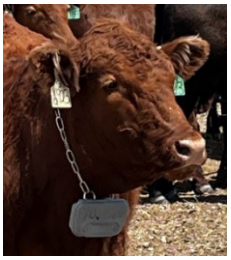
TECHNICAL NOTES

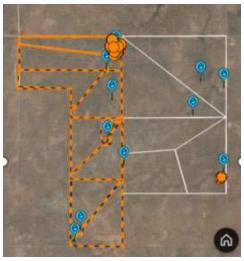
U.S. DEPARTMENT OF AGRICULTURE STATE OF WYOMING NATURAL RESOURCES CONSERVATION SERVICE

RANGE TECHNICAL NOTE NO. 4 – Virtual Fence April 2026

To: All Field and Area Offices
From: State Rangeland Management Specialist

Title: NRCS Technical Note – Practical Uses of Virtual Fence (VF) Technologies for Adaptive Grazing Management



This Technical Note provides NRCS planners, partners, and landowners with guidance on the practical uses of Virtual Fence (VF) technologies on Wyoming and Western rangelands. VF is a technological tool offering novel capabilities to support implementation of Grazing Management (528) in achieving desired conservation planning goals and objectives to improve grazing land resources. Possible practical uses of VF technologies include target grazing for non-desirable plants, short-term exclusion without physical fencing for protecting riparian areas or plant/site recovery associated with restoration, facilitating matching of animal demand with available forage amounts and quality, and providing flexibility for adaptive grazing management applications without the need for temporary (electric) or permanent interior fencing to alter distribution of livestock within and among pastures. Monitoring key metrics associated with the conservation planning goals and objectives is needed to adaptively use VF technology for practical applications. Effective use of **VF technology for adaptive grazing management requires properly identifying** conservation planning goals and objectives prior to applying VF for adaptive grazing management, and **monitoring of key metrics to be used as science-informed decision-making input to effectively accomplish resource goals and objectives.**

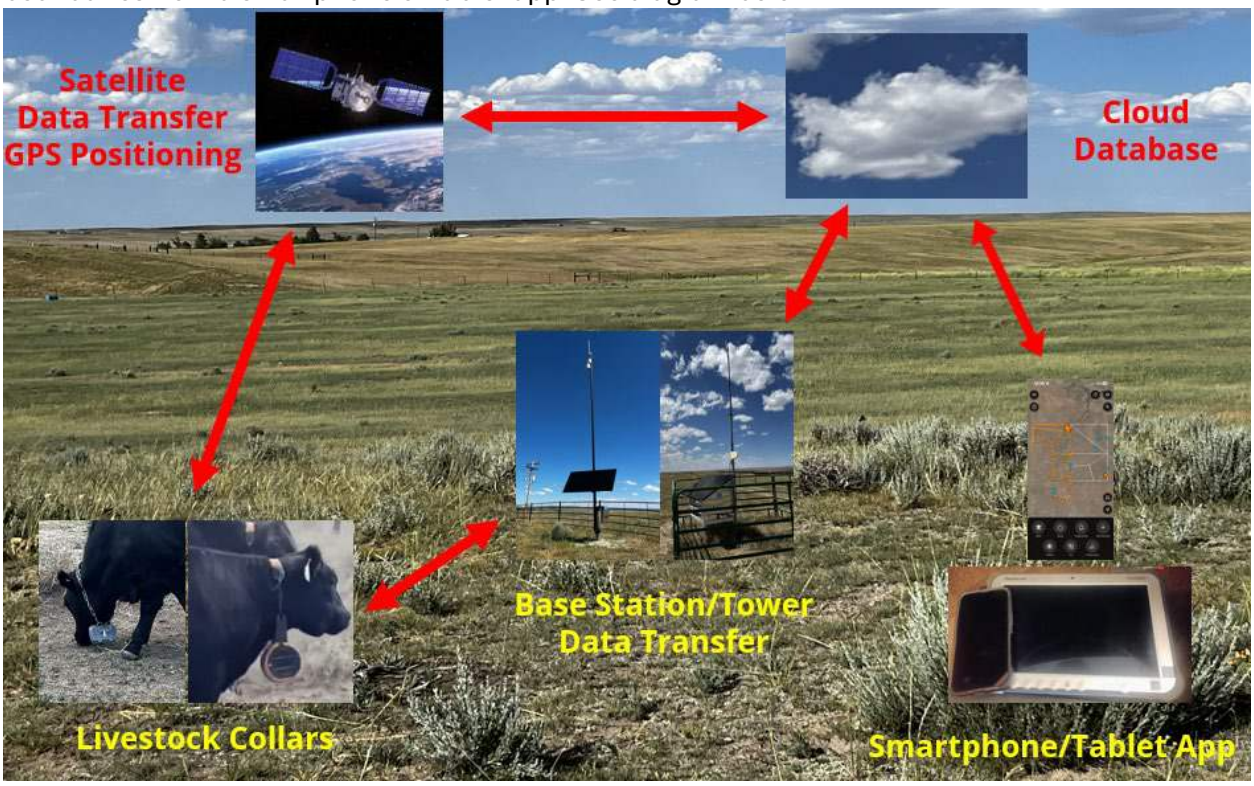
Introduction

Virtual Fence systems use GPS-enabled collars to guide livestock through audio cues and mild electrical stimuli as needed. Managers draw and adjust boundaries digitally via software that communicates with collars using cellular, radio base-station, or satellite links. This creates flexible grazing boundaries without wire and posts. Interest in Wyoming has grown due to expansive allotments and pasture sizes, rugged terrain, variable forage with limited precipitation, drought conditions, labor constraints, physical fence costs, and wildlife migration needs. **It is highly recommended to consult with each Virtual Fence company to determine product application**

