Development of Landslide Susceptibility Map for the County of Summit, Ohio

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Why Study Landslides?

- From USGS, landslides annually cause:
  - $3.5 Billion in damages
  - 25 to 50 fatalities
- CoSE sought to "...develop a comprehensive and effective strategy for reducing risks, damage and losses from landslides and slope movements..."

Scope of Work

- County of Summit Engineer's (CoSE) Scope of Work included:
  - Landslide Inventory with site information and associated Inventory Map
  - Graphical User Interface (GUI) to allow CoSE to update Inventory
  - Landslide Susceptiblity Map
  - Landslide Risk Map

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SLOW
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Landslides in County of Summit

- Principally two types of slides observed:
  - Rotational Slides
  - Translational Slides
- Streambank Erosion common triggering mechanism.


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Susceptibility Factors

- Intuitively, multiple factors come to mind:
  - Slope
  - Aspect
  - Soil Type
  - Depth to Groundwater
  - Depth to Bedrock
  - Geomorphology of the Site
- Many early Maps identified areas of steep slopes and/or soil types as always having a high susceptibility.

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Development of Susceptibility Map

- Combine available data in GIS database
- Use Inventory of known slides to calibrate model
- Rank based on probability factors

Susceptiblity Factors

- Factors Included
  - Slope
  - Aspect
  - Problematic Soil Types
  - Highly Erodible Soils
  - Proximity to Streams
- Factors Not Included
  - Depth to Bedrock
  - Hydrology
  - Surficial Geology
  - Glacial Geology
  - Depth to Groundwater

Exclusion of Factors

- Care taken to balance factors that appear to influence stability, but may not.
- For example, many slides occurred in “Till, sand, silt, clay – variable” as identified in the Surficial Materials Map. Yet, large areas of the same material did not have slides, and only the areas with steep slopes were prone to slides – so the import factor is slope, not surficial material.

Inventory Findings

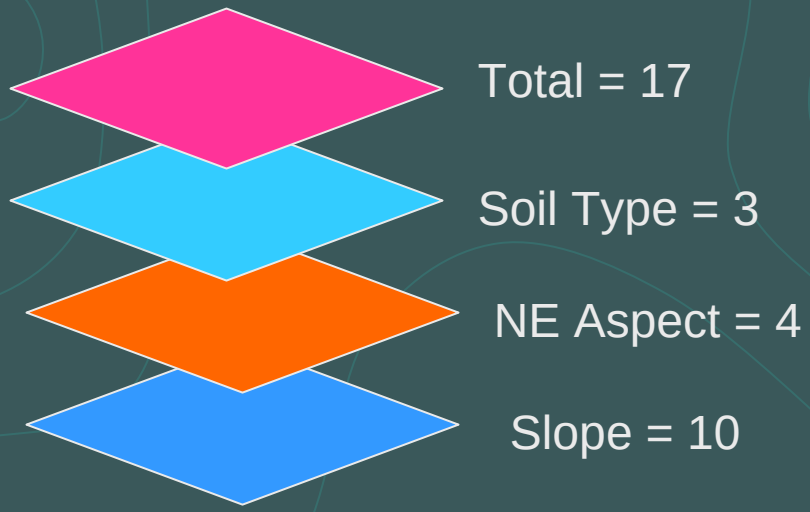
- No slides with an average slope above 30 degrees. We concluded this is because the slope is either a rock outcrop, or a rock mass with a thin veneer or soil probably held in-place by vegetation.
- Northeast and West facing slopes were prone to have slides at flatter slopes and/or with more competent materials than other slopes.

Process

- Process is iterative – based on generating a ranking system, applying the model, and then adjusting the scores to refine the Map.

