

Can ecological theory help us develop better targeted grazing and browsing systems?



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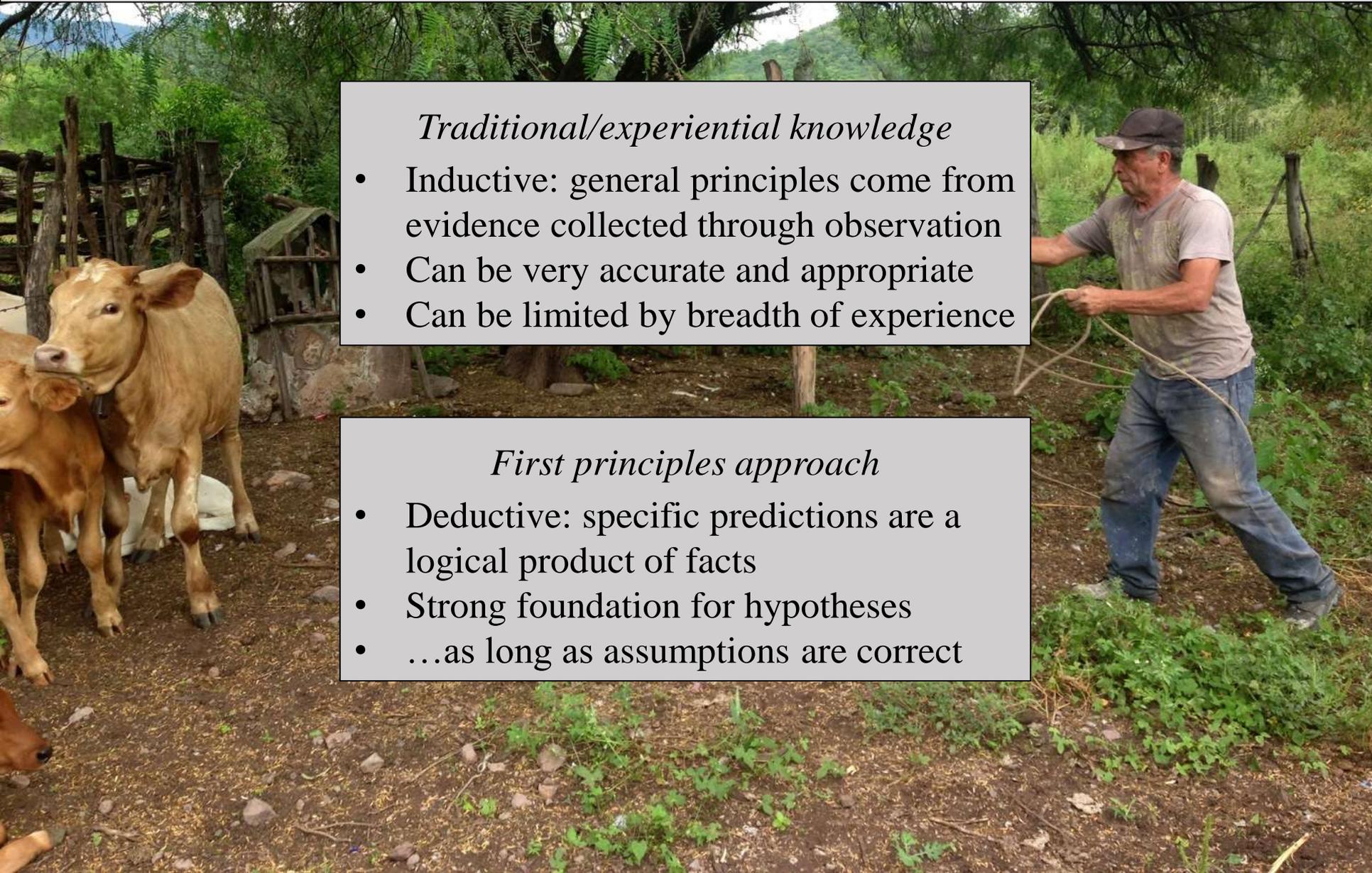
How long will it take? What kind of animals? How many? At what time of year? How much land can they cover? **Will it work? Is it feasible?**

Traditional/experiential knowledge

- Inductive: general principles come from evidence collected through observation
- Can be very accurate and appropriate
- Can be limited by breadth of experience

First principles approach

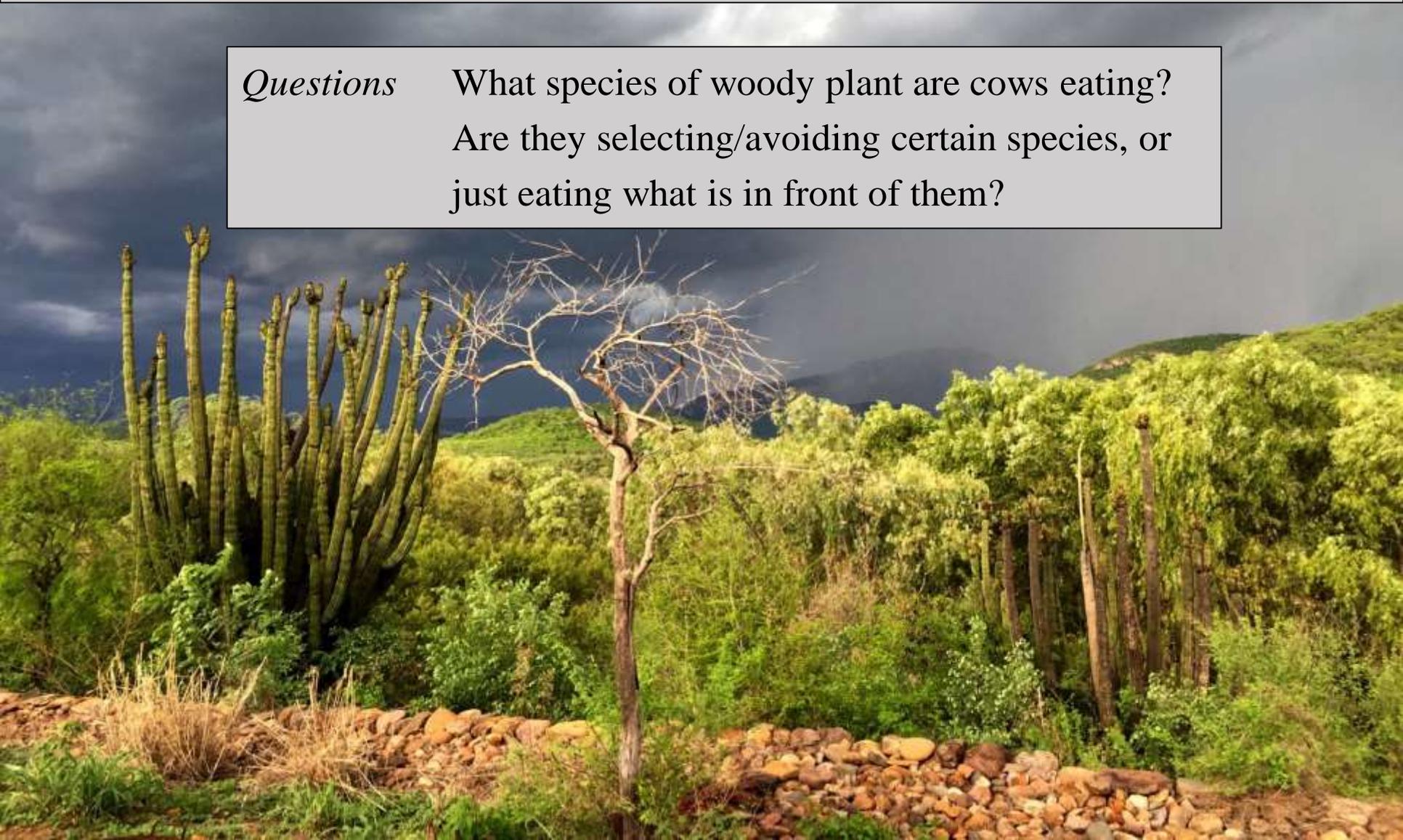
- Deductive: specific predictions are a logical product of facts
- Strong foundation for hypotheses
- ...as long as assumptions are correct



