Wolf-cattle Interactions in the Northern Rocky Mountains

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SUMMARY

Since gray wolf reintroduction in 1995, wolf populations in the northern Rocky Mountains have increased dramatically. Incidents of wolf predation on livestock have increased with wolf populations. Although rough tallies of livestock death or injury losses caused by wolf predation are made each year, we know almost nothing about the indirect effects of wolf-livestock interactions on cattle production. Research projects were initiated during 2004 in central Idaho and 2007 in western Idaho-northeastern Oregon to evaluate habitat use, activity budget, and productivity responses of range cattle to increasing wolf predation pressure. Global positioning system (GPS) tracking collars were used to locate mature beef cows every 30 minutes or every 5 minutes throughout 3- to 6-month grazing seasons. Effects of wolf presence on cattle preference for riparian/upland habitats, terrain use, bunching/dispersion, and activity budgets are being evaluated relative to forage conditions, cattle age/experience, and other production system and environmental factors. Preliminary results suggest individual cows exhibit considerable variability in their preference for near-stream habitats (less than 100 yards from perennial streams). Annual variability in near-stream preference was noted and the relationship between this variability and wolf presence levels is being evaluated. Annual variability in cattle activity budgets was detected and evaluations are underway to determine if this variability is an effect of recent technology upgrades or is a consequence of variability in wolf presence. We found GPS tracking technology accurate enough to detect predator-avoidance behavior in cattle, including bunching and sustained-flight events, even at the coarse, 30-min collection interval. The northern Rocky Mountains is a very complex ecological system involving numerous interacting factors; consequently, it will require at least several more years of data collection before we can begin to draw conclusions from these studies. When developing grazing plans, however, cattle producers and natural resource managers of the northern Rockies should consider that the presence of reintroduced gray wolves may be influence cattle distribution and behavior and these effects may continue for some time after wolves have left or have been removed from the grazing area.

INTRODUCTION

In 1995 and 1996, gray wolves (*Canis lupus*) were reintroduced to Yellowstone National Park and central Idaho by the U.S. Fish and Wildlife Service. This large carnivore had been absent since the 1930's and, as an apex predator, has induced changes in both the natural ecosystems and livestock production systems of the northern Rocky Mountains. Wolf numbers and range have increased steadily since their reintroduction (Fig. 1). By 2008 there were at least 846 wolves in Idaho, 497 in Montana, and 302 in Wyoming. A wolf pack was also confirmed in Washington in 2008 (Sime and Bangs 2009).

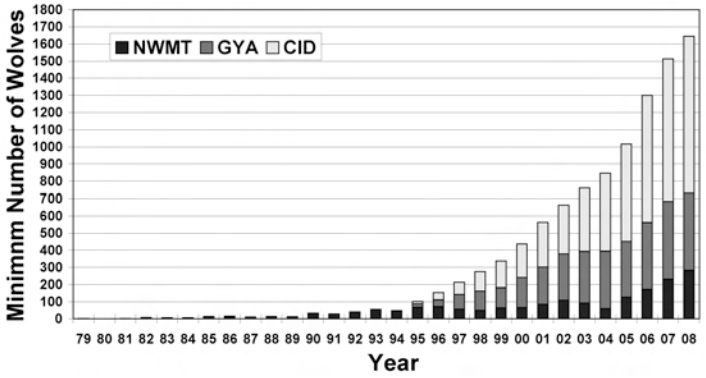

Figure 1. Expansion of gray wolf populations in the Northern Rocky Mountains between 1979 and 2008. CID = Central Idaho; GYA = Greater Yellowstone Area; NWMT = Northwestern Montana. (Sime and Bangs 2009).

As wolves expanded their range, reports of livestock predation also increased in the northern Rocky Mountain region (Fig. 2). The extent of wolf reintroduction effects on livestock production systems and regional ecosystems are largely unknown. Considerable controversy exists regarding the effect of wolves on livestock-rearing systems. Some have suggested wolf predation will reduce economic viability of range livestock enterprises to the point of economic failure, adversely impacting the economy of rural communities. Others have emphasized the positive aspects of wolf introduction, centering on the economic benefits resulting from increased tourism and possible increases in land values.

