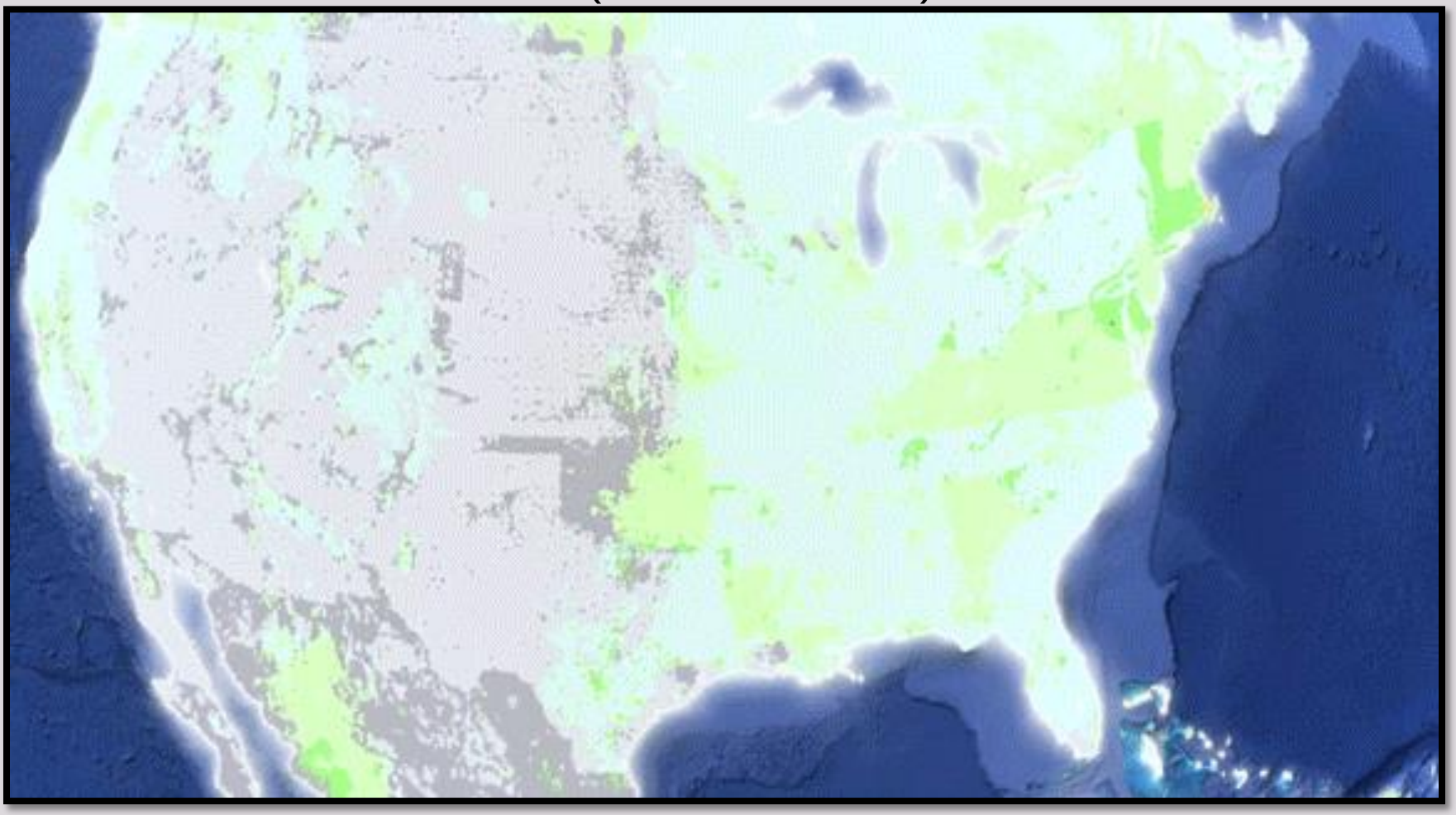
Civil airports from a landscape perspective: a multi-scale approach

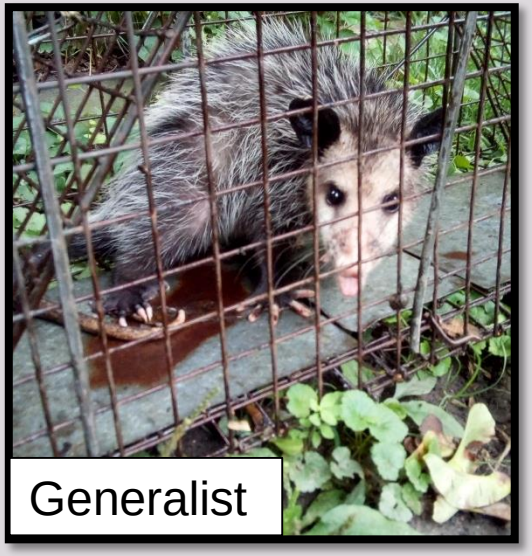
Morgan B. Pfeiffer, Jason D. Kougher, and Travis L. DeVault

Land use change (Ellis et al. 2010)



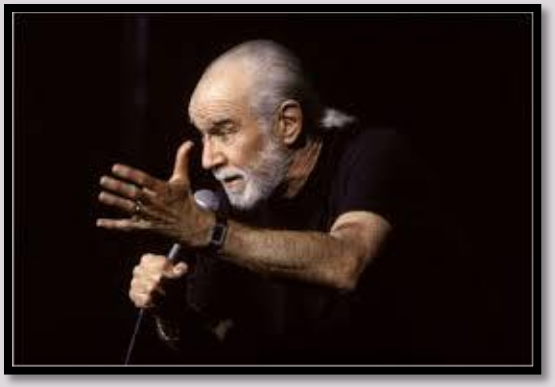
Land use change benefits **generalist** species

