Components of Successful Reclamation: Wildlife Issues

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Habitats are those areas that provide resources and conditions necessary for occupancy, survival, and reproduction by wildlife species (Hall et al. 1997)

Basic Components of Habitat

- Food – function
- Water – function or structure
- Cover – structure
- Space - function

What about?

- Dust
- Noise
- Security from humans/vehicles
- Visual obstruction

Potential Impacts to Wildlife

- **Direct**
  - habitat loss
  - fragmentation
- **Indirect**
  - displacement due to avoidance behavior
  - reduced fitness
    - changes in trends in population parameters (e.g., lek counts)
    - changes in resource selection
    - changes to vital rates

Habitat Fragmentation

http://danr.ucop.edu/ihrmp/oak52.htm

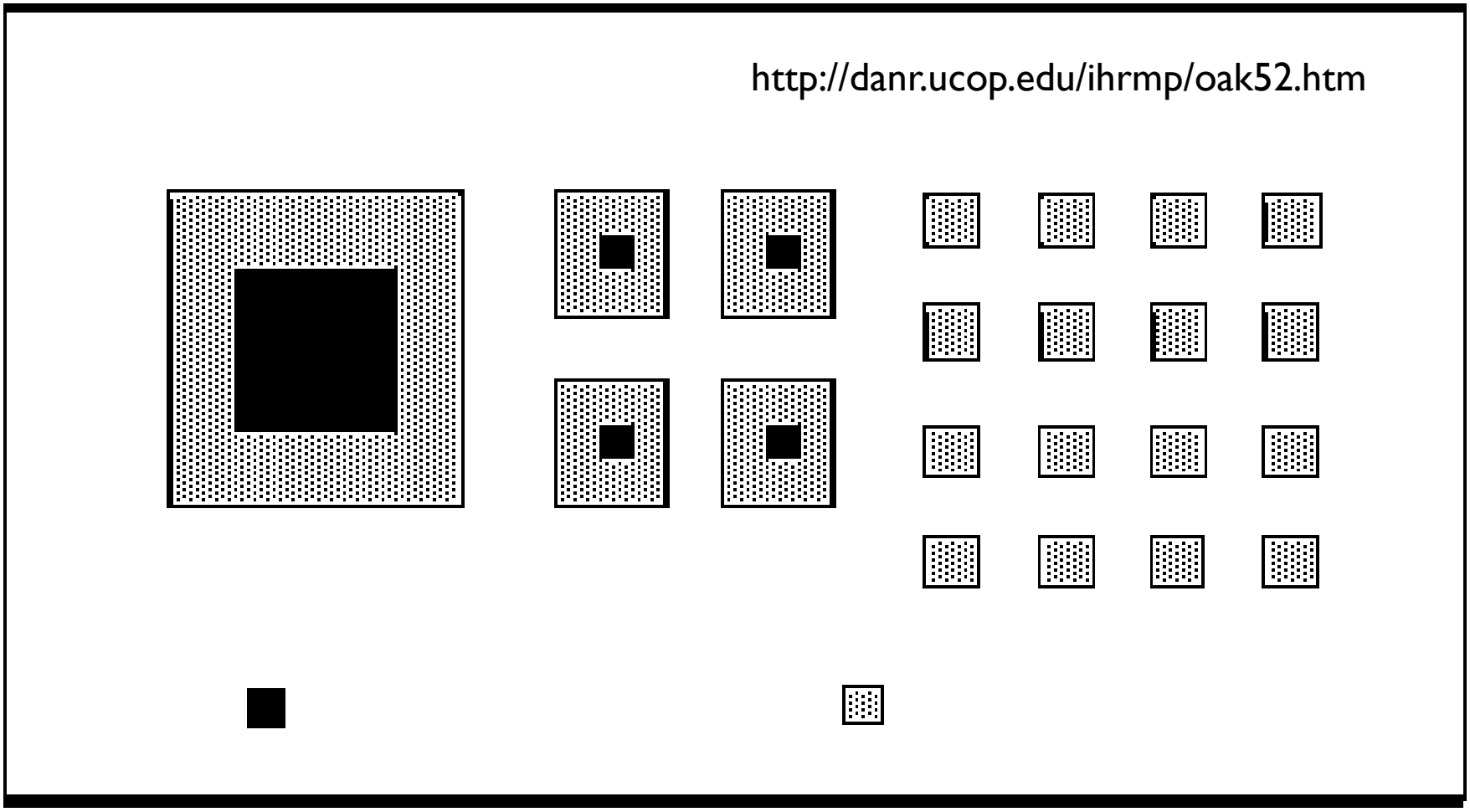
