Wyoming Cooperative Fish and Wildlife Research Unit

UNIVERSITY OF WYOMING

2013 Annual Report

# Evaluating the Influence of Development on Mule Deer Migrations

Teal Wyckoff[1,2], Matt Kauffman[3], Hall Sawyer[4], Shannon Albeke[2]

[1]Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, Laramie, WY

[2]Wyoming Geographic Information Science Center, University of Wyoming, Laramie, WY

[3]US Geological Survey, Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, Laramie, WY

[4]Western EcoSystems Technology (WEST), Inc., Laramie, WY

## Introduction

The Wyoming Cooperative Fish and Wildlife Research Unit and the University of Wyoming with support from the Wyoming Game and Fish Department (WGFD) and Wyoming Wildlife: The Foundation (WWTF), initiated this project in 2011 with the following objectives:

> To evaluate the relationship between development intensity and behavior of migrating mule deer
>
> To assess whether development intensity impedes the ability of migratory mule deer to track phenology

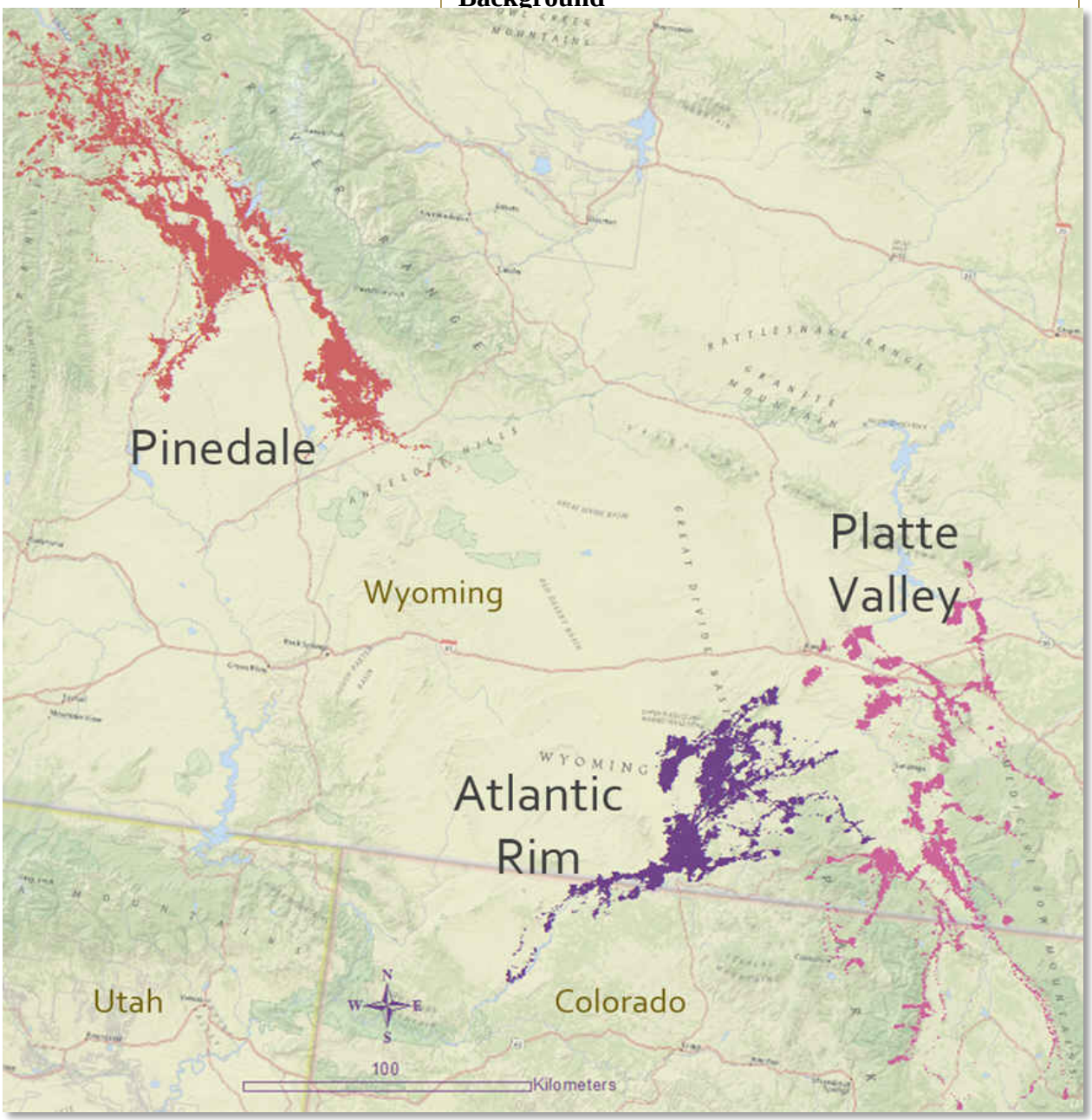
This project leverages data partnerships with the U.S. Geological Survey (USGS) and Western Ecosystems Technology, Inc. (WEST).