- Abundance of food
- Increased edge habitat
- Landscape diversity

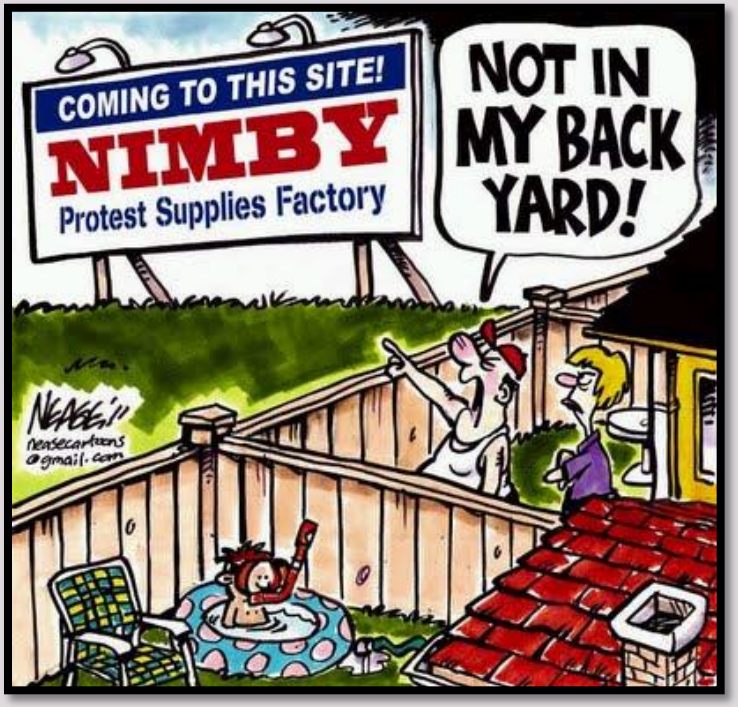

Generalist


Specialist

Airports are locally **unwanted**



- Close enough to cities
- Urban-rural interface
- Water and crops



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The issue: bird strikes

- Human safety
- $229 million estimated direct and indirect losses

  (Dolbeer et al. 2015)
- Increase in strikes outside the airport boundary

  (Dolbeer et al. 2011)
- Fewer mitigation options outside the airport

What species are involved in strikes?

- Some high-hazard species prefer **managed turf** over mature grassland (Blackwell et al 2013)
- Waterbirds and raptors (DeVault et al. 2016)




How does the landscape matrix influence the bird strike rate?

Predictions:

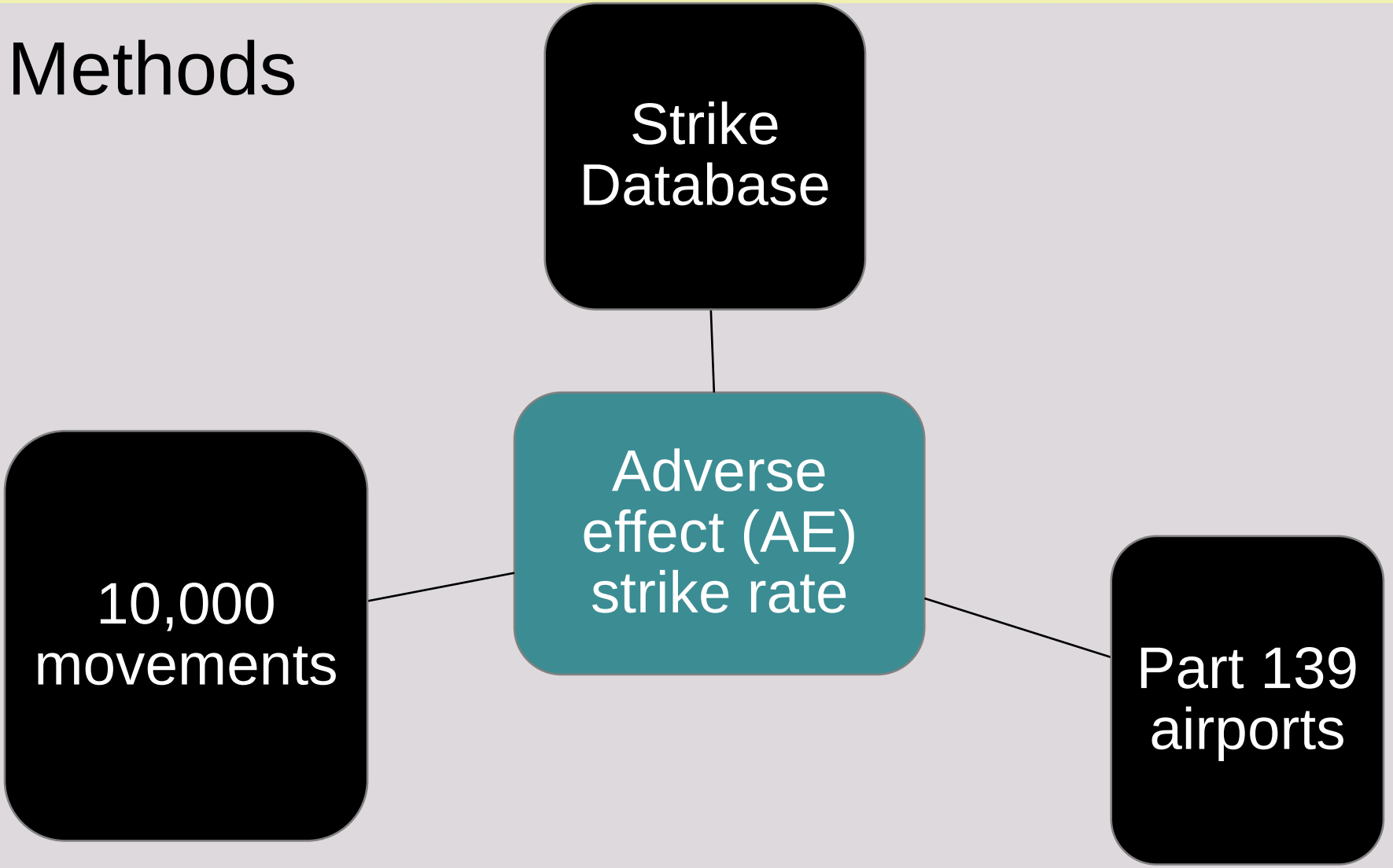
1. The influence of landscape will differ based on spatial scale.

