

Can Remote Sensing Predict Fire Damage in Plants and Soil Microbial Activity?

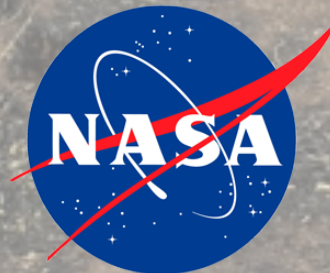
Clarisa Avalos

Rachel Gallery and Martha Gebhardt– School of Natural Resources and the Environment
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Fire effects



- Ground cover loss and tree mortality
- Lower albedo
- High soil erosion
- Loss of organic matter
- More alkaline pH

Goals

- Use remote sensing to investigate how vegetation recovers after a fire and infer how soil microbial activity responds based on plant regrowth
- Determine the relative importance of vegetation and microbial activity in driving fire recovery

Site History and Sample Collection

Santa Rita Experimental Range

- Semi-arid environment
- Soils from Pleistocene (25,000 to 2 million years ago) and Holocene/Late Pleistocene (10,000 to 25,000 years before present)
- Fires in 1994 and 2017

Bare Soil



Grass Covered Soil



Mesquite covered soil



LANDSAT Satellite to study Plant Growth

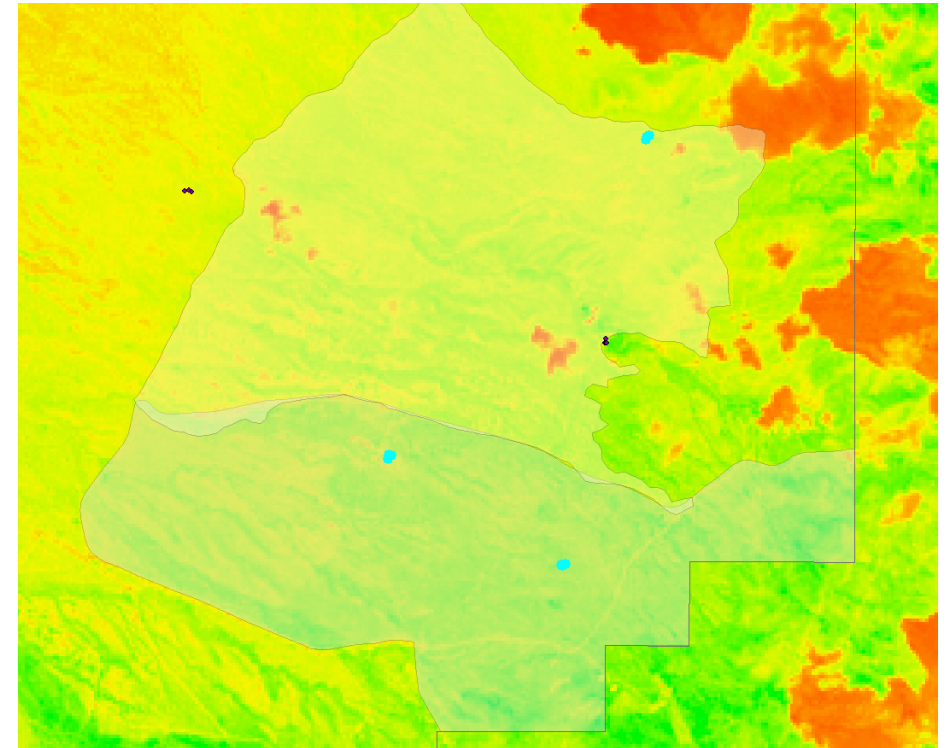


Dri.edu

30m spatial resolution

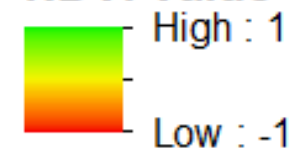
Normalized Difference Vegetation Index
(NDVI) = plant "greenness"/growth

