

UF/IFAS

Range Cattle Research & Education Center NEWS

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fall 2020

IN THIS ISSUE

Biosolids Research Update

by Dr. Maria L. Silveira

Biosolids represent a viable alternative to supply nutrients and organic matter to perennial forage crops while reducing the dependence on inorganic fertilizer. Recycling biosolids in perennial pasture systems is an environmentally friendly option of disposal as it reduces landfill space demand and minimizes human exposure to various contaminants. Although biosolids have clear agronomic benefits, concerns over nutrient accumulation in soils and subsequent impacts on water quality can limit land application in Florida. Biochar, a by-product of biomass pyrolysis, has the potential to be used in combination with biosolids to improve nutrient use efficiency and thus, reduce nutrient losses.



Ona Field Trial

A field trial was established in 2016 to evaluate the agronomic and environmental impacts of various biosolids sources applied to bahiagrass pastures at the Range Cattle REC in Ona. Our principal hypothesis was that most biosolids applied to pastures convey significant agronomic benefits as they behave as “slow release” nutrient sources with minimal negative environmental impact.

During the 4 yr study (2016 to 2019), one Class A biosolids, two Class B biosolids materials, and one wood biochar were annually applied to the experimental area and compared to nutrition provided with inorganic fertilizers. Biosolids sources were applied either alone or in combination with biochar to supply an estimated rate of 160 lb plant available nitrogen (N)/A/yr, which correspond to UF/IFAS high N option for established bahiagrass and the most common application rate used by commercial cow-calf operations in Florida. The availability of N in the biosolids was estimated using Florida -DEP factor of 1.5. Biochar was also applied annually at a rate of 50 tons/A, which corresponds to an application rate of approximately 1% (wt. basis). Control treatments included plots receiving inorganic commercial fertilizer (ammonium nitrate + triple superphosphate alone and in combinations with biochar) and pastures receiving no biosolids, fertilizer, or biochar. For-

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age, soil, water quality, soil moisture, ground water levels, and gas emissions were monitored during the 4 yr study.

Results

Bahiagrass Responses - A peer-reviewed publication was published in 2020 on bahiagrass response to biosolids and biochar application (Lu et al., 2020). Briefly, bahiagrass total annual herbage accumulation was similar for biosolids and inorganic fertilizer treatments in 2017; however, inorganic fertilizer and aerobically-digested Class B biosolids increased total annual herbage accumulation by as much as ~29% relative to other sources in 2018. Biosolids and inorganic fertilizer increased bahiagrass crude protein concentration by as much as ~22 and ~39% in 2017 and 2018, respectively, compared to unfertilized bahiagrass. No treatment effects were observed on *in vitro* digestible organic matter (IVDOM) concentration in 2017; however, in 2018 biosolids resulted in greater IVDOM than inorganic fertilizer. Data suggested no benefit of biochar on bahiagrass responses. Bahiagrass tissue mineral concentrations in both biosolids and inorganic fertilizer treatments were generally within sufficient range for optimum plant growth. Biosolids can be a viable alternative for sustainable bahia-



grass production while reducing the dependence on inorganic fertilizer.

Soil Responses - The majority (64%) of applied N accumulated in above-ground bahiagrass biomass, while ~63% of applied phosphorus (P) was retained in subsurface soil layers (<20 inches). Neither soil N or P concentrations were affected by repeated annual application of biosolids or inorganic fertilizer. Despite the relatively high annual loads (average of 98 lb P/A/yr) that far exceeded agronomic recommendations, repeated application of biosolids or inorganic fertilizer showed no effects on soil total P concentrations at any soil depth. At the end of the study, soil P decreased by ~15% in the top 12 inches depth followed by an associated increase in the 24 to 36 inches depth (1431 lb P/A/yr in 2016 vs. 1740 lb P/A/yr in 2019). These data suggested potential vertical redistribution of P within the soil profile. Phosphorus vertical transport is highly influenced by fluctuating water table commonly experienced in Florida Spodosols. Biochar had no impacts on soil N or P dynamics. Despite the significant annual P loads (14 to 42 lb P/A/yr), biochar did not increase soil P levels or reduce P solubility. This result contradicts previous studies that suggested that biochar can affect soil P availability by changing soil pH and P sorption capacity.

