

Mycorrhizal Associations of Coastal Sage Scrub: Implications for Restoration

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Coastal Sage Scrub (CSS)



- A natural habitat of southern CA
- high levels of biodiversity and endemism
- An endangered ecosystem
- Threatened by non-native species, pollution, and fragmentation

2 Contrasting Sites in Newport Backbay Ecological Reserve

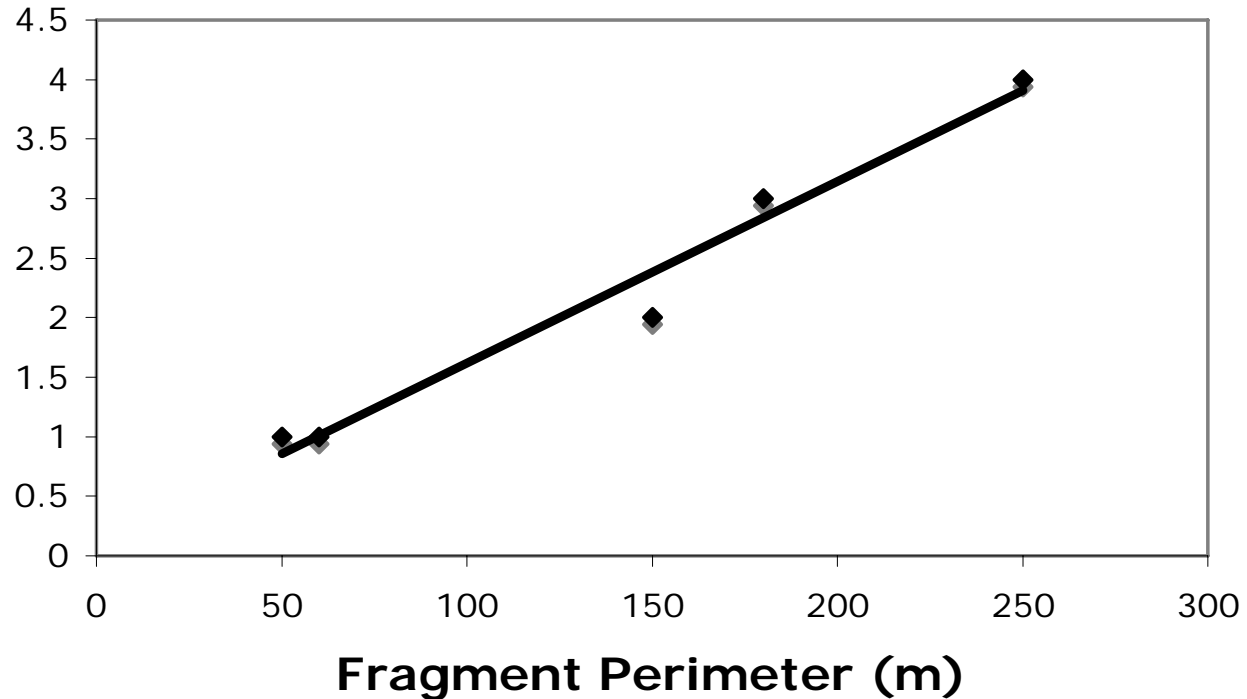


- BVS (Bayview Slope) Site (232,165 m²):
 - Eroded; degraded from previous farming and grazing
 - sparsely fragmented with CSS
 - invaded by non-native plants



- CSS Site (149,737 m²):
 - Relatively unaltered and undisturbed
 - Densely populated CSS
 - Habitat for threatened CA Gnatcatcher

Native Plant Diversity vs. Fragment Size



- 4 fragments on BVS; CSS site = 5th fragment.
- Biodiversity as an indicator of health of habitat
- Data compiled from both sites

Restoration

- Necessary for degraded, eroded, invaded and fragmented areas
- But how can restoration be most successful and efficient?
 - First, we must understand the ecology of the system:
Mycorrhizal fungi 



Mycorrhizal Fungi

- Two types: Ectomycorrhizal fungi (ECM) and Arbuscular mycorrhizal fungi (AMF)
 - So. Cal Chaparral plants (elevation 300-500m) known to have ECM and AMF
 - The extent of ECM vs. AMF in Coastal Sage Scrub unknown!
- AMF recur in succession quicker than ECM, which can take 15 years (Treseder, 2004).

Hypotheses

- 1) Greater percent ECM colonization of roots in the CSS site expected; greater AMF colonization of roots in the BVS site expected
- 2) *Encelia californica* expected to grow better in the site with more AMF; *Eriogonum fasciculatum* expected to grow better in the site with more ECM.

