Identification and Mapping of Critical Ecosystems for the Lower Midwestern USA

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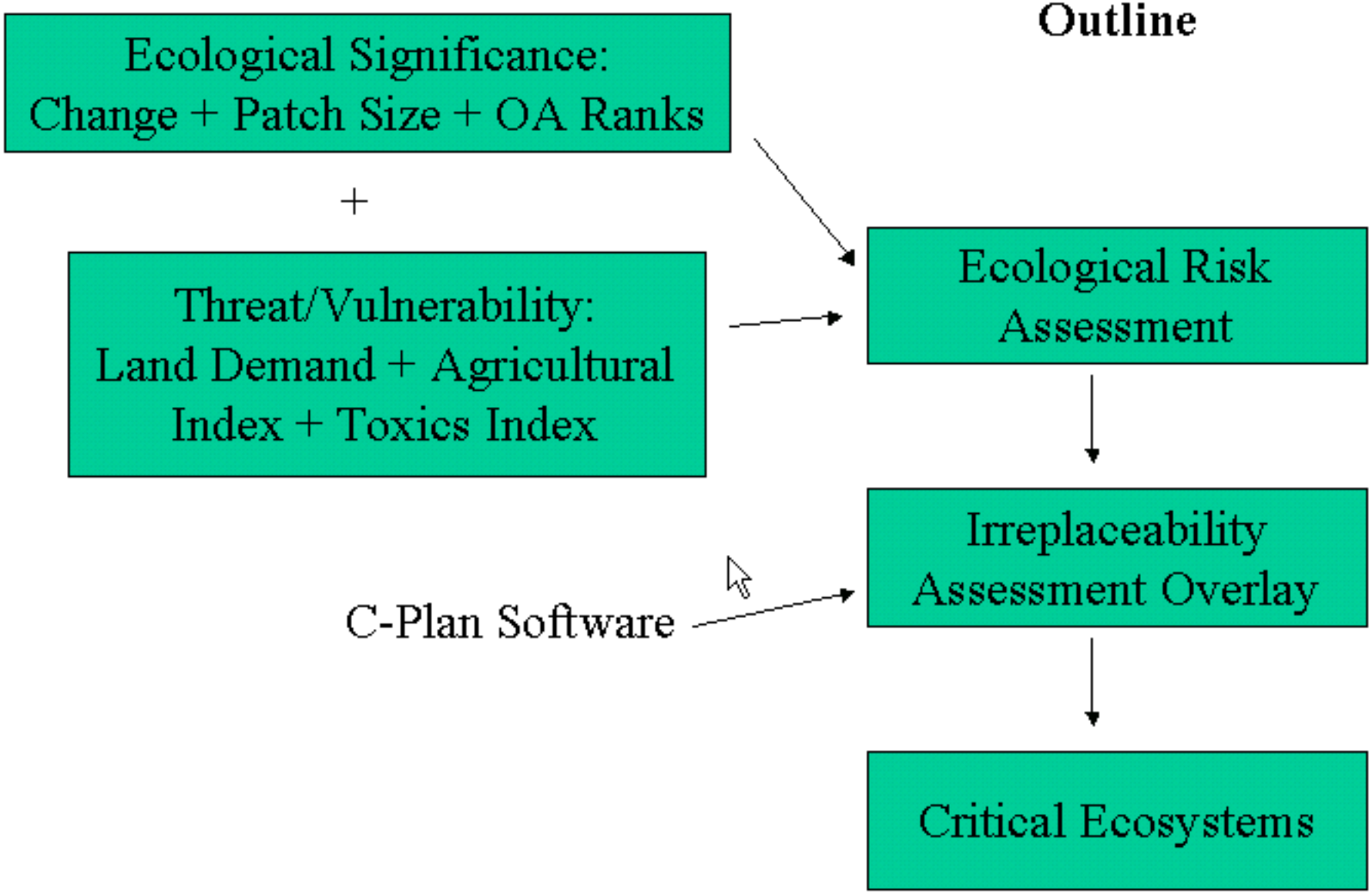
Critical Ecosystems Methods Outline



Modeling Geolandforms and Historic Vegetation to Calculate Change

Geology/Soils + Slope + Aspect

+ Slope Position + Floodplain/Riparian Overlay = Geolandform

Model Historic Ecosystems

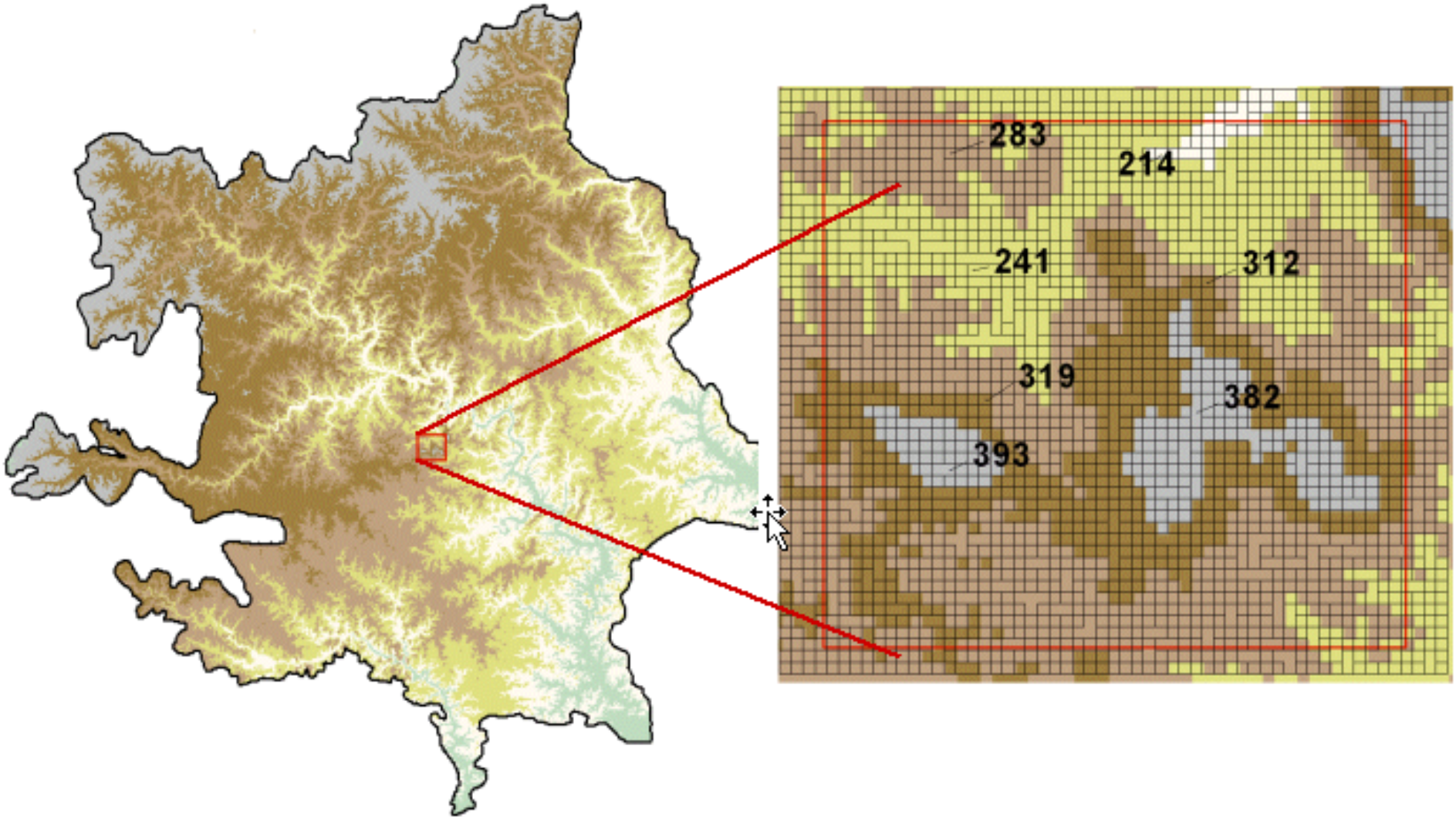
Overlay Modern Land Cover

Calculate Change By Geolandform

Landform modeling

- Modeled by ecological section or subsection and by major landscape
- Percent slope
- Landscape position
  - Calculates each cell's position in the landscape by determining the mean elevation at various radii (out to 1 km2). Subtracts the cell elevation from the mean at each radius and divides by the distance
- Floodplains modeled separately