11 bands



Legend

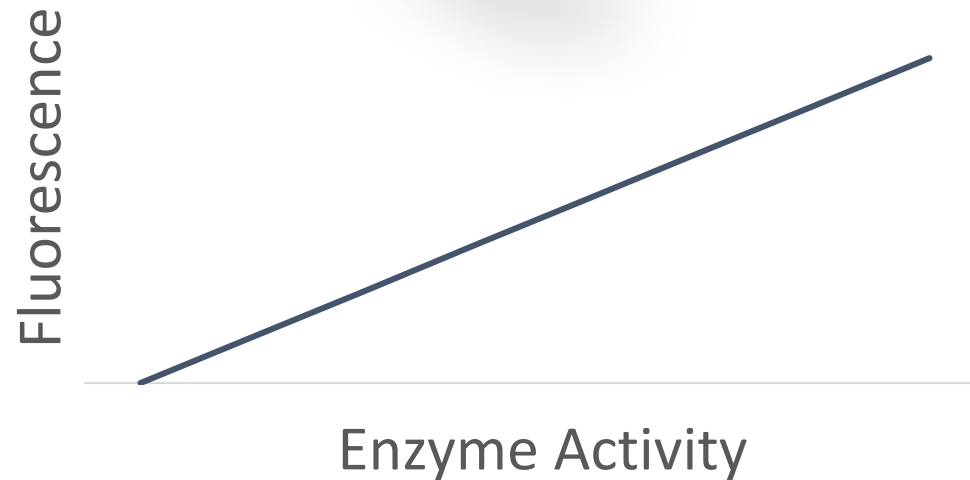
NDVI Value



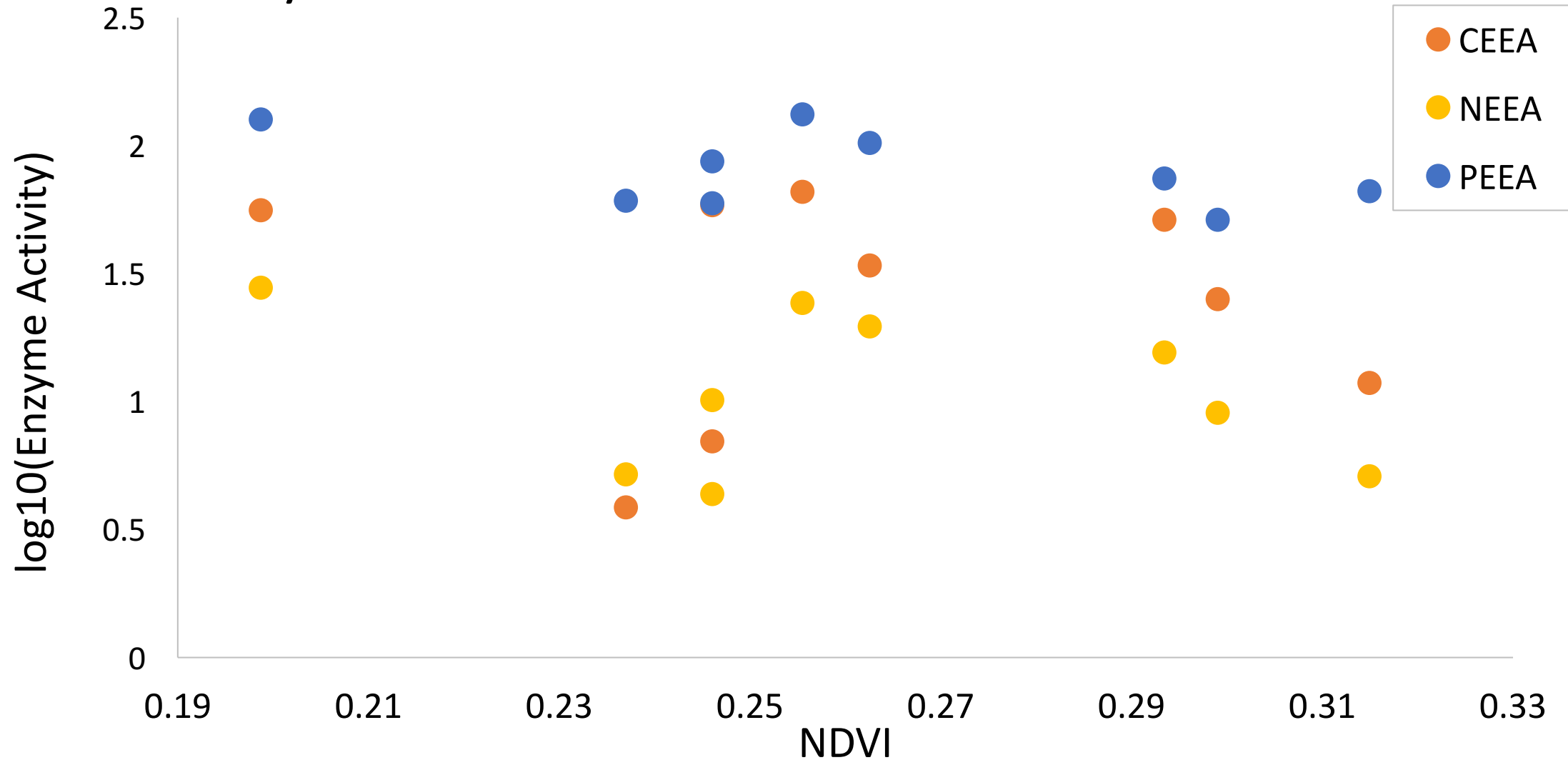
Potential extracellular enzyme activity (EEA)



