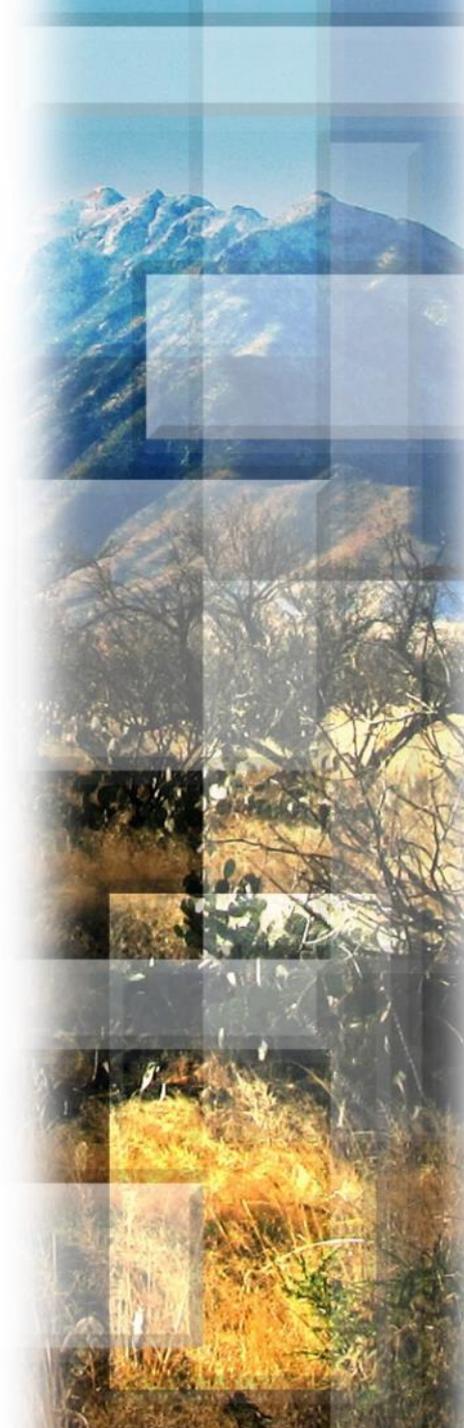


Brush management on the Santa Rita Experimental Range: a pre-treatment assessment of ecosystem services

Adam T. Naito, PhD

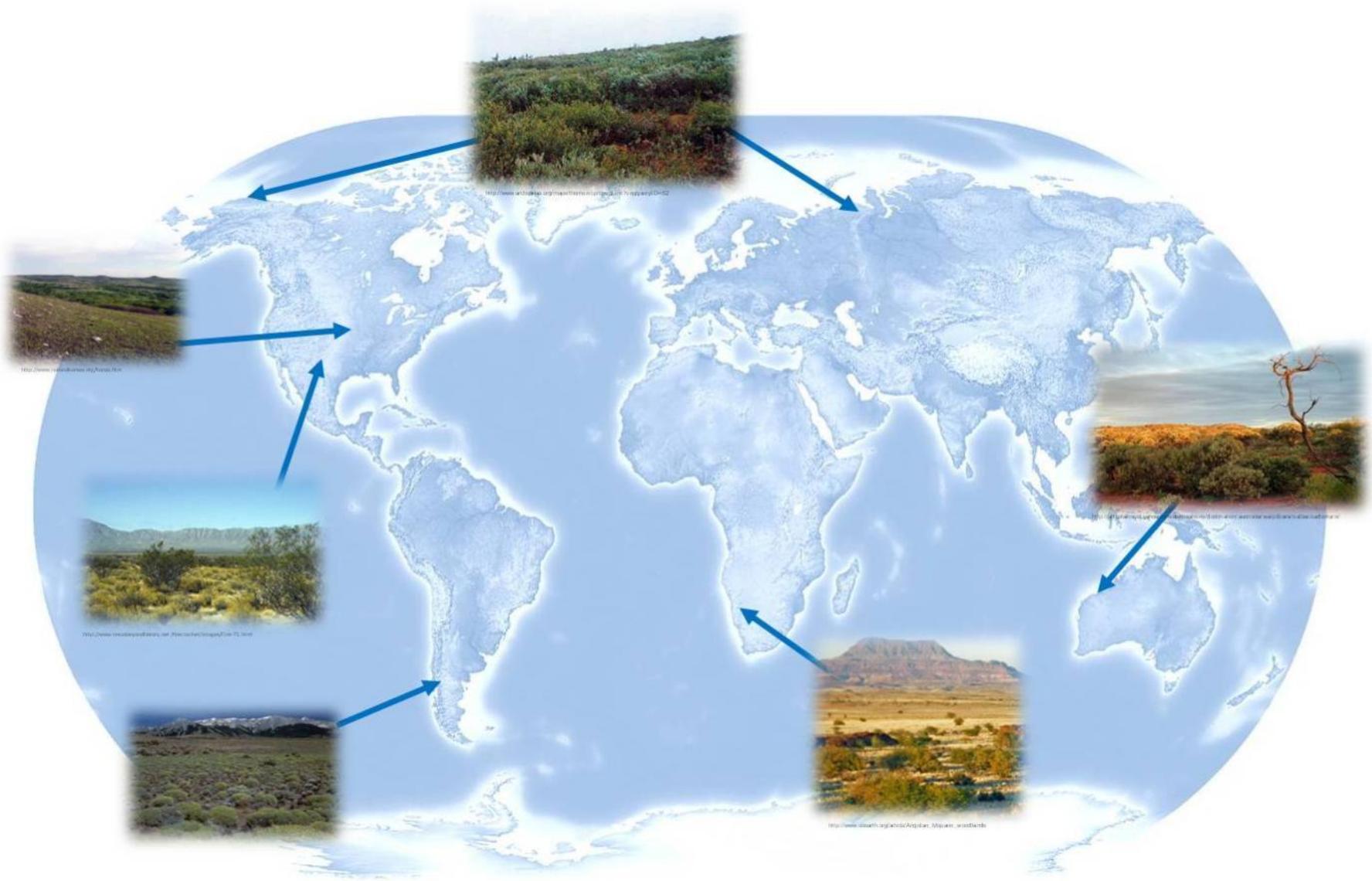
School of Natural Resources and the Environment
University of Arizona
Tucson, AZ USA

08 October 2016



Background

Woody encroachment as a global phenomenon



Adapted from Naito & Cairns (2011), *Prog. Phys. Geog.*



Photos by Griffiths, Reynolds, Buttery, and McClaran

SRER Repeat Photography (<http://ag.arizona.edu/SRER/photos.html>)

Background

Woody encroachment in Arizona

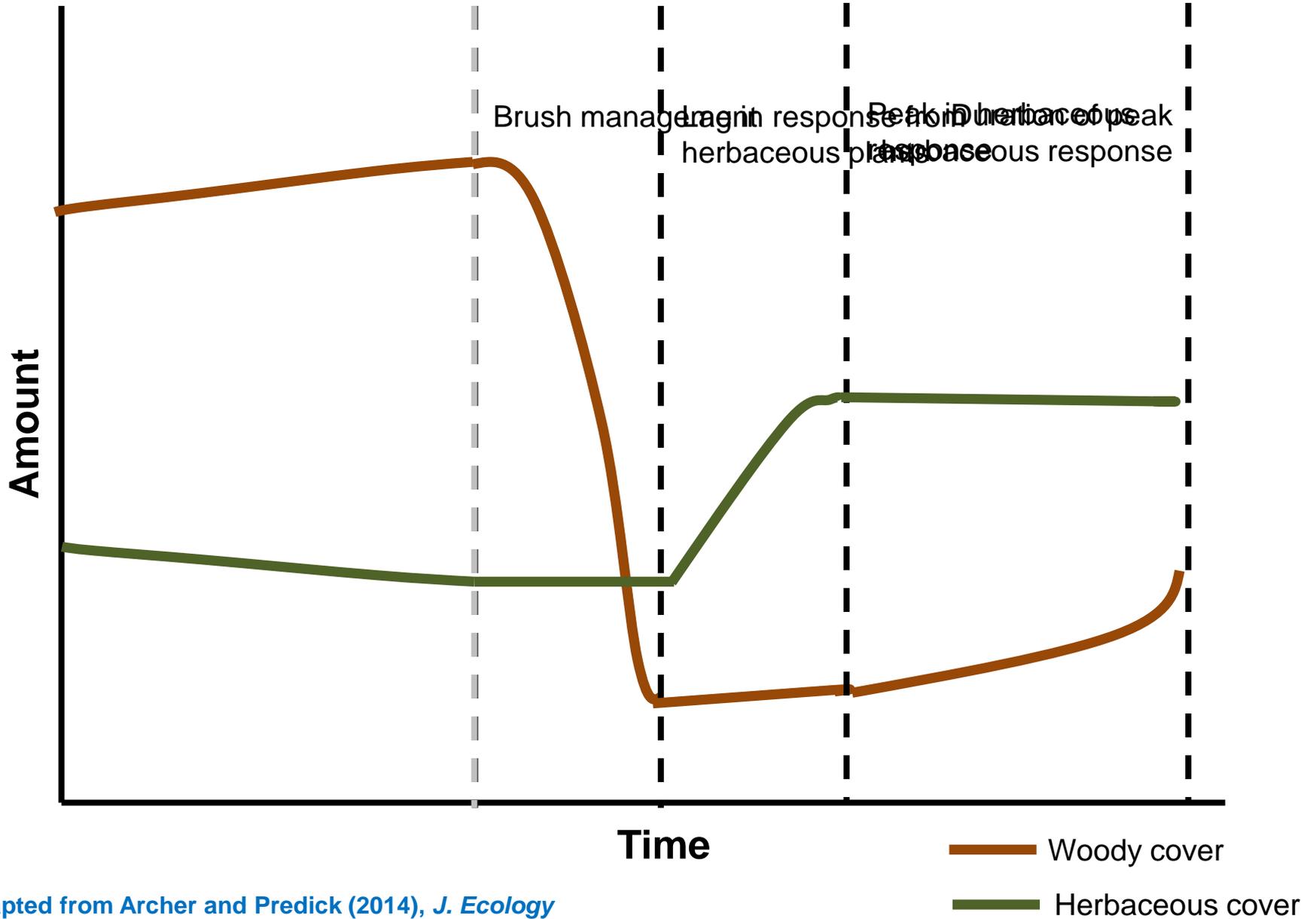


Photo courtesy of Mark Heitlinger

- What ecosystem services are affected by brush management, and what are the potential long-term trade-offs?
- **Ecosystem services:** direct and indirect services an ecosystem and wildlife provide humans and society. [From Costanza et al. \(1997\) *Nature*](#)
 - Provisioning services
 - Supporting services
 - Regulating services

