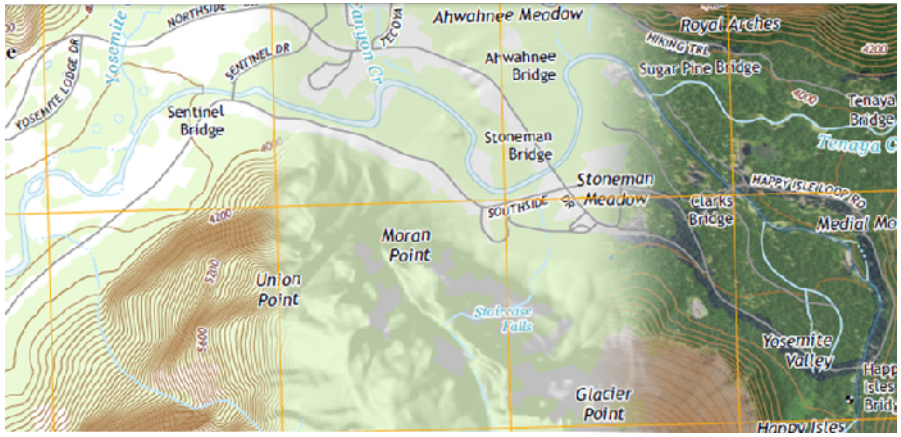
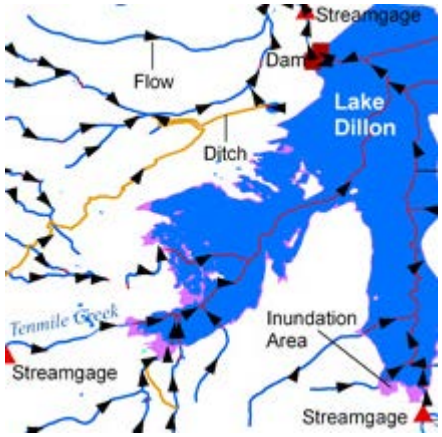
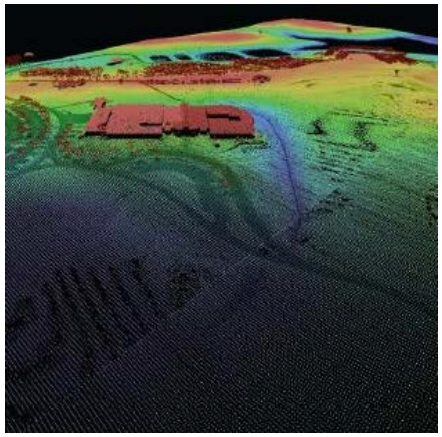
Aerial Imaging and Lidar Point Cloud Fusion for Low-Order Stream Identification







USGS science for a changing world

The National Map
Your Source for Topographic Information

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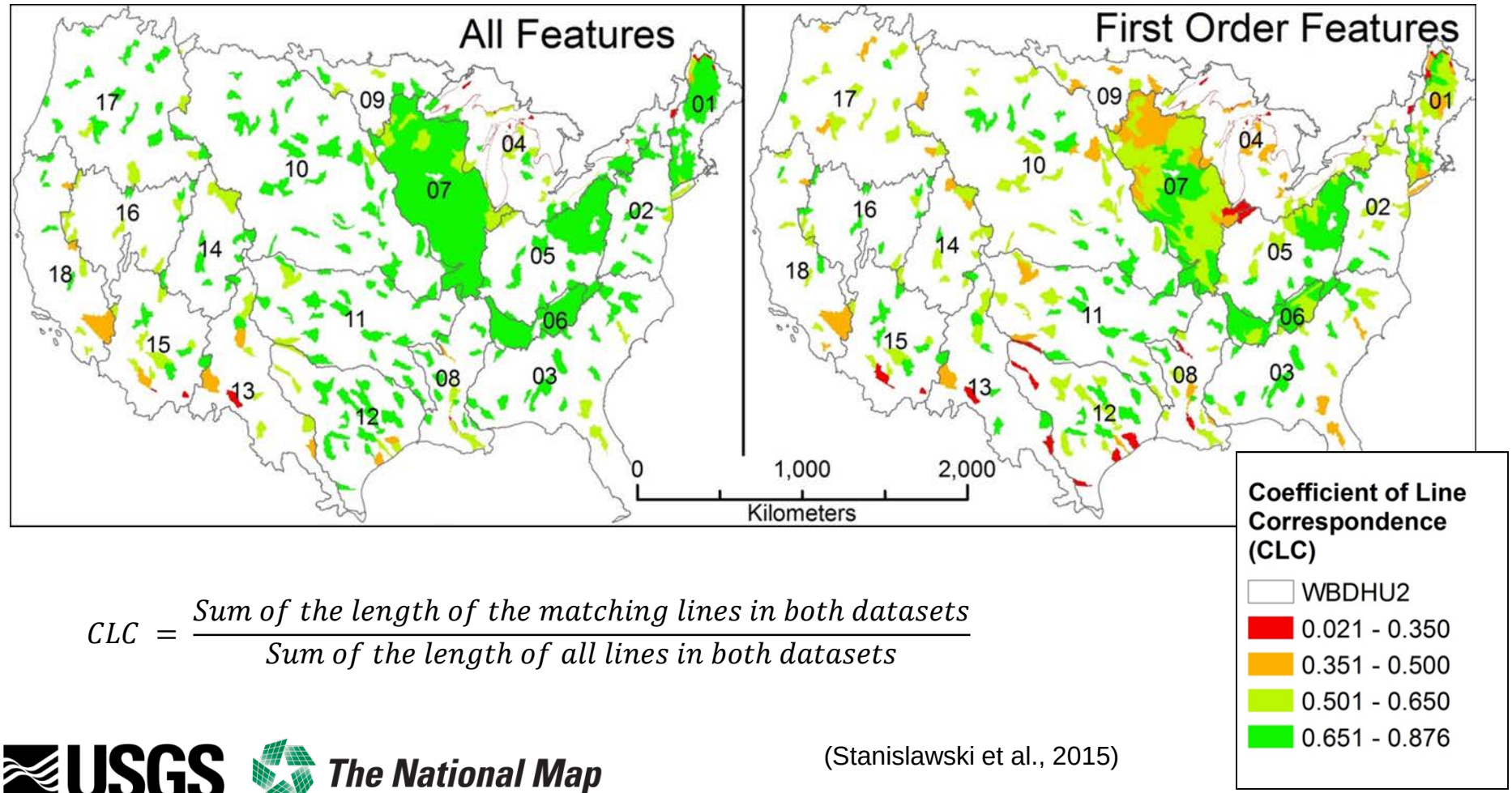
Outline

- Introduction
- Objectives and Challenges
- Methods
- Preliminary Results
- Conclusions and Future Work

+ Introduction

- Weighted Flow Accumulation model and NHD
- Identify matching and mismatching features in both datasets
- Coefficient of Line Correspondence (CLC) metric



$$CLC = \frac{Sum\ of\ the\ length\ of\ the\ matching\ lines\ in\ both\ datasets}{Sum\ of\ the\ length\ of\ all\ lines\ in\ both\ datasets}$$

(Stanislawski et al., 2015)

