USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Pacific Northwest Research Station | Issue 269 | August 2024

Science FINDINGS

INSIDE

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

Decoding Hunter and Prey Movements: Insights to Improve Wildlife Management and Hunting Success

A bull elk. Male elk shifted their distributions during controlled 5-day hunts in the Starkey Experimental Forest and Range outside of La Grande, Oregon. They avoided open roads and selected greater canopy cover during the day. Photo courtesy of Oregon Department of Fish and Wildlife.

IN SUMMARY

Hunting is a popular recreational pursuit that can provide social, economic, and ecological benefits. It also serves as a primary tool for managing deer and elk populations. Yet hunter behavior—how different types of hunters (elk vs deer, rifle vs archery) use landscapes and the factors that influence hunting success—is seldom quantified.

Scientists at the Starkey Experimental Forest and Range collected real-time data from tracking units worn by hunters to better understand their movements as well as how deer and elk respond to their presence. They found that hunters used a small portion of the available landscape. Hunters that scouted before the hunt and spent more time in the field hunting were generally more successful. Prey response differed by species and hunt types. Elk shifted their distribution during hunts to avoid open roads; mule deer stayed within their ranges but moved faster thus spending more energy to avoid humans.

This information may help land managers looking to improve hunter satisfaction, maintain healthy populations of game species, and minimize damage to private land. Understanding how different hunter groups use a landscape, and the population-level consequences that hunting may have for deer and elk, can inform the design of hunting seasons. Strategically managing open roads, cover, and forage areas can support the health, distribution, and abundance of game species.

To hunt means to have the land around you like clothing—to engage in a wordless dialogue with it, one so absorbing that you cease to talk with your human companions.

—Barry Lopez, author

New scientific research confirms what deer and elk have already figured out—human hunters are predictable.

"As hunters, and I'm a hunter, we tend to think that we aren't predictable in how we use landscapes, how we hunt," says Mike Wisdom, research wildlife biologist with the USDA Forest Service, Pacific Northwest (PNW) Research Station. "But in fact, just like any other animal species, hunters do have very predictable patterns of behavior."

Deer and elk have learned to recognize these patterns and use this knowledge to escape the crosshairs of hunters. Now, scientists have analyzed patterns of hunter activity to improve both wildlife management and hunter experiences.

Studies of the hide-and-seek choreography of predators (human hunters) and prey (deer and

elk) tend to focus on the wildlife. Humans are seldom the focus—or tracked and observed with the same scrutiny given to wildlife. But for 6 years that is precisely what scientists did at the Starkey Experimental Forest and Range near La Grande, Oregon.

Mary Rowland, an emeritus wildlife biologist with the PNW Research Station, and Darren Clark, a wildlife research program leader with the Oregon Department of Fish and Wildlife, collaborated with Wisdom to track hunter movements as well as those of deer and elk.

"We were able to quantify how long people spend [at their base] camp, collect data about hunter success, and document how different types of hunters use the landscape," Rowland says.

PNW Science Findings

Providing scientific information to people who make and influence decisions about managing land.

PNW Science Findings is published monthly by:

Pacific Northwest Research Station
USDA Forest Service
1220 SW 3rd Ave., Suite 1400
Portland, OR 97204

Send new subscription and change of address information to:

SM.FS.pnw_pnwpubs@usda.gov

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The findings may be useful to wildlife and land managers and the hunting public alike. Accounting for differences in space use among different hunter groups as well as findings about consequences hunting may have for nontargeted deer and elk can inform how hunting seasons are structured. Strategically managing open roads, cover, and forage areas can help strike a balance between hunting satisfaction and healthy populations of prey species.

Land Use and Hunting Success

From 2008 to 2013, more than 300 hunters agreed to wear telemetry units as they traipsed through the ponderosa pine and Douglas-fir forest and grasslands of a 19,000-acre study area in search of their prey. The scientists collected data for three types of hunts—archery elk, rifle elk, and rifle deer—during 5-day hunts.

Hunter location data collected from the experiment allowed the scientists to model, or predict, the areas that hunters were most likely to use. All three types of hunters used a smaller portion (less than 16 percent) of the available hunting area than expected. Such concentrated use was especially prevalent among hunters that met with success.

"A successful hunter probably understands animal behavior and habitat requirements better," Rowland says. "They may be more strategic hunters. They seem to zero in on a very small area and go back to a few key places until they harvest an animal."

