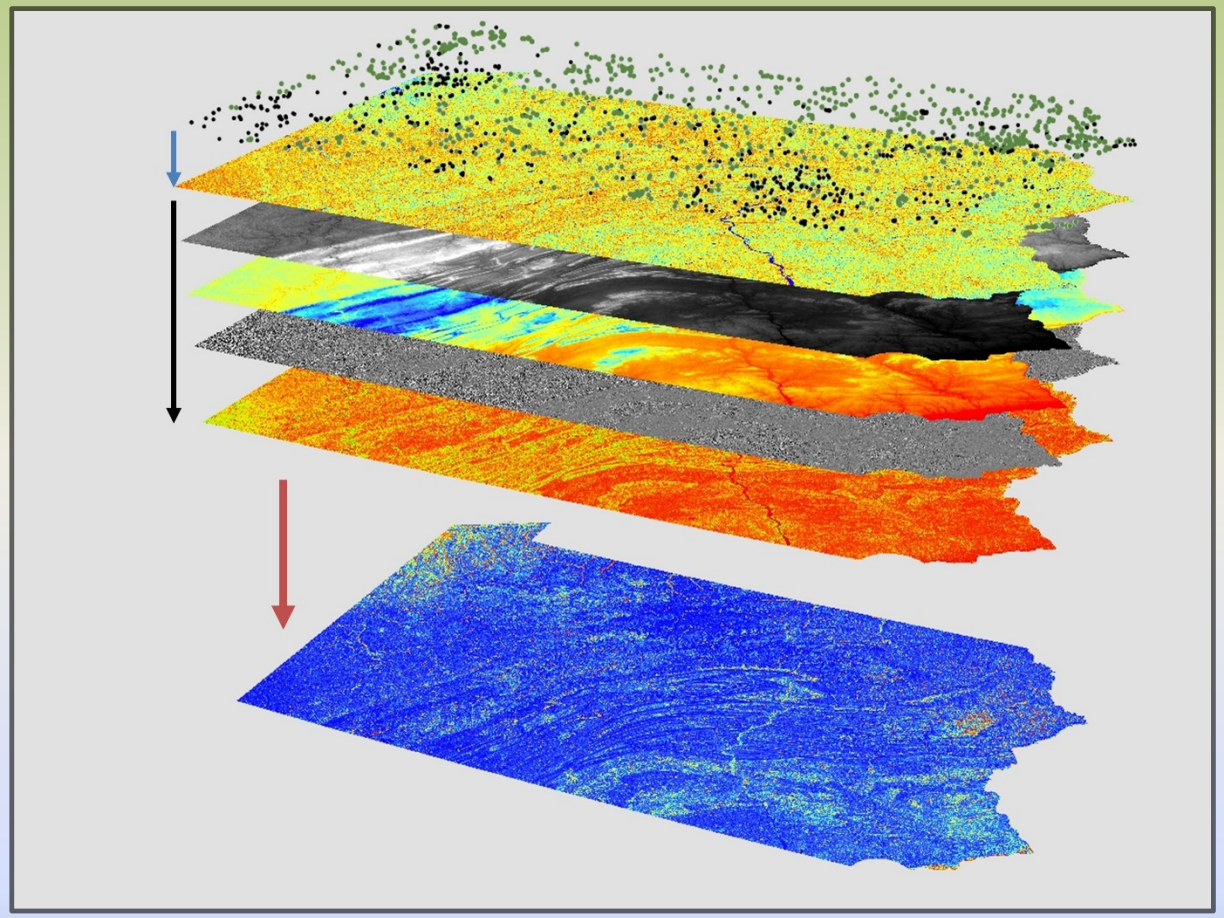
Modeling wetland features from geostatistical models

