

Modeling the Impacts of Oil and Gas Development and Woody Cover on Northern Bobwhites and Eastern Meadowlarks

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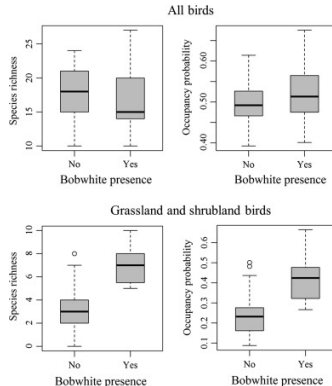
Objectives of LCC

The GCP LCC vision is a sustainable landscape of natural and cultural resources in the GCP geography that is resilient to the threats and stressors associated with climate change and land use changes.

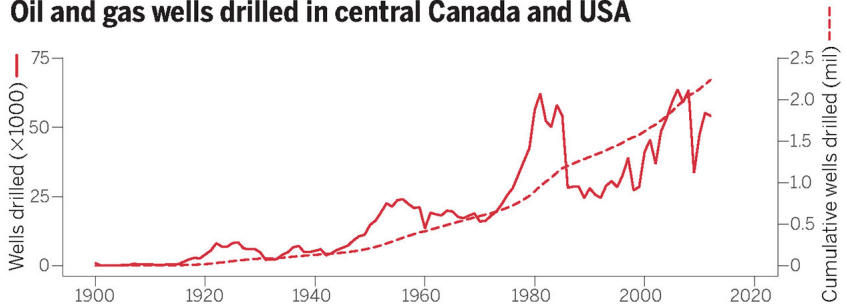


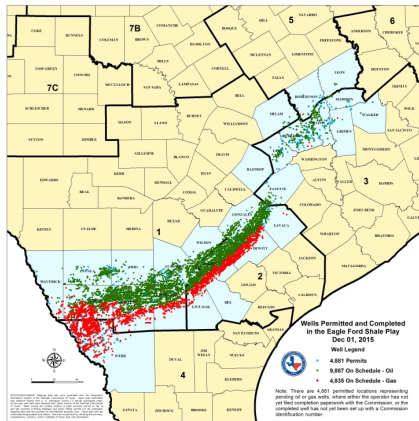
Objectives of LCC

...ensuring their [focal species] health is most likely to result in productive habitats and healthy ecosystems that can support self-sustaining populations of a much broader array of wildlife.



Oil and gas wells drilled in central Canada and USA





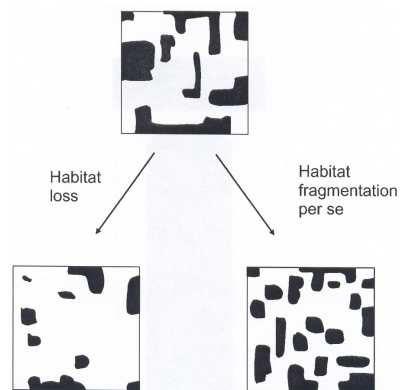


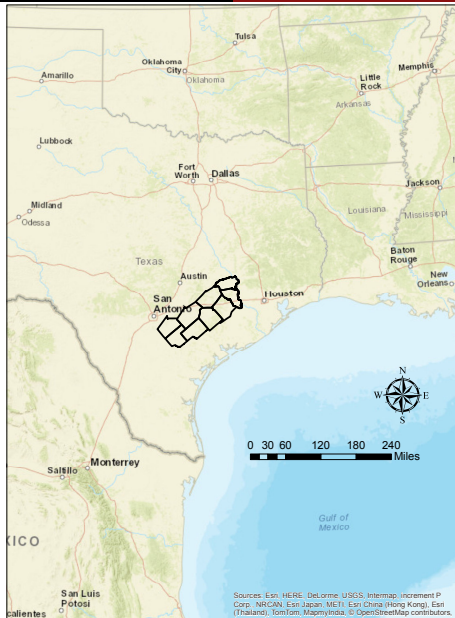
Figure 5 Both habitat loss and habitat fragmentation per se (independent of habitat loss) result in smaller patches. Therefore, patch size itself is ambiguous as a measure of either habitat amount or habitat fragmentation per se. Note also that habitat fragmentation per se leads to reduced patch isolation.

