Elevation Derived Hydrology

Challenges and Solutions

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Overview of talk

- There has been a lot of discussion on how to create Elevation Derived Hydrology (EDH)
- Less discussion on where the current approaches fail
- Moving from lidar to EDH more difficult than it seems
- Running algorithms =

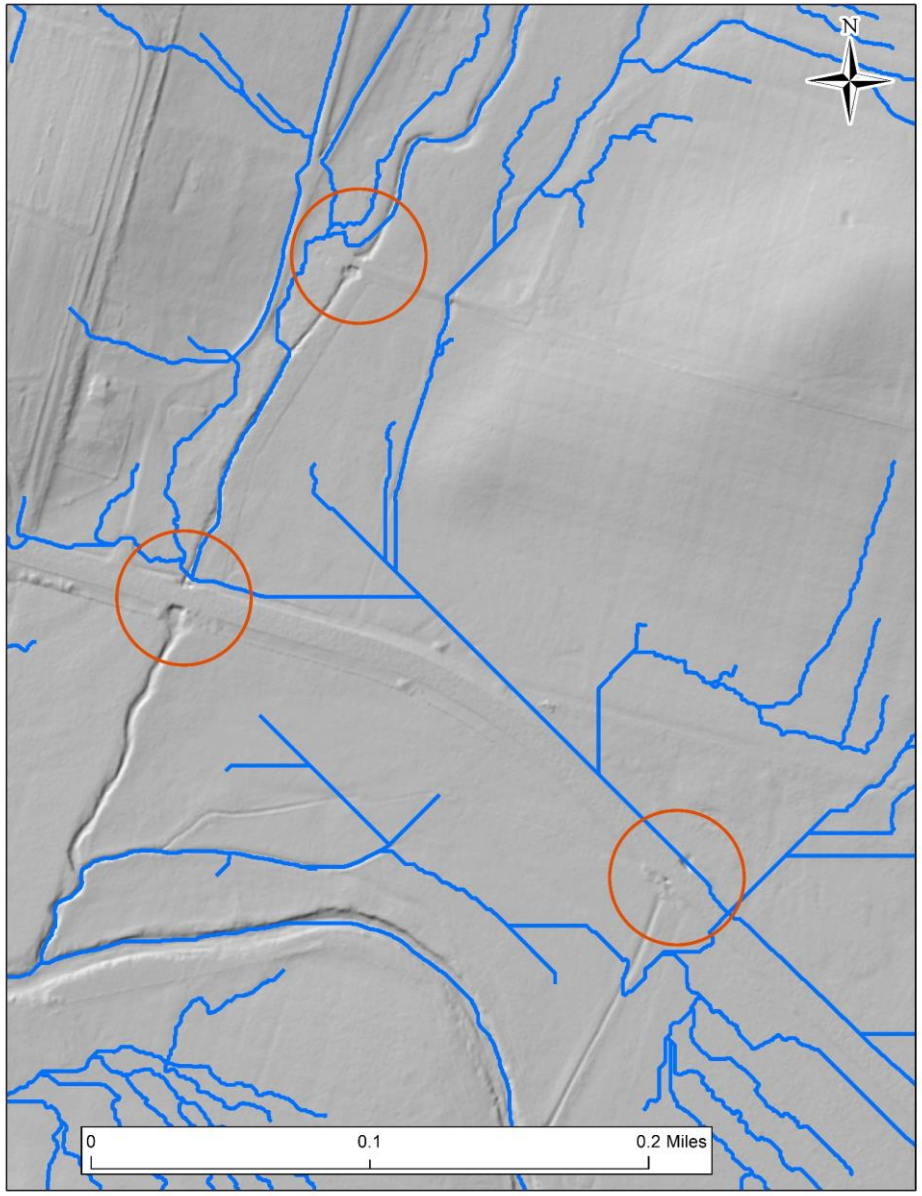
- Getting consistent and accurate data =

- Focus on the problems that can impact the program
- Provide some solutions

Problem: Automated Hydro-enforcement

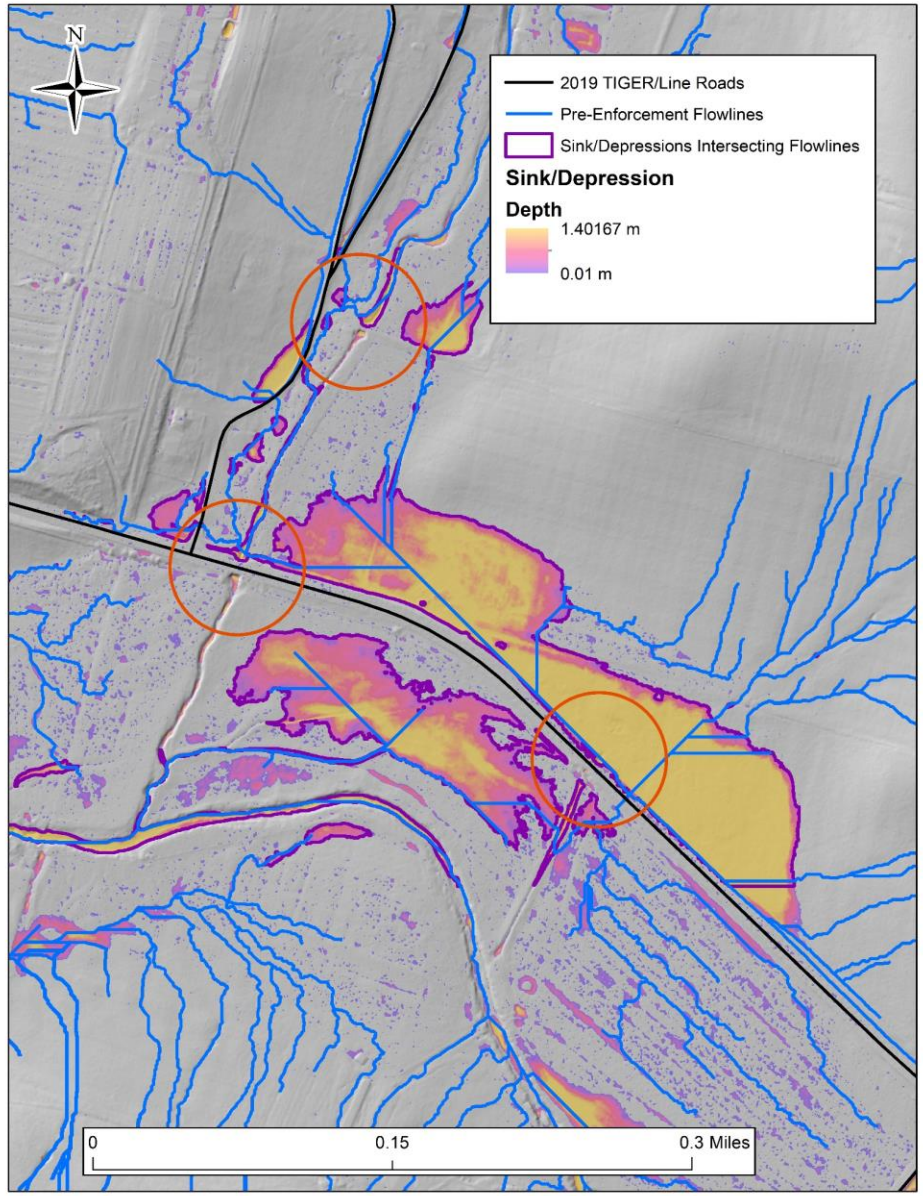
Flow accumulation and the geomorphon approaches can extract lines efficiently, especially together but…

