

The Varmint Question

**Wolves are making elk
behave like elk again**

By Cristina Eisenberg
Boone and Crockett Fellow

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conservation essays, *A Sand County
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Mid-May in Glacier National Park, Montana, is not a time or place for the fainthearted. The gunmetal sky is beginning to spit snow at me and my field crew as we hurry to finish a track transect before a late-season blizzard breaks out. We pull up the hoods on our parkas and carry on. All day, wolves have been howling around us. It has been difficult to pinpoint their location over the rising wind, but it seems as though they are moving along a benchland one-tenth of a mile east of us. The sounds are a vivid reminder of the wildness of the predator-prey system I am studying for my Ph.D. in Forestry and Wildlife at Oregon State University.

A Land Where Game Abounds

I am conducting research on how an apex predator (meaning one at the top of the food chain) such as the wolf affects aspen communities by influencing abundance and behavior of elk, its main prey. My work includes 50 miles of track transects in Glacier National Park's North Fork, arguably one of the wildest and most intact systems in the lower 48 United States. This place harbors a full suite of large predators: cougars, grizzly bears, wolves, and lynx, in one of the highest densities outside of Canada and Alaska, as well as abundant elk and deer. Located in the Crown of the Continent Ecosystem, this prime winter range contains some of the most spectacular trophy bull elk I have observed afield, plus all the wildlife species present at the time of the Lewis and Clark Expedition.

A key question is: how can such high prey densities persist in a system with so many predators? I am using traditional wildlife census methods to measure elk, deer, moose, wolf, cougar, and bear occurrence and to document their interactions. I also am measuring predation risk to determine whether wolves and other predators influence elk movements by causing them to avoid areas with escape and view impediments. Wildlife biologist Joel Brown has termed this phenomenon “the ecology of fear.”

My observations thus far create a compelling picture of a robust elk population thriving amid a full suite of large predators. This mirrors what Aldo Leopold observed during a 1937 bow-hunting trip to the Mexican Sierra Madre: an ecologically complete system. Having read Leopold's unpublished field notes, I was not surprised by the North Fork's relatively high elk density, and am finding other familiar patterns sharply etched on

About the Author

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the landscape. These elk are spending more time on flat, open ground and less time in riskier terrain where detecting or escaping predators is more difficult.

Conservation Roots

The American conservation movement originated in the late 19th century when hunters, alarmed about the steep declines in game populations, began demanding stronger fish and game laws. During an 1883 visit to North Dakota in search of a prize buffalo trophy, Theodore Roosevelt came to realize that the vast migratory herds, once icons of the American West, were gone. The conservation movement gathered momentum through Roosevelt's subsequent actions. In 1887 he co-founded the Boone and Crockett Club with a goal to conserve as much of America's wildlife and hunting heritage as possible. The first private organization to address wildlife conservation issues nationally, the Club engaged prominent sportsmen, industrialists, politicians, scientists, and writers in the shared cause of wildlife conservation.

From the beginning, the Boone and Crockett Club has recognized the need to balance human and wildlife needs. Members such as George Bird Grinnell, Gifford Pinchot, and Aldo Leopold—later regarded as the “father” of wildlife science—laid the foundation for a world-class system of wildlife conservation. Initially their conservation legacy called for the elimination of large predators, called “varmints” back then. Gradually, as a result of Leopold's influence and the work of contemporary scientists, the vision expanded to include wolves in places where people are willing to share the land with them.

Predator Epiphany

Aldo Leopold began to address “the varmint question” early in his career. His writings from the late 1910s show that Leopold, like most game managers of his era, advocated predator extermination. Leopold edited the newsletter of the New Mexico Game Protective Association, *The Pinecone*, in which he wrote that “game protection makes the killing of varmints necessary.” He also wrote, “It is going to take patience and money to catch the last wolf or lion in New Mexico. But the last one must be caught before the job can be called successful.” Leopold would later change his mind. A pivotal event was his field encounter with an alpha wolf and her pups, which he killed and wrote about late in his life in the reflective essay, “*Thinking Like a Mountain*.” He also was influenced by the insights of colleagues Joseph Grinnell and Adolph

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wildlife students at the University of Wisconsin that “To keep every cog and wheel is the first precaution of intelligent tinkering.” He was among the first scientists to argue that diversity is essential to optimal functioning in the natural world, a concept we are starting to grasp fully only now. My Ph.D. project is part of ongoing research to shed light on these relationships.