This project will be completed in July 2014.

**Study Area**

Migratory mule deer in southwestern Wyoming winter in basin sagebrush steppe habitat and follow greenup as they migrate in spring to higher elevation summer ranges. Data used in this study were collected for other long-term monitoring projects from the Pinedale area, the Atlantic Rim and the Platte Valley. These migrations vary in the amount of development each animal encounters, from relatively intact to heavily developed habitat.

**Background**





**Understanding Behavioral Change Relative to Amount of Development**

We are evaluating each route for amount of disturbance, across a gradient of development from the most intact to the most disturbed migration corridors. Once each route is scored, the behavior of each animal is analyzed and compared.

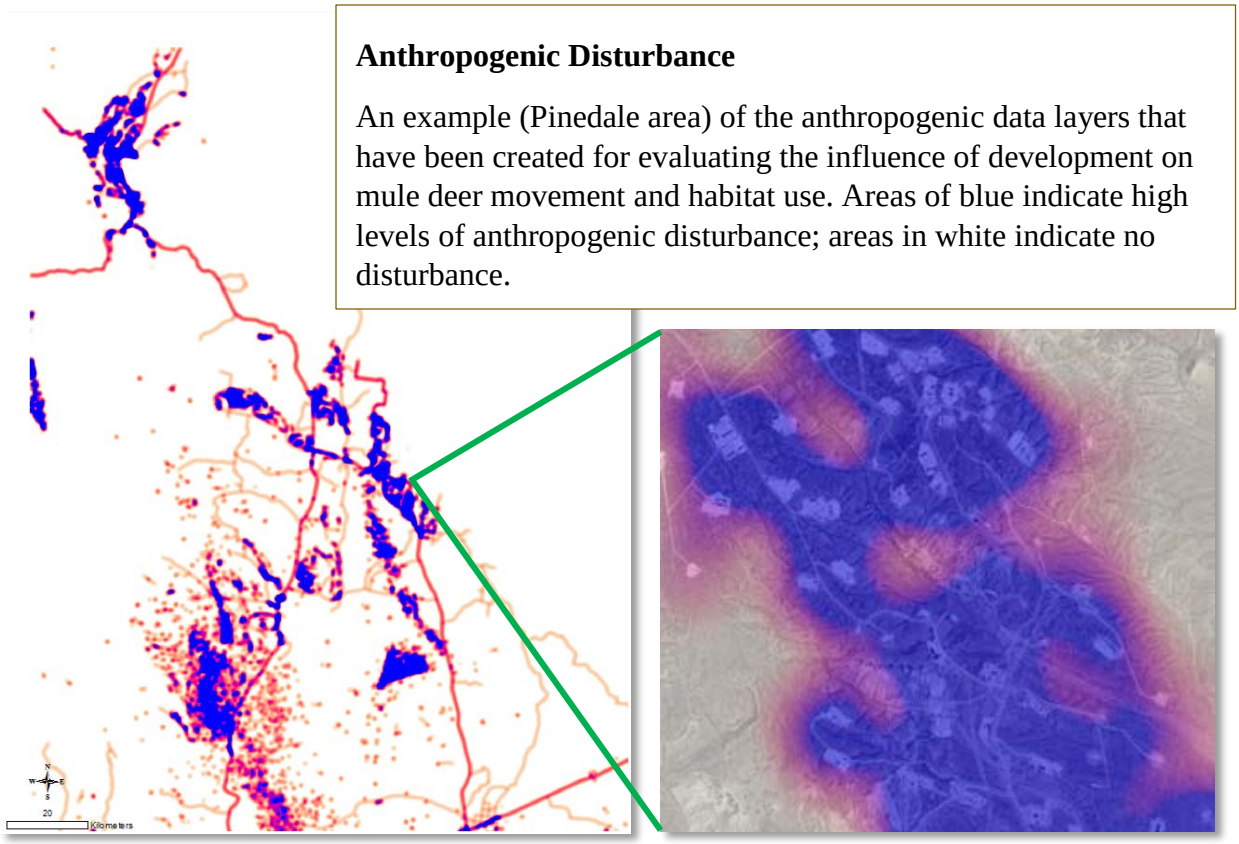
**Anthropogenic Disturbance**

Human disturbance in southwestern Wyoming consists of a variety of human-developed landscape features, from energy development and associated roads and well pads, to housing