Quantifying Changes in Carbon Storage due to Forest Transformations in the North Central U.S.

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NC RISCC

The **NC RISCC** network produces and communicates research on invasive species in a changing climate to protect native systems and enhance resilience in the region.

nc-riscc.org

North Central RISCC MANAGEMENT NETWORK

Invasive Plant Species

Costly, difficult to manage

Changing native ecosystems


Cheatgrass
NPS Photo/ Robb Hannawacke


Purple Loosestrife
Invasive Species Centre


Buffelgrass
NPS Photo


Saltcedar
Steve Dewey; Utah State University

Climate is Changing

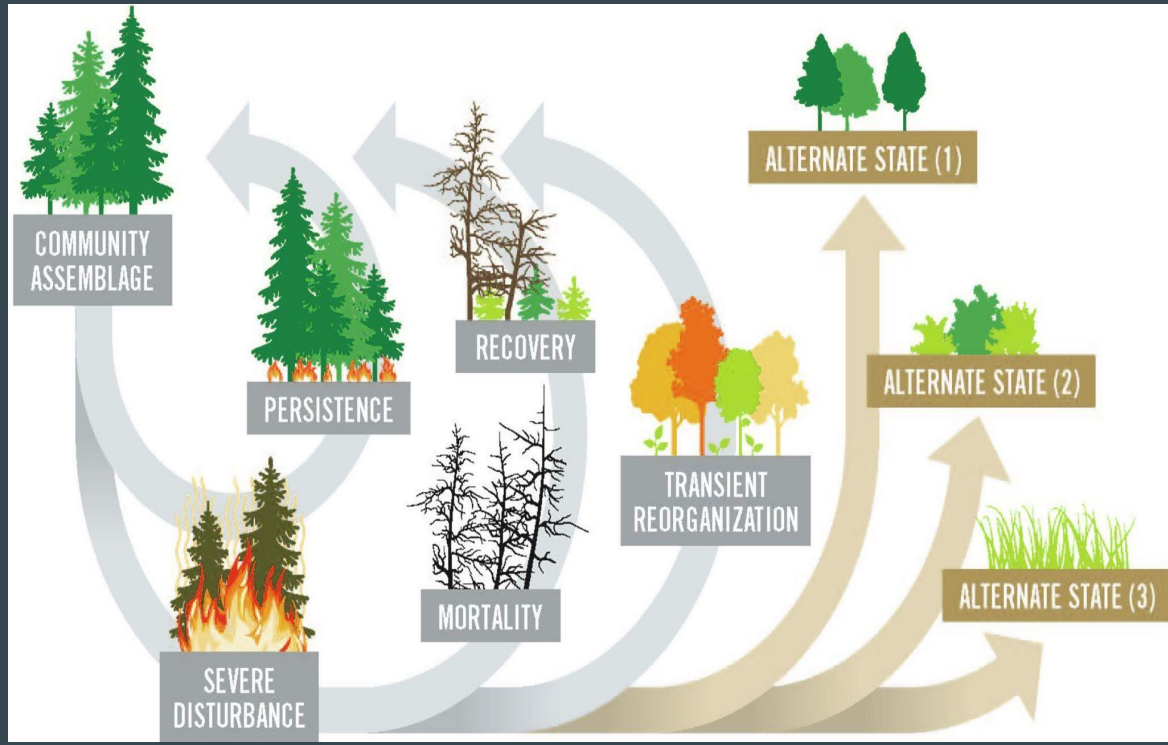
Global CO_2 concentrations and temperatures are rising
Precipitation patterns are changing
Extreme events are becoming more frequent

Wildfire

After a Fire…

Potential Paths

1. Persistence
2. Recovery
3. Transient reorganization
4. Alternate states

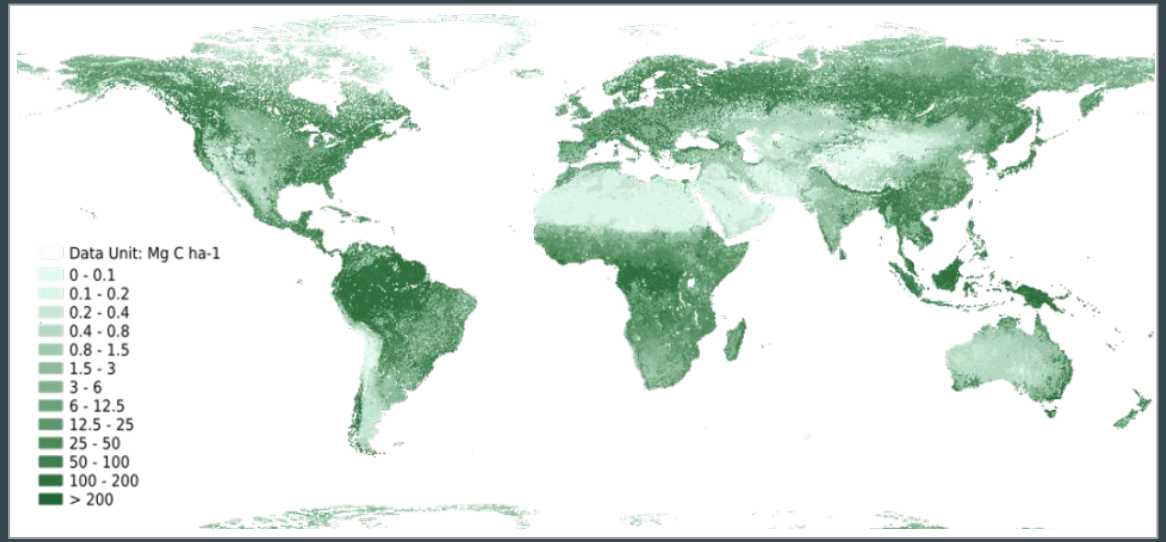


Source: Falk et al. 2022

Ecological Transformation

State change, regime shift, vegetation type conversion

Aboveground Biomass Carbon Storage



Source: NASA

Changes in Carbon Storage

Global Change Biology

Invasive grass reduces aboveground carbon stocks in shrublands of the Western US

BETHANY A. BRADLEY, R. A. HOUGHTON, JOHN F. MUSTARD, STEVEN P. HAMBURG

First published: 21 August 2006 | https://doi.org/10.1111/j.1365-2486.2006.01232.x | Citations: 147

