UF/IFAS Range Cattle Research and Education Center
Research Update

The UF/IFAS Range Cattle Research and Education Center has a long history of service to the Florida Cattlemen. Since 1941, our research efforts have focused on relevant problems impacting beef production throughout Florida. We focus upon important issues spanning a broad scope of overlapping topics relevant to Florida's grazinglands such as forage and pest management, soil fertility and water quality, beef cattle management, wildlife, and beef cattle and forage economics.

Presently, the Center has 7 faculty programs with 20 support staff. In addition to research and extension projects, the Center's faculty mentor numerous MS and PhD graduate students as well as international exchange scholars. This article provides a highlight from each of the Center's faculty regarding work they are presently involved with in response to the research priorities of the Florida Cattlemen's Association.

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Brent Sellers, Professor and Center Director
Pasture and Rangeland Weed Management

Broomsedge (*Andropogon*) species are native, warm-season, short-lived perennial bunchgrasses with an average life span of 3 to 5 years. While some species are desirable in many natural areas and native rangeland, they are problematic in improved bahiagrass pastures throughout central and south Florida as mature broomsedge is typically avoided by cattle. There is no easy answer to this increasing problem as there are no herbicides that will selectively remove broomsedge from desirable forage grasses.

Our research since 2012 has been investigating annual applications of NPK fertilizer at 50:25:50 lb/A in addition to liming when appropriate. While not all broomsedge species responded to these soil amendments, we did observe some promising results at two of the three locations. That led to a new study that was initiated in 2017 to investigate separate N, P, and K treatments.

Experiments were established at Buck Island Ranch and Ona in 2017. Broomsedge density was recorded prior to beginning the experiment in geo-referenced locations within each plot and was recorded annually prior to fertilization. Treatments included: 1) N (50 lb N/A) ± P (based on soil and tissue testing); 2) 25 lb P/A; 3) K (50 lb K_2O/A), 4) N + P (50 lb N/A + 25 lb P/A); 5) N + K (50 lb N/A + 50 lb K_2O/A; 6) P + K (25 lb P/A + 50 lb K_2O/A); and 7) N + P + K (50 lb N/A + 25 lb P/A + 50 lb K_2O/A). An untreated check will also be included to be able to observe any natural changes in time due to other management imposed on the pasture. Fertilizer is applied annually in the spring (March-April) of each year, but is dependent upon environmental conditions. Velpar (2 qt/A) was applied at the Ona location in 2016 to remove smutgrass from the experimental area.

The only macronutrient to have an impact on broomsedge density at both Buck Island and Ona was potassium by 2019. There was no impact of potassium application on broomsedge density one year after the first application, but we observed at least a 33% reduction in broomsedge density by 2019 at Buck Island and at least a 56% reduction by 2019 at Ona. The Velpar application at the Ona location had a detrimental impact on broomsedge populations; however, it is apparent that broomsedge density is increasing over time in both fertilized and non-fertilized plots. Even at Buck Island, broomsedge is still present in fertilized plots. Although fertilization will not completely prevent broomsedge establishment it is likely that potassium fertilization is making the bahiagrass more competitive and able to withstand significant broomsedge establishment compared to non-fertilized bahiagrass.

Impact of potassium fertilizer on broomsedge densities at Ona and Buck Island from 2017 through 2021.

Treatment[1]	Buck Island				Ona			
	2018	2019	2020	2021	2018	2019	2020	2021
	no. of plant/m^2							
0 K	6.4 a[2]	7.8 a	8.4 a	9.6 a	0.4 a	2.6 a	4.8 a	13.3 a
50 K	5.4 a	5.3 b	3.0 b	4.3 b	0.3 a	0.7 b	1.9 b	5.9 b
p-value	0.2322	0.0184	0.0007	0.0006	0.3360	0.0126	0.0050	0.0085

[1] Potassium was applied annually beginning in 2017 at 50 lb K_2O/acre.
[2] Values within each column followed by different letters are significantly different at $P<0.05$.

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Hance Ellington, Assistant Professor
Rangeland Wildlife Ecology

Recent research shows that the abundance of breeding rangeland birds in the USA have declined by more than 700 million since 1970. Furthermore, most of the individual rangeland bird species are estimated to be in decline (74%) causing a loss in biodiversity as well. Some of the drivers of the collapse in rangeland birds across the USA are land conversion (urbanization, resource extraction), agricultural intensification, and the use of pesticides. Many of these same threats are present in Florida's rangelands, but urbanization is perhaps the biggest threat – Florida continues to grow rapidly (gaining over 200,000 new residents last year) and this population growth continues to spur new land clearing and development. Furthermore, over the next 50-70 years sea level rise driven by climate change will force many people from coastal areas further inland, further increasing pressure on rangelands.

