PERC

PLAN DETAILS
SEPTEMBER 2024

East Yellowstone **Brucellosis Compensation Fund**

Prospectus developed by the Property and Environment Research Center (PERC)

INTRODUCTION

The region to the east of Yellowstone National Park, at the base of the Absaroka Mountain Range in Wyoming, is home to two elk herds 10,000-elk strong. These elk migrate across a patchwork of federal and state land, working cattle ranches, and an increasing number of subdivided and developed lands.

Winter in Yellowstone National Park is harsh and unforgiving. The elk herds know this well, so they move out of the park as winter sets in. Months later, as summer takes hold, they follow the green-up of grass back into the park. Thanks to long-term research by ecologists who have collared elk and tracked their migrations, we know more about these elk than ever before. The Clarks Fork elk herd spends the summer months in the northeastern reaches of Yellowstone National Park, then migrates through Sunlight Basin and the Absaroka Foothills to spend winter months on private lands north of Cody, Wyoming. The herd includes approximately 3,000 elk and migrates as far as 67 miles one way each year. The Cody herd, numbering approximately 7,000 elk, spends summer months in the southeastern portion of Yellowstone, then migrates more than 100 miles through the North and South Forks of the Shoshone River to spend winters on private lands south of Cody.

The elk migrations are impressive and unique to the region. However, as development pressure increases and more private lands are turned from open space and ranches into homes, the elk population becomes increasingly reliant on the remaining working cattle ranches for its migration and winter range. One of the biggest challenges facing the region is finding ways to allow ranchers to continue their livestock operations to avoid further development.

Given the prevalence of brucellosis stored among the herds, seasonal movements of elk can wreak havoc on the livestock producers who maintain the very winter habitat and open space the elk rely on for survival. Brucellosis is a disease that can spread from elk to cattle, causing failed pregnancies in cattle and forcing livestock producers into arduous quarantines. The disease is difficult to vaccinate against and is present in up to 70 percent of elk.

Through partnerships and private fundraising, PERC and the East Yellowstone Collaborative are establishing an East Yellowstone Brucellosis Compensation Fund for the cattle ranching community in Park County. The fund will cover a portion of the costs of mandatory cattle quarantine that livestock producers incur after a positive brucellosis test. (See Figure 1.)

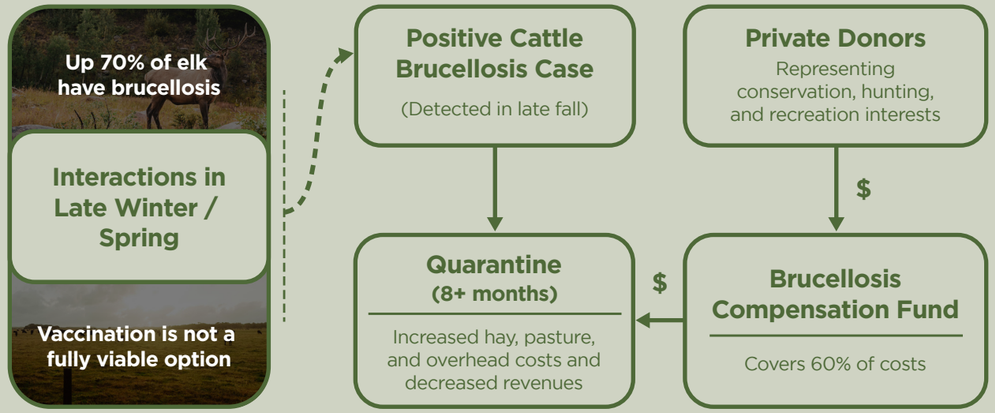
PERC first engaged with the East Yellowstone Collaborative and livestock producers in Park County on this idea in September of 2023. At the first meeting, PERC staff described its existing brucellosis compensation fund in Montana's Paradise Valley and encouraged Wyoming ranchers to think about what would be needed to address their unique concerns related to brucellosis. PERC met with Cody-area ranchers again in December 2023 to collaboratively frame a brucellosis compensation fund for the East Yellowstone region. After modeling potential outcomes and refining the fund's payout structure, PERC met once again with the ranchers in January 2024 to share and discuss the details of the fund.