Foraging behavior of free-ranging cattle and community interactions in a tropical deciduous forest

Or, “Cows (that browse) choose the forest, and some trees”

Questions What species of woody plant are cows eating?
Are they selecting/avoiding certain species, or
just eating what is in front of them?



A targeted approach: initial conditions

Area / property size



Spatial ecology

- Species-area relationship

Number of animals



Rangeland ecology

- AUMs/AUEs (Animal Unit Months/Equivalents), sustainable stocking, rotation

Length of time in area



Number of plants/patches



Community ecology

- Eg: neutral theory, competition, mutualism

Diversity of plants



Preferredness of plants to animals



Foraging ecology

- Marginal value theorem, selectivity, bias

Animal movements

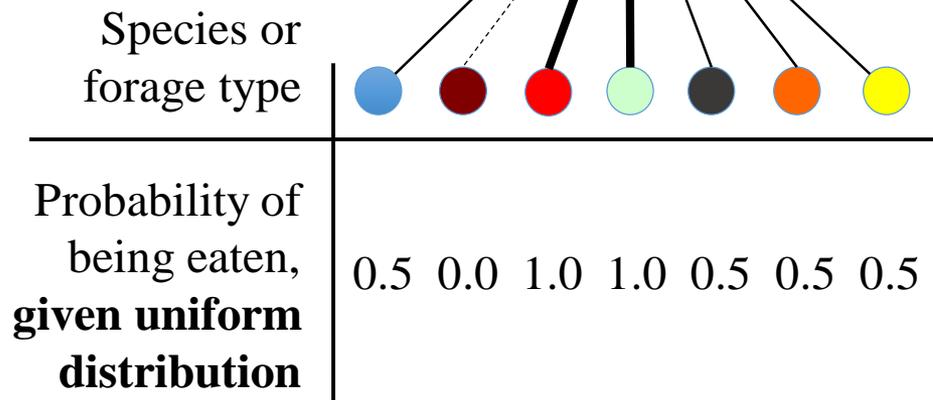


Movement/spatial ecology

- Random walks, resource selection functions

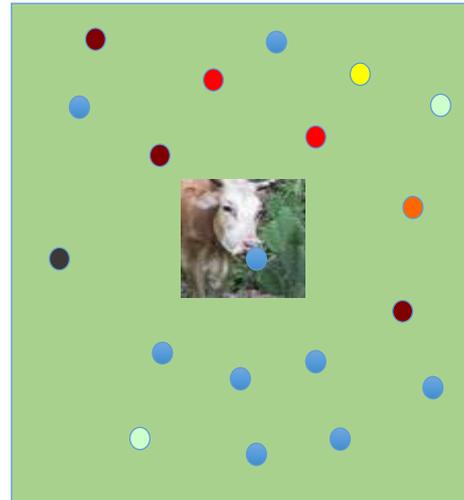
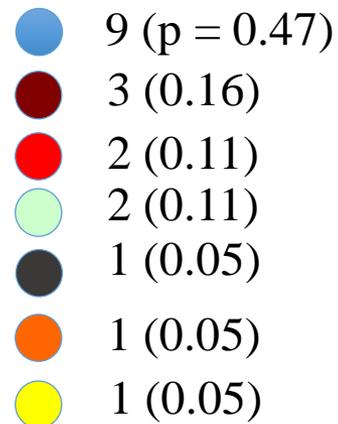
Foraging ecology: preference

Which one will she eat?



A “smorgasbord” experiment

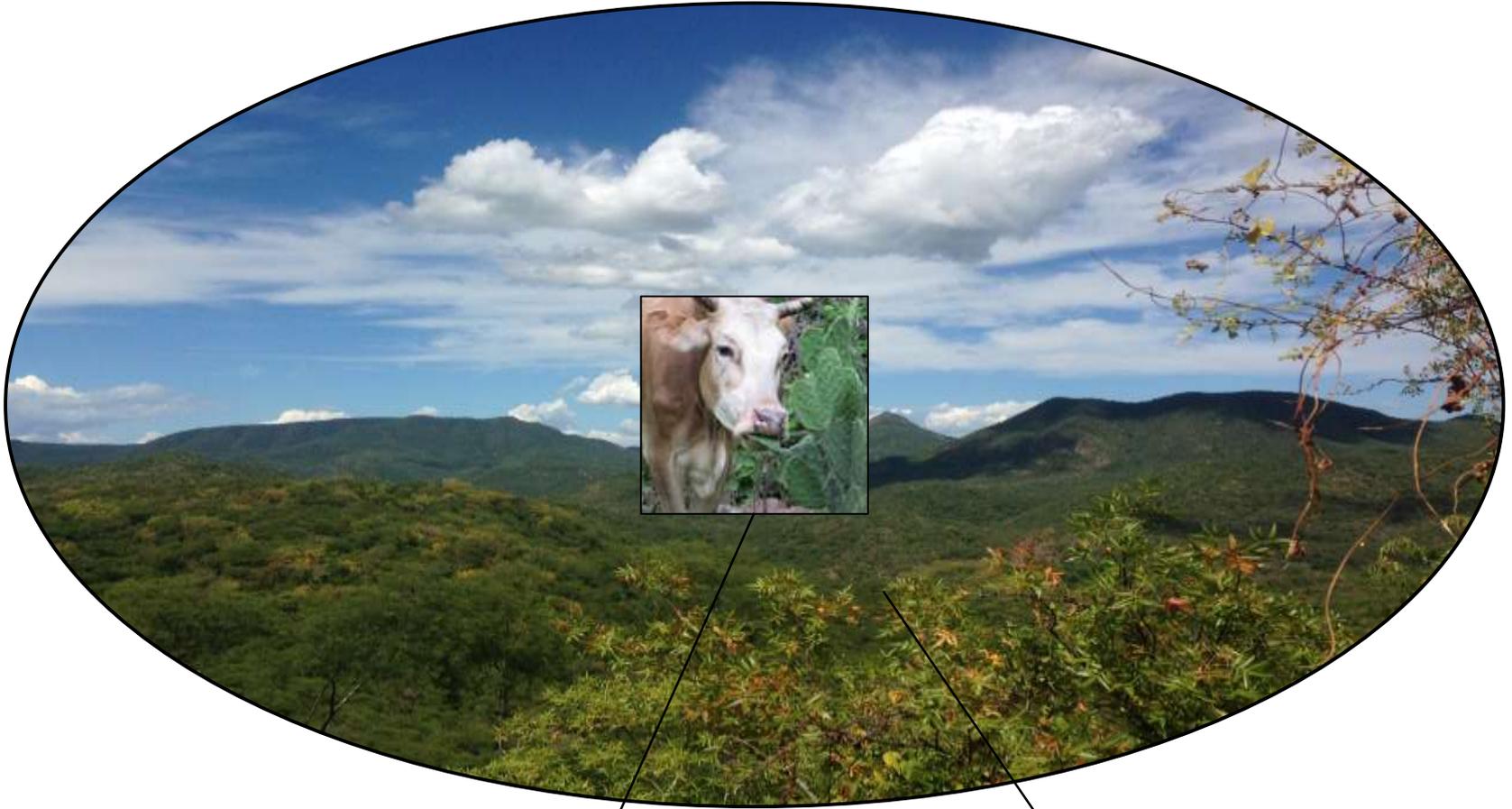
Will she eat it *in context*? (Can she find it?)