Experimental Design

- To test hypothesis 1:
 - Percent colonization of roots from soil cores of both sites were measured for ECM and AMF.
- To test hypothesis 2:
 - In the greenhouse, 2 plants were grown in the soil from both sites. Plant height was measured once every 5 days for 1 month.

2 CSS Plants



- *Encelia californica* - family Asteraceae known to form AMF associations
- *Eriogonum fasciculatum* - known to form ECM associations

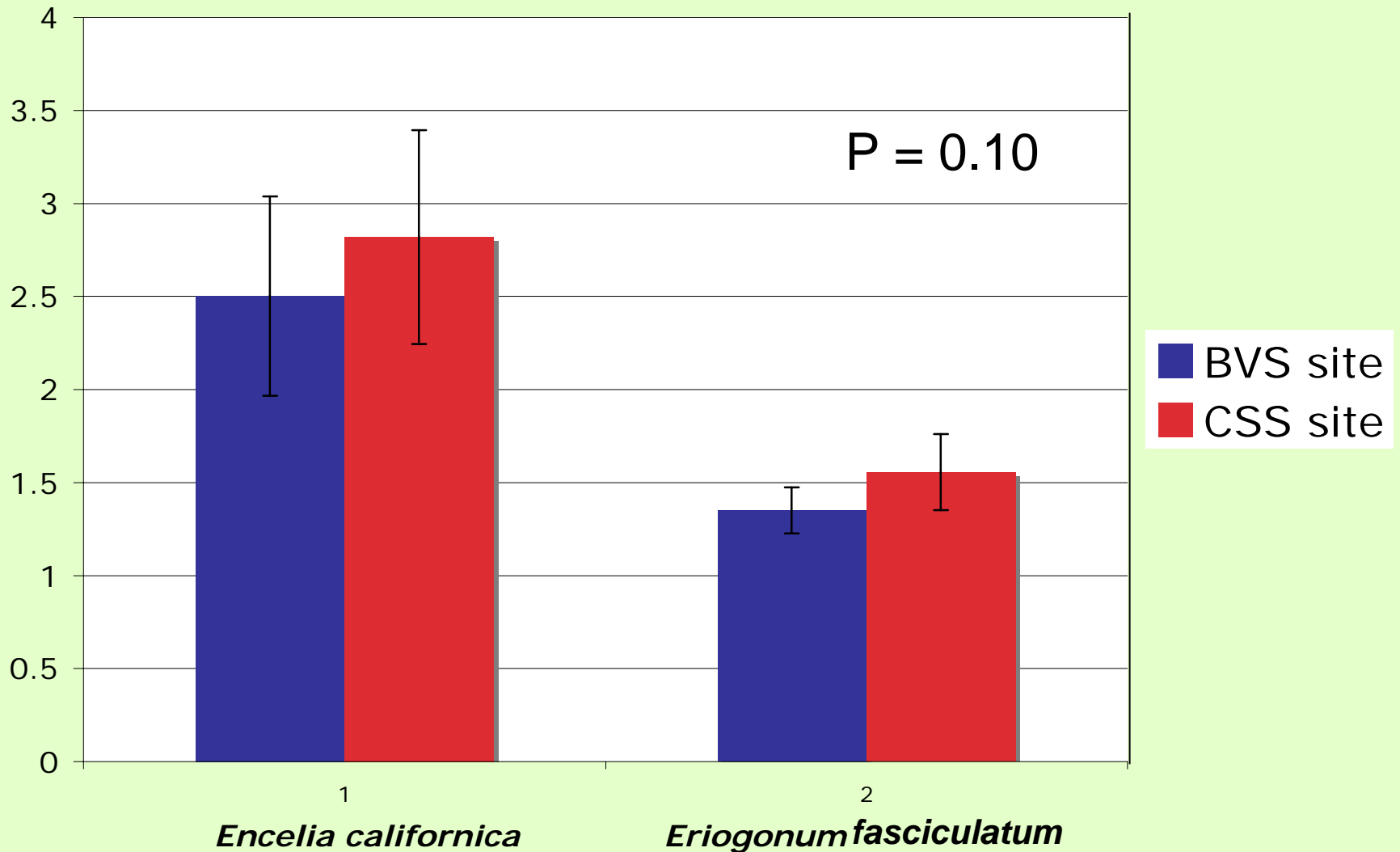
Greenhouse Experiment

- Which plant species grows better in which soil?



- 6 replicates of each species in BVS and CSS soil
- Plant height recorded once every 5 days for 1 month.

