Accounting for aboveground carbon storage in shrubland and woodland ecosystems in the Great Basin

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Background:

Improving the accuracy of carbon accounting in terrestrial ecosystems is critical for understanding carbon fluxes associated with land cover change, with significant implications for global carbon cycling and climate change. Semi-arid ecosystems account for an estimated 45% of global terrestrial ecosystem area and are in many locations experiencing high degrees of degradation. However, aboveground carbon accounting has largely focused on tropical and forested ecosystems, while the amount of carbon stored in drylands has been relatively under reported.

Analysis:

We used a combination of field estimates, remotely sensed data (canopy cover estimates from high resolution aerial images), and existing land cover maps (Landsat derived) to create a spatially explicit estimate of aboveground carbon storage within the Great Basin, a semi-arid region of the western US.

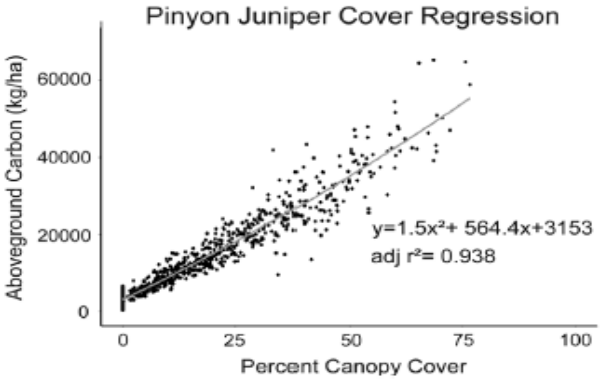
We stratified the region into distinct land cover types, and generated carbon estimates by applying a combination of allometric models (relating woodland canopy cover to aboveground carbon) and fixed carbon estimates in non-woodland cover types.

Findings:

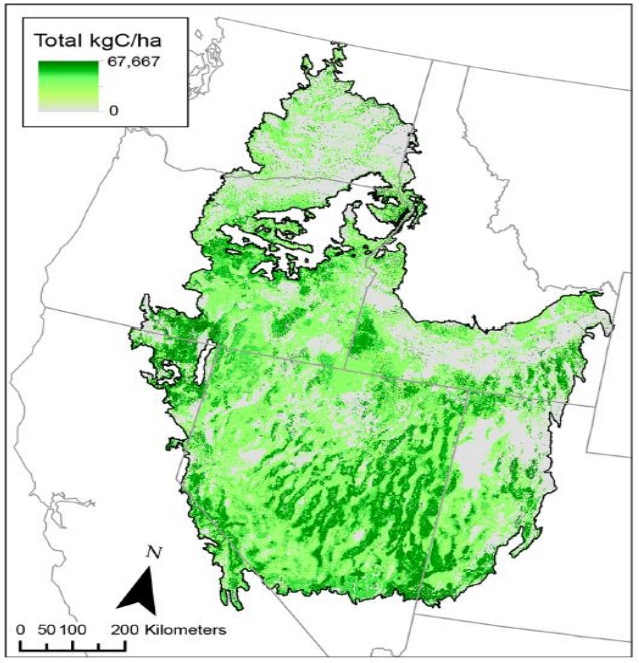
- The Great Basin contains an estimated 295.4 Tg in aboveground carbon, which is almost double previous estimates that only included forested ecosystems when performing carbon accounting across the same area.
- Aboveground carbon was disproportionately stored in pinyon-juniper woodlands (43.7% of the carbon, 16.9% of the land area), while the shrubland systems accounted for roughly half of the total land area (49.1%) and one-third of the total carbon.

Significance:

Our results emphasize the importance of distinguishing between and accounting for the distinctive contributions of shrubland and woodland ecosystems when creating carbon storage estimates for dryland regions.



Relationship between woodland canopy cover and aboveground carbon



Great Basin aboveground carbon map