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# Direct and Indirect Impacts to Ranchers from Wolves and Other Predators: Building a Baseline in California

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**ABSTRACT:** While the direct economic impacts of gray wolves and other predators on rangeland livestock production are relatively easy to measure, indirect impacts (e.g., reduced livestock productivity and increased expense) may be more economically significant. We initiated a long-term (10 year), longitudinal survey of rangeland cattle, sheep and goat producers in northern California to quantify the direct and indirect impacts from gray wolves, which are increasing in numbers in the state, and other large carnivores on rangeland livestock production. During winter/spring 2017, we hosted seven producer-researcher workshops across northern California, featuring livestock-predator conflict experts. At these workshops, we collected the first round of survey data from 90 livestock operations. Our initial survey results document the adoption rates, efficacy and cost of a variety of commonly used livestock protection tools on rangeland livestock operations at a variety of scales.

**KEY WORDS:** coyotes, gray wolves, livestock depredation, mountain lions, nonlethal livestock protection tools, predator impacts

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## INTRODUCTION

In 2011, a collared gray wolf (*Canis lupis*) from the Imnaha pack Oregon (OR-7) entered northeastern California and became the first confirmed wolf in the state since 1924. By 2015, the Shasta pack (consisting of one breeding pair) produced 5 pups and were likely responsible for killing a calf in Siskiyou County, California. In 2017, a separate breeding pair (including a female collared by the California Department of Fish and Wildlife; CDFW) produced at least 4 pups (CDFW 2018). CDFW confirmed that the Lassen pack was responsible for killing livestock in Lassen County in October 2017 (CDFW 2017).

While the direct economic cost of livestock predator losses are relatively easy to define, emerging work suggests that indirect impacts are potentially more costly for livestock producers (Ramler et al. 2014). Livestock production losses due to stress and harassment from wolves can be significant, possibly exceeding the economic value of killed animals. Factors like weight gain, conception rate, and body condition may suffer due to presence of and harassment by wolves. While predator losses may appear minor in terms of statewide statistics, localized predator impacts can be severe. To better understand these direct and indirect impacts, and to analyze the use of nonlethal predator protection tools, we developed a comprehensive producer survey to establish baseline data for analyzing livestock production practices and economics in northern California.

## METHODS

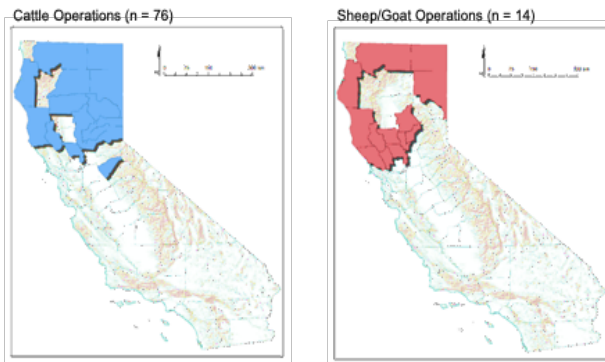
To analyze predator impacts, livestock protection tools, and the degree of cooperation between landowners,

we developed an online survey via Qualtrics. The survey consisted of ≥30 questions organized into seven broad themes:

1. Operator demographics
2. Production practices
3. Operation location and forage type/calendar
4. Predator impacts (direct losses, indirect costs)
5. Livestock protection tools
6. Cooperation with neighboring landowners and government wildlife management agencies

The survey was developed by the project team in consultation with CDFW staff and National Wildlife Research Center researchers.

University of California Cooperative Extension farm advisors in the counties likely to be impacted by gray wolves (north of Interstate 80 in the Sierra Nevada and north of the Sonoma-Mendocino County line in the Coast Range) (Kovacs et al. 2016) contacted commercial-scale beef cattle, sheep and goat producers who had at least five years of production records. These producers received a paper version of the survey questions a week prior to receiving the online survey link to help prepare them to complete the online survey. During winter/spring 2017, we hosted seven producer-researcher workshops across northern California. At these workshops, and via additional contacts, we collected the first round of survey data on 90 individual livestock units. We defined a unit as a group of livestock that were typically managed together; an individual producer might report on multiple units (e.g., fall-calving and spring-calving herds or a cattle herd and sheep flock). Producers enrolled units that they expected to maintain for at least 10 years.