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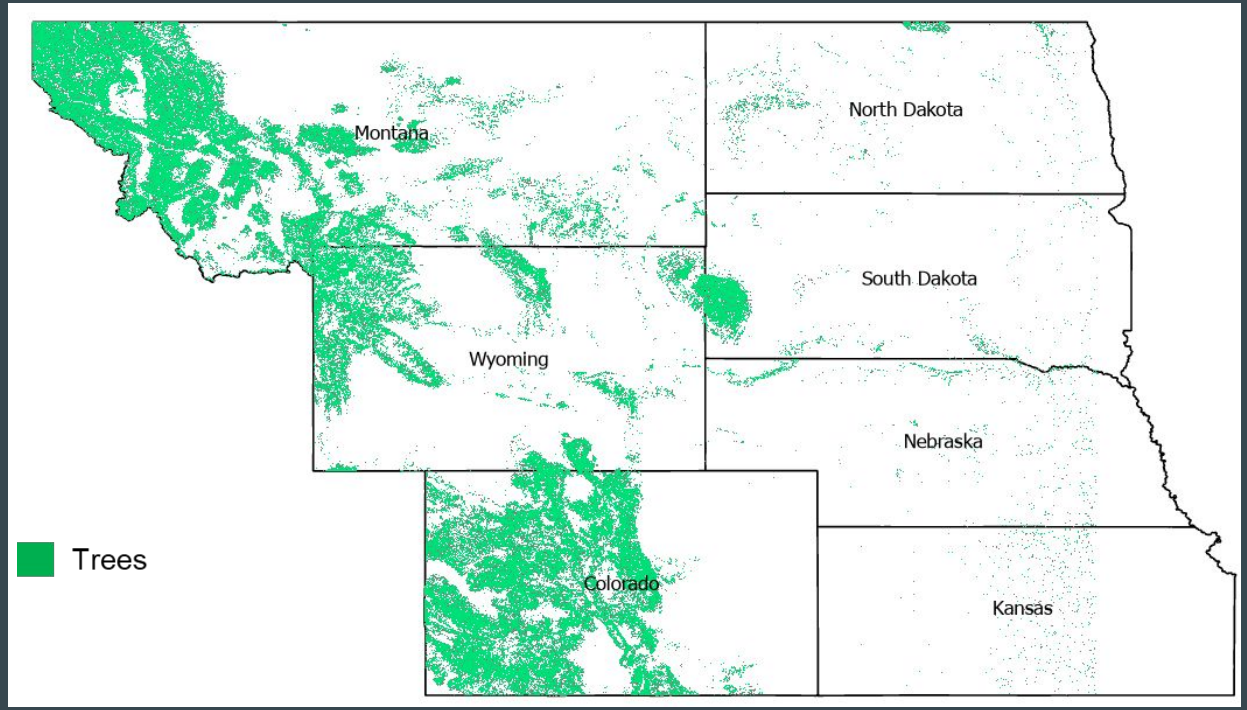
Research Questions

- Where have ecological transformations occurred in the North Central U.S. in recent decades?
- How has carbon storage in forested systems changed due to ecological transformations?
- Which areas are at risk of future transformation?

Approach

Remote sensing analysis, data integration, literature review, and stakeholder engagement

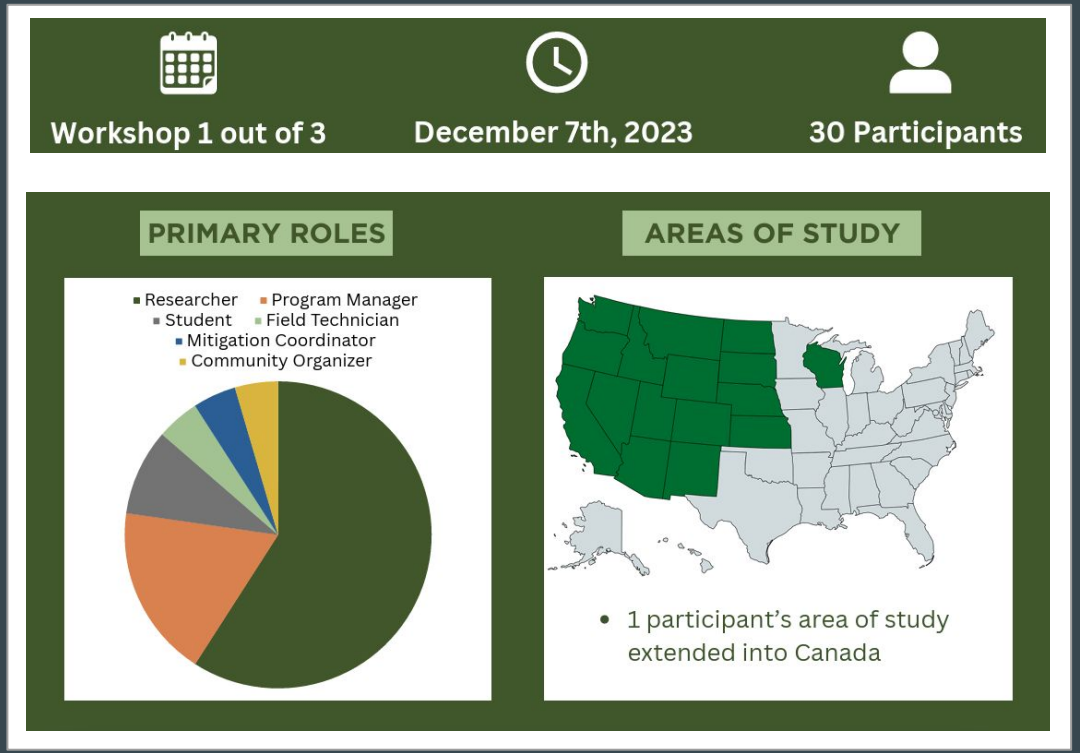
Forests in the North Central U.S.