The fund is based conceptually on the Paradise Valley Brucellosis Compensation Fund that PERC established in 2023, with several modifications designed to specifically address the unique landscape of Park County, Wyoming. Similar to the Paradise Valley Fund, we are establishing a three-year pilot project for the East Yellowstone Fund, which will begin in early 2025 and run through the end of 2027, available to any livestock producer who grazes cattle in Park County, Wyoming.

The East Yellowstone Fund reflects the context of the area, includes the needs and wants of the producers, and accounts for the Wyoming Livestock Board's existing disease mitigation fund. The producers of the region were influential in shaping the compensation fund to address their concerns and reduce the burdens of a potential brucellosis transmission event.

Figure 1

Depiction of the fund's role in the brucellosis infection/quarantine system.



The fund has two primary purposes:

1. Provide a financial backstop to help producers "weather the storm" of mandatory brucellosis quarantine.
2. Provide a mechanism for third parties interested in supporting and enhancing elk habitat to share the costs producers bear when providing that habitat.

Capitalized at between $150,000 and $200,000, the East Yellowstone Fund will provide cattle producers whose cattle are quarantined under an order from the Wyoming Livestock Board with per head, per month payments to help cover the costs associated with quarantining cattle in response to a brucellosis outbreak.

For the first year of the fund, the payment will be $45 per head per month, depending on the season, and subject to change to reflect the conditions actually faced by producers on the ground. Payment is based on the cost of hay and pasture, with the assumption that producers in the region are feeding cattle half the time with hay and half the time on pasture. We also included a maintenance fee in the overall payment to account for overhead and ancillary costs. The full cost of raising cattle in quarantine is $75 per head per month, and the fund will pay 60 percent of that—$45—to retain sound rancher incentives and avoid depleting the fund too quickly.

Preserving a cost-sharing component encourages the continued use of best practices (such as working to prevent intermingling of elk and cattle) to minimize the likelihood of transmission. There is no direct financial contribution required from producers to access the fund, but there are modest eligibility criteria that must be met, as described in the following section.

The initial size target for the fund was determined based on the coverage objective (between 50 and 70 percent of producers' quarantine costs) and a targeted three-year lifespan of the fund. There is a cap on total payouts (50 percent of the initial fund size) for any one quarantine event, which prevents the fund from being exhausted by a single large case. The total fund size includes an estimated $10,000 to cover administration costs. The fund has been designed to minimize administration costs by relying on the Wyoming Livestock Board's oversight and monitoring and documentation for qualification and payments.

The fund is designed to operate for three years unless it is drawn down before then. At the end of the three-year period, any remaining funds may be rolled over into a new iteration of the fund, which could include altering the payout structure, expanding it to cover other areas in the Greater Yellowstone Ecosystem, or changing the structure.

FUND SUMMARY AND STRUCTURE

TARGET FUND SIZE:
$150,000 – $200,000
The initial capital in the fund allocated to brucellosis payouts

FIRST YEAR PAYOUT:
$45/head/month (60 percent of estimated quarantine costs)
Payments made on a per head, per half-month basis according to the payout structure (see Table 1) to eligible producers undergoing a brucellosis quarantine event. These payouts currently include the hay cost rate and pasture lease rate. See Table 1 for a proposed specific rate schedule based on season and cattle classification.

MAXIMUM PAYOUT:
50 percent of the initial fund size
The maximum payout from the fund for any single quarantine event

ANTICIPATED OPERATIONAL PERIOD:
Three years

Table 1: First Year Payout Rate

Quarantine Circumstances		Rates
Season	**Livestock Category**	**Per Month Per Cow**
Fall-Winter	Market	$45
	Herd	-
Non-Winter	Market	$45
	Herd	$45

*Rate table assuming **hay price** is $200/ton, and **pasture lease price** range is $30-$45/AUM (low/high). The difference between herd and market cattle is based on the number of cattle the producer was expecting to keep regardless of quarantine (herd cattle) vs. the number of cattle over and above that baseline number of cattle (market cattle).*

