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 6 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)

A control (untreated) plot was included, so that any natural changes over time could be observed - due to other land management practices. 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.

Table 1. Impact of potassium applications on broomsedge density at Buck Island and Ona from 2018 through 2021.

Treatment[1]	Buck Island					Ona				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
	no. of plant/m^2									
0 K	6.4 a[2]	7.8 a	8.4 a	9.6 a	4.2 a	0.4 a	2.6 a	4.8 a	13.3 a	5.5 a
50 K	5.4 a	5.3 b	3.0 b	4.3 b	2.0 b	0.3 a	0.7 b	1.9 b	5.9 b	3.0 b
p-value	0.2322	0.0184	0.0007	0.0006	0.0005	0.3360	0.0126	0.0050	0.0085	0.0009

[1] Potassium was applied annually beginning in 2017 at 50 lb K/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

Non-native Argentine black and white tegus (*Salvator merianae*; hereafter tegus; Figure 1) are large, diurnal, active-foraging lizards that were introduced to Florida via the pet trade. Established, breeding tegu populations now occur in Charlotte, Hillsborough, Miami-Dade, and St. Lucie counties. Tegus have a high reproductive capacity, and population modelling suggests that tegu populations can double in size every three years. Moreover, tegus can potentially cause major disruptions to local ecosystems because they eat a wide variety of food items, including berries, invertebrates, and vertebrates. Of notable concern, tegus are known to consume the eggs of ground-nesting birds and reptiles, such as turkey, quail, and gopher tortoise. Unlike Burmese pythons and iguanas, tegus can survive cold winters by entering brumation, a reptilian version of hibernation, in underground burrows. This behavior helps them to survive in places experiencing colder seasons, meaning that tegus are not limited by winter temperatures and could, therefore, expand across a large portion of the southeastern United States. Given the threat of this invasive species, the goals of tegu management in Florida should be both detection and eradication.

Early Detection and Rapid Response (EDRR) is a key tenet of invasive species management, where “detection” is the process of documenting the presence of an invasive species, and “response” is the process of reacting to the detection. For detection and eradication of invasive tegu in Charlotte County to be successful, we must have two things: the ability to detect tegu presence on the landscape before the population becomes too numerous to effectively control, and accurate data on current population abundance. One of the projects in the Rangeland Wildlife Ecology Lab, the *Charlotte County Tegu Project*, is providing this crucial data about the tegu population that occurs in Charlotte County just north of the Babcock-Webb WMA. In partnership with the Florida Fish and Wildlife Commission, we have deployed a standardized trapping grid across our study area (Figure 1). We have worked closely with private landowners to safely deploy and monitor traps on their land. In fact, our partnerships with private landowners are crucial, not only to this research project, but also for our long-term ability to remove all invasive tegus in Charlotte County to prevent further spread. Without the partnership and cooperation of private landowners in Charlotte County, there are areas where tegus can find refuge from our traps and continue to persist, reproduce, and reinvade areas where we have removed them.

Invasive tegus are a threat to Florida’s native wildlife, including both important game species and some of our threatened species. With good data, governmental support, and the cooperation of private landowners, together we can help prevent invasive tegus from gaining a larger foothold in Florida’s rangelands.

