Stemler Cave Nature Preserve Recharge Area

Vulnerability to damage from vehicle accidents or spills

Purpose

Groundwater contamination caused by traffic accidents is a significant risk in karst terrains. The Illinois Department of Transportation is planning to widen IL Route 158 from 2 lanes to 4 lanes. The southern end of this highway crosses the recharge area for Stemler Cave Nature Preserve. This model illustrates the areas of particularly high risk for a traffic accident or spill within the groundwater recharge boundary. The information from the model may be used in choosing highway corridors and future development.

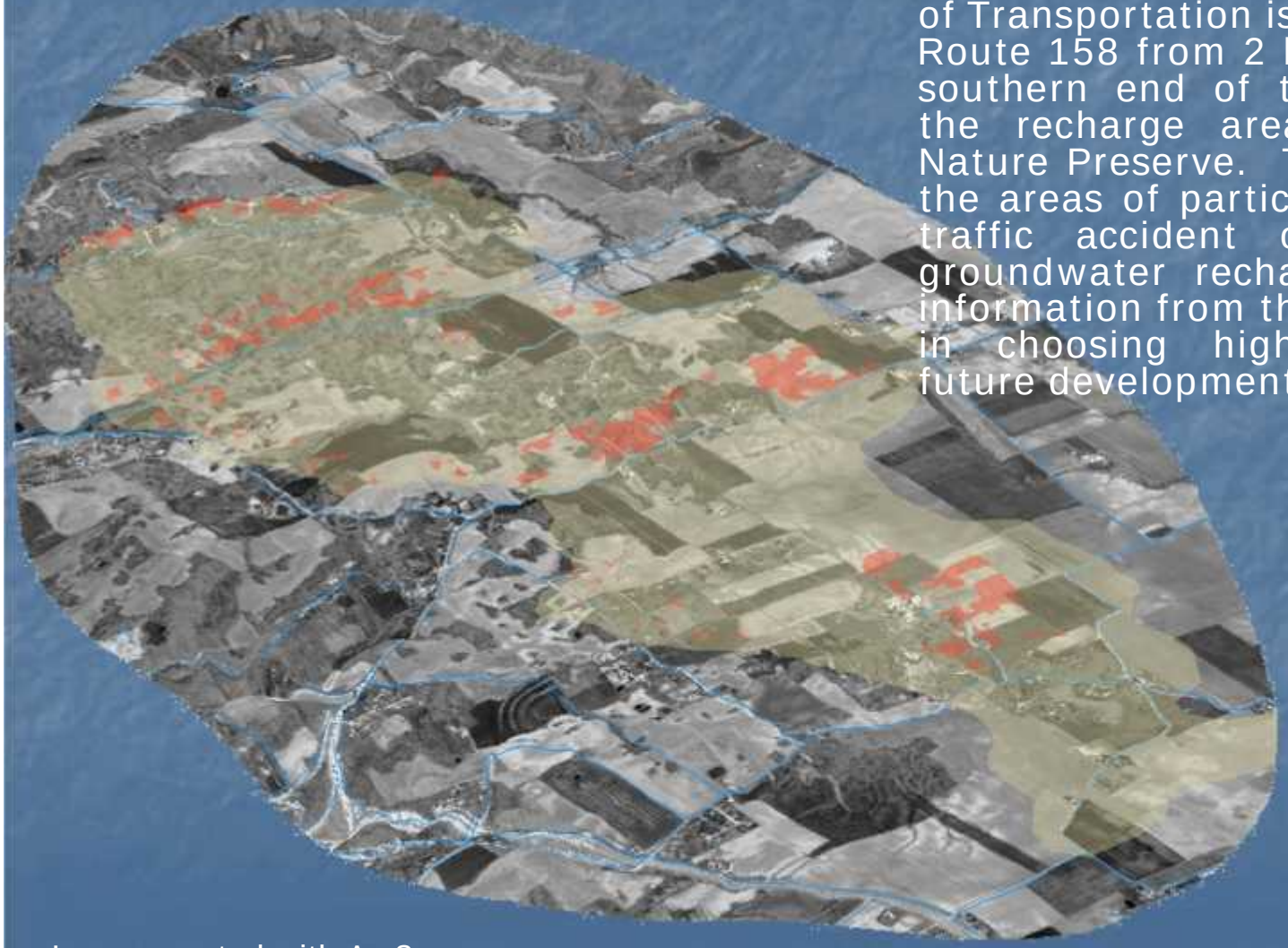


Image created with ArcScene

Study Area