Successful archers used a fraction of the landscape compared to rifle hunters. Archers use a stalking or ambush approach that requires cover and closer distances to prey. Rifle hunters, on the other hand, often traverse large, open areas before they deliver a killing shot. Their weapon of choice lends itself to shooting animals in flight if needed.

Unsuccessful hunters ranged over a much wider area, but there was little overlap between the spaces used by the two groups.

▲ *Hunters in the study wore the pictured telemetry units to track their movements during hunts at the Starkey Experimental Forest and Range. USDA Forest Service photo by Mary Rowland.*

▼ *A typical elk hunting camp in the Wallowa-Whitman National Forest in eastern Oregon. . Photo courtesy of Bill Richardson.*

"Traditionally, deer hunting tends to be more of a family or social outing than elk hunting," Rowland says. "They tend to drive roads more and then hunt a little off the road, whereas successful elk hunters are on foot more and away from the roads."

Elk hunters roved up to 2 miles away from open roads, trailing elk into areas with cover.

Elk hunters that scouted ahead of a hunt were four times more likely to take home an elk compared to those who didn't. Deer hunters that left their base camp for longer stretches of time were much more fruitful in their efforts—for each additional hour they spent outside of camp, their success rate increased by 26 percent.

Successful or not, shifts in the distribution of deer and elk were more pronounced during rifle hunts compared to archery hunts.

KEY FINDINGS

- Hunters in the Starkey Experimental Forest and Range concentrated their use of the land to a relatively small portion of the area available for hunting. The area used by successful hunters did not overlap much with the area used by unsuccessful hunters. Elk hunters, both rifle and archery, tended to move into areas with more vegetation cover, while rifle deer hunters preferred open sites near roads.
- For deer hunters using rifles, each additional hour spent away from base camp increased their success rate by 26 percent. For elk hunters using rifles, scouting before the hunt increased the odds of success by more than four times compared to those who did not scout.
- Male elk shifted their distributions during hunts, avoiding open roads during all periods—except nighttime in the breeding season—and selecting greater canopy cover during the day. These shifts were more pronounced during rifle hunts than they were during archery hunts.
- Nontarget (female) deer and elk also changed their behavior during hunts for males. Elk strongly avoided forage sites and open roads during the day. Mule deer movement rates increased but they stayed within their traditional ranges.

The Price of Avoiding Predators

The act of hunting, regardless of weapon choice or success, affected deer and elk populations. Over the course of many years of Starkey hunting research, the study team observed that the presence of human hunters influenced when and where prey populations were active, foraging and habitat use, and levels of vigilance and avoidance behavior. This can affect the health of prey species. In Oregon, the combined deer and elk hunting season runs from late August through mid-November, with little down time for both species in between hunts.

During hunting seasons at Starkey, male elk generally avoided open roads during the day. During breeding season, they were less inclined to avoid roads at night but sought areas with greater tree cover in the daytime.

