

The background of the slide is a green-tinted photograph of a riverbank. In the foreground, there are dark, rounded rocks. A boat is partially visible on the left side of the river. The water reflects the surrounding greenery. The overall scene is serene and natural.

Delaware River Watershed Initiative

ACCELERATING CONSERVATION. ASSESSING IMPACT.

Phase 2 Planning: Shippensburg University Future Land Use Scenarios

February 23, 2017

**Presenter:
Dr. Claire A. Jantz**

Purpose

Coordinating Committee's perspective

What will be available, methodology

How scenarios can inform planning

Timeline/accessing the data

Supporting Focus Area Selection

Using tool not required

Comparing focus areas:

- Threatened protection focus area: beneficial to protect
- Restoration/Protection focus area: significant development upstream anticipated that could over-ride benefits

Validating and tie breaking

Local knowledge may supersede results

Modeling future development in the Delaware River Basin (DRB2070 version 1.0)

Dr. Claire A. Jantz	Director and Professor
Dr. Scott Drzyzga	Director and Professor
Mr. Alfonso Yáñez	GIS Analyst
Ms. Antonia Price	Project Coordinator
Mr. Joshua Barth	Graduate Student Fellow
Ms. Caitlin Lucas	Student Fellow



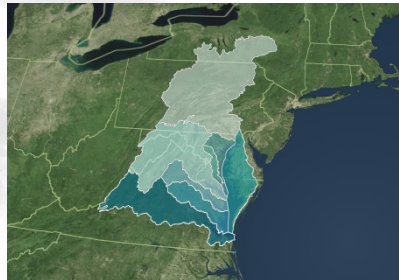
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About the CLUS

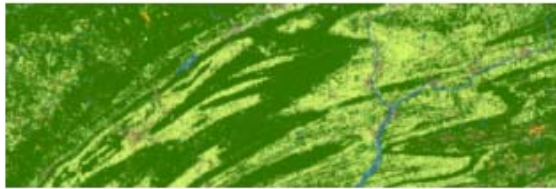
- We are housed within the Department of Geography-Earth Science at Shippensburg University
- The mission of the CLUS is to support science-based solutions to interdisciplinary sustainability challenges
- We promote sustainable land use, economic development, and cultural & natural resource management at local, regional, and global scales

www.centerforlanduse.org



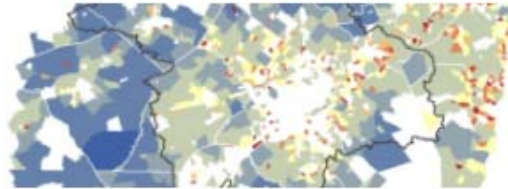
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Mapping and modeling land use in the Delaware River Basin



MAPPING

High-resolution LiDAR-based land cover data for all 43 counties in the watershed



MODELING

Connecting models of land cover change, climate change, hydrology, and tree species to explore development and environmental impacts



MONITORING

Feasibility Analysis: establishing a long-term land cover monitoring program

www.drproject.org

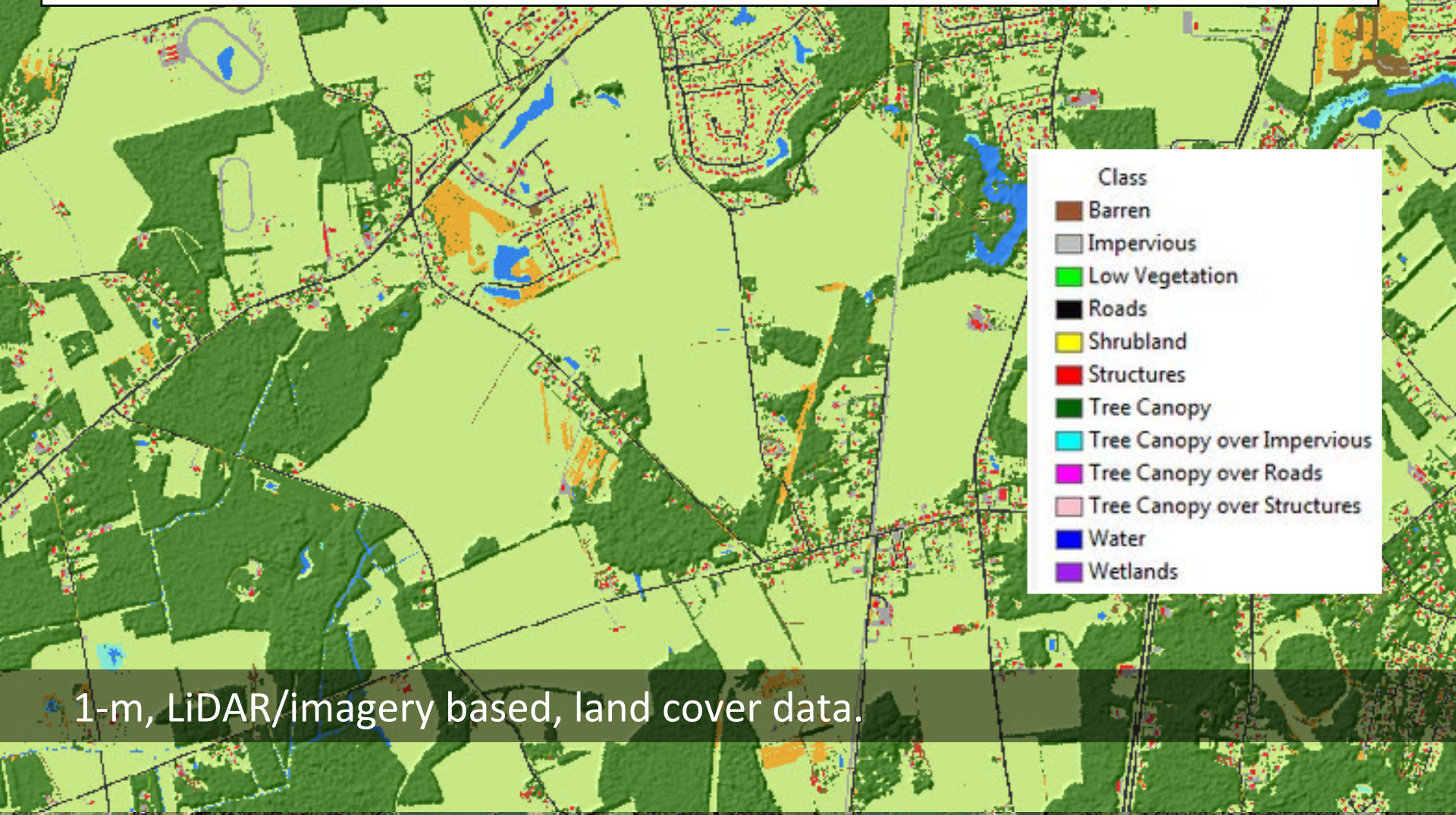


High-Resolution LiDAR-based land cover data:

University of Vermont Spatial Analysis Lab

Available on PASDA: www.pasda.psu.edu (#DRWI)

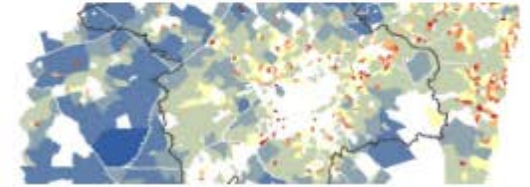
OR on our website: www.drbproject.org/products/



1-m, LiDAR/imagery based, land cover data.

Today's Webinar

- Forecasting development to 2070 under “baseline” conditions
 - Our approach
 - Inputs and outputs
 - Example applications
- The release of DRB2070 version 1.0 baseline data
- What's next



MODELING

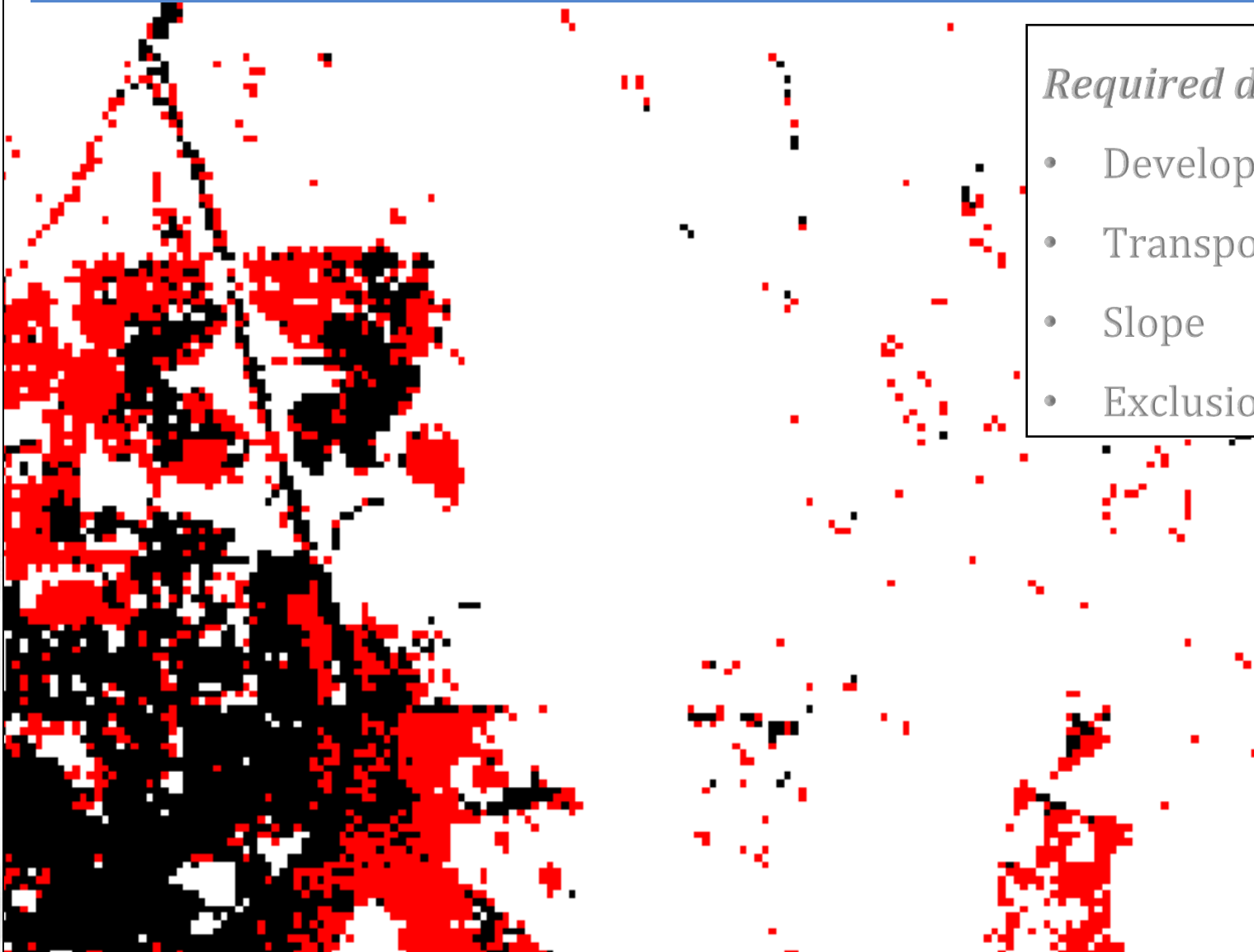


***SLEUTH** (Slope, Land use, Exclusion, Urban, Transportation, Hillshade)
is an open source, probabilistic, cell-based model*