for individual operation and costs. VF is most applicable on large or remote rangelands where interior fences are impractical or costly. It enables adaptive grazing rotations and helps manage livestock around wildlife corridors, riparian areas, restoration efforts and steep slopes. VF systems are well-suited to pastureland as well because they allow adaptive, fine-scale grazing management that aligns with plant growth rates, soil conditions, and pasture performance goals. By making rotational adjustments easier and more precise, VF supports optimal stubble height management, enhances utilization monitoring, and reduces the risk of overgrazing. When combined with a well-designed grazing plan, VF can significantly elevate the productivity, resilience, and ecological function of Wyoming pasture systems. Wyoming-specific considerations include limited cellular coverage, winter conditions, and alignment with public-land permits.

System Components

VF systems typically include GPS-enabled collars, a communication network using cellular towers, radio towers, or satellite signals, and a cloud platform for drawing and monitoring virtual boundaries from a smartphone or tablet app. See diagram below.



Animal Behavior and Training

- All VF companies require a training period prior to full product use.
- All mature cows (ewes, does) must be collared in the VF herd, bulls (rams, bucks) and calves (lambs, kids) do not need to be collard.
- Currently only one company (Nofence) provides a product for sheep and goats.
- Most cattle learn audio cues within 3–7 days during training.
- Follow VF manufacturers training periods and location recommendations and procedures.
- A small percentage of animals may not respond and require alternative management or replacement in the herd.

Implementation Steps (Overview)

Implementing VF begins with defining clear management objectives and inventorying existing resources such as fences, water, terrain, and areas needing exclusion. Planners and landowners then assess connectivity requirements, select a manageable pilot pasture for Year 1, and design initial virtual boundaries that align with forage availability, sensitive habitats, and livestock behavior. Collar deployment, charging, and maintenance schedules should be established early, along with a training plan that uses calm handling and close observation during the first week. As cattle adapt, users monitor forage use, heatmaps, and behavior to refine boundaries and ensure objectives are being met. Contingency plans for weather, malfunctions, and breaches should be in place, and coordination with wildlife agencies is important where migration corridors or seasonal habitats occur. Finally, an economic assessment helps compare VF costs and benefits relative to traditional fencing, labor, and long-term management goals.

Considerations Before Choosing Virtual Fence

- **Objectives of Grazing Management:**
  - Targeted Grazing of Weed species – Is the time needed or allowed worth the expense? Are there other methods that have been proven more effective, cheaper?
  - Post wildfire (disaster) recovery – Is this temporary? What to do next, continuing VF?
  - Even Utilization – How is current utilization determined? Is there predictable regrowth? Can areas be excluded that have been grazed too hard in the past? Under current management, how does livestock use each pasture? Are there over-utilized places and under-utilized? Do you want to run multiple herds/multiple species?
  - Distribution – Water dependent, can the pasture(s) be used differently? How are pastures currently watered? What are the sizes of pastures and the number and placement of water sources? Is more water needed to better distribute livestock?
  - Wildlife – What percentage of forage is used by wildlife, and during which seasons? How does this affect my livestock grazing plan? Are there wildlife habitat or enterprise considerations that change pasture design?
  - Carrying Capacity – Do you know current carrying capacity? How is it determined?
  - Stocking Rate – Financially established or based on carrying capacity data?
  - Future – Can you see yourself using VF for the next 5, 10, 20 years? Costs? Support?
- **Management Load:** Are you prepared for the increased level (mental labor) of management and monitoring needed, or is near-real-time animal location the primary attraction? Ear tags might be cheaper for just real-time animal location.
- **Operation Infrastructure:** Livestock handling facilities (chute with adequate head catch) for collaring livestock? Larger operations are there multiple handling facilities across the operation in the event collars are lost? How will lost collars be handled. Will additional labor be needed for the collaring task and keeping records to identify collar with animal (ear tag)?
- **Livestock:** Livestock daily requirements **(See Appendix A)**
  - Stocking Rate is equal to or below Carrying Capacity.
  - 1600-pound cow requires more forage than a 1100-pound cow.
  - Can you manage multiple herds in one pasture (splitting cow/calf numbers into sperate herds), can you run multiple species (cow/calf and yearlings, cattle and sheep)?

- **Monitoring:** Willingness to put the time in to monitor current conditions and outcomes and use the data and information to help make grazing decisions?
- **Boundary and Interior fences:** Boundary fences will need to be maintained annually. Existing interior fences will need to be maintained until it has been determined that VF is the appropriate management tool for the operation. This will allow for adequate time to evaluate the data being utilized for decision support.
- **Virtual Fence will not help or is limited:**
    1. Lack of livestock drinking water.
    2. VF does not change precipitation amounts and patterns.
    3. Does not change forage composition quickly in the short term, maybe long-term.
    4. Does not produce more forage if currently exceeding carrying capacity.

Animal Welfare and Training Notes

Livestock generally learn virtual-fence audio cues quickly, with stimulus use declining sharply once animals are conditioned. Effective training relies on calm, low-stress handling, consistent exposure to uncomplicated boundaries, and introducing animals in familiar pastures to reduce confusion. Initial users have reported livestock collared for the first time leave handling facilities bucking and slinging their heads trying to throw off the collar but then settle within minutes. Early training periods should be monitored to ensure animals respond predictably to cues and to identify individuals that may need additional conditioning. Virtual fencing can also support animal welfare by reducing the stress associated with traditional gathering, lowering injury risk from wire fences, and enabling more gradual, low-pressure pasture movements. Clear training protocols, attentive observation during the first 3–7 days and maintaining adequate forage and water access within virtual pastures all contribute to safe and successful adoption.