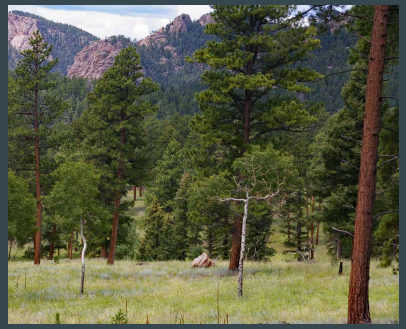
Data source: https://www.usgs.gov/data/lcmap-conus-reference-data-product-1984-2021-land-cover-land-use-and-change-process-attributes

"Preliminary Information-Subject to Revision. Not for Citation or Distribution."

Stakeholder Workshop



Stakeholder Input: Areas of Known Transformation



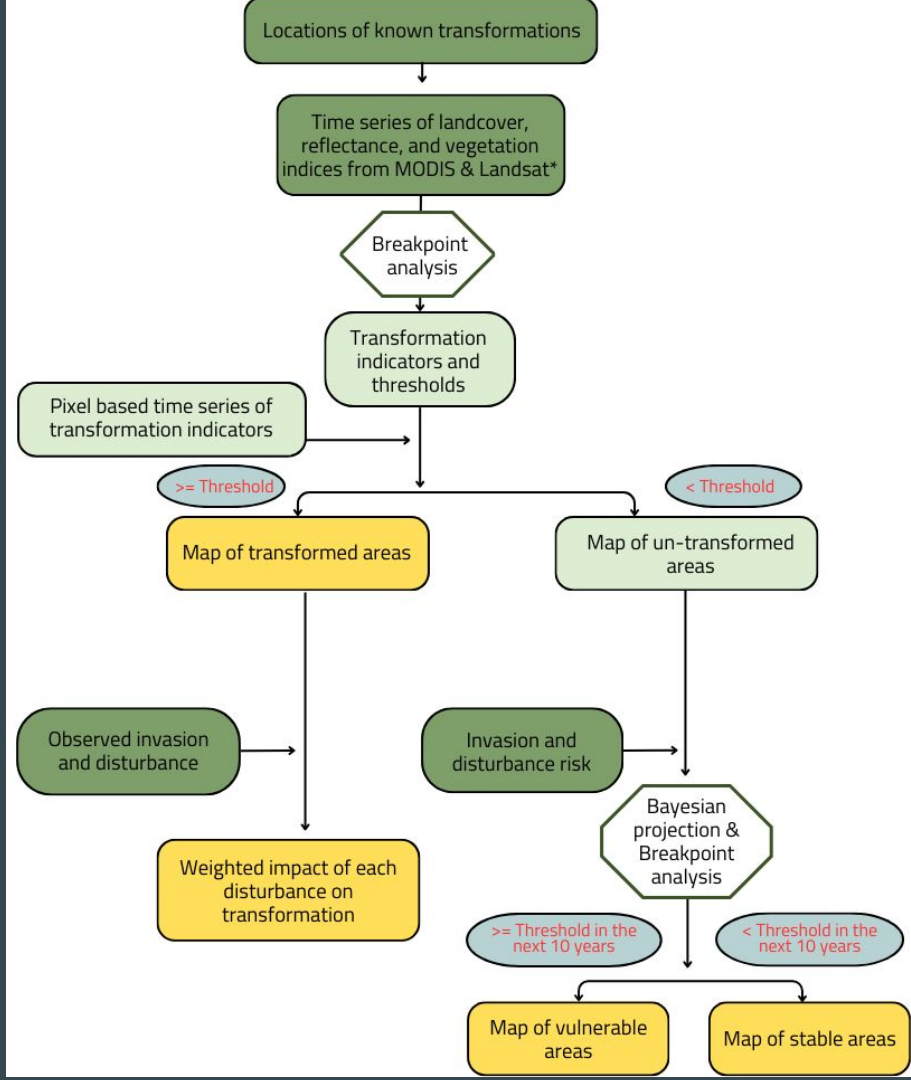
Ponderosa Pine

Invasive Grasses

Mixed Coniferous Forest

Deciduous forest

Detecting Transformation



How is Carbon Measured?

