Identifying and Mapping Critical Ecosystems in the Lower Midwestern USA

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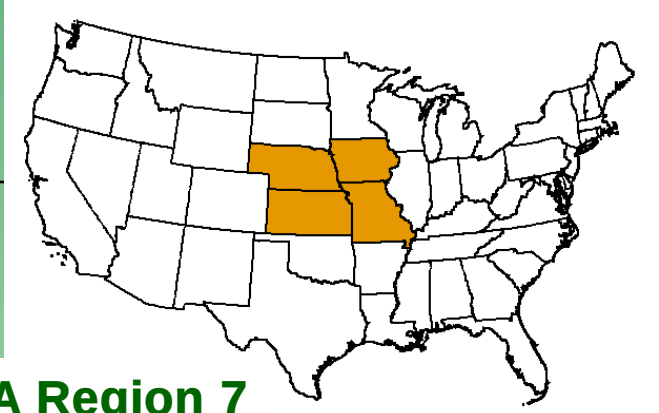
Robbyn J.F. Abbitt
Missouri Resource Assessment Partnership (MoRAP)

David D. Diamond, MoRAP
C. Diane True, MoRAP
Walt E. Foster, EPA Region 7
Hollis Mehl, EPA Region 7

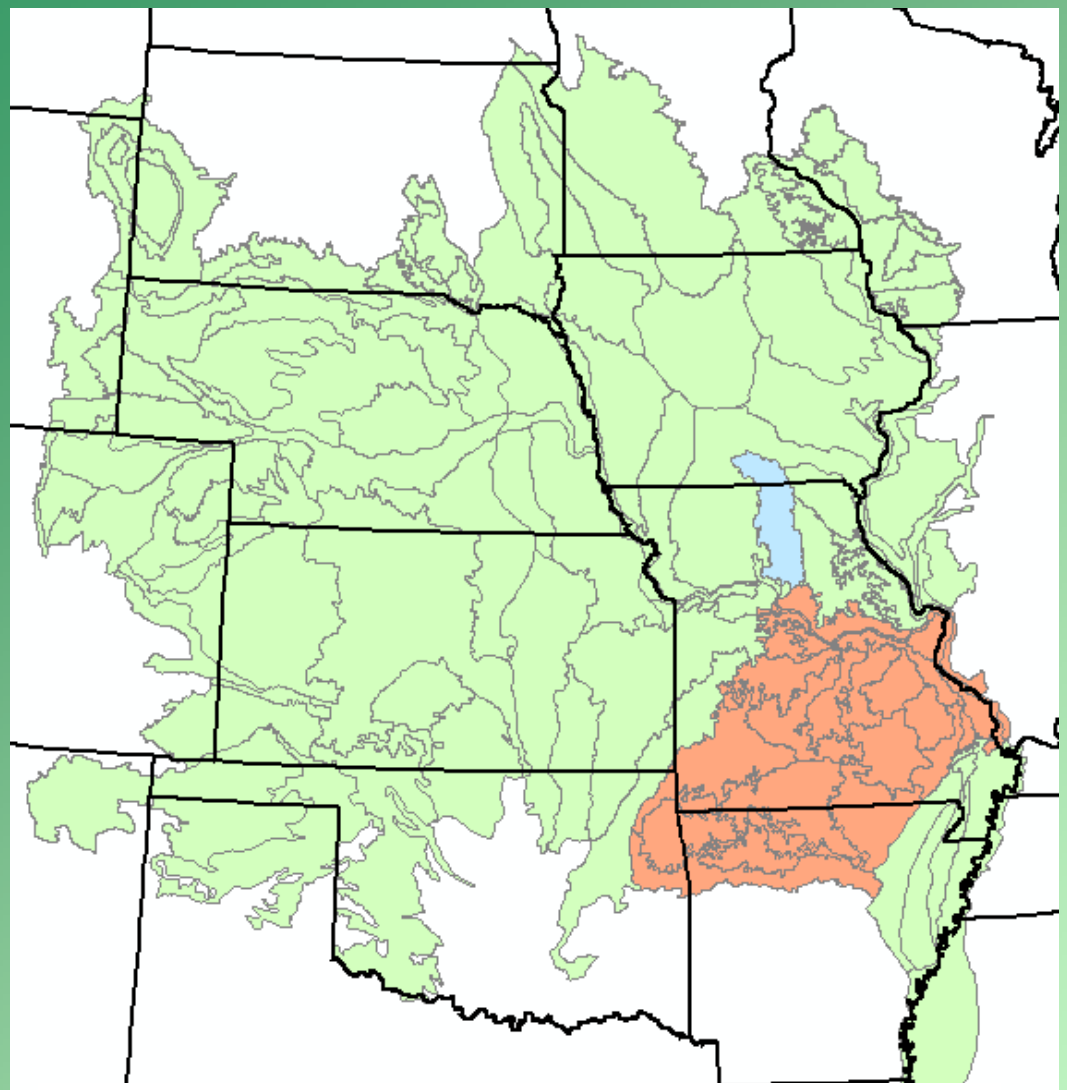
Project Background

- In 2001 EPA Region 7 (IA, KS, MO, NE) identified Critical Ecosystems as 1 of 3 priorities for the region
- MoRAP and EPA have worked together to identify these Critical Ecosystems
- In 2004 a pilot study focusing on the Ozark Highlands Section and the Chariton River Hills Subsection was completed

