



FENCING TOOLKIT



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2021-2024

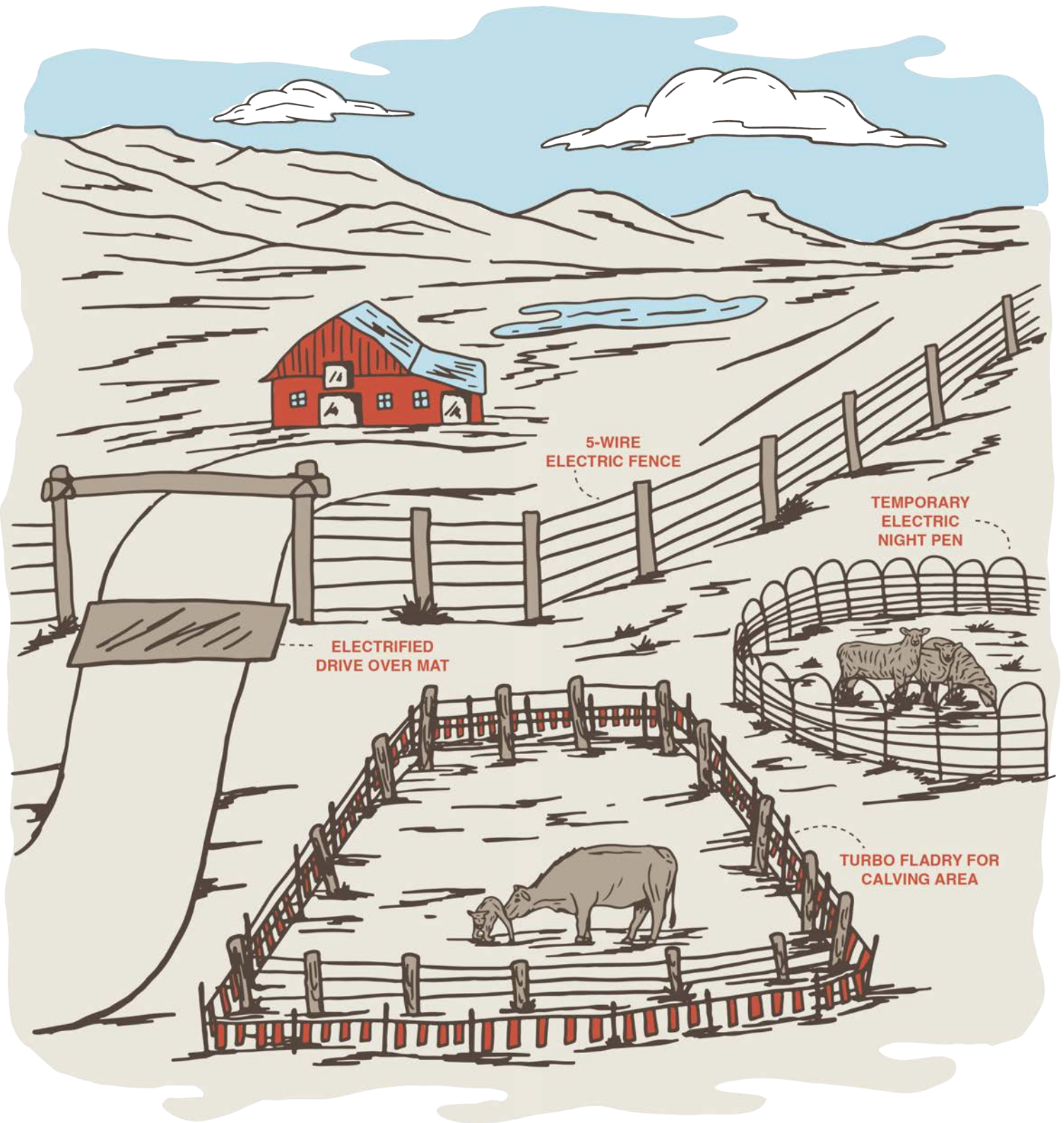


Photo by: Rob Green

ELECTRIC FENCING PRODUCER TOOL KIT

Fencing, turbo fladry and electric drive over mats are tools that can be used to deter conflict through exclusion of large carnivores and/or containment of livestock. These temporary, semi-permanent or permanent barriers, while effective to reduce conflict with carnivores if implemented appropriately, come with challenges and limitations. This document details a set of considerations for implementation, backed by real life case studies. Understanding these considerations and how they fit with existing production systems and landscapes will ultimately make for more effective implementation.