- There are always errors that require review
- Where are the errors?
- Need eyes on every line
- Problems more significant in urban area but problematic even in natural lands
- Local knowledge helps
- Can be time consuming



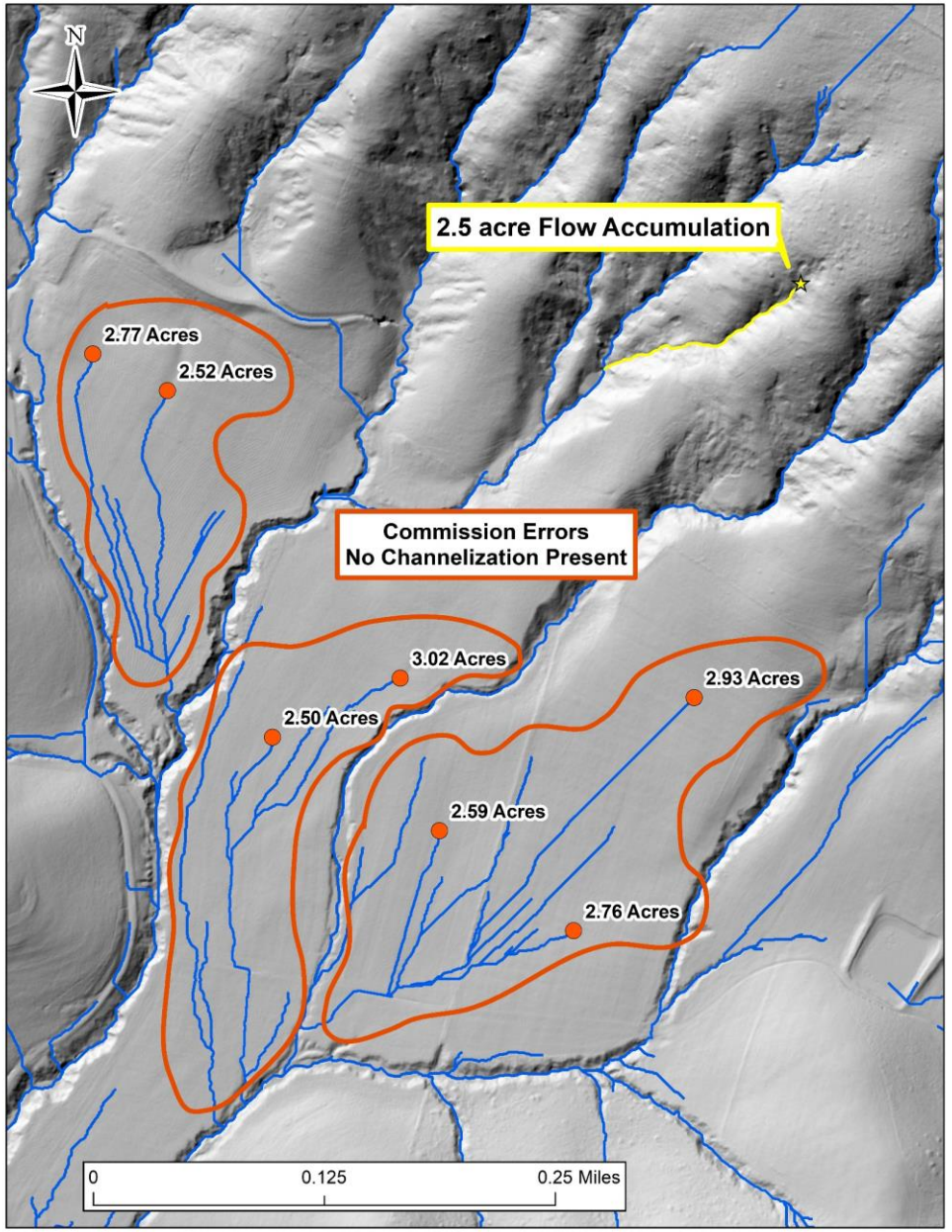
Solution : Automated Hydro-enforcement

- Rapid review is essential by analyst
- Identifying where the problems are most likely to be: Depressions near roads. Need to draw reviewers eyes to these locations
- Getting input from local stakeholders
- Access to culvert information