Pilot Study Area



EPA Region 7

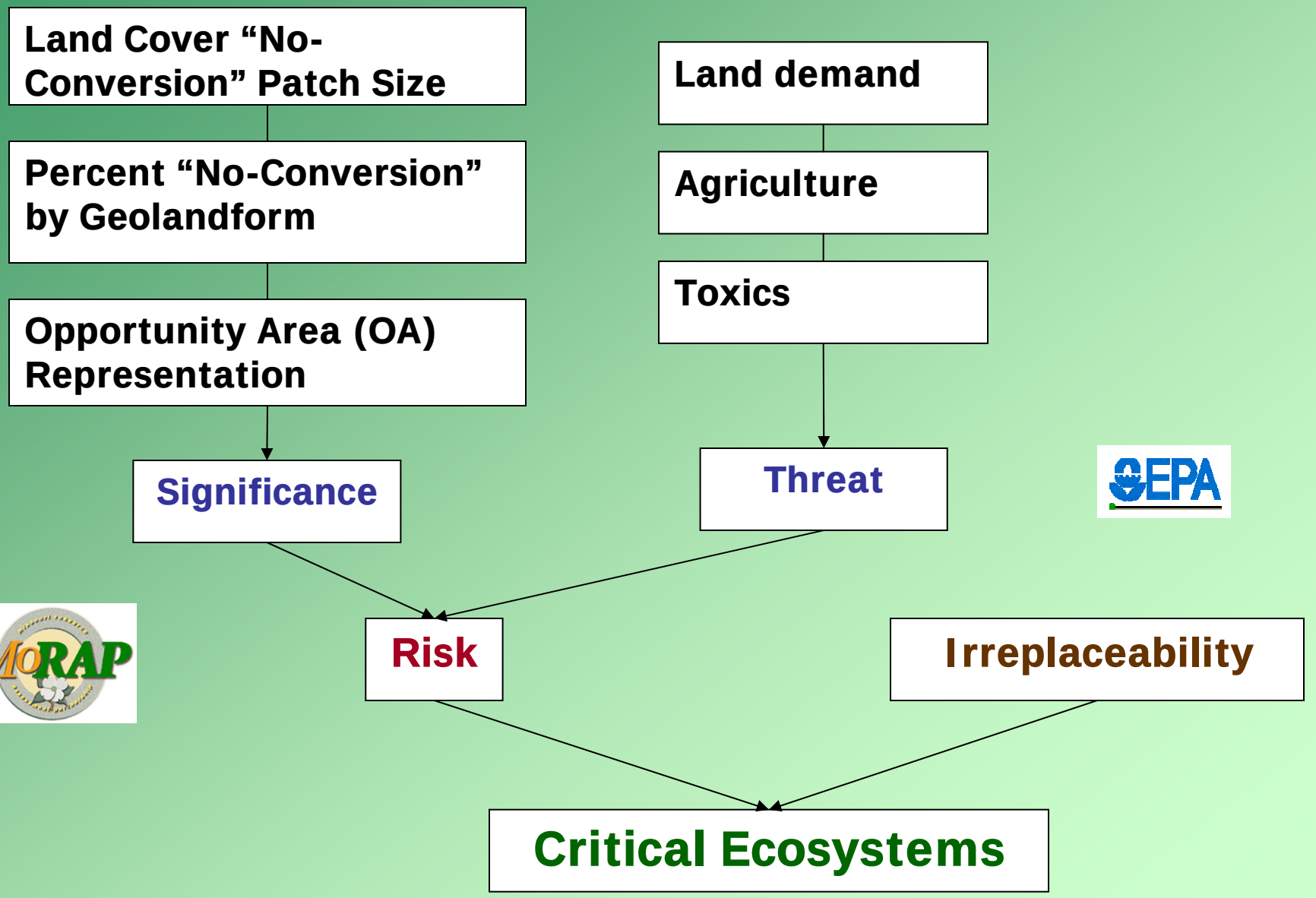


Subsection Boundaries within Region 7

Chariton River Hills Subsection

Ozark Highlands Section

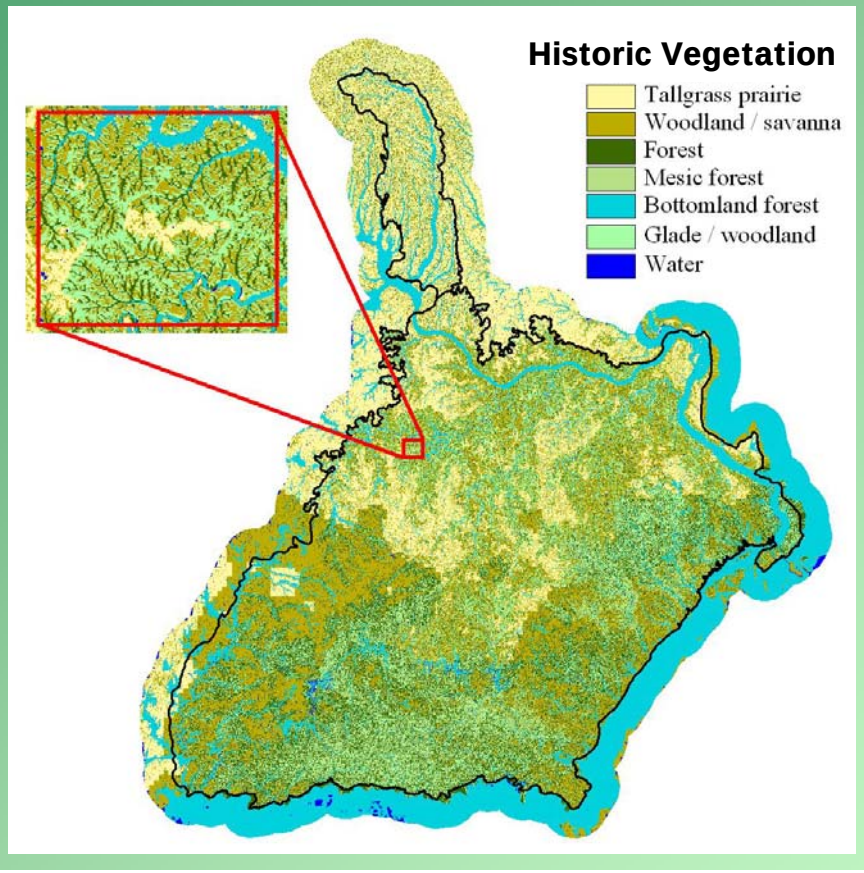
Defining Critical Ecosystems

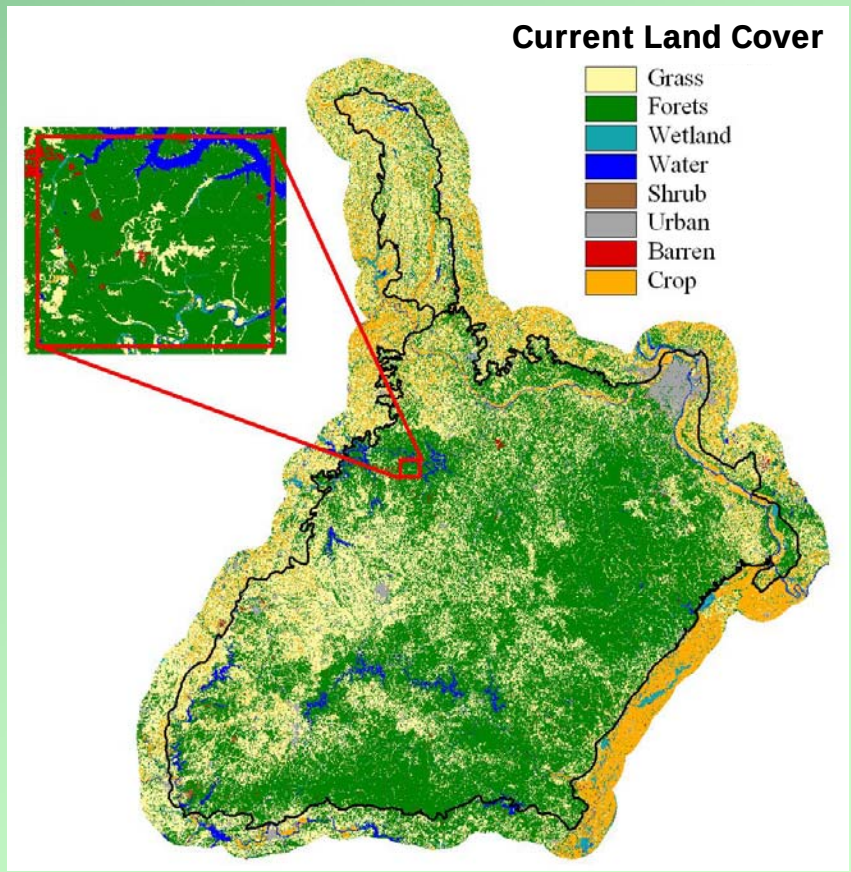


Ecological Significance

Land Cover Patch Size

- **Patch size of "no-conversion" vegetation**
- **Areas where current land cover (NLCD) is similar to modeled historic vegetation = "no-conversion" patches**

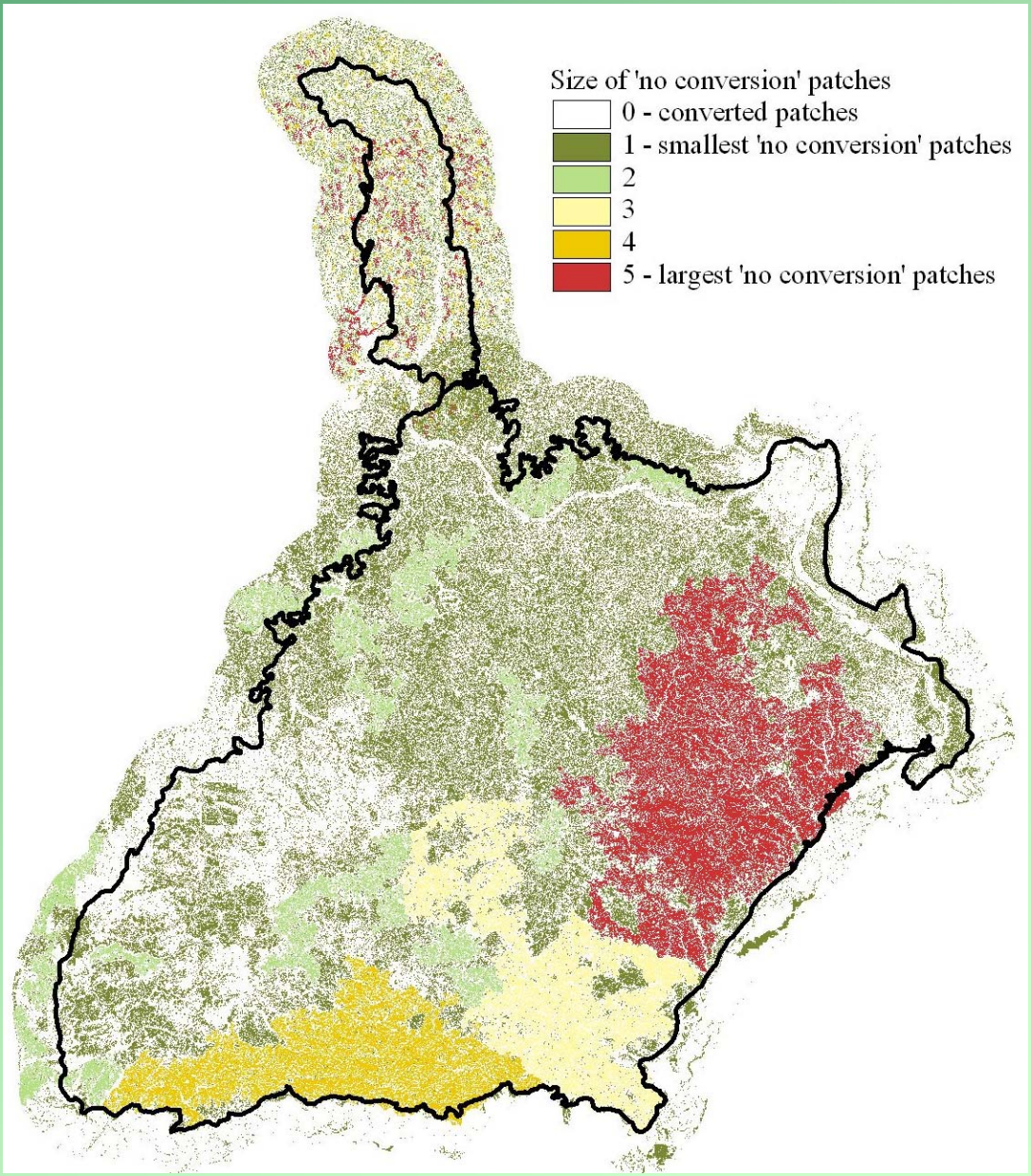




Ecological Significance

Land Cover Patch Size

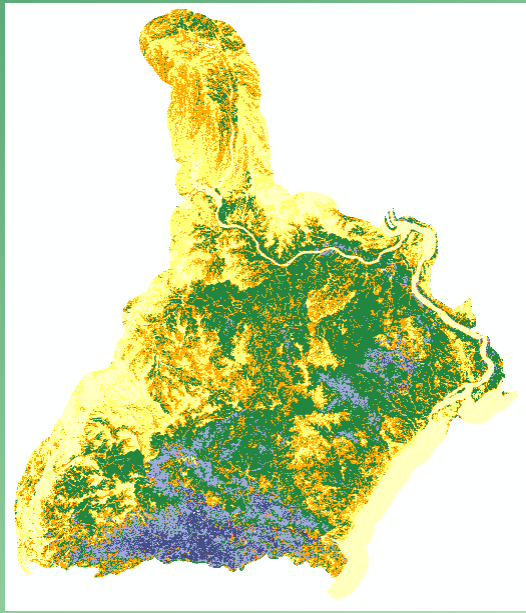
- **Patch size of “no-conversion” vegetation**