Water Quality and Greenhouse Gas Responses - Water quality and greenhouse responses to biosolids and biochar application were reported in 2 recently published peer-reviewed publications (Lu et al., 2020a,b). Briefly, results demonstrated significant temporal variability in leachate N and P, with larger pulses generally occurring during periods of high water table levels or following intensive (> 1.5 inches) rainfall. Inorganic fertilizer generally resulted in greater leachate N and P losses than biosolids. No differences in leachate N and P losses between biosolids and control were observed. Approximately 1%



of applied N was lost via leaching from biosolids treatments vs. 16% for inorganic fertilizer. Regardless of the P source, negligible (0.1 to 0.2% of applied P) cumulative P leaching occurred during the 3-yr study. Biochar had no effect on P leaching, but reduced N leaching from treatments receiving inorganic fertilizer by 60%. Nutrient source had no effect on soil CO₂ and CH₄ emissions, but annual and cumulative (3-yr) N₂O emissions increased with biosolids (7 lb N₂O/A/yr) compared with inorganic fertilizer (5 lb N₂O/A/yr) application. Data suggested that environmental conditions played a more important role on GHG fluxes than nutrient additions. Biochar reduced CO₂ emissions modestly (<9%), but had no effects on N₂O and CH₄ emissions. Data suggested that prudent nutrient management is possible even on biosolids-amended Spodosols with high water tables.

Summary and Conclusions

During the first 4 years of this project, significant resources and efforts were committed to two main priorities: 1. documenting soil, forage, water, and gas emissions baseline data, and 2. instrumenting the experimental area. However, several biotic and abiotic factors (e.g., rainfall, temperature, and timing of fertilizer application)

can affect bahiagrass responses to biosolids application. Thus, multi-year research is necessary to confirm and validate the data. Pastures represent the major cropping system for biosolids recycling in Florida, but multi-year field data to support the sustainability and safety of the practice are scarce. Most previous studies were conducted in greenhouses or laboratories. The agronomic and environmental impacts must be demonstrated in the field to credibly promote environmentally-sound biosolids land applications in livestock production systems. Data obtained in this study suggested no significant differences in bahiagrass herbage accumulation between commercial inorganic fertilizer and Class AA biosolids. No benefits of biochar application were observed. Application of biosolids (either alone or in combination with biochar) had no significant impact on water quality or greenhouse gas emissions.

Future Direction - In 2020, new treatments were imposed onto the experimental area to evaluate the impacts of reduced biosolids application rate (to meet crop P requirements) on agronomic and environmental responses. Despite

the numerous agronomic benefits, public pressure has led to stricter policies that will severely limit land application of biosolids in the state. Among many changes, proposed new biosolids rules require that biosolids have to be applied at P-based rate. Because of the unbalanced N:P ratio in biosolids (3:1 to 3:4) relative to plant requirements (6:1 to 8:1), pastures fertilized with biosolids at P-based rates would need additional N application in order to meet crop N requirement. The current experimental area offers a unique scenario where science-based information regarding the benefits of land application of biosolids can be generated and disseminated.

ACKNOWLEDGEMENTS - We thank H&H Liquid Disposal for their assistance obtaining and hauling the biosolids materials to the study site. We also want to extend our appreciation to the Florida Cattle Beef Board for providing the funds to support this project.

References

Lu, Y., Silveira, M.L., Cavigelli, M., O'Connor, G.A., Vendramini, J.M.B., Erickson, J.E., and Li, Y.C. 2020. Biochar

impacts on nutrient dynamics in subtropical grassland soil: 2. Greenhouse gas emissions. *Journal of Environmental Quality*, DOI: 10.1002/jeq2.20141.