Field inventories

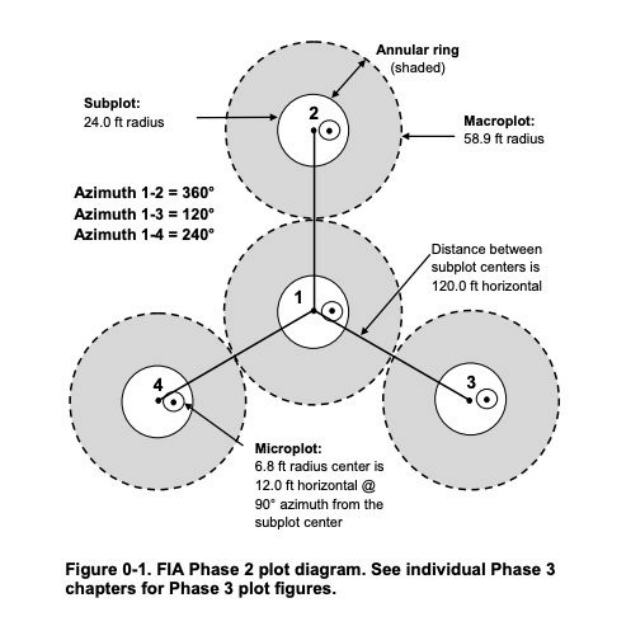
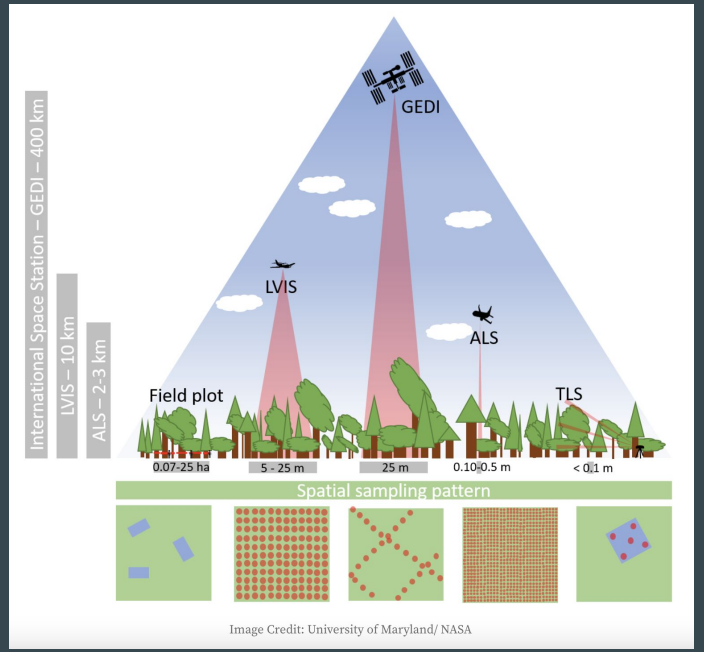


Figure 0-1. FIA Phase 2 plot diagram. See individual Phase 3 chapters for Phase 3 plot figures.