- The groundwater recharge area for Stemler Cave Nature Preserve is located approximately twenty miles southeast of St. Louis, Mo. near Columbia, Illinois.
- The known cave system is developed in the Waterloo karst of the Salem Plateau. The cave system is also habitat for the federally endangered Illinois Cave Amphipod (Gammarus acherondytes)

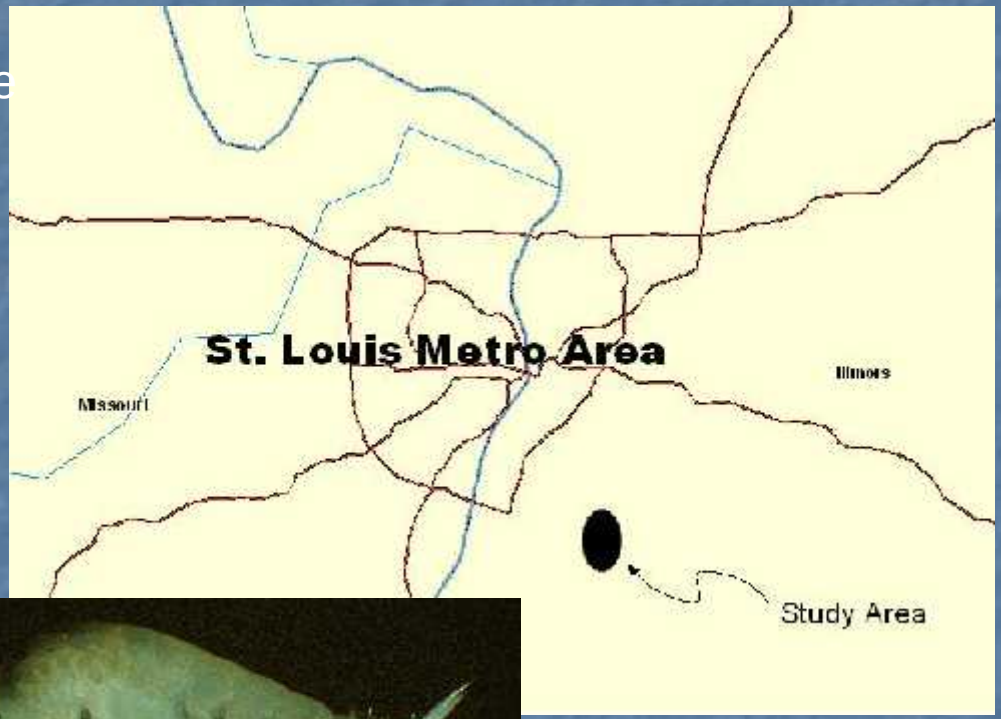


Photo by Steve Taylor

Field Methods

Model Criteria

- Must be within the groundwater recharge area for Stemler Cave Nature Preserve
- Must be within 150m of a road
- May be within the closed contour of a sinkhole
- May have a flow accumulation of 250 (25,000 sq. meters) or higher

Sinkhole plain before a rain.

