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Science
FINDINGS

INSIDE

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"Science affects the way we think together."
Lewis Thomas

Seasonal Neighbors: Residential Development Encroaches on Mule Deer Winter Range in Central Oregon

"The question is not whether your part of the world is going to change. The question is how."
—Edward T. McMahon

Situated in the high desert east of the Cascade Range, Deschutes County in central Oregon boasts a pleasant climate and a unique combination of geological features, making it a mecca for year-round outdoor recreationists. Hunters, fishermen, campers, hikers, mountain bikers, rock climbers, water sport enthusiasts, off-road vehicle riders, skiers, golfers, and wildlife viewers have helped make it the fastest growing county in Oregon.

Nick Myatt/ODFW

In the winter, mule deer migrate to lower elevations in central Oregon. Roads and residential development are disrupting this migration.

A booming outdoor recreation industry, coupled with traditional activities related to timber sales, ranching and agriculture, have boosted Deschutes County's population nearly sevenfold since 1960. Most of that growth occurred in the past 20 years—the population almost doubled between 1990 and 2010, concentrated around the county seat of Bend and four major destination resorts. A report released by the county in 2004 anticipates about 70 percent more population by 2025.

The area's civic leaders, land use planners, and public land managers are charged with a delicate balancing act: fostering a vibrant economy while working to ensure that the area's attractions remain healthy and sustainable for future generations. So when two large areas of private forest in central Oregon were being considered for high-density housing and

IN SUMMARY

Mule deer populations in central Oregon are in decline, largely because of habitat loss. Several factors are likely contributors. Encroaching juniper and invasive cheatgrass are replacing deer forage with high nutritional value, such as bitterbrush and sagebrush. Fire suppression and reduced timber harvests mean fewer acres of early successional forest, which also offer forage opportunities. Human development, including homes and roads, is another factor. It is this one that scientists with the Pacific Northwest Research Station and their collaborators investigated in a recent study.

As part of an interagency assessment of the ecological effects of resort development near Bend, Oregon, researchers examined recent and potential development rates and patterns and evaluated their impact on mule deer winter range.

They found that residential development in central Oregon is upsetting traditional migratory patterns, reducing available habitat, and possibly increasing stress for mule deer. Many herds of mule deer spend the summer in the Cascade Range and move to lower elevations during the winter. An increasing number of buildings, vehicle traffic, fencing, and other obstacles that accompany human land use are making it difficult for mule deer to access and use their winter habitat. The study provides valuable information for civic leaders, land use planners, and land managers to use in weighing the ecological impact of various land use decisions in central Oregon.

recreation, the Pacific Northwest Research Station was asked to evaluate the potential ecological impacts.

Jeff Kline, a research forester and economist with the station, created a set of fine-scale land use projections to support the resulting interagency assessment of the possible ecological effects of the proposed resort on a parcel known as Skyline Forest. Because a primary interest was the impact on mule deer winter range, Kline also used his land use projections to separately evaluate where future development is likely to affect the deer's traditional migratory patterns in the greater Bend area.

KEY FINDINGS

- In the central Oregon study area, mule deer that summer in the mountains migrate to lower elevations for wintering. Increasing residential development in their traditional winter range is causing direct and indirect habitat loss that could contribute to a decline in mule deer population.
- By 2000, development in traditional mule deer crossing areas was sufficient to disrupt migratory patterns.
- Projections suggest greater development in the future, especially in key wintering areas and along migration corridors.
- Even at low building densities, development could adversely affect mule deer migration and winter use through fencing, collisions with motor vehicles, and human activities on private and public property.

LAND USE PROJECTIONS IN CENTRAL OREGON

As a foundation for his land use projections, Kline used historical data that was originally created by counting buildings in aerial photos taken during the 1970s, '80s, '90s, and 2000s. The data are used to construct a statistical model that correlates new buildings with population trends and certain socioeconomic variables, such as the buildings' location relative to cities and transportation corridors. The model forecasts where buildings will be built in the future if trends follow the rates and patterns of the past.