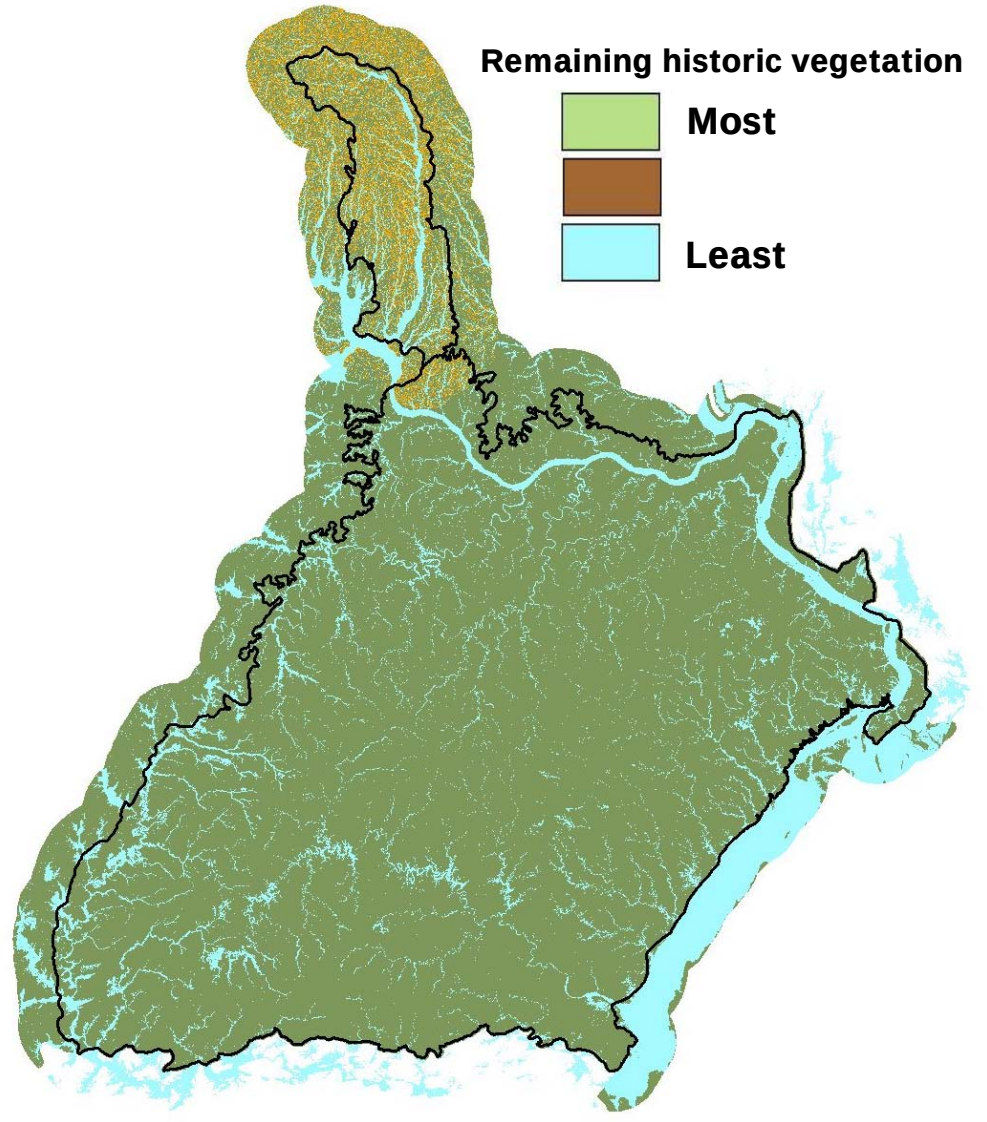
Ecological Significance

Percent of "No-Conversion" by Geolandform

- **Hammond's landforms ranked by percent of "no-conversion" pixels in each landform**



- **Used to identify landforms with the least amount of remaining historic vegetation**

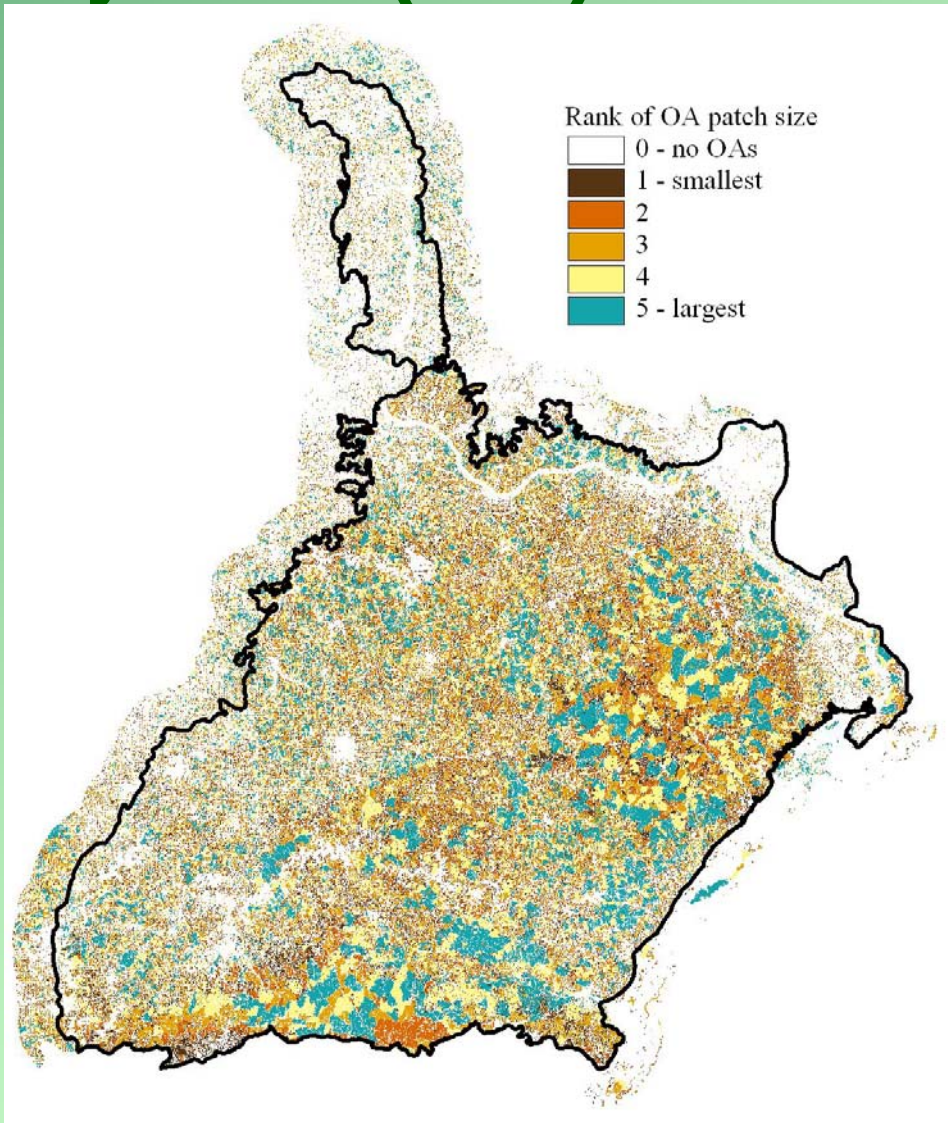


Ecological Significance

Conservation Opportunity Areas (OAs)

- **Natural and semi-natural land cover patches away from roads and habitat patch edges**

- **OAs were ranked by their size within landforms**
  - **Larger OAs within each landform were given higher ranks**