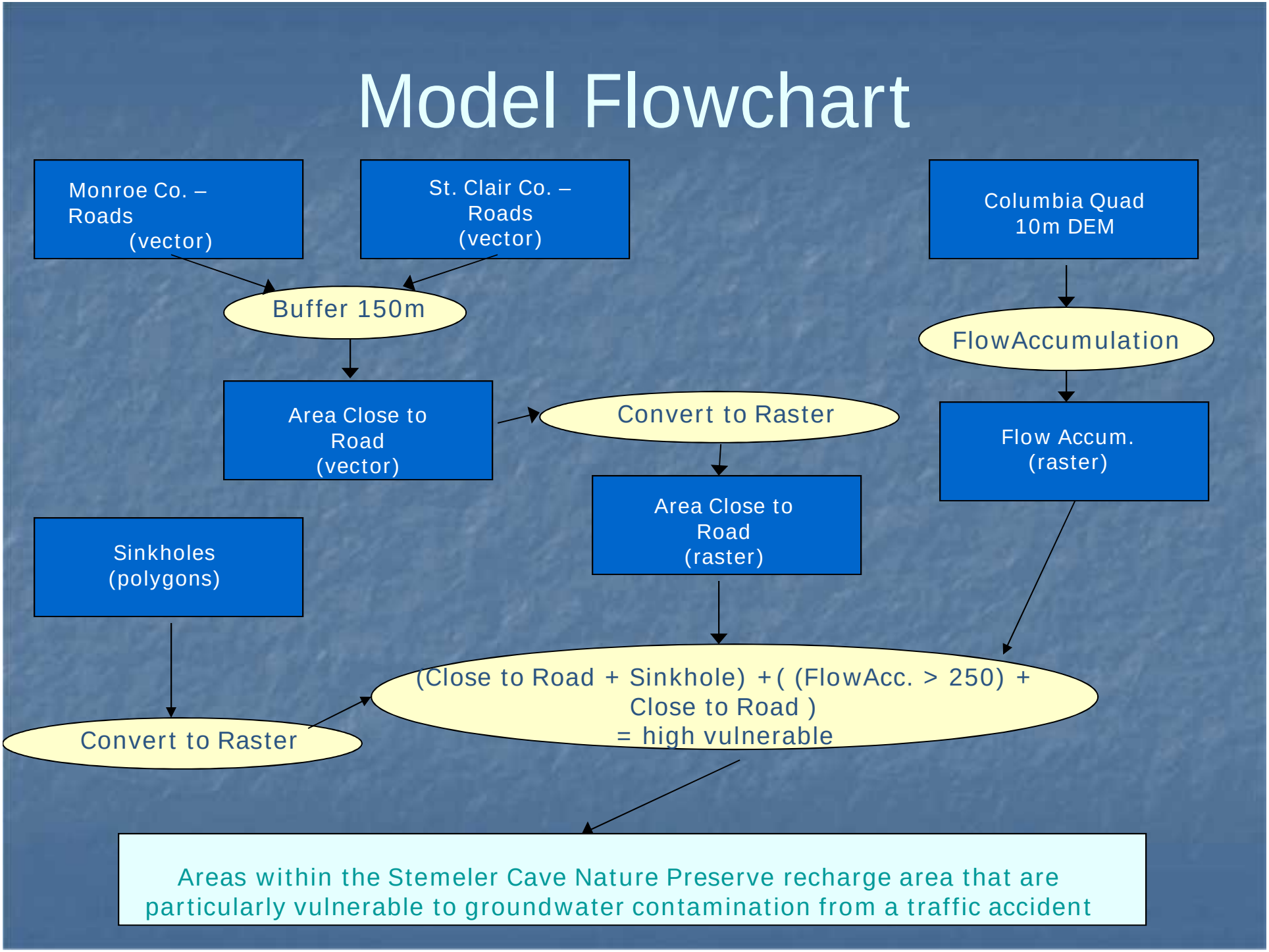
Sinkhole plain after a rain.

Model Classification

- This model is primarily des
  SIP is a map showing whe
  segments pass through th
  areas of the recharge.