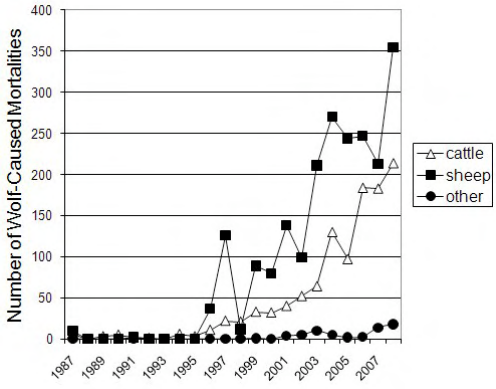

Figure 2. Confirmed wolf kills of livestock from 1987 to 2008 in the northern Rocky Mountain region. (Sime and Bangs 2009)

The economic and environmental effects of wolf reintroduction are by no means clear-cut. One contention is that livestock harried by wolves become stressed, forage less efficiently, gain fewer pounds and may have more difficulty rebreeding and producing off-spring. It has been suggested wolf presence may also alter distribution patterns and resources impacts of livestock and wild ungulates. Numerous studies have examined wolf/wild prey species interactions and feedback mechanisms. Recent studies in Yellowstone National Park (YNP) found reintroduction of wolves changed ungulate habitat selection patterns (Creel et al. 2005) and in some cases, elicited recovery responses in riparian vegetation such as cottonwood (*Populus spp.*) (Ripple and Betscha 2003). Pyare and Berger (2003) suggested, however, that our understanding of the ecological impacts of wolf re-introduction within the YNP, where livestock are absent, is quite incomplete. A more complicated situation exists on rangelands occupied by livestock, wild ungulates, and wolves. Some recent work has been done in the northern Rocky Mountains (e.g., Bradley and Pletscher 2005, Oakleaf et al. 2003) but most of our limited understanding of wolf-livestock interactions is based primarily on studies from Canada, Europe, and the upper Midwest. No study, however, has rigorously evaluated the environmental consequences of these interactions. If cattle and elk respond similarly to wolf presence by reducing riparian occupation, total impacts on riparian vegetation and

stream-water quality may be reduced. Will this shift in ungulate distribution then result in concentrated use and impact on preferred upland sites? Will this shift also increase interspecific competition between sympatric ungulates and reduce their productivity and, in the case of cattle, profitability? The true magnitude and extent of environmental effects of wolf reintroduction on grazed rangelands is essentially unknown.

The objective of our research is to evaluate effects of wolf presence on cattle habitat selection, terrain use, activity budgets, expression of predation-avoidance behavior, and productivity. We are particularly interested in wolf-presence effects on cattle preference for near-stream or riparian habitats.

METHODS

Distribution, activity, and movement pattern responses of beef cattle to the presence of reintroduced gray wolves have been evaluated since 2004 on mountainous rangeland of central Idaho and since 2007 in the mountains of western Idaho and northeastern Oregon. Twenty mature beef cows equipped with GPS collars are being tracked on two central Idaho study areas while 10 beef cows are being tracked in each of 3 study areas in Idaho and 3 study areas in Oregon. GPS locations of collared cattle have been recorded every 30 min prior to 2008 and every 5 min in 2008 during the grazing season (April-October). Prior to 2008, most of the GPS tracking data were collected using older model (2001 vintage), commercial tracking collars. In 2008, all 60 collars deployed on the western Idaho-northeastern Oregon sites and 17 collars on the central Idaho sites were new, custom-built devices, all recording locations and fix-quality information at 5-min intervals. The purpose for applying this new technology was to allow more intensive monitoring of cattle distribution and behavior over the entire 6-month grazing season.

Presence of gray wolves within the study areas during the trial periods is monitored by a combination of techniques including bi-weekly surveys of VHF-collared wolves; field efforts involving howling surveys, track and scat counts, and direct observation; and finally GPS tracking collars. The Idaho Department of Fish and Game (IDFG), in cooperation with USDA-APHIS Wildlife Services, began GPS tracking wolves on or near the study areas in 2006. Capture and installation of wolf GPS collars was conducted by Wildlife Services personnel following their Institutional Animal Care and Use Committee animal care and handling protocols. In addition, IDFG, Nez Perce tribe, and Wildlife Services personnel have collared wolves with VHF telemetry collars for general population monitoring. VHF-collar locations occurring in the study areas are used to augment the wolf GPS-location data. Wolf kill sites are confirmed by Wildlife Services. Direct observation of wolves and track and scat surveys in the study areas are conducted by trained range riders, IDFG field staff, and project personnel.

The experiment is a randomized block design. Experimental unit is a collared cow. Blocks are paired study sites (30,000 to 100,000+ acres/site) within a study area. Main effect is the wolf-presence treatment with at least two levels: wolf-presence detected within a study site boundary and wolf-presence undetected under otherwise

equal monitoring effort and conditions. A single detection incidence is weighted to represent 3 days of wolf presence based on an assumed wolf consumption rate (minimum) of a large ungulate carcass. In other words, if one or more wolves made a large ungulate kill, it was assumed they would require, at most, 72 hours to completely consume the carcass and potentially move off the study site where the detection incident occurred. Multiple detection incidences sustained over an extended period (e.g., 1 week) allow classification of additional levels of wolf presence. Other measured or estimated factors include growing-season conditions, forage quality and productivity, terrain, location and status of water and supplement sources, human presence, road and trail density, cattle breed and experience, calf age, etc. Response variables measured are cattle preference for riparian/upland habitats, terrain use, bunching/dispersion, and activity budgets of collared cattle. Cattle productivity measures include rates of gain, body condition, and conception rates.