Required data inputs:

- Developed land cover
- Transportation
- Slope
- Exclusion/attraction

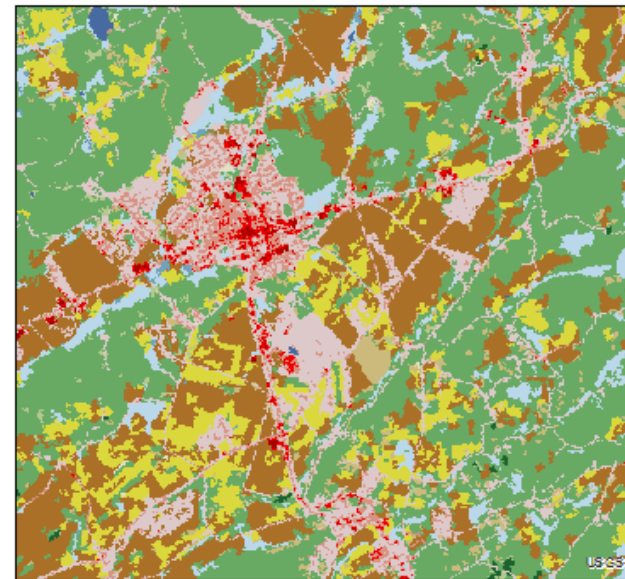
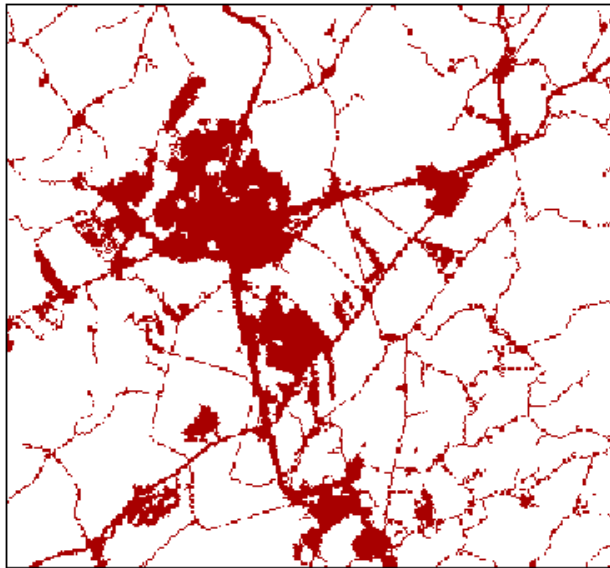
2011
2070



SLEUTH model inputs (DRB2070 Version 1.0 Baseline)

Developed/not developed

NLCD 2001 - 2011



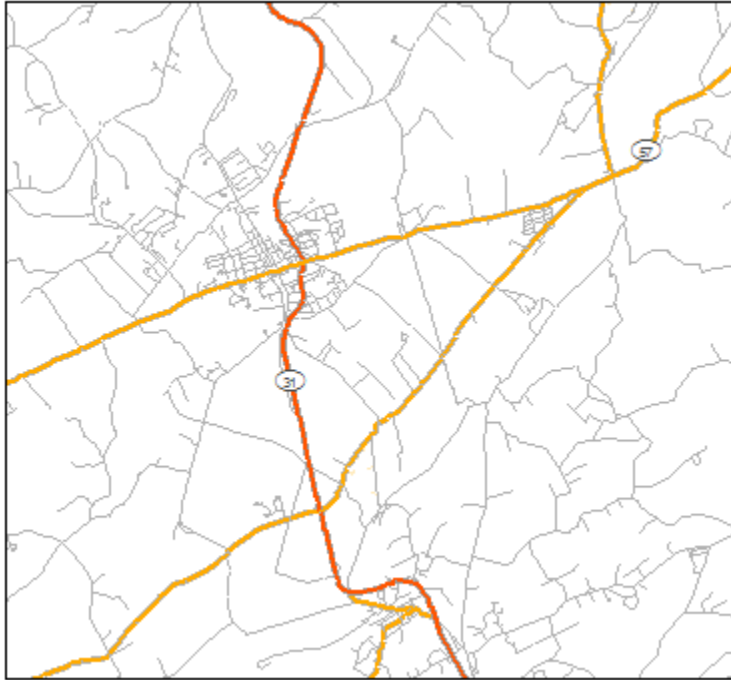
- | | |
|-------------------------------|--------------------------------|
| ■ Developed, High Intensity | ■ Emergent Herbaceous Wetlands |
| ■ Developed, Low Intensity | ■ Woody Wetlands |
| ■ Developed, Medium Intensity | ■ Evergreen Forest |
| ■ Developed, Open Space | ■ Mixed Forest |
| ■ Pasture/Hay | ■ Deciduous Forest |
| ■ Cultivated Crops | ■ Grassland/Herbaceous |
| ■ Shrub/Scrub | ■ Open Water |
| | ■ Barren Land (Rock/Sand/Clay) |



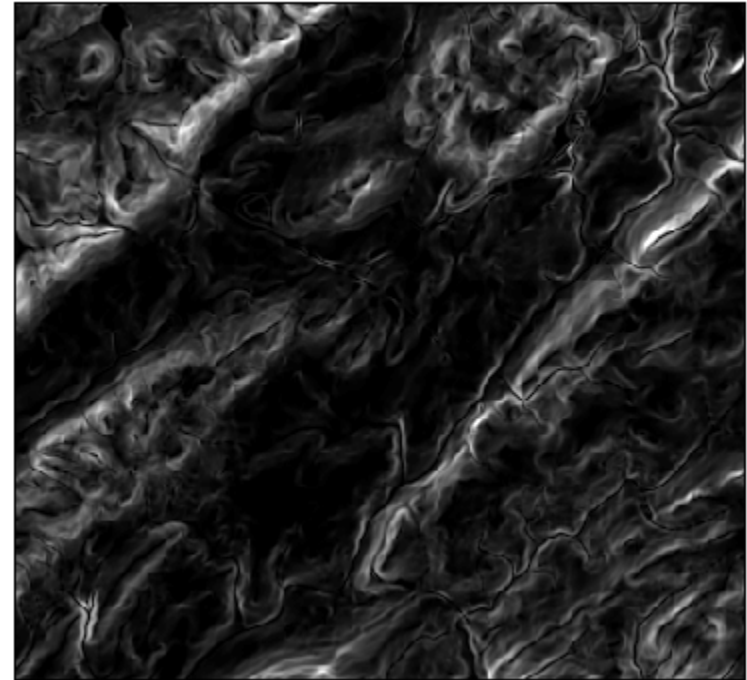
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SLEUTH model inputs (DRB2070 Version 1.0 Baseline)



Transportation



Slope



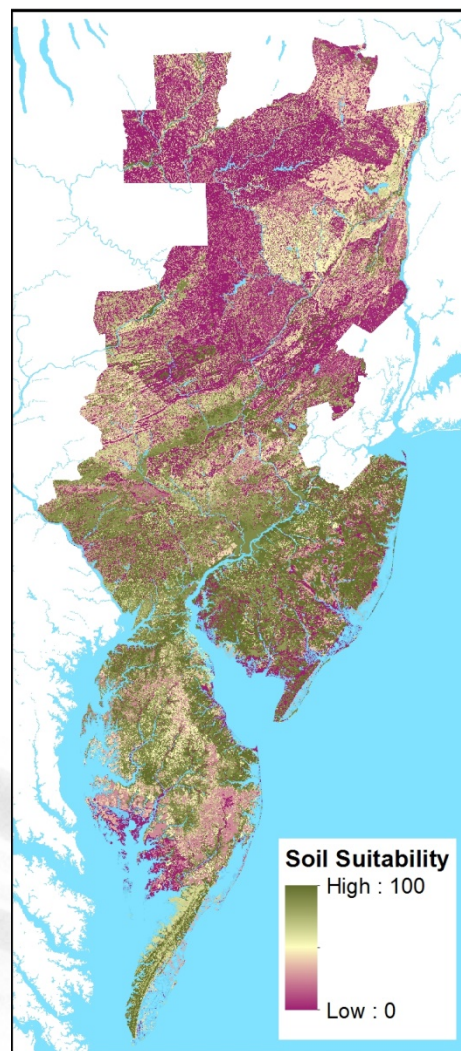
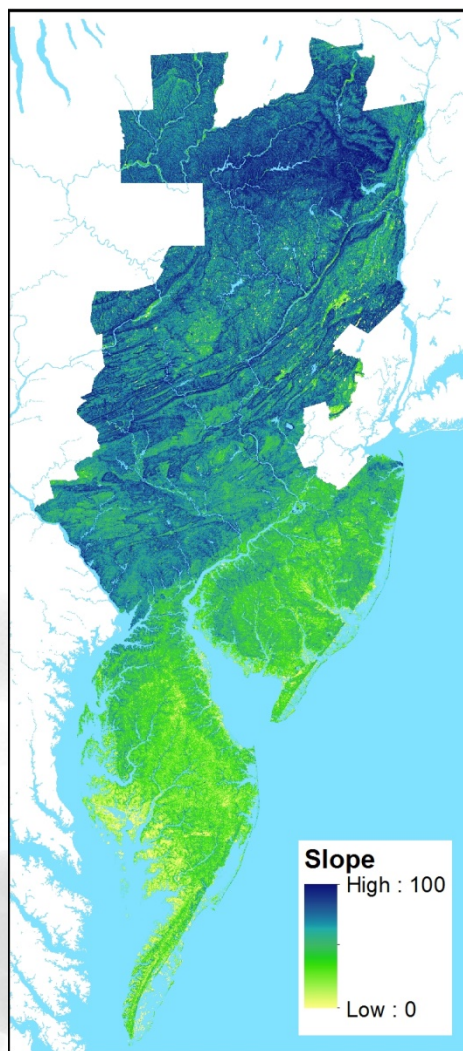
SLEUTH model inputs