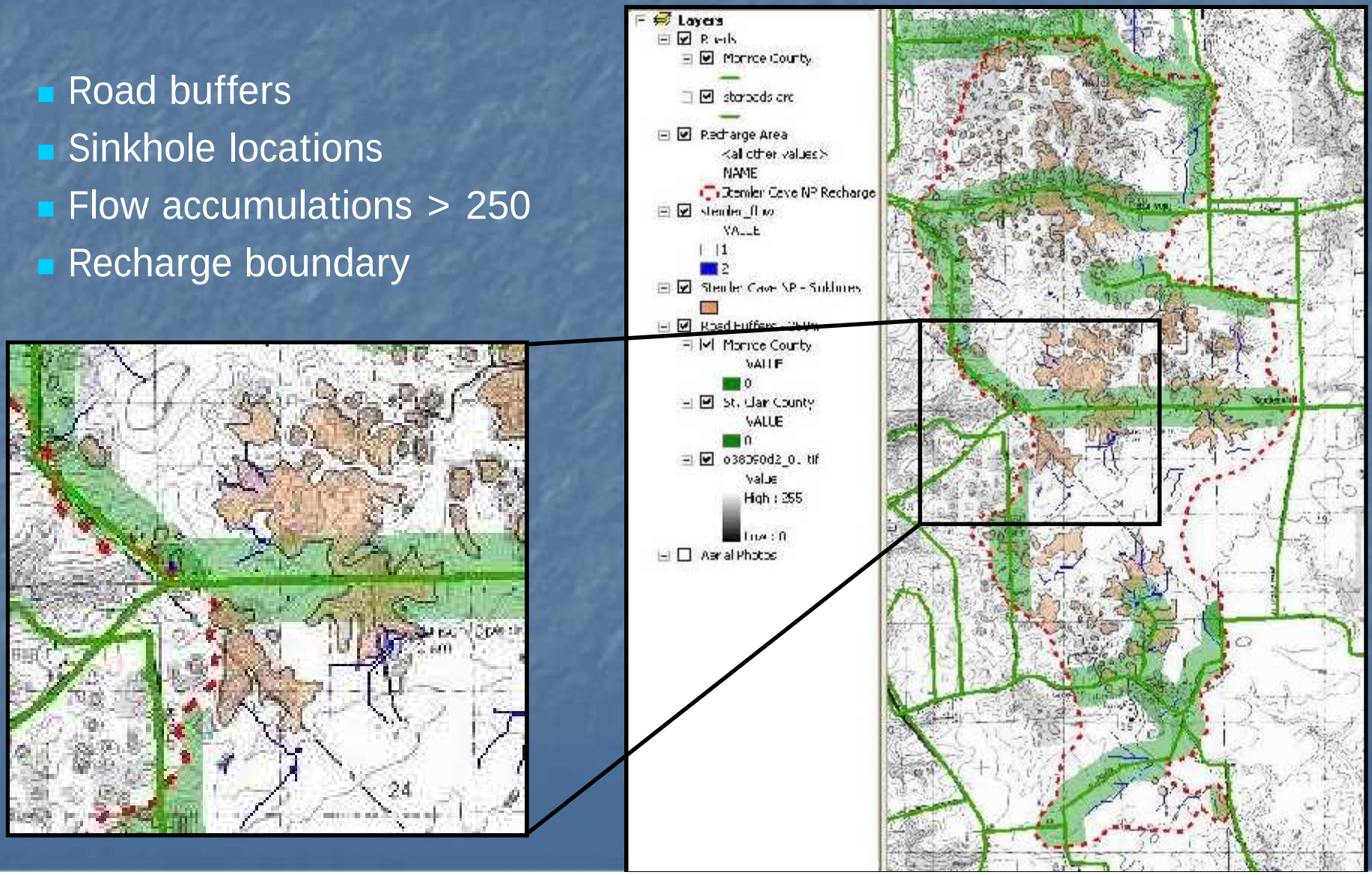
- The model could also be used for prescriptive tasks such as road signs with contact information in case of an accident or spill, and special protection, like buffer zones etc... for the sinkholes.