- Quantifying and assessing these services at landscape/land-management scales before and after a brush management scheme using herbicide.
 - Herbaceous diversity
 - Aboveground biomass (woody and herbaceous)
 - Aboveground and belowground carbon sequestration potential
 - Aboveground woody storage (live shrubs and coarse woody debris)
 - Soil carbon and nitrogen
 - Runoff
 - Carbon flux and evapotranspiration

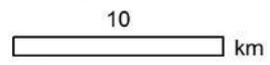
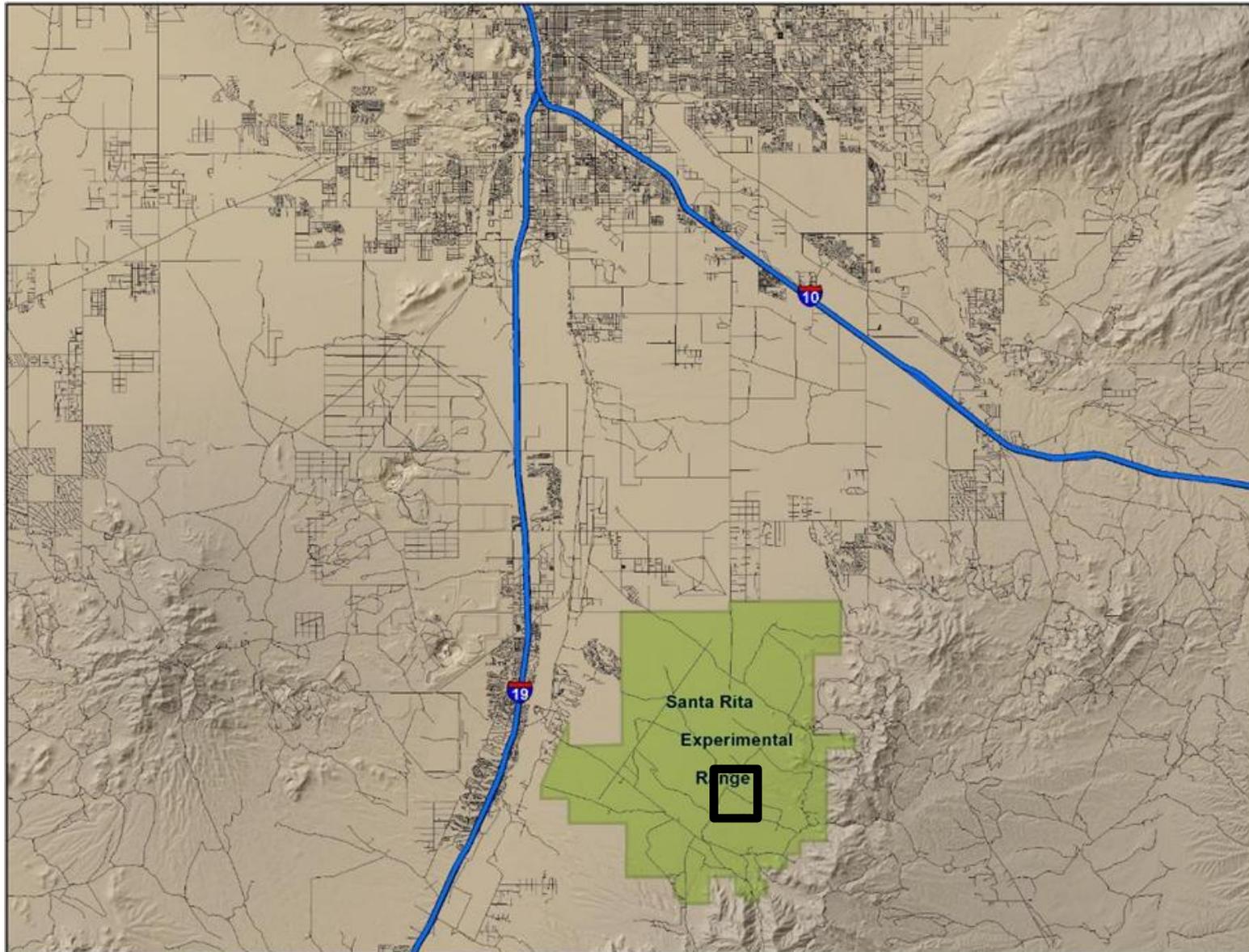
Conceptual model of herbaceous response to brush management