Within this toolkit, we share information on four of the most promising forms of fencing and other barriers to reduce conflict with large carnivores: electrified netting for night pens, turbo fladry, 5- and 4-wire electric fences, and electric drive-over mats. This guide includes case studies that highlight lessons learned through implementation and continued maintenance on ranches in Oregon and Montana. Each facet of this toolkit draws from a co-production process, including meetings amongst landowners, livestock producers, Tribal members, wildlife biologists, researchers, staff representing partner organizations and federal and state agencies. It coalesces years of knowledge and experience gained on the land through carnivore-livestock conflict management and research and is intended to serve as a guide for livestock producers, and other partners in stewarding landscapes shared by people, livestock, and wildlife.



5-WIRE
ELECTRIC FENCE

TEMPORARY
ELECTRIC
NIGHT PEN

ELECTRIFIED
DRIVE OVER MAT

TURBO FLADRY FOR
CALVING AREA

TYPES OF ELECTRIC FENCING

TO DETER CONFLICT



PRINCIPLES FOR PREDATION MANAGEMENT

A diverse group of stakeholders, guided by the direct experience of livestock producers across seven states in the American West, contributed to the development of Principles for Predation Risk Management. As a general guide, the following steps can be used to inform decision-making when working to reduce wildlife-livestock conflicts and manage connected, highly functional landscapes:

1. **Know your context**
2. **Identify goals and objectives**
3. **Context-specific application**
4. **Communicate for success**
5. **Integrate emerging strategies and complementary technology**
6. **Continue to assess risk, evaluate outcomes and adapt activities**

STEP 1: Know your context

What types of large carnivores are present on your landscape? What areas do they frequent and when? What kind of livestock do you run, and when are they the most vulnerable to predation? What are the natural prey of the large carnivores, and how do they use the landscape? Are there areas of your operation that are more human dominated compared to others (i.e., farmstead vs. large pastures, allotments)? Thinking through some of these questions and the prompts in the Risk Assessment Framework below will help you understand your operation's predation risk and work toward solutions that are realistic for your operation. To learn more about applying this framework, please follow the QR code on the back page of this document.

Species: Type and population density of predators and type and age class of livestock alter the level of risk, as does the abundance and diversity of non-livestock prey.

Place: Each site or region has a unique set of abiotic and biotic conditions influencing predation risk (e.g., topography, water sources, forage availability, climate).

Time: Conflict or predation risk happens in a temporal setting and changes over time based on habitat use and livestock/grazing management, annual life cycles of wildlife and annual production cycles of livestock or other agriculture crops.

Disturbance: Events whose effects may strongly influence wildlife populations, behavior, and ecosystem dynamics and therefore impact predation risk (e.g., snow depth, drought, fire, recreation, lethal control, sudden declines in natural prey abundance or other natural foods).

Landscape/land use: The size, shape, and spatial relationships of habitat patches and livestock pastures on a ranch or in a region affect ecosystem function, community dynamics and predation risk, along with the ability to implement certain strategies (e.g., road access).



STEP 2: Identify your goals & objectives

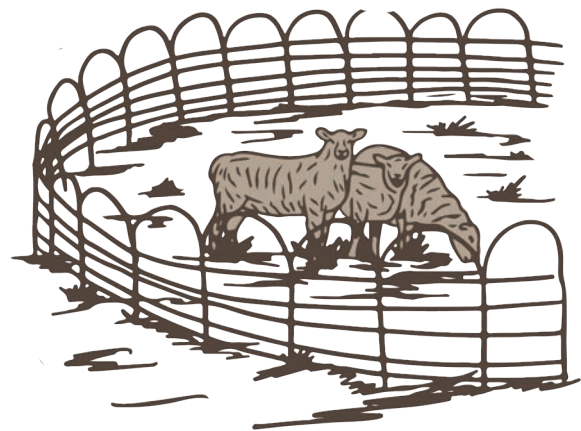
The types of fencing and other barriers described in this document have specific applications, ones that should be tailored to each ranch and landscape context and the objectives you seek to accomplish. If the goal is to exclude carnivores from human and livestock-intensive use areas, 4- and 5-wire fencing may be employed to secure farmsteads or attractants, or turbo-fladry may be installed temporarily to secure calving pastures. If the goal is to enclose livestock in an open range setting, temporary electrified netting can be used for night pens for sheep, or semi-permanent or permanent 5-wire electrified night pens may be considered. If the goal is to secure the farmstead fencing for foot and vehicle traffic without worrying about gate closures, then electric drive-over pads may be considered.

STEP 3: Context-specific application

Fencing is particularly useful in areas of intensive human/livestock use, enclosing homesteads or calving and weaning pastures. While some fence types, including electrified woven wire night-pens or turbo-fladry, may be helpful to temporarily exclude carnivores from targeted area in open-rangeland contexts, these practices are not always applicable at extensive scales, as materials and monitoring costs increase steeply and efficacy of the practices for preventing conflict may decrease. To be successful and effective, a fence should be built according to best practices. Information on what makes effective temporary and permanent fences is widely available and can be found in a list of resources linked in the QR code the end of this document. This section provides an overview of each fence type and information to support appropriate application within human dominated or shared landscapes with carnivores.