+ Introduction

- Headwater Stream length as a percentage of total stream length

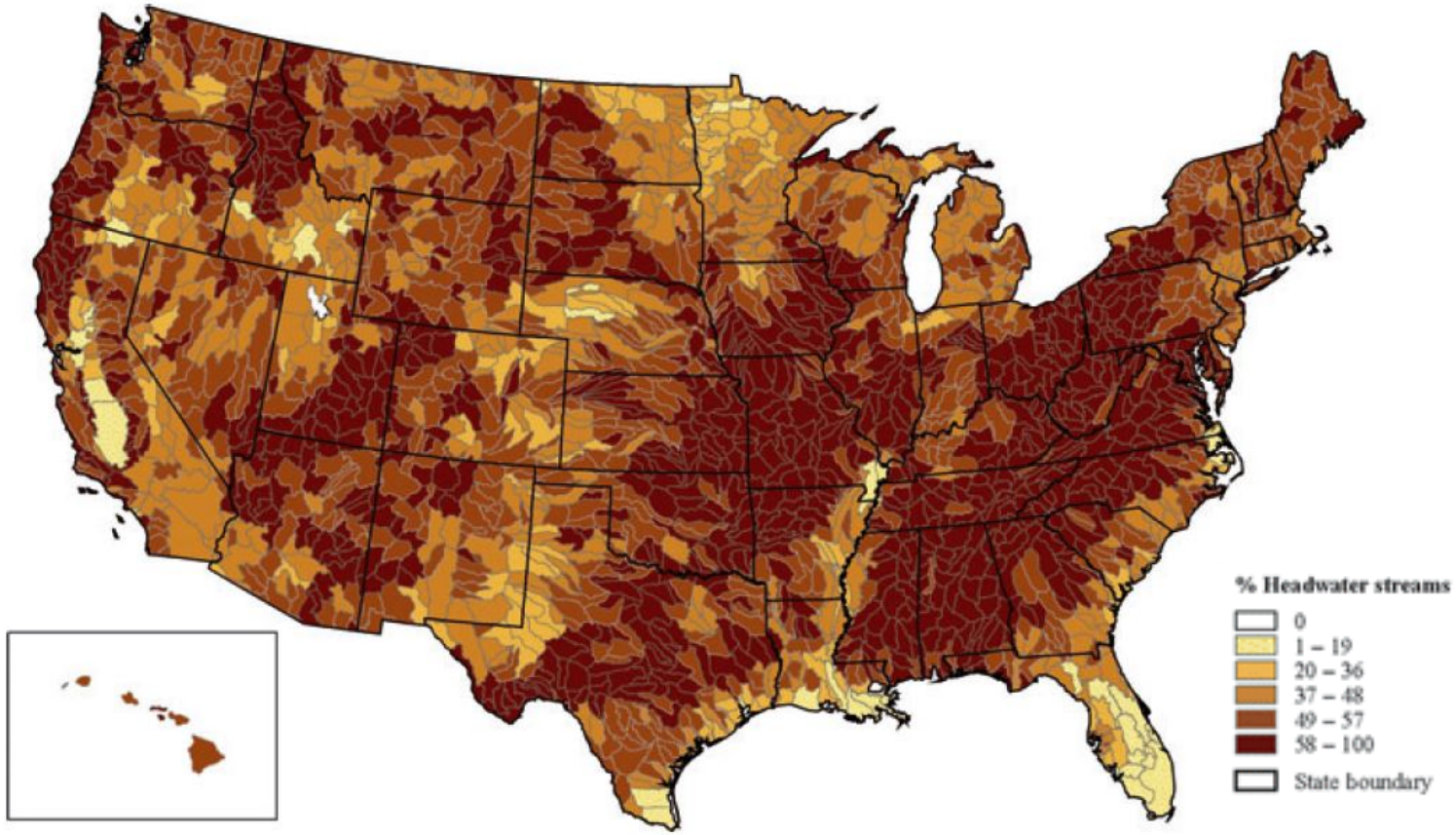


FIGURE 1. Headwater Stream Length, as a Proportion of Total Stream Length Within Each 8 Digit HUC Watershed, in the U.S., Excluding Alaska, as Computed Querying the NHD RAD v2.0 for Reaches That Have No Other Inflowing Streams at the 1:100,000 Scale. The NHD RAD v2.0 Does not Capture Streams Under 1 mile (i.e., 1.61 km) in Length.

(Nadeau and Rains, 2007)

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Challenge and Objectives

Challenge

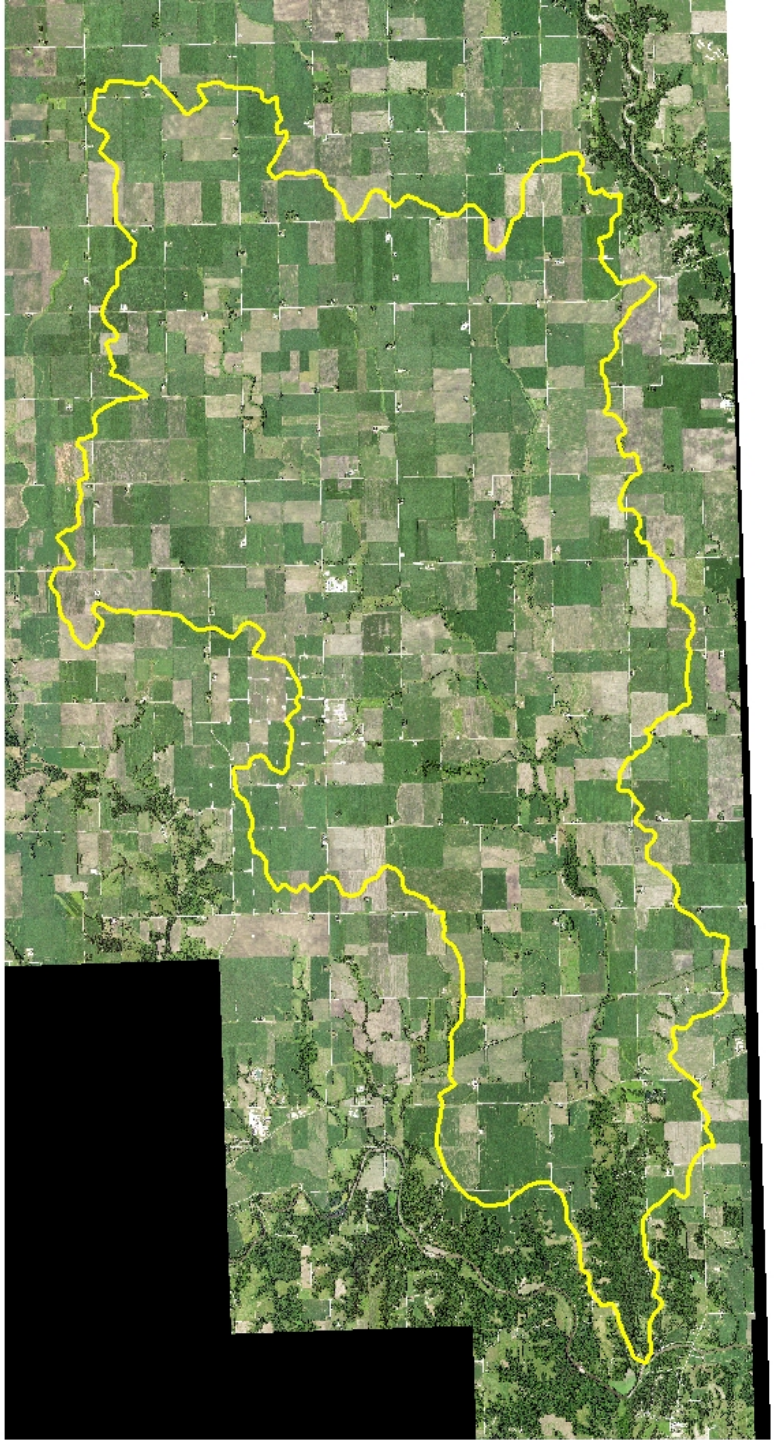
- Regular NHD validation and updating
- Low order stream modeling inaccuracy

Objectives

- Automate low-order stream identification in low topographic relief humid regions
- Identify conditions that allow for stream classification