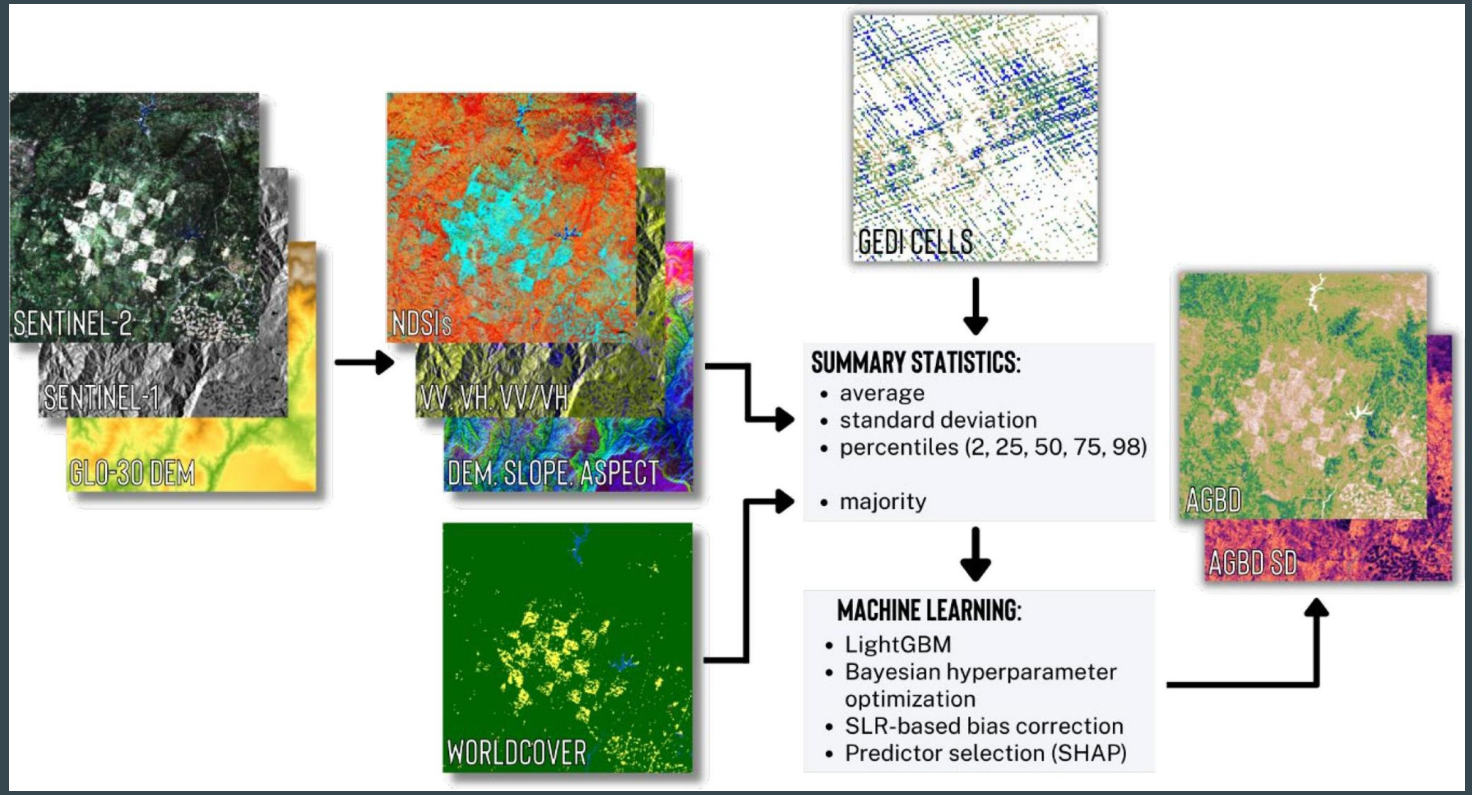
Source: USDA

Remotely sensed data



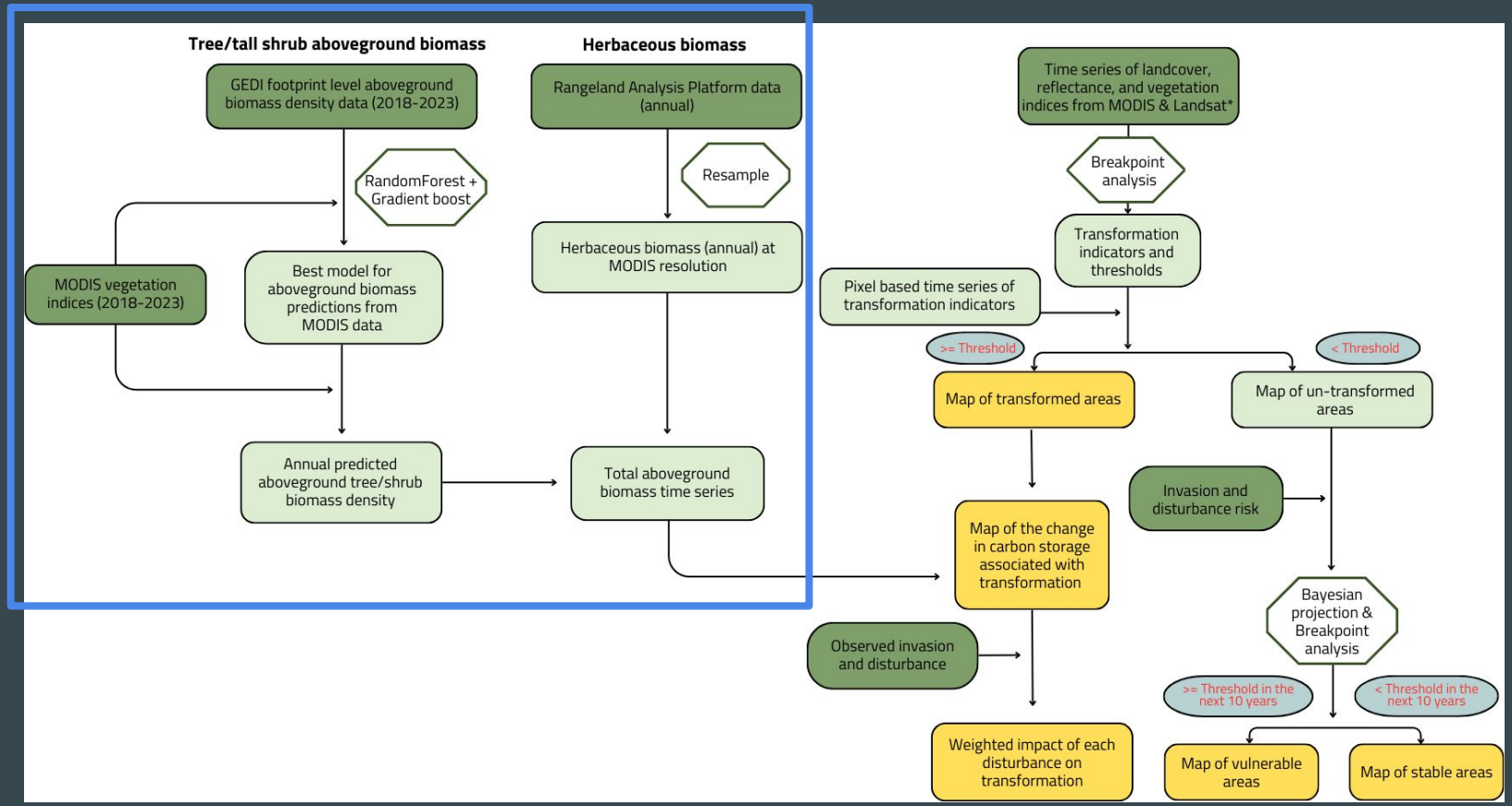
Source: Mangrove Science

Biomass Time Series

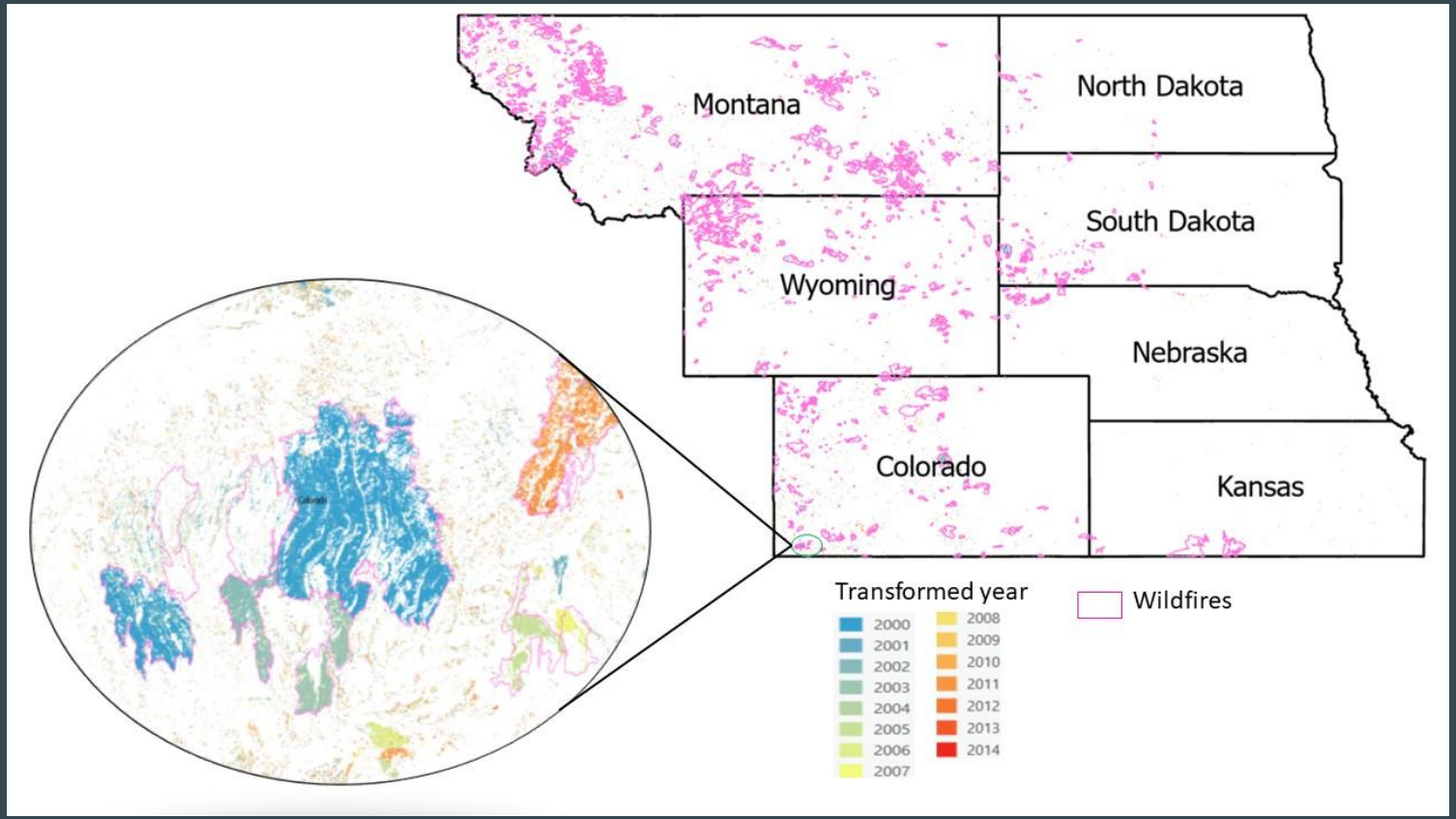