19 total, 7 species

Bias towards and/or against species or plant communities
in a diverse environment?

In context, preference does not always predict bias



The plants cows
actually ate

What plants cows could
have eaten easily, given
where they foraged

What they ate: VACAMS

VACAMS (Video And Coordinate Automated Monitoring System)

Methods in Ecology and Evolution

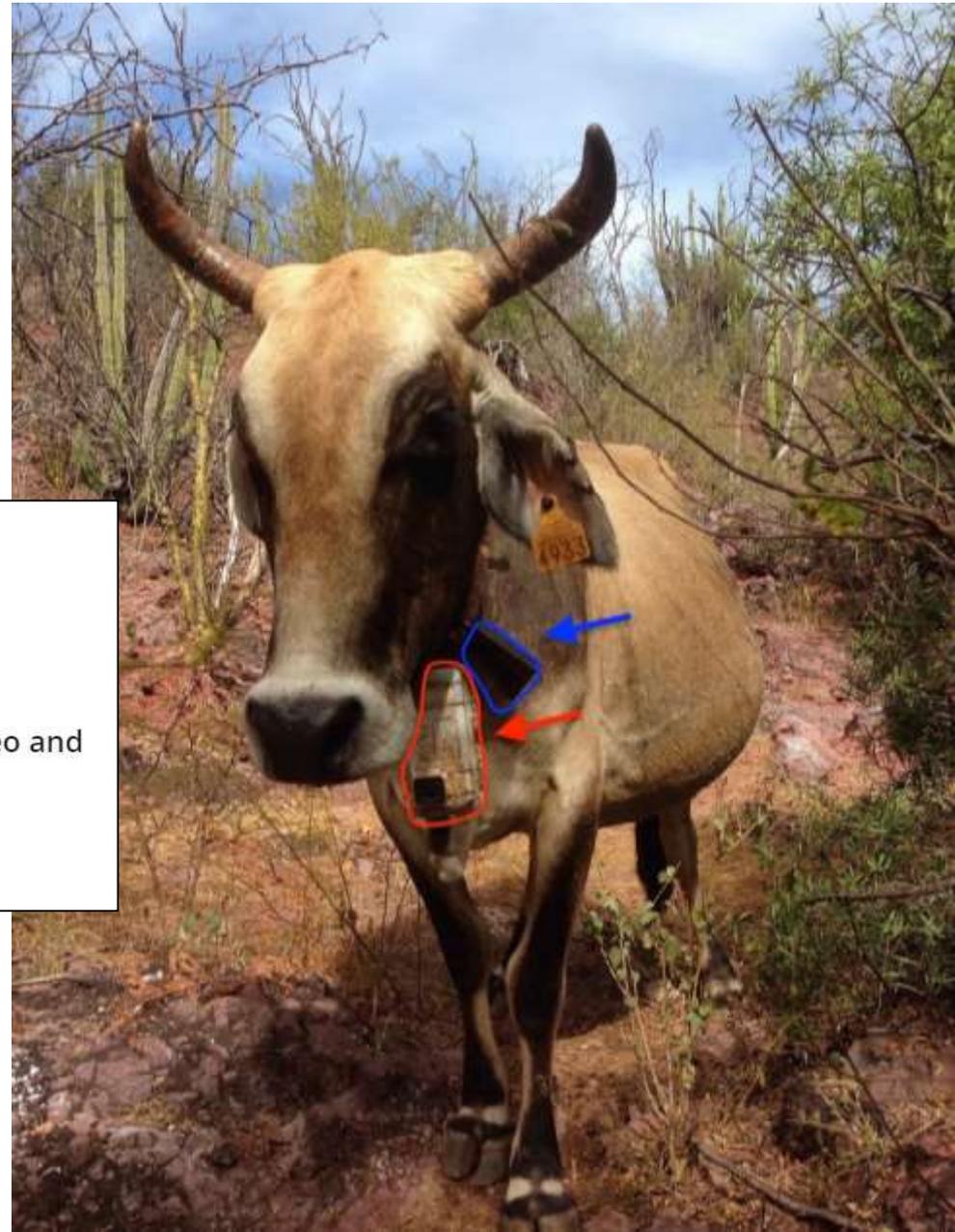


RESEARCH ARTICLE | [Full Access](#)

An inexpensive and open-source method to study large terrestrial animal diet and behaviour using time-lapse video and GPS

