The Effects of Fire Suppression and Fire Intensity on Soil Organic Carbon in Newton Hills State Park and in the Black Hills

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SD NASA EPSCoR Program Initiation Grant

Background-Augustana College

- Focus
  - Undergraduate research
- Strengths
  - Students
  - Soil Sampling
  - C:N, ^{13}C
- Goals-to increase
  - Student interest
  - Opportunities

Background-Project

Fire suppression-fuels
- Newton-ecological succession
- Black Hills-succession/fire

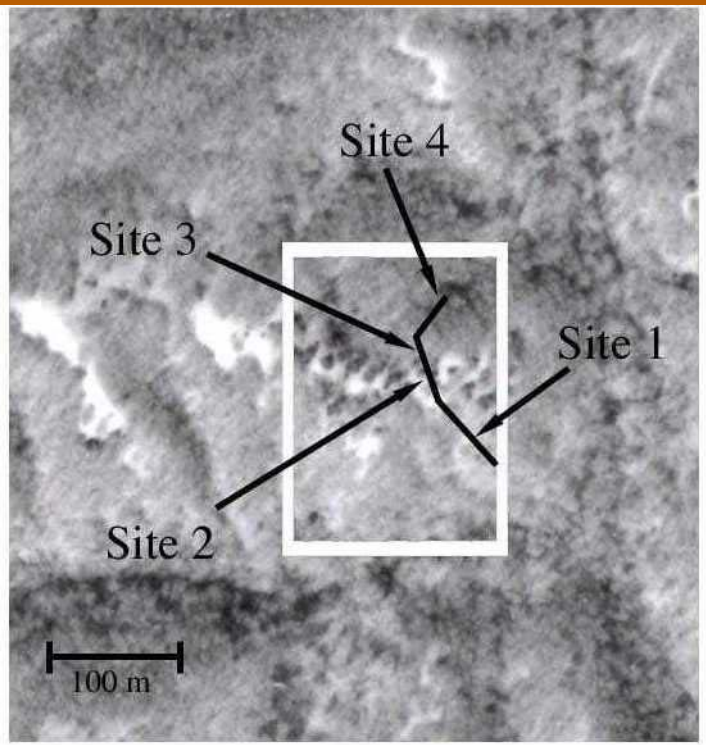
Effect on carbon budgets (below ground)
- Catastrophic fires-high instensity
- Prescribed burns-low intensity

Fire suppression-Newton

Fire suppression-Newton

Fire suppression-Newton

Fire suppression-Newton



1941 1976 2000

Fire suppression-Black Hills

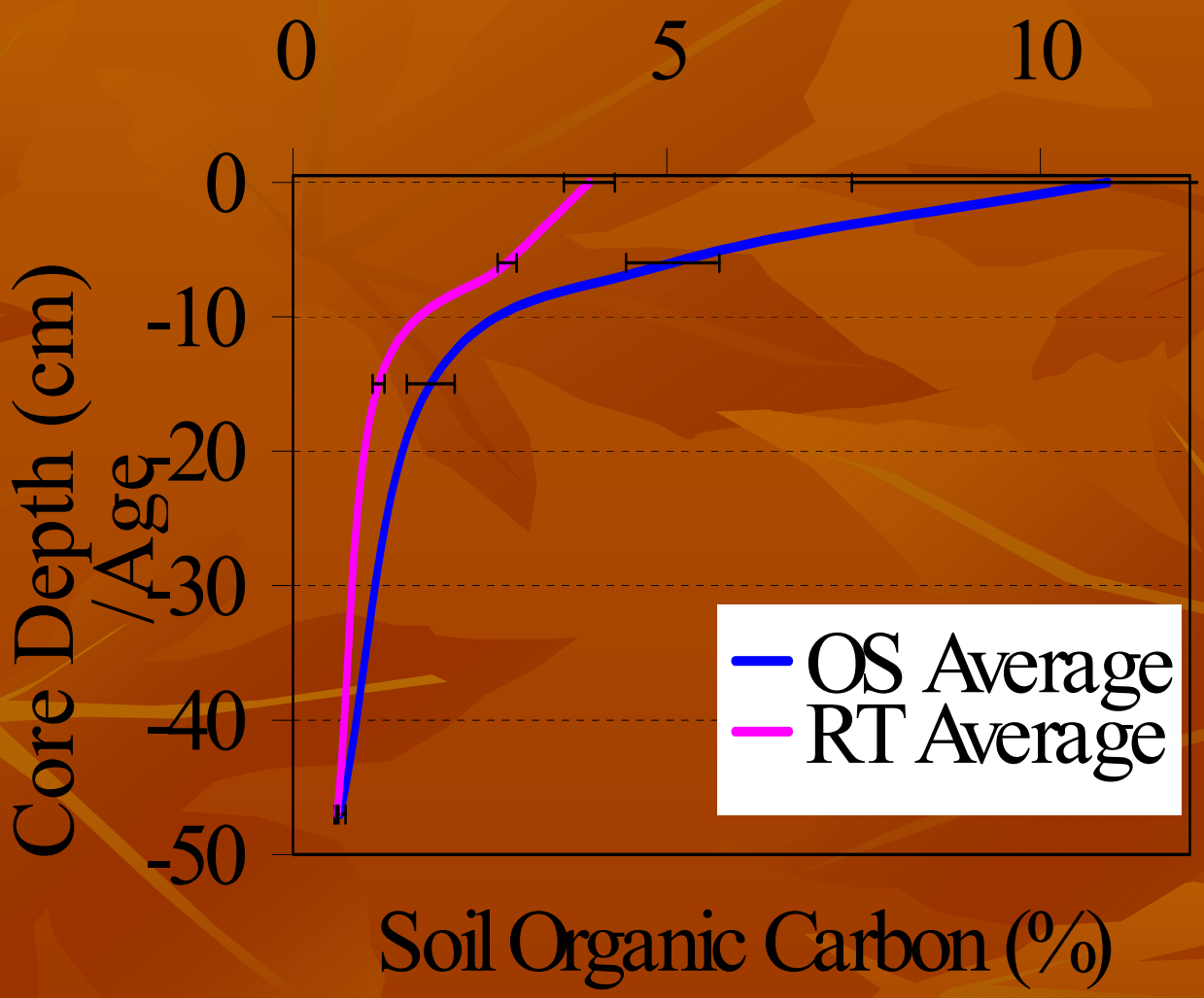
Fires in the Black Hills

Effects of fire intensity-on vegetation recovery (1 yr. post)