development and all of its features – traffic, dogs, horses, and other noise. We have developed a human footprint on the landscape that acts as a proxy for human presence, including traffic and associated noise and movement.

Because southwest Wyoming is undergoing rapid expansion of energy resource extraction and associated housing development, we seek to understand what level of development can occur and still sustain viable migratory ungulate populations.

## Anthropogenic Disturbance

An example (Pinedale area) of the anthropogenic data layers that have been created for evaluating the influence of development on mule deer movement and habitat use. Areas of blue indicate high levels of anthropogenic disturbance; areas in white indicate no disturbance.



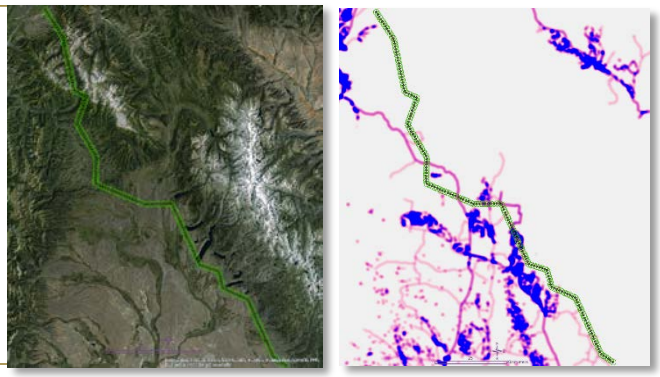
| Dataset Name | Assigned Weight |
|---|---|
| Residential Roads | 1.0 |
| Major Roads | 0.9 |
| Well Pads | 0.8 |
| Well Pad Roads | 0.3 |
| County Roads | 0.3 |
| Fences | 0.1 |

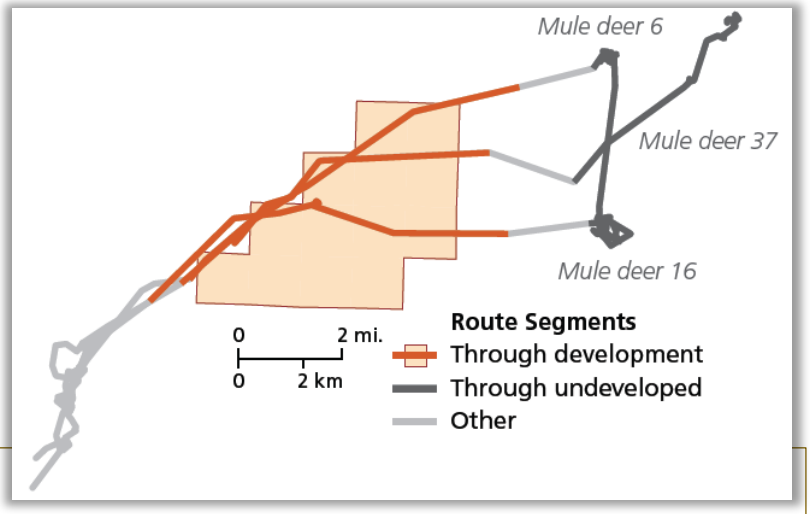
## Combined 'Weight' of Development Features