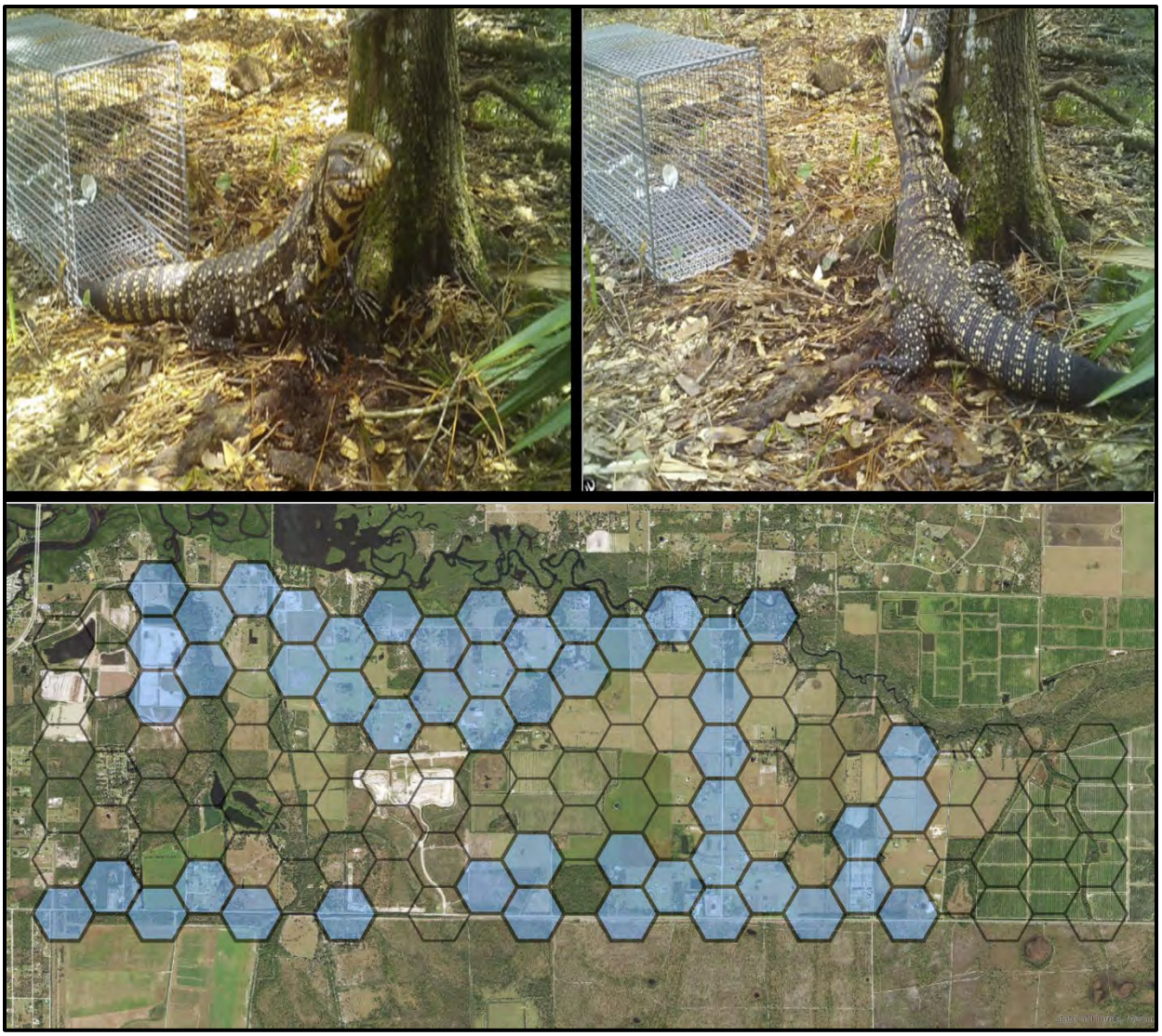

Figure 1. The Argentine black and white tegu in a large diurnal lizard that is invasive in Florida (top). We have deployed a standardized trapping grid in the area north of Babcock-Webb WMA in Charlotte County (bottom) to determine the population size of tegu in the area and remove tegu from this landscape. Blue hexagons (62 acres) represent units of our trapping grid for which we have active traps set. Empty hexagons represent units for which we do not yet have private landowner permission to set tegu traps. Landowner cooperation across the entire occupied region is essential for complete eradication of the species.

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Golmar Golmohammadi, Assistant Professor
Hydrology and Water Quality

Groundwater modeling in Central Florida

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

Bakery waste: an alternative feed ingredient for pregnant beef females in Florida

Our recent study evaluated if bakery waste could be an alternative feed ingredient for pregnant beef females in Florida. Bakery waste consists of unused products, such as bread, bread rolls, biscuits, cakes, cookies, and dough that did not meet consumer preferences or are due to expire. Nutritionally, bakery waste contains less starch and fiber but more sugars and fat from seed oils rich in omega-6 fatty acids, which have been shown to benefit cow reproductive performance and fetal development. Our hypothesis was that precalving supplementation of bakery waste containing low or high concentrations of fat would enhance maternal circulating concentrations of omega-6 fatty acids during gestation and body condition score (**BCS**) at calving leading to increased offspring growth and immune function compared to no supplementation. We also believed that bakery waste containing higher concentrations of omega-6 fatty acids would lead to the best results on calf performance.

