Post-fire moss colonization and rehabilitation in forests of the southwestern United States

Grover, Henry S[1]; Bowker, Matthew A[1]; Fulé, Peter Z[1]; Doherty, Kyle D[1]; Sieg, Carolyn H[2]; and Antoninka, Anita J[1]

Funaria hygrometrica Hedw.

Bryum argenteum Hedw.

Ceratodon purpureus (Hedw.), Brid

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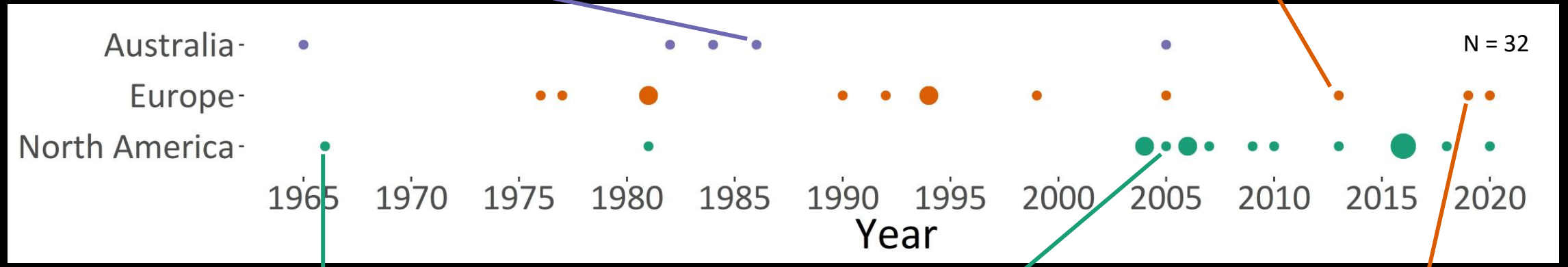
Fire moss publications by continent with functional traits highlighted

Nitrogen fixation associated with bryophytes colonizing burnt sites in Southern Tasmania, Australia

H. M. BRASELL, S. K. DAVIES and J. P. MATTAY

ELEVATIONAL PATTERNS OF GENETIC VARIATION IN THE COSMOPOLITAN MOSS *BRYUM ARGENTEUM* (BRYACEAE)[1]

SERGIO PISA[2,5], OLAF WERNER[2], ALAIN VANDERPOORTEN[3], MAHMOUD MAGDY[2,4], AND ROSA M. ROS[2]



Selective sweeps and intercontinental migration in the cosmopolitan moss *Ceratodon purpureus* (Hedw.) Brid.

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ECOLOGICAL STUDIES OF *FUNARIA HYGROMETRICA* HEDW. IN EASTERN WASHINGTON AND NORTHERN IDAHO

