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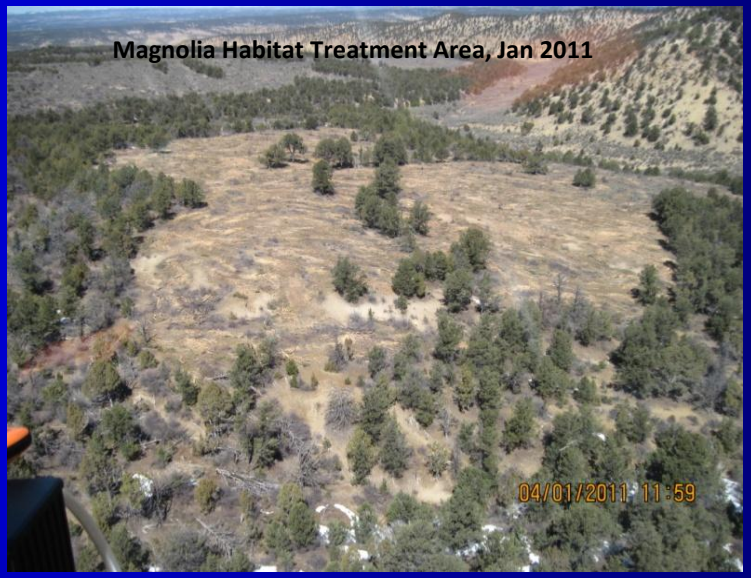
Piceance Basin Mule Deer & Energy Development: Demographic influences and mitigation



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How Could Energy Extraction On Winter Ranges Compromise The Ability of Mule Deer to Survive Winter?

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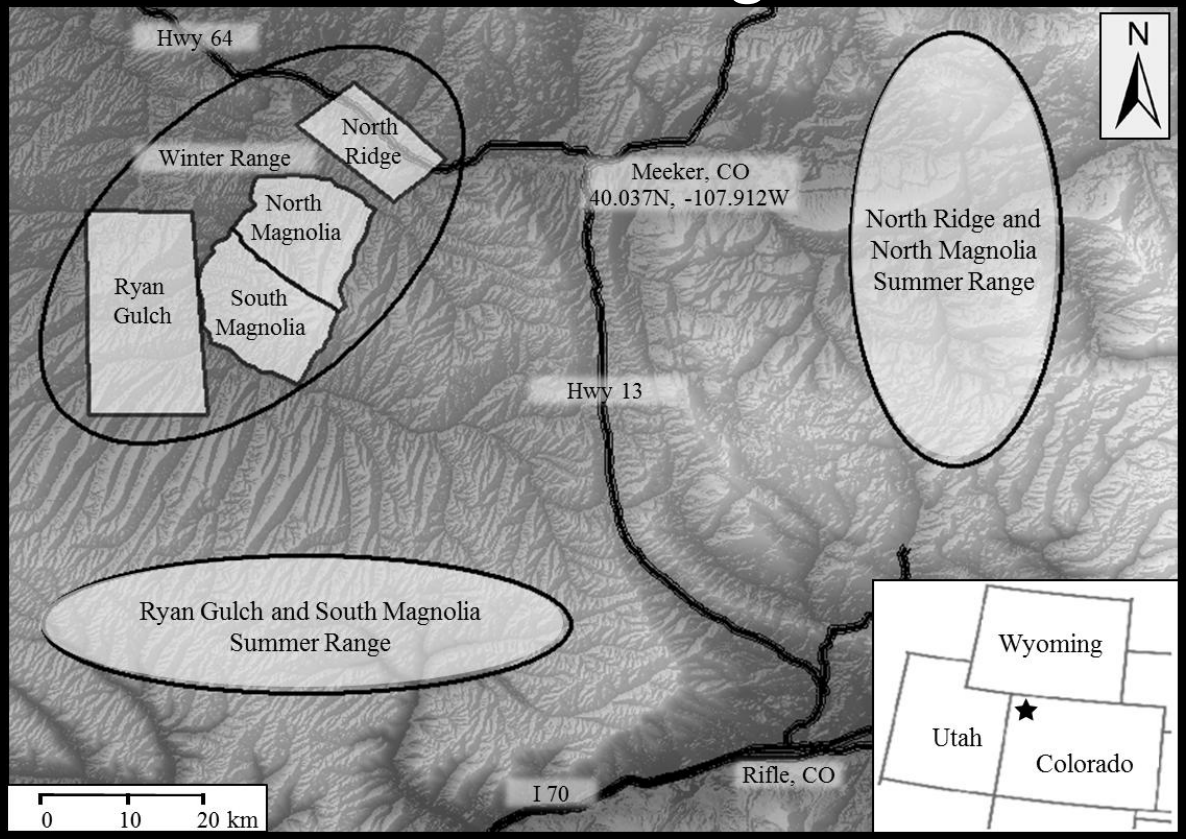
Goal: Identify approaches to energy development that benefit mule deer populations

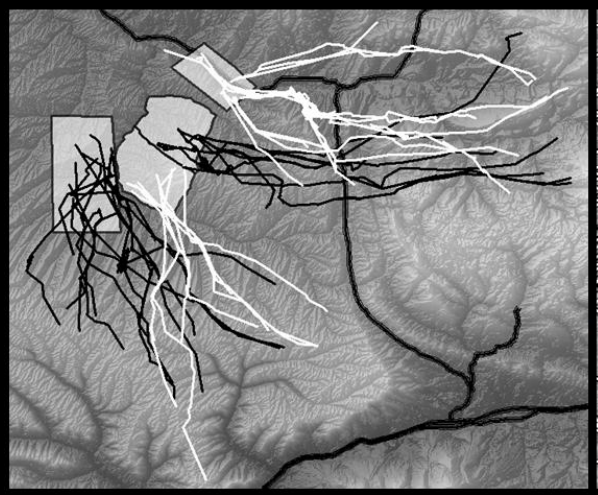
- **Objective 1: Address development activity relative to mule deer migration (Patrick Lendrum, Idaho State University)**
- **Objective 2: Monitor deer response to development to inform development planning (Joe Northrup, CSU)**
- **Objective 3: Address newborn fawn survival in developed & undeveloped landscapes (Mark Peterson, CSU)**
- **Objective 4: Evaluate habitat treatments as mitigation**