The study began in August 2021 (70 days before calving) and finished in December 2022. Cows grazed bahiagrass pastures and received: no precalving supplementation (**NOSUP**); 2 lb/day of low-fat bakery waste from August until calving (**LFAT**); or 2 lb/day of a high-fat bakery waste from August until calving (**HFAT**). Low- and high-fat bakery supplements provided equal amounts of energy and protein. In June 2022, 40 heifers were weaned and assigned to a 45-day evaluation period of growth and immune response. Low-fat and **HFAT** bakery waste increased cow BCS at calving by 0.73 and 0.54-units, respectively, compared to no maternal

supplementation. Although cow pregnancy rate did not differ, a greater percentage of cows conceived earlier and calved within the first 21 days of the calving season when they were offered high-fat bakery waste (86% vs. 68% and 71% for cows fed high-fat bakery waste vs. low-fat bakery waste and no supplement). Calf birth body weight was not impacted by maternal treatment. However, calf weaning weight were highest for calves born from cows offered low-fat bakery waste (537 lb), intermediate for calves born from cows fed high-fat bakery waste (515 lb), and lowest for calves born from cows that were not supplemented (500 lb). In terms of immune function, serum antibody titers produced against 2 viruses that cause bovine respiratory disease (infectious bovine rhinotracheitis and bovine respiratory syncytial virus) were greatest at the end of the vaccination protocol for calves born from cows fed high-fat bakery waste.

In summary, low-fat bakery waste led to greatest calf weaning weight whereas high-fat bakery waste enhanced maternal reproduction and had minor benefits to calf post-vaccination immune response. **Precalving supplementation of bakery waste is an additional economic feasible strategy for Florida beef producers**.

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Maria Silveira, Professor
Soil and Water Science

Evaluating the agronomic and environmental impacts of new FL-DEP biosolids rule

Biosolids have clear agronomic benefits, but public concerns over nutrient accumulation and subsequent impacts on water quality limit land application in FL. New FL-DEP biosolids regulations (effective June 2021) are expected to limit the rates of biosolids that can be recycled in pastures. Although this new regulation will likely not solve state-wide water quality issues, it may result in several other unintended environmental consequences. From an agronomic standpoint, it will be necessary to supplement pasture fertilization with inorganic fertilizers, which typically cost more and have greater environmental risk than biosolids. Currently there is no scientific study demonstrating the link between land application of biosolids and water quality degradation in Florida. Our previous work (Silveira et al., 2019, Lu et al., 2019, 2020, 2021) demonstrated that prudent nutrient management is possible even on biosolids-amended Spodosols with high water tables. Pastures in Florida are typically low-input systems and have been historically under-fertilized and often overgrazed. Biosolids can be

valuable resources to improve the sustainability of degraded pastures and to restore ecosystem functions. Data from a recent paper from our group demonstrated negligible amounts of phosphorus were released from biosolids-amended soils (Vieira et al., 2023). This response was mainly to the appreciable amounts of aluminum (Al) and iron (Fe) added with biosolids that reduce soil phosphorus solubility. Phosphorus leaching from biosolids-amended soil were 45% less than unamended pastures. Our data also suggests that field validation of soil phosphorus storage capacity concept is warranted. Although short-term studies conducted under controlled laboratory conditions are instrumental in developing guidelines for safe land application of nutrients in many areas of Florida and nationally, they are not universally applicable. Field-scale trials are essential for accurate assessment of the risks and benefits of land application of biosolids to pastures in Florida. One of our current projects in this area is focused on evaluating the impacts of new FL DEP biosolids rule on bahiagrass responses, soil health, and water quality. Our goal is also to maintain a long-term, instrumented research and demonstration field trial designed to evaluate the agronomic benefits and environmental risks associated with land application of biosolids. To our knowledge, this is the only fully instrumented field site in Florida addressing this important topic. We expect that this project will generate science-based information regarding the benefits of biosolids recycling programs to pastures in Florida, such as soil organic matter accumulation and carbon sequestration while also reducing dependence on commercial fertilizers.