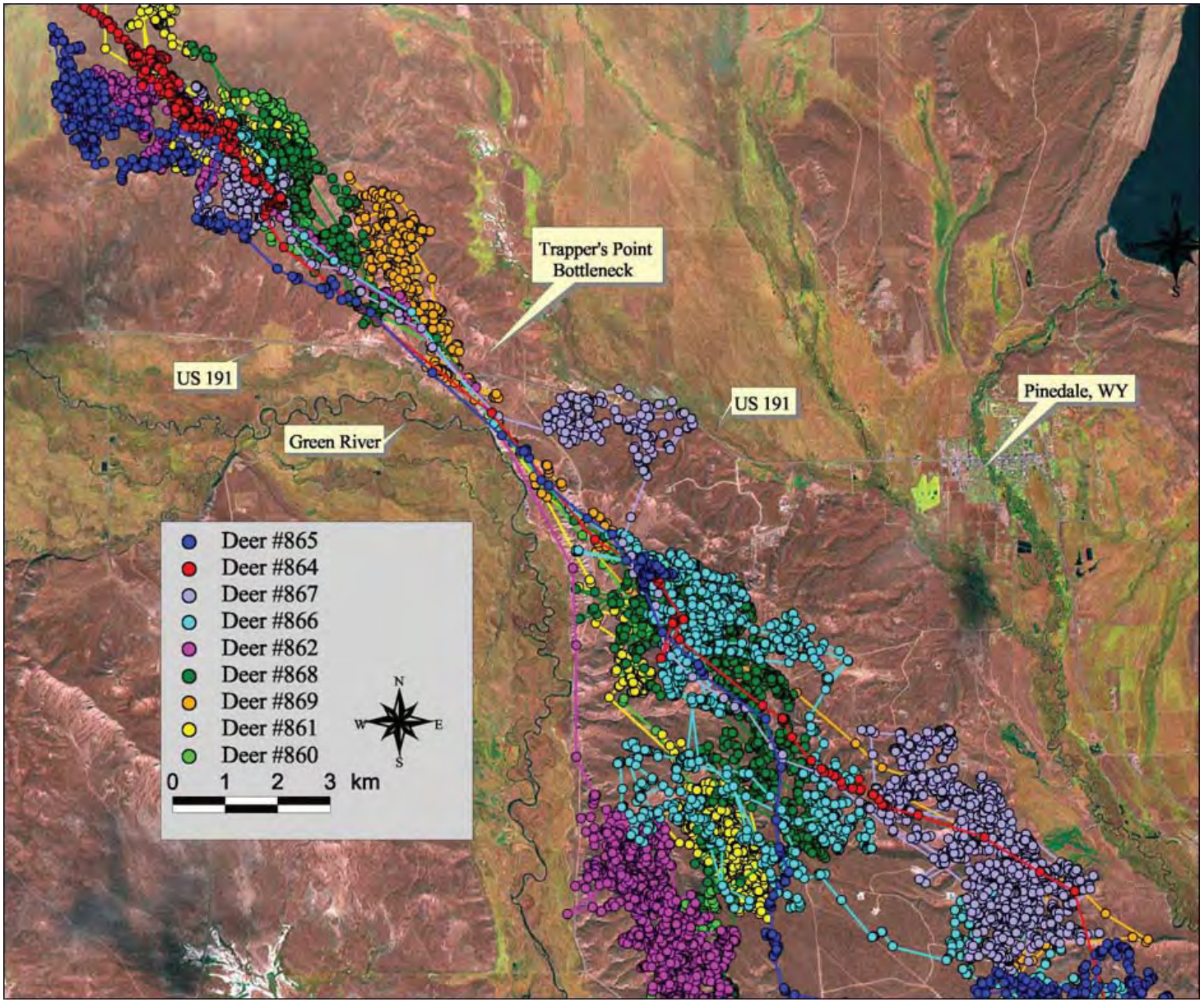


Figure 4. (A) Large patches provide interior habitat (B) Fragmentation decreases the amount of interior habitat (C) Further fragmentation increases edge habitat at the expense of interior habitat. Planning for Wildlife (from Soule', M.. 1991. Land-use planning and wildlife in urban landscapes. J. Am. Planning Assoc. 57 (3): 313-323)

Hourly locations and movement patterns (January–April, 2001) for nine GPS-marked mule deer through Trappers Point in northwest Wyoming (from Sawyer et al., [2005])



Changes to Wildlife Communities

• Some species habituate to human-disturbed areas

• Some species cannot tolerate increased levels of fragmentation, noise, traffic, and visual obstruction

• Some species may be drawn to resources provided by disturbed or reclaimed areas