2. Larger distances between resource patches will result in lower strike rate.

3. Increases in edge habitat will increase the strike rate.

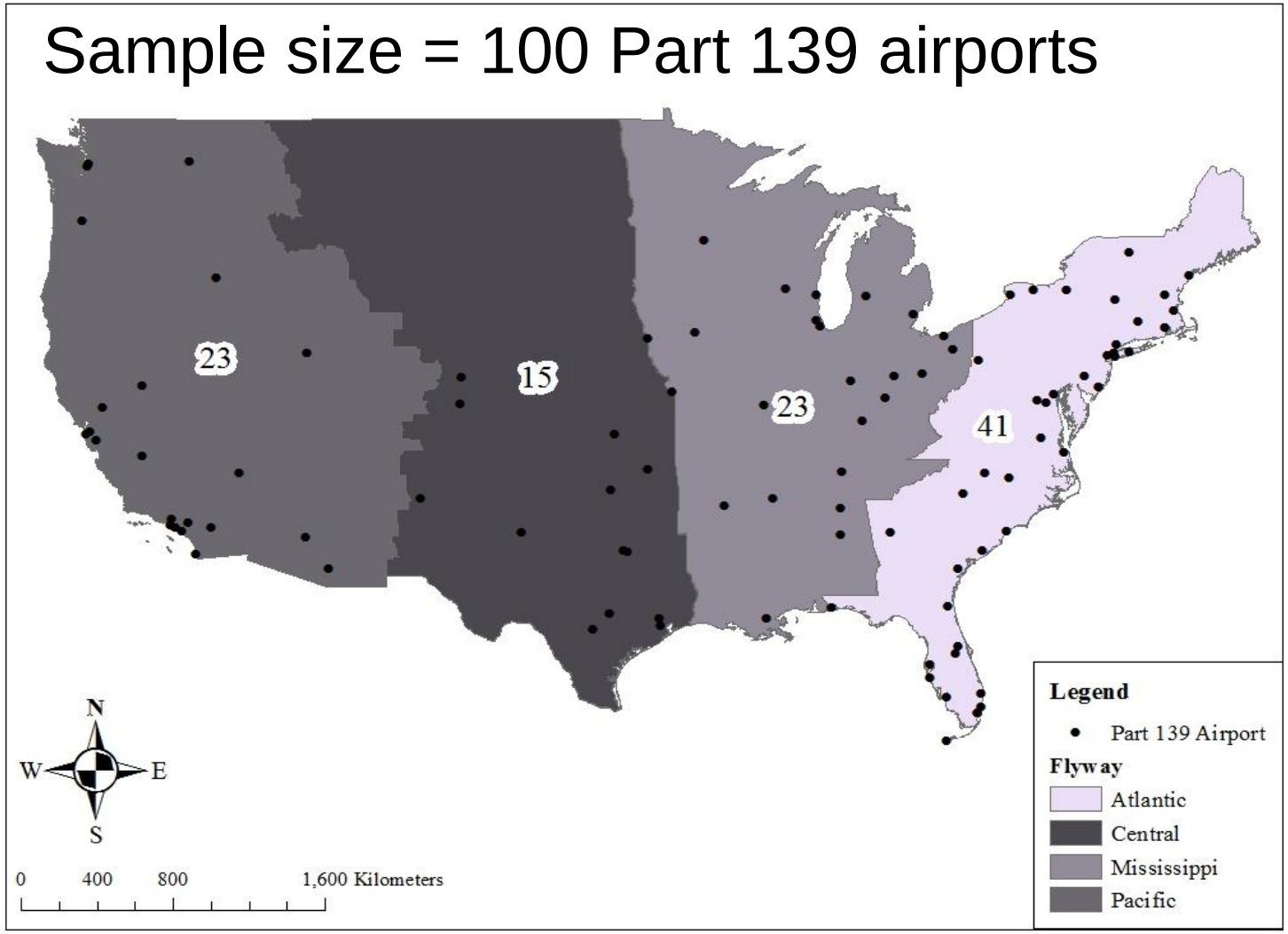
4. Landscape diversity will increase the strike rate.