Getting Started

Year 1 – Getting Started

• Select a VF provider, determine collar numbers, and evaluate connectivity (cell, LoRa – Long Range wireless radio frequency technology, satellite).

• Train cattle in a small, familiar pasture using calm handling and start with simple, uncomplicated VF boundaries.

• Utilize current pasture carrying capacity estimates to produce a reasonable approximation of available forage.

• Run livestock using current management (with collars on) to learn how livestock currently/historically utilize pastures. Learn where they select to graze on their own.

• Identify livestock that do not adopt the technology, separate from herd to avoid problems. If problem animals remain in the herd due to logistical reasons (gathering, market timing, etc.),it is suggested that collar adoption is used as one of the annual evaluation culling criteria.

• Set up initial virtual pastures, exclusion zones, and daily monitoring routines.

• Track animal response to cues, watch for early breaches, and refine boundary placement.

• Begin collecting heatmaps, boundary logs, and field observations to understand distribution and behavior. Identify monitoring methods and locations, identify other data that needs to be collected to be used for decision making.

• VF companies recommend starting stocking rate conservatively, breaking pastures initially in half, seeing how the livestock and forage respond then splitting the pastures again and so on.

Years 2 and Beyond – Full Implementation & Optimization

• Expand use of VF across larger physical pastures by creating additional virtual pastures and incorporate more complex grazing rotations.

• Apply seasonal or resource-specific exclusions if needed (riparian, treated acres, sensitive wildlife habitat).

• Use VF data (heatmaps, compliance reports, time-in-paddock logs) to adaptively manage forage and timing in conjunction with on the ground monitoring.

• Adjust virtual boundaries hourly, daily, weekly or annually to meet habitat, distribution, or recovery objectives. More commitment and management are required for fine-tuned hourly and daily movements.

• Continue refining training, replacing collars as needed, and integrating VF data into long-term monitoring and planning.

Planning Considerations for NRCS Planners and Landowners

Planners must address resource concerns, grazing objectives, and integration with conservation practice standards. VF assists with riparian protection, livestock distribution, vegetation utilization, invasive species, and wildlife needs. Training, terrain/topography, forage availability, water availability and climate guide design. **Livestock water availability is the most limiting factor of VF and grazing management on rangelands.**

Three Ways NRCS Can Help Livestock Operations with Grazing Management Using VF

1. **Livestock Distribution, Forage Utilization, and Distance to Available Water**
   Water availability governs the usable grazing radius—typically 0.5 to 1 mile on gentle terrain. VF *behaves like a fence* but **cannot override the main distribution driver**:
   - If water distribution is poor, livestock distribution will remain poor.
   - If new water is added, VF becomes dramatically more effective.

   VF + water development is a **much stronger pairing** than VF alone. Planners should consider such factors and ensure that new water developments will not create additional resource concerns.
   - Consider class of livestock (Cattle (British vs. Continental), Sheep, Goats, Cow/calf, yearlings) along with grazing season climatic conditions that affect livestock water consumption and distance able to travel.
   - Pasture size - currently 100% utilization additional physical or VF is not needed.

Livestock Water Availability

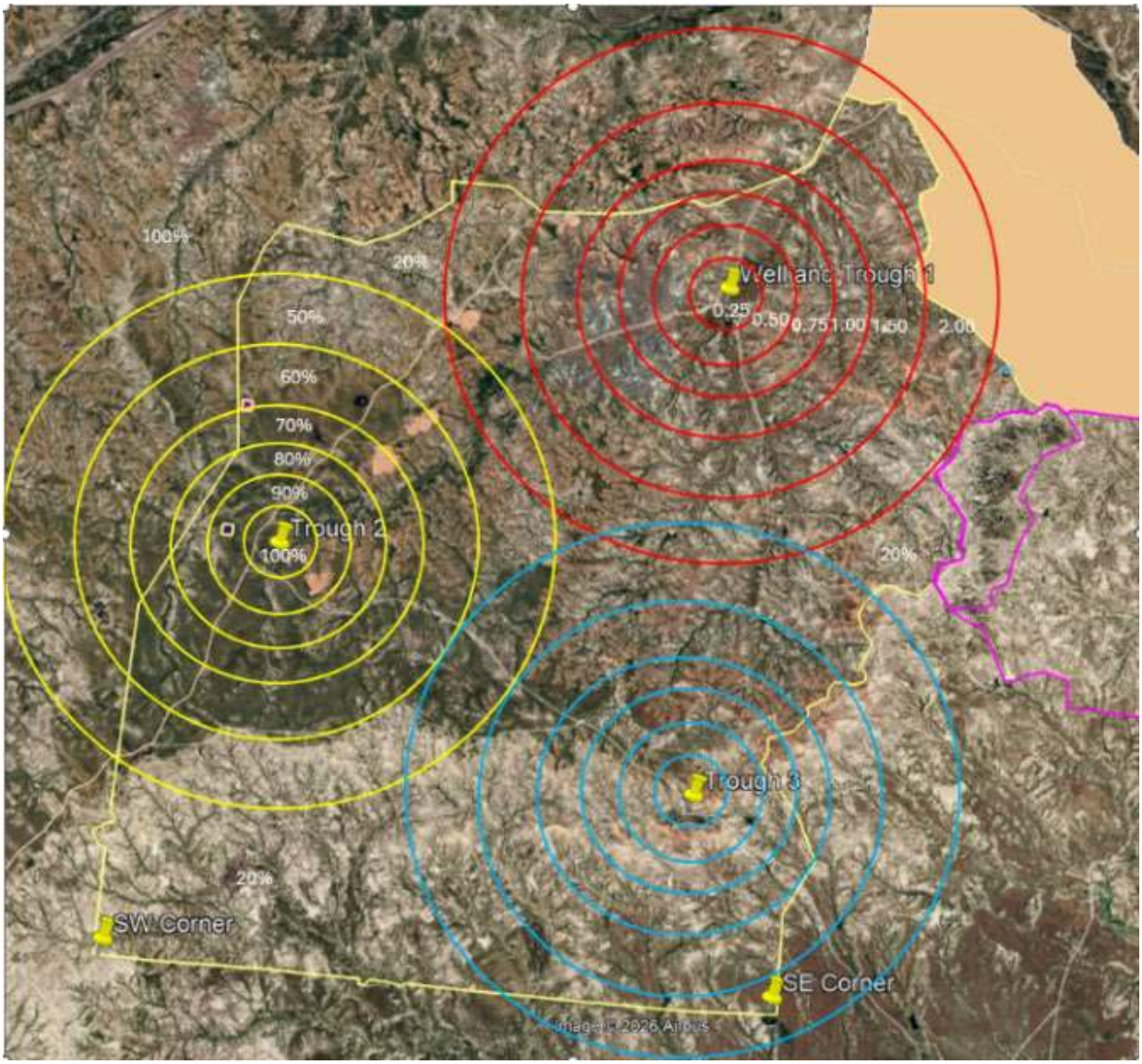
Distance from Water (Miles)	% Reduction in Grazing Capacity
0 - 1	None
1 - 2	50
2	100*
	* Consider this area ungrazable

