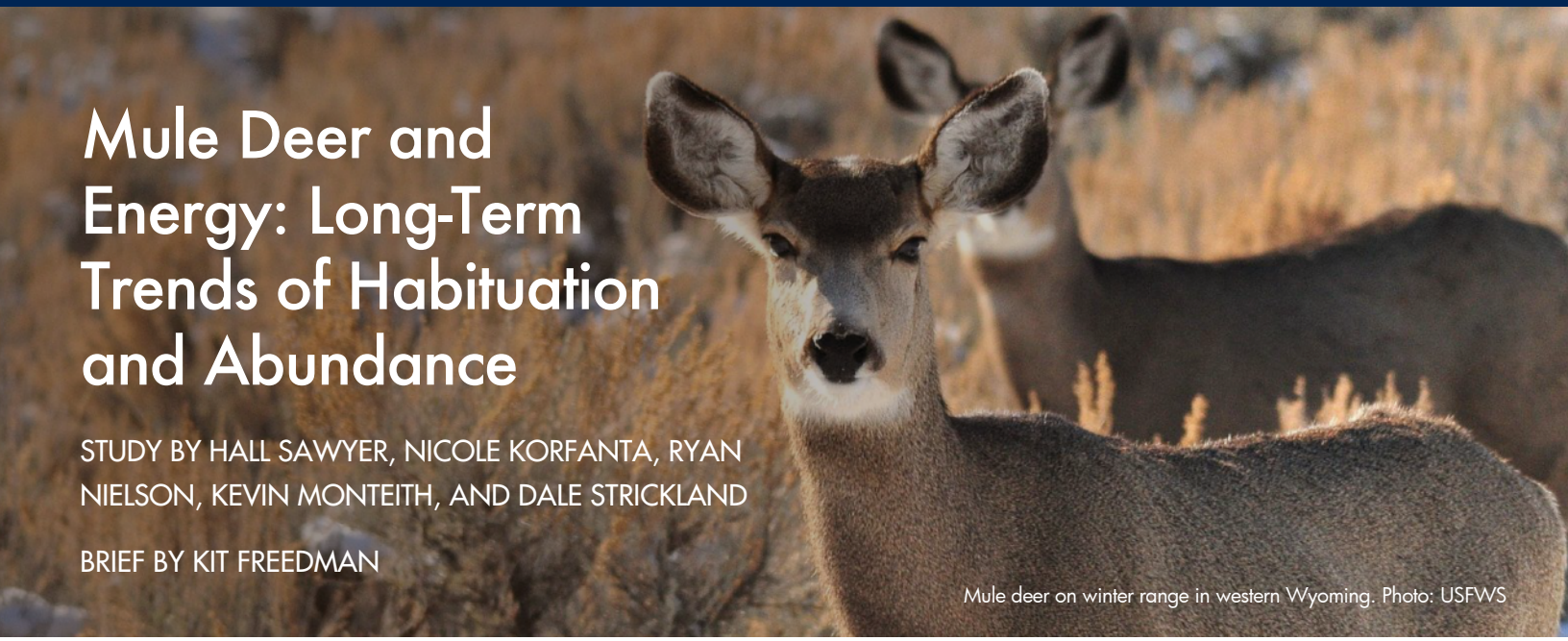
HAUB SCHOOL OF ENVIRONMENT AND NATURAL RESOURCES

RESEARCH BRIEF
SUMMARY OF FACULTY SCHOLARSHIP

Mule Deer and Energy: Long-Term Trends of Habituation and Abundance

STUDY BY HALL SAWYER, NICOLE KORFANTA, RYAN NIELSON, KEVIN MONTEITH, AND DALE STRICKLAND

BRIEF BY KIT FREEDMAN



Mule deer on winter range in western Wyoming. Photo: USFWS

Why this study was needed

In western North America, advances in drilling technology, along with carbon dioxide reduction incentives, have accelerated natural gas development and converted large swaths of big game habitat into roads, well pads, and pipelines. Some of the largest natural gas fields in the United States overlap critical winter ranges for mule deer, an iconic and economically important species.

Mule deer are known to avoid natural gas activity and infrastructure, including wells and roads. But a common perception is that mule deer habituate to energy infrastructure over time. For instance, the National Environmental Policy Act documents that guide federal decision making on millions of acres of public lands in the western United States, typically describe natural gas development as a short-term impact to which animals habituate once drilling activities are complete. This was the first study to test the assumption of habituation and determine whether mule deer avoidance of infrastructure is indeed short term.

How it was done

The study area includes 100 square miles of the Pinedale Anticline, a large natural gas field in the Upper Green River Basin of western Wyoming, which is also winter range for thousands of mule deer. From 1998 to 2000, before intensive energy development commenced, the researchers radio-collared and tracked movements of 23 mule deer. During energy development, from 2001 to 2015, the researchers tracked another 164 mule deer using GPS collars. They also used satellite imagery to calculate acres of sagebrush habitat converted to energy infrastructure each year and combined that analysis with the radio-telemetry and GPS-collar data to determine whether avoidance decreased with time. Concurrently, the number of mule deer were counted each year to monitor trends in abundance.