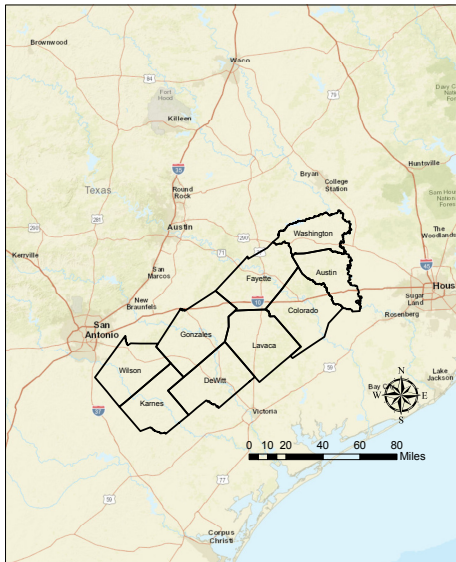


Objectives of Study

- 1 Analyze the effect of oil and gas development of NOBO and EAME
- 2 Project these effects into the future
- 3 Project the effects of conservation
- 4 Identify areas in need of conservation









- 1 Surveyed for 14-17 species (varied by state)
- 2 5 minute counts in 1-minute intervals
- 3 30 points per route
- 4 5 routes per county
- 5 Distances recorded for all bird detections



$$N_i \sim \text{Poisson}(\lambda_i)$$

$$\log(\lambda_i) = \alpha_0 + \alpha_1(\text{WOODY}(x_i)) + \alpha_2(\text{WOODY}^2(x_i)) + \alpha_3(\text{OIL}(x_i))$$

$$\alpha_0 \sim \text{Normal}(\mu_{\alpha_0}, \tau_{\alpha_0})$$

$$\alpha_1 \sim \text{Normal}(\mu_{\alpha_1}, \tau_{\alpha_1})$$

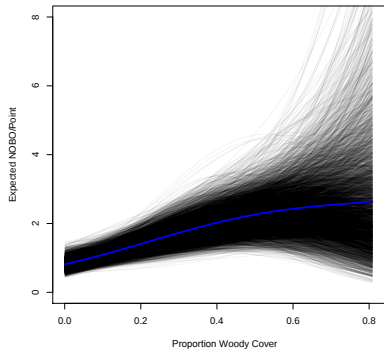
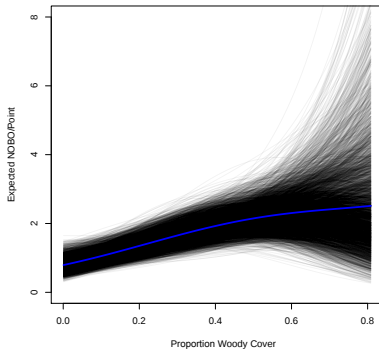
$$\alpha_2 \sim \text{Normal}(\mu_{\alpha_2}, \tau_{\alpha_2})$$

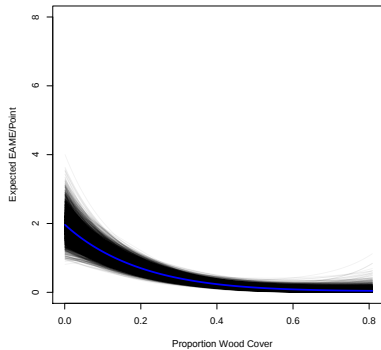
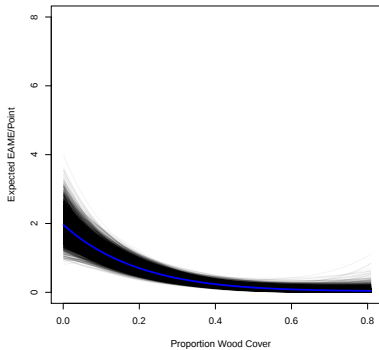
$$\alpha_3 \sim \text{Normal}(\mu_{\alpha_3}, \tau_{\alpha_3})$$