GEORGE R. HOFFMAN

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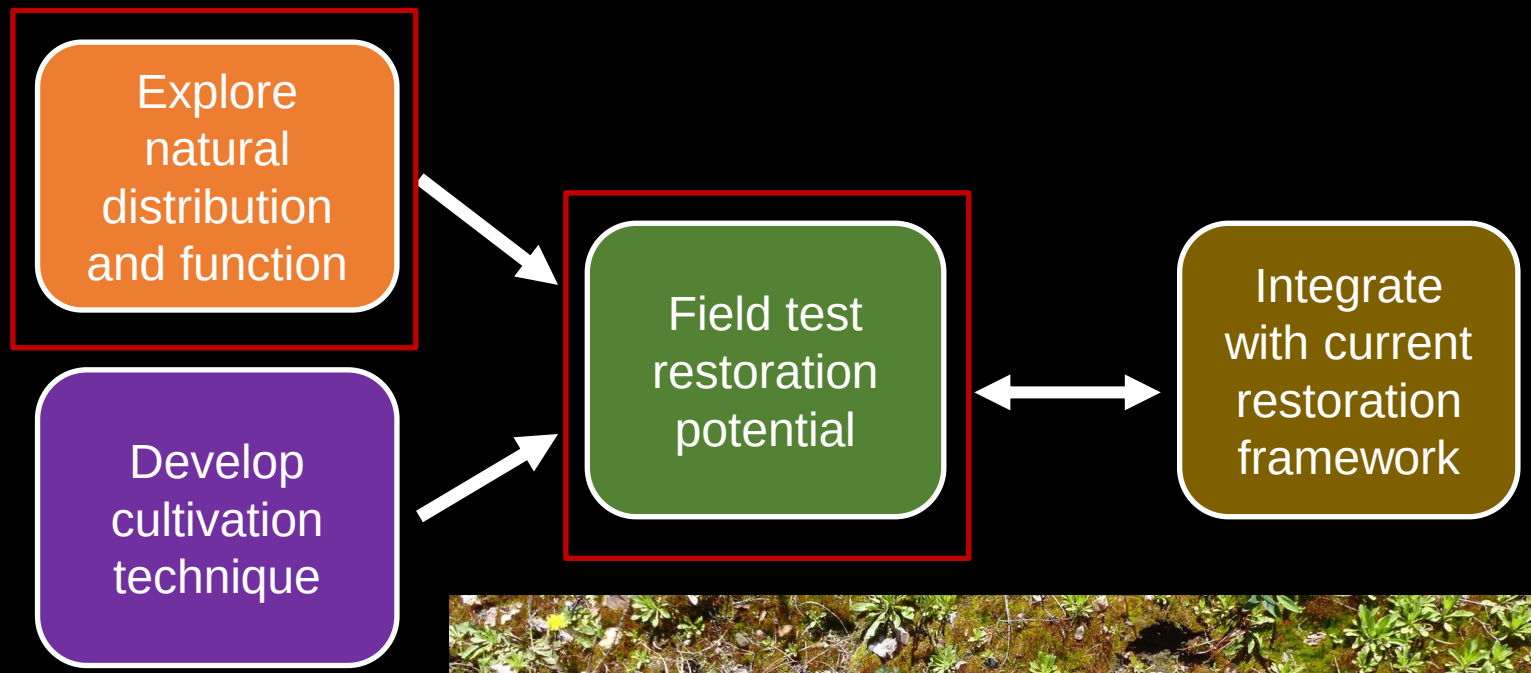
Effect of moss crusts on mitigation of post-fire soil erosion

Flávio C. Silva[a,*], Diana C.S. Vieira[a,b], Els van der Spek[a], J. Jacob Keizer[a]

Driving Questions:

1. When and where are mosses colonizing burned landscapes?
2. Do mosses have restoration value?
3. How can we establish fire mosses in the field?
4. Does greenhouse grown moss cover provide additional function?