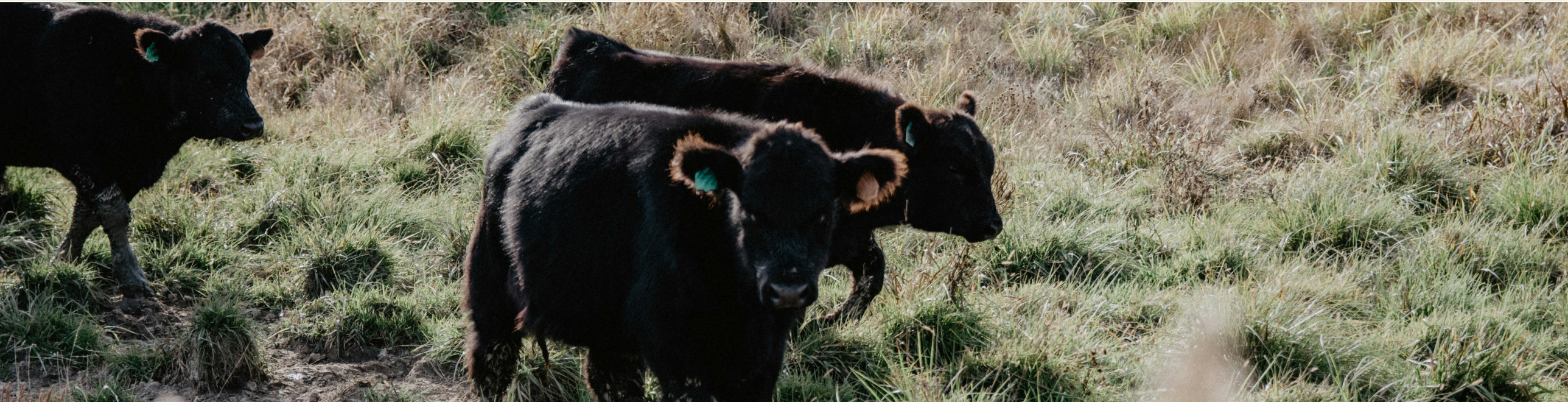
Table 2: Summary of how the Fund determined a Payout Rate

Cost	Description	Amount
Hay	This is the price producers pay per month to feed one cow hay.	$90
Private Land Lease Rate	This is the price producers pay per month to lease private land to provide pasture for one cow. Alternatively, it is the monthly opportunity cost of private pasture to feed one cow. There are high and low private lease rates, and the difference between the rates is the cost of maintenance (see Maintenance Costs below).	$30
Blended Feed Cost	This is the monthly cost of feeding one cow a diet of 1/2 hay and 1/2 pasture over the course of a year. (Half of $90 for hay + Half of $30 for pasture)	$60
Maintenance Cost	This is the monthly total overhead and ancillary costs associated with raising and maintaining one cow, such as infrastructure maintenance, water provision, etc.	$15
Cost of Raising a Cow	This is the monthly cost of raising a cow that eats a diet of 1/2 hay and 1/2 pasture, plus associated maintenance costs. It is calculated by summing the Blended Feed Cost and the Maintenance Cost.	$75
First Year Payout Rate	This is the monthly payment a producer will receive for each qualified quarantined cow. In the first year of the fund, the payout rate is 60% of the Cost of Raising a cow, making the initial payout amount $45.	$45

ELIGIBILITY

The following eligibility criteria must be met for a landowner to receive compensation from the fund:

1. Cattle (the only type of livestock covered by this fund) must be required to be quarantined by the Wyoming Department of Livestock under brucellosis management regulations.
2. Cattle have spent a portion of the past 12 months in Park County, Wyoming, defined by county borders.
3. Applicable rules associated with presence in the Wyoming designated surveillance area (including any required vaccination, testing, or adherence to management plans) were followed leading up to the positive test.
4. There is no evidence of actions to intentionally attract elk to locations where cattle were present during the season of likely transmission (March to May).
5. Reasonable methods to prevent livestock from mingling with elk were used.
6. Reasonable effort is taken to resolve the quarantine as quickly as possible by working with the relevant state institutions.
7. Costs associated with quarantine are not compensated by a private insurance policy.
8. Claims are received by the East Yellowstone Brucellosis Compensation Fund within three months of the release of quarantine. Claims may be made as frequently as every month during the quarantine period.



ADDITIONAL CONSIDERATIONS

State Fund

One additional consideration in Wyoming is the existence of a state fund designed to cover quarantine costs. In Wyoming, livestock producers facing quarantine can apply for "Brucellosis Quarantine Mitigation Expense Reimbursement" in accordance with the Livestock Board Rules, Chapter 25. Under the Brucellosis Quarantine Mitigation Expense Reimbursement program, producers may be reimbursed by the state for "Qualifying Expenses" or expenses that would not be incurred if not for the quarantine, such as shipping cattle to comply with the quarantine, veterinarian mileage to visit a ranch to test a herd, and extra labor. PERC worked closely with the Wyoming Livestock Board to ensure the East Yellowstone Fund would be additive to and complementary of the existing fund, without creating a windfall to producers.