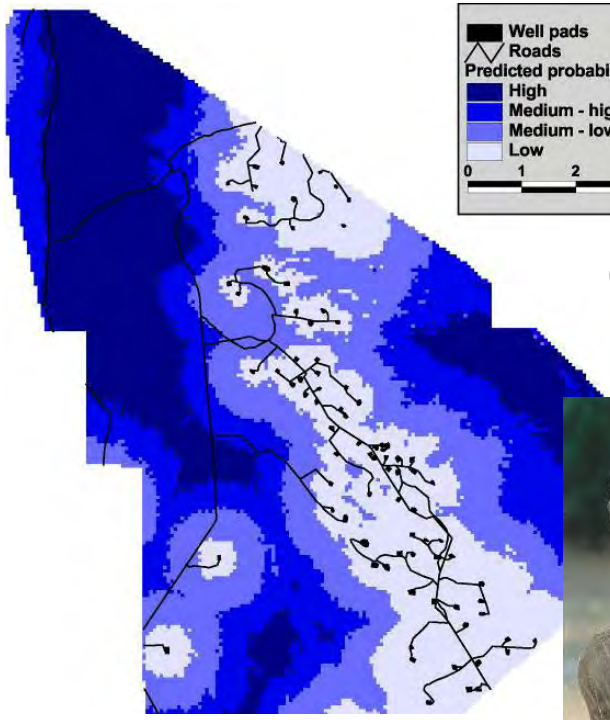
Choices and Consequences

- **To optimize fitness, animals inhabiting areas undergoing energy development are confronted with two choices**
  1. **Emigrate to undisturbed, offsite habitats**
  2. **Occupy increasingly disturbed habitats**
     - Habituate to compromised resource conditions
     - Shift resource selection to ameliorate consequences of disturbance

- **Animals occupying increasingly disturbed landscapes may exhibit cumulative effects**
  - Lower body condition
  - Lower reproductive output
  - Lower survival

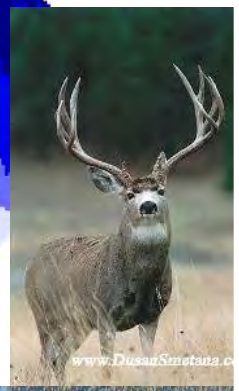
Steps to Reclaiming Wildlife Habitats Impacted by Energy Development

1. **Understanding impacts**
2. Mitigating impacts during development and production phases
3. **Restoring/reclaiming habitats after development and production phases**



Courtesy
K. Doherty

Sawyer et al. 2006 JWM

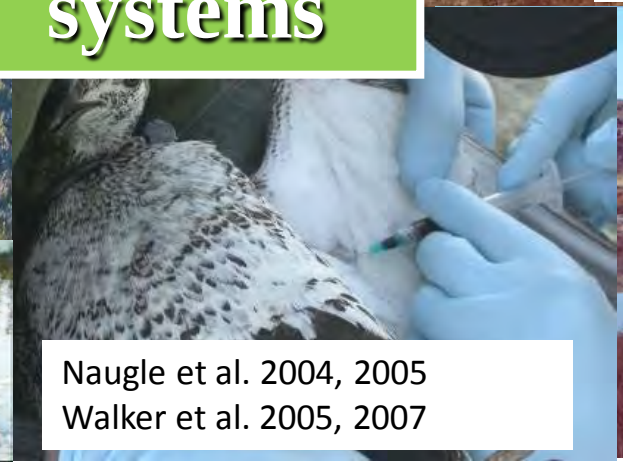


Ingelfinger and Anderson 2004
Bayne et al. 2008

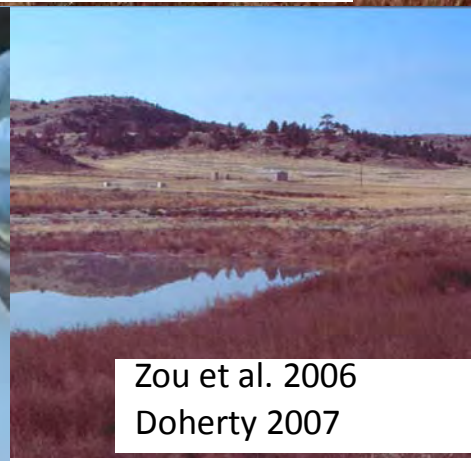
Impacts emerging across differing taxa and systems