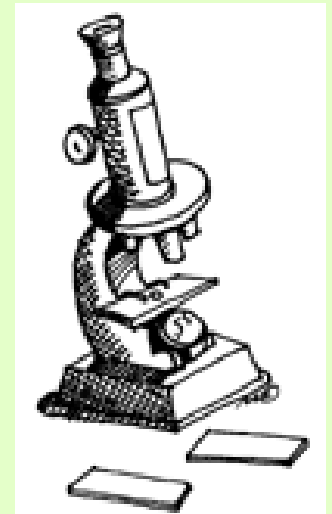
Plant Growth



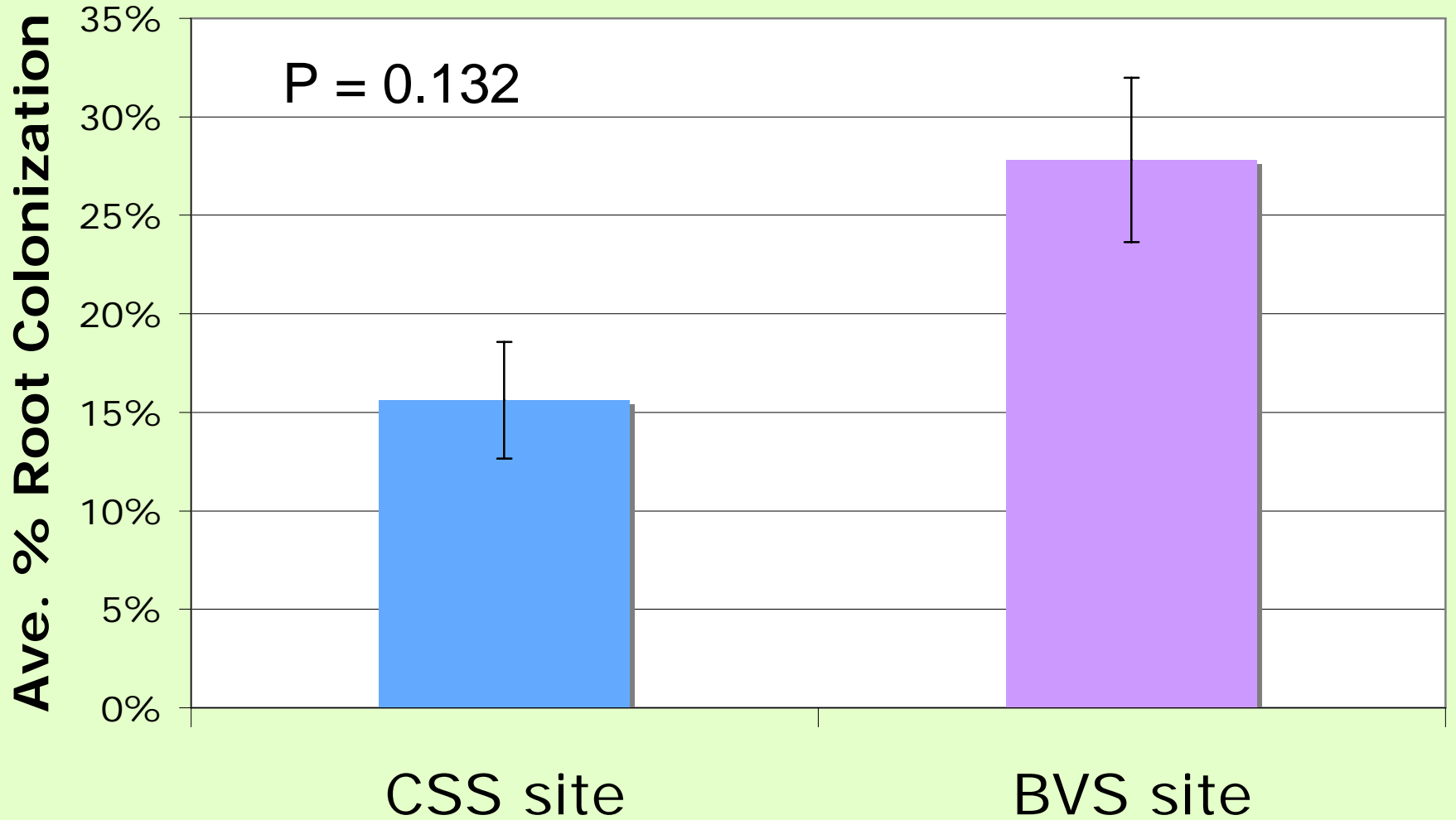
- Note: p-value refers to plant growth within each soil type

ECM and AMF colonization of roots

- % colonization of ECM measured by examination of extracted roots under 30x magnification (Brundrett 1991).
- % colonization of AMF measured by Trypan blue staining of extracted fine roots (Koske and Gemma 1989, McGonigle et al. 1990).