Adapted from Archer and Predick (2014), *J. Ecology*

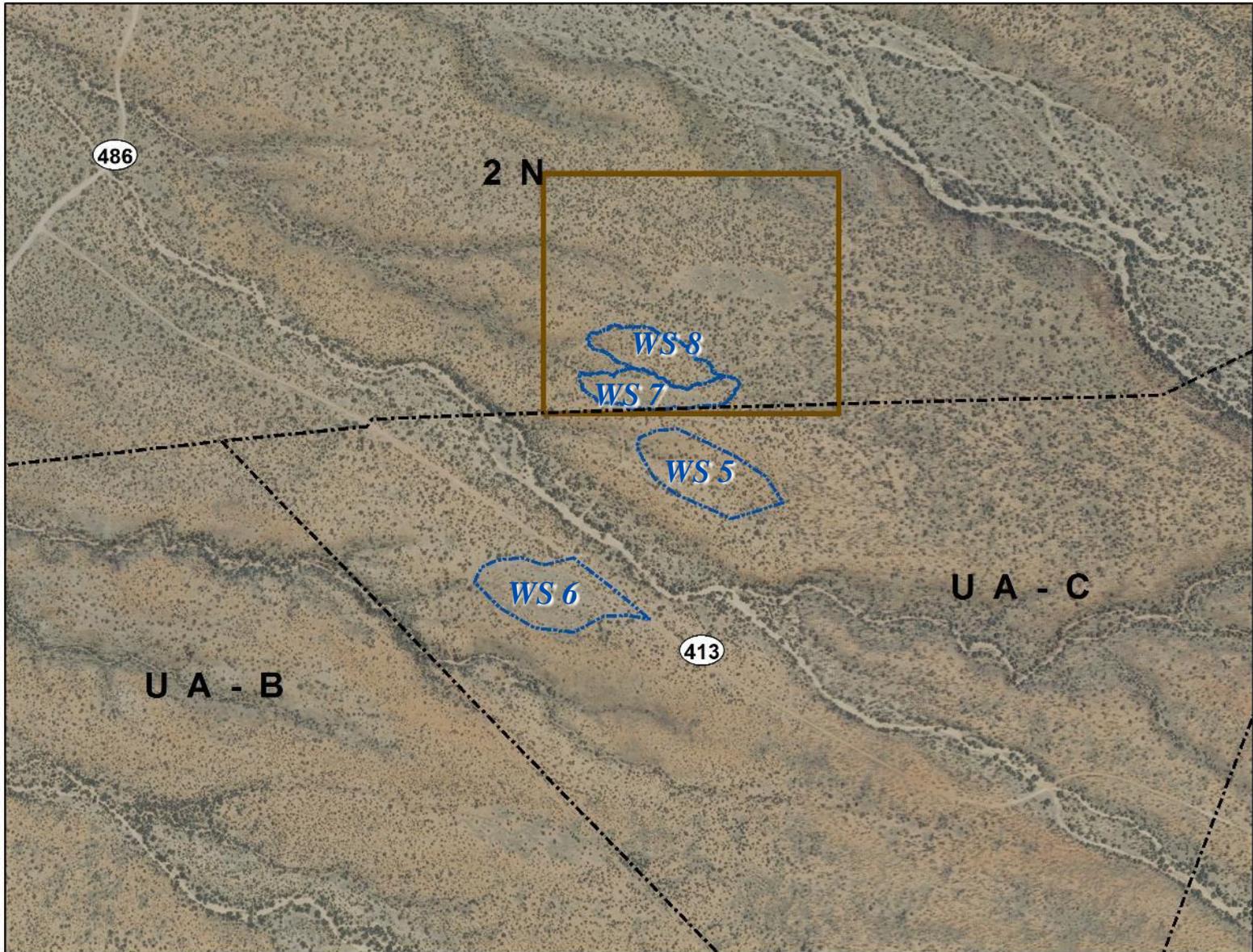
Study area

Santa Rita Experimental Range



Study area

Santa Rita Experimental Range



250

m

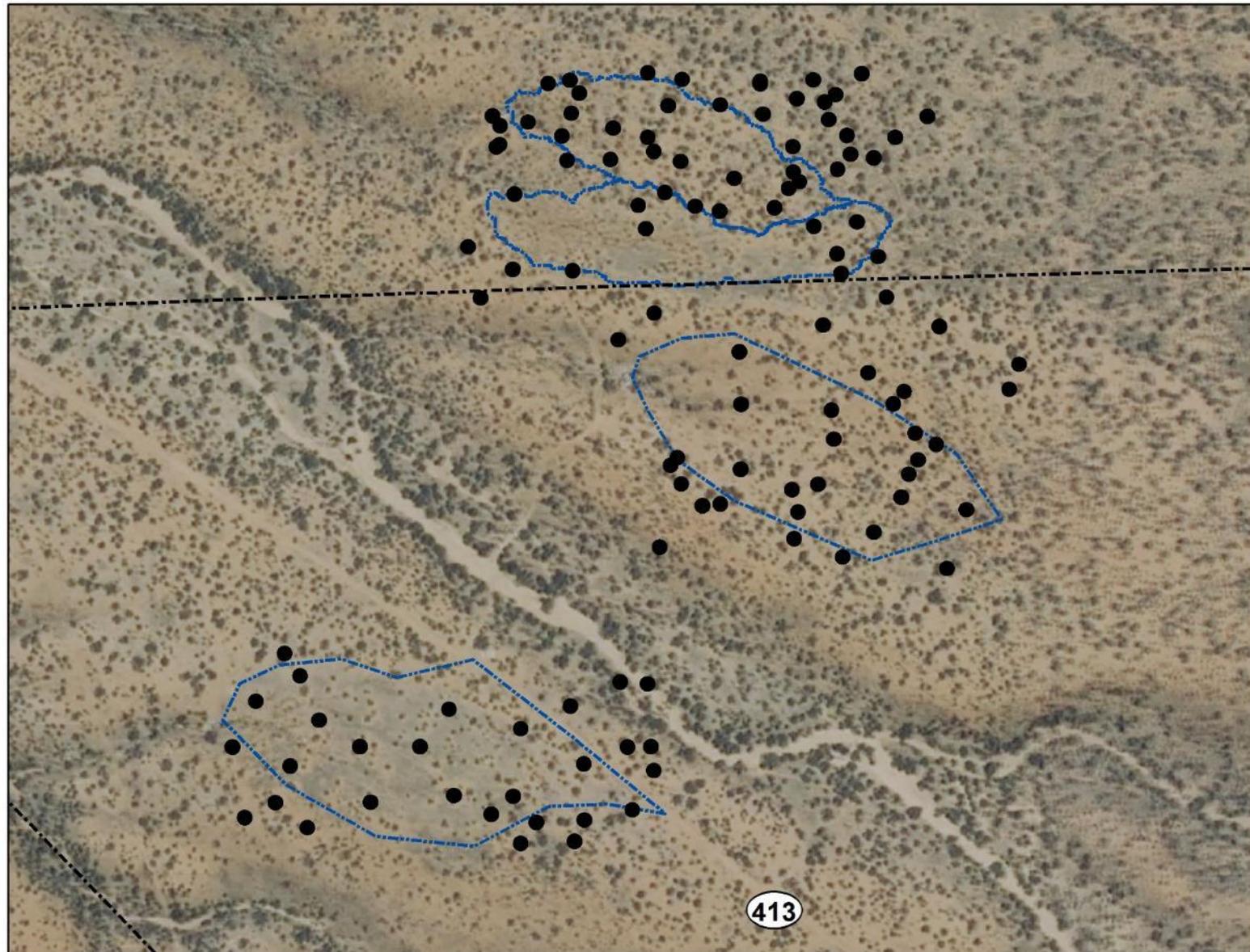
Study area

Santa Rita Experimental Range



Methods

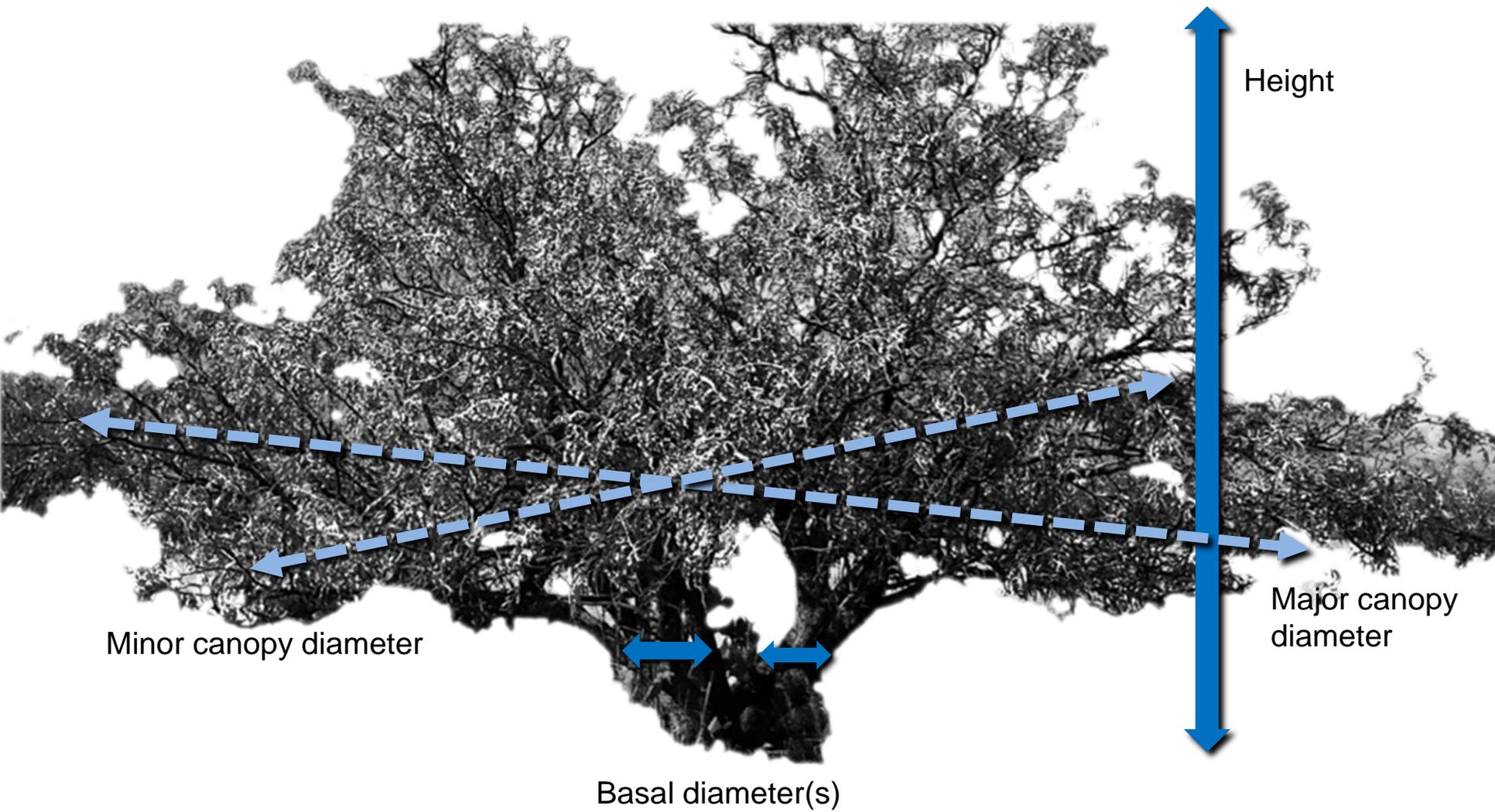