New Insights from Intact Ecosystems

My study area includes Alberta’s Waterton Lakes National Park because the elk herd I am studying migrates across the U.S.-Canada border. Such wildlife corridors provide natural laboratories where ecologists can learn much about wildlife movements and habitat needs. This project is part of a broader research effort in the Northern Rockies, the Southwest Alberta Montane Elk Study, which encompasses half the Crown of the Continent Ecosystem. Funded by Shell Canada and several government agencies and considered the largest elk study ever in North America, this project brings together industry, researchers from three universities, hunting groups, and agencies to study how to sustain elk populations, habitat, and hunting in the face of natural resources development.

The Boone and Crockett Club has long sponsored research on predator-prey relationships. A prime example is the wolf and moose ecology study started by Boone and Crockett Club member Durward Allen in 1958 and conducted by Rolf Peterson in Isle Royale National Park since the 1973. One of the longest-running scientific projects of its kind, the study was instrumental in changing public perceptions of the wolf and in the removal of the Midwestern U.S. population from the Endangered Species List. Peterson found that wolf presence improved moose fitness by bringing the population density down to a level that can be sustained by the available habitat. After years of gathering moose jaws on Isle Royale and comparing their sizes, Peterson found jawbones to be a reliable surrogate measure of a population’s fitness. Through time, as wolves established on the island in the 1940s, moose jaws have increased in overall size. Peterson collaborated with Yellowstone wolf biologist Doug Smith to compare elk jaws in that park, with similar results.

Leopold noted that wolf presence influences elk behavior as well as density. Why do wolves have these effects but not cougars or bears? The answer is found in the different hunting strategies employed by these species and the omnivorous food habits of bears, which weaken potential

and Olaus Murie. Through the writings of British ecologist Charles Elton, who created the food pyramid concept, Leopold came to understand that predators perform a critical ecological role. He learned that they function much like the keystone in an arch: remove them and the whole system begins to collapse. Today, we call top predators *keystone species* and their ecological effects *trophic cascades*.

Carried out as flesh-and-blood encounters between predators and prey, trophic cascades involve the passage of energy and matter from one species to another. Each act of predation ends one life so another can continue. Predation can have strong direct and indirect effects throughout food webs, with far-reaching consequences. Cascading top-down species interactions have been reported in all sorts of ecosystems, from the Bering Sea to the Rocky Mountains. All these systems involve three fundamental levels: predators, their prey, and vegetation. These relationships indirectly touch many other members of a biotic community—for example, even songbirds and beavers in the systems I study. Ecologists now understand that loss of a keystone predator can disrupt ecological processes such as predator-prey interactions, nutrient cycling, and seed dispersal. Such disruptions can lead to the unraveling of entire biological communities.

His “varmint days” behind him, Leopold in 1935 wrote about how predators help increase species richness and how their presence affects everything from prey to plant communities. He admonished his



TONY BYNUM



trophic cascades. Although bears eat meat, they don't primarily eat ungulates and consume many other things, including plants and insects. This raises another question: why don't human hunters have the same beneficial effect on herd fitness as wolves? Leopold found, as has contemporary ecologist Joel Berger, that seasonal hunting by humans acts differently than year-round hunting by wild carnivores. This is largely explained by differences in methods between human and non-human hunters, such as wolves' predilection for taking the young and old.

Researchers William J. Ripple and Robert Beschta discovered that wolves have been reshaping ecological relationships in the decade since their reintroduction to the Yellowstone ecosystem. Wolves are making elk behave like elk again by keeping them moving and alert. Behaving less like feedlot animals than before, Yellowstone elk now spend less time eating in one spot. This enables streambank plants such as willows and cottonwoods, over-browsed for decades, to grow again. These species, as well as aspen, provide critical nutrition for elk and other ungulates. They also provide essential habitat for songbirds, beavers, butterflies, and even amphibians. Once again, these plants are growing taller than browse height in areas where the risk of wolf predation is high.