“exclusion/attraction” layer



- Defines areas that repel or attract development

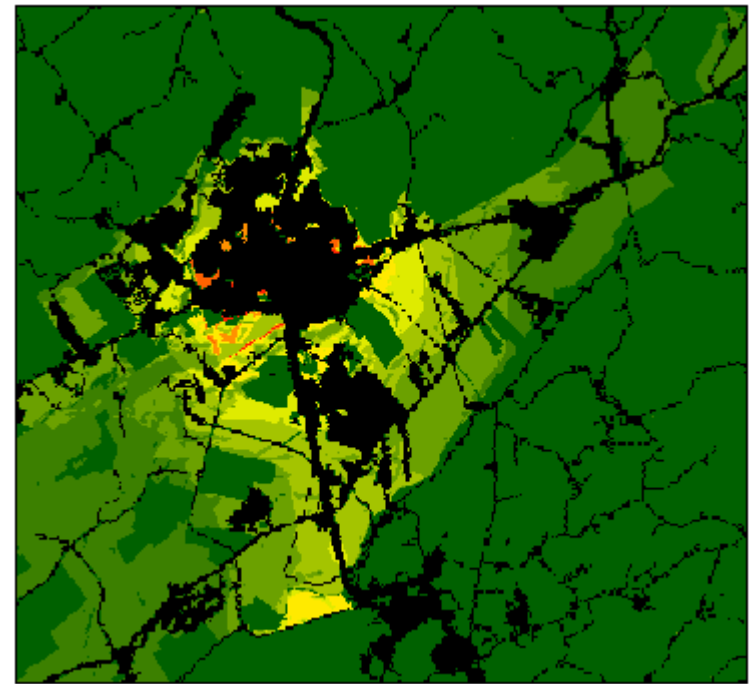
Environmental suitability factors



SLEUTH model inputs

“exclusion/attraction” layer

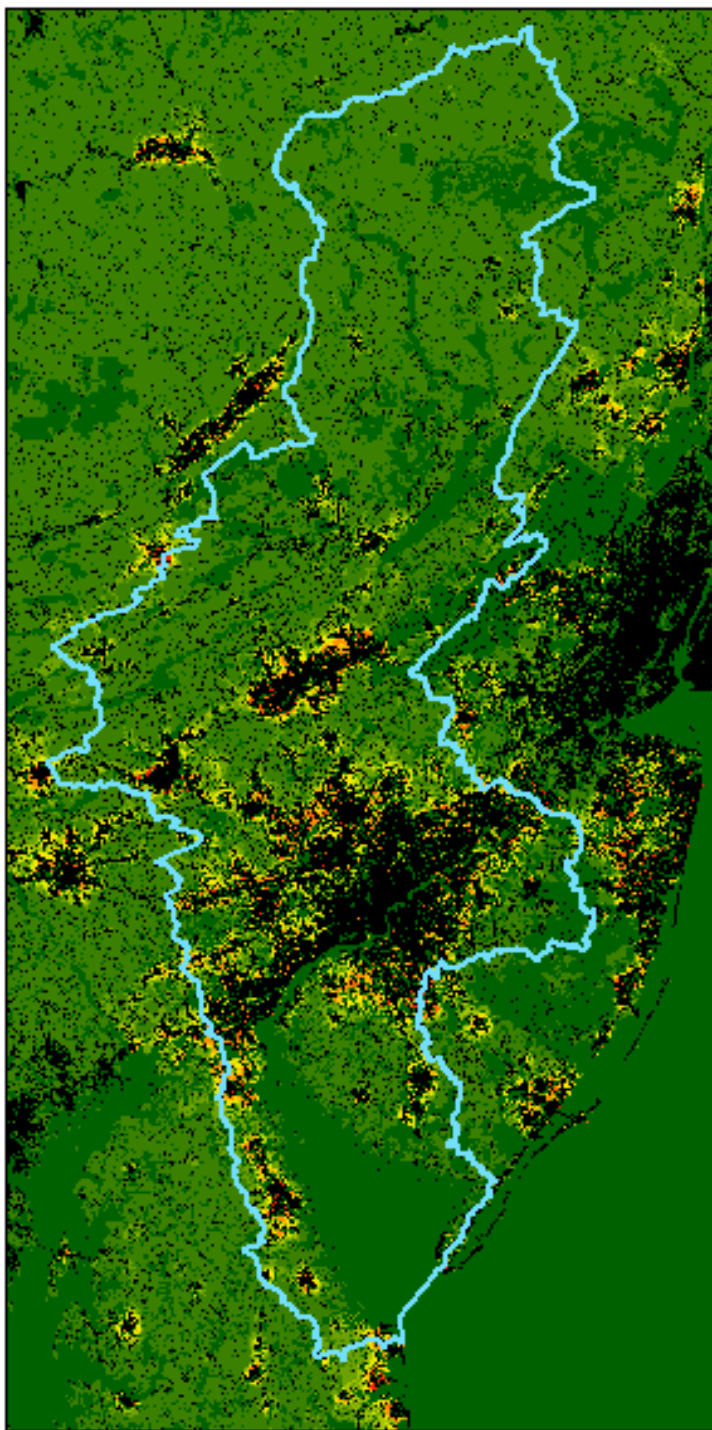
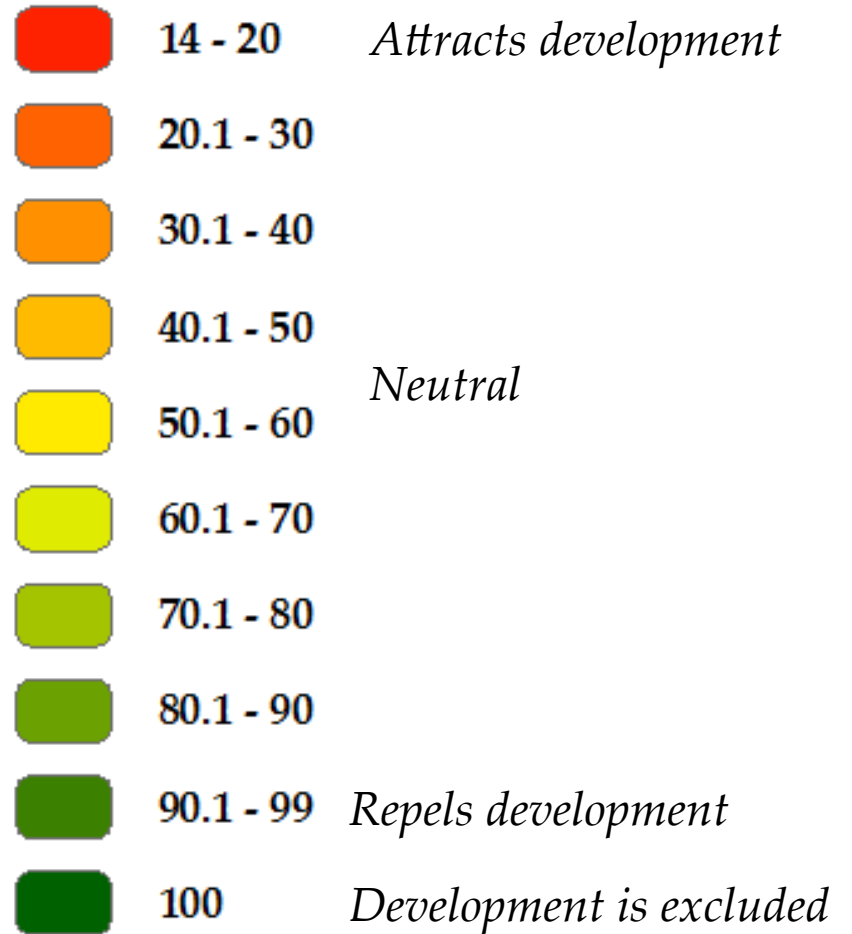
Overall “exclusion/attraction”
map for development



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DRB2070 Version 1.0 Baseline Exclusion/Attraction Map

Exclusion/Attraction



SLEUTH (*Slope, Land use, Exclusion, Urban, Transportation, Hillshade*)
is an open source, probabilistic, cell-based model

Patterns:

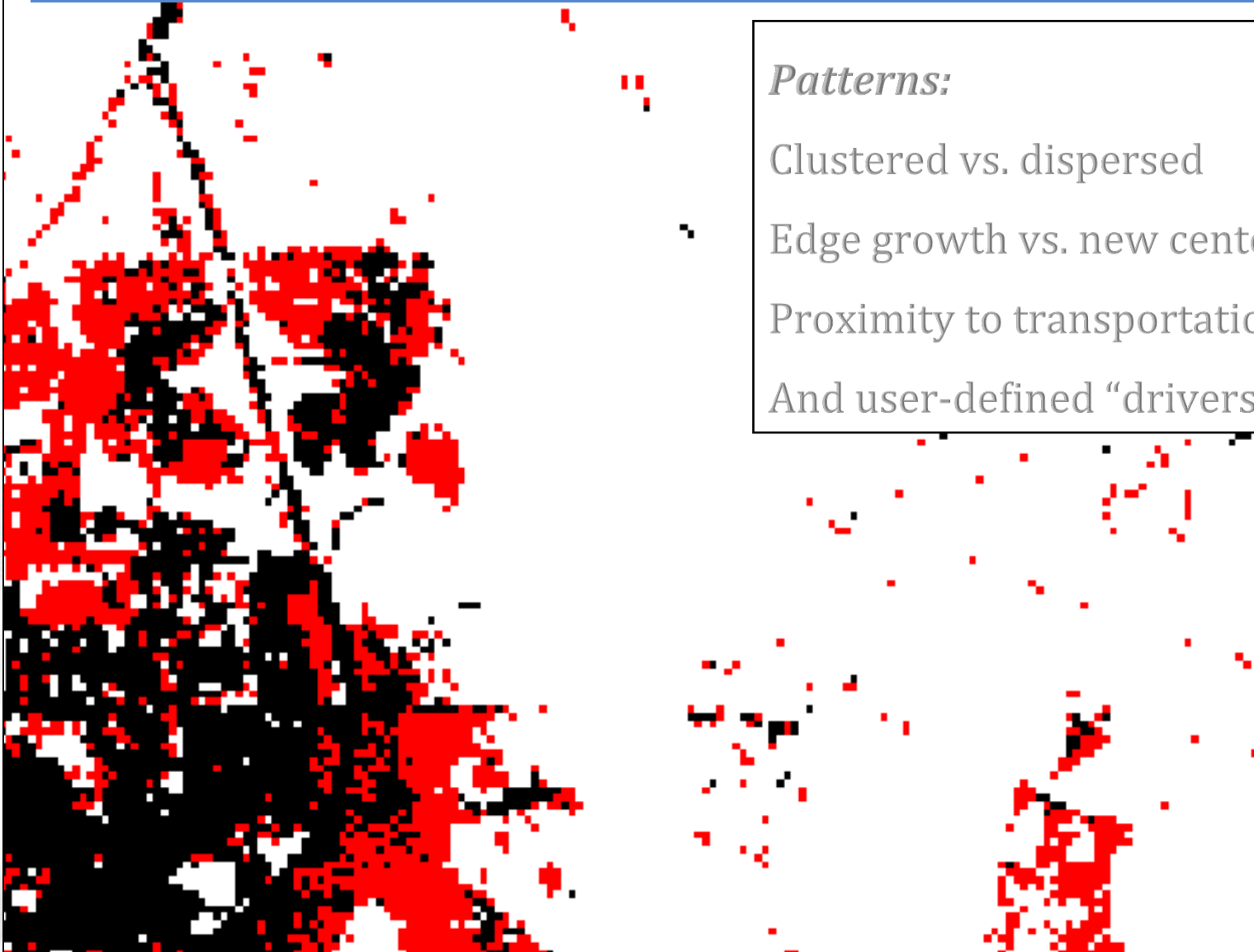
Clustered vs. dispersed

Edge growth vs. new centers of growth

Proximity to transportation network

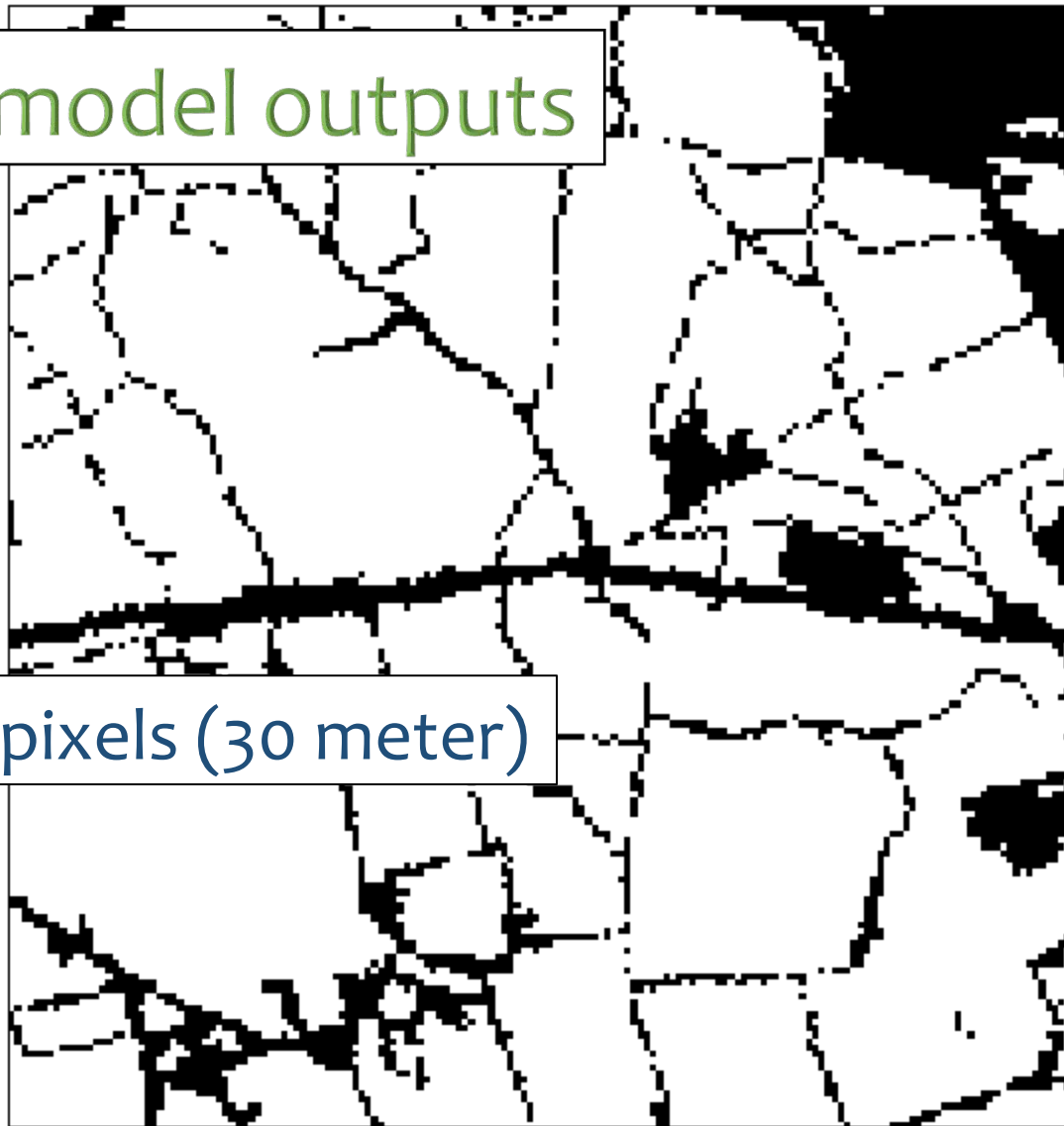
And user-defined “drivers” of change

2011
2070



SLEUTH model outputs

Developed pixels (30 meter)

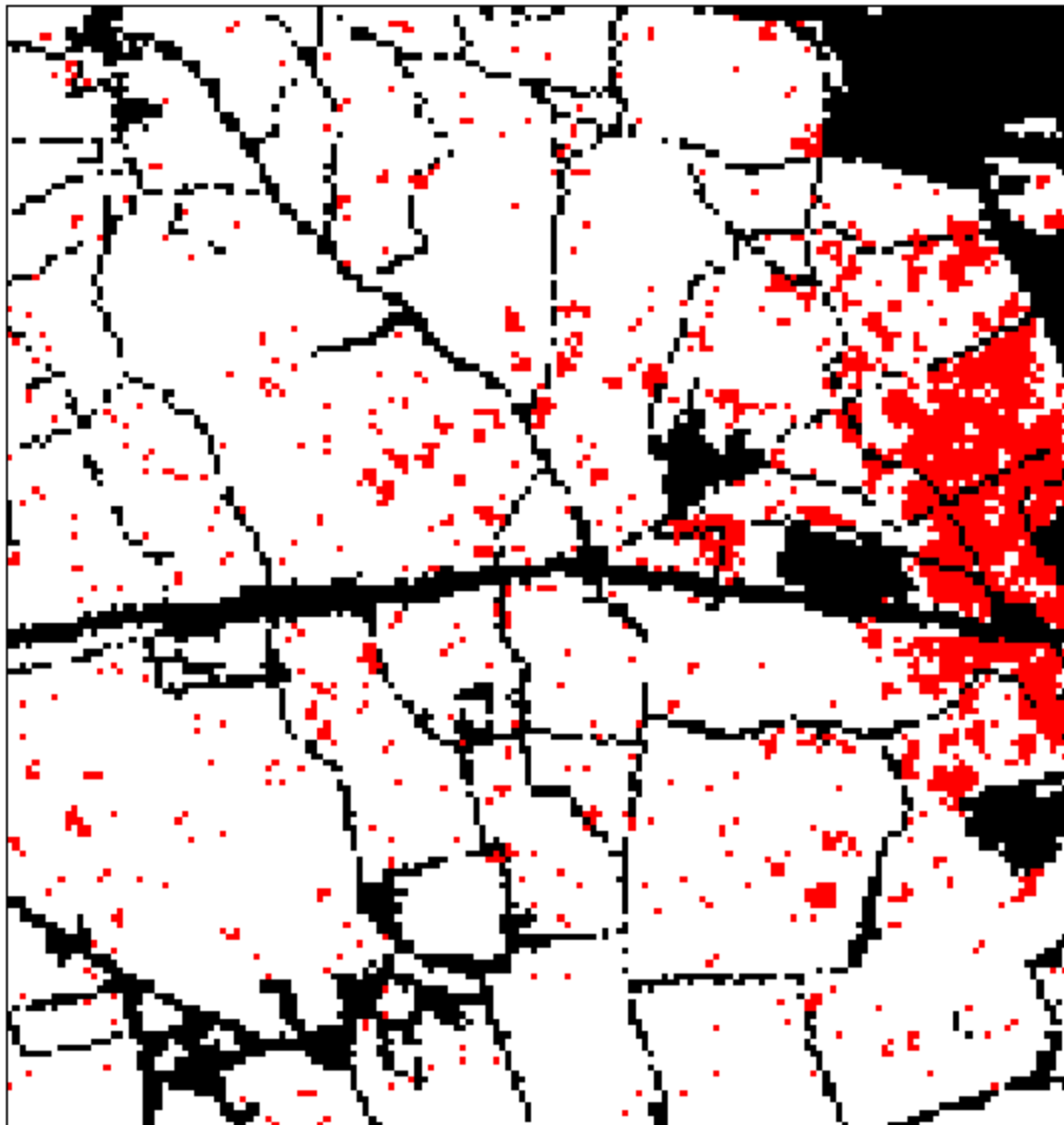


2011



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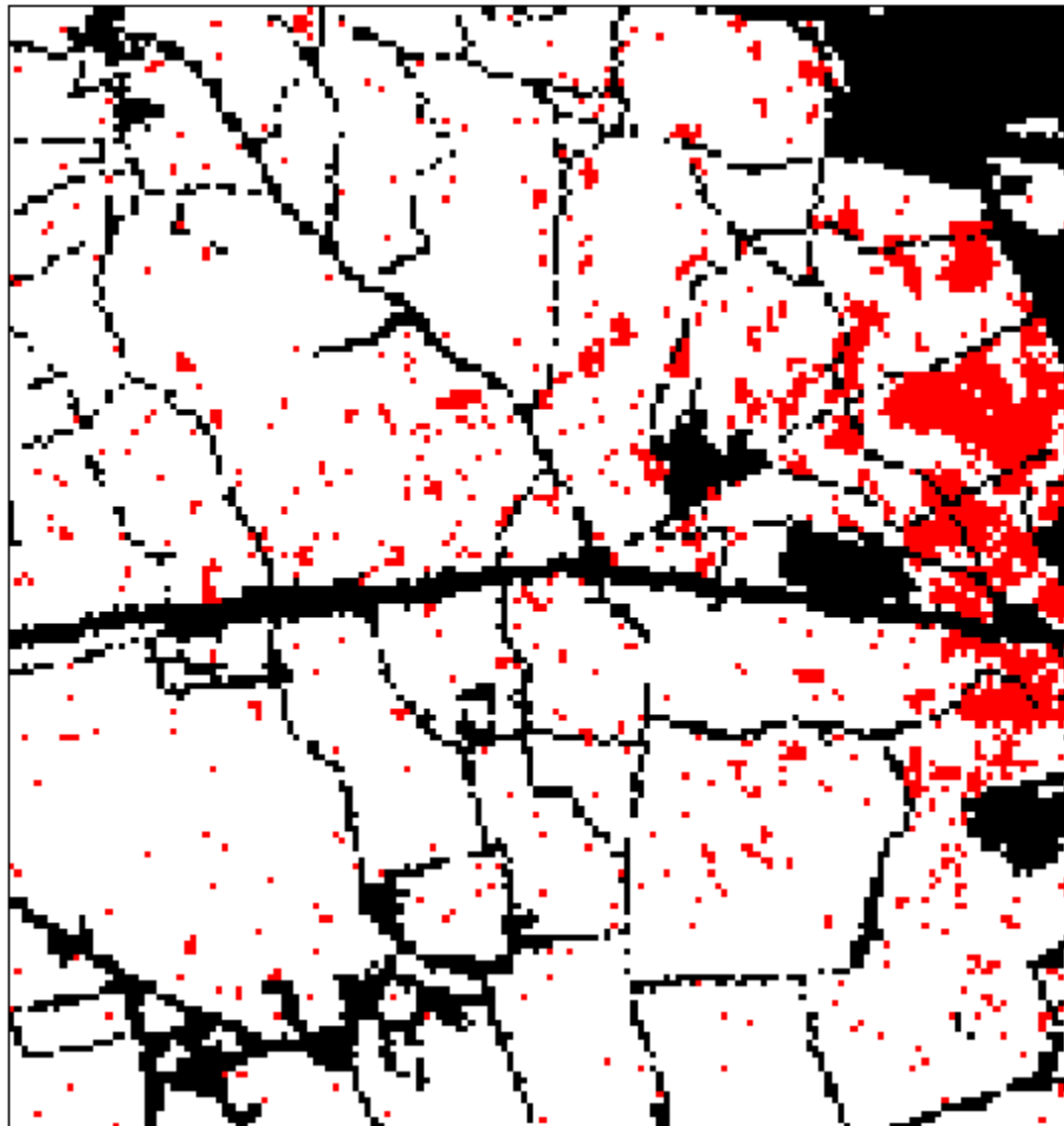