Sampling mesquite



200

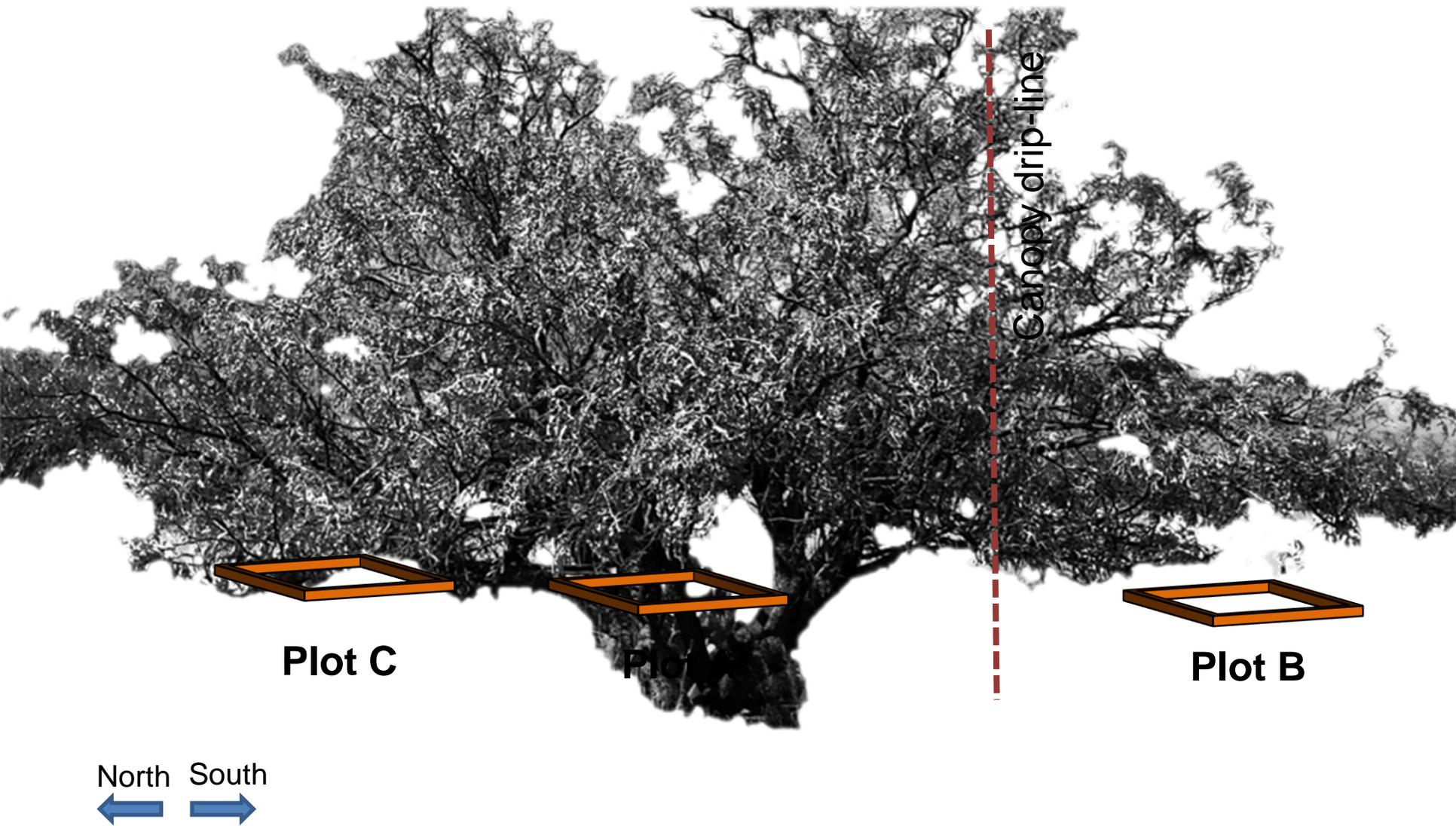
m





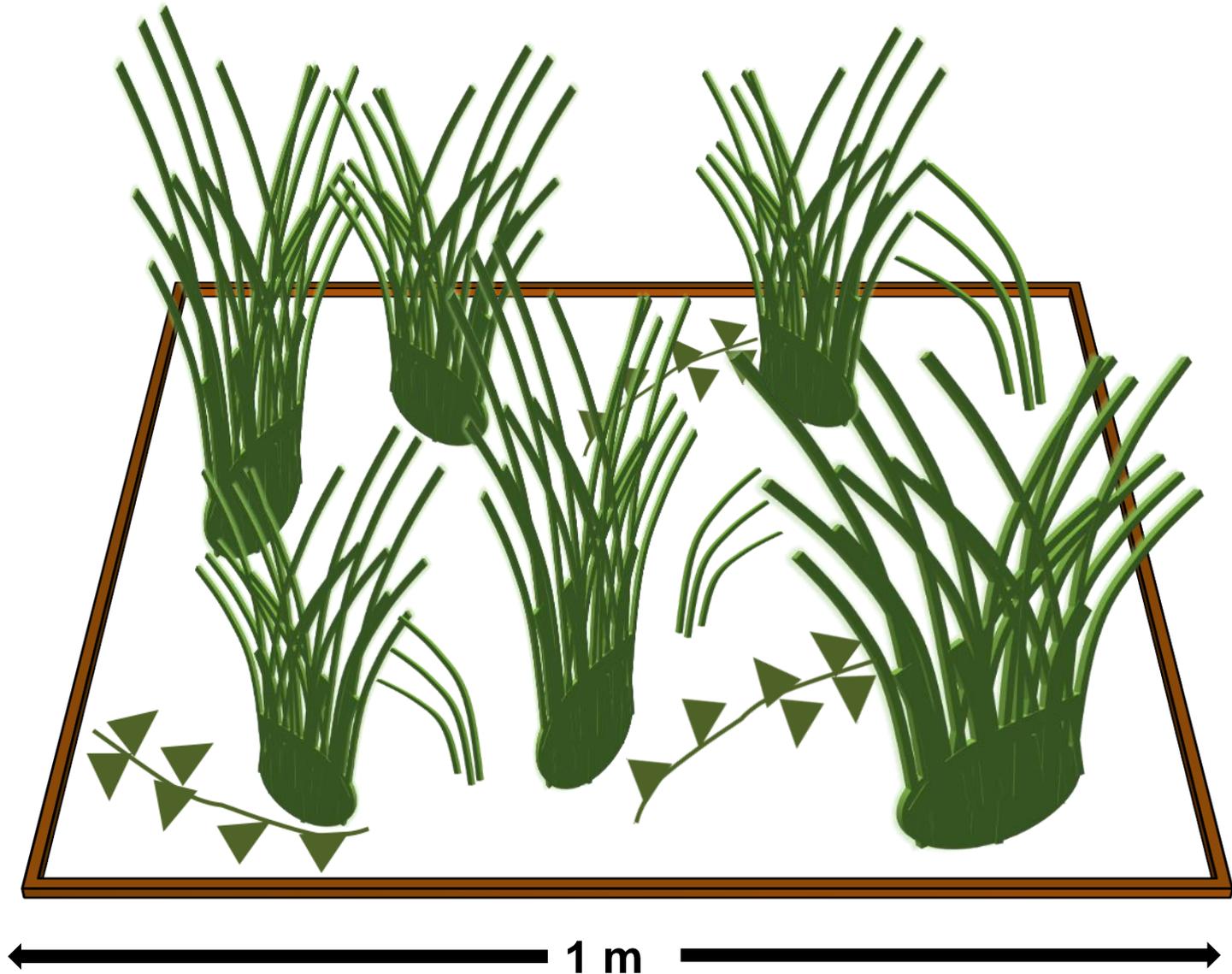
Methods

Herbaceous diversity and biomass



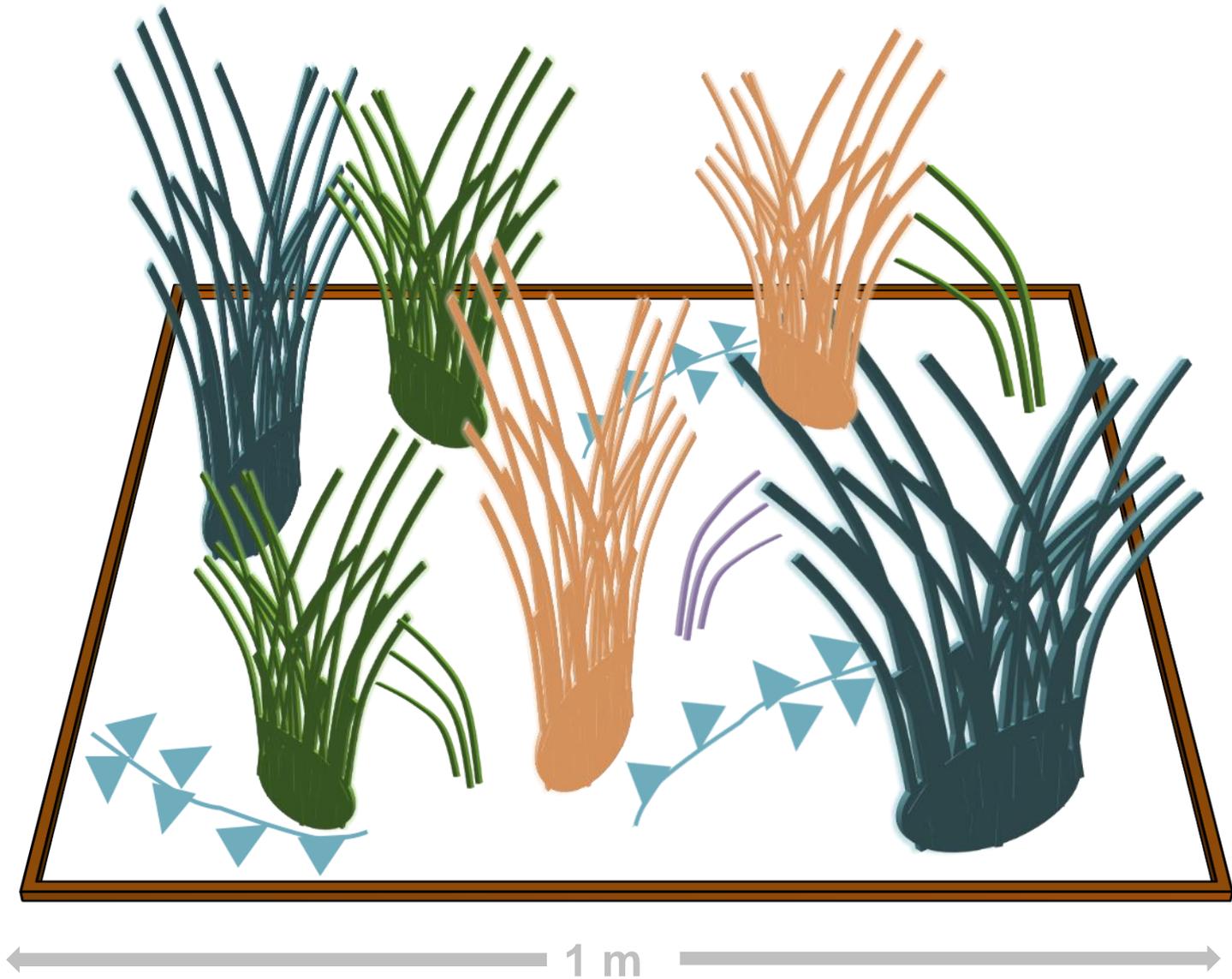
Methods

Herbaceous diversity and biomass



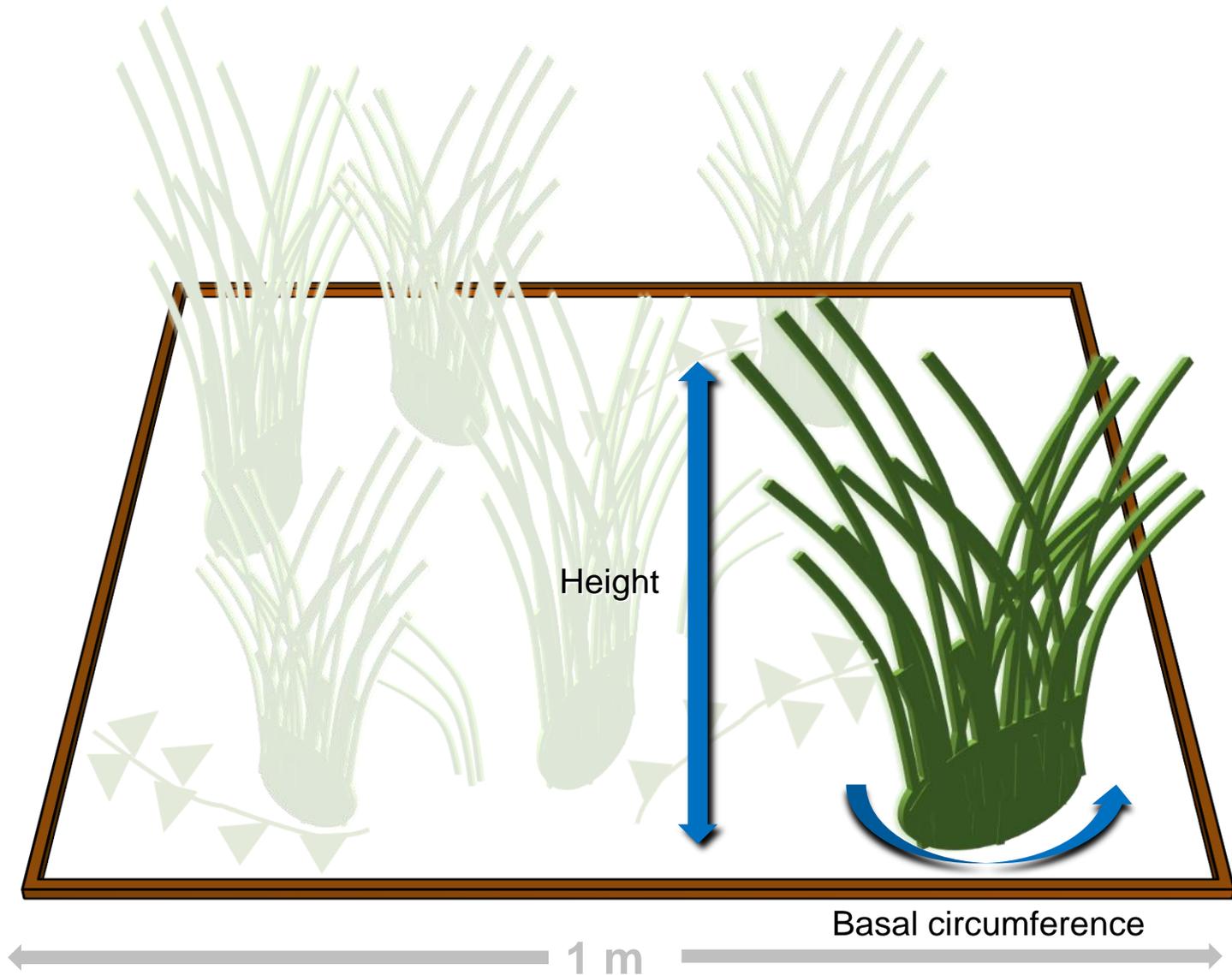
Methods

Herbaceous diversity and biomass