How GIS Builds the Map

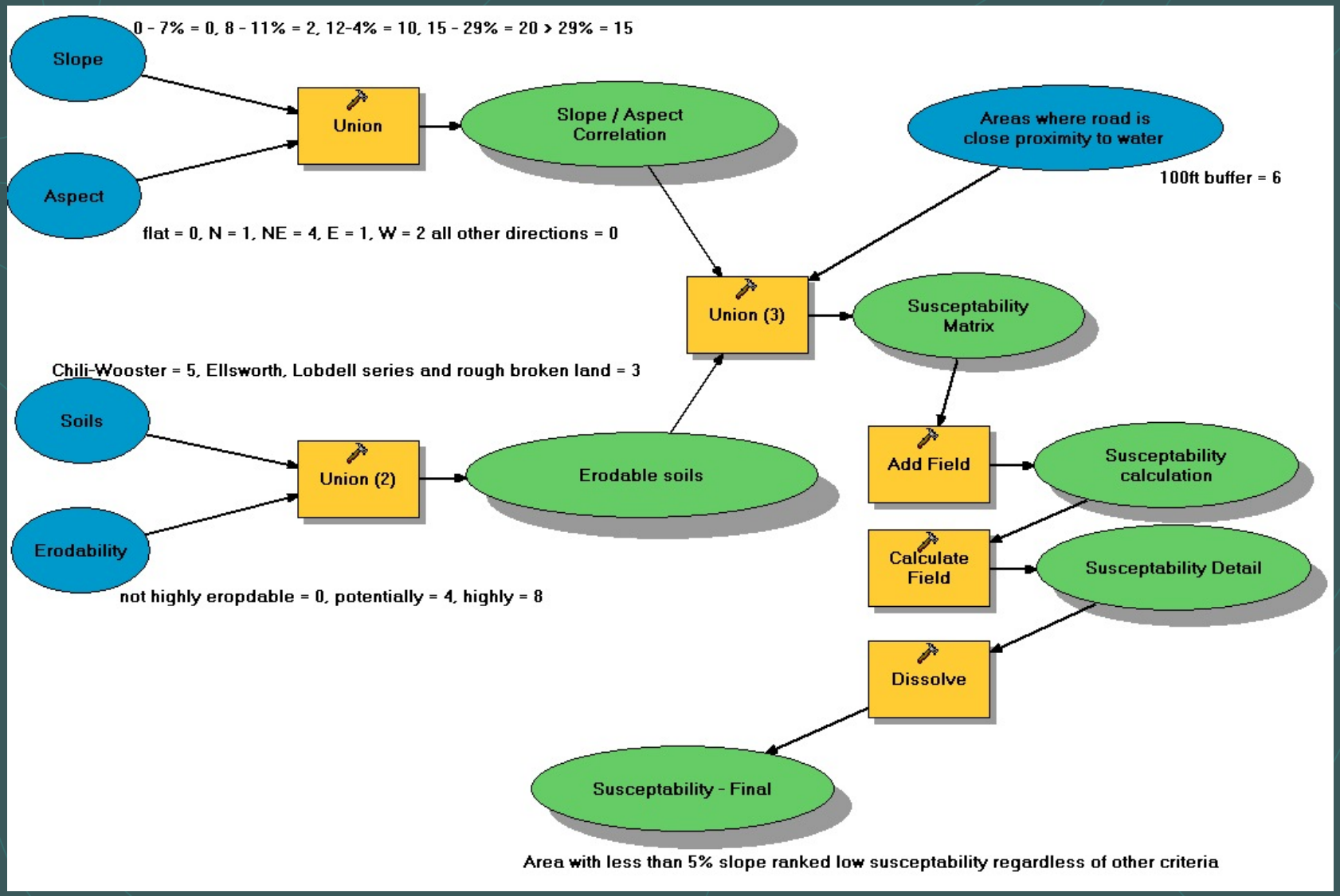
- GIS Constructs a series of polygons for each attribute and assigns the given value. Then the polygons are summed for the Total Score.



