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

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Funaria hygrometrica
Hedw.

Bryum argenteum
Hedw.

Ceratodon purpureus
(Hedw.), Brid
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

Serigo Pisa², Olaf Werner², Alain Vanderpoorten³, Mahmoud Magdy²,⁴, and Rosa M. Ros²

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

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5, 6, Correspondence to: Flávio C. Silva, e-mail: flamingo@ufpr.br
Developing a fire moss restoration technology

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?

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)

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

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

https://www.fs.fed.us/lwm/index.html

N = 65
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.
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 $\approx 2$hrs
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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[Logos and institutions]