Navigating trade-offs when managing for multi-species avian communities

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Trade-offs encountered in multi-species management

Who
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Single vs. Multi-Species

- Majority of traditional conservation/management is species-based
- More recently increase in multi-species conservation plans
Umbrella species as multi-species management shortcuts

• Protection for 1 = protection for many

• Poor general performance of umbrellas
Is the heuristic *too* simple?

- Ecological proxies not accurate to biological response of interest
Low initial investment methods

- Rarity
- Body size
- Information available
- Sample-ability
- Home range

Rodriguez et al. 1998, Fleishman et al. 2000, Branton and Richardson 2010, and citations therein
Data-rich method

• How much could we benefit by investing in data-driven umbrella

• Framework for identifying umbrella species that match ‘optimal’ habitat conditions

• Use species-habitat models to support strategic planning
Define Species Set

Conduct Species Monitoring

Create Species-Specific Multi-Scale Habitat Models

Identify Set-Wide ‘Optimal’ Multi-Scale Habitat Composition
Study Goals:

• Compare whether species-habitat relationships lead to better expected outcomes compared to common umbrella selection approaches
Define Species Set

Conduct Species Monitoring

Create Species-Specific Multi-Scale Habitat Models

Identify Set-Wide ‘Optimal’ Multi-Scale Habitat Composition
### Possible species set

<table>
<thead>
<tr>
<th>Selection Metric</th>
<th>Potential Umbrella Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiversity indicator/ # co-occurring species</td>
<td>EAME, FISP</td>
</tr>
<tr>
<td>Charismatic</td>
<td>NOBO, RNEP, WME</td>
</tr>
<tr>
<td>Habitat specialist/resource limited</td>
<td>FISP</td>
</tr>
<tr>
<td>Large area requirement</td>
<td>DICK</td>
</tr>
<tr>
<td>Large body size</td>
<td>RNEP</td>
</tr>
<tr>
<td>Large geographic range</td>
<td>GRSP, WME</td>
</tr>
<tr>
<td>Low population density</td>
<td>LASP</td>
</tr>
<tr>
<td>Relatively abundant</td>
<td>GRSP</td>
</tr>
<tr>
<td>Game species</td>
<td>NOBO, RNEP</td>
</tr>
<tr>
<td>Large home range</td>
<td>RNEP</td>
</tr>
<tr>
<td>Migratory</td>
<td>DICK, EAME, FISP, GRSP, LASP, WME</td>
</tr>
<tr>
<td>Dispersal-limited</td>
<td>RNEP</td>
</tr>
</tbody>
</table>

1: based on Lambeck (1997); Caro and O'doherty (1999); and Fleishman et al. (2000).
Define Species Set

Create Species-Specific Multi-Scale Habitat Models

Conduct Species Monitoring

Identify Set-Wide ‘Optimal’ Multi-Scale Habitat Composition
Species monitoring

- Point count surveys
- 2010 – 2012: 405 survey locations (600-1000 surveys/yr)
Define Species Set

Create Species-Specific Multi-Scale Habitat Models

Conduct Species Monitoring

Identify Set-Wide ‘Optimal’ Multi-Scale Habitat Composition
Habitat models
Habitat models

- Habitat classification: Rainwater Basin Joint Venture NE landcover development product (Bishop et al. 2011)
Habitat models

- Habitat classification: Rainwater Basin Joint Venture NE landcover development product (Bishop et al. 2011)
- Derived proportion of woodland and grassland within:
  - 500m
  - 1000m
  - 1500m
  - 2000m
  - 3000m
  - 4000m
  - 5000m (radii)
What are the ecological neighborhoods? (trees)

Small Scale

GRSP  EAME  FISP  DICK
WEME  LASP  RNEP
NOBO
What are the ecological neighborhoods? (grass)
Define Species Set
Create Species-Specific Multi-Scale Habitat Models
Identify Set-Wide ‘Optimal’ Multi-Scale Habitat Composition
Conduct Species Monitoring
Community Optimum

For each species:

• Calculated species-specific ‘optimal’ habitat characteristics

• Given the optimal characteristics of each species, how much ‘collective abundance’ can we expect?
Who's habitat characteristics also maximizes abundance across our species set?

Maximum Collective Abundance

-10%

-20%
Conclusions

• More often than not, selection by simple criteria is sub-optimal
• Greater initial input might facilitate greater eventual return
Management option: habitat management
Define Species Set

Create Species

- Specific Multi-Scale Habitat Models

Identify Set

- Wide ‘Optimal’ Multi-Scale Management Action

Conduct Species Monitoring

Create Species-Specific Multi-Scale Habitat Models

Identify Set-Wide ‘Optimal’ Multi-Scale Management Action
Opportunity costs to management
Where do birds respond strongest?
Where do birds respond strongest?

![Graph showing the relationship between spatial scale and strongest effect size for Grassland and Woodland management.](image)
Where does our species-set respond strongest?
Where does our species-set respond strongest?
Conclusions

• Initial investment allows quantification of trade-offs
• Can be used to justify management action
• Petition for (more) resources
• Shape decisions for conservation-umbrellas, management-umbrellas
• Abandon umbrellas?
Additional doses of reality

• Weight collective abundance score by rarity

• Weight collective abundance score by habitat cost or availability

• Weight decisions by risk-aversion
Navigating trade-offs when managing for multi-species avian communities
Thank you!
<table>
<thead>
<tr>
<th>Grassland Scale</th>
<th>Proportion Grassland</th>
<th>Woodland Scale</th>
<th>Proportion Woodland</th>
</tr>
</thead>
<tbody>
<tr>
<td>5000</td>
<td>0.20</td>
<td>5000</td>
<td>0.05</td>
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<tr>
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<td>3000</td>
<td>0.31</td>
</tr>
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<td>2000</td>
<td>0.31</td>
</tr>
<tr>
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<td>0.86</td>
<td>1000</td>
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<tr>
<td>500</td>
<td>0.53</td>
<td>3000</td>
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<td>2000</td>
<td>0.86</td>
<td>5000</td>
<td>0.0003</td>
</tr>
</tbody>
</table>
Management Tools

• Strategic land acquisition

• Ecological restoration/habitat management projects
Management option: land acquisition