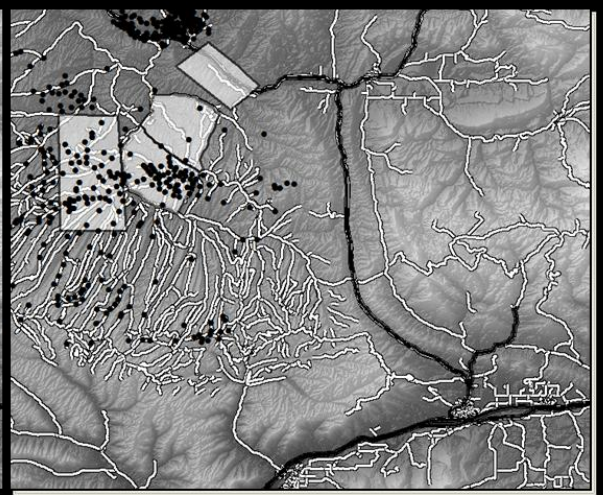
Measure Mule Deer Responses to Development & Mitigation

- **Behavior/habitat selection (GPS collars ≥ 5 locations/day)**
- **Body condition (Dec & Mar)**
- **Newborn fawn survival**
- **Over-winter fawn survival**
- **Deer density (helicopter surveys)**

Mule Deer Migration







Piceance Migration Summary

- Mule deer moved more quickly through the most developed areas
- Selected habitats with increased cover.
- Avoided roads except in the most developed area
  - High road densities may preclude avoidance
- Selected areas close to well pads
  - Predator avoidance? elk competition? foraging opportunities?

Atlantic Rim, WY mule deer migration

Sawyer, H., M.J. Kauffman, A.D. Middleton, T.A. Morrison, R.M. Nielson, and T.B. Wyckoff. 2013. A framework for understanding semi-permeable barrier effects on migratory ungulates. Journal of Applied Ecology doi: 10.1111/1365-2664.12013

- Evaluated permeability of 2 migration routes north of Baggs, WY with progressing CBM development
- Addressed movement rates, stopover use, and migration routes as development progressed
- Identified potential threshold in development activity that alters migration behavior

Atlantic Rim Migration Summary

- Mule deer increased migration rates through developed areas and reduced rates through non-developed areas
- Reduced stopover use in developed areas
- Altered migration routes at high development densities (up to 2.8 pads/km^2)

Migration Comparison

Piceance Basin, CO

- Migration dist: 36 km (43 km)
- Elevation: ~1980-2400 m
- Vegetation: PJ woodland, mtn. shrub, aspen/conifer
- Migration duration: 3-8 days
- Stopover use: uncommon
- Pad density: 1.5–2.0/km^2*

Atlantic Rim, WY

- Migration dist: 40 km
- Elevation: ~2065-2385 m
- Vegetation: sparse PJ/sage, sage, aspen/sage
- Migration duration: 3 weeks
- Stopover use: common
- Pad density: 0.8–2.8/km^2*

*Pad density calculations differ

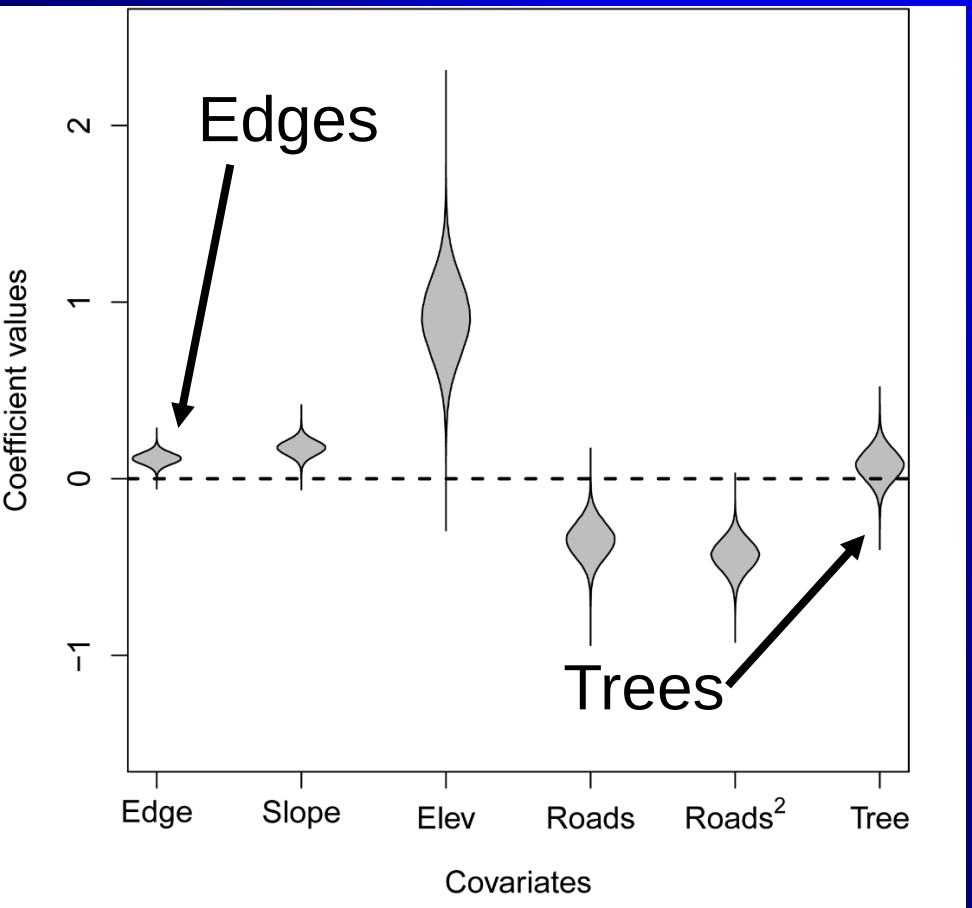
Migration Implications

- Apparent threshold in development intensity that alters migration behavior
  - Migration rate, migration route, stopover use if present
- Demographic consequences?
  - Not evident in Piceance, not addressed in Atlantic Rim
- Habitat quality may enhance permeability
  - Increased security cover = increased permeability?
- Habitat quality related to rate of migration/stopover use?
- Clustered development along migration routes may alter migratory behavior
- Dispersed development along migration routes should enhance permeability and maintain migratory behavior

