download it to their device to ensure the best quality printing.
- Depending on the device, browser, and the setting for each, the user will experience different options for saving and printing the map.



- The application informs you the map is being created.
  1. To download your map into your device and or browser click ***Here***.



- Saving and downloading procedures may vary depending on your device and browser.
- Two suggested methods for saving the created map.
  1. Right mouse click to open the options menu for your browser, then Select ***Save as…***
  2. Hover over the Options Bar in the browser

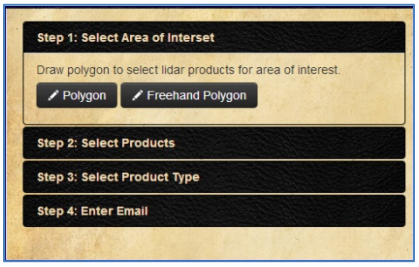


- Printed maps have the following components:
  - Map window containing the view of the screen
  - North Arrow and Scale bar
  - Locator map of Minnesota Counties
  - Standardized disclaimer
-

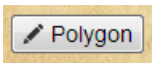
VII. Data Download

DATA DOWNLOAD

- The application supports downloading various LiDAR products based on a polygon area of interest that is defined by the user. The user can specify which data layers they want to download and the format they would like it delivered in.
  - UTM Zone 15, NAD83
  - Raster and Vector data are merged/mosaiced
  - LAS data is stored as compressed LAZ files
  - LAS data is NOT merged
  - Metadata is included
  - 10gb download limit



Step 1. ***Define Area of Interest*** **–** User draws a polygon on the screen specifying the area of interest; the LiDAR tiles that intersect the polygon are highlighted.

- 

- An area of interest polygon is drawn by clicking on the mouse at every vertex and double-clicking to close the polygon.

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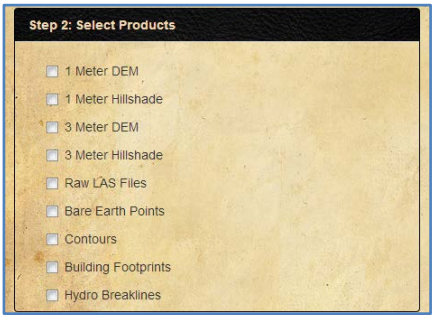
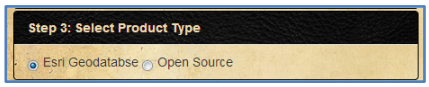
- An area of interest polygon is drawn by pressing and holding the left mouse button to 'trace' a polygon. The polygon is closed when the mouse button is released.



Step 2. ***Select Products*** - The user specifies the layers they want downloaded.

- 1 meter DEM
- 1 meter Hillshade
- 3 meter DEM
- 3 meter Hillshade
- Raw LAS File [*Tile_ID.las]*
  - Full point cloud in LAS format]
- Bare Earth Points
- Contours
- Building Footprints (if available)
- Hydro Breaklines (if available)



Step 3. ***Select Product Type*** - The user has the ability to specify the data download format.

- Selecting ESRI Geodatabase format downloads the data in the common data storage and management framework for use in ArcMap.
  - Geodatabase
    - http://www.esri.com/software/arcgis/geodatabase/
- For Open Source data, the *Vector* data will be converted to Shapefiles and the *Raster* data will be in binary floating-point raster format.
  - Shapefile
    - http://en.wikipedia.org/wiki/Shapefile
  - Floating Point Binary format
    - http://en.wikipedia.org/wiki/Floating_point
    - http://en.wikipedia.org/wiki/Binary_file

	**Step 4.** ***Enter Email*** - The user enters an e-mail address and is notified when the package is ready.

FUNDING:

- The development and management of MnTOPO is a collaborative effort between MN.IT Services @ Minnesota Department of Natural Resources (DNR) and MN.IT Services @ Minnesota's Geospatial Information Office (MnGeo).
- Funding was provided by the Clean Water Fund of the Clean Water, Land and Legacy Amendment. http://www.legacy.leg.mn/funds/clean-water-fund.

Appendix A

Appendix – A: **Cross Section Printing**

- Printing of Cross Section directly from the application is not yet available but planned for the future.
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Suggested Work Around

1) Download the profile as a CSV file and then load it into Excel and produce your cross-section there.
2) Do a screen capture of the profile on the MnTOPO screen and paste the image into a word document.