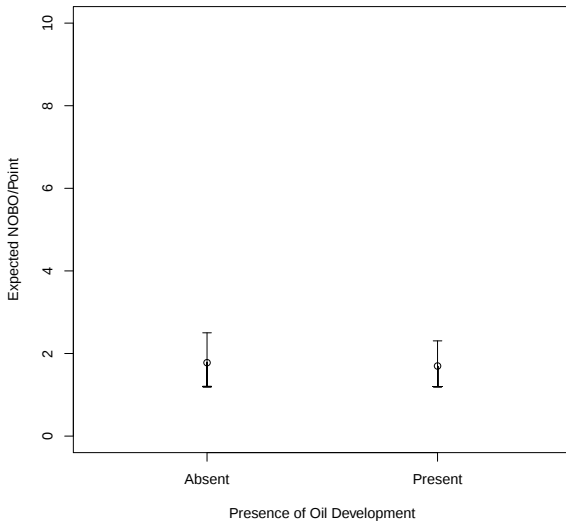


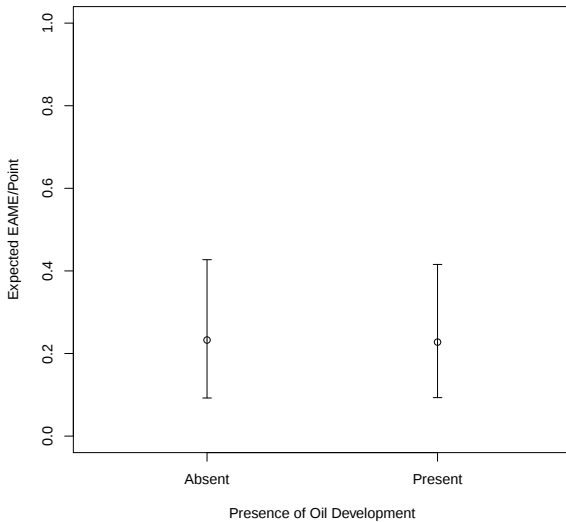
- NOBO detections in 2015: 657
- EAME detections in 2015: 308
- Range of Woody in 2015 = (0-80%)
- 44% of sites had Oil Development in 2015
- Land % in 1000m buffer in Oil Development was 0-5.9% in 2015

