Grassland bird abundance and habitat quality at Fort Drum, New York

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OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION (ORISE), A DIVISION OF THE US DEPARTMENT OF ENERGY
&
THE COLLEGE AT BROCKPORT
Outline: overview

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2. OGBB habitat and abundance
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   3. OGBB models
   4. Modeling conclusion

3. Case study
   1. Sedge wren ecology
   2. Sedge wren management

4. Conclusion
Why study grassland birds?

- Grassland birds are declining:
  - More than any other bird group in North America (Sauer et al. 2012)
  - In NY, nine of 11 species have significantly declined (Sauer et al. 2012)

- Decrease in grassland
  - Decrease in hayfields and grassland area (Foster et al. 2002)
  - More frequent haycropping (Bollinger et al. 1990)
  - Re-forestation (Foster et al. 2002)

- Grassland birds are declining and listed as threatened on a world wide basis
  - making preservation of grassland habitat a priority (Hunter et al. 2001).
Objectives

- OGBB abundance and habitat preferences
  - Create habitat models
- Observe sedge wrens
  - Habitat preferences
- Management recommendations for Fort Drum, NY
  - Implications for the NE
Fort Drum in context of Northeastern United States

Fort Drum, Lewis and Jefferson Counties, New York, USA
OGBB habitat and abundance
### 2011 Species Abundance

- **OGBB BOBO**: 78
- **OGBB SAVS**: 52
- **OGBB SEWR**: 5
- **SBB ALFL**: 23
- **SBB COYE**: 78
- **SBB FISP**: 1
- **SBB GRCA**: 1
- **SBB SOSP**: 28
- **SBB WIFL**: 5
- **SBB YWAR**: 24
- **Other**: 57

### 2012 Species Abundance

- **OGBB BOBO**: 70
- **OGBB HESP**: 1
- **OGBB SAVS**: 22
- **OGBB SEWR**: 1
- **SBB ALFL**: 19
- **SBB AMGO**: 1
- **SBB COYE**: 113
- **SBB GRCA**: 3
- **SBB SOSP**: 22
- **SBB WIFL**: 18
- **SBB YWAR**: 27
- **Other**: 43

### Mean abundance/plot

<table>
<thead>
<tr>
<th>Year</th>
<th>OGBB Mean</th>
<th>SBB Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>3.29 (±0.301)†(0,9)*</td>
<td>3.90 (±0.304)†(1,8)*</td>
</tr>
<tr>
<td>2012</td>
<td>2.29 (±0.267)(0,6)</td>
<td>4.95 (±0.418)(0,11)</td>
</tr>
<tr>
<td>2011 &amp; 2012</td>
<td>2.79 (±0.207)(0,9)</td>
<td>4.43 (±0.263)(0,11)</td>
</tr>
</tbody>
</table>
Vegetation Survey Methods

- Vegetation analysis
  - Robel Pole
  - Plant taxa richness
  - Litter depth
  - Percent cover: grass, forb, shrub, golden rod, standing dead, bare ground

- SEWR Territories
Why do bird-habitat modeling?

- **Natural selection/niche:**
  - a species is molded to a specific environment where it is most likely to “do well”

- **Management:**
  - Identify habitat variables that influence abundance

- **Parsimony**
What is GLM?

1. GLM – generalized linear model
   1. Better suited for discrete response variables (ie. counts)
      1. “zero-inflated distributions”
   2. Like a linear regression but it is “generalized” to fit many types of dependent variables
What is GLM?

- **Link functions:**
  - Allows the equation to linearly produce “n”
  - The “link” makes the GLM
  - Without it, the equation would just be a linear equation being applied to a non-linear relationship

\[ \eta = \sum_{k=1}^{K} \beta_k X_k \]

- **Natural logarithm link**
  - Used for count data when the numbers do not get very large
  - Often count data are not normally distributed
  - Work well with Poisson distributions
What is GLM?

- Poisson distribution
  - Count data
  - Lower bound is zero
  - Integers are discrete (not continuous)
  - Often has a rapidly descending tail

- Example:
  - Prussian Army – death by mule
What is AIC?

- Used for choosing models/eliminating variables
- Considers:
  - Goodness of fit
  - Model complexity
- Reflects:
  - Amount of information lost
  - Lower scores are better
- Now the standard for model selection

- Akaike Weights
  - Weighted score when AIC differs by <2
- AICc
  - For small sample sizes
  - When \( \frac{n}{K} < 40 \)
    - \( n = \text{sample size} \)
    - \( K = \# \text{ of parameters} \)
- Akaike Information Criterion
### Modeling Results: OGBB

