A Wyoming Landowner's Handbook to

Fences & Wildlife

Practical Tips for Fencing with Wildlife in Mind

Third Edition, revised & updated 2025

Acknowledgements

Many resource and wildlife specialists, ranchers, and landowners generously offered their insights and experience for this guide. The first edition was published by the Green River Valley Land Trust (formerly Wyoming Land Trust) in 2012. A second edition was published in 2015 by the Wyoming Wildlife Foundation/ Wyoming Community Foundation. Our deep thanks to all those who contributed to and helped make the earlier editions possible.

This third edition is published by Wyoming Game and Fish Department and is freshly revised and updated. It benefits from new research on wildlife interactions with fences, and the creative ideas and practical experience of landowners and resource managers who have adopted a wildlife friendly approach in their operations. Many individuals and organizations provided information and support for the creation of this third edition. These include the Bureau of Land Management, East Yellowstone Collaborative, Greater Yellowstone Coalition, Jackson Hole Wildlife Foundation, Knoblock Family Foundation, Rocky Mountain Elk Foundation, Sublette County Conservation District, Teton County Conservation District, The Nature Conservancy, University of Wyoming, USDA Natural Resources Conservation Service, Western Landowners Alliance, WYldlife Fund, Wyoming Game and Fish Department, Wyoming Governor's Big Game License Coalition, Wyoming Wildlife Federation, and Wyoming Wild Sheep Foundation.

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Credit: Wyoming Migration Initiative.

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Credit: Christine Paige.

Trail cam mule deer going under modified fence. *Credit: Upper Green Fence Initiative.*

MODIFYING FENCES AND REMOVING OBSOLETE FENCES ARE RELATIVELY EASY AND COST-EFFECTIVE SOLUTIONS TO HELP SUSTAIN OUR WILDLIFE HERITAGE.

WILDLIFE and Fences

Credit: Christine Paige.

Credit: Wyoming Migration Initiative.

Why Build Fences with Wildlife in Mind?

Countless miles of fence crisscross the West. Fences are important tools for controlling livestock and deterring trespass. They define and separate ranches and farms, outline property boundaries, enclose pastures and rangelands, and prevent livestock from straying onto highways.

As common as fences are, the interactions of wildlife with fences are complex and their effects can be substantial. Fences create hazards and barriers for many species, from big game animals to birds. Fences can block or hinder daily wildlife movements, seasonal migrations, and access to food and water.

Searching for safe crossings and navigating over, under, or through fences costs energy needed for survival, and wildlife may avoid otherwise good habitat with too many fences to navigate. When animals collide or tangle in fences they can be injured or killed, and wildlife damage to fencing can be costly and frustrating for landowners.

The goal of wildlife friendlier fencing is to sustain short- and long-distance wildlife movements across landscapes that are essential for many species to thrive. A growing number of government and nonprofit initiatives and programs across Wyoming are working to remove or improve fencing for wildlife and assist private landowners.

By tailoring fence design and placement, you can reduce harm to wildlife and damage to your fence. Many of these methods are low-cost and can save money and labor by reducing the need for future fence repair.

This guide will help you design new or modify existing fences and crossings that can help wildlife move across the landscape while still meeting management goals. It also will help you with sources for technical assistance and possible cost-share opportunities.

MANY WILDLIFE FRIENDLIER FENCE DESIGNS AND MODIFICATIONS ARE RELATIVELY EASY AND CAN SAVE MONEY BY REDUCING FUTURE FENCE REPAIR.

Credit: Kathy Lichtendahl.

Fence Law in Wyoming

A "Fence Out" State

By law, Wyoming is a "fence out" state, which means landowners are responsible for protecting their own property from ranging livestock. A stock owner is not liable for trespass or damage if a property is not adequately protected by a "lawful fence" (Wyoming Statute § 11-28-103).

The fence out rule applies to cattle and domestic bison according to Wyoming Statute § 11-28-108. But Wyoming case law and accepted practice suggests Wyoming is a "fence in" state for sheep (see Cosgriff v, 68 P. 286 (Wyo. 1902)). This custom has deep roots in Wyoming's history due to ranching traditions and the large areas of open range in the state.

Generally, a lawful fence is constructed well enough to keep out livestock. Wyoming Statute §11-28-102 stipulates that 3-strand barbed wire, board, pole, or rail fence are all acceptable, and the statute provides some examples and specifications.

In addition, however, Wyoming Statute §11-28-102(b) states: "All other fences made and constructed of boards, rails, poles, stones, hedge plants or other material which upon evidence is declared to be as strong and well-calculated to protect enclosures and is as effective for resisting breaching stock as those described in subsection (a) of this section, shall be considered a lawful fence."

Posting Against Trespass

Wyoming Statute §6-3-303(a)(ii) provides that notice of trespass is given by "posting of signs reasonably likely to come to the attention of intruders."

While many states stipulate the use of orange paint on fence posts or tree trunks to designate no hunting or trespass, there are no specific regulations in Wyoming regarding marking against trespass in this manner.

Other Regulations

Check with your county and city offices for any local ordinances or regulations specific to fencing. If your property adjoins a state highway, check with the Wyoming Department of Transportation (WYDOT) regarding highway right-of-way fence and options for removing or modifying fence for wildlife.

PROBLEM
Fences

Credit: WGFD.

Credits: above - Dean Clause, WGFD; top right - Spencer Carstens; botttom right - Jeremy Roberts, Conservation Media.

Problem Fences

Fences may block wildlife access to water, food, other important resources, and inhibit their use of seasonal ranges. Although deer, pronghorn, elk, moose, and bighorn sheep, are capable of jumping typical rangeland fences, they often spend valuable energy looking for safe crossings. Pronghorn, mule deer, and the young of other ungulates often prefer to crawl under a fence if they can find a large enough gap and will spend considerable energy tracing fence lines to find openings. Fence crossings in deep snow or on steep slopes are challenging for migrating ungulates, especially for winter-stressed, pregnant, and young individuals.

Wildlife also can be injured or tangled in fences. Barbs and wire can snag and snare legs or antlers, especially if wires are loose, spaced too closely, or are strung too high. Deer, elk, pronghorn, and other wildlife often bear large scars from repeatedly crossing barbed wire. Injuries from fence collisions can include broken bones, strained muscles, torn ligaments, and infections that can dramatically decrease an animal's chance of survival. When entangled in a fence and unable to break free, animals usually die of trauma and stress.

Certain fence designs, especially woven wire fence, pose a complete barrier for young fawns and calves, although many adult ungulates will readily jump over. When separated from their mothers and stranded from the herd, fawns and calves are vulnerable to dying from exposure or predation. Although woven wire is used as a barrier for livestock in many situations, it can snare or strangle medium-sized animals if they try to push through and blocks wildlife from crawling under.

Young ungulates are especially vulnerable to being blocked by or tangled in fences.
Credits: left - Mark Gocke, WGFD, right - Troy Fieseler, WGFD.

WINTER-STRESSED, PREGNANT, AND YOUNG ANIMALS MAY ESPECIALLY HAVE TROUBLE CLEARING FENCES. AN INJURY OR INFECTION FROM TANGLING WITH FENCES CAN WEAKEN AN ANIMAL'S CHANCE OF SURVIVAL. IF ANIMALS CAN'T PULL FREE AT ALL, THEY DIE OF TRAUMA AND STRESS.

If woven wire is topped with one or more strands of barbed wire the fence can become a complete barrier, especially for fawns, calves, pronghorn, and other animals that are incapable or unwilling to jump over such a fence. Animals trying to jump a woven wire/barbed wire fence are even more likely to tangle a leg between the top barbed wire and the stiff woven wire. Tall woven wire fence is effective at excluding wildlife and livestock from highways but must be combined with escape routes for animals trapped in the right-of-way.

Fences topped with barbs or pointed spikes, such as decorative iron fences used in residential areas, can trap or impale leaping deer and other animals. Some iron fences with closely spaced, vertical bars also become traps for fawns because they may be able to slip through when very young, but they can get wedged between bars when older and larger.

What Kinds of Fence Cause Problems for Wildlife?

Fences that:

- **Are too high to jump.**
- **Are too low to crawl under.**
- **Have loose or broken wires.**
- **Have wires spaced too closely together.**
- **Can impale or snag a leaping animal.**
- **Are difficult for moving wildlife to see.**
- **Create a complete barrier.**

Credit: Paul Queneau.

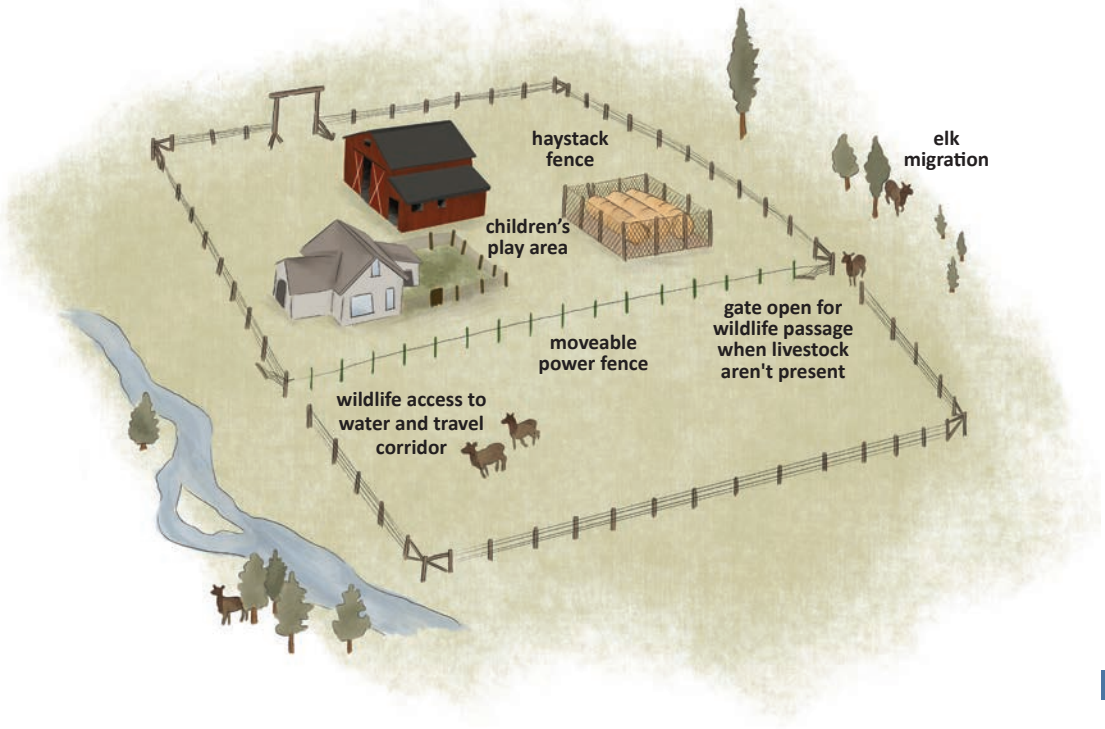
Credit: Paul Queneau.

Fences also may pose a hazard to low-flying birds. Collisions can result in entanglement, broken wings, and death. Ducks, geese, cranes, swans, grouse, hawks, and owls are especially vulnerable. Waterfowl fly into fences that run near or across waterways, low-flying grouse can collide with fences, and hawks and owls may careen into fences when swooping in on prey.

Pronghorn prefer to crawl under fences, but deep snow can hinder fence crossings. Credit: Arnold Brokling, www.arniebrokling.photo.

WILDLIFE
Friendlier Fences

Credit: Christine Paige.



Credit: WGFD.

MOST FENCES CAN BE DESIGNED OR MODIFIED TO ALLOW EASIER PASSAGE FOR WILDLIFE WHILE MEETING THE NEEDS OF THE LANDOWNER.

Getting Started

The best situation for wildlife is open habitat with no fences. Wherever possible, remove obsolete fences that are no longer needed. Livestock managers might consider alternatives such as virtual fence and range riding.

Where you need to build new fence, wildlife friendlier designs and less fence overall are better. Existing fences can be modified to allow easier passage, and new fence can be planned and designed with wildlife in mind.

To get started, consider your needs, how your setting fits within the landscape and wildlife movements and create a plan. You can tailor any of the designs in this guide to your specific needs.

First consider these questions:

1. What is the purpose of the fence?
Do you need to mark a boundary? Deter trespass? Enclose or exclude livestock? If your fence is for livestock, what kind, in what seasons, and for how long?

Your purpose should determine your fence design and placement.

2. What is the topography?
Are you fencing on hills, in rocky country where posts cannot be driven, in and around streams or wetlands?

Design your fence to avoid creating traps for wildlife.

3. Which wildlife species are in your area?
Build fence or crossings that young and adult animals can negotiate.

4. What are the daily or seasonal wildlife movements in the area?
Do animals have young nearby? Does wildlife winter nearby or migrate through to winter or breeding areas?

Wild animals often use habitual pathways and crossings. Allow movement and access through natural corridors and habitats.

Fence and Crossing Placement

Placement of fences is just as important as the type of fence used.

Fencing can be designed to allow wildlife movement through your property. Plan and design your fence to provide wildlife free travel to important habitats and corridors, as well as access to water. Wetlands and riparian habitats are especially important for all wildlife.

Watch for daily and seasonal wildlife movement patterns and look for trails. Limit impenetrable, special-purpose fence to specific areas where it is critical, such as livestock calving or lambing pastures, haystacks, gardens, orchards, play areas, or kennels.

Pipe crossing structure. *Credit: WGFD.*

Design boundary fences so wildlife can easily cross, when land ownership boundaries allow. Use open gates, adjustable wires, dedicated wildlife jumps, or lay-down sections for wildlife movement when livestock are not present.

Work with your land's topography. Swales, gullies, ridges, and stream corridors can funnel wildlife through an area – keep these open to allow wildlife passage and avoid topography traps.

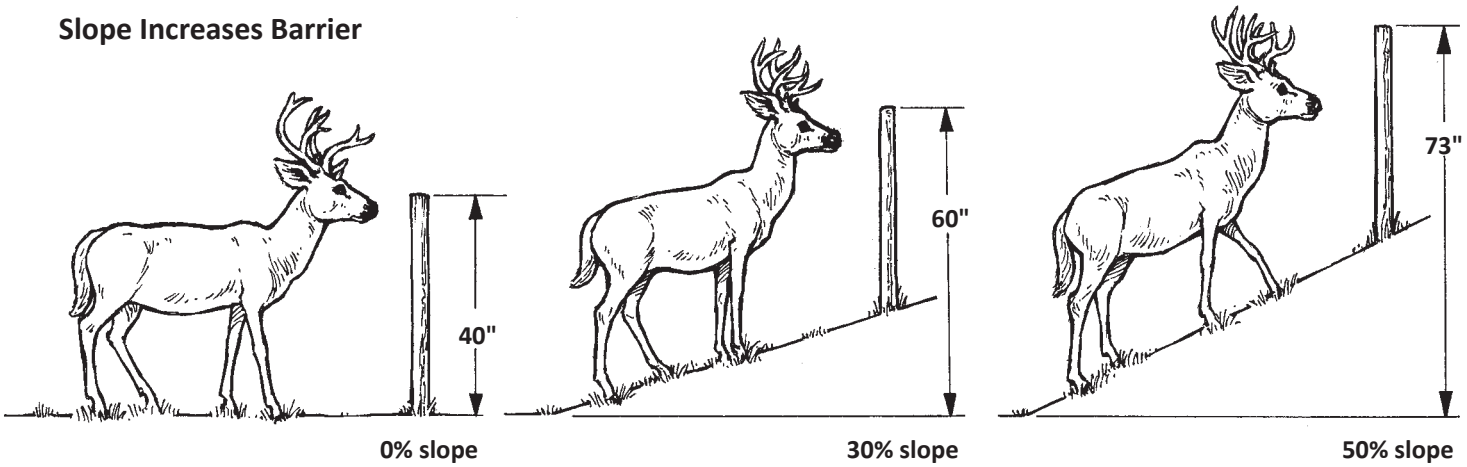
When You Design Your Fence, Consider:

- **Purpose of the fence.**
- **Topography – hills, gullies, streams, and wetlands.**
- **Species of wildlife present.**
- **Daily or seasonal wildlife movements in the area.**
- **Presence of water, food, and cover for wildlife.**
- **Presence of young animals.**

TAILOR YOUR FENCES TO SPECIFIC NEEDS AND ALLOW WILDLIFE ACCESS TO WATER, IMPORTANT HABITATS, AND TRAVEL CORRIDORS.

A fence of any height is more difficult to cross when placed across a steep slope or next to a deep ditch.

As ground slope increases, the height an animal must jump to clear the fence increases considerably. For instance, a 40" fence may be passable on level ground, but a slope of only 10% increases the effective fence height to 46.6"; a slope of 30% increases effective height to 60", and on 50% slope animals encounter an obstacle 73" high. **Fences on steep slopes become nearly impossible for animals to jump without injury.**



Good Fence Placement Tips:

- **Look for wildlife trails and watch for seasonal patterns.**
- **Provide wildlife access to riparian habitats, water holes, and other high-quality habitats.**
- **Provide passage along swales, gullies, ridges, and stream corridors.**
- **Use the appropriate fence design and gates for each activity.**
- **On slopes and in natural travel corridors, plan for wildlife crossings.**

Credit: Jennifer Hayward.

FRIENDLIER
Designs

Credit: WGFD.

Modified fence designs can allow easier passage for wildlife while still meeting landowners' needs. *Credit: Mark Gocke, WGFD; above: Wyoming Game and Fish Dept.*

A Friendlier Fence

A fence that is friendly to wildlife should:

- Allow animals to jump over and crawl under or through easily without injury.
- Be highly visible for both ungulates and birds.
- Decrease fence maintenance labor and costs for landowners.

You can combine or tailor many of the ideas presented in this guide for your specific situation. The top wire or rail should be low enough for adult animals to jump over: 40" max and 38" encouraged. Although a 42" top has long been recommended for wildlife friendlier fence, research now shows a 40" top or lower notably reduces fence hazards for most species (see "How High" on p. 34.)

The distance between the top two wires should be no less than 12" apart. Deer and elk easily tangle their back legs if the top wires are closer together.

The bottom wire or rail should be high enough for pronghorn, mule deer, and especially juvenile ungulates to crawl under. We recommend a bottom wire or rail have at least an 18" gap above the ground, and 20" is better for an inflexible rail (Laskin 2020). Take advantage of small dips, swales, and gullies to provide a slightly larger gap below the fence and allow animals to pass under easily. Many cattle ranchers have found that although a small calf may slip under the higher bottom wire, they also can easily slip back to mom and not be stranded on the wrong side of the fence.

The Wildlife Friendlier Fence: A Livestock/Wildlife Compromise

These standards will control cattle in most situations and allow for easier wildlife passage. Fences should be low enough for adult animals to jump, high enough for wildlife to crawl under, and minimize the chance of tangling.

We recommend:

- **A top wire or rail preferably 38-40" above the ground.**
- **At least 12" between the top two wires.**
- **A bottom barbless wire at 18" or rail at 20" above the ground.**
- **Barbless wire or rail for the top, barbless wire on bottom.**
- **No vertical stays. If used, consider stiff wood, plastic, or composite stays. Do not allow stays to protrude above top or below bottom wire.**
- **Gates, drop-downs, or other passages where wildlife concentrate and cross.**

ALTHOUGH CALVES MAY SLIP UNDER A HIGHER BOTTOM WIRE, THEY ALSO CAN EASILY SLIP BACK AGAIN TO MOM AND NOT BE STRANDED.