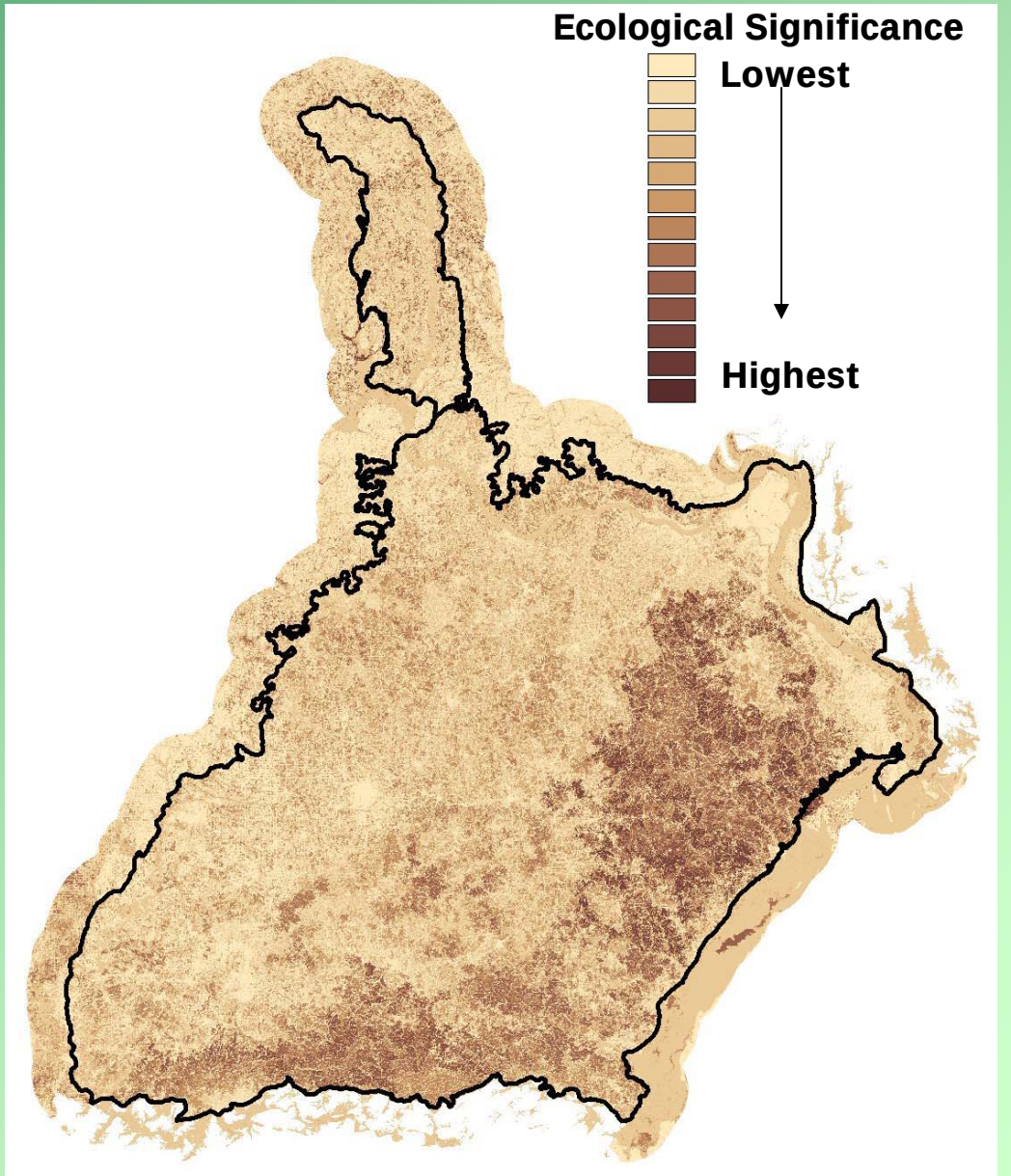


Ecological Significance

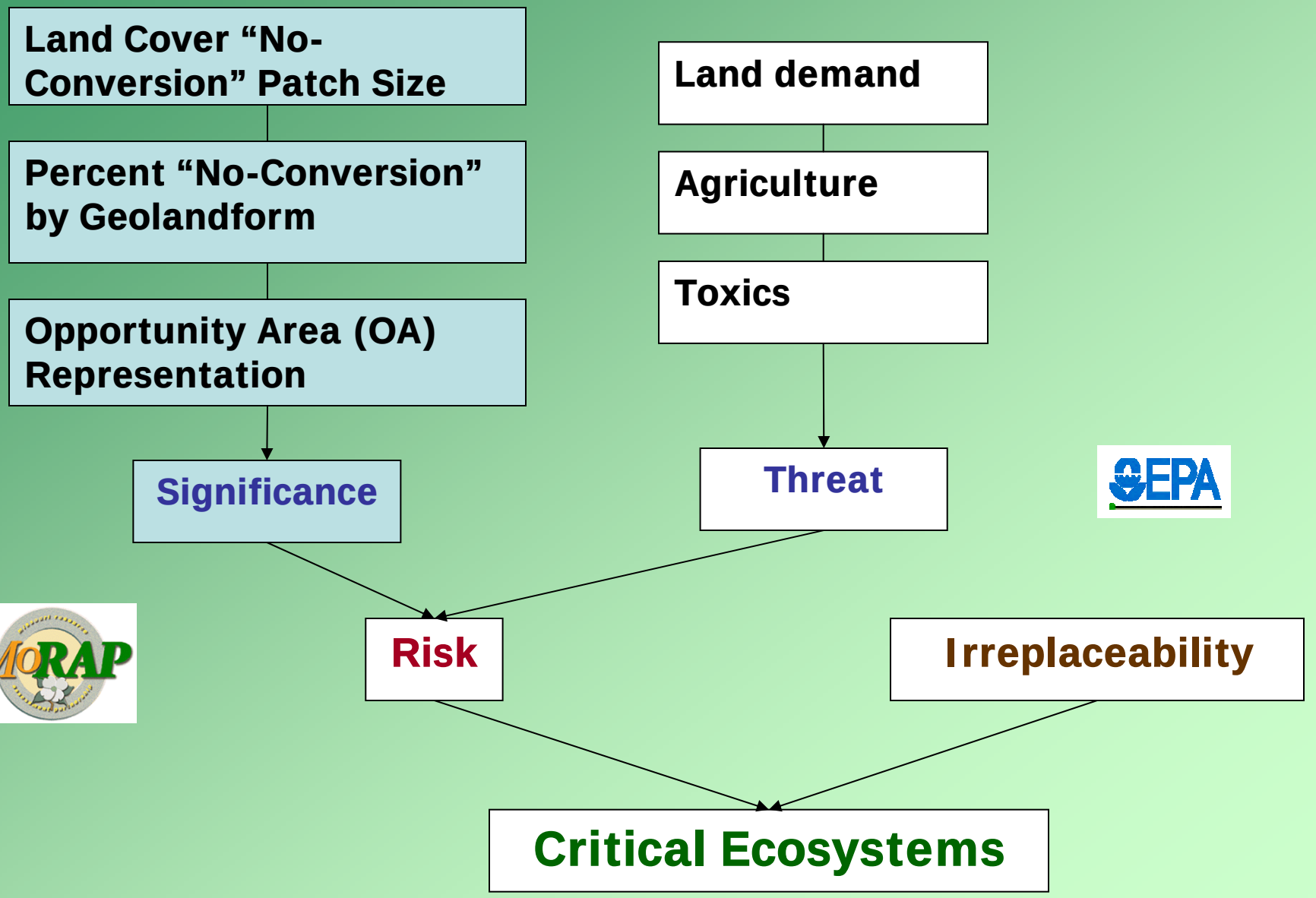
Final Ecological Significance Data Layer

Large patches of "no-conversion" land cover
+
Low % of "no-conversion" in a geolandform
+
Large Opportunity Areas

High Significance



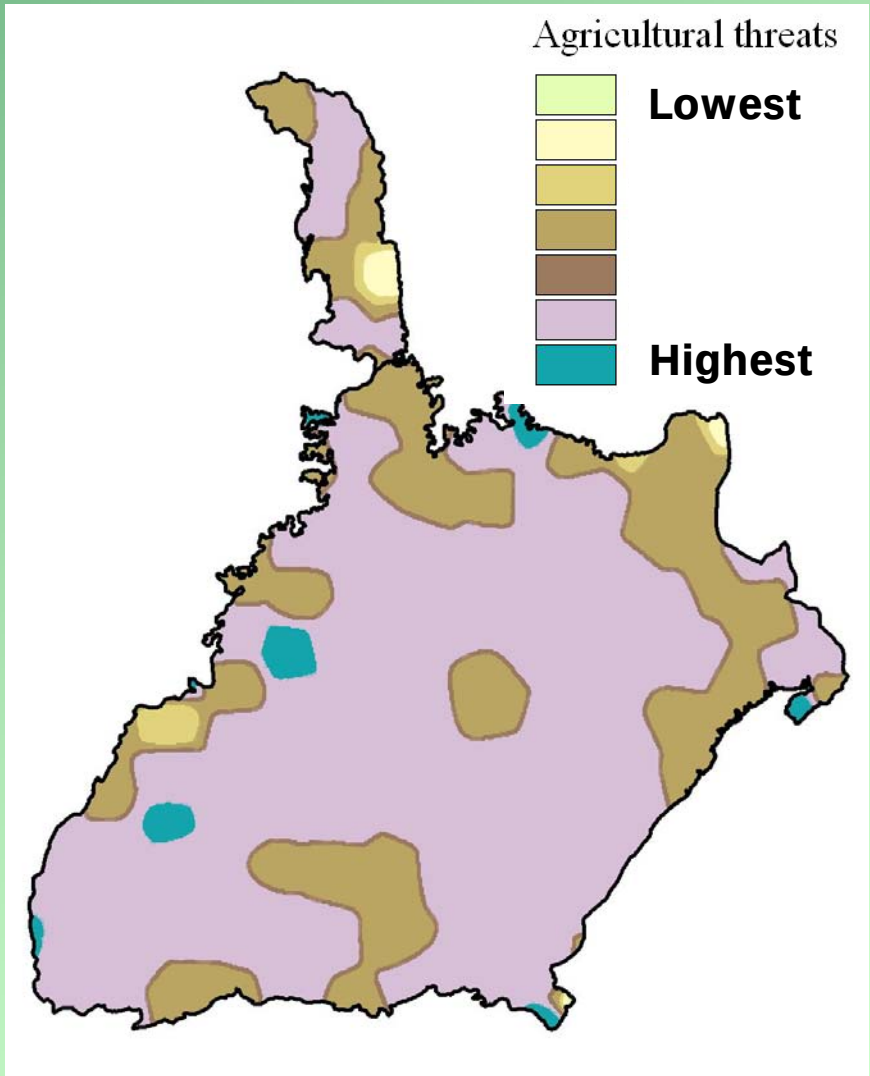
Defining Critical Ecosystems



Ecological Threats (EPA data layers)

Agricultural Threat

- Threat of conversion of semi-natural vegetation to rowcrop agriculture
- Used 1992 and 1997 county agriculture census
  - (area of cropland 1997) – (area of cropland 1992)
  - Smoothed over a county centroid



