

# Advances in landscape ecology: exploring ecosystem function in a landscape context

Margie Mayfield  
University of Queensland



# Landscape ecology

1. Population level processes
2. Biogeochemical processes
3. Biodiversity in human-altered landscapes

# Ecological function & landscape structure

- How do ecological processes vary across heterogeneous landscapes?
- What aspects of landscape structure impact ecological processes?
- Key Advances:
  - Larger datasets
  - Collaborative meta-analysis
  - Cross-discipline projects
- Important future directions
  - Data on ecological processes across landscapes

# Landscapes & Ecological Processes

- Collaborators
  - Charles Yackulic - Columbia University
  - Jason Kreitler - UC Santa Barbara
  - C. Alcazar, L. Ramirez, A. Sanfiorezo, D. C. Useche,
  - R. Kelsey, UC Davis
  - NCEAS
- Mayfield, M. M., Ackerly, D. and Daily G. C. **2006**. The diversity and conservation of plant reproductive and dispersal functional traits in human-dominated tropical landscapes. *Journal of Ecology* 94(3): 522-536.
- **Kreitler, J., Yackulic, C.** Alcazar, C., Kelsey, R., Ramirez, L., Sanfiorezo, A. Useche, D. C., DeClerck, F. Mayfield, M. M. **In Prep.** Landscape structure and the distribution of plants in Meso-American agricultural landscapes

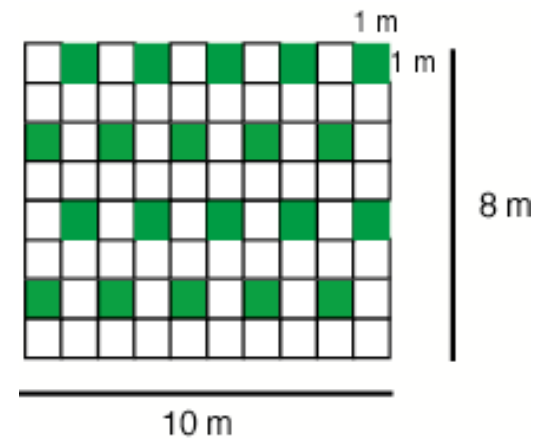
# Sampled Diversity

- How does landscape structure impact plant-animal interactions?
- Can certain plant-animal interactions explain the distribution of plant species in fragmented landscapes?



# Study Design

- Locations:
  - Las Cruces: 27 sites
  - La Palma: 29 sites
  - Pt. Jimenez: 29 sites
- Sampling:
  - Herbs and shrubs
  - 20 1 X 1m quadrats/site
  - Richness
  - Abundance