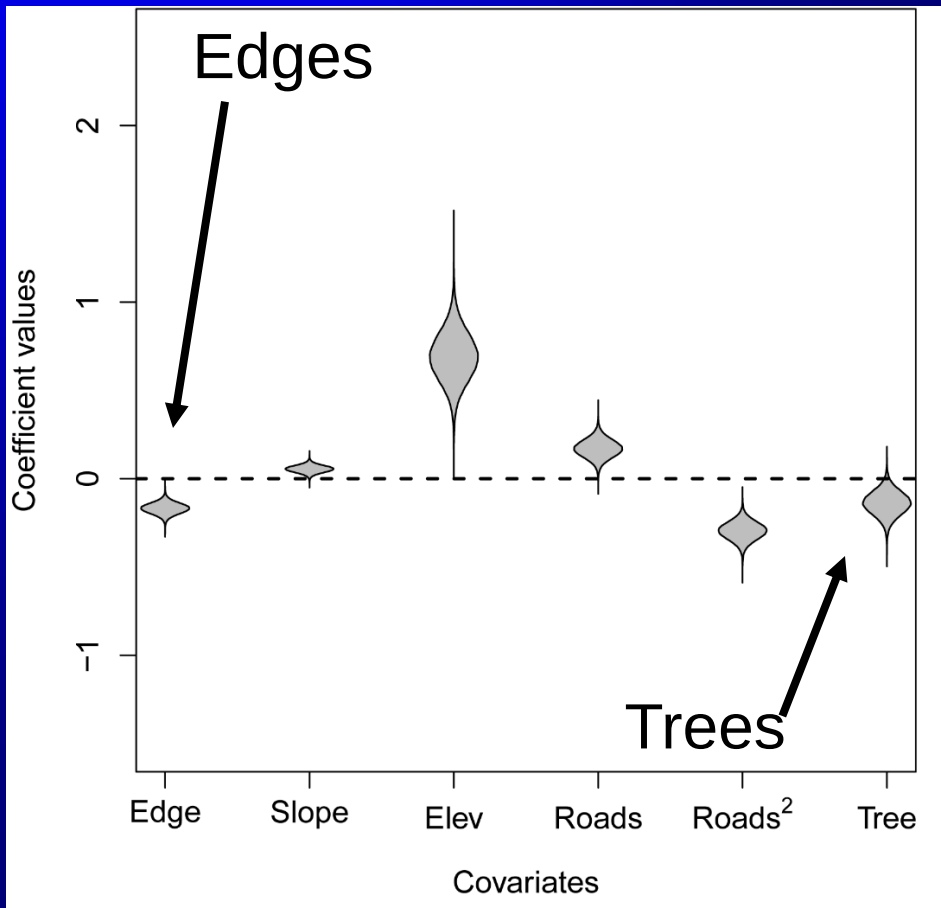
Deer Behavioral Responses

Environmental Covariates

Day



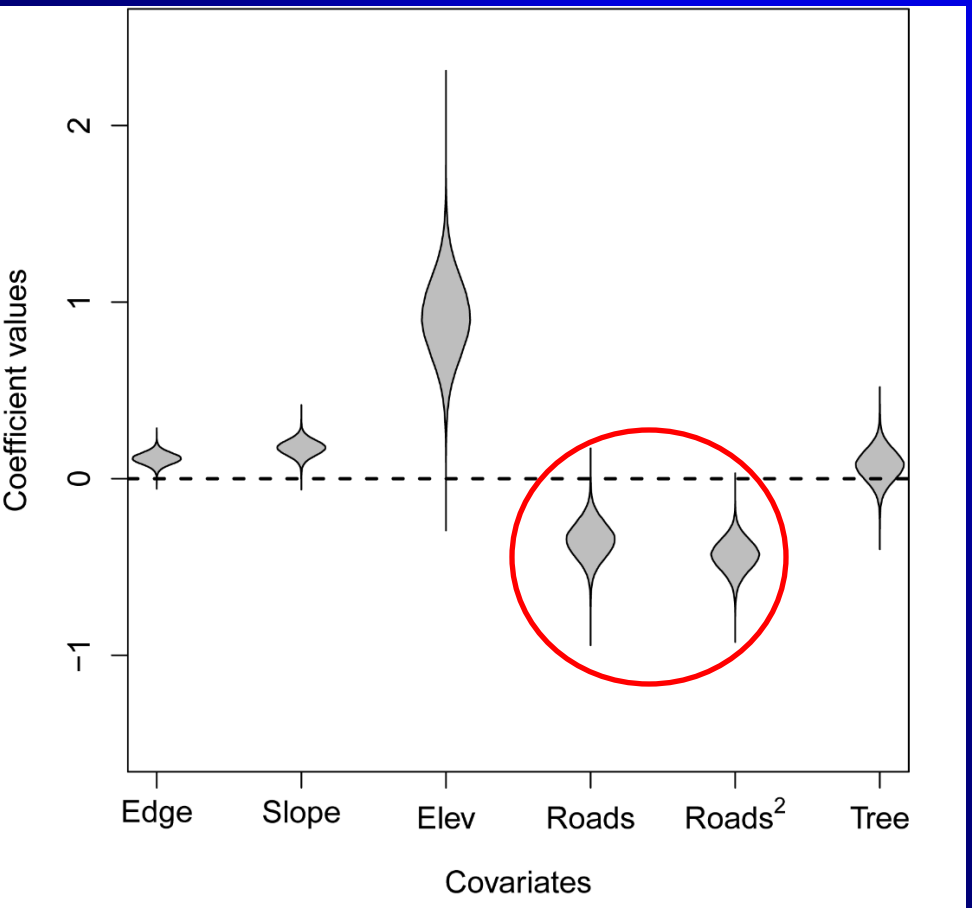
Night



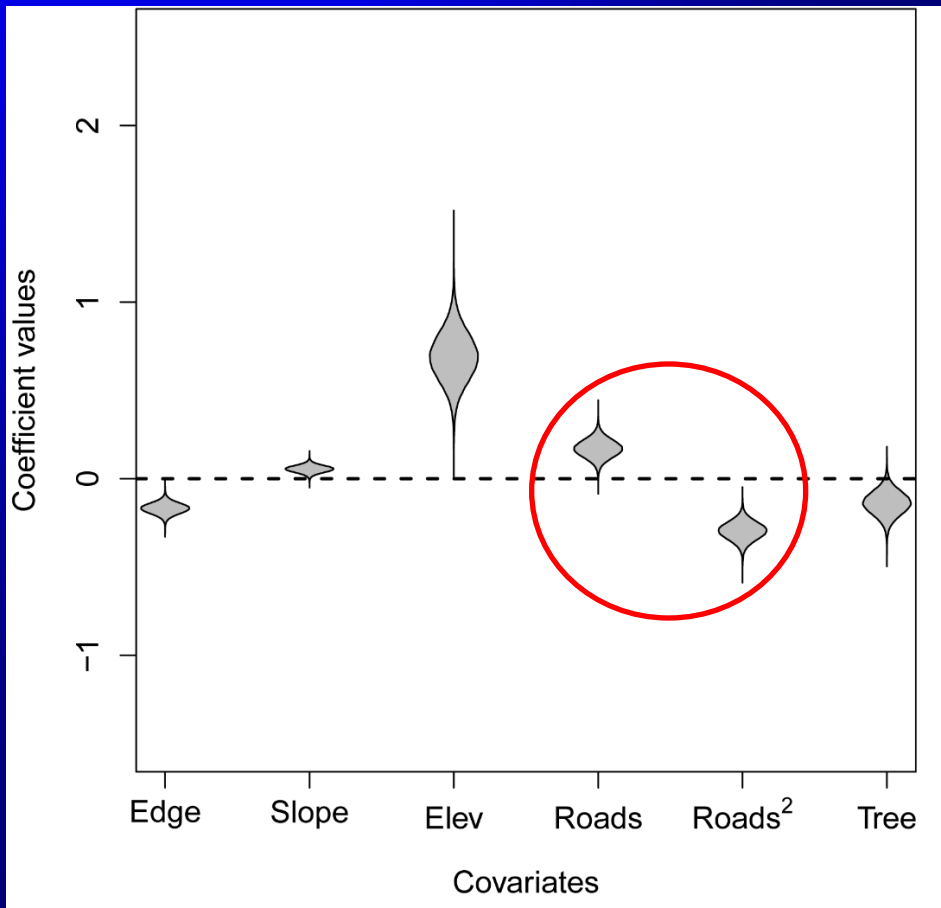
Deer Behavioral Responses

Influence of roads

Day



Night

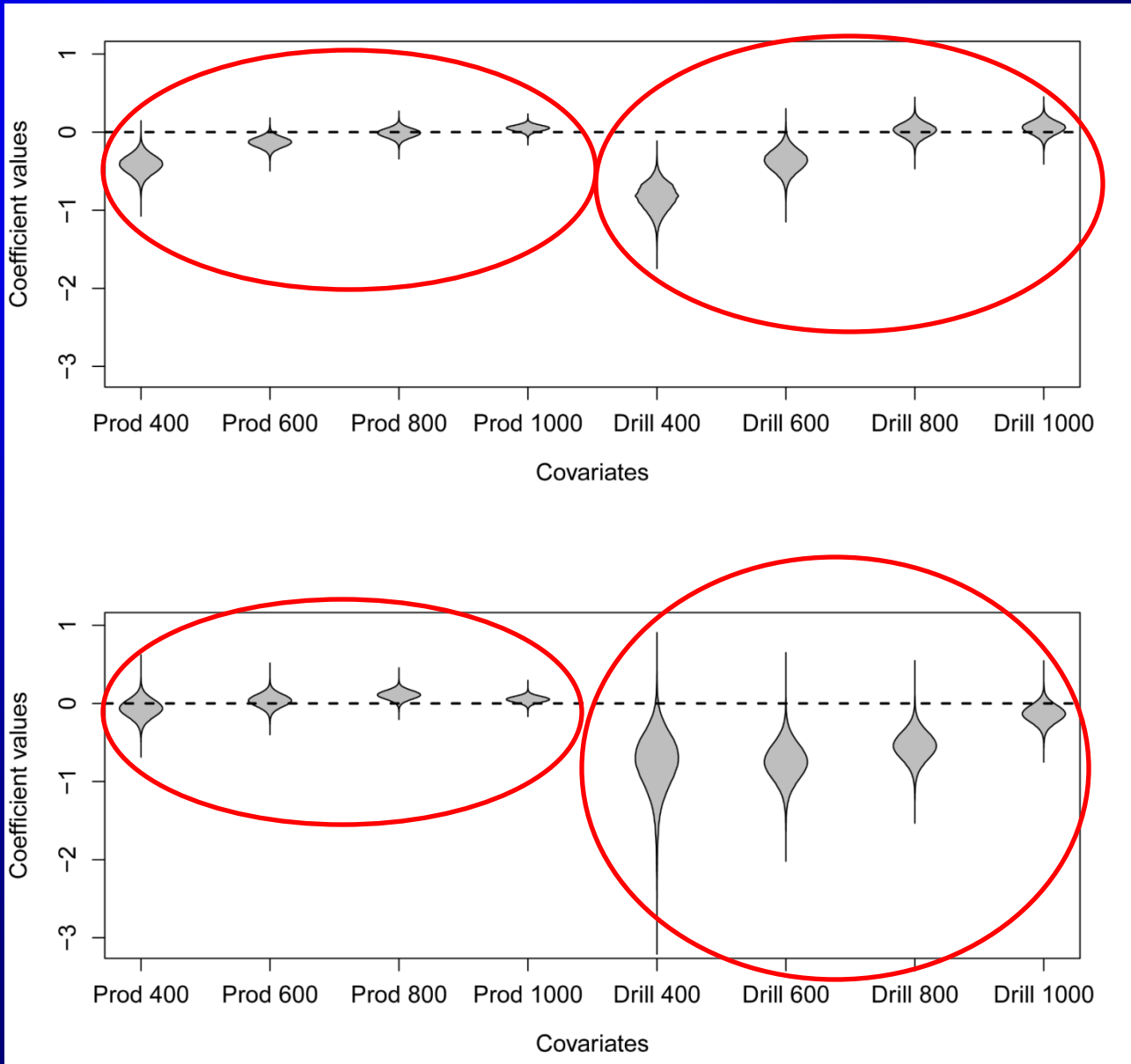