Carlos A. de la Rosa

First published: 10 January 2019 | <https://doi.org/10.1111/2041-210X.13146>

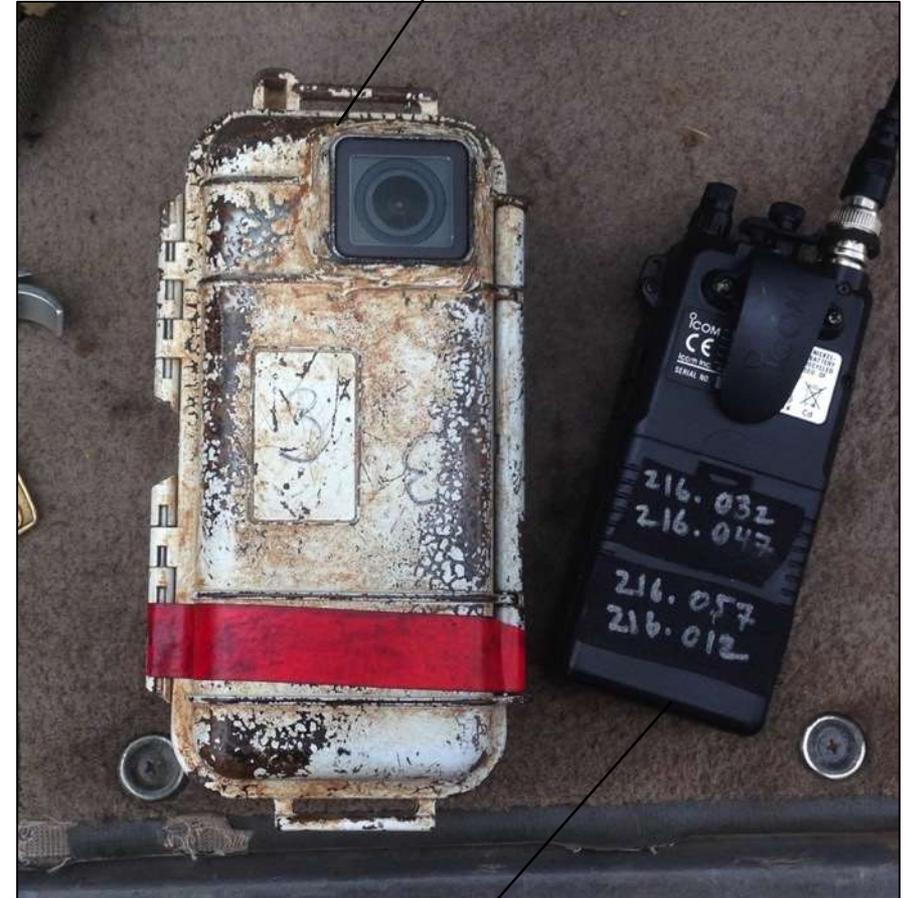


VACAMS components

Scheduler/timer

Camera

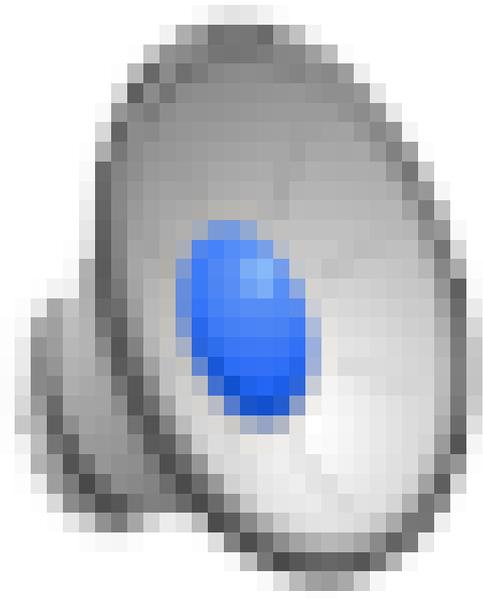
Water/shockproof case



VHF transmitter

External battery

Wideband receiver



GOPR2831.MP4



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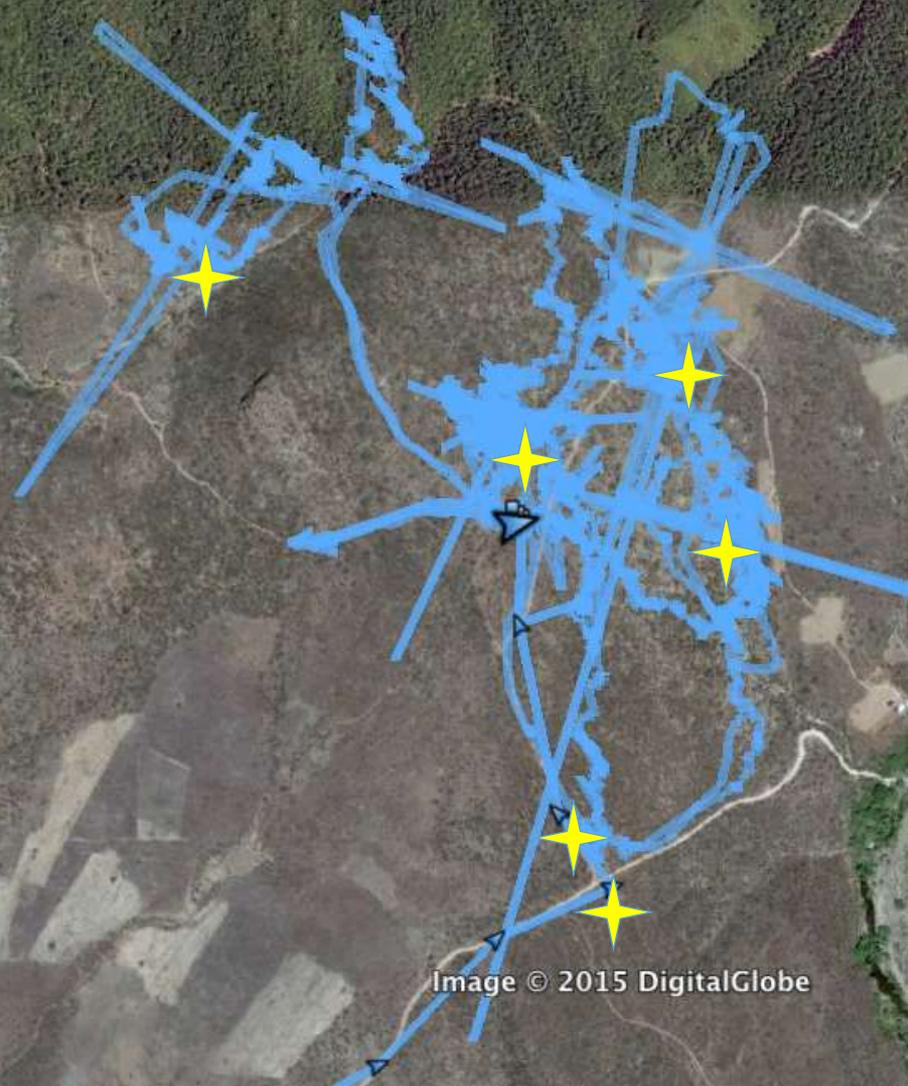
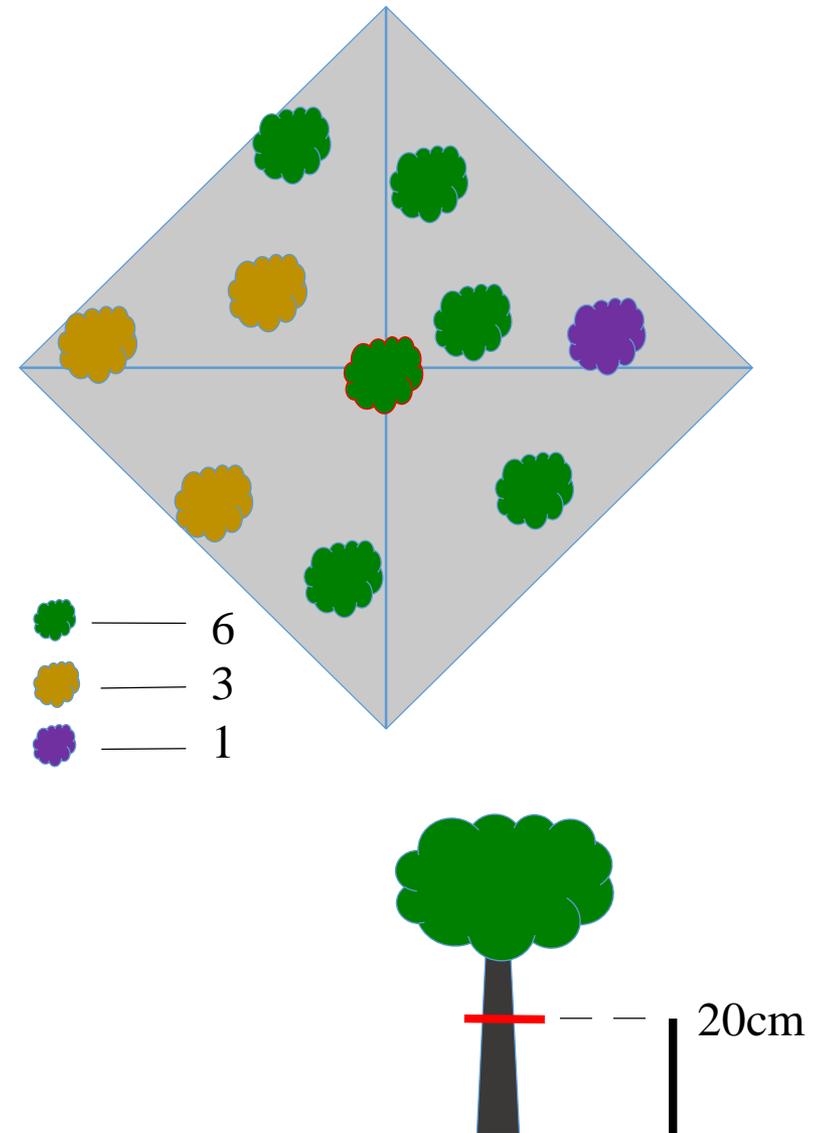
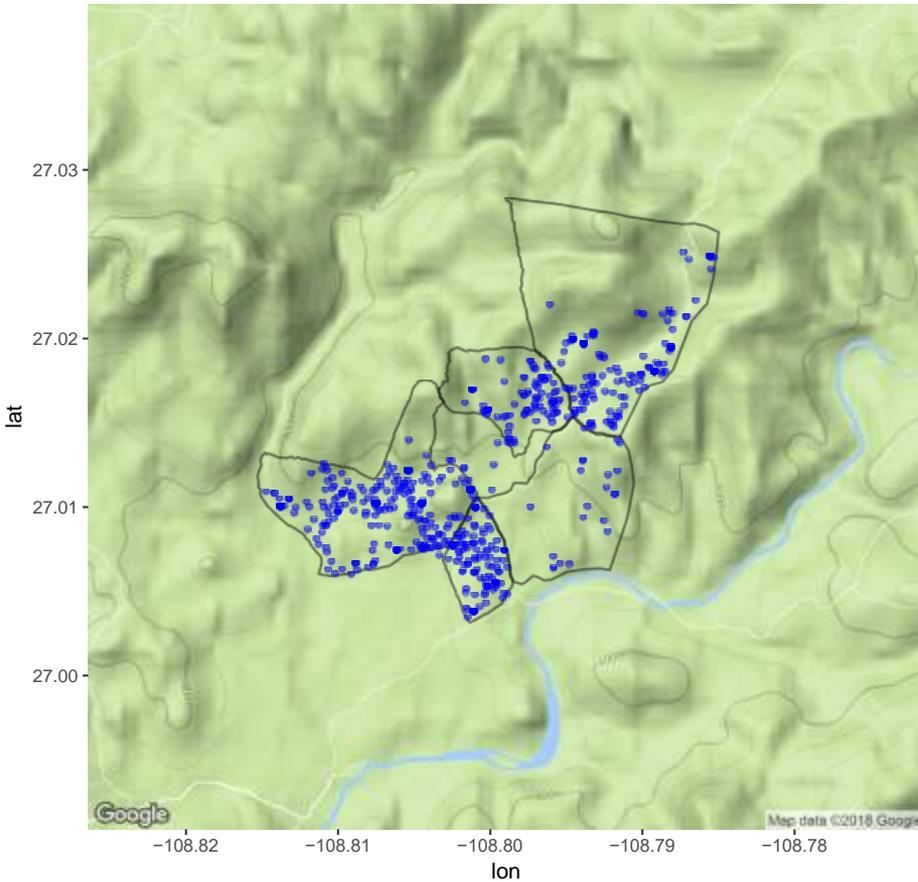