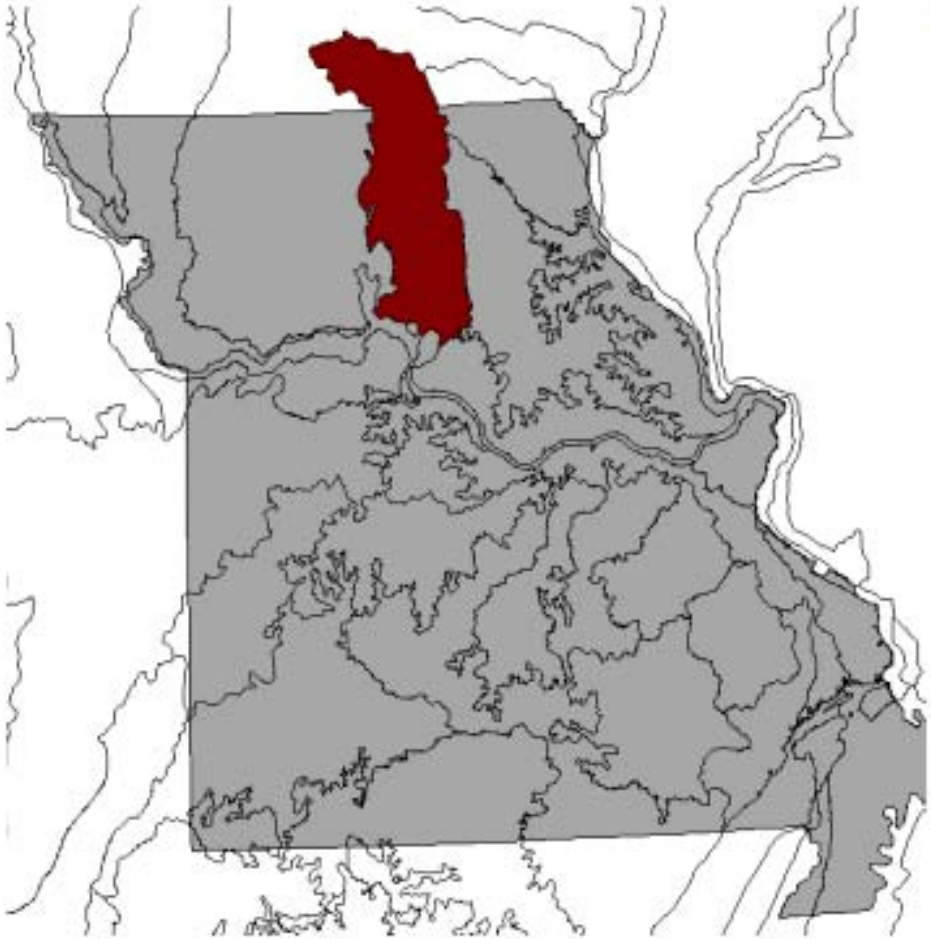
Digital Elevation Model (DEM): Elevation is represented by a regular grid with elevation values

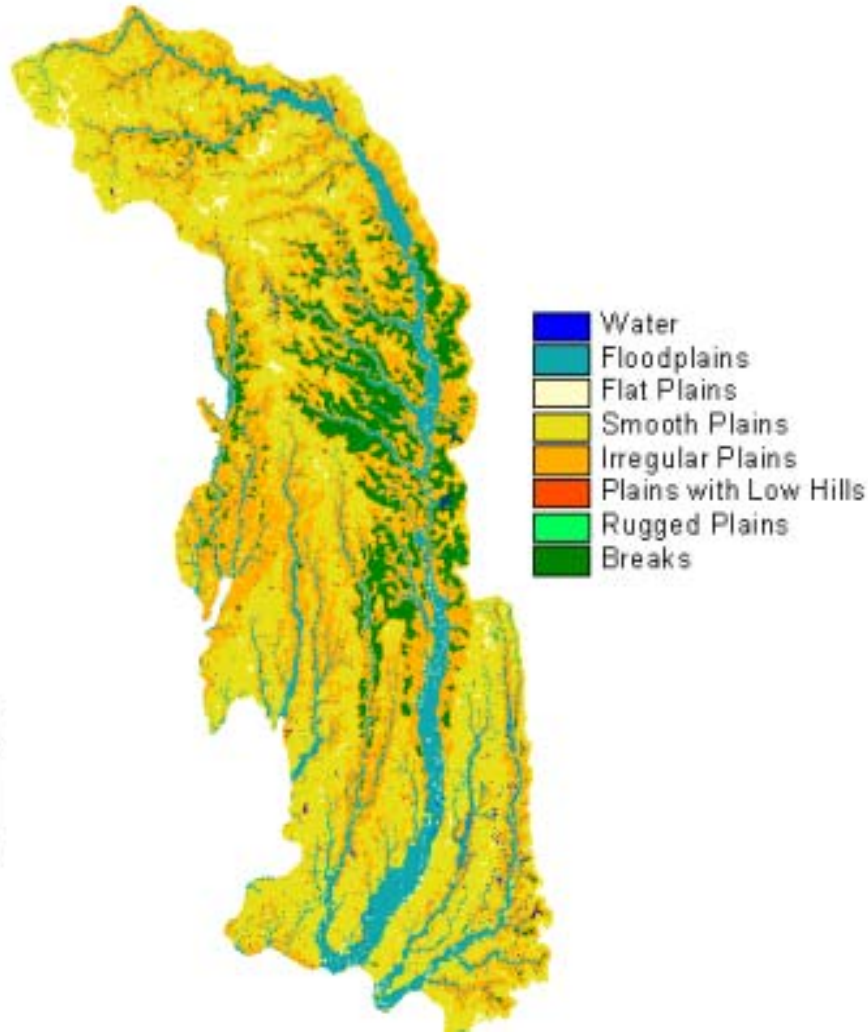


“A little inaccuracy sometimes saves a ton of explanation.”