# Site Types

## FOREST HABITATS

## DEFORESTED HABITATS

**Understory**



**Tree-fall gaps**



**Forest River Banks**



**Pasture**



**Road verges**



**Pasture River Banks**



# Sampled Diversity

- 772 species
- 79 plant families
  
- Excluded:
  - Trees
  - Pasture grasses





# Ecologically Important Traits

- Pollination
  - 13 modes



- Fruit Type
  - 12 types



- **Dispersal**
  - 11 modes



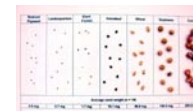
- Fruit Size
  - 6 categories



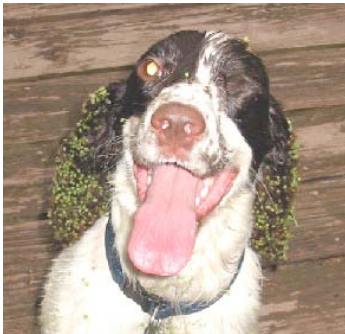
- Growth Form
  - 5 types



- Seed Size
  - 5 categories



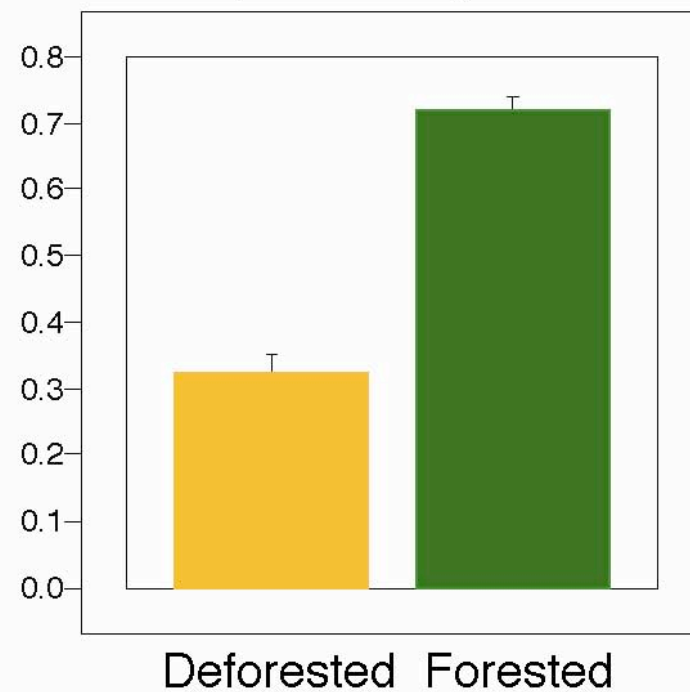
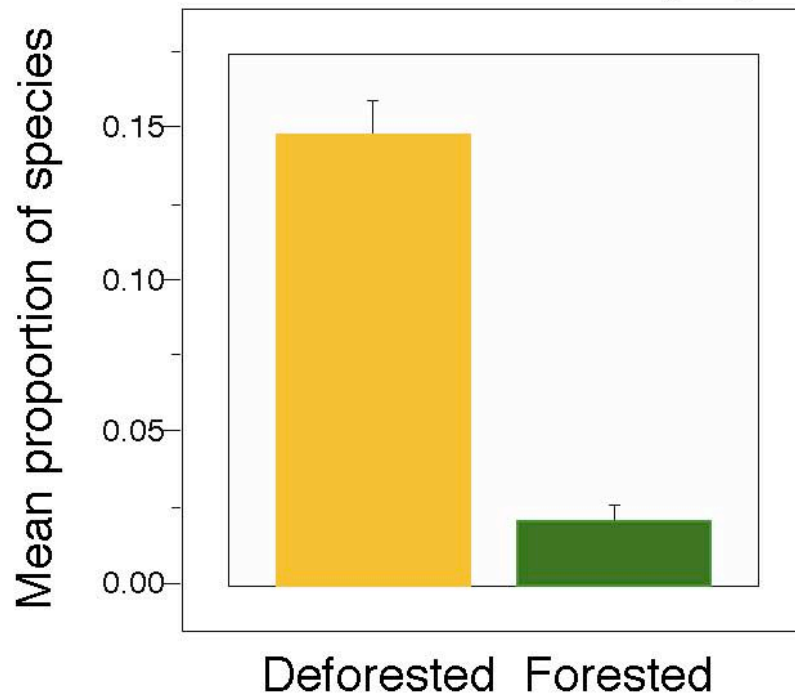
# Are certain dispersal mechanisms associated with particular landscape components (habitats)?



