COLORADO STATE UNIVERSITY
EXTENSION

Wolf Economics

Information Sheet 8.012 People and Predator Series | Colorado Wolves

By the Center for Human-Carnivore Coexistence (6/20)

Estimating the value of wolves

Comparing costs and benefits of different options is often helpful for making decisions about how we manage natural resources. But how do we estimate a value for something not found in markets? For example, water flowing in our rivers is valued for its aesthetic attributes, boating and fishing, and to provide habitat for endangered fish. Water is also a critical resource for growing crops, for industry, for washing dishes, and to water lawns. Some uses of water, like irrigating crops or use in our homes, have markets where prices indicate their value. Other uses, like floating down a river in your personal kayak, may not have markets that indicate their economic value. Likewise, we know wolves provide both benefits that are valued in the market, like the price of a wolf pelt, and benefits that don't have a market value, like their contribution toward balancing eco-systems.

To be able to compare benefits and costs, we have to convert them into common units (that is, dollars), including those that do not have a market value. Economists have several ways to calculate non-market values.[1,2] The types of market and non-market values referred to in this Information Sheet are:

- *Consumptive use value* – Consumptive uses reduce the quantity of a resource. For example, hunting wolves would produce economic benefits to those reliant on the hunting industry, but would reduce (consume) the wolf population. Likewise, predators like wolves will reduce consumptive use values (a cost) when they consume big game that others want to hunt.
- *Non-consumptive use value* - Non-consumptive uses do not diminish the quantity or value of a resource. For example, viewing or snapping a picture of a wolf is non-consumptive, because the number of wolves is not affected by the economic activity. Video or printed photos for nature programs are examples of non-consumptive uses.
- *Existence and bequest value* – Some people would be willing to donate or allow their tax money to be used to protect wolves and other carnivores, even if they would never get a chance to see them in person. They would pay for their existence, and to make sure the resource is there for future generations.

Benefits

No studies in Colorado have measured the economic benefit of wolves, but we can look at the consumptive use, non-consumptive use, and existence/bequest values found in research about other states or regions for some insight.

Key Points

- The cost of wolves includes weight and death losses to livestock producers, lost hunting and recreation opportunities, and costs for monitoring and management.
- Benefits include consumptive use (e.g., state and private returns from wolf hunting, if allowed), non-consumptive use (e.g., tourism to view wolves), and existence and bequest values (the value to just know wolves exist and will be there for future generations).
- The benefits of wolves would apply broadly to people in Colorado, but costs will fall disproportionately on relatively few, especially livestock producers and potentially those reliant on the big game hunting industry. Careful planning and discussion about how to mitigate losses from wolves, manage wolf populations, and compensate people for losses can be aided by extensive experience in other states.

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Consumptive use values - Wolf hunting is now allowed in much of the Northern Rocky Mountains (NRM), which generates revenues that would be considered consumptive use. For example, the sale of licenses for hunting and trapping wolves in Montana tops $400,000 per year.[3] Plus, hunters spend money for travel, housing, food, and equipment, generating income for hotels, restaurants, and hunting guides. Some ranchers may be able to offset losses associated with wolves by providing access to their property and services (guiding, housing) to people that hunt wolves, if and when hunting is allowed in Colorado. For example, some private ranches in Colorado[4a] charge from $2,400-2,950 per hunter, in groups of [4-6], for private elk and deer hunts (up to $90,000 per ranch). An Idaho outfitter[4b] offers wolf hunting on Idaho ranches for $3,800 for a single hunter. The potential for revenues based on consumptive uses is clearly present in Colorado.

Non-consumptive use values - Wolves provide opportunities for people to view, film, photograph, listen to, or otherwise experience wolves in their natural habitats. Tourists flock to Yellowstone National Park for a chance to see wolves. When first introduced into Yellowstone National Park in 1995, economists estimated that visitor use would increase by 5% for out-of-area residents and 10% for local residents.[5] Ten years later, economists confirmed that visitation was as predicted and that wolf-related visitation produced $47 million annually in travel expenditures in Idaho, Montana, and Wyoming.[6,7]

Wolf watchers in Yellowstone National Park. Photo courtesy of National Park Service.

Today, guided hiking to view wolves in Yellowstone costs $600 to $900 per day, depending on the size of the group, and a six-day 'wolf vacation' goes for $1,950 per person.[4c] The benefit of wolf-related tourism in Colorado may be more limited than the unique wolf viewing opportunities in Yellowstone's northern range, which has high wolf density, radio-collared wolves, outstanding viewsheds, and good access via paved year-round roads. However, Colorado is also a top tourist destination and many of its citizens would likely benefit from developing a wolf-related tourism industry.

