AN ASSESSMENT OF HERBICIDE TREATMENT AND GRAZING ON LESSER PRAIRIE-CHICKEN SURVIVAL, NEST SITE SELECTION, AND BROOD SITE SELECTION IN EASTERN NEW MEXICO
Historically co-dominated by grasses and shrubs

Unmanaged grazing ultimate changed community composition to shinnery oak monoculture

Range of lesser prairie-chicken overlaps distribution of shinnery oak communities
Haukos and Smith 1989
- 8 of 10 hens nested in untreated shinnery oak pastures
- All nests were found in residual grasses

Johnson et al. 2004
- 13 of 14 nests were located in untreated shinnery oak pastures
- “This study suggests that herbicide treatment to control shinnery oak might adversely impact nesting lesser prairie-chickens”
Tebuthiuron: Problem/Solution?

TYPICAL APPLICATION

- Ultimate goal is to eliminate shinnery oak to promote forage for cattle
- Little or no desire to assess effects of application on wildlife populations
2000

- The herbicide tebuthiuron was applied at 0.60 kg/ha to 518 hectares (ha)
  - Plots were 65 ha, except for one, which was 80 ha
  - Application rate was less than one half of the recommended dose
- 518 ha of public land adjacent to treatment plots was not treated
Grazing

- Short duration system
  - Plots were grazed once during dormant season and once during the growing season
  - Designed to remove 25% herbaceous material
  - Meant to break soil cap-litter incorporation, water penetration, and seed germination (Savory and Parsons 1980)
  - No grazing two years post herbicide treatment
Plots consisted of two treatments arranged in four combinations
- Tebuthiuron with grazing (T-G)
- Tebuthiuron without grazing (T-NG)
- No tebuthiuron with grazing (NT-G)
- A control of no tebuthiuron or grazing (NT-NG)
Experimental plots for monitoring the effects of shrub control and grazing on lesser prairie chickens in eastern New Mexico. NB signifies the North Bluitt Prairie Chicken Area plots. WR signifies the Weaver Ranch plots. The configuration of plots differed on the Weaver Ranch because of the presence of abandoned cultivated fields.

Geographic Location is T7S, R37E, Sec. 34 and T8S, R37E, Sec. 3.
Ultimate Project Goals

JENNIFER ZAVALET
- Vegetation response
- Small mammal/herpetofauna/invertebrate abundance

PHIL BORSDORF
- LEPC spatial distribution/home range/movements in context to different land use patterns

BLAKE GRISHAM
- LEPC reproductive ecology/survival/demography
- Assess potential influence of climate change on LEPC nesting ecology/nest survival
LEPC nest survival
Nest site structure
  - Brood/random
  - Among treatment plots
Brood survival
Brood site structure
  - Brood/random
  - Treated v. Untreated plots
Invertebrate abundance at brood locations
Overview of Information

- Breeding season survival
  - 2006-2010
- Nest site selection
  - 2001-2010
- Brood site selection
  - 2006-2010
- Discussion
Survival assessment

- Females only
- 2006-2010
- Known fate models
- Assessed # of locations in each treatment type per individual
- Grouped each individual by treatment where the greatest proportion of locations were recorded
## Breeding Season Survival

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Treatments Same</td>
<td>No difference in survival across treatments</td>
</tr>
<tr>
<td>Grazing</td>
<td>No difference in survival across similar grazing treatments</td>
</tr>
<tr>
<td>All Treatments Different</td>
<td>Daily survival differs across all treatments</td>
</tr>
<tr>
<td>Reciprocal</td>
<td>No difference in daily survival between treatments that have different herbicide and grazing treatments</td>
</tr>
<tr>
<td>Herbicide</td>
<td>No difference in survival across similar herbicide treatments</td>
</tr>
</tbody>
</table>

Smythe and Haukos 2009
Breeding Season Survival

- 66 encounter histories from 53 unique individuals
  - 3 had the greatest proportion of locations in T-NG areas
  - 5 had the greatest proportion of locations in NT-NG areas
  - 27 had the greatest proportion of locations in T-G areas
  - 32 had the greatest proportion of locations in NT-G areas
No evidence of differences in breeding season survival across treatment types

- 0.81 (SE = 0.07) for T-NG areas
- 0.80 (SE = 0.06) for T-G areas
- 0.76 (SE = 0.08) for NT-NG areas
- 0.79 (SE = 0.06) for NT-G areas
Nest Site Selection

- Two assessments
  - Population level (Type II)
    - Availability determined by combining all individuals
    - Buffer leks by 1.9 km
    - 1,000 randomly placed points
    - Observed v. expected
  - Within each individual lek of capture (Type III)
    - Availability determined by breaking nest up by lek of capture
    - Buffer each lek by 1.9km
    - 100 randomly placed points per lek
    - Observed v. expected
Population Level Assessment

- **2001-2002**
  - 50 nests
  - NT-G - Used as expected
  - NT-NG - Used more
  - T-NG - Used less

- **2003-2010**
  - 132 nests
  - NT-G - Used as expected
  - NT-NG - Used more
  - T-NG - Used as expected
  - T-G - Used as expected
Individual Lek Assessment

- **2001-2002**
  - 18 nests from 1 lek of capture
  - All treatment types were used as expected