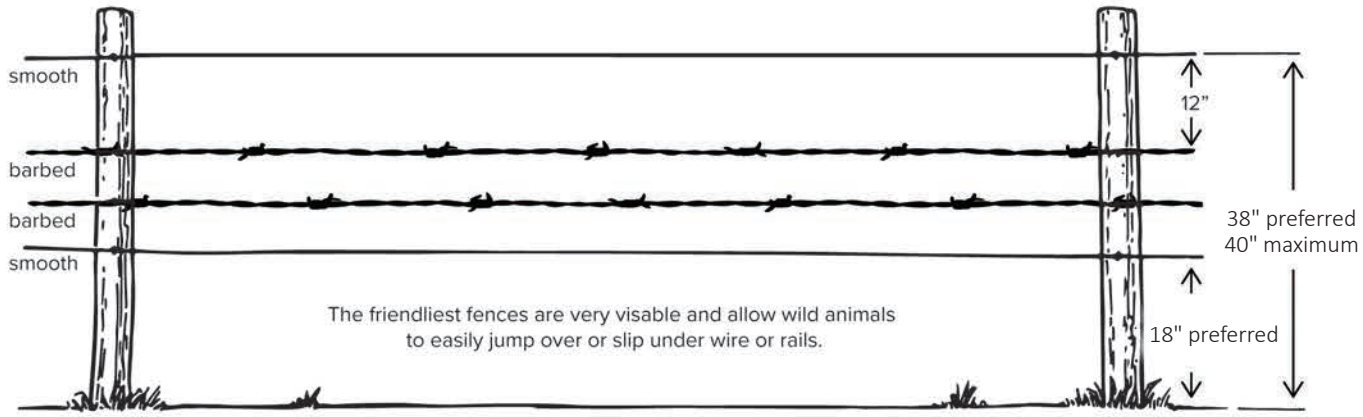
Increasing visibility using a top rail, high-visibility poly-tape, flagging, or other markers can help ungulates and birds better avoid or navigate fences. Using barbless wire (double-stranded twisted) wire for top and bottom strands also will increase visibility and prevent snagging and injuries.

Use electric tape or braid only for temporary applications. It should be removed or lowered to the ground when livestock are not present to prevent entanglement of horns or antlers.

In some situations, fence stays can help maintain distance between strands will also prevent snagging and injuries. However, stays can cause issues and should be used strictly where needed. Wire stays are easily bent over, collapsing the fence and creating a three-dimensional hazard, and need to be regularly maintained. An alternative is a stiff plastic or composite stay or fiberglass post that flexes but maintains its shape. Stays should not be used for drop fence (adjustable wire fence) but are needed for lay-down fence. If used, prevent stays from protruding above or below the wires, which can prevent wildlife from navigating a fence. In wildlife migration areas, drop-down fence, lay-down fence, or gates can be incorporated into fence sections for seasonal wildlife passage.

Sound husbandry practices go hand in hand with wildlife friendlier fences. Livestock that have good forage, water, and the security and companionship they want are much less likely to test or challenge fences.

A Friendlier Fence for Wildlife



Credit: WGFD.

Wildlife Friendlier Fence Considerations for Focal Wildlife Species

(Table adapted from Hamilton et al. 2023.)

Species	Top height	Top spacing	Bottom gap	Visibility elements	Notes
Mule deer	38-40”	12” (10” min)	18”		• Lower top wire is best. Drop top to 31” for females at known crossings. • Keep top two wires tight and well-spaced. • Barbless bottom wire. • Add gates to be left open seasonally.
Pronghorn	38-40”	12” (10” min)	18”		• Barbless bottom wire. • Add gates to be left open seasonally.
Elk	38-40”	12” (10” min)	18” min	Yes	• Lower top height is best. • Install top rail or other high visibility features in areas of high use or low visibility to reduce annual maintenance. • Top rail, top PVC should be done in long runs or elk will seek wire sections. • Highest bottom gap possible (≥20”) is best. • Barbless bottom wire.
Bighorn sheep	38-40”	12” (10” min)	18”		• 3-wire fence preferable. • Barbless bottom wire or all barbless.
Moose	38-40”	12” (10” min)	18”	Yes	• Install top rail or other high visibility features in areas of high use or low visibility, such as thick willows. • Lower fence height is better. • Barbless bottom wire. • Install highest possible bottom gap, >18” middle gap, or a 2-rail wildlife crossing for juveniles. • Leave gates open in spring for young calves.
Sage-grouse	N/A	N/A	N/A	Yes	• Install visibility elements such as fence markers. • Use wood posts where possible to increase visibility.

A friendlier wire fence with smooth bottom wire and 12” gap between top and second wires. Credit: Christine Paige.

This 4-wire wildlife-friendlier fence was installed within the Sublette Mule Deer Migration Corridor as part of the Upper Green Fence Initiative. Credit: Troy Fieseler, WGFD.

Partnerships in Action: Wyoming's Upper Green Fence Initiative

The Upper Green River Basin, centered around Sublette County, is renowned for world-class big game migrations and abundant sage-grouse populations. One of the threats impacting migratory ungulates and sage-grouse in the region is fencing that restricts crucial movements, poses risks of entanglement or collisions, and results in animal injury and mortality.

Conservation partners in Sublette County have a rich history of collaboration to achieve landscape-scale results across ownership boundaries. Since 2012, a coalition of private and agency partners have come together as the Upper Green Fence Initiative (UGFI) to address fence issues and enhance wildlife movement. Wyoming Game and Fish Department, Natural Resources Conservation Service, Sublette County Conservation District, The Nature Conservancy, Green River Valley Program of the Jackson Hole Land Trust, Bureau of Land Management, private landowners, and other agencies and non-governmental organizations have worked together to make over 700 miles of fence friendlier for wildlife across this sweeping landscape as of 2024.

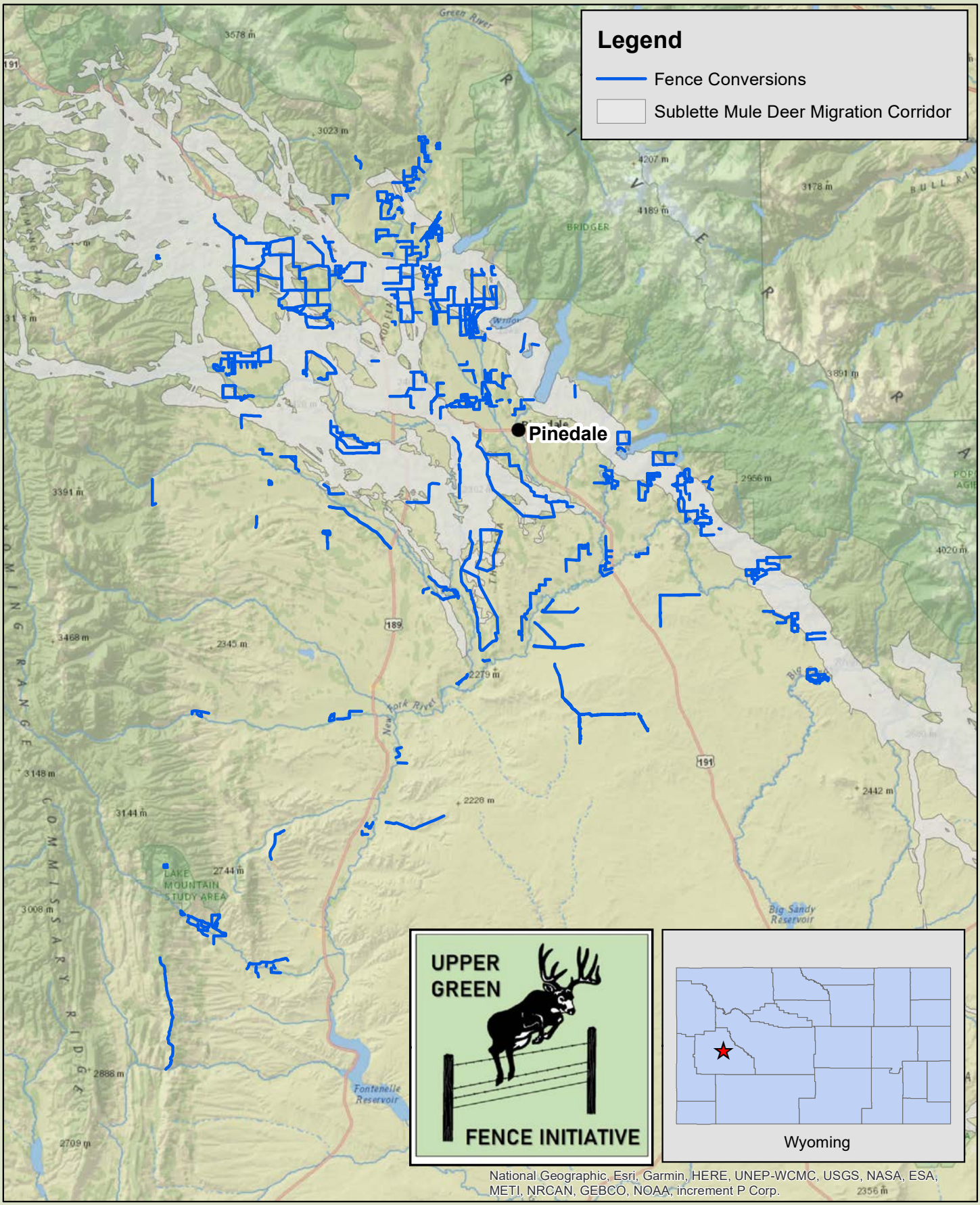
Targeting high-priority areas, the Fence Initiative has converted old fences to wildlife friendlier designs, removed unnecessary or harmful fences, and made simple modifications to existing fences to improve wildlife movements in crucial habitats. The initiative leverages each partner's technical and financial resources and capacities to identify problematic fences and improve fence permeability for wildlife while also meeting the needs of livestock producers.

UGFI partners contribute local knowledge and expertise, wildlife data, fundraising and grant writing, field staff and labor, and project funding to help private landowners improve priority fences. For example, Wyoming Game and Fish Department biologists provide data and expertise on wildlife corridors and wildlife friendly fence designs, conservation district partners secure and administer grants to help inventory fences, and NRCS conservationists help landowners design and fund necessary fence conversions or modifications. The initiative also developed a prioritization tool to rank inventoried fences and strategize when and where resources will be allocated annually.

"The formation of the initiative has been instrumental for implementing this fencing program at a landscape-level," explains Troy Fieseler, Terrestrial Habitat Biologist with Wyoming Game and Fish Department. "And these collaborative, on-the-ground projects have increased public awareness of the risks fences can pose to wildlife."

Keys to the Initiative's success are the dedication and motivation of the team, the unique roles each partner plays in providing technical expertise and funding, and the respect and trust they've built to address a common vision of healthy working landscapes in an area of great importance to migrating big game and sage-grouse.

Completed Wildlife-Friendly Fence Conversions
Pinedale Region



Credit: Upper Green Fence Initiative.

Visibility

Running animals and low-flying birds may not see a wire fence clearly against the landscape. Making a fence highly visible prevents collisions and can help animals judge the height of a fence for jumping.

One solution is a top rail placed no higher than 40" at the top. A rounded rail will shed snow more easily. Heavy snow buildup can sometimes deter elk and deer from crossing. For wire fences, an inexpensive modification is to slip small diameter, light weight PVC pipe over the top strand to increase visibility. Mule deer, white-tailed deer, and pronghorn are not deterred by PVC on top fence wires (Jones et al. 2020). PVC should be light enough that it does not cause wire to sag, increasing maintenance issues.

Smooth wire fences, especially high-tensile wire, may be essentially invisible to animals. These can be made more visible by adding fence markers. Barbless (double-stranded twisted wire) is more visible than a single wire strand. White wire is the most visible in summer, but black and white wire or tape makes the fence more visible against both summer vegetation and snow.

HIGH VISIBILITY HELPS ANIMALS AVOID AND NEGOTIATE FENCES. IT IS ESPECIALLY IMPORTANT IN GRASSLANDS AND NEAR CREEKS AND WETLANDS TO PROTECT LOW-FLYING BIRDS SUCH AS GROUSE, OWLS, AND SWANS. RAILS, PVC PIPE, FLAGGING, OR BLACK-AND-WHITE WIRE CAN ALL MAKE FENCES MORE VISIBLE.

Credit: Mark Gocke, WGFD.

Credit: WGFD; inset: Montana Fish, Wildlife and Parks.

Credit: WGFD.

Fence Flags for Grouse and Other Birds

Fence flags or markers dramatically increase visibility of wire fences for wildlife, especially birds, and help animals avoid and negotiate fences

Credit: Christine Paige.

Research on greater sage-grouse and other prairie grouse has shown that fence collisions are common and widespread, especially at sites where grouse congregate daily, including breeding areas called leks, winter sites where they consume alkaline soils called geophagy sites, and agricultural and riparian sites that attract grouse for water and food. Grouse fly fast and low into these areas, typically just before dawn and in late evening. In the low light, they are vulnerable to colliding with nearby fences.

Improving fence for visibility can reduce collisions by 57%-83% (Christiansen 2009; Stevens et al. 2012b, Van Lanen et al. 2017). A variety of markers clipped onto fence wires have been widely used to increase visibility and reduce collisions.

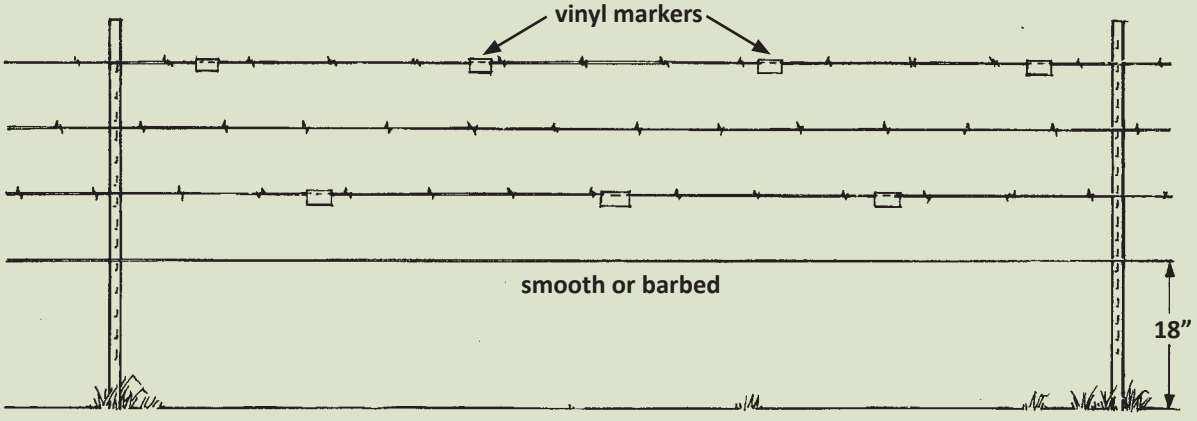
In addition, fences with steel t-posts are less visible than those with wood posts and are worse for grouse collisions. At a distance, steel t-posts seem to disappear against the landscape, where wood posts remain conspicuous. Research suggests wood post fences without markers are as effective at deterring birds as mixed t-post and wood post fences with markers, and adding markers to fences with wood posts further reduces collisions (Van Lanen 2017). When planning and constructing new fence in sage-grouse habitats, use wood posts if possible.

RESEARCH ON GREATER SAGE-GROUSE IN WYOMING, IDAHO, AND MONTANA HAS SHOWN THAT FENCE MARKERS CAN REDUCE FATAL FENCE COLLISIONS.

Not every mile of fence needs to be marked for grouse: prioritize areas of high sage-grouse use. Marking is most important where there are high densities of birds: within 1.2 miles of a lek, in wintering areas, and where grouse congregate to eat alkaline soil. In some areas, winter and breeding areas overlap, and grouse may be found in the same area several months of the year. Sage-grouse are also most vulnerable to collisions in open, flat, or rolling country, and in areas with more fences (>1.5 miles of fence per square mile; Stevens et al. 2012a, 2012b).

A relatively inexpensive and durable marking technique uses 3" flags cut from undersill or trim strips of vinyl siding.

Durable Markers on Wire Fence



Credit: Christine Paige.

The undersill siding has a lip that can be snapped onto barbed wire fence, with the barbs keeping the markers from sliding. [See box for DIY instructions.] Consider using both white and black fence markers to be visible against both vegetation and snow. Adding markers to both top and second wires can increase visibility.

Commercially produced fence markers also can be purchased in quantity through retail and online outlets, including grouse-style vinyl snap-on markers and dangling reflective diverters of various styles. For example, Pexco LLC sells a durable version in black and white made with rigid plastic and a reflective strip, available on their website.

While fence markers have proven to be effective, collisions may still occur where many factors of habitat use, fence density, and visibility are at play. Where monitoring shows continued high rates of grouse collisions, consider converting to an adjustable wire fence (see page 39) that can be lowered seasonally. Lowering the top wire may reduce most grouse collisions (BLM unpublished data). In many cases grouse concentration sites overlap with big game winter ranges and migration areas where drop wire fences can benefit multiple species.

DURABLE AND LIGHTWEIGHT FENCE MARKERS CAN BE CUT FROM STRIPS OF VINYL SIDING TRIM. THE TRIM STRIP HAS A LIP THAT SNAPS ONTO FENCE WIRES.

DIY Visibility Markers for Wire Fence

For barbed or woven wire fence:

- Use several 12’ strips of undersill or trim strips of white and black vinyl siding, available at home hardware centers. It has become standard to use both white and black markers for visibility in summer and winter.
- Cut strips to 3" pieces. Use tin snips for small projects or use a 10" miter saw with a 200-tooth blade to cut up to 16 pieces at a time for larger projects.
- One 12’ siding strip yields 48 pieces.
- For extra visibility, add reflective tape to both sides of the markers, which increases detection in low light. Use both black and white markers for visibility against snow and vegetation.
- Snap pieces onto fence wires – they are held in place between barbs. The Wyoming Game and Fish Department has found that for each section of fence a minimum of two pieces with reflective tape on the top wire is effective. You also can alternate four pieces of black and white markers on the top wire, or alternate markers on top and second wire.

For barbless wire fence:

- To keep the vinyl siding markers from sliding crimp a ferrule, twist a small spring, or tighten a UV-resistant zip- tie onto the wire on each side of the marker. Although this adds time to installation, it keeps the markers in place. Crimping the marker itself causes the marker to wear and break.
- An alternative is to make flags from reflective tape that can adhere to the wire. Note that reflective tape will conduct power on a hot wire.
- Some commercially made markers available online or in ranch supply outlets may work better on barbless wire.
- Place a minimum of two flags per 16' of fence on the top wire; or up to four on the top wire and three on the middle or bottom wire.

Credit: WGFD.

Sites with High or Continuous Livestock Use

Most livestock pastures do not require a 5- to 6-strand barbed wire fence. In many situations, a 3- or 4-strand barbed wire fence, combination of barbless and barbed wire, or electric fence will work well for livestock control, particularly if the pasture quality inside the fence is as good or better as outside the fence.

Virtual fence (see page 29), which allows livestock management across large, unfenced rangelands, is being tested and adopted by Wyoming stock growers. Virtual fence holds promise for herd management that is dynamic in space and time while reducing the need for fences and allowing free wildlife movement.

Tips for Livestock Fences

Sheep, bison, and cows with calves may require a more impermeable fence for control. If you must use fences with woven wire or more than four wires, follow these tips:

- **Consider the placement of the fence perimeter carefully and limit the extent of impermeable fence wherever possible.**
- **Avoid excluding wildlife from riparian habitats and water sources or cutting off migration and travel corridors.**
- **Keep fence height to 40" (38” preferred).**
- **Create periodic underpasses by raising the bottom to 18" or greater from the ground, placed where animals typically travel.**
- **Avoid topping woven wire fences with barbed wire, the most hazardous design for wildlife. In any situation, allow 12" between the top wire and the next wire below -- whether barbless, barbed, or woven wire.**
- **Create seasonal openings by leaving gates open, lowering rails or wires, or using lay-down fence sections when livestock are not present.**

Create seasonal openings by leaving a gate open, lowering rails or wires, or using sections of lay-down fence during months when livestock are not present. Credit: Mark Gocke, WGFD.