Holechek, J.L. 1988. An approach for setting the stocking rate. Rangelands, 10(1), 10-14.

Distance to Water (feet)	% Adjustment
2640	100%
5280	90%
7920	70%
10560	50%

% Slope	% Adjustment
0 – 15	100%
15 – 30	70%
31 - 60	40%
>60	0%*
* Consider this area ungrazable	

USDA – NRCS National Range and Pasture Handbook, Subpart F

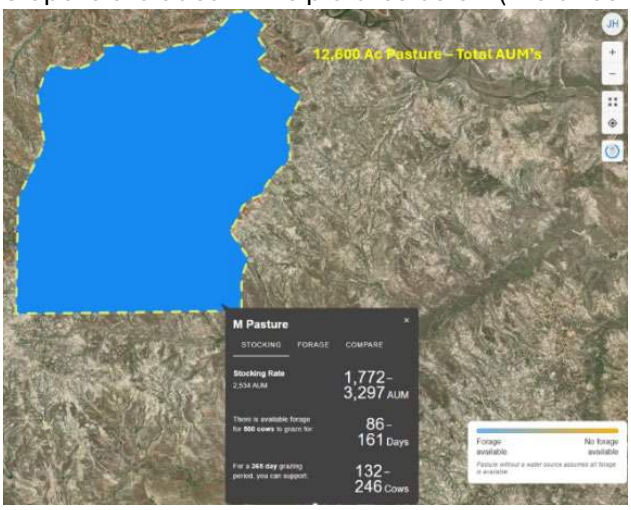


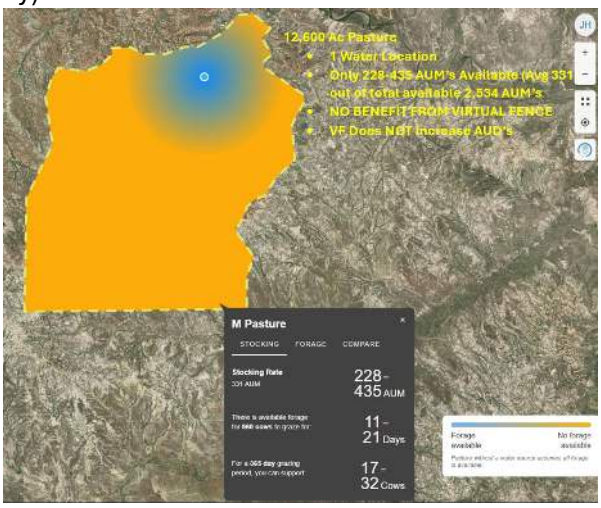
Map made using Google Earth

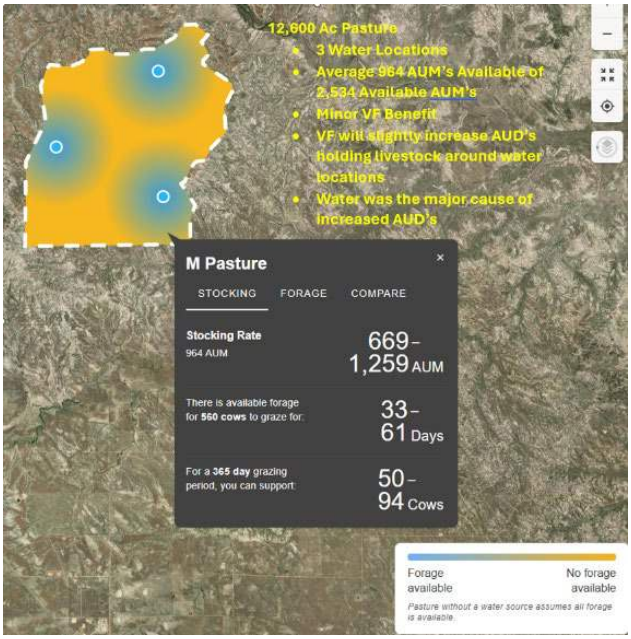
Red circles depict ¼, ½, ¾, 1, 1½, 2 miles radiating out from water.
Yellow circles depict utilization levels out from water:
Mile – Utilization %
0 – ¼ - 100%
¼ - ½ - 90%
½ - ¾ - 80%
¾ - 1 – 70%
1 – 1½ - 60%
1½ - 2 – 50%
Over 2 miles – considered ungrazable.
Yellow, Red and Blue – distance overlap from one water location to the next water location.

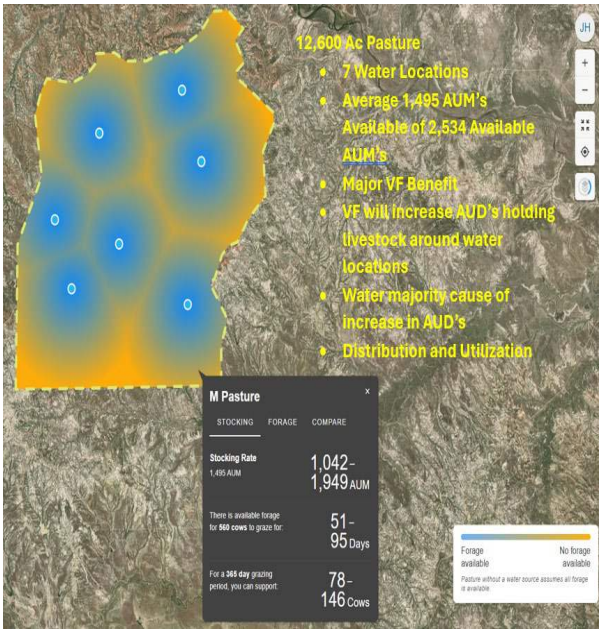
Distance to Water in Relation to Grazing Utilization

Slope is excluded in the pictures below (Distance only)



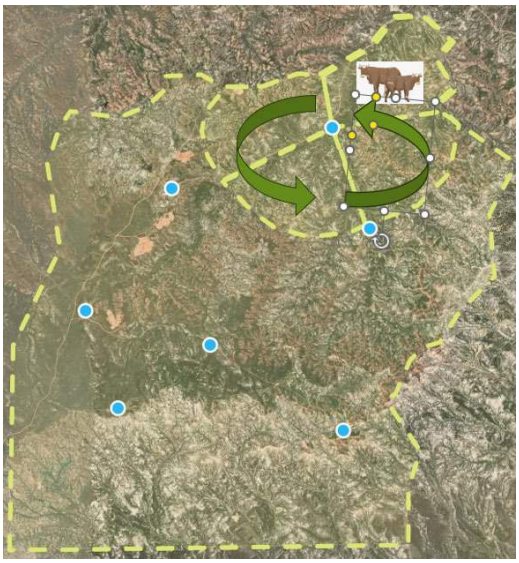






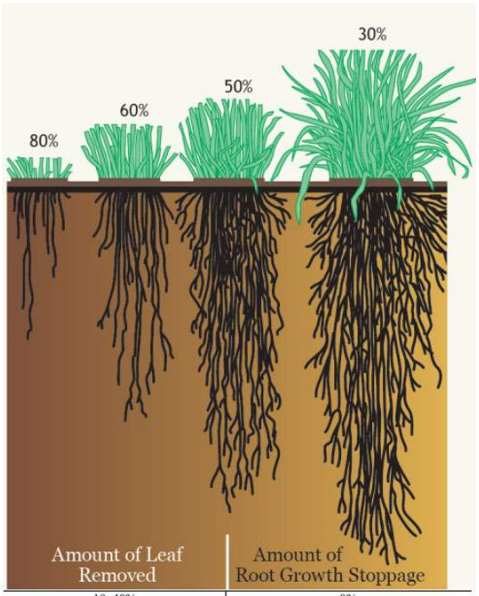
Pasture Acres	Total AUM's Pasture	# Water Locations	Number of Head	Cow Weight	Available AUM's	Days in Pasture
12,600	2,534	1	560	1100	331	16
12,600	2,534	3	560	1100	964	47
12,600	2,534	7	560	1100	1,495	73
12,600	2,534	7	560	1400	1,495	58
12,600	2,534	7	560	1600	1,495	50

STOCKSMART Login - https://www.stock-smart.com/
STOCKSMART How-to User Guide - https://docs.google.com/document/d/1Trv8zYG_NSz18jgya_-bzWoyg3-8HDV1JCLFPuqsclA/edit?tab=t.0



Use VF to create small pastures around water to keep animals concentrated in these locations, eliminating animal preference to areas in the larger pasture, providing for more even utilization.
A single herd can be rotated through larger pasture by water location or herd can be divided by water location depending on comfort level of management and VF system.
Monitor plant and livestock response to different rotations, timing/season of use, grazing intensity and recovery period.
Use the monitoring data to determine if meeting objectives, addressing resource concern(s) and in the decision-making process.