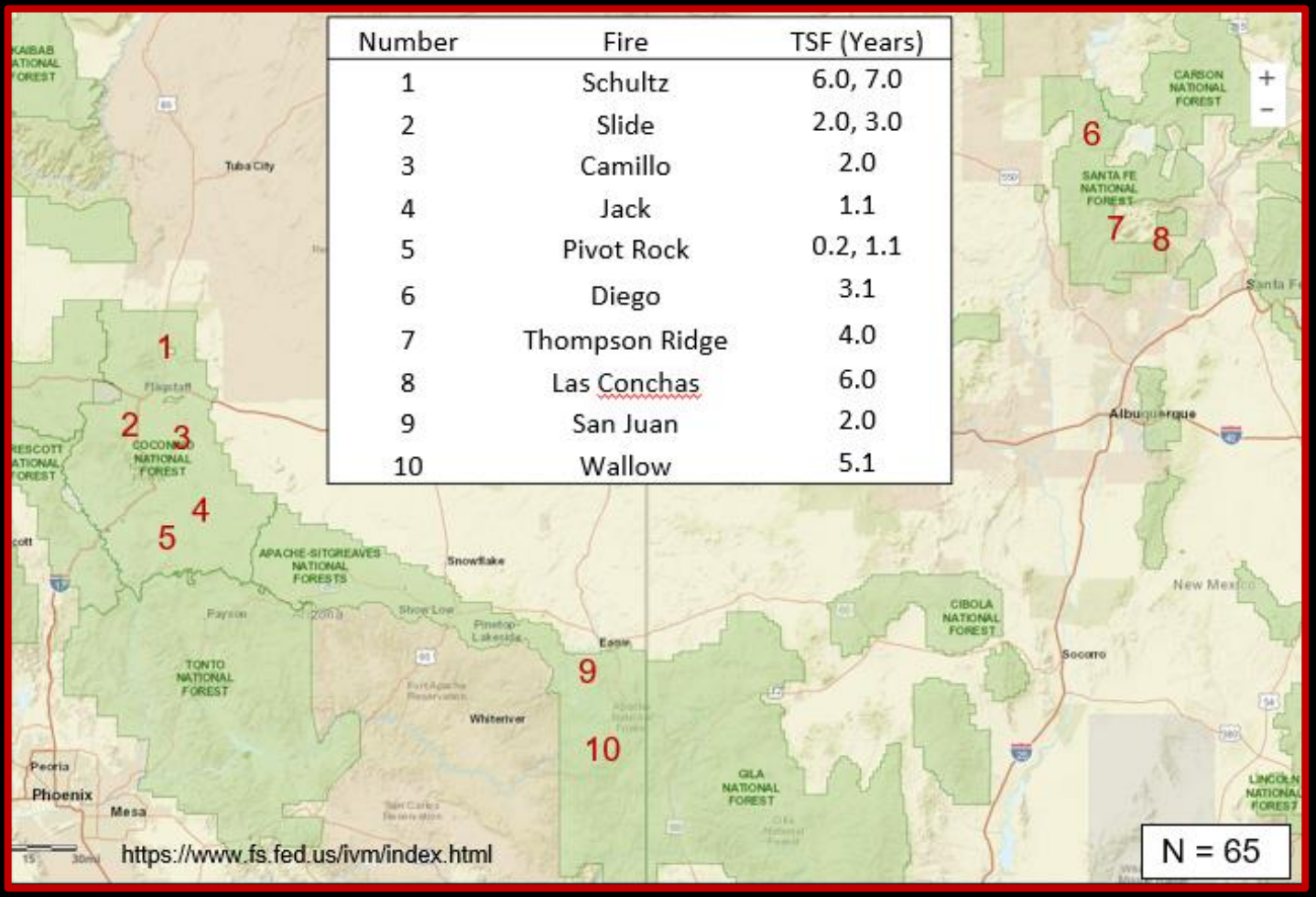
Developing a fire moss restoration technology

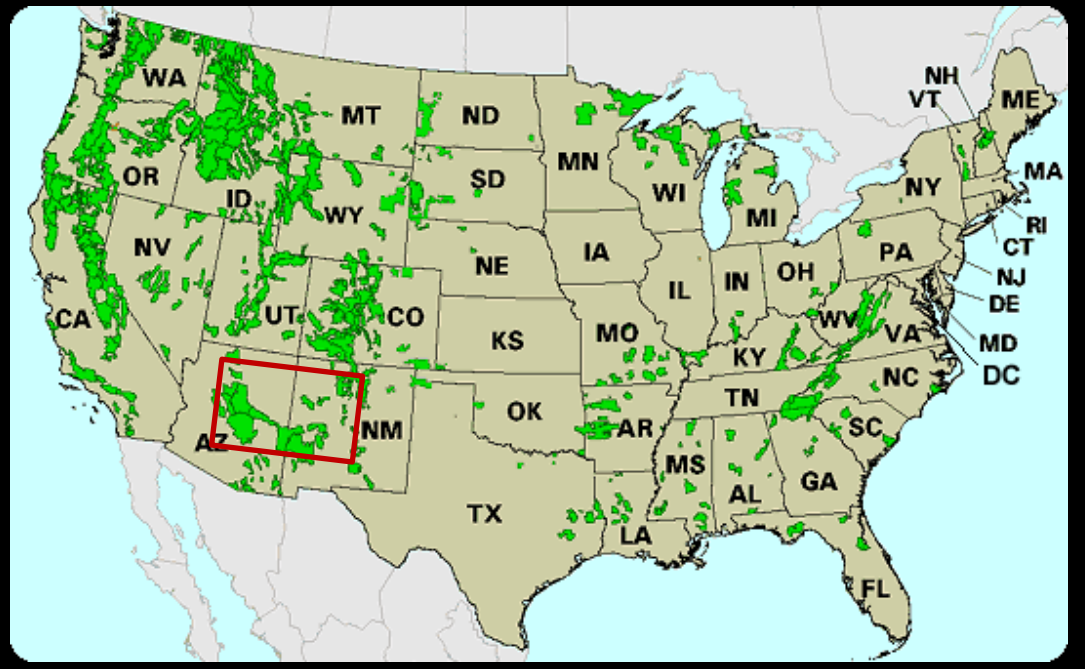


Information on cultivation can be found in Grover *et al* 2019, Restoration Ecology