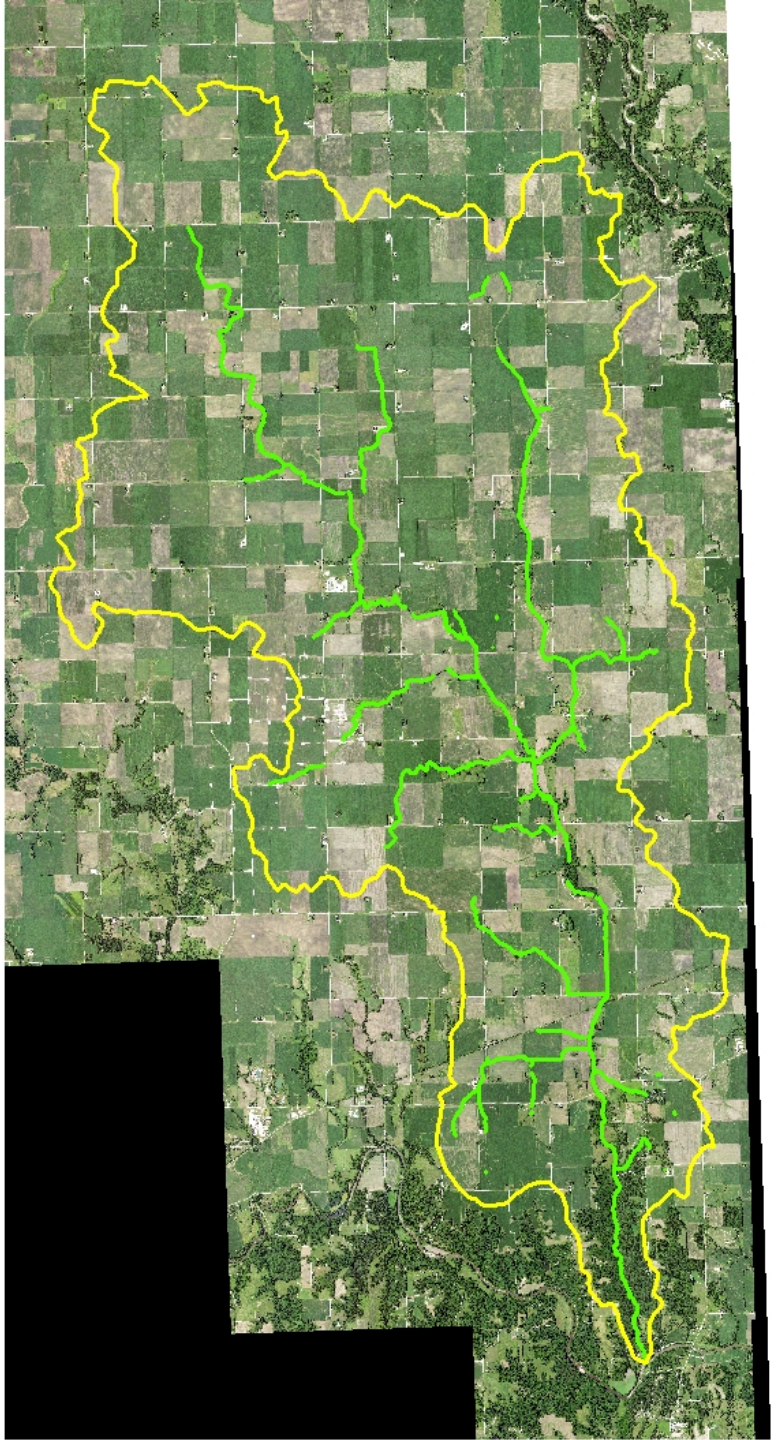
+ Methods

Low topographic relief agricultural region



+ Methods

NHD agreement with elevation-derived channels



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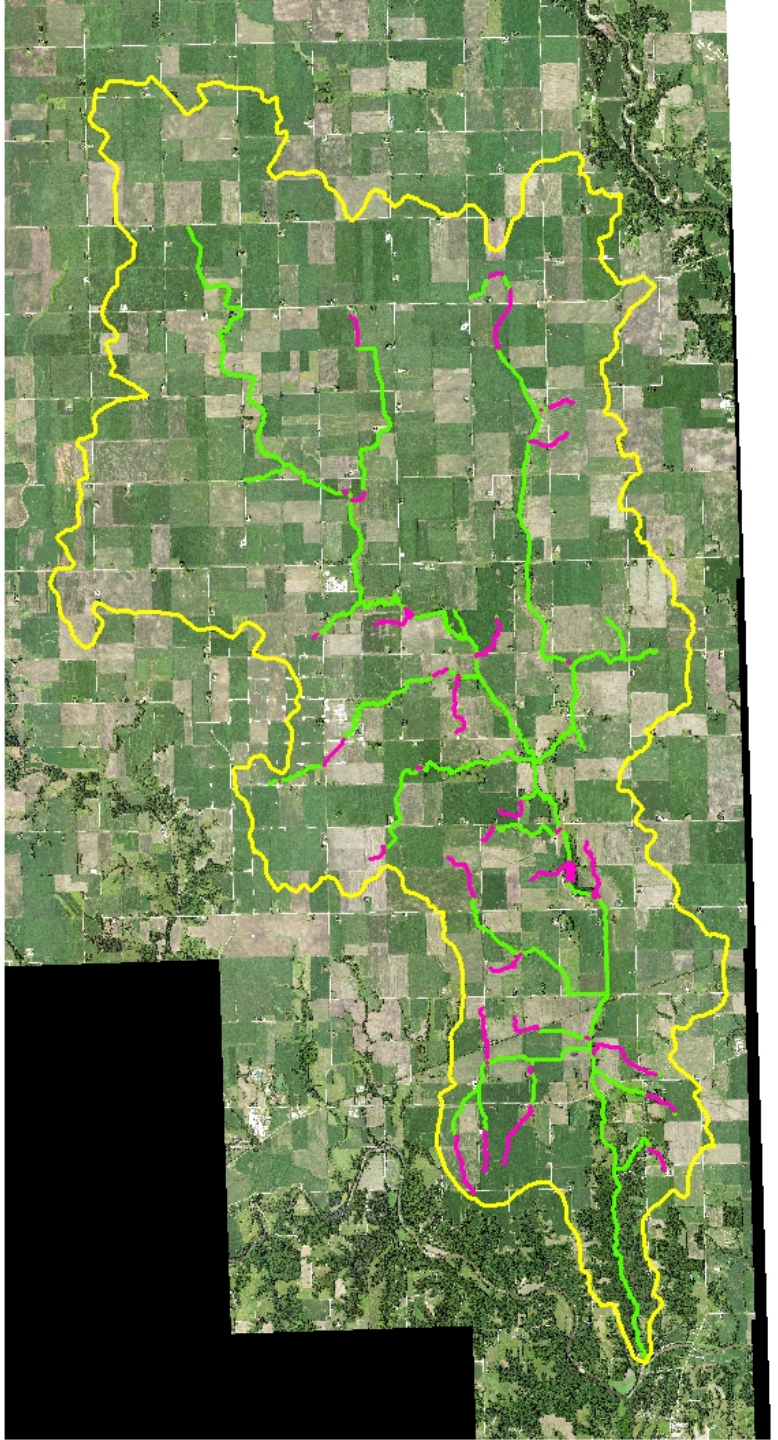
Elevation-derived channels: omissions



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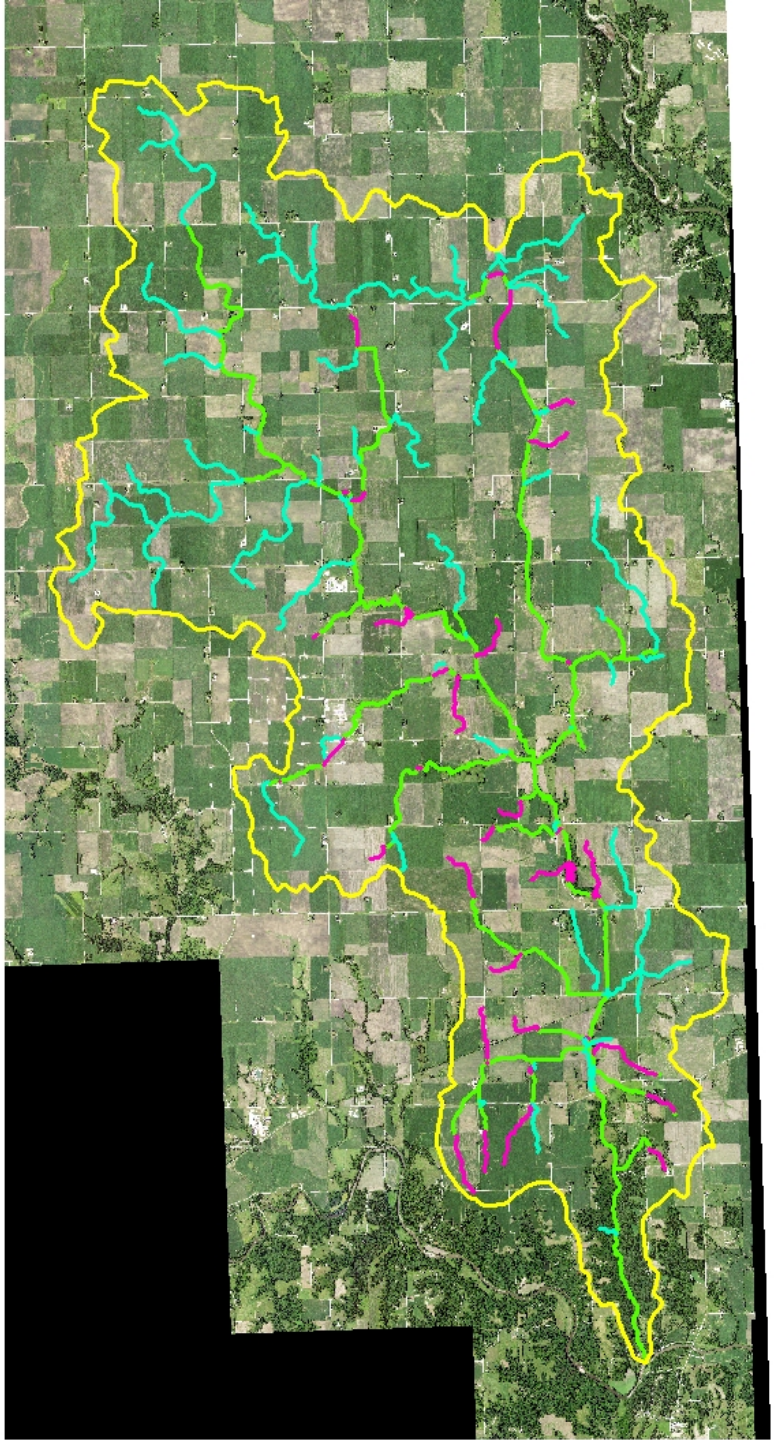
Elevation-derived channels: commission errors



