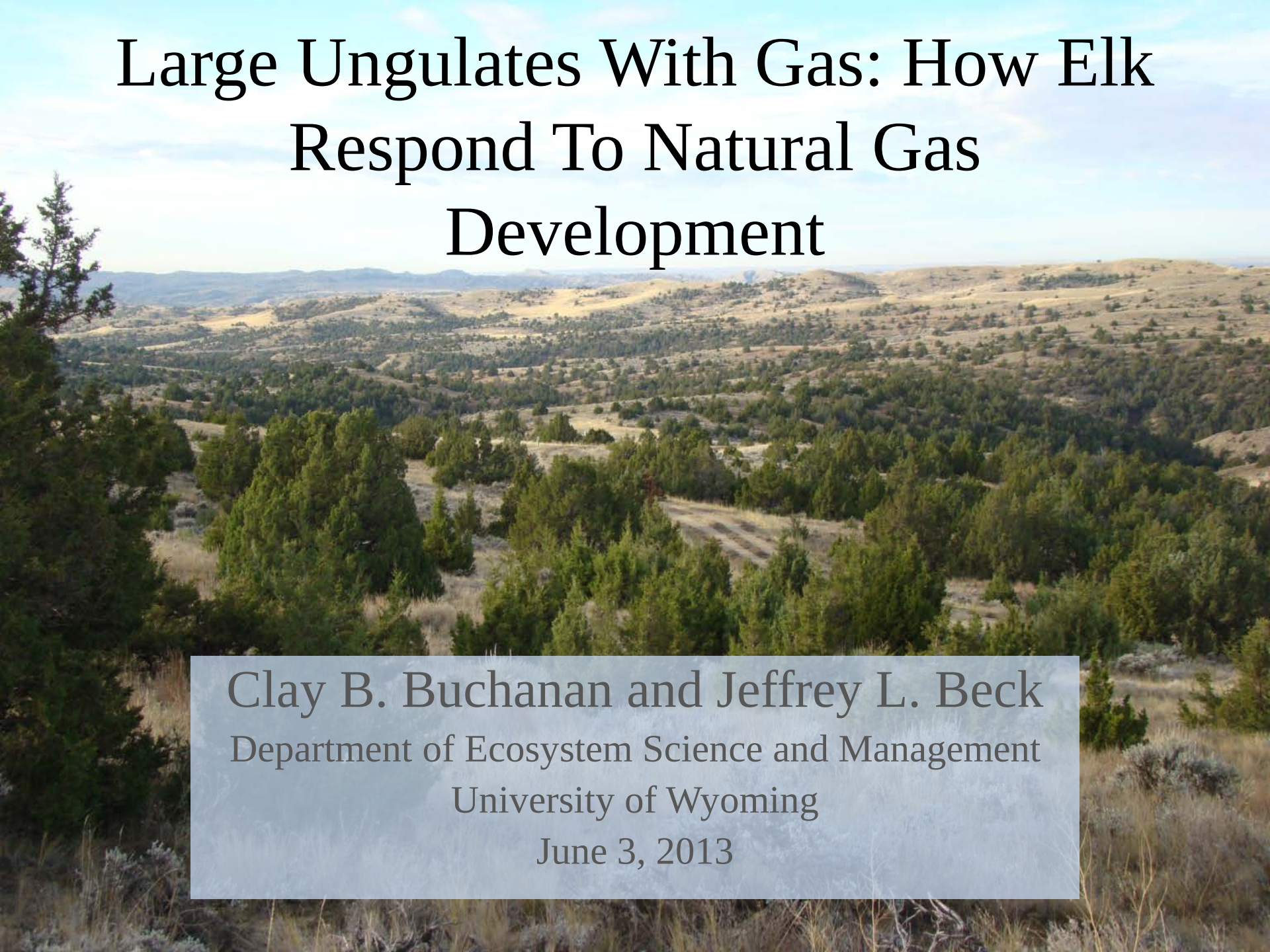
Large Ungulates With Gas: How Elk Respond To Natural Gas Development



Clay B. Buchanan and Jeffrey L. Beck
Department of Ecosystem Science and Management
University of Wyoming
June 3, 2013

Risk *– A state of uncertainty where some of the possibilities involve a loss, catastrophe, or other undesirable outcome*

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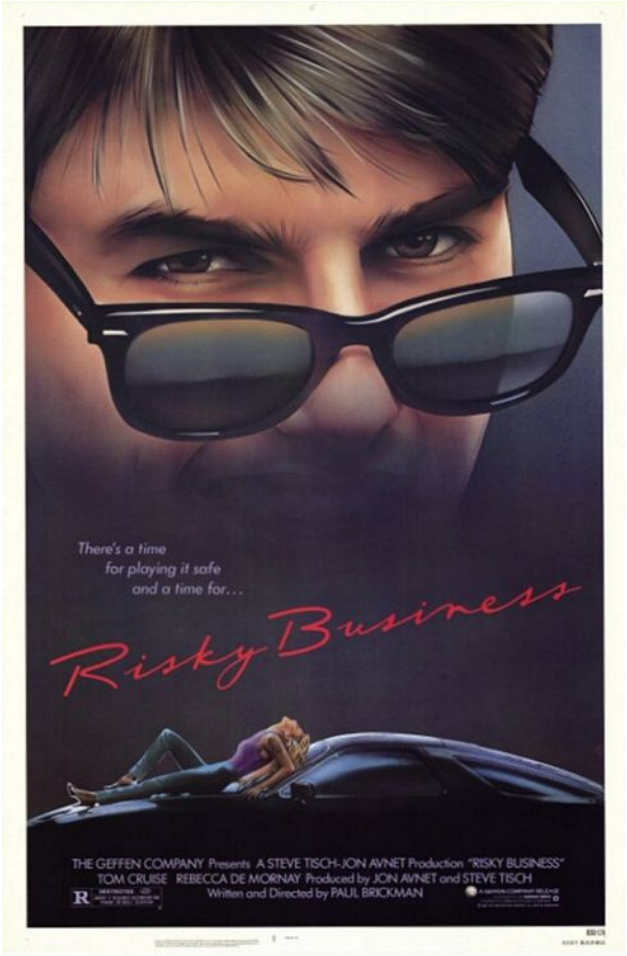
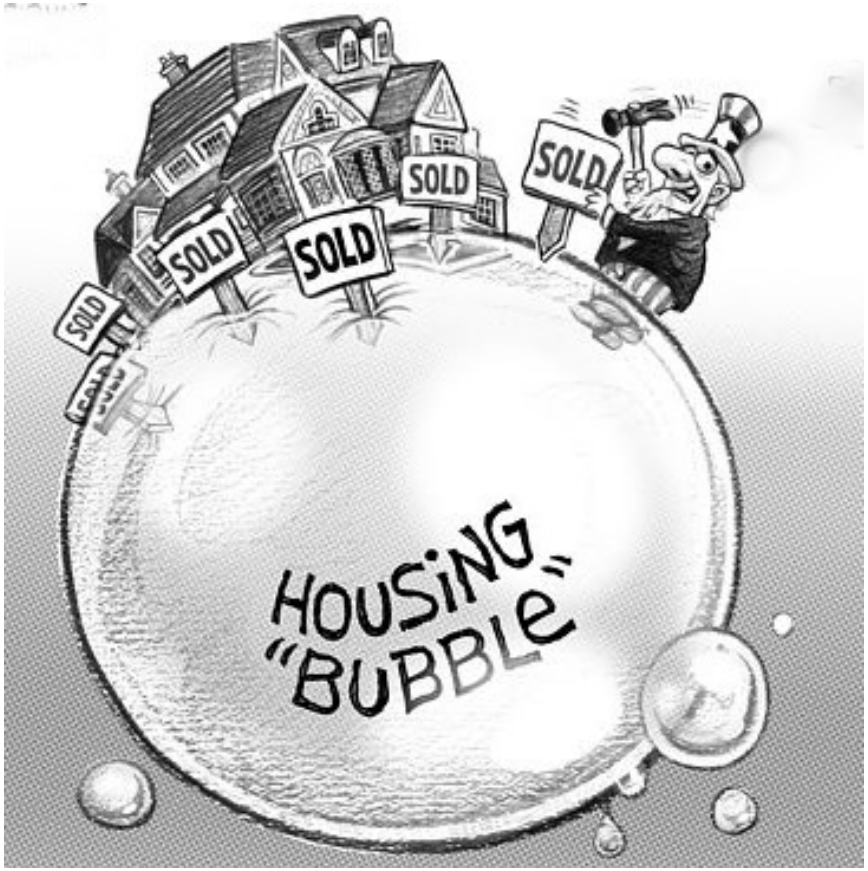
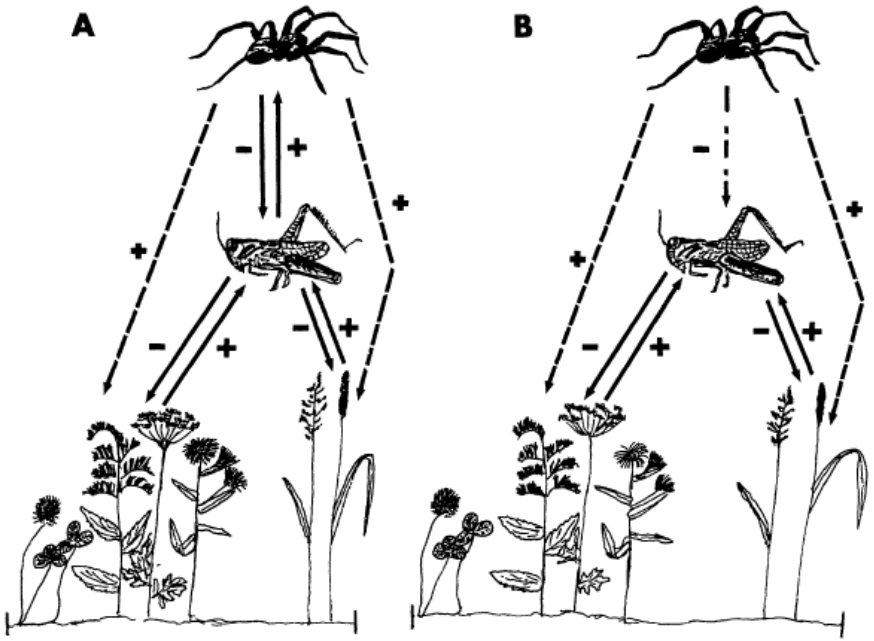