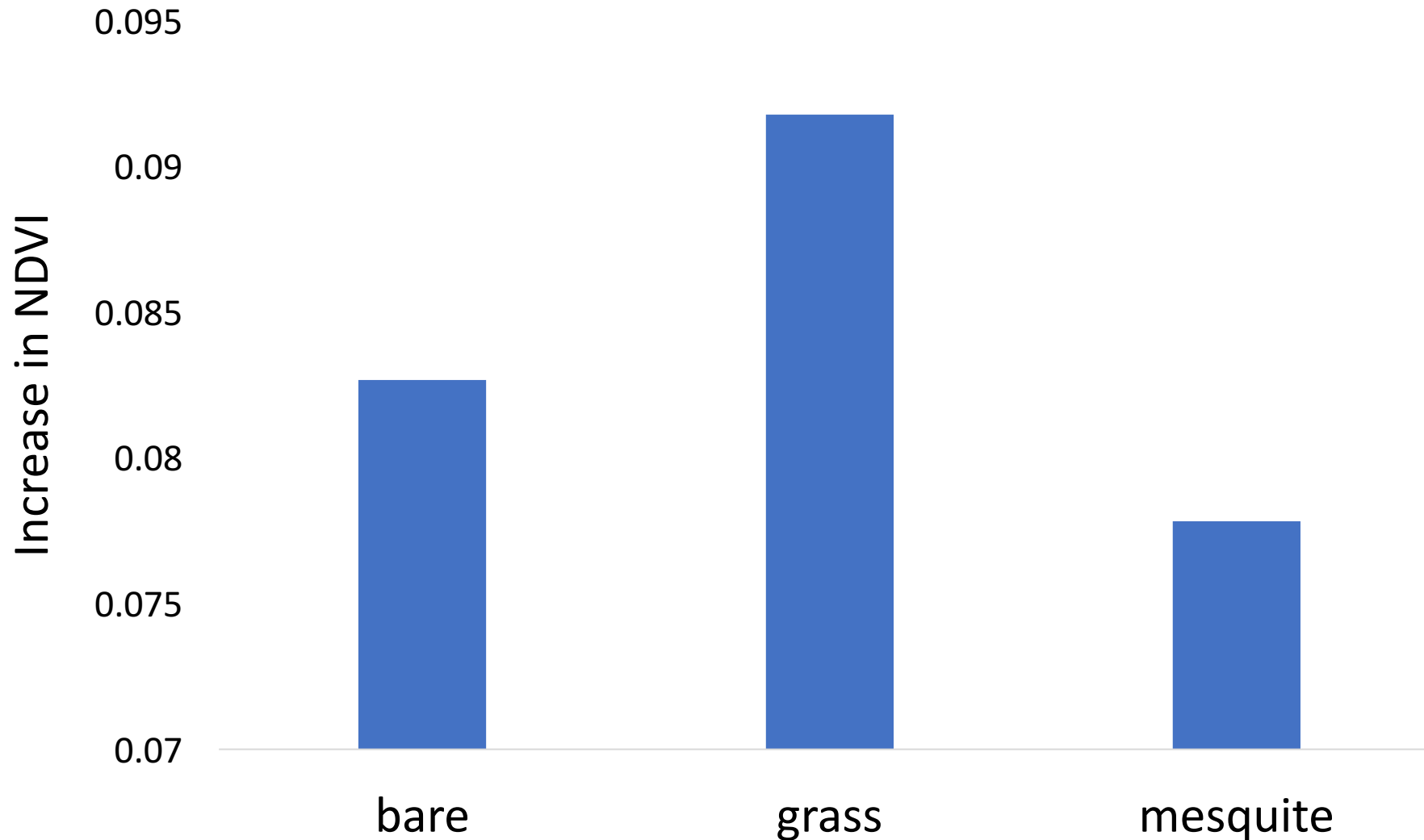
<https://content.ces.ncsu.edu/extension-gardener-handbook/1-soils-and-plant-nutrients>



