

# Robots, telemetry and the sex lives of wild birds



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*“The sight of a feather in a peacock’s tail, whenever I gaze at it, makes me feel sick!”* – Darwin, letter to Asa Gray 1860



### **Why pay attention to displays?**

- Learn about his genes
- Learn about direct benefits
- Sucker for dazzling sexiness



## **Greater Sage-grouse** *Centrocercus urophasianus*

- Studying sexual selection in sage-grouse
- conservation research informed by basic science
- Linking sexual selection to foraging and habitat use



Lander, WY







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# Sexual selection in Sage-Grouse

## Females are extremely picky, but not about looks

Successful males...

- Show up and work hard
  - Attend the lek more often
  - Strut at a high rate
- Have fewer scars from parasites
- Have lots of other hens around
- Sound good

Wiley 1970; Hartzler 1972; Gibson et al. 1985, 1991; Gibson 1996; Boyce 1990; Patricelli & Krakauer 2010; Koch, Krakauer & Patricelli 2015; Krakauer et al. 2016; Perry et al. *in prep*



# Sexual selection in Sage-Grouse

## Sound is especially important:

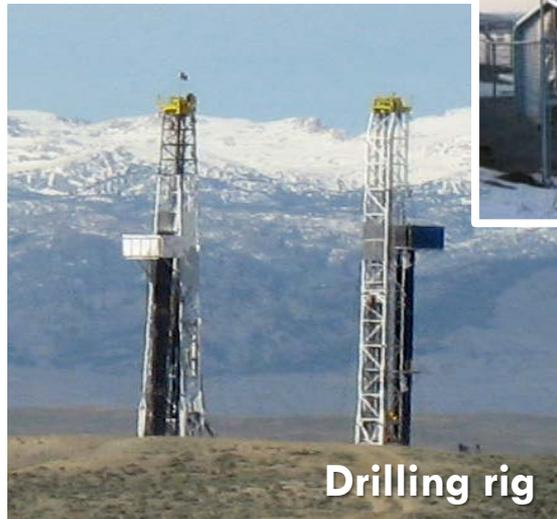
- Sounds are used to attract females from a distance for courtship (Gibson 1989)
- Mate choice is related to both the quantity and quality of male acoustic displays (Gibson 1996; Patricelli & Krakauer 2010)

*These facts led us to address the impact of noise on reproductive behaviors*

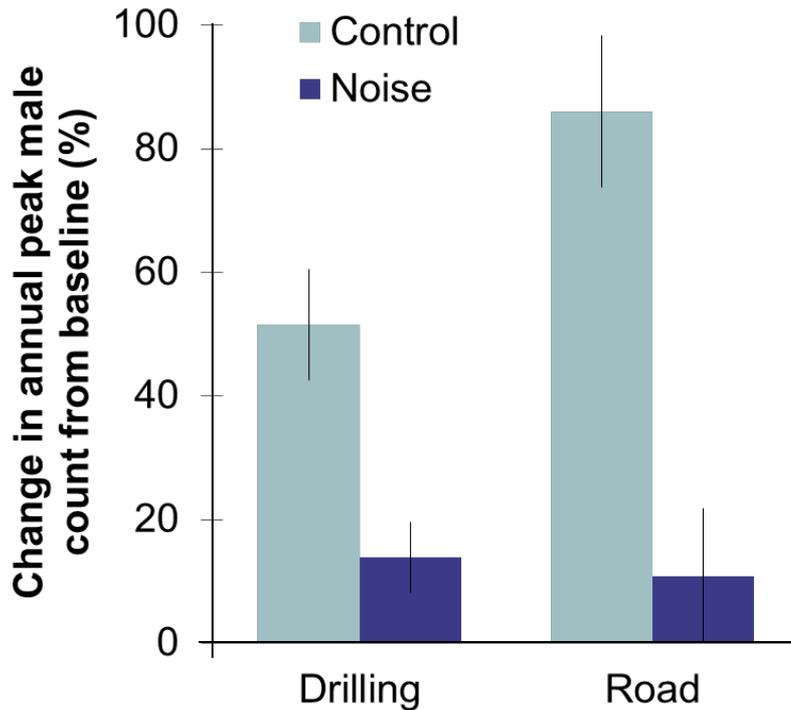


# Noise impacts on sage-grouse

- Sage-grouse populations are **declining**, leading to their consideration for listing as endangered
- Declines are extremely rapid in areas of industrial development, with evidence that **noise pollution** may be one cause (Holloran 2005; Kaiser 2006; Walker et al. 2007; Doherty et al. 2008; Naugle et al. 2011)
- To test this, we recorded noise and played it back to undisturbed leks