November 14, 2018



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Ducks Unlimited

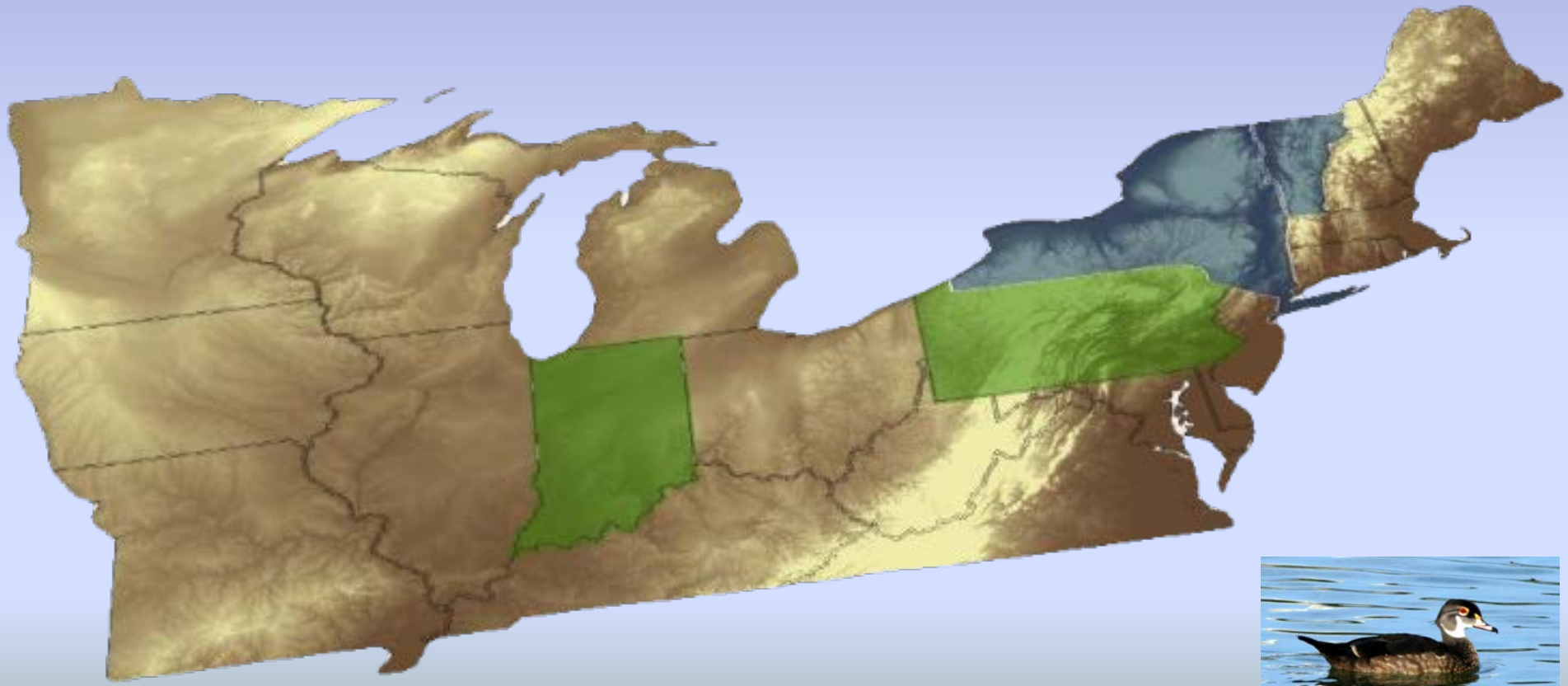
praney@ducks.org

Acknowledgements

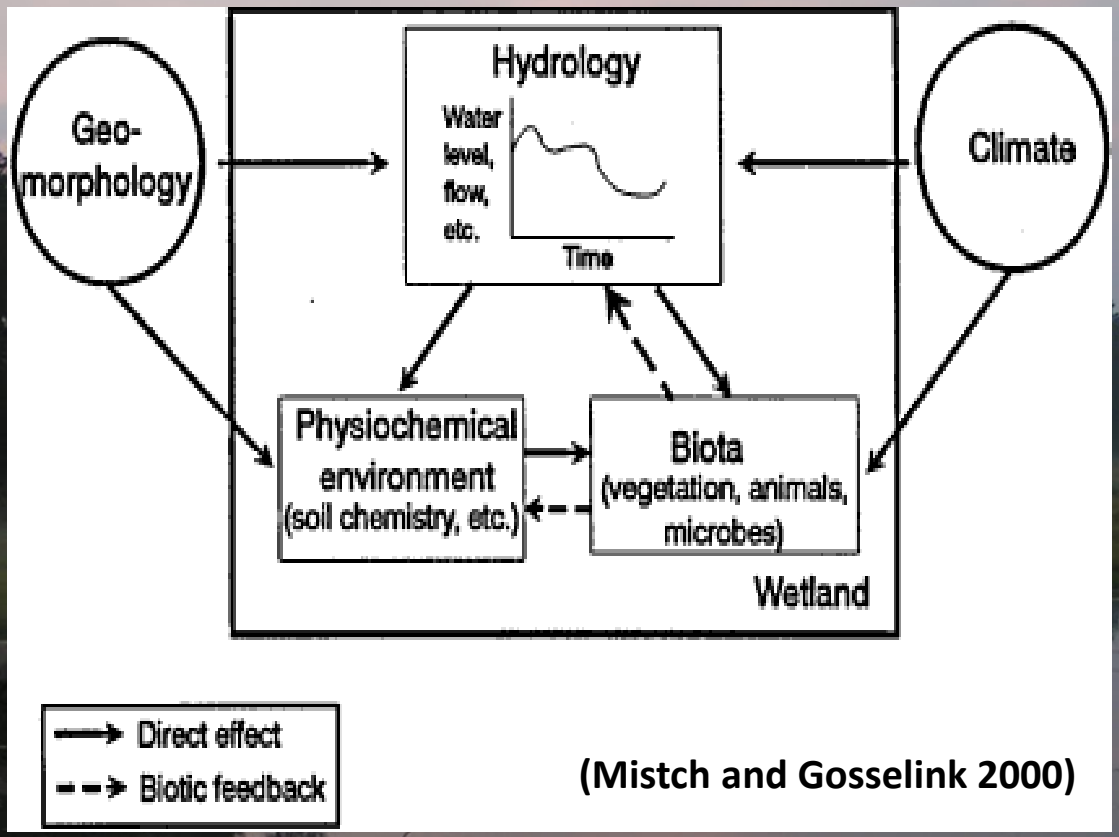
Statistical Mapping Areas

Completed

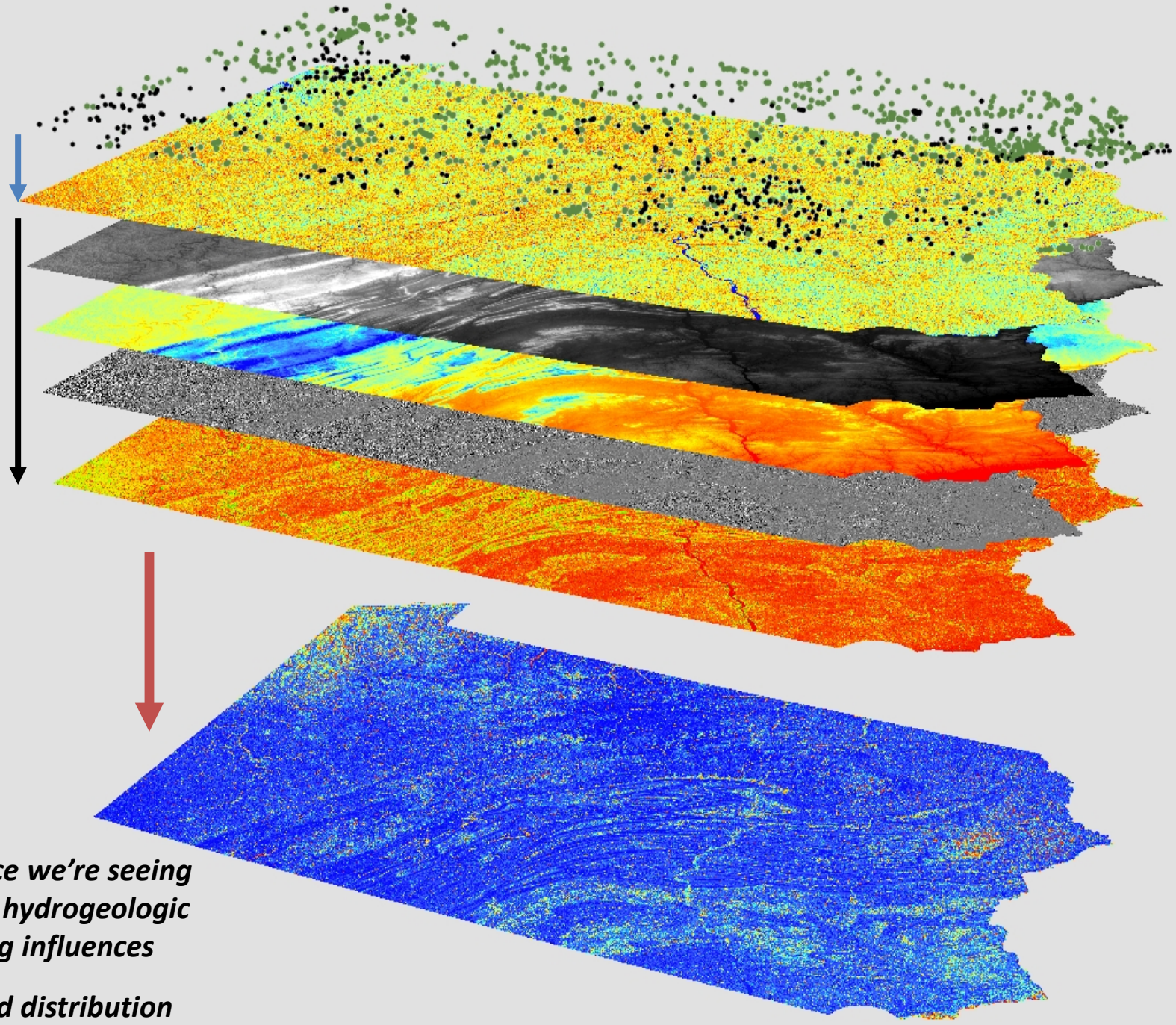
Underway



What controls wetland distribution & how do we mimic that in a GIS?



(Mistch and Gosselink 2000)

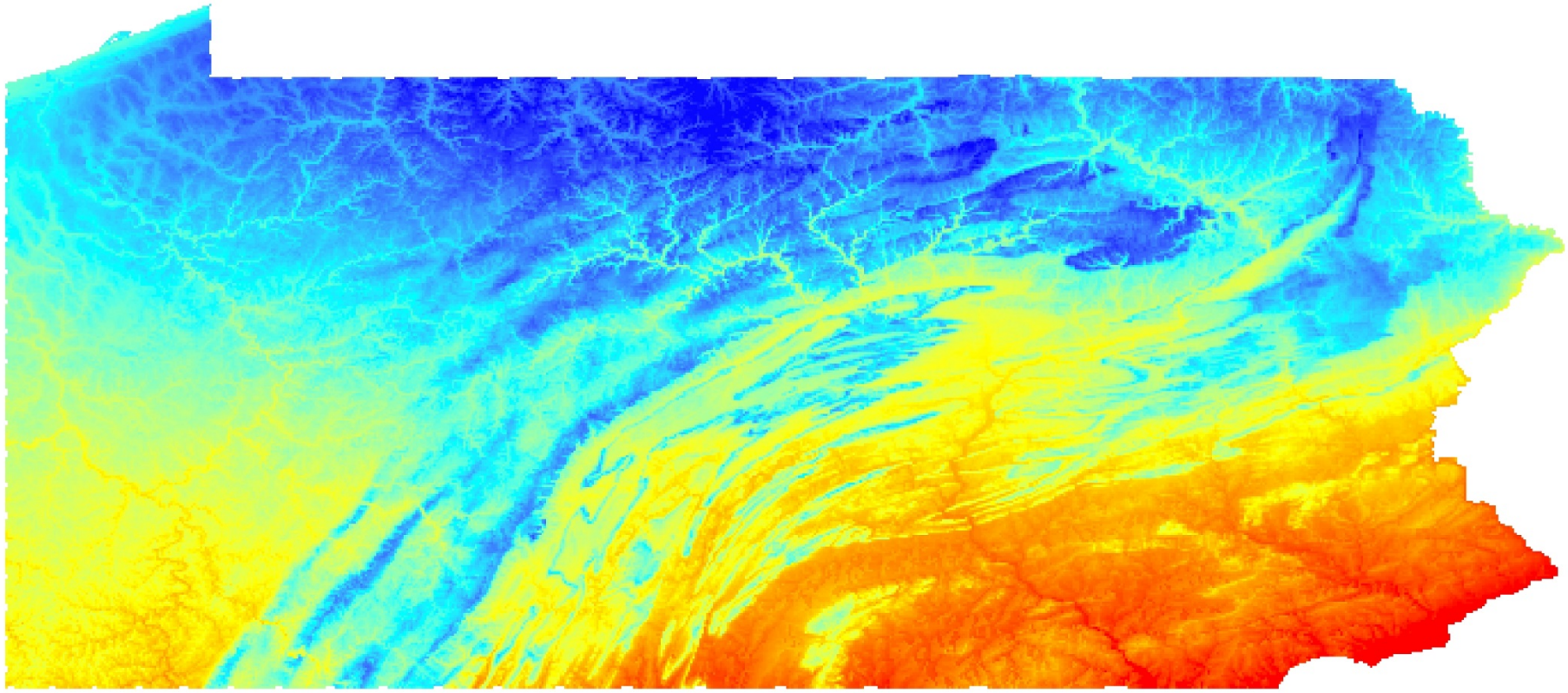


In essence we're seeing how the hydrogeologic setting influences

wetland distribution

Climate downscaling

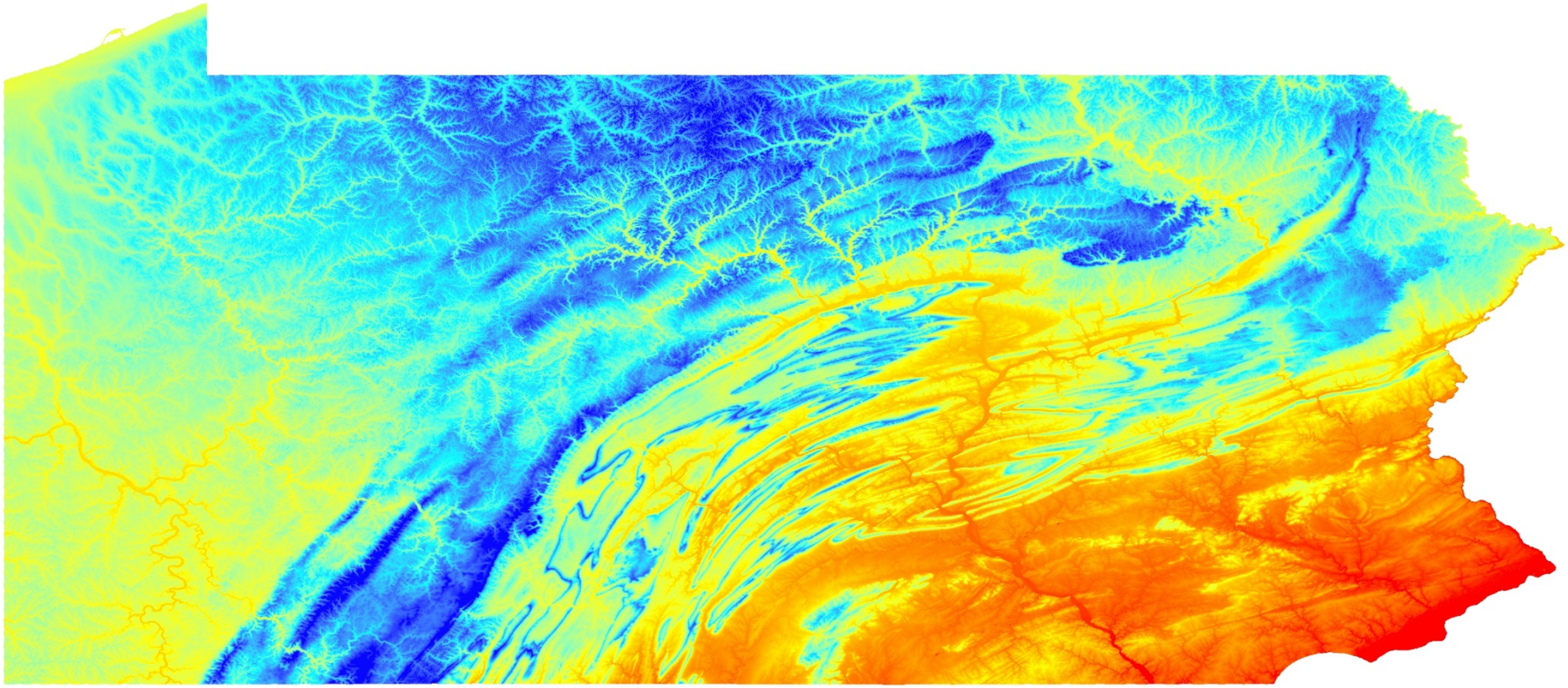
(Principle Components Axis: Temp & Humidity Variables)