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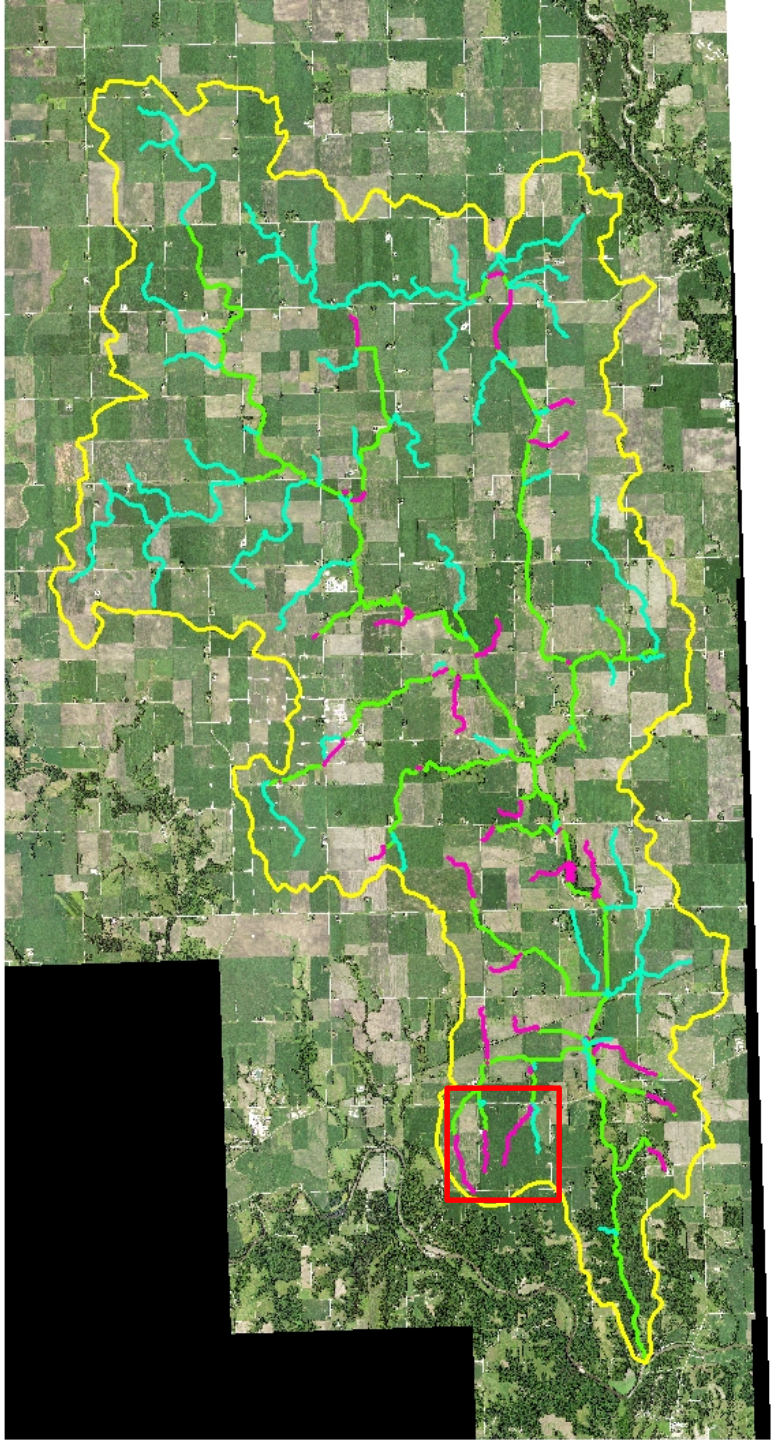
Elevation-derived channels: commission errors



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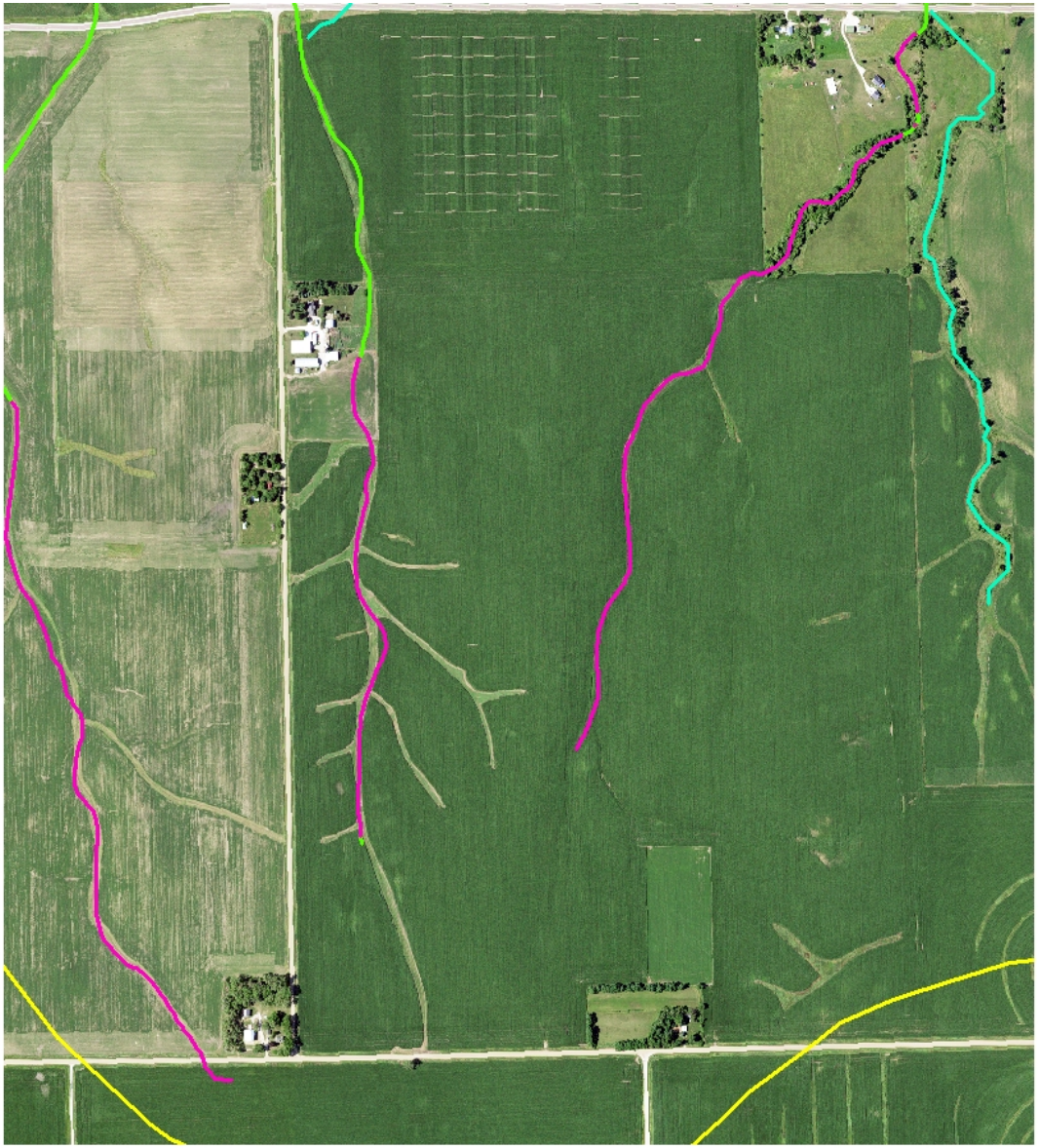
Stream permanence



