Spatio-Temporal Dynamics of Woody Plant Encroachment in Semiarid Rangelands of Argentina

NICHOLAS SCHOOL OF THE ENVIRONMENT
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forging a sustainable future

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Introduction

Land cover change dynamics alter ecosystem and climate functioning primarily through changes in matter cycles and energy fluxes. Woody plant encroachment (WPE) in semiarid rangelands is a global process of land cover change. The widespread increase in woody plant cover alters ecosystem distribution of carbon and other nutrients and influences the radiative balance due to the different reflective properties of grasses, soil and woody plants. WPE is known to occur in some regions of South America, but no regional assessment has yet been performed. This study is aimed to analyze the consequences of WPE on ecosystem carbon stocks and albedo at a regional scale in the rangelands of central Argentina. The first goal of this study is to analyze woody plant dynamics in this region.

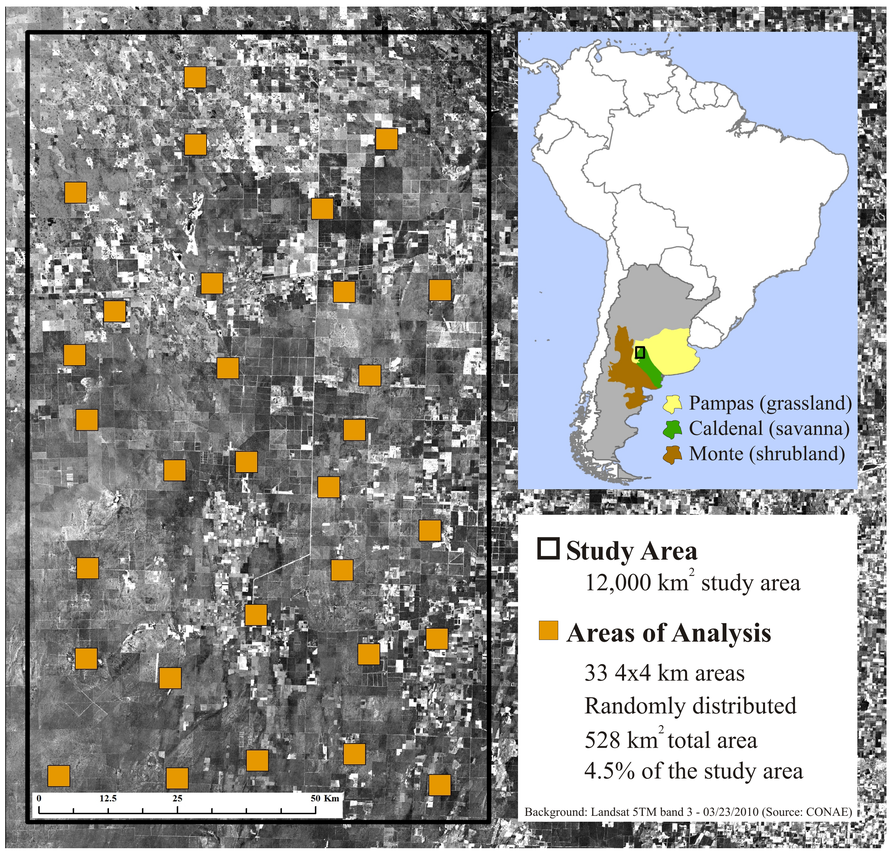
Overall Questions

1. How does woody plant encroachment affect C stocks and albedo in semiarid rangeland ecosystems?
2. How can field estimates of C stocks be scaled up to regional estimates with remote sensing? Landsat to MODIS.
3. How have C stocks and albedo changed over 50 years across a broad region of semiarid rangelands?

First Year Objective

Analize the spatio-temporal dynamics of tree cover in the semiarid Caldenal Savanna of central Argentina over 50 years.