4-Strand Barbed Wire for Cattle or Sheep

Woven wire fence, the most common type of fence on sheep range, is also the most problematic for wildlife. It can block wildlife passage, particularly for fawns, calves, pronghorn, and medium-sized animals unable to jump fences. When combined with barbed wire, it has the highest rate of entanglements for wildlife.

An alternative for sheep and cattle range is a 4-strand barbed wire fence that controls livestock but still allows passage for wildlife. For cattle, use a wire spacing of 18–22–28–40." The top wire should be 40" or less. Allow 12" between the top two wires and 18" between the bottom wire and the ground. Use a barbless (double-stranded twisted) bottom wire.

In situations with less livestock pressure, a fence with barbless (double-stranded twisted) wire on both top and bottom and barbed center wires can still effectively contain livestock but allow for easier wildlife passage.

Sheep are more easily managed with a low fence, blocking wildlife from crawling under it. However, a 4-strand fence for sheep can have a top wire of 32" high, which is low enough for most adult ungulates to jump. Spacing should be 10"-16"-22"-32." Allow at least 10" between the top two wires. For the bottom wire, use double-stranded smooth wire at least 10" above the ground.

When livestock aren't present, secure gates open and create bottom gaps by raising the bottom wire with quick links or fence clips.

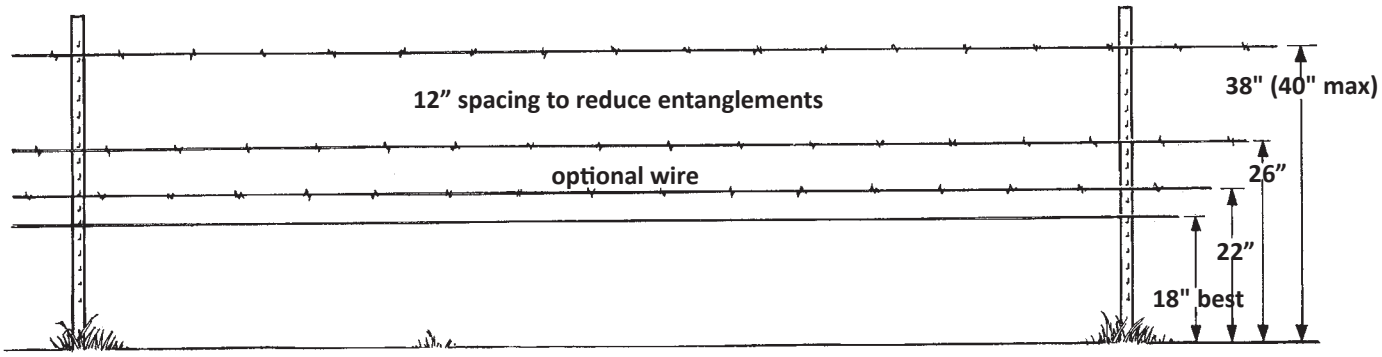
A bottom barbless wire at least 18" from the ground aids passage for pronghorn and other wildlife. Credit: WGFD.

Recommended wire heights above the ground

	Cattle	Sheep	Sheep & Cattle
Top wire	38" (max 40") barbed	32" barbed	38" (max 40") barbed
2nd wire	26" barbed	22" barbed	26" barbed
3rd wire	22" barbed	16" barbed	18" barbed
4th wire	18" barbless	10" barbless	10" barbless

Mule deer take advantage of a wildlife friendlier fence. Given at least 18" of bottom clearance, mule deer females, juveniles and even young males prefer to slip under a fence. Credit: Wyoming Migration Initiative.

3- to 4- strand Wire Fence with Bottom Smooth Wire for Cattle



Jeff Boardman has worked with the NRCS on several projects to make his ranch more productive for livestock and wildlife. Credit: Shana Marie of Shana Marie Moments Photography.

Better Fences Save Time, Money, and Wildlife on the Little Powder River

Jeff Boardman runs a cow-calf and yearling operation on the high plains near Gillette, Wyoming. His ranch lies along the Little Powder River about 25 miles south of Montana. He took over the century-old ranch in 2015, working the land his father and grandfather managed before him. To keep his prairie healthy, Boardman has partnered with the USDA Natural Resources Conservation Service (NRCS) on projects that improve soil, water, and wildlife habitat. Boardman views NRCS staff as "a real asset" for making ranches more productive and profitable. "I ask them questions about grass and land management all the time," Boardman said.

Eastern Wyoming's wide-open grasslands offer valuable forage for livestock. This shortgrass prairie also provides food for migrating herds of pronghorn, elk, and mule deer. Unfortunately, deer or pronghorn sometimes get "twisted up" and die in Boardman's barbed wire fences. "I've had to fix a lot of broken wires. And I feel bad for the animals, too," Boardman said.

With help from the NRCS Environmental Quality Incentives Program (EQIP), Boardman recently replaced a few of the aging five-strand barbed wire fences with wildlife-friendly designs.

"These new fences are less maintenance," said Tim Kellogg, NRCS District Conservationist in the Gillette Field Office, who works with Boardman. Kellogg said most producers in the area spend an average of two weeks each spring fixing fences that have been destroyed by wildlife. That maintenance time gets cut down to two days after installing wildlife-friendly fencing. "Everybody who's built them really likes them. They rave about how well they work," Kellogg said

Boardman is a fan. Although he thought the wildlife friendly fence design was "kind of goofy looking at first," he's been impressed with how well they hold in his cattle. He plans to use the same design when replacing more fences on his ranch in the coming year.

In Wyoming, NRCS offers landowners an incentive payment through EQIP that covers approximately 75% of the estimated cost of installing a new wildlife-friendly fence. This program, launched in 2017, is popular with producers. "Most fences in this area went in in the 1920s and need an upgrade," Kellogg said. "We had 16 fence modification applications come in this year in Gillette."

Taking a cue from the success of projects like Boardman's, USDA is expanding its investment in replacing old fences to benefit landowners and wildlife alike. More Farm Bill dollars are being committed to improve wildlife migration corridors through the Migratory Big Game Initiative (MBGI), an initiative through the Working Lands for Wildlife umbrella of NRCS. Kellogg said the goal is to scale up the Wyoming model to other states where migrating wildlife roam across private farms and ranches. "There's a need to replace old fences west wide, and in the east and southeast, too," Kellogg said.

Boardman agrees wholeheartedly, "It's more important than ever that wildlife are able to move, especially with droughts and weather getting more extreme."

In addition to wildlife friendly fencing, Boardman has tapped into EQIP to plant cover crops, switch to no-till practices, and install stock water tanks and riparian fencing so his cows can use upland pastures. The suite of conservation practices Boardman has put in place on his ranch not only maximizes precious water and protect wildlife but also saves him time and money. "We have good feed for livestock and we're helping bring the ecosystem back in balance," Boardman said. To learn more about available programs, contact your local USDA-NRCS Service Center or the NRCS Wyoming State Office.

Written by Brianna Randall. This story first appeared in NRCS Working Lands for Wildlife, Nov 18, 2022. It is reprinted with permission and was edited for length.

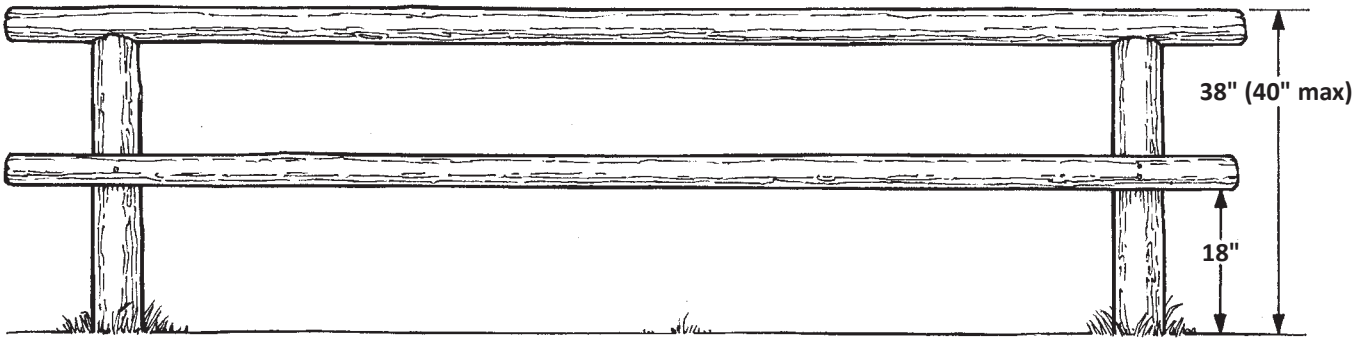
Credit: Tim Kellogg, Wyoming NRCS.

Post and Pole Fence

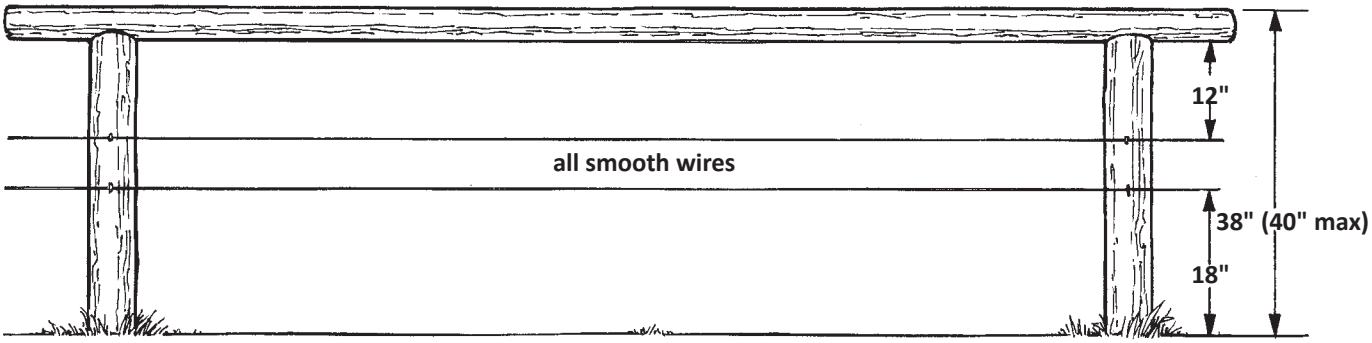
A post and pole fence is highly visible to wildlife and can be constructed for situations with or without livestock. Rail fences can use a top pole with wires below or two to three horizontal rails total. For wildlife, a fence with two horizontal rails is preferable to three.

Rounded poles shed snow better than square or split rails. Unless the fence is quite low, use rounded poles for the top to prevent snow build-up, which can deter elk and deer and speed rotting. Using flat boards or planks as horizontal rails creates more visual barrier and is not recommended.

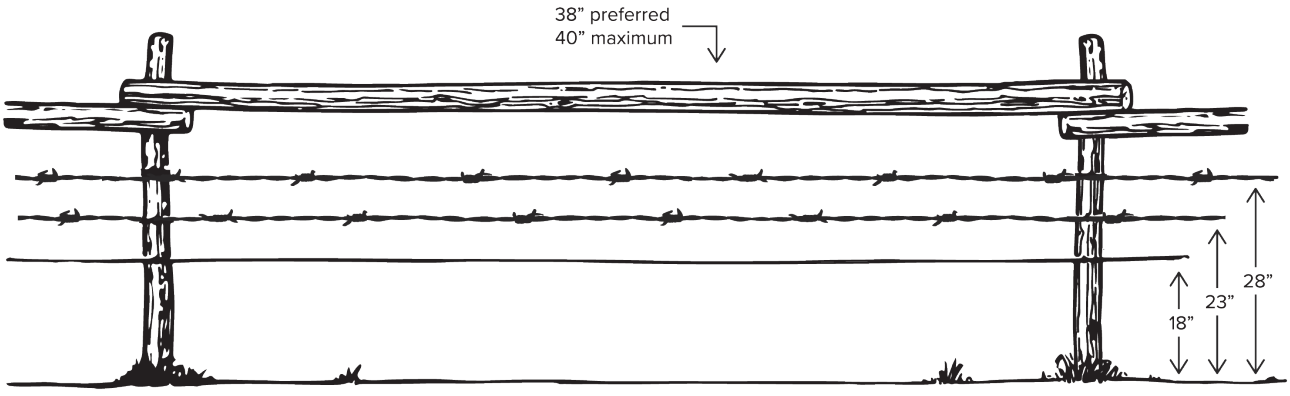
2-Rail Post and Pole Fence



Top Pole and Barbless Wire Fence



Top Pole and Barbless and Smooth Wires



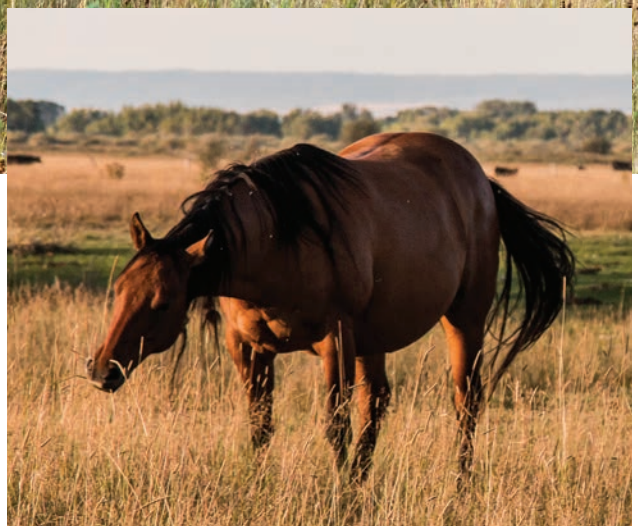
Rail fences are safer for both horses and wildlife—a top pole combined with barbless wire will contain most horses. Credit: Christine Paige.

Horse Pastures

A wide variety of fences can be used to contain horses, including post and pole, pipe, barbless (double-stranded twisted) wire, vinyl, or electric poly-rope fence. Consider safety when choosing a fence style. Horses have difficulty seeing wire fences, and if spooked can tangle in wires or suffer injuries on barbs or smooth high-tensile wire. Post and pole, pipe, vinyl, and electric poly-rope fences are much more visible to horses and wildlife and reduce the risk of injury.

Horses can break worn boards and weak rails, and nails are a hazard as a fence wears. Wood fences should be constructed with treated rails and posts using construction lag screws or bolts. If bolts are used, cut off the excess to prevent injury.

If electric fence is an option, a 2-strand electric braided poly-rope fence is highly visible and allows animals to bounce off the fence without injury to themselves or the fence. Nearly any standard fence also can be electrified with a single wire to prevent horses from touching or leaning over the fence — use electric braid or tape for visibility. Temporary pastures can be enclosed with a single strand of electric tape or braid.



Credit: Christine Paige.

The usual wildlife friendly standards apply. Place the top of the fence no higher than 40," which is adequate to contain nearly all horse breeds in most pasture situations. Allow 12" between the top two wires or a minimum 10" between a top rail and next wire. Allow a clearance of at least 18" from the ground to the bottom wire, rail, or pipe for wildlife to crawl underneath.

3-Wire High-tensile Electric Fence

A flexible 3-wire high-tensile fence with a hot–ground–hot configuration is effective for containing cattle and bison, and allows elk, mule deer and pronghorn to traverse the fence. Wild ungulates are usually not deterred by electric fence even with charges ranging from 0.5-4.5 joules, perhaps because of the insulating properties of their hair. Although wild ungulates are occasionally shocked when they nose or bite a wire, or touch hot and grounded wires together, most animals readily negotiate this style of high-tensile fence.

This 3-wire fence has been shown to contain bulls separated from cows coming into estrus, and calves from cows in the fall. It has also been shown to be as effective for containing bison as a 4-wire fence. This design with spacing at 22”–32”–40” above the ground is readily navigated by pronghorn and other wildlife. A 2-wire high-tensile fence can be used for areas without weaning calves (Karhu and Anderson 2003, 2006, Quitmeyer et al. 2004).

High-tensile fences require proper construction techniques including adequate braces, proper tensioning, care not to kink or break wire, and proper attachments and insulators for line posts and braces. The flexibility of the fence is key to allowing wildlife to pass over and through the fence. Fiberglass posts are used for all line posts, and wooden posts are used only for braces, direction changes and gates.

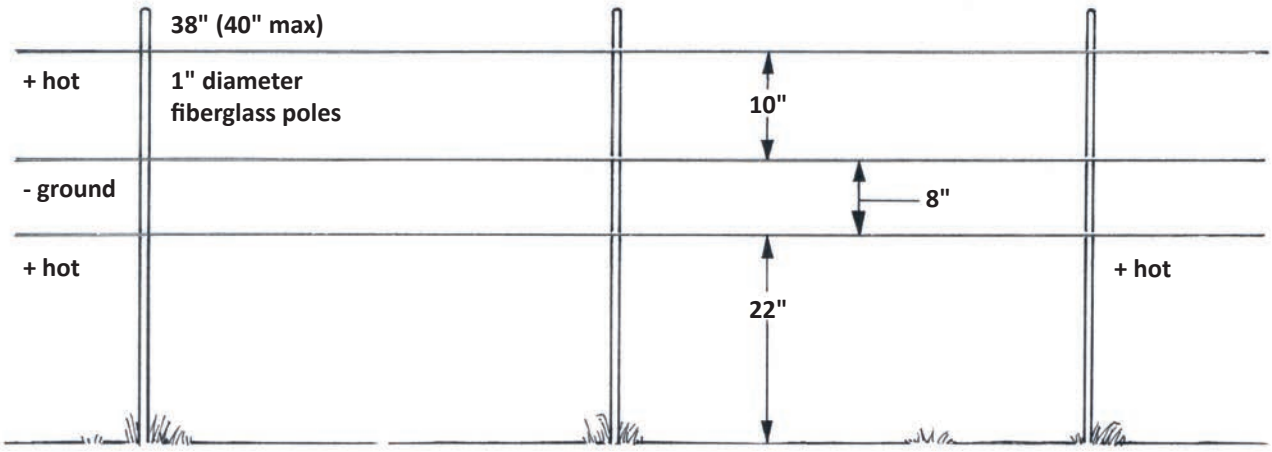
High-tensile fences need minimal maintenance, provide great strength, can be easily electrified, and will outlast most other fences. For technical details, see the Natural Resources Conservation Service specifications for permanent power fence (NRCS 2017).

Note that smooth high-tensile wire can be difficult for animals to see. Adding markers or survey flagging to the top wire can help. Many styles of visibility markers and diverters are available commercially.

Keeping the fence powered prevents wildlife from leaning into it. If power is off, consider laying the fence flat to the ground if it will not create an entanglement hazard.