Deer Behavioral Responses

Day

Well Pads

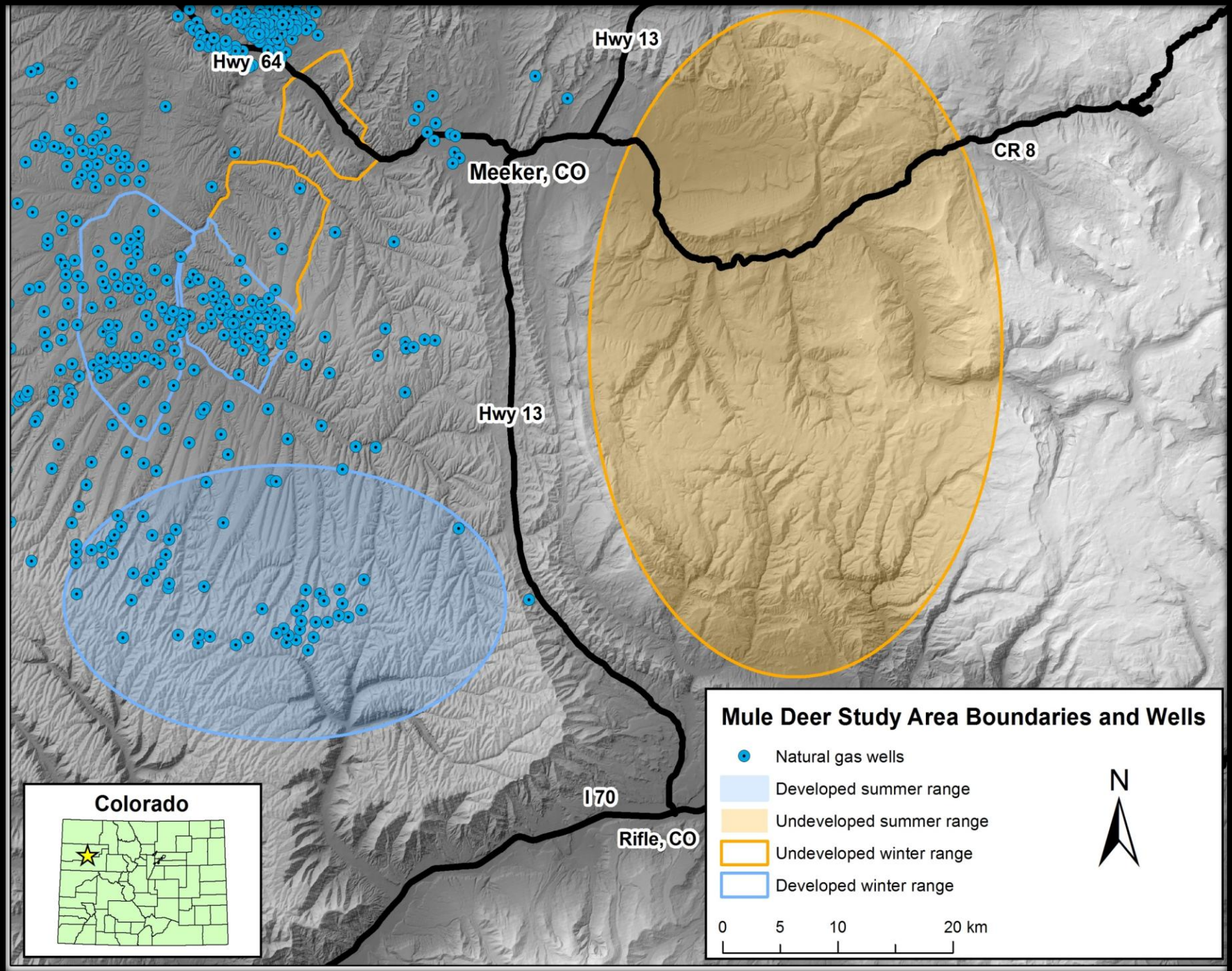
Night



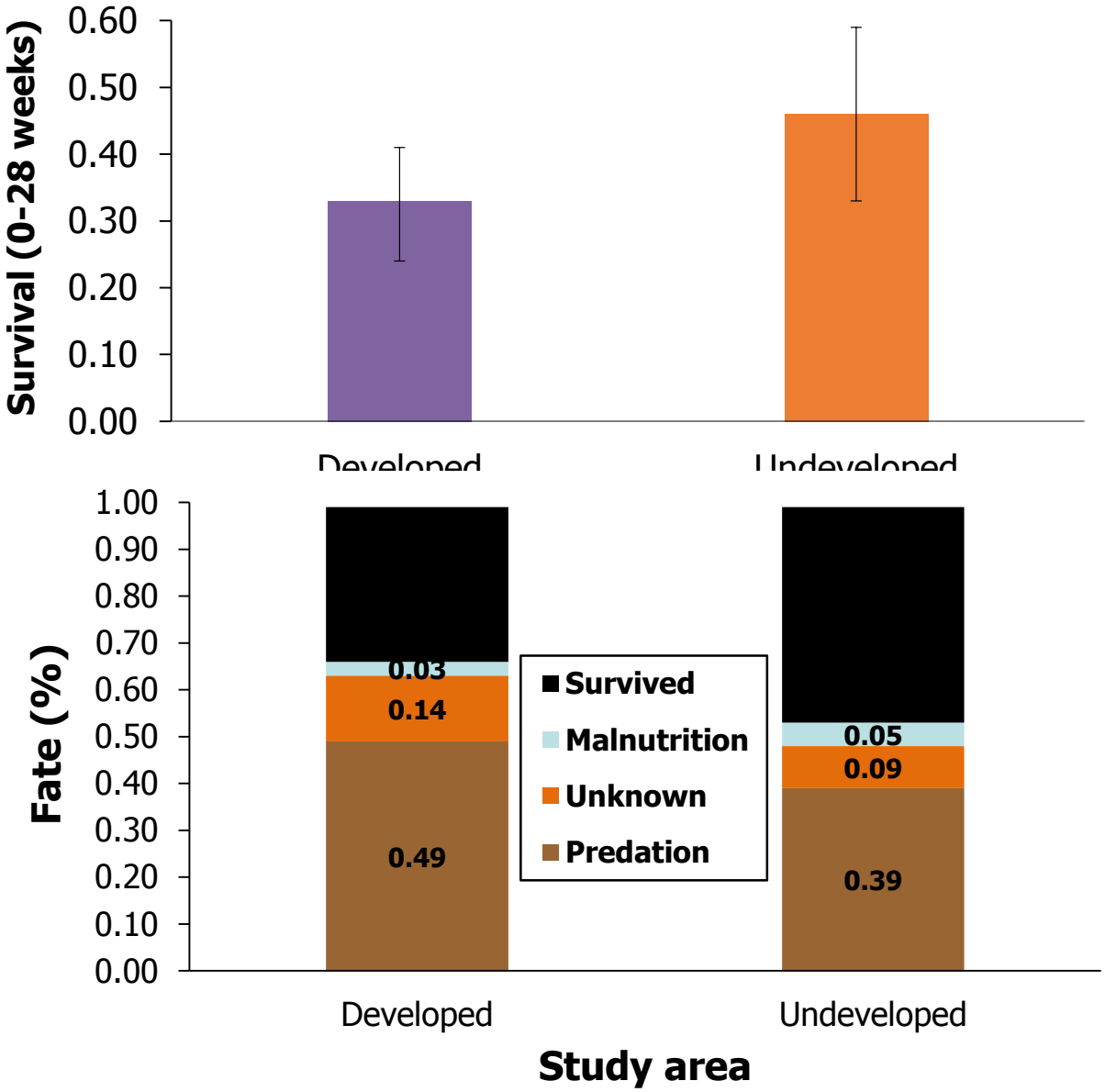
Behavioral Summary

- Temporal patterning modified by development
  - Open areas at night / cover during day
  - Roads (avoid during day, closer at night)
  - Producing pads (avoid during day, not at night)
- Drilling pads
  - Strong avoidance (at least 600-800 m)
- >25% severe winter range within these distances (night-time avoidance)
- However, deer behaviorally offset demographic influences under current conditions

