DIGITAL MAPPING TECHNIQUES 2023

The following was presented at DMT’23
May 21 - 24, 2023

The contents of this document are provisional

See Presentations and Proceedings from the DMT Meetings (1997-2023)

http://ngmdb.usgs.gov/info/dmt/
Using custom scripts in ArcPro to create editing layout for cross sections at 1km spacing

Sarah Francis, Minnesota Geological Survey
DMT 2023
Anchorage, AK
Quaternary Cross Sections at the MGS

County Geologic Atlas Program

Hennepin County Geologic Atlas

Chippewa County surficial geology and cross section lines (draft)
How have we traditionally displayed cross sections?

Uses real-life elevation (z) for Y coordinates (in feet)

X coordinate is calculated by:

- Distance from “start” of cross section at western side of the project area/county (meters)
- Vertical exaggeration factor “squishes” the x coordinate

\[ X = \frac{D}{0.3048} \div \text{VE} \]

- **Distance from “start” of cross section**
- **Meters to feet**
- **Compresses X coordinates to create vertical exaggeration**
Actual numbers here are meaningless for drawing lines.
All cross sections have the same coordinates, regardless of cross section number or location.
Use data-driven pages to filter by cross section
Pros of the “traditional” cross section display

- Easy to see real-world elevation while drawing lines
- Simple calculation
- Runs smoothly with data driven pages
- Works with cross sections in any orientation
Problems with the “traditional” cross section display (i.e., why change things?)

- **Doesn’t function** in ArcGIS Pro (changes in data-driven pages structure)
- **Difficult** to locate points along the cross section in map view
- **Challenging** to match cross sections with adjacent counties
- Entering id number for every stratline drawn is confusing
- Can be **difficult to visualize** north-south continuity
Solution

Plot cross sections in a “stacked” display using either ArcMap or ArcPro
How does it work?

Uses real-life UTMX coordinate

Y coordinate is calculated using:

- True Z (elevation) coordinate
- mn_et_id (statewide cross section ID)
- Vertical exaggeration

\[ Y = (((z \times 0.3048) - (700 \times mn\_et\_id)) \times VE) + 23,100,000 \]

Feet to meters

Arbitrary constant to vertically space cross sections with no overlap

Arbitrary constant to keep all coordinates above zero

Order cross sections the same way as map view

this map displays only every 5 lines
mn_et_id from 471-516
More cross sections above and below this one

Exactly match x coordinates in map view

Meaningless coordinate, based on calculate in slide 8
Tools to convert back to real coordinates

- Convert Stratlines to Mapview
- Convert stratline vertices to mapview points with unit and elevation attributes
Suite of script tools

- Gather input data
- Create data in XS view using input data with mapview coordinates
- Create reference grid to show elevation and UTME coordinates
- Quality control to check unit order and line angles
- Conversion tools to switch between “traditional” display and “stacked” display
Challenges

- Only works with straight east/west cross sections
  - Vertical exaggeration factor will be skewed if cross section is diagonal or zig zag
- Easy to get “lost” between cross sections
  - Solution: bookmarks
  - Hope to automate bookmark creation in the future
- Compatibility between old/new data
  - Solution: conversion tools that switch between systems
Questions?