Given these threats, momentum has been building for initiatives to support and protect Florida's natural landscapes and wildlife. Programs such as the Florida Ecological Greenways Network and initiatives like the Florida Wildlife Corridor seek to create a network of protected areas that can act as bulwark against less hospitable land use types as well as providing a corridor for wildlife movement and gene flow. Florida's cattle industry can play an important role in these efforts. Livestock production in Florida can be more conducive to wildlife than most other forms of human land use. It is possible for ranches to be managed for both cattle production and wildlife habitat, especially if we contrive ways to increase ecological productivity without reducing cattle production.

It is this idea that is driving one of our lab's new research projects, Grazing and bird biodiversity. We are examining how different grazing management strategies, such as pasture types (improved, semi-native, and dry prairie), rotation schedules, and stocking rates, impact bird biodiversity. We predict that these different grazing management strategies lead to differences in the underlying vegetation structure and diversity, which then impacts bird habitat use and occurrence. In March 2022, we deployed 70 acoustic recording units (ARUs) in 14 pastures across the Range Cattle REC and the Deluca Preserve. We are using these ARUs to record sound data which we then analyze using machine learning techniques to identify individual bird songs and calls. We also have field crews monitoring vegetation structure and diversity in these pastures and we are monitoring changes to grazing management (cattle rotations and stocking rate) using Precision Agriculture applications such as AgriWebb. We are

just starting to analyze our acoustic, vegetation, and cattle data and we anticipate many interesting findings in the future.