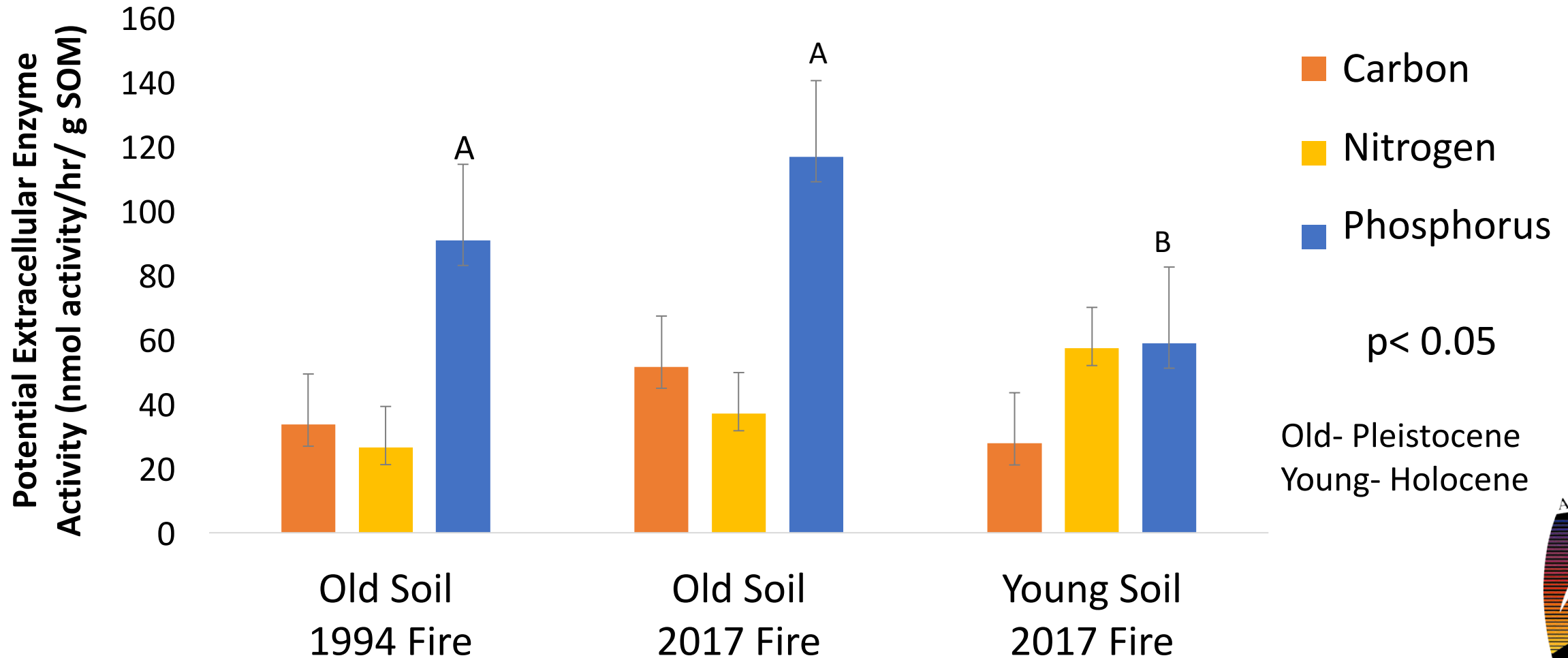
No correlation between NDVI and microbial activity