<table>
<thead>
<tr>
<th>Response Variable</th>
<th>Rank</th>
<th>AICc</th>
<th>ΔAICc</th>
<th>Wi</th>
<th>K</th>
<th>Predictor Variable</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGBB 2011</td>
<td>1</td>
<td>165.559</td>
<td>0.000</td>
<td>0.32499</td>
<td>3</td>
<td>Standing dead</td>
<td>-0.174</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Plant taxa richness</td>
<td>-0.195</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Robel</td>
<td>-0.288</td>
</tr>
<tr>
<td>OGBB 2012</td>
<td>1</td>
<td>135.585</td>
<td>0.000</td>
<td>0.45256</td>
<td>1</td>
<td>Graminoid</td>
<td>0.575</td>
</tr>
</tbody>
</table>
Modeling results: OGBB

- Abundance: OGBB 2011
  - Robel pole score vs. Abundance

- Abundance: OGBB 2012
  - % graminoid cover vs. Abundance
## Modeling Results: BOBO and SAVS

<table>
<thead>
<tr>
<th>Response Variable</th>
<th>Rank</th>
<th>AICc</th>
<th>ΔAICc</th>
<th>Wi</th>
<th>K</th>
<th>Predictor Variable</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOBO 2011</td>
<td>1</td>
<td>131.443</td>
<td>0.000</td>
<td>0.4428</td>
<td>1</td>
<td>Robel</td>
<td>-0.124</td>
</tr>
<tr>
<td>BOBO 2012</td>
<td>1</td>
<td>120.910</td>
<td>0.000</td>
<td>0.3330</td>
<td>2</td>
<td>Robel</td>
<td>-0.272</td>
</tr>
<tr>
<td>Graminoid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.557</td>
</tr>
<tr>
<td>SAVS 2011</td>
<td>1</td>
<td>118.343</td>
<td>0.000</td>
<td>0.4221</td>
<td>2</td>
<td>Robel</td>
<td>-0.287</td>
</tr>
<tr>
<td>SAVS 2012</td>
<td>1</td>
<td>82.623</td>
<td>0.000</td>
<td>0.6895</td>
<td>1</td>
<td>Graminoid</td>
<td>0.201</td>
</tr>
</tbody>
</table>
Conclusion: OGBB Modeling

- **OGBB on Fort Drum:**
  - Shorter less dense vegetation, more graminoid cover, large areas

- **OGBB and military training:**
  - Fort Drum needs to maintain open spaces for training
  - Use rotational mowing regime
    - Creates varied habitat for both training and birds

- **Cooperative management**
  - Fish and Wildlife Program and ITAM (those who mow)
Conclusion: OGBB and modeling

- Models are guidelines
  - Did we measure enough variables to surpass the tolerance of the species?
  - Habitat varies by year and so does species response

- Mosaic landscape
  - Large areas increase probability of habitat diversity
    - Ribic et al. 2009, Rotenberry and Wiens 2009, Jacobs et al. 2012,

- Preemptive
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Case Study: Sedge wren (*Cistothorus platensis*)

- 7-10g
- Tall, dense grasses and sedges in moist areas
- Nomadic migrant
  - Or is it?
Case study: Sedge wren

- NYS status: threatened
  - Endangered in 5 out of 6 New England states
Case study: sedge wren

http://www.stateofthebirds.org/maps/grasslands/species-maps
Case Study: Sedge wren

Sedge wren locations by year 2006-2012

Year
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012

Dominant Vegetation
- Perennial Graminoid Vegetation

Abundance

SEWR

HESP

Year
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012

Abundance
SEWR and HESP

Sedge Wren

Henslow's Sparrow
Results: Sedge wren territories

- Live cover
- Graminoid
- Forb
- Goldenrod
- Woody Veg
- Standing Dead

Percent Cover Class

Territory
Random
Results: Sedge wren territories

Litter depth (cm)

- Territory
- Random
Sedge wren summary

- **Declines:**
  - Edge of range
  - Nomadic
  - Regional declines, affecting local abundance

- **Studying a rare species is difficult**
  - Abundance fluctuates
  - Hard to find
  - Sample size is small

- **Preemptive vs. reactive**
  - Everyone wants to save endangered species
Conclusion

- **OGBB on Fort Drum:**
  - Shorter less dense vegetation, more graminoid cover, large areas

- **Modeling**
  - Guideline for complex systems
  - Manage for a mosaic landscape

- **Sedge wren**
  - Regional declines, affecting local abundance
  - Edge of range
  - Nomadic
Conclusion: Ft. Drum’s mission & OGBB

- Good practices will benefit the military:
  - Mow, no dormant season burns
  - Manage and train rotationally
    - more habitat diversity for training and OGBB
- Large grassland habitat
  - training only in portions and not continuous
- OGBB are used to disturbances
  - their niche is a disturbance mediated system
- Cooperative management
The ITAM issue

- ITAM – Integrated Training Area Management
  - Those who mow
- No communication or cooperation
- Wildlife management practices would even benefit ITAM’s objectives
Acknowledgements

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    - US Department of Fish and Wildlife, Fort Drum, NY
Questions?

Well, I probably won’t be able to convince all of you to save the birds