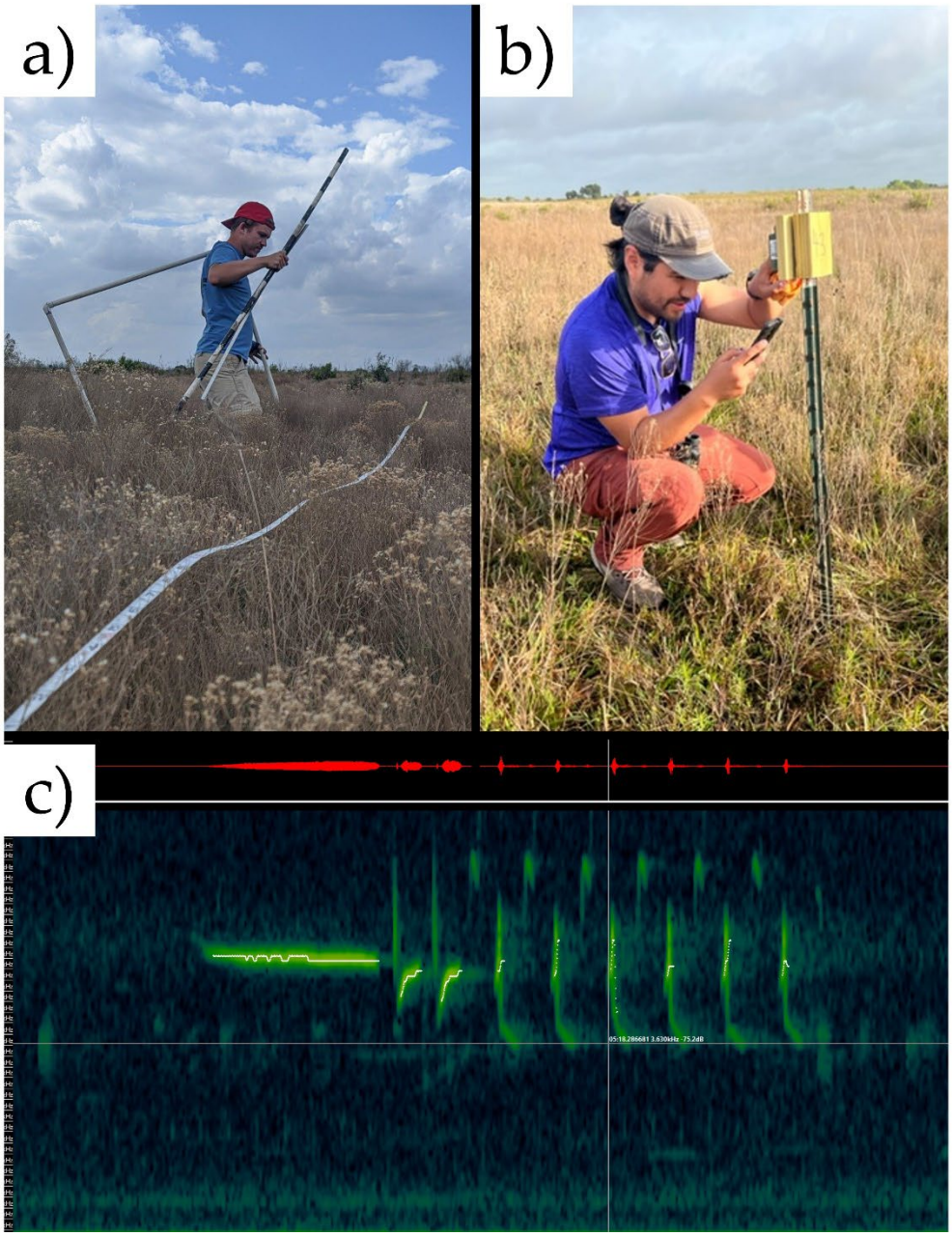

Figure 1. Zach Holmes conducting vegetation surveys (a), Edder Antunez monitoring an acoustic recording unit, and a visual representation of acoustic data (spectrogram) used for machine learning based identification of bird calls (c).

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Golmar Golmohammadi, Assistant Professor
Watershed Hydrology and Biogeochemistry

New Program Underway

Water is part of a natural system which is at risk due to the high demands on available water and high levels of nutrients flowing into the water system.

Rapid population growth and urban development will increasingly compete with agriculture for available water supplies. Therefore, Water quality and quantity protection is expected to be an important issue for Floridians in near future. However, management of Florida's water resources requires a novel approach which considers all the relevant factors, rather than looking at only one factor of development.

The nutrients, nitrogen (N) and phosphorus (P), that are collected from agricultural lands are key issues in South Florida's agricultural and water resources management. These elements are essential nutrients for growing plants, and important to local farming as fertilizers. These are also introduced by the animal wastes produced on ranch lands of South Florida. However, it is important to note that the environmental services provided by grazinglands may help to improve both water quality and quantity.

One important way of reducing N and P discharges and enhance the quality of water is through a program called Best Management Practices (BMPs) which are practical, science-based recommendations. Agricultural/cattle producers are encouraged to adopt BMPs to minimize the loss of agricultural chemicals by managing the water and fertilizers inputs as well as managing their discharge to the environment. However, little research has been proposed to determine the benefit of these BMPs on the landscape level.

In order to help Florida cattle producers, one of the main objectives of this program will be to conduct a long-term evaluation of the effectiveness of BMPs on cattle ranches in central and southern Florida. We can inform cattle producers about the environmental and economic benefits of providing water quality enhancements on private ranches as well as conservation easements in Central and South Florida. The program will work on:

- sustainable water management practices to conserve water considering water quality and quantity, with a goal to identify realistic and sustainable solutions. The efforts will be placed to evaluate the effectiveness of various conservation practices reducing nutrient loadings.

- our program will also focus on water monitoring network and modelling. We are currently evaluating the headwater/ditches to identify locations and types of potential water monitoring stations to collect water data. We are also applying hydrologic models to evaluate the influence of grazing management on water quality and mitigation strategies to better manage water to meet growing population needs considering increasing water supply uncertainty and climate change.

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Philipe Moriel, Associate Professor
Beef Cattle Nutrition and Management

Should we supplement beef cows before calving in Florida ?

Beef cattle production is constantly exposed to environmental and seasonal conditions that can lead to nutrient deficiency in pregnant beef females. **Even in Florida**, protein and energy deficiencies can occur during late-Summer and Fall, despite the adequate amount of forage available for cows. Late gestation is a critical period for fetal formation of muscle and adipose tissues and also calf health following birth.