These anthropogenic disturbance layers consist of a combination of GIS datasets: roads (residential, major, county, well pad roads) and well pads. We applied a kernel density estimate to each dataset individually with a maximum distance of 1 kilometer, and then combined the individual kernel density estimates and weighted each one by their relative influence as outlined by previous literature and field work.

## Quantifying Disturbance

We know there is development along the migration route of a deer as she migrates from her summer range in Jackson, to her winter range along the Pinedale Front. Now we have a measure of that development, and can evaluate her behavior relative to the disturbance.



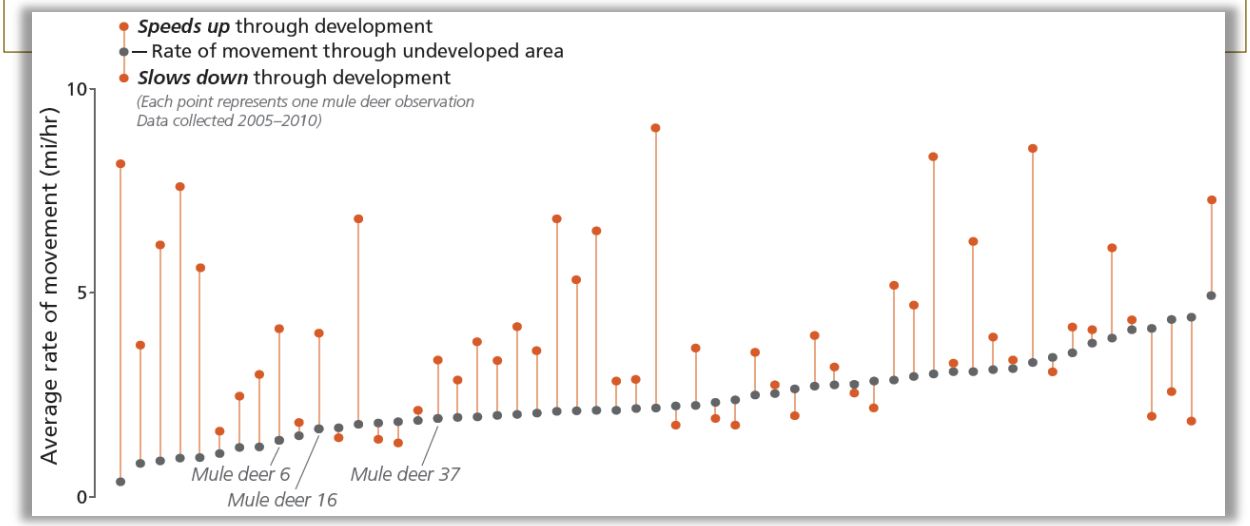


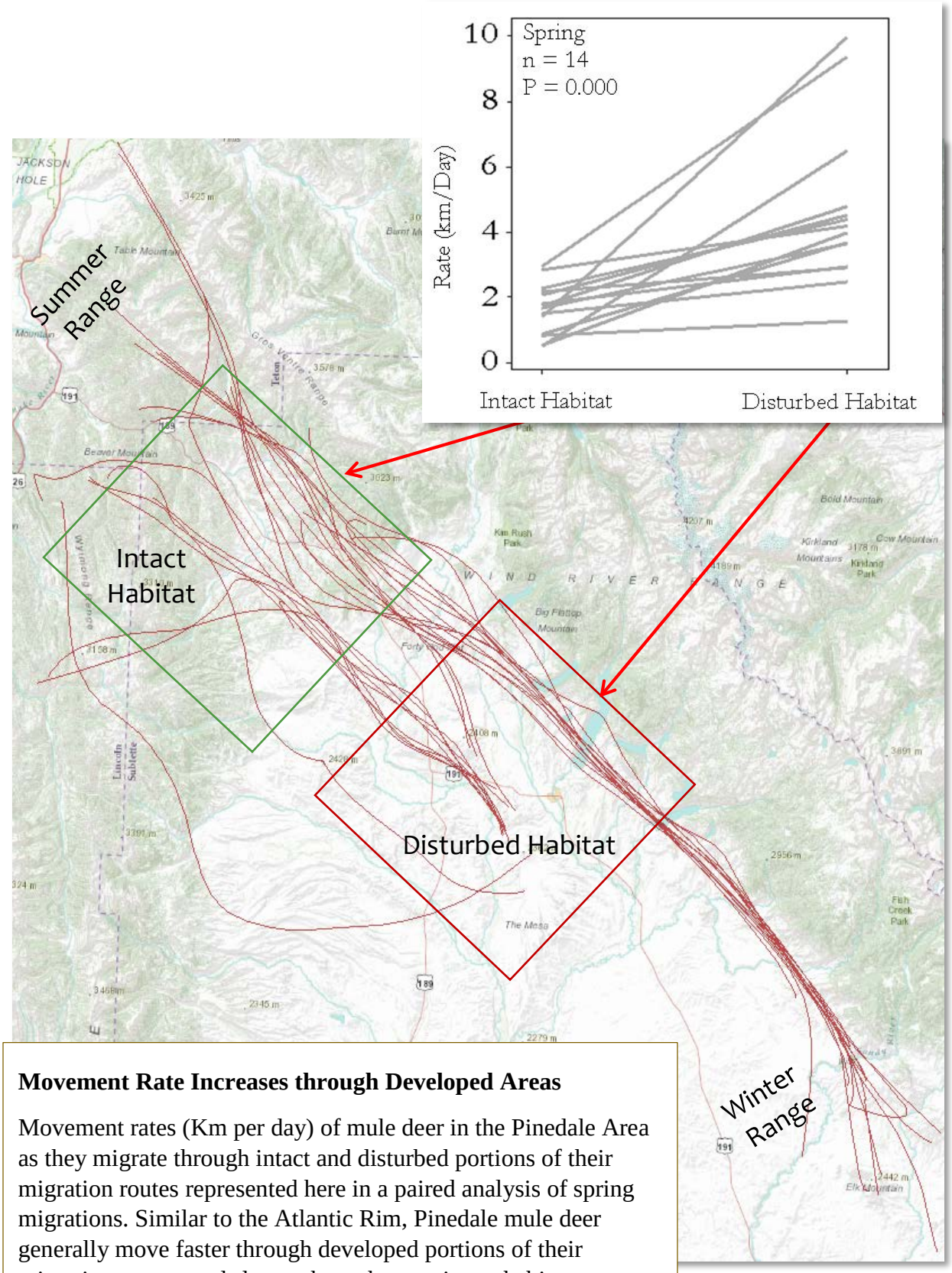

## Movement Rate

At early phenology, plants are highest in crude protein and digestibility. When forage plants develop beyond early phenology, ungulates travel to higher elevation where plants are just beginning to emerge, effectively 'surfing the green wave'. Development may cause impediments to this movement and reduce access to high quality forage.

Thus fare, we have used GPS collar technology to evaluate if migrating animals alter their rate of travel through different portions of migration routes.

These graph below depicts movement rate in gray dots for each individual animal in the Atlantic Rim area, and movement rate through development in the connected orange dot. In general, animals move faster through developed areas than through more intact portions of their migration routes. Three of these individuals are depicted in the map above, illustrating intact and disturbed habitat segments.