2. **Plant Growth and Plant Response – Utilization and Harvest Efficiency**
   Plants have a tolerance to grazing, but if herbage removal exceeds a critical point, most plants will lose vigor, produce less and if excessive removal continues, the plants will eventually die. Proper utilization is the approximate point of forage harvest that will not lead to range or pasture deterioration or decreased animal performance. The key to proper utilization is to leave sufficient leaf area to allow the plant to restore depleted energy reserves in response to grazing and thus maintain desirable productivity and composition. In 1955, Crider published a study on the effect of above ground leaf removal on below ground root response (Figure below).



Amount of Leaf Removed	Amount of Root Growth Stoppage
10–40%	0%
50%	2–4%
60%	50%
70%	78%
80–90%	100%

If 80% of plant leaf material is removed, plant root growth can cease for 12 full days, which slows plant regrowth considerably (Crider 1955, Dietz 1989, USDA-NRCS 2016. If only 10% to 40% of plant leaf material is removed, plant root growth doesn't stop, and the plant regrows faster and remains healthier; but this effect varies by species (USDA-NRCS 2016).

USDA-NRCS National Range and Pasture Handbook

A common starting point or rule of thumb for planning an appropriate level of utilization is "take half and leave half" or 50 percent utilization of annual forage production. This utilization includes actual forage consumed by the animal, but also damage to plants caused by trampling, loafing and other non-livestock factors such as loss to insects or utilization by wildlife. Some estimate as much as 25% of total annual production is lost to livestock damage and other competitive uses under low stocking density continuous grazing program. This can be referred to as harvest efficiency which is defined as the percentage of total annual standing forage that is consumed by the grazing animal. Harvest efficiency should not be confused with grazing efficiency which refers to the percentage of allowable standing forage consumed and results in higher percentages. Harvest efficiencies above 35% have a negative impact on animal performance. Table below provides guidance on determining harvest efficiency based upon type of grazing system and management level used for the operation. An example of how Harvest Efficiency and the rule of thumb "Take Half, Leave Half "are related.

(1000 lbs/ac x 50% Use) – (1000 lbs/ac x 25% loss due to trampling, fouling, insects, etc.) = 500 lbs/ac – 250lbs/ac = 250 lbs/ac of available forage.

To simplify the equation, use 1000 lbs/ac x 25% Harvest Efficiency = 250 lbs/ac available forage.

Grazing Management Level	**Harvest Efficiency**
Continuous, Season Long	25%
Deferred Rotation, 2+ Pastures	25-30%
Rest Rotation, Multiple Pastures	25-30%
Short Duration, High Intensity	30-35%

Grazing large pastures in Wyoming and the arid west, where livestock can utilize the available forage, harvest efficiency is likely greater than 25% currently. It is important with any grazing management system to determine how much actual forage the livestock are consuming and leaving behind. In an area where livestock have currently grazed, how many plants are noticeably trampled or defecated on, forage bitten off but dropped, and used or needed by wildlife? In the arid west where bare ground is more prevalent, harvest efficiency is difficult to estimate and evaluate. The monthly precipitation graph below is from MLRA 58B (Central, NE Wyoming), 10–14-inch precipitation, vegetation growth on average is primarily from the beginning of April to mid-June with a short second growth period in September to October. With limited precipitation a grazing system must be developed that allows for sufficient regrowth or leaves plants with enough vegetation that allows plants to recover quickly. With Harvest Efficiency being so difficult to estimate and evaluate, taking no more than 50% utilization by weight of available forage and monitoring key areas or key species is the key to success.

MLRA 58B 10–14-inch Precipitation and Vegetation Growth Curve

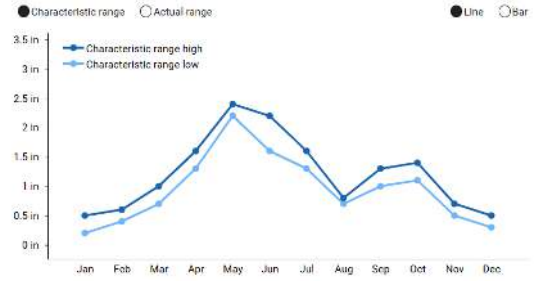


Figure 2. Monthly precipitation range

3. **Area Protection/Recovery**
    - Post treatment recovery
        - Example: Herbaceous Weed Treatment (cheatgrass)- Virtual fencing can be utilized to exclude livestock from herbicide-treated units within large pastures, supporting planned post-treatment recovery while enabling continued, controlled grazing on untreated acres to meet overall resource objectives.
    - Riparian area exclusion
        - Example: Virtual fencing can be applied to create seasonally or permanently excluded riparian corridors, reducing livestock pressure on streambanks and enhancing channel stability, vegetation recovery, and water-quality outcomes.
    - Post disaster vegetation recovery
        - Example: Wildfire Recovery- Virtual fencing can be implemented to temporarily exclude livestock from post-wildfire burn units, promoting soil stabilization, native vegetation recovery, and reduced erosion risk while allowing planned grazing to continue unaffected areas.
    - Targeted grazing
        - Example: Early spring cattle grazing may suppress cheatgrass by removing its early vegetative growth during the period when perennials are still largely dormant, reducing annual grass height, biomass, and seedhead formation. This shift in growth timing increases light and

soil-moisture availability for perennial bunchgrasses, improving their competitive advantage later in the season.