In 2020/2021, our program completed a series of studies evaluating how maternal nutrition impacts the long-term performance of calves in Florida. Most studies were funded by the Florida Cattle Enhancement Board since 2016, and they are summarized herein. **Study 1:** Pregnant heifers were provided no supplement or 2.2 lb/day of molasses+urea during the last 57 days before calving (2.2 lb/day × 57 days = 125 lb per cow). **Study 2:** Pregnant mature cows were offered no supplement or 2.2 lb/day of molasses+urea during the last 47 days before calving (2.2 lb/day × 47 days = 103 lb per cow). **Study 3:** Pregnant mature cows were offered no supplement for the last trimester gestation, 2.2 lb/day of DDG for the last trimester of gestation (2.2 lb/day × 84 days = 185 lb per cow), or 4.4 lb/day of DDG during the first half of the last trimester of gestation (4.4 lb/day × 42 days = 185 lb per cow). In all studies, cows and their calves were managed similarly from calving until calf weaning.

Results: Added calf body weight at the time of weaning was on average +21 lb greater for calves born from cows that received precalving supplementation compared to calves born from non-supplemented cows (**Study 1** = +20 lb; **Study 2** = +18 lb; **Study 3** = +31 lb when supplement was offered during the entire third trimester and +13 lb when supplement was offered during the

first half of third trimester). Assuming a calf price at weaning of $1.71 per calf lb, the average added calf body weight at the time of weaning (*21 lb × $1.71 per lb = $35.91 per calf weaned*) was sufficient to cover the extra cost of supplementing beef cows for approximately 65 days before calving in Florida (*on average 143 lb per cow × $0.17 per lb of feed = $24.31 of feed cost per cow*), except for 1 treatment (supplementing DDG for only the first 42 days of last trimester of gestation). In **Studies 1 and 3**, we also observed that calves born from cows that were offered precalving supplementation had a stronger response to vaccination (more calves responded to the vaccine) compared to calves born from non-supplemented cows. A stronger response to vaccine suggests that the immune system of these calves born from supplemented cows were better prepared to deal with pathogen infections after weaning.

Therefore, this data overview highlights the importance of good maternal nutrition before calving. **Our studies indicate that precalving supplementation can be an economic feasible strategy and should be implemented by Florida beef producers**.

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Chris Prevatt, State Specialized Agent II
Beef Cattle and Forage Economics

The last two years have been extremely stressful for all participants in the U.S. cattle industry as extreme volatility from both the knowns and the unknowns have created chaos in our livestock markets and our global supply chains. During this time, producers have seen extreme declines in price, followed by significant rallies. This volatile marketplace has made paying close attention to prices on a daily or weekly basis extremely important. Therefore, a major focus of the Beef Cattle and Forage Economics Extension Program has been placed on marketing feeder cattle. As is true of production programs and management practices, many marketing alternatives are available to cattle producers. Many producers spend most of their time and effort improving production practices while spending less time developing a marketing plan for their operation. However, time spent on marketing feeder cattle in today's complex economic environment can pay larger dividends than time spent on improving or implementing most production practices. Anyone can sell, but few producers can market feeder calves with skill. Profit can be the difference between implementing a well-researched market strategy or accepting what the cash market provides. Moving forward, our goal will be to provide learning opportunities that help producers understand the various opportunities available when marketing feeder calves. These alternatives can help producers develop a

market plan for each year, as well as a contingency or backup plan should market prices, or availability to market, differ from original expectations.

Another major project that the Beef Cattle and Forage Economics Extension Program is focused on is utilizing the long-term projections from the Food and Agricultural Policy Research Institute (FAPRI). These projections can be a valuable guide in the decision-making process that can help in the development of a long-term plan, or vision, for the future of beef cattle operations. The goal of this project will be to evaluate long-term projections for feeder calf prices as well as revenue, cost of production, and net returns over costs for Florida cow-calf operations. These economic projections will provide a guide from which many questions can be answered such as: how much can I pay for replacement heifers? Is now the time to expand the size of my cattle operation? Is my cost of production reasonable compared to others in the industry? What level of net returns are expected in the Florida cow-calf industry moving forward? This economic model can be used to guide producers and help them begin to answer these difficult questions that each Florida cattle operation faces. Developing a written long-term plan can be a time consuming and repetitive process, but it will improve the decision-making and competitiveness of your beef cattle operation.