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Lu, Y., Silveira, M.L., Vendramini, J.M.B., Erickson, J.E., Li, Y. 2020. Biosolids and biochar application effects on bahiagrass herbage accumulation and nutritive value. *Agronomy Journal*, 112, 1330-1345.

Questions? Contact Dr. Silveira at mlas@ufl.edu



Faculty News

Become a Bluebird Watcher – Rangeland Wildlife Education Series

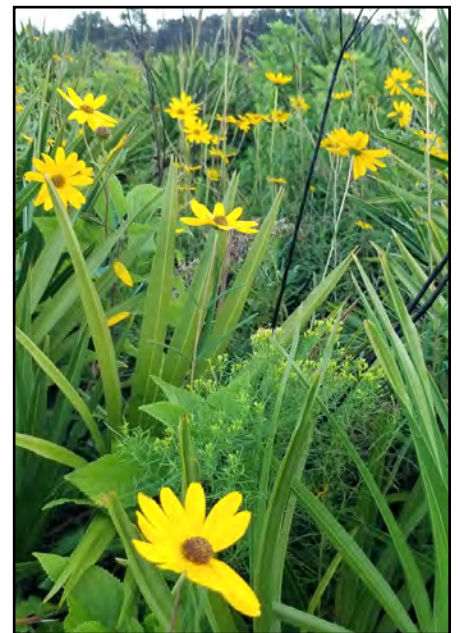
with Dr. Hance Ellington



We invite you to join us for an eight-part series of virtual sessions with videos and live presentations beginning on December 5th, 2020 and running through June 2021. In this series, participants will learn about

bluebird biology and ecology in Florida. Participants will also learn about the importance of nest boxes for bluebirds and how to construct, monitor, and maintain nest boxes. Finally, participants will ride along with wildlife researchers as we conduct important research on bluebirds at the Range Cattle Research and Education Center. The first virtual session will be on December 5th, 2020 from 1:00-2:00pm.

You can register for the entire bluebird series at https://uf_virtualbluebirdwatcher.eventbrite.com. Please contact Hance Ellington e.ellington@ufl.edu for more information.





Chris Prevatt Receives State & National Honors

State Specialized Agent, Chris Prevatt, received the Florida Association of County Agricultural Agents and the National Association of County Agricultural Agents Achievement Awards. This honor is awarded to Agents and Specialists with less than 10 years of service in Extension who have exhibited excellence in the field.



Dr. Maria Silveria Named Multi-State Project Chair

Official Oct. 1, 2020, Dr. Maria Silveria is serving as the chair (5 yr term) on the multi-state project “W4170: Beneficial use of residuals to improve soil health and protect public, and ecosystem health.” This research group

has more than a 45-year history of biosolids research used to support the regulatory community for promulgation of Part 503 of Chapter 40 of the Code of Federal Regulations (Title 40 CFR Part 503 – Standards for the Use or Disposal of Biosolids) and other science-based state and federal guidelines and regulations. Participants of this multi-state project includes scientists from different institutions in the U.S., industry (wastewater facilities), and regulatory agencies. The group meets once a year (W4170 annual meeting) and each state submits a report that is then compiled into a cohesive document that reflects the work done at the national scale. This link provides some additional info: <https://www.nimss.org/projects/view/mrp/outline/18624>