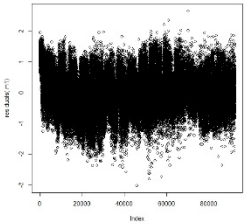


Downscaling needed to get climate on same "spatial resolution" as other predictor variables

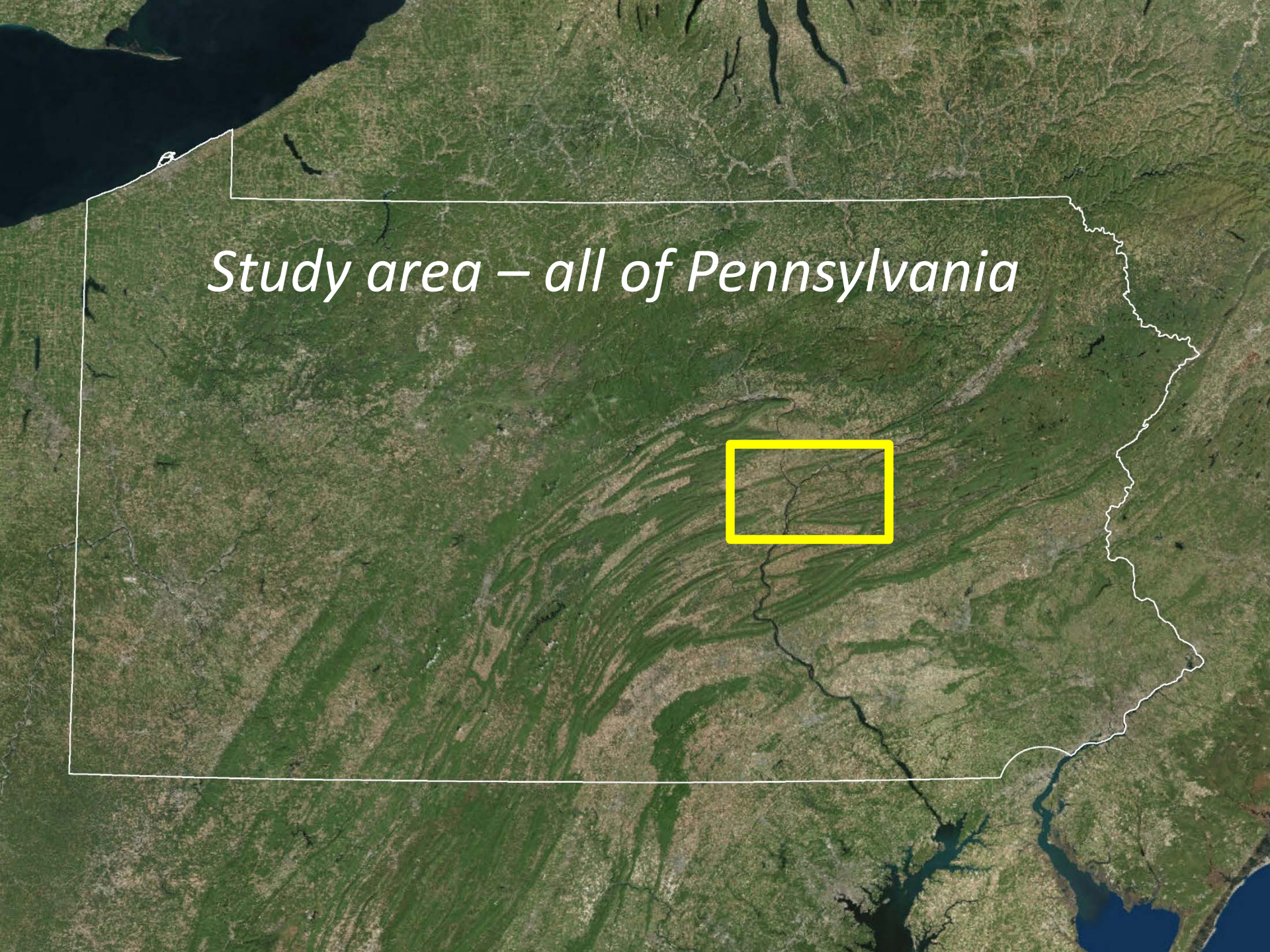
Prediction to 10m from fitted linear model:

climpc1 ~ lat*elev*aspect



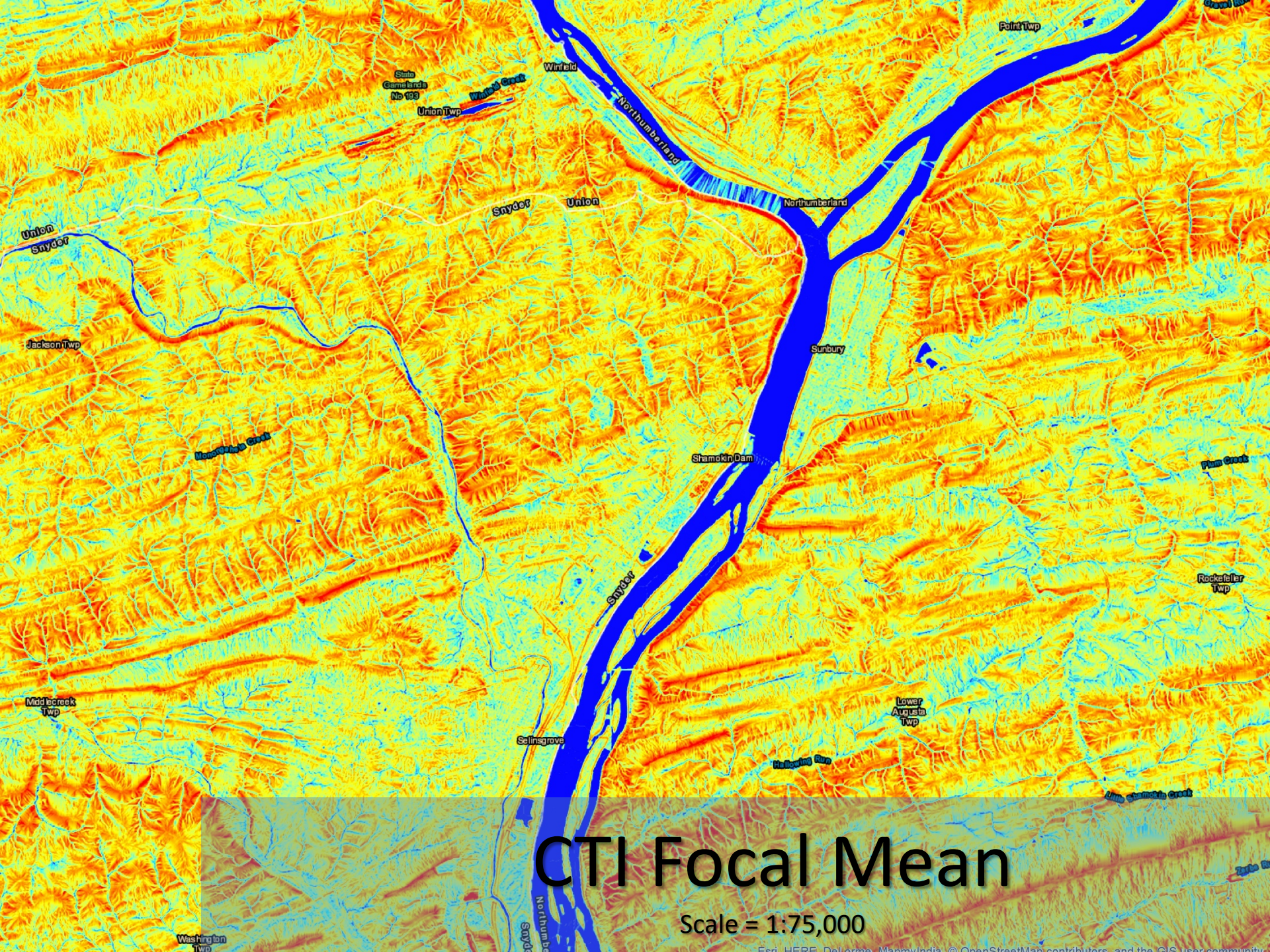


R^2=0.91 on 92,130 validation observations


Study area – all of Pennsylvania

Aerial:

Scale = 1:75,000

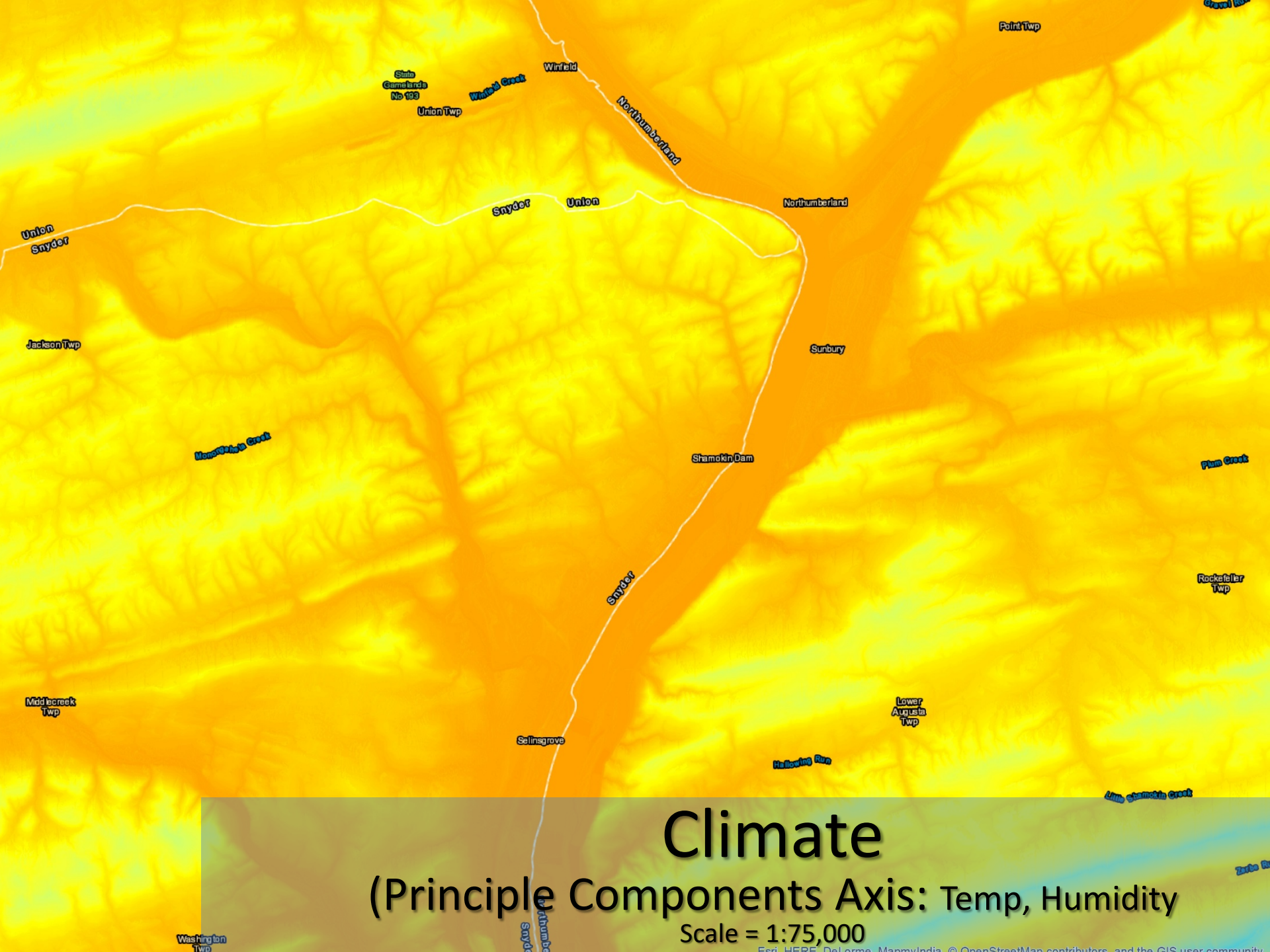


CTI Focal Mean

Scale = 1:75,000

Topographic Position Index

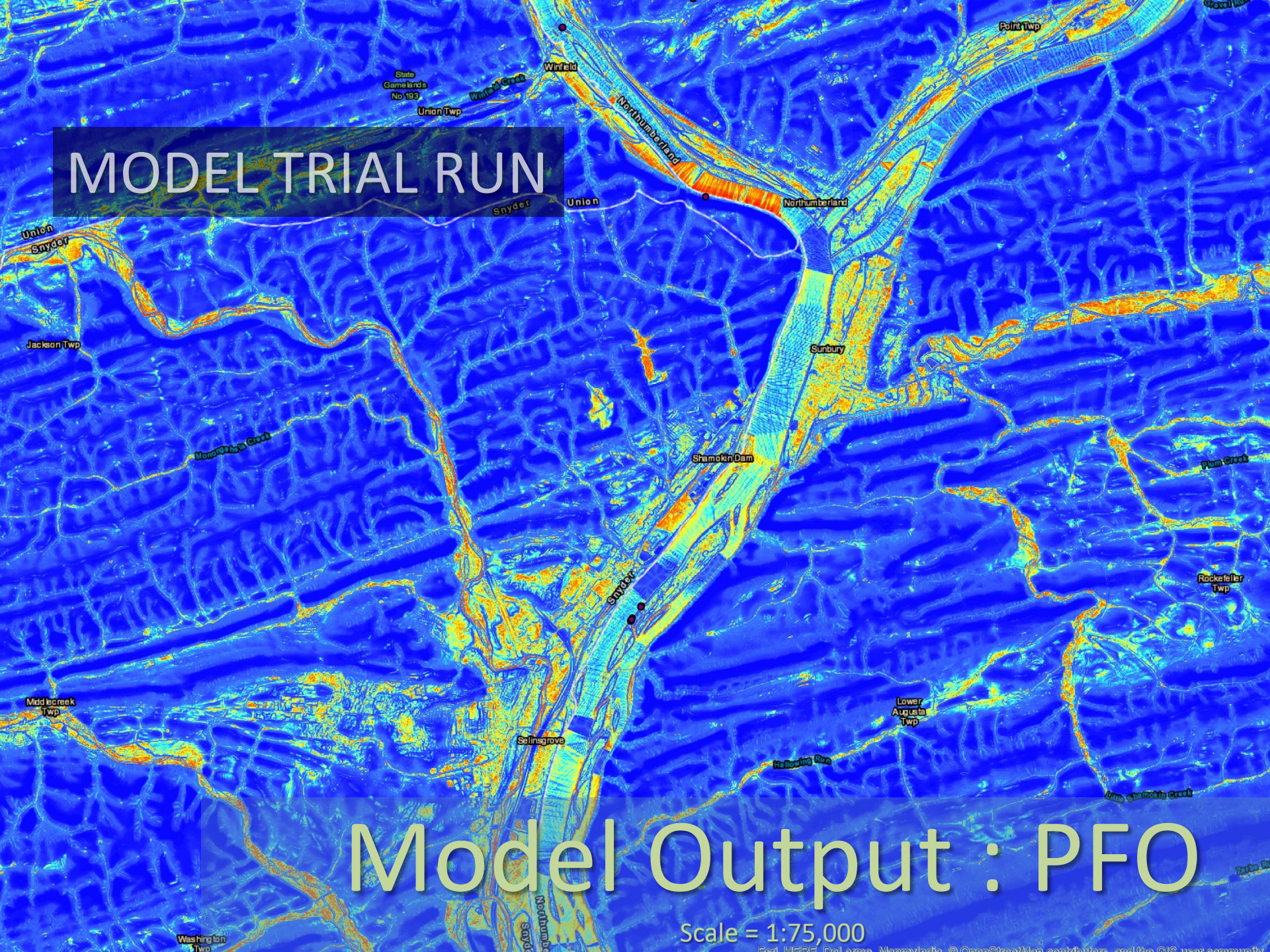
Scale = 1:75,000

