

Virtual Containment

Electronic collars and GPS offer new fencing solutions.

by Heather Smith Thomas

Permanent or portable fencing traditionally kept livestock in designated pastures. Now, ranchers have another option. Virtual fencing creates invisible boundaries using GPS coordinates that can be moved using a computer or smart phone. Cattle are fitted with boundary-sensing collars and trained to respect the defined boundaries.

Communication towers connect collars on the cows to the GPS coordinates. As an animal approaches the virtual boundary, the collar emits a warning beep. The animal receives an electric shock if it continues to approach the invisible boundary. So, cattle learn to respect the virtual fence.

Paul Meiman, University of Nevada-Reno Extension specialist, leads a virtual fencing research project for a couple of Nevada ranches. Graduate student Nathan Jero has been assisting with this research. Jero was involved with virtual fences as an undergraduate at the University of Idaho. He became interested in using virtual fence as a conservation management technique to target-graze invasive species like cheat grass. Specifically, Jero wants to learn how stocking density impacts fence effectiveness and whether desired density can be achieved to control various plant species in areas that otherwise would never be grazed and become a fire hazard.

Typically, target grazing requires fencing, herding or use of supplements to keep cattle in the desired area. But virtual fencing could be a low-labor option to use in landscapes where other containment methods are difficult or impossible. Virtual fences could also be used to create moving water gaps, protect fragile riparian systems and maintain ecological health while allowing grazing animals access to streams and streambanks. Riparian areas — land bordering streams and rivers — need to be grazed, but not overgrazed. It's beneficial to avoid using permanent fences in some of these areas.

"One of the ranches we're working with sometimes has issues with larkspur and losing cattle. An exclusion zone to keep the cattle out of that larkspur and prevent losses would be helpful," Jero says.

"We also want to see if we can use virtual fencing to decrease the amount of time ranchers have to ride to keep cattle out of creeks or riding fences and gathering cattle that cross into the wrong areas. Even if virtual fence is not entirely successful at completely containing the animals, it might make enough difference that riders might only have to go out once a week instead of every day or two. It could save a lot of time."

Virtual fence in action

Maggie Creek Ranch is one of the ranches involved in the research. The ranch agreed to try virtual fencing for two years at its stocker operation near Lamoille, south of Elko, Nev. Travis Whitely is the Lamoille division foreman.

"In 2020 we collared 200 yearlings," Whitely says.

The yearlings were kept in relatively small pastures, with about 80 head per 100-acre pasture.

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— Travis Whitely, Maggie Creek Ranch

or quarters, and keep the cattle in those portions — or graze certain areas harder than others. We have a stream that runs through each pasture, and we wanted to set up water gaps and have the cattle only go into the stream in those designated areas."

It took some training to keep the yearlings in the smaller areas. Whitely and his crew first located the virtual fence along boundary fences cattle could see.

"Once the yearlings respected that boundary — responding to the virtual fence near the real fence — the virtual fence was moved farther and farther away from the fence line, into the area where we

wanted the cattle to be," Whitely says. "Some of them figured it out quickly, but others were more independent and didn't want to respect the virtual fence. Yearlings are typically more independent than adults and like to wander."

Occasionally, ill-fitting collars also caused some problems, especially for yearlings.

"Some would slip the collar off, or it got hooked on something. The buckles are designed to break, so the animal doesn't get hung up on something. But then we'd have some heifers that were not staying where we wanted them," Whitely explains.

Stray cattle would go to the other end of the field and graze. Other cattle in the pasture would see them and want to join their wayward buddies. Some of the cows got to the point they'd endure the shock and go through the virtual fence to wherever they wanted, but most of the yearlings respected the fence.

"During the summer we always have to doctor a few cattle for pinkeye or foot rot on those meadows. We just catch them out there, rather than bring them to a corral. I wondered how those collars would hold up when we roped those yearlings, and whether they'd run through the virtual fence when we were trying to catch them," Whitely says. "That wasn't a problem. We were able to hold them at one end of the pasture, away from the virtual fence and get them doctored. When we'd rope them, we never did pull a collar off; the collars were pretty durable."

"It's a technology still in its infancy, and now they've redesigned their collars, so they fit better," Whitely explains. "The original collars were a little loose on yearlings. Some collars would flip around and be upside down on the neck and didn't make contact for giving the shock."

The collar still beeped when the animal approached the virtual fence, but cattle lost respect for the noise when they figured out there was no associated shock.