Source : Shendryk, 2022

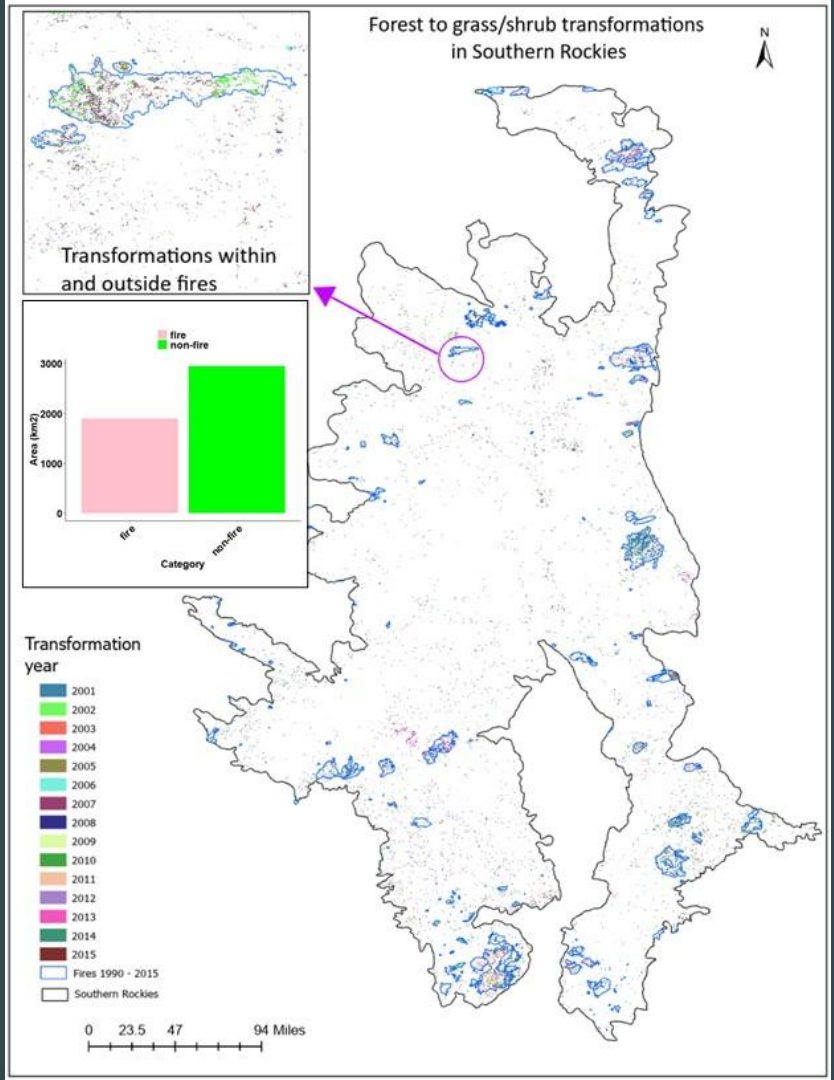
Monitoring Changes in Carbon Storage



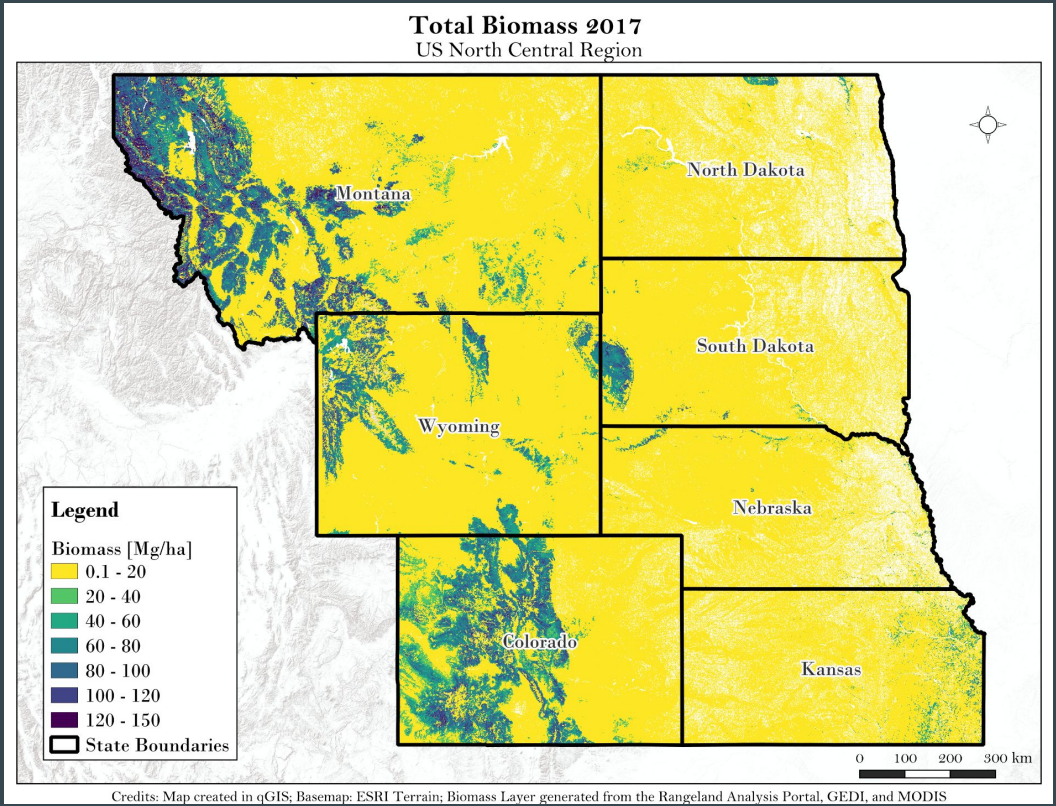
Preliminary Results: Transformation