Methods



Dolbeer 2015

Sample size = 100 Part 139 airports



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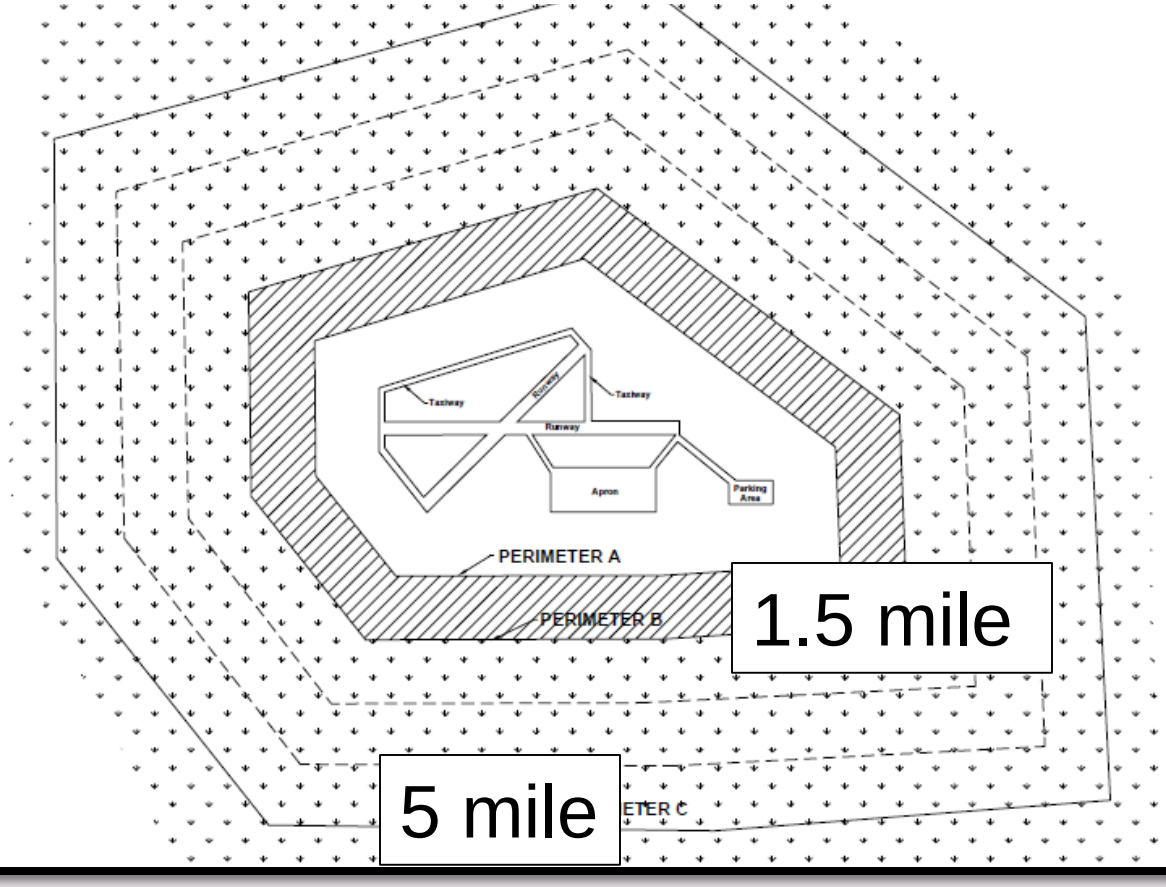
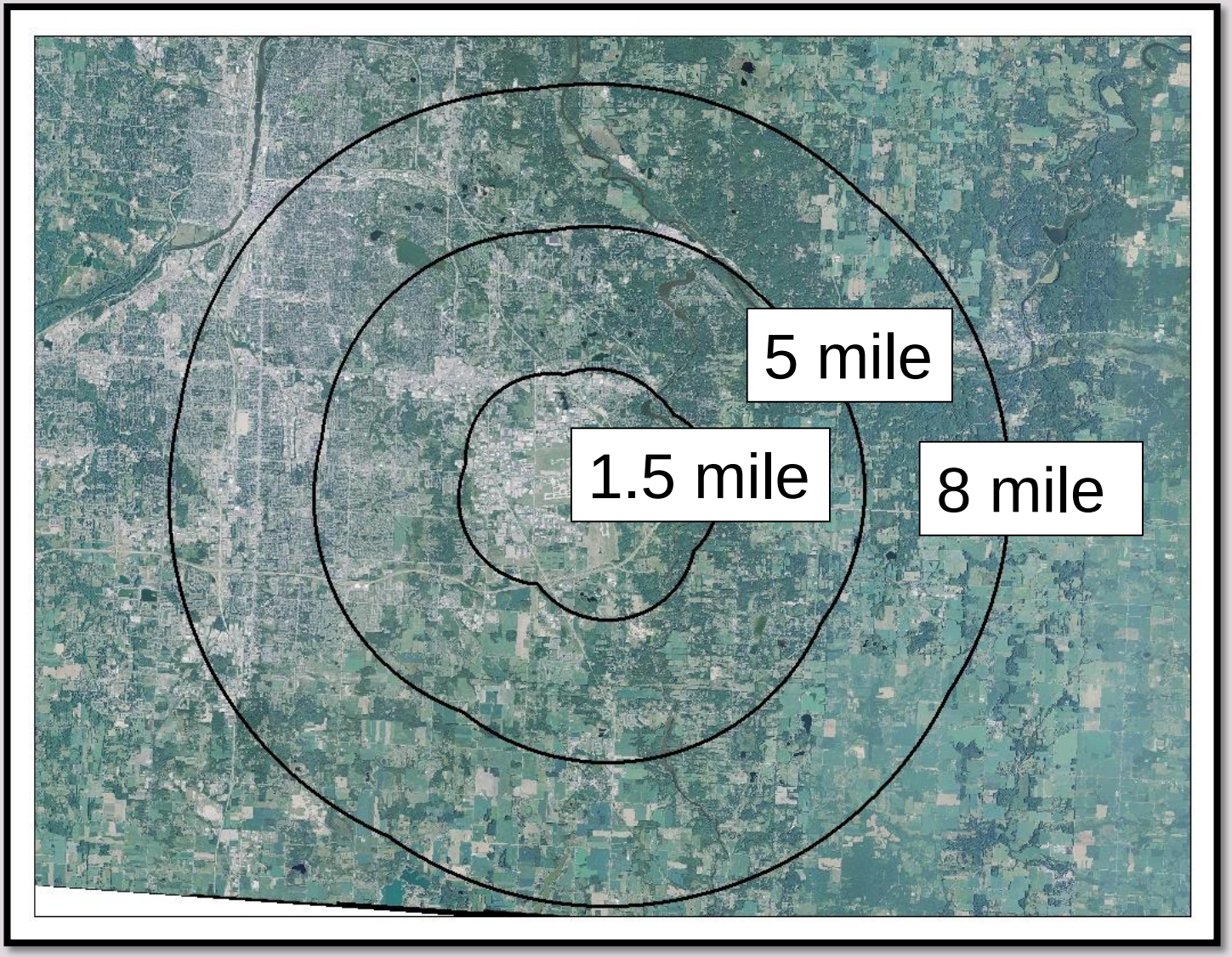
Multi-scale approach

ICAO: 8 mile

FAA Advisory Circular 150/5200-33B





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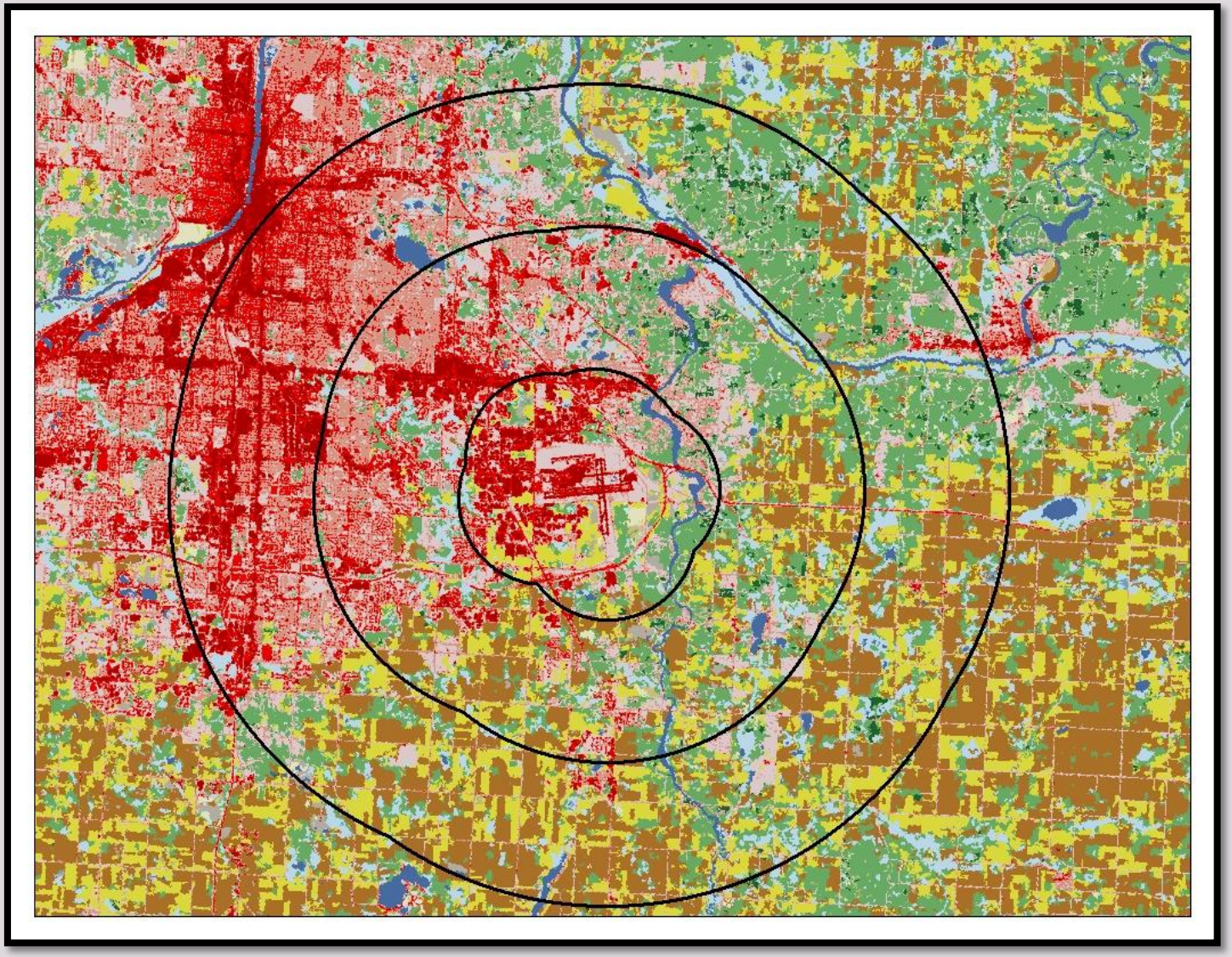