A 3-wire high-tensile electric fence is effective for separating bulls from cows in estrus and for containing bison. Using high tensile wire at the proper tension is key to prevent wildlife damage. *Credit Rory Karhu.*

3-Wire High-tensile Electric Fence

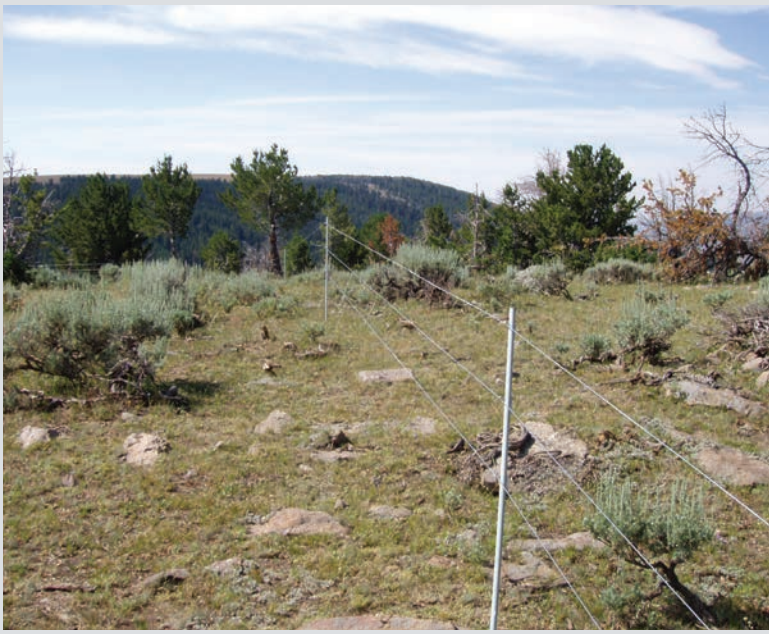


This flexible 3-wire high-tensile fence contains cattle, bison, and horses, but allows big game to easily pass.

3-Wire High-tensile Electric Fence

Maintaining fence flexibility is key to allowing wildlife to traverse the fence

- **Use fiberglass line posts no greater than 1" in diameter.**
- **Brace fence with wood posts at least 5" in diameter. Brace all corners, gates, and direction changes greater than 15 degrees. Appropriate insulators are needed with wooden posts.**
- **Space line posts 45' to 60' apart and do not use stays. Fence stays make it harder for wildlife to pass between the wires and may cause the fence to flip.**
- **Smooth, 12.5-gauge, Class III galvanized wire with a tensile strength of 170,000 PSI and breaking strength of 1308 lbs. is adequate.**
- **Increase visibility by using flagging, fence markers or high tensile wire coated for visibility.**
- **Top wire is hot; second wire is grounded; bottom wire is hot.**
- **Space wires at 22”–32”–38” from the ground. The top wire should be no higher than 40" with 10" between the top two wires. The 10" spacing is necessary for cattle to contact both hot and ground wires but poses little hazard for wildlife due to the fence's flexibility. A bottom wire at 22" allows both young and adult wild animals to pass under easily. The fiberglass posts are predrilled with the 22”–32”–38” spacing.**
- **Connect wires to posts with metal clips or fasteners designed for electric fences. Use porcelain insulators on wooden braces.**
- **Tighten wires to 150-pound tension. If too tight, the wires are more likely to break. Although high-tensile wire has a high breaking point, it is also more brittle and easily broken if tightly bent or kinked.**
- **Place energizer according to manufacturer recommendations.**
- **Ground fence properly according to the energizer instructions, and add extra rods as needed. Locate ground rods at fence ends and intermittently in between.**
- **Ground rods are relatively cheap and extra rods will ensure the fence will be effective.**
- **When livestock aren't present, either drop the wires flat to the ground or keep the fence electrified to prevent wildlife damage. Keeping the fence powered also can prevent the battery from freezing and prolong battery life.**
- **Securely attach electric fence warning signs intermittently along the fence and at crossing points.**



Credit Rory Karbu.

Bison Fence

Fence security for bison and fence permeability for wildlife are important considerations when grazing bison. Sound husbandry practices that provide bison with healthy range, water access, and space to move while allowing for effective grassland rest periods all factor into fence design and placement. Content bison are less likely to push or test fences.

A bison perimeter fence that allows some wildlife crossing can be constructed with five smooth, taut wires and in-line spring tensioners. Wire placement should be 18”–30”–40”–50”–60.” Place the top three wires at 10” intervals and allow 12” between the bottom and second-to-bottom wires. Install spring tensioners on the top, bottom, and second-to-bottom wires to allow the wires to give if wildlife push through or attempt to jump over. Electrifying the third (middle) wire adds security for bison. Build in lay-down fence clips so wires can be lowered when bison aren’t present. (Gates 2006).

A 5-wire drift fence with 20” bottom wire, 60” top and 10”–12” between wires adequately deflected reintroduced bison (Laskin et al 2020). To make this design a dynamic fence that can be adjusted for seasonal wildlife crossing, install wires using lay-down fence clips. Lowering the top two wires to 40” and bottom wire up to 30” creates a fence that is permeable to most wildlife species. The fence can remain modified for wildlife until bison presence is high (Laskin et al. 2020).

An alternative fence design for low-pressure areas is to add an electric wire to a standard wildlife friendlier fence. Wire spacing should be: 18-20” barbless (double-stranded twisted) bottom wire, 24” barbed wire, 30” high-tensile electric wire, 42” barbed top wire. This design increases permeability for wildlife, especially pronghorn, mule deer, and juveniles (Segar and Keane 2020).

Electrified high-tensile smooth wire can adequately contain bison in internal pastures. Use an energizer adequate for the length of the fence and check the voltage regularly. Bison must be trained to electric fence in a secure pasture for one to two weeks before being moved to larger pastures. Bison calves can be conditioned during weaning. See pages 22-23 for high-tensile fence specifications.

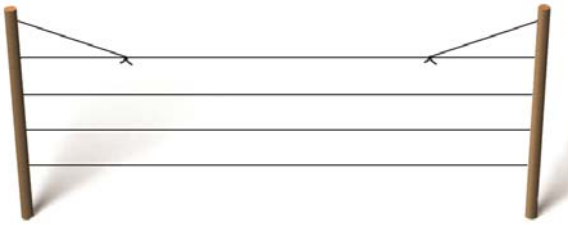
For impermeable bison fence, provide wildlife crossing structures at frequent intervals (e.g., each ¼ mile), at known crossings, along movement corridors, and near water. To install a 3-rail wildlife jump in 60” bison fence, place the top rail at 54”-56”, bottom rail at 18”-22” and allow at least 12” between the bottom and center rail. Bison can easily jump anything lower, but most adult elk and moose can clear the top rail, and younger animals can crawl under or through (Gates 2006).

A 4-rail jump with removable top rail also is effective for seasonal big game passage in bison fence. This style can be welded with steel pipe. Install the lower three rails at 18”–30”–40” measuring from the bottom of each rail. The top is installed at 60” and drops onto 1.5” pipe sleeves welded to the steel posts. A cradle with pin or 6” spike keeps the top rail in place. The top rail can then be removed for wildlife when bison aren’t present. This style of crossing was tested by the Wyoming Game and Fish Department and found to be effective for deer, elk, and moose (WGFD 2022).

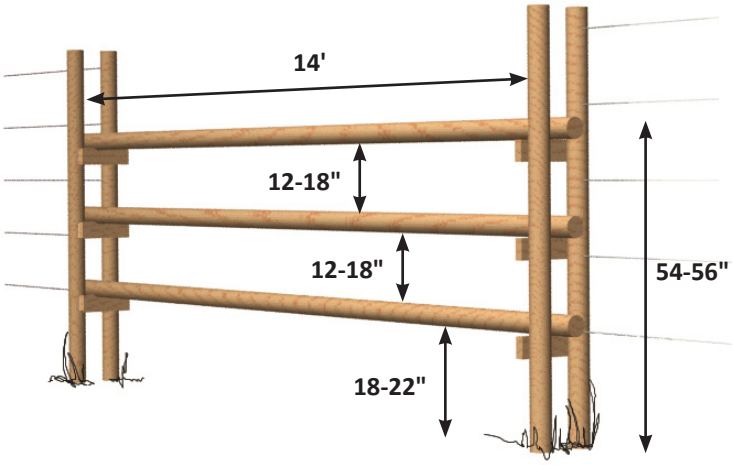
Credit: Christine Paige.

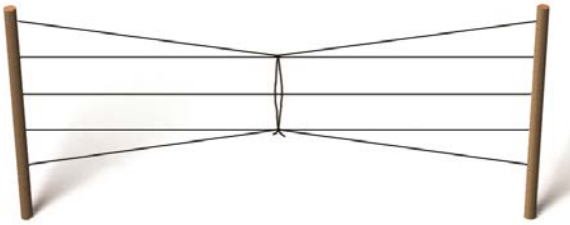
Wyoming Game and Fish Department tested wildlife jumps in bison fence near Bondurant. The jumps were built with welded pipes at 16-18," 30," and 40" with a removable top rail at 60." During spring and fall migrations, the top rail is removed, making passage easier for elk, deer, and moose while still containing bison and excluding nearby cattle. Credit: WGFD.

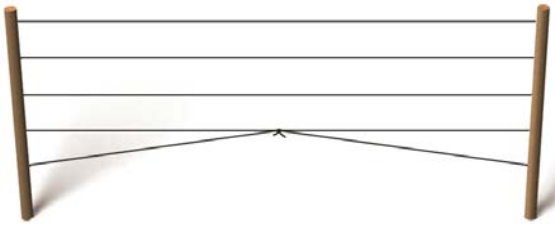
A 5-wire fence for bison with smooth wire and spring tensioners to ease wildlife passage.



Permanent jump rails for big game in bison fence.







Illustrations from Gates 2006 used with permission of the author.

Sites with Low or Seasonal Livestock Use

Not all situations require a 5-strand barbed wire or a woven wire fence

Many sites with low or seasonal livestock use can be fenced with a 3-strand barbless wire fence, various types of post and rail fences, or moveable electric fence. Seasonal pastures, cross fences dividing pastures, and horse pasture fences lend themselves to designs that are much more permeable for wildlife.

3-strand barbless wire fence

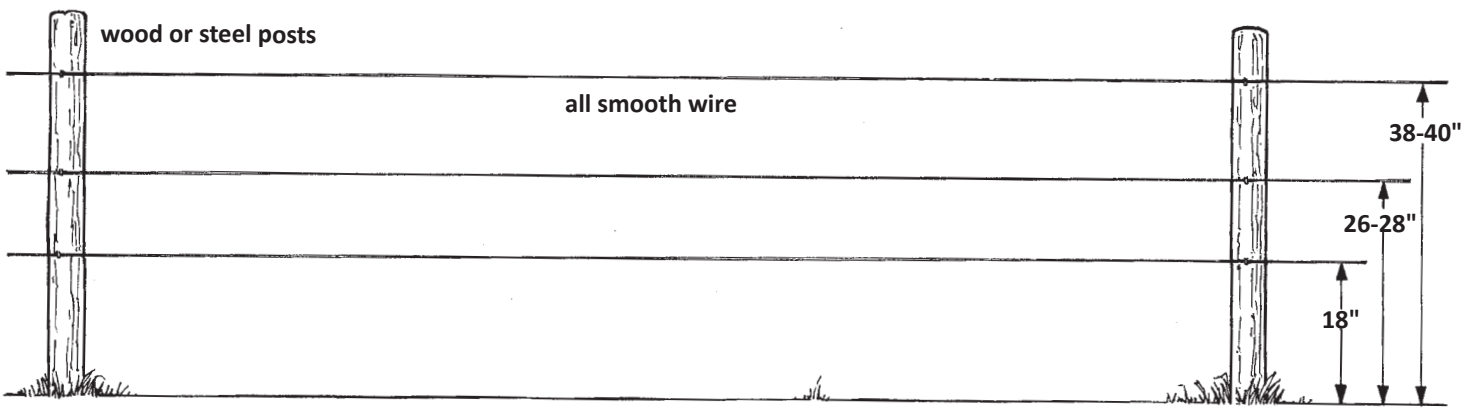
Use 3 strands of barbless wire set at 18” bottom, no more than 40" top and 12” between the top and middle wire. Use barbless double-stranded smooth wire, which is safer and more durable than single-strand smooth wire. High-tensile wire should only be used for electrified applications. High-tensile can be difficult for animals to see, horses can sometimes be cut by high-tensile wire, and it is brittle in cold temperatures.

3-Strand Smooth Wire Fence

- **Top wire 38-40."**
- **Center wire: maintain 12" spacing with the top wire.**
- **Bottom wire 18" above the ground.**
- **Preferably, no vertical stays.**
- **Wood or steel posts intervals appropriate for terrain.**
- **Use barbless (double-stranded twisted) wire on the bottom.**

Adjacent to bighorn sheep winter range, this smooth wire fence replaced old 4- and 5-strand barbed wire fence. The fence is 3-strand smooth wire with a 39" top wire and 18" bottom wire. Bighorn sheep readily hop over and duck under the fence. Note, we now recommend avoiding wire stays. *Credit: Christine Paige; inset: Paul Jones.*

3-Strand Smooth Wire Fence



A temporary electric fence used to manage forage and protect sensitive areas is easily crossed by wildlife. Credit: Lindsay Wood.

Moveable Electric Wire Fence

Moveable electric fence can be used for short-duration grazing, to keep livestock out of sensitive areas such as wetlands, or for other situations where livestock need to be temporarily controlled. This fence works well for livestock that have been previously trained to electric fence.

The design can be tailored to your situation, but a simple fence can be constructed using high visibility tape or "turbo wire" and fiberglass posts or plastic-insulated steel posts. A moveable fence can use either a single hot wire (when there is sufficient moisture for an adequate ground) or two wires, the top one hot, the lower wire grounded. Moveable posts on the market include designs with hooked or pigtail tops for quickly stringing wire, and a tread-in base. These can be rapidly set up and moved as needed.

Moveable Electric Wire Fence

- **Use 40-42" fiberglass or plastic-insulated steel posts, designed with hooks or loops for wire and tread-in spikes at the base.**
- **Place one to two strands of high-visibility tape or polymer-covered turbo wire. If two wires, the top should be hot, the lower wire grounded. Top wire should be no higher than 40"; bottom wire no lower than 18."**
- **Use a solar electric energizer. Size and placement depend on the run length of fence.**

Tips on Electric Fences

Most electric fence problems are caused by poor grounding or over-tightening wires. Be cautious tensioning wires. If stretched too tight, tensile strength is reduced and wires become brittle. Follow the manufacturer's specifications for grounding the energizer and fence for your fence type and conditions.

The number of ground rods needed may vary; a maximum reading of 0.2kv on a voltmeter in dry conditions indicates an adequate ground. Wooden and steel fence posts require insulators for attaching hot wires; ground wires can be stapled or clipped on directly. Fiberglass and plastic line posts do not need insulators but do require special clips for attaching wires. Check the fence regularly to be sure it is charged.

Portable Electric Fence

Portable solar fence allows ranchers to customize their grazing systems, and such systems can be more economical than permanent fence. Electric fence components are available at local ranch supply stores.

Range Ward produces solar-powered trailer systems that can carry and supply a half mile to 2 miles of power fence for flexible management of livestock and forage. The Razer Grazer and Power Grazer trailer systems can operate in many types of terrain and allow managers to quickly deploy, roll up, and move temporary electric fence.

These trailers include a solar panel for remote use, a deep-cycle battery, reels with braided turbo rope, and pigtail posts. Range Ward's original Razer Grazer carries a half-mile of single-strand fence. The Power Grazer carries 1 mile of single-strand fence, or 2 miles with an extra reel and posts. Two new models of Razer Grazer allow deployment of 4-strand electric fence for sheep, or 2-strand electric fence for bison. The trailers can be towed with a pickup or ATV, allowing quick deployment. It takes about an hour for one person to put up or take down a mile of fence.

The 1/4" rope is reflective and has two copper wires braided in for conductivity. It is easily seen by wildlife and will withstand 1,300 pounds of force before breaking. Deer, elk, and other ungulates easily pass over or under, and raptors can't perch on the rope or pigtail posts.

These trailer systems are particularly useful in large landscapes, remote areas, and rugged terrain. The trailers allow flexibility in deploying fence for a wide range of uses, from managing cattle grazing time and grass rest periods, to fencing out livestock from sensitive habitats or reclamation sites. They can replace permanent interior fences for more dynamic management of grass and habitats.

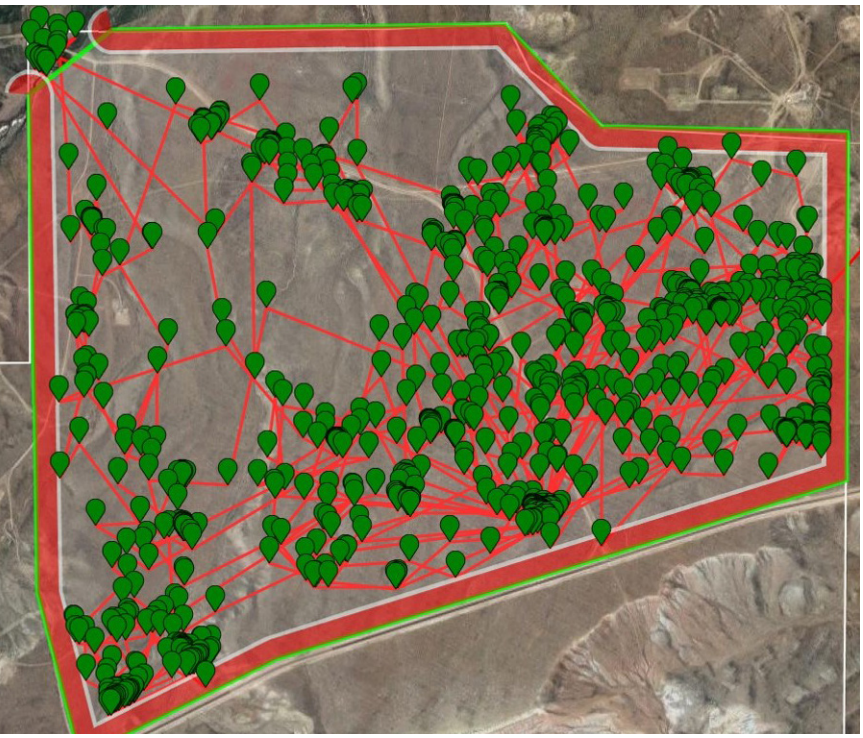
This commercially available solar trailer system by Range Ward can quickly deploy electric fence for flexible forage management. Credit: Norm Ward, Range Ward.

Virtual Fence: The Future is Here

Virtual fencing allows ranchers to control livestock distribution across rangelands without physical fences, and many Wyoming producers are testing and adopting this new technology.

Livestock wear collars with GPS (global positioning system) tracking that communicates with a base station. The base station is linked by cellular network to the user's tablet or smartphone. Dedicated mapping software allows the user to define virtual fence boundaries. As livestock approach the virtual fence boundaries, the collar emits a series of beeps, and if they cross the virtual fence line, they receive a benign shock, much like a dog e-collar. Animals do not receive a shock if they stop or return across the fence line. Cattle quickly learn to respond to the cues, and studies show success with sheep and goats as well. (Boyd et al. 2022, Goliński et al. 2022).

Virtual fence can be dynamic in space and time providing great flexibility in managing rangeland resources. The system tracks livestock locations in real time and allows the user to adapt virtual fence lines to changing conditions. Virtual fence can deter livestock from sensitive areas, such as riparian habitats, burned areas, grouse leks, or topographic traps (Campbell et al. 2020, Boyd et al. 2022). Fence lines can be altered as needed for grazing management and used to herd animals at their own pace (Campbell et al. 2021). Because collars provide exact location of animals, managers can respond quickly when issues arise. Physical and behavioral measures of acute and chronic stress in cattle have shown no welfare issues using virtual fence (Lee and Campbell 2021, Sonne et al. 2022).



This map shows the locations of a single collared cow remaining within the virtual fence line. *Credit: Sublette County Conservation District.*

Although the technology is still evolving, adoption of virtual fence is quickly spreading. The initial cost of equipment is high, though less than the initial cost of building or replacing. The system requires an investment of time to train both users and livestock, as well as direct handling of animals to install collars. Issues such as collar fit and loss, collar safety, battery life, individual animals indifferent to the cues, and deployment logistics continue to be tested.