Wolves naturally recolonized Glacier National Park in the 1980s. As in Yellowstone, Glacier's elk and deer used to browse young aspen suckers as soon as they emerged. Today, aspen stands may be showing a vital flush of recruitment above browse height. This new growth has the potential to enrich habitat for a broad range of species and improves streambank stability. These effects cascade down from keystone predators to create a complex web of interactions that can improve ecosystem resilience.

Applying Lessons Learned

Trophic cascades can enhance the overall quality of ungulate range conditions, which in turn can enhance herd fitness. Aldo Leopold gained these insights in northern Mexico in the 1930s and applied the lessons following his return to the Midwest. In his new role as chair of the Wisconsin Game Commission, he addressed what had become widely known as "the deer problem." Deer were over-hunted in the Midwest almost to extinction by the late 1900s. Wolves and other predators were extirpated from this area by the 1920s,

allowing deer numbers to rise exponentially, a phenomenon Leopold termed an "irruption." In his investigation of deer irruptions throughout North America, which had severely degraded wildlife habitat and physically weakened herds, Leopold noted that none had occurred in the presence of wolves. As game commissioner, Leopold advocated restoring wolves as the soundest way to address the deer problem. He died in 1949 of a heart attack while fighting a grass fire on his neighbor's property. During his lifetime Leopold was unable to inspire much tolerance for wolves in the Midwest. It has only been in the decades since his death, through the work of other scientists, that wildlife managers, conservationists, and the general public have created and supported the policy changes that enabled wolf recovery in the Upper Midwest and Northern Rockies.

As I write this, wolves have just been removed from the Endangered Species

am left with an ominous feeling in the pit of my stomach. Something about their behavior makes me uneasy, but I can't put words to it.

I finish just as the blizzard hits. When I look back toward where we began the transect, I encounter a sight so unexpected, so shocking, that initially I think I am imagining it. For there, conspicuous even through a scrim of falling snow, lies a fresh bull elk carcass. The animal looks impossibly huge. The wind carries clouds of steam from its gaping belly. I am amazed that none of us heard the takedown, even over the moaning wind. One minute the dead elk wasn't there and the next minute it was, meeting death in an area I had moments earlier characterized as having high predation risk. I investigate the carcass—an old bull surrounded by crimson wolf tracks on snow, its flesh still warm beneath my hands. The wolves had removed most of its hindquarter meat and some organs. I look up, my senses sharpened by the coppery scent of blood and by this primal encounter with the ecology of fear. A fresh carcass soon draws cougars and bears; I linger only long enough to record location coordinates.

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List in Montana, Idaho, and Wyoming and reclassified as a game species (and during the magazine's production, a Federal District Court in Missoula in mid-July ordered wolves back on the endangered species list). Although it is impractical to have wolves in every landscape that has an ungulate population, trophic cascades research and proactive management practices in the Upper Midwest and Northern Rockies offer powerful lessons about sustaining our American wild heritage and improving game habitat and herd fitness.

Observations and Reflections

Another afternoon in the field, and I race to finish my work before the weather deteriorates further. A bachelor herd of a dozen skittish elk stands fifty yards away, sporting velvety new antler buds. I gauge their ages from body size and behavior. The younger bulls nervously run around in circles while the mature bulls eye us warily, standing their ground. Eventually they leave, the young bulls taking cues from their elders, moving in the elegant head-high trot characteristic of their kind. As they vanish into the inky conifers below the benchland, I

The next morning, a young grizzly is feeding on the carcass. I watch it patiently for an hour as it removes much of the remaining meat, makes a vain attempt to haul the still heavy carcass up the bench, and then lumbers away to sleep off its meal. Later in another transect, I find a recently-shed elk antler so massive, it would have been one for the Boone and Crockett Club's records book had the bull that shed it been hunted by humans outside the park.

The spectacle is cause for reflection, and the writings of Aldo Leopold come to mind. In his classic collection of conservation essays, *A Sand County Almanac*, Leopold wrote, "Only the mountain has lived long enough to listen objectively to the howl of a wolf." I'm reminded that everything in the natural world has function and purpose: the howl of the wolf, an elk's crimson blood on snow, and the renewal of aspen communities. The landscapes of hope these things create are part of what Roosevelt and his colleagues envisioned so many years ago, and are part of the vital legacy the Boone and Crockett Club embodies. ■