The Big Dogs Are Back

Prey Responses to Wolves in Greater Yellowstone

By Todd Atwood
B&C Grant Recipient

My obsession with predator-prey interactions began in childhood. I sat transfixed as Jim Fowler wrestled a bull elephant to the ground, while Marlin Perkins hovered safely 100 feet above in a helicopter. I especially loved those slo-mo predation sequences in which cheetahs overtook fleeing gazelles or a pride of lions made short work of a cape buffalo. The power and grace of these predators captivated me, and even more so, the act of predation itself—the ordered strategy of the hunt, the chaotic chase and kill, and the subsequent return to order that followed. Later, as a college student, I began to understand that the apparent chaos was, in fact, finely choreographed by evolution.

Large terrestrial predators have evolved two methods for catching and killing prey. Ambush predators, typically solitary hunters, rely on dense cover to stalk and quickly overwhelm prey. Coursing predators, often cooperative hunters, require open habitats to pursue and test prey for weakness before identifying a target victim. These fundamentally different hunting styles allow predators with similar food preferences to coexist. While targeting the same prey species, their use of different habitats and methods means that direct competition is minimized.

For their own part, prey animals have evolved behaviors to manage predation risk. Just watch a group of elk or mule deer foraging on an exposed grassy valley, and notice how some portion of the group always remains vigilant. In fact, some biologists argue that group foraging itself is an example of an anti-predator behavior.

My fascination with predators, prey, and the dynamics between them would lure me west and onto the career path of a research wildlife biologist.

ABOUT THE AUTHOR: Todd Atwood is completing his Ph.D. at Utah State University in Logan. His conservation grant from Boone and Crockett enabled him to begin this research and to pursue his lifelong interest in predator-prey relationships. Atwood thanks Boone and Crockett Club for helping fund the study and for the Club's strong commitment to the conservation of wildlife resources.

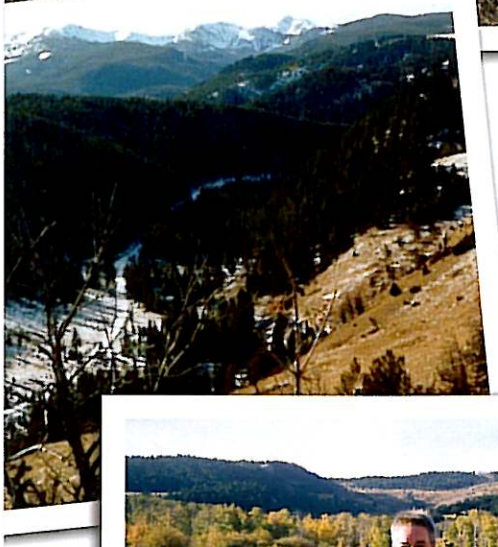
Mule Deer Dilemma: Eat, or be Eaten

Declining mule-deer populations are a concern in many parts of the western U.S. But at the same time some elk populations are increasing, which leads to speculation that the two trends might be related. Of the myriad reasons that might explain mule deer declines, the prolonged drought (seven years so far) in the intermountain West is a key one. Other possible factors include localized increases in predation, decadent habitat from years of fire suppression, and loss of winter range to resource and urban development. The curious thing is, these problems should also impact elk, which doesn't seem to be the case. So what is causing mule deer-population declines?

Scientists are now thinking that competition between elk and mule deer may be a contributing factor. The scenario may go something like the following. Elk and mule deer

© DENVER BRYAN

The Big Dogs Are Back



Images from the author during his days in the field conducting his research. From the top: A cougar's typical cache site hiding a mule deer carcass; a view of the valley in the research area; and the author with a young wolf he has captured to study.

share winter ranges, but elk move around in larger groups and are capable of displacing mule deer from prime foraging habitat. The displaced mule deer must then feed in forage-poor areas such as rough canyon habitats that are prime hunting haunts for cougars. These deer face a trade-off between feeding and exposing themselves to greater predation risk. This scenario seems straightforward enough in a system where cougars are the sole predator. But what happens when you throw a second predator, such as wolves, into the mix?

An opportunity to study a multi-predator system came about when wolves were reintroduced to Yellowstone National Park in 1995 after nearly 70 years of absence. I closely followed the reintroduction efforts and began to delve into the carnivore and predator-prey literature. By the summer of 2002 I had completed my B.S. and M.S. degrees, acquired some solid research experience with whitetail deer and coyotes, and was ready to "trade up" and begin studying the big dogs in Montana.

I was accepted into a doctoral position with Utah State University's Dr. Eric Gese, who is renowned in the carnivore-biology community for his ground-breaking research on the social ecology of canids. Our search for a research problem brought us into contact with Dr. Kyran Kunkel, who at the time was a conservation biologist with the Turner Endangered Species Fund and was well-known for his research on wolf-prey relationships in northern Montana. Together we designed an investigation of how Greater Yellowstone's prey community—elk, mule deer, and whitetail deer—would respond to the return of wolves in the "predatory landscape."

Wolves at the Gate

Before 1995, cougars were the major predator of adult ungulates in the Greater Yellowstone Ecosystem. Cougars, like most felids, are ambush predators that require stalking cover. Prey exposed to predation pressure from cougars tend to select relatively open areas, and such was the habit of generations of adult elk and mule deer in Greater Yellowstone. An unintended consequence, we surmised, was intensified competition between elk and mule deer for open, cougar-free habitats — with solitary mule deer losing out to gregarious elk. Our working hypothesis, which we aimed to test, was that mule deer shifted habitats in response to competition from elk, and this led to excessive cougar predation that limited deer population growth. We selected as our study site a ranch 45 miles northwest of Yellowstone National Park, and crossed our fingers because wolves had yet to recolonize the area. If the wolves failed to show up, our study was doomed.