Preliminary Results: Transformation in the Southern Rockies



Preliminary Results: Aboveground Biomass



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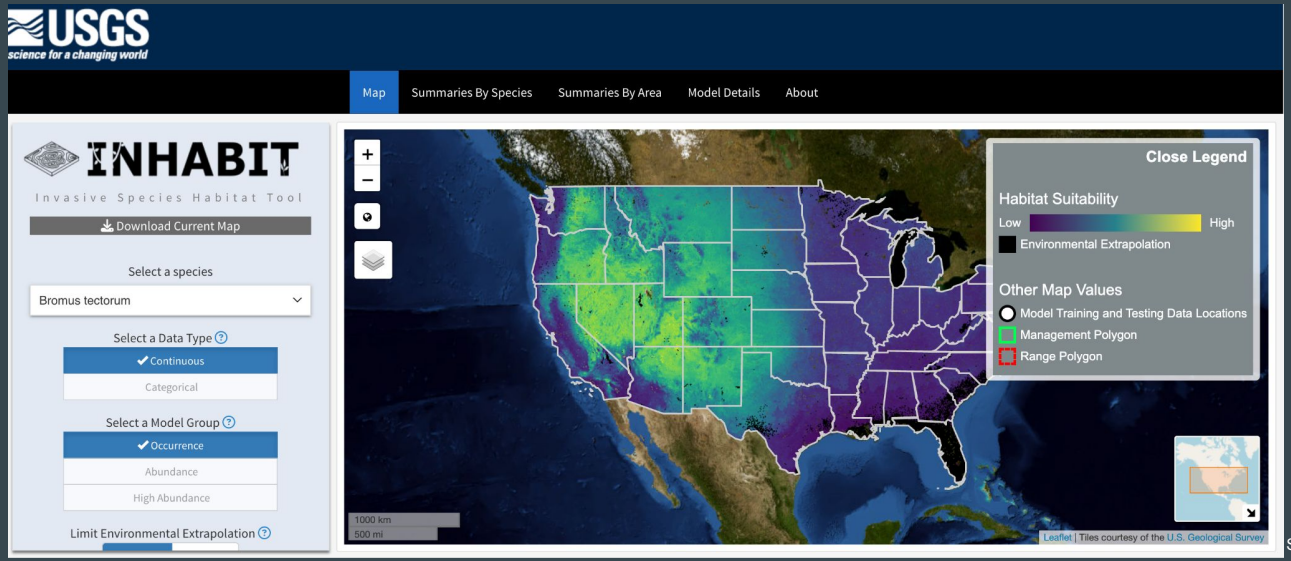
Next Steps