The state fund has recently increased its payout limit to $50,000 per quarantine but can only cover quarantine-related costs that can be documented with a receipt, such as transportation, additional testing, additional staff, and other similar expenses. The state fund also only pays out once, meaning producers must accumulate costs until the end of quarantine or forgo payouts to apply for an earlier reimbursement in the event of cash-flow issues.

In practice, the state fund does not cover costs that are difficult to account for, such as lost marketing opportunities associated with keeping cattle past their expected sale date, and opportunity costs of feeding additional cattle on pasture or with hay. The East Yellowstone Fund is intended to account for the more significant costs that are more difficult for ranchers to track (e.g., lost marketing opportunities and costs of feeding additional cattle) and does not require ranchers to produce receipts for incurred expenses.

The East Yellowstone Brucellosis Compensation Fund is a much-needed complement to the state fund. Unlike the state fund, the private fund provides payouts during quarantine and is not tied to specific, receipt-requiring reimbursable expenses. We also do not expect payouts from the East Yellowstone Brucellosis Compensation Fund, when combined with any potential compensation from the state fund, to exceed–or even meet– actual incurred costs in most quarantine events.

Elective Testing

Livestock producers in Park County, Wyoming, expressed an interest in encouraging elective brucellosis testing practices as a part of this fund to ensure that benefits accrue to those who are testing regularly and to potentially incentivize those who aren't testing regularly to do so. For now, the fund will encourage regular elective testing but does not make it a requirement for either eligibility or modifier on payouts. Given the variability of producers in the East Yellowstone region, and the number of additional considerations that influence a producer's decision to test or not, this is the most efficient option, but could be adjusted in later years of the fund.

MODELING THE PAYOUT

In Park County, Wyoming, the nature of producers' quarantine costs can vary widely due to the range of herd sizes (from less than 20 head to more than 5,000 head) and operational circumstances while under quarantine. For example, some producers under quarantine will need to feed their animals hay in one restricted area, while others may have the ability to use some or all of their normal pasture. Despite the variance in how producers incur quarantine costs, producers in the area have indicated that the scale of actual per head quarantine costs is likely to be similar across operations, even if those costs accumulate in very different circumstances.

To approximate quarantine costs for all producers, we constructed a per head Cost Index specific to Park County, Wyoming, that represents the costs associated with feeding and maintaining one head (cow or calf) under quarantine. This index is built with publicly available and verifiable market data that will adjust every year as feed and management costs change. From this Cost Index, a quarantine payout rate is calculated based on a predetermined percentage, information about quarantine demographics, and time of year. While the index is based on the costs of raising a cow or calf, producers are not obligated or expected to track how they spend the funds. Instead, the funds are based on the cost of raising a cow or calf as a proxy, and producers have the flexibility to use the compensation to cover any costs they want.

Cost Index

The Cost Index uses three publicly available data points: 1) local hay price; 2) a local lease rate where the landlord maintains fences, checks water, provides salt, and carries out other management actions; and 3) a local lease rate where the lessee is responsible for all of those costs. From this data we calculate two parts of the index: Feed Cost (i.e., the cost of providing nutrition for a cow, whether by feeding hay or providing pasture) and Maintenance Cost (i.e., cattle management and ancillary costs such as salt provision and fencing/infrastructure maintenance), which are added together to construct the Cost Index (Equation 1).

Equation 1 **Feed Cost + Maintenance Cost = Cost Index**

This Cost Index is designed to closely track a large portion of the costs associated with raising cattle in Park County, Wyoming.

Feed Cost

To calculate a total payout rate, we must first understand how much it costs to feed a cow or calf. The feed cost portion of the Cost Index captures information about the cost of hay and the opportunity cost of pasture. It is a blended per AUM rate of hay cost (calculated using hay price and a monthly consumption rate) and private pasture lease rate,[1] which we interpreted as the "cost" of pasture feeding.[2] Table 3 shows the inputs and conversion to per AUM rates, so it shows the monthly per head rate of feeding either hay or pasture. Table 4 shows how different blending rates (the proportion of feed that comes from hay vs. pasture) generate different outcomes. In the first year, the fund will use a 50 percent blend rate, which can loosely be interpreted as representing costs associated with feeding a cow half with hay and half on pasture over a one-year period. Given the experimental nature of the fund, the blend rate may be adjusted based on actual producer conditions in later years. PERC, the East Yellowstone Collaborative, and Cody-area livestock producers will work together to determine appropriate changes to the blend rate, if any, after the first year.