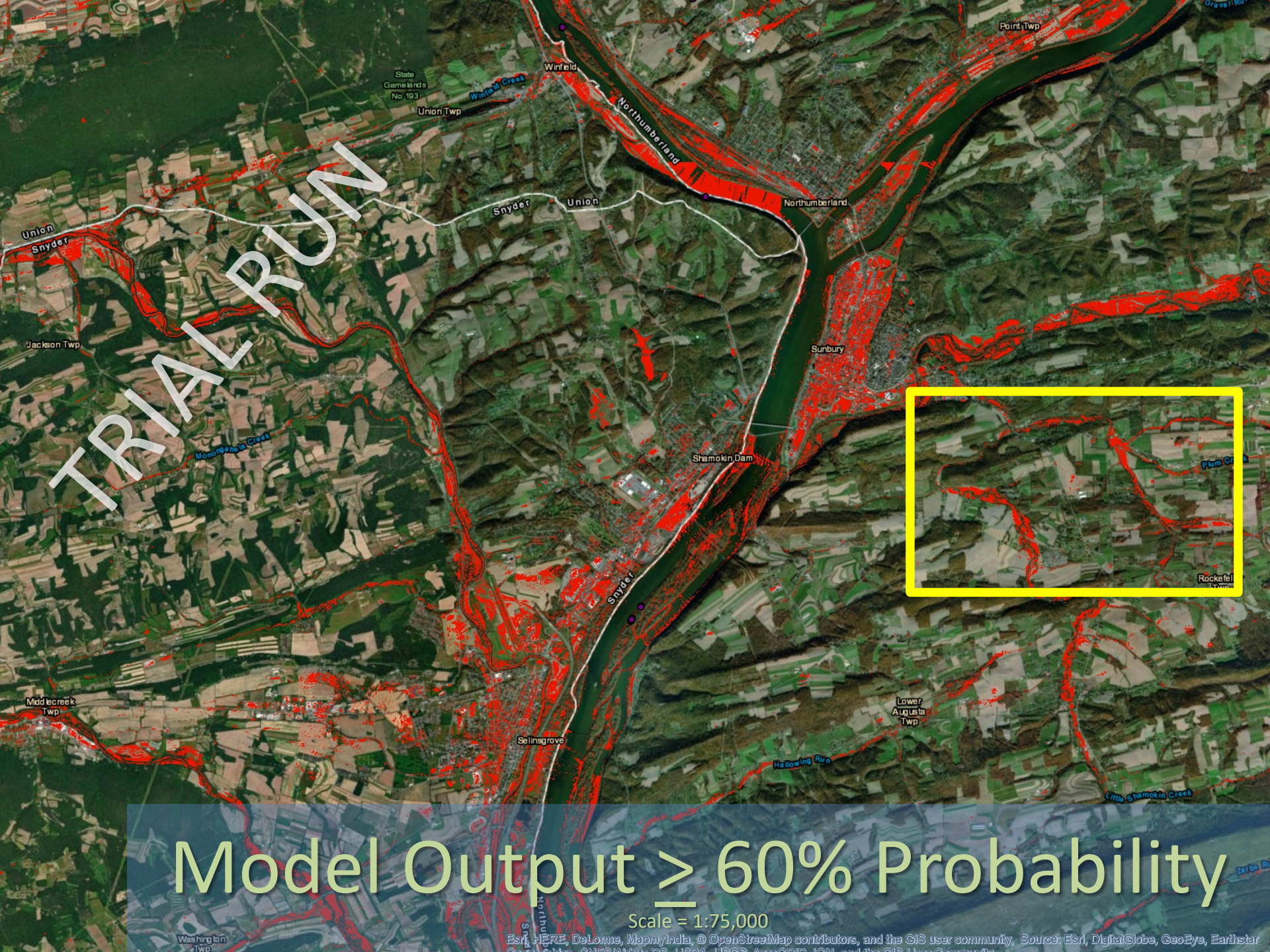


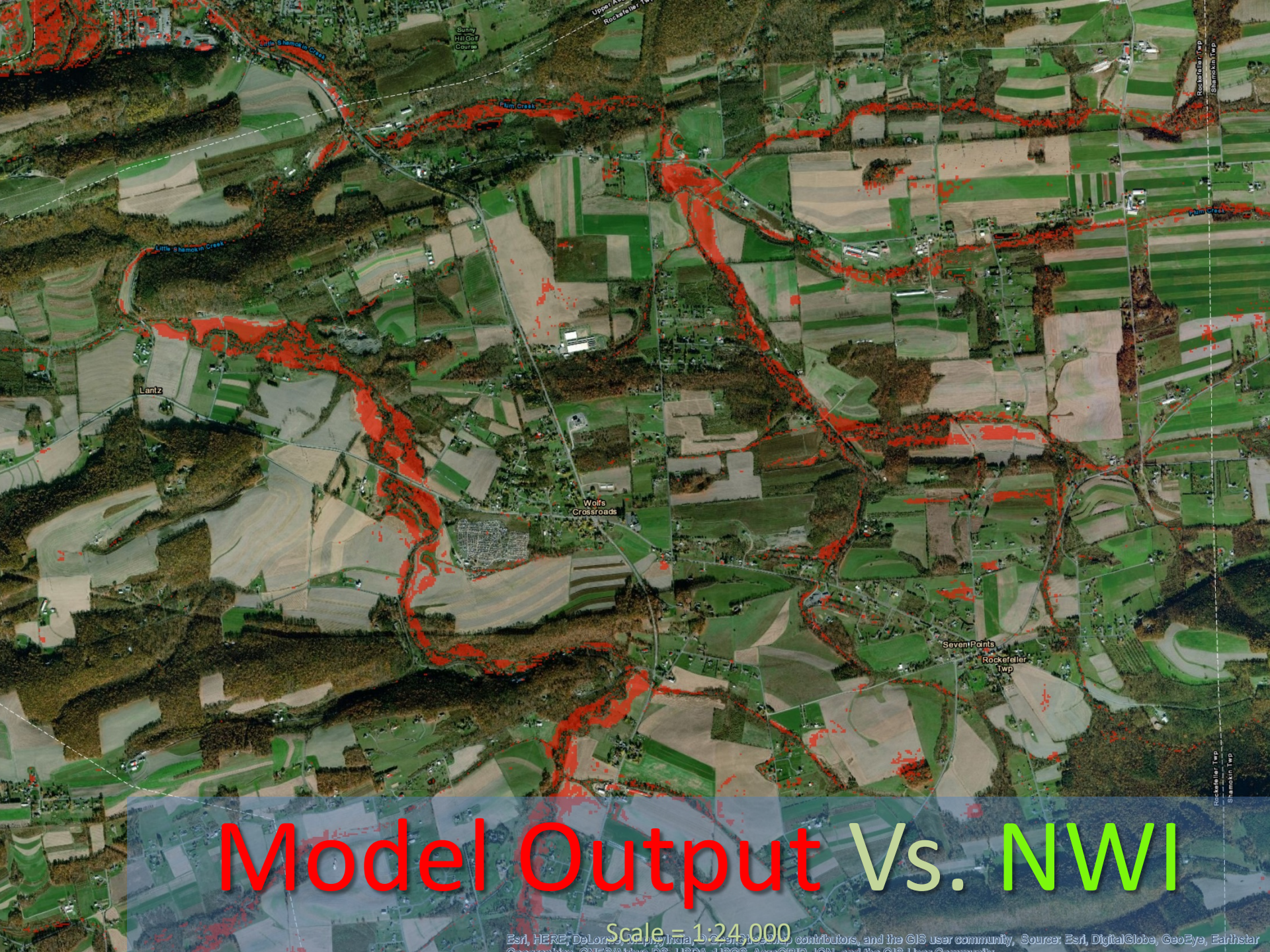
Climate

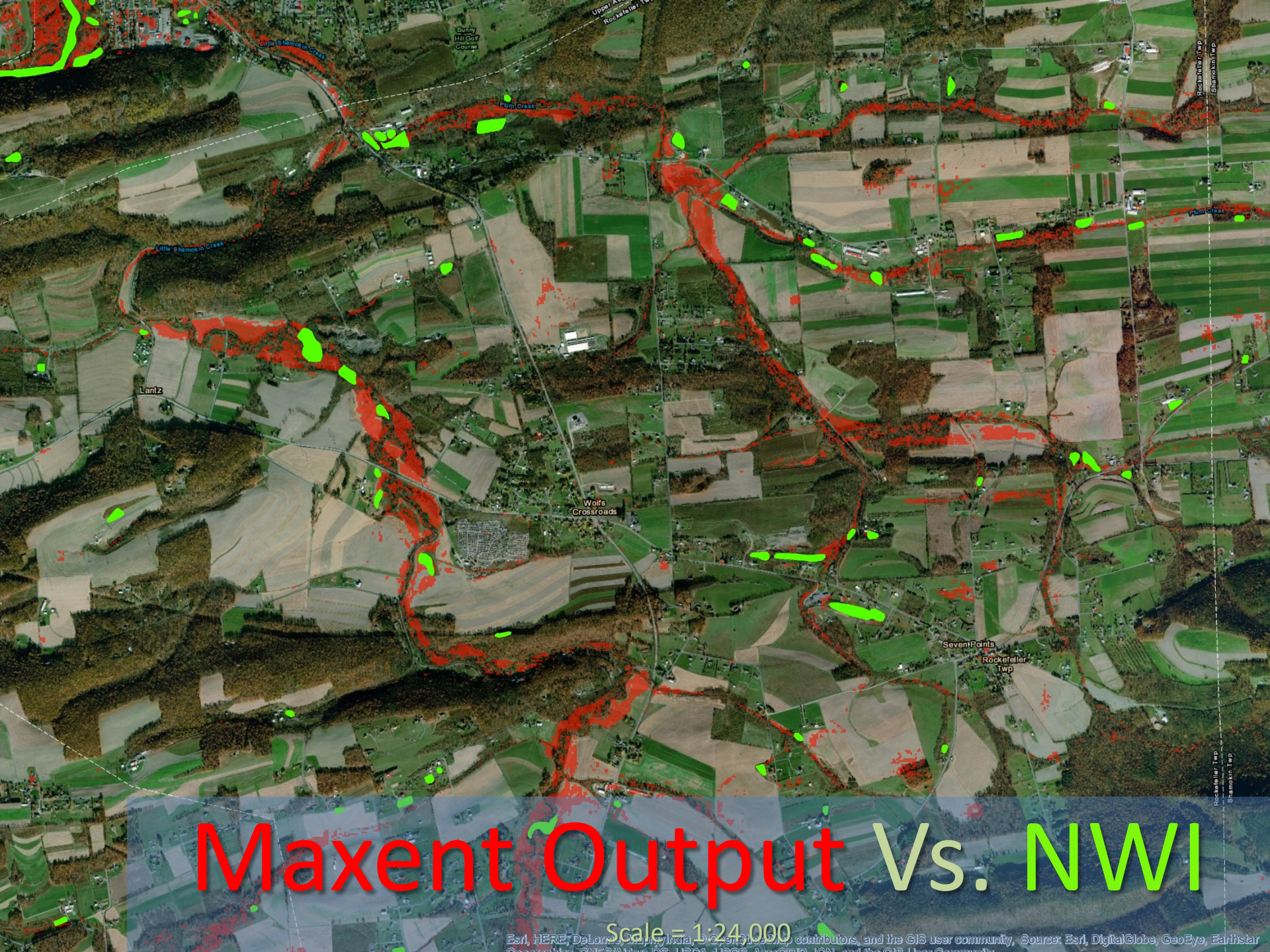
(Principle Components Axis: Temp, Humidity