Study Area

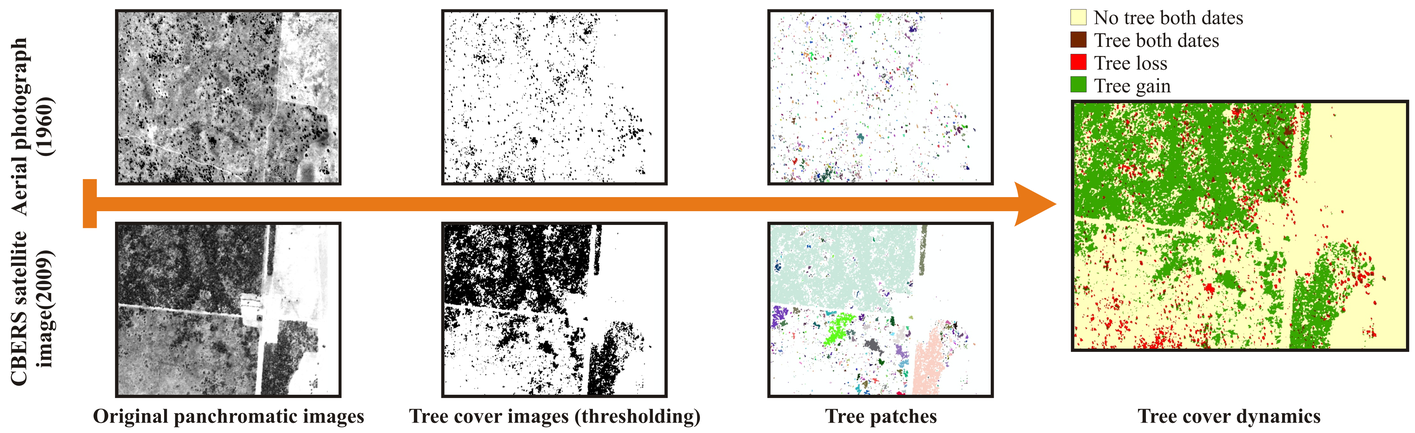


Drivers of Change

Increase
- Fire (pattern changes)
- Cattle seed dispersal
- CO_2 increase (?)

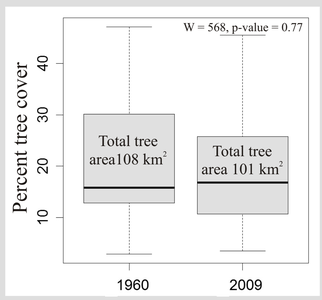
Decrease
- Clearing for agriculture
- Logging
- Fire breaks
- Fire (pattern changes)

Methods

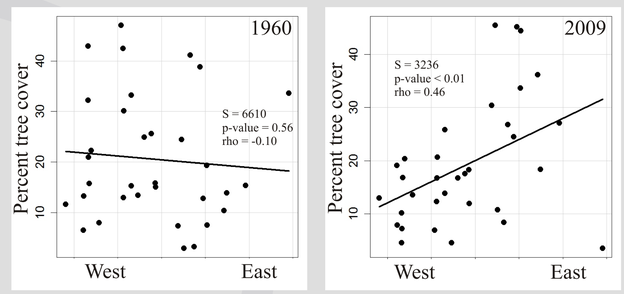


Results

1 No net regional change in tree cover



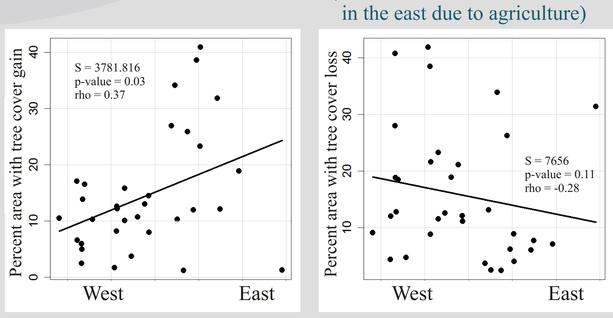
2 There was no longitudinal gradient in tree cover in 1960, this pattern is changed in 2009



3 Gain in tree cover is higher to the East

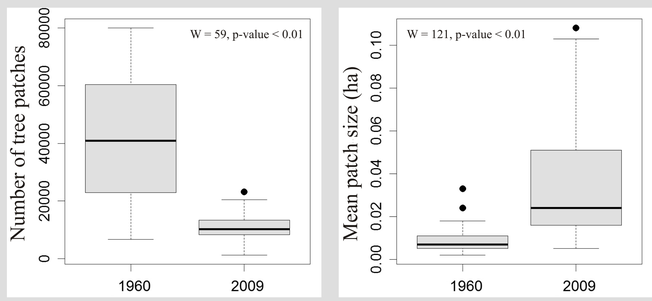
Loss in tree cover is higher to the West

(loss in the west due to fire, and in the east due to agriculture)



4 Less tree patches

Bigger tree patches



Next Steps...

- Analyze long term dynamics (1881-2009).
- Analyze dynamics at increasing scales.
- Analyze consequences of changes in tree cover abundance and pattern, and the interplay of WPE and clearing for agriculture in ecosystem C stocks and albedo.

Acknowledgments

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