Bergquist et al. 2007

Sorensen et al. 2008 JWM



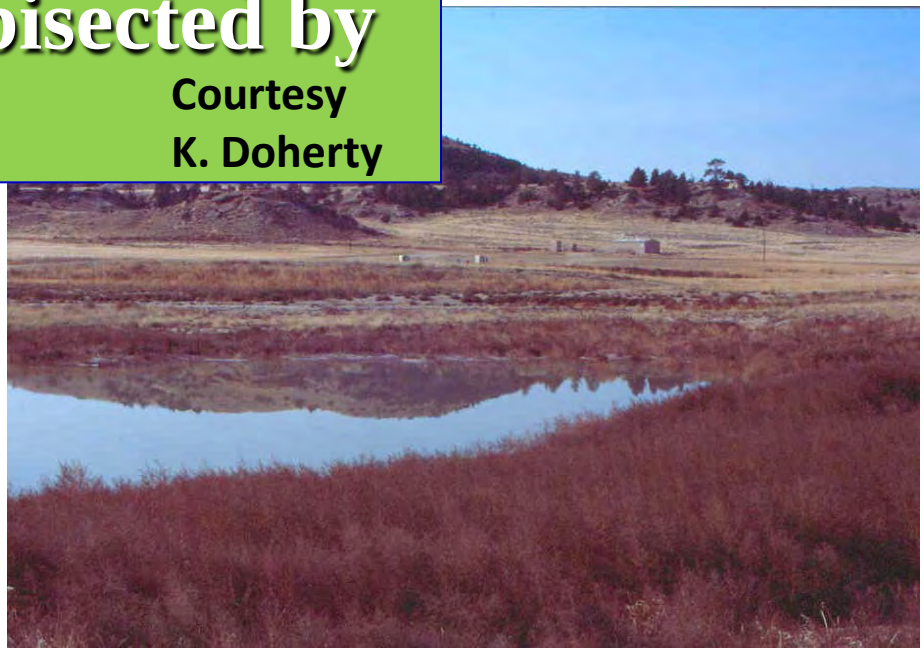
Naugle et al. 2004, 2005
Walker et al. 2005, 2007



Zou et al. 2006
Doherty 2007

Every km^2 bounded by a road and bisected by a powerline

Courtesy K. Doherty



Naugle et al. 2010 (in press)

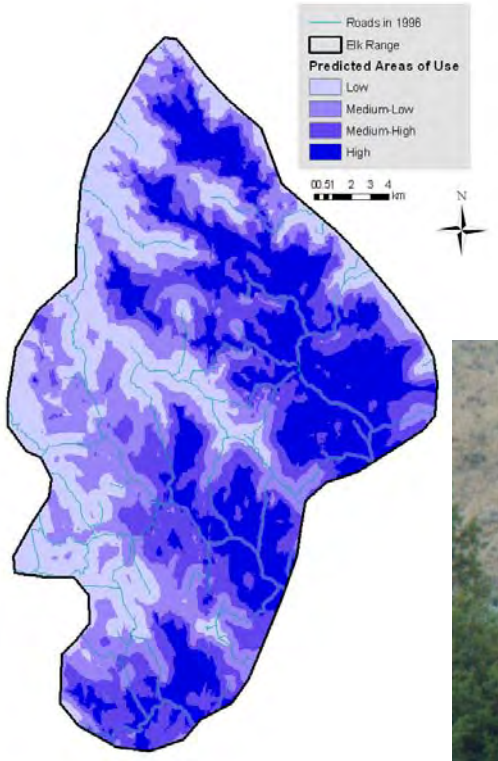
1992–1996

BEFORE DEVELOPMENT

Predicted Probability of Elk Occurrence

Roads (–) and Elevation (+) best predictors

(ΔAICc ≥4.56, w_i = 0.871)