Selected 10 fires in three regions with a range of times since fire (TSF)

Number	Fire	TSF (Years)
1	Schultz	6.0, 7.0
2	Slide	2.0, 3.0
3	Camillo	2.0
4	Jack	1.1
5	Pivot Rock	0.2, 1.1
6	Diego	3.1
7	Thompson Ridge	4.0
8	Las Conchas	6.0
9	San Juan	2.0
10	Wallow	5.1

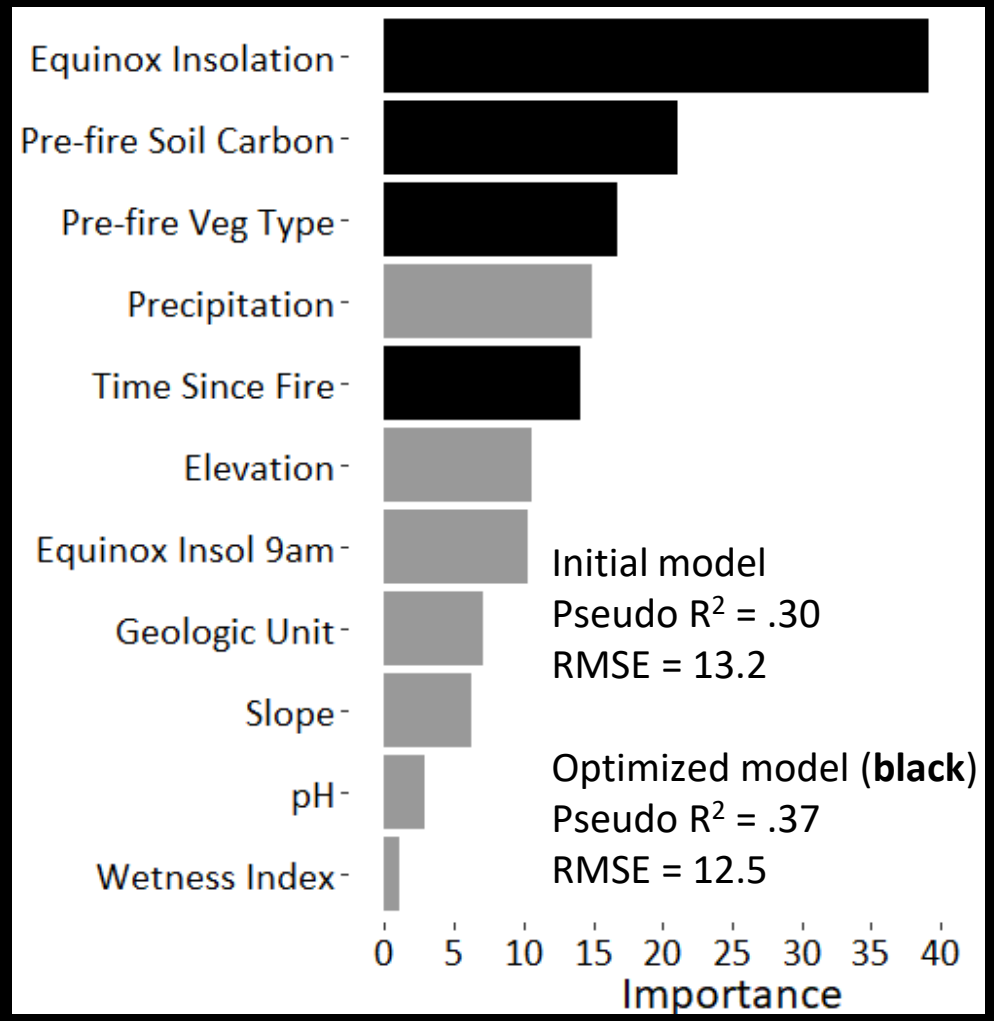




Extracted high severity pixels 30-230m from roads (RdNBR > 643)