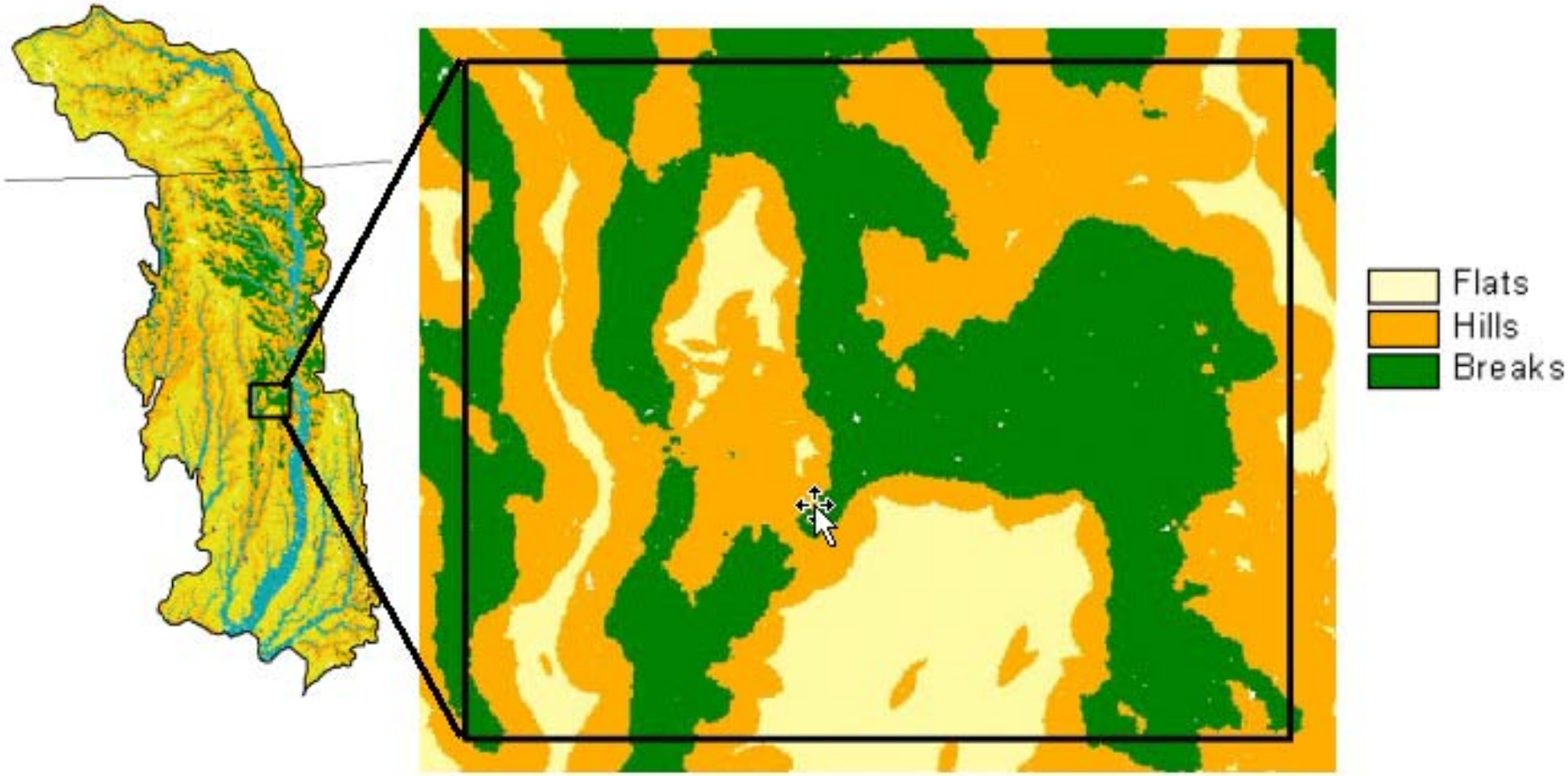
~H. H. Munro~

Example – Chariton River Hills subsection

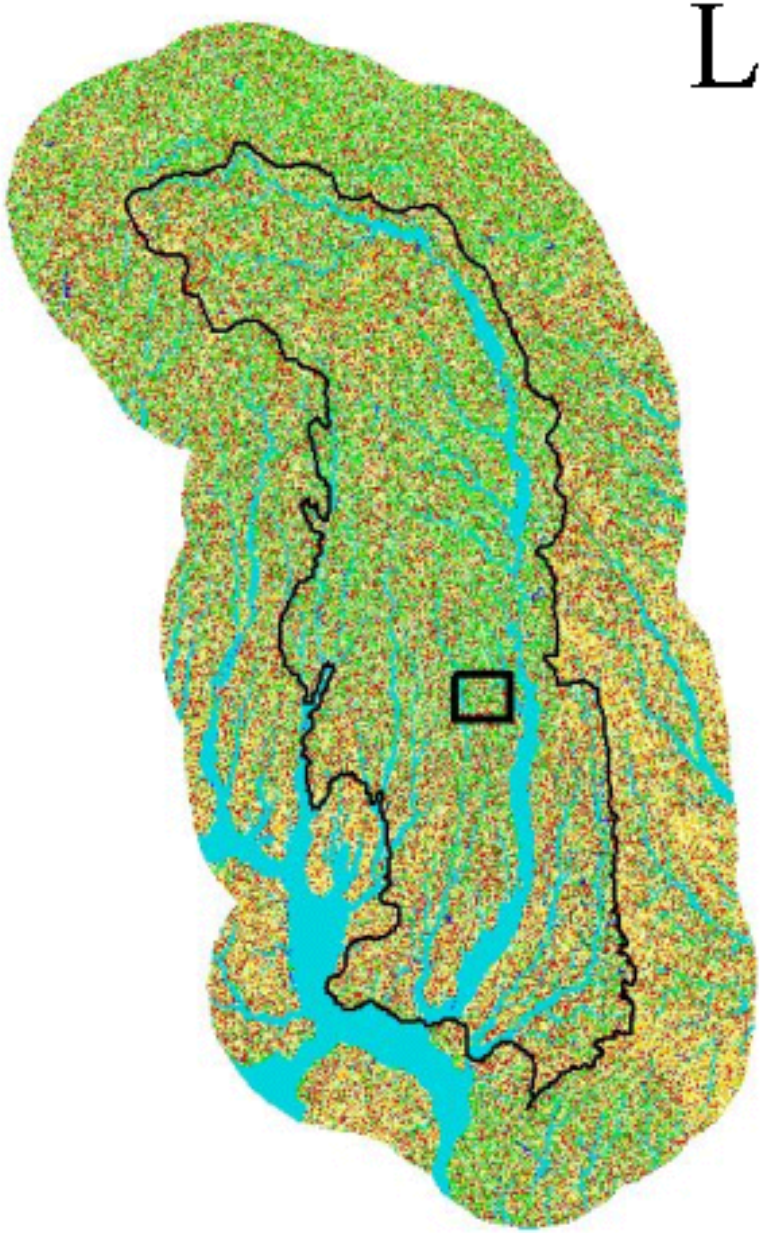


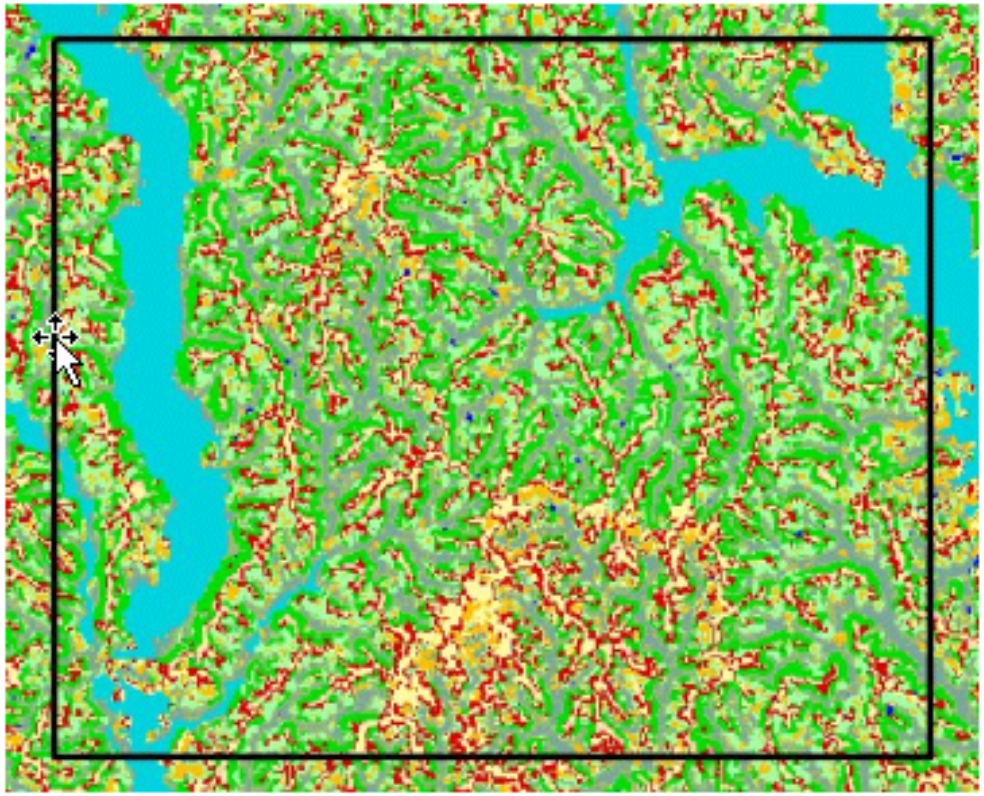


Slope and landscape position classes are