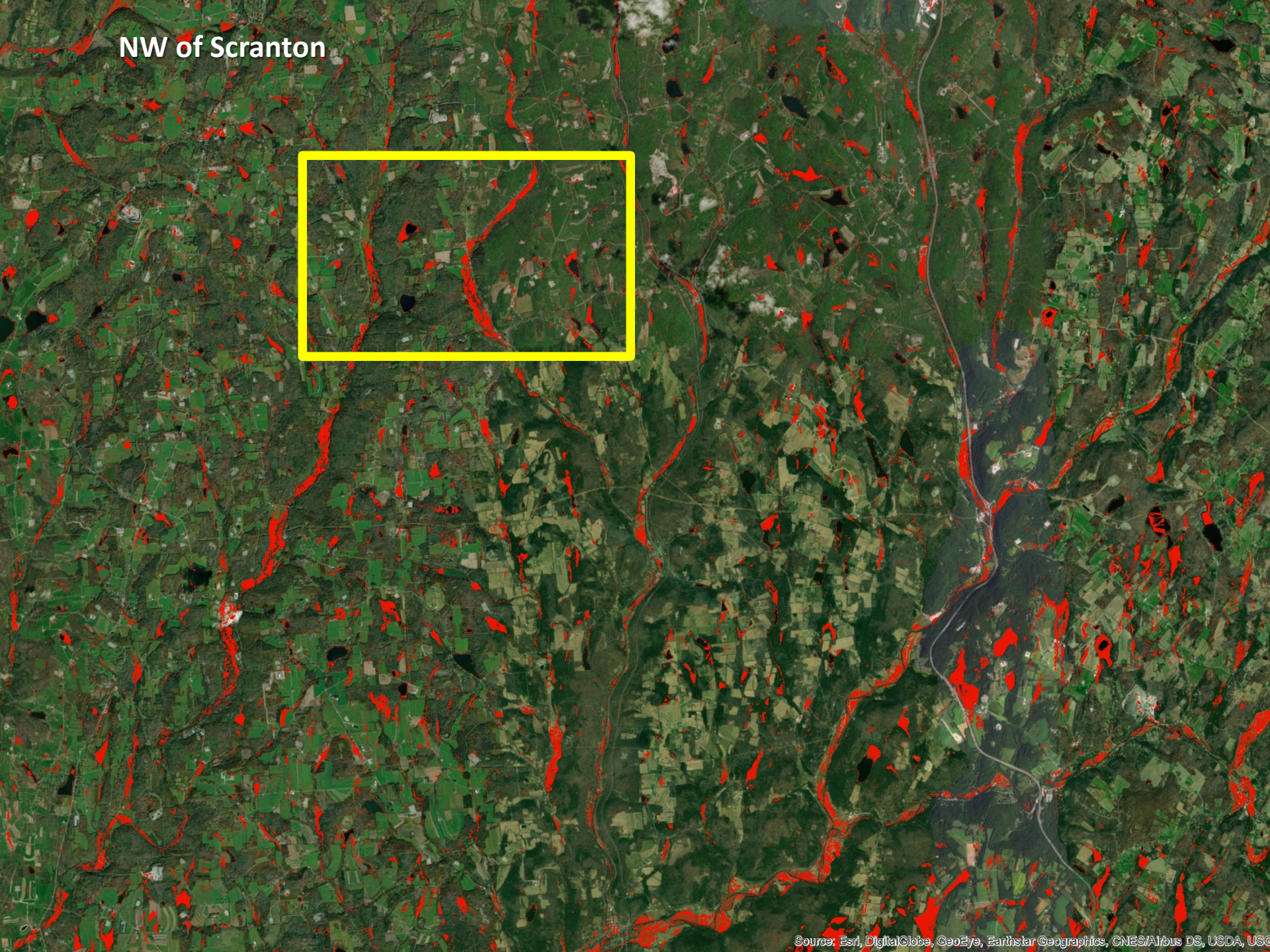
Scale = 1:75,000

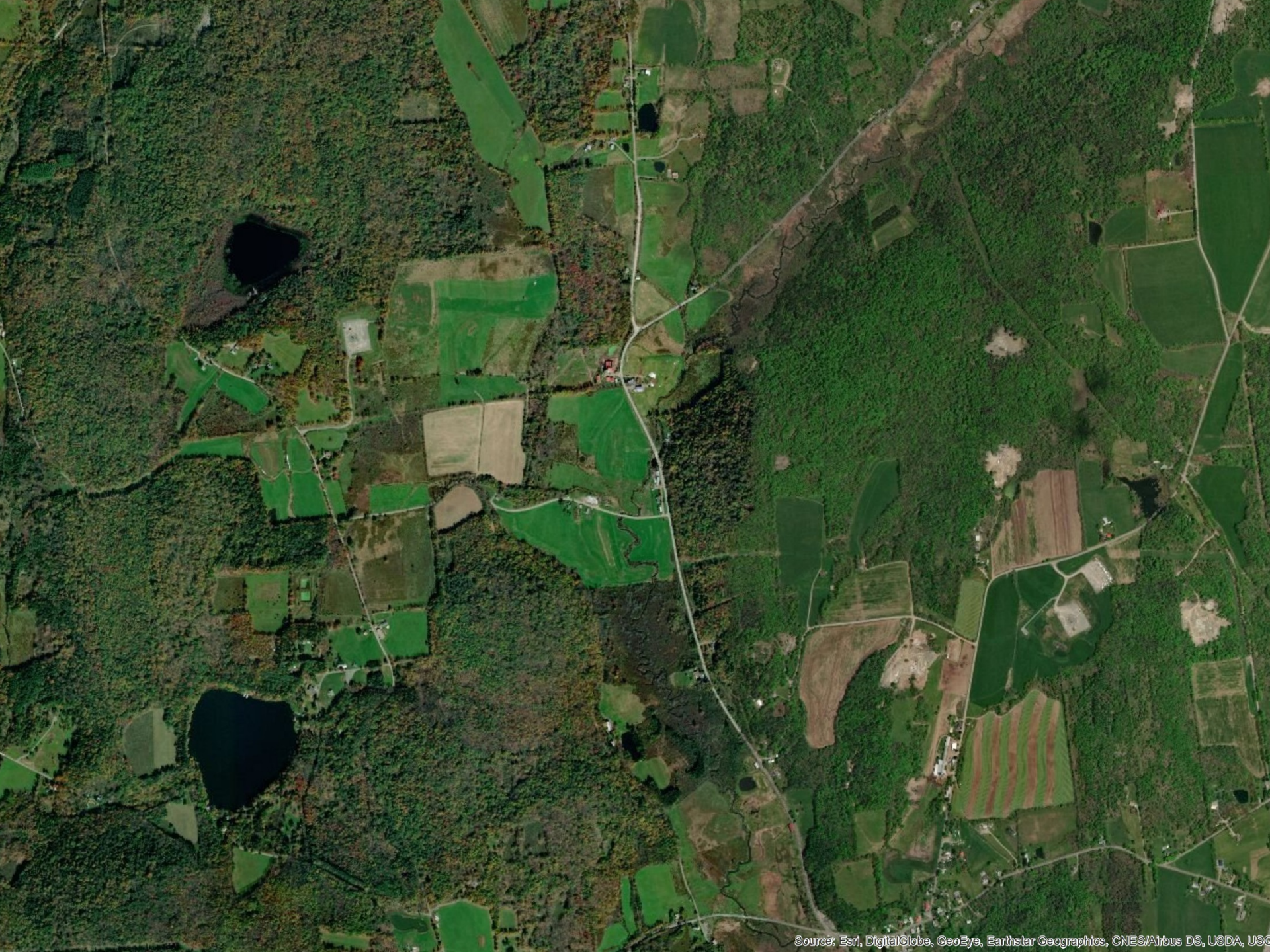

MODEL TRIAL RUN
Model Output : PFO
Scale = 1:75,000
Winfield
Union Twp
Point Twp
Northumberland
Union
Snyder
Jackson Twp
Sunbury
Shamokin Dam
Rockefeller Twp
Middlecreek Twp
Lower Augusta Twp
Selinsgrove
Washington Twp

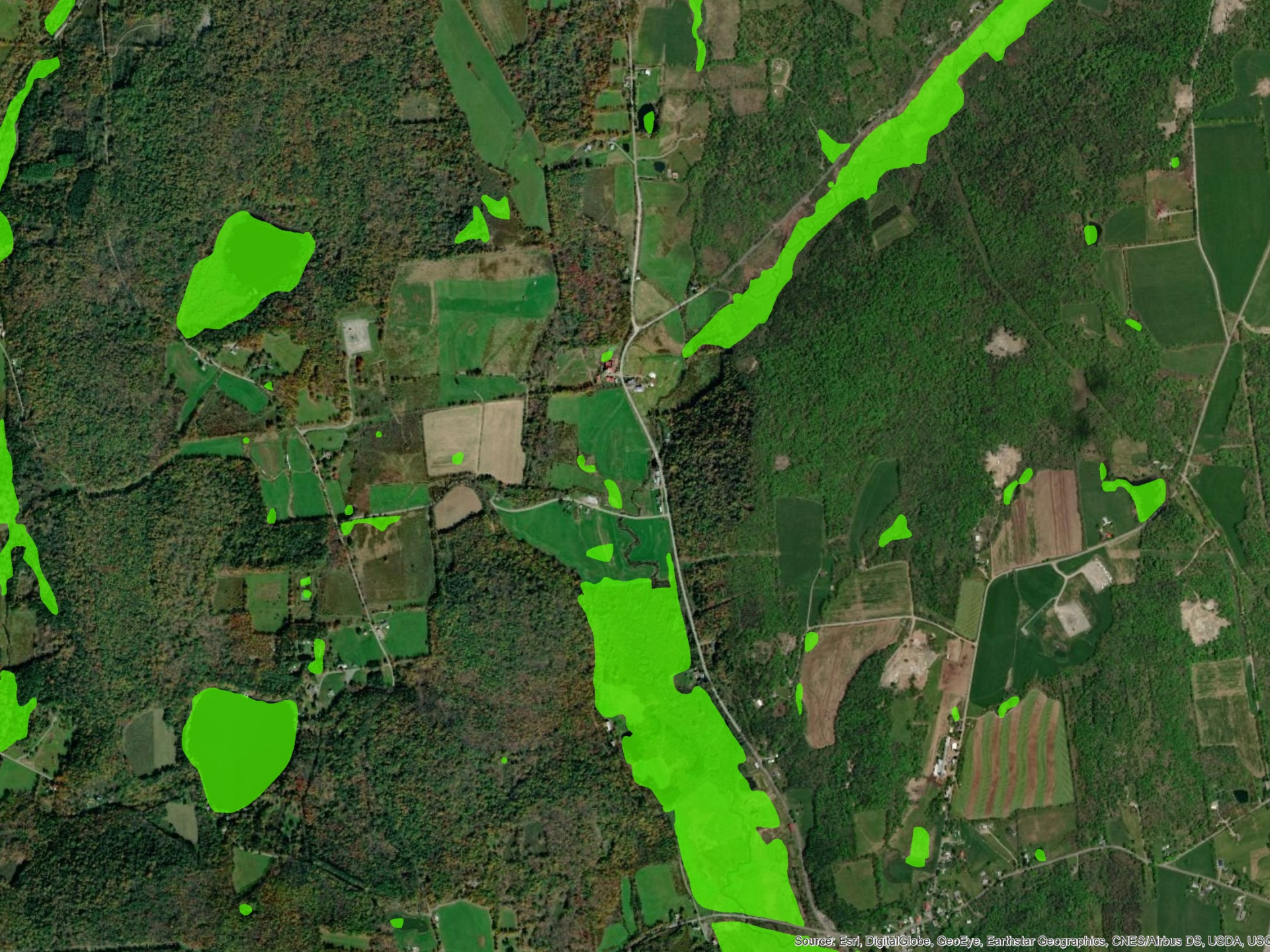

TRIAL RUN
Model Output ≥ 60% Probability
Scale = 1:75,000
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar
Point Twp
Winfield
State Gamelands No 193
Union Twp
Northumberland
Union
Snyder
Northumberland
Jackson Twp
Sunbury
Shamokin Dam
Snyder
Middlecreek Twp
Selinsgrove
Lower Augusta Twp
Hallowing Run
Little Shamokin Creek
Washington Twp