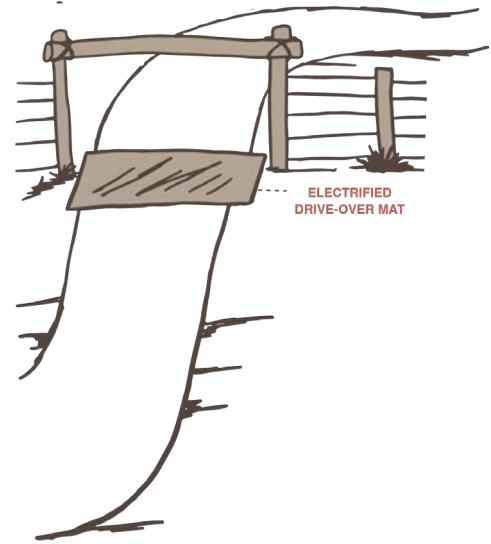
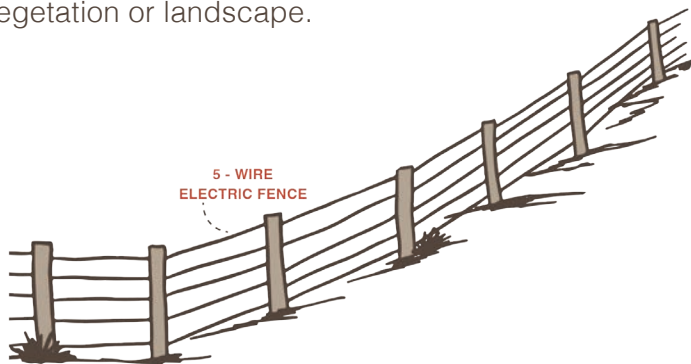
Night penning

Livestock can be grouped together at night using permanent or temporary fencing. This grouping serves to keep livestock from separating too much throughout the night and becoming easy targets for carnivores. Electrified net fencing is commonly used for night penning, as it is easy to install, portable and connects in series to surround livestock. The enclosure should be small enough to prevent excessive movement during the night, but not too small to cause lambs to be laid on. They should be big enough for sheep to be able to lay down comfortably. In conditions of heavy rain or mud, it is recommended to move the pen more frequently to mitigate spread of disease. Night penning is made more effective by use in conjunction with electrified fencing, fladry or guard dogs. These pens are also typically more successful when they are close to humans or human structures.



5 and 4- wire fences

This permanent fence type may be used to exclude predators from the ranch or farmstead or secure attractants including grain or calving pens. Fence posts should be at least 40" out of the ground with wires attached every 6 to 8 inches. Permanent electric fences are most effective when they are constructed using 12-14-gauge wire. To protect against wolves and coyotes, the fence should be charged to a minimum of 5000 volts and the bottom wire should not be placed above 6" above the ground, as canines are known to dig under wire, if possible, to reach prey. For grizzly bears, the bottom wire should be about 8-12 inches above ground and the top wire should be located between 36 and 42 inches above ground. Wires should be spaced around 8 inches apart. The fence should be charged to 6000 volts or more which requires an energizer of at least 0.7 joules to deliver adequate power over the distance covered. Because these fences must stay charged to work successfully, it is important that they are checked at least once a day to ensure that it is not disrupted by vegetation or landscape.



Electric drive-over mats

Electric drive-over mats reduce the need for individuals to open and close gates when moving between pastures, calving pens or the home ranch. The mats provide an opening for foot traffic or vehicles with rubber absorbing any electric charge, but not one that is passable by predators. They are most effective against grizzly bears when charged alongside a 5-wire electric fence. The mats should be charged to provide a strong enough shock to deter the bear from passing. As demonstrated by applications in Montana's Blackfoot Valley, there are multiple design options. Both the Pitman Machining mat that consists of a rubber pad and a 2" x 2" metal grid held in place by a ring of rubber matting, as well as a BS Fabrication plastic pad with a layer of galvanized steel on top, have proven to be effective in keeping bears out.