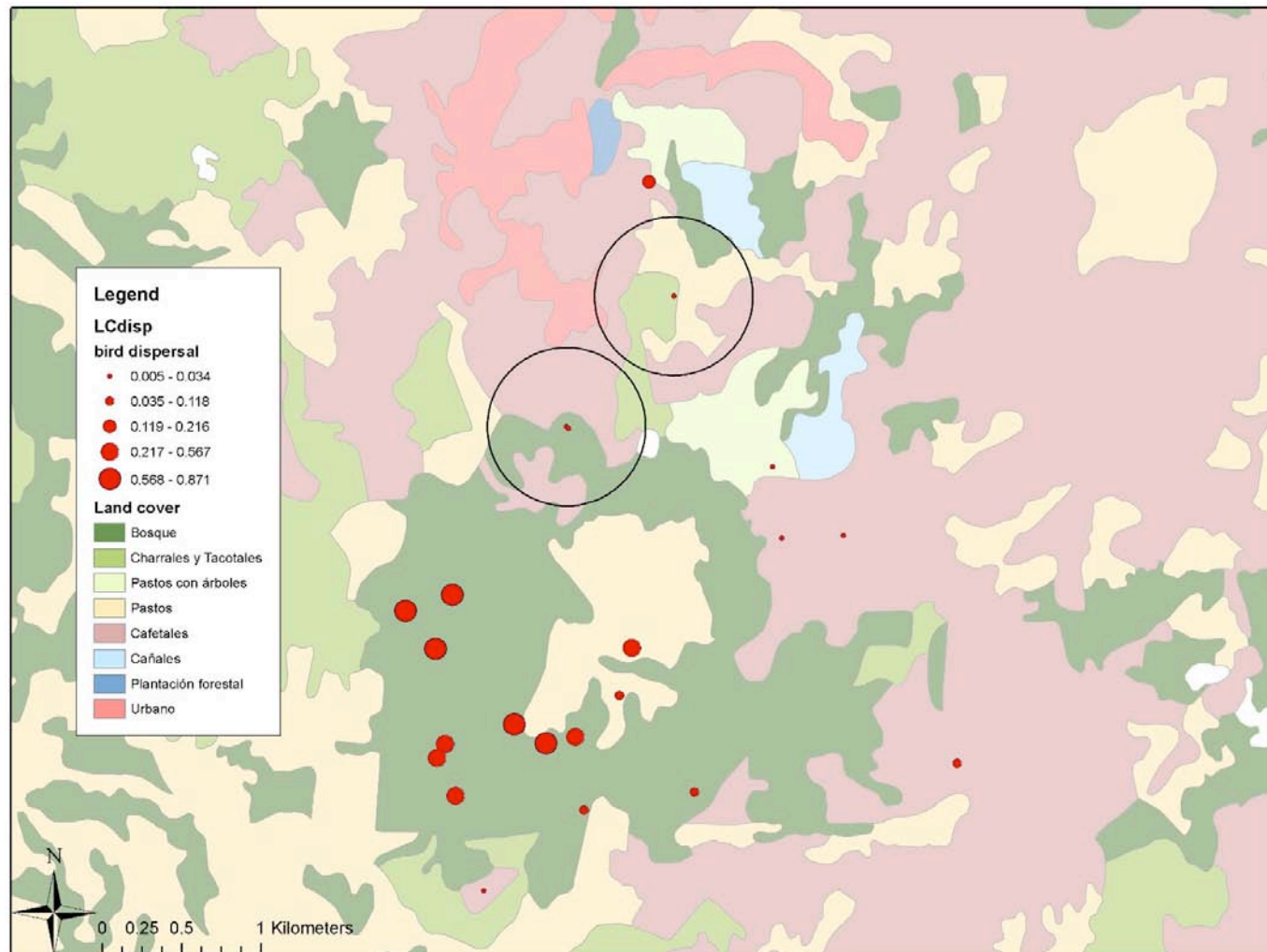
Mammal Exterior (fur)