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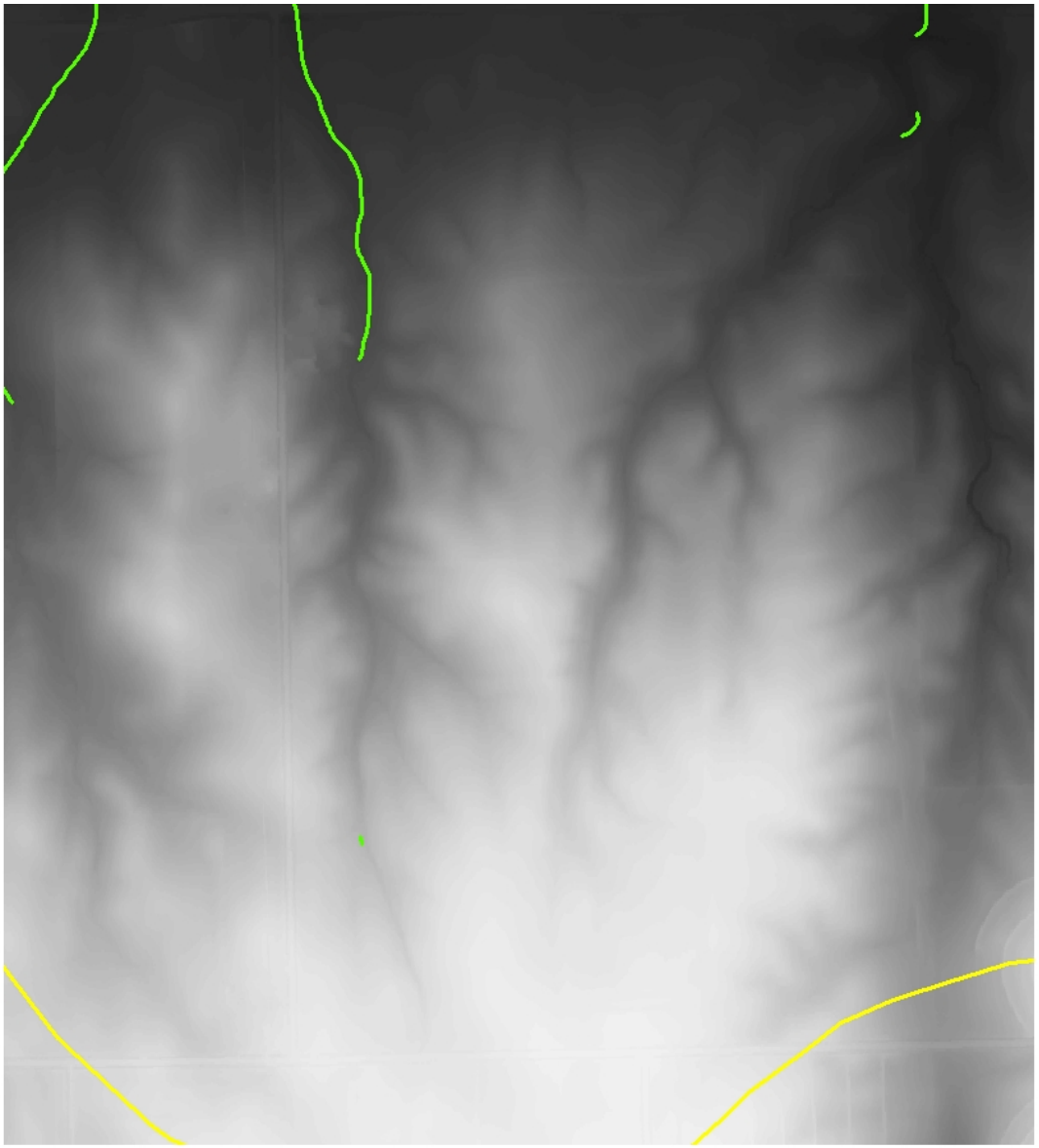
3 m DEM



Panther Creek WS

0.2

Miles

Model match

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Return intensity

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+ Methods

Topographic Position Index

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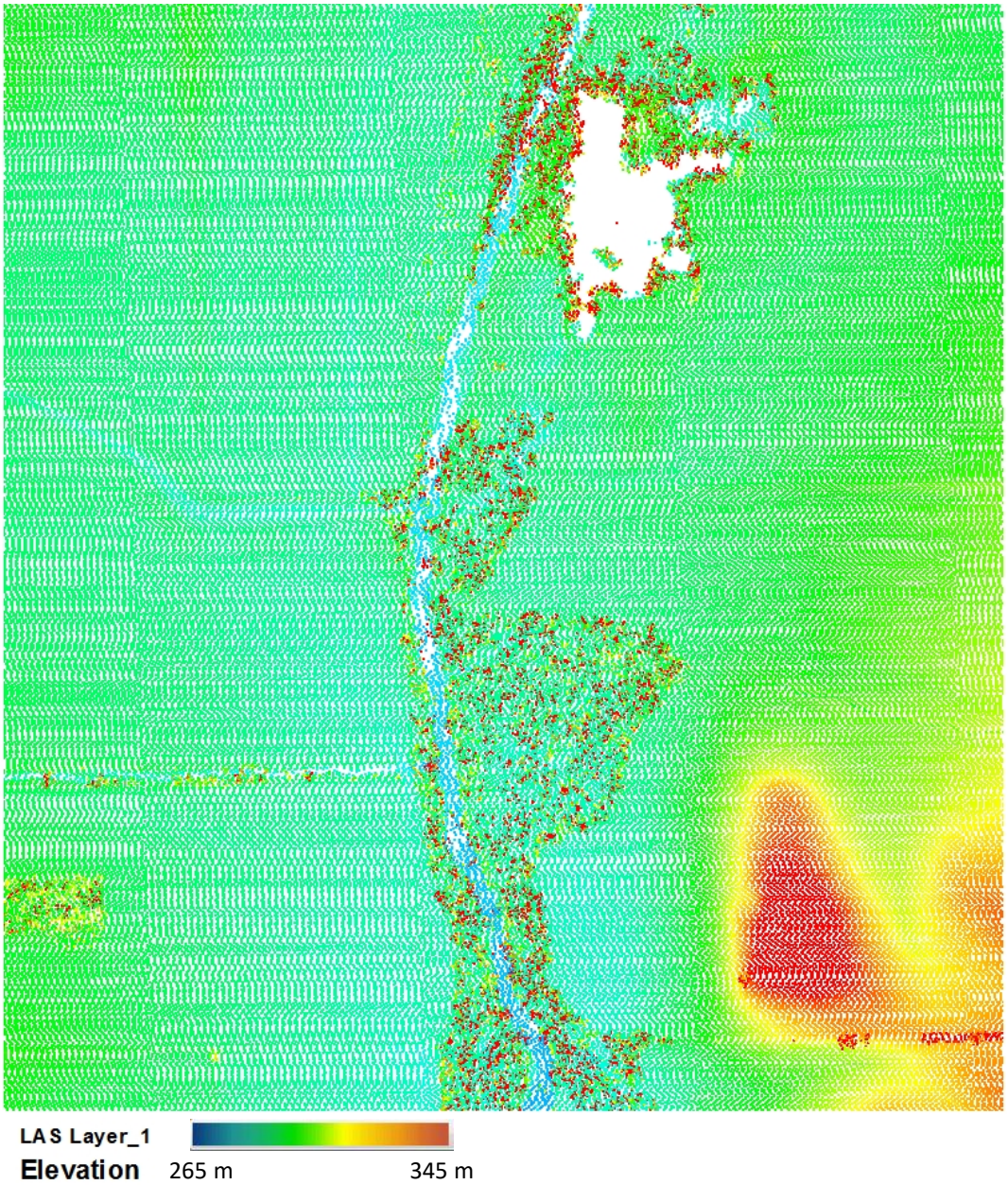
Point drop out