Model Output Vs. NWI
Scale = 1:24,000
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar
Sunny Hill Golf Course
Little Shamokin Creek
Palm Creek
Lantz
Wolfs Crossroads
Seven Points
Rockefeller Twp
Shamokin Twp


Maxent Output Vs. NWI
Scale = 1:24,000
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar
Sunny Hill Golf Course
Little Shamokin Creek
Plum Creek
Lantz
Wolfs Crossroads
Seven Points
Rockefeller Twp
Shamokin Twp


NW of Scranton
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USG


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USG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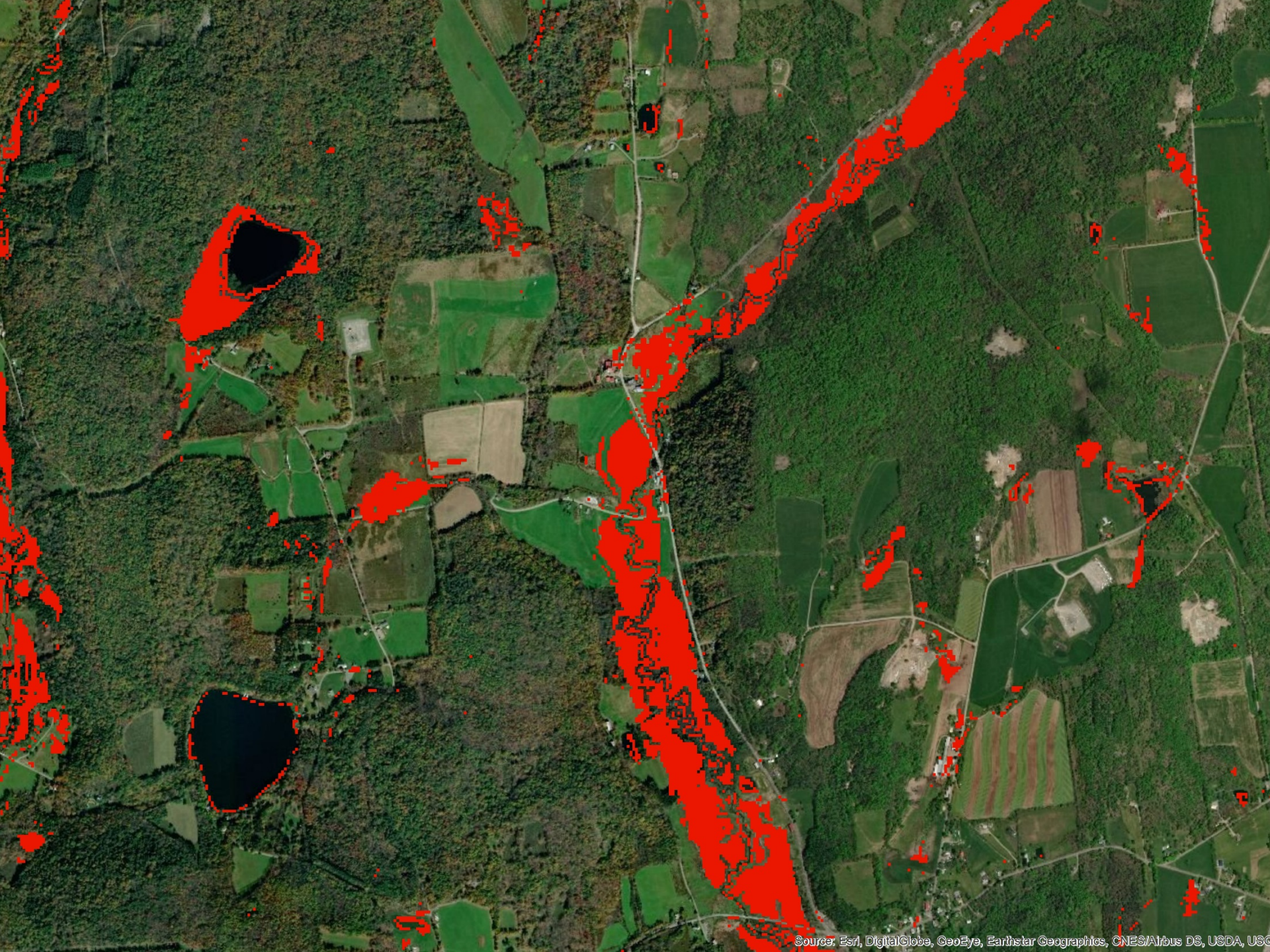
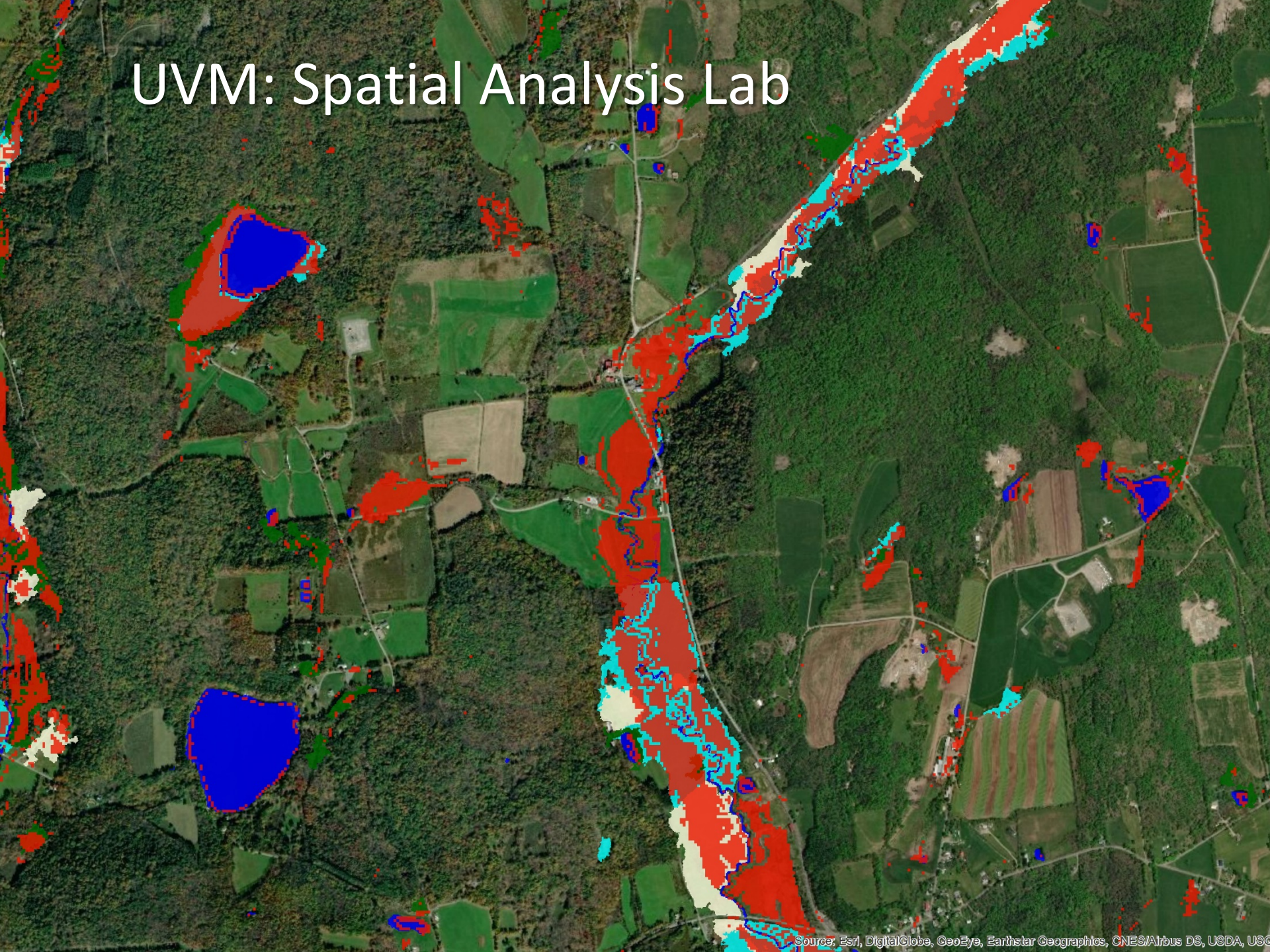
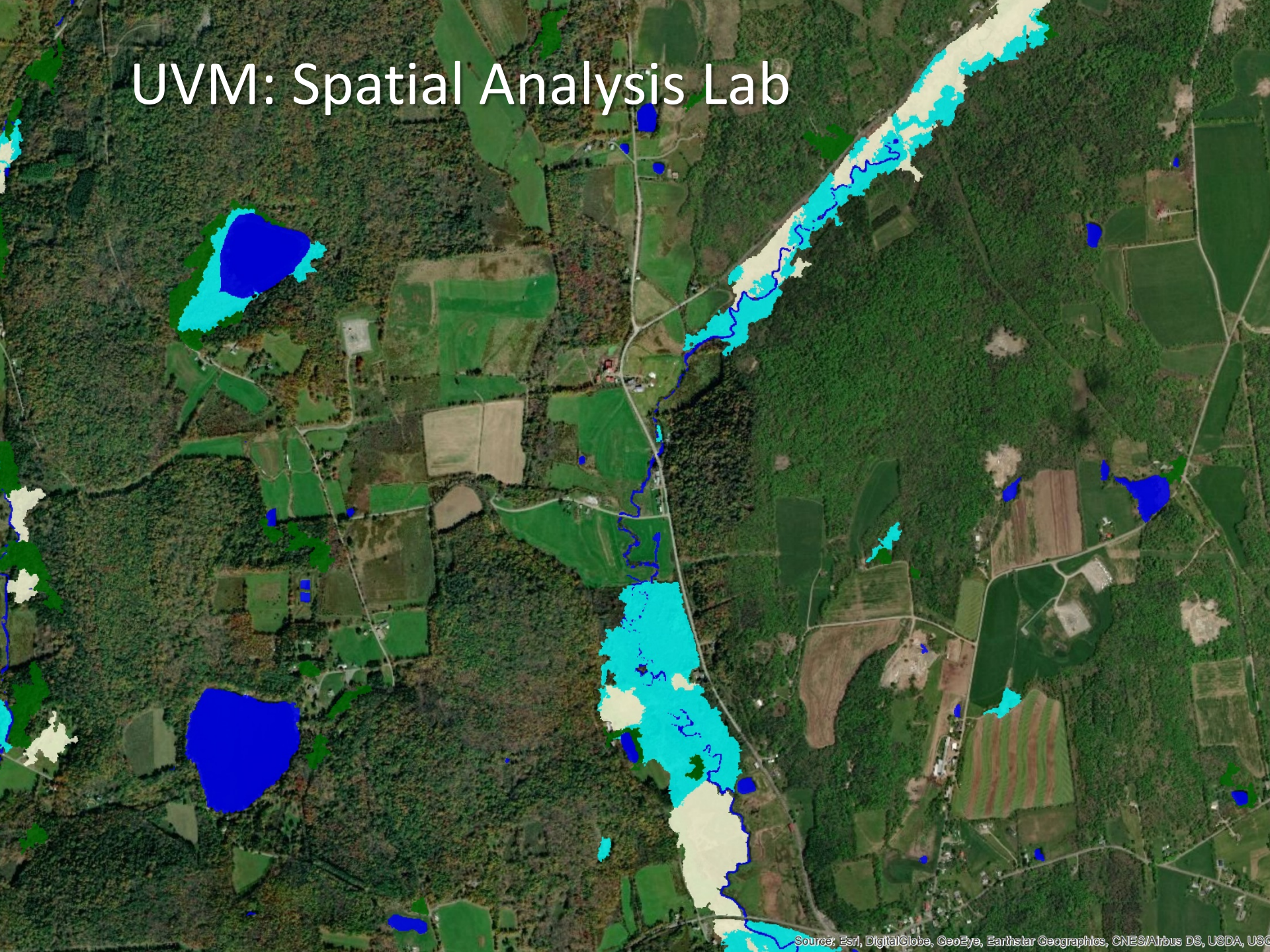

