COLLAR ADJUSTMENTS WHEN USING VIRTUAL FENCE TO MANAGE YEARLING STEER DISTRIBUTION

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VIRTUAL FENCE is an emerging technology that enables remote manipulation of livestock grazing locations (see **Figure 1**). It uses collars that emit tactile and/or audible cues to which cattle are trained, allowing for user-defined boundaries that can be more dynamic and less expensive than traditional fencing. Understandably, much research has focused on the effectiveness of virtual fence in maintaining the cattle herd within the invisible boundaries. However, a key concern of ranchers interested in virtual fence are practical constraints such as collar failure and adjustment rates.

For many rangeland livestock producers, the handling required to replace or adjust a collar can be difficult and costly, especially when grazing large pastures or on public lands.

Virtual fence manufacturers have worked to design collars that minimize failure due to damage, water infiltration, or slipping off the neck. However, one issue is likely to be unavoidable — rapidly growing animals leading to tightening collars that can cause discomfort and other animal welfare concerns. It is possible that future iterations of virtual fence collars will be self-adjusting, but current models must be manually adjusted.

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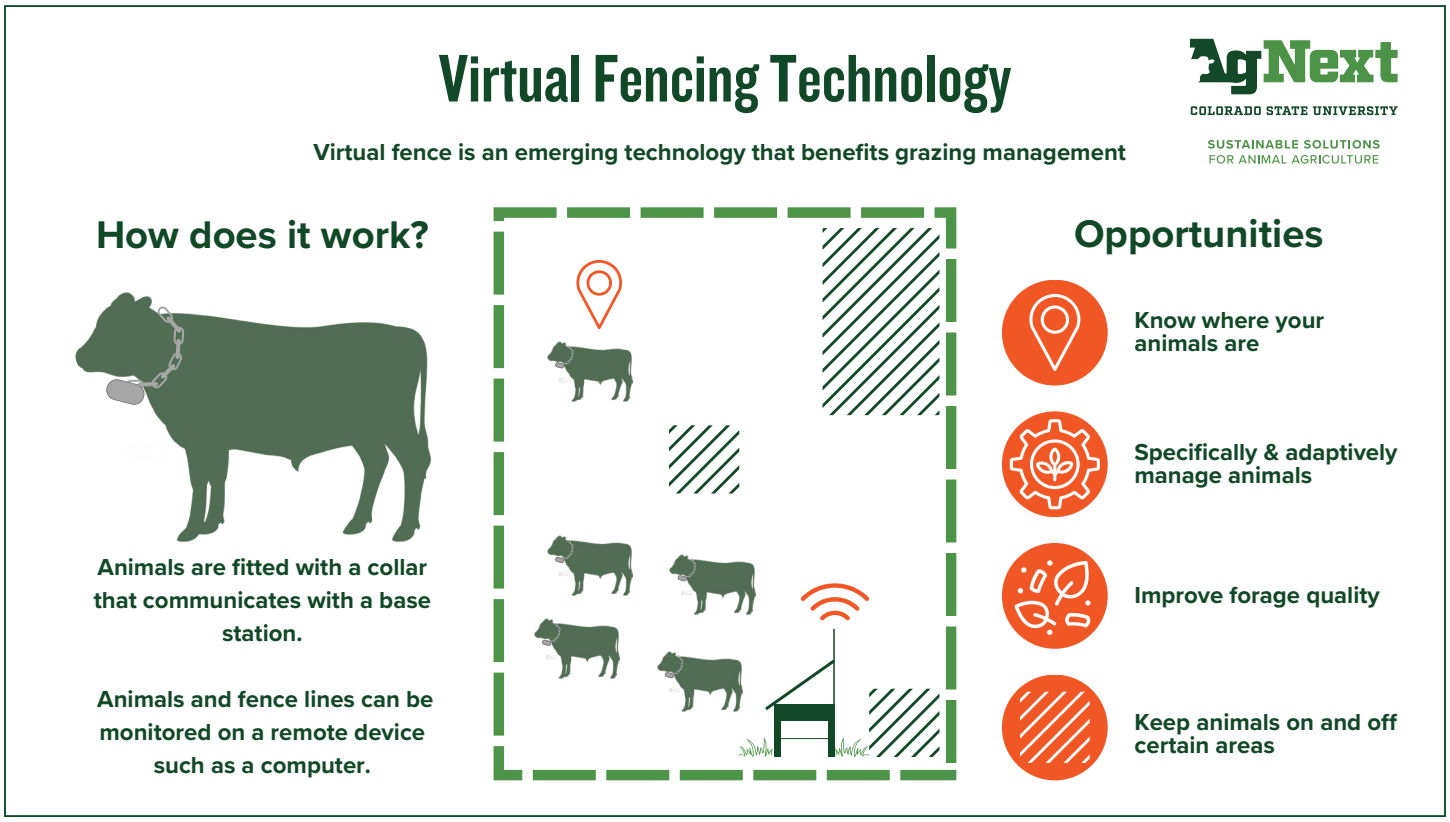
Figure 1. Virtual fence diagram for employing virtual fence to manage beef cattle distribution.