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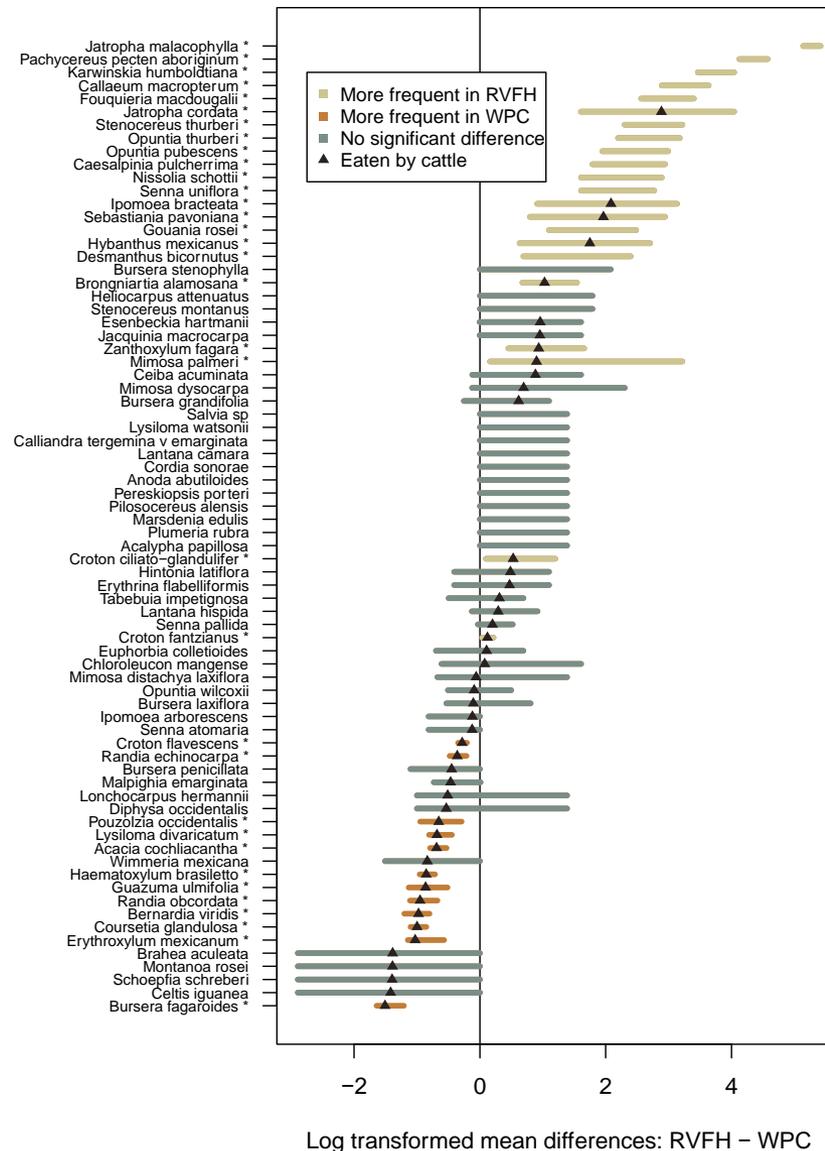
Google earth

Repeat-visit foraging habitat: other species in the component of habitat where cows ate woody plants

