Virtual Fencing: A tool for management and research on rangeland management and wildlife interactions with cattle

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Virtual fencing is an innovative technology that allows ranchers to manage livestock movement across grazing lands without the need for traditional physical fences. The system relies on GPS-enabled collars worn by livestock, which use both satellite positioning and radio frequency to communicate with reception towers. These devices track cattle in real time and guide them within designated areas determined by land managers.

Dr. Joao Vendramini first introduced virtual fencing to Florida's agricultural community through his March 2024 Ona Report, published in the *Florida Cattleman and Livestock Journal*. Since then, interest in this technology has grown, leading to its adoption across various regions in Florida for both ranching operations and scientific research.

One of the most recent implementations of virtual fencing has been at the UF/IFAS DeLuca Preserve. This initiative is part of a collaborative effort between the University of Florida and Archbold Biological Station, made possible through the cooperation of the cattle lessee operating on the property. At the DeLuca Preserve, virtual fencing is being used to support a wide range of research projects aimed at understanding the environmental and economic impacts of different land management practices on Florida's rangelands.

One such application involves establishing virtual boundaries around recently burned areas to create grazing deferments. This approach helps us assess how the temporary exclusion of cattle from certain areas affects the ecosystem. Two key outcomes we are studying include:

1. **Florida Grasshopper Sparrows** – This critically endangered bird is found only in a few central Florida locations. Researchers are evaluating whether grazing deferments improve habitat conditions for these rare birds and the wider avian community.
2. **Forage Availability and Quality** – The research also examines how grazing deferments influence the availability and nutritive value of forage for cattle, with implications for both conservation and ranch productivity.

The virtual fencing system not only allows active control of livestock but also passively collects precise location data. These GPS records enable researchers to monitor cattle distribution patterns across the landscape and assess how cattle interact with different pasture types. At the

DeLuca Preserve, we are comparing cattle movement data with wildlife activity to explore broader ecological interactions (Figure 1).

A particularly interesting focus is the spatial relationship between cattle and coyotes. In parallel with the virtual cattle fencing system, we have equipped coyotes at the Preserve with GPS collars that track their locations every 15 minutes. In 2024, 15 coyotes were collared; in 2025, another 12 were added. If funding allows, more coyotes will be tracked in 2026.

The GPS data from coyotes can offer detailed insights into their movement behavior, habitat preferences, and activity patterns. By integrating the cattle and coyote datasets, we can investigate potential interactions between the two species (Figure 1). This line of inquiry is especially relevant because coyotes are frequently implicated in calf predation across Florida.

With continued funding, the research team hopes to determine whether coyotes are attracted to cattle during calving seasons and whether their behavior suggests hunting activity when near herds. Such findings could reshape our understanding of predator-livestock dynamics and inform more effective livestock protection strategies.

The application of virtual fencing at the DeLuca Preserve is a promising example of how technology can simultaneously enhance agricultural productivity and support conservation goals. By precisely managing livestock distribution and gathering extensive data on animal behavior, land managers can make more informed decisions that benefit both ranchers and wildlife.

As Florida continues to face challenges related to land use, conservation, and sustainable agriculture, virtual fencing offers a powerful tool to bridge the gap between production and preservation. Through ongoing research and collaboration, this cutting-edge technology may help pave the way for more resilient and ecologically sound rangeland management practices across the state.

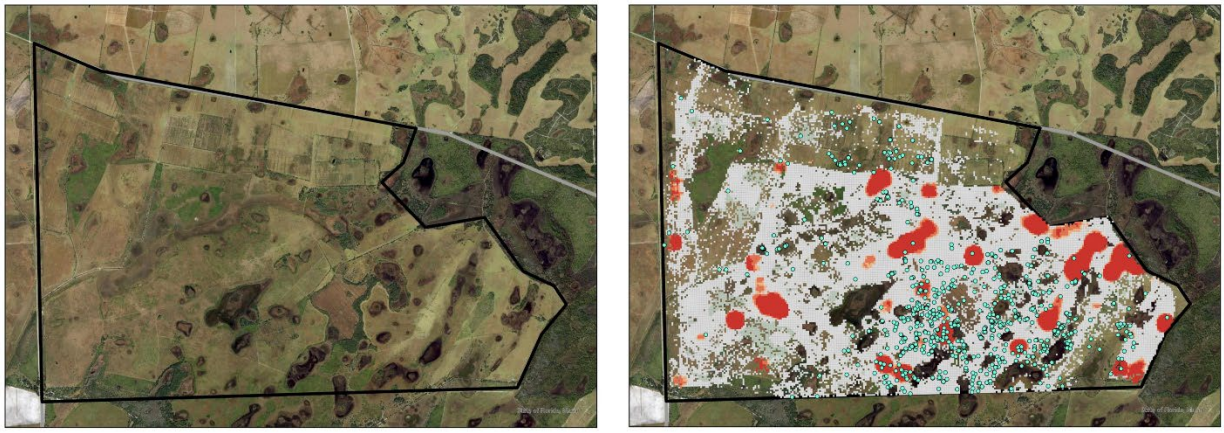

Figure 1. Map of the northern pastures at the UF/IFAS DeLuca Preserve (left), along with an example of cattle use patterns and coyote locations (right). Cattle use intensity is color-coded: red indicates high use, gray indicates moderate use, and pale blue indicates low use. Coyote locations are shown as bright blue dots.