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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.

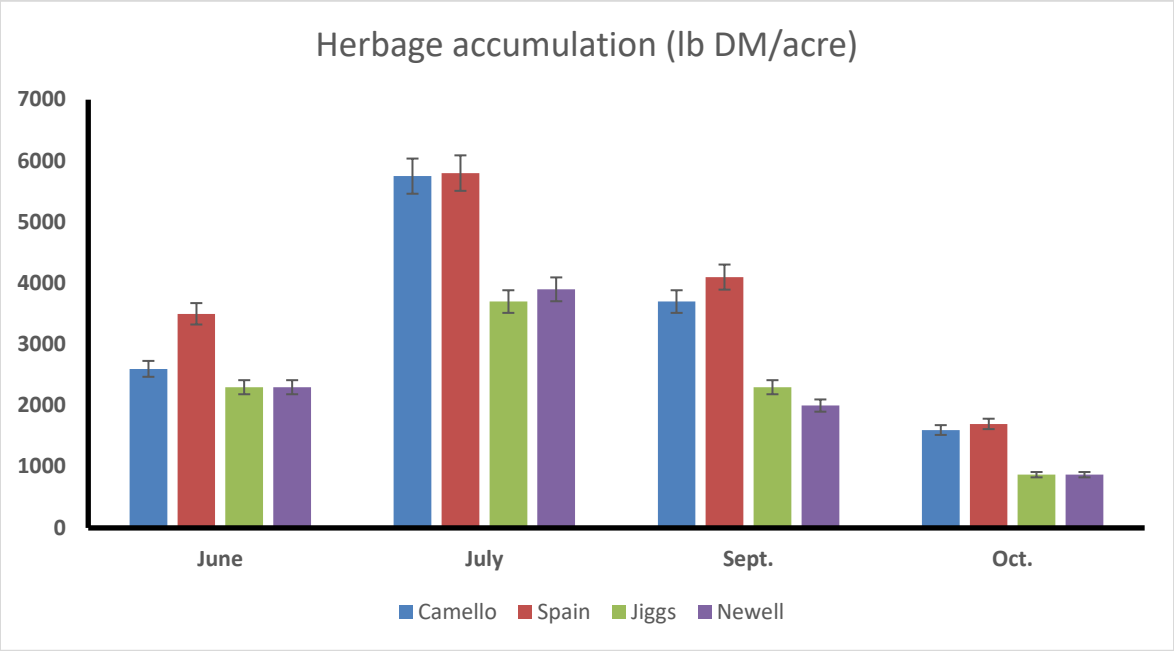
Two new seed-propagated forage cultivars, 'Spain' (*Megathyrsus maximus)* and 'Camello' (*Brachiaria* spp.) have been tested at Ona and Citra and showed superior forage production (Figure 1) and nutritive value. In the grazing trial, Spain had greater forage production and nutritive value than Jiggs and Camello. It was observed that Camello did not persist under grazing in poorly drained soils. In 2023, a required invasiveness assessment of Spain will be conducted, which will be the last step before the genotype can be released as a new cultivar in Florida.

Sunn hemp is a warm-season annual legume that has been extensively used as cover crop by vegetable producers in South Florida. There is a potential to use sunn hemp as forage for beef cattle; however, sunn hemp has alkaloids that may decrease forage intake and animal performance. We conducted a polyploid mutation of a selected sunn hemp genotype and expect to reduce alkaloid concentration and extend growth and production.

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 significant increase in fertilizer cost has led producers to decrease fertilizer utilization in grazing systems, and consequently decrease productivity of beef cattle production systems. Phosphorus (P) 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 water bodies in South Florida. The results from the 2022 trial indicated that P fertilization in soils with low P concentration did not increase forage production. In addition, there was no

effect of P fertilization on water quality. The minimum tissue P concentration was 0.26%. The experiment will be repeated in 2023 and we expect to include tissue P concentration as a new tool to optimize limpograss P fertilization in South Florida.



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