Repeat-visit foraging habitat

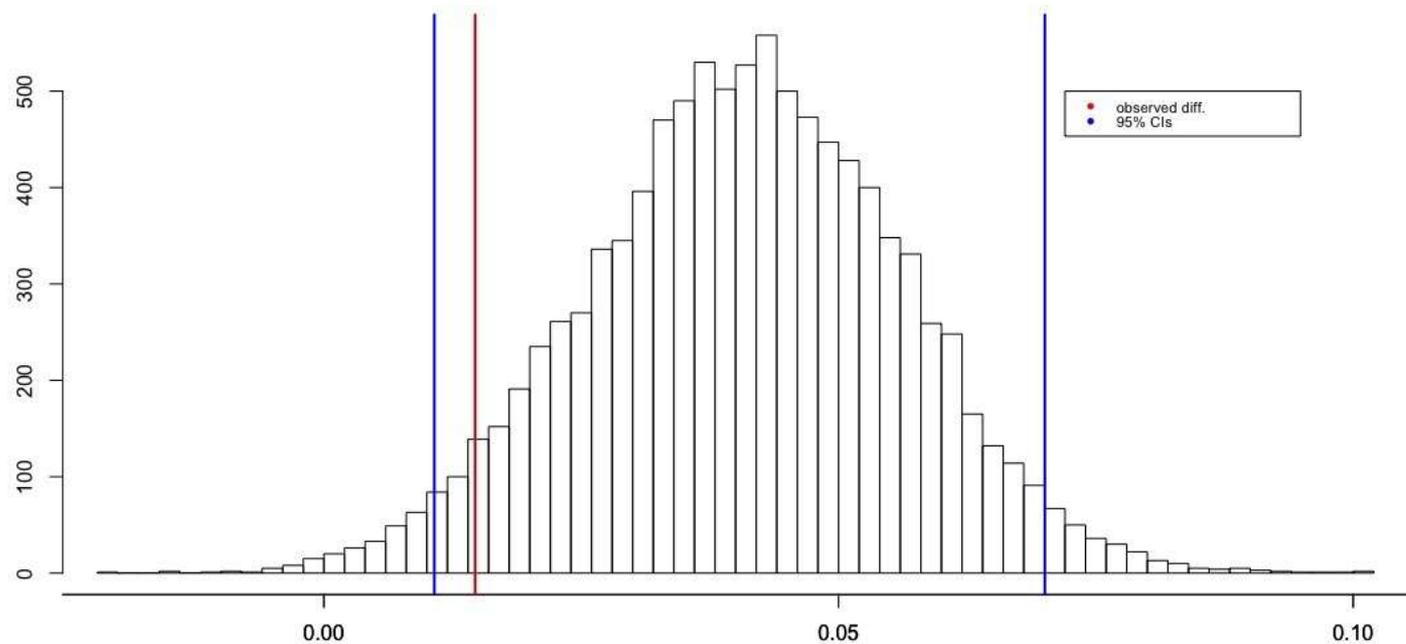


Seeking and avoiding, or eating what's available?



Tan: Species significantly more frequent in habitat
 Orange: Species significantly more frequent in diet

Diversity where cows forage is the best predictor of diversity in cow diet

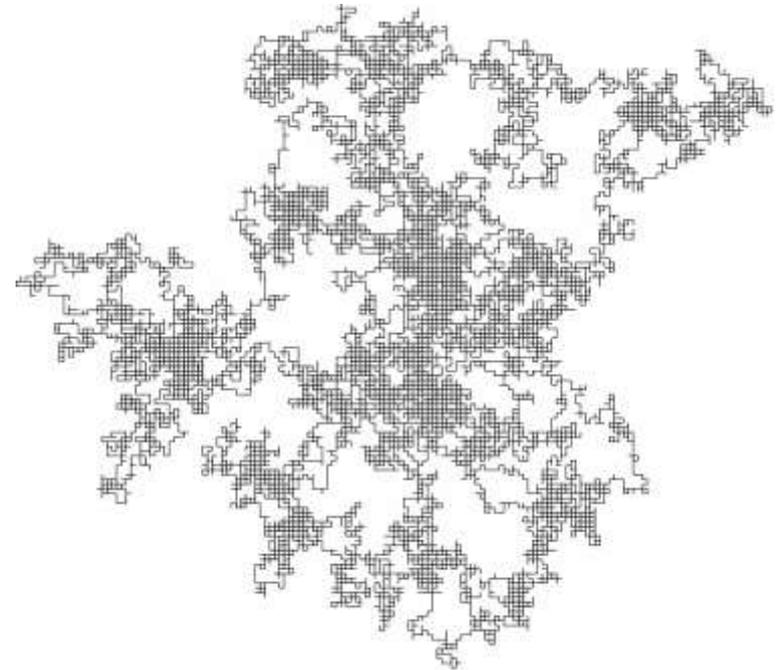
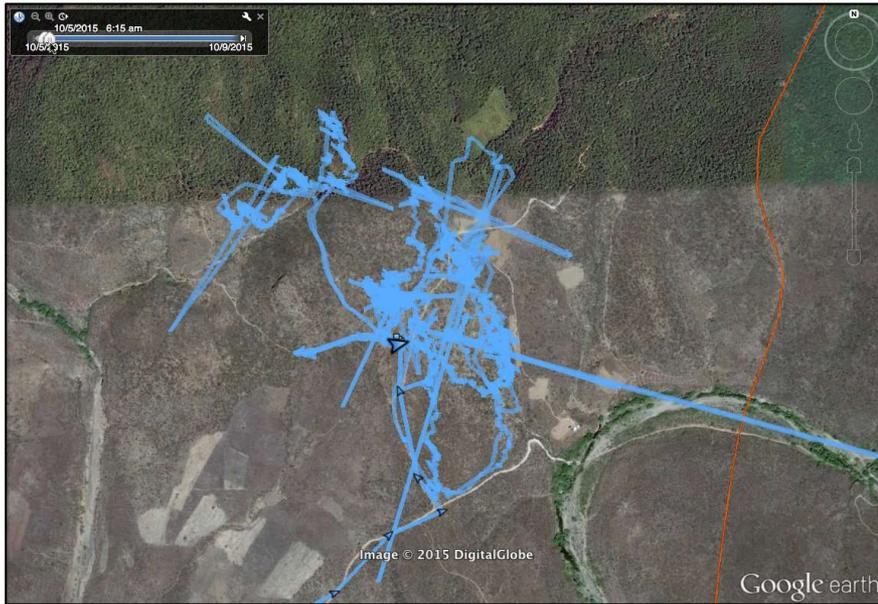


- Tree species evenness in cow diets is not statistically distinguishable from tree species evenness in forests where they browse on woody vegetation
- (Diet evenness: **0.6812**, foraging system evenness: **0.6665**)

Can methods and theory from ecology help improve management?

(Qualified) yes! Experiments and models can...

- Help explain successes and failures
- Provide new and interesting insights
- Create many new questions!