Model Flowchart



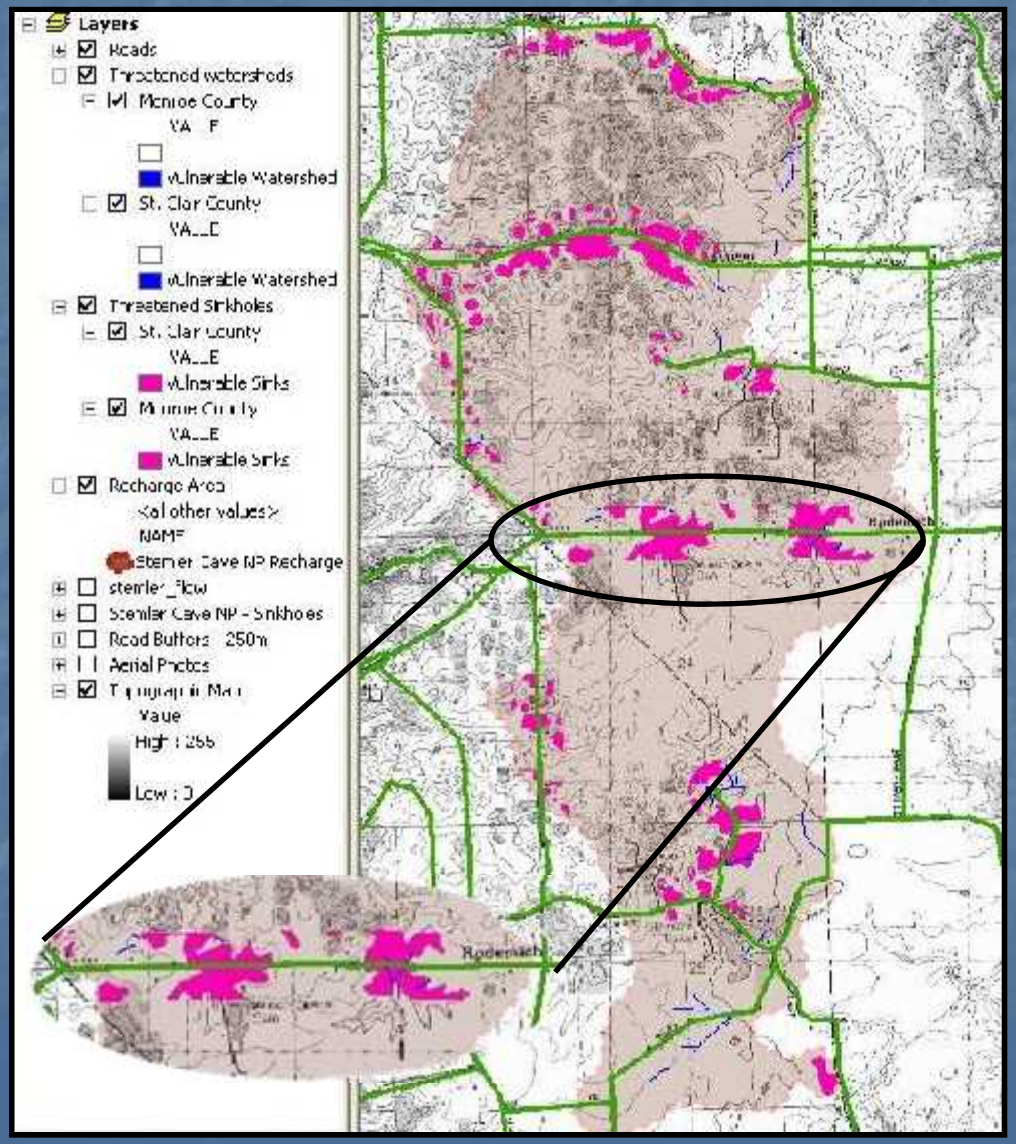
Model Inputs

- Road buffers
- Sinkhole locations
- Flow accumulations > 250
- Recharge boundary



Model Results

- The SIP from the model is a map illustrating the areas of concern. The bright pink areas show where sinkholes are close to roads and the blue lines show significant watersheds.
- The output map should be distributed to state and local decision makers as well as local emergency crews and residents that live within the study area.