Several virtual fence companies operate around the globe. As of this writing, Vence Corp (a subsidiary of Merck Animal Health) is the primary virtual fence supplier in the U.S. and has deployed pilot systems on small- and large-scale operations (Goliński et al. 2022). Gallagher is introducing its eShepherd system to North America and other companies, such as Halter and Corral Technologies, are developing and expanding their systems as well. Technical assistance varies by region across Wyoming. Ranchers interested in virtual fence can reach out to their local WGFD habitat biologist, conservation district, or the University of Wyoming Extension.

Virtual fence is not appropriate for boundary fence, corrals, or to keep livestock out of crop fields, but it can largely replace interior pasture fence and drift fences. It has promising applications for leased grazing on public lands as well, allowing the removal of deteriorating allotment fences.

Cattle equipped with tracking collars quickly learn to respond to cues: an audible tone when they approach a virtual fence line and a small shock if they cross. Credit: Monte Reed.

Testing Virtual Fence on the Reed Ranch

Dating to 1947, the Reed Ranch lies adjacent to Thunder Basin National Grassland in north central Wyoming. Elk, mule deer, pronghorn, sage-grouse, and other native prairie wildlife abound in the region. The ranch produces natural grass-fed beef and natural lamb, grazing both cows and sheep with practices that support the quality and diversity of native plants and wildlife. In 2017, the ranch was certified as an Audubon Bird Friendly Ranch, reflecting the family's commitment to habitat management, sustainability, and welfare of their animals.

Over the past three years, the Reeds have partnered with researchers from University of Wyoming, the USDA Agricultural Research Service (ARS) and Thunder Basin Grasslands Prairie Ecosystem Association (TBGPA) to test virtual fence. Across part of the ranch, pastures are divided by semi-permanent electric fence: two strands of double-stranded twisted wire with composite posts. These fences work well for summer grazing rotations, and some are dropped for winter sheep grazing and in case of drifting during storms. At 30" high, they are also wildlife friendly.

But even semi-permanent fences can be problematic in some pastures. The research program gave the Reeds the chance to use virtual fence where their pastures are bisected by county or oil-field roads, in grassland grazing permits where gates are sometimes left open, permits where electric fence isn't permitted, areas where elk habitually knock down fences, or where they want more immediate control over forage management.

"With virtual fence, we move cows every ten days during parts of the grazing season," explains Monte Reed. "We take down one virtual fence, put one up on the other side, and the cows move themselves. We can rotate graze pastures, control the time and timing when cows will graze a particular spot, and better utilize all the AUMs on permit land."

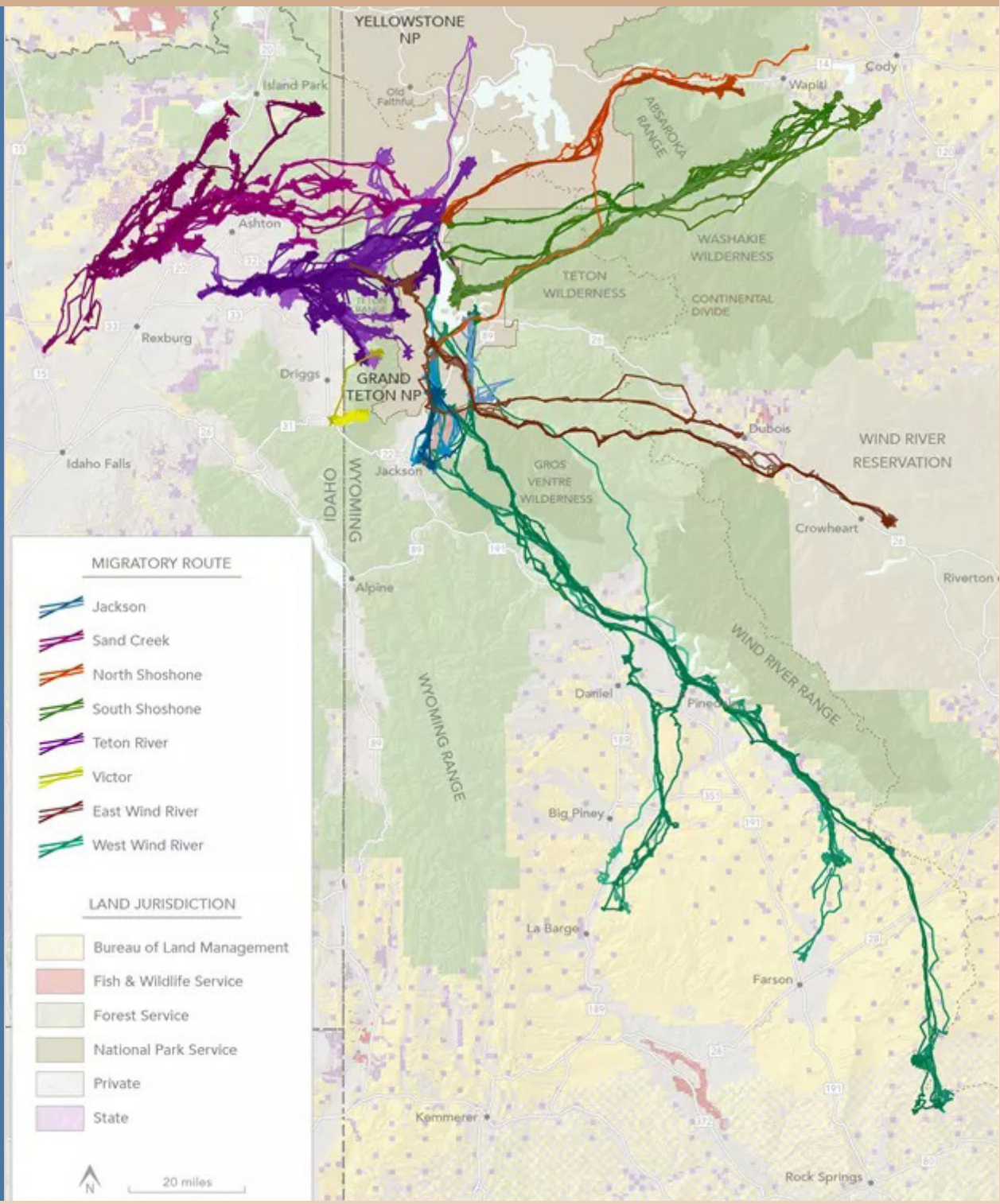
Credit: Sublette County Conservation District.

With virtual fence technology still evolving, the Reed's experience hasn't been without issues. Collaring their 150-cow herd requires time and labor, and battery failure sometimes requires re-collaring mid-season. Signal error can cause virtual fence lines and cow locations to be inaccurate, and up to 10% of their collared cattle either don't listen to the collar beep, drop their collar, or experience some malfunction. Once the research project has ended, the Reeds will evaluate whether the cost of collar rental and base station pencils out to be economical for their operation.

"We manage our grazing to help the grass and produce more good grass," says Reed. "Virtual fence is the next step—the same grazing management but a new tool. We're getting the bugs worked out. It's a nice tool to have—very viable in certain situations."

EVOLVING
Science

Credit: Christine Paige.



Wyoming's ungulates depend on private and public lands throughout the year, often travelling vast distances during migration and contending with many barriers. For example, these mule deer herds that summer in Grand Teton National Park cross a mosaic of land ownerships as they surf spring's green wave and return to lower country to evade deep winter snows. Credit: Grand Teton National Park

Evolving Science

The growing field of fence ecology seeks to better understand how wild and domestic species interact with fences and develop practical solutions that benefit wildlife, ecosystems, and people.

How much fence?

Simply knowing where fences are, their types, and condition is a basic tool for management. The extent of fence can far exceed roads (Jakes et al. 2018b). However, because so much fencing crisscrosses landscapes and fences vary widely in design and condition, mapping and inventories are labor intensive.

Models based on land ownership and other factors can help estimate how much fence occurs on a landscape. One analysis conservatively estimated that at least 620,000 miles of fencing lace the rural lands of the western United States (McInturff et al. 2020). Regional assessments suggest the total could be much higher. In Montana, at least 164,000 miles of fencing exists in 13 northern counties (Poor et al. 2014), and more than 55,500 miles in two southwestern counties (Buzzard et al. 2022). In the Greater Yellowstone Ecosystem, at least 10,000 miles of fence exist in elk winter ranges (Gigliotti et al. 2022).

The density of fence varies widely across western rural lands, for example from 1.5 to 24 miles of fence per square mile in several rural Montana counties (Buzzard 2022, Poor 2014). As one would expect, high densities occur around developed communities, roads, and railroads. But there are also hotspots of high fence density that stand out in regions remote from human development, including areas of eastern Wyoming. Such areas may be especially important for projects that enhance wildlife movement (McInturff et al. 2022).

Daily and seasonal movements and behavior

Many ungulate populations include resident, short-distance, and long-distance migrants, with each strategy providing different trade-offs for survival. Migration pathways and stopover habitats are now understood as a third seasonal range of critical foraging habitat. In spring, ungulates move in sync with greening vegetation, also known as surfing the green wave (Aikens et al. 2018, Jakes et al. 2018a), which gives them a boost in fat gain and survival. Each new generation learns migration routes and local timing of the green wave from their elders. This social learning is critical for many species. Once broken it can be permanently lost (Jesmer et al. 2018, Middleton et al. 2018, Sawyer et al. 2016).

Migrating animals encounter human developments, roads, and fences, all of which pose crossing challenges and alter behavior (Jakes et al. 2020). Fences act as semi-permeable barriers and can restrict wildlife access to and use of habitats (Jones et al. 2019, Xu et al. 2020, Jones et al. 2022). For example, as fence density increases pronghorn use of habitat falls off dramatically (Sheldon 2005, Jones et al. 2019, Reinking et al. 2019). When barriers disrupt migrations, population decline, and local extirpation can follow (Jesmer et al. 2018).

Pronghorn will largely avoid fences, roads, and railroads. These features can restrict their use of an area and reduce the availability of high-quality habitat. Unimpeded access to quality habitat is particularly important during winter when snow can limit access to forage. In winter, pronghorn may bunch up along fences when heavy snow impedes crossing, increasing stress levels (Robb et al. 2022, Jones et al. 2022) and at times leading to mass mortality events. A study of pronghorn herds across Montana found that woven wire fence strongly altered their movement and blocked crossing in 88% of encounters (DeVoe et al. 2022).

Despite Wyoming's vast spaces, the number of fences animals encounter in a year is startling. In western Wyoming, individual pronghorn navigate an average of 249 fences each year (Xu et al. 2020). Mule deer females that migrate long distances from the Red Desert to the northwest mountains (an average 141 miles each way) cross an average of 171 fences in an annual cycle, which is a considerable risk and energy expenditure for pregnant does in the spring and for does with fawns in tow in the fall (Sawyer et al. 2016).

Credit: Tanner Warder, Wyoming Coop Unit, University of Wyoming

Ungulates remember known fence crossings and different species will often use the same crossings (Burkholder et al. 2018; Jones et al. 2018, 2019, MacDonald et al. 2022). When encountering fences, mule deer and pronghorn cross quickly only about half the time, but 40% of encounters alter their movements: "bouncing" away or moving along fence to find potential crossings (Xu et al. 2020, Jones et al. 2020).

Mapping ungulate movements through the seasons reveals many herds cross great distances and private lands provide essential habitats, especially in migration and winter ranges. Wyoming's rural private lands largely exist as ranches with extensive rangeland, but also contain higher fence densities than public lands. Private rangelands offer valuable opportunities for habitat stewardship and enhancement (Gigliotti et al. 2022, Kauffman et al. 2018, Tack et al. 2019).

Direct mortality and injuries

Wildlife can be injured or die if they are entangled or blocked by fences. A study of pronghorn mortality risks across landscapes found higher fence density is linked to greater pronghorn mortality (Eaker et al. 2023). Although direct mortality and injuries are difficult to research, a study in Utah and Colorado recorded concerningly high mortality rates, especially for newly weaned ungulates that must follow their mothers to learn and access important habitats (Harrington and Conover 2006).

Harrington (2005) tallied mortalities of elk, mule deer, and pronghorn along 600 miles of fence over two years. For animals found tangled in fence, they found an average of one death for every 2.5 miles of fence per year. Most of these (69% of juveniles and 77% of adults) died by getting a leg caught in the top two wires. In addition, for animals found dead near but not tangled in a fence, they reported an average of one death for every 1.2 miles of fence per year. Ninety percent of these were fawns lying in a curled position next to woven wire fences, possibly separated from their mothers when they could not cross (Harrington and Conover 2006). This loss of fawns and overall recruitment to the herd can be hard to detect because their remains can be easily overlooked in tall vegetation and may be quickly scavenged.

In sum, Harrington's study found juveniles are 8 times more likely to die in fences than adults, and deaths peaked during August when fawns were weaned. Further, woven wire caused the most issues. Woven wire blocked juveniles and woven wire topped with barbed wire was the most lethal fence type. Of all mortalities, 70% were on fences higher than 40"

(Harrington and Conover 2006). Fence mortalities beg for more study across multiple species and different landscapes, especially the impact on young of the year.

Deaths of birds colliding with fences have been well-documented (e.g., Allen and Ramirez 1990, Nero 1974, Gillihan 2000, Patla and Lockman 2004,) and sage-grouse mortalities in fences represent a particular conservation concern. Large and heavy bodied sage-grouse are vulnerable to striking fences when they fly low over shrubs into their mating areas (lek sites) in the dim light of dawn and dusk. Although not a perfect solution, installing visibility markers can substantially reduce grouse fence strikes and mortality (Stevens et al. 2012b, 2013, Van Lanen 2017).

Wildlife injuries from scraping on barbs, tangling in fence, or bad landings from jumps are hard to research, although camera traps sometimes reveal incidents and injuries. One study found a surprising number of pronghorn with major scarring and hair loss from scraping under low barbed wire fences (Jones 2014). Such injuries, whether a broken leg, pulled tendon, open wound, or hair loss can leave animals vulnerable and reduce chances of survival.

How high?

Fence height and bottom gaps strongly influence where ungulates quickly and safely cross. It's commonly known that pronghorn prefer to crawl under fences. But studies of modified fences reveal that white-tailed deer, mule deer, and even bighorn sheep also choose to go under fences with enough bottom clearance, especially females and juveniles (Jones et al. 2020; Laskin et al. 2020, MacDonald et al. 2022). With a bottom gap of at least 18," pronghorn crawl under the wire 99% of the time, mule deer 80%, and white-tailed deer 65% (Burkholder et al. 2018, Jones et al. 2020, Laskin et al. 2020). Elk more often jump fences, although juveniles will often crawl under a gap of 21" or more (Knight et al 1997, Visscher et al. 2022).

Fences higher than 40" increase the risk of fatal entanglement (Harrington and Conover 2006). Higher than 43" deters mule deer from jumping. Even a 40" top height can dissuade female mule deer, however,

Wildlife and Fence Take-Aways:

- Less fence is better. Fences reduce usable habitat and restrict wildlife movement.
- Wildlife use habitual routes and remember known fence crossings.
- Woven wire fences cause the most issues by blocking movement of young and adult animals, and woven wire topped with a strand of barbed wire is the most lethal.
- Many species prefer to slip under a fence if gaps are high enough.
- The lower the fence top and higher the bottom, the easier it is to cross for most species.
- Modifications that make fences more permeable and visible increase safe crossings.

Credit: Gregory Nickerson, Wyoming Migration Initiative.

a 40" top and 18" bottom gap provided 75% crossing success for mule deer (MacDonald et al. 2020). While elk can often clear higher fences, lowering the top to 32" greatly increases crossing success for elk (Knight et al. 1997) and reduces annual maintenance requirements from broken wires. Although different species and individuals vary in how they cross fences, a study in Montana found that wildlife crossings created with two wires set at 31" bottom and 40" top maximized crossing possibility for most species (Laskin et al. 2020).

REMEDIES
for Existing Fences

Credit: Christine Paige.

Credit: Christine Paige.

ARE YOU CONSTANTLY REPAIRING THE SAME SECTION OF FENCE? HOW CAN YOU MAKE EXISTING FENCES MORE WILDLIFE FRIENDLY? FENCE MAINTENANCE AND MODIFICATIONS CAN SIGNIFICANTLY REDUCE WILDLIFE DAMAGE. IF YOU DON'T PLAN TO COMPLETELY REMOVE OR REPLACE AN EXISTING FENCE, ALTER INDIVIDUAL SECTIONS TO CREATE CROSSINGS AND EASIER PASSAGE.

Improving Existing Fence

Maintenance

- Keep wires tight. Sagging wires and neglected fences create a hazard for domestic animals and wildlife. Tight wires reduce the chance of entanglement.

Modifications

- Replace barbed wire with barbless (double-stranded twisted) wire, particularly for top and bottom strands. Barbless wire reduces injury and risk of entanglement.
- Adjust the height of the top wire to 38" (40" max) above the ground.
- Increase the distance between the top two wires to 12" to reduce entanglements.
- Reduce the number of wires to three, or at most four.
- Install a top pole or PVC cover on the top wire, or install grouse markers to increase visibility and prevent collision or entanglement.
- Raise the bottom wire to at least 18" above the ground to allow animals to slip under.
- In selected fence sections, raise the bottom wire to the level of the third wire and secure with a staple lock.
- For pronghorn and mule deer, raise the bottom wire with staple locks, clips, or quick links to at least 18” to create an underpass (refer to pages 42-43)
- Add wildlife crossings where wildlife trails cross fences by using dropped wires, dropped rails, lay-down fence, or underpasses.
- Secure gates open when livestock aren’t present to allow free passage for wildlife.
- Provide wildlife access to rivers, streams, wetlands, and water holes, and through seasonal migration areas.

Removal

- Remove old fences that are in disrepair or no longer in use. Remove unnecessary interior fences.
- Bale and carry away piles of wire. Some recycling centers will recycle old wire. Never leave wire on the ground.
- Many volunteer groups are interested in helping with fence removal projects to help wildlife, such as local chapters of sportsman’s groups, scout troops, 4-H, and others.

Credit: Mark Gocke, WGFD.

Easiest Mitigations

Simple changes can enhance your land for wildlife:

- Remove obsolete fence.
- Open gates when livestock aren’t present.
- Use quick links, fence clips, or staple locks to adjust wire height.
- Use fence clips to drop wires to ground seasonally.
- Make 18” underpasses with quick links or clipping and folding up woven wire.
- Add visibility fence markers for sage-grouse.

WILDLIFE
Crossings

Credit: Christine Paige.

Credit: Christine Paige.

Openings, Crossings and Passes

Fence passes reduce injuries, keep fawns and calves from being stranded, provide openings for animals unable to jump fences, and help wildlife cross in deep snow.

You can include wildlife crossings in any new fence or as modifications in existing fence. Short sections can be altered to wildlife friendly standards to help wildlife cross, or gates and jumps can be added. The simplest solution is to install gates that can be secured open when pasture isn't used by livestock.

Animals are creatures of habit. Place jumps and openings where there are signs of habitual crossing by wildlife. Look for worn trails, tracks, and hair caught on fence wires. Also place crossings in fence corners and sites where animals are funneled by the topography or fence line.

Fence openings and passes are especially important when fawns and calves are small, from June 1 through the summer, and for areas of seasonal wildlife movements and ranges. They can reduce fence damage and decrease maintenance costs.

Fence Alterations Can Include:

- **Lowering the top wire or rail to 38" (40" max).**
- **Increasing the distance between top and second wires to 12."**
- **Raising the bottom wire or rail to 18" or higher.**
- **Replacing the bottom and top wires with barbless (double stranded twisted) wire.**
- **Increasing visibility with a top rail, PVC pipe, of fence markers.**

Wildlife Openings and Passes Can Include:

- **Gates secured open.**
- **Wildlife jumps and crossings.**
- **Rail wildlife jumps.**
- **Dropped rails.**
- **Sections with adjustable wires or rails.**
- **Sections of seasonal lay-down fence.**
- **PVC modifications for big game crossing.**

Use your local topography and patterns of wildlife travel to help you determine the best placement for crossings. Look for signs of wildlife use and travel such as game trails, tufts of hair caught on fence wires, trails to water, or gullies and swales that act as wildlife corridors.