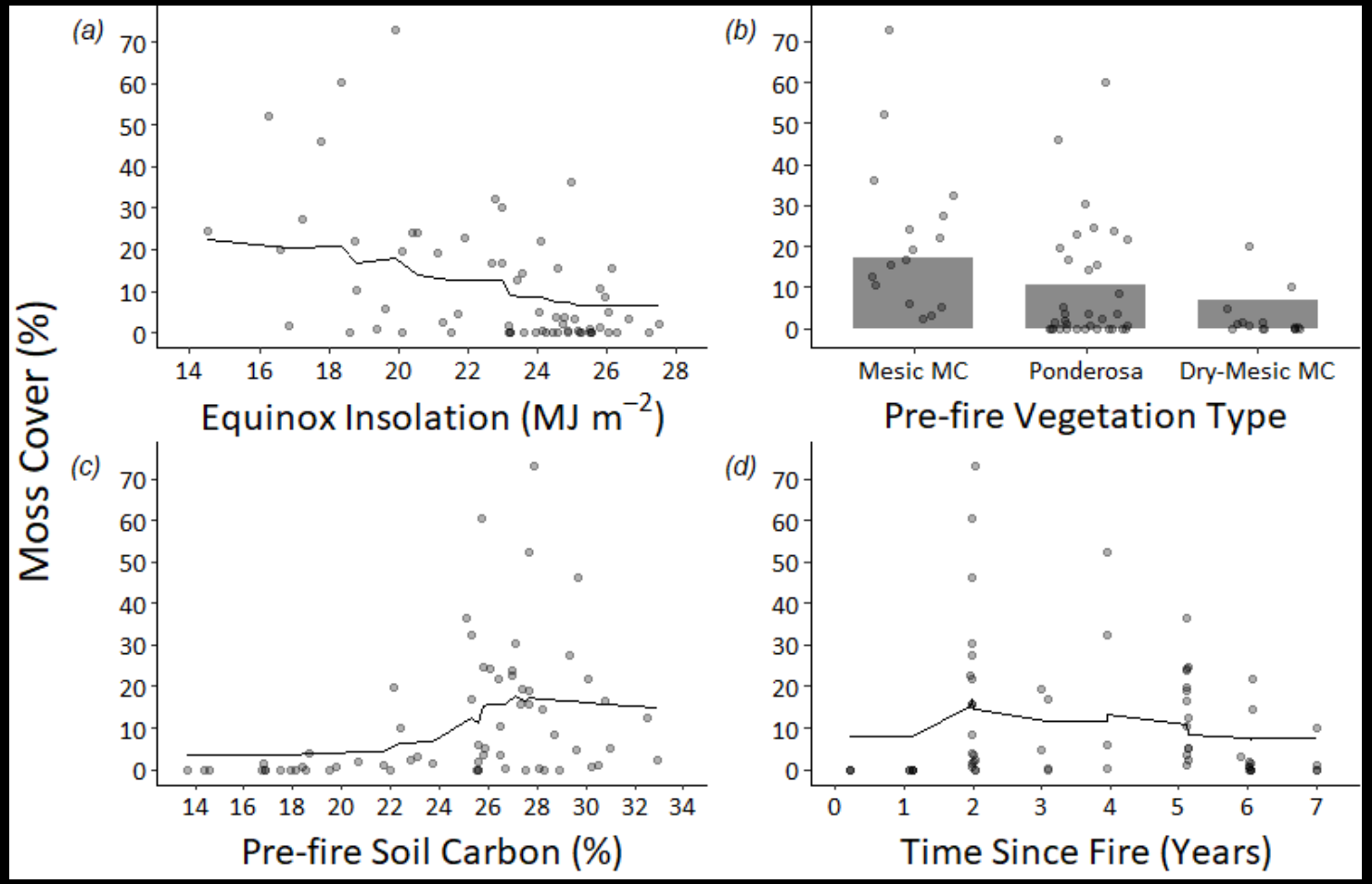
Stratified by winter insolation and elevation

