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

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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. Sanfiorozeno, D. C. Useche,
  – R. Kelsey, UC Davis
  – NCEAS


• Kreitler, J., Yackulic, C. Alcazar, C., Kelsey, R., Ramirez, L., Sanfiorozeno, 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

<table>
<thead>
<tr>
<th>Understory</th>
<th>Tree-fall gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Forest River Banks" /></td>
<td><img src="image2" alt="Forest River Banks" /></td>
</tr>
</tbody>
</table>

### DEFORESTED HABITATS

<table>
<thead>
<tr>
<th>Pasture</th>
<th>Road verges</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Pasture River Banks" /></td>
<td><img src="image4" alt="Pasture River Banks" /></td>
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</tbody>
</table>
Sampled Diversity

- 772 species
- 79 plant families

- Excluded:
  - Trees
  - Pasture grasses
Ecologically Important Traits

- Pollination
  - 13 modes

- Dispersal
  - 11 modes

- Growth Form
  - 5 types

- Fruit Type
  - 12 types

- Fruit Size
  - 6 categories

- Seed Size
  - 5 categories
Are certain dispersal mechanisms associated with particular landscape components (habitats)?
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
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