


Economic wins and losses from reintroducing wolves in Colorado

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- In 2020, Coloradans narrowly voted, 51-49%, to reintroduce wolves in late 2023.
- We estimate that the benefits to yes-voters are about $115 million/year, likely more than 50 times government spending for those that will experience losses.
- Almost 90% of the benefits fall in the Front Range, where very few people will ever encounter a wolf, while about 5.4% fall on the Western Slope, where almost all costs occur.
- Can or should the benefits from reintroduction be used to compensate people that incur costs?

Economic Winners and Losers

Coloradans voted to reintroduce wolves in Colorado through Amendment 114 in November 2020. The amendment narrowly passed, with 51% of voters favoring reintroduction. The vote to reintroduce wolves generated division and animosity among some Colorado voters. One likely cause of turmoil lies in the asymmetric distribution of benefits and costs of the reintroduction. For example, most Coloradans will never see a wolf in the wild, and even fewer will have an encounter with one. This means that the average Coloradan will experience the benefits of reintroduction mostly by knowing that wolves will once again occupy the state. Economists call this a "warm glow" benefit. But costs are more consolidated and visible to those people that experience them. If you are a rancher who worries about wolves preying on your livestock, or make part of your living leading deer, elk or moose hunts, you probably are more focused on the potential costs. A typical person might be unaware of who will be hurt by the reintroduction of wolves, simply because these costs are less well known.

The state, and many private groups, provide services to redistribute some of the benefits to those that incur costs. Many private groups help ranchers, usually by sharing costs to learn and adopt management practices that can help reduce conflicts with predators. For example, range riders can help producers keep tabs on wolves and manage cattle accordingly. Some producers use guard dogs, and special fencing (called fladry) can be used to keep wolves at bay for a short period of time, such as in critical times like calving. It was a private group, the Defenders of Wildlife, that first provided funding to compensate

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producers for predation losses in the famous wolf reintroduction in Yellowstone and Idaho in the mid-1990s. But most funding for compensation and cost sharing comes from the government.

As we show below, our survey of Colorado voters suggests that most of the benefits from reintroduction will be realized by people that will never experience costs. However, the economic benefit of reintroduction is very high relative to expected costs, which creates an opportunity for willing benefactors to help people that incur costs. In this case, conservation can easily pay its own way even if only a portion of benefactors are willing to help.

A Survey of Colorado Voters

Faculty at Colorado State University recently conducted a study that looked at costs and benefits of wolf reintroduction. We measured the economic value that people who voted yes would receive when wolves are reintroduced. Specifically, we measured willingness to pay (WTP) for reintroduction using a survey of over 400 adults and standard economic techniques. To better understand WTP, suppose you wanted to go to an amusement park but the price of admission was $100, which was too high for your budget. You then see an admissions coupon for 50% off, and you decide to go. This implies that your willingness to pay to go to the amusement park was at least $50. In other words, you were not willing to pay $100, but you were willing to pay $50, which means you expected to receive at least $50 worth of benefits from attending the amusement park. Our study estimates a similar value for wolf reintroduction among people that voted yes on the amendment. In the context of wolf reintroduction, however, no one is required to pay directly because the action is supported by tax dollars. This is akin to going to the amusement park expecting to pay $50, but showing up at the entrance and finding out that admission is free on that day. This means that entering the amusement park on the free day gave you $50 worth of benefits. In the context of wolf reintroduction, WTP describes how much value or benefit reintroduction adds to the economy when the government (taxpayers) provides the wolves.

We take no position, pro or con, about the reintroduction of wolves in Colorado. We provide information about the costs and benefits of wolf reintroduction in the hope that conflicts between groups for and against wolves can be reduced by better understanding what each group perceives it is gaining or losing.

Results: Coloradoans' Willingness to Pay for Wolves

The most frequently mentioned reasons that survey respondents said they voted yes for reintroduction included: 1) to restore a balanced ecosystem/environment; 2) to keep wolves from going extinct; and 3) that protecting and returning wolves is the right thing to do. For respondents who voted against wolf reintroduction, the most often mentioned reasons for their vote included: 1) negative impacts on livestock and agriculture; and 2) it is a waste of money to reintroduce wolves.

On average, people that voted yes on the original amendment had a WTP of approximately $27 per person for a population of 200 wolves (which we represented as the biologically sustainable population in our survey). In addition, they were also willing to pay or contribute $55.66 for fair market compensation for livestock losses (the market value of a lost animal) or $72 for compensation of direct and indirect (reduced pregnancy rates, weight loss or stress due to pursuits) livestock losses. People did not want to pay for cost sharing, indicating a dislike or lack of understanding of our description. The average respondent was willing to pay $0.29 to avoid an additional livestock kill and $1.13 to avoid lethal control of the government euthanizing an additional problem wolf that has come into conflict

with livestock producers. While the "no voters" put a negative value on wolves overall, they would be willing to pay $196.84 for wolf hunting, if ever allowed.

When the values are combined and applied to the number of yes votes in every Colorado county, our results indicate that Colorado yes voters would be willing to pay $31 million per year to reintroduce a population of 200 wolves. That value increases by another $84 million if compensation for fair market value and indirect loss is included, as proposed for the state's initial plan (Colorado Parks and Wildlife. 2022). Therefore, the total annual value of a program to reintroduce and manage wolves is estimated at $99.7 per yes voting household or $115,488,154 across all yes voting households.