Selected plots at extreme values to maximize environmental diversity



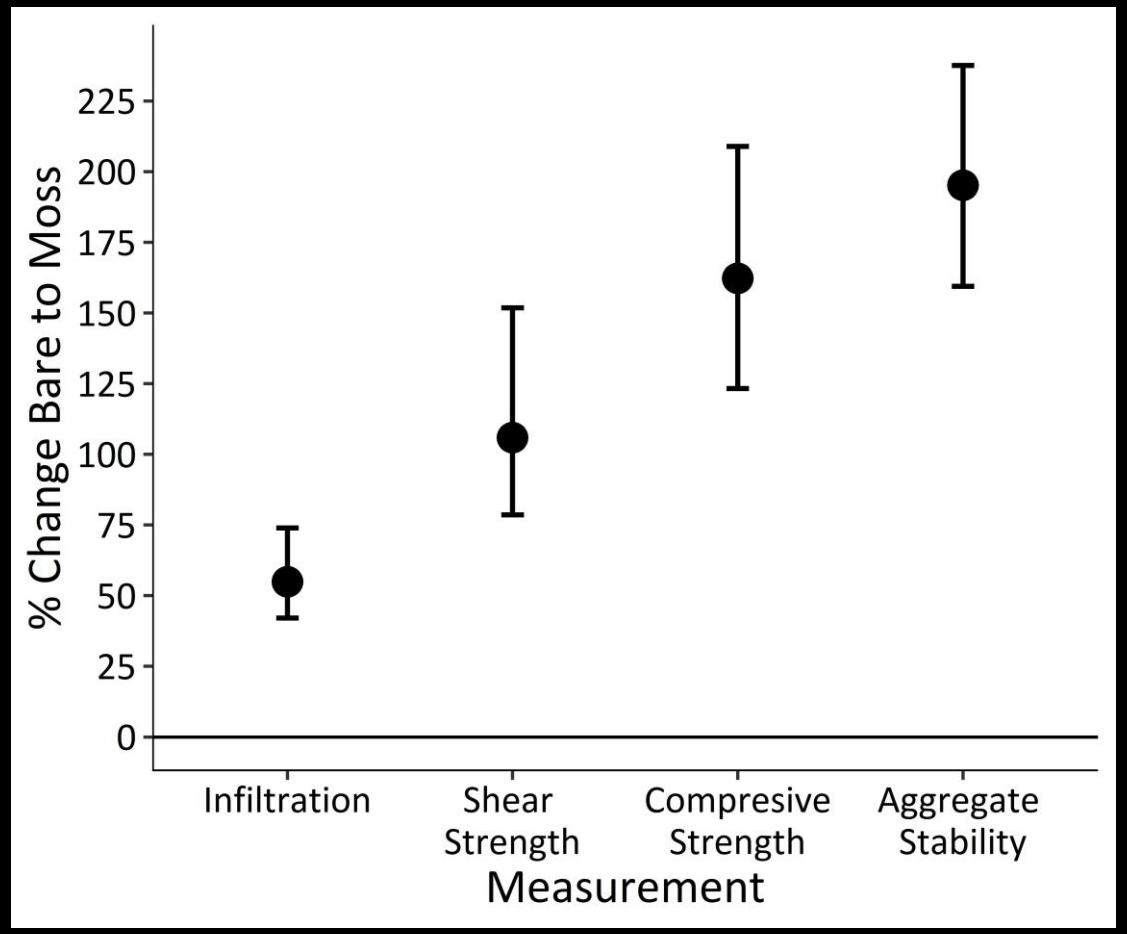
Chose 11 predictors and used random forests to determine landscape drivers of moss cover

Select most important predictors to create optimized model and created bivariate plot visualizations



Grover et al 2020,
International Journal of Wildland Fire

Collected data on paired Moss covered and Bare soil microsites



Moss cover provides dramatic increase in function

Erosion resistance result agrees with 1x1m runoff plots but not infiltration.

(Seitz *et al.* 2017; Silva *et al.* 2019)