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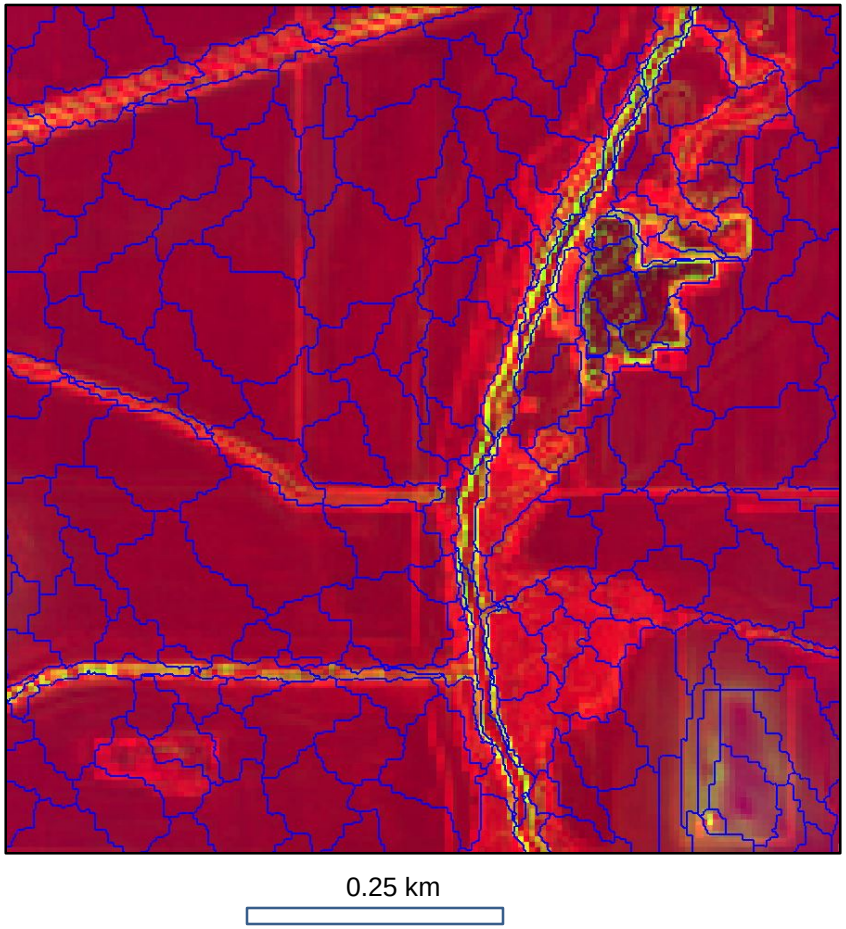
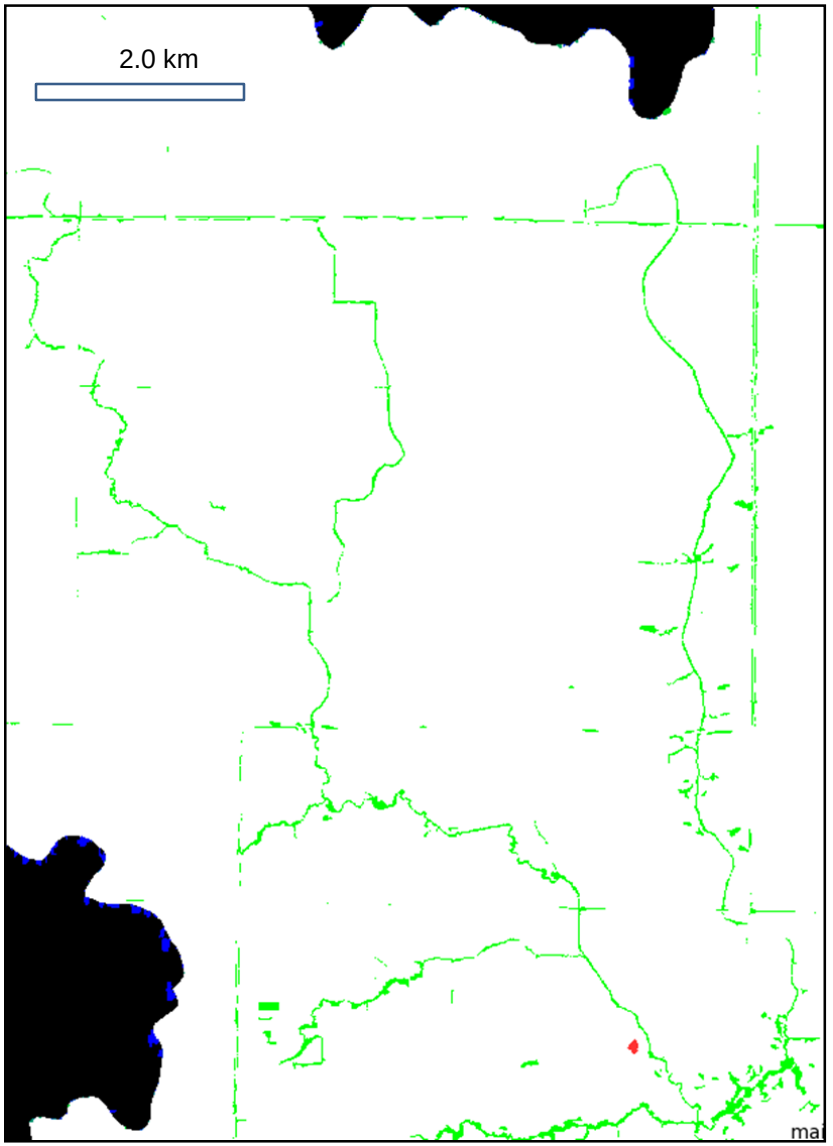
NAIP analysis

+ Methods

Object Based Image Analysis





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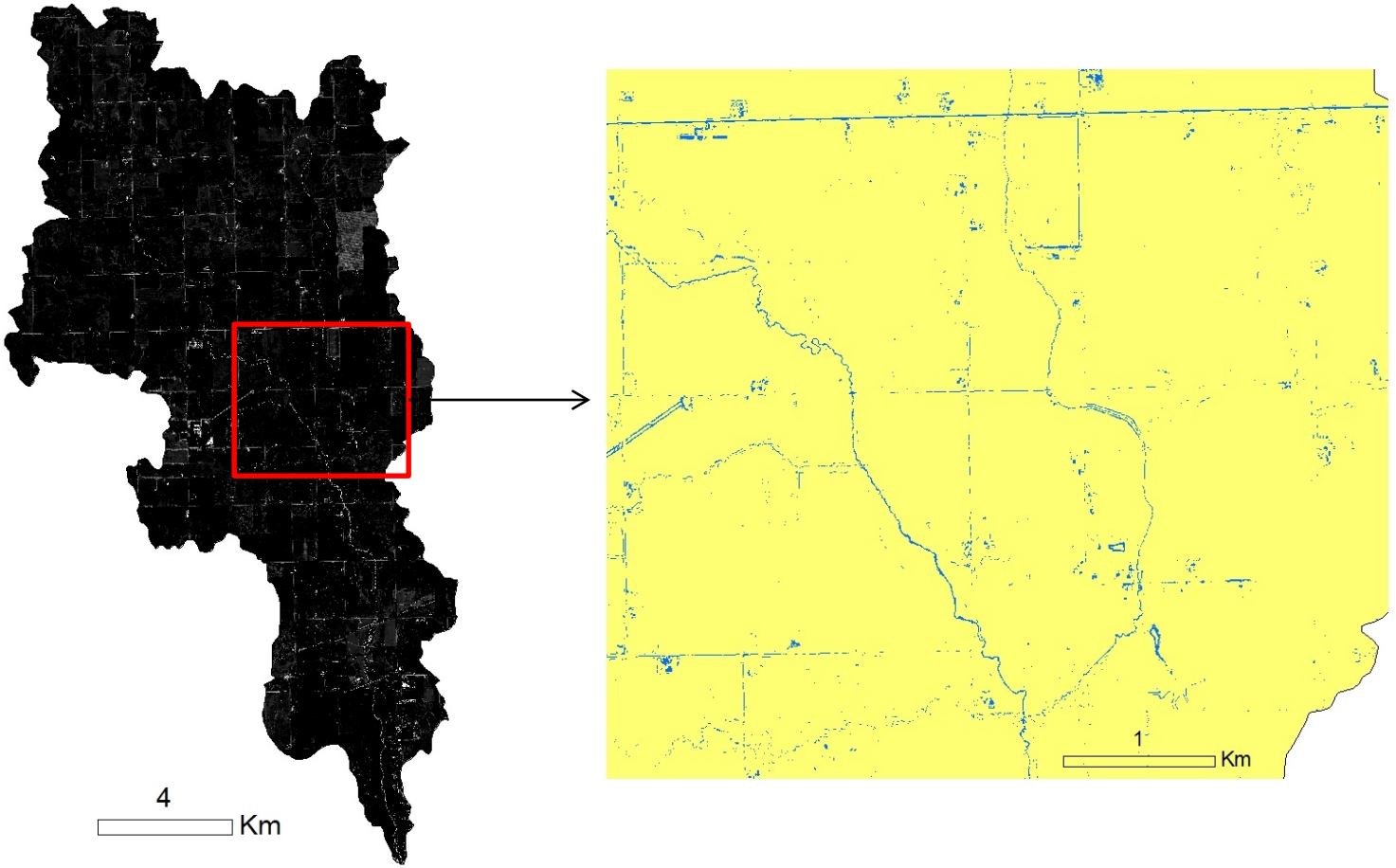
Preliminary Results