Table 3: Hay and Pasture Feed Costs

Measure	Cost Type	Price | Rate	Rate / AUM
Hay	Hay Feed	$200	$90
Low Pvt Lease	Pasture Feed	$30	$30

Orange figures are input annually from market data. Hay Price is in dollars/ton. Low Private Lease Rate is the low end of the range of per AUM grazing lease rates in the USDA's Annual Grazing Report.

Table 4: Feed Cost with Different Blend Rates

Blend Rate	cost/head/month
25%	$45
50%	$60
75%	$75

The Blend Rate indicates the percentage of the feed cost that is attributable to hay (e.g., 25% means the producer is feeding cattle 25% hay and 75% on pasture).

Maintenance Cost

The maintenance cost portion of the index is intended to capture ancillary and overhead costs. This rate is calculated using the range of reported grazing lease rates in the USDA's Annual Grazing Report, as seen in Table 5. The high reported lease rate includes maintenance costs, i.e., costs associated with "maintain[ing] fences, check[ing] windmills/ponds/stock water, cattle, provid[ing] salt, etc." The low reported lease rate does not include maintenance costs. We therefore take the difference in rates as an estimate of maintenance costs on a per AUM basis (Equation 2).

Equation 2

High Grazing Lease Rate - Low Grazing Lease Rate = Maintenance Cost
where
High Grazing Lease Rate = Pasture Cost + Maintenance Cost
and
Low Grazing Lease Rate = Pasture Cost

Table 5: Maintenance Cost

Measure	Price / Rate	Rate / AUM	Maintenance Cost
Low Private Lease	$30	$30	$15
High Private Lease	$45	$45	

Inputs and calculation table for maintenance cost. Orange values are input from the USDA Annual Grazing Report.

Payout Rate

The Cost Index is calculated by adding together the Feed and Maintenance Costs, as shown in Table 6. For example, given a hay price of $200/ton, lease rates of $30-$45 (yielding $15 in maintenance costs) per AUM, and a blend rate of 50 percent, the Cost Index is $75 per head per month (or $2.50 per head per day).

To encourage continued use of ranching best practices and a reasonable cost share (such as working to prevent intermingling of elk and cattle), the quarantine payout rate for the first year is calculated as 60 percent of the Cost Index (full cost of raising a cow), as shown in Table 6. We selected 60 percent because it falls between our target coverage rate of 50 and 70 percent. This adjustment may fluctuate based on the lease rate of pasture or cost of hay (for example, if hay prices increase dramatically, the fund will have to cover less of the overall cost to avoid exhausting the fund).

Table 6: Cost Index and Payout Rate

Measure	Blend Rate	cost/head/month	cost/head/day
Feed	50%	$60	**$2.00**
Maintenance	-	$15	**$0.50**
Total	-	$75	**$2.50**
Payout Rate	**Pay Adjustment**	**/head/month**	**/head/day**
	60%	$45	**$1.50**

Cost Index and Payout Rate calculations. Assumes a hay price of $200/ton and grazing lease rates of $30-$45 per AUM.

Payouts and Cap

Payouts are calculated on a nearest half-month (15 days) basis. To ensure the fund is not depleted with a single incident, the maximum payout for any one incident is half of the initial fund size (e.g., $100,000 for a $200,000 fund). Payouts can be requested monthly during quarantine, beginning with the date one month after the quarantine officially begins. Payouts must be requested within three months of the end of quarantine.

DEFINING QUARANTINE CIRCUMSTANCES

Livestock Categories

Animals required to quarantine will be assigned into two categories to tailor payouts to specific costs faced that vary by annual herd dynamics. The two categories are:

1. Market: Animals that, absent a brucellosis outbreak, would have been sold and therefore would not have remained on the ranch during the majority of the quarantine period.
2. Herd: Animals that would have remained at the ranch even if there was no quarantine.

For each quarantine event, the number of animals in each of these categories will be determined jointly by the East Yellowstone Brucellosis Compensation Fund and the producer. The fund has a calculation to establish the default number of cows in each category based on the quarantine order. Those numbers could be adjusted based on documentation provided by the rancher.

