UF Long-Term Agroecosystem Research (LTAR) Research Update

Ona Webinar
Nov. 22, 2024

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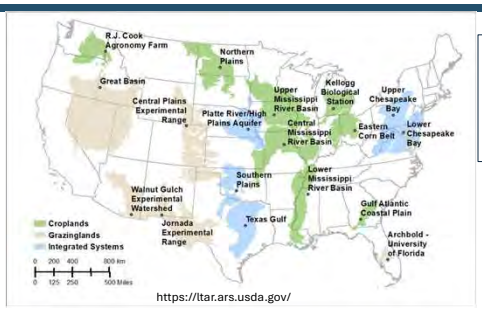
USDA, Long-Term Agroecosystem Research Network (LTAR)



https://ltar.ars.usda.gov/

Research network focused on finding solutions that **increase** agricultural production while also improving the quality of the environment and the well-being of America's farming communities.

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JEQ Nov-Dec Special Issue

Landscape and Watershed Processes

The LTAR Grazing Land Common Experiment at Archbold Biological Station-University of Florida

Core ideas

- Archbold Biological Station-University of Florida (ABS-UF) is located in an ecologically sensitive region.
- ABS-UF is testing alternative grazing and fire regimes on key indicators of sustainability.
- Grazing and fire regimes are evaluated across different grazing land types on a gradient of management intensity.
- Through stakeholder engagement, ABS-UF develops real-world solutions to grazing land sustainability challenges.
- ABS-UF provides a unique perspective from subtropical humid grazing lands for continental-scale research.

Abstract | Full text | PDF | References | Request permissions | Check for Full Text

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CSA News – October 2024

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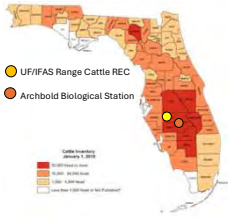
Common Experiment at the Archbold-UF LTAR Site



1. Improved pastures – 8 x 40 acres (Archbold BIR and UF RCREC)
2. Semi-native pastures – 8 x 40 acres (Archbold BIR)
3. Native rangeland – 16 x 40 acres (UF RCREC)

How does pasture management affect cow-calf production and multiple ecosystem services across a land use intensity gradient?

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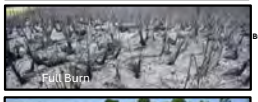
UF Common Experiment

Native Rangelands

Control

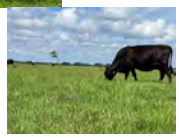


Burned (2 or 4 yr)

Burned + chopped

Bahiagrass Pasture

Stocking rates



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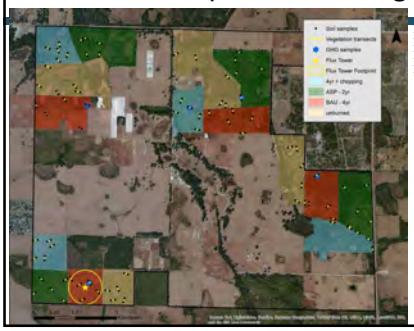
UF Common Experiment - Rangelands



- Prescribed fire in 2019, 2021, and 2023
- 16 experimental units (~40-70 acres each)
- 5 transects (150 ft) in each experimental unit
- Winter grazing (90 d; Nov. to Jan; ~ 13 acres/animal)

June 6-8 2023

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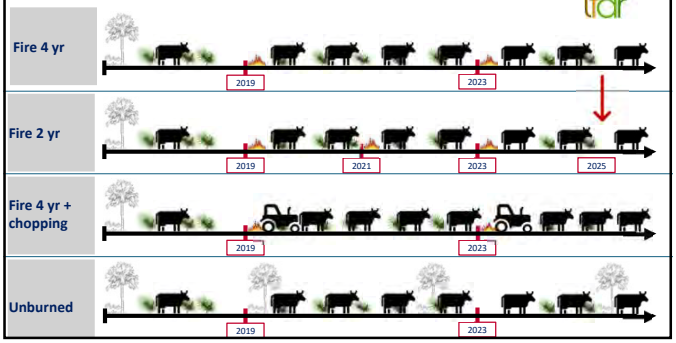
UF Common Experiment –Rangelands



