Effects of Grazing Management on Nest Survival of Sharp-tailed Grouse

Megan Milligan¹, Lance B. McNew¹ and Lorelle Berkeley²

Introduction

- Grazing occurs across 70% of the western US
- Rest-rotation is implemented on conservation easements in MT and could create patch-level heterogeneity
- Sharp-tailed grouse (Tympanuchus phasianellus) are an ideal species to evaluate the effects of livestock management on prairie habitats
- Nest survival is one of the most important vital rates influencing grouse populations

Objectives

- Assess factors influencing nest survival for sharp-tailed grouse in eastern Montana and evaluate rest-rotation as a management strategy for improving nest survival

Methods

- Monitored radio-marked females 3 times/week in 2016 and 2017 to determine nest fate
- Classified fate as hatched or failed
- Measured vegetation at the nest using Daubenmire frame and Robel pole (Fig 1)
- Measured home range habitat using GIS
- Nest survival models using Program MARK
- Hierarchical model selection using AICc

Habitat Covariates
- % new grass, residual grass, forbs, shrubs, bare ground
- Visual obstruction
- Habitat edge and shape complexity
- Prop. grassland and dist. to grassland edge

Results

- 127 nests from 85 hens
- Nesting frequency = 1
- Renesting frequency = 0.64 ± 0.04
- Overall nest survival = 0.22 ± 0.06

Table 1. Support for candidate models predicting nest survival during the breeding season. The null model represents constant daily survival.

<table>
<thead>
<tr>
<th>Model</th>
<th>K</th>
<th>AIC</th>
<th>ΔAIC</th>
<th>AICw</th>
<th>Deviance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nest Age + ln(VOR)</td>
<td>3</td>
<td>545.79</td>
<td>0.00</td>
<td>0.49</td>
<td>539.76</td>
</tr>
<tr>
<td>Nest Attempt + ln(VOR)</td>
<td>3</td>
<td>548.76</td>
<td>2.97</td>
<td>0.11</td>
<td>542.75</td>
</tr>
<tr>
<td>Flush Nest + ln(VOR)</td>
<td>3</td>
<td>549.03</td>
<td>3.24</td>
<td>0.10</td>
<td>543.02</td>
</tr>
<tr>
<td>Female Age + Nest Attempt</td>
<td>4</td>
<td>549.75</td>
<td>3.96</td>
<td>0.07</td>
<td>541.74</td>
</tr>
<tr>
<td>ln(VOR)</td>
<td>2</td>
<td>549.82</td>
<td>4.02</td>
<td>0.07</td>
<td>545.81</td>
</tr>
<tr>
<td>Nest Age</td>
<td>2</td>
<td>550.59</td>
<td>4.80</td>
<td>0.04</td>
<td>546.59</td>
</tr>
<tr>
<td>Year + ln(VOR)</td>
<td>3</td>
<td>550.64</td>
<td>4.84</td>
<td>0.04</td>
<td>544.63</td>
</tr>
<tr>
<td>Flush Nest</td>
<td>2</td>
<td>552.11</td>
<td>6.31</td>
<td>0.02</td>
<td>548.10</td>
</tr>
<tr>
<td>Nest Attempt</td>
<td>2</td>
<td>552.21</td>
<td>6.41</td>
<td>0.02</td>
<td>548.20</td>
</tr>
<tr>
<td>Female Age + Nest Attempt</td>
<td>3</td>
<td>552.69</td>
<td>6.89</td>
<td>0.02</td>
<td>546.67</td>
</tr>
<tr>
<td>Year</td>
<td>2</td>
<td>553.04</td>
<td>7.25</td>
<td>0.01</td>
<td>549.03</td>
</tr>
<tr>
<td>Null</td>
<td>1</td>
<td>553.40</td>
<td>7.61</td>
<td>0.01</td>
<td>551.40</td>
</tr>
<tr>
<td>Stocking Rate</td>
<td>2</td>
<td>554.69</td>
<td>8.90</td>
<td>0.01</td>
<td>550.69</td>
</tr>
<tr>
<td>Grazing System</td>
<td>3</td>
<td>556.65</td>
<td>10.86</td>
<td>0.00</td>
<td>550.64</td>
</tr>
</tbody>
</table>

VOR represents visual obstruction as measured with a Robel pole.

Figure 1. Vegetation plot.

Figure 2. Study area with successful and failed nests.

Figure 3. Daily nest survival (± 85% confidence intervals) in each grazing treatment.

Figure 4. Pseudo-threshold relationship between VOR and daily survival rate.

Figure 5. Effect size (β = 85% confidence intervals) for each variable in the nest survival analysis. Rotation and rest-rotation systems measured in relation to season-long grazing.

Figure 5. A female sitting on a well-concealed nest.

- Interaction of visual obstruction with nest age was best predictor of nest survival
- Nest survival increased with greater cover
- Nest survival decreased with nest age

Conclusions

- No evidence for an effect of grazing system or stocking rates on nest survival
- Grazing may influence other factors such as brood survival rather than nest survival
- Nest survival increased with available cover but only to a certain threshold
- Nests are more vulnerable later in season
- Strong effect of nest age may be result of drought with little new vegetation growth later in the season to provide nesting cover

Questions?

Feel free to ask!

Acknowledgments
- PN Grant #1628.0
- IACUC Protocol #2016-01
- All the ranchers whose cooperation have made this study possible
- Thanks to Adam Bradley, Adrian Cline, Drew Howing, John Landsiedel, Joshua Luft, Chris Smith and Skye Vold

1 Montana State University, Department of Animal and Range Sciences
2 Montana Fish, Wildlife and Parks

Feel free to ask!