**Figure 1. Location of beef cattle and small ruminant operations participating in the survey.**

## RESULTS

We received completed surveys from 76 beef cattle units and 14 sheep/goat units located in 15 counties in northern California (Figure 1). Because of their geographic location (far northern California), these operations were predominately spring calving and lambing. Beef cattle operations ranged in size from 16 head to 10,250 head, while small ruminant operations ranged in size from 15 head to 8,700 head. Some operations were multi-species (both beef cattle and small ruminants). Seventy-six percent of the respondents were men with an average of just under 30 years of experience managing ranching operations. Approximately half of the operations were breeding only (cow-calf or sheep), while half also incorporated stocker cattle or feeder lambs.

USDA-APHIS provided California-specific data from its 2015 sheep and lamb predator and nonpredator death loss report and its 2016 cattle and calves predator death loss report. This data included reported death losses as well as information on the adoption of nonlethal livestock protection tools. Livestock losses to all predators (gray wolves, coyotes, mountain lions, black bear, domestic dogs, birds of prey, other birds, and humans) were more significant in comparison with disease

and natural causes in our survey than in data collected by USDA-APHIS (Table 1).

Similarly, adoption rates of nonlethal livestock protection tools differed from data collected by USDA-APHIS (Table 2). Small ruminant producers were more likely to use nonlethal livestock protection tools, and the adoption of specific tools varied by operation type as well (Table 3).

Finally, producers provided perspectives on the impacts of predator control techniques on neighboring land on their own operations. Three-quarters of producers felt that lethal control on neighboring land reduced predator pressure on their operations, while most were ambivalent as to whether nonlethal control on neighboring land had any impact. Furthermore, 18 percent of cattle producers and 35 percent of sheep and goat producers reported that they formally cooperated with neighbors on predation reductions strategies.

## DISCUSSION

Even though northern California ranchers have not had to contend with predation by gray wolves in nearly a century, other predators can have a significant impact on ranching operations and economic viability. The results of our survey suggest that the impacts of specific predators vary by operation type (beef cattle versus small ruminants).

Small ruminant producers are more likely to use nonlethal livestock protection tools compared to beef cattle producers. Anecdotally, some of the cattle ranchers who participated in our survey indicated that they had switched from or eliminated a sheep enterprise in response to predator pressure. We will explore this question further in follow-up surveys.

Cooperation between landowners also varies by production type, with sheep producers more likely to cooperate with neighbors. Sixty-four percent of small ruminant producers work with county or federal wildlife management agencies (e.g., county trappers or federal Wildlife Services agents), while 61% of cattle producers work with these agencies.

**Table 1. Percentages of livestock losses by category.**

Cause of Death	Beef Cattle		Sheep	
	USDA (2015)	UC Survey (2016)	USDA (2014)	UC Survey (2016)
Predators	4%	35%	29%	52%
Diseases & Natural Causes	96%	65%	71%	48%

**Table 2. Adoption of nonlethal livestock protection tools by beef cattle and sheep producers.**

Type of Producer	USDA (National Data)	UC Survey (CA Data)
Beef cattle	20%	34%
Sheep	58%	100%

**Table 3. Top 3 most commonly used livestock protection tools by production type.**

Beef Cattle (n=76)	Small Ruminants (Sheep/Goats) (n=14)
Lethal Control (6%)	Livestock Guardian Dogs (71%)
Other Guard Animals (Llamas or Donkeys) (4.8%)	Night Penning (43%)
Electric Fencing (4.8%)	Electric Fencing (36%), Alarm Devices (36%)

We are currently entering the second year of our 10-year study. Participating operations will be asked to report on production, land use, and livestock protection parameters for the 2017 grazing year, and this data will be compared with their reported 2016 and typical year data. Future surveys will try to ascertain the relationship between land use and ownership patterns and changes and on-ranch predator impacts.

Direct economic losses to predators may be less than those associated with disease or other factors; however, localized predator impacts can be significant. Emerging work is suggesting potentially significant indirect impacts, such as reduced reproductive success and weaning weights, and increased labor costs. The overlap between large carnivore habitat and rangeland livestock production in northern California makes conflict inevitable (Macon et al. 2018). Site- and operation-specific combinations of tools may help prevent some direct losses and reduce indirect impacts in some operations. Additionally, land use changes in northern California may impact livestock-predator interactions and influence the types of tools and cooperative opportunities available to livestock producers.

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