Limitations

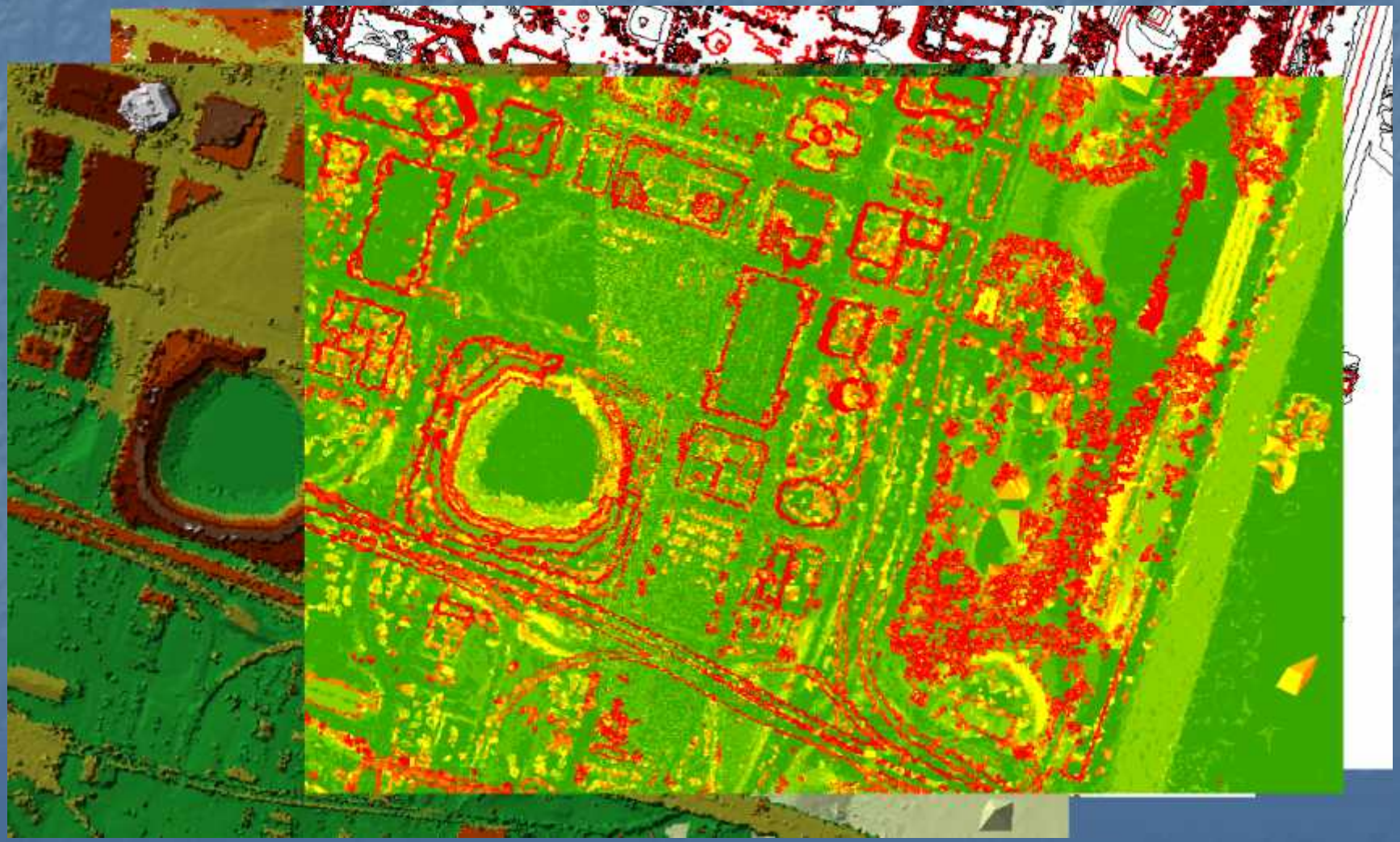
- The model is limited to roads. Ideally the model would show all of the areas within the recharge area and classify their vulnerability. Even though the entire area has internal drainage, not all areas present the same risk to the recharge system.
- Additionally, many other factors should be considered in the model. Ground cover, row crop types, slopes, and open sinkholes (caves), just to name a few, all contribute to the total equation.

Data Sources

- Illinois Geological Survey (base maps for county data)
- USGS (DEM, DOQQ and DRG data)
- Ozark Underground Labs (boundary for recharge area)
- Aaron Addison (created sinkhole polygons)

Lidar

- What does it mean?