determined within broad landscapes



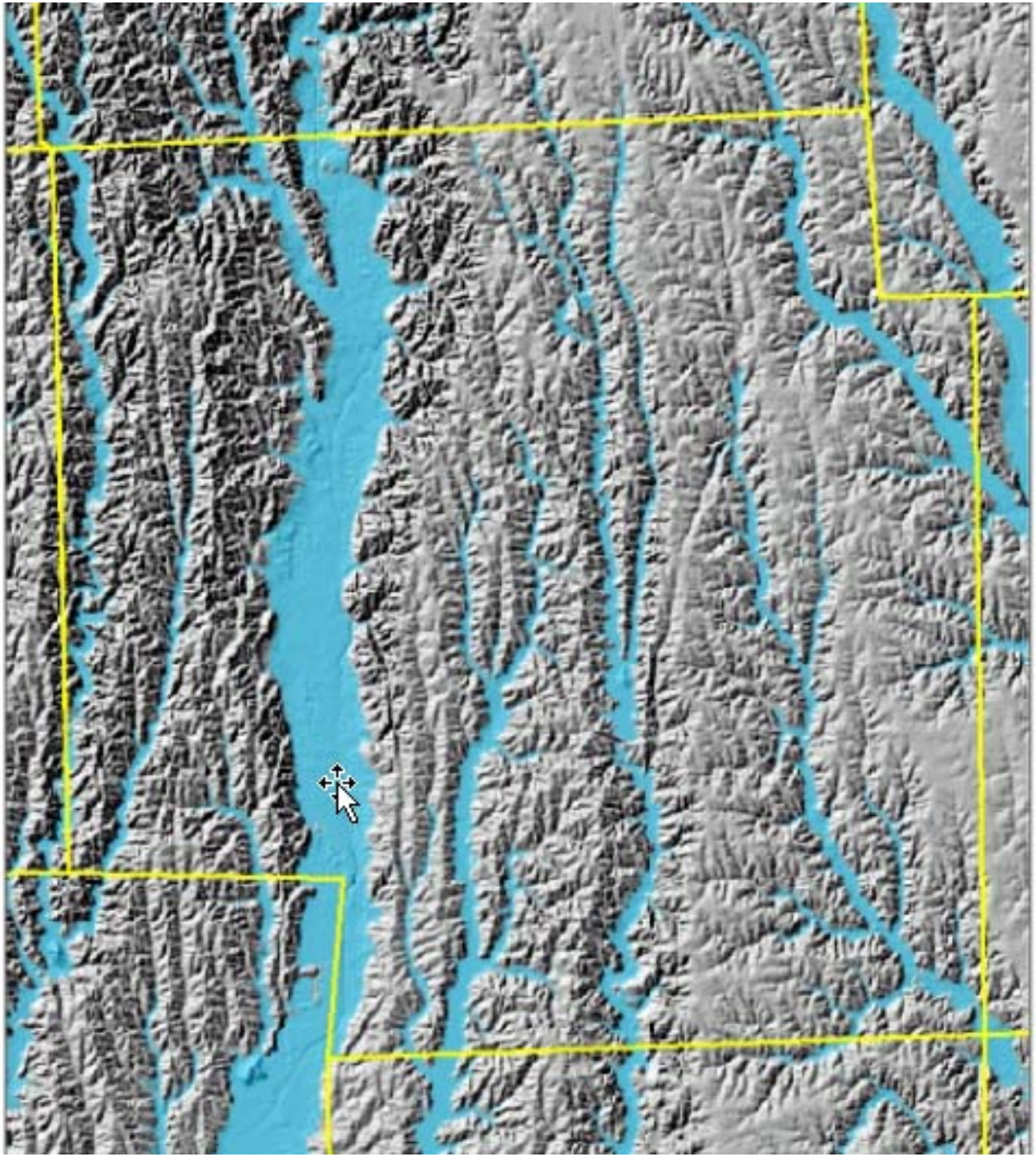
Landforms





- Water
- Floodplain
- Steep slope
- Slope crest
- Upper slope
- Flat summit
- Sideslope
- Lower sideslope
- High flat
- Low flat