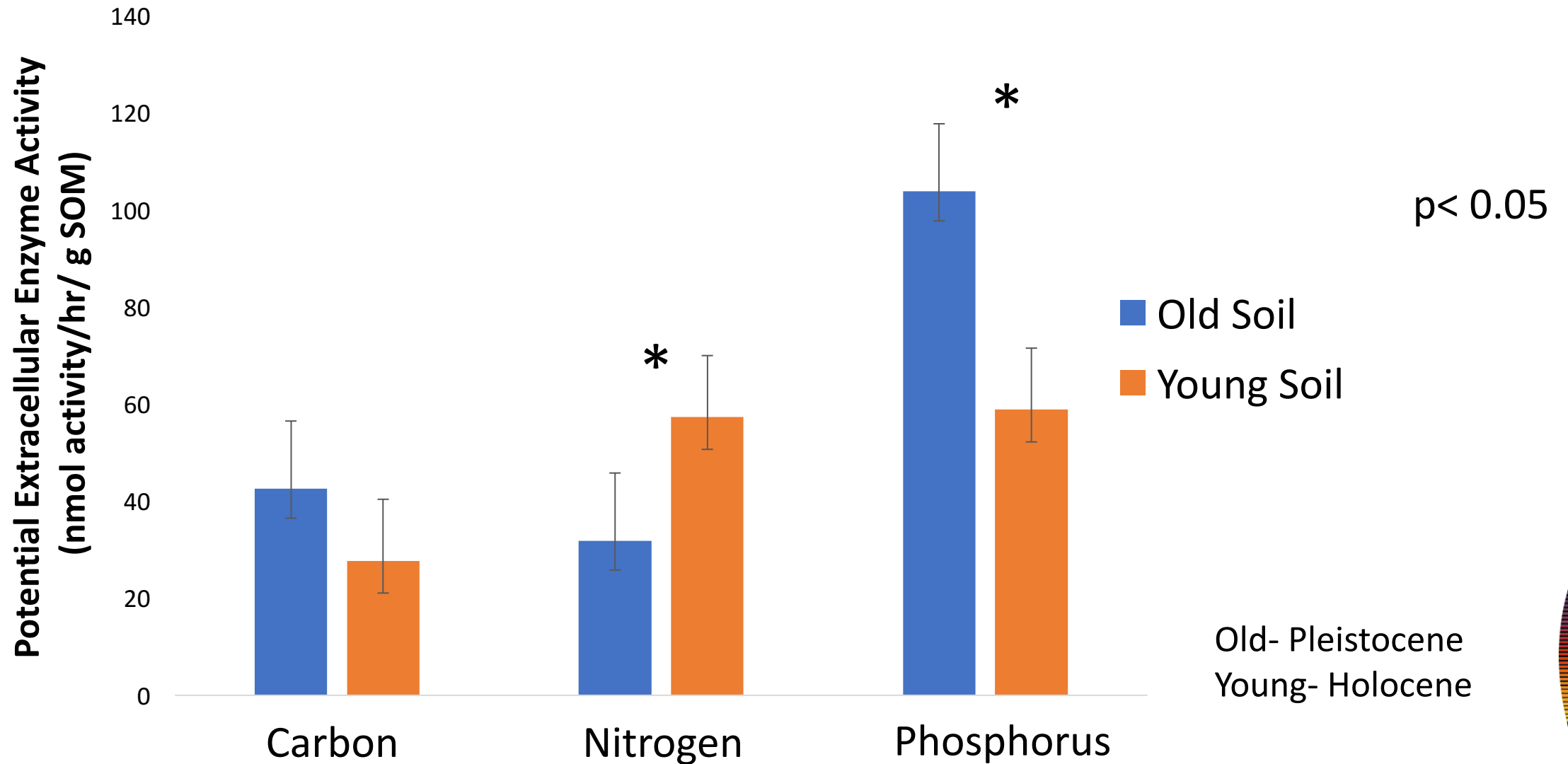
NDVI shows plant recovery post fire



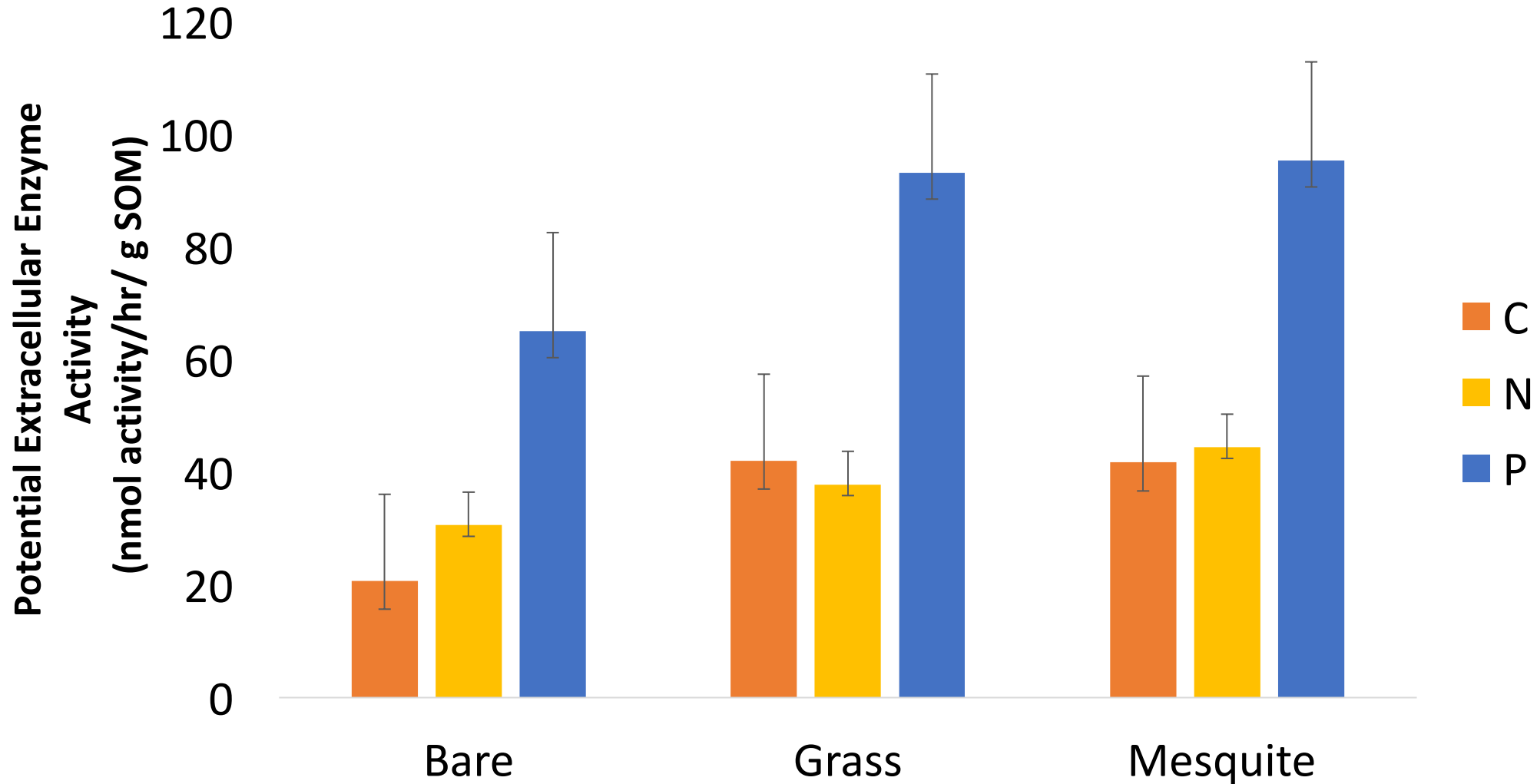
Phosphorus activity lowest in young, recently burned soils



Significant effect of soil age on Nitrogen and Phosphorus activities



No significant effect of plants on enzyme activities



Conclusion

- In semi-arid grasslands, NDVI can be used to monitor vegetation recovery post fire
- No difference in microbial activities based on vegetation cover
- Nitrogen activity highest and Phosphorus activity lowest in younger, recently burned soils
- There is not a clear relationship between remotely sensed vegetation cover and in-situ soil biogeochemistry



Thank You!



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