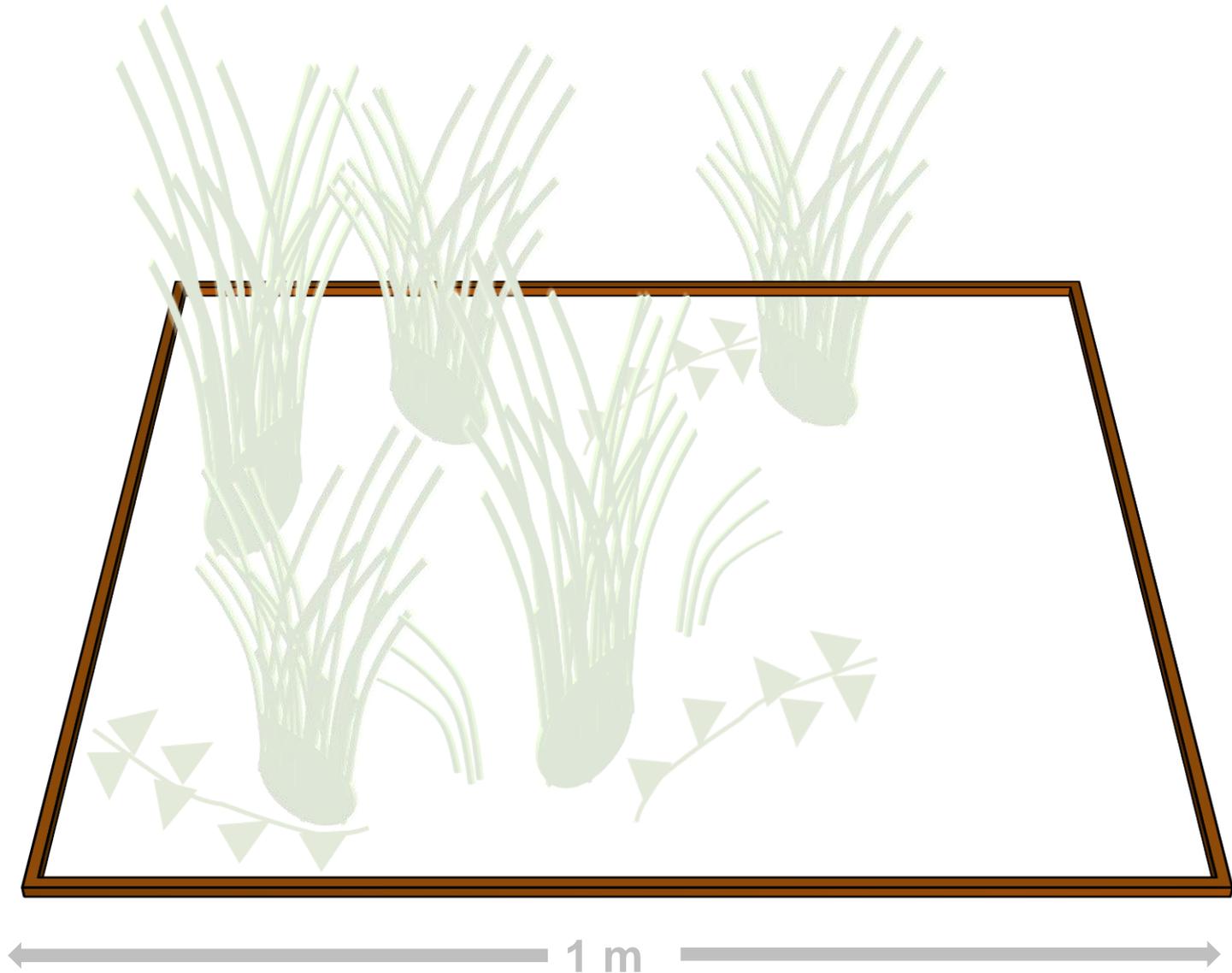
Methods

Herbaceous diversity and biomass



Methods

Herbaceous diversity and biomass



Methods

Herbaceous diversity and biomass



Methods

Herbaceous diversity and biomass



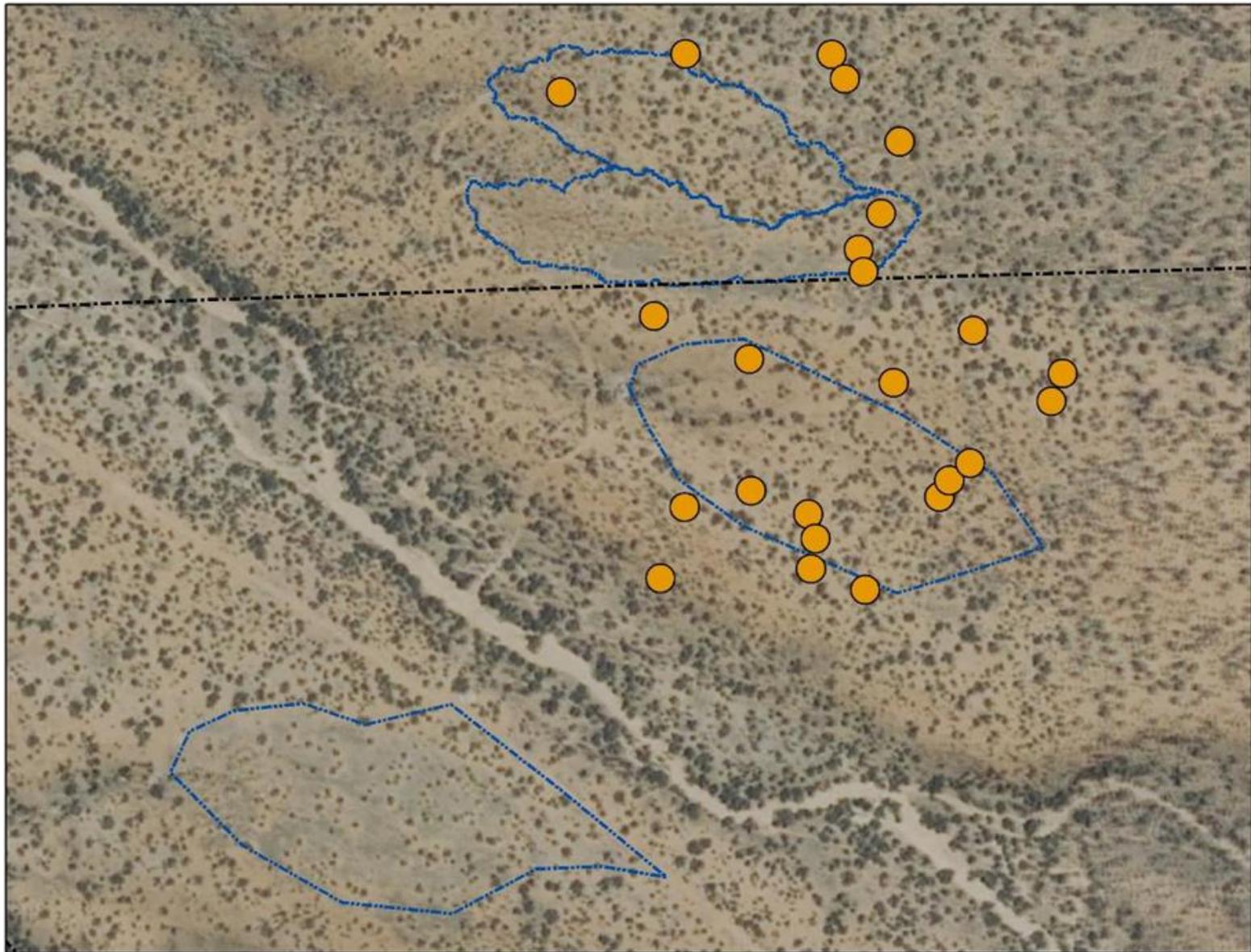
Methods

Coarse woody debris sampling



Methods