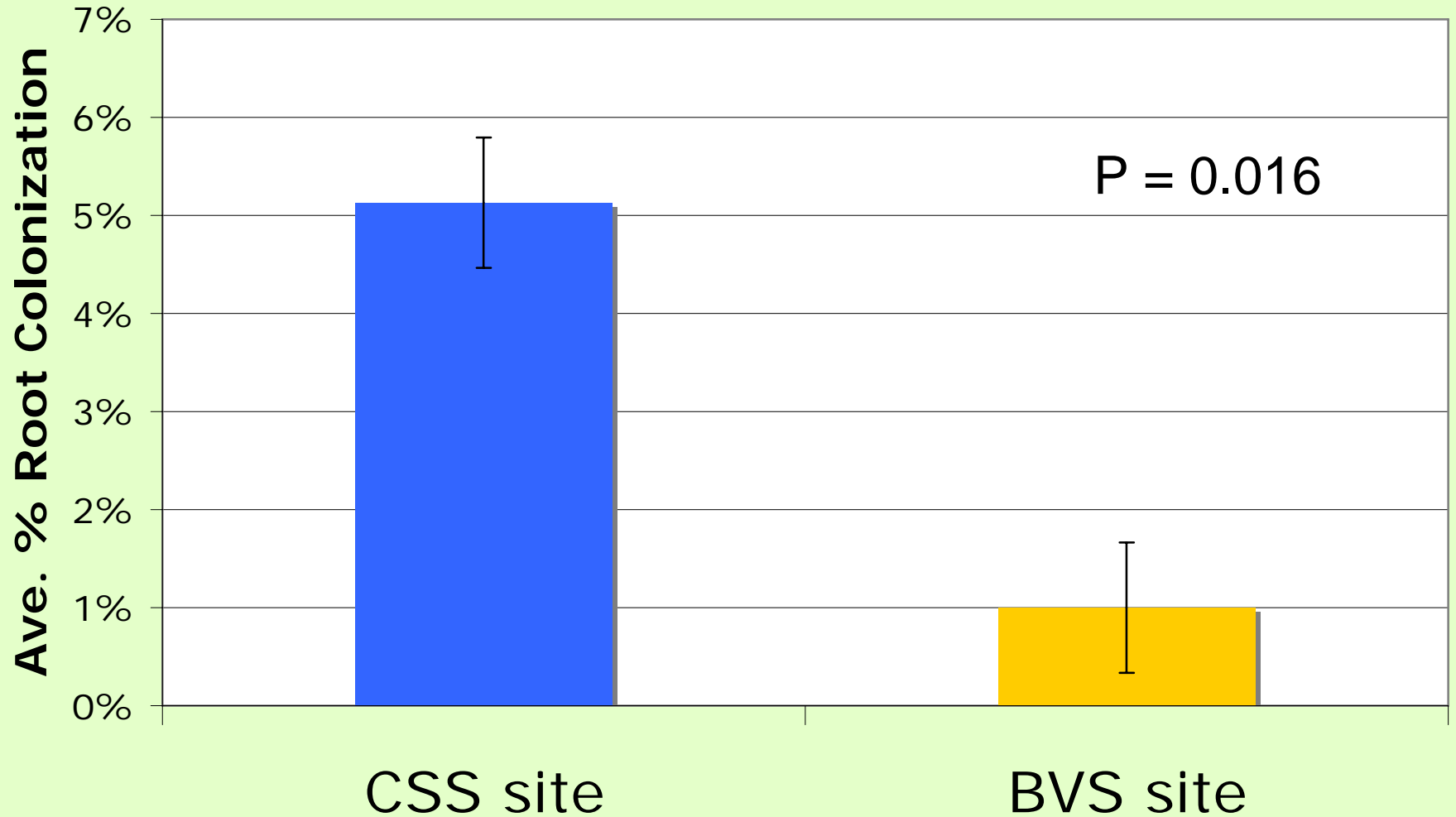


AMF Colonization



Results

ECM Colonization



Conclusion

- Hypothesis 1 supported: CSS site has significantly more ECM, while the BVS site has more AMF, although not significant.
 - Likely explanation: ECM has not recovered from land degradation in BVS yet.

Conclusion

- Hypothesis 2 partially supported: Both plant species grew better in the CSS site soil, although not significant.
 - Likely explanation: other soil characteristics also involved (i.e. pH, salinity, amount of K, P, and N in soil)

Acknowledgements

- Treseder Lab at UC Irvine
- Matthew D. Whiteside, Ph.D. student, Treseder Lab
- Kearney Foundation of Soil Sciences
- S & S Seeds