For cow-calf operations, we assume a stable herd size plan (i.e., # of replacement calves = # of cull cows). This means that any given year the number of replacement cows will equal the number of cull cows, and the total number of cows in the herd will remain steady. This stable herd size enables the following assumptions:

1. The default number of herd cows is assumed to be the number of adult cows entering quarantine:

Herd cows = Kept cows + Replacement calves
where, Kept cows =
Adult cows - Cull cows
when, # of Cull cows = # of Replacement calves,
Herd cows = Adult cows

2. The default number of market cows is assumed to be the number of calves entering quarantine:

Market Cows = Sold calves + Cull cows
where, Sold calves =
Total calves - Replacement calves
when, # of Replacement calves = # of Cull cows,
Market Cows = Total calves

Season

Fall-Winter (Quarantine Start to April 15)

During the winter, producers generally have a plan to feed their herds, whether quarantined or not. Quarantine, however, imposes additional costs in the winter, such as changing operations and feeding cows that would have been sold and thus would not have remained on the ranch. For this reason, the fund pays out for market animals but not herd animals during the winter months.

Non-Winter (April 16 to December 15)

During this period, animals not under quarantine are generally put on pasture, either owned or leased. Some quarantine plans allow for quarantined animals to go on pasture, as long as there is no risk that they might spread the disease to neighboring herds. Other plans require animals to be kept in smaller defined areas that require them to be fed. Hay for feed is expensive and accounts for the vast majority of quarantine expenses during non-winter months. The fund covers all quarantined animals in the non-winter months.

APPENDIX

A fund simulation model was used to assess the performance of the fund and choose the proposed payout rates and structure. The primary objective of the modeling exercise is to assess how varying key fund attributes impacted fund objectives using data on the size of cattle operations and brucellosis risk in Park County, Wyoming.

The Fund

Key fund attributes are decision variables, meaning they are chosen pre-simulation and can be optimized based on their impact on key outcomes. There are three key fund attributes that must be specified in order to fully describe the fund:

- The **maximum allowable payout** is some number less than the initial fund size and is present to ensure that the fund isn't fully depleted with one brucellosis case.
- The **initial fund size** sets the objective for fundraising.
- The **compensation rate** is variable as described in the prospectus. The rates are chosen to target between 50 and 70 percent compensation relative to actual incurred costs. For the first year, the compensation rate will be 50 percent of estimated quarantine costs.

Measured outcomes from the simulation are used to evaluate performance of the fund given the choices made about fund attributes. The fund is evaluated on two outcomes:

- **Coverage performance**. Percent of estimated true costs covered by the fund. The target is between 50 and 70 percent.
- **Probability of exhaustion**. This is the expected probability that the fund is depleted within the three year pilot period.

Simulation

We simulate quarantine events and fund performance over 10,000 ten-year periods. Fund performance is measured using summary statistics across all simulations.

Quarantine

Quarantine events are simulated using a Monte Carlo strategy to determine quarantine attributes according to assumed probability distributions. Specifically, for each year within the simulation, we determine if a quarantine event occurred, how many cattle were affected, when the quarantine started, how long it lasted, and whether or not pasture was available for use during quarantine. There is no autocorrelation between events (i.e., the occurrence of an event in one year does not affect the probability of an event occurring the next year).

Event: We randomly choose from the probability distribution of brucellosis cases to determine whether there are 0, 1, 2, or 3 quarantine events in any year. Based on historical infection data for Park County we assume that there is a 40 percent chance of at least one case in any given year, 15 percent chance of at least two cases, and 5 percent chance of three cases.

Number of Head: The number of head affected is determined by randomly selecting a "ranch" from the synthetic ranch dataset. This synthetic dataset was created to match data from the 2017 USDA Ag Census which provides the number of operations within different size (i.e., cattle inventory) bands and the average inventory per ranch in each band. We chose 5,000 head as the maximum size and did not include ranches with <20 head in the simulation.

Start and Length of Quarantine: We assume a uniform distribution of start dates from Oct 15 - Dec 31. For simplicity we round down to the nearest half month. The length of quarantine is chosen from a uniform distribution of 6-13 months.

Herd Demographics: To determine accurate fund payouts we also have to assume the demographics of each affected herd. Specifically what percent of the herd falls into each of our two categories (Market, Herd). For each affected herd we randomly choose a percentage for Market cows, leaving the remainder as Herd. For Market cows, we assume a uniform distribution between 30 and 50 percent.