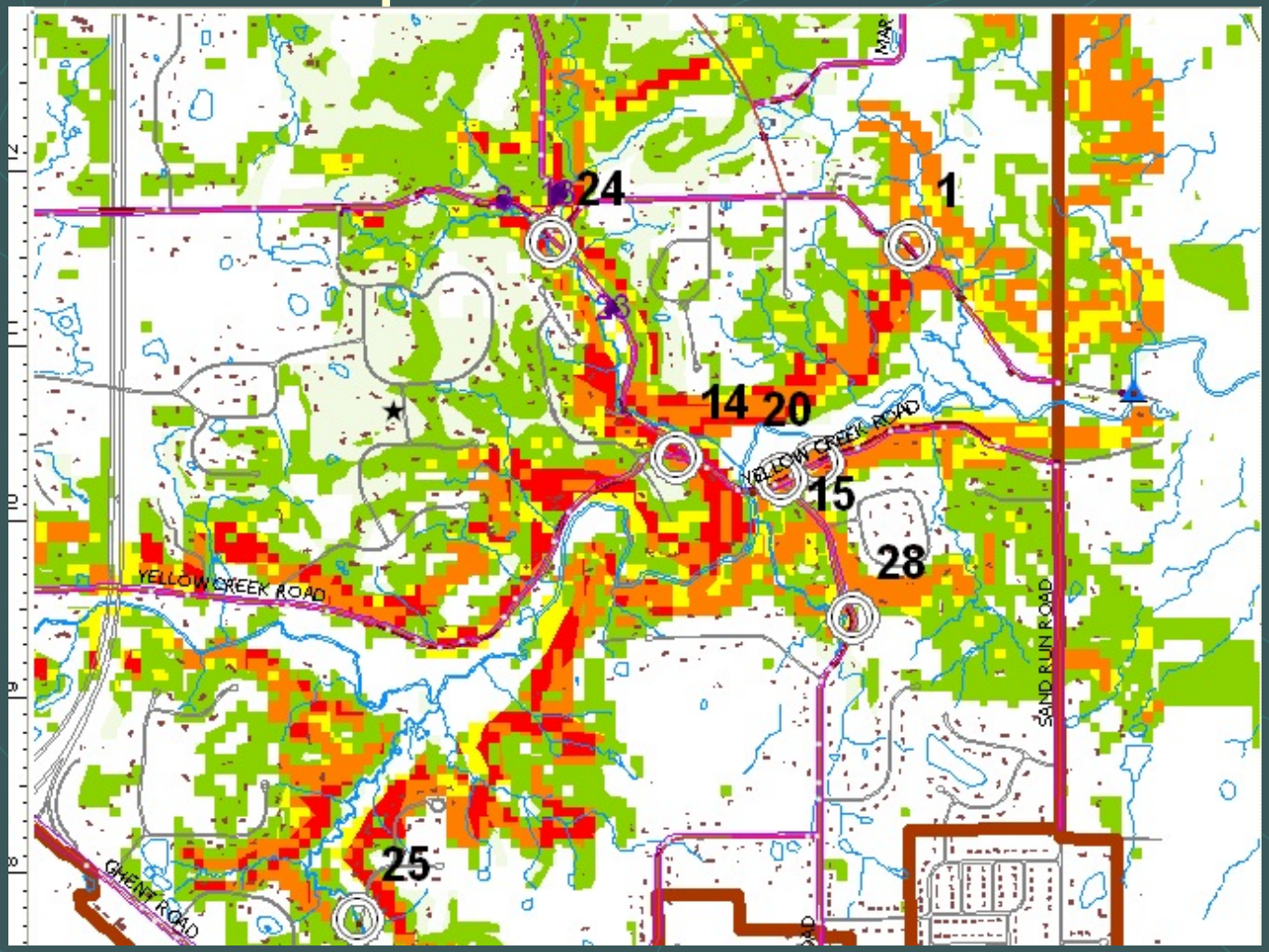
Final Rankings

Category	Total Score
Very Low	0-5
Low	6-15
Moderate	16-22
High	23-30
Very High	31+