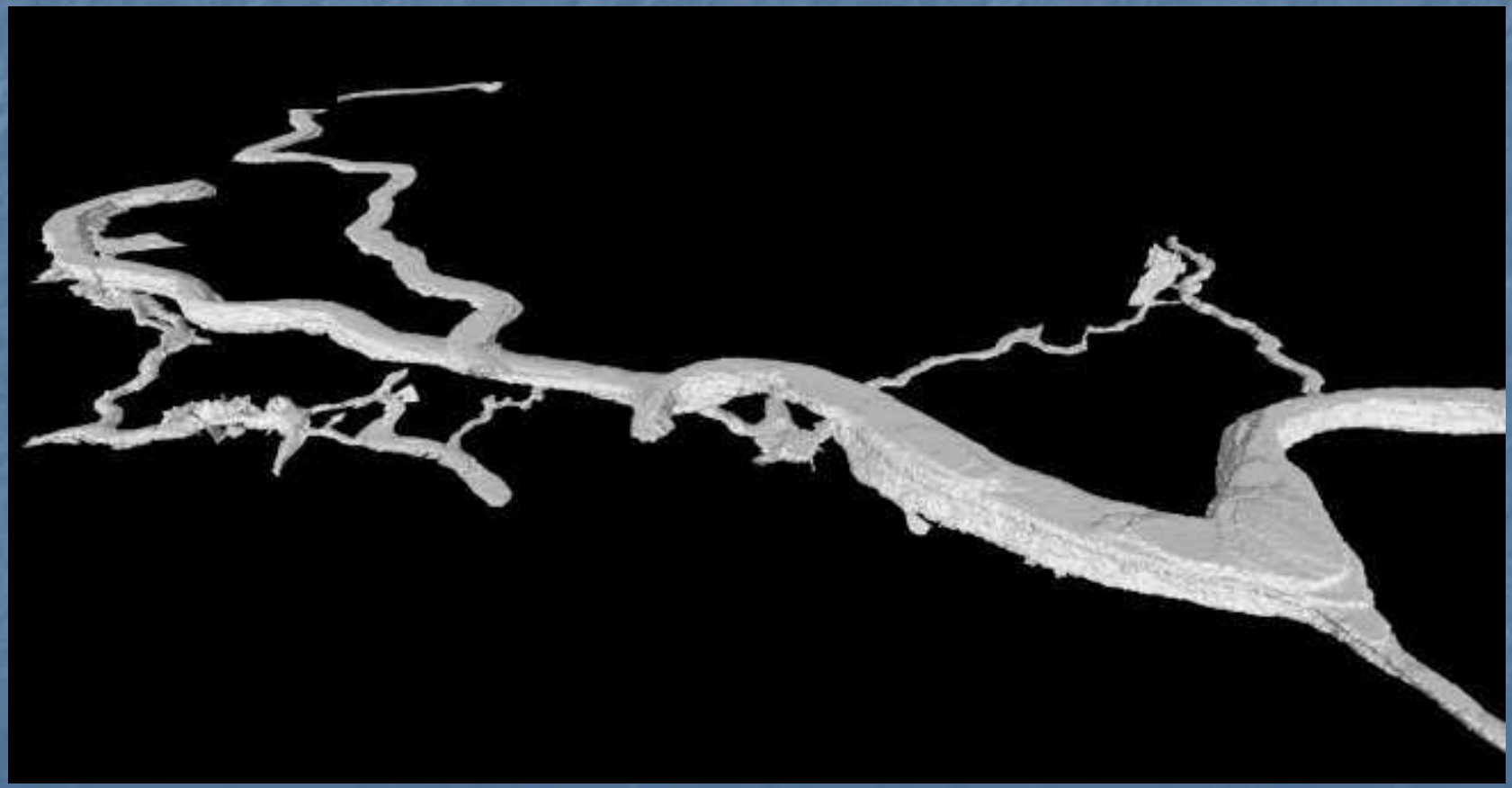


What's in a name?

- What I hear "I need LIDAR data"
- What that seems to mean "I want a really good DEM, contours, slope, etc…."
  - Raw LIDAR → not very useful
    - Large tile size, choppy data, hard to process
  - Derivative LIDAR → very useful!
    - Post processing is key!
    - Excellent DEM results, smoothed contours, etc...

What it looks like

Ground-based LIDAR



Thank you

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