RESULTS and DISCUSSION

The complexity of interacting factors affecting livestock behavior, productivity, and predator-prey relationships in the northern Rocky Mountains precludes any short-term, conclusive findings from these studies. Only long-term (10+ years) research carefully replicated in both time and space will yield conclusive results in this ecosystem. The reader is seriously cautioned, therefore, to interpret the following as only preliminary results that may very likely change as additional data are collected during the course of these long-term studies.

In central Idaho, collared, mature beef cows with calves exhibited considerable variability in their preference for near-stream habitats (Fig. 3). Some individuals exhibited a neutral to slightly positive preference (use/availability = 1 to 1.5) for areas within 10 yd and areas between 10 and 100 yd from perennial streams. On the other extreme, some cows exhibited a very strong preference (use/availability greater than 3) for the 0- to -10 yd and 10- to -100 yd stream buffers.

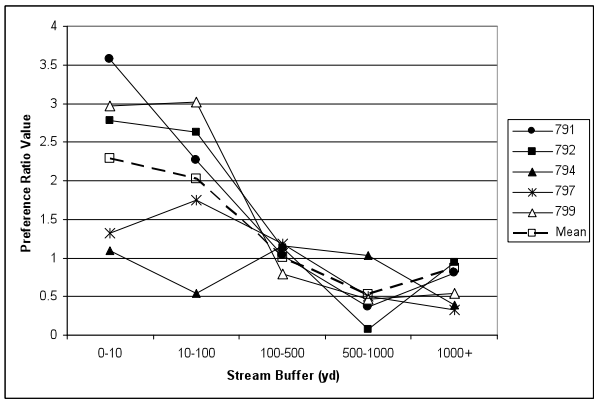

Figure 3. Preference ratio relative to distance buffers from perennial streams for five GPS-collared, mature beef cows tracked in Pasture H/Site 1 of the central Idaho study area during the 2006 grazing season.

Although study-site averages for near-stream preference generally ranged from 2 to 2.7, there was evidence of differences in variability among pastures and among years. Differing terrain and riparian vegetation structure may explain preference differences among pastures. Pastures dominated by glacial canyons with very steep canyon walls tend to limit cattle from accessing upland habitats. Pastures with more open, less confining terrain offered cattle more range-use choices. Brushy, willow-

dominated riparian areas present a visual obstruction for cattle occupying these areas. More open, herb and low-stature shrub-dominated riparian areas offer a greater field of view to prey animals attempting to avoid wolf predation. Annual variability in cattle preference for near-stream habitats may be explained by growing conditions and forage productivity that varied among years. Wolf presence and predation levels on cattle also varied among years. On-going evaluations are testing the strength of relationships among varying wolf-presence levels, vegetation, and environmental factors relative to variability observed in cattle preference for near-stream habitats.

Cattle activity budgets in central Idaho were defined as a composite of six possible activity types based on cattle movement rates or velocities derived from sequential GPS locations (Fig. 4). Activity budgets have been remarkably consistent among individual cows but varied among years. Prior to summer 2008, cattle activity budgets were dominated by stationary (0-0.01 mph) activity (e.g., bedding, ruminating or standing alert). In 2008, cattle activity appeared to have shifted to fewer stationary periods and more time engaged in very slow (0.01-0.06 mph) and slow (0.06-0.25 mph) movement (e.g., foraging).

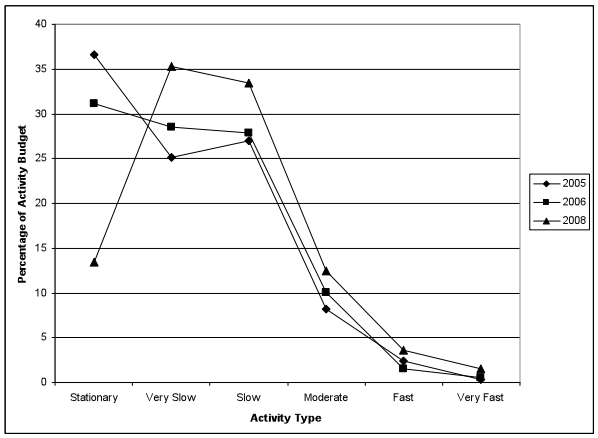

Figure 4. Mean percentage of daily activity budgets for six activity types (velocity classes) exhibited by GPS-collared beef cows grazing Pasture F/Site 1 of the central Idaho study area during 2005, 2006, and 2008.