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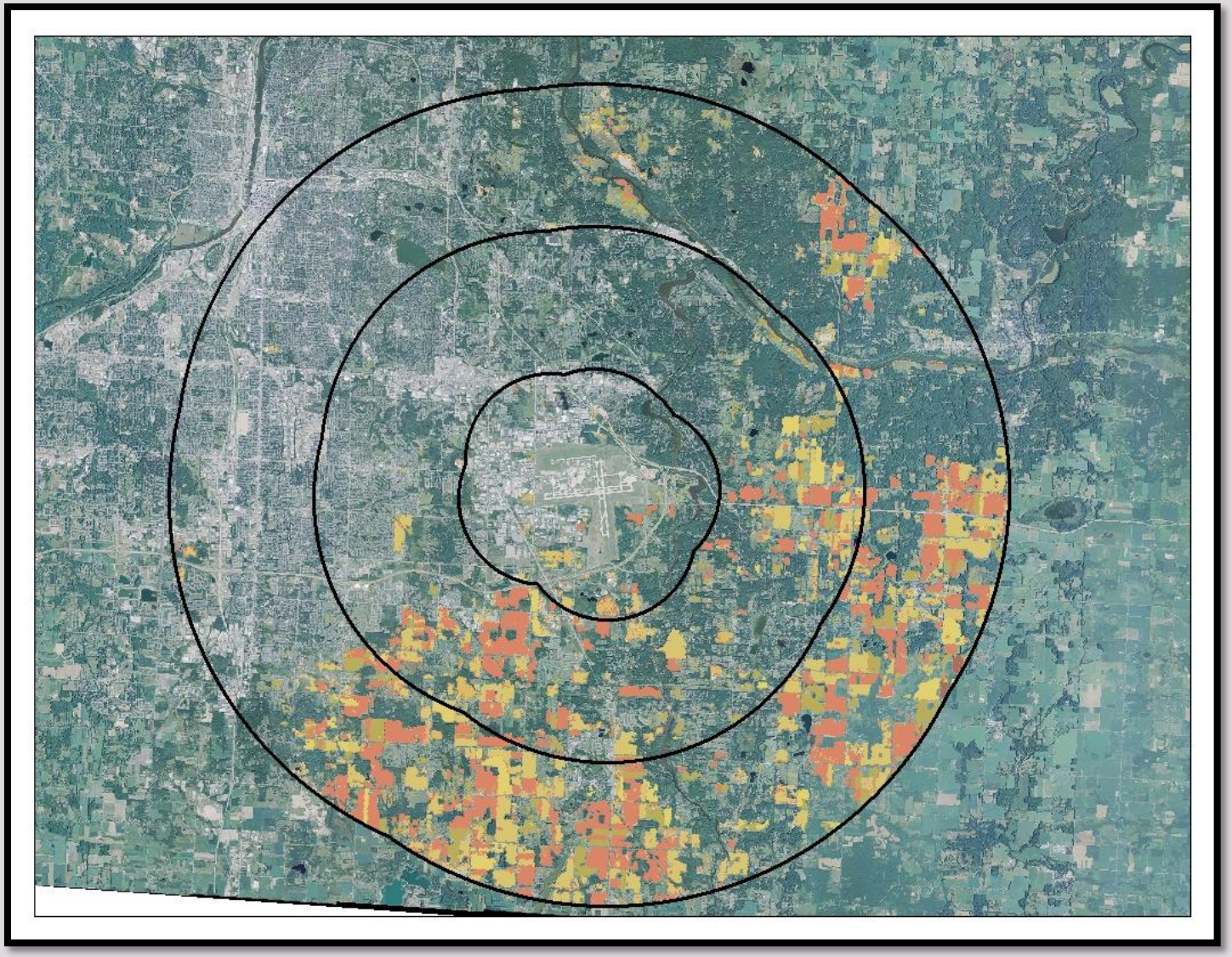