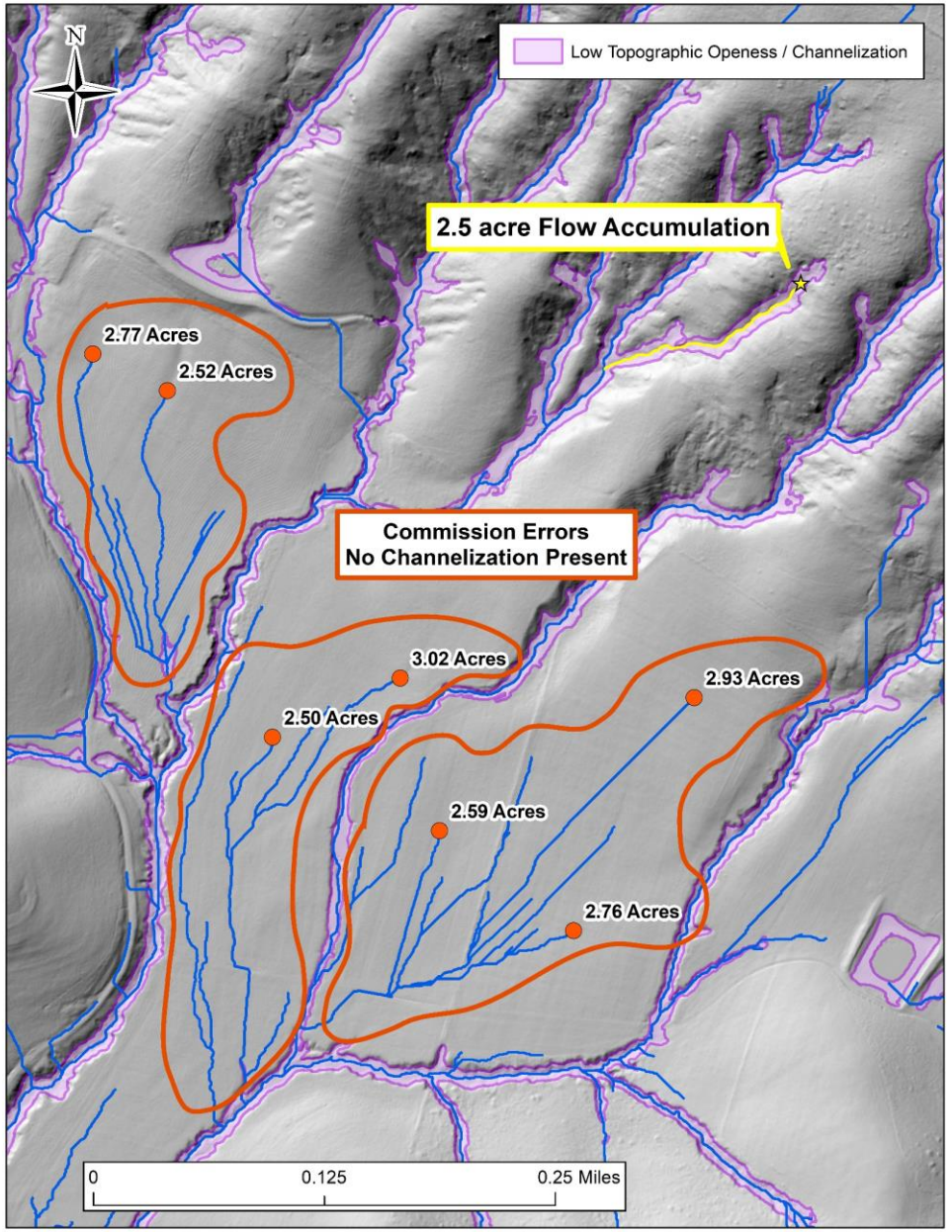
Problem: Flat vs. Steep Landscapes

- In flat landscapes
  - Valleys poorly defined
  - Flow direction and therefore accumulation unclear
- Difficult to map where stream and rivers flow
- Lots of commission error



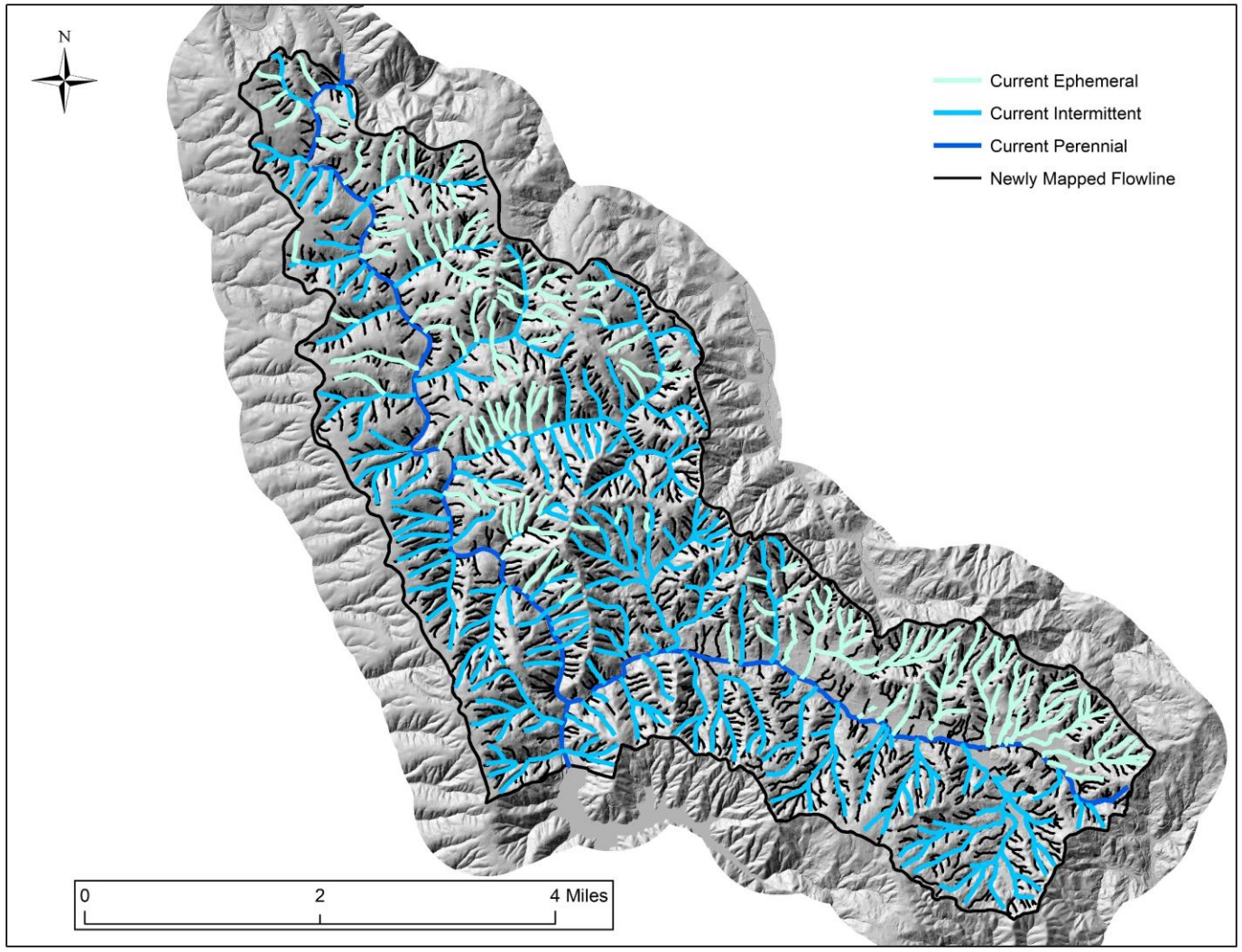
Solution: Flat vs. Steep Landscapes

- Incorporate Geomorphons and Topographic Openess
  - Allows a very low flow accumulation threshold to be used by aiding in commission filtering
  - Aids in ommission identification



