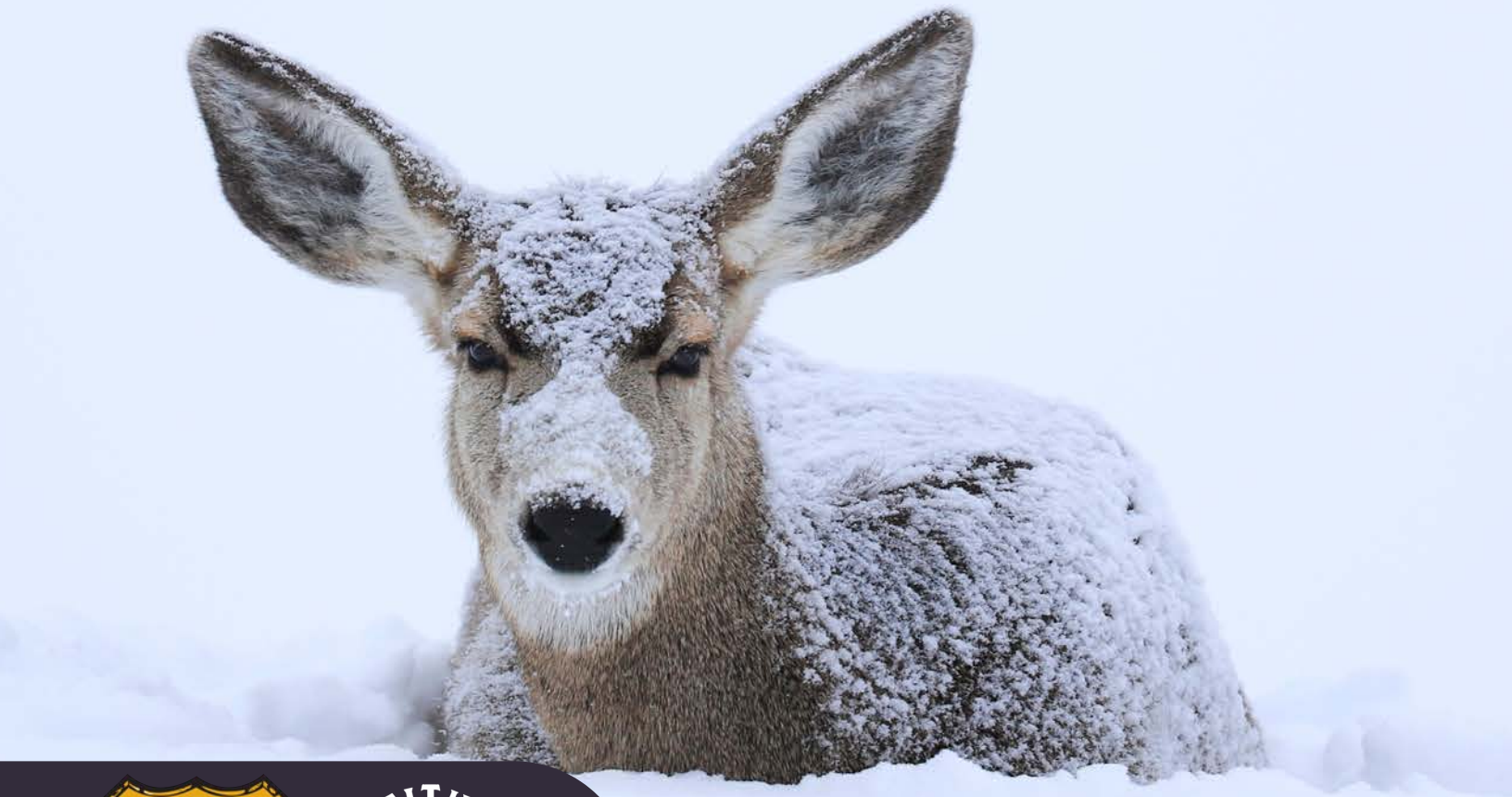
Mule deer & harsh winters

What does it take for mule deer to survive Wyoming's winters?