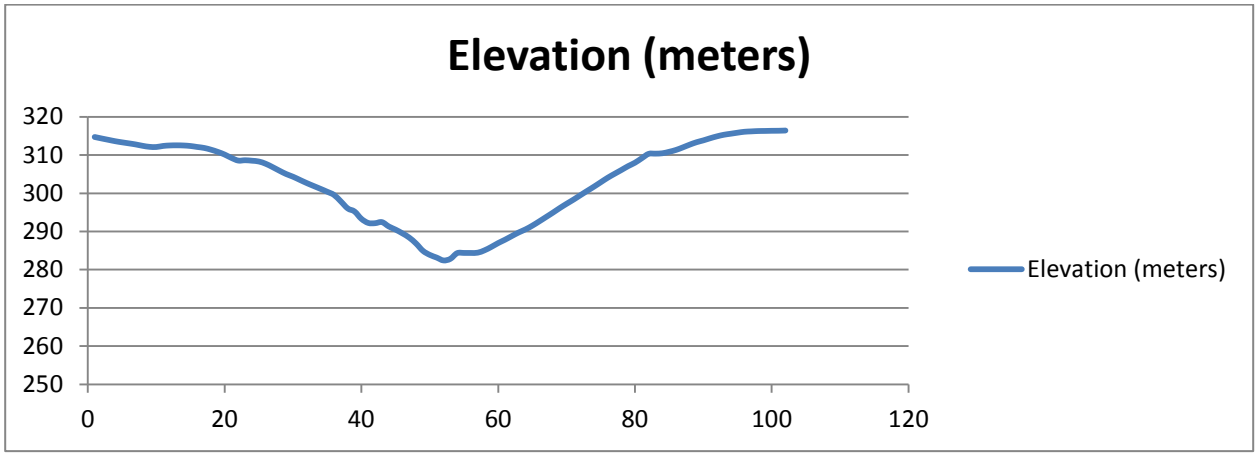
To create a cross section in Excel you need to do a couple of things:

1) Open the CSV file in Excel
2) Create a new column that has a calculation that determines the distance from the previous point to this point

Y	Z (meters)	Distance (meters)	Distance (feet)	Z (feet)
4931110.114	314.716057	0		
4931110.127	314.336335	1.602962901	5.259064635	1031.287188
4931110.139	313.975726	3.205925801	10.51812927	1030.104087
4931110.151	313.614861	4.808888702	15.7771939	1028.920146
4931110.163	313.318965	6.411851603	21.03625854	1027.949361
4931110.175	313.051652	8.014814503	26.29532317	1027.07235
4931110.187	312.766639	9.617777404	31.55438781	1026.137269
4931110.201	312.413282	11.31241914	37.11423601	1024.97796
4931110.215	312.145441	13.00706087	42.67408422	1024.099216
4931110.228	312.09552	14.7017026	48.23393242	1023.935432
4931110.242	312.373689	16.39634433	53.79378062	1024.848062
4931110.256	312.502112	18.09098607	59.35362883	1025.269395
4931110.269	312.53611	19.7856278	64.91347703	1025.380937
4931110.283	312.494361	21.48026953	70.47332524	1025.243966
4931110.296	312.362093	23.17491126	76.03317344	1024.810015

3) Insert a graph using the new distance column on the X axis and the elevation on the Y axis

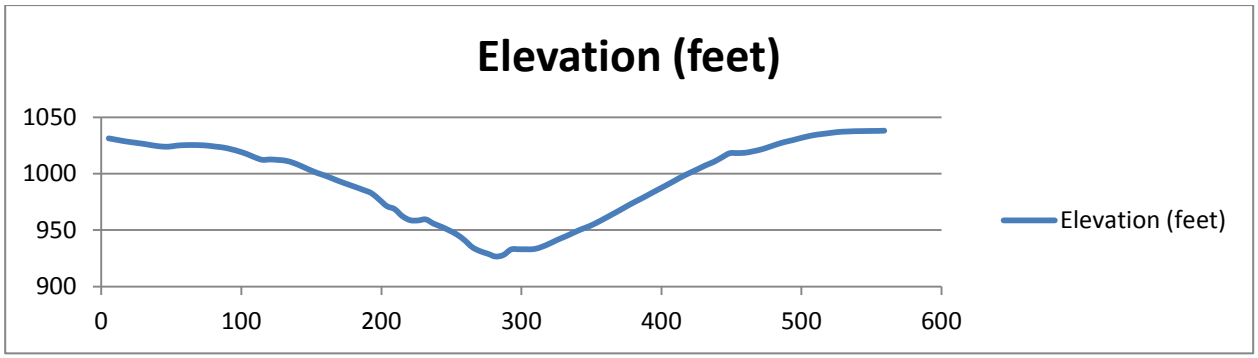
Example:



Open a Comma Seperated Value (CSV) file downloaded from MnTOPO in Excel to create a graphic profile.
Assume that the first record in the table is the start and to produce the profile you need to calculate the distance from one point to the next using the Pythagorean Theorem.

d = sqrt((x2 - x1) + (y2 - y1))

To get cumulative distance you need to add that to the distance in the previous cell.
Then insert a X, Y graph and Z field as the Data and things come out as shown above.



If you want to show the distance and elevation in feet create additional columns and multiply meters * 3.280839895.