Analysis Model



Bath Township Sites



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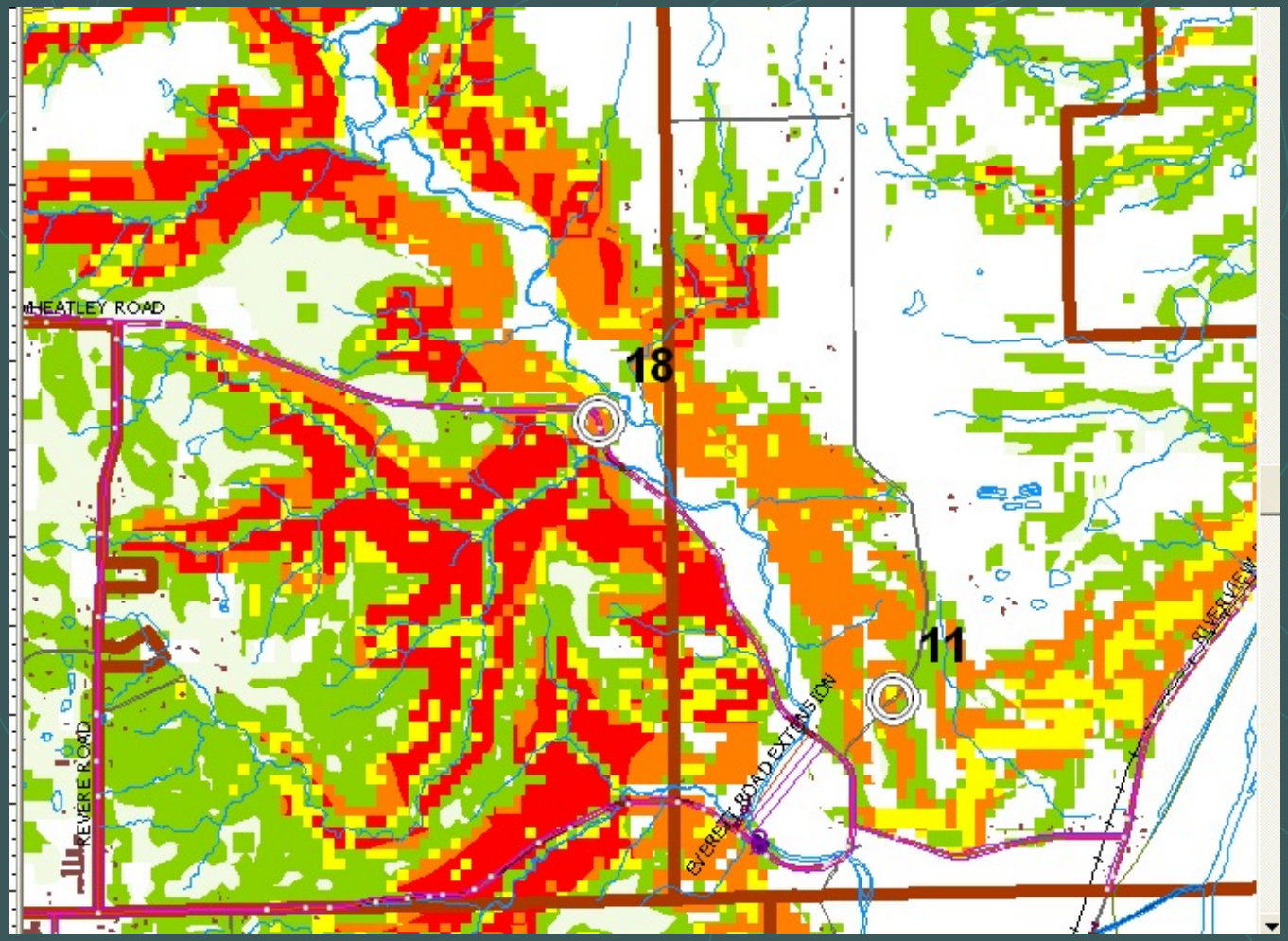
Revere Road