Fund Performance

The process described above is repeated over every year of the simulation and estimated quarantine costs are calculated for each quarantine event. Then, we simulate the performance of the fund over each 10-year segment. The fund starts at the initial fund size in year 0 and payouts are calculated for each year through year ten. We do this process 10,000 times, representing 10,000 simulations of the fund. Payouts are determined using the simulated quarantine attributes and the corresponding payouts detailed in the prospectus. Results are summarized across all 10,000 simulations.

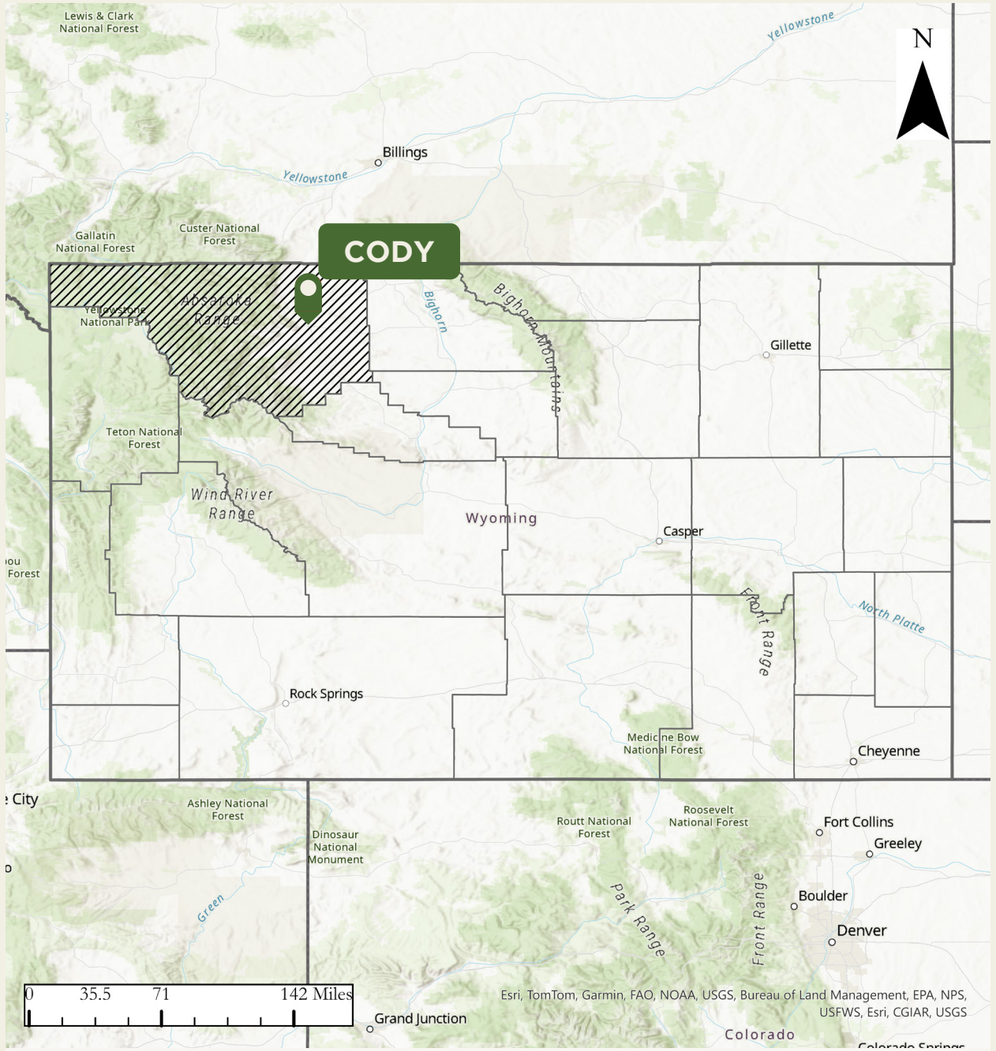
Results:

Early modeling results suggest that a fund capitalized at >$150,000 would achieve a <10 percent probability of exhaustion (>90 percent probability of the fund having a positive balance after three years) and between 50 and 65 percent coverage performance across a range of hay prices ($150/ton-$350/ton). These results are preliminary and are likely to change as assumptions are refined and payout functions are adjusted. They do indicate a likely range for key fund parameters though.