WYOMING GAME & FISH DEPARTMENT

MONTEITH SHOP

ADVANCING SCIENCE AND MANAGEMENT

December 2023

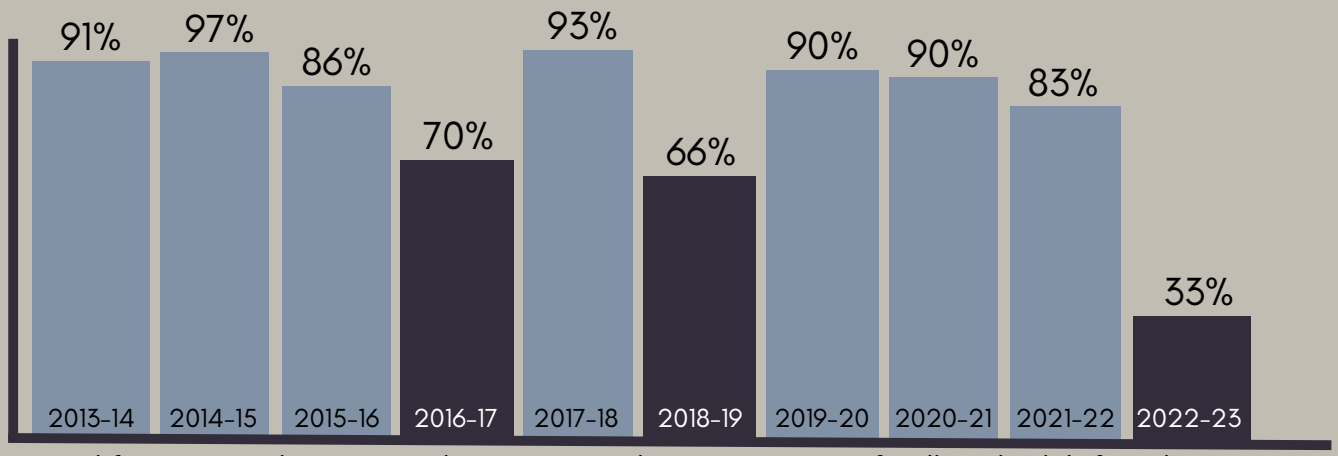

Rafferty

Harsh winters are hard on mule deer.

Frigid temperatures and deep snow can make winter the toughest time of the year for mule deer, but they are well adapted to it. During most winters and across most populations of mule deer, over 85% of adult females will live to see another spring.

Winters with above average snowpack or below average temperatures, however, are a different story. With deep snow and cold temperatures, overwinter survival of mule deer in the Wyoming Range dipped below typical levels during 3 harsh winters in the past decade.

Overwinter survival of adult female deer in the Wyoming Range.



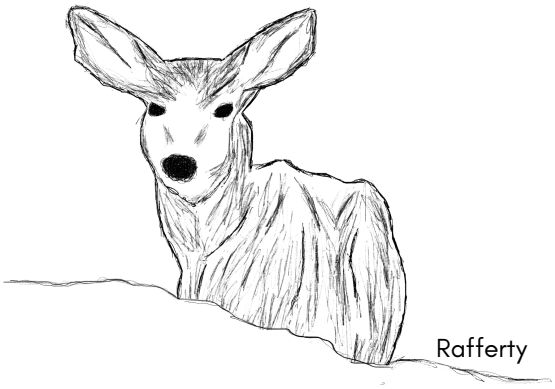
Survival from December 1 to April 30, measured via monitoring of collared adult females.

Many scientists predict that weather will become more variable and extreme events like harsh winter storms will become more frequent in the coming years. With that in mind, this document details the factors that influence how Wyoming Range mule deer fare during and after harsh winters, and what we can do to buffer these impacts.


LaSharr

Surviving winter takes energy.

Surviving when temperatures drop well below freezing and the landscape is covered with deep snow takes a tremendous amount of energy. Female mule deer in the Wyoming Range use 2 primary sources of energy to survive winter: food and fat.


Rafferty

Food.

Mule deer mostly eat sagebrush, along with rabbitbrush, mountain mahogany, and bitterbrush throughout the winter. The best thing about these shrubs is that they are typically available when little else is. However, they are relatively low in nutrients and calories.


Gocke


Randall

Fat.

During summer, mule deer eat nutritious plants like hollyhock, lupine, and geranium. Although some of these nutrients go into raising offspring and building body reserves, additional energy is stored as fat. Mule deer start winter with fat they have built up over the summer, and slowly draw down these reserves until spring arrives.

Winter harshness shapes how much energy is needed.

During normal winters, mule deer don't need to move through deep snow to find food, and the nutrients from sagebrush often provide them with enough energy to make it through the winter. Mule deer spend less energy overall, and they don't have to rely as heavily on their fat reserves to survive the winter.

During harsh winters, moving through deep snow costs enormous amounts of energy, and the shrubs that normally meet energy needs may be covered in snow. When temperatures dip exceptionally low, mule deer must also spend extra energy to stay warm. During harsh winters more energy is needed, yet food is harder to access; mule deer must rely even more on their stored fat to survive.