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Maria Silveira, Professor

Soil and Water Science

Ecosystem carbon balance and sequestration potential of Florida native grazing lands

Grazing lands (including both native rangelands and cultivated pastures) act as an important sink or source of atmospheric carbon (C) and play an important role in climate change regulation. However, the ability of grazing lands to sequester C is strongly influenced by management. Most previous studies addressing ecosystem C responses to management have been mainly focused on temperate ecosystems with much less effort on subtropical regions. Florida grazing lands have unique climate and soil characteristics, thus, a better understanding of the potential effects of management on C balances is a necessary component in predicting and understanding soil C sequestration potential in this region. Moreover, a significant portion of grazing lands in Florida is being replaced by more intensive agriculture and urban development and, therefore, continuation of this trend is expected to have major impacts on net C balance in this region. In this study, we evaluated C balance and warming potential of a typical Florida native rangeland

and a cultivated bahiagrass pasture using a combination of eddy covariance technique and chamber measurements. To our knowledge this study represents the first attempt to quantify multi-year C balance and soil greenhouse fluxes of native and cultivated Florida pastures.

Results indicated that the native rangeland was a C sink with average sequestration rate of -3.4 ton C/ha yr. Approximately 60% of the aboveground biomass was combusted during a single fire event, which resulted in native rangelands temporarily shifting from a net C sink to a net C source. However, 60 days after fire vegetation recovered its photosynthetic and C uptake capacity. Our 4-yr study also showed that native rangelands represent a methane sink offsetting between -5.7 and -14 kg C-CO2eqv ha-1 yr-1 as methane.

Preliminary data showed that bahiagrass pasture sequestered almost twice as much C (-6.4 ton C/ha yr) as the native rangeland. Methane emissions in bahiagrass pasture was 0.89 ton C-CO2eqv during the last six months of 2021; however, it was offset by a C gain of -1.9 ton C/ha during the same period. Results demonstrated that Florida native rangelands are well-adapted to seasonal droughts and fire, therefore, represent a viable C mitigation alternative to climate-vulnerable ecosystems. Despite the relatively higher methane emissions compared to native rangelands, bahiagrass pastures exhibited very high annual C uptake that may help mitigating global warming.

This research was a contribution from the Long-Term Agroecosystem Research (LTAR) network. LTAR is supported by the United States Department of Agriculture. We thank Dr. Rosvel Bracho (UF, School of Forest Resources and Conservation) for his substantial contribution including data acquisition, analysis, and interpretation. We also thank the Ona LTAR team, Drs. Marta Kohmann and Abmael Cardoso for their help with data collection and interpretation.

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Joao Vendramini, Professor
Forage Management

New forage cultivars

Warm-season perennial grasses are the dominant forages used by beef cattle producers in Florida. Forage production, nutritive value, and persistence are the main desirable traits in warm-season perennial grasses. Bahiagrass is the most planted warm-season grass in Florida; however, bahiagrass has limited production and nutritive value when compared to other warm-

season species, such as bermudagrass, stargrass, and limpograss. However, the most productive and adapted warm-season perennial grasses in Florida are propagated by vegetative plant material. There are several limitations of planting vegetative material, such as unpredictable climatic conditions to produce vegetative plant material, logistics of transporting vegetative material between locations, and machines and labor required for planting.

Two new seed-propagated forage cultivars, 'Spain' (Megathyrsus maximus) and 'Camello' (Brachiaria spp.) has been tested at Ona and Citra and showed superior forage production and nutritive value. These new cultivars are currently being tested in a grazing trial at Ona and the preliminary results showed that Spain had greater forage production and nutritive value than Jiggs, while Camello did not persist under grazing in poorly drained soils in South Florida.

Sunn hemp is a warm-season annual legume that has been extensively used as cover crop by vegetable producers in South Florida. However, there is a potential to use sunn hemp as forage for beef cattle. The most cost-effective sunn hemp cultivar used in Florida has reduced herbage production and N fixation due to early flowering. My research program is selecting sunn hemp cultivars with longer vegetative growth and greater forage production, and a new UF sunn hemp cultivar will be released in few years.

Limpograss P fertilization

Fertilization is one of the most-costly inputs in cow-calf production systems in Florida. However, fertilization is essential to enhance production, nutritive value and persistence of warm-season forages. Over the last 10 years, the expressive increase in fertilizer cost has led producers to decrease fertilizer utilization in grazing systems, and consequently decrease productivity of beef cattle production systems. Phosphorus fertilizer has been cited as a major contributor to eutrophication in Lake Okeechobee. In spite of a significant reduction in the utilization of P fertilizer due to the implementation of BMPs, it is necessary to evaluate levels of P fertilization that will optimize forage production and persistence of limpograss cultivars, without impacting the water bodies in South Florida. A field and a greenhouse study have been conducted at Ona to test the effects of different levels of P fertilization on limpograss production, nutritive value, and water quality.

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