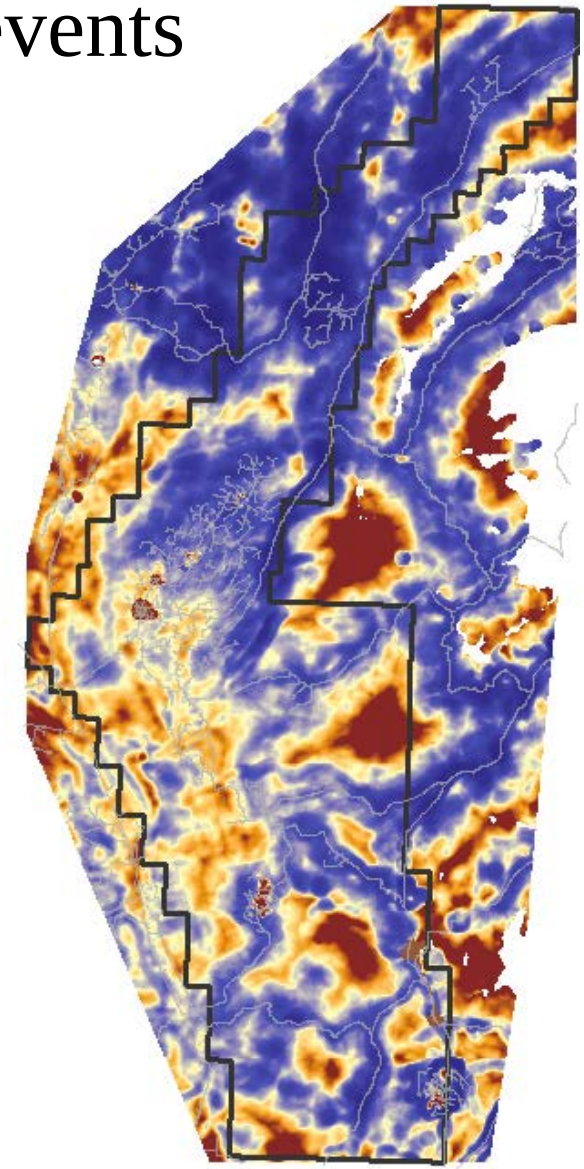
www.foreclosurehamlet.org

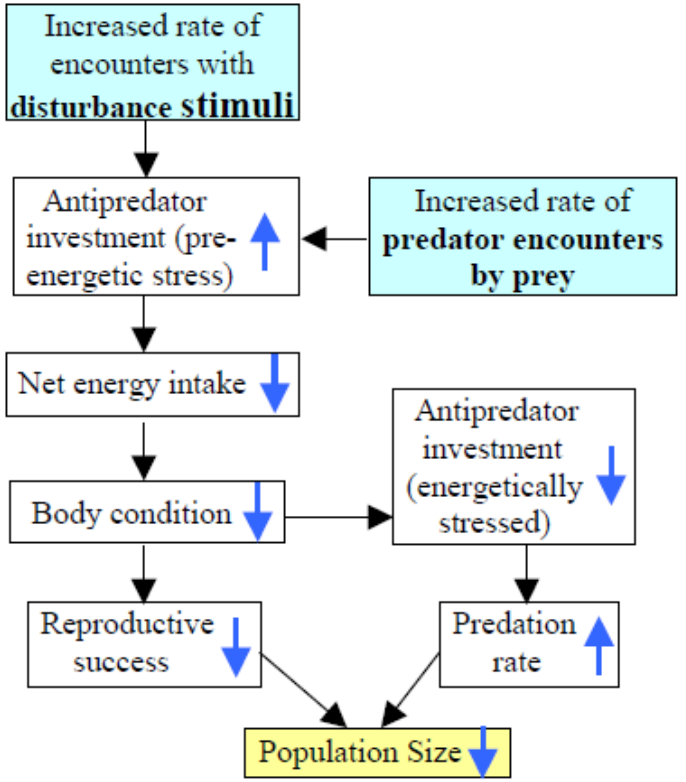


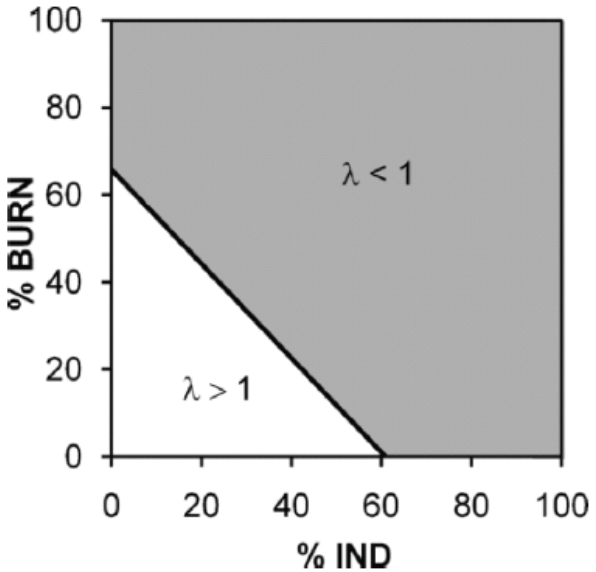
Pursued
Injury
Death

Foraging
Locating a mate
Migrating

- Risk concepts are transferable to disturbance events



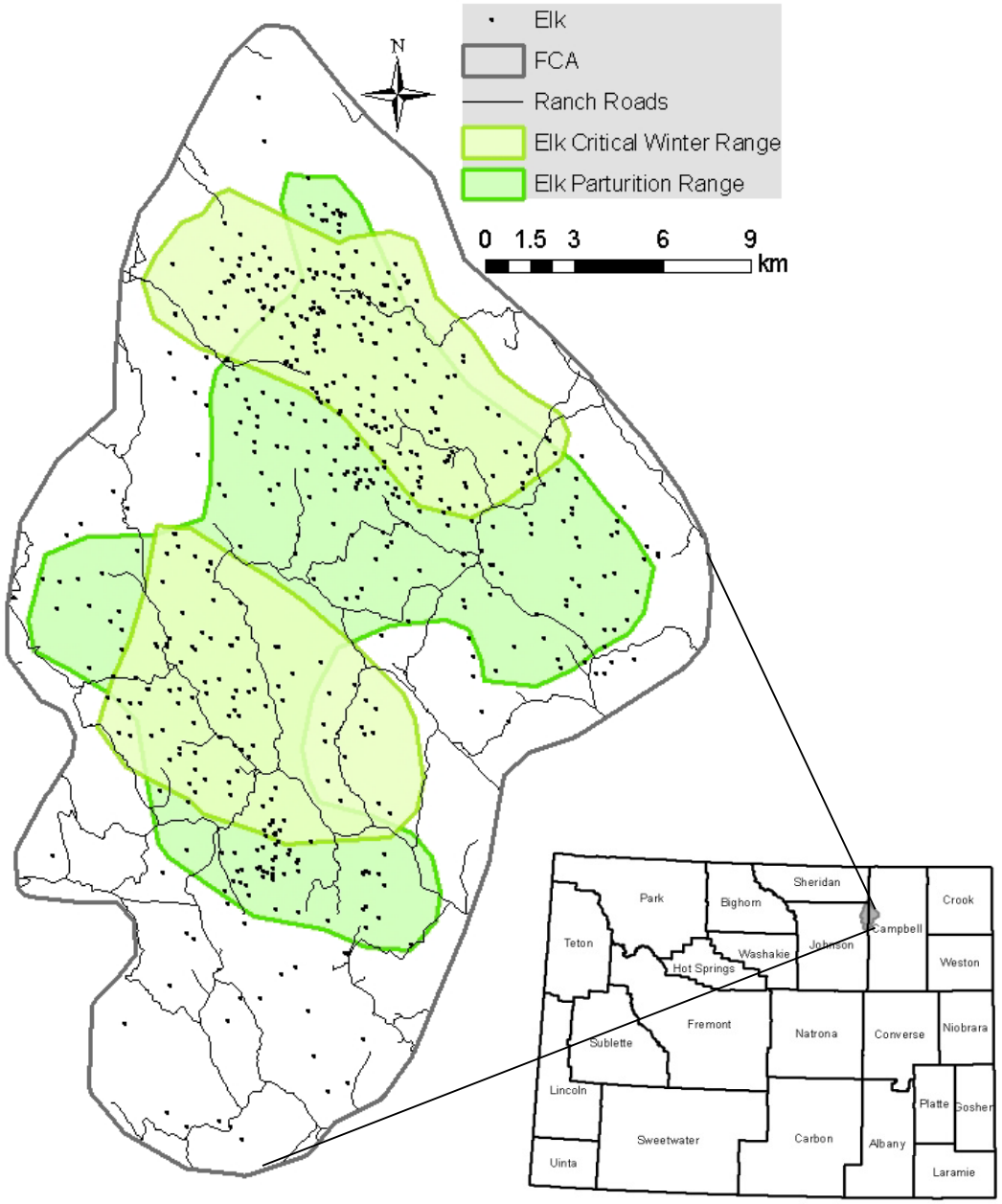


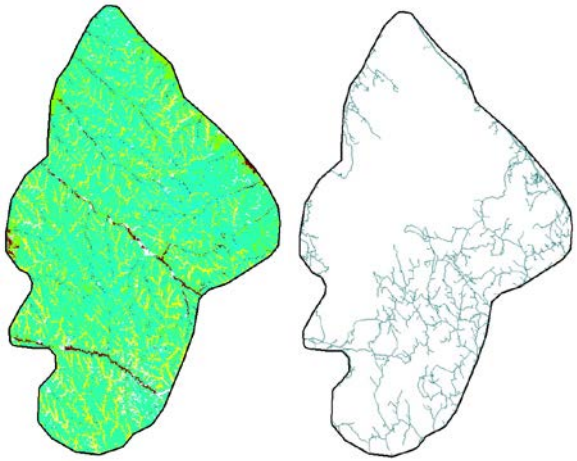


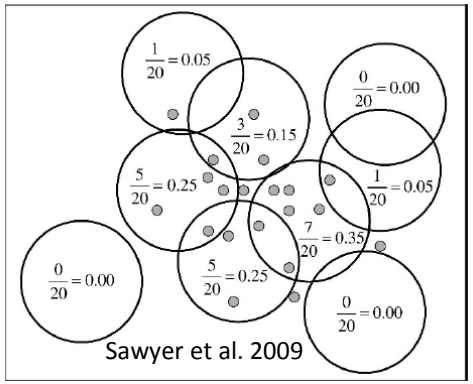
Fortification Creek Elk

- Sample elk distribution and resource selection
- Measure influences of coal bed natural gas (CBNG) development
- Assess elk ability to reduce impacts

- Fortification Creek Area (FCA; ~498 km^2)
- Non-migratory elk population of ~230 individuals
- CBNG development began in early 2000s
- >700 wells at the end date of GPS data
- Sagebrush/grassland dominated