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How frequently can a rangeland cattle producer managing young steers expect to adjust collars?

Not finding any information on this topic in the scientific literature or virtual fence company documentation, we collected data to estimate this. As part of an ongoing study at the USDA Agricultural Research Service Central Plains Experimental Range (CPER), during the 2024 grazing season we measured the weight and neck circumference of 118 yearling steers fitted with virtual fence collars regularly from mid-May through early September.

Though practical and logistical constraints meant that the steers were measured at different times, we were able to weigh the 118 steers at least four times and measure the neck circumference of 116 steers at least three times during the 114-day period. We used manufacturer guidelines to properly fit the collars in May and then adjusted them when they were too tight according to those same guidelines.

Overall, 27 of the 118 steers (23%) required collar adjustment at some point during the grazing season (see **Table 1**). As might be expected, the steers that needed adjustment gained more weight, on average, than those that did not. However, there were steers that gained less and nevertheless needed a collar loosened while others that grew more quickly did not.

Similarly, steers that needed collar adjustment had greater growth in neck circumference over the season than those that did not, but there were some with greater neck growth that did not need adjustment while some with less neck growth did. This is partially explained by the fact that some steers experienced rapid neck growth in one period, received a collar adjustment, and then neck circumference subsequently declined. Additionally, it is possible that collar settings on some were initially slightly looser, relatively speaking, than others due to collar size options, such that there was more room for neck growth. For those steers that did need collar adjustment, seven needed adjusting at the first measurement after 45 days, 12 needed adjusting at 58 days, five at 76 days, and four at 86 days (one of which was for the second time).

It is important to note that the differences between the steer group that needed adjusting and the group that did not were not statistically significant (at α=0.05). Another caveat is that 2024 was a dry growing season (March-July precipitation was 66% below the 81-year average), so animal performance was below historical averages on the CPER. Increased performance could lead to higher rates of collar adjustment.

Ultimately, we learned that roughly one in four yearling steers required collar adjustment over the course of a 114-day grazing season. These adjustments appeared to be correlated to individual animal weight gain and neck growth but there were many exceptions.

We recognize that it is difficult for most producers to have their animals in the chute as frequently as researchers do. Nevertheless, we recommend that those using virtual fence with growing steers plan to restrain them and check collar fit at least every 45-60 days to avoid potential negative outcomes. These findings are likely to apply to yearling heifers as well.

Table 1. Performance of yearling steers wearing virtual fence collars not needing adjustment vs those needing adjustment during the 2024 grazing season

In-season adjustment	Count	Avg daily gain (lbs)	Neck circumference change (inches)	Avg start wt (lbs)	Avg end wt (lbs)
No	91	1.59	0.11	877	1059
Yes	27*	1.93	0.88	880	1100

* Includes one steer that needed adjustment twice

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