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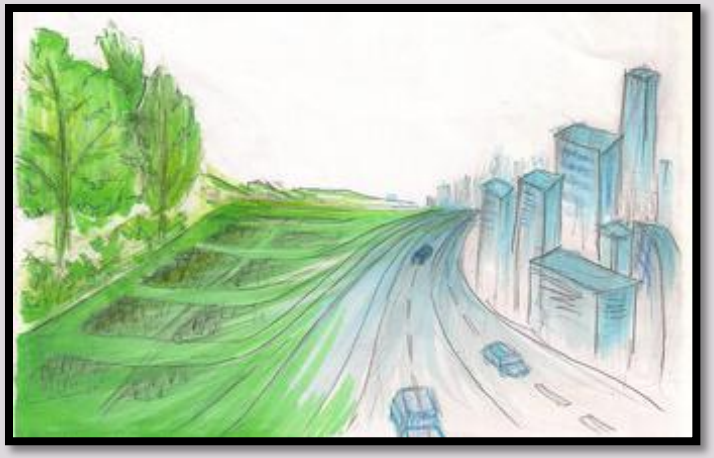
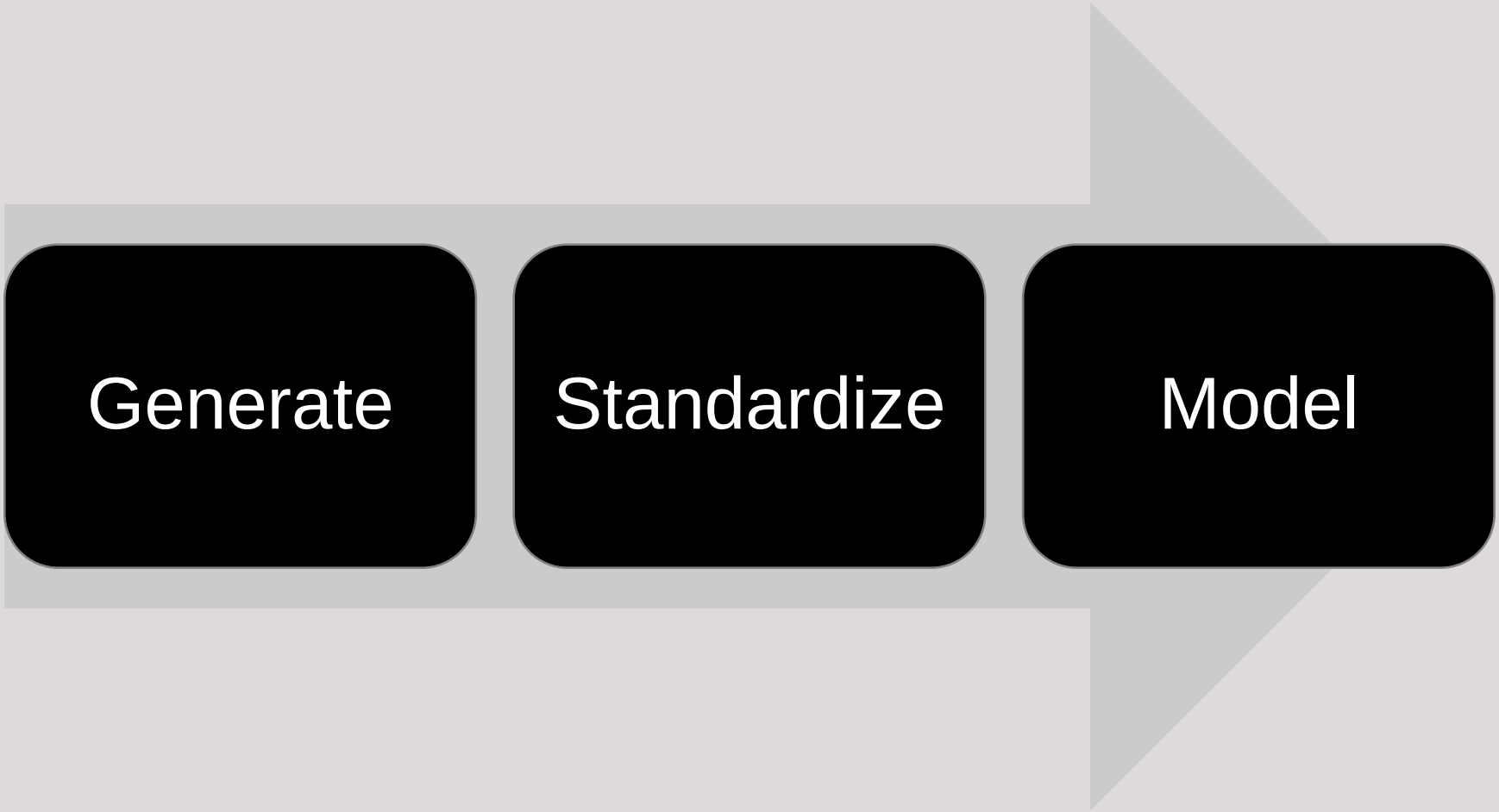
Landscape variables



- Landscape-level
  - Diversity index
  - Crop diversity

- Class-level **crop, water, wetland, open space**
  - Number of patches
  - Patch percentage of landscape
  - Distance from other patches
  - Total edge of patch

Statistical Analysis



Species	Number of AE strikes
Red-tailed hawk	110
Canada goose	72
Rock pigeon	63
Turkey vulture	52
European starling	50
Mourning dove	49
Mallard	48
Black vulture	30
Ring-billed gull	30
Herring gull	28
Northern pintail	28

Results

- 1.5 mile

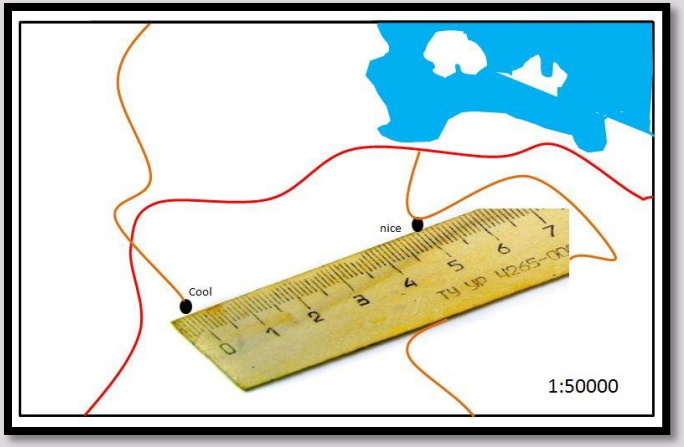
  Model support = 73%

- **5 mile**

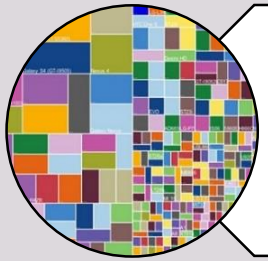
  Model support = 59%

- 8 mile

  Model support = 73%



Significant predictors



1.5 mile

- Increased landscape diversity
- Increased crop area/edge

↑ strikes

5 mile

- Increased wetland patch/edge
- Increased crop area/edge
- Increased water patch/edge