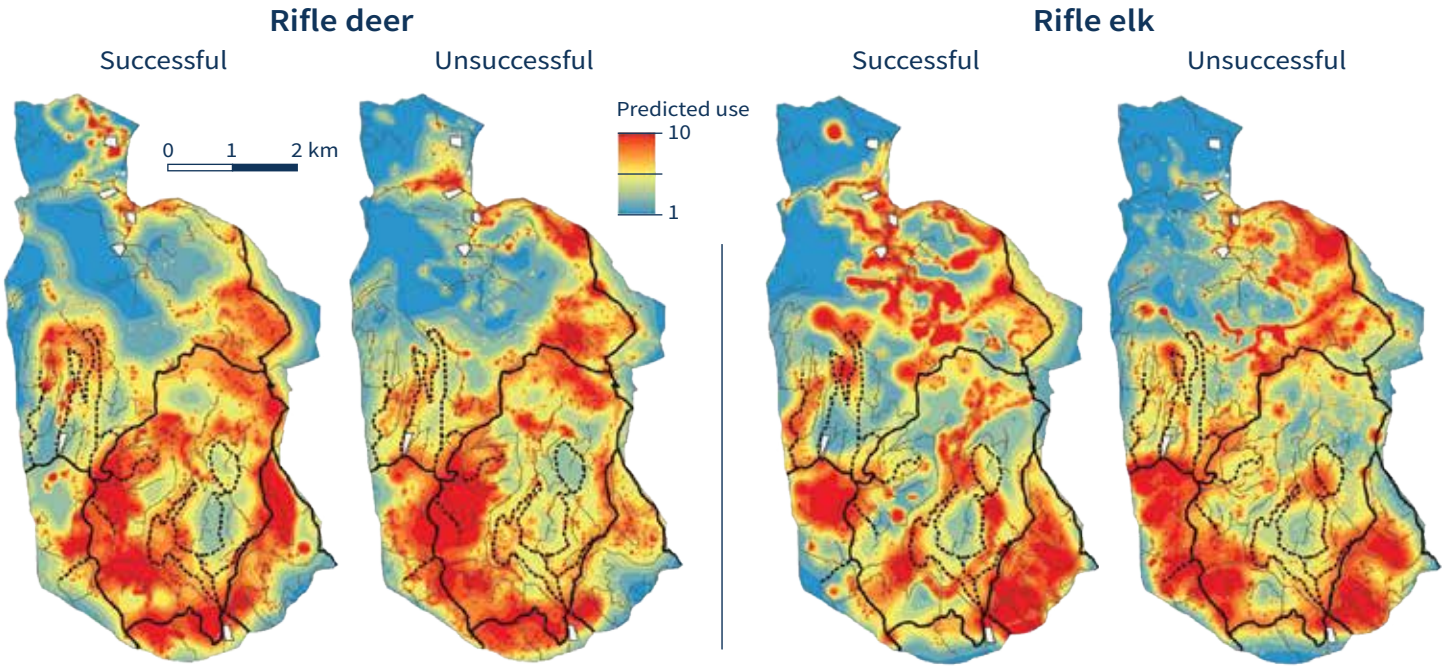
Although they are not the target of hunters, female elk are keenly attuned to hunter activity. Females avoided elk hunters more than they avoided deer hunters, which suggests they can distinguish between the two types. They also avoided rifle hunters more than archery hunters.

Avoiding hunters of any kind often comes at a price. Whether or not they are the intended target, females may sacrifice nutrition to avoid hunters. Female elk spent more energy moving about to avoid roads and trails during hunts. Females without calves chose to forego nutritional opportunities they would otherwise focus on if hunters weren't present. Females with calves braved feeding in nutritionally rich forage areas even if those areas were used heavily by hunters. By winter, lack of nutrition can affect the ability of female elk to make it through to spring and to reproduce.

Nevertheless, Clark says elk populations in the region are relatively healthy and robust.

"With elk, our biggest management concern is distribution," he says. "With deer, our main concern is large population declines over the past 20 years."

The causes are numerous and difficult to tease apart. However, female mule deer response to hunting, and how that might influence survival and their ability to procreate, could be key.



Rifle hunters at Starkey Experimental Forest and Range used the landscape in different ways. Red indicates the areas of highest predicted use by hunters. All rifle deer hunters, regardless of success, used the same portions of the Starkey landscape. In contrast, successful rifle elk hunters used areas with fewer roads in the northwest portion of the study area far more than their counterparts.

During the 5-day study of controlled hunts, female elk avoided forage sites and open roads during the day. Photo courtesy of Oregon Department of Fish and Wildlife.

Like elk, female mule deer moved more during the day when hunters were present, and they spent less time exploring areas with nutritionally valuable forage. However, rather than shift their distribution with the onset of hunting, deer maintained what scientists call "site fidelity." They tended to stay put in sites that are familiar to them, often at the expense of getting enough to eat by seeking better food sources elsewhere. On top of that, their caloric needs intensified from moving about to avoid humans, even as forage quality deteriorated. The result is that females can lose body fat that is needed for reproduction, and they also become more vulnerable to predators and harsh winters.

Minimizing Impact, Maximizing Satisfaction

Striking a balance between minimizing the indirect impacts of hunting on wildlife and maximizing hunter satisfaction is a tricky undertaking for public land managers.

Hunting designs and landscape management practices can help lessen the indirect effects of hunting on deer and elk. For example, strategic road closures or seasonal restrictions on the use of motorized vehicles may offer respite. Thinning or controlled burns can help to create a mosaic of forest conditions that provide quiet refuge, cover, or food sources during hunting seasons.

One of Clark's biggest headaches is the fact that when elk are hunted, they often seek refuge on private land, where they may destroy agricultural crops or damage fences.

"If we can understand how hunters are using the landscape and how their presence influences where deer and elk are," Clark says, "we can use that knowledge to move elk around."