- Lidar derivatives: DEM (TPI and profile curvature), intensity, and density of returns
- NAIP: σ(blue)* blue/ NIR (below)



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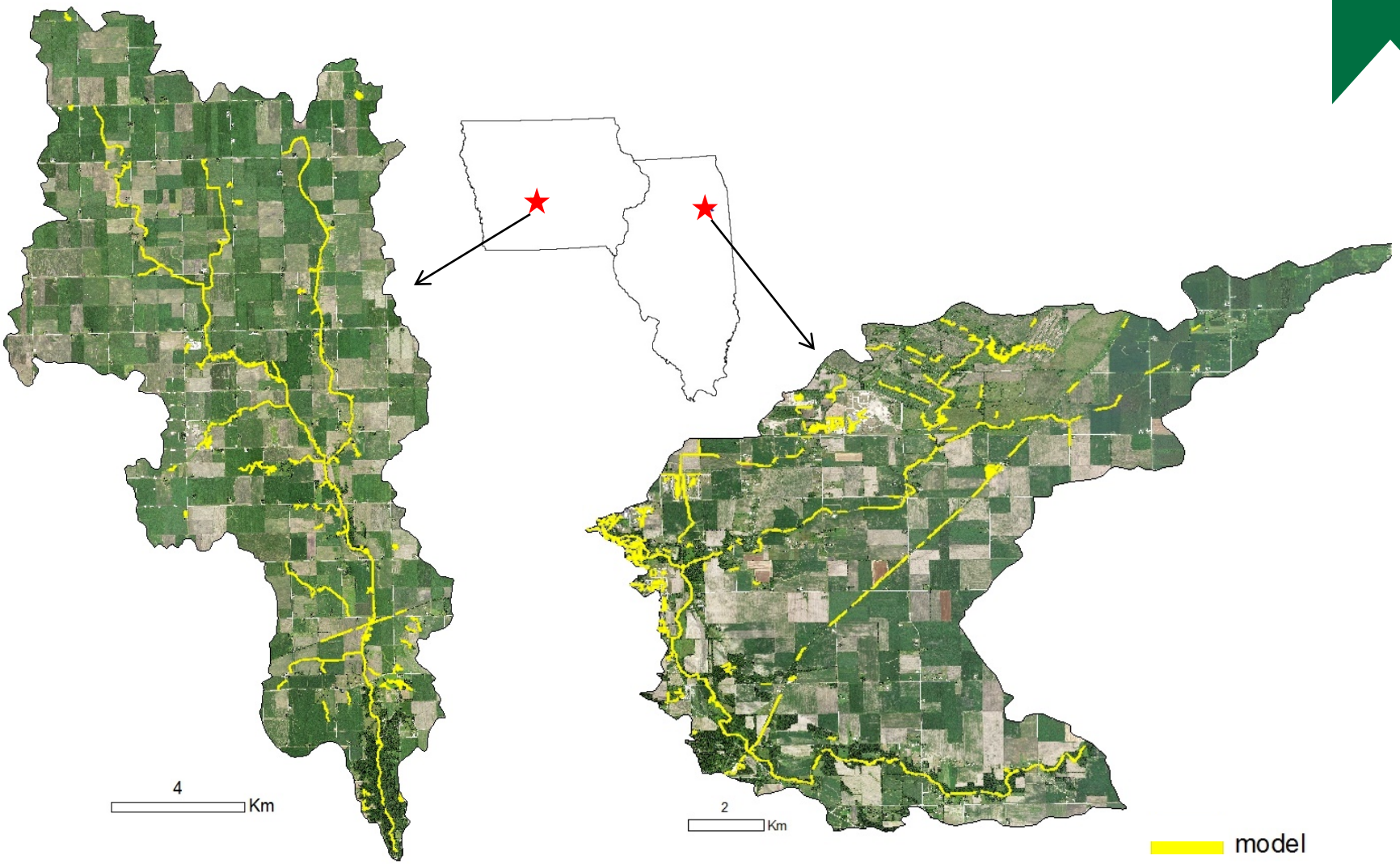
+ Preliminary Results



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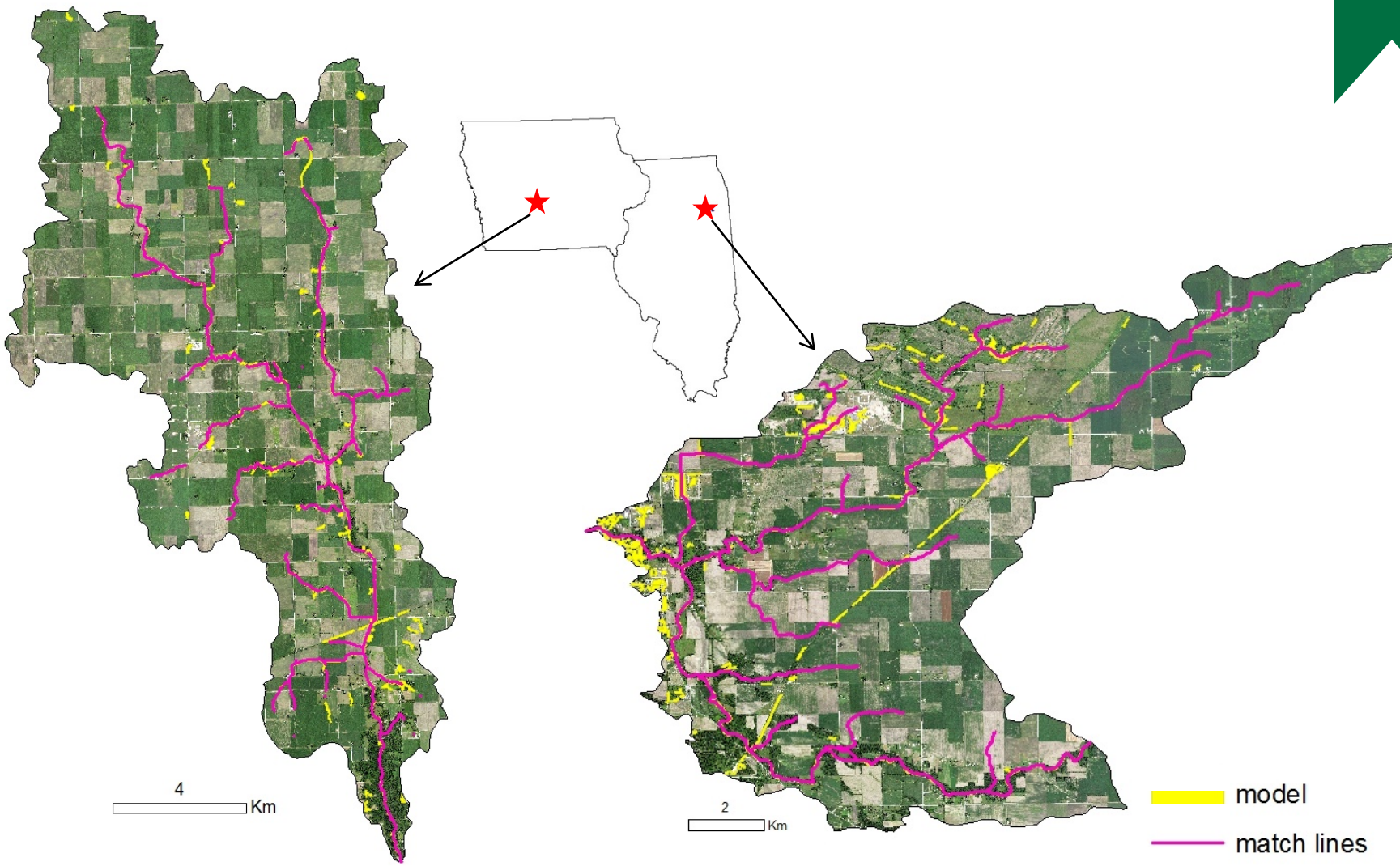