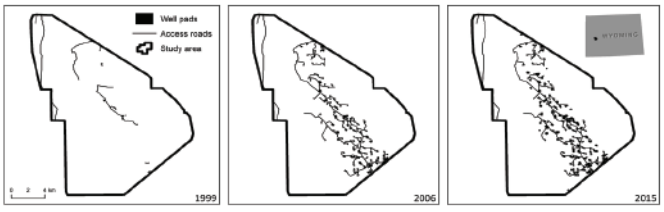


Figure 1. Well pad and road development in the Pinedale Anticline over time.

This study was a collaboration between researchers at Western EcoSystems Technology, Inc. (WEST, Inc.), and the University of Wyoming's Haub School of Environment and Natural Resources.

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What the researchers discovered

MULE DEER DID NOT HABITUATE TO GAS DEVELOPMENT.

Throughout 15 years of natural gas development in western Wyoming, mule deer did not habituate to energy infrastructure. Researchers used the 2015 energy infrastructure as a reference point to compare deer use of the study area, calculating the average distance from each deer to the nearest 2015 well pad. Prior to development (1998–1999), mule deer used areas that averaged 1.25 km from well pads. From 2000 to 2015, as drilling and production occurred, the mule deer population shifted average habitat use about 1 km farther from the well pads. If deer had habituated to the energy infrastructure, that distance would have decreased during the last three years of development (2013–2015) when most wells were in production and under reclamation. Instead, deer shifted even farther from the well pads.

Average mule deer distance from natural gas development

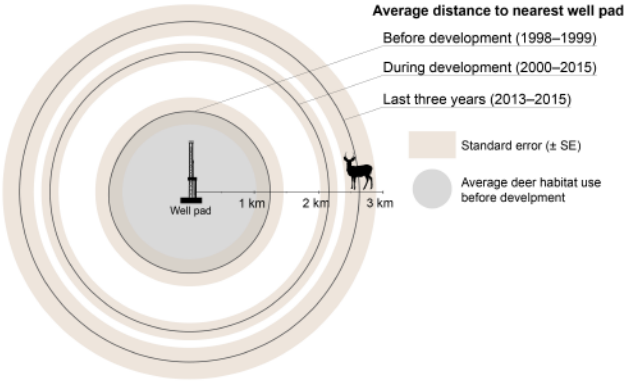

Figure 2. Mule deer habitat use relative to 2015 energy infrastructure in the study area showing failure to habituate to development over time.

THE MULE DEER POPULATION DECLINED BY 36–42 PERCENT.

Despite a series of mild winters, fewer hunting licenses, and extensive on-site mitigation, mule deer numbers on the Pinedale Anticline declined by 36–42 percent over the 15-year development period. This reduction is not explained by overall mule deer declines in the region (only 16 percent) or by mule deer switching to other winter ranges (less than 2 percent). Rather, such declines are expected when long-term avoidance of infrastructure reduces the size of winter range and limits the number of animals that can be supported.

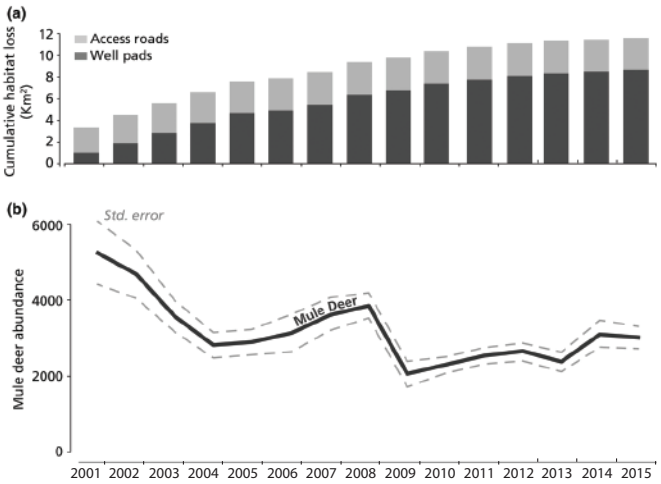

Figure 3. (a) Direct habitat loss associated with roads and well pads, and (b) annual mule deer population estimates in the study area.

Why it's important

This 17-year dataset indicates that mule deer avoid energy infrastructure over the long term, and the resulting indirect habitat loss can lead to significant population declines. Mitigation efforts including directional drilling, liquids gathering systems that reduced truck traffic to well pads, and off-site habitat protection reduced the magnitude of impacts but did not eliminate them. These findings reveal the trade-offs of energy development placed in critical mule deer habitat and suggest that federal planning documents consider these impacts to be long term.

Read the paper

H. Sawyer, N.M. Korfanta, R.M. Nielson, K.L. Monteith, and D. Strickland, "Mule Deer and Energy Development–Long-Term Trends of Habituation and Abundance," *Global Change Biology*, (2017). Access the article for free at the Global Change Biology website.

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