# Noise impacts on sage-grouse

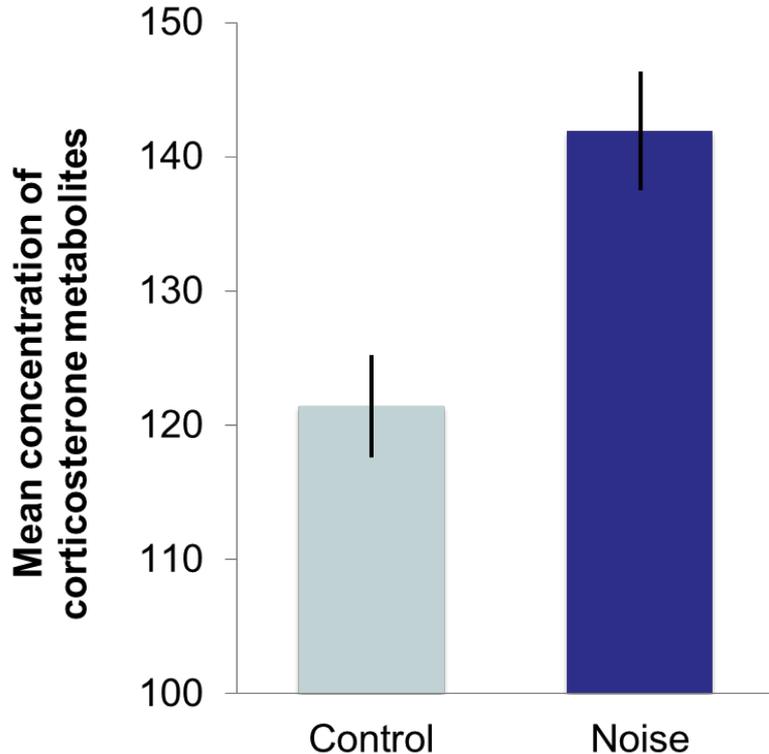


## Playback of noise from roads and natural gas drilling disrupts sage-grouse lekking activities

- Lower male attendance on noise leks than controls
- Road noise had a larger impact (73%) than drilling noise (29%)

(Blickley, et al. 2012a & 2012b; Blickley & Patricelli 2012; Blickley 2013)