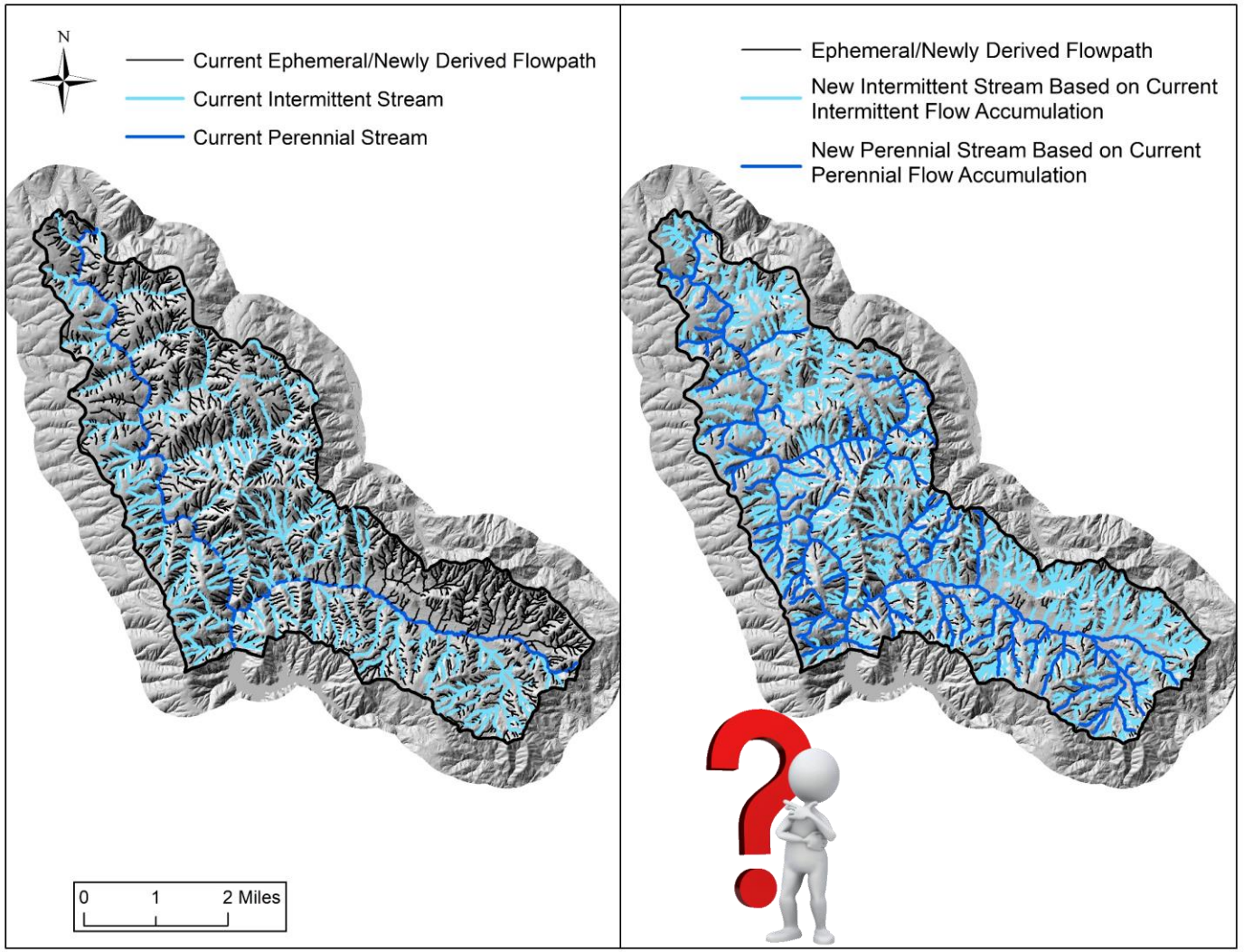
Problem: Periodicity Classification

- Going from 1:24,000 to 1:5,000 creates 10 times more streams
- Most of these streams do not have any attributes
- One key attribute is periodicity
  - Permanent – whole year
  - Intermittent – part of the year
  - Ephemeral – heavy rains
- Significant in terms of regulation and habitat



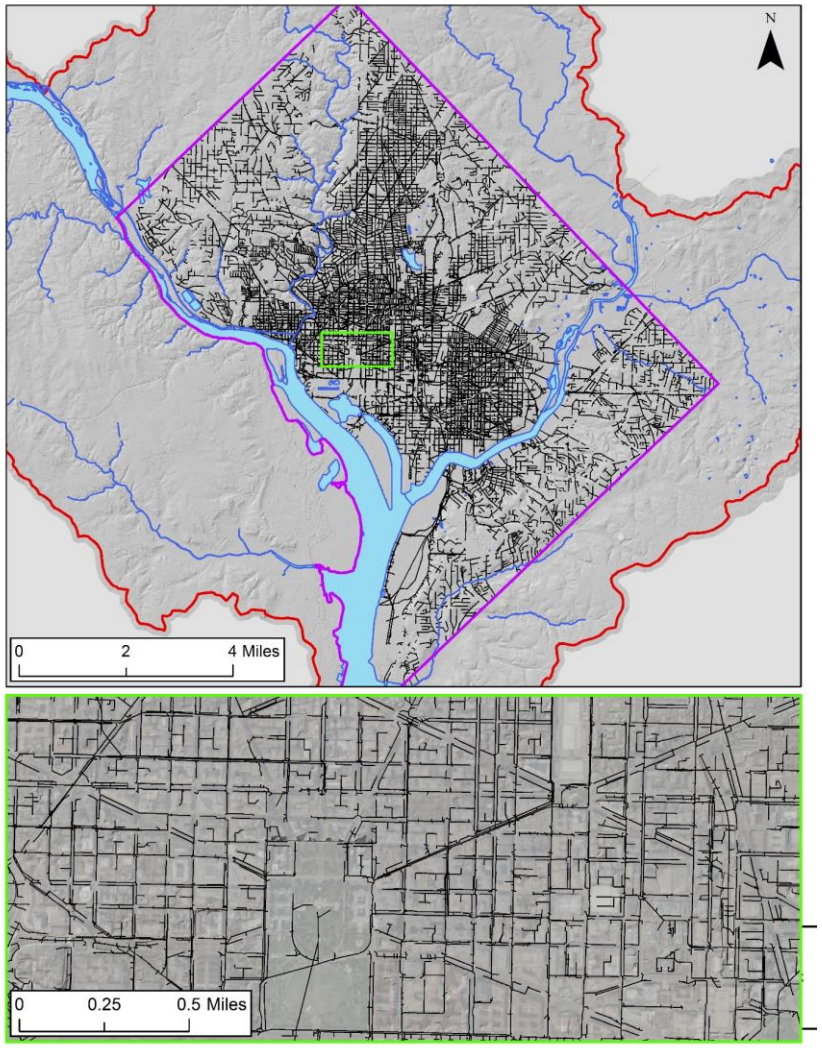
Solution: Periodicity Classification

- Flow accumulation
- Geology
- Soils
- Slope
- Will depend on
  - Ecosystem
  - Climate
  - Vegetation
- Models