Field testing moss restoration potential

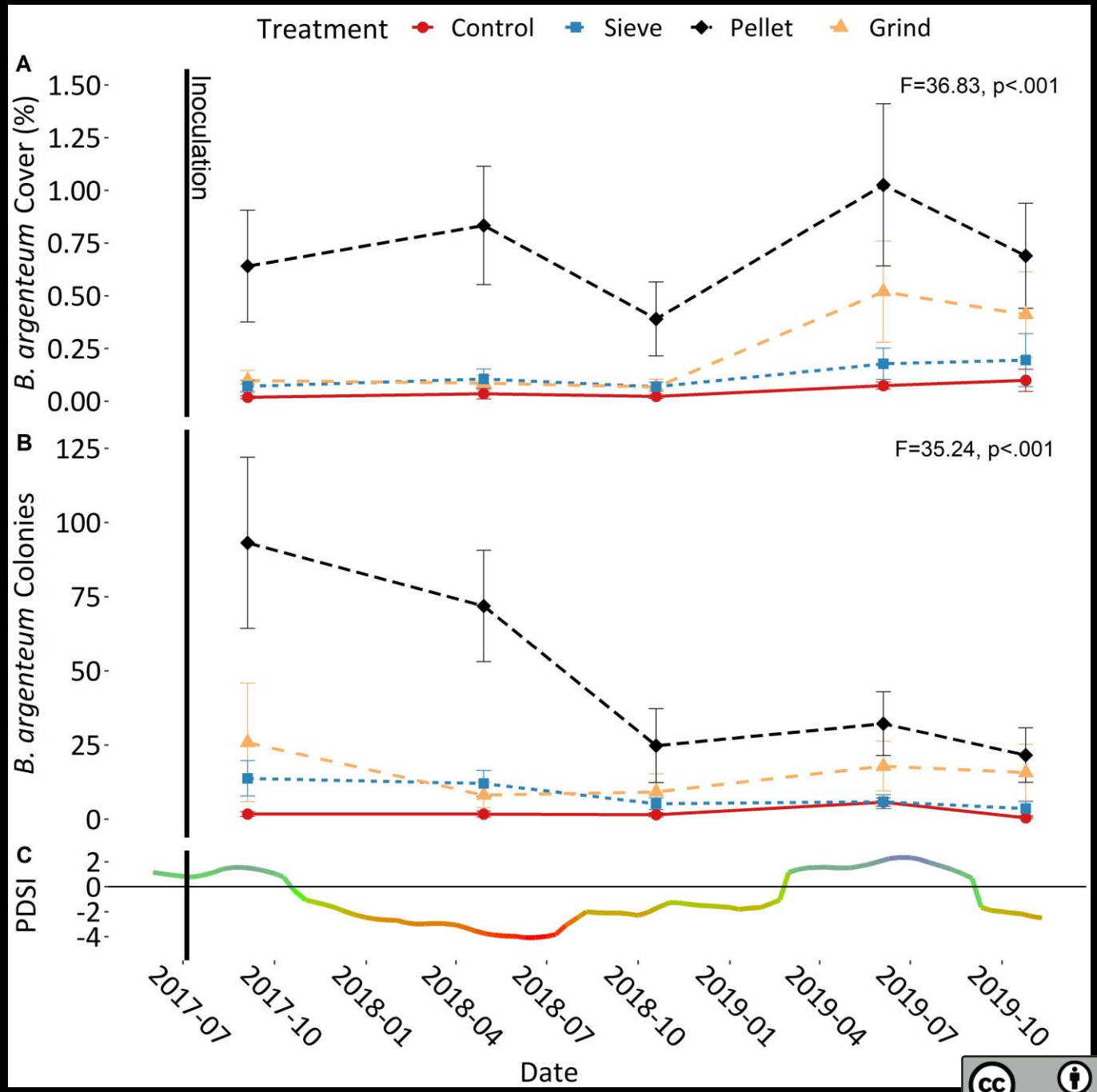
Added greenhouse grown dry moss sieved to 2mm onto recently burned soil in a completely randomized design using 1x1m plots

Ants (Myrmica sp.) collected all moss fragments in ≈2hrs

Added treatments to reduce predation:
1. Ground moss
2. Moss pelletized with diatomaceous earth