# Noise impacts on sage-grouse

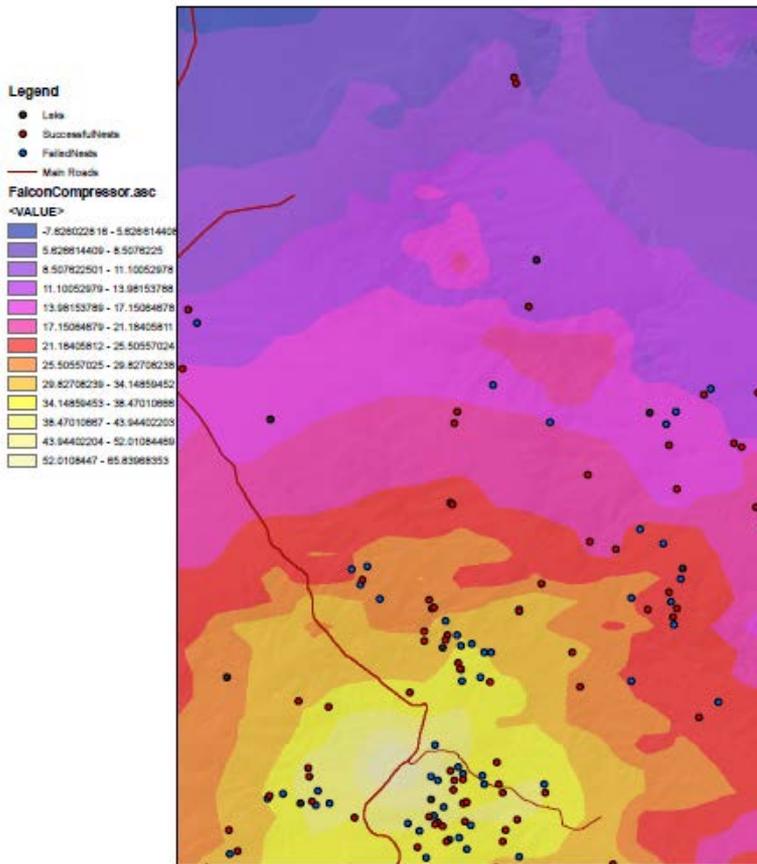


## Playback of noise from roads and natural gas drilling disrupts sage-grouse lekking activities

- Lower male attendance on noise leks than controls
- Road noise had a larger impact (73%) than drilling noise (29%)
- Evidence of increased stress in noise
- The timing of strutting behaviors altered in noise

(Blickley, et al. 2012a & 2012b; Blickley & Patricelli 2012; Blickley 2013)

# Noise impacts on sage-grouse



Acoustic footprint--  
Pinedale Anticline

## Playback of noise from roads and natural gas drilling disrupts sage-grouse lekking activities

- Currently creating noise layers for habitat selection modeling to help determine appropriate thresholds
- We've been working with state and federal agencies to integrate noise protections into management

**Basic research on sexual selection using sage-grouse as a model system informed this project at every stage**

# Sexual selection in Sage-Grouse

**Females are extremely picky, but not about looks**

Successful males...

- Show up and work hard
  - Attend the lek more often
  - **Strut at a high rate**
- Have fewer scars from parasites
- Have lots of other hens around
- **Sound good**



# Sexual selection in Sage-Grouse

## It's hard to be sexy...

- **Strutting is energetically costly** (Vehrencamp et al 1989)
- **Previous research suggested a quantity-quality tradeoff** (Gibson 1996)
- **We found a tradeoff only in unsuccessful males; successful males could increase quantity without a decline in quality** (Patricelli & Krakauer 2010)

**This research suggests that success is largely about the acquisition and use of energy...which comes from food**



Photo:  
Neil Losin

# Foraging ecology & display behaviors



Dr. Alan Krakauer, UC Davis  
Dr. Jen Forbey, Boise State University

**We're investigating how  
males acquire and use energy  
during the breeding season**



Dr. John Burt, Univ of Washington

# Foraging ecology & display behaviors



## Encounternet

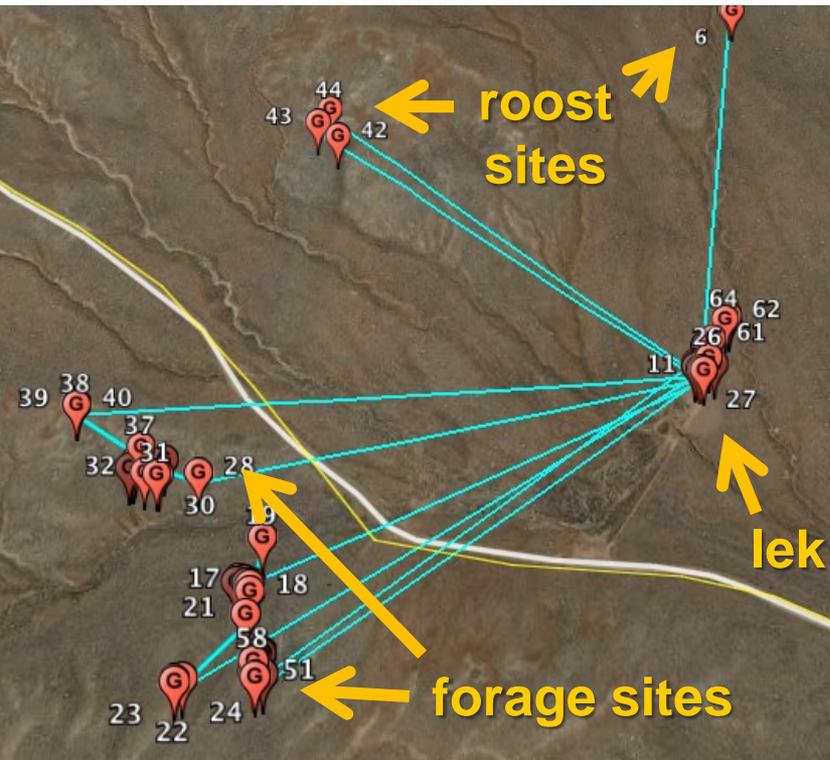
- Tags with GPS and accelerometer
- Store data until it can be uploaded to base stations on leks
- We collect hourly GPS points and accelerometer samples