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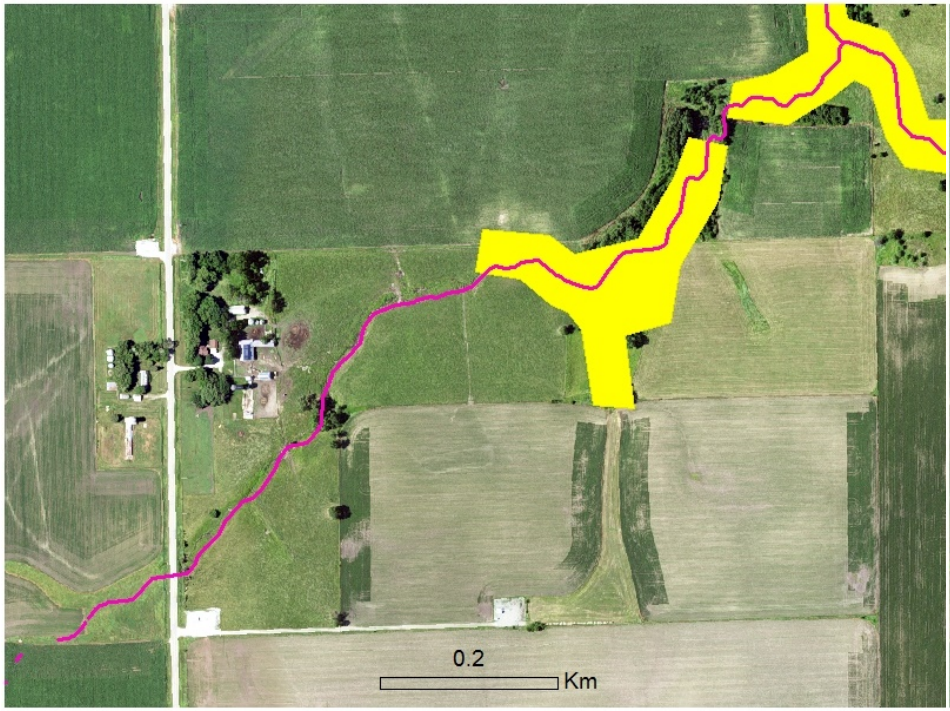
+ Preliminary Results

Panther Creek	intermittent	Perennial
Match lines	36.74	40.67
Model lines	22.02	37.69
	59 %	93 %

Forked Creek	intermittent	Perennial
Match lines	22.11	37.43
Model lines	5.45	29.23
	25 %	78 %



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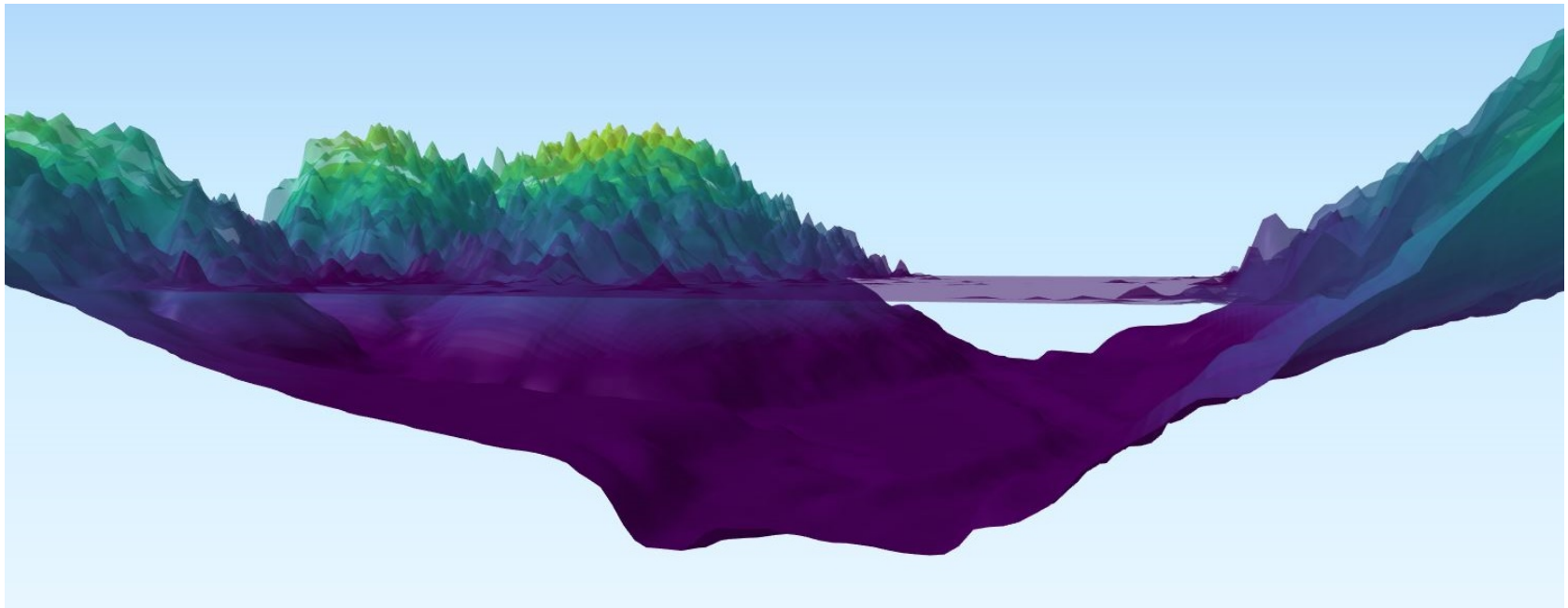
Conclusions and Future Work

- Lidar derivatives and NAIP data can be used to extract streams
- Classification as ratio of model match
- Ground-truthing
- Dynamic weighting may be required for automation



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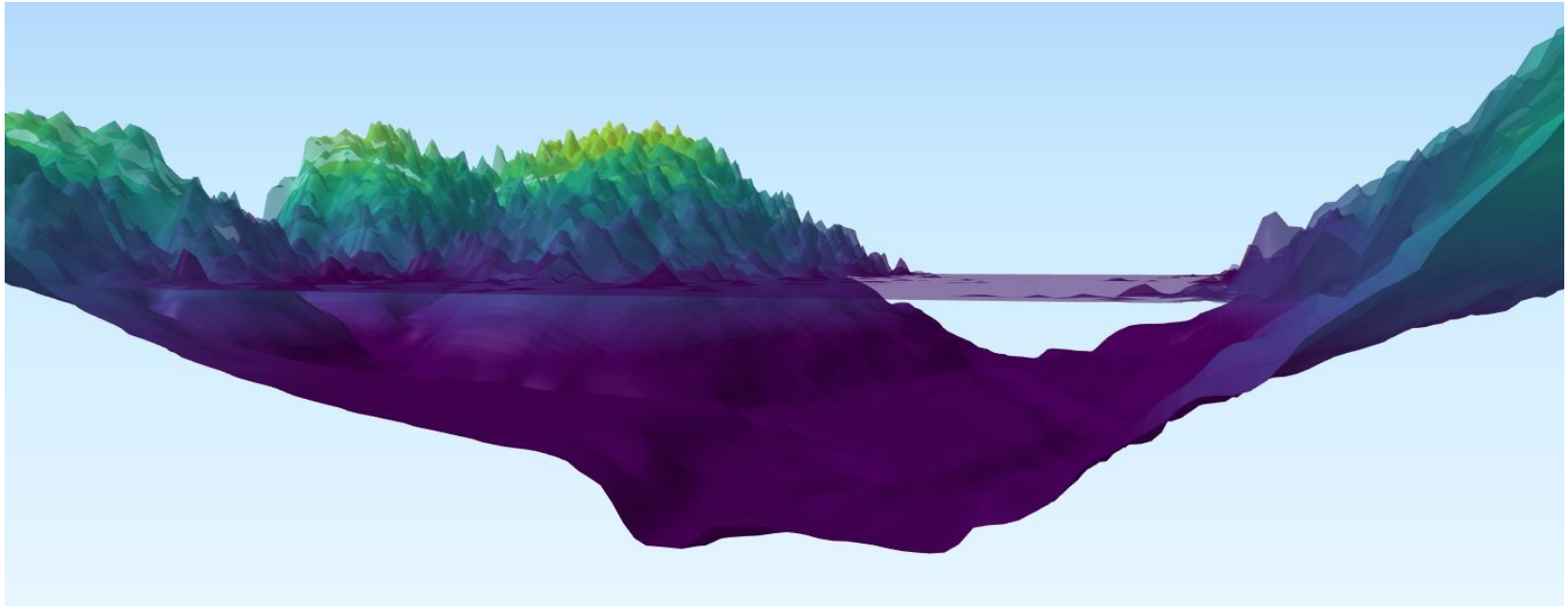
- Stanislawski, L. V., Buttenfield, B. P., & Doumbouya, A. (2015). A rapid approach for automated comparison of independently derived stream networks. *Cartography And Geographic Information Science*, (5), 435.



Thanks

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