Existence and bequest values – Few studies have estimated the existence value of wolves. One study estimated that existence value from introducing wolves in northern Yellowstone was $11 million per year when adding together everyone's willingness to pay in the United States.[7] Existence values can be compared to the costs of introducing wolves, along with other benefits and costs, to help policy makers manage natural resources. If benefits outweigh costs, society gains by introducing wolves. Existence values will likely be important in Colorado too, but a specific study would be required to know how much.

Costs

Many costs accompany coexistence with wolves. Some are more difficult to value than others. Costs generally fall into three main categories: personal impacts, commercial production, and public management.

Personal impacts occur when people's lives are personally changed in some meaningful way. For example, although the risk of wolves attacking people is low (see *Wolves and Human Safety Information Sheet*)[8], people who fear wolves might alter their recreation plans. There are no known studies about the costs of personal impacts, but anecdotal Information can show what these costs might be. For example, parks and governmental agencies post warnings about the risk of wolf attacks when hiking, especially with dogs.[9] Although rare, people have been bitten, have experienced standoffs with wolves on the trail, and have even been chased away from campsites.[10] These potential negative encounters almost certainly lead some people to curtail their recreational activities, but studies would be required to confirm their true impacts.

Costs to commercial production - Another potential cost of wolves is reduced income for some Colorado

businesses, primarily hunting and ranching. At a local level in states with strong wolf populations, elk numbers are stable or increasing in many areas where wolves and elk interact, but they have declined in others.[11] At the statewide level, the number of elk harvested by hunters has not declined in the Northern Rocky Mountains (NRM), despite increases of wolves (see *Wolves, Big Game, and Hunting Information Sheet*). An economic analysis in Montana concluded that, overall, wolves have not had a significant economic effect on elk harvest in the state.[12] Rather, demand for hunting shifted from the southwest region near Yellowstone to areas farther away from where wolves were first introduced. Based on the few studies that are available, hunting-related benefits in Colorado are not likely to decline substantially overall. However, at a local level, where wolves contribute to declines in big game herds and hence hunting opportunities, this would result in a cost to those reliant on hunting to support their livelihoods.

The largest commercial cost is from wolves harassing and/or killing livestock. The economic cost of livestock killed by wolves is determined by multiplying the number of animals lost times fair market value. However, counting these losses is difficult because the exact number of livestock killed by wolves is not known (see *Wolves and Livestock Information Sheet*). For example, the U.S. Fish and Wildlife Service (USFWS) confirmed a total of 136 cattle (both adults and calves) and 114 sheep (adults and lambs) killed by wolves in 2014 in the NRM.[13] In contrast, the National Agricultural Statistics Service (NASS) reported 2,835 cattle and 453 sheep killed by wolves in the same region and year.[14,15] The USFWS data are underestimates because they don't include livestock killed by wolves but are never found or reported, whereas the NASS numbers are likely overestimates because they are based on self-reported surveys of livestock producers and do not include verification of kills. Thus, these vastly different estimates of the number of livestock killed by wolves makes it difficult to calculate the precise cost of wolf depredation. What is known is that the proportion of livestock killed by wolves is low, and mortality caused by wolves is a small economic cost to the livestock industry as a whole.[16]

Although wolf depredation on cattle and sheep accounts for less than 1% of the annual gross income from livestock operations in the Northern Rocky Mountains[16], these costs are unevenly distributed and localized (see *Wolves and Livestock Information Sheet*). As such, low average industry-wide costs could mask high costs for some individual producers. Studies show that producers that experience predation are more likely to continue to so.[17] Furthermore, several studies show that costs could be many times higher when including unconfirmed deaths and indirect losses such as lower market weights, reduced conception rates due to stress, and producer mitigation costs to deter wolves or to seek compensation.[16-20] For example, one study found that calves in herds that experienced predation were 22 lbs. lighter and, when added across all calves in those herds, accounted for a greater loss than confirmed depredations.[17] Other studies found unverified and indirect losses to be at least 6 times that of verified losses.[18-19] A later study found that these estimates of unaccounted losses may be overstated.[21] Clearly, more research is required to know exactly how much producers might lose if wolf populations expand in Colorado.