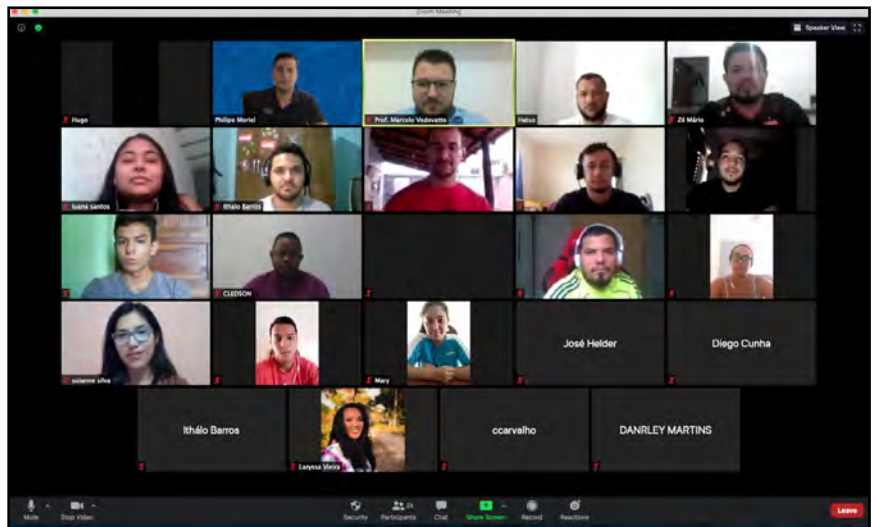
Dr. Philippe Moriel Teaches Course

Dr. Philippe Moriel taught the course “Nutrition for beef females” for graduate students (n = 25; masters and PhD in animal sciences) from Federal University of Tocantins,

Federal University of Maranhao, and Federal Rural University of Amazon. This series included 6 webinars, held every Tuesday and Friday during the first 3 weeks of October. Attendance was great. He expects the course will be offered again next year and may be offered to students from additional universities.

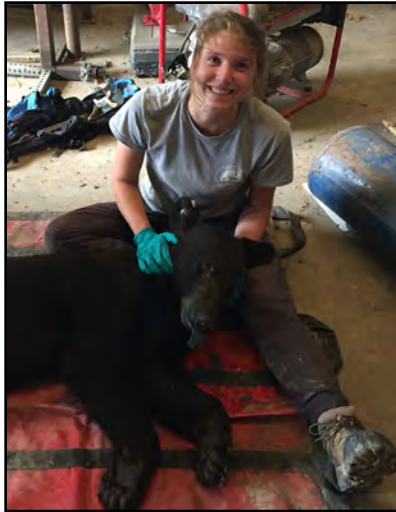
Dr. Joao Vendramini Guest Speaker at FIU

On October 23, Dr. Joao Vendramini presented, “Ecosystem Services Provided by Grazinglands in South Florida.” A Zoom event, hosted by Florida Atlantic University, Department of Earth and Environment. [Click here](#) to listen.



Student News

Congratulations Graduates!



Kelly Koriakin - Summer 2020
 M.S. Wildlife Ecology and Conservation
 Advised by: Dr. Raoul Boughton
 Lives in: Jacksonville, FL

Kelly is currently on a one year, post-graduation adventure, traveling the United States with her husband. She estimates, she'll begin her job search about 6-months before they expect to return.



Liz Rose - Fall 2020
 Ph.D. Interdisciplinary Ecology
 Advised by: Dr. Raoul Boughton
 Lives in: Gainesville, FL

Liz is currently a research consultant for Audubon of the Western Everglades working on their Owl Watch project.



Wes Anderson - Fall 2020
 Ph.D. Wildlife Ecology and Conservation
 Advised by: Dr. Raoul Boughton
 Lives in: Tampa, FL

In December, Wes will be finishing up as an adjunct instructor in the Department of Integrative Biology at the University of South Florida. Then he'll be starting as an assistant professor and wildlife extension specialist in the School of Forestry and Wildlife Sciences at Auburn University where his appointment will be 70% extension and 30% teaching.

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Ona Reports

Sept. 2020 - 'UF/IFAS Range Cattle REC Long-Term Agroecosystem Research (LTAR) Research Updates' by Marta Kohmann, Joao Sanchez, Maria Silveira, Rosvel Bracho-Garillo, and Shanna Stingy

Oct. 2020 - 'Phosphorous budget for cow-calf operations in Florida – Producer Survey Results' by Maria L. Silveira and Leandro Vieira Filho

Nov. 2020 - 'Boosting reproduction without increasing feed costs of beef heifers in Florida' by Philippe Moriel

Florida Cattle Market Price Watch

This helpful resource is provided monthly by Chris Prevatt, State Specialized Agent II, Beef Cattle and

Forage Economics. View a complete listing of past reports on our website, [click here](#).