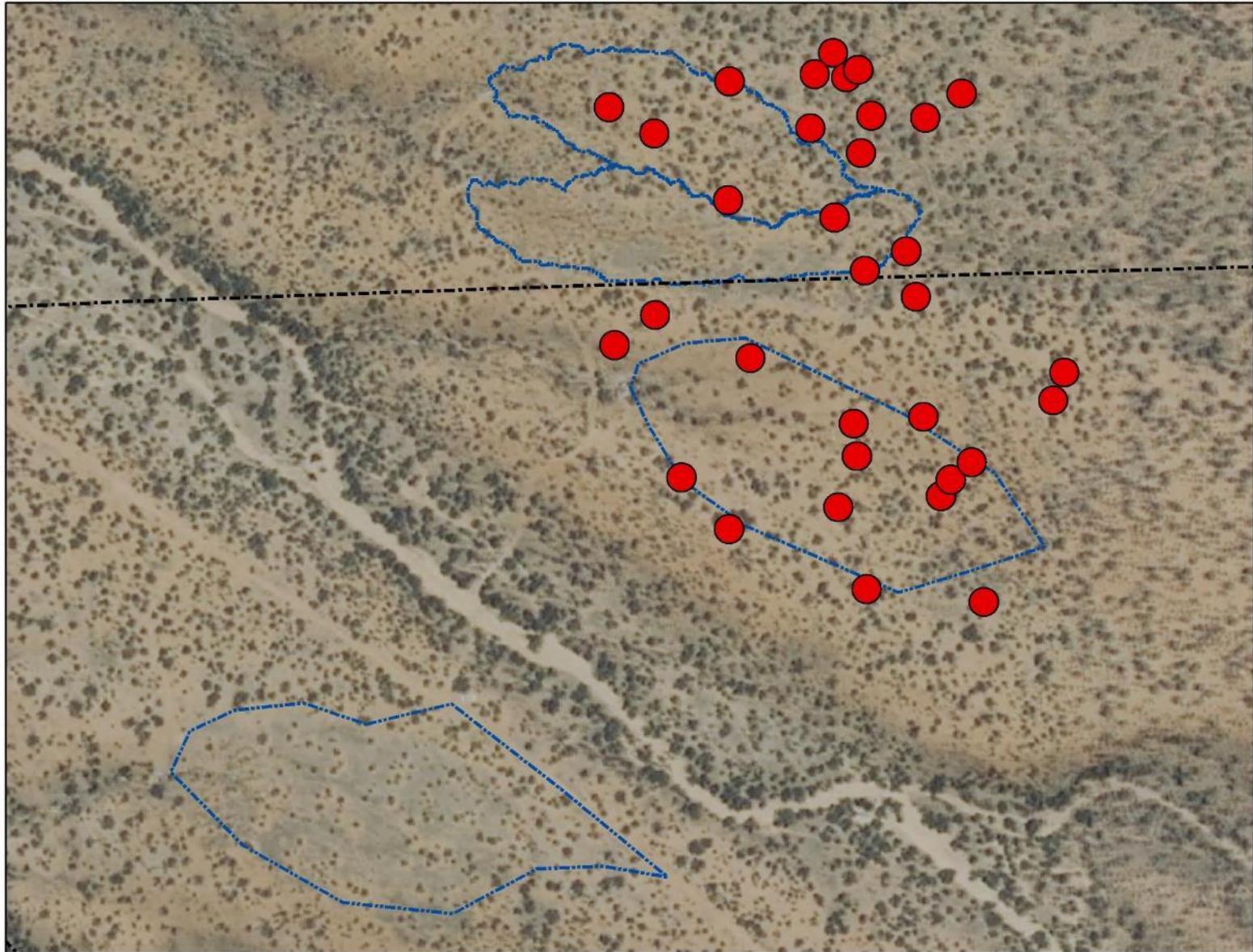
Coarse woody debris sampling



250

m





250



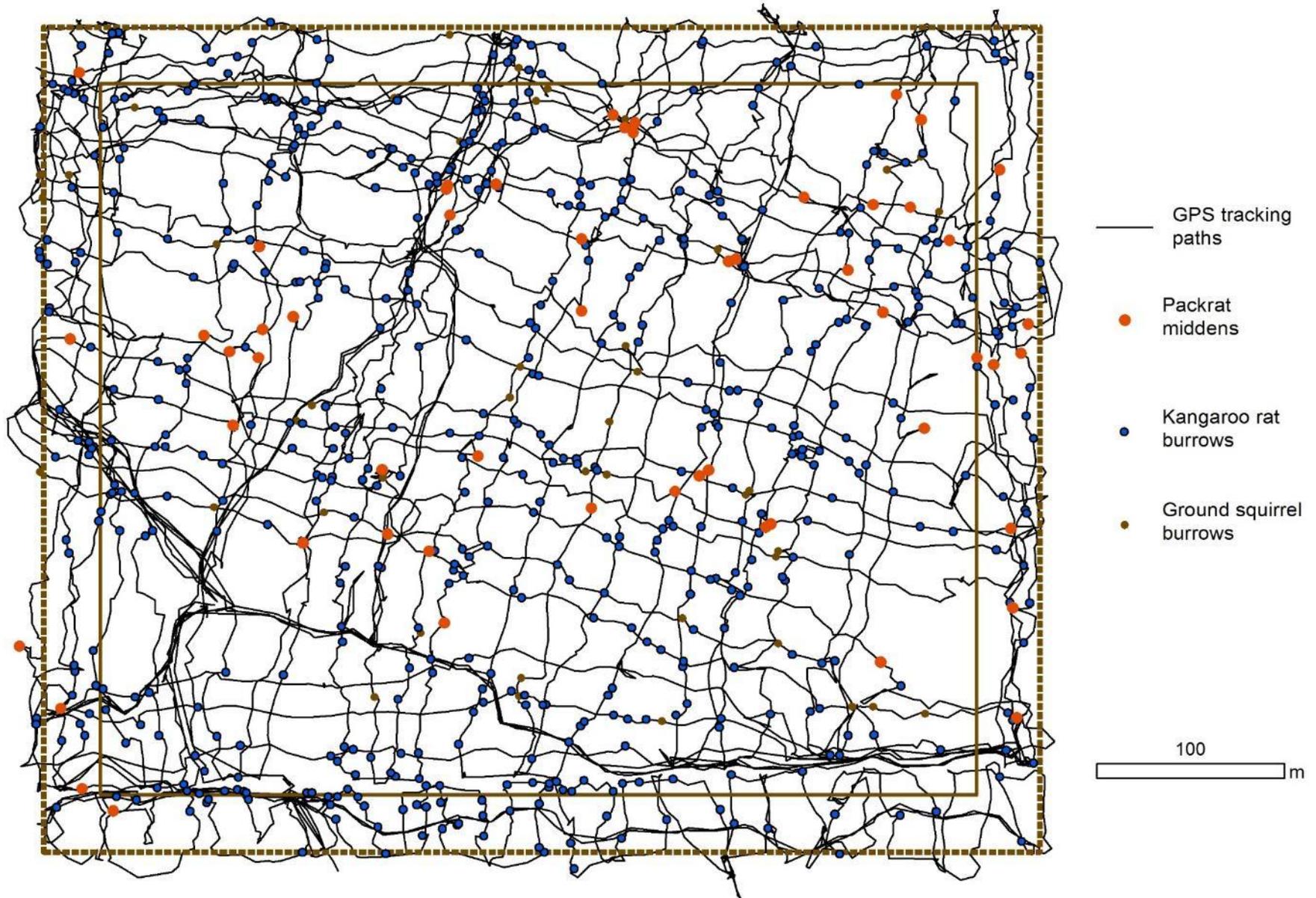
Methods

Pima pineapple cactus survey



Methods

Pima pineapple cactus survey



Methods

Herbicide application

Preliminary results

Herbaceous diversity under mesquite canopies



Large-spike bristlegrass