Effects of fire intensity on soil organic carbon

Soil sampling-Newton

- 13 Paired samples- forest vs. grassland
  - Grassland sites along ridges, but differ in slope and aspect
  - Forest sites under “spreading oak” with similar topography


0
5
10
0
-10
-20
-30
-40
-50
Core Depth (cm)
/Age
OS Average
RT Average
Soil Organic Carbon (%)

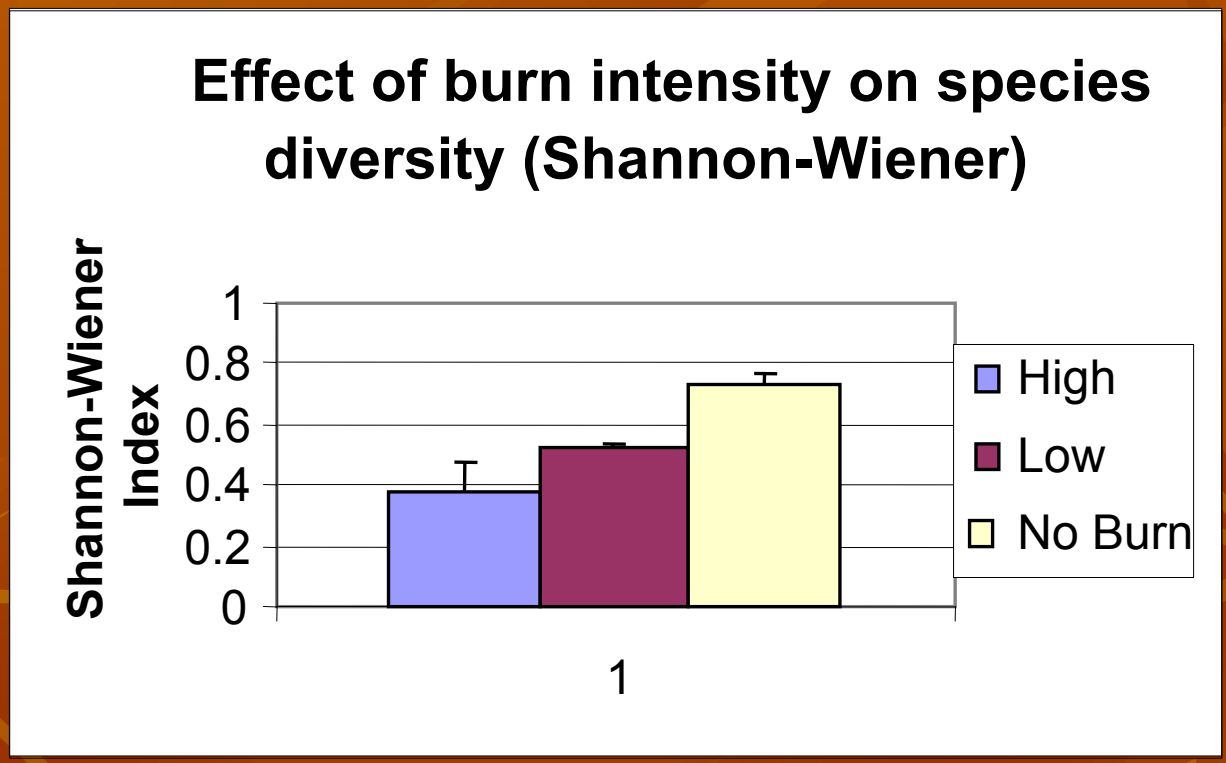
Soil sampling-Black Hills

- 14 sites in 2000 Jasper burn area
  - 3 no burn sites
  - 3 high intensity burn
  - 4 medium intensity burn
  - 4 low intensity burn
- 3 samples per site

Results-Soil organic carbon

- Soil samples have been collected
- in process of grinding and de-vegetating
- still need to analyze for % carbon

Results-vegetation recovery
(2 years post-fire)



High vs. No burn (P<=0.009)

Low vs. No burn (P<=0.005)

Future Directions-Research

- Fire ecology
  - Combining our experience with soil sampling and ^{13}C isotope analysis with remote sensing
- Forest water balance
  - Combining my interest in plant water relations with existing infrastructure (flux tower)

Future Directions-Synergistic Activities

- Continued collaboration with Vierling lab
  - Fire chronosequence project
  - Program initiation grant
- Implementation of a remote sensing minor
  - Augie and EROS
- “Remote sensing” NSF-REU
  - Augie, EROS, SDSM&T

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Major Contributors

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Lee Vierling lab

Other Contributors

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Katie Derr

Jaimie Phipps

Laura Gooch

Experimental Design

- Sites were selected
  - Had slope of 5 degrees or less
- Plots set up within sites
  - >50 meters from road
  - >25 meter from neighboring plot
  - Approx. 4 plots per site
  - 25 X 25 meters
- Subplots within plots
  - Could not be on edge of plot
  - 6 subplots per plot
  - 1 X 1 meter

Variation in Species Presence