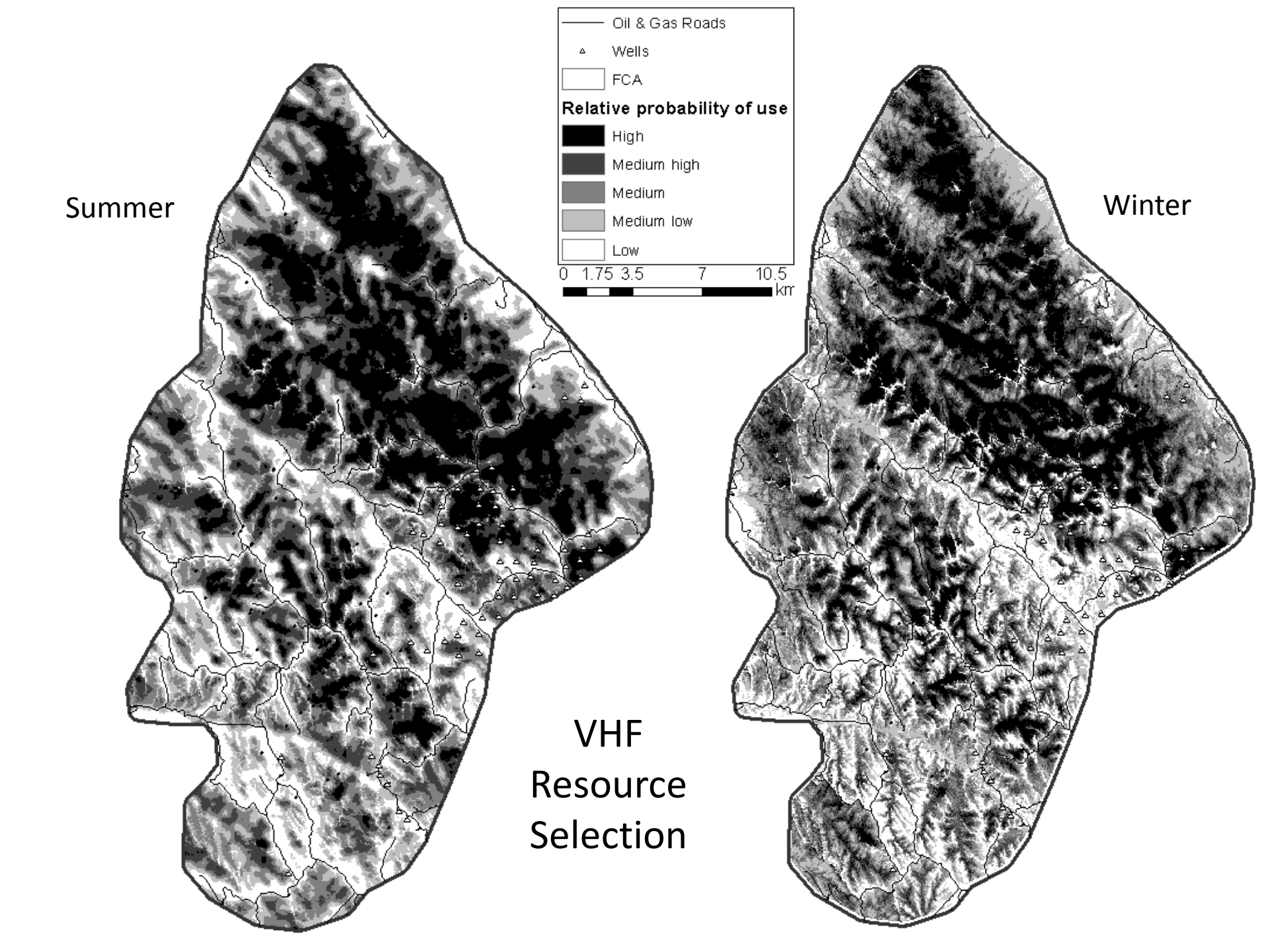


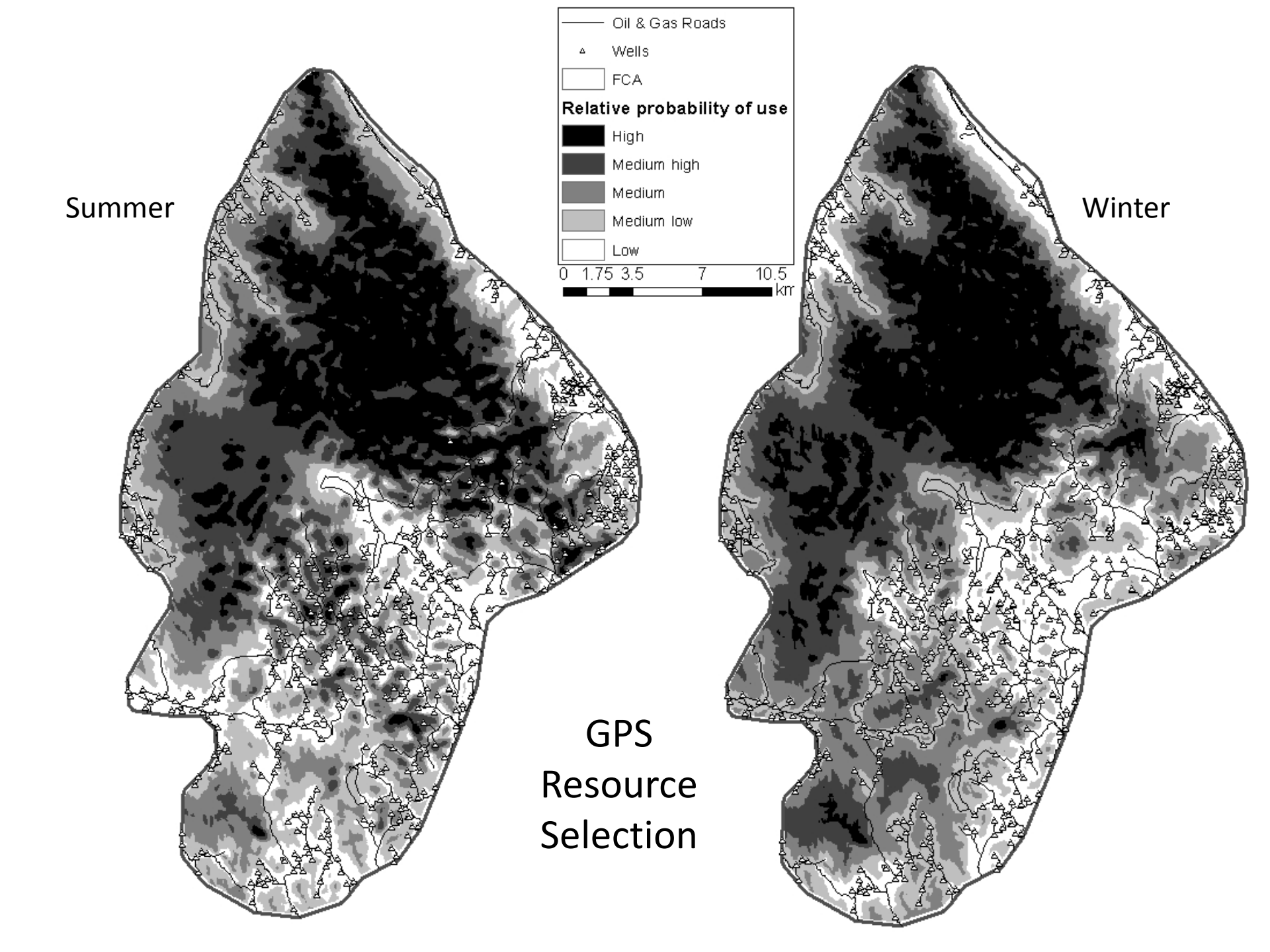




Sawyer et al. 2009

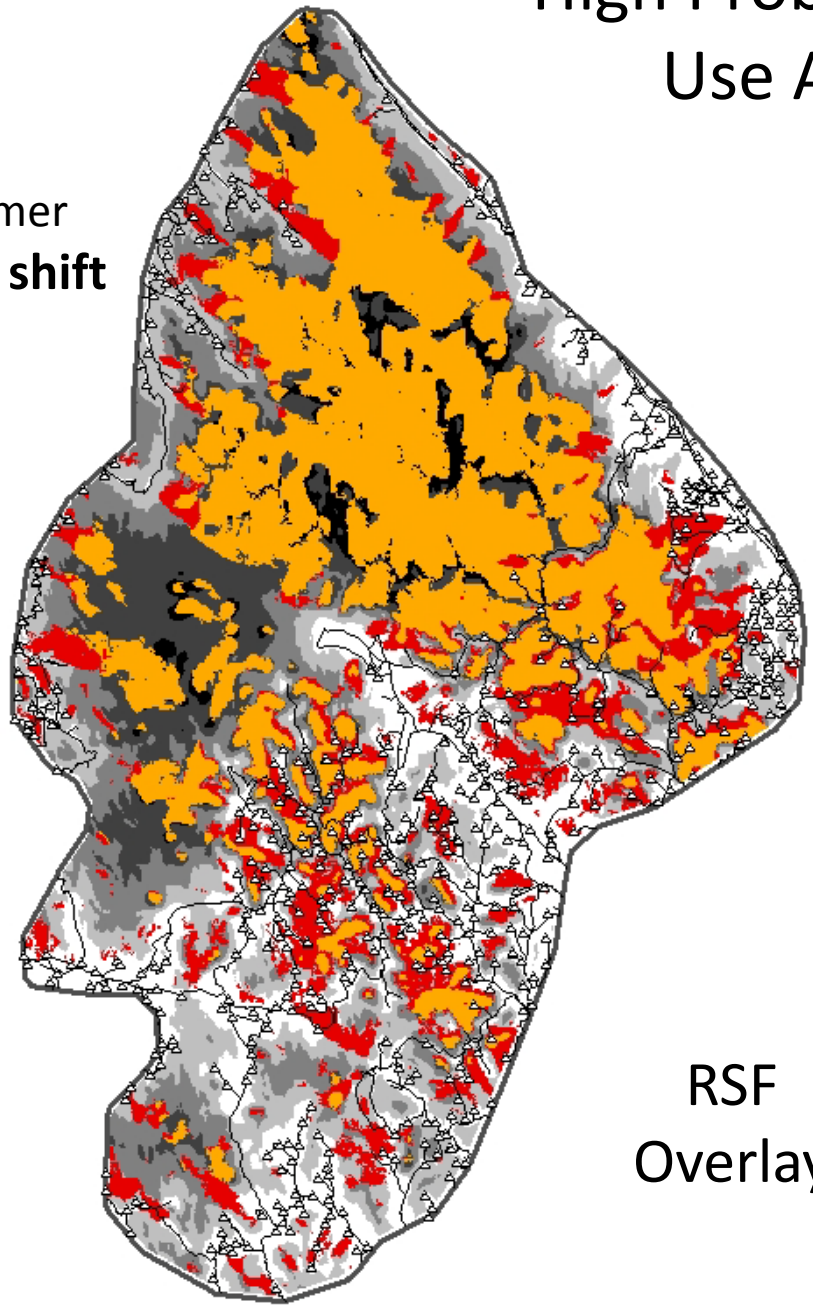
- GPS collared female elk
- Measured traffic volume and environmental variables
- Resource selection functions (RSF, Manly et al. 2002)
  - Pooled data across individual elk
  - Relative probability of elk use as the response variable
  - Summer and winter RSFs
  - Day and night during early and late summer RSFs