Setaria macrostachya



Arizona cottontop
Digitaria californica



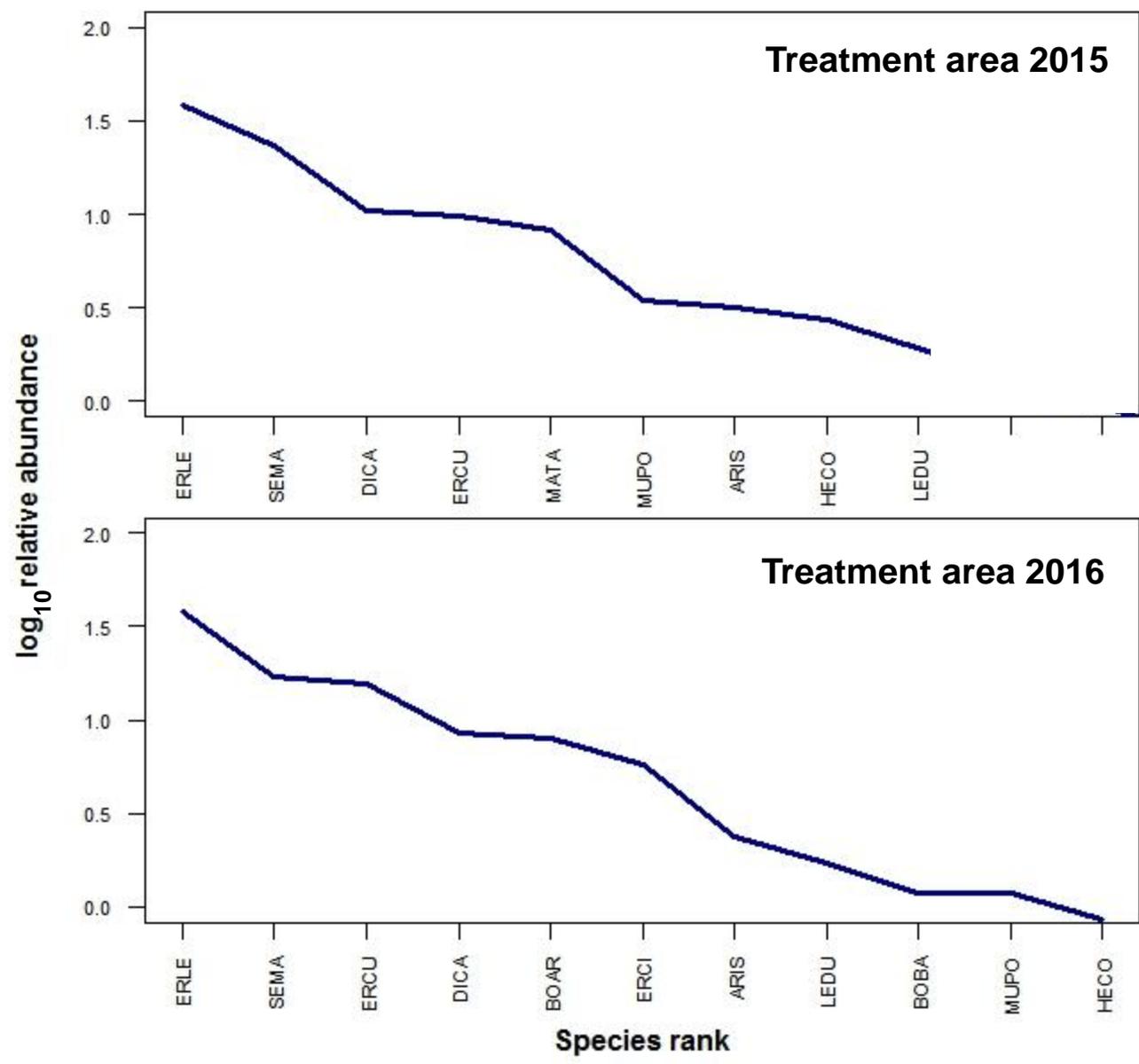
Weeping lovegrass
Eragrostis curvula



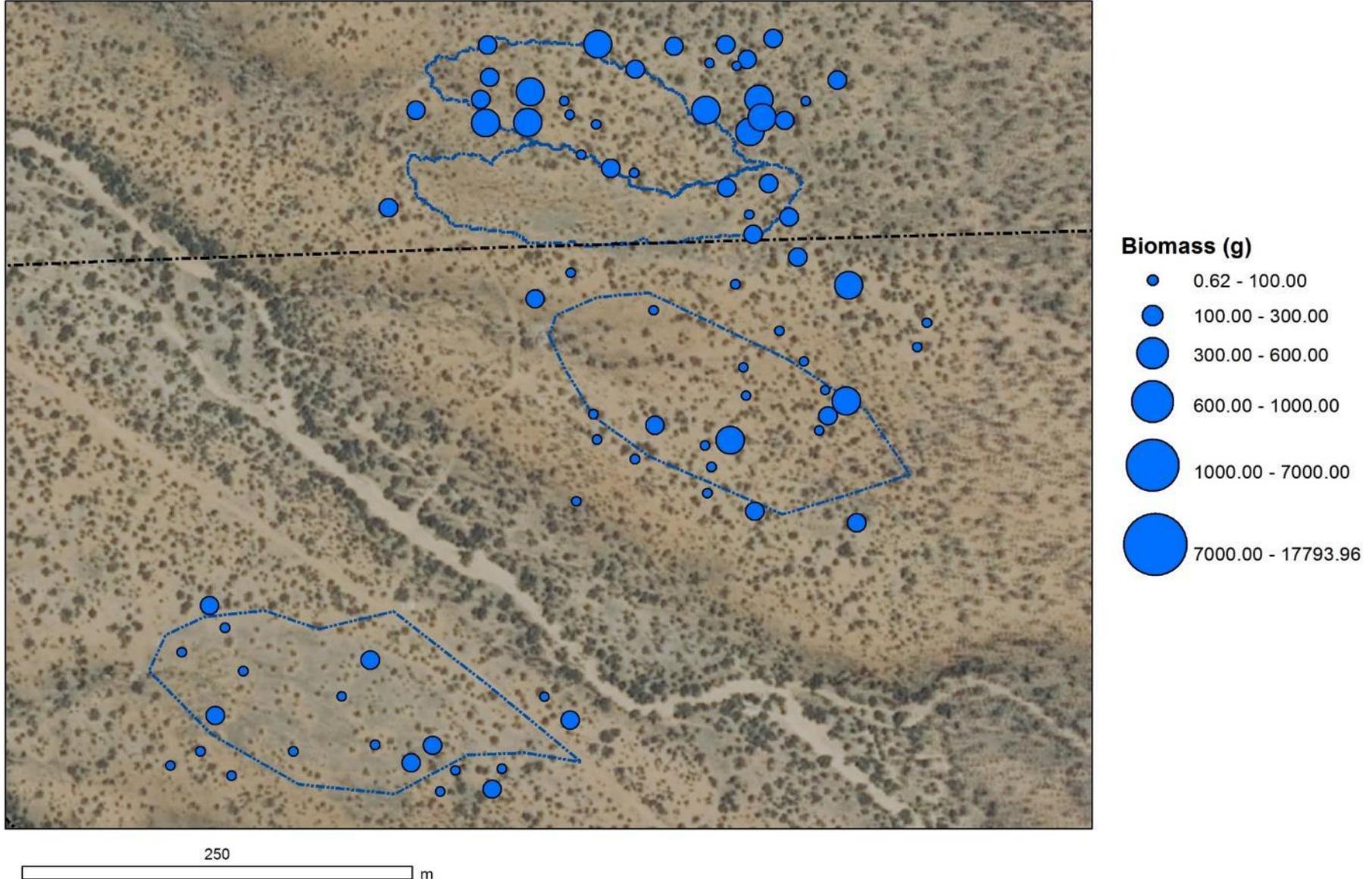
Lehmann lovegrass
Eragrostis lehmanniana

Preliminary results

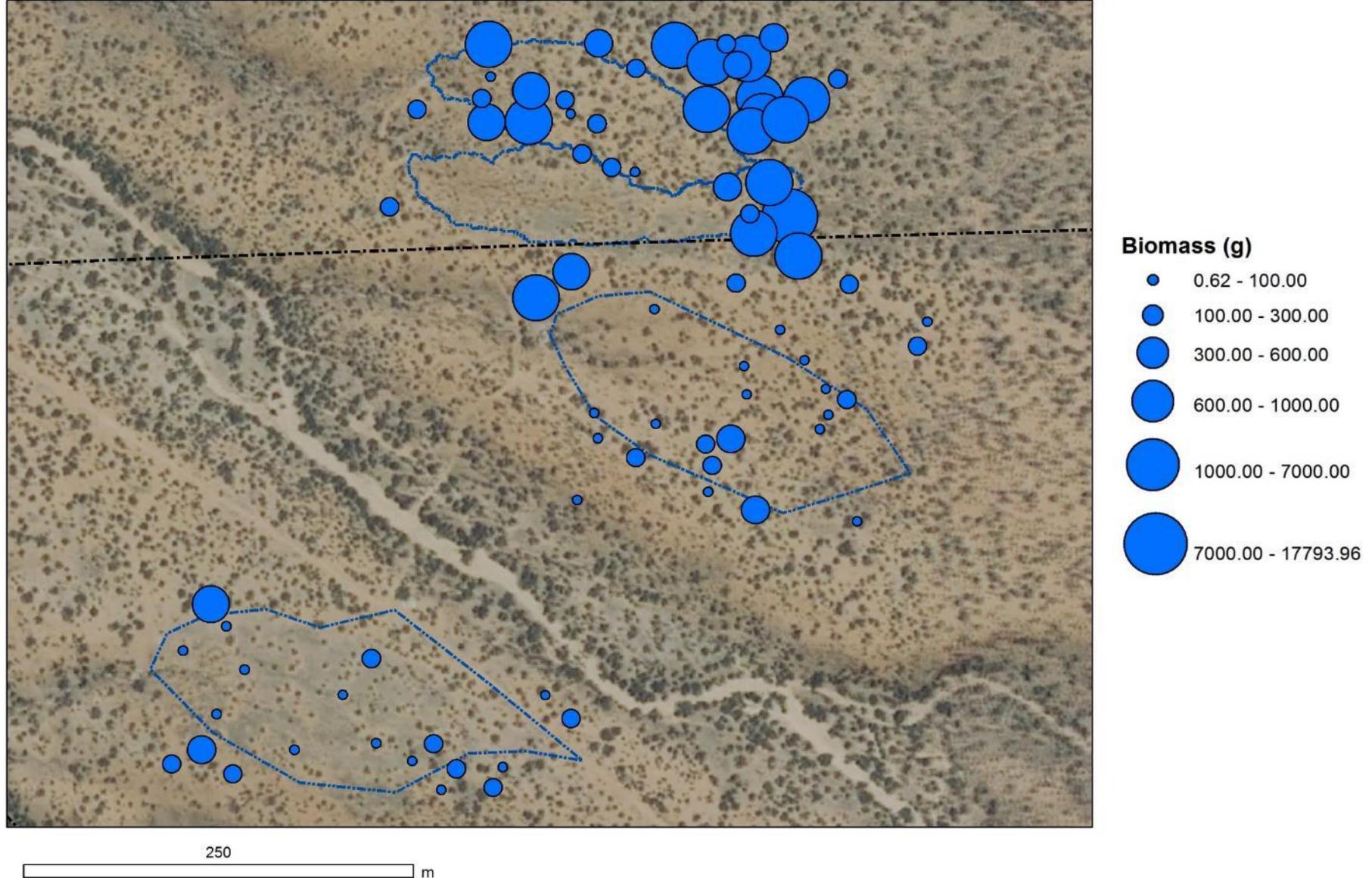
Herbaceous diversity under mesquite canopies