Potential and fine-tuning

Virtual fencing equipment continues to improve as researchers and producers learn more



about its potential applications. Meiman's research project goals included identifying virtual fence effectiveness for intensive rotational grazing, grazing on larger rangelands and target-grazing some areas more than others.

As mentioned, virtual fences rely on signals relayed via communication towers.

"For us, they set up two towers so the signal between them could cover the whole valley where we have cattle," Whitely explains. "They could change the virtual fence line wherever it needed to be, with those two towers. In a mountainous area a person might need more towers — maybe on several ridges."

Hog panels protected towers and guy wires from cattle rubbing against them.

"There are places in our pastures that have rose-briars and thistles, and we generally try to mechanically mow or spray them. With virtual fence we could hold the animals in those places early in the grazing season and make them eat it down," Whitely says. He explains cattle could reap the nutritional benefit from these patches while reducing the thistles and briars.

"This system would be helpful in riparian areas on the range. If a rancher is getting kicked off his allotment because of cattle getting in there, this could be a solution," Whitely says.

The GPS collar also provides the opportunity to know where every individual animal is located at any given time. Some operations could find value in this ability.



Virtual fencing employs GPS-enabled, battery-powered collars worn by cattle, which interact with base station towers and software. GPS coordinates designate fence boundaries.

“In our situation, that’s not as much of a concern because we have people on the ground going through those cattle and looking at them, so we are seeing them anyway,” Whitely says.

Multiple research projects underway are exploring virtual fencing systems as a feasibility in big range pastures as well as for more intensive rotational grazing on smaller farms.

Other researchers with current projects include the University of Arizona Santa Rita Experimental Range station and the Agricultural Research Service (ARS) at the Central Plains Experimental Range station in Colorado.

Other considerations

A growing number of companies with varied goals and focuses offer virtual fencing. As an example, Vence, a U.S. company, is developing applications for extensive rangeland-based operations. On the other hand, Halter, a New Zealand company, is working with dairies to achieve higher-accuracy rotational grazing.

“Battery life in the collars is a major consideration,” Meiman says. “Higher accuracy information about animal locations requires more battery power. For cattle on a big range pasture all summer, you’d need a longer-lasting battery, and in most rangeland systems, we’re not trying to keep cattle in a tiny area. We might have a pasture thousands of acres in

size and want to subdivide that into multiple subunits, but these would still be huge compared to a small farm in more productive country that wants to rotational graze a 50-acre pasture divided into four pieces.”

The ARS in Oregon recently finished a study with the Vence system, looking at whether they can keep cattle out of burned areas with a virtual fence. When public rangeland burns, the burned area is typically off-limits to grazing for a couple years to allow it to recover. Virtual fence might be an alternative to conventional fence or resting the entire area.

Chad Boyd, ARS research leader in Burns, Ore., worked with the research project to see how virtual fencing might be beneficial on federal allotments.

“If 20% of a 10,000-acre pasture burns, you are looking at either building a fence to exclude cattle from that portion of the allotment or non-use of the whole pasture,” Boyd says.

Even if the ranch in this example wanted to build fence, he explains doing so on public land means going through a lot of different administrative processes that take time. Never mind the fact that terrain is challenging on wide swaths of public land.

“We wondered if virtual fencing might be a management alternative to keep cattle out of burned areas, enabling ranchers to graze areas that didn’t burn.



Photos by Heather Smith Thomas

Virtual fencing could be a great option during the recovery period, and not impede wildlife with an actual fence,” Boyd says. “There is a cost to utilize virtual fence, however. We paid \$40 per collar. With the company we worked with, you lease the collars rather than buy them. This is probably a good thing, because the technology is evolving so fast that if you spend a lot of money purchasing collars, those might be obsolete in a year or so.”

Additionally, there is a cost for requisite base stations.

“For smaller areas, one base station may be adequate, but for

larger areas, or more complex topography, additional base stations may be needed,” Boyd says.

Still, virtual fencing could be cheaper than physical fence in some situations. Virtual fence might also offer temporary solutions. **HW**

Editor’s Note: Heather Smith Thomas and her husband, Lynn, have ranched near Salmon, Idaho, for more than four decades. She also writes cattle articles that appear in numerous U.S. and Canadian cattle publications, including *Hereford World*. She is the author of numerous books, including “The Cattle Health Handbook.”