Oil & Gas Roads
Wells
FCA
Relative probability of use
High
Medium high
Medium
Medium low
Low
0 1.75 3.5 7 10.5
km
Summer
Winter
VHF
Resource
Selection


Oil & Gas Roads
Wells
FCA
Relative probability of use
High
Medium high
Medium
Medium low
Low
0 1.75 3.5 7 10.5
km
Summer
Winter
GPS
Resource
Selection

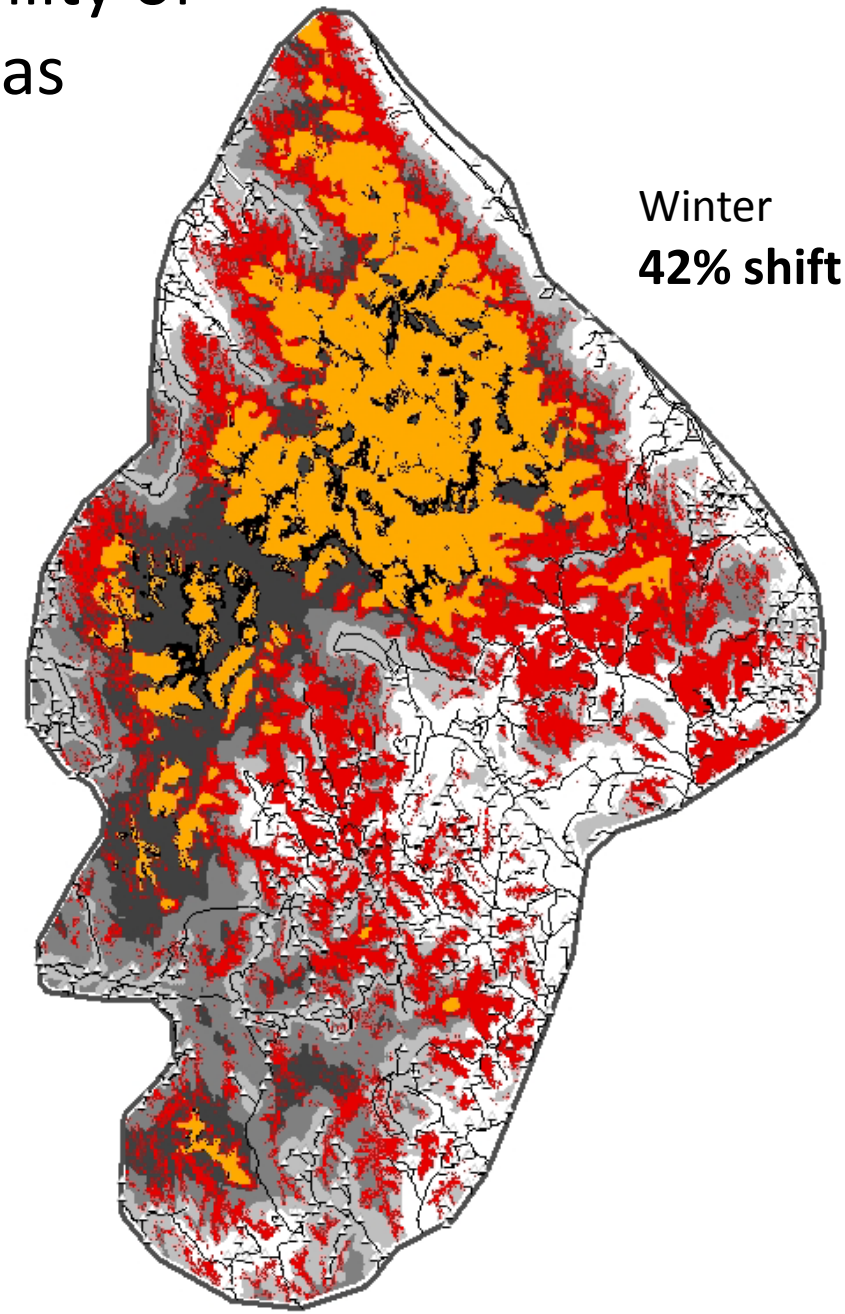
High Probability of Use Areas

Summer
31% shift



RSF Overlay

Winter
42% shift



Conclusion: Part 1

- Elk avoided CBNG roads
  - Increased avoidance during development
  - Human activities levels vary
  - Avoided roads with lowest activity
- Juniper cover type and ruggedness
  - Predictive during all periods
    - Thermoregulation
  - Increasing importance during development
    - Escape cover

Elk Self Mitigation of Development Impacts

Mitigation *– the act of making a condition or consequence less severe*

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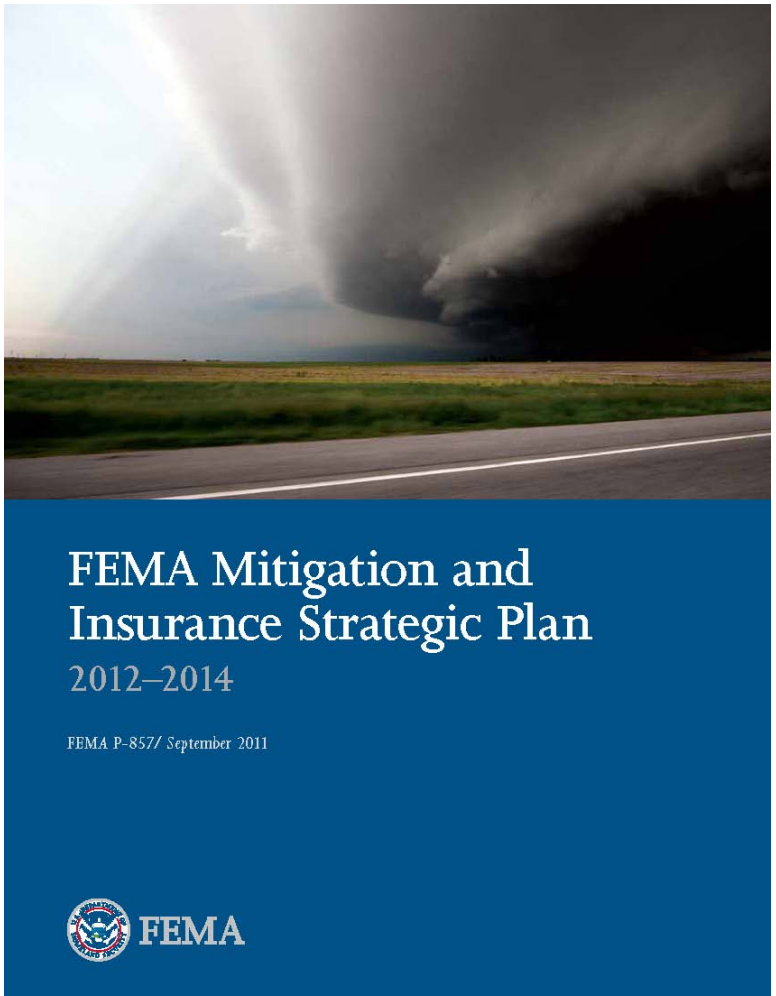


Mitigation

- Examples of:
  - Resource use shifts
  - Some return to original resource after disturbance lessens or concludes
- Do animals use resources on a smaller temporal or spatial scale to mitigate disturbance effects?