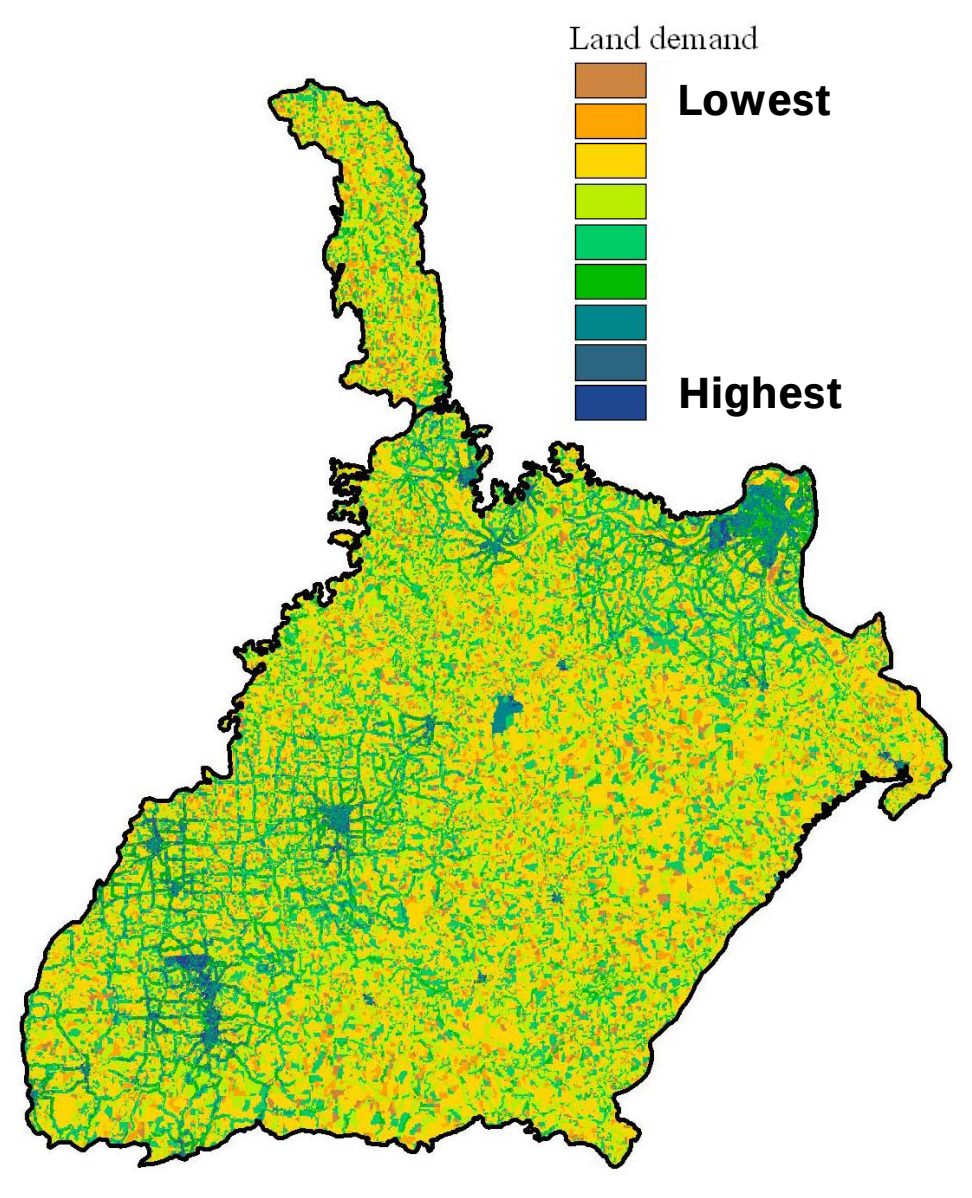
Ecological Threats (EPA data layers)

Land Demand

- **Sum of 2 scores**

  1) Population density change by census block (1990-2000)

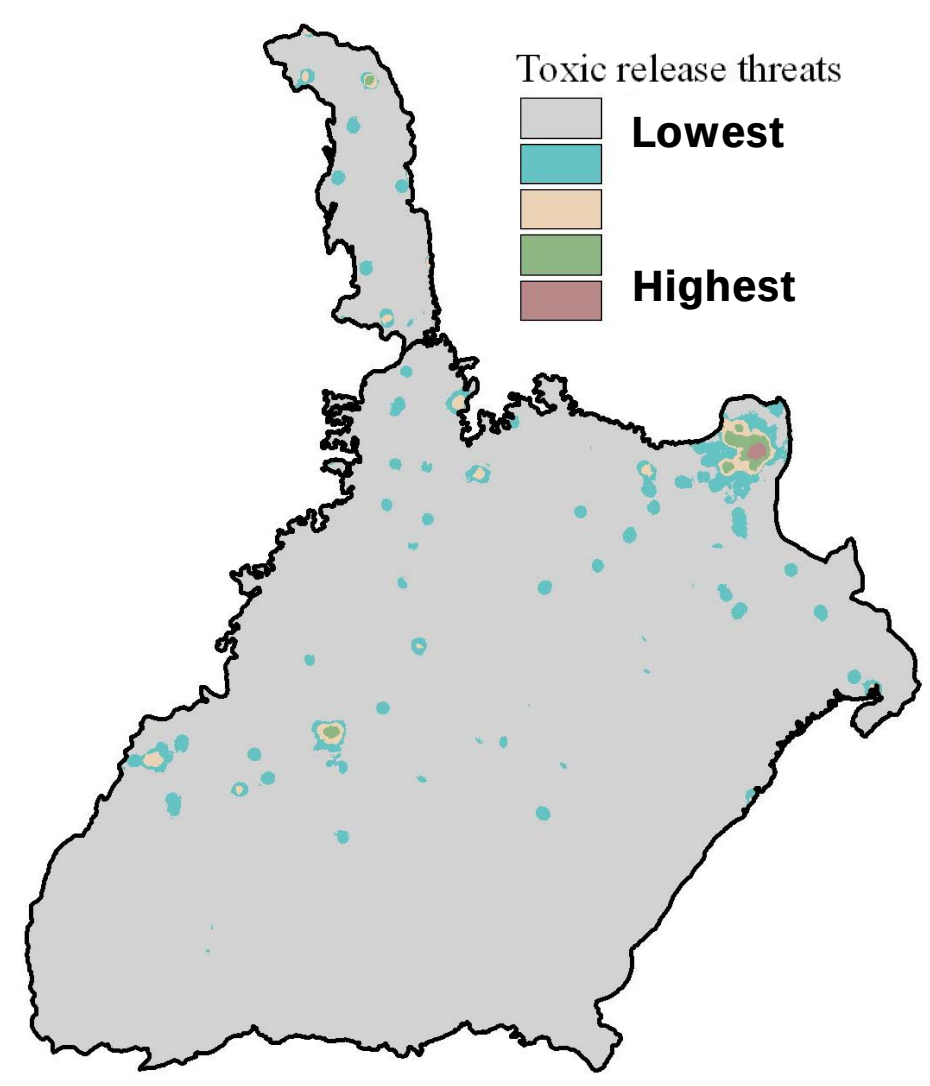
  2) Proximity to roads and urban centers



Ecological Threats (EPA data layers)

Toxic Release

- Assigned based upon proximity to known toxic release sites
- Known sites were scored 1-10 and pixel values were assigned using neighborhood analysis



Ecological Threats (EPA data layer)