Macon County, Missouri

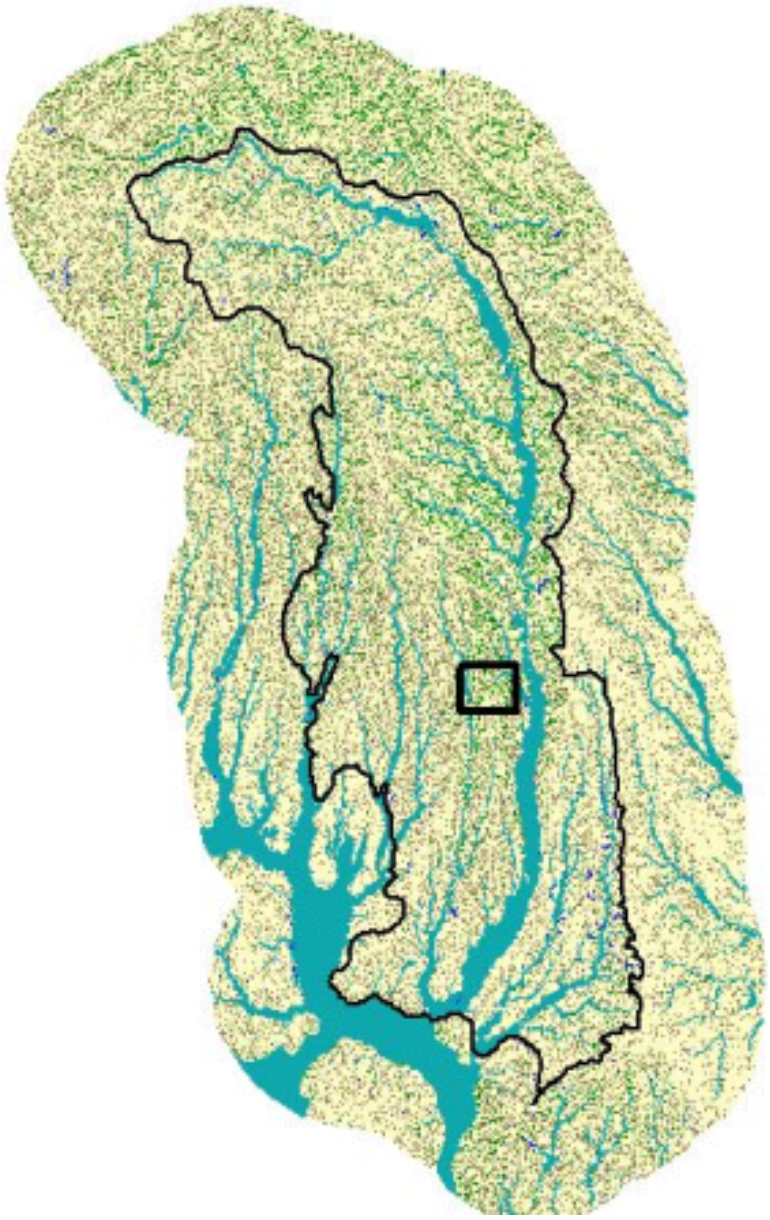


Floodplain

Counties

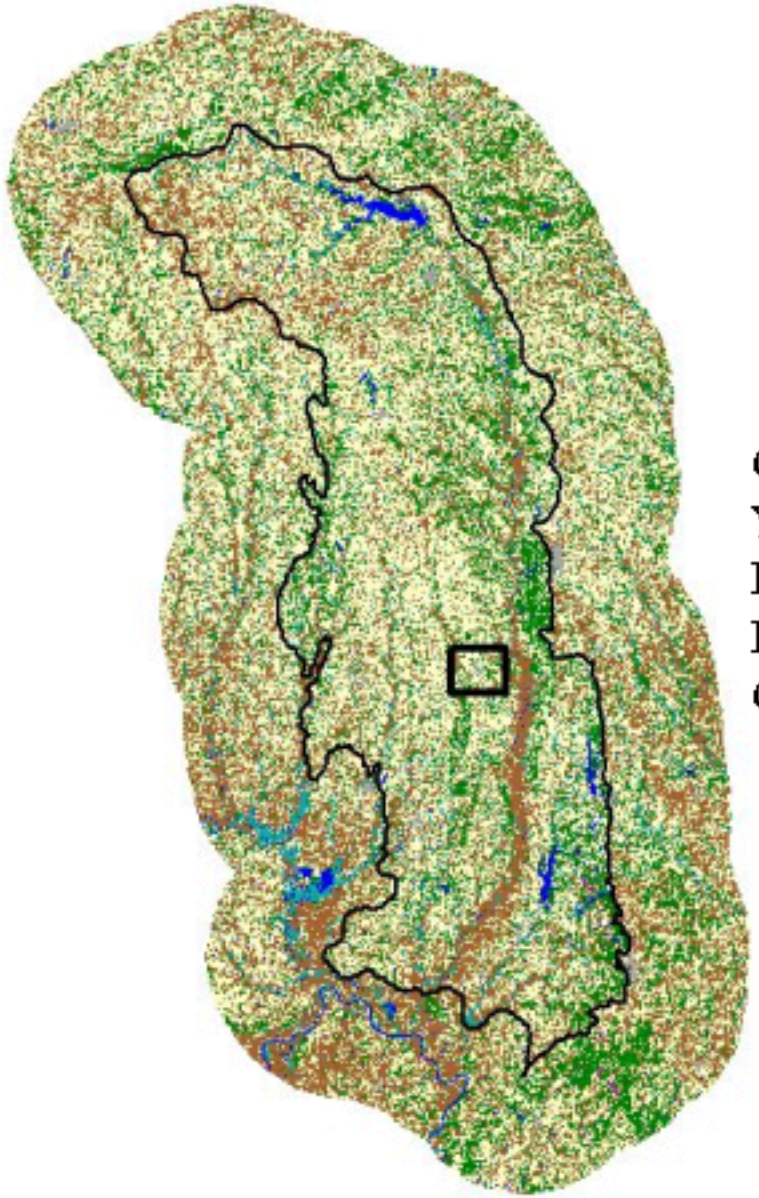
CENTRAL DISSECTED TILL PLAINS SECTION HISTORIC VEGETATION MODEL			
Landscape Type	**Geolandform**	**Solar Insolation**	**Historic Vegetation**
flat plains, smooth plains,	high and mid-elevation flats, gentle	neutral	tallgrass prairie
irrigular plains	high and mid-elevation slopes	wet	forest
		dry	tallgrass prairie
	gentle lower slopes, low flats	neutral	woodland or savanna
		wet	mesic forest
		dry	tallgrass prairie
	steep slopes	neutral	forest
		wet	mesic forest
		dry	tallgrass prairie
	riparian zones/floodplains		bottomland forest
hills, breaks	high and mid-elevation flats, gentle	netural	tallgrass plairie
	high and mid-elevation slopes	wet	mesic forest
		dry	tallgrass prairie
	gentle lower slopes, low flats	neutral	mesic forest
		wet	mesic forest
		dry	tallgrass prairie
	steep slopes	neutral	forest
		wet	mesic forest
		dry	tallgrass prairie
river floodplains	all	all	bottomland forest

Modeled historic vegetation



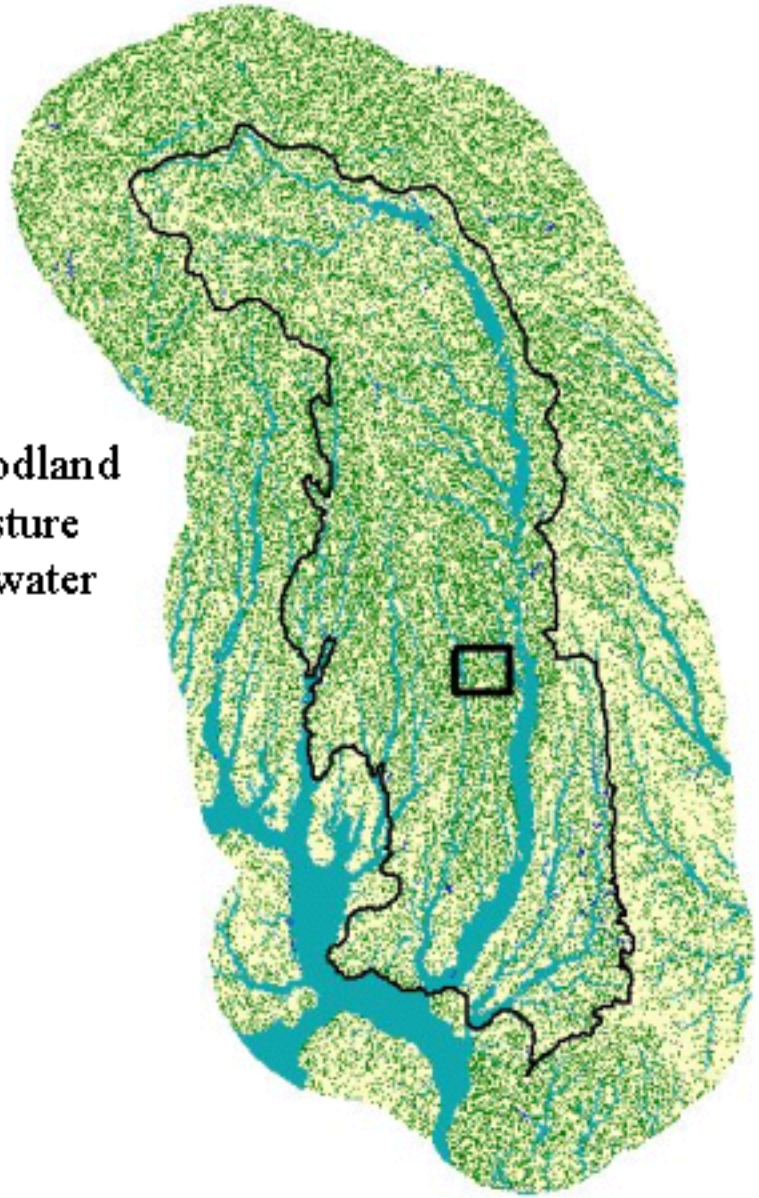
1 Tallgrass prairie
2 Woodland/savanna
3 Forest
4 Mesic forest
5 Bottomland forest
6 Water