Journal of Applied Ecology 2008, **45**, 845–853 doi: 10.1111/j.1365-2664.2008.01465.x

Ski tourism affects habitat use and evokes a physiological stress response in capercaillie *Tetrao urogallus*: a new methodological approach

Dominik Thiel[1,2*], Susanne Jenni-Eiermann[1], Veronika Braunisch[3], Rupert Palme[4] and Lukas Jenni[1]

Journal of Applied Ecology 2007 44, 1219–1230

Risk-disturbance overrides density dependence in a hunted colonial rodent, the black-tailed prairie dog *Cynomys ludovicianus*

JONATHAN N. PAULI and STEVEN W. BUSKIRK
Department of Zoology and Physiology, University of Wyoming, 1000 E. University Avenue, Laramie, Wyoming 82071–3166, USA

Current Biology 19, 1415–1419, August 25, 2009 ©2009 Elsevier Ltd All rights reserved DOI 10.1016/j.cub.2009.06.052

Noise Pollution Changes Avian Communities and Species Interactions

Clinton D. Francis,[1,*] Catherine P. Ortega,[2] and Alexander Cruz[1]

To date, noise has been associate ties [10–14], prompting conserva

Identifying indirect habitat loss and avoidance of human infrastructure by northern mountain woodland caribou

J.L. Polfus [a,*], M. Hebblewhite [a], K. Heinemeyer [b]
[a] *Wildlife Biology Program, College of Forestry and Conservation, University of Montana, Missoula, MT 59812, USA*
[b] *Round River Conservation Studies, 284 West 400 North, Suite 105, Salt Lake City, UT 84103, USA*

Management and Conservation Article

Influence of Well Pad Activity on Winter Habitat Selection Patterns of Mule Deer

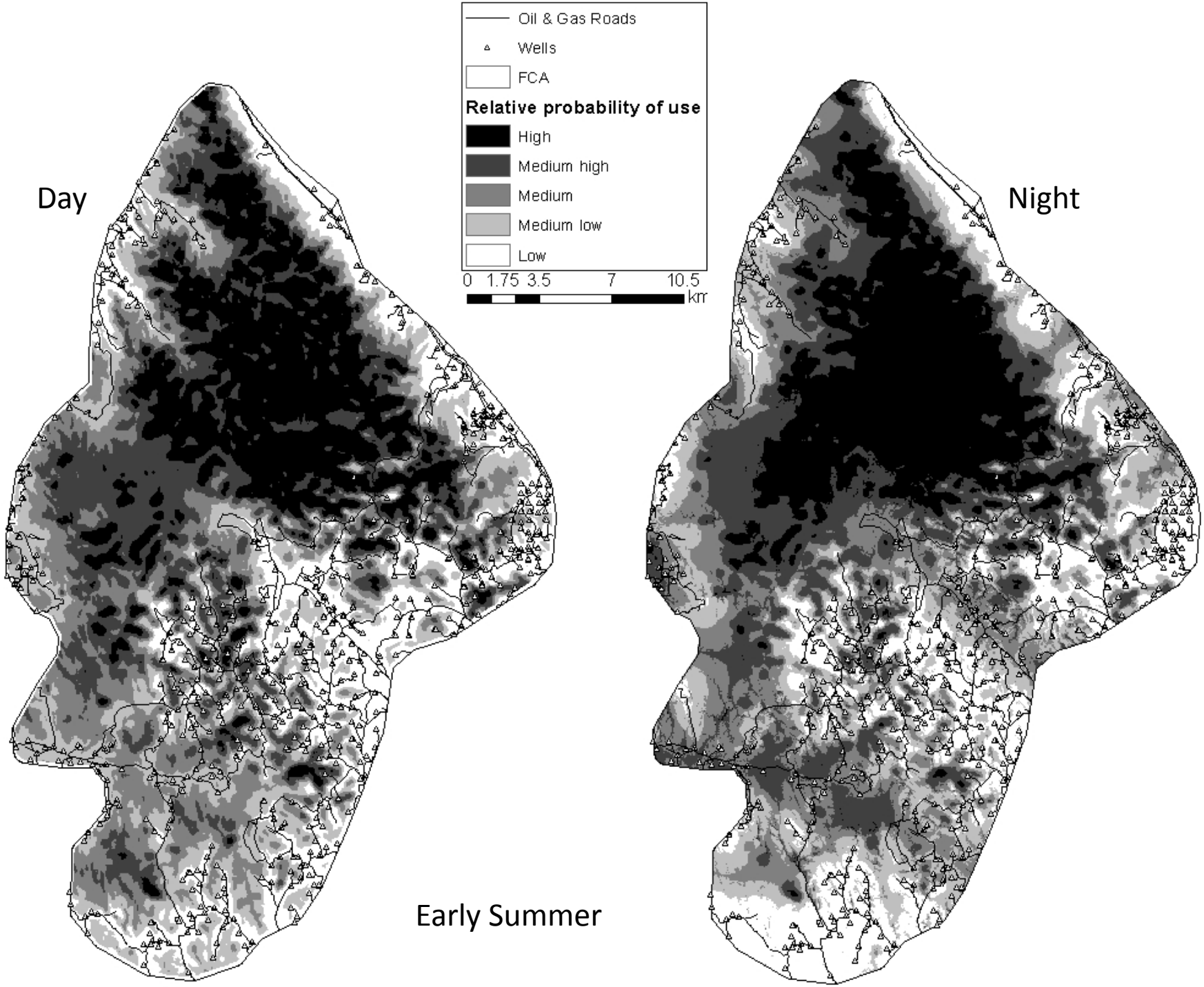
HALL SAWYER,[1] *Western EcoSystems Technology, Inc., 2003 Central Avenue, Cheyenne, WY 82001, USA; and Wyoming Cooperative Fish and Wildlife Research Unit, Department of Zoology and Physiology, University of Wyoming, 1000 E University Avenue, Box 3166, Laramie, WY 82071, USA*
MATTHEW J. KAUFFMAN, *United States Geological Survey, Wyoming Cooperative Fish and Wildlife Research Unit, Department of Zoology and Physiology, University of Wyoming, 1000 E University Avenue, Box 3166, Laramie, WY 82071, USA*
RYAN M. NIELSON, *Western EcoSystems Technology, Inc., 2003 Central Avenue, Cheyenne, WY 82001, USA*