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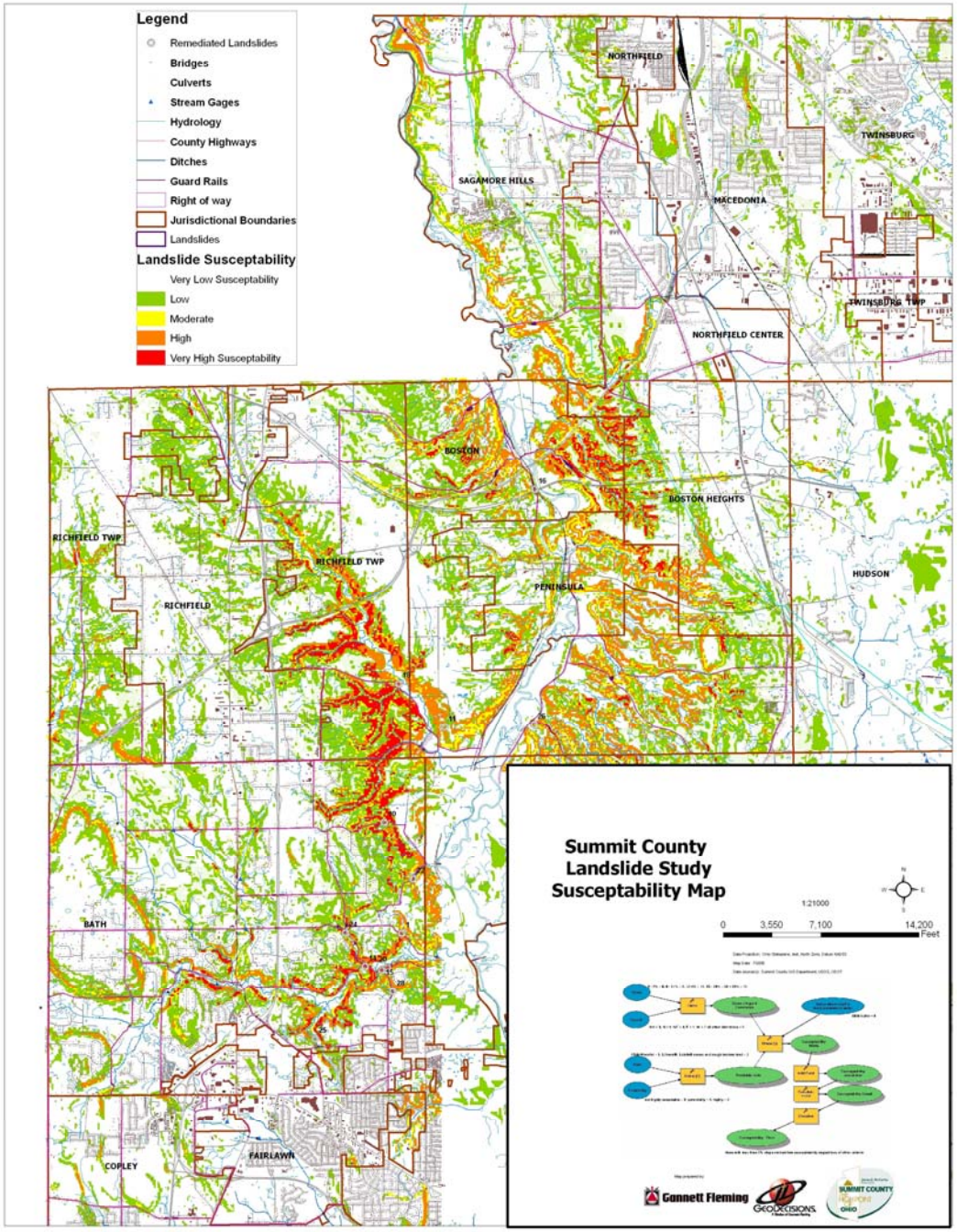
Final Map



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Conclusion

- Identification of High Susceptibility areas can result in new Building Code and Zoning requirements to mitigate.
- Can provide mitigation in high risk areas to avoid road closures.
- Cost of mapping comparable to remediation cost at one site.
- Database allows for monitoring of low priority sites and input of new sites.