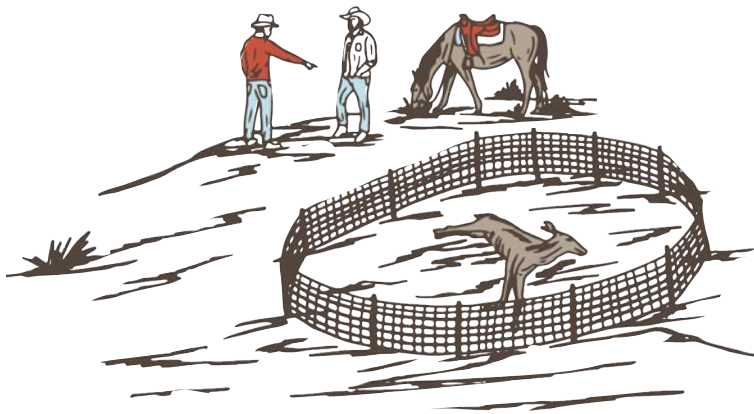


Photo by: Matt Collins



Turbo fladry

Turbo Fladry consists of a row of colored nylon or polyester flags (typically red) connected to electric poly-wire surrounding a specific livestock pasture. The movement of flags or streamers in the wind off of a fenced area creates a disturbance that makes predators, particularly wolves and coyotes, hesitant to approach. Fladry is not an effective deterrent for bears. It can be rapidly and easily installed to complement many types of fences, which makes it very useful for a wide variety of operations. Turbo fladry itself should not be used as a permanent tool as it loses its efficacy over time as wolves or coyotes become habituated. The fence can be installed during calving or lambing season annually and removed after. It has been shown to deter wolves for up to 60 days and is recommended to be removed after 60 days to prevent habituation. Fladry should be placed close to 18" apart on temporary or permanent fencing. It should hang on a fence strand that is no higher than 28" above the ground and should be placed to avoid surrounding vegetation. A fiberglass or other lightweight post should be placed approximately every 10 yards to sustain the poly-wire. Fladry is less practical when used in terrain that has vegetation or other terrain obstacles that may disrupt movement of the material. This tool requires consistent maintenance in order to be effective.



STEP 4: Communicate for success

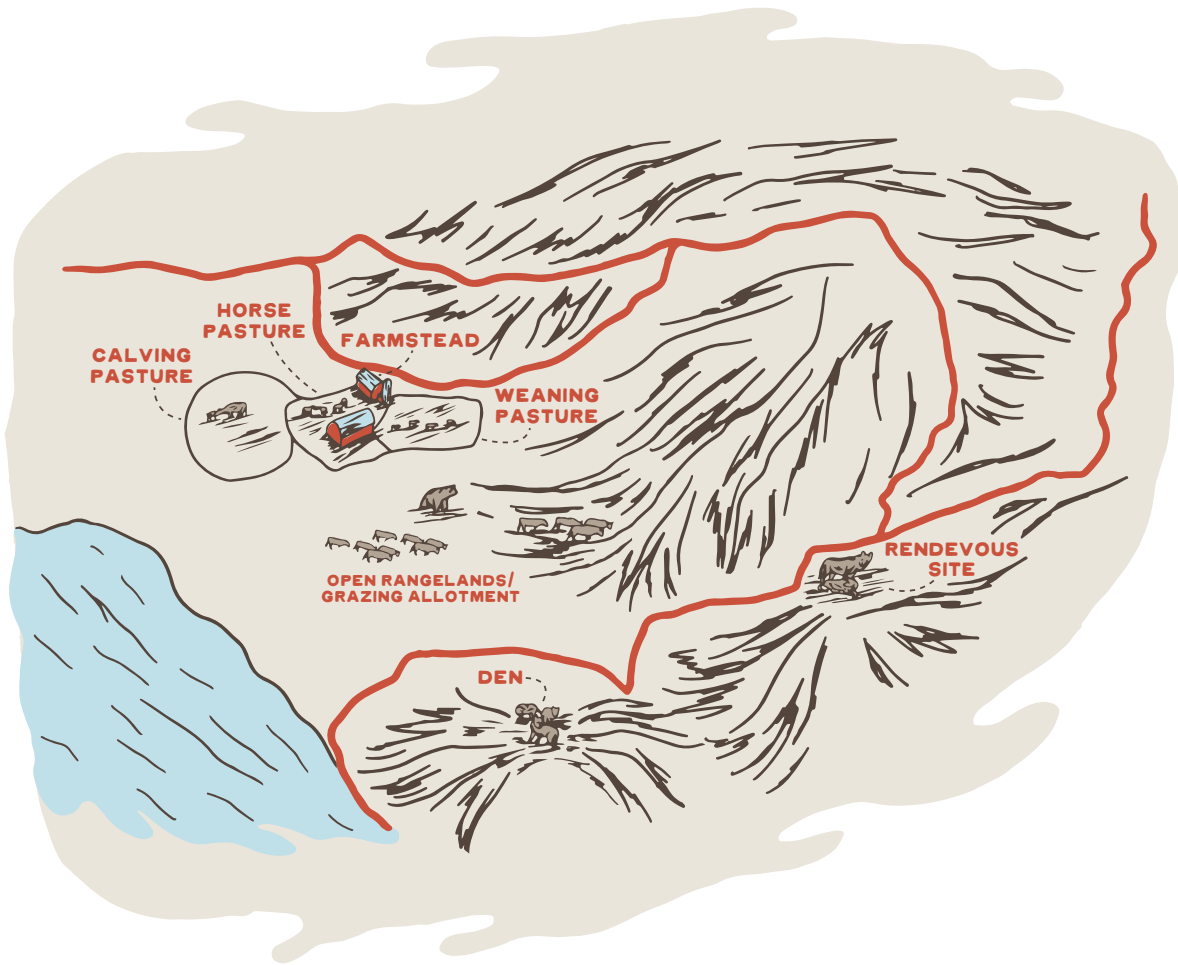
Partnerships play a vital role in addressing wildlife conflicts, involving various stakeholders at multiple levels. In this endeavor, nonprofits, state and federal agencies, and universities serve as crucial technical and funding partners, contributing to the success of wildlife conflict management initiatives. Establishing and nurturing relationships and trust among private landowners are paramount, as the human aspect presents one of the most significant challenges in addressing wildlife conflicts and to securing fencing resources. There is rarely a situation where the person stewarding the land can afford to install the fencing that works, but nonprofits, government agencies and neighbors can share the costs. Relationships are sometimes the biggest challenge, and their importance cannot be overstated. Neighbors with similar objectives and resource concerns can be addressed together. For example, a fence designed to keep out grizzly bears with a common boundary may take in two calving lots and two headquarters: This addresses a high concentration of attractants.