Most Common Resource Concerns Associated with Virtual Fence

- Plant Productivity and Health (Plant)
- Plant Pest Pressure (Plant)
- Plant Structure and Composition (Plant)
- Feed and Forage Imbalance (Animal)

Limitations, Risks and Compliance

VF performance depends on connectivity, battery life, weather, terrain, and maintenance. **VF is not a substitute for legal boundary fencing.** Due to the definition of a lawful fence in Wyoming, NRCS cannot plan and implement VF for the purpose of a boundary fence. Wyoming is a 'fence-out' state for cattle and horses, considerations must be made to avoid unwanted grazing. Introducing cattle into historically ungrazed areas may produce long-term ecological effects. VF use must comply with NRCS Grazing Management (528), whereas grazing utilization on range or grazeable woodland grasses and grass-like species will not remove more than 50 percent by weight of the current year's growth of the designated key species when grazed during the growing season. When grazed during the dormant season or in a grazing schedule that allows for short grazing periods followed by long deferment periods will not remove more than 60 percent. Grazing utilization on pasturelands (non-rangeland) will be based on leaf length. Towers and water developments may require cultural resource review. Public-land use requires agency coordination and must follow agency use requirements. VF boundaries and records should align with legal property lines and be integrated into the Grazing Management (528) plan.

Wildlife Considerations

Virtual fencing can support wildlife-friendly grazing management by reducing the need for interior wire and allowing managers to adjust pasture boundaries seasonally to accommodate wildlife movement patterns. This flexibility can help maintain open corridors used by pronghorn, mule deer, and other wide-ranging species, particularly when coordinated with agencies responsible for designated migration routes. Virtual fencing can also provide habitat benefits by temporarily excluding livestock from key areas such as sage-grouse nesting zones, fawning areas, or riparian brood-rearing habitat, allowing vegetation structure and cover to recover during sensitive periods. At the same time, planners should recognize that the ability to graze all acres with precision could inadvertently reduce the availability of important wildlife habitat if not managed carefully. Identifying priority species, key habitat components, and seasonal requirements within the management unit is essential to ensure virtual fencing enhances, rather than diminishes, wildlife habitat conditions.

Economic Considerations

Costs include collars, subscriptions, and base-station towers. Producers often report savings from reduced fence maintenance and labor. A partial budget helps evaluate benefits.
From the Planning Considerations section above do the benefits outweigh the costs?
Each VF company has their own costs per collar and tower (if needed), Unit of production (calf or livestock) prices change annually as well, use the table below to estimate costs.

Economic Consideration of VF Example and Calculations (does not include base station/tower costs, to include those as annual costs, total tower(s) costs divided by 7 years (expected lifespan)):

Year	Total Cows in Herd	Annual Cost per Collar	Annual Cost of Collars	% Death Loss	% Conception Rate	Total Calves Sold	Market $/Calf	Calves needed to pay for VF
2025	300	$50	$15,000	10	95	255	$2500	6
2022	300	$50	$15,000	10	95	255	$1500	10
	300 x $50 = $15,000			10%+5%=15%x300=255			6x$2500=$15000	
Use Green Row below for your operations numbers and Break Even								

Consider whether increases in **carrying capacity**, **stocking rate**, **harvest efficiency**, and **labor savings** offset VF costs within your operation.

Data and Documentation

VF platforms can generate a variety of operational data and documentation that can allow a producer to manage adaptively and help NRCS verify practice implementation, monitoring, and outcomes.

Typical outputs include:

- **Animal location tracks (GPS)** and real-time herd visibility
- **Grazing heatmaps** / space-use intensity layers
- **Boundary compliance** & interaction logs
- **Time-in-paddock** & scheduled moves
- **Exclusion zone adherence** (riparian, post-treatment, burn units)
- **Animal activity/behavior indices**
- **Device/operational telemetry** (battery, connectivity)
- **Accelerometer** If equipped, grazing periods verse resting, walking, running, etc.
- **Alerts & event reports** Include data summaries and maps in the **528 Grazing Plan** file to support decisions and compliance.

Monitoring

Refer to **NRCS CPS 528** for monitoring expectations. Monitoring is critical to short- and long-term evaluation of grazing plan effectiveness and informs adjustments to grazing sequences based on plant vigor/composition, animal class, environmental conditions, and management objectives. NRCS will assist with establishing monitoring locations and protocols and is available to meet at least annually to determine if adjustments are needed.

Sampling Intensity:

- One site per dominant ecological site, with at least one per pasture if the pasture is <1,000 acres.
- If >1,000 acres, monitor one site per 1,000 acres (additional sites as appropriate).

Special Case: Producers Using Many Small Virtual Pastures

When a rancher is running a lot of small VF paddocks **(e.g., 10–40 acres each)** in a rotation that changes every few days, here is the recommended approach:

1. Cluster paddocks into "monitoring zones."

Instead of monitoring every paddock:

- Group 4–6 adjacent VF paddocks into a **zone**
- Monitor **one representative paddock** per zone
- Move monitoring to a different paddock in the next cycle

This keeps workload manageable without losing accuracy. NRCS should work diligently with the producer to locate and establish these monitoring zones.

2. Use a time-based check schedule

For producers rotating **every 1–5 days**:

- Check monitor points **every 2–3 days**
- Take photos **each entry and exit**

This aligns monitoring frequency with rotation frequency.

3. Tie animal behavior to pasture condition

VF gives real-time behavior data:

- If cattle start spending >70% of time in a single corner → forage is running out
- If audio cues or stim rates spike → animals are "searching"
- If step counts decline → forage availability is dropping

Producers can use this to avoid overuse of forage in small paddocks.