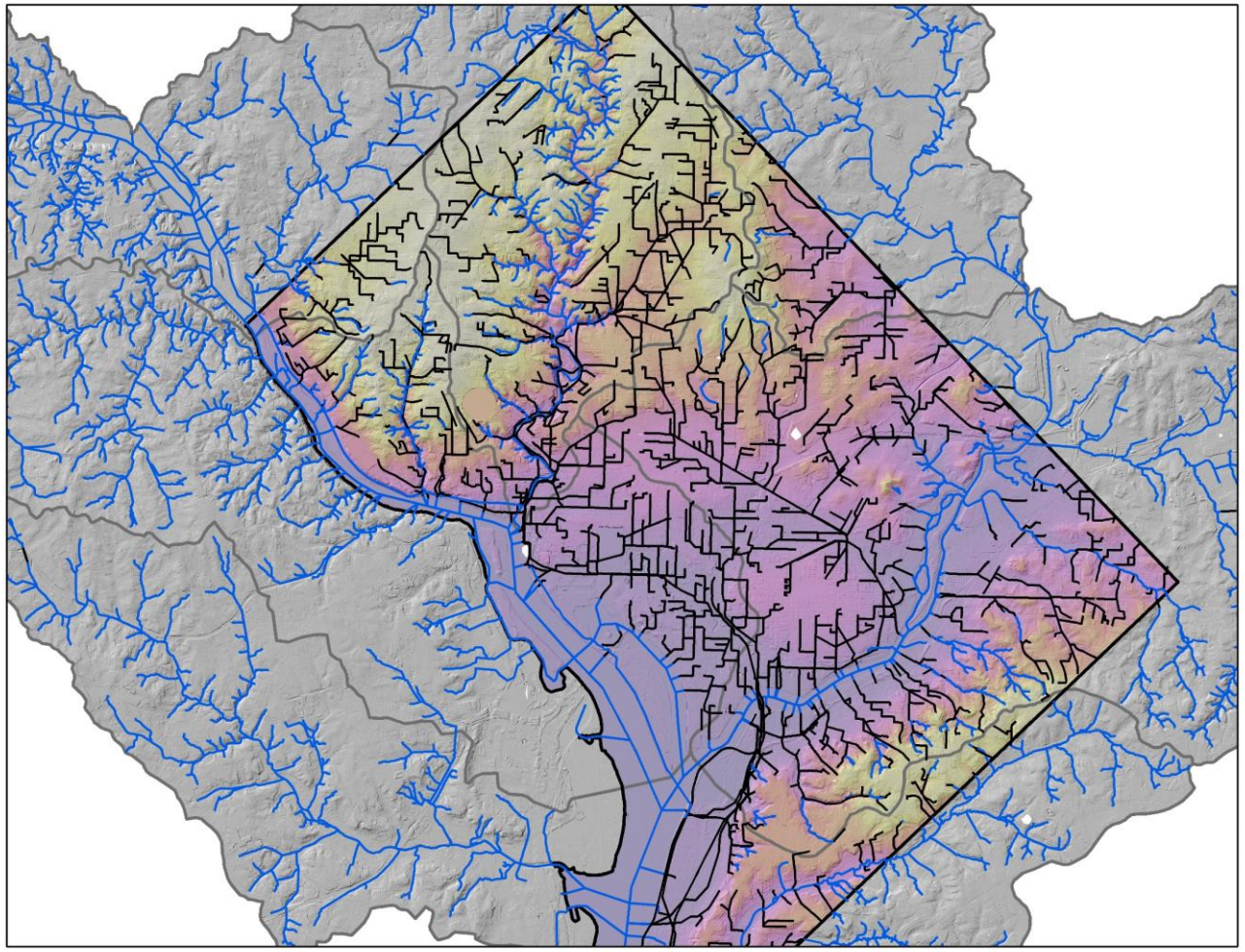
Problem: Urban Landscapes

- Subsurface pipe networks are often primary hydrologic drivers of surface water transport in urban landscapes
- High road density
- Lidar does not indicate what happens when streams go underground
- Complex many – many relationships
- Can depend on flow magnitude – need engineering info.
- Same for challenges exist for Karst landscapes



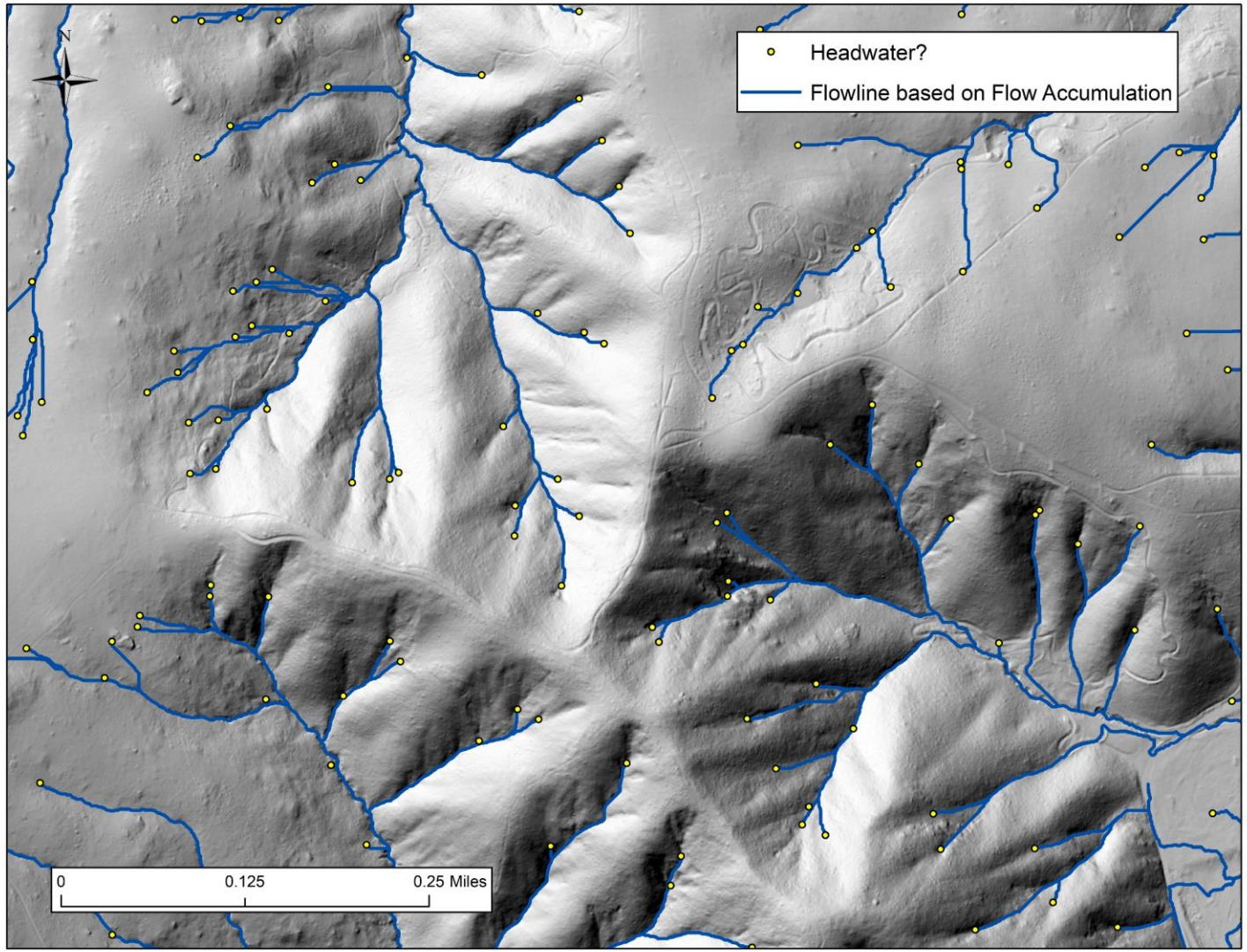
Solution: Urban Landscapes

- Integration with pipe network
  - Filtering to identify pipes with connections to natural surface flow
- Insert local connectors
- Upstream and downstream flow logic
- Culvert databases
- Local review