Current land cover

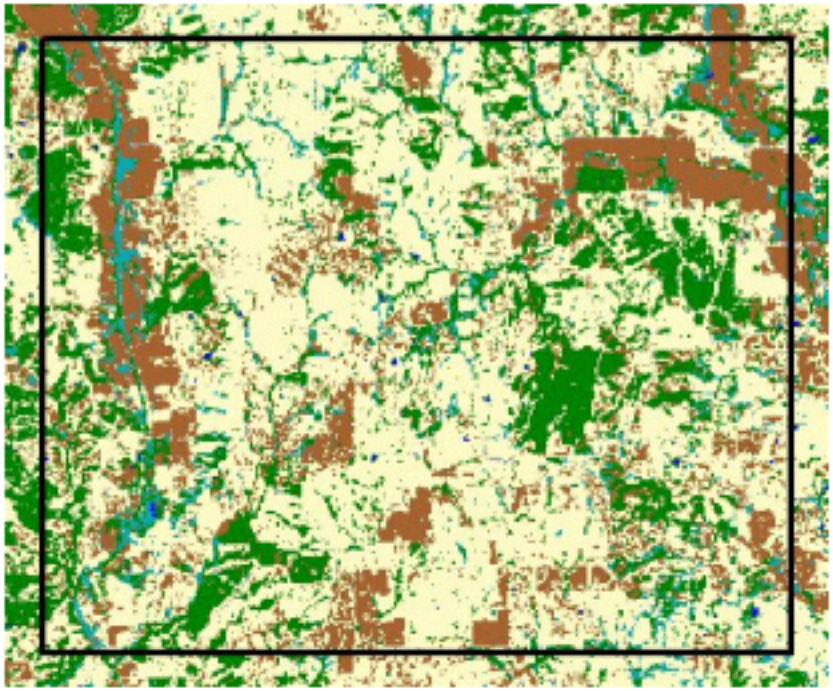


Greens – forest/woodland
Yellows – grass/pasture
Blues – floodplain/water
Brown – cropland
Grey - urban

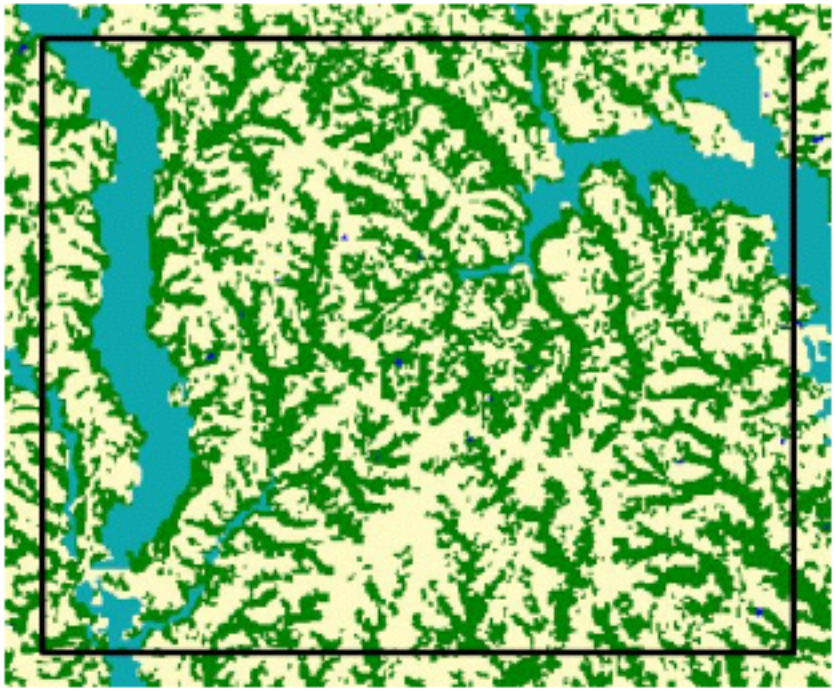
Modeled historic vegetation



Current land cover



Modeled historic vegetation



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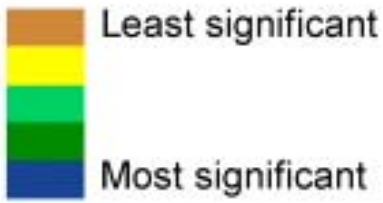
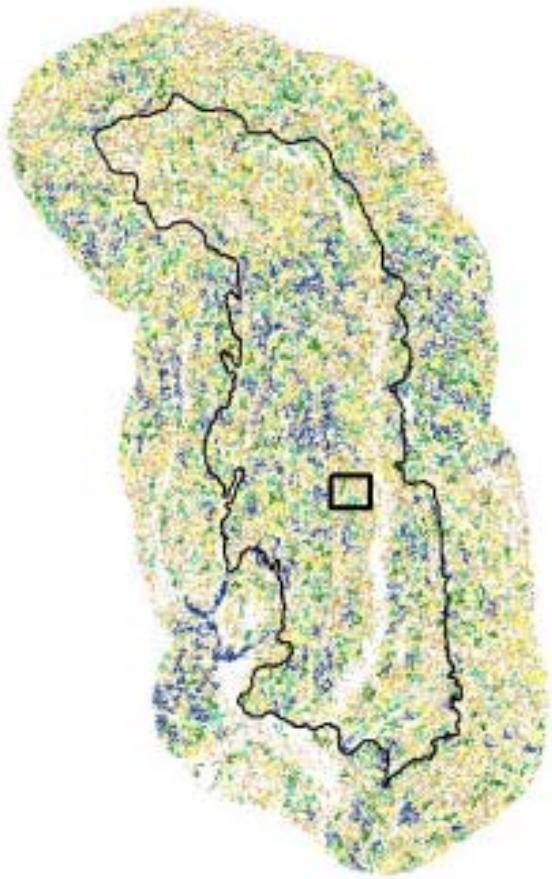
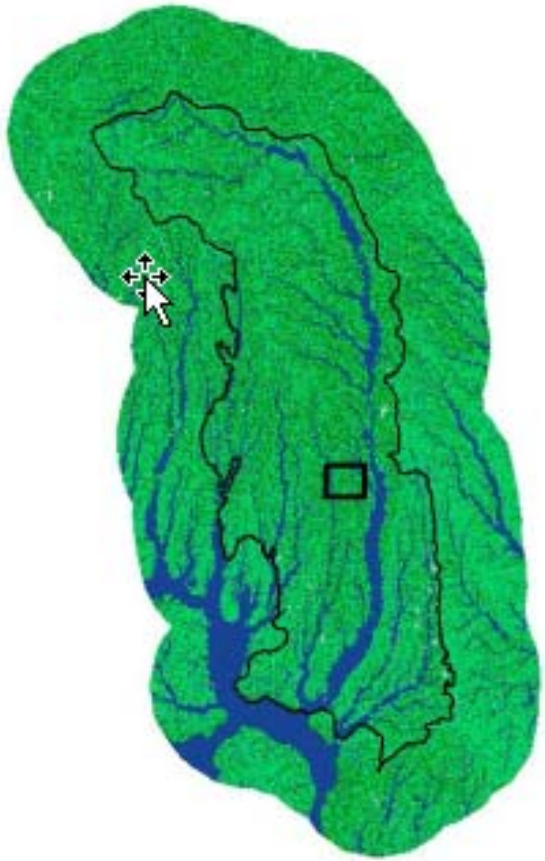
Significance



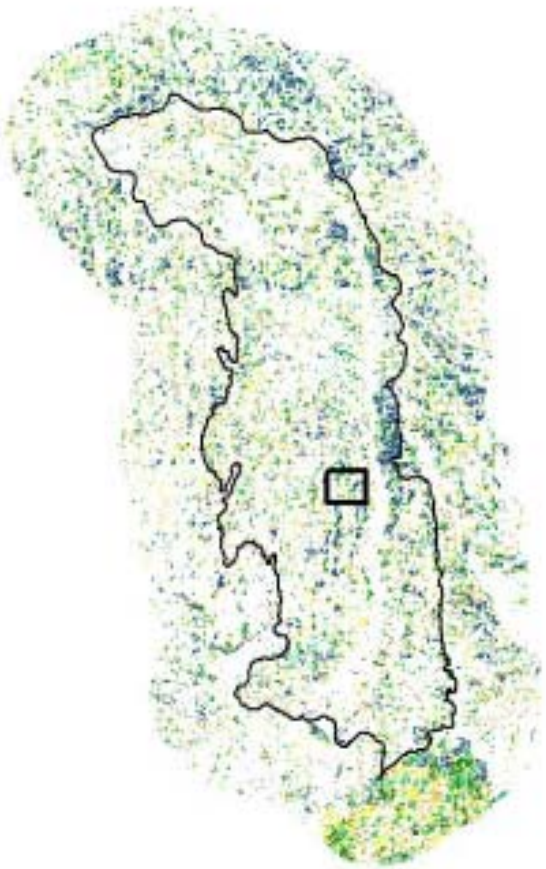
Patch size of
'no conversion'