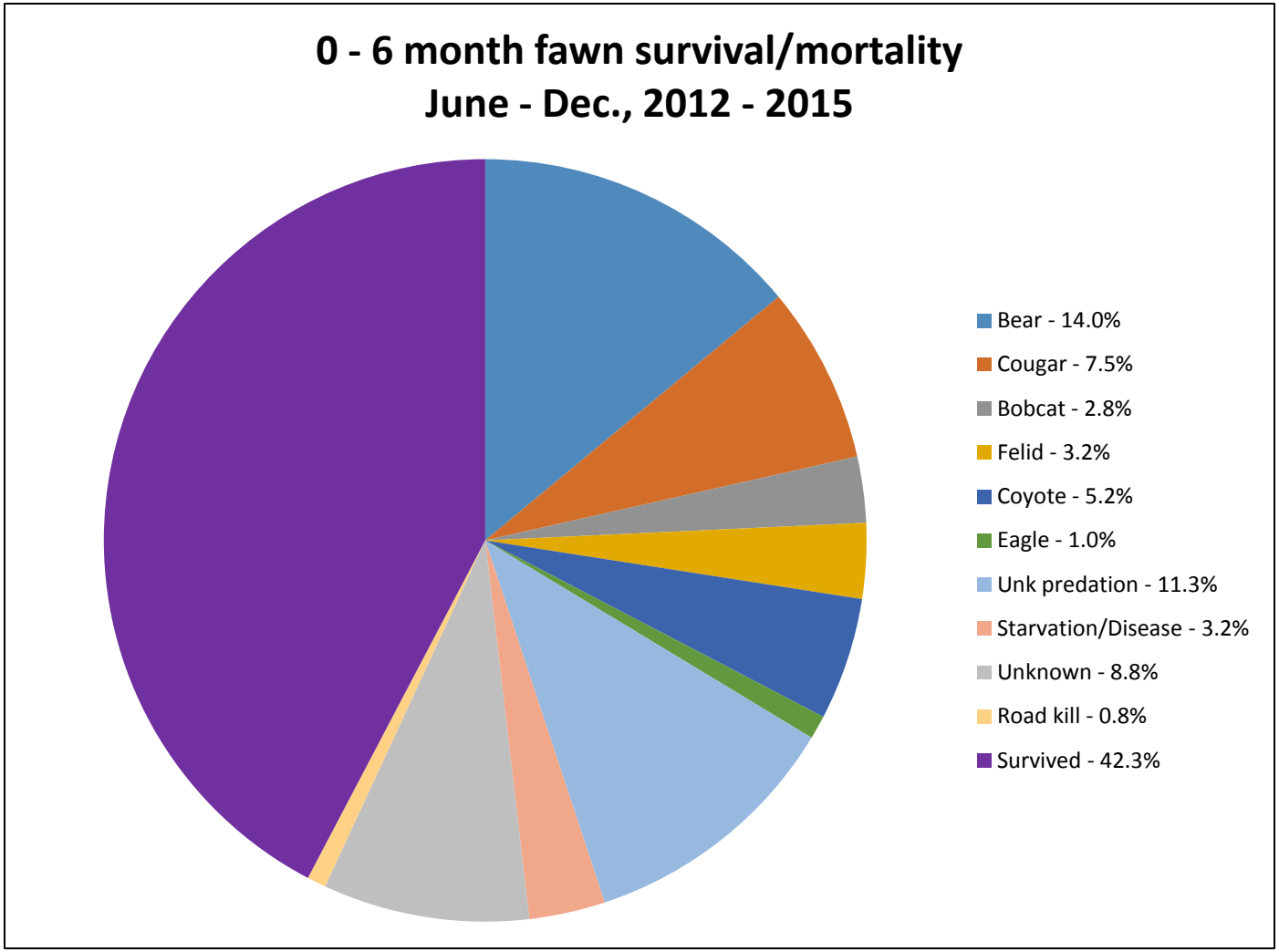
Newborn Fawn Survival


Hwy 64
Hwy 13
Meeker, CO
CR 8
Hwy 13
I 70
Rifle, CO
Colorado
Mule Deer Study Area Boundaries and Wells
Natural gas wells
Developed summer range
Undeveloped summer range
Undeveloped winter range
Developed winter range
N
0
5
10
20 km