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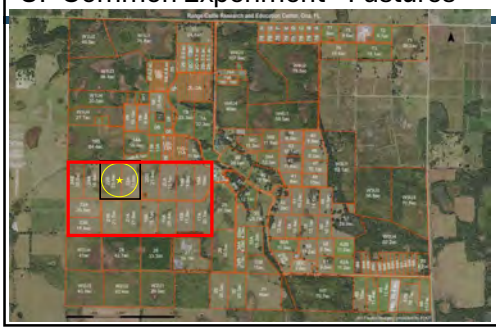
UF Common Experiment - Pastures



2 stocking rates : a) 0.66 AU/ha; and b) 20% increase in stocking rate (0.8 AU/ha). 1.6 or 2 acres/cow-calf pair

Optimum utilization of forage resources and animal performance with minimum impact on soil and GHG responses

- Forage mass and nutritive value, tissue mineral comp.
- Soil health, soil carbon (up 3 ft)
- Greenhouse gas emissioms
- Animal responses

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Silvopasture system

~ 20 acres. 450 trees/A. South Florida slash pine (*Pinus elliottii* var. densa)
Spacing: 4' X 8' X 40'

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Measurements in the Common Experiment

- **Fire characteristics**: peak temperature, heating duration, % combusted biomass, ash deposition
- **Vegetation**: composition, herbage mass, nutritive value, tissue mineral composition
- **Soils**: soil chemical, physical and biological properties, nutrient cycling, soil carbon (quantity and quality, spatial distribution of nutrients/soil properties
- **Environmental**: greenhouse gas measurements (2 eddy covariance towers (CO_2,CH_4) and chamber-based)
- **Animals**: body condition score, body weight, blood metabolites (cortisol, plasma urea N, glucose, IGF1), animal behavior, calf birth and weaning wt.

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Common Experiment - Results

Native Rangelands

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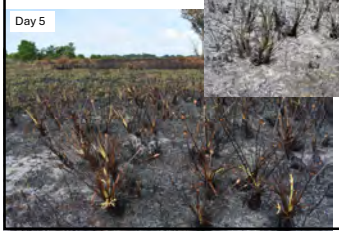
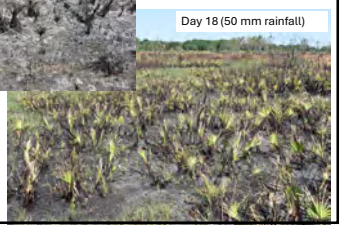
Fire-induced vegetation responses





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Day 5 –native grasses

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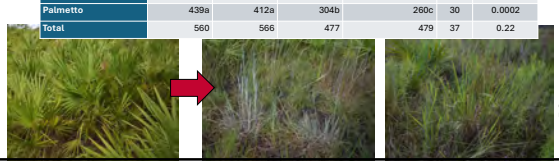
Fire-induced vegetation responses (2017-2023)

Functional Groups	Treatments					
	Unburned	4-yr Fire	2-yr Fire	4-yr Fire + mechanical control	SE	P value
	g m^{-2}					
Undesirable grass	38b	47b	43b	73a	9	0.0054
Desirable grass	9b	31a	27a	35a	8	0.0004
Forbs	12b	25a	27a	26a	3	0.05
Shrubs	63	51	77	85	20	0.22
Palmetto	439a	412a	304b	260c	30	0.0002
Total	560	566	477	479	37	0.22



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Fire-induced vegetation responses (2017-2023)

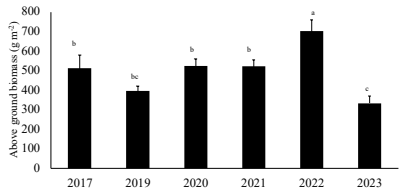

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Table 3 Carbon, N, and P stocks in aboveground biomass, remaining biomass, and net loss stocks in Saw-palmetto and Grass vegetation at Ona, FL.