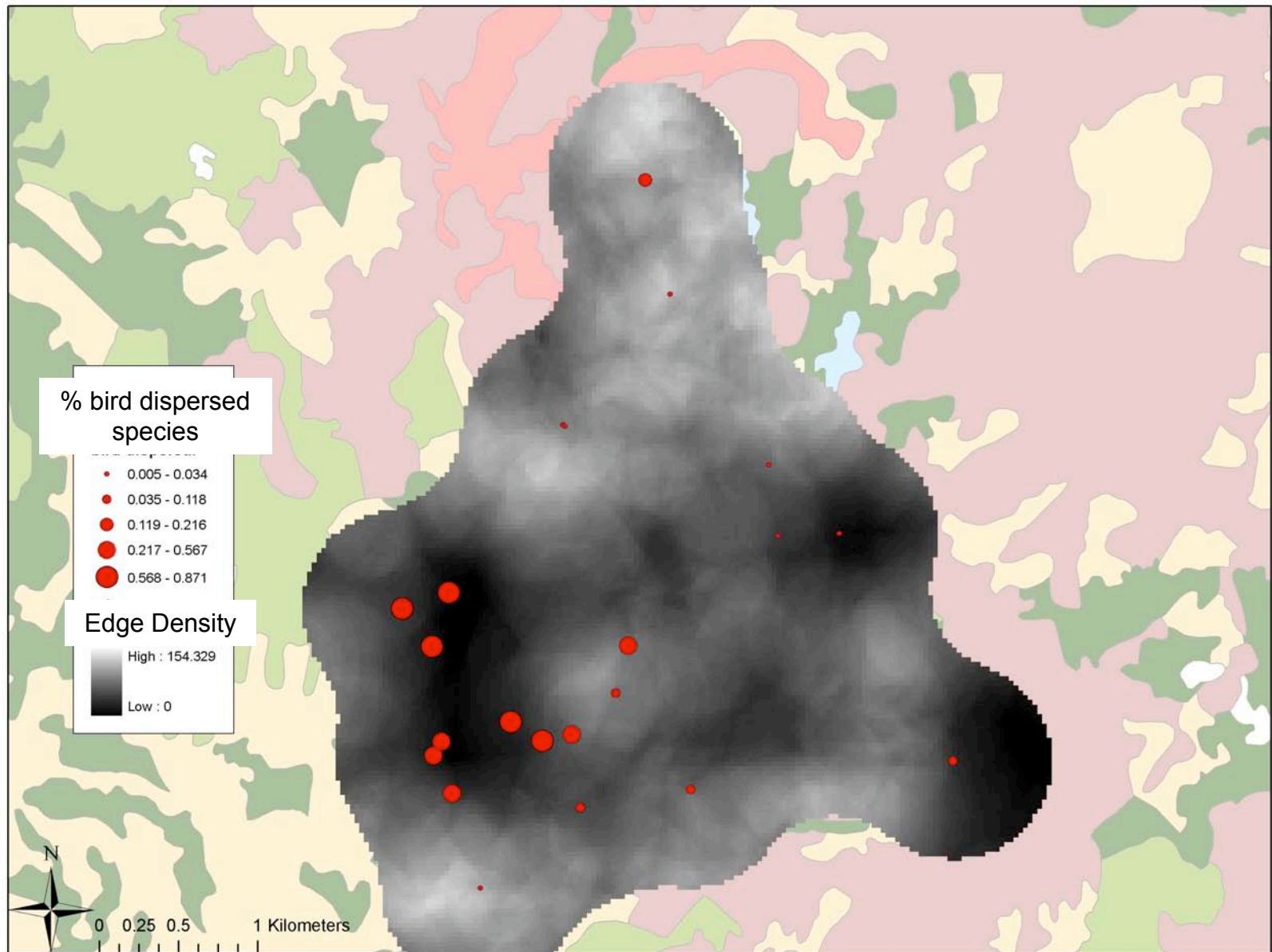


Dispersed by Birds



How does landscape structure influence the distribution of plant species reliant on animals for dispersal?