STEP 5: Integrate emerging strategies and complementary technology

Available and emerging management practices and technologies can support producers in implementing non-lethal predator risk management practices. Partnerships and coordination with agencies, NGOs and place-based groups can build capacity necessary for the integration of novel tools and management strategies within holistic frameworks to reduce predation risk.

Emerging technologies and management practices provide ample opportunities for combination with fencing. Technology and tools, including range riding, carcass management, virtual fencing, drone use for livestock and carnivore monitoring, game cameras with artificial intelligence and communication capabilities, and mechanized mineral bins to clump livestock, may work to improve the efficacy of this practice. Other examples of incorporating technology to support producer-implemented and coordinated activities might look like:

- Enclosing livestock guardian dogs wearing flashing light collars in electrified night pens alongside livestock..
- Utilizing radio activated guard (RAG) boxes that set off sounds and lights when VHF collared wolves approach, as well as fox lights, in conjunction with permanent and temporary fencing.
- Implementing range riding in conjunction with night penning or virtual fencing to allow for targeted grazing, reduce scattering and human presence in the event of predators in close proximity.
- Creating a carcass management site, with distance from any fenced or penned animals, allowing for disposal of carcasses that might attract predators and relocating to an area where predators will not interact with livestock.
- Using tracking technology, such as GPS collars, on cattle to increase the efficiency of locating and checking livestock health and behavior; or deploying game cameras to evaluate the effectiveness of fencing or incorporating artificial intelligence and cellular technology into game cameras to automated remote detection of predator species.



STEP 6: Continue to assess risk, evaluate outcomes and adapt activities

To curb carnivore learning, it is important to continually change and adapt temporary fencing practices to prevent habituation and transference of this knowledge to packs and offspring. Fences, permanent or temporary, require continual monitoring, maintenance, and adaptive management to maintain effectiveness in preventing conflicts.

Monitoring: It is necessary to regularly monitor fences. Regular monitoring gives landowners insight regarding the efficacy of the fence in achieving desired goals, and also allows them to stay ahead of needed maintenance. Turbo-fladry is also a practice that requires frequent monitoring to ensure that the fence maintains charge, does not blow down in the wind, or get flattened by snow. If the flags are not able to flow and create noise, the practice becomes less effective.

Maintenance: Established physical infrastructure for fencing requires continued maintenance which varies in timing and intensity. It is important to clearly outline the party or parties responsible for maintain-

ing the infrastructure. Who is responsible for repairs and damages associated with the fencing in place? Without regular maintenance, fencing may become increasingly ineffective as infrastructure blows down, shorts out through vegetation growth or falls into disrepair.

Adaptive management: In order to support predator risk management, producers along with agencies or other partners providing technical assistance should consider adapting how, when and where practices are implemented, as well as goals, should new disturbances occur. After developing an understanding of whether a practice or practices are or are not making progress towards identified goals, the planner and producer should strive to adapt their management plans and practices to meet any shortcomings. This may, for example, include changing the location or timing of turbo fladry placement. Further, changing range conditions or added disturbances may necessitate shifting, or adding new goals to address. This may necessitate further shifting how, when and where practices are implemented for increased effectiveness.



Photo by: Ellie Gage

NIGHT PENNING TO SECURE SHEEP NORTHEAST OREGON

Know your context: Kim Kerns, a sheep producer in Northeast Oregon, has experienced conflicts with gray wolves on summer allotments while grazing a band of ewes with lambs. The allotments are under the jurisdiction of the US Forest Service (USFS) and Bureau of Land Management (BLM). Management of the flock is conducted by a full-time shepherd and livestock guardian dogs. Kim runs a band of sheep (approx. 1,000 head) over the summer after snow has melted and the allotments are accessible, with predation events historically occurring at night.

