BEYOND YELLOWSTONE PROGRAM

RESEARCH BRIEF

HOW DOES LAND DEVELOPMENT AFFECT BIG GAME?

Housing and energy development are expanding across the Greater Yellowstone Ecosystem (GYE). Many of our partners wonder how this development affects wildlife, especially the GYE's migratory herds of elk, mule deer, and pronghorn. Members of our research team have been studying this question over the past decade. The studies range from global to local extents, evaluating animal movements from seasonal to hourly timescales with a particular focus on the herds of the GYE.

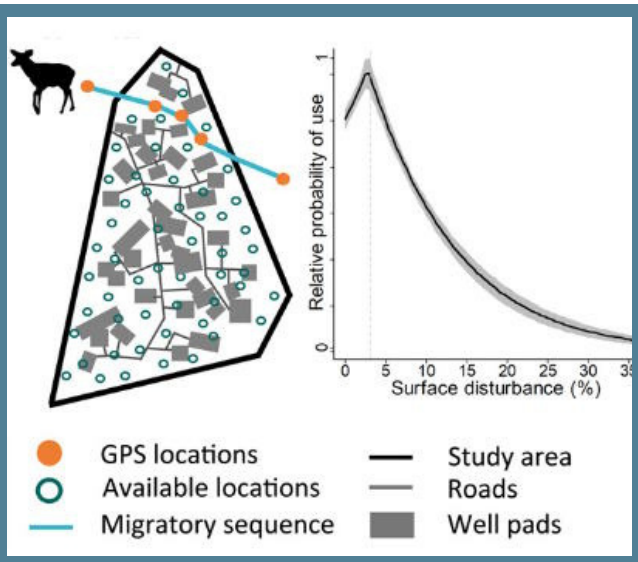
HOUSING AND ENERGY DEVELOPMENT HAVE BEEN EXPANDING.

Even before the recent influx of remote workers and Yellowstone enthusiasts, the GYE was one of the fastest-developing areas in the country. Demands for housing, energy, and commercial development are significant, and they're projected to increase into the future. Much of the land that remains open to development overlaps with areas used by migratory animals. Through our work with GPS-collared animals and in close collaboration with research partners, we are starting to understand *how much* and *what type* of development it takes to alter migratory movements in the GYE.

WE SEE ANIMALS AVOIDING DEVELOPMENT.

Our work reveals land development is one of the strongest single influences on migratory big game, affecting everything from where herds live within the broader landscape to where individual animals walk each day. Elk actively avoid developed areas[1], and their movements are more constrained when they do have to live near humans.[2] Both pronghorn[3] and mule deer[4] also avoid using otherwise good habitat that's close to development, and mule deer migrate abnormally quickly when they have to go through developed land.[5]

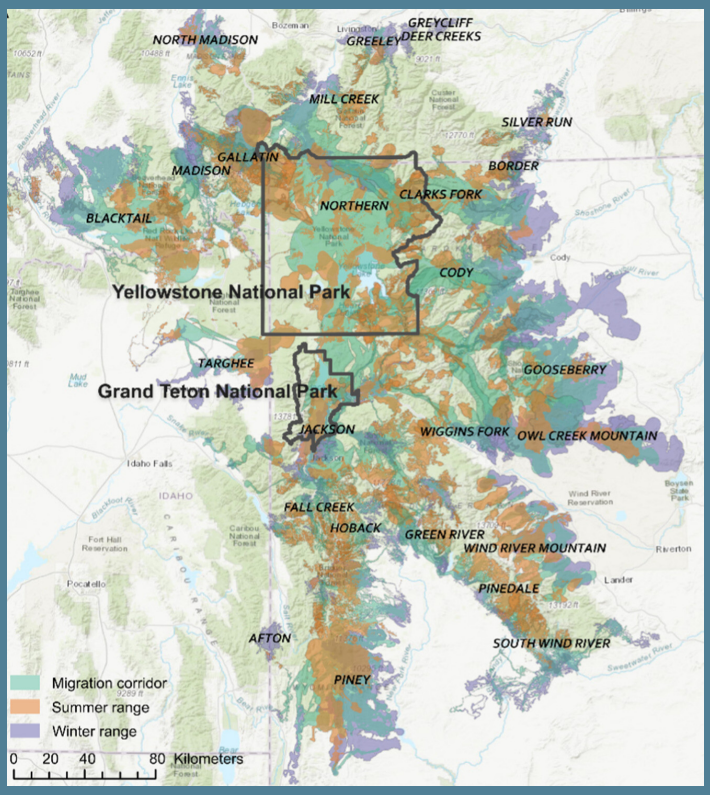
Our insights are starting to show **tipping points for land development** - while also revealing several tools available to policymakers, managers, and landowners who want to limit impacts and protect migratory herds.