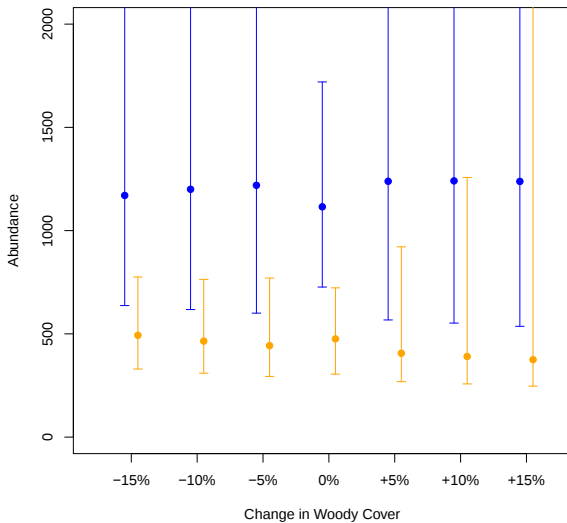


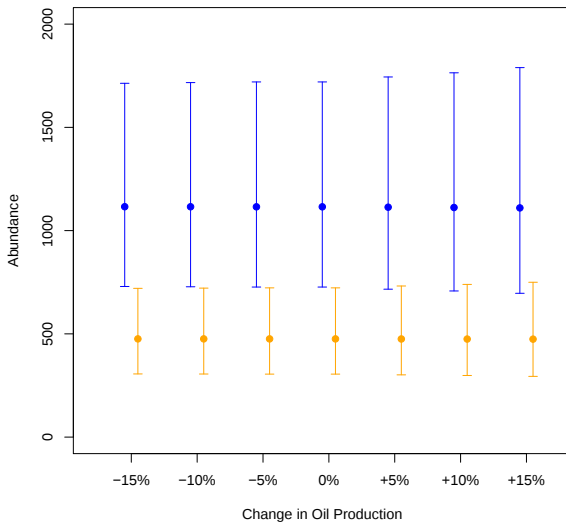


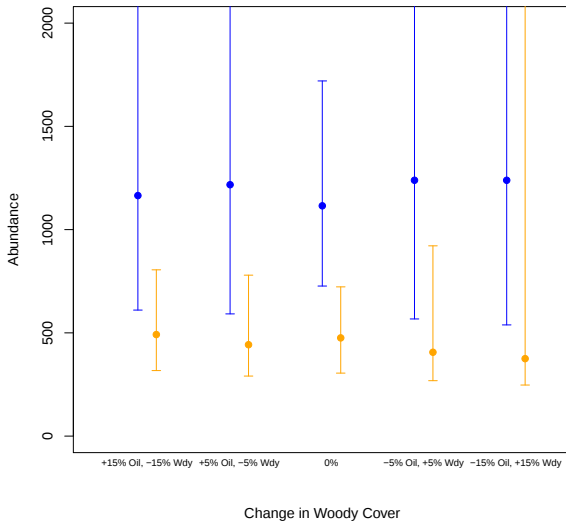


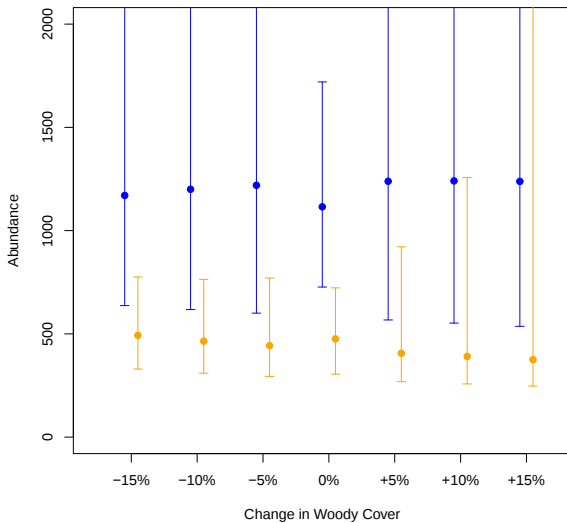


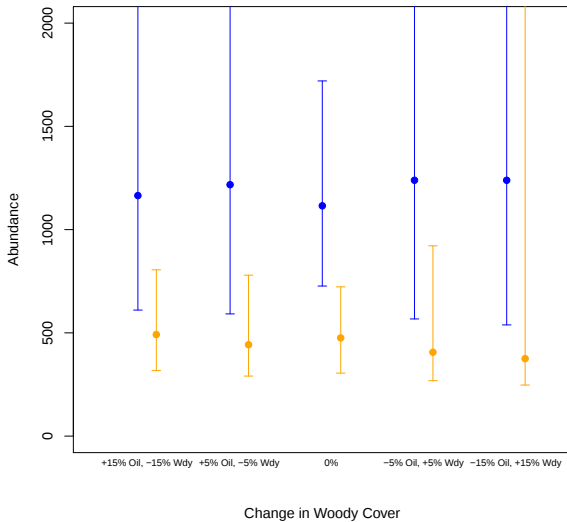












level density of well pads; lek attendance at well-pad densities of 1.54 well pads/km² (4 well pads/mile²) ranged from 13% to 74% lower than attendance at unimpacted leks (leks with zero well pads within 8.5 km). Lek attendance at a well-pad density of 3.09 well pads/km² (8 well pads/mile²) ranged from 77% to 79% lower than attendance at leks with no well pad within 8.5 km. Further, our analysis of time-lag effects suggested that there is a delay of 2–10 years between activity associated with energy development and its measurable effects on lek attendance. These results offer new information for consideration by land managers on spatial and temporal associations between human activity and lek attendance in sage-grouse, and suggest that regional variation is an important consideration in refining existing management strategies.



Discussion

- ① Economic markets are tenuous to predict
- ② Land use change may be even harder
- ③ Scale of effect likely varies
- ④ The effect of weather is a major driver



Caveats

- 1 Have not accounted for calling probability
- 2 No temporal population dynamics in model
- 3 No threshold effects of oil development
- 4 Used a 1000m buffer for scale of effect
- 5 Vital rates are needed



Future Directions

- 1 Expand geographic scope
- 2 Include additional covariates in the model
- 3 Identify areas of conservation concern
- 4 Investigate the impacts of GRIP
- 5 Integrate other datasets (e.g., BBS or Texas Roadside Counts)