Identify your goals and objectives: Before the 2014 arrival of wolves on the landscape, Kern's goal was keeping sheep close to camp overnight. Beginning in 2014, the goal became preventing wolf depredations at night.

Context specific application: Kerns decided to use electrified night penning as the best-fit tool to enclose sheep in hopes of preventing depredations when they are most vulnerable at night. Other stewardship benefits from using electrified night penning include improved range management, as the night pen can be set up in a specific area to be used as a targeted grazing project to manage undesirable vegetation and remove dead forage. After grazing, Kerns broadcasts native grass seed on the area and the site is returned to its original state or better.

Communicate for success: In 2014, the local USFS district ranger alerted Kerns that the Oregon Department of Fish and Wildlife (ODFW) would purchase an electric fence to support night penning sheep for wolf-sheep conflict reduction. ODFW has now purchased fences three times to date for Kerns to support night penning, recognizing a life span of approximately three years per fence. Kerns' operation has been shared by USFS as an example of effective night penning for other producers interested in incorporating the practice into their management plans, of which federal and state agencies in Oregon have been universally supportive.

Integrate emerging strategies and complementary technologies: Kerns believes that the use of livestock guardian dogs is complementary to night penning, and often one of the dogs will spend the night with the sheep while the others stay on the outside to maintain a perimeter presence.

Adapt based on changing risk and opportunities: Daytime depredation incidents increased after 4-5 years of night penning as predators changed their activity patterns in response to this management practice. That being said, Kerns finds it easier to haze wolves during daylight hours and has experienced zero nighttime sheep depredations since incorporating electrified night penning.

It takes one person approximately 15 minutes to set up and take down the fence.

as a management tool. Penning has also been used successfully in the winter time to keep sheep safe during periods of increased snow.

Equipment specifications: Positive/negative netting for night penning is effective in dry environments: there is no grounding required. It is lightweight and portable; no tools are required to set up. The preferred fencing is 48" high with 3.5" vertical line spacing, semi-rigid vertical stay and 13 double-spiked step-in posts are built into the netting for easy installation. A fence charger is required to electrify the netting, and Kerns recommends using a Speedrite Charger (3-joule, lightweight, durable, user-friendly) with solar panel and battery.

Kerns uses 5 rolls of fence per night per band of sheep. In 2023, prices were \$189 for 5 rolls for a total of \$945 per pen. A circular pen is made with an approximate diameter of 260'. It is important to set up a night pen in an area where the fence doesn't short out on dry vegetation and start a fire.

Tips for best results: It is common for the fence to get torn down during initial use as the lambs test the electric fence. It is important to herd sheep in and out of the pen with the electricity off to prevent shocking and pen-shy animals, but the pen needs to be electrified if sheep are grazing nearby to prevent them from damaging it by chewing on it.

Kerns has found that it is easy to train sheep to enter the pen with salt. It is recommended to move the pen more frequently in heavy rain and mud to prevent disease and site degradation. It takes one person approximately 15 minutes to set up and take down the fence. It is easy to roll up and load in the back of the pickup when moving camp. The fence lasts about 3 years before it becomes too worn to repair, and it requires light maintenance and repairs throughout the grazing season.



Photo by: Ellie Gage



Photo by: Rob Green

SEEING RED

RANCHING IN MONTANA AND THE LINE BETWEEN CONFLICT AND ECONOMIC VIABILITY

Wayne Slaght stares out across the Two Creek Monture Ranch near Ovando, Montana at the state wildlife managers unspooling strips of red fabric that now encircle his calving lot. A breeze coming off the southern end of the Swan Range animates the flags, waving at him as he braces against the stinging March cold.

“I hate the look of that stuff,” he says. “Looks like a used car lot. But it works.”

Slaght has lived on the Two Creek Monture Ranch his whole life, and he and his family have managed the cattle ranch since the early 1980s. Located in the lowlands along Montana’s Blackfoot River, Slaght has seen an influx over the last four decades of grizzly bears and wolves.

Since grizzly bears were listed as threatened under the Endangered Species Act in 1975, they have rebounded from just a couple hundred individuals in

the entire Lower 48 to more than 1,100 in just the Northern Continental Divide Ecosystem alone—an area just north of Two Creek. Similarly, gray wolves were nearly exterminated from the Lower 48 by the early 1900s. Since the 1970s, wolf protections and reintroduction efforts have resulted in some 6,000 individuals south of the Canadian border, with roughly 1,700 inhabiting the Northern Rockies.

“It’s fine that most Montanans want to have grizzly bears around,” Slaght explains, “but for us it’s a headache. There are 10 to 12 bears on this ranch every day during the summer. We’ve got grizzlies 50 feet outside the front door of our house, and any time that we go out to check cows, we have to be aware of them, because they’re out there.”