"My projections are what you might call 'naïve projections,'" says Kline. "They just say 'here's what happened in the past, and if we follow the same pattern and the same correlation in the future, this is what would happen.'"

When Kline overlaid maps of mule deer habitat with maps showing his land use projections, a major problem was revealed: land development is increasingly infringing on mule deer habitat and blocking passage between the deer's summer and winter ranges. By 2000, development was already present in many locations within mule deer winter range, "some of it at sufficiently high densities to influence winter use and migratory patterns," says Kline.

The problem is not so much that development is spreading out across the wide area of the deer's winter range, he notes, but that it tends to locate in "key choke points." It affects the deer's ability to move freely among the lower elevation areas where they are accustomed to wintering. "In some locations, development coincides with narrow sections of winter range with the potential to disrupt movement of individuals throughout the range," says Kline.

Jeff Kline

The population of Deschutes County, Oregon, nearly doubled between 1990 and 2010, with most of the growth concentrated around the city of Bend.

In addition, as residential development increases, land managers with responsibility for protecting adjacent public lands are removing brush and trees within defined limits to protect property against fire. These preventive measures reduce forage and cover needed by wintering mule deer. "Residential developments have a footprint that extends way beyond the development," says Glen Ardt, a wildlife habitat biologist with the Oregon Department of Fish and Wildlife (ODFW) who collaborated with Kline on the study. "There is also indirect loss of habitat due to disturbance from the people and pets that radiates out from these residences."

STRESSED OUT IN CENTRAL OREGON

Along with Rocky Mountain elk and bald eagles, mule deer are often used as iconic representations of the Old West. They provided essential life support for Native Americans and early pioneers, and they continue to be a valuable economic, aesthetic, and ecological resource for central Oregon. In fact, deer hunting and wildlife viewing are major sources of revenue for the state. According to ODFW, residents and nonresidents spent $517.9 million on activities related to hunting and $1.02 billion on activities related to wildlife viewing in 2008.

Despite long-term management by ODFW, average spring mule deer population in the Upper Deschutes management area has shrunk by nearly 55 percent since 1960. Several factors are likely at play, including fewer quality foraging opportunities brought about by various changes on the landscape. Invasive cheatgrass and encroaching juniper are crowding out more nutritious plants such as bitterbrush and sagebrush. Wildfire suppression and less timber harvesting has led to fewer acres of early successional forest, which provide foraging opportunities for the deer. Human development in the deer's traditional winter habitat is another factor.

Laurie Houston

Recreational opportunities in Deschutes County have attracted visitors and new residents but may negatively affect the deer's browsing habits.

Like many Oregonians and visitors from around the world, mule deer enjoy spending time in the high Cascades in the summer. They browse on the forest undergrowth and accumulate fat reserves for the coming winter. However, as forest composition in the mountains has changed in recent decades due to fire suppression, it is becoming harder for mule deer to find nutrient-dense forage, says Ardt.

"A lot of white fir has come in underneath the ponderosa pine and has reduced the amount of forage that's out there. Forage for deer, like bitterbrush and buckbrush, gets shaded out when the forest canopy overtops it and it doesn't get the sunlight it needs to live," he says. In addition, more traffic on forest roads and an intensification of recreational activities—off-road vehicle use and mountain biking in particular—disturbs wildlife and affects browsing habits. Consequently, many deer enter the cold season without a sufficient layer of fat to sustain them through the winter.

Deer are not equipped to handle deep snow, so by the time a foot or so has accumulated in the higher elevations, they migrate down the mountain, attempting to spread out on the desert west and east of Bend. Dodging motor vehicles and finding quality forage in the flatlands are only two of the challenges they face as winter approaches. With each passing season, they encounter more and more obstacles along the paths they have traditionally used to access their winter range.

"Not only do you have loss of habitat (owing to development and recreation), but you have development breaking up the habitat and inhibiting movement," says Kline. "In the mountainous West, the most likely place people are going to develop is the lower elevation flats, so you have development locating right where the grazing animals want to congregate in the wintertime."