B. argenteum colonization successful with pellets dissolving onto soil surface

Cover remained low due to extreme drought

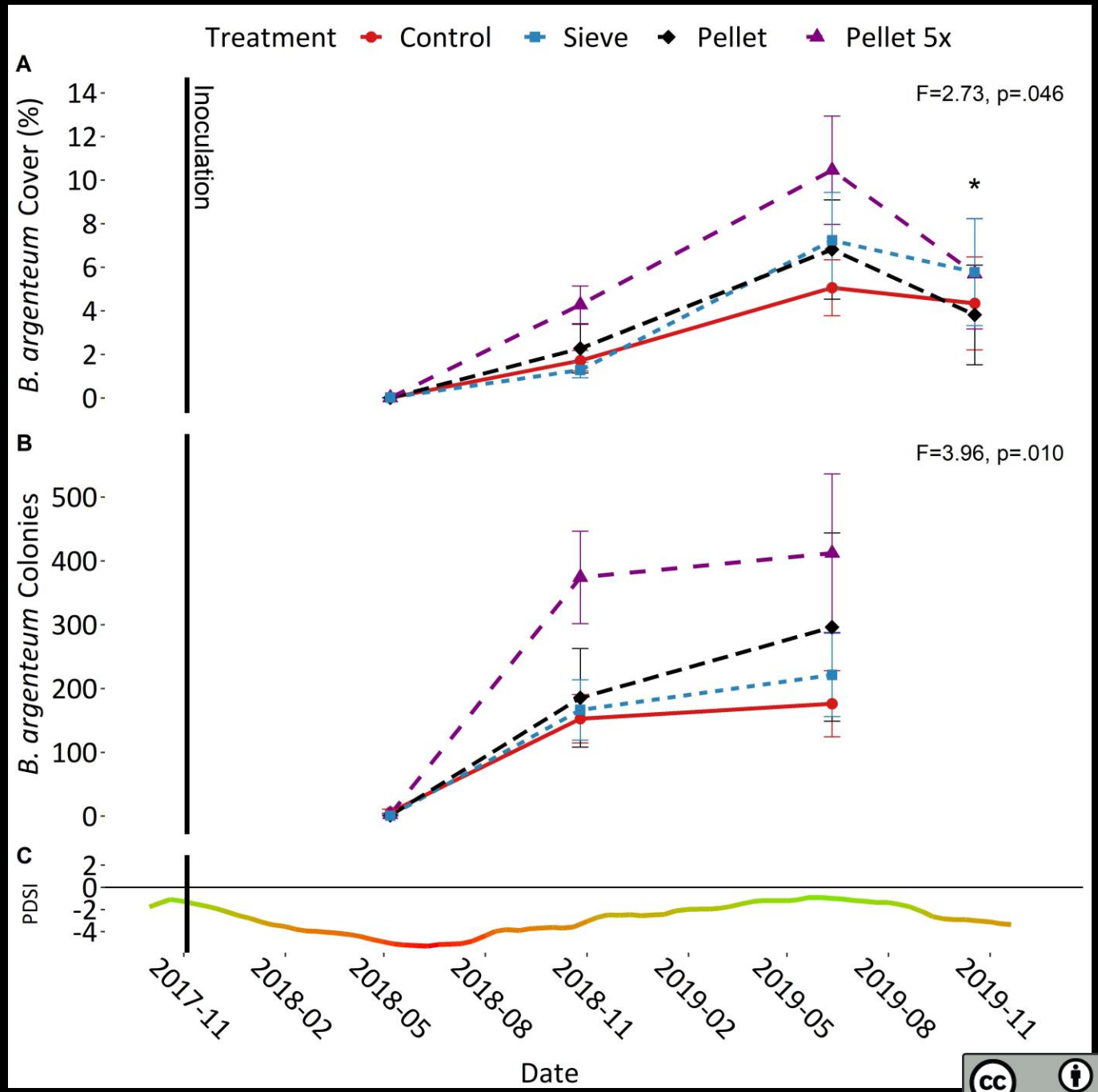


Second test of restoration potential

Switched grind treatment for pellet at 5x volume, six months later pellets had not dissolved due to drought

Could not find moss on plots at first monitoring timepoint

B. argenteum survived and grew when precipitation returned but cover was too low to test function



Conclusions

1. When and where are mosses colonizing burnt landscapes?

Mosses prefer north facing slopes that were mesic mixed conifer forests with high soil carbon pre-fire. Maximum cover 2 years after fire

2. Do mosses have restoration value?

Yes, they enhance soil erosion resistance. Infiltration impacts should be studied further

3. How can we establish fire mosses in the field?

Pelletization overcomes barriers to establishment for *B. argenteum*. Insect predation is a novel barrier

4. Does greenhouse grown moss cover provide additional function?

We were unable to test this due to drought-induced low moss cover

Thank you for your attention!

Contact information, Email: Henrygrover@nau.edu

Factsheet available here

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