2011
2070



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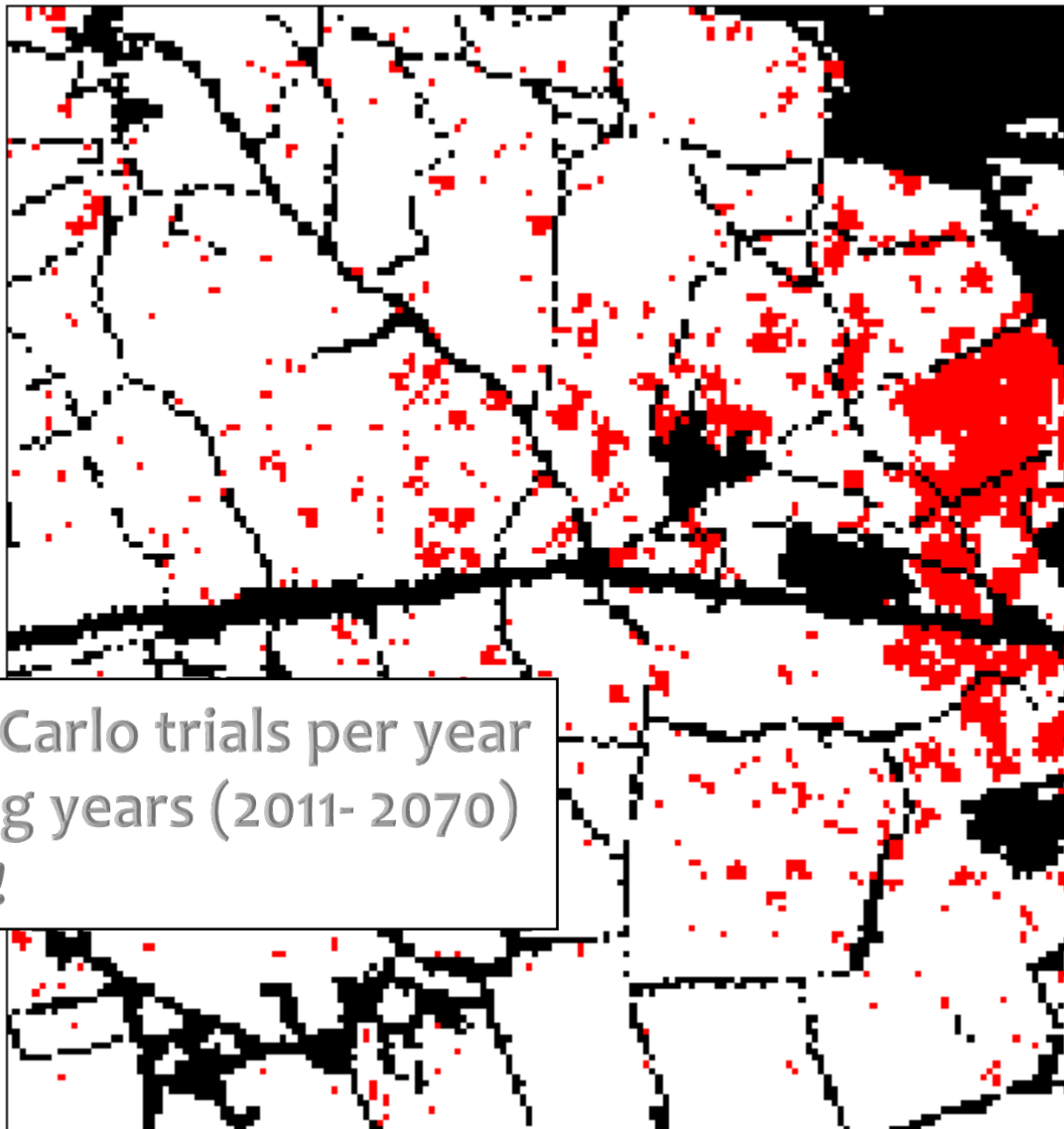


2011
2070



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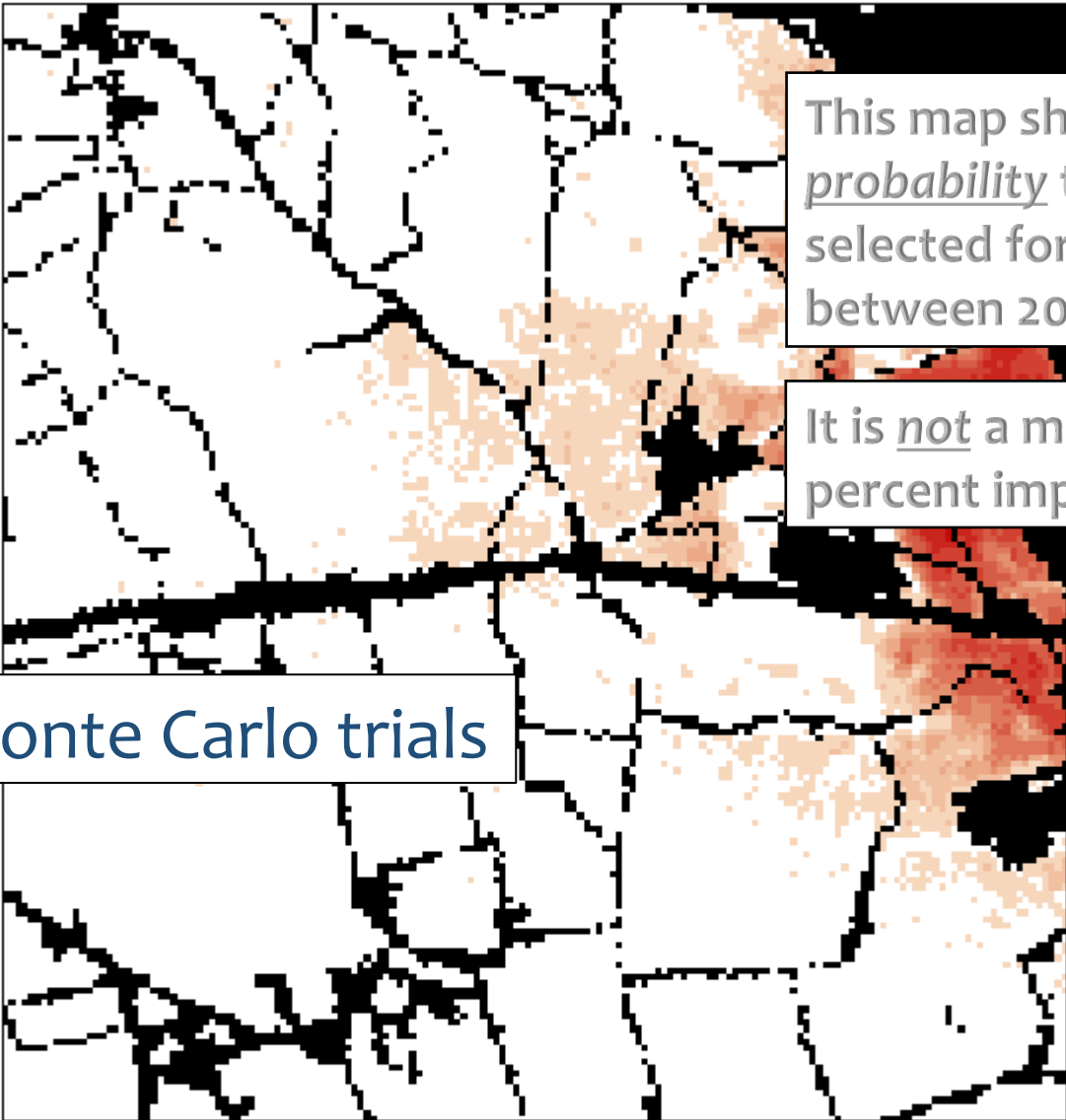
- 100 Monte Carlo trials per year
- 59 modeling years (2011- 2070)
- 5900 maps!

2011
2070



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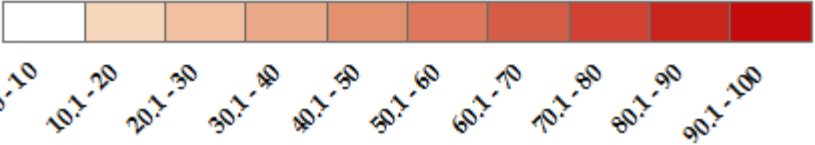


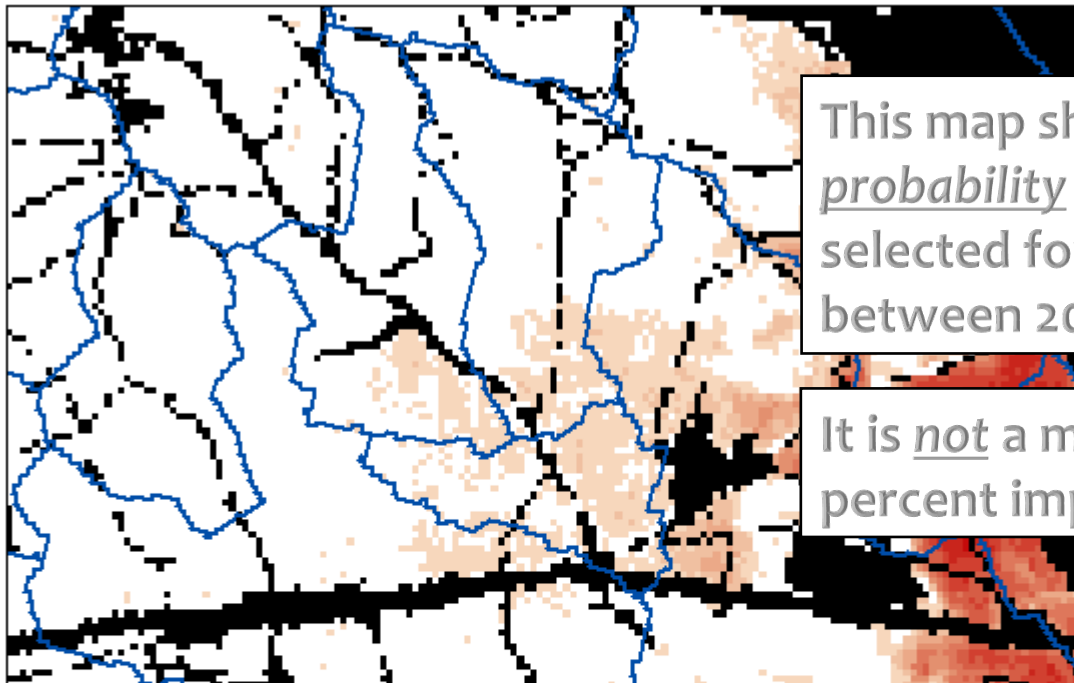
This map shows the probability that a cell was selected for development between 2011 and 2070.

It is not a map that shows percent impervious.

Combine Monte Carlo trials

Probability of being developed by 2070





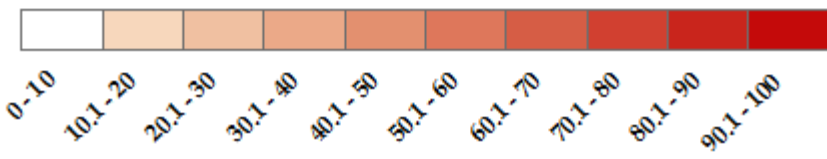
This map shows the probability that a cell was selected for development between 2011 and 2070.