Determining just when wolves moved in would be crucial to the success of the study. Ideally, data collection would begin before their arrival, so we would have baseline information on prey spatial distribution and a firm grasp of the hunting patterns of cougars. This would give us a good idea of how prey were behaving in response to the risk of predation from cougars only; for example, the types of habitat used by prey versus that used by cougars for hunting. Then if and when wolves arrived, we could compare pre-wolf behaviors to post-wolf behaviors, and through the miracles of modern computing technology, model changes in predation risk as elk and deer tried to cope with these two predators.

The data collection itself was pure nuts-and-bolts. Most fieldwork occurred during winter (December through April), when prey animals are most vulnerable to predation and deer and elk are most likely to interact on shared winter range. It's also the time of year when most sane folks seek the comfort of sofas and wood-burning stoves. So in January 2003 we grabbed our snowshoes, loaded a cantankerous snow-machine, and headed for the field.

The first order of business was to place radio-collars on mule deer and to begin collecting data on the cougar's primary prey. Mule-deer numbers on the ranch were low compared to elk, and we lacked funding to collar both species, so we thought it best to place collars on the animals that would be the hardest to monitor otherwise. It wasn't long before we picked up our first mortality signal from a collared deer. As I homed into the area from which the signal was emanating, the rapid *bip-bip-bip* of the mortality-mode pulse (signaling "dead deer") changed to the lazy *blop...blop...blop* of the normal activity mode (signaling "deer on the move"). The deer was indeed dead, but the cougar was moving it to another cache site while I was trying to find her! Finally locating the doe in a rocky juniper canyon, I performed the field necropsy to confirm predation as the cause of death, and collected marrow from the

femur and mandible bones to assess physical condition. When all was done, I beat a hasty retreat back out of the canyon in the opposite direction of the cougar's tracks.

We didn't have to wait long for wolves to take up residence in our study area. In late February we sighted a group of four led by a large black male, traveling a ridgeline above one of the main elk and deer winter ranges. We waited for the wolves, later named the Bear Trap Pack, to move out of view before back-tracking them in the hopes of finding a kill. We used this method throughout the study to collect data on both cougar and wolf hunting habitats and patterns of prey selection. What we found far exceeded our initial expectations and provided valuable insight into how prey animals alter their behavior to accommodate changes in predation risk.

Predator-Prey Shuffle

We quickly found that wolves in our study area were having no direct effect on mule deer survival. At more than 200 kill sites, we could document only two instances of wolves killing mule deer. Wolves preyed primarily on elk and, to a lesser degree, on whitetail deer, and this pattern was remarkably consistent throughout three years of data collection. However, we observed that cougars changed during this period, and were killing more elk and fewer mule deer. What could possibly explain this exciting but unexpected change in prey selection by cougars?

Let's approach that question from an elk's perspective. When wolves first showed up, the elk in our study area were clueless about the type of threat they posed. Of course, a few instances of watching herd members get chased across the valley floor, pulled down, and eaten was a powerful force in "educating" the elk and motivating behavioral change. Elk responded to the new threat by retreating into structured habitat, where vegetative cover served as refuge from wolves. Elk didn't stop using the forage-rich valley floors and grassy benches, but they did increase their vigilance while feeding there. They learned that when wolves are detected, the best strategy is to break for cover.

Interestingly, these refugia used by elk were also used by mule deer, but for a different reason. Mule deer tended to be displaced by elk from the prime foraging habitat, and this served to buffer them from predation by wolves. But it also exposed them to heightened risk from cougars, as they were forced into less hospitable habitats having greater stalking cover. Whenever wolves would show up at the prime foraging sites, elk would retreat to cover in those habitats occupied by mule deer and favored by cougars. Being more abundant, elk were more available to cougars than mule deer. The cougars, for their part, took full advantage of this wolf-induced stroke of luck. The net result was that predation by cougars on mule deer dropped by nearly 40 percent, while predation on elk increased by over 100 percent.

This was a truly interesting find, but what are the implications for mule deer conservation and management?

Wolves and Mule Deer Do Mix

The arrival of wolves in our study area increased the net predation risk for elk and had no effect on mule deer. Deer still had to manage the risk of predation by cougars, but elk absorbed some of that predation risk when they sought refuge in less-open habitat in response to pressure from wolves. Elk, on the other hand, were exposed to a predation double-whammy, with each predator using a different hunting style and favored hunting habitat. There was little safe haven for elk.

What were the population effects? We saw yearly increases in mule-deer numbers, while elk declined in year two and increased in year three. Wildlife managers and outfitters were pleased with the increase in mule deer, and hoped that elk numbers would eventually decline to levels consistent with management goals.

It's important to note that our study was a three-year snapshot of predator-prey interactions as wolves recolonized an area where elk dominated as prey. Indirectly, the arrival of wolves reduced food competition between elk and mule deer and increased competition for cover habitat. The net result was positive for mule deer because elk absorbed predation pressure from cougars, the primary predator of mule deer. If we were to extend this study over 10 years, the results might be completely different. For example, elk might adopt a new strategy to confine their exposure to wolves only, the more detectable predator, and manage that risk accordingly. Conversely, they may try to seek out a middle ground, selecting habitat characteristics of sufficient complexity to interfere with wolf hunting strategies but not so complex that cougars have ample stalking cover.

One thing we can be hopeful about is that perhaps the reduced predation on mule deer will spur an increase in population numbers and create enough momentum to help overcome recent downward trends.

As the drama between prey and predators in Greater Yellowstone continues to play out, the best advice is to "stay tuned." I know I will. ■