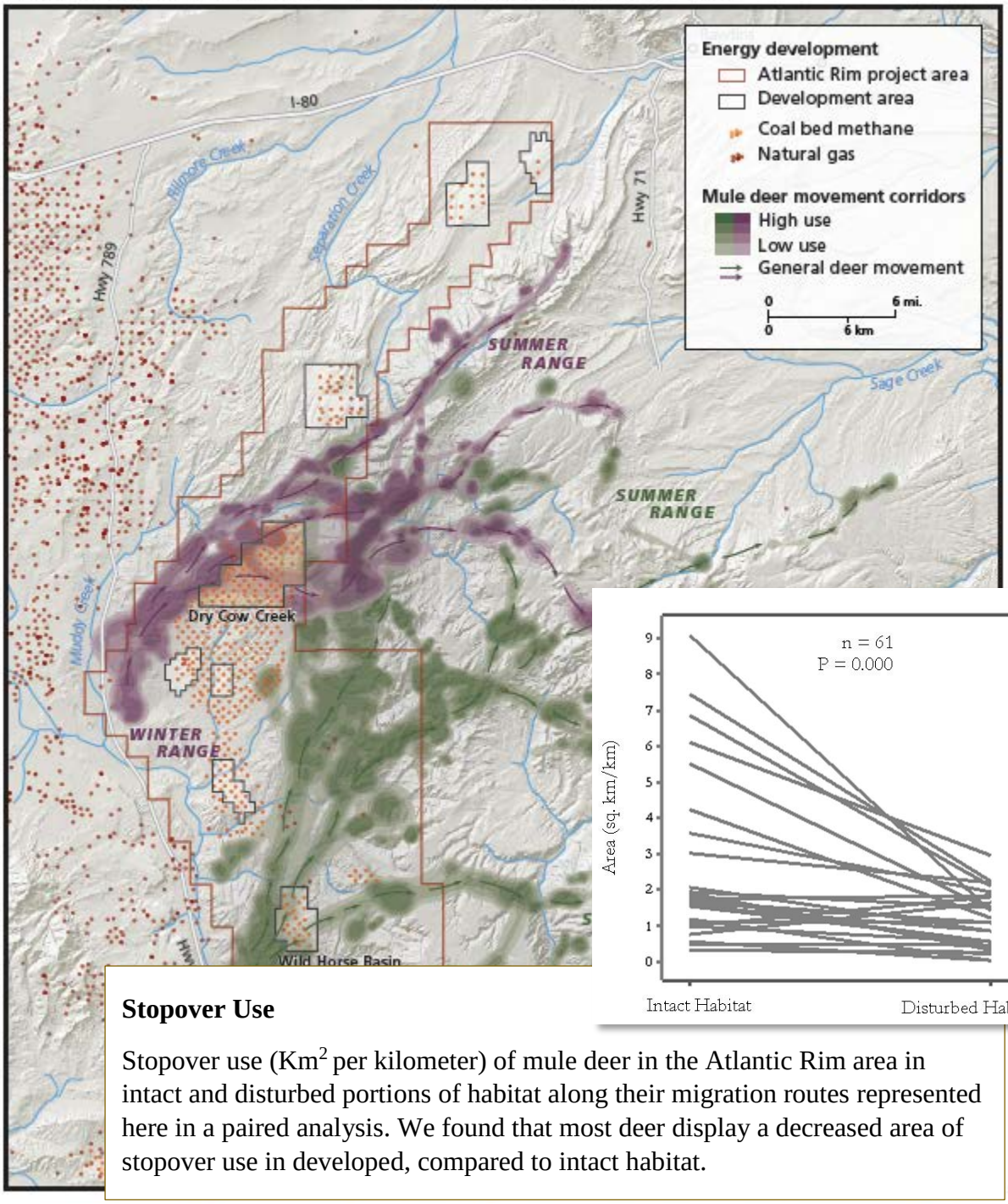

**Movement Rate Increases through Developed Areas**

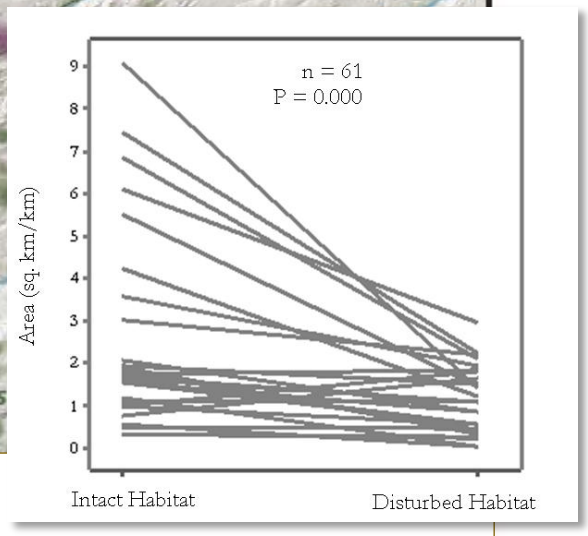
Movement rates (Km per day) of mule deer in the Pinedale Area as they migrate through intact and disturbed portions of their migration routes represented here in a paired analysis of spring migrations. Similar to the Atlantic Rim, Pinedale mule deer generally move faster through developed portions of their migration routes, and slower through more intact habitat.

**Stopover Sites**

Mule deer use stopover areas to forage along their migration routes. Deer spend 95% of their time along their migration foraging in these stopovers, to which they have high fidelity between seasons and year.