ENDNOTES

1. As reported in the Annual Grazing Fee Report from the USDA-NE Dept Ag Market News. USDA reports a range (e.g., $30-$45) for leasing pasture on a per AUM basis in Western Wyoming. Data is collected from actual market transactions. The most recent report is available at: https://www.ams.usda.gov/mnreports/to_ls150.txt
2. We use the low end of the grazing lease price range reported for Cow/Calf pairs in Western Wyoming to set the cost of private pasture, which refers to the lease rate that applies when landowners do not maintain fences or manage cattle. This rate requires cattle owners to "maintain fences, check windmills/ponds/stock water, cattle, provide salt, etc." Because the cost of those ancillary services is excluded from the rate, we assume that rate is exclusively capturing the value of the pasture as feed.

Park County, Wyoming

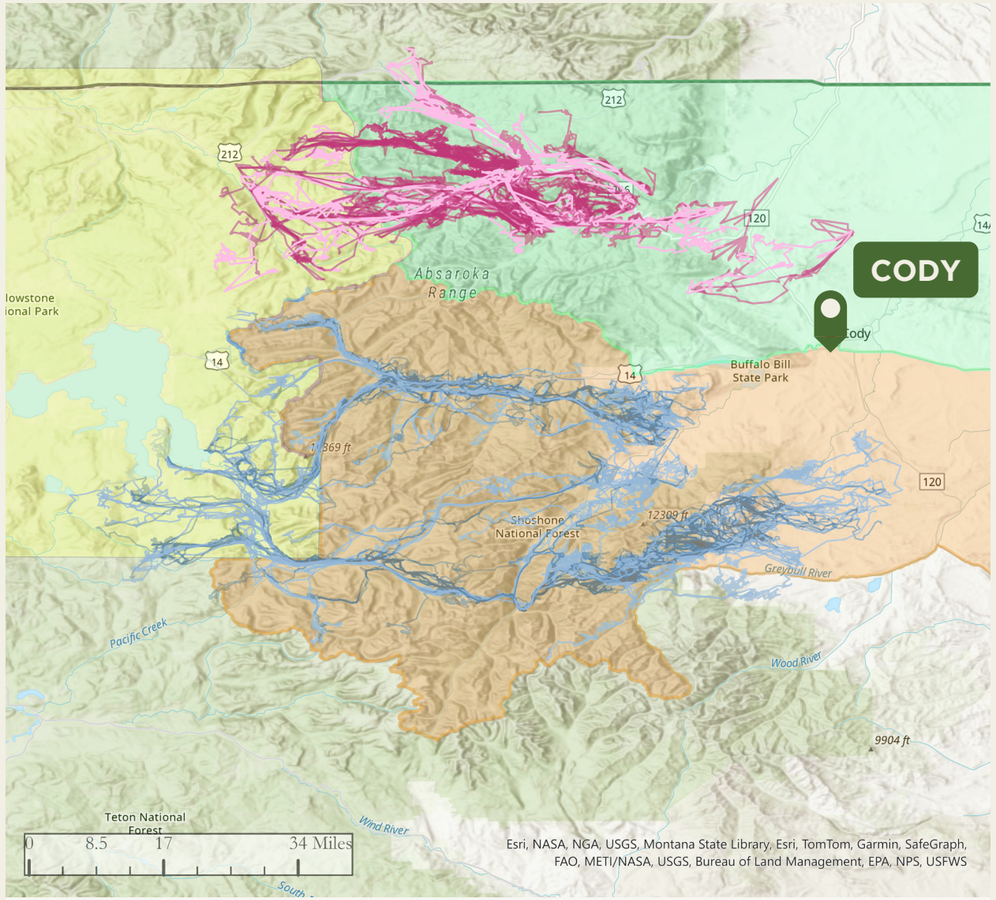


Park County

Counties

States

East Yellowstone Elk Herds: Ranges and Migration Routes



Cody Elk Herd Migration Routes

Fall Spring

Clarks Fork Elk Herd Migration Routes

Fall Spring

States

Cody Elk Herd Range

Clarks Fork Elk Herd Range

Yellowstone National Park

If you are interested in partnering with PERC and other conservation and funding partners on the East Yellowstone Brucellosis Compensation Fund, please reach out to Brian Yablonski at brian@perc.org or 406-587-9591.

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