The cost of reintroduction is not well known, but other Western states spend between $1-2 million annually for compensation, cost-sharing and management. Colorado HB21-1243 appropriated $1.1 million for FY 21-22, but more can be spent through other funding mechanisms (e.g. a federal program helps provide funds). Making a simple assumption that government spending is $2 million implies there is about $57.5 of benefit for each $1 of government spending for costs. But estimating true "cost" is complicated. Livestock producers spend on prevention, mitigation and dealing with injured or killed animals (including locating them and disposing of them), where the economic consequences are poorly understood. Producers also incur lost revenue when an animal is injured or killed, or if there are indirect yield losses through factors such as reduced pregnancies or weight loss for surviving animals that were harassed. Government spending represents only a portion of actual losses, because not all conflicts are avoided through management techniques or compensated when animals are lost. Therefore, the true cost of wolf reintroduction on livestock losses is unknown. Finally, the way costs are distributed is also important, as losses are often concentrated, which can be devasting to individual businesses.

There are also other costs such as losses to hunting guides and hunters, recreational experiences, and lost pets that are not discussed here due to a lack of data and information.

Lessons Learned

This study provides information about the potential costs and benefits of wolf reintroduction. Advocates get to enjoy the financial equivalent of a $115 million per year of benefit through the knowledge that wolves will be reintroduced. If the distribution of benefits is proportionate to where the yes voters reside, then 89.7% percent of the benefits will occur in the Front Range where wolves are unlikely to be seen, and only 5.4% percent of the benefits are on the Western Slope where most of the costs will occur. That is, the benefit-cost ratio obscures a highly disproportionate and potentially inequitable distribution of benefits and costs.

Taken by Wyoming Game and Fish

A pressing question for many people in Colorado is:

How much of the benefit from reintroduction can and should be used to compensate the people that incur the costs?

Though it would be difficult, people on both sides would benefit from discussions about how benefits and costs might be shared. For perspective, it would take less than 2% of the benefits to double what the government plans to spend on compensation and management. Several groups offer assistance to effected livestock producers. For example, the Wolf Conflict Reduction Fund at Colorado State University accepts tax deductible donations to implement on-the-ground, non-lethal tools to assist livestock producers and local communities in regions with wolves (https://advancing.colostate.edu/WOLFCONFLICTREDUCTION).

Appendix: Methodology

We calculated WTP for a sustainable wolf population by considering six program attributes: 1) state wolf population, 2) compensation for livestock-related losses, 3) cost-sharing for conflict reduction, 4) number of livestock killed statewide, 5) lethal government control of wolves, and 6) wolf hunting (Table 1). We surveyed over 400 people representing typical age, gender, income and locations in Colorado. The method we used asked survey participants to choose a program with different levels of the six attributes, and to repeat their choices eight times with different levels each time. For example, a person was asked to choose from examples like those in Table 2. A person could choose the status quo (Option 3), which presents 10 wolves that migrated to Colorado on their own, no compensation, no cost sharing, a low level of livestock losses (just from the 10 wolves), no lethal removal of wolves, no wolf hunting allowed, and no payments. Or they could pick an alternative like Option 1, with 200 wolves, compensation of the fair market value for livestock killed by wolves, no cost sharing, a moderate number of livestock killed statewide, no wolf hunting and a payment of $100 per year. Asking respondents to make choices between three options, like those shown in Table 2, eight different times allows us to estimate how the survey participant values each attribute. For example, if a person is willing to pay $100 in Option 1 in the first round, but does not choose that option when we raise the payment to $150 in a subsequent round, then we know their willingness to pay is somewhere between $100 and $150. When we do this with over 400 people, we get enough information to derive estimates for the value of each attribute.

Table 1. Choice experiment attributes and attribute levels provided in the survey. Status-quo levels are bold and italicized.

Attribute	Attribute Descriptions	Attribute levels for survey
Wolf population	The total number of wolves expected to live in Colorado in the long run.	***10 wolves;*** Minimal sustainable population 200, or 400 or 600 for an abundant population.
Compensation	A payment that a producer receives for confirmed livestock losses.	***No Compensation*** Fair Market Value Fair Market Value + indirect losses.
Cost Sharing	Financial assistance to livestock producers to offset their costs for the implementation of conflict reduction tools.	***No cost sharing*** 100% of the actual cost
Livestock killed	Number of livestock killed in Colorado in a single year by wolves.	Minimum (5 cows and 3 sheep per year) ***Low (15 cows and 18 sheep per year)*** Moderate (60 cows, 30 sheep per year) High (120 cows, 60 sheep per year)
Lethal government control of wolves	The number of "conflict" wolves that could be killed by the government under strict legal requirements due to preying on livestock or other problems.	***No wolves lethally removed*** Approximately 30 wolves per year. Approximately 50 wolves per year.
Wolf Hunting	Whether regulated wolf hunting is allowed once the population reaches a sustainable level.	***Not allowed,*** Allowed after wolf population is sustainable
Annual Voluntary Contribution per Household	The amount that your Colorado household would be willing to contribute every year to support the wolf management program.	***$0 per year*** $100 per year $10 per year $150 per year $50 per year $ 200 per year

Table 2: Example of choice set provided to survey participants. Each survey participant is provided with eight sets of choices described as referendums.

Attribute	Option 1	Option 2	Option 3
Wolf population	200 wolves	400 wolves	10 wolves
Compensation	Fair market value	Fair market value + indirect losses	No compensation
Cost sharing	No cost sharing	100% of the actual cost	No cost sharing
Livestock killed per year	Moderate (60 cows and 30 sheep per year)	High (120 cows and 60 sheep per year)	Minimum (5 cows and 3 sheep per year)
Government lethal control of wolves	No wolves lethally removed	Approximately 30 wolves per year (only kill wolves that consistently engage in conflict with livestock)	No wolves lethally removed
Wolf hunting	Not allowed	Allowed after wolf population is sustainable	Not allowed
Annual Voluntary contribution per household	$100	$150	$0
Check one circle	◯	◯	◯