New Videos

Ona Highlights Webinars

Save the date and join us for an upcoming Ona Highlight webinar. These informative presentations are held each month. They begin at 11:00 a.m. and last about 45 minutes. See our online calendar for upcoming webinars, [here](#).

Recordings of recent webinars:

'Reproductive management strategies for beef cattle in Florida' with Dr. Mario Binelli
9/8/2020
Run time: 56.54 minutes

'Carbon and water dynamics in Florida Rangelands: Management Environmental Fluctuations' with Dr. Rosvel Bracho
10/13/2020
Run time: 52.04 minutes

Check out our latest blogs:

These recent posts feature **Graduate Student, Wes Anderson and Visiting Scholar, Dr. Joao Sanchez**. The Highlights were written by Bethany Wight, UF/IFAS Range Cattle REC, Rangeland Wildlife and Conservation, Biological Scientist: <http://blogs.ifas.ufl.edu/rcrec/>

Dr. Joao Sanchez



Wes Anderson



PROGRAM RECORDINGS AVAILABLE -

Winter Supplementation Seminar

recorded on 9/24/20
Panelists provide ranch data and experiences.

3rd Annual Nutrition for Beef Females program

recorded on 10/22/20

Supplementing Beef Females - Mature cows and replacement heifers - Dr. Philippe Moriel

Boosting the Reproductive Efficiency of Beef Females - Dr. Mario Binelli



Visit the Center -

Take a video tour of the Center!

Go to: <https://www.youtube.com/watch?v=Y3bWDGQKGBI>

You can view all of our our past webinars, program recordings, field day videos, and other recordings on YouTube or on our website's [Virtual Classroom](#).

Listen or download the latest **Joe What? Podcasts:**



in beef cattle. (Run time: 17.02 min.)

Aug. 2020 - Dr. Philippe Moriel, of the UF/IFAS Range Cattle Research and Education Center. They discuss fetal programming



the graduate coordinator. They discuss the major changes in forage management in Florida in the last 30 years. (Run time: 15.48 min.)

Sept. 2020 - Dr. Lynn Soltenberger, distinguished professor in the UF Agronomy Department specializing in forage crops and



Oct. 2020 – Dr. Brent Sellers of the UF/IFAS Range Cattle Research and Education Center. Brent Sellers provides an update on controlling Florida's most troublesome pasture weeds. (Run time: 18.30 min.)

These monthly podcasts can be found on:

- [Podbean](#) [YouTube](#) [UF/IFAS Range Cattle REC Website](#)

**We Appreciate Your Support!
Giving Opportunities Available**



Dr. Brent Sellers, Center Director

Opportunities for Supporting Excellence in Research, Extension, and Teaching at the UF/IFAS Range Cattle Research and Education Center

Giving is essential to our Center's continued progress as private funds provide essential support to faculty, graduate students and facility upgrades. Additionally, endowments serve as permanent resources and valuable recruiting tools to attract and retain the talent we need to continue meeting the challenges faced by the managers and owners of Florida's grazinglands. Please consider the RCREC in your year-end giving as 2020 comes to a close.

The RCREC benefits from the following endowments, and you can give to these funds to grow their impact:

Florida Cattlemen's Endowment - Originally known as the "Don L. Plagge and Findlay Pate Beef Nutrition Research Endowment," the Florida Cattlemen's Endowment supports research and education activities at the RCREC to improve the efficiencies, quality and profitability of Florida beef production.

Elver M. Hodges Forage Production and Management Endowment - Elver "Doc" Hodges was the first agronomist

at the RCREC, working here from 1941-1980 and remaining involved until his passing in 2019. His forage research revolutionized peninsular Florida beef production, and this endowment supports forage-related teaching, research and Extension efforts at the Center.