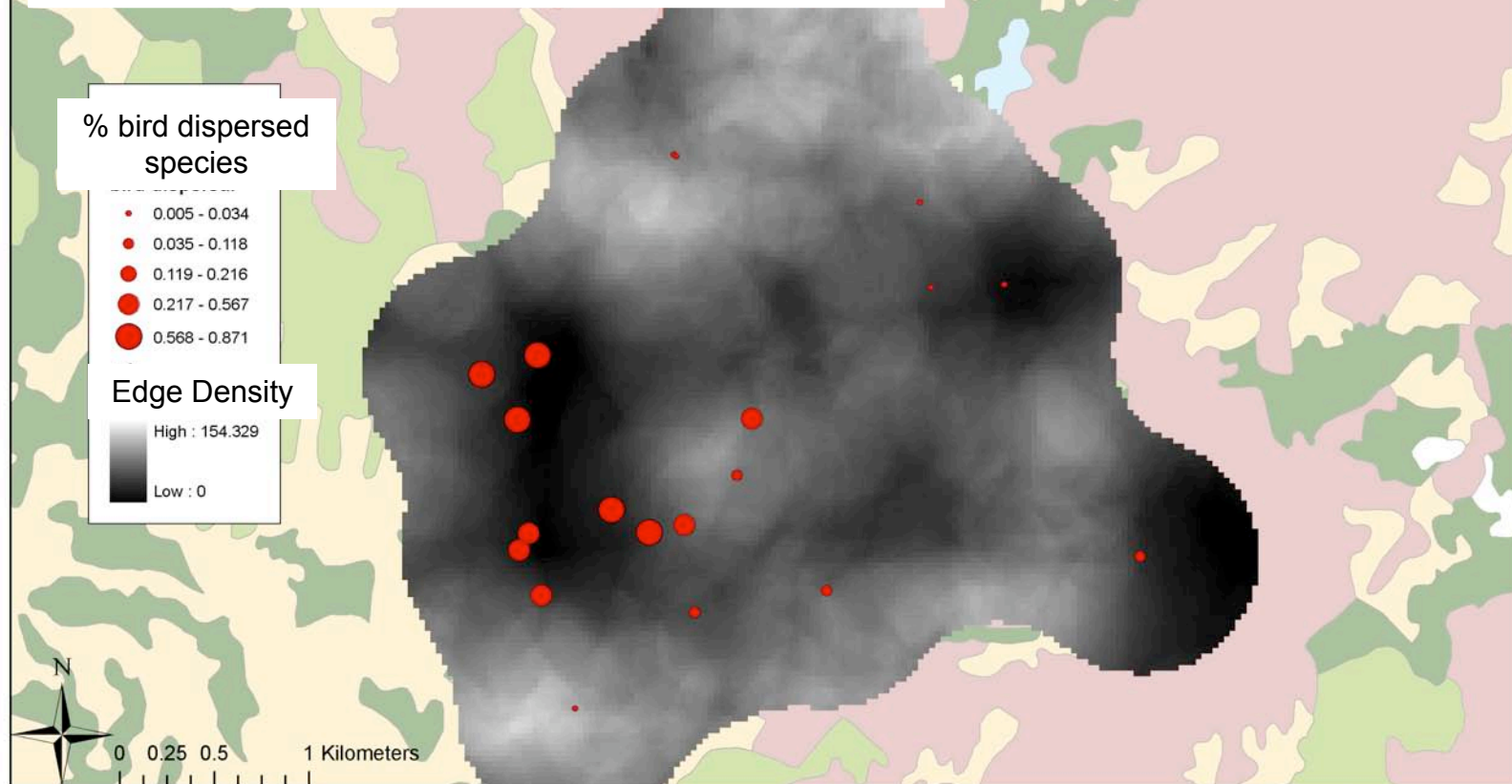




Proportion of species that are bird dispersed x edge density

## Pearson's product-moment correlation

Proportion bird dispersed and edge density  
 $t = -2.1336$ ,  $df = 22$ ,  $p\text{-value} = 0.04427$   
correlation value =  $-0.4140632$



Negative correlations between species dispersed by birds and the edge density in a landscape

# Advances in Landscape Ecology

- New tools allow new types of questions
- Manual landscape classifications still important
- Much larger datasets can be analyzed
  - Collaborations, meta-analysis

# Revised schedule

- 1350 Mayfield
- 1410 Morgan
- 1430 Buckley
- 1450 focus groups 2
- 1530 tea break
  - Please collect signs etc?
- 1545 focus groups reporting back