It is not a map that shows percent impervious.

Overlay NHDPlus Catchments



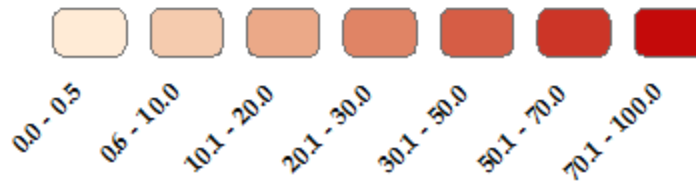
Probability of being developed by 2070



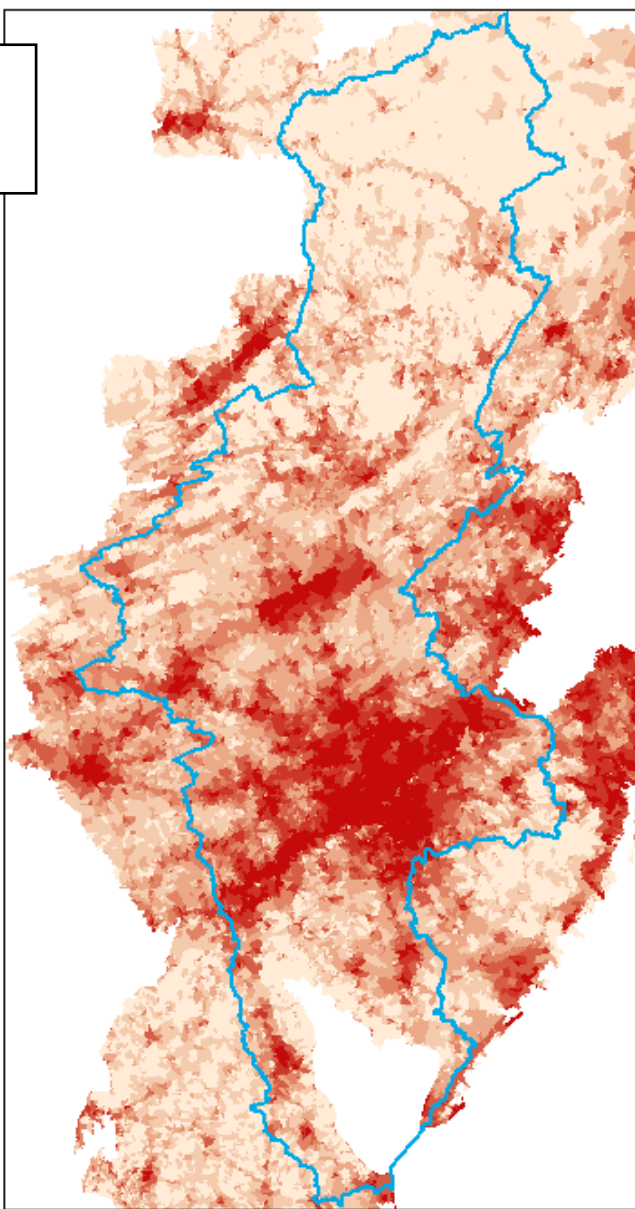
Summarize to NHDPlus Catchments

- Developed, High Intensity
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, Open Space