We do not currently know whether this apparent activity shift is due to changes in collar technology, GPS location collection rate, or some set of environmental or ecological factors. It is possible that more GPS location error may be accruing when the new, custom GPS technology is applied in the very rugged terrain of central Idaho compared to older, commercial technology. This would decrease the number of locations classified as stationary and inflate the apparent amount of slow and very slow movement. It is also possible that by intensifying the GPS location collection interval from 30 min to 5 min, we may be detecting brief slow and very slow movement bouts not detected by the coarser collection interval. Alternatively, these data may reflect real shifts in activity. Wolf presence prior to 2008 was highly variable but tended to be greater than during 2008, when wolves appeared to be mostly absent. Prior to 2008 cattle may have spent longer periods standing alert and watchful for predators than during 2008 when a shift toward increased foraging time may have occurred. We are evaluating field data collected concurrently by older commercial technology and newer GPS technology at similar and different collection rates to separate technology-related effects from potential wolf-presence effects on cattle activity budgets.

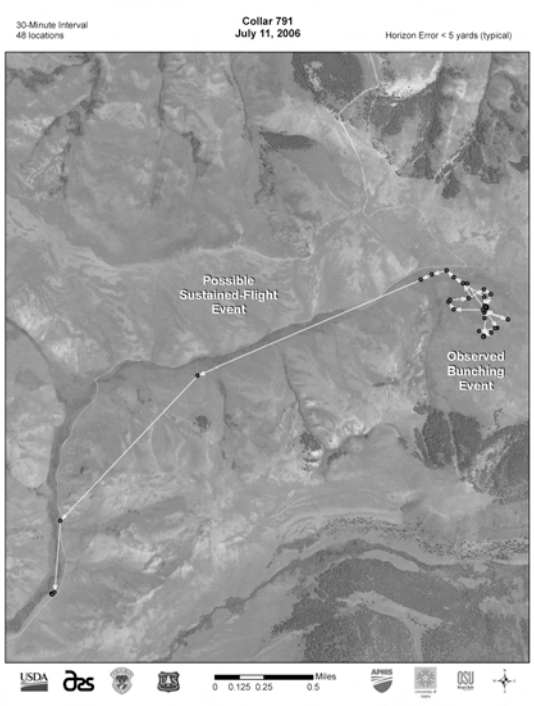

Figure 5. GPS tracking collar locations and movement path for a beef cow exhibiting predator avoidance behavior in Pasture W/Site 1 of the central Idaho study area on July 11, 2006.

Concurrent collection of direct observation field data and tracking collar data has revealed GPS technology is capable of accurately detecting cattle bunching and sustained-flight events (Fig. 5), even at a 30-min sampling interval, if the collar sample size is adequate for the herd size. Bunching events occurring during periods when wolves were present tended to occur in upland habitats where vegetation stature was low and the terrain afforded an extensive field of view. In cases where bunching events were directly observed, up to 100 head of cattle remained tightly massed and vocalizing for up to 1 hour before dispersing. Bunching events identified using GPS tracking data typically appeared, at first glance, to be 2-3 collared cows bedding (i.e., each having many consecutive stationary GPS locations) in close proximity to each other but in an unusual bedding site. Tight clustering of locations from multiple animals, during mid-day, on open, unshaded sites were situations we commonly tagged as suspected bunching events that were then evaluated with a timely field visit. Actual bedding sites on open, breezy ridge-tops, however, were difficult to separate from bunch event sites. Sustained-flight or relocation events occur when a prey animal moves a considerable distance from an area of high predation threat to an area of lower predation threat. Sustained-flight events were evident in GPS tracking data as linear paths consisting primarily of fast (0.62 – 1.2 mph) and very fast (over 1.2 mph) movement continuing more than 0.5 mi. These flight events were particularly evident if they occurred between 10:00 PM and 3:00 AM when cattle should typically be bedded following the evening foraging bout.

MANAGEMENT IMPLICATIONS

The northern Rocky Mountains is a very complex ecological system involving numerous interacting factors; consequently, it will require at least several more years of data collection before we can begin to draw conclusions from these studies. When developing grazing plans, however, cattle producers and natural resource managers of the northern Rockies should consider that the presence of reintroduced gray wolves may influence cattle distribution and behavior and these effects may continue for some time after wolves have left or have been removed from the grazing area.

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