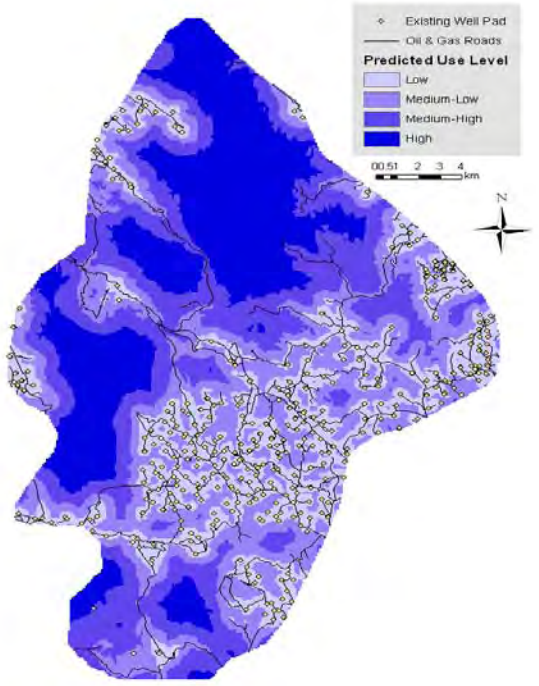


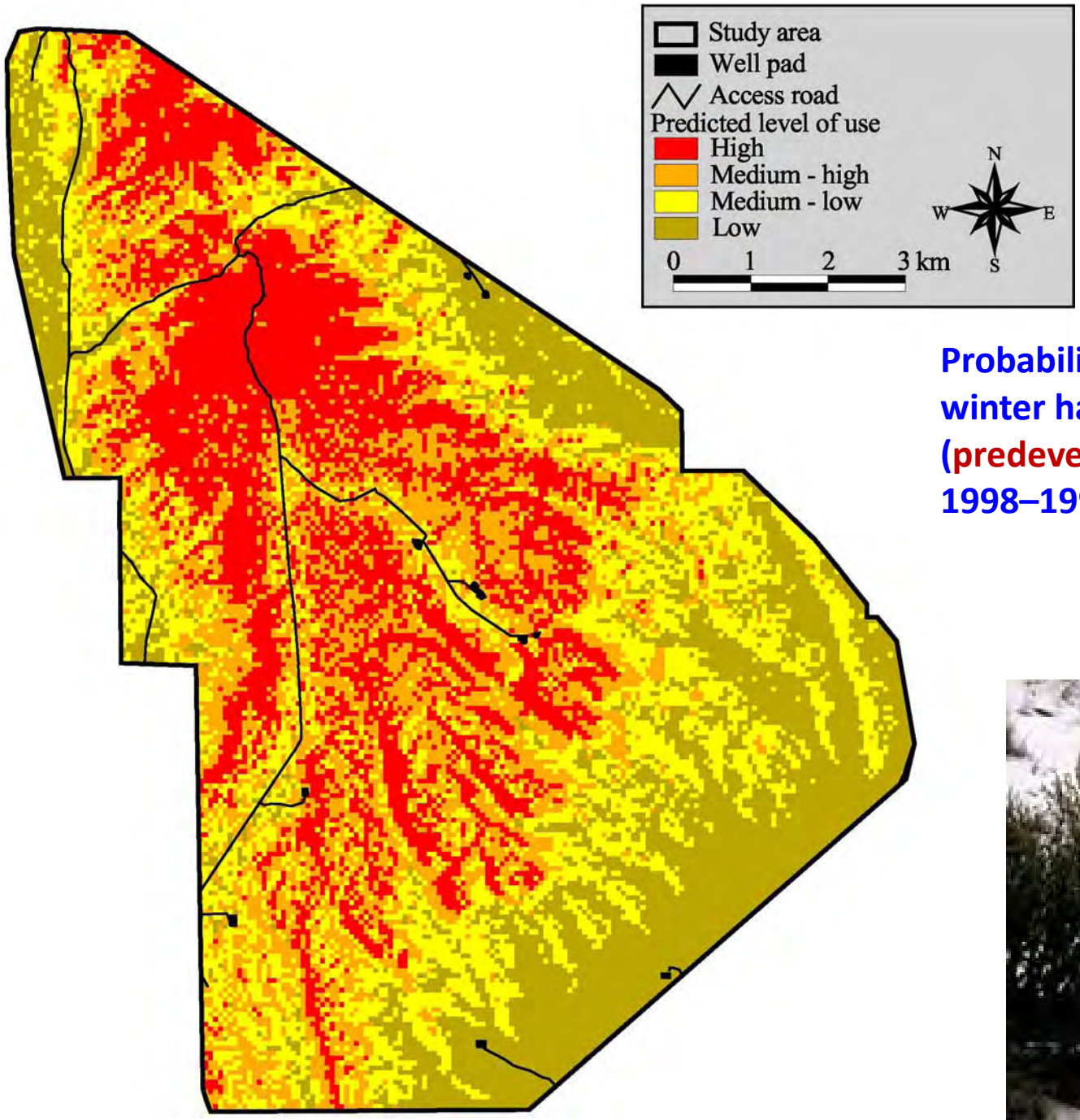
2009

DURING DEVELOPMENT

Mean Characteristics in Highest Probability of Use Areas