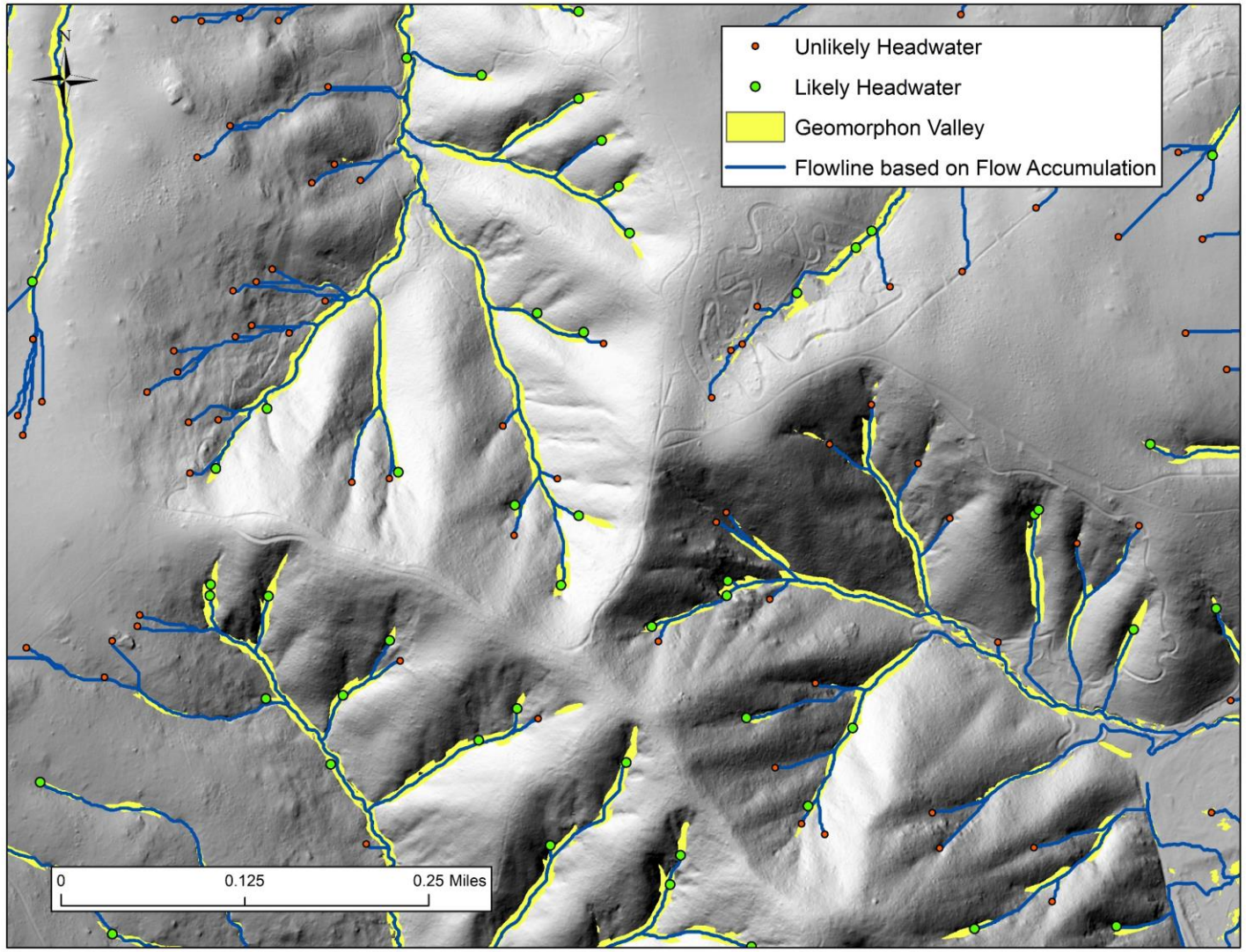
Problem: Stream Initiation

- In headwater stream flow accumulation not necessarily reliable source for initiation
- Some streams created from ground water
- Field work required to find initiation points