Implementation Requirements Fence (382) & Grazing Management (528) Virtual Fence

- Attach 382, 528 IR (Virtual Fence) hardcopy to this Technical Note
- NRCS Field Office Technical Guide – Wyoming – Section 4 – Conservation Practices Standards & Supporting Documents – Fence (382) – 382 WY IR Fence-Virtual Fence 2025

Appendix A — Calculations

Determining livestock daily needs (AUM's, AUD's), Animal Unit Equivalents, carrying capacity, stocking rate, acres required, number of pastures.

References and Informational Links

Company/Manufacturer Web Sites:

Gallagher e-Shepard - https://am.gallagher.com/en-US/Solutions/eShepherd/
Halter – https://www.halterhq.com/en-us
Nofence – https://www.nofence.com/
Vence - https://www.merck-animal-health-usa.com/hub/vence/

NRCS Field Office Technical Guide - https://efotg.sc.egov.usda.gov/#/
Wyoming - Section 4 – Conservation Practice Standards & Support Documents – Grazing Management (528) – 528 WY CPS Prescribed Grazing 2024.

NRCS National Range and Pasture Handbook (NRPH) - https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/animals/livestock/national-range-and-pasture-handbook

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Appendix A — Calculations

Animal Unit Month (AUM) Concepts and Applications for Grazing Rangelands – https://wyoextension.org/publications/html/B1320/

National Range and Pasture Handbook – Subpart F – Management of Grazing Lands

Animal Unit Equivalent (AUE)

Table 1. Classes of livestock and wildlife and their animal unit equivalents (AUEs)

Class of Animal	Animal Unit Equivalent
Cow, 1000 lb, dry	0.92
Cow 1000 lb, with calf	1.00
Bull, mature	1.35
Cattle, 1 year old	0.60
Cattle, 2 years old	0.80
Horse, mature	1.25
Sheep, mature	0.20
Lamb, 1 year old	0.15
Goat, mature	0.15
Kid, 1 year old	0.10
Deer, white tailed, mature	0.15
Deer, mule, mature	0.20
Elk, mature	0.60
Antelope, mature	0.20
Bison, mature	1.00
Sheep, bighorn, mature	0.20

Table 2. Examples of different cow weights and their corresponding animal unit equivalents (AUEs)

Class of Animal	Animal Unit Equivalent
Cow 1000 lbs, with calf	1.0
Cow, 1200 lbs, with calf	1.2
Cow, 1400 lbs, with calf	1.4
Cow, 1600 lbs, with calf	1.6

Animal Daily Intake or Forage Demand

Average Animal Weight x daily intake (%) = X lbs/day

= Animal Unit Day (AUD)

***Air – dry weight of forage**

*2.6% - 3% on Arid Western Rangelands – Use 2.6% with high plant species diversity with high nutrient values (% protein). Use 3.0% with low species diversity and low nutrient values (Arid Western Rangelands). 3% is more conservative.

1000lbs x 3% (0.03) = 30 lbs/head/day
1200lbs x 3% (0.03) = 36 lbs/head/day
1400lbs x 3% (0.03) = 42 lbs/head/day
1600lbs x 3% (0.03) = 48 lbs/head/day

Pounds per Month = X lbs/day x 30.42

= Animal Unit Month (AUM)

(365days/year/12months/year = 30.42avgdays/month)
1000lbs - 30lbs/day x 30.42days/month=912.6lbs/month
1200lbs - 36lbs/day x 30.42days/month=1,095.1lbs/month
1400lbs - 42lbs/day x 30.42days/month=1,277.6lbs/month
1600lbs - 48lbs/day x 30.42days/month=1,460.2lbs/month

1 Acre = 43,560sqft or 209ft x 209ft

Carrying Capacity=$\frac{\text{Grazeable acres x Forage Production (lbs/ac) x Utilization (\%)}}{\text{Livestock Daily Intake (lbs/head/day) x number of days (d)}}$

Stocking Rate or Number of Livestock = $\frac{\text{Total usable forage (lbs)}}{\text{Total Forage Demand (lbs)}}$

Total Usable Forage = Forage production (lb/ac) x % allowable use (25%) x acres
Or Total forage (lbs) available for grazing – Ex. 800lbs/ac x .25 x 2,000acres = 400,000lbs

Acres Required = $\frac{\text{Livestock daily intake (lbs/head/day) x \# of animals x days}}{\text{Available forage production (lbs/ac) x Utilization rate (\%)}}$

Example: 1000 lb cow = 30lbs/head/day, 800 lbs/ac Available forage production, 25% (.25) Utilization, 1 month (30.42 days) = 30lbs/h/d x 1 x 30.42/800lbs/ac x .25 = 912.6/200 = 4.6 acres for 1 cow for 1 month, 300 head x 4.6 ac = 1,380 acres/month or divide by 30.42 = 46 acres for 300 (1,000lb) cows for 1 day

Ecological Site Description (ESD) Plant Community Production Carrying Capacity:
Example 1: Bluebunch Wheatgrass/ Rhizomatous Wheatgrasses/ Needle and thread/ Wyoming Big Sagebrush 175-575 0.07
175 (above) is the low vegetation production pounds per acre value and the 575 is the High vegetation production pounds per acre. The ESD also has a representative value (not always average) in the Ecological Dynamics section – use the representative value.
0.07 is the carrying capacity of this plant community = 1 AUM/0.07 = 14.29 acres for 1 – 1,000lb cow for 1 month.
Example 2: Rhizomatous WG, Needle and thread, Blue Grama 700-1500 .4 = 1 AUM/0.4 = 2.5 acres for 1 – 1,000lb cow for 1 month.