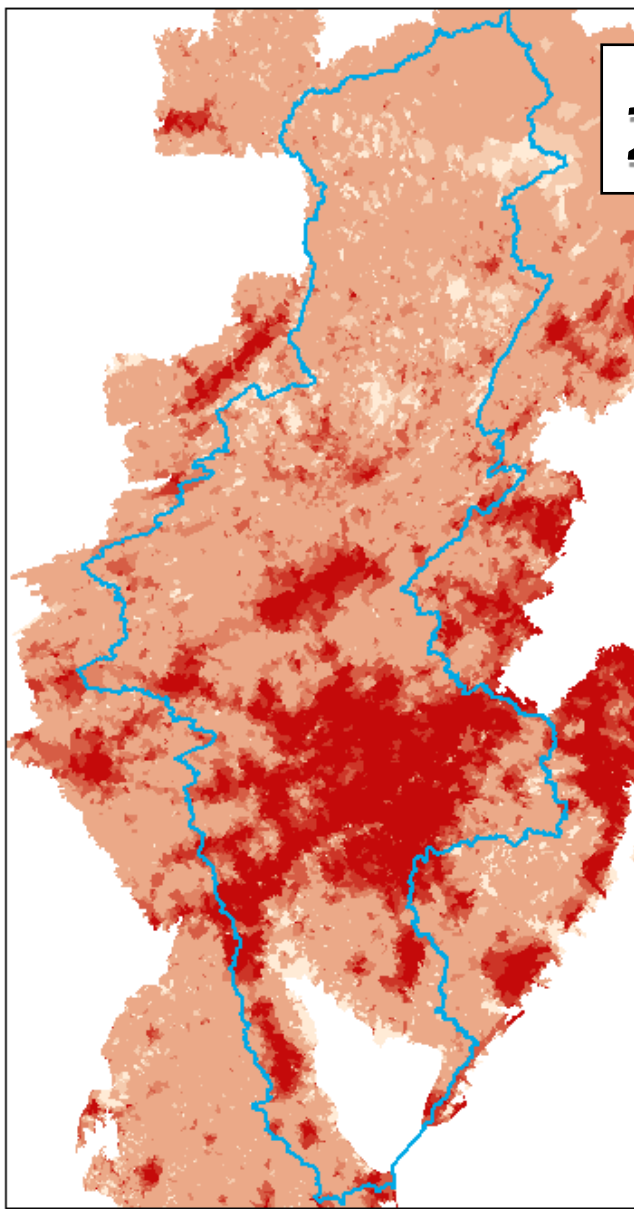
2070 Percent Developed



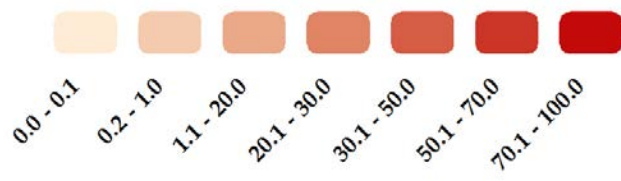
2011



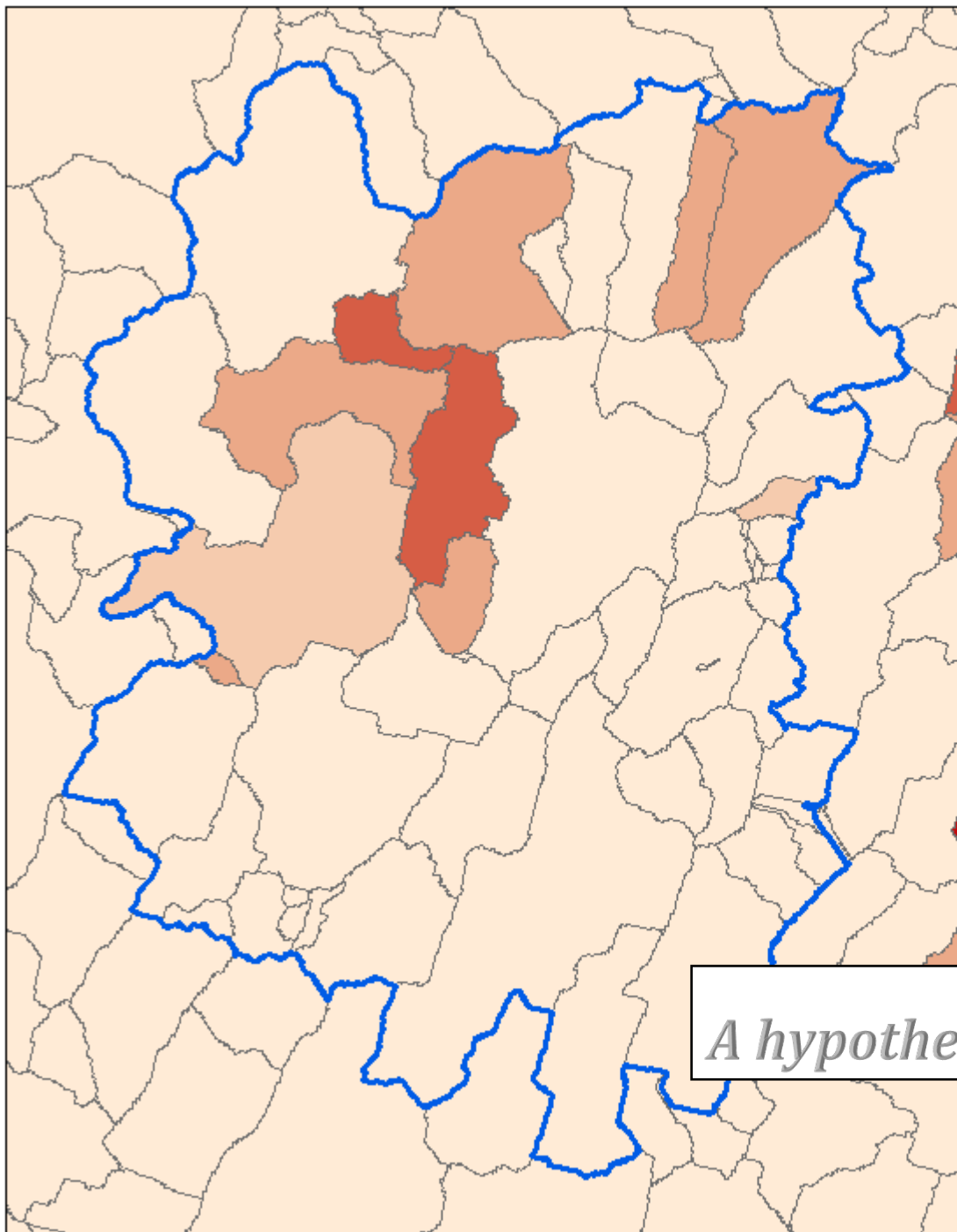
2070



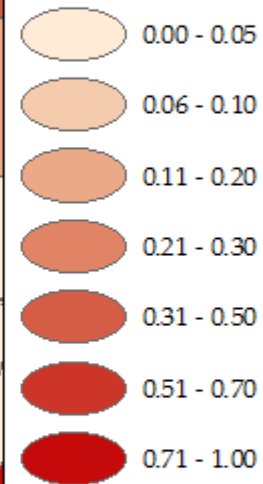
Percent developed



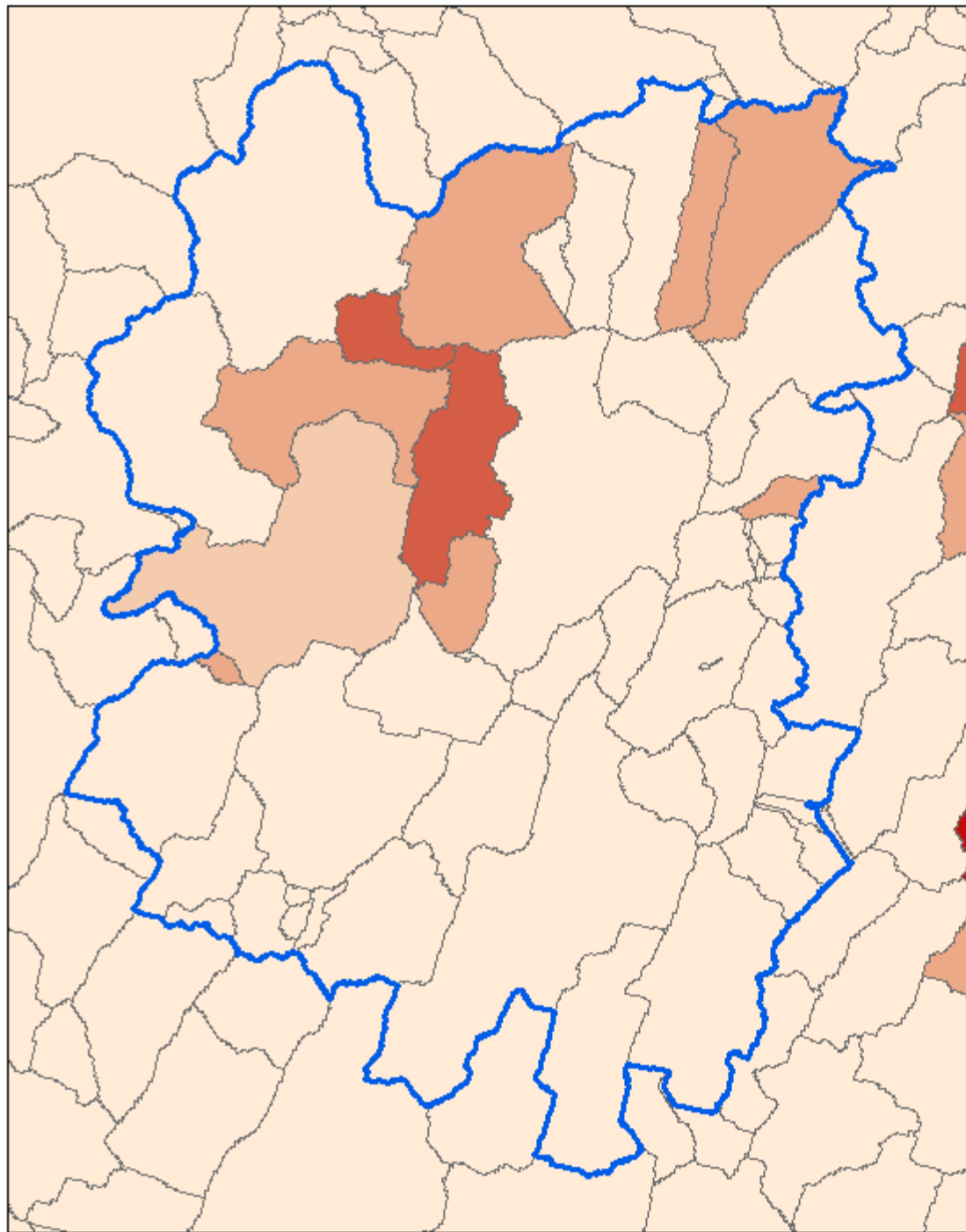
Model Applications



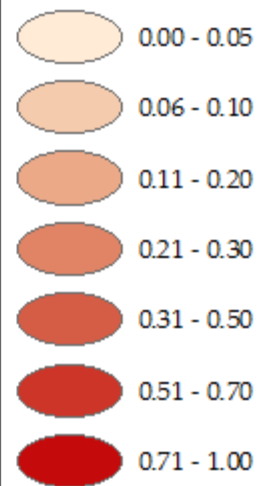
2011 Developed Proportion

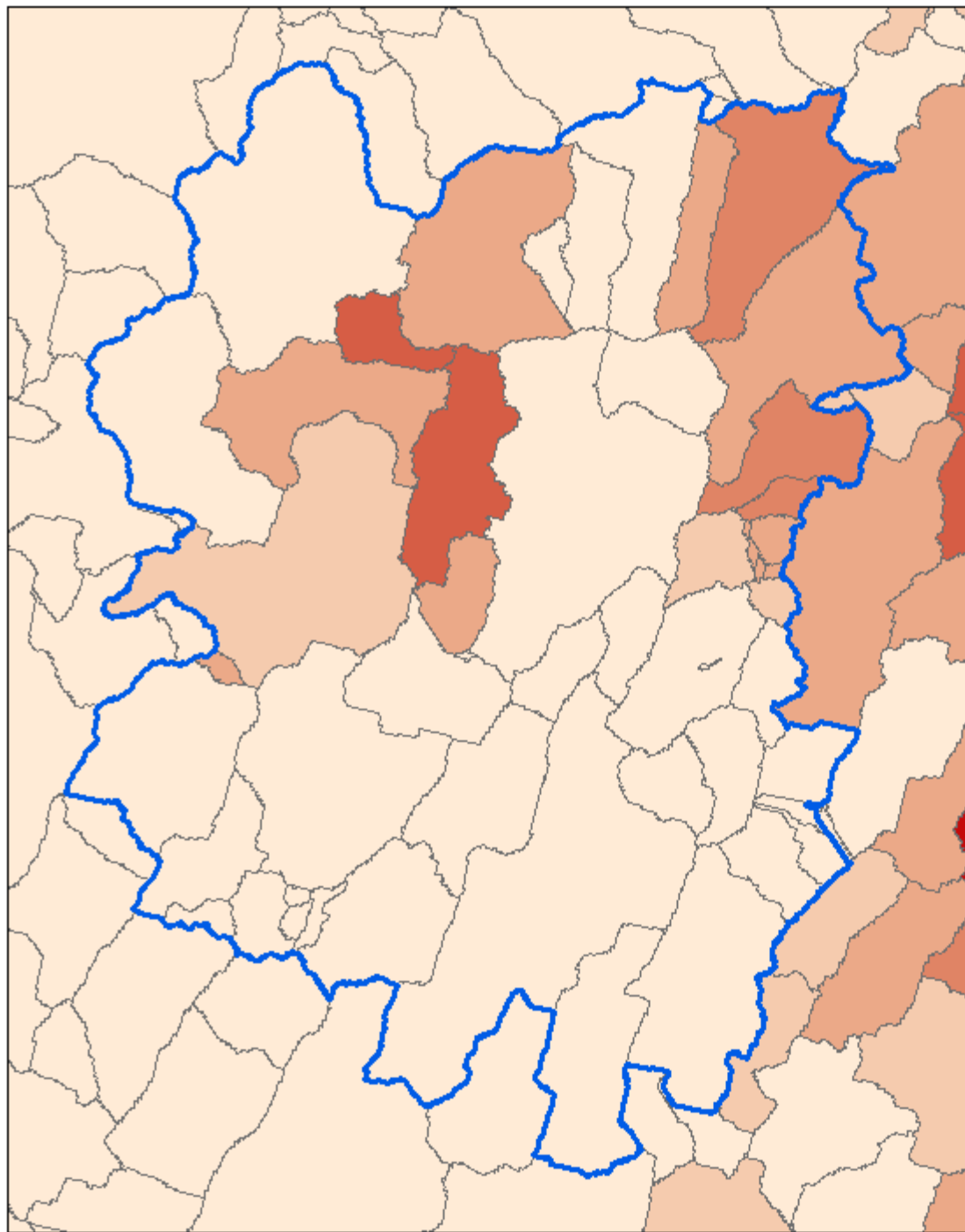


A hypothetical focus area...