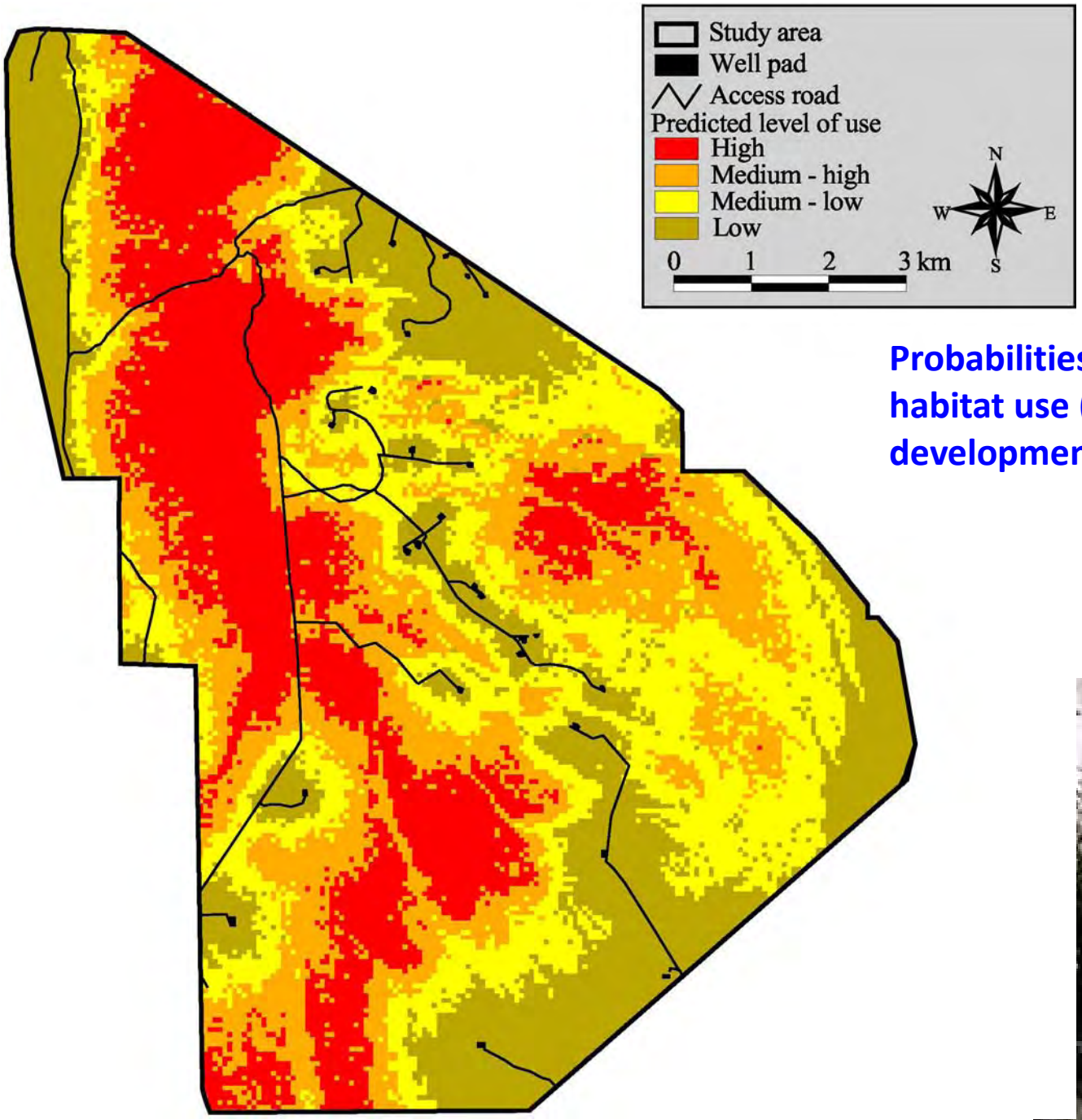
- **Slope = 6.8 degrees**
- **Elevation = 1,319 m**
- **Distance to road = 2,030 m**
- **Distance to well = 2,785 m**