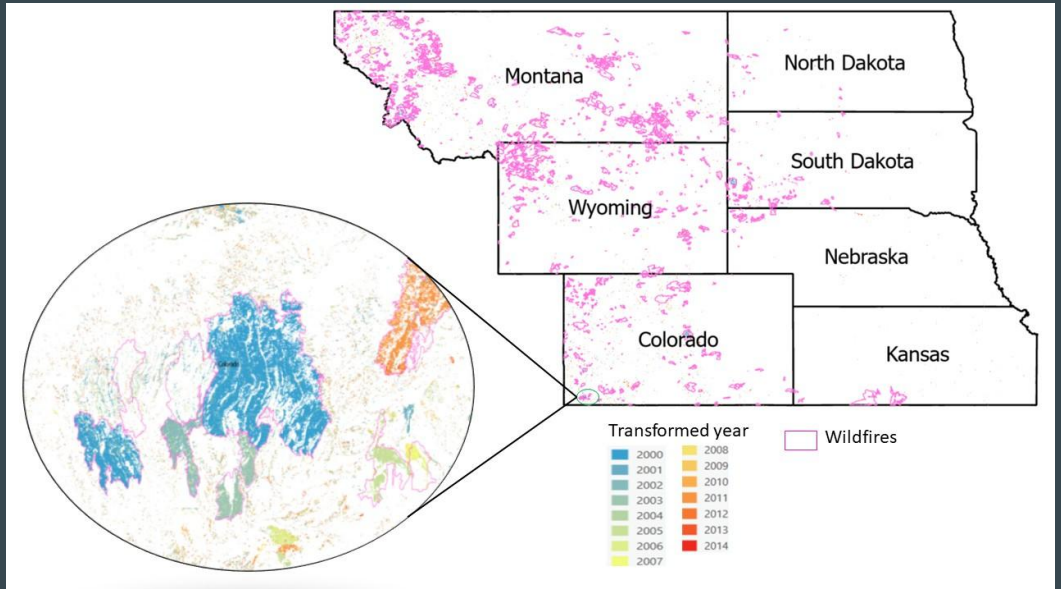
Change in carbon storage with transformation
Invasive plant species data
Areas vulnerable to transformation



Source: INHABIT

Products

Map of where transformations have occurred
Map of changes in carbon storage
Map of areas vulnerable to future transformations



Managing for Invasive Annual Grasses

Conducting literature review
Creating management menu

Source: Invasive Plant Control

Forest Carbon Management Menu

Strategy 1: Maintain or increase extent of forest ecosystems

Strategy 2: Sustain fundamental ecological functions

Strategy 3: Reduce carbon losses from natural disturbance, including wildfire

Strategy 4: Enhance forest recovery following disturbance

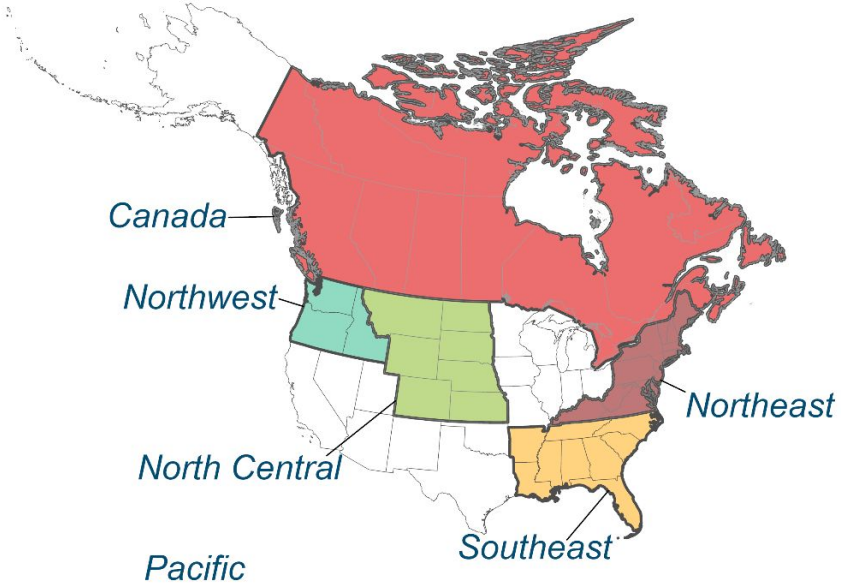
Strategy 5: Prioritize management of locations that provide high carbon value across the landscape

Strategy 6: Maintain or enhance existing carbon stocks while retaining forest character

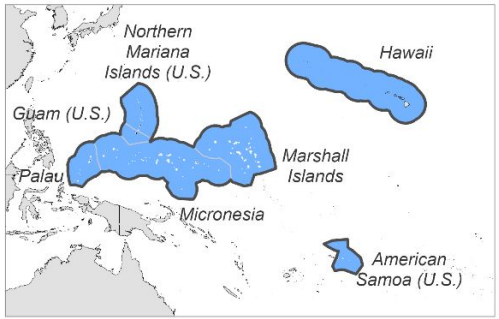
Strategy 7: Enhance or maintain sequestration capacity through significant forest alterations

Source: Ontl et al., 2020

RISCC Network Across North America & The Pacific



Pacific



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Source: RISCC