Newborn Fawn Survival



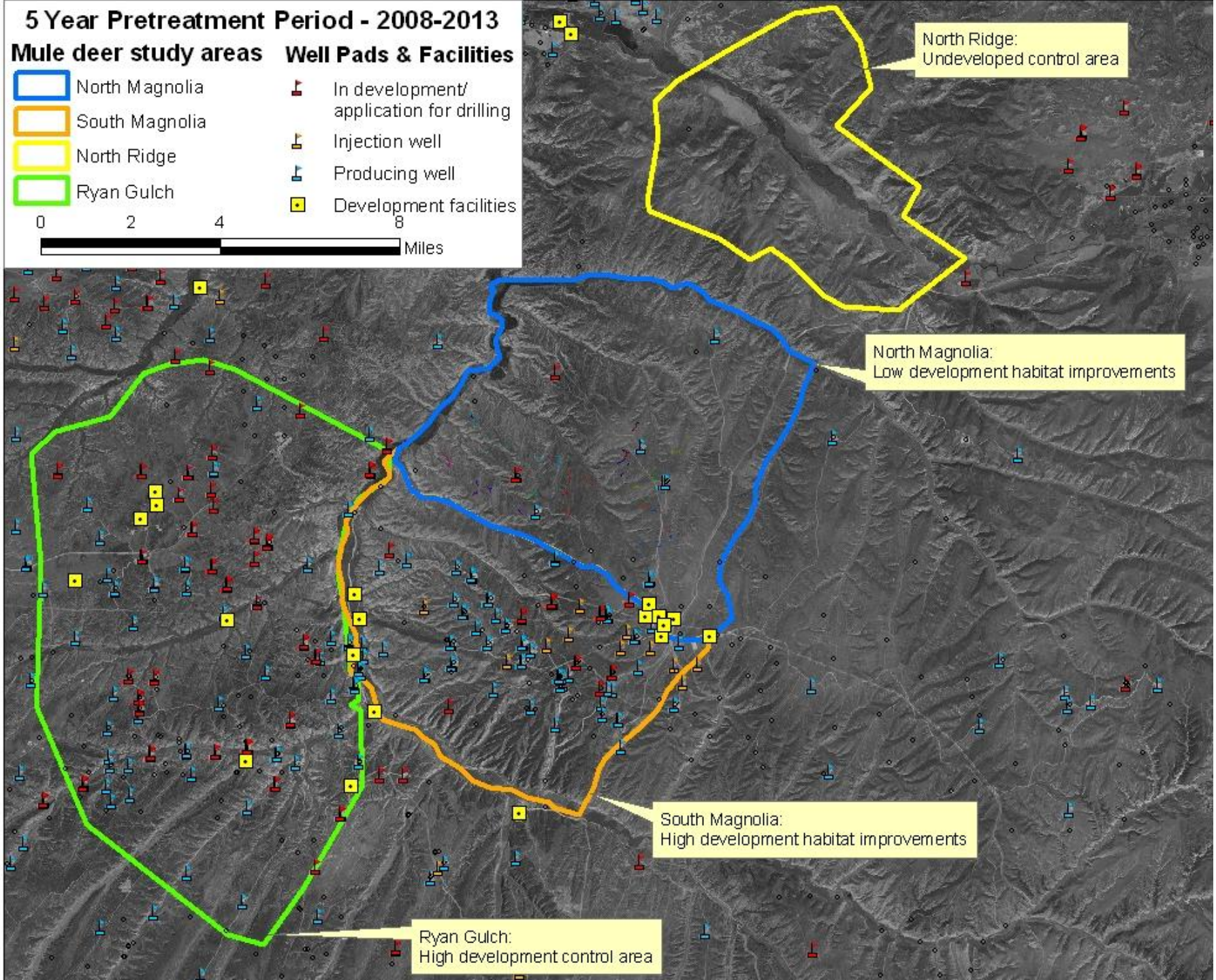
Mortality cause

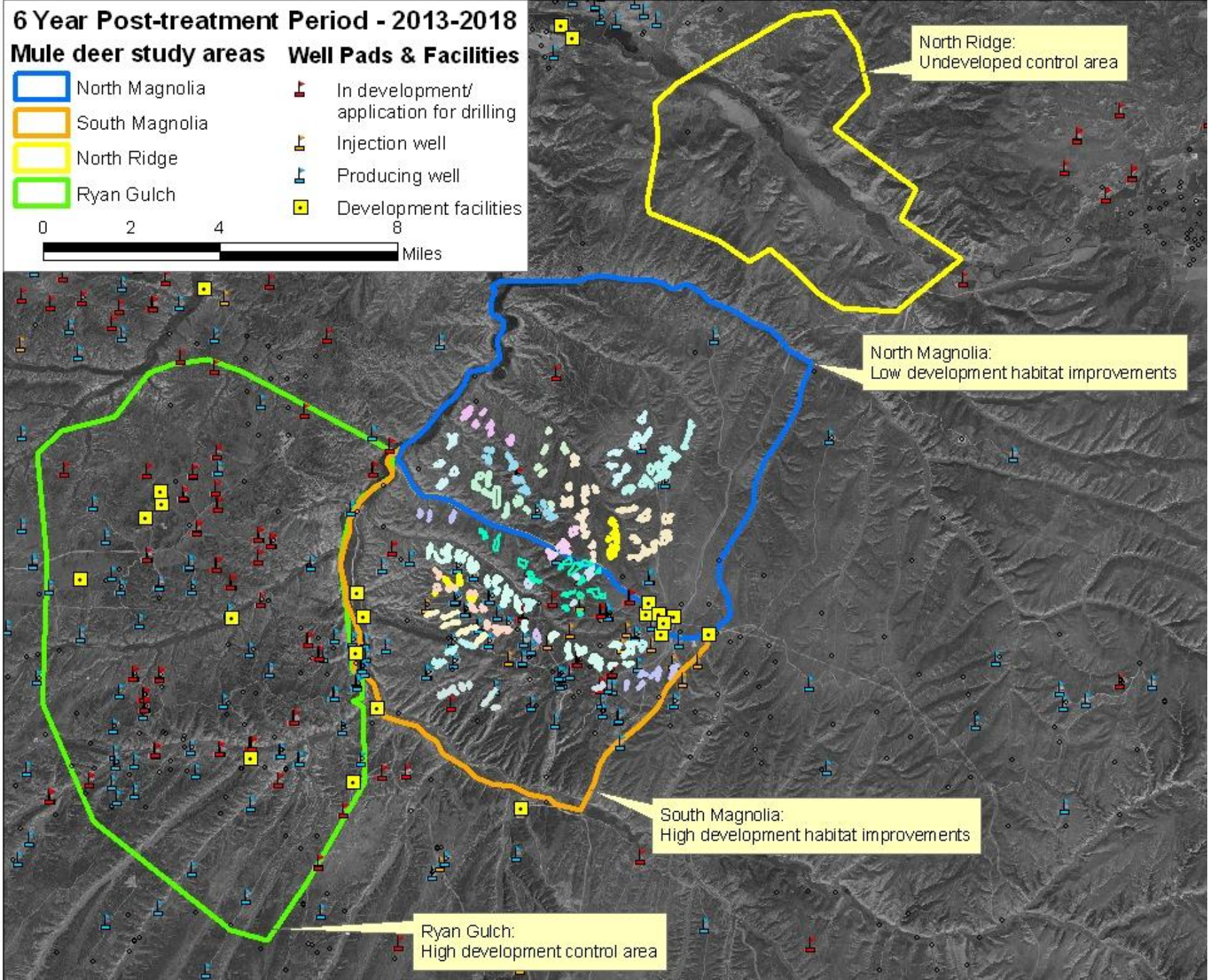


Mule Deer Parturition

- Deer select areas with increased hiding cover, which tend to be farther from disturbed sites

- Some evidence of lower newborn fawn survival under extreme environmental conditions (e.g., drought), but survival apparently not influenced during typical climate conditions.


5 Year Pretreatment Period - 2008-2013
Mule deer study areas
North Magnolia
South Magnolia
North Ridge
Ryan Gulch
Well Pads & Facilities
In development/ application for drilling
Injection well
Producing well
Development facilities
0
2
4
8
Miles
North Ridge:
Undeveloped control area
North Magnolia:
Low development habitat improvements
South Magnolia:
High development habitat improvements
Ryan Gulch:
High development control area


6 Year Post-treatment Period - 2013-2018
Mule deer study areas
North Magnolia
South Magnolia
North Ridge
Ryan Gulch
Well Pads & Facilities
In development/ application for drilling
Injection well
Producing well
Development facilities
0
2
4
8
Miles
North Ridge:
Undeveloped control area
North Magnolia:
Low development habitat improvements
South Magnolia:
High development habitat improvements
Ryan Gulch:
High development control area

Current Status

1. Completed pretreatment period (5 yrs) and continuing through year 4 of post-treatment addressing deer behavior/habitat selection

2. Completed pretreatment period addressing survival, body condition, & deer density

3. Monitoring 4th growing season of post-habitat treatment phase

4. Two additional years of post-treatment monitoring

Pretreatment (2010)


1st year post-treatment (2011)
LEE GULCH #8
LGT08


2nd year post-treatment (2012)


3rd year post-treatment (2013)


4th year post-treatment (2014)
JUNE 7 2014
LGT08
LEE GULCH
TRANSECT #8

Habitat Mitigation Results

- Excellent vegetation responses beginning years 3-4
- Evidence of deer use and improved winter fawn condition, but additional evaluation pending

Questions?

U.S. Department of the Interior
Bureau of Land Management

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Department of Natural Resources

Williams

EXXON

Colorado Mule Deer Association

Mule Deer Foundation

Fair Chase and Conservation
Since 1887

Wildlife Restoration

State of Colorado
Oil & Gas
Conservation Commission

WPXENERGY

EnCana

Marathon

SCI
First for Hunters

XTO Energy

Idaho State University