Ardt believes that a main contributor to the decrease in the mule deer population in central Oregon is stress. Insecurity in their environment causes deer to react much as humans do when faced with the unexpected. "When disturbance occurs, wildlife either freeze, flee, or fight. And just because they don't flee, it doesn't mean they aren't being disturbed," he says. "Studies have shown that when an animal is disturbed, its cortisol level goes up—that's a stress hormone."

Even if forage is available, the deer may not browse if they are disturbed, and undernourished or stressed-out deer can die prematurely. Stress also can cause a doe in poor condition to abort or reabsorb a fetus, says Ardt, which further reduces the herd. "If they are disturbed, they are using energy they wouldn't otherwise, which can be critical in mid to late winter when their body condition is at its poorest or during the post-fawning and rearing periods when energy demands are higher," he says.

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TRACKING MIGRATORY PATTERNS

In the 1960s, the ODFW conducted its first study to try to determine exactly how mule deer move from their winter range to their summer range in central Oregon. At that time, deer were trapped, tagged, and collared, which provided a way for biologists, foresters, loggers, hunters, and others to observe deer movements and report sightings to the ODFW. "These methods allowed us to better identify summer and winter ranges, project movement between the two, and determine animal distribution between wildlife management units," says Ardt.

In 2005, the agency embarked on a new study to update and refine its understanding of deer behavior and movement. The Oregon Department of Transportation (ODOT) provided funding to the ODFW to purchase global positioning system (GPS) collars that are helping to determine mule deer crossing behavior on Highway 97, the main highway that runs north and south through the Bend metropolitan area and separates the deer's summer and winter ranges.

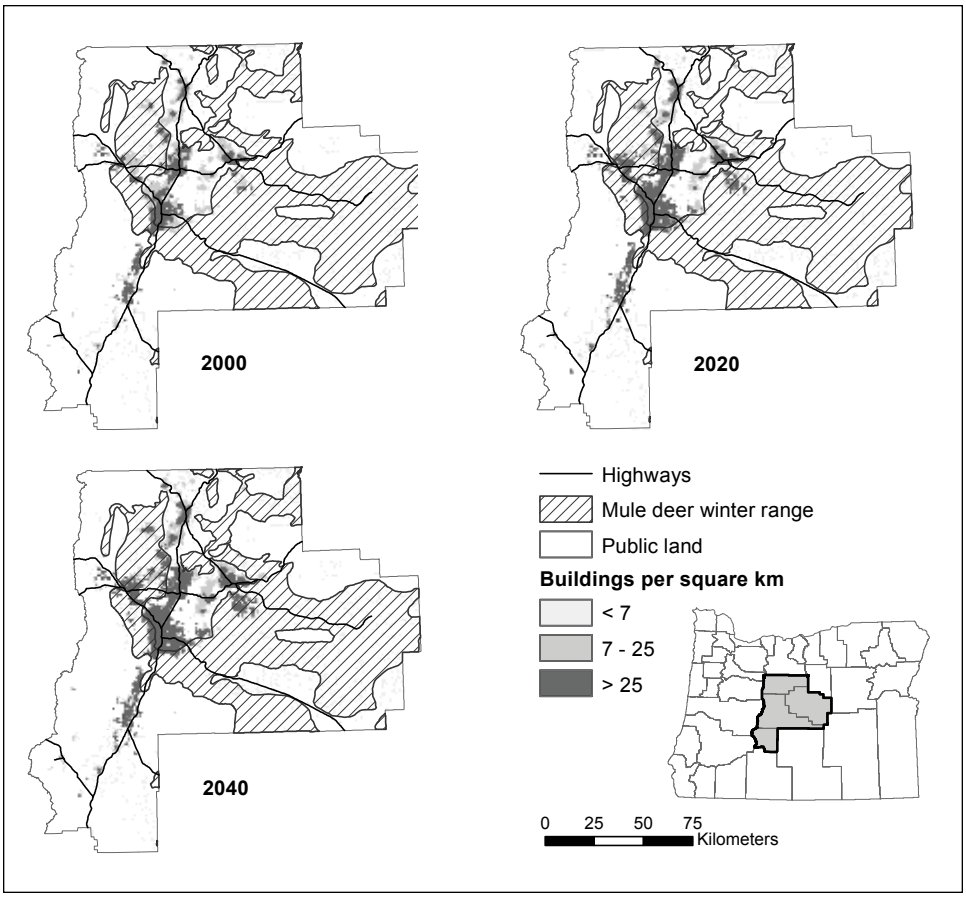
A total of 457 mule deer in central and south-central Oregon have been fitted with GPS collars and 250 of these collars have been recovered. The remaining collars are expected to be recovered within the next year. Although observations from the 1960s revealed that deer were moving across Highway 97 to the flatlands east of Bend to winter, data collected from the GPS collars indicate that deer are choosing to go north instead of east. "A lot of that is probably due to the amount of traffic that's on Highway 97 now between Bend and Sunriver [a popular resort]," says Ardt. As it turns out, more deer are killed on secondary and residential access roads than on the main highway.