↑ strikes

8 mile

- Increased water distance

↓ strikes

- Increased crop area/edge
- Increased wetland area/edge

↑ strikes

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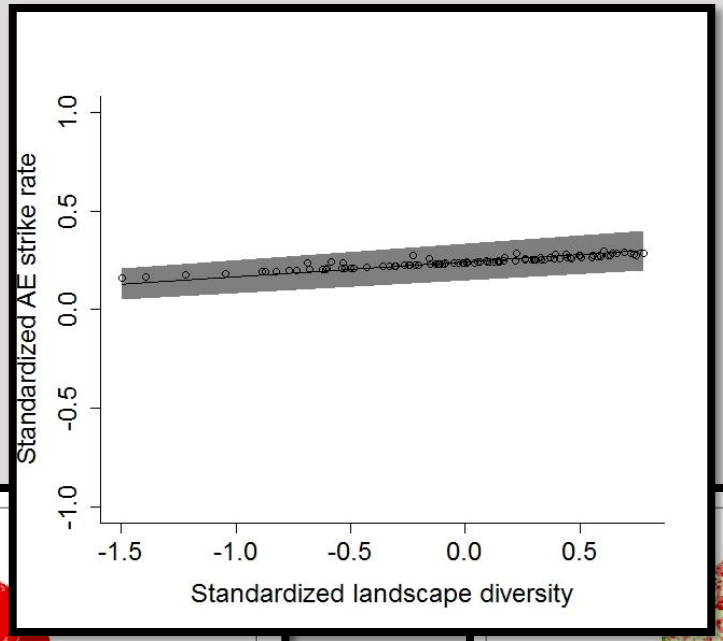
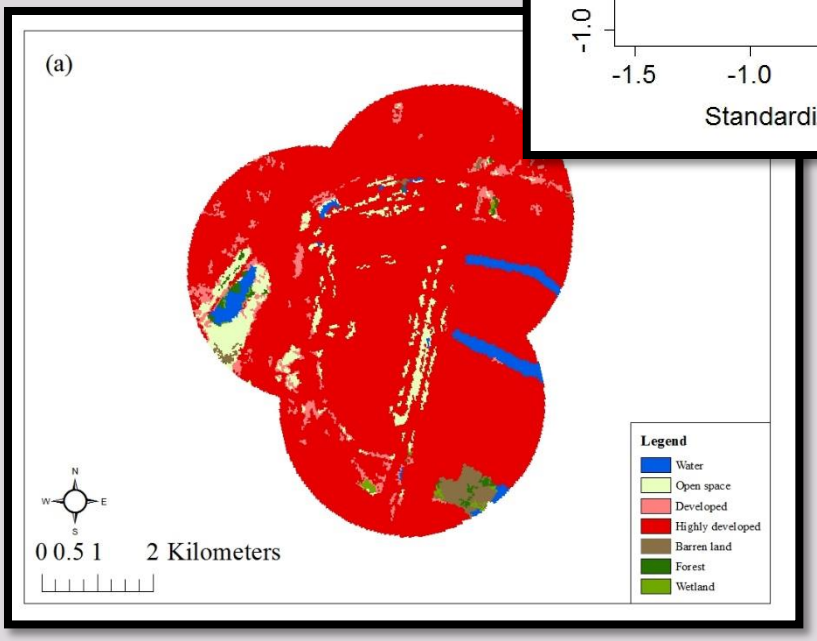
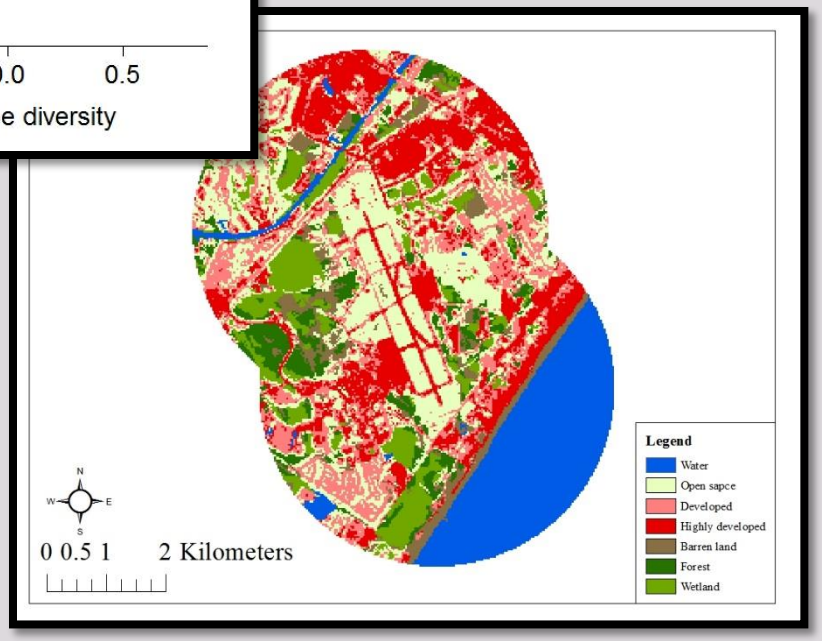
Landscape diversity 1.5 mile







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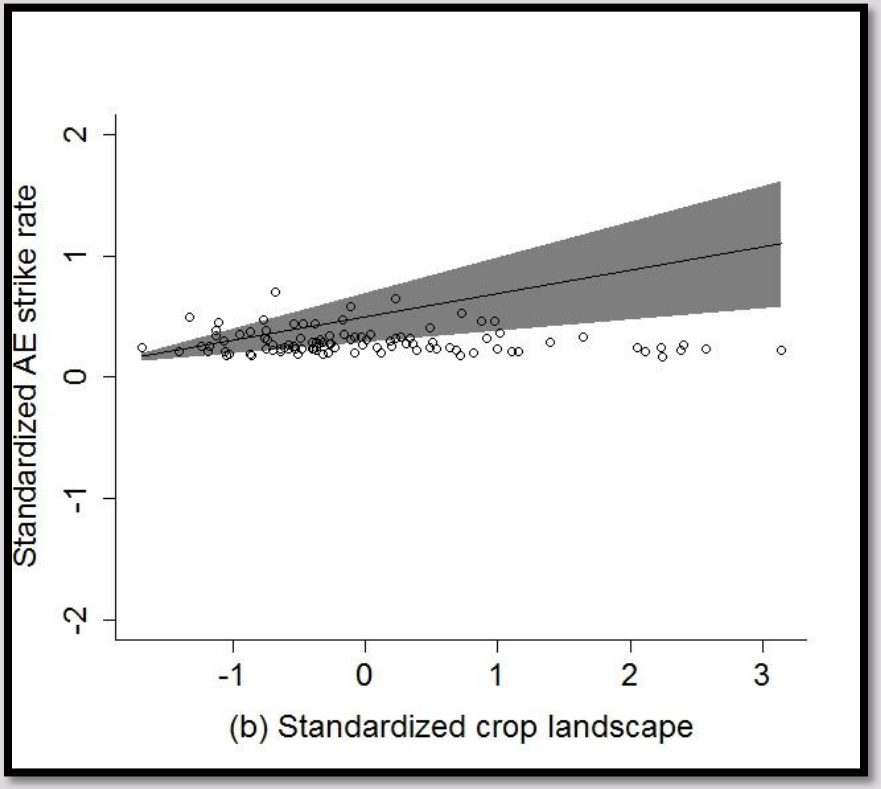
Crop area/edge (All distances)