Final Ecological Threats Data Layer

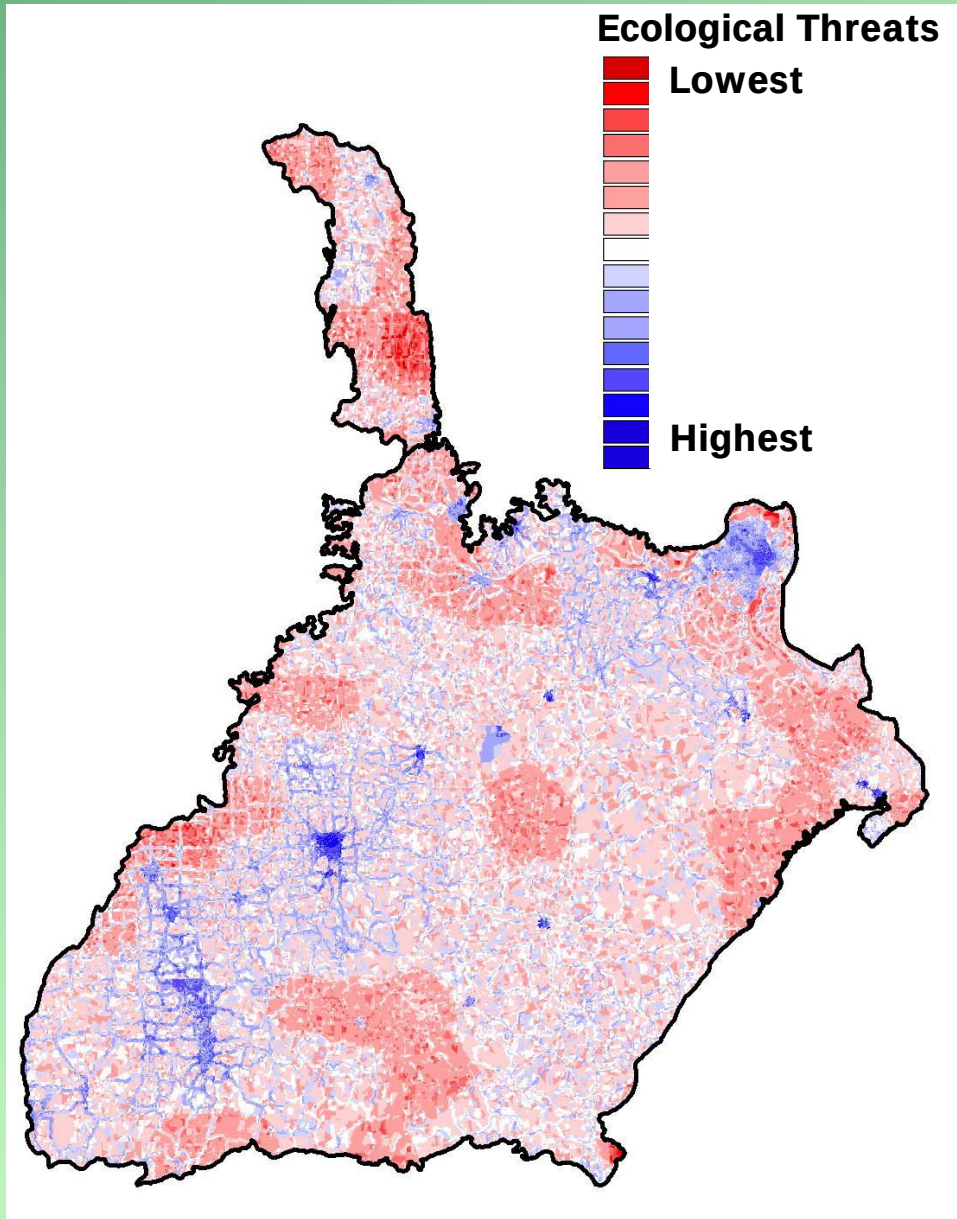
Agricultural Threat

+

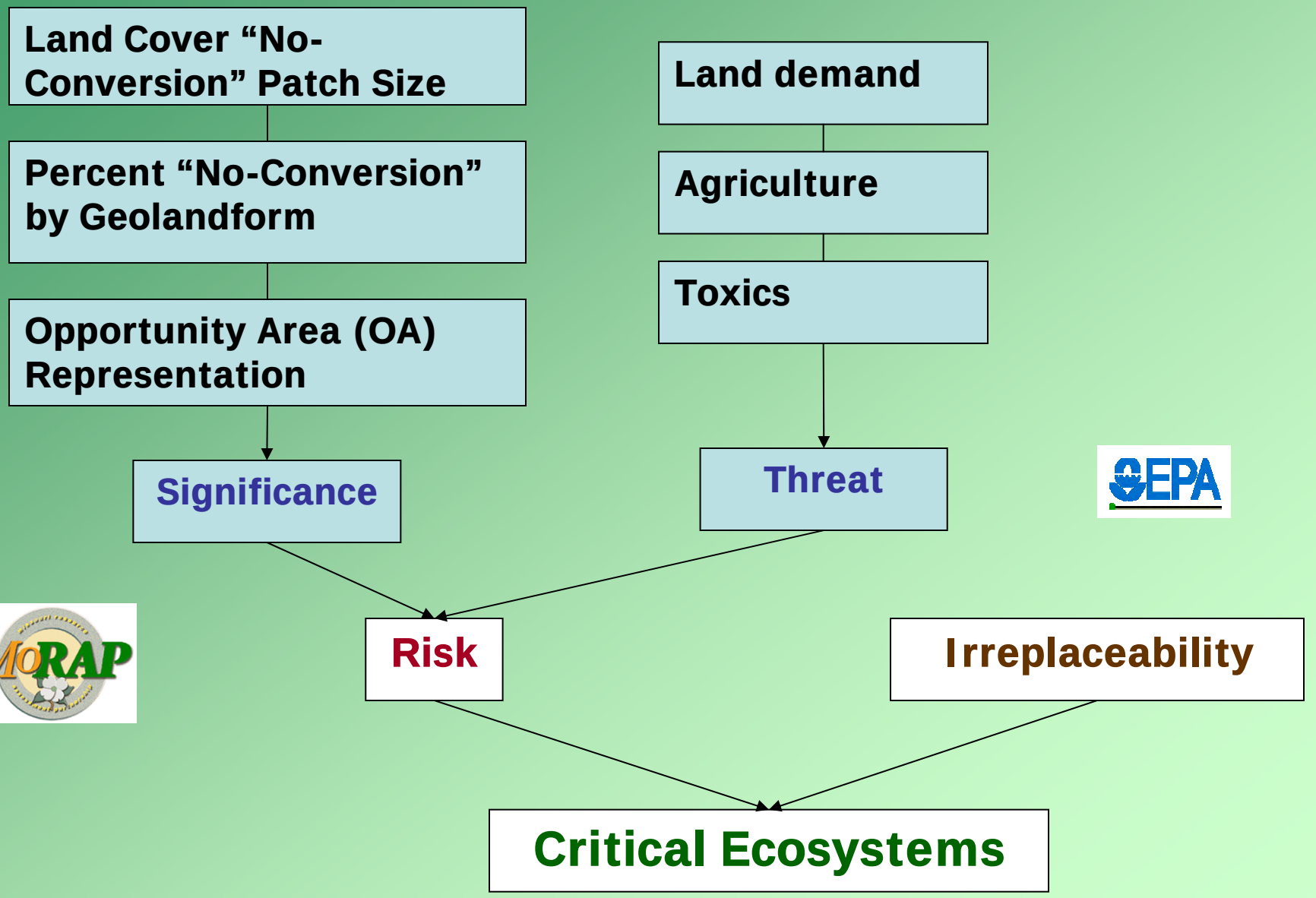
Land Demand

+

Toxic Release Threat



Defining Critical Ecosystems

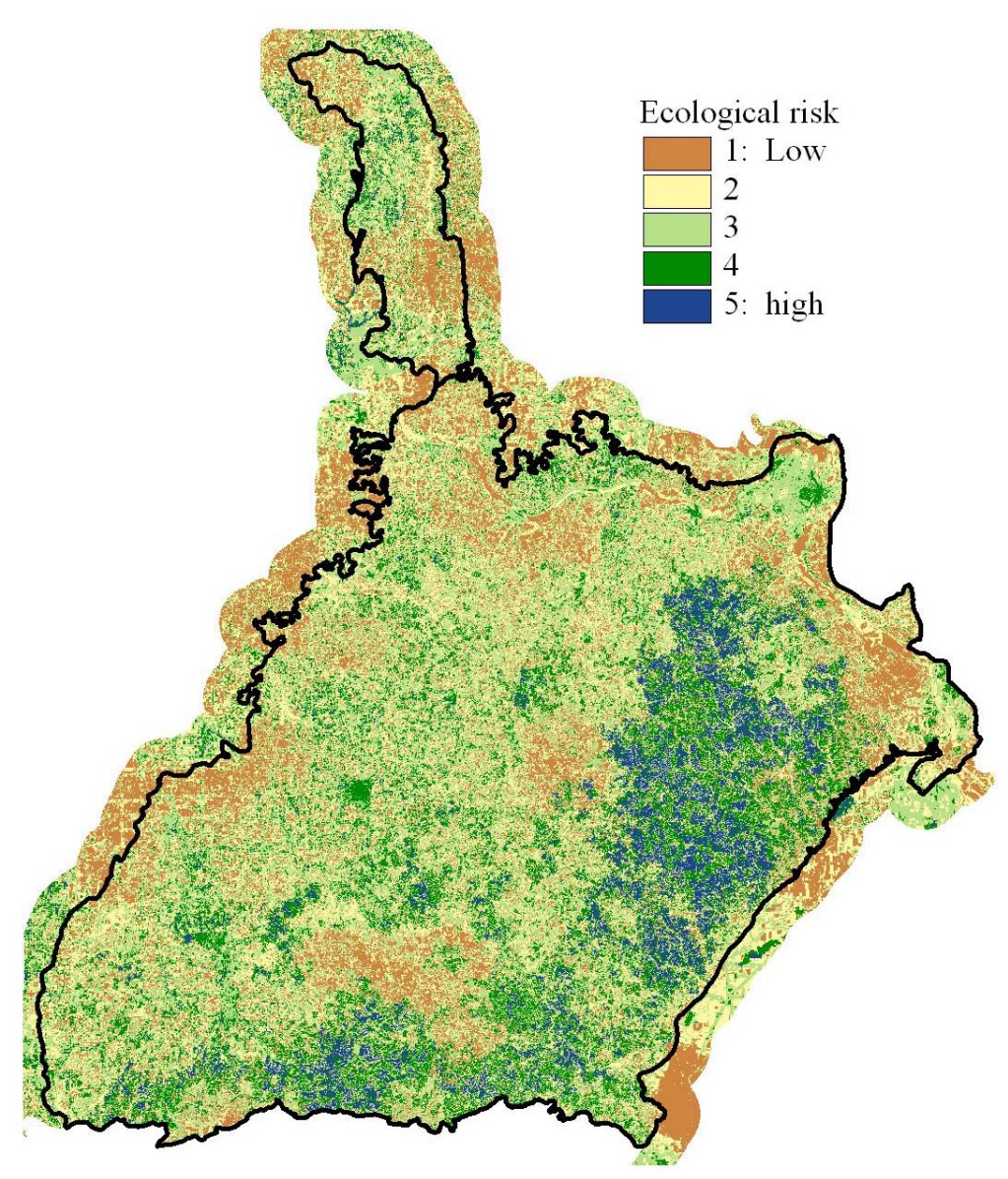


Ecological Risk

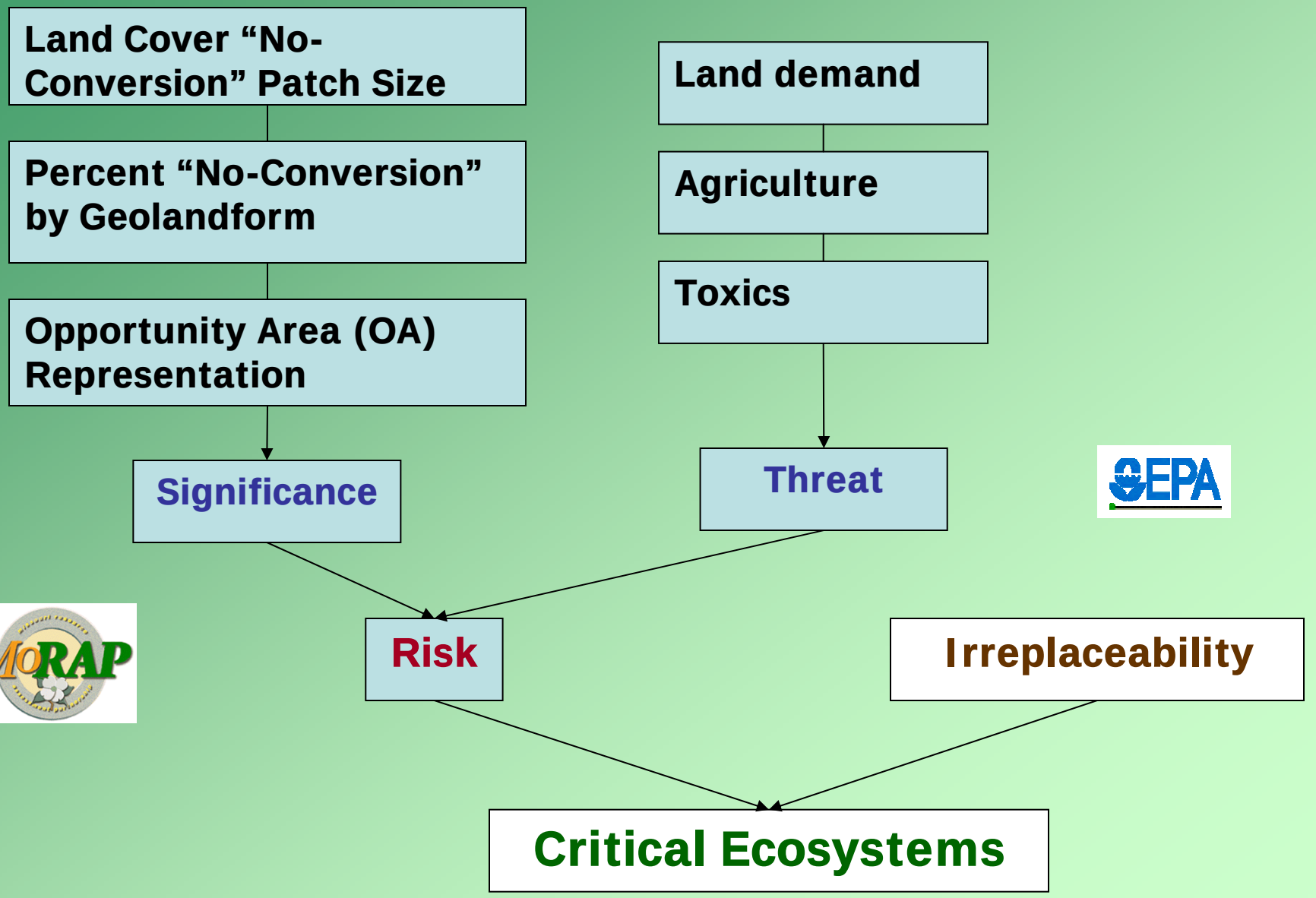
- **Sum of significance and threat for each 30m pixel**