Securing an open gate when livestock aren't present allows easy passage for wildlife. Credit: Jill Randall, WGFD.

Adjustable Wire Fence

Adjusting the height of one or more wires, or letting all wires down to the ground, is an effective way to allow wildlife to cross when livestock aren't present.

Simple staple locks or commercial fence clips installed on posts allow just one person to rapidly adjust wire heights. Drop the top wire to the level of the second wire, either in sections or along an entire run of fence, to allow wildlife to jump over easily. Lowering the top wire to 25" or less allows elk and deer to hop over in almost all conditions. Raise the lowest wire to at least 18" to allow wildlife crawl under.

An alternative is to raise bottom wires to 31" and top wires to 40." This configuration was found to be permeable for elk, mule deer, white-tailed deer, and bighorn sheep (Laskin 2020). Letting all wires to the ground opens clear passage for wildlife. However, if wires would be hung up in vegetation, it is better to leave wires in place and adjust heights using clips to prevent tripping.

Another simple solution is to use quick links to clip bottom wires and/or top wires together, allowing animals to slip under or jump over more easily. Use quick links in pairs top or bottom for each fence section with 2 to 3 feet between links.

Fence Clips and Staple Locks

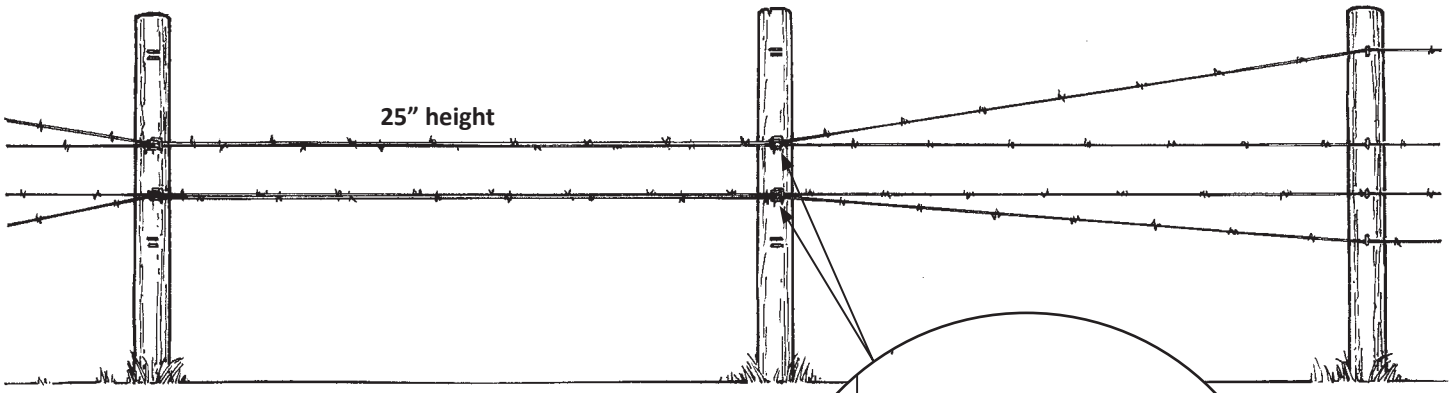
Fence clips or staple locks allow wire heights to be quickly adjusted to create seasonal crossings for wildlife. Wires can be dropped to the ground or gathered to create a wildlife jump, allowing easier clearance above and underneath. Ample space below the bottom wires is especially important in areas that receive heavy snow. Fence clips for steel or wood posts (right) are available commercially from Tin Cup Creek Fence online.

Credit: tincupcreekfence.com.

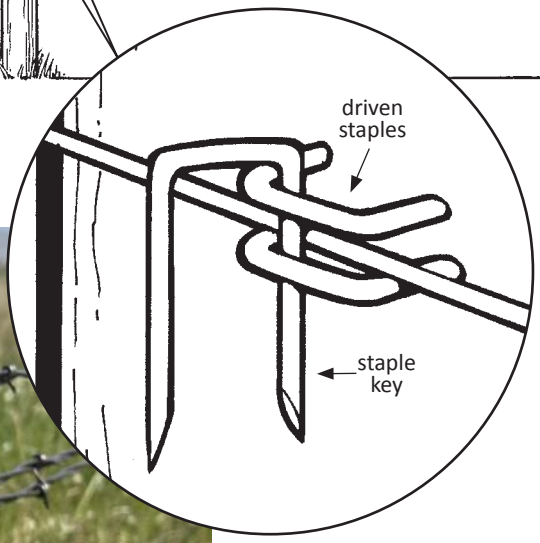
Credit: tincupcreekfence.com.

Credits (left): Mark Gocke, WGFD; (right): Dale Woolwine, Bureau of Land Management.

Easy Wire Fence Adjustments



Top and bottom wires can be adjusted seasonally to allow easy passage for wildlife, especially in migration and wintering areas.



Staple Lock

Staple Lock for Wooden Posts

- **Install two fence staples horizontally less than an inch apart on each post at the level of both the top wire and the second wire.**
- **Slip the fence wire between the two staples.**
- **Secure it in place by hooking a third staple through the paired staples vertically, like a latch.**

Quick Link

- **Use oval quick links, available at ranch supply stores, to pull together the top two and/or bottom two wires to create seasonal wildlife passes (see also p. 42).**

Oval quick links used to pull wires together can quickly modify a fence for wildlife passage. Photo credits: Troy Fieseler, WGFD.

Pronghorn and Mule Deer Underpass

Pronghorn and mule deer show a strong preference for slipping under fences if there is an adequate gap. Even though pronghorn are capable of jumping high fences in extreme situations, they almost seem unaware of their ability to "high jump." Pronghorn will often run for miles looking for fence openings or spots to crawl under a fence, and have been known to die of starvation when blocked by a fence they see as impassable. Given at least 18" of bottom clearance, pronghorn will choose to go under 99% of the time and mule deer 80% (Burkholder et al. 2018, Jones et al. 2018).

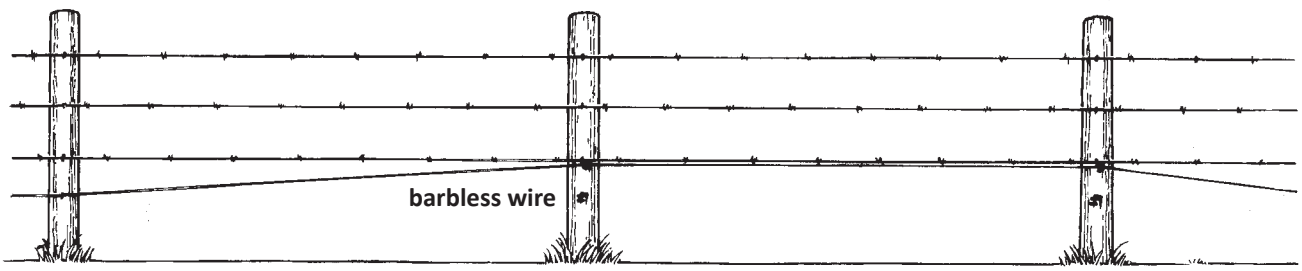
In sheep range

Pronghorn have the greatest difficulty navigating sheep fence, which is typically woven wire or uses low barbed wire strands. An underpass can be created by raising the bottom strand to create an 18" gap underneath in selected sections.

- Space wires for sheep fence at 10"–18"–24"–32" above the ground. The top three wires are barbed, the bottom wire barbless. Secure bottom two wires with staple locks or lay-down fence clips to allow wire to be adjusted for an underpass. **Note**: if using 2" quick links to raise the bottom wire, space fence wires at 10"–20"–24"–32" to allow an 18" underpass.

- In selected sites, raise the bottom wire up to the third wire, securing in place with a staple lock on the posts, or with clips or quick links on the wires. If needed, the bottom wire can be dropped again when sheep are present.

Pronghorn and Mule Deer Underpass with Raised Wire

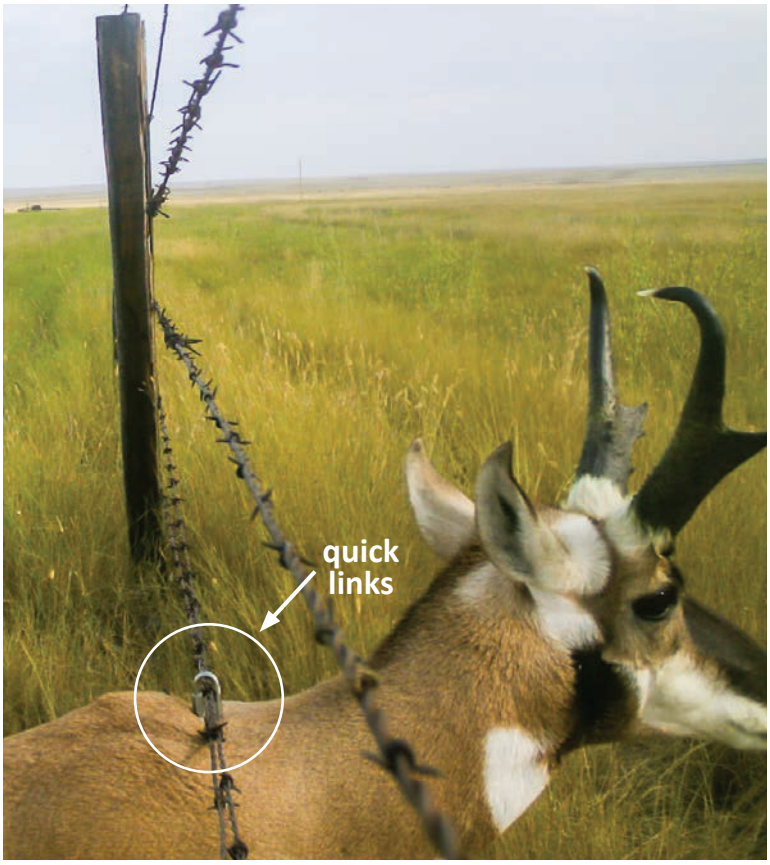


Credit: Jill Randall, WGFD.

WILDLIFE TEND TO USE THE SAME TRAILS AND FENCE CROSSINGS HABITUALLY. LOOK FOR GAME TRAILS AND RAISE THE BOTTOM WIRE AT KNOWN SITES TO AT LEAST 18".

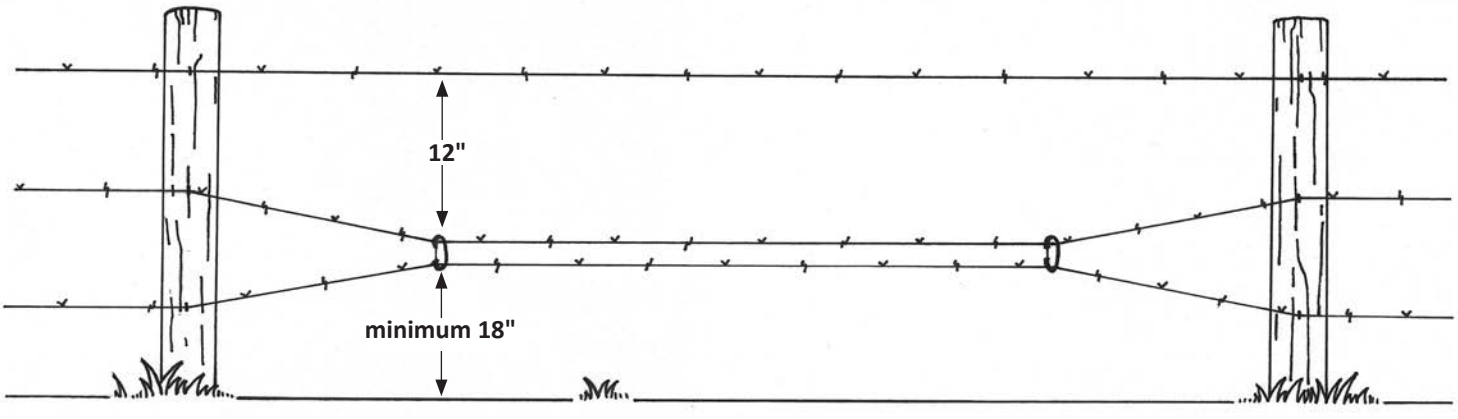
In cattle and horse range

An underpass can be created easily in a single fence section by raising the bottom wire up to the next highest wire with staple locks or fence clips on the posts. An even simpler alternative is to use two inexpensive clips or quick links to clip the bottom wire to the next highest wire. Provide a gap of at least 18" for pronghorn and mule deer to crawl under, or higher where snow can be deep. **To be most effective, place the underpass where wildlife habitually cross.**



Barbed wire can cause serious scarring and hair loss. For pronghorn and other wildlife that prefer to crawl under fence, simply raising the bottom wire with fence clips or quick links can ease passage. Underpasses are most effective if placed where animals habitually cross. *Photo credits: Alberta Conservation Association.*

Underpass with Quick Link



Credit: Kristen Rumbolt Miller.

Seasonal fence openings such as adjusted rails, wires, or gates, allow free movement of wildlife. Credit: Ian Tator, WGFD.

Wildlife Jumps and Passes

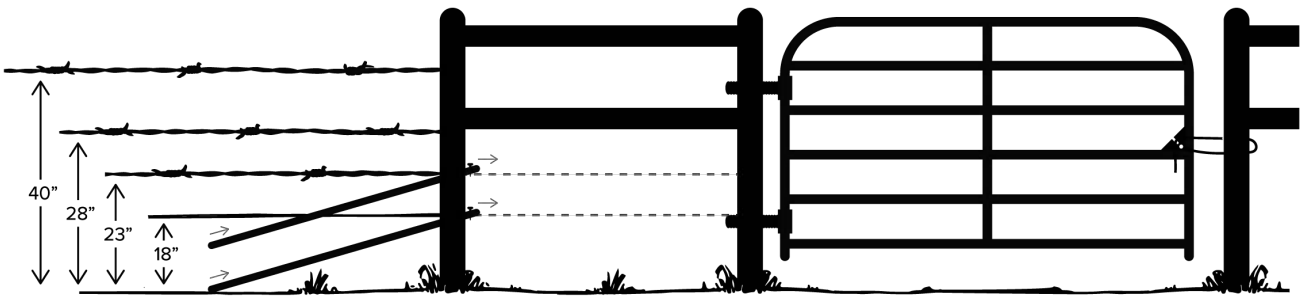
A variety of jumps and passes are possible to install for ungulates and other wildlife. These are especially useful where livestock pressure is low, although some can be altered seasonally when livestock are present. A durable wildlife pass can be erected in nearly any permanent fence using wood or welded metal rails. Place passes where there are wildlife trails, evidence of wildlife crossing, or fence damage from wildlife.

Credit: WGFD.

Wooden rail wildlife pass

In a fence with wood posts (see image to the left), allow 3-4 feet between posts for the wildlife pass. Install two wood cross rails with top rail set at 32–38” and at least 20” clearance from bottom rail to the ground. Rails can be secured with anchor bolts and heavy-duty wingnuts or construction lag screws.

For a sliding rail gate that can be opened when needed, install paired supporting posts perpendicular to the fence line. Install short cross pieces at appropriate heights to support the rails between the posts. Rails can slide to one side to open the pass completely.



Credit: WGFD.

Metal rail wildlife pass

For fence with metal posts, weld two to three cross rails in a section 4’ to 8’ wide. This type of wildlife crossing is useful where there are not small livestock. The top rail should be set at 38” and no higher than 40.” Because rails do not give like wires as animals crawl under or through, allow 20” clearance between the ground and bottom rail.

H-Brace wildlife pass

This wildlife pass was designed and tested by the Muley Fanatic Foundation and the Wyoming Game and Fish Department and found to successfully ease wildlife crossing. The pass is constructed of metal drill stem pipe and can be installed as an H-brace almost anywhere in a wire fence. The swinging top rail can be opened seasonally and is secured with a chain latch when closed, and the lower rails deter vehicles and livestock from crossing. The brace is 6.5 feet wide. The top rail when closed is at 40,” second rail at 28,” and the bottom rail allows 18” clearance from the ground. All pipes are 2 3/8” drill stem pipes, except the upright post that holds the swing arm, which is 2 7/8” pipe. The swinging top rail is constructed by welding a short section of 2 3/8" pipe at a 90 degree angle to create an "L" shape. This short section of pipe then slips into the larger 2 7/8" pipe allowing it to pivot and swing open.

H-Brace wildlife pass. *Credit: WGFD.*

X-gate

An X-gate uses wire crossed in an “X” between supporting posts that provides a relatively high crawl opening for pronghorn and deer. Install two H-braces approximately 3 feet apart. Use smooth wire to install an X that crosses at 28” from the ground. If needed for livestock, install barbed wire between posts at 38-40” and 28” (no lower than the X opening). This design does not require seasonal adjustment but may not be passable in heavy snow.

X-gate. *Credit: WGFD.*

Slip gate

A slip gate is a series of posts spaced so that wildlife can pass through but not most cattle. Install two H-braces about 10 feet apart. Drive five 6-inch posts into the ground between the braces, spaced 15” apart. Fifteen inches is adequate for most pronghorn and mule deer. Posts must be set deeply to withstand animal rubbing and plumb so gaps are consistent; setting posts when soils are moist is advised. Cut post tops to 38–40.”

Slip gate. *Credit: Dale Woolwine, Bureau of Land Management.*

It may take time for wildlife to adapt to using this unusual style of pass, and snow may drift against the structure in some settings. If cattle rub posts or attempt to press through, string wire across the structure—a top barbed wire at 38” and a smooth wire 28” off the ground. Adding a top wooden rail is also appropriate in place of wire and adds good visibility and strength to the crossing.

PVC pipe threaded over bunched fence wires and quick links to gather bottoms wires can create a durable big game passage, especially on road rights-of-way. Credit: Montana Fish, Wildlife and Parks.

Durable PVC Big Game Passage

Installing PVC pipe over bunched fence wires is an inexpensive way to allow elk, deer, and pronghorn to freely cross existing barbed wire fence with minimal risk. Use quick links to gather bottom wires instead of PVC so as not to deter pronghorn. While not used widely, it is applicable in areas of major ungulate movement. **This design can be useful where elk, deer, moose, or pronghorn cross heavily traveled roadways and have difficulty crossing a fence, delaying their movement out of danger – particularly in spring and summer when calves are small.** Along roads, the big game passage should be installed on both sides of the right-of-way.

An elk herd races to cross a highway. Animals are especially vulnerable to tangling when alarmed or crowded by others. Credit: Shawn Bryant.

PVC Game Passage for Wire Fence

These instructions are for a metal t-post, 5-strand barbed wire fence, with no livestock present, but can be adapted for other situations.

Materials

To modify two 60' sections of barbed wire fence.

- **Ten 10’ sections of 1.5" OD PVC pipe.**
- **One 100-count bag of large (7" or 11") UV-resistant plastic cable ties.**
- **#16 or larger soft wire.**
- **16 or more quick links.**
- **Fencing pliers, wire cutter, leather gloves.**

Before Installation

With a table saw, cut a ¼" slot the entire length of each PVC pipe. Note that a ¼" cut can be made by matching up two ⅛" wide blades and using a wood guide.

Installation

Step 1: Remove all wire clips from about 60’ or three fence posts and allow wire to hang freely.

Step 2: Beginning near first post with clips removed, grip the top three strands of wire and pinch together. Locate a space between barbs that will allow you to thread on the PVC pipe. Push pipe onto wire (not wire into pipe) concentrating on fore-end of pipe. If the pipe gets hung up on a barb at the fore-end, work barb into end of pipe and continue. Once the pipe has been adequately started, grip pipe near the fore-end and begin pulling down the length of the wire. The wire will feed itself into the pipe. Pull pipe down the wire until about 8’ from where posts with clipped wires resume.