# Foraging ecology & display behaviors

## Encounternet

- Map foraging and roosting locations



2 days in the life of Steve

# Foraging ecology & display behaviors



## Encounternet

- Map foraging and roosting locations
- Collected veg data and sample browsed and unbrowsed sagebrush
- Samples are being analyzed for toxins and nutritional content in Forbey lab
- Learn characteristics of preferred plants and habitats, and how foraging success relates to body condition, display effort and mating success

# Foraging ecology & display behaviors



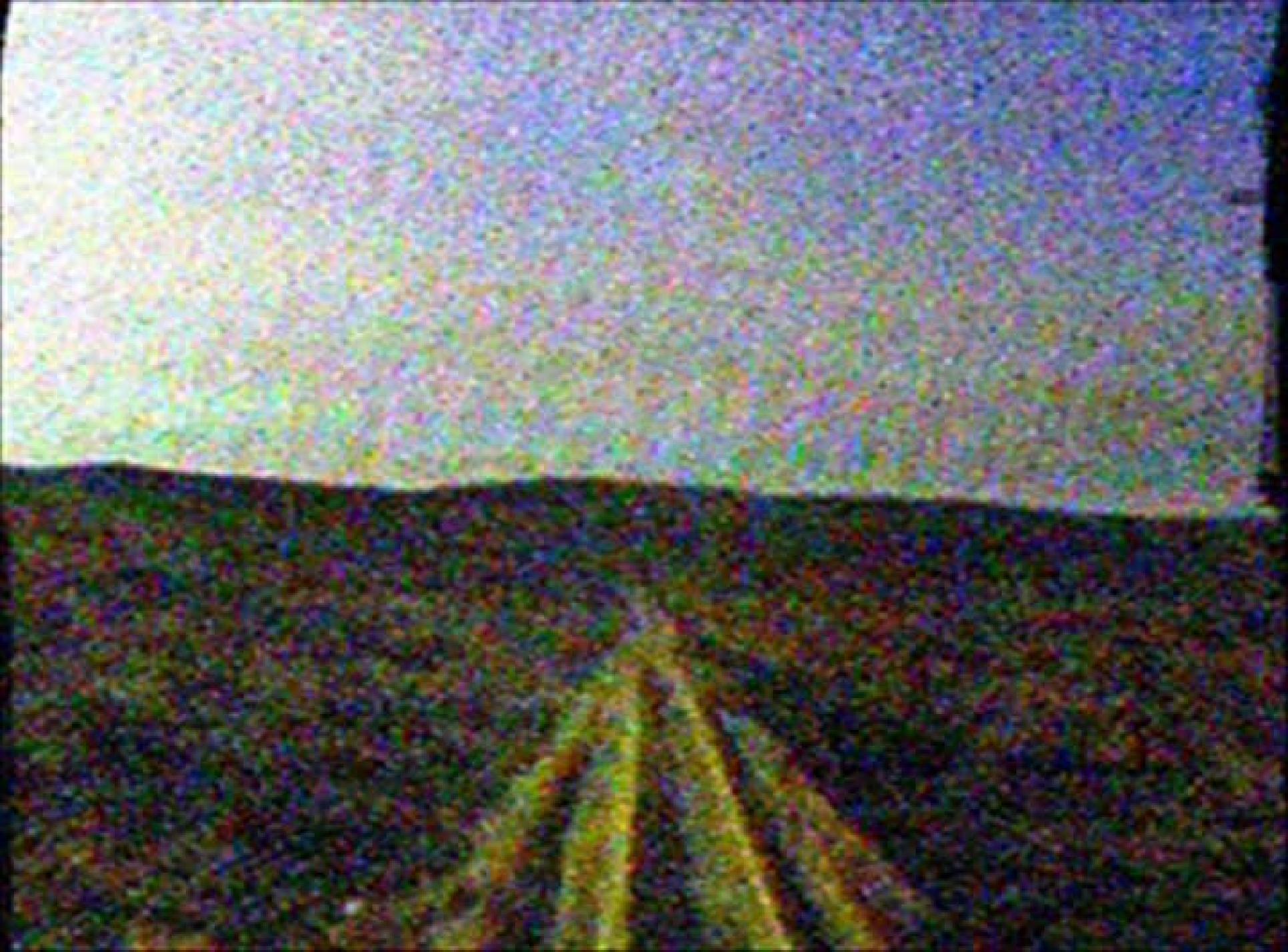
Photo: Noppadol Paothong

## Assay of display behavior

- We study male behavior in natural courtships and courtships with **robotic females**
  - This allows us to assay unsuccessful males and to hold female behavior constant
  - It also allows us to experimentally manipulate the interactions between males and females

**One of our major aims is to understand how courtship tactics – social intelligence and skill – can evolve by sexual selection**







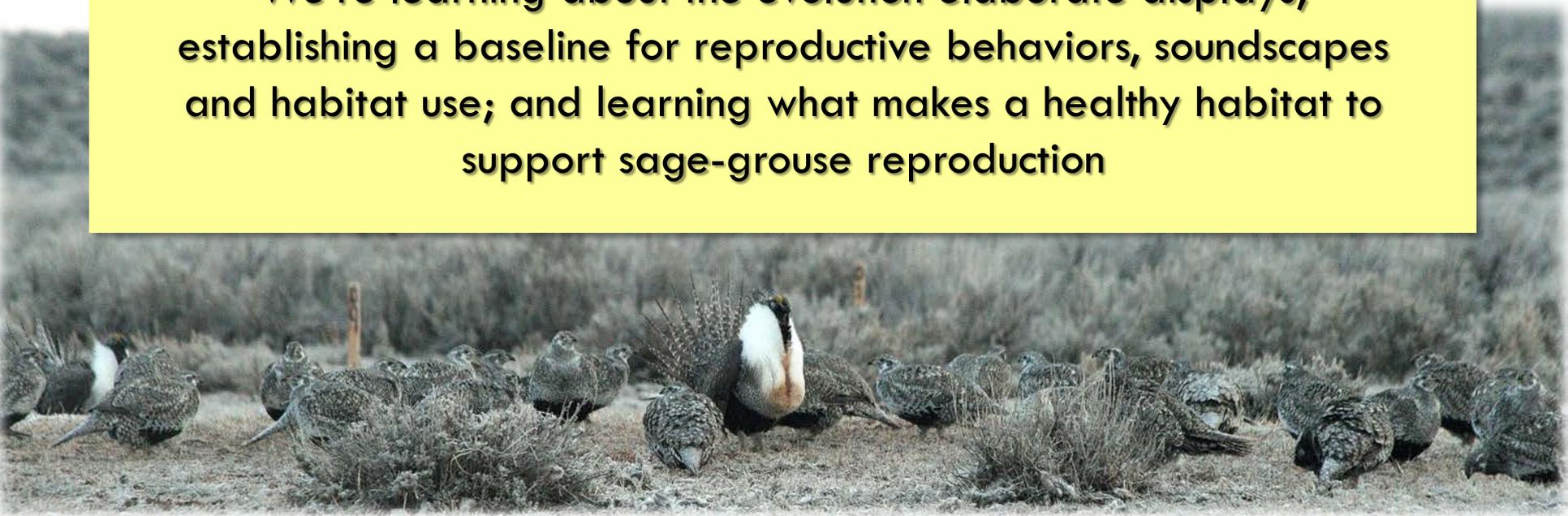


# Sexual Selection in Sage-Grouse

Using the fembots, we've identified multiple courtship tactics related to the quality of male displays and male mating success (Patricelli & Krakauer 2010; Koch et al. 2015; Krakauer et al. 2016; Perry et al. *in prep*)

Ongoing works links these courtship tactics to foraging behaviors, habitat quality and diet quality

We're learning about the evolution elaborate displays; establishing a baseline for reproductive behaviors, soundscapes and habitat use; and learning what makes a healthy habitat to support sage-grouse reproduction



**Sage-grouse have been an important model system in evolutionary and behavioral biology**

*And while these questions may seem a bit esoteric with populations in decline...*





*As the need for conservation action becomes more acute, there is more need than ever for communication and collaboration between researchers focused on basic and applied questions*

# ACKNOWLEDGEMENTS:

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