High Ecological Significance
+
High Ecological Threat

High Risk



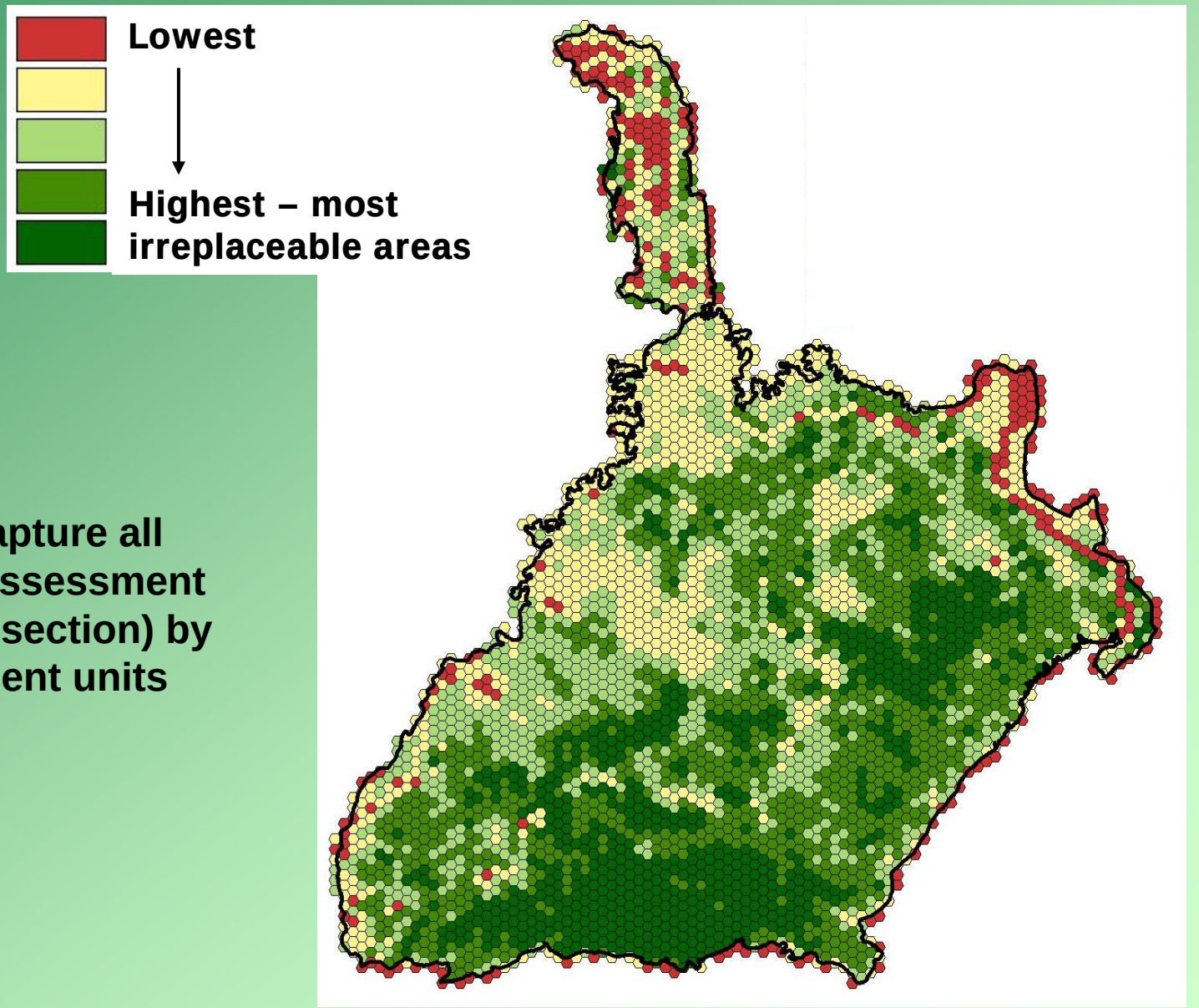
Defining Critical Ecosystems



Irreplaceability (EPA data layer)

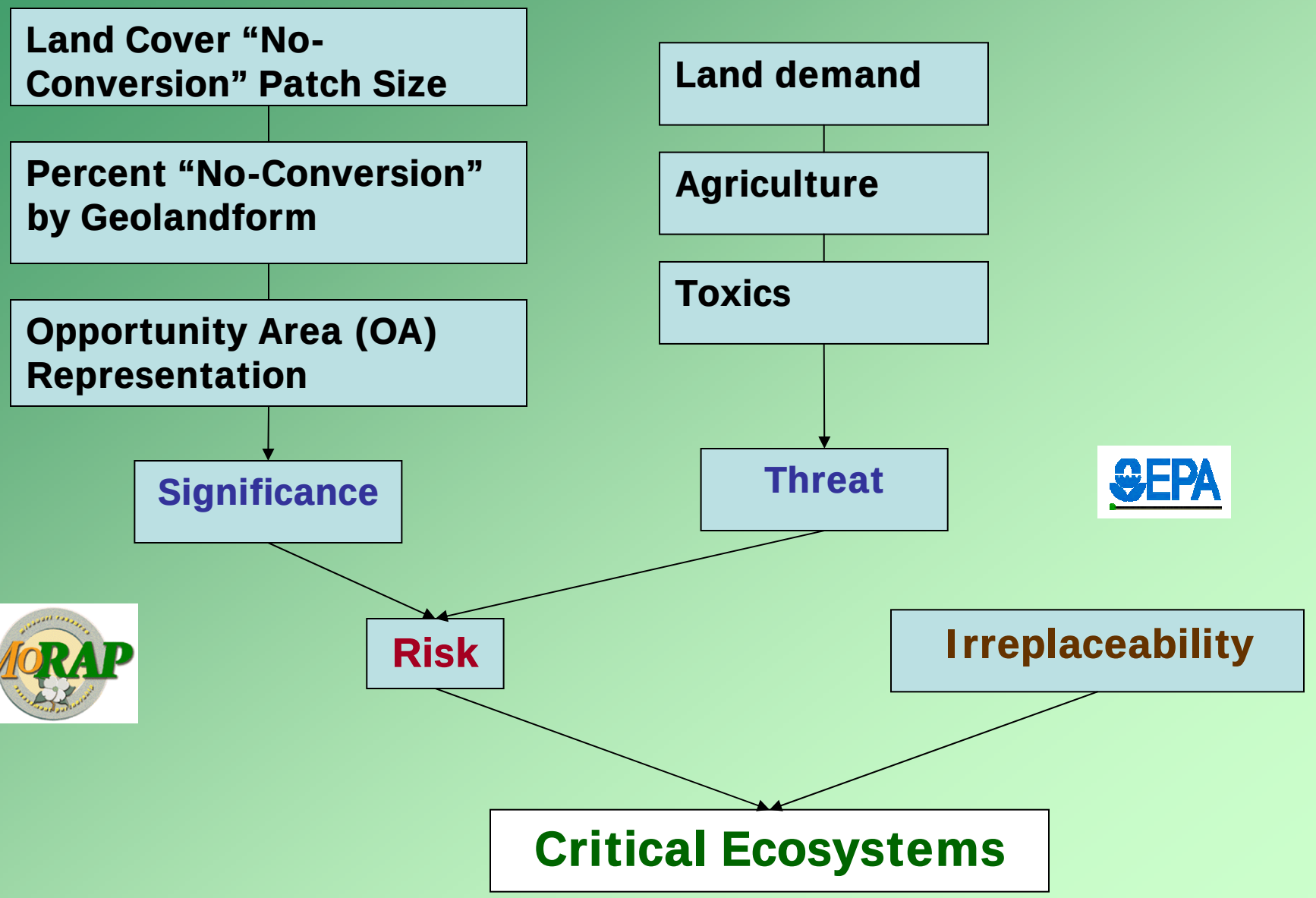
- "the likelihood that a given site will need to be protected to achieve a specified set of targets, or conversely, the extent to which options for achieving these targets are reduced if the site is not protected" (Pressey et al, 1994)
- C-Plan conservation planning software used
- Analysis ranks 40 km^2 hexagons within ecological sections
- Targets:
  - Abiotic (landforms and abiotic site types)
  - Biotic (areas of high vertebrate diversity; conservation opportunity areas)