Step 3: Repeat with three more pipes. Space the joint between two pipes at a post where possible. This will allow you to clip the three wires together to a post.

Step 4: The last (fifth) pipe must be installed in the reverse direction. Starting near the end of the fourth pipe, find a space between barbs and install pipe as in Step 2, push into place 8’ from where posts with clips resume.

Step 5: On the bottom two wires, install at least two quick links per fence section, spaced 2–3 feet apart, to gather the wires together.

Step 6: Using #16 or larger soft wire, attach the top PVC pipe to posts no more than 40" above the ground. Where a joint between pipes is located at a post, enough space can be left to clip the wires to the post. Attach the bottom wires at 18" above the ground or dropped close to the ground to create a larger middle gap for deer fawns/elk calves to go through rather than under.

Step 7: Attach three cable ties per 10’ section of PVC pipe, one near each end and one in the middle. Squeeze PVC pipe while pulling cable tie tight. Gap from the cut will not be completely closed but will be small enough to allow the pipe to roll and not work its way off the wire. Clip tag end of cable tie.

Step 8: Repeat on opposite side of road right-of-way.

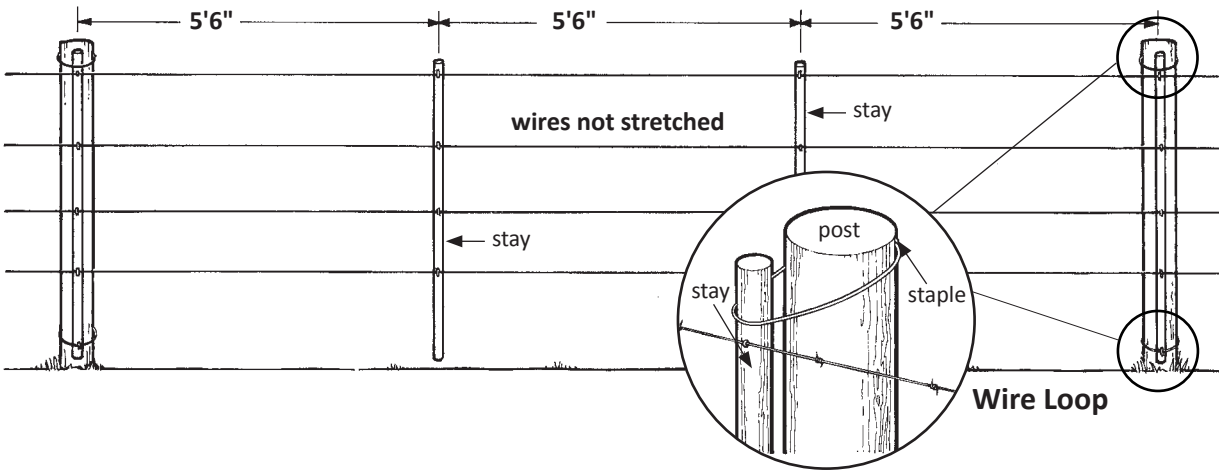
Lay-Down Fence

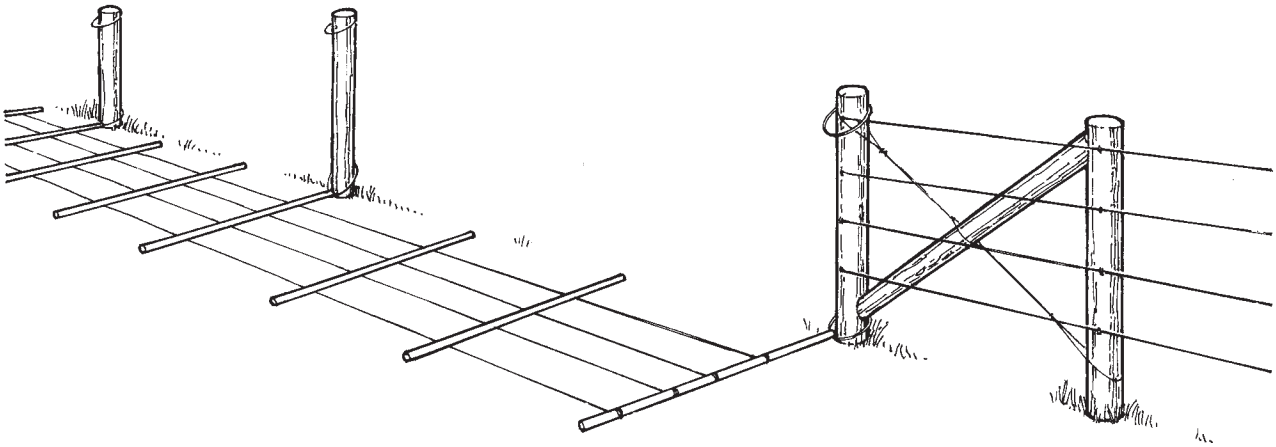
A lay-down fence is a standard 3-wire or 4-wire fence that can be laid on the ground as a unit to allow ungulates to pass through during migration or seasonal use. A lay-down fence can reduce wildlife damage and save maintenance costs. Most designs allow a single person working alone to easily let the fence down or put it back up in a short time. *Note that it is important to consider who will be responsible for the seasonal adjustment and maintenance of this fence type over the long term.*

Lay-down fence can be constructed from smooth wire or barbed wire. Fence posts can be wood or steel, but treated wood is more durable in heavy snow areas. To be most effective for elk and reduce fence damage, install lay-down in at least 4- 6 consecutive sections of fence. In areas with heavy elk migration or winter use, entire fence runs can be installed with lay-down fence to minimize wildlife fence damage.

Space posts at 12-16' intervals. For barbed- or smooth-wire fence, one to two wooden stays are needed between fence posts, plus a stay lined up with each fence post. Wire is attached to wood stays and not attached or stretched between posts. The stays maintain spacing between wires. Wire loops, secured at the top and bottom of the fence posts, support the fence stays. Be sure the fence stays do not touch the ground. The lay-down section can then be dropped by flipping up the top wire loop and lifting the stays out of the bottom loop.

Wire Loop





A lay-down fence installed near Pinedale, Wyoming, allows pronghorn and other wildlife to moveacross rangeland unhindered. Credit: WGFD.

Credit: Christine Paige.

Credit: WGFD.

Credit: Christine Paige.

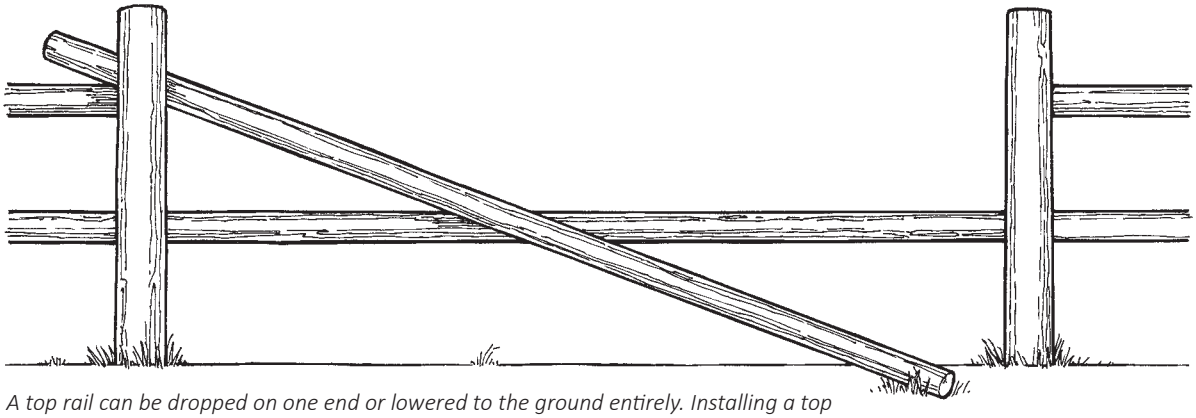
Dropped Rail Wildlife Pass

Buck and rail fence (also called buck and pole or jackleg fence), high post-and-pole fences, and worm (zigzag) fences are very difficult for wildlife to navigate and are ***not recommended.***

For existing rail fences, create gaps to provide wildlife crossings. Drop rails in sections where there are signs of wildlife movement, such as game trails, pasture corners, stream corridors, gullies, or other natural funnels.

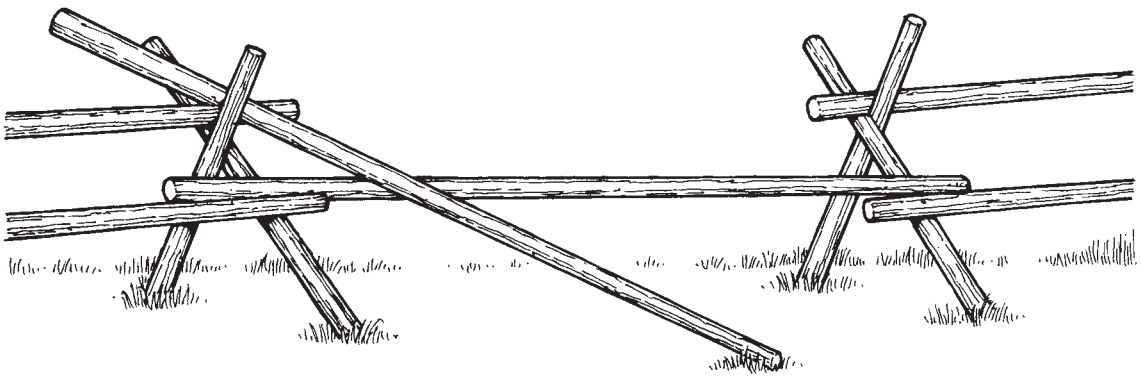
Simply drop one end of the top rail or the entire rail to the ground in intermittent sections, such as every 100,' to allow animals to step across more easily. By installing the top rail with anchor bolts and wingnuts you can quickly alter the fence seasonally if needed.

Dropped Rail for Wildlife Jump



A top rail can be dropped on one end or lowered to the ground entirely. Installing a top rail with anchor bolts and wingnuts makes it easy to alter the rail seasonally.

Dropped Rail in Buck and Rail Fence



Modified Buck and Rail Design

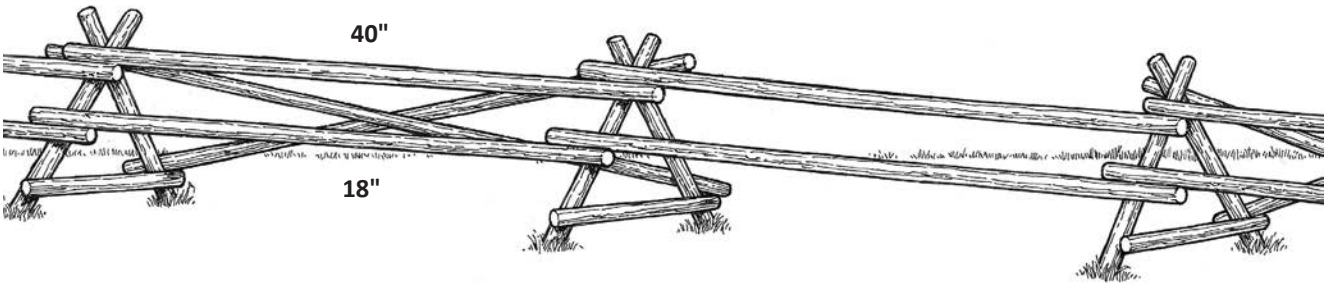
Although buck and rail fence can be useful in wet or rocky ground where posts can't be driven, it is hazardous for wildlife, and its use should be limited to short sections. Buck and rail fence is usually built too high, too wide, and with rails too close together for animals to navigate easily. It becomes a hazard when combined with woven or barbed wire or placed on steep terrain.

If buck and rail *must* be used due to terrain, or if you can alter existing fence, this modified design is easier for wildlife to navigate.

Modified Buck and Rail

- **No rail in the top "cradle" of the bucks.**
- **Install two rails on the outside: top rail at 40" top height and bottom rail with 18" clearance from the ground. Use bolts and wingnuts to drop rails seasonally in some sections if desired.**
- **Do not install an interior rub rail. Instead, in alternate sections, install crossed rails on the interior to stabilize the fence.**
- **The alternating 2-rail sections without internal rub rails allow animals to cross more easily.**
- **Add a brace at the bottom of the buck to "close the triangle" and stabilize the bucks.**
- ***Never add woven wire or barbed wire to the fence.***

Buck and Rail Modified for Wildlife



Don't Forget the Humans

Consider installing fence crossings for people, especially if the fence is on or adjacent to public lands or if you allow public hunting on your property. It will help preserve your fence and promote goodwill. Gates are one obvious choice, although gates are sometimes left open accidentally. Two other styles keep the fence secure and are easily installed: a wooden ladder over a fence or a V-gate that prevents livestock from squeezing through but allows humans and smaller animals to pass.

A V-gate (left) or fence ladder (right) allows humans on foot to cross easily without the risk a gate will be left open inadvertently. Photo credits: (left): Christine Paige, (right) WGFD.

VERTICAL
Pipe Hazards

Credit: Sean Rowe.

CAP OR SCREEN OPEN VERTICAL PIPES TO PREVENT BIRDS AND OTHER SMALL ANIMALS FROM BEING FATALLY TRAPPED.

Credit: Sean Rowe.

Credit: Sean Rowe.

Wildlife "Death Pipes"

Open vertical pipes are silent and overlooked killers of birds and small animals. Hollow metal and plastic (PVC) pipes serve a wide variety of purposes, from ventilation pipes for buildings, outhouses, or irrigation systems, to fence posts, corner posts, gate uprights, and mining claim markers.

Birds, small mammals, and reptiles will investigate hollow pipes, especially for potential nest sites. Once inside they become fatally trapped, unable to find purchase on the pipe's smooth walls. In 2009, for example, a biologist at the Audubon California Kern River Preserve found more than 200 dead birds in a fallen 50-year-old irrigation standpipe.

Most of the victims are cavity-nesting birds such as bluebirds, woodpeckers, kestrels and small owls. Because open pipes are so prevalent across our landscapes, the overall toll on birds and small animals may be in the millions.

Easy Fixes for Open Pipes

- **Remove unused obsolete pipes.**
- **Permanently cap or fill pipes used as fence posts, gate uprights, sign posts, claim markers, or monuments.**
- **These can be capped with concrete, or entirely filled with sand, gravel, or concrete. Chain link fence posts can be capped with commercial caps.**
- **Cover ventilation pipes on buildings, irrigation systems and outhouses with galvanized hardware cloth held in place by steel pipe clamps, or install commercial vent caps.**

RESIDENTIAL
FENCES

Credit: Christine Paige.

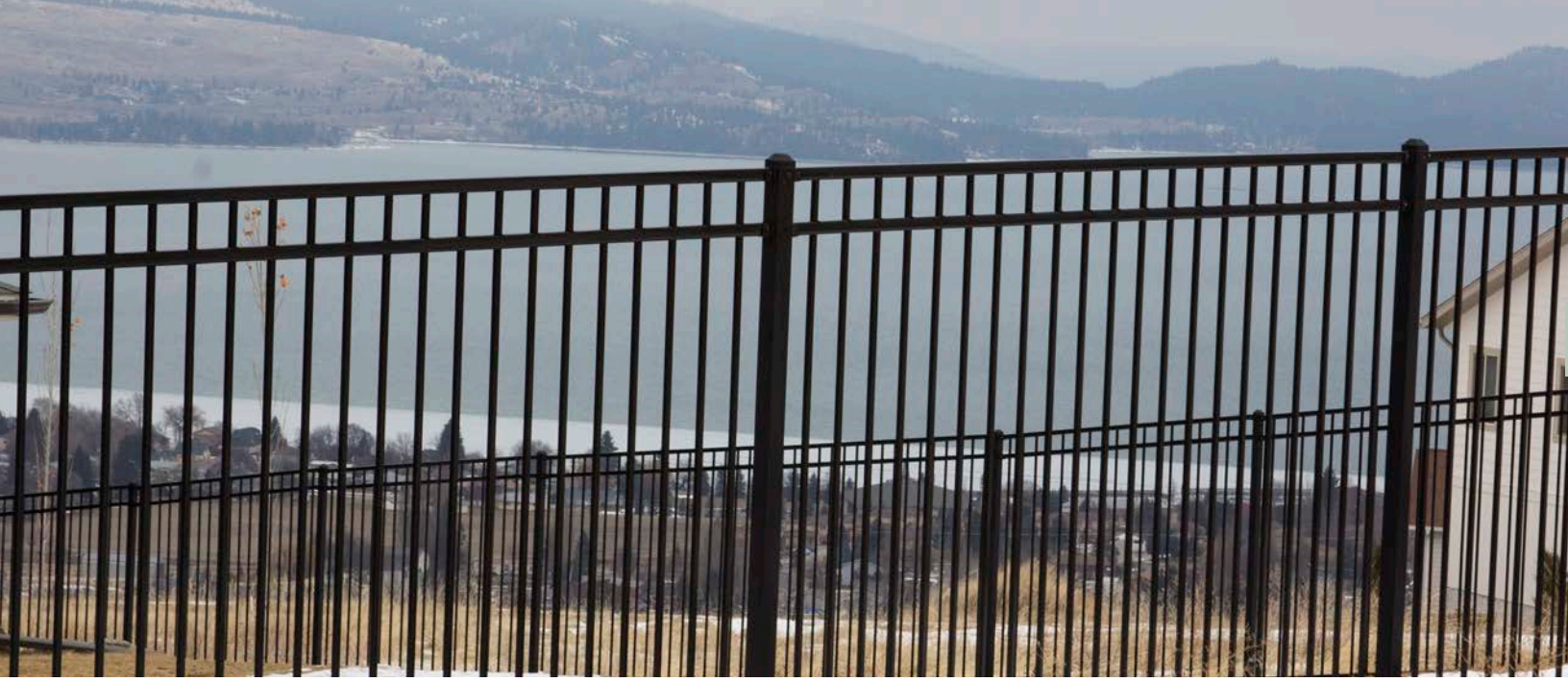
A low post and rail fence creates little hazard for wildlife. A woven wire yard fence topped with a rail at 40" or less is easily jumped by adult deer (top). Credit: Christine Paige.

Fences serve many functions around homes, both aesthetic and practical. They may define a boundary, create a play space, contain pets, or discourage wildlife from yards and gardens.

Avoid fences with spikes, pickets, or barbs that protrude above the top bar. Many wrought iron fence designs have decorative spikes on top that are dangerous for deer, moose, and other wildlife that inhabit residential areas. Gauging a jump by the uppermost horizontal bar, animals can misjudge the fence height and be lethally caught or impaled on the fence.

Any tall residential fence, whether wrought iron, plank, picket, or chain link should be used only for small areas around the home, and not for larger perimeter fences. If a fence provides a complete barrier, an open gate may allow animals to find a way in but not out. Be sure vertical planks or bars are spaced closely enough that animals will not try to push through and become trapped.