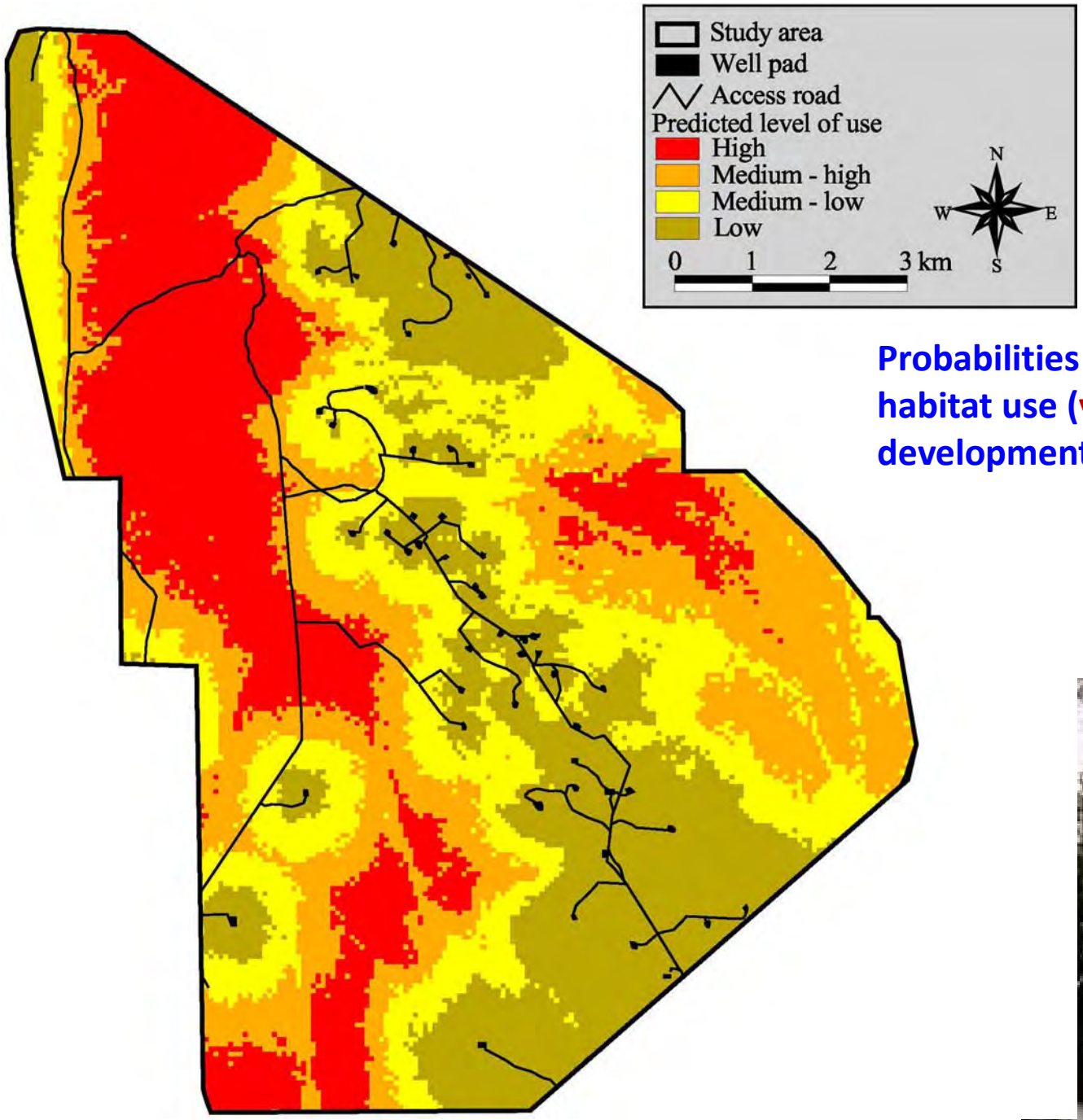
Courtesy of Hall Sawyer (JWM 2006)

Probabilities of mule deer winter habitat use (predevelopment –winters 1998–1999 and 1999–2000)