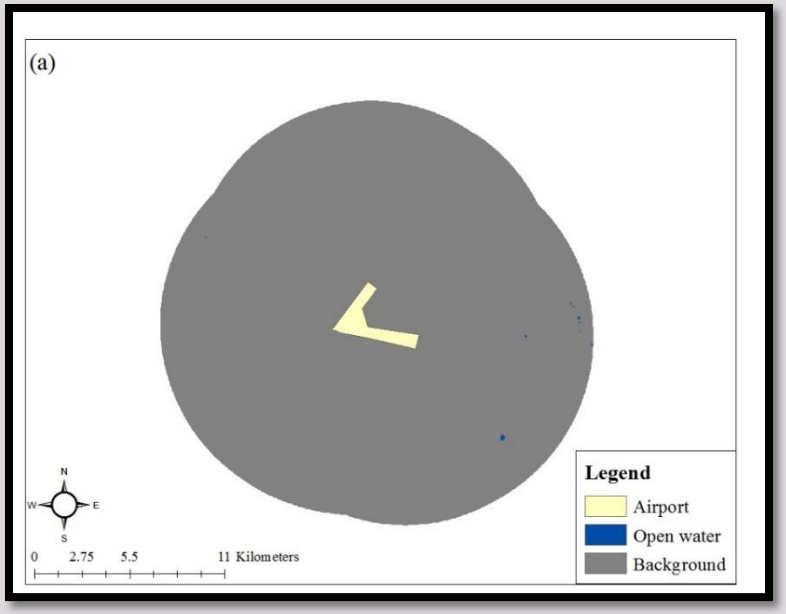


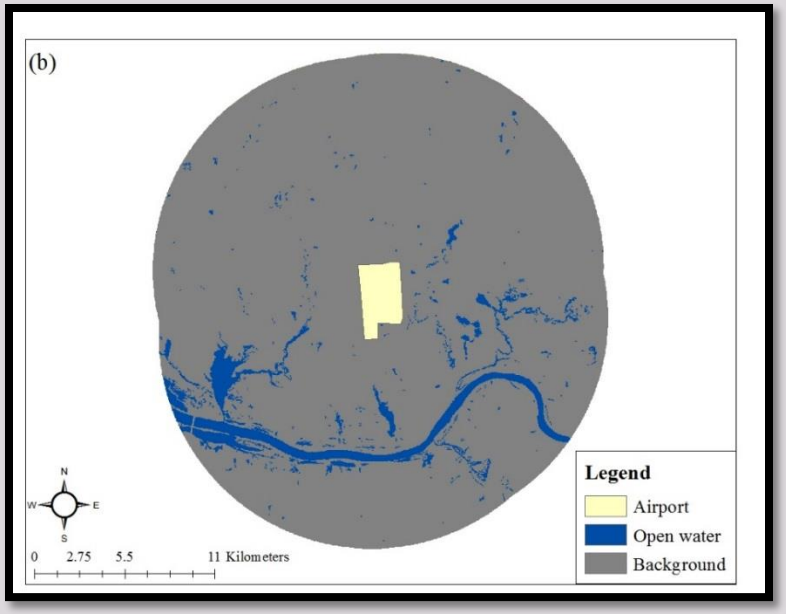
- All cultivated crop
- Slight trend with corn
- Crop diversity not important at this scale

Aquatic habitat 8 mile

Number of wetland and water

Distance between water (Blackwell et al 2008)





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Limitations

- Snapshot of land use (2011)
- Crop rotations

Recommendations

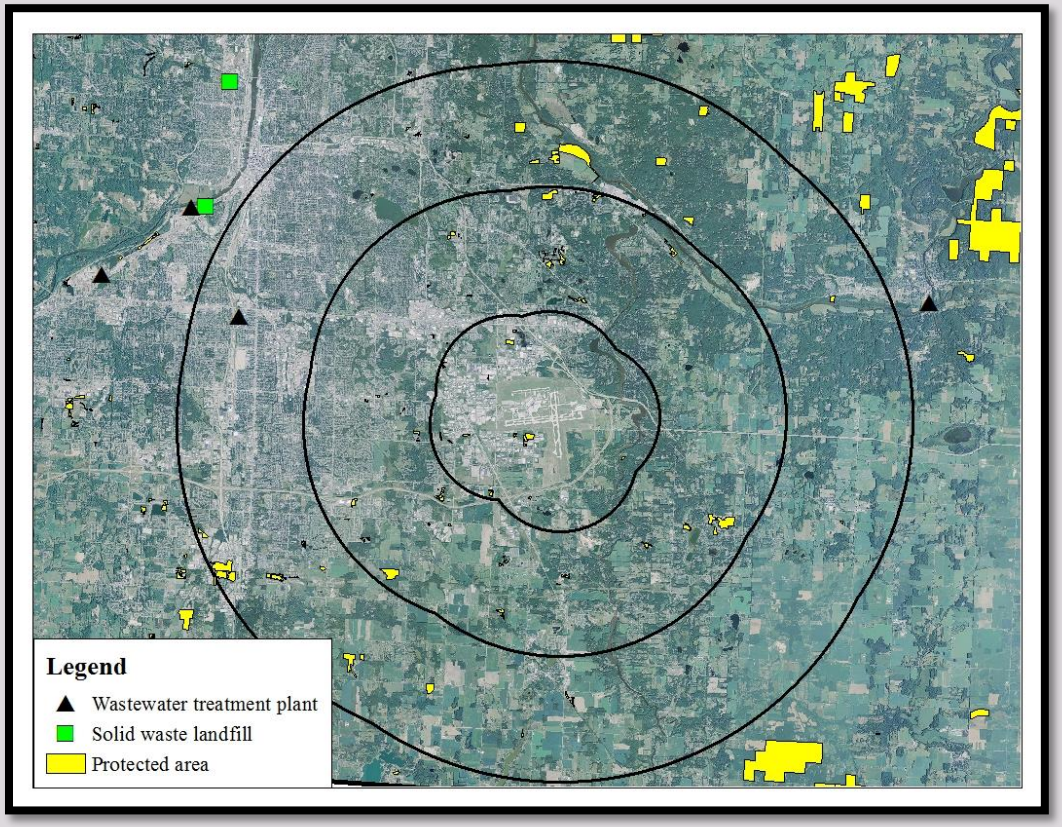
- Land use important at 1.5, 5, and 8 mile
  - Regulators look out to 8 mile
- Water, wetland, and crop attractants
- Distance between water patches
  - Focus on the 8 mile scale

- Use in conjunction with other mitigation
- Tool for collaboration

Future research

- Specific wildlife attractants

- Crop types



Acknowledgments

- FAA for funding

- Experimental design: Jenny Washburn, Richard Dolbeer, Phyllis Miller, Brad Blackwell, and Thomas Seamans

- Office support: Betsy Poggiali

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Questions?

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