Irreplaceability (EPA data layer)



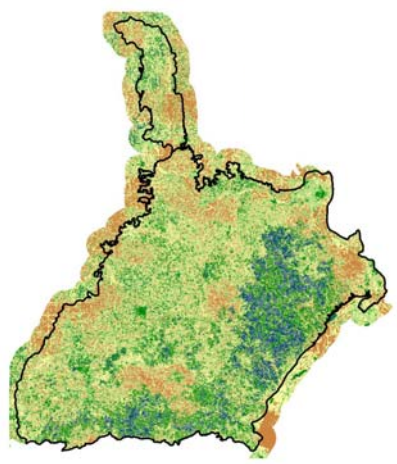
Goal: Efficiently capture all targets within an assessment region (ecological section) by selecting assessment units (hexagons)

Defining Critical Ecosystems

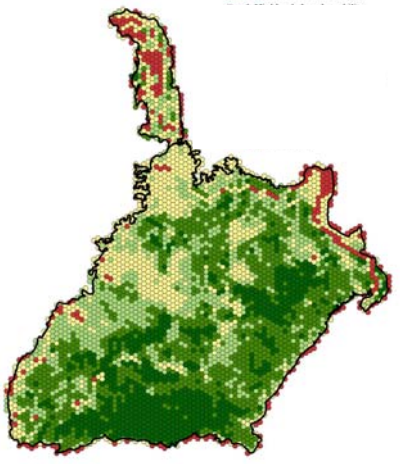


Critical Ecosystems

- **Defined by overlaying results from Ecological Risk and Irreplaceability Assessments**



+



- **3 Definitions:**

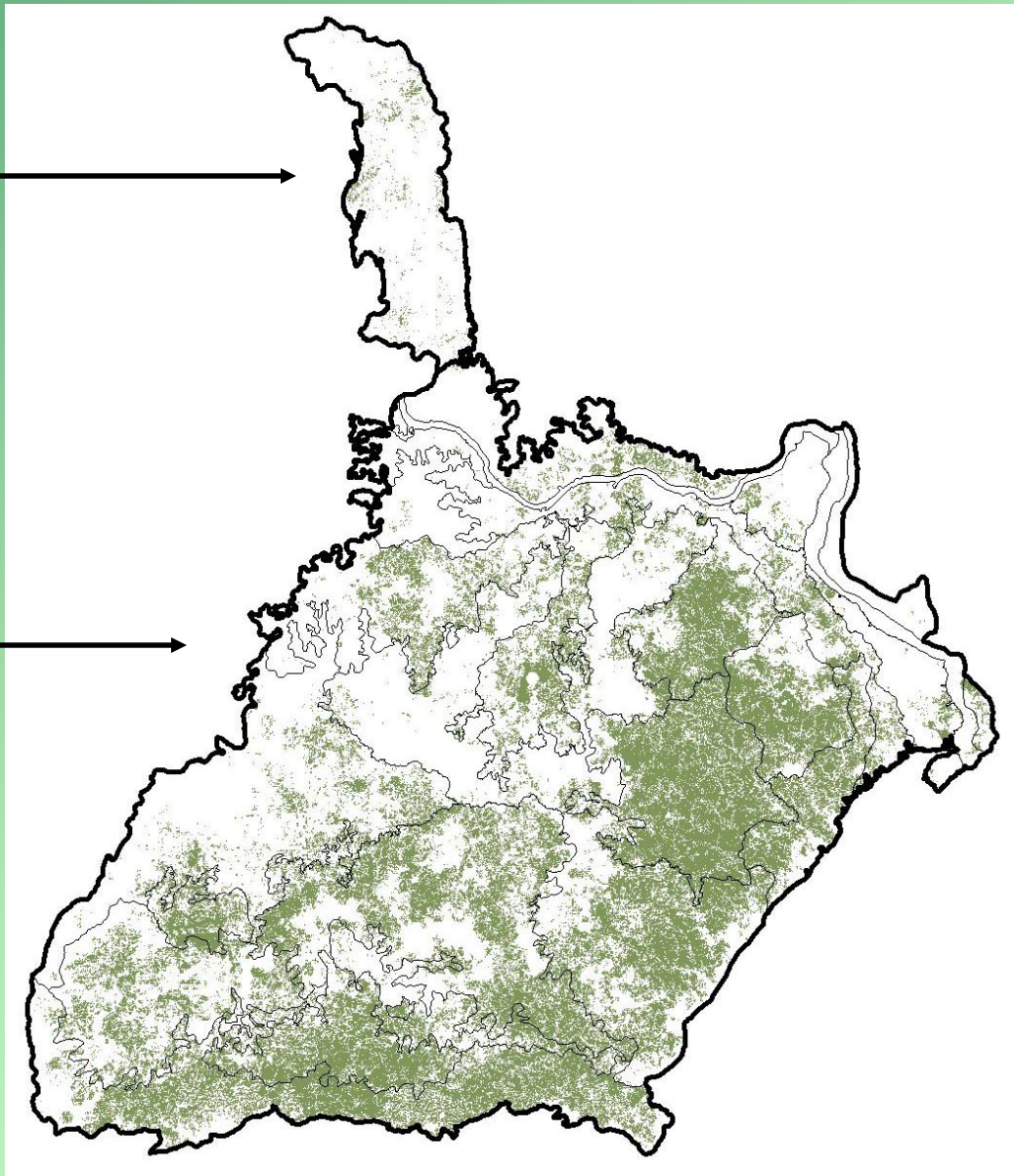
High Ecological Risk
+
Any Irreplaceability values

Med, High, or Very High Risk
+
High Irreplaceability

Med-High Risk
+
Med, High or Very High Irreplaceability

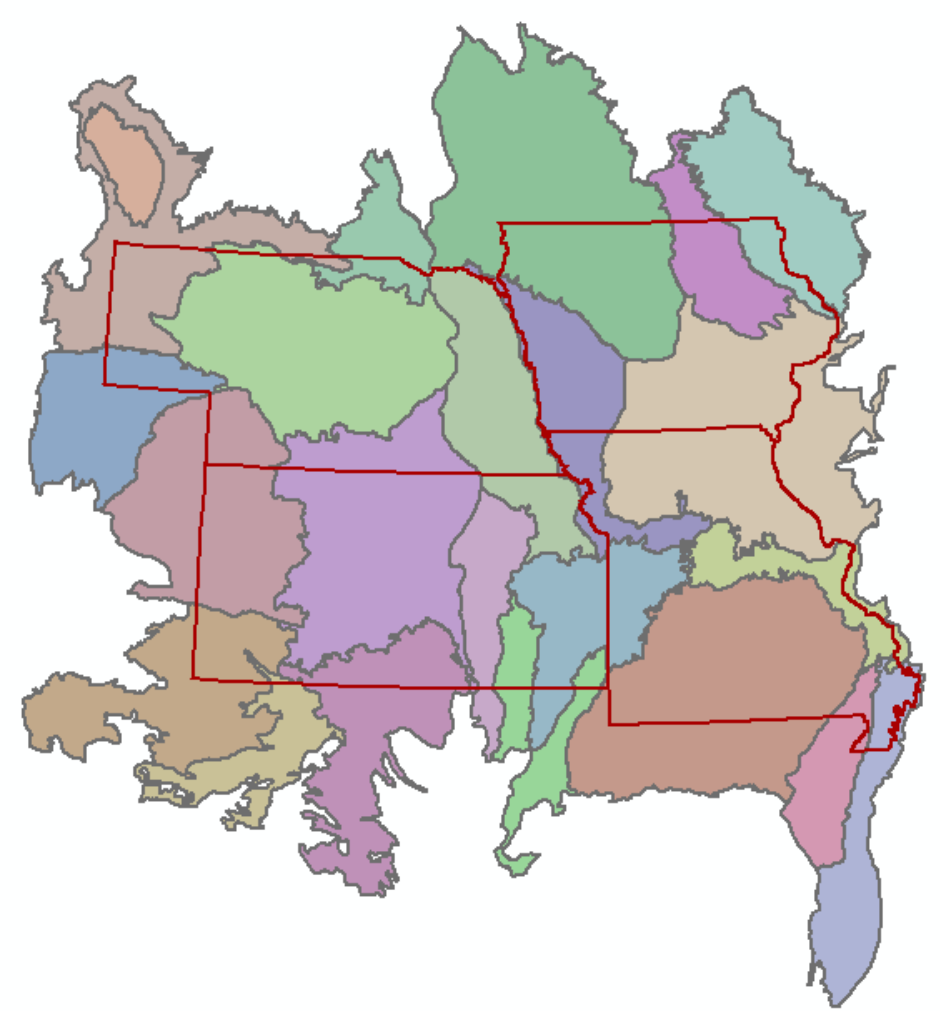
Critical Ecosystems

- **4.4% of the Chariton River Hills subsection**
  - **Primarily forested hills and breaks in the east and northeast**
  - **Primarily forested bottomlands in the southwest**
- **32.9% of the Ozark Highlands section**
  - **Heavily forested areas in south and east**



What's Next?

- MoRAP is currently expanding this pilot study (with some modifications to the Significance data layer) to include 23 ecological sections that fall within EPA Region 7



- Final Critical Ecosystem Assessment to be completed in fall 2005

Project Contacts

MoRAP (www.cerc.usgs.gov/morap)

David D. Diamond
David_Diamond@usgs.gov

Robbyn J.F. Abbitt
Robbyn_Abbitt@usgs.gov

C. Diane True
truecd@missouri.edu

EPA Region 7 (www.epa.gov/region7)

Walt E. Foster
Foster.Walt@epamail.epa.gov