Cost of public management – The government also incurs costs to manage wolves. State government monitors wolves, prepares reports, and manages hunting licenses. The federal government also monitors and manages wolves where they are endangered. The government also provides compensation payments through federal, state, and county programs, as do some non-governmental agencies. The USFWS estimated that, in 2015,

almost $6.5 million was spent on managing wolves by state, federal, and tribal agencies in a region composed of northern Wyoming, Montana, North Dakota, the Idaho panhandle, Washington and Oregon.[13]

Fiscal analysis of Ballot Proposition 114 (see *Wolf Policy Information Sheet*) forecasts annual costs to the state of Colorado of $350,000-450,000 for the first 2 years of the planning phase of wolf reintroduction.[22] Costs are expected to increase as the plan is implemented and wolves are reintroduced. Future costs will depend on the details of the plan that is developed by Colorado Parks and Wildlife.

Compensation

Government agencies and private organizations offer a variety of programs to compensate producers for livestock lost to predators, including wolves.[20,23] Defenders of Wildlife, for example, operated a trust to pay for livestock losses for nearly 25 years starting in 1987.[24] Most states have created separate programs for wolves and receive federal grants to help with the cost. Wyoming paid about $170,000 in 2018 for livestock killed or injured by wolves[25], which is a typical amount for western states. The USDA Farm Services Agency's Livestock Indemnity Program will reimburse 75% of the value of killed livestock.[26]

Studies show that livestock producers underuse these programs and often do not like the way they are operated.[16,23,27-31] Primary problems include high costs and burden of proof to verify kills. Producers that use the USDA Livestock Indemnity Program, for example, sometimes find that they receive only a portion of their costs and with a significant wait time. Another criticism is inadequate funding to fully compensate for unverified kills or indirect losses. Some states do pay based on a compensation ratio meant to account for unverified kills and indirect losses. For example, Washington state pays 2 to 1 for confirmed damages[32], whereas Wyoming pays up to 7 to 1.[20] As discussed above, there is a great degree of disagreement among studies about actual losses. If the wolf population expands in Colorado, determining these values will be important for producers and the efficacy of wolf management in the state.

The value and structure of compensation programs has been widely discussed in the literature. One study[20] looked at over 100 programs around the world and found five reasons for compensation programs: 1) to reduce retaliatory or preventative killing of predators; 2) to improve producer attitudes toward predators; 3) to improve compliance with suggested conflict avoidance/reduction schemes; 4) to assist the economic sustainability of large ranches that have potential to coexist with predators (thereby preventing conversion of these lands to residential development); and 5) to improve economic equity (i.e., fairness) by distributing the costs of carnivore conservation among a larger group and not solely on affected producers. Studies show, however, that compensation programs do not necessarily change ranchers' attitudes towards carnivores.[23,30] Also, most do not offer incentives for producers to take preventative measures to avoid conflict.[27,28,30,31] Some solutions have been proposed in the scientific literature. For example, some have suggested that instead of paying ranchers for losses, we should be paying them to coexist with wolves.[27, 34, 35] This idea, and others, need to be considered thoroughly if Colorado is to have a fair and effective program.

Currently, Colorado Parks and Wildlife (CPW) does not have the authority to compensate ranchers for livestock losses caused by wolves.[36, 37] Proposition 114 mandates that, if wolves are reintroduced, producers receive fair compensation for livestock depredation by wolves (see *Wolf Policy Information Sheet*).[38] Costs for compensation are to be borne by CPW's wildlife cash fund, derived from hunting and fishing licenses, unless the wildlife cash fund can't fully pay for such expenses.[37] The details of the compensation process are yet to be determined but

will depend on the restoration plan developed by CPW, in cooperation with other governmental agencies, private citizens, and organizations.[36, 37]

Conclusions

It is difficult to make precise estimates of economic costs and benefits of wolves in Colorado. Based on past research and experience in other states with wolves, Colorado citizens could benefit from consumptive use (e.g., hunting wolves), non-consumptive use (e.g., tourism related to viewing), existence value, and bequest values for future generations. But, at what cost? The benefits were estimated to be about twice the costs where wolves were first introduced into Yellowstone and northern Idaho,[7] but could be different in Colorado. In addition, the size of the benefits or costs may not be the most important issue. Costs will fall disproportionately on livestock ranchers and potentially those reliant on the big game hunting industry. The distribution of who pays these costs, versus who gets the benefits, presents a significant social and political challenge. This challenge can be met, and potential social conflict reduced, if Colorado maintains a productive dialog with those most affected by wolf reintroduction (see *Dialogue and Social Conflict Information Sheet*). This process can be aided by the experiences of other states that have dealt with similar situations.

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