The tricky part that both ranchers and wildlife managers are trying to deal with is the fact that predators are intelligent, and eventually the turbo fladry’s novelty wears off—generally within a few months. But when it’s used in combination with other tools like five-wire electric fencing, foxlights, drive-over elec-

“We have not had a grizzly bear depredation in over 20 years,” Slaght says, “and we haven’t had a wolf depredation in probably 13 or 14 years, so that tells me that something we’re doing is working.” Wayne Slaght

trified mats, and participation in carcass removal programs to prevent dead livestock from attracting scavengers, fladry can be part of an effective toolkit to share space with predators on critical habitat and working lands.

Still, that toolkit can be expensive. While variable, a single mile of electric fence can cost \$18,000, a steel shipping container used to protect grain from bears can cost \$3,500 and a mile of turbo fladry without posts or energizers nearly \$5,000. For many ranch families operating on tight margins, those costs add up quickly. What might be the most creative part of Slaght’s approach to livestock conflict reduction is his willingness to partner with conservation groups and agencies to help offset the cost for non-lethal technologies.

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There are those who are quick to draw lines between

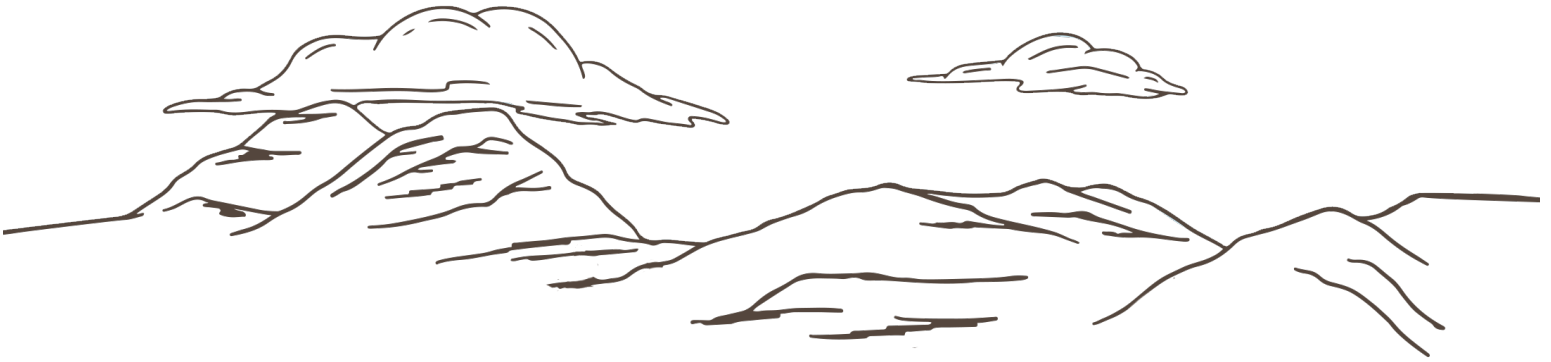
conservation and ranching, but at Two Creek those lines just so happen to have fladry attached to them, and that means something. Out here, the only red flags are the ones that flap in the wind, a signal of a shift that protects ranchers’ way of life, the working lands they rely on, and the wildlife that makes Montana’s landscape whole.

“As ranchers, it sometimes seems like urban America would rather have us gone than the bears and wolves,” Slaght says, “but we’re the first true environmentalists. I know there are a lot of interpretations of that word, ‘environmentalist,’ but we take care of this land because we love it here. This is the only life I know. We get a bad knock in agriculture about how we’re abusing the land, but if we’re not taking care of it to the best of our ability, we’re not producing and we’re not making money. We care about the land. We care about both our livestock and the wildlife: those animals are here and they’re part of an environment and they’re going to be here, so we have to learn to deal with that.”



Photo by: Matt Collins

Adapted from a story within Western Landowners Alliance’s On-Land Magazine by Rob Green