- **2003-2010**
  - 84 nests from 5 leks of capture
  - Treatments used disproportionately to expected for 4 of 5 leks
  - No noticeable pattern of use/avoidance
## Nest Site Selection

<table>
<thead>
<tr>
<th>Lek</th>
<th>TRT</th>
<th>Observed</th>
<th>95% Confidence Interval</th>
<th>Expected</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NT-G</td>
<td>0.14</td>
<td>0.08-0.20</td>
<td>0.53</td>
<td>Used Less</td>
</tr>
<tr>
<td></td>
<td>NT-NG</td>
<td>0.50</td>
<td>0.41-0.59</td>
<td>0.31</td>
<td>No Difference</td>
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<tr>
<td></td>
<td>T-G</td>
<td>0.14</td>
<td>0.08-0.20</td>
<td>0.08</td>
<td>No Difference</td>
</tr>
<tr>
<td></td>
<td>T-NG</td>
<td>0.14</td>
<td>0.08-0.20</td>
<td>0.08</td>
<td>No Difference</td>
</tr>
<tr>
<td>4</td>
<td>NT-G</td>
<td>0.56</td>
<td>0.48-0.64</td>
<td>1.00</td>
<td>Used Less</td>
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<tr>
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<td>NT-NG</td>
<td>0.06</td>
<td>0.02-0.10</td>
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<tr>
<td></td>
<td>T-G</td>
<td>0.38</td>
<td>0.30-0.46</td>
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<td>Used More</td>
</tr>
<tr>
<td></td>
<td>T-NG</td>
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<td>0.00-0.00</td>
<td>0.00</td>
<td>No Difference</td>
</tr>
<tr>
<td>7</td>
<td>NT-G</td>
<td>0.32</td>
<td>0.24-0.40</td>
<td>0.00</td>
<td>Used More</td>
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<tr>
<td></td>
<td>NT-NG</td>
<td>0.04</td>
<td>0.01-0.07</td>
<td>0.00</td>
<td>Used More</td>
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<tr>
<td></td>
<td>T-G</td>
<td>0.64</td>
<td>0.56-0.72</td>
<td>0.93</td>
<td>Used Less</td>
</tr>
<tr>
<td></td>
<td>T-NG</td>
<td>0.04</td>
<td>0.01-0.07</td>
<td>0.07</td>
<td>No Difference</td>
</tr>
<tr>
<td>17</td>
<td>NT-G</td>
<td>0.08</td>
<td>0.04-0.12</td>
<td>0.63</td>
<td>Used Less</td>
</tr>
<tr>
<td></td>
<td>NT-NG</td>
<td>0.67</td>
<td>0.59-0.75</td>
<td>0.29</td>
<td>Used More</td>
</tr>
<tr>
<td></td>
<td>T-G</td>
<td>0.25</td>
<td>0.18-0.32</td>
<td>0.08</td>
<td>Used More</td>
</tr>
<tr>
<td></td>
<td>T-NG</td>
<td>0.00</td>
<td>0.00-0.00</td>
<td>0.00</td>
<td>No Difference</td>
</tr>
</tbody>
</table>
Brood Site Selection

- Two assessments
  - 2006-2008
  - 2009-2010
- Nearby ranch was treated with tebuthiuron in 2008 and changed availability
- Population level (all brood locations combined)
  - Low sample sizes of brood locations
  - 44% of all broods were lost 1-4 days post hatch
2006-2008

- 27 locations from 9 brood rearing hens
- All treatments were available
- All locations were either in T-G or NT-G areas
- Brood rearing hens did not use treatment types disproportionately to what was expected

2009-2010

- 48 locations from 8 brood rearing hens
- All treatments were available
- All locations were either in T-G or NT-G areas
- Brood rearing hens did not use treatment types disproportionately to what was expected
Discussion

Appears to be no effect of herbicide and grazing treatments on female survival during the breeding season.

Results differ from Patten et al. (2005)
- Greater survivorship in areas >20% shrubs
- Survivorship was higher in Kansas on Site II (4,000-6,000 sagebrush/ha)

Spatial scale and temporal response of shrubs
- Patten et al. (2005)- 2-3 years post treatment
- This assessment – 6-10 years post treatment
Discussion

- Population level assessment for nest sites is inappropriate due to lek site fidelity
- At smaller scales (individual leks), there was no consistent use/avoidance patterns
- Nest survival did not vary among treatment type
- Nest had similar structure regardless of treatment type, suggesting all treatments provide sufficient nesting habitat
Brood rearing hens did not select treatment types differently from what was expected
Differs from Bell et al. (2010)
- Brooding hens selected for NT areas
- Thermal refugia
Temporal response of shrub cover
- Shrub cover in treated areas improved 5-10 years post treatment
Brood survival is boom-bust and not related to treatment type
Treatments mimic natural disturbance
- Can be detrimental in short term
- Effects appear to be minimal to LEPC ecology in long term

Benefits?
- Smythe and Haukos (2009)- higher density of grassland songbird nest in treated areas
- Zavaleta (2012)- study site reached ecological site description standards in 2009
- The need to improve the quality of LEPC habitat, not just the quantity
Acknowledgements

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