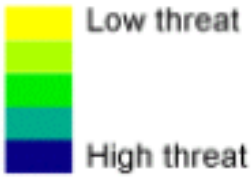
Geolandform rank
by % conversion



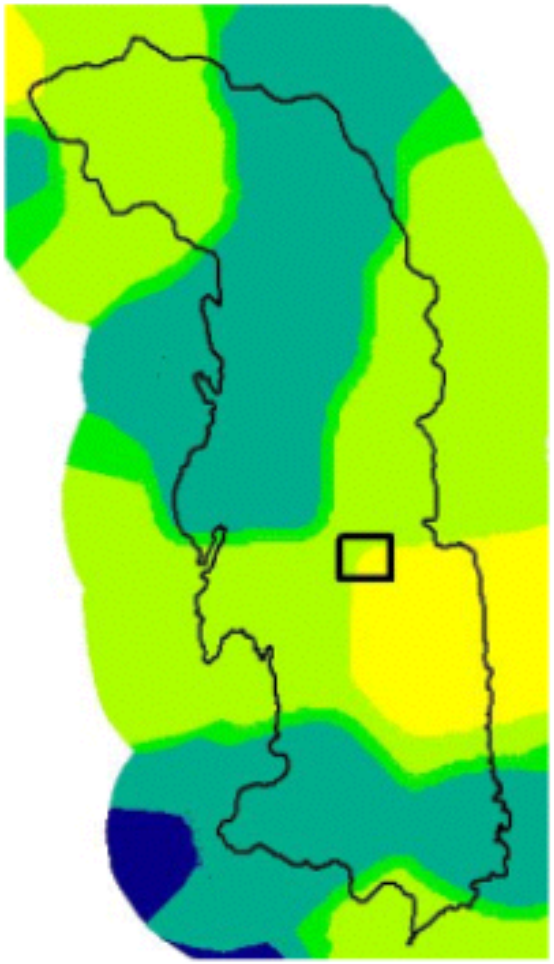
Opportunity
Area rank



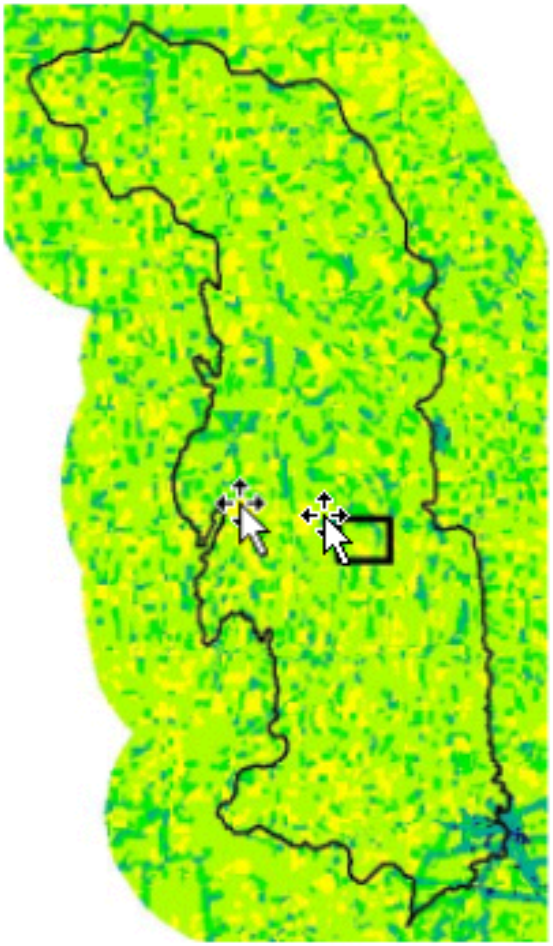
Threats



Agricultural

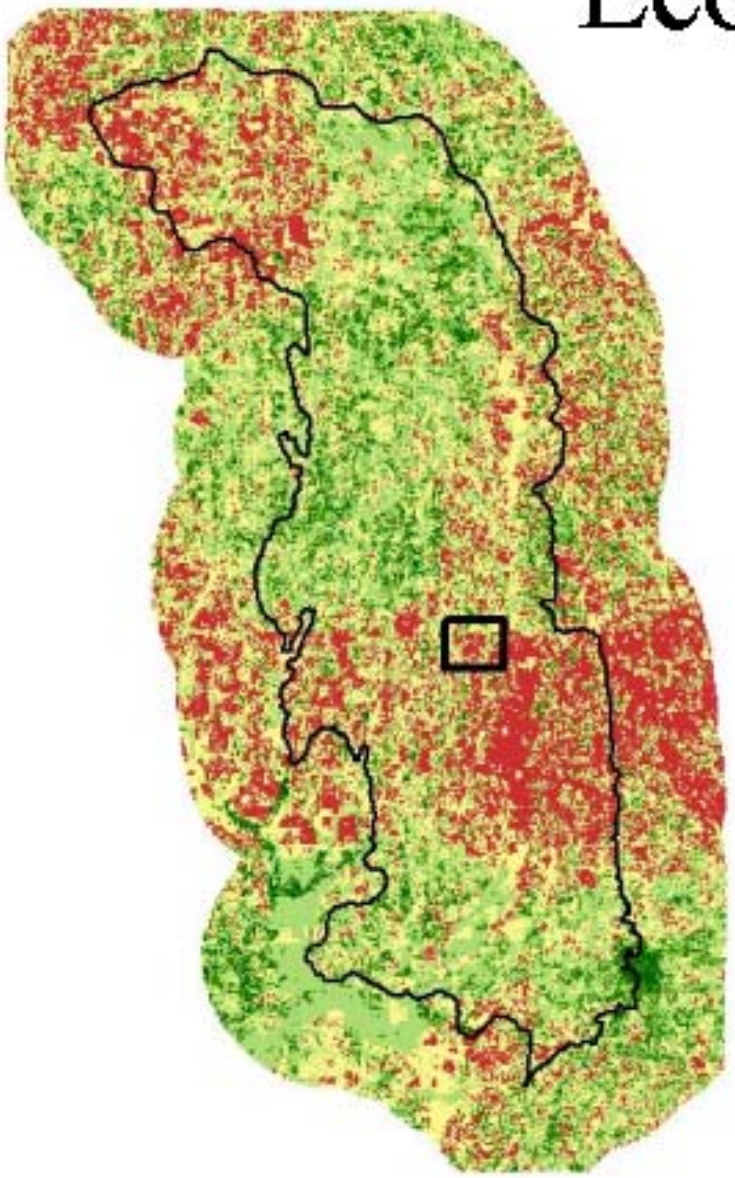


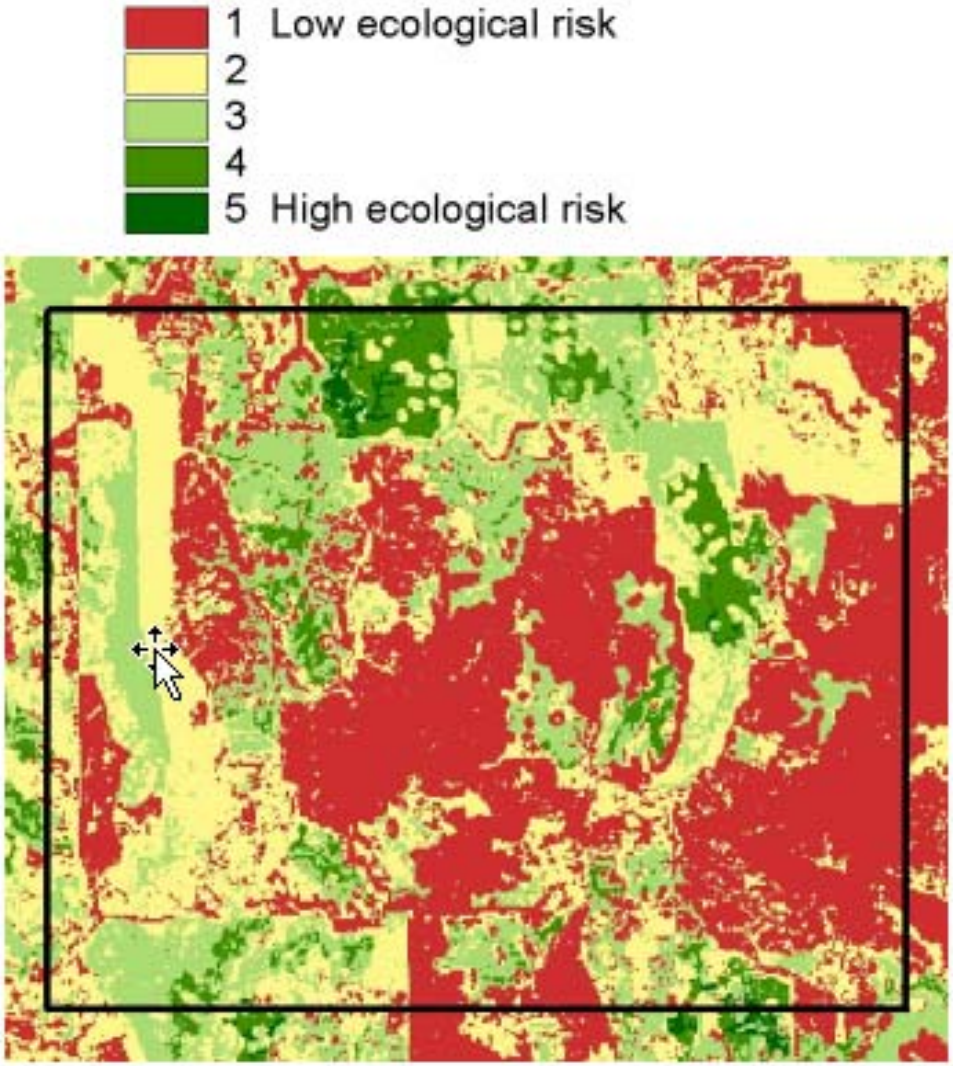
Land Demand



Toxics

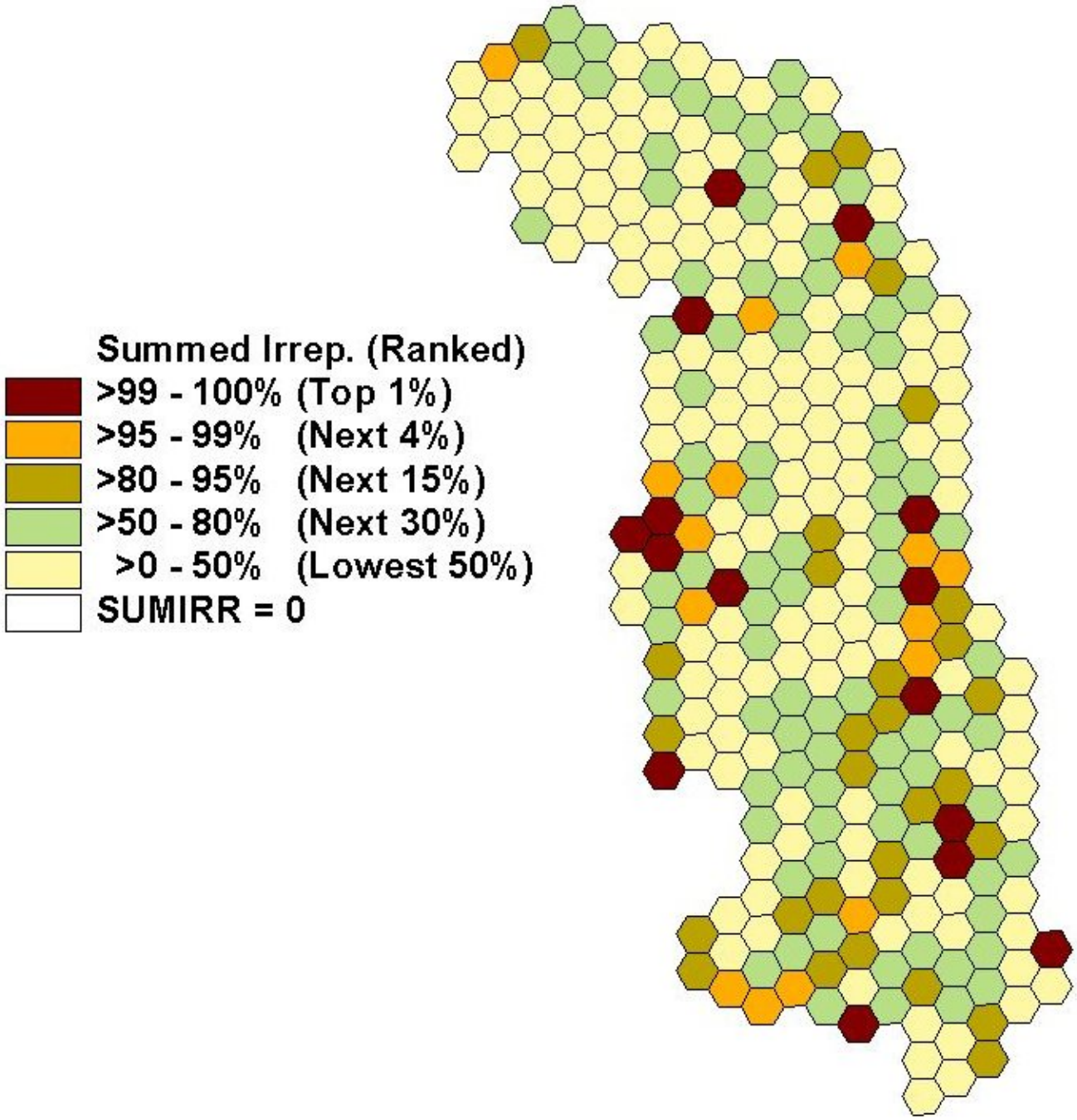
Ecological Risk Surface





Irreplaceability Assessment

- Planning region: ecological subsections
- Assessment units: 96 sq km hexagons
- Targets:
  - Abiotic: geolandforms (two resolutions)
  - Biotic:
    - species diversity (Gap)
    - target bird presence (breeding bird atlas)
    - landscapes (from neighborhood analysis of current land cover) conservation opportunity areas (semi-natural vegetation that is 75m from an patch edge or a road)


Summed Irrep. (Ranked)
>99 - 100% (Top 1%)
>95 - 99% (Next 4%)
>80 - 95% (Next 15%)
>50 - 80% (Next 30%)
>0 - 50% (Lowest 50%)
SUMIRR = 0

Product Utility for Conservation Planning

- Irreplaceability Assessment: coarse-resolution tool for setting regional priorities for action and funding
- Ecological Risk Surface: fine-resolution tool for project/permit review and setting priorities for action or funding
- Critical Ecosystems: those areas of high ecological risk within high irreplaceability polygons