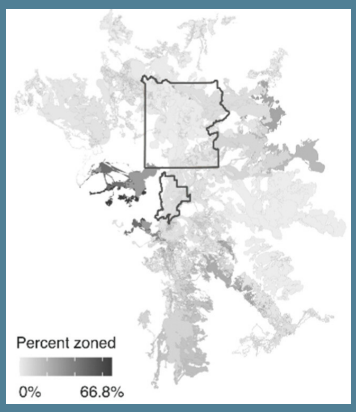
In the Pinedale Anticline gas field in western Wyoming, mule deer use of migratory habitat sharply declined after surface disturbance exceeded 3%.

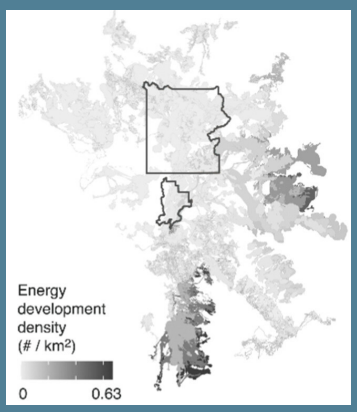
Adapted from Sawyer, Lambert, & Merkle 2020, JWM.

Prepared by Kristin Barker



In addition to the 26 herds of elk whose seasonal ranges are shown here, the GYE also supports migratory populations of mule deer, pronghorn antelope, bighorn sheep, moose, bison, and other animals that are sensitive to changes in land use.





Much of the habitat that migratory animals rely on is susceptible to the increasing demands for residential, commercial, and energy development across the region.

Gigliotti et al. 2022 Biol. Cons.

THERE'S A LIMIT TO THE AMOUNT OF DEVELOPMENT THAT MIGRATORY HERDS CAN TOLERATE.

A key new insight emerging from our work is that there are thresholds of development that animals can no longer adjust to. These thresholds can be quite low – as little as 1-2% of land development can cause elk to avoid an area,[6] and use of natural gas fields by mule deer plummets after 3% of the land has been disturbed.[7] Exceeding a Human Footprint Index of 6 on a scale from 1-100 can cause a stark change in the ways elk move across the landscape.[2]

LESS USABLE HABITAT MEANS FEWER ANIMALS ON THE LANDSCAPE.

Development doesn't just physically remove habitat. By changing how animals behave, development can also make it harder for them to use the habitat that's left. For example, mule deer that change their migrations to avoid energy development can get disconnected from the flush of extra-nutritious vegetation they're trying to follow in spring,[8] and animals that closely track this vegetation are healthier than those that don't.[9]

IF POPULATIONS DECLINE, SO COULD IMPORTANT ECONOMIC, ECOLOGICAL, AND SOCIAL VALUES.

Many migratory herds are declining, and the research collectively suggests that habitat loss plays a role. Retaining these herds is key for continued ecological and socioeconomic health.[10] Migratory animals provide food and materials for locals and nonresidents, and revenue from hunting and wildlife-related tourism bolsters economies from the local to the national level.[11] Migratory wildlife also fuel ecosystem services and functions as they move across the GYE.[12]

THERE ARE MANY TOOLS THAT CAN HELP LIMIT THE NEGATIVE IMPACTS OF DEVELOPMENT ON MIGRATORY WILDLIFE.

Conservationists, managers, and policymakers are building an increasingly diverse set of tools that can help limit negative effects of development on migratory herds. Communities can use any combination of these tools, adapted to local needs and conditions, to help migratory herds and their habitats thrive.

Regulatory tools help steer land management decisions from county to federal levels – for instance by delineating appropriate areas for future growth or establishing development strategies that retain wildlife permeability.

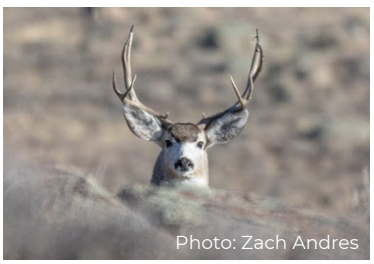


Photo: Zach Andres

Incentive-based tools can provide funding and support to landowners who protect wildlife habitat - for instance through conservation easements, wildlife habitat leases, or pay-for-presence programs.

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