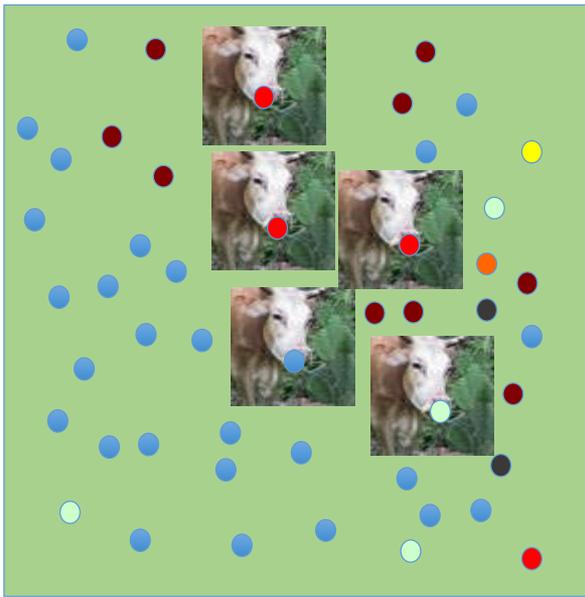
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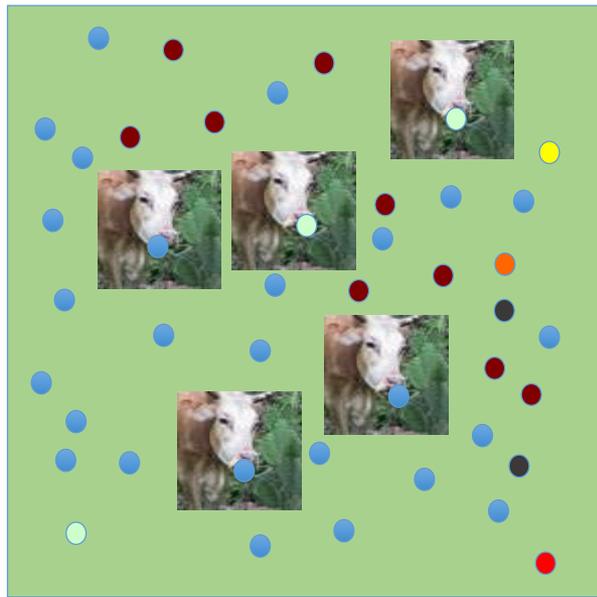


Thank you!

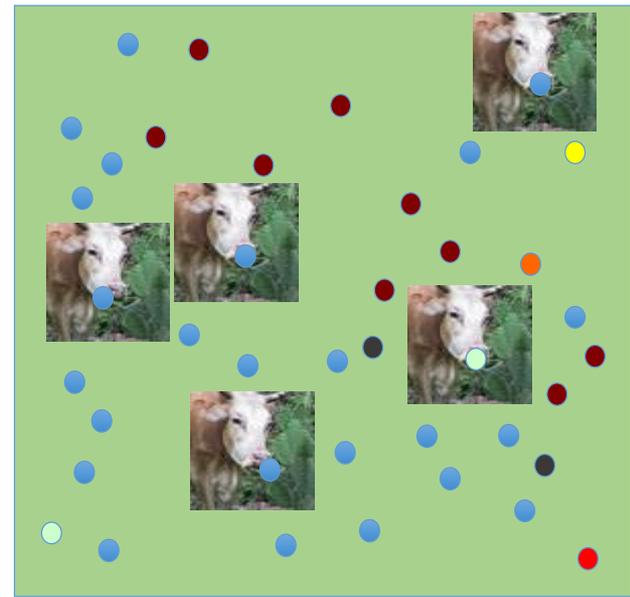




Week 1: 48, 7 species



Week 2: 43, 7 species



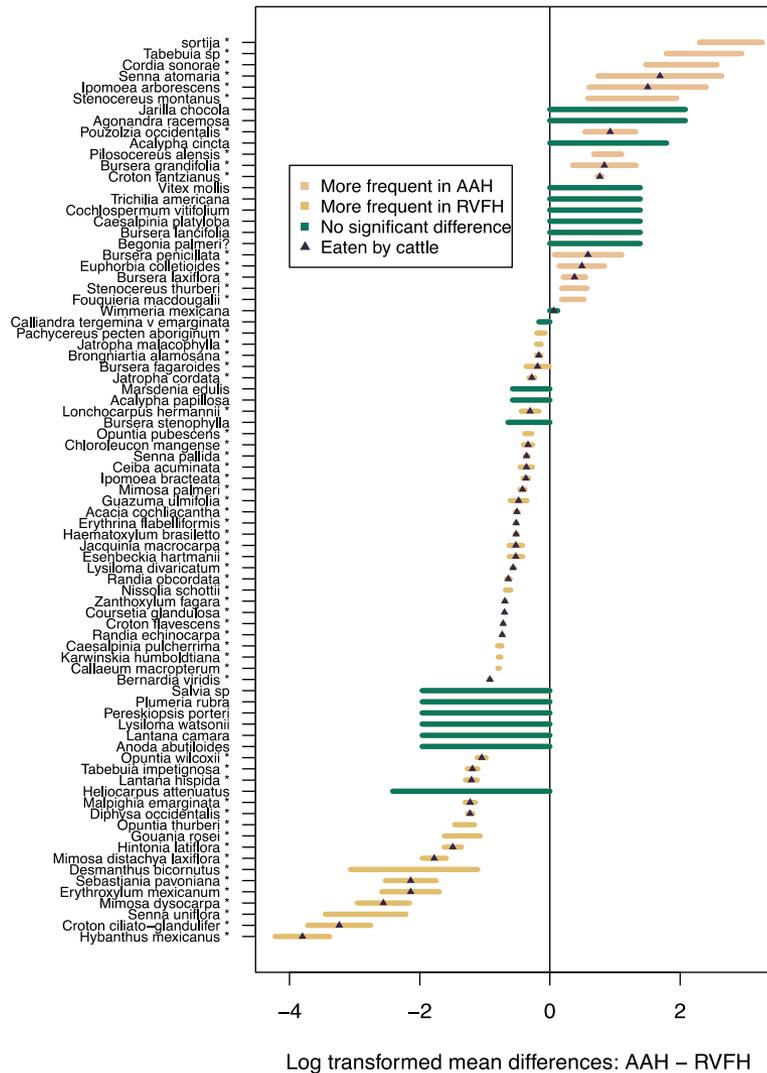
Week 3: 38, 7 species

Sp	N	Freq
●	27	.56
●	9	.19
●	4	.08
○	4	.08
●	2	.04
●	1	.02
●	1	.02

Sp	N	Freq	+/-
●	26	.61	+.05
●	9	.21	+.02
●	1	.02	-.06
○	3	.07	-.01
●	2	.05	+.01
●	1	.02	0
●	1	.02	0

Sp	N	Freq	+/-
●	24	.63	+.02
●	9	.24	+.03
●	1	.02	0
○	1	.02	-.05
●	2	.05	0
●	1	.02	0
●	1	.02	0