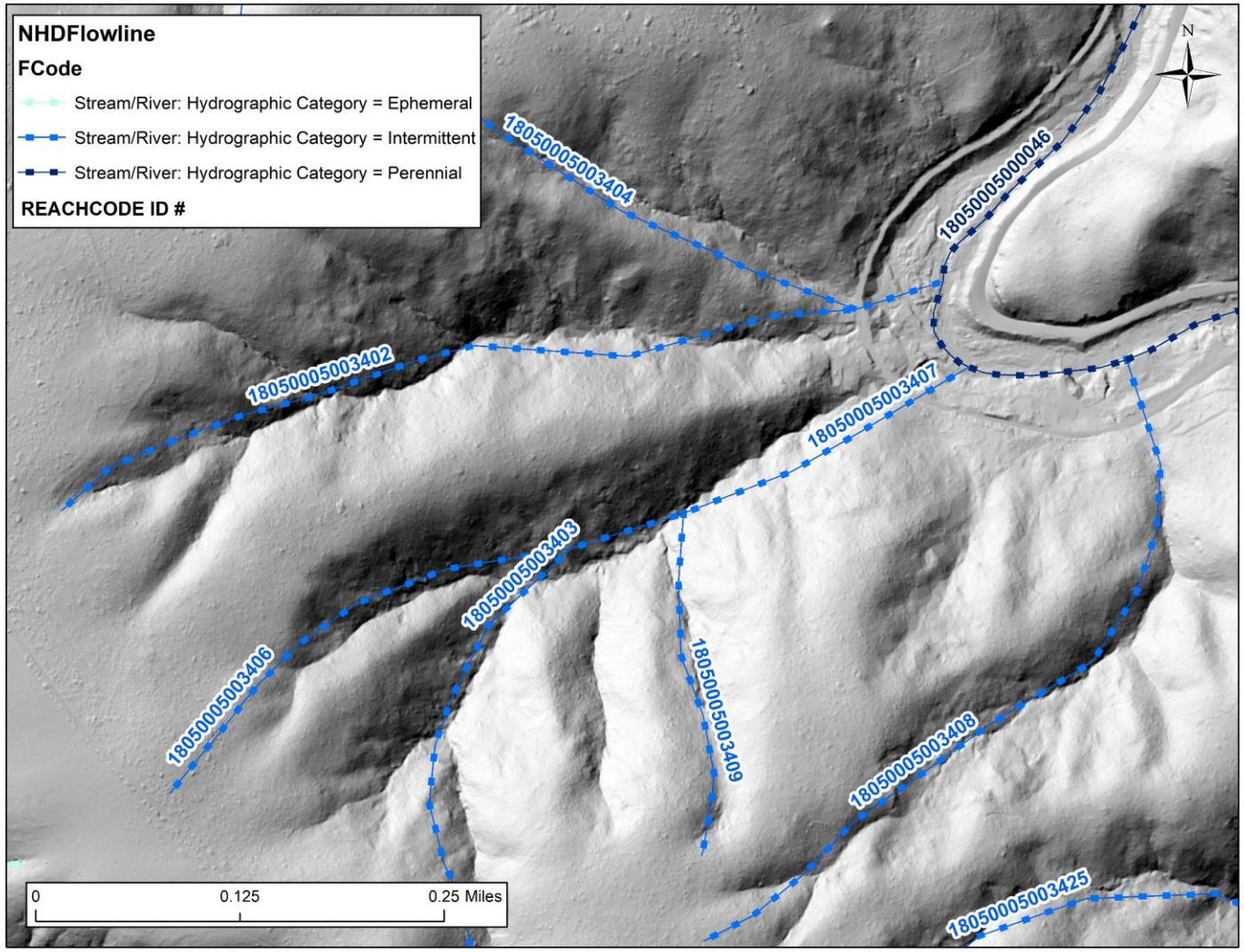
Solution: Stream Initiation

- Look for stream channels not just flow accumulation
- Utilize multiple inputs for identification of high probability
- Build empirical models using field work as reference data



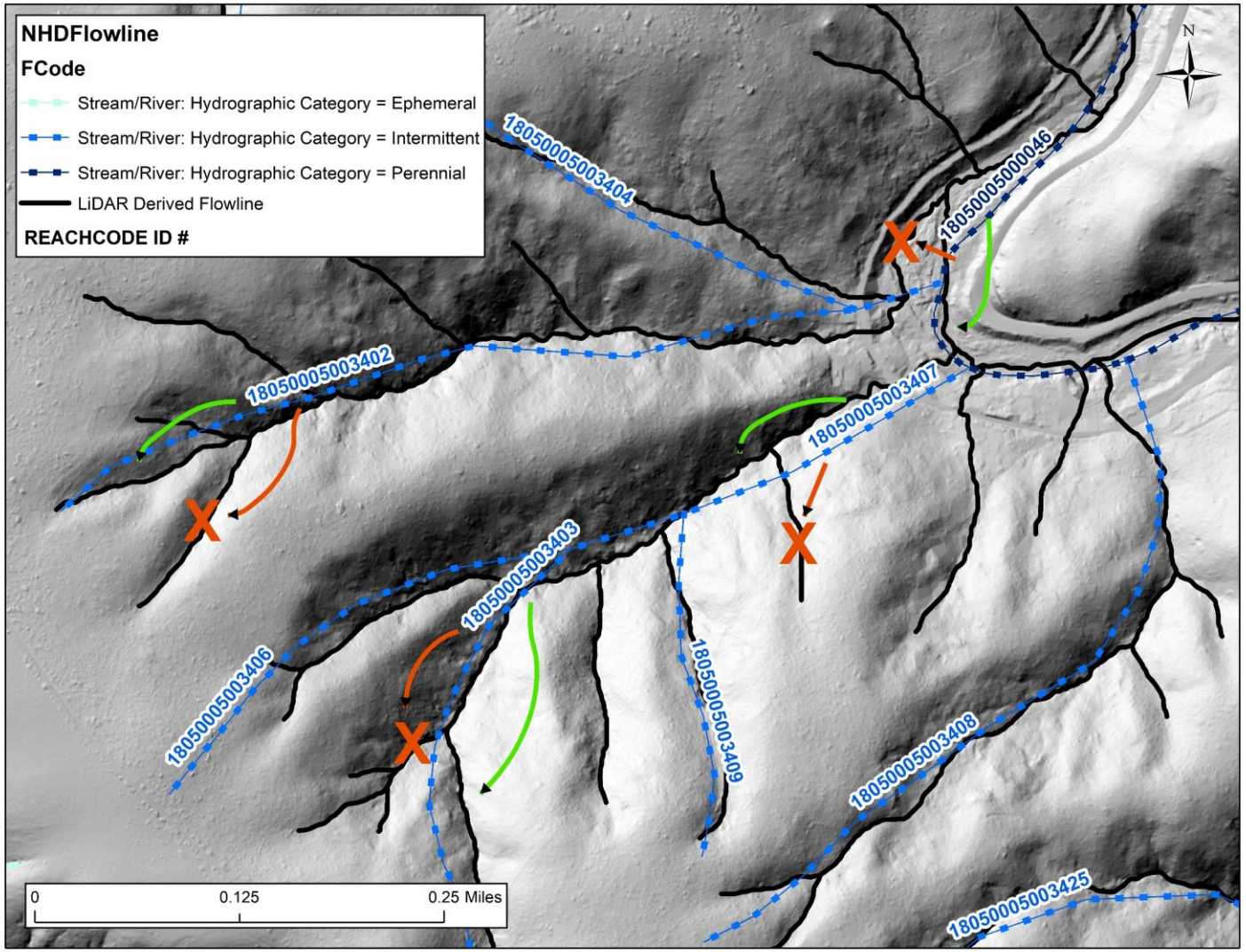
Problem: Conflation

- Conflation is the process of taking attributes from one **Source** dataset (i.e NHD 1:24,000) and applying them to another **Target** dataset (i.e. EDH 1:5,000)
- Relies on locational accuracy
- Line density can cause problem in attribute transfer
- Many datasets linked to the NHD so careful tracking of features and their geometry is required