Details about these analyses and results are available in the published paper "Behavior, nutrition, and environment drive survival of a large herbivore in the face of extreme winter conditions," published in Ecosphere in 2023.


Jakopak

Having the energy to survive winter starts in summer.

Females spend their summers raising fawns and putting on fat, securing their own survival and raising the young animals which will join the population in the future as adults. Because females and the offspring they are raising drive population maintenance or growth, they generally are the focal point of management.

It can be hard to remember the lush vegetation of summer during the long Wyoming winters, but the environments that mule deer experience in the high country while they are on summer range determine how they fare during the winter. Multiple factors can shape how much fat a mule deer is able to gain over the summer.

Environmental conditions.

Moisture is especially important for determining how nutritious and how abundant plants are. Wet springs lead to an abundance of nutritious plants, but hot and dry springs and summers shorten the growing season.


Jakopak


LaSharr

Deer density.

Deer share their summer food with the other animals that live there. Since landscapes can only produce so much forage, each animal will have less food with each increase in the number of mouths to feed. With less food, deer do not build up as much fat in preparation for winter.

Forage and deer density in summer, as well as snow depth in winter, affect survival.

Mule deer need fat to survive an average winter, and they need even more fat to make it through harsh winters. Both the quality of food and the size of the deer population influence how much fat a deer can build up during the summer, which ultimately determines her chance of surviving the winter. Having a population of mule deer that is capable of maintaining high survival through winter means thinking not just about winter conditions, but also about how summer conditions prepare them for winter.


Jakopak


LaSharr

Consider the survival of a mule deer that successfully raised 1 fawn during her prime, in different situations. Her chance of surviving winter after spending summer in habitat that is...

	Normal winter	**Harsh winter**
low quality and shared with **many** other deer	54%	12%
high quality and shared with **many** other deer	64%	14%
low quality and shared with **few** other deer	69%	23%
high quality and shared with **few** other deer	90%	55%

Details about these analyses and other results are available in the published paper "Shifts in risk sensitivity and resource availability alter fat stores for a large mammal following extreme winter conditions," published in Functional Ecology in 2023.

Management can buffer the effects of harsh winters.

Regardless of the particulars, the condition of summer and winter habitat influence the survival of mule deer, and this is especially true during harsh winters.

Multiple federal and state partners, private landowners, nonprofits, Wyoming Game and Fish Department, and other partners have been putting decades worth of knowledge gained about mule deer and their habitats into action.


Jakopak

Habitat conservation.

On summer range, management practices emphasize increasing and maintaining the diversity, quantity and quality of flowering plants and aspen stands. On winter range, managers strive to maintain healthy sagebrush-dominated communities and improve annual growth and age class diversity of sagebrush and other shrubs.

Improve or maintain connectivity.

Mule deer must be able to access their seasonal habitats, unimpeded by physical barriers such as fences, roads, and development. The Wyoming Game and Fish Department works with partners and developers to convert fencing to more wildlife friendly designs, find local solutions to reduce wildlife-vehicle collisions, and minimize impacts to mule deer and other wildlife.


LaSharr


Monteith

Manage the number of mouths to feed.

Wildlife managers work to manage wildlife populations towards population objectives via harvest and habitat conservation. Wildlife management is conducted using a combination of data collection to inform understanding of populations and input through public process.

You can help support the long-term conservation of the Wyoming Range herd!

You can help by supporting options to maintain habitat connectivity and permeability (fence conversions and pulls, wildlife crossing projects), habitat treatments (weed management and reclamation), respecting wintering wildlife and refraining from feeding them, showing up to a season setting meeting, buying a conservation license plate, engaging with land management agencies, and being willing to listen and learn.


Gocke


Jakopak


Martin

Science informed management can buffer mule deer against extremes.

The information provided in this document was made possible through multiple sources of data collected through collaborative efforts by the Wyoming Game and Fish Department, the University of Wyoming, the Bureau of Land Management, the United States Forest Service, and many other critical partners and collaborators.

By working together, we can gain detailed information of where animals move, the body condition they are in across seasons, and how the next generation fares to enhance our understanding and conservation of this revered species.

Thinking through the factors that influence whether mule deer survive the winter means that we need to think about the entire ecosystem, throughout the entire year. It's hard to do, but mule deer deserve nothing less.

Supporters and partners.

The research highlighted in this document was supported by Wyoming Game and Fish Department, Muley Fanatic Foundation, Wyoming Governor's Big Game License Coalition, Wyoming Wildlife Natural Resources Trust, Knobloch Family Foundation, and multiple other organizations, agencies, and individuals.

Cover photos: Gocke.