USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Virtual Fence Systems for Managing Livestock


Photo credit: NoFence

Introduction

This fact sheet provides a basic understanding of virtual fencing (VF) technology and how it may be use to manage grazing livestock.

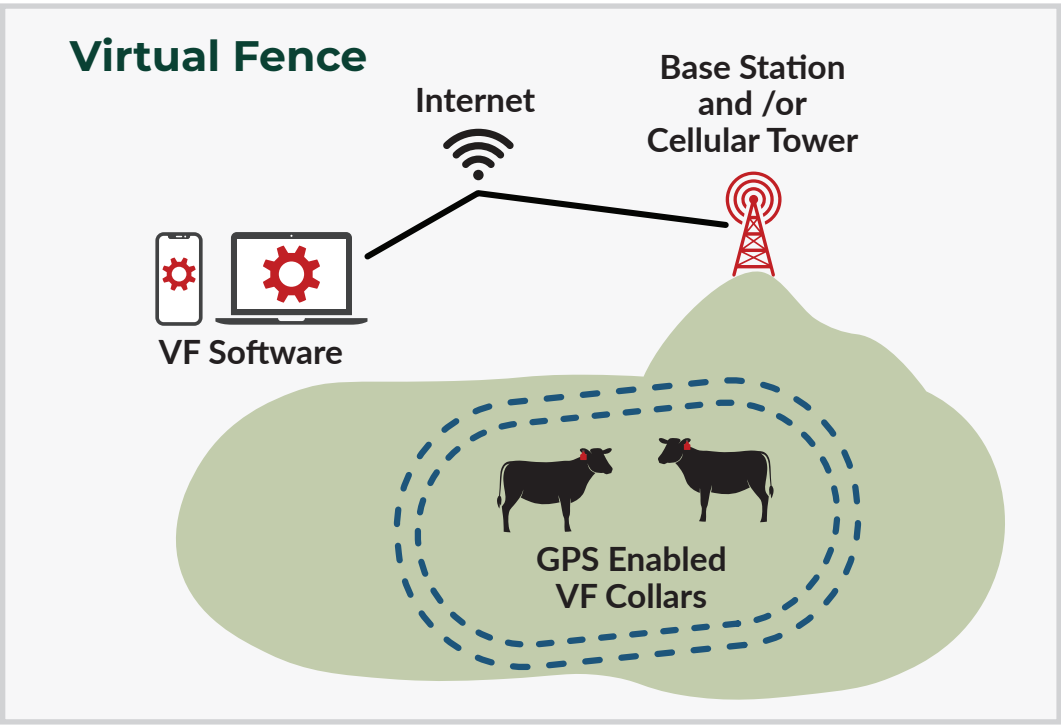
What is a Virtual Fence System?

Virtual fence technology research and development began in the 1980's. Recently due to advances in electronic communication and devices (smart phones, cell towers, computer tablets), the technology is more cost effective and available. The number of virtual fence systems available is currently limited and expected to grow as demand increases. A virtual fence system consists of three main components: Global Positioning Satellite (GPS), collar worn by the animal, and a computer or other device (tablet or smart phone).

How does it work?

The livestock collars communicate with the GPS system to determine the location of the collar. The precision of this location is dependent on many factors (typically between 10 and 35 feet).

The collars are powered by a battery. The battery may be rechargeable, replaceable, or supplemented by solar panels built into the collar. The battery charge will last from several weeks to months, depending on the demand on the battery from encounters with virtual fence boundaries and how often the collar communicates with the GPS system and client computer.



Orignal image by Amber Dalke, University of Arizona (recreated and reprinted with permission).

More Information

The following website has useful information including videos and frequently asked questions:

https://rangelandsgateway.org/vf

Producers and landowners should contact the NRCS office at their local USDA Service Center for additional information and one-on-one technical support specific to their working land. USDA Service Centers are in nearly every county across the United States

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The collars communicate with the producer's computer or other device, often done using cellular networks and the internet and requires good cell coverage within the grazing area. Some virtual fence systems use a local area network (LAN) to assist with communication between the collars and the internet or cellular service for situations where reliable cellular coverage is lacking.

Information that is communicated between the collars and the client computer include collar location (from collar to computer) and virtual fence location (from computer to collar).

Virtual fence locations are determined by the client, typically via their home computer. The smartphone, tablet, or computer software interface is used to digitally draw virtual fence lines on an image of the landscape using satellite imagery or a topographic map. Fence locations are communicated to each collar via the network (cellular or LAN). These locations are retained by each collar until it is next updated. This allows the virtual fence system to work (using GPS) even if the network is offline or unreachable.

Collars will emit sounds as the animal approaches the virtual fence boundary. These sounds are designed to get the animal's attention and, with appropriate training, cause the animal to turn away from the virtual fence boundary.

If the animal continues to approach the virtual fence boundary, an electrical stimulus is given to the animal through the collar. This stimulus is designed to cause the animal to turn away from the boundary. If the animal does pass through the virtual fence boundary, the system will allow the animal to return to the grazing area without experiencing additional stimulus.

Who might be interested?

Grazers willing to learn new software, willing to adapt, be problem solvers, and have clearly described grazing land management goals and objectives that will benefit from a virtual fence system.

Where can the systems be used?

Virtual fence systems can be applied on all grazed lands. Areas need to have good connectivity between the collars and the client computer (or other device), typically through the cellular network or a LAN.

Opportunities with Virtual Fence Systems

Virtual fence systems are useful where increased control of livestock grazing (location, and time) is desired. The systems are easier to modify than physical fence systems and boundaries can be added or removed. The virtual fence systems allow more flexibility to adapt to the variable conditions caused by drought, floods, wildfire, or other situations. Virtual fencing has the potential to enhance the efficiency of grazing management by controlling the distribution of livestock to ensure the timing, intensity, duration and frequency of grazing is appropriate for the area being grazed. Because of the spatially and temporally transitory nature of virtual fences there are many grazing land management applications for this technology, including rotational grazing, targeted grazing, cover crop or residual aftermath grazing, post fire grazing in unburned areas, protection of riparian, wetland and other sensitive habitats.

Virtual fence systems may decrease labor requirements for locating livestock, moving herds to different grazing areas, or building and repairing physical fences.

Potential Challenges with Virtual Fence Systems

There can be challenges associated with virtual fence systems.

Systems rely on functional technology and collar connectivity. Tree cover and slopes may affect connectivity issues with both GPS and producer's computer.

There are significant upfront costs associated with collars and any necessary base stations and systems require an annual subscription fee. These systems may not be an economically viable option for some livestock producers.

Livestock will need to be trained to respond appropriately to the stimuli provided by the collars, as well as be comfortable wearing the device.

Livestock may need to be handled several times during the grazing season to replace lost collars, replace batteries as needed, or clean devices.

Physical fences will still be needed in some areas. This is especially true at boundaries (to control neighboring livestock or avoid highways) or around hazardous areas.

Virtual fence systems will not contain 100% of the herd 100% of the time, **complete exclusion** of livestock from a specific area may not be possible with virtual fence.

Clients will need to ensure that the technology will enable them to meet their grazing management objectives (economic and ecological).