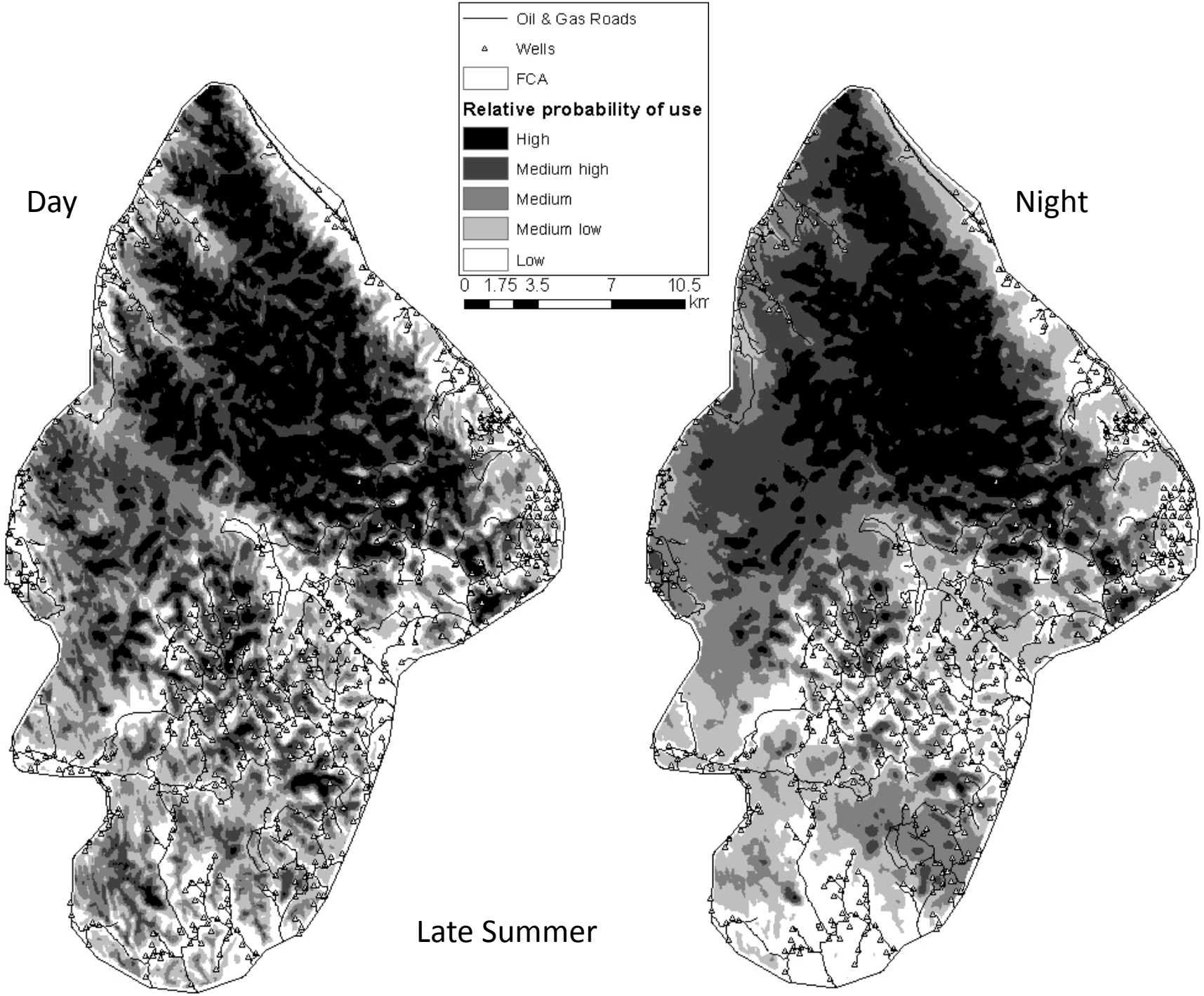
Decline in Relative Abundance of Bottlenose Dolphins Exposed to Long-Term Disturbance

LARS BEJDER,*§§ AMY SAMUELS,† HAL WHITEHEAD,* NICK GALES,‡ JANET MANN,§ RICHARD CONNOR,** MIKE HEITHAUS,†† JANA WATSON-CAPPS,§ CINDY FLAHERTY,‡‡*** AND MICHAEL KRÜTZEN†††

Similar Methods

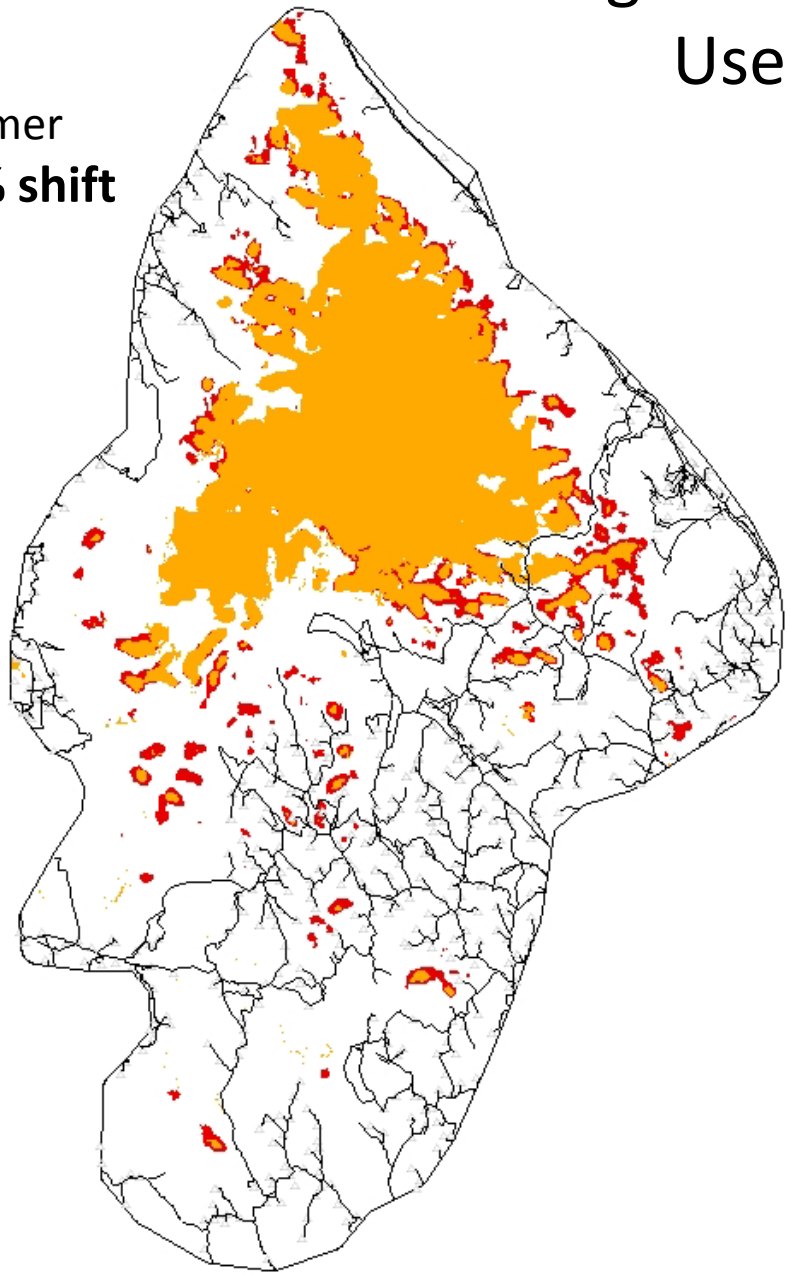
- Pooled GPS data across individuals
- Relative frequency of use as the dependent variable
- Locations separated by time of day
  - Day (700 – 1900 hrs)
  - Night (1900 – 700 hrs)
- Seasons
  - Early summer (April 1 – July 14)
  - Late summer (July 15 – October 15


Oil & Gas Roads
Wells
FCA
Relative probability of use
High
Medium high
Medium
Medium low
Low
0 1.75 3.5 7 10.5
km
Day
Night
Early Summer