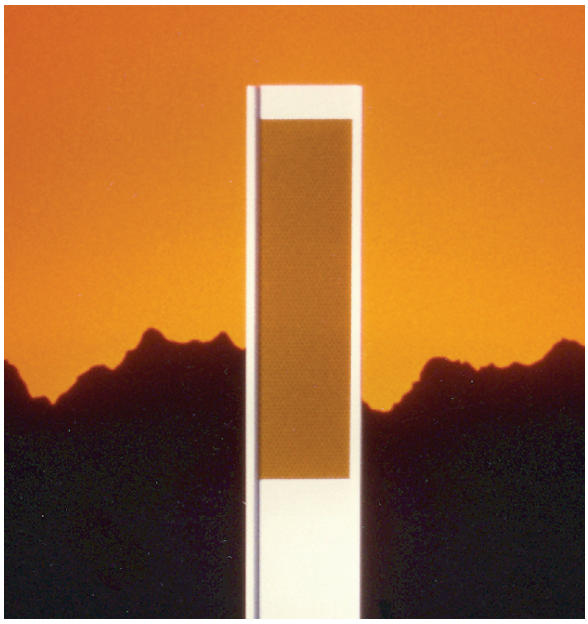
Check city and county ordinances for fence regulations. Many residential areas are in wildlife winter range. Using landscaping instead of fencing, or using only low, permeable fences, allows wildlife to move freely through neighborhoods. If you are not containing pets, allow for passage of small and medium-sized animals by opening gaps in the fence at ground level.



A solid top rail and narrow vertical bars on this iron fence reduce hazards to wildlife. Bars should be spaced less than 6" apart so fawns aren't trapped if they try to press though. Credit: Christine Paige.

Fence Alternative: Boundary Markers

Where you do not need a fence, consider marking property boundaries with signs or with fence posts spaced at intervals without cross wires. Property boundaries also can be marked with flexible fiberglass or plastic posts such as Carsonite or Flexstake posts, available through survey and forestry suppliers. Commercial fiberglass and plastic marker posts are highly visible and durable. However, the cost per post can be greater than a heavy-duty steel fencing t-post.



Posts can mark a boundary where a fence is not needed. Flexible plastic posts can be ordered with reflective tape or custom lettering. Photo courtesy Carsonite Composits.

A post fence with a single cable or chain between posts can also mark a boundary yet give wildlife free passage. Credit: Christine Paige.

IF YOU MUST
EXCLUDE

Use chain link fences only for specific purposes, such as play areas and dog kennels. Credit: Christine Paige.

Credit: Christine Paige.

There are times when exclusion fence to keep wildlife out is necessary

If you must put up an exclusion fence, avoid fencing a large area that bars wildlife from important habitats or movement areas. Focus exclusion fences on small areas for specific purposes, such as fencing around play areas, vegetable gardens, beehives, calving and lambing areas, or haystack yards. Keep exclusion fence close to the activity you need protected and allow wildlife to use other parts of the property.

In special situations, fences may be needed to separate domestic livestock from wildlife over concerns such as disease transmission, predation, or other wildlife conflicts. In such cases, coordinate with local Wyoming Game and Fish Department wildlife experts to develop a strategy and best design.

For any exclusion fence, place gates at corners where possible. An animal that inadvertently finds itself trapped inside is more likely to find escape through an open corner gate than through a side gate.

Wooden plank fence or chain link fence

Chain link fences and wooden fences with closely spaced vertical planks are especially unfriendly to wildlife and can create a complete barrier to animals of all sizes, from turtles to moose. If you must use chain link or plank fences, limit their use to small enclosures.

Yard fences and play area fences do not need to be more than 4′ high and often lower: 38”-40” is preferred. If higher to provide privacy or secure pets, keep gates closed to prevent animals from finding their way in.

For small chain link dog kennels, attach a roof to prevent wild animals from becoming trapped inside. A roof also provides shade and shelter for your pets.

Deer and elk exclusion fence

A permanent, non-electric exclusion fence for deer and elk should be 7-8′ high. Such fences are usually used for vegetable gardens or as exclusion fence on highway right-of ways to guide wildlife to wildlife underpasses and overpasses. A 7-8′ wooden privacy fence that animals can’t see through is sometimes used around residential back yards.

A 7'-8' fence is an effective barrier to elk and deer, but should be used only for specific needs such as gardens, haystack yards, or as highway wildlife barriers in conjunction with wildlife crossings and jump-outs. Credit: Mark Gocke, WGFD.

For gardens, vineyards and other agricultural plots, 8′ woven wire fence is more often used with posts set at 8-20′ intervals, and the wire is brought tight to the ground. Make the top more visible by using a top rail or flagging. Place gates at corners, where an accidentally trapped animal is more likely to find an escape.

Haystacks and Hay Yards

Several options exist for protecting haystacks from wildlife damage. These include electric, non-electric, temporary and permanent designs.

Temporary solutions

A simple and cost-effective solution is to wrap haystacks with heavy-duty plastic mesh netting, such as Deer-D- Fence, a 2x2" durable plastic mesh that is strong, lightweight, and easy to handle. Haystacks and large bales can be wrapped quickly, and the netting is readily lifted off when not needed. This netting is especially useful for temporary applications, rapid installation, and remote settings.

Plastic netting also can be used as fencing instead of woven wire and installed on wood or steel posts using UV-resistant zip-ties. The plastic is UV-resistant and durable, and materials cost is comparable to woven wire. However, labor costs for fence construction can be greater than with traditional materials.

Increase visibility by adding poly-tape, braid, or flagging when using plastic mesh as fencing. Although the mesh would cause little harm to most large animals, it is nearly invisible when erected and should be flagged to be visible to birds.

A traditional 8′woven wire fence can protect a stackyard from game damage. Credit: Christine Paige.

Deer-D-Fence. Credit: Montana Fish, Wildlife and Parks.

Permanent Fences

Many landowners prefer to protect a large haystack yard with a permanent fence. The traditional stackyard fence is at least 8′ high and uses woven wire with wood posts or a combination of wood and steel posts. One-way gates should be placed in the corners to allow animals that might be inadvertently trapped inside to find a way out more easily.

A permanent electric fence, 6-7′ high, also is effective for protecting stackyards from game damage. This fence is constructed with high-tensile smooth wire spaced at 10" intervals with alternating hot and grounded wires.

A 7-wire fence 72" high with strands at 10" intervals is adequate for elk. Deer, on the other hand, require a higher fence of 84" with 8-9 wires.

Haystack Fence

- **Use 10′ pressure-treated wooden line posts, 3"-4" in diameter, driven 2.5′ into the ground and spaced at 30 intervals.**
- **Use 10′ pressure-treated wooden brace posts, 4"-5" in diameter, driven 3′ into the ground.**
- **Use 12.5-gauge, smooth Class III galvanized wire with a tensile strength of 170,000 PSI and breaking strength of 1,308 lbs. To increase visibility, use white poly-coated wire with the same specifications.**
- **Space seven strands at 10" intervals; the top wire at 72" for elk or 84" for deer. Wooden posts require using insulators.**
- **Alternate hot and ground wires. The bottom wire is grounded and top two wires are hot.**
- **Place solar energizer according to manufacturer recommendations.**
- **Ground fence properly according to the energizer instructions.**
- **Install electric fence warning signs.**

Credit: Montana Fish, Wildlife and Parks.

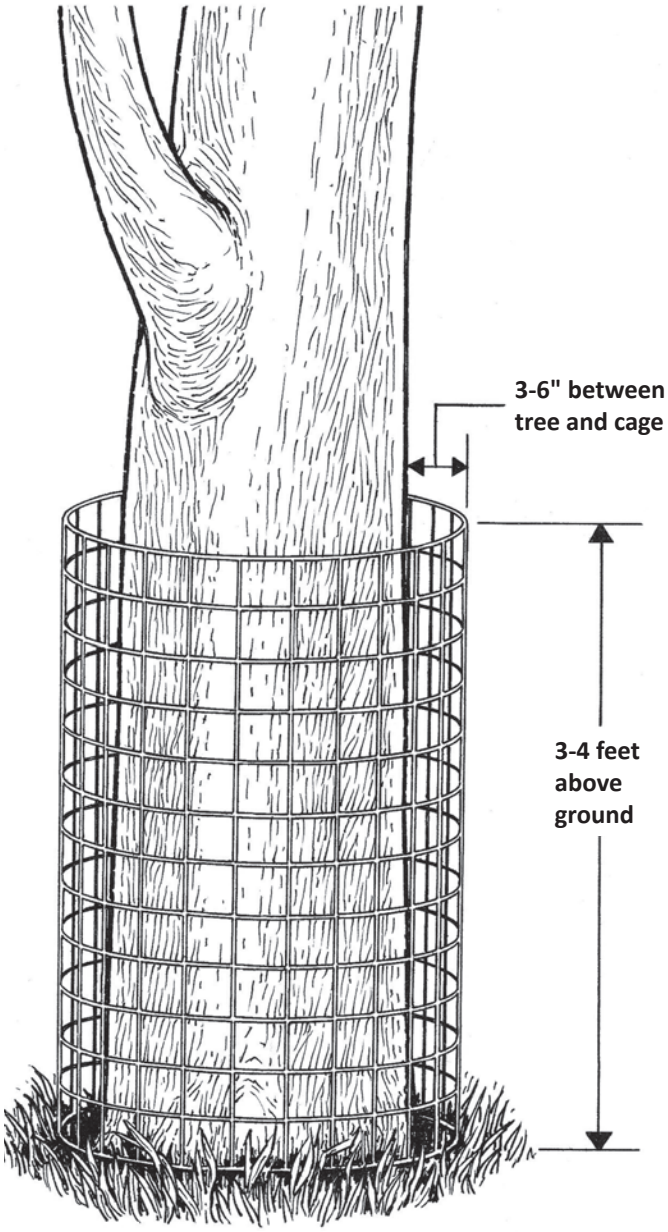
A permanent electric fence is an effective alternative to woven wire fence. A 6' fence with 7 strands at 10" intervals is adequate for elk. Vegetation, cold temperatures, and snow can create issues for electric fence, so check voltage and condition regularly. *Credit: Montana Fish, Wildlife and Parks.*

Wire Mesh Cages to Protect Trees from Beaver

The simplest method to prevent beaver from harvesting trees is to install a cylindrical mesh cage around tree trunks (Pollock et al. 2017). Heavy-gauge rolled hardware cloth or mesh fencing is available from ranch supply and hardware stores.

Credit: Arnold Brokling, www.arniebrokling.photo.

Wire Mesh Cage



Wire Mesh Cage

Use heavy woven or welded wire mesh fencing (e.g., 6 gauge) to prevent beaver from chewing through. Chicken wire is not effective. Mesh size should be 4"x4," 2"x2," or smaller — small enough to prevent beavers from squeezing through or getting tangled. Leave a 3-6" gap between the tree and cage to allow for tree growth. The cage should extend 3-4 feet above the ground or above the potential snow line.

Credit: Debo Boddiford.

DETERRING
Predators

Credit: Christine Paige.

Predator deterrent fencing should be used only around specific areas such as corrals and beehives. Always hang warning signs on electric fences. Photo credits: Seth Wilson.

A variety of permanent and temporary electric fence designs can deter large predators. These fences are used primarily for small-scale operations, such as beehives, dumpsters, lambing or calving areas, corrals, bone piles and other small areas in need of protection from scavenging or predation.

A 5- to 7-wire permanent electric fence from 42”-54” high is the most common style used to deter bears and wolves. In special situations, such as corral or home areas, a higher 9-wire or 11-wire fence might be used. It is more important to install a hot, well-constructed fence and keep it maintained than to create a taller fence with a lot of wires. Bears do not often jump fences, so a lower top wire is adequate, and a bottom hot wire at 6” prevents cubs of the year from crawling under.

In dry, rocky soils the fence should have alternating charged and grounded wires, with top and bottom wires hot. In this setup, an animal must touch both a hot and a ground wire to receive a full shock. However, use a grounded bottom wire if the wire is likely to touch vegetation. In regularly damp or moist soil, a fence with all hot wires will be sufficiently grounded when the animal touches a hot wire while standing on soil.

Key to the success of any electric fence for predators is to erect them **before** the attractant level is high, so that animals are trained to a fence early. **The amount of energy your setup can deliver over the full distance of the fence is crucial.** Because of predators’ thick fur, the system must deliver enough shock to deter them. For grizzlies, the system should deliver 6,000 volts or more and will require an energizer with a rating of at least 0.7 output joules (stored joules may be higher).

Be sure your energizer can deliver adequate power over the distance you need. Vegetation touching the wires, snow drifts, and other situations can cause energy leakage. Regularly check the voltage on every hot wire with a high-quality voltage tester, especially midway and at the farthest distance from the energizer. **Always install warning signs on the fence.**

An electric fence that is properly constructed and well-maintained should not pose a risk of fire or injury. The low amperage from the energizer does not produce heat, so the ability to ignite a fire is minimal. There also is small risk of injury to humans and most animals. Fences should be kept clear of vegetation and be properly signed. Regularly check for broken or loose wires, test the fence voltage, and check the power supply.

For more complete instructions and appropriate designs, see "Deterring Bears with Electrified Fencing: A Beginner's Guide" (Annis 2022) published by Montana Fish, Wildlife and Parks, available online. Also see "Practical Electric Fencing Resource Guide: Controlling Predators" (Sowka 2013) published by the Living with Wildlife Foundation, and "Electric Fences Keep Bears Out" (Bearwise 2023), both available online.

Bear Deterrent Unwelcome Mat

An electrified mat, also called an unwelcome mat, is an effective bear deterrent in front of doorways, under windows, on decks, and next to sheds. Larger mats may have applications for drive-throughs at carcass pens, dumpsters, and other situations.

This mat is safe to use. It can be walked on with rubber-soled shoes, and larger mats can be driven over with rubber tires. The electric shock delivered deters animals but will not cause injury. However, ensure that pets have an alternate pathway if used around homes or by entrances.

An electrified unwelcome mat is an effective deterrent for bears. This safe commercial version for residential use is made by Bear-ier Solutions, available online. DIY versions can be assembled from materials available at ranch supply centers. Credit: Bear-ier Solutions, bearierssolutions.com

Chicken coops and beehives are irresistible to bears, but high-energy electric fence is effective protection. Credit: Tim Manley.

Permanent Bear and Wolf Deterrent Power Fencing

(Adapted from MT NRCS 2017, Annis 2022, Bearwise 2023)

Charge and Recommended Wire Heights from Ground Level.

Wire	Charge	Bear[1] 5-wire	Bear[1] 7-wire	Wolf & Bear[2] 7-wire	Beehive or Chicken Coop[3] 7-wire
Top	+	42"	42"	54"	54"
2nd	–	32"	36"	42"	42"
3rd	+	23"	30"	32"	32"
4th	–	12"	24"	24"	24"
5th	+	6"	18"	18 "	18 "
6th	–		12"	12"	12"
7th	+		6"	6"	6"

1. Bear 5- or 7-wire: Primarily to deter grizzly and black bears; 42" height allows deer and elk passage.
2. Wolf & Bear 7-wire: Primarily to deter predators from calving and lambing areas; moderate to low predator risk.
3. Beehive or Chicken Coop 7-wire: Exclosure to grizzly and black bears from beehives & chicken coops.

A DIY unwelcome mat can be made using a rubber base, such as a horse stall mat, with metal 4x4" mesh wire affixed to the top, and wires attached to an energizer rated to at least 0.7 joules. Be careful that no metal goes through the mat that would ground out the system. Be sure to install a warning sign. For DIY instructions, see "Unwelcome Mats" by Colorado Parks and Wildlife, available online. Note the DIY mat is an all-hot mat that can be used on bare ground but will not be adequately grounded if used on a deck or other surface.

Attractive commercial unwelcome mats for residential areas are made by Bear-ier Solutions and Tahoe Bear Busters, both available online. These mats can be used on decks and porches as well as other areas around homes.

Fladry to Deter Wolves

Fladry is a line of wire strung with long flags or streamers and used to deter predators from livestock. It is portable, temporary, and requires comparatively little planning — it can be deployed similarly to non-flagged polywire electric fencing. Fladry works any time of year, and for all livestock, including calving pastures, sheep night pens, horse pasture, and dead piles. It works best for enclosures of 240 acres or less and as a short-term deterrent (45-90 days; Lance et al. 2023.)

Deployed around temporary pastures, fladry has been shown to deter wolves for up to 60 days, and longer if electrified (called turbo fladry). The flapping flags trigger an innate avoidance in wolves because of their novelty, and an electric shock reinforces the deterrent (Lance et al. 2023).

Fladry must be regularly maintained to work properly. Heavy snow or vegetation can cause grounding issues, and high wind can cause flags to tangle in vegetation or wrap around wire. However, because it is portable and temporary, many western ranchers have found it to be an effective tool to protect livestock from wolves (Primm et al. 2018).

Credit: Steve Primm.

Fladry

- **Use a large spool or reel (6" minimum diameter and 11" minimum width) to coil and deploy fladry. Handling by hand is enormously time-consuming.**
- **Electrified fladry (turbo fladry) is effective for a longer time and deters livestock from trampling the line.**
- **Use ⅜" x 4' fiberglass rod posts. Carry these in an old golf bag to deploy in the field.**
- **Line height should be no higher than 28," and fladry flags should hang above the ground. In spring and summer, it is difficult to keep flags from touching vegetation.**
- **To secure the line, use a harp clip, which allows the fladry flags to slide through the clip. See https://www.premier1supplies.com/ for an effective harp clip.**
- **For anchor posts, use thicker composite posts with wire clips, steel t-posts with insulators, or insulators on permanent wooden posts of existing fence.**
- **Create gates using anchor posts and good quality electric fence handles connected to an eye-bolt on the post.**
- **Electrify with an energizer that will provide an output of at least one joule per mile of fladry.**
- **A wide impedance energizer will deliver more consistent voltage under adverse conditions, such as dry soils, dry snow, cold temperatures, and long, insulating fur.**

GETTING HELP

Credit: Kathy Lichtendahl.

People and organizations like hands-on projects that enhance habitat for wildlife. Many local land trusts, sportsmen's clubs, community groups, and conservation organizations may be able to provide cost-share support or volunteers for wildlife friendly fencing projects to enhance wildlife habitat on private or public lands.

The Jackson Hole Wildlife Foundation and regional fence initiatives, such as the Absaroka Fence Initiative in Cody, Upper Green Fence Initiative in Pinedale, Platte Valley Habitat Partnership in Saratoga, and Bighorn Fence Initiative in Sheridan have dedicated volunteer groups that help willing landowners remove or modify fences for wildlife.

Enthusiastic local volunteers can often be recruited to pitch in on cooperative projects that enhance wildlife habitat. These include chapters of sportsmen's groups (such as Rocky Mountain Elk Foundation, Backcountry Hunters and Anglers, and Wild Sheep Foundation), land and water conservation groups, Scouts, 4-H groups, AmeriCorps members, school classes and clubs, and employee teams from local businesses.

The Wyoming Game and Fish Department leads many fence projects to enhance wildlife movement and habitat. WGFD can provide technical expertise and administers agreements, contracts, and funds on certain cooperative projects. Funding sources on partner projects may range from private donations and foundation grants to state and federal grants.

Your local conservation district may have grants and resources available to help with fence projects that provide a public benefit by enhancing wildlife resources. The Wyoming Association of Conservation Districts website lists all county offices.

The Natural Resources Conservation Service (NRCS) works on a voluntary basis with private landowners across the U.S. and offers cooperative programs to enhance natural resources, including improvements to wildlife habitat. NRCS can provide technical and financial assistance for many types of projects, including new wildlife friendly fencing and retrofitting existing fence to be more wildlife friendly. Their primary focus is on addressing resource concerns on private land, however some of their programs can be used on federal or state lands as well. See the NRCS website for programs and Wyoming Field Offices.

The Bureau of Land Management and U.S. Forest Service advocate using wildlife friendly fence as well. If you share a boundary with federal lands or lease a federal grazing allotment, contact the agency's local office to inquire about opportunities for cooperative projects to replace or modify fences with wildlife in mind.

Reach out for help. State and federal agencies, land trusts, sportsmen's clubs, community groups, and conservation organizations may be able to help with technical assistance, staff support, or small grants on fence projects that benefit wildlife. Credit: Mark Gocke, WGFD.

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