The location, timing, and number of available hunting tags can be adjusted to reduce pressure on elk to give them a break from human disturbance or to increase pressure to encourage them to move away from a particular area. Where forage for mule deer is limited, reducing the number of tags might be appropriate if hunting pressure is thought to be contributing to nutritional stress.

Healthy populations of deer and elk underpin recreational hunting. Hunter satisfaction also hinges on access to land.

Increasing access by foot or by vehicle is a priority for the Rocky Mountain Elk Foundation, a land trust that supports elk hunting and habitat conservation. Bill Richardson, the senior conservation program manager for the Rocky Mountain Elk Foundation in the Western United States, says he's very interested in the Starkey Project findings about how far hunters generally traveled from access points.

"We worked with the folks at Starkey to develop our own access analysis so that we can consistently and accurately account for access acres that come along with an acquisition project," Richardson says. "Our partnership with the Starkey Experimental Forest and Range is hugely important because we want to be science based."

A female mule deer with fawns. During the studied hunts, female mule deer movement rates increased, but they stayed within their traditional ranges. Photo courtesy of Jim Ward.

Access is a two-way street, however. Too little or too much can become a problem.

"The more hunters out there, usually the less satisfied people become." Clark says. "Harvest success rates decline, and hunters may not have as much of a nature experience with a lot of people everywhere."

An Uncertain Future for Hunting

Deer and elk hunting have long been part of the social and economic fabric of rural communities and small towns, but the future of recreational hunting and its use in conservation management is uncertain.

With population growth and urbanization, demand for other types of recreation, which may not be compatible with hunting, is projected to rise. Access to huntable areas may also diminish. Ironically, one of the biggest threats is a lack of hunters.

Hunting, Rowland says, "is basically the most powerful tool that state wildlife agencies have to manage game species. But the number of hunters nationally and in the West are dwindling. The hunter population is aging."

The U.S. Fish and Wildlife Service estimates that 5.5 percent (14.4 million) of Americans aged 16 and older hunted in 2022. Nearly half were aged 45 or older, and 77 percent were male.

Rowland and Wisdom both note that the decline in hunters is a part of a broader trend of increasing disconnection with nature, wild lands, and the outdoors among the population in general.

"It's not just an anti-hunting sentiment," Rowland says. "It's hard to find people to hire for summer field work, even with good salaries and housing."

Dwindling too is revenue generated by the sale of hunting licenses and tags that state agencies rely on for wildlife conservation management. These trends are worrisome, not just for hunting, but for natural resource management in general.

Managing for hunter satisfaction is paramount to retaining and recruiting existing and new hunters. Providing new, younger hunters with the skills and knowledge to hunt is a focus of many state wildlife agencies as well as the Rocky Mountain Elk Foundation, which offers opportunities to develop hunting skills.

"We want to make sure that we pass that knowledge on to next generations so that we can keep it in the toolbox for management," says Richardson.

A bright spot on the horizon for recruiting new hunters, particularly women, is a growing interest in locally sourced, natural protein. Female hunters are significantly underrepresented among hunters; however, their success rates in the Starkey Project study were comparable to those of male hunters. This finding may help to encourage recruitment and retention of women.

In the face of population growth, development, and climate change, providing opportunities for recreation, including hunting and protecting and conserving the gifts of nature that many people depend on, requires insight. Whether hunting for a closer connection with nature and place, to better know where food comes from, or to recognize and honor wildlife, the consequences of human actions, including managing the land, can be illuminated by science.

"Hunting is not only a way to put food on the table, but it's also a reminder of our place in the ecosystem and our responsibility to protect it."

—Steven Rinella, conservationist and author

LAND MANAGEMENT IMPLICATIONS

- Accounting for differences in space use among hunter groups and understanding species-specific responses to hunting pressure and land management can inform wildlife management and policy. This information can be used, for example, to design hunting seasons that balance disturbance to the animals with hunter opportunity.
- The fitness consequences of increased movement caused by hunting on nontarget (female) population segments are important to consider when structuring hunting seasons, especially for species with declining population trends, such as mule deer.
- Strategic management of open roads and forest cover can balance hunter opportunity and satisfaction with harvest objectives and the biological needs of prey species.
- Information from this study can be used to educate hunters about the explicit value of effort in hunt success. The finding that female hunters were just as successful as male hunters may encourage recruitment and retention of females, a substantially underrepresented hunter group.

Further Reading

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