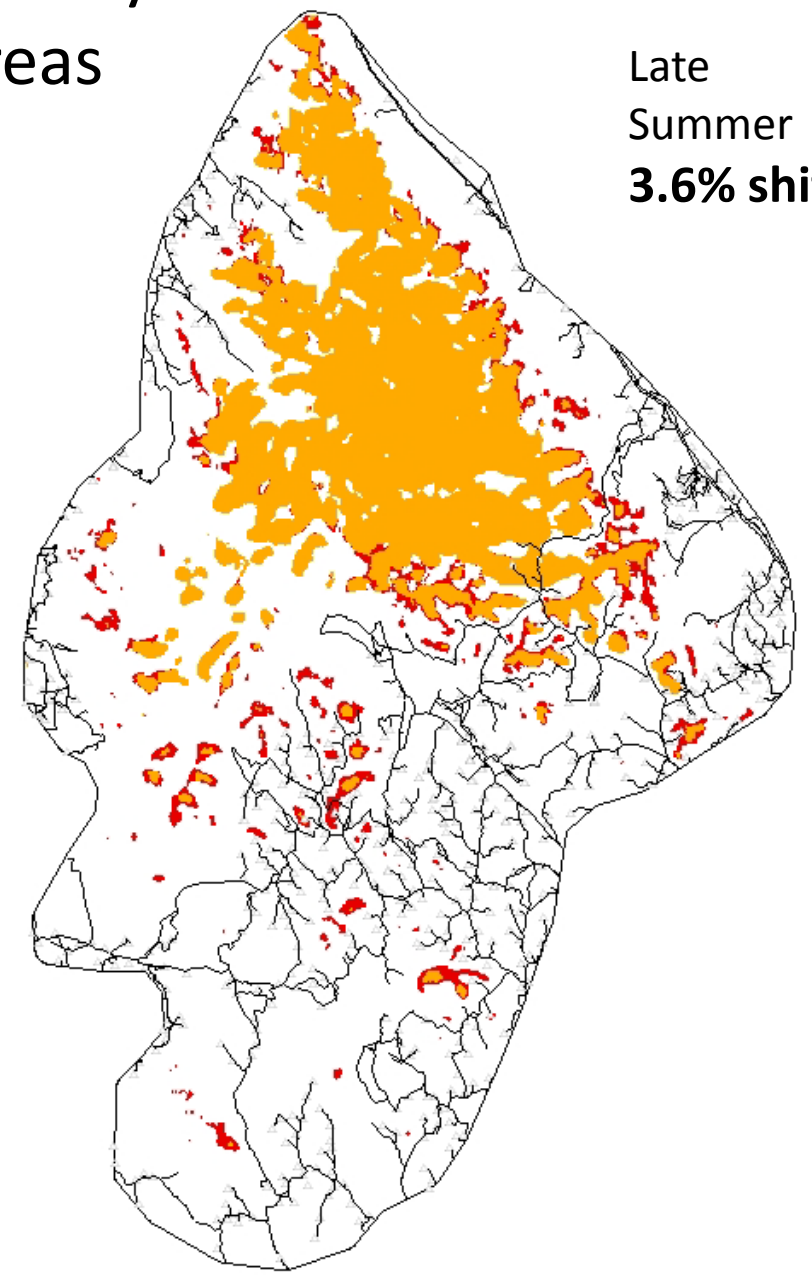

Oil & Gas Roads
Wells
FCA
Relative probability of use
High
Medium high
Medium
Medium low
Low
0 1.75 3.5 7 10.5
km
Day
Night
Late Summer

High Probability of Use Areas

Early Summer
3.5% shift



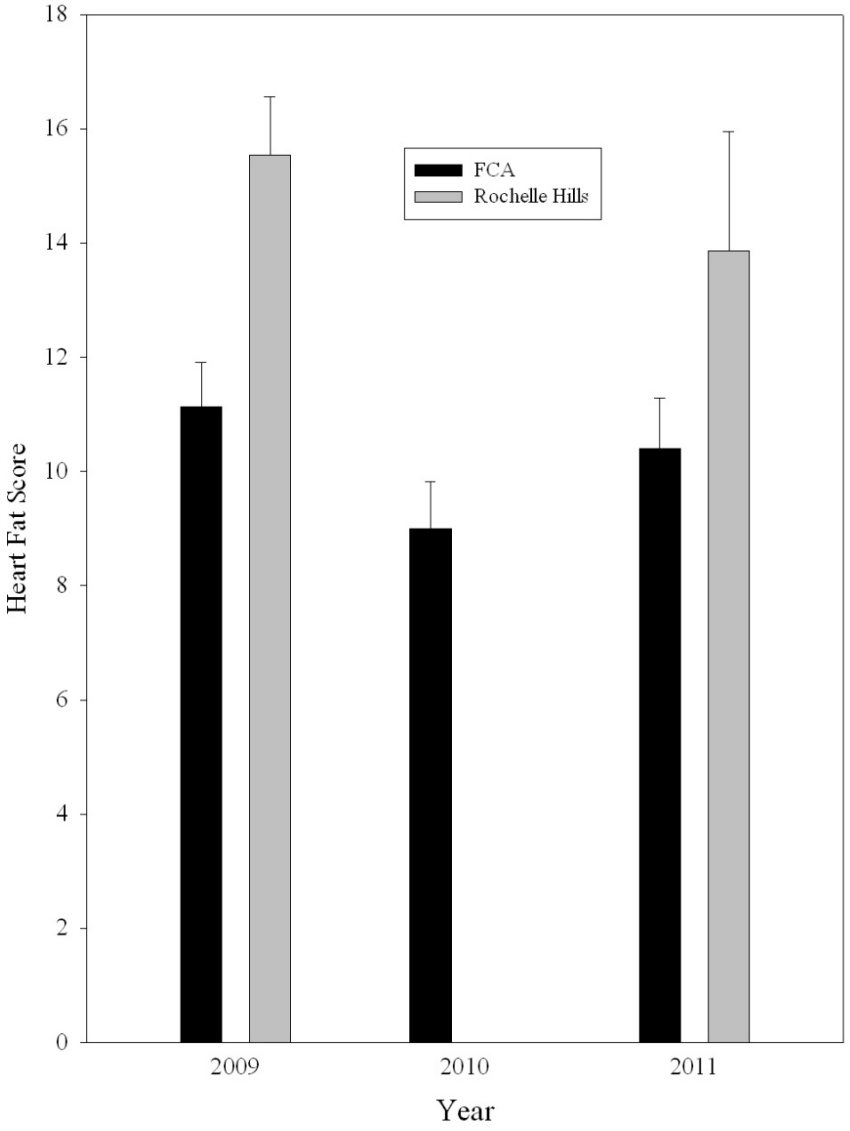
Late Summer
3.6% shift



Conclusion: Part 2

- High use areas
  - Average distance further away from roads at night than during the day
    - Early summer—250 m further
    - Late summer—280 m further
  - Maintaining avoidance of roads
    - Vehicle traffic present but decreased at night
    - Less predictable traffic pattern

- Has this effected demography?
  - Approx. 90% pregnancy rate
  - Cow:calf are consistant
  - Population numbers remain constant
- Body condition (organ fat content) is lower than reference population



Overall Conclusions

- FCA elk appear to perceive varying levels of risk
  - Respond by avoiding risky areas
  - Mixed demographic signals
- Short term mitigation is not occurring
  - FCA elk maintain or extend distance from roads at night

Overall Conclusions

- FCA elk avoided CBNG roads
  - Avoidance behavior was greater during CBNG development
    - Compared with pre development elk resource selection
- Loss of high use habitat of 30–40%
- FCA elk did not opportunistically return at night
- Reducing vehicle volume may reduce pressure
  - Also: telemetred wells, directional drilling, refugia

Committee members:
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D. F. Doak

Private landowners:
Hayden Ranch, Powder River Ranch, and Maycock Ranch

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National Parks Service Natural Sounds Lab
Wyoming Fish and Wildlife Cooperative Unit
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BLM
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PiE program in ecology
WRRC Wyoming Reclamation & Restoration Center
SER University of Wyoming School of Energy Resources
Wyoming Game & Fish Department
University of Wyoming Ecosystem Science & Management
Anadarko
PETRO-CANADA
MARATHON

Questions