One might wonder why, if people and cars stress them so much, deer can be found munching on the landscaping in people's backyards in the winter. Ardt speculates that it's because it is where they have always wintered, and data from GPS tracking supports that theory. "Telemetry data show deer moving through another deer's summer or winter area to get to their own, thereby showing their strong fidelity for a particular area," he says. It's the homing instinct in action.

Jeff Kline

Jeff Kline

Mule deer outfitted with GPS collars revealed strong fidelity to a particular area, even if it meant crossing major roads to get there.



By 2040, development in and around Bend, Oregon, is projected to further constrain mule deer access to winter habitat.

WANTING OUR DEER AND DEVELOPMENT, TOO

Kline's projections indicated that the Skyline Forest property could be developed as early as 2020. He says this finding originally was met with some skepticism because the property is currently zoned as forest land, but he points out that zoning laws can change and land developers can work around existing codes.

"Just because land is zoned the way it is doesn't mean that things won't happen—things do happen—people get exceptions," he says. "And the history in our land use data suggests that it is so—we can see development in areas that were previously forest and farmland. The land use planning system gives some level of protection, but it's not infallible. Some people tend to think of it as a permanent protection, but it really isn't."

It would seem that Skyline Forest is an example of how things can change. The property's owner wanted to build a resort, but the Deschutes Land Trust has been working to conserve as much of the land as possible. In June 2009, the Oregon legislature passed a bill that permitted the property's current owner to develop a small portion of the land if they sell the remainder to the trust for preservation. The owner was given a five-year time limit on the deal, but the downturn in the housing market has stalled the plans, so the future of Skyline Forest is still unknown.

Kline says his projections give landscape planners and managers data to inform their decisionmaking about what conservation measures may be necessary for certain plots of land, given population trends and past development patterns. "They could use information like this to figure out where development is likely to be," he says. "We're not trying to make any judgments about whether development is good or bad. We're just saying, 'here's how buildings are growing on this landscape.'"

Jeff Kline

Conservation easements and land use zoning are tools that could be used to maintain existing mule deer migration corridors.

Several options are available that could meet a variety of land use goals in the area, says Kline. "Land use planning might do the job, but there might be other things to consider that would augment planning," he says, such as establishing conservation easements or an outright purchase of land that is set aside for habitat conservation. He also suggests that policymakers might consider providing consistent or increased funding to existing state programs that protect and enhance critical winter habitat.

"The fate of animals is...indissolubly connected with the fate of men."
—Émile Zola

LAND MANAGEMENT IMPLICATIONS

- Resource managers may want to initiate or expand efforts to work with landowners, local land use planning officials, and nonprofit conservation organizations to consider how to address anticipated development within mule deer winter range.
- Modified land use zoning, conservation easements, and land purchases might be considered to help maintain existing migration corridors and minimize disturbances associated with new development.
- Policymakers might consider providing more consistent or increased funding to existing state programs that protect and enhance habitat.

FOR FURTHER READING

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