Adams Ranch Endowment - The Adams family is a long-time supporter of the RCREC. This endowment supports teaching, research and Extension activities associated with natural resources and Florida grazinglands.

Herb and Muncy Chapman Endowment - Dr. Chapman was the Center Director at the RCREC from 1965-1982. He and his wife Muncy established two gift annuities in 2006, supporting research and academic programs at the Center.

Other ways you can give include:

Range Cattle Research and Education Center General Fund - Gifts to this fund support all efforts of the RCREC including facility upgrades, a current priority of the Center. In the coming months we will begin sharing plans for upgrading various facilities at the Center over the next several years.

Create a Named Endowment - Interest generated from an endowment provides a permanent annual support to a program of the donor's choice. The minimum endowment amount at UF is \$30,000.

Create a Charitable Gift Annuity - Annuities provide the

Upcoming Events

View our online calendar for more info on these events and the links to register:

<http://rcrec-ona.ifas.ufl.edu/calendar-of-events/>

Ona Graduate Student Highlight with Elizabeth 'Liz' Palmer

- Nov. 10, 11:00 - 11:45 AM

Liz, a Ph.D. student in the Animal Sciences Department, is advised by Dr. Philippe Moriel. She will be presenting, "Pre-calving Nutrition of Beef Females."

Become a Bluebird Watcher: Session 1, Introduction to the program and the research objectives

- Dec. 5, 1:00 - 2:00 PM

Ona Graduate Student Highlight with Wes Anderson

- Dec. 8, 11:00 - 11:45 AM

Wes, a Ph.D. student in the Wildlife, Ecology, and Conservation Department advised by Dr. Raoul Boughton, will be graduating in December. He will be presenting, "Impacts of an invasive ecosystem engineer upon wetlands and aquatic communities across a subtropical agroecosystem."

Become a Bluebird Watcher: Session 2, Constructing nest boxes

- Dec. 12, 1:00 - 2:00 PM

Become a Bluebird Watcher: Session 3, Deploying nest boxes/wildlife tour of RCREC

- Jan. 9, 1:00 - 2:00 PM

38th Annual Florida Cattlemen's Institute & Allied Trade Show

- Jan. 21, 1:00 PM

This will be an online program with 5 speakers. Sponsorships are available. Call Laura Bennett, program chair for more information, 352-518-0156



donor with immediate tax savings and a stable source of income for life, then benefit a program of the donor's choice. Donors 65 years of age or older may establish an annuity with UF starting at \$25,000.

How to give:

Give online by visiting <https://give.ifas.ufl.edu/rcrec-giving/> where one of the above funds may be selected.

Checks payable to **UF Foundation** may be sent to:

IFAS Advancement
PO Box 110170
Gainesville FL, 32611

For questions or more information contact UF/IFAS Advancement at (352) 392-1975 or advancement@ifas.ufl.edu.

Publications - Refereed

Dias, J. L. C. S. & Sellers, B. A. (2020). Control of Nuttall's thistle in perennial grass pastures. *Crop, Forage & Turfgrass Management*, <https://doi.org/10.1002/cft2.20066>

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Our Faculty -

Dr. Brent Sellers, sellersb@ufl.edu - Pasture and Rangeland Weed Management

Dr. Maria Silveira, mlas@ufl.edu - Soil and Water Science

Dr. Joao Vendramini, jv@ufl.edu - Forage Management

Dr. Philippe Moriel, pmoriel@ufl.edu - Beef Cattle Nutrition & Management

Chris Prevatt, prevacc@ufl.edu - Beef Cattle and Forage Economics

Dr. Hance Ellington, e.ellington@ufl.edu - Grazinglands Wildlife Specialist

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This newsletter is a publication of the UF/IFAS Range Cattle Research and Education Center (RCREC) located in South Central Florida in the heart of Florida's cattle country. Our goal is to keep you up to date on RCREC happenings, publications, research, faculty & student news, upcoming events and bring you beneficial information you can use in your beef cattle or forage operation.

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