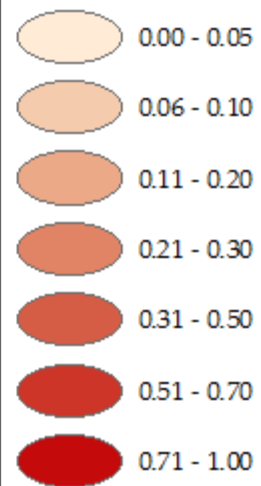


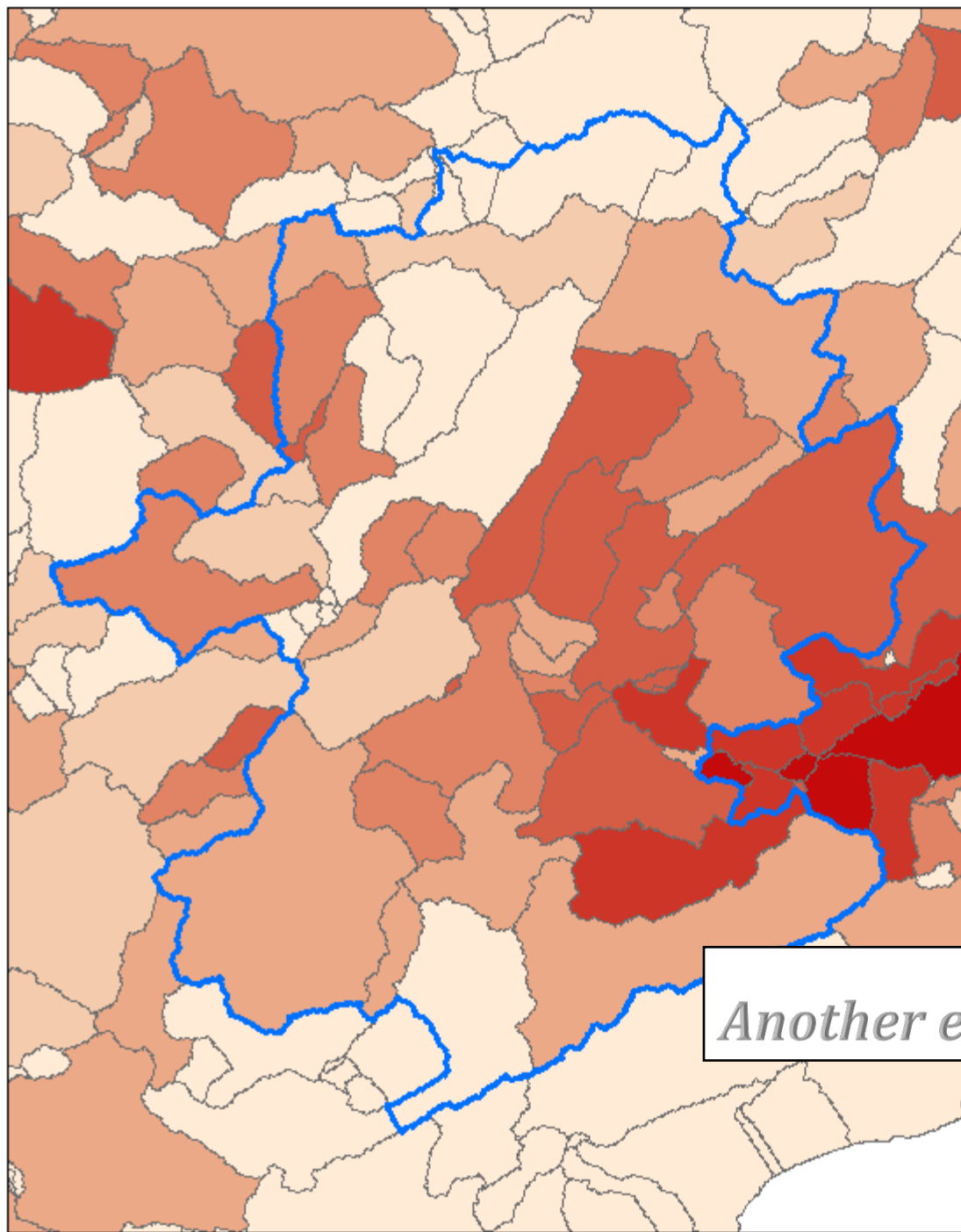
2030 Developed Proportion



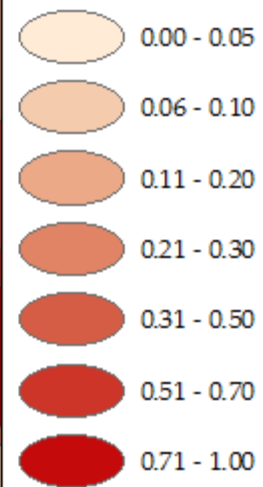


2070 Developed Proportion

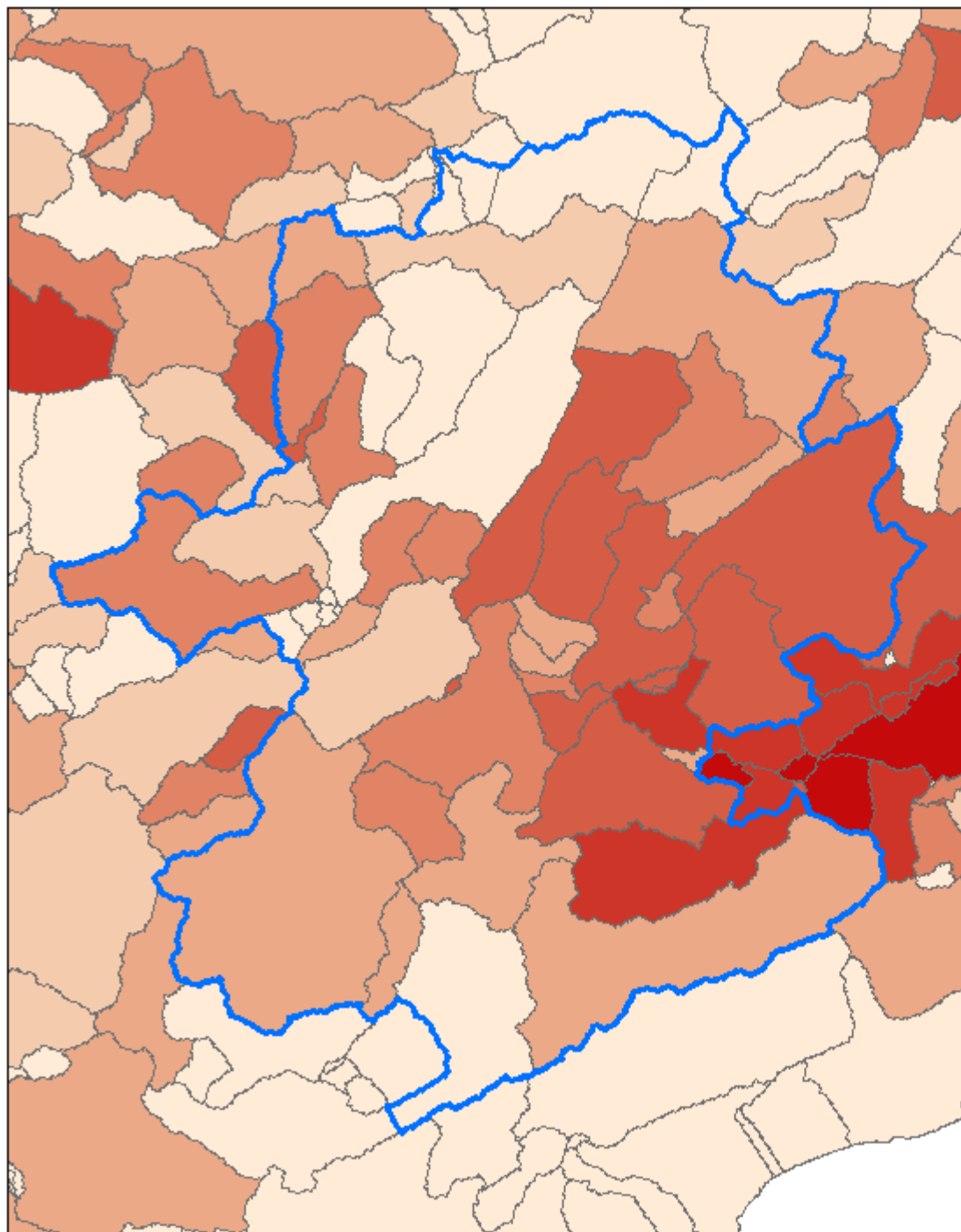




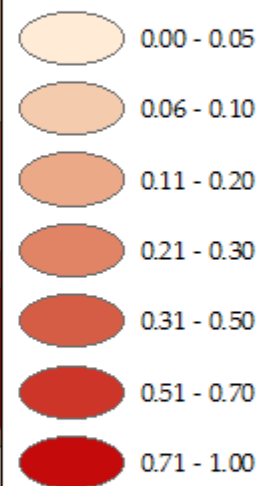
2011 Developed Proportion

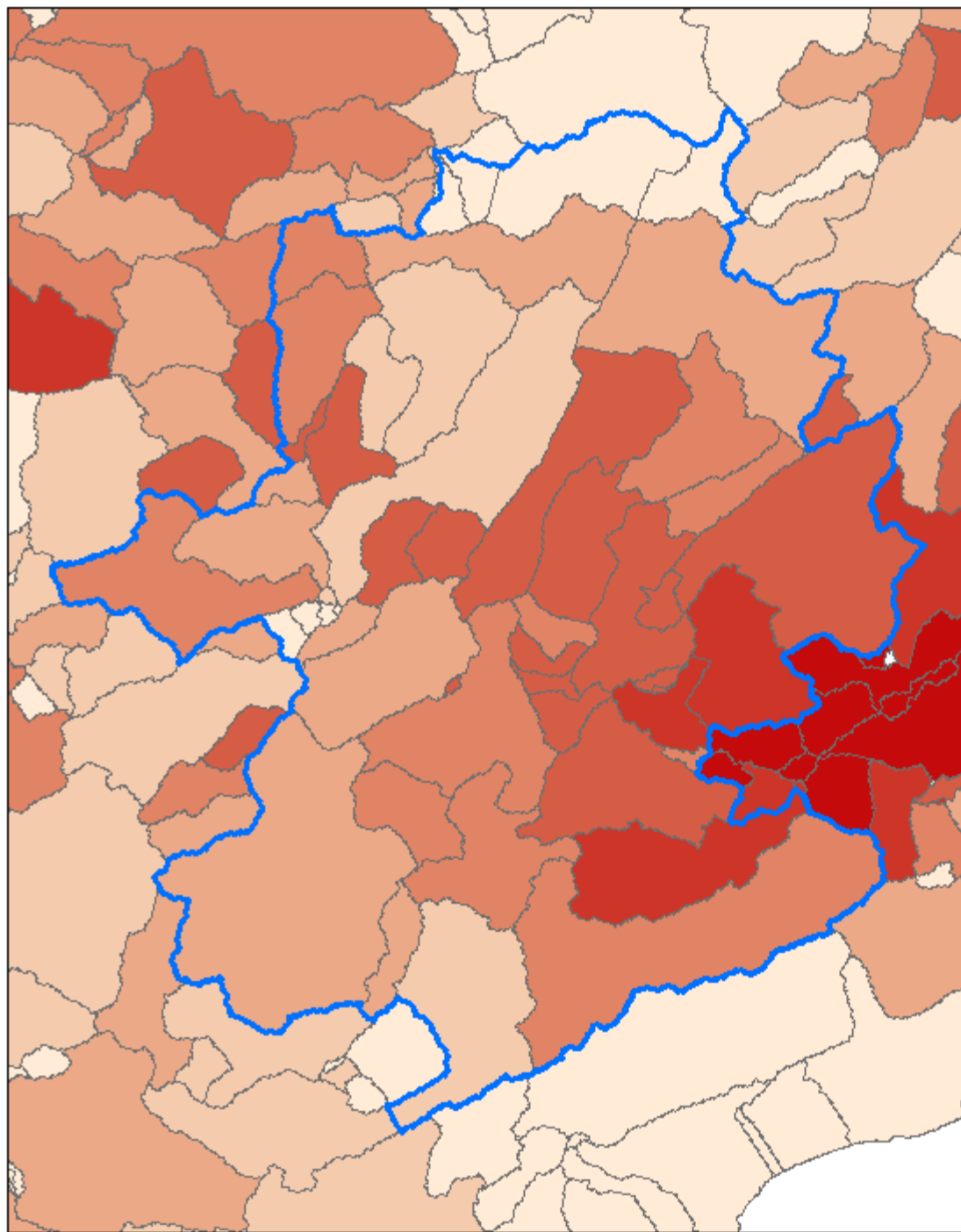


Another example...

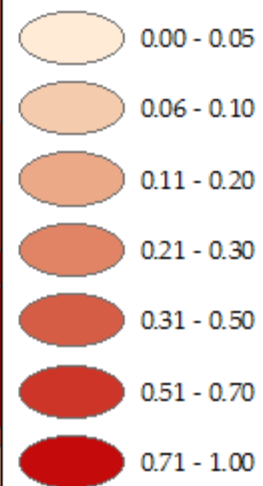


2030 Developed Proportion





2070 Developed Proportion



Roll-Out Plan

DRB2070 Version 1.0 Baseline:

- **Data files:** Proportion developed for catchments (2001, 2011, 2030, 2070) prepackaged with an ArcMap document (.mxd) available in 1 week
- **ArcGIS online tool:** available in 1-2 weeks
- **Integration with SRAT:** available in 2-3 weeks

www.drbproject.org/products

What's Next?

DRB2070 Version 2.0:

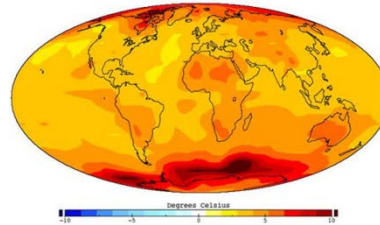
- **Baseline scenario:** recent trends
- **Alternative scenario 1:** Increased population with growth along corridors (focus on sprawl and climate change)
- **Alternative scenario 2:** Localized growth in historic centers (focus on conservation and technology with centralized growth “hubs”)

Stay tuned for: How will forest ecosystems and hydrologic processes in the DRB be affected by climate change and land cover change?

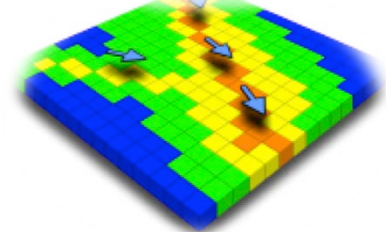
Land Use Change



Climate Change



Gridded Hydrologic Model



Tree Species Distribution Model



Water Runoff Model



With funding from the Delaware Watershed Research Fund



**NORTHERN
ARIZONA
UNIVERSITY**



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Thank you!

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