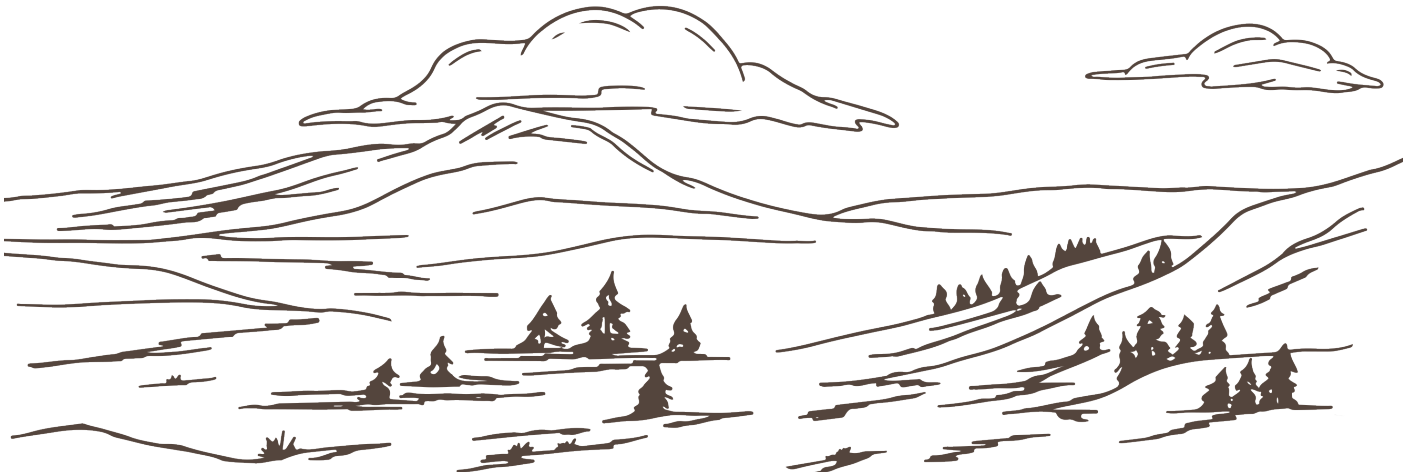
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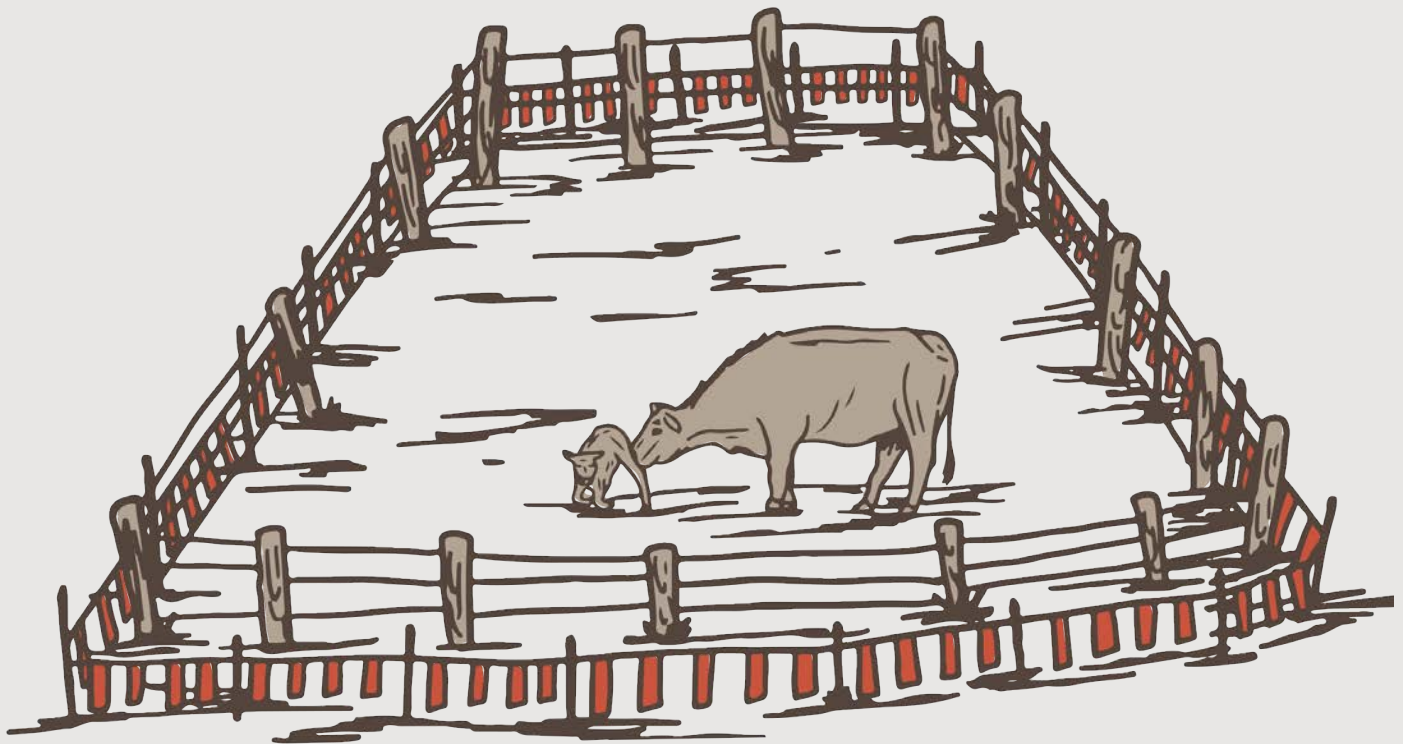


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ELECTRIC FENCING

Producer Tool Kit



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