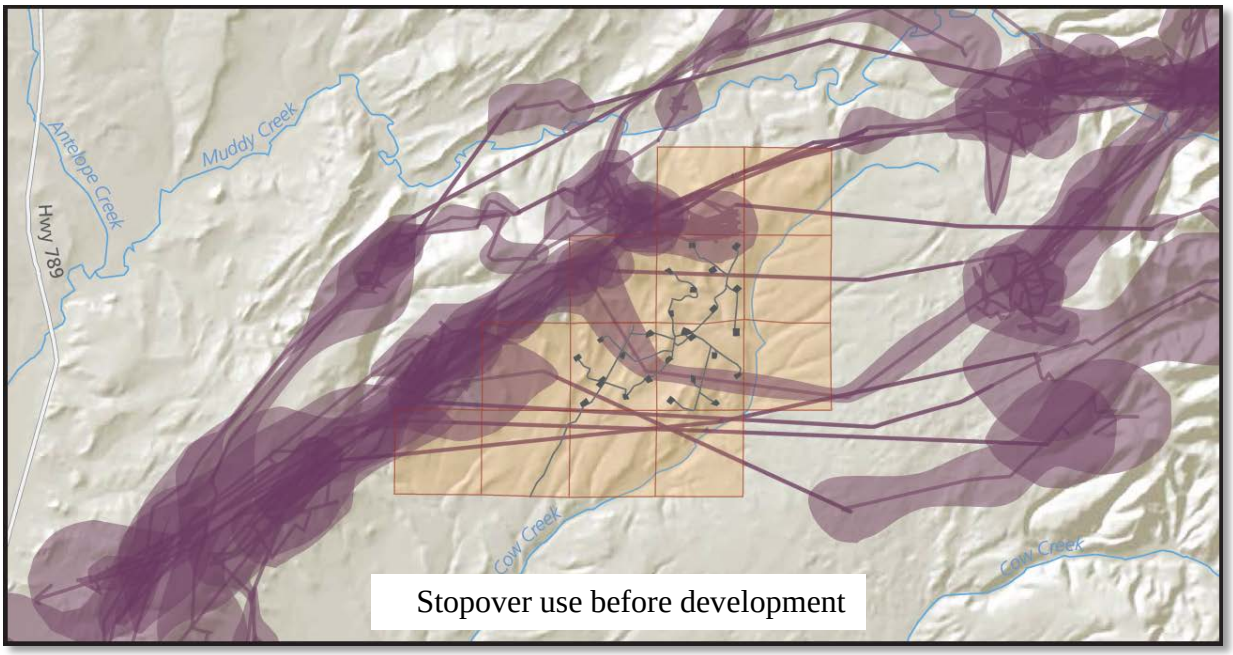

## Energy and Migration in Atlantic Rim Project Area

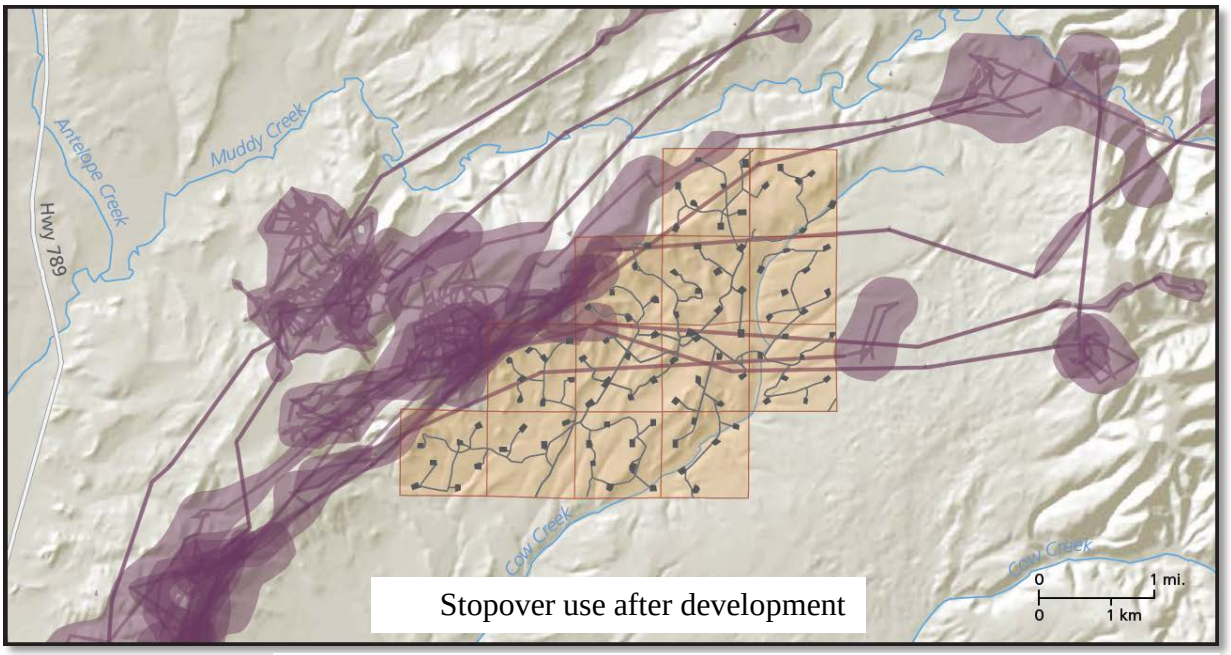



**Stopover Use**

Stopover use ($Km^2$ per kilometer) of mule deer in the Atlantic Rim area in intact and disturbed portions of habitat along their migration routes represented here in a paired analysis. We found that most deer display a decreased area of stopover use in developed, compared to intact habitat.




**Mule deer migration routes**

- Stopover site
- Movement route

**Energy development**

- Energy development
- Dry Cow Creek development area

**Decreased Stopover Use**

We found that stopover use decreased between years in an area of the Atlantic Rim that was developed during the summer of 2008. This makes the migration less viable for mule deer, and may indicate a reduction in the foraging benefit of migration.

## Next Steps

We are using behavioral information to identify critical thresholds in amount of development that alter how migrating deer use the landscape. For instance, at some threshold mule deer may stop using a migration route, or stop migrating altogether, thereby loosing access to the critical spring, summer and fall seasonal forage. Understanding these critical thresholds will enhance our ability to conserve migration routes and stopover areas.

In addition to understanding behavioral changes of migratory mule deer, we will also assess the ability of deer to track changes in forage greenup across the landscape, and assess whether development impedes this ability. We anticipate project completion in 2014.


## Acknowledgements

Thank you to all of our project supporters and partners without whom this project would not be possible.

*Major Financial Support has been provided by:*
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