2015

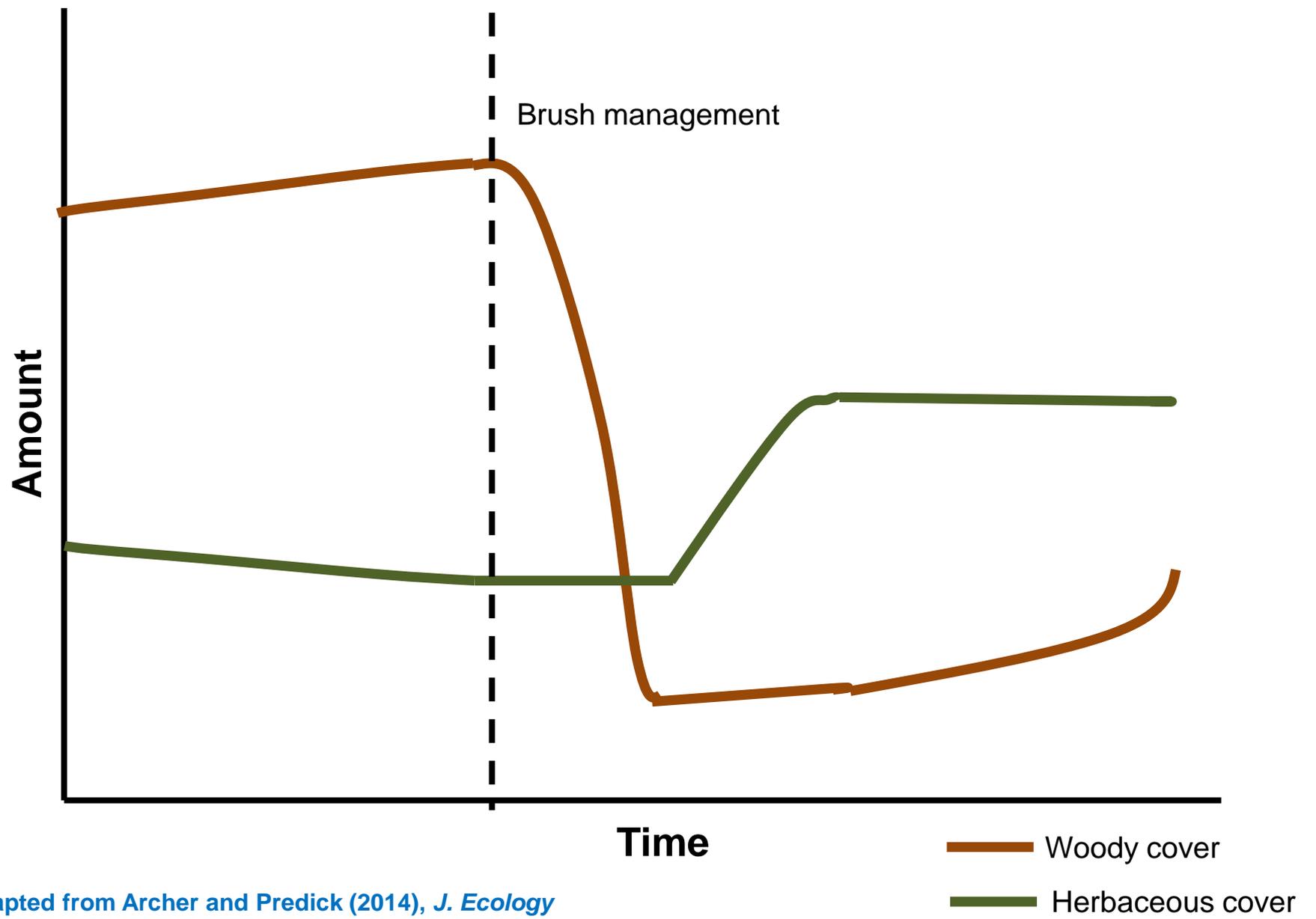


2016



Preliminary results

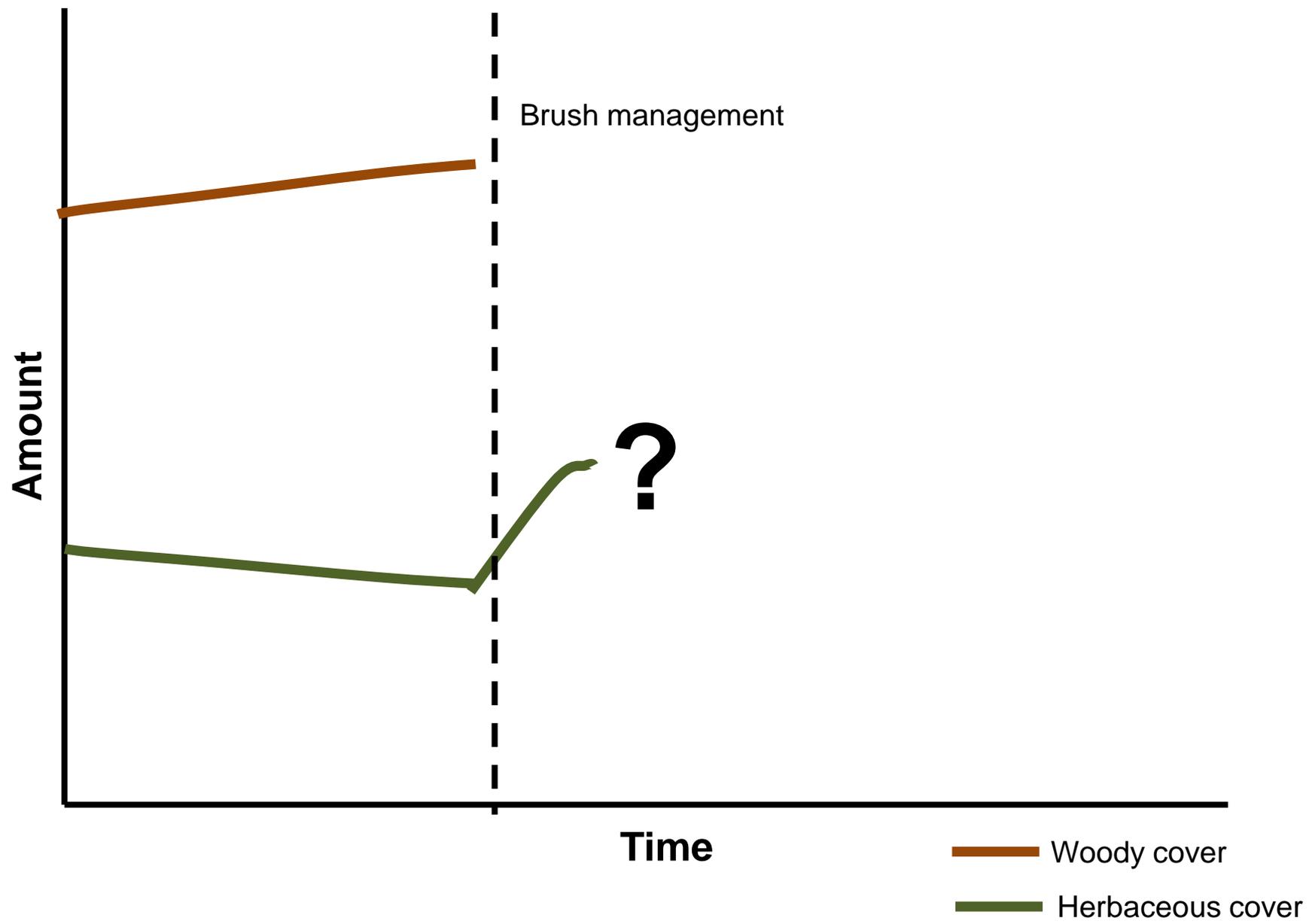
Conceptual model of herbaceous response to brush management



Adapted from Archer and Predick (2014), *J. Ecology*

Preliminary results

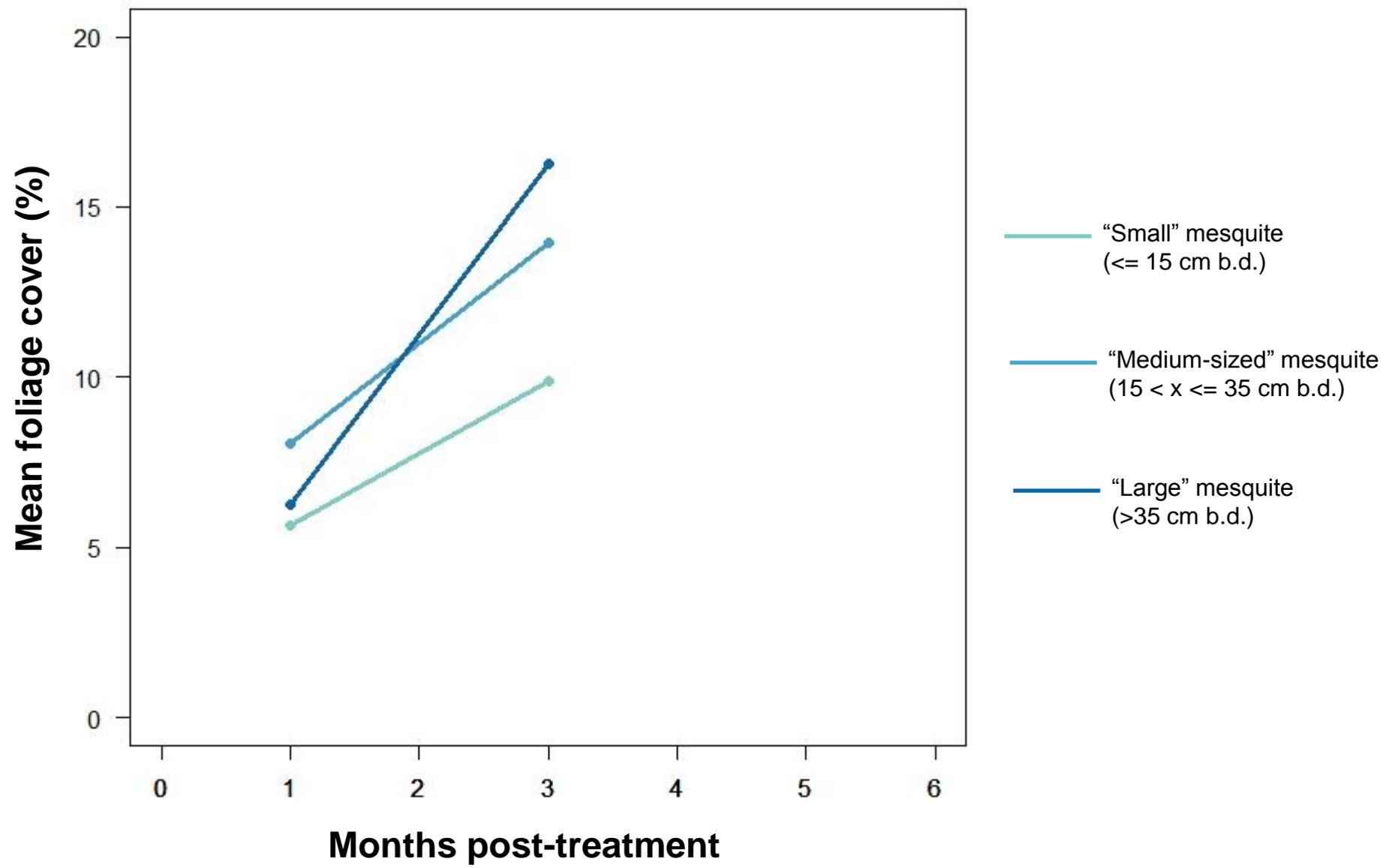
“Empirical” model of herbaceous response to brush management



Preliminary results

Mesquite recovery





- Scheduling and conducting post-treatment CWD and soil sampling.
- Scheduling a new herbicide treatment.
- Begin parameterizing computer models of runoff and soil carbon from field data to generate spatially-explicit field data and samples to predict long-term responses of ecosystem services.
- Linking field data with drone-based remote sensing.

Is brush management worth it?





















Acknowledgements

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