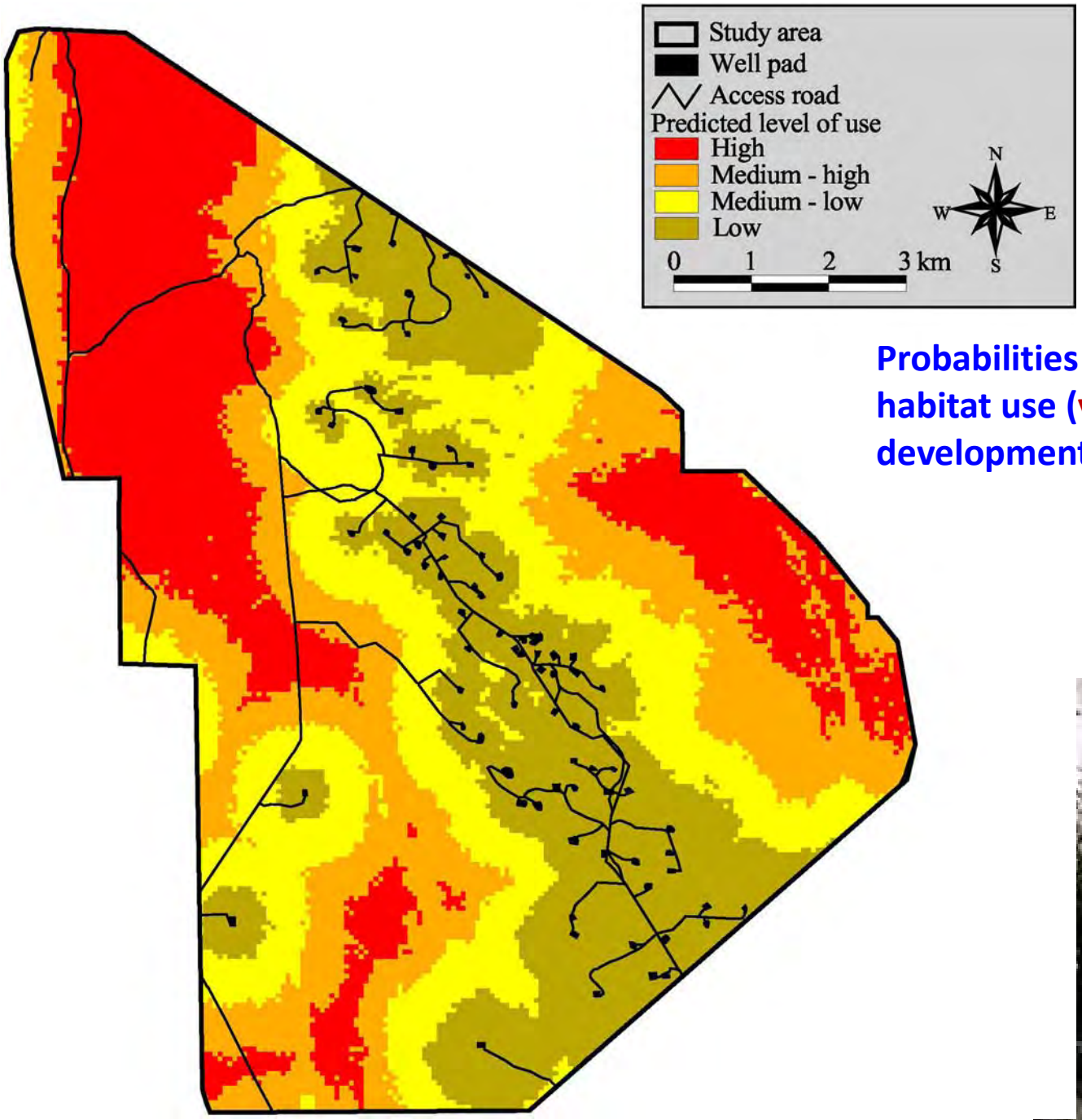
Courtesy of Hall Sawyer (JWM 2006)

Probabilities of mule deer winter habitat use (year 1 of natural gas development – winter 2000–2001)



Courtesy of Hall Sawyer (JWM 2006)

Probabilities of mule deer winter habitat use (year 2 of natural gas development – winter 2001–2002)



Courtesy of Hall Sawyer (JWM 2006)

Probabilities of mule deer winter habitat use (year 3 of natural gas development – winter 2002–2003)

Summary of Pinedale Study (Sawyer et al. 2006)

- Only 37% of high use, predevelopment habitat was classified as high use 3 years into development
- 2.4% direct habitat loss (2008)
- Selected habitats ≥3 km from well pads
- Deer herd has declined 30%, while the rest of the WGFD Sublette Deer Unit has only declined 10%
- **Most impacts were indirect**

Example of Beneficial Mitigations (Sawyer et al. 2009:1052)

- Indirect habitat loss may be reduced by approximately 38–63% when condensate and produced water are collected in LGS pipelines rather than stored at well pads and removed via tanker trucks

- LGS appeared to reduce long-term (i.e., production phase) indirect habitat loss to wintering mule deer, whereas drilling in crucial winter range created a short-term (i.e., drilling phase) increase in deer disturbance and indirect habitat loss

Goal for Reclamation Success

Energy development that limits habitat loss and fragmentation and minimizes noise, traffic, and other disturbances can assist in increasing the acceptability of developed landscapes to wildlife and promote future restoration efforts

Development Considerations

1. **Limit the amount of physical disturbance to the landscape** to conserve wildlife habitat and promote future habitat restoration

2. **Minimize physical disturbance during development and production** phases such as roads, traffic, noise, dust, and visual obstruction that create conditions that lead to wildlife avoidance of otherwise suitable habitats

Three Considerations in Reclaiming Wildlife Habitats

1. Disturb habitats as little as possible during development and production to maintain structure and as much function as possible

2. Reclaim disturbed habitats
   - Consider reestablishing native plant species
   - **Ecological structure (e.g., vegetation cover and composition) and functionality (e.g., habitat connectivity, food resources)** are important

3. Reduce or remove factors causing animals to avoid habitats


Wyoming Game and Fish Department Photo