	Saw-palmetto	Grass	*P* value
	C stocks (g C m^{-2})		
Pre-fire			
Green biomass	283 ± 58	64 ± 17	0.04
Senescent biomass	129 ± 41	155 ± 40	0.43
Plant biomass	412 ± 86	219 ± 57	0.02
Litter	60 ± 12	65 ± 8	0.78
Total stock	473 ± 82	284 ± 65	0.01
Post-fire			
Plant biomass	159 ± 52	8 ± 3	0.09
Ash	20 ± 5	19 ± 5	0.86
Total stock	179 ± 52	27 ± 8	0.08
Net loss	−293 ± 76	−257 ± 59	0.36
Pre-fire	N stocks (g N m^{-2})		
Green biomass	5.1 ± 1.1	0.9 ± 0.2	0.05
Senescent biomass	1.6 ± 0.5	1.3 ± 0.3	0.60
Plant biomass	6.6 ± 1.5	2.2 ± 0.6	0.04
Litter	1.0 ± 0.3	1.1 ± 0.1	0.86
Total stock	7.6 ± 1.4	3.3 ± 0.7	0.03
Post-fire			
Plant biomass	1.2 ± 0.5	0.1 ± 0.1	0.13
Ash	0.4 ± 0.1	0.5 ± 0.1	0.73
Total stock	1.6 ± 0.5	0.6 ± 0.1	0.10
Net loss	−6.0 ± 1.1	−2.7 ± 0.6	0.02

- 97% of biomass in grass vs. 65% in saw-palmetto were combusted during fire.
- Aboveground C and P stocks followed same pattern
- 79 to 82% of total above-ground N stocks were lost after fire

Kohmann et al. 2023.

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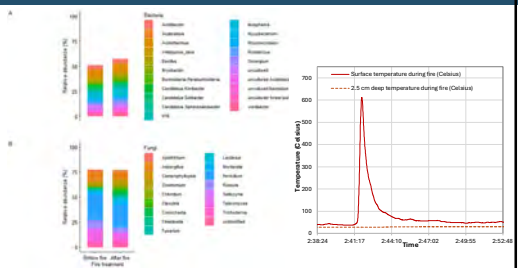
Fire-induced changes in soil microbial community



Relative abundance of bacterial (A) and fungal (B) genera for 0-10 cm soil depth before and 2 days after fire.

Rai, et al. 2023.Short-term prescribed fire-induced changes in soil microbial communities and nutrients in native rangelands of Florida. *Applied Soil Ecology* 189, 104914. https://doi.org/10.1016/j.apsoil.2023.104914

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Results


Agricultural and Forest Meteorology

Carbon dynamics and soil greenhouse fluxes in a Florida's native rangeland before and after fire

Year	NEP	GPP	R_{ECO}	R_S	ET (mm)	Precip (mm)	ET:Precip
2016	-409	1854	1445	NA	1062	1089	0.97
2017	-327	1750	1422	NA	1021	1121	0.91
2018	-369	1861	1492	611	1070	1309	0.81
2019	-182	2033	1851	783	1147	1026	1.11

Fire effect was short-lived: 60 d after fire vegetation photosynthetic capacity

Native rangeland acted as a C sink sequestering ~ -1148 g C m^{-2} during the 4-yr study (2.9 Mt C ha^{-1} yr^{-1})

Florida's rangeland a very resilient ecosystem and a viable option for C mitigation under forecasted climate scenarios and management

Bracho et al. 2021

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- RCREC faculty

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- Nikitha Kovvuri
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- Drilon Voca
- Pedro Kikucho



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Thank you!

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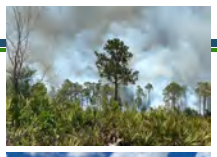

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Upcoming Events

Join us for our next Ona Highlight!

Tuesday, Dec. 10, 11:00 – 11:45 a.m.

'Groundwater modeling, quantity, and quality'

with Dr. Golmar Golmohammadi, a watershed hydrologist at the UF/IFAS Range Cattle REC in Ona

UF/IFAS Range Cattle Research & Education Center – Ona, FL

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