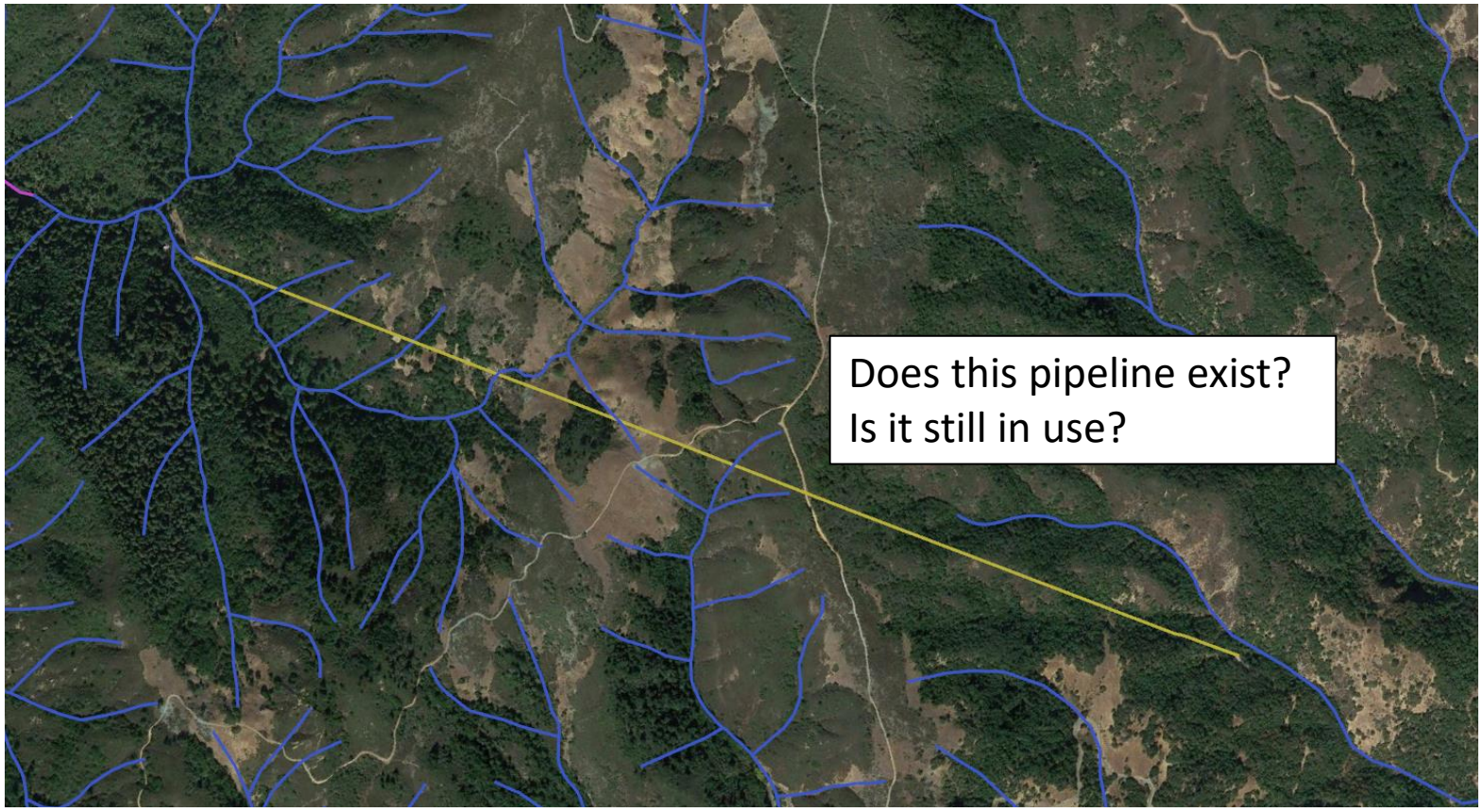
Solution: Conflation

- Quality QC before entering the GeoConflation process is critical
- Once wide scale geoconflation begins, no geometry or attribute changes or you will likely need to start over!
  - USGS has tools built that aid in QC
- Experience in interpretation and with NHD Geoconflation tools is important for success



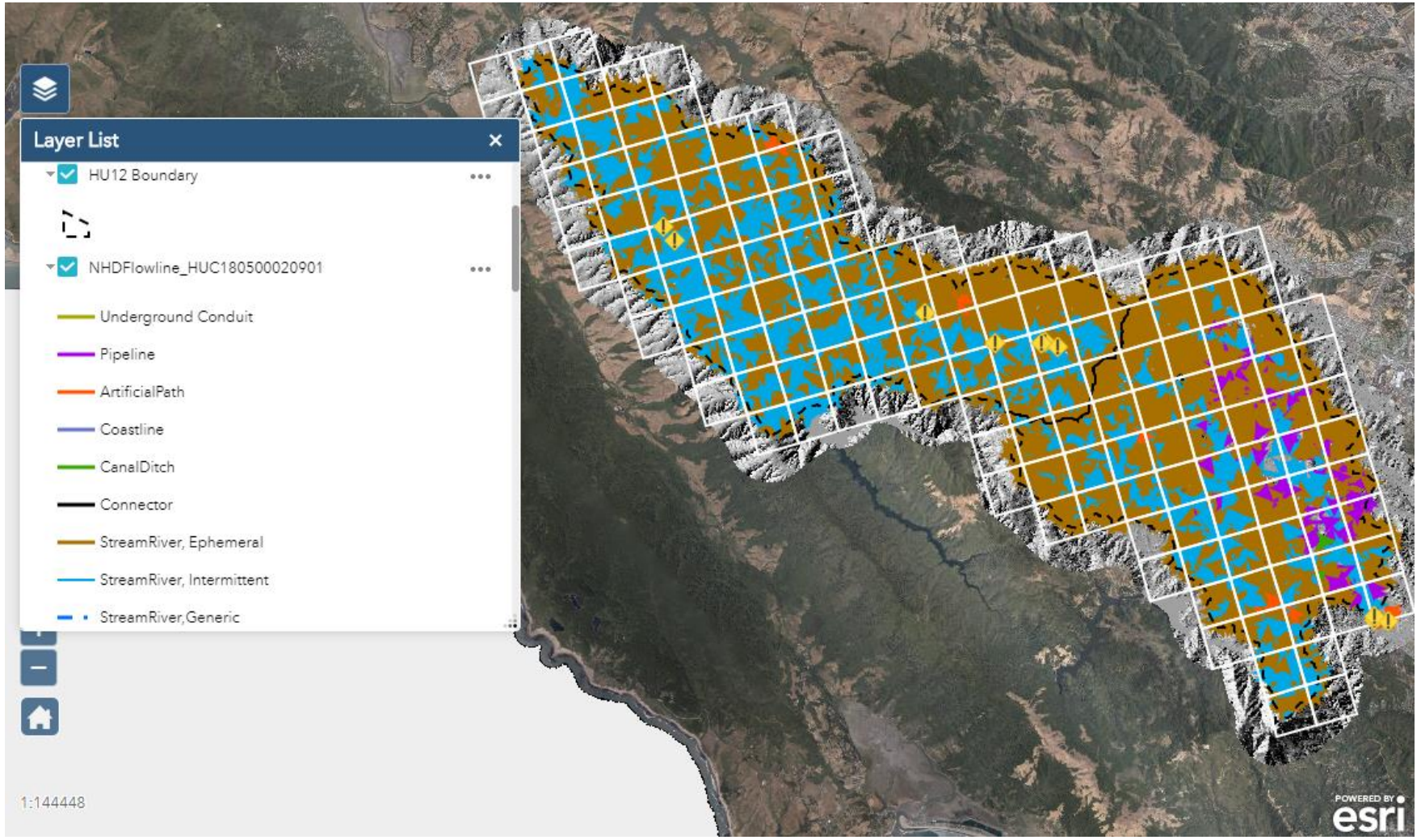
Problem: Quality Control

- Need local input but only want qualified editors to edit network, otherwise will introduce errors
- Need specific locational input but no editing of master database
- Want suggestions not edits to maintain and control consistency
- Need to focus local review on highly questionable areas



Solution: Quality Control

- Reviewers interact with data through web portal where they can provide input. Similar to USGS WebMarkup app but avoids bad data ever entering the NHD database at all.
- Input controlled to provide data that can be used to support the clean up of data
- All edits done by trained analysts
- Work closely with local experts from start of project to get buy-in



Summary

- Creating the linework is just the first step
- Need to set up work-flows that identify and address potential problems with the dataset
- Make sure the dataset is accurate and acceptable to all users by engaging with local stakeholders