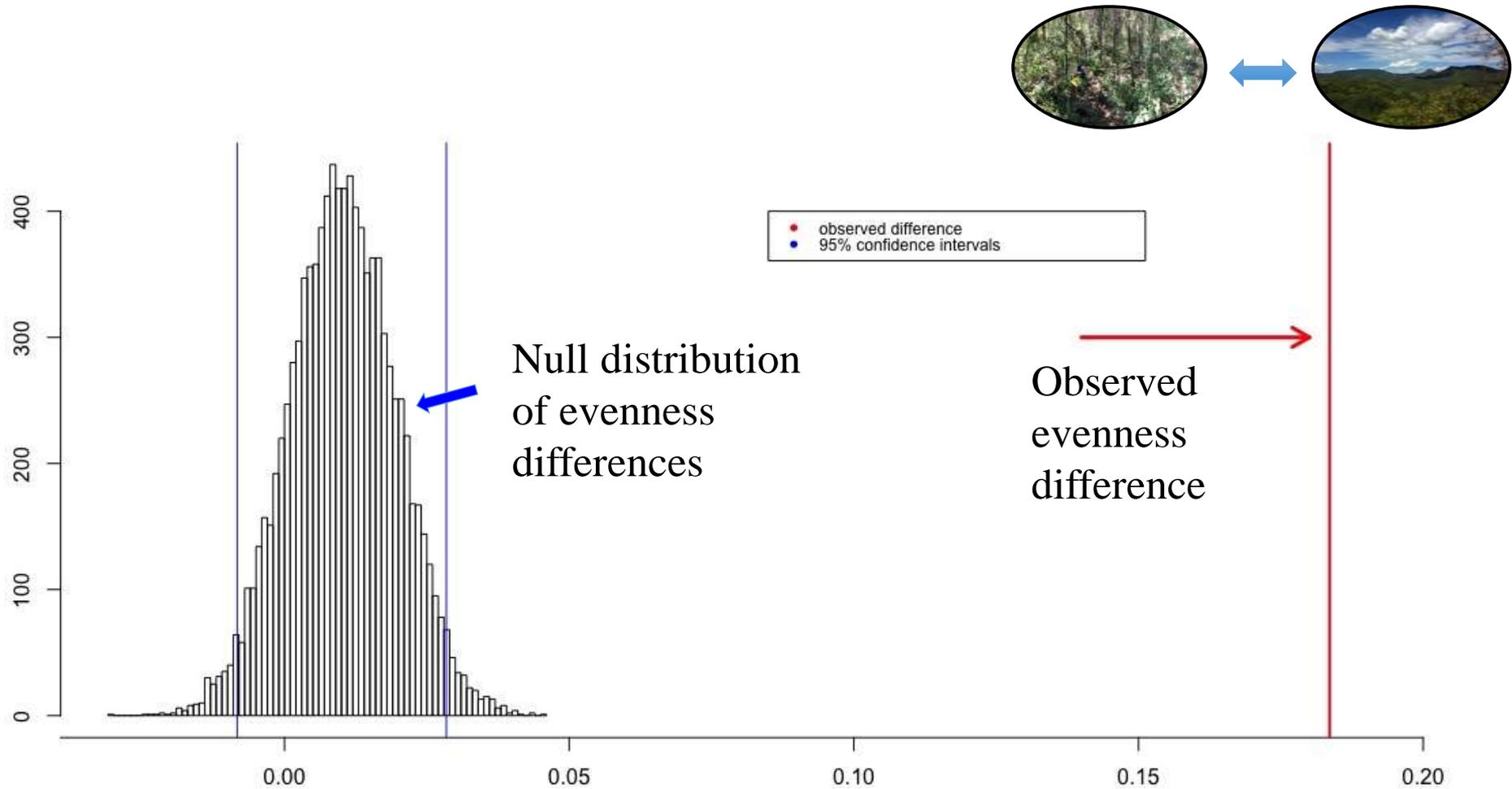
Is all accessible habitat (AAH) different from repeat-visit foraging habitat (RVFH)?



Peach: species significantly more frequent in all available habitat

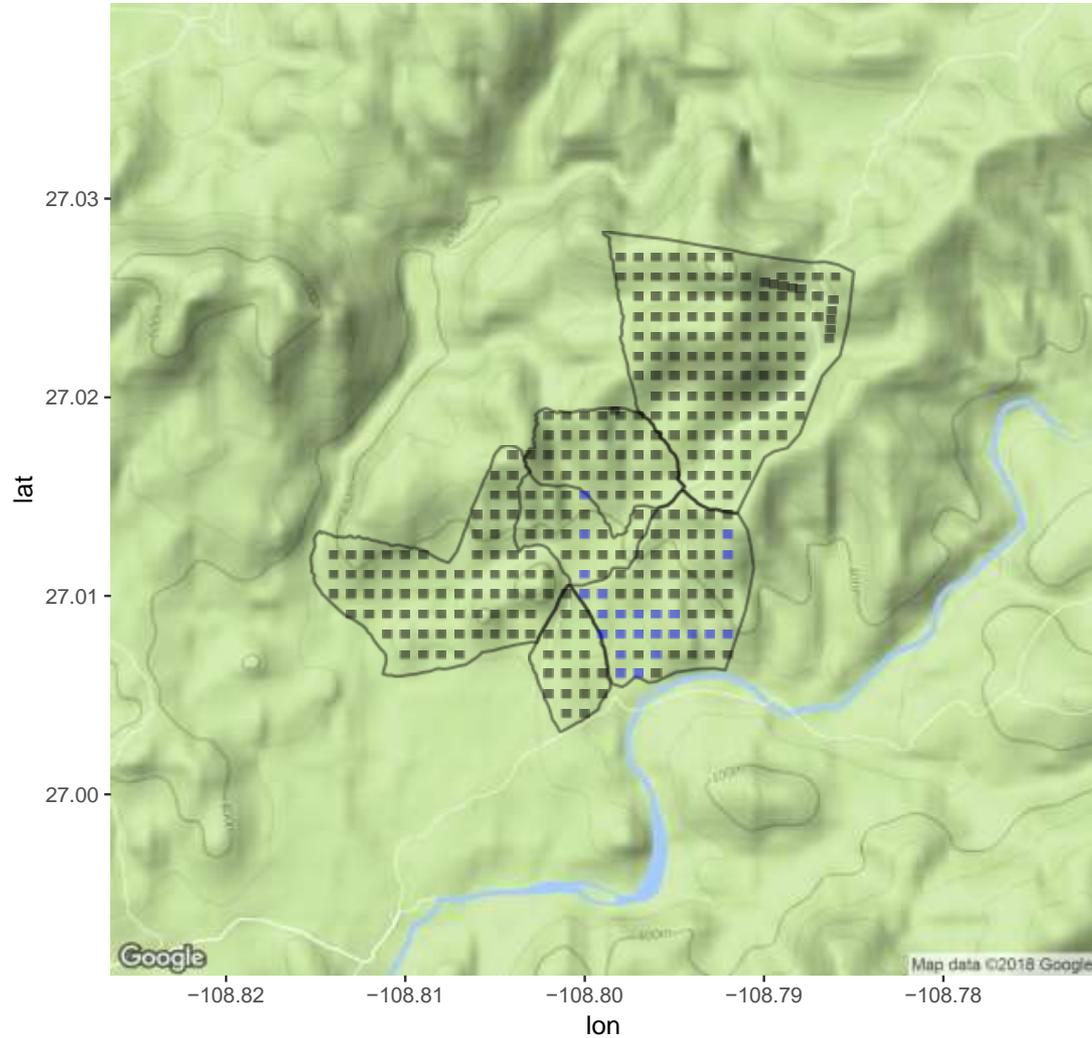
Tan: species significantly more frequent in repeatedly visited foraging habitat

Foraging habitat is actually **more diverse** than all available habitat



- (Foraging syst. evenness: **0.6665**, ranch evenness: **0.4828**)

All available habitat: a sample of everything accessible to cows (whether or not they went there)



Scalar data



The plants cows
actually ate

What plants cows could
have eaten easily, given
where they foraged

What plants cows could have
eaten if they foraged randomly
across all available habitat