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USG

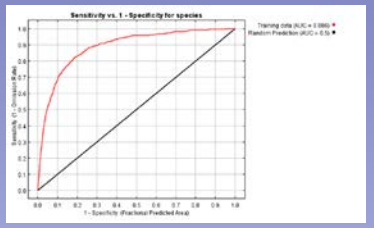
UVM: Spatial Analysis Lab



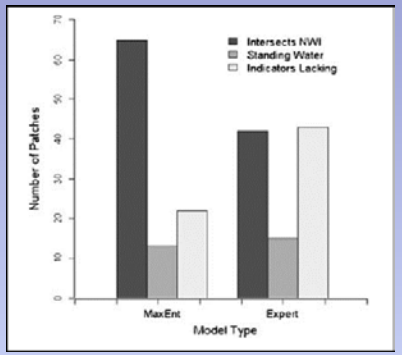
UVM: Spatial Analysis Lab

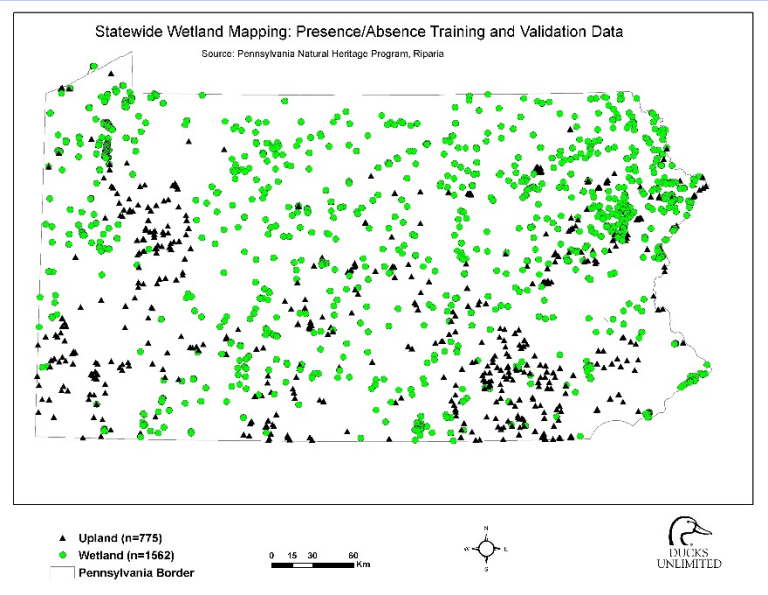


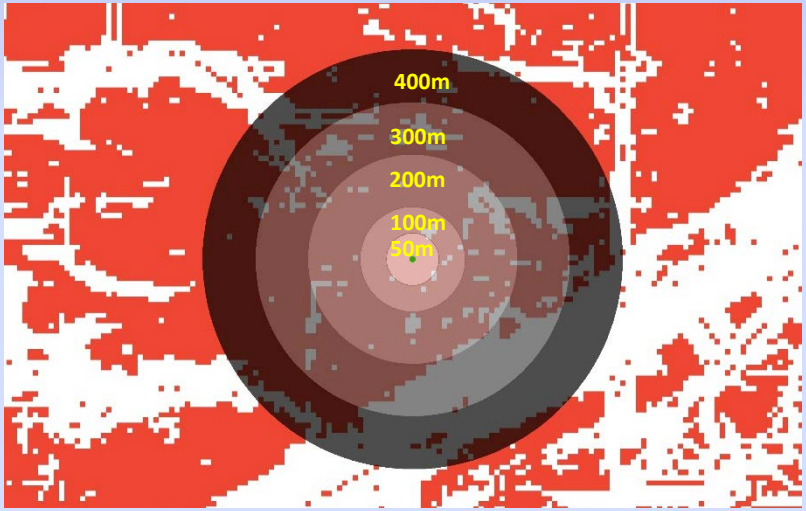
Validation techniques



- **Model-fitting techniques** (e.g., R^2, AUC,
- **Point based methods** (of field verified presence / absences)
- **Area based methods** (of field verified presence / absences)
- **Aerial imagery interpretation** (of hydrological indicators)



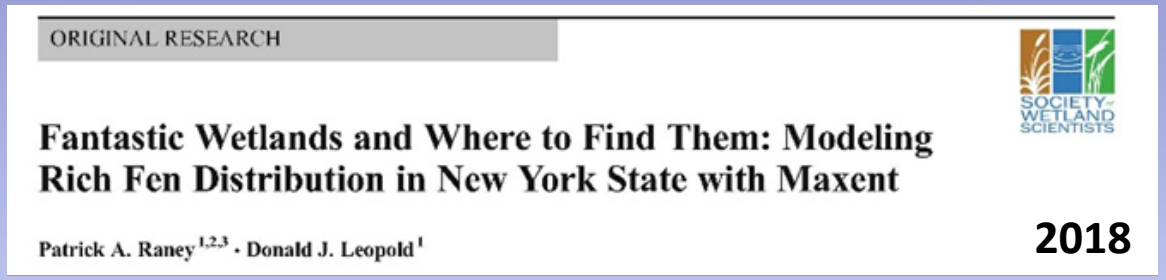




Let the record show: “scientists do not ground-truth”, we systematically estimate error based on validation observations

Technical Reports

Institutional Affiliations of Report


ORIGINAL RESEARCH

Fantastic Wetlands and Where to Find Them: Modeling Rich Fen Distribution in New York State with Maxent

Patrick A. Raney[1,2,3] · Donald J. Leopold[1]

SOCIETY OF WETLAND SCIENTISTS

2018

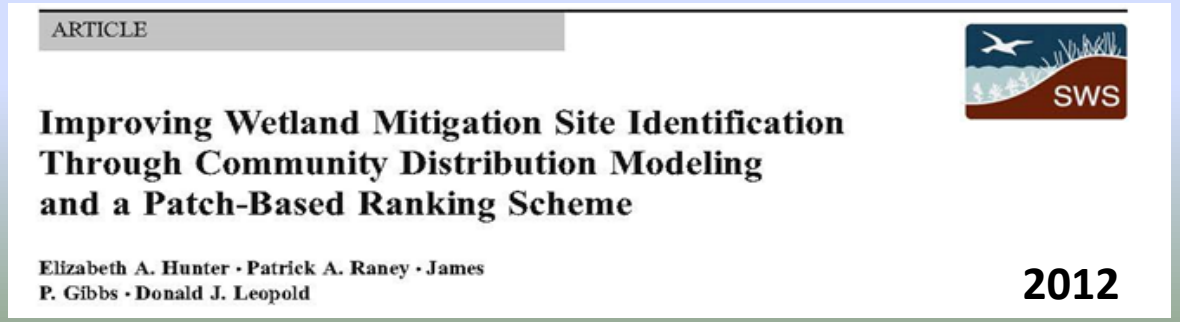
SUNY-ESF & USC & DU

- Raney P.A., Macfaden, S., O'Neil-Dunne J. (2017) A **LiDAR-aided hydrogeologic modeling and object-based wetland mapping approach for Pennsylvania.** Technical report to Chesapeake Bay Wetlands Work Group.

USC & UVM

- Raney, P.A., **Identifying potential refugia from climate change in wetlands** (2014) Ph.D. Dissertation. SUNY-ESF, Syracuse, NY

SUNY-ESF


ARTICLE

Improving Wetland Mitigation Site Identification Through Community Distribution Modeling and a Patch-Based Ranking Scheme

Elizabeth A. Hunter · Patrick A. Raney · James P. Gibbs · Donald J. Leopold

SWS

2012

SUNY-ESF & USC