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Detecting Biocrust Spectral Signature Before and After A Prescribed Fire

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Introduction

- Diverse microbial communities called biocrusts inhabit the soil surfaces of northern Australian savanna landscapes, playing a critical role in maintaining soil health and providing essential ecosystem services. Prescribed fire is a common management strategy in these ecosystems, and it may impact biocrust function (Williams et al., 2022).
- Detecting biocrusts using remote sensing can be challenging, particularly in northern Australia, where they are mixed with other land covers such as bare soil, grass, shrubs, and trees.
- Remote sensing provides a potential tool for identifying different land covers at large scales.

Aims

- This research investigated the effectiveness of distinguishing biocrust from other land cover classes by analysing spectral signal changes both before and after a fire event.

Methods

- The study was based on 30-years of fire research at Victoria River Research Station (VRRS), Northern Territory.
- We used Planet images with a spatial resolution of 3 m to monitor the spectral signature changes of biocrusts before and after fire in the landscape.
- We collected reference data from different ground covers, including bare degraded soil, biocrust and grass covered areas.
- Comparative analysis of spectral values for Bare Soil, Biocrust, and Grass using:
- Normalized Difference Vegetation Index (NDVI)
- Optimized Soil Adjusted Vegetation Index (OSAVI)
- Enhanced Vegetation Index (EVI)
- Crust Index (CI_Crust Index)

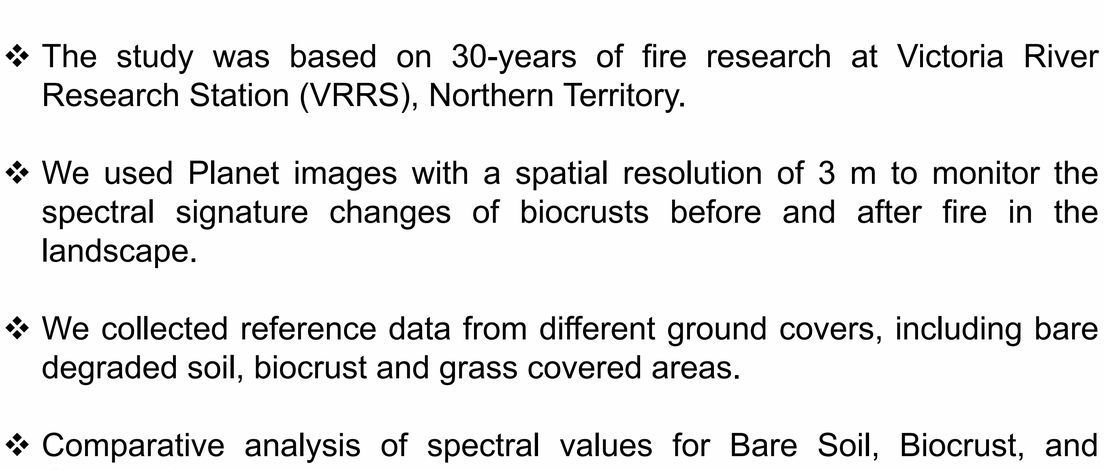

Figure 1. Training polygons for Ground Cover Classes, Bare Soil, Biocrust and Grass in Fire-Grazed Area

Results

- **We can distinguish biocrusts using satellite imagery**
- EVI and CI effectively distinguished spectral response of three land cover classes.
- **Prior to the fire event:** NDVI and OSAVI were less effective in distinguishing grass from biocrust (Figure 2.)
- **After the fire and rainfall:** all indices effectively differentiated grass, biocrust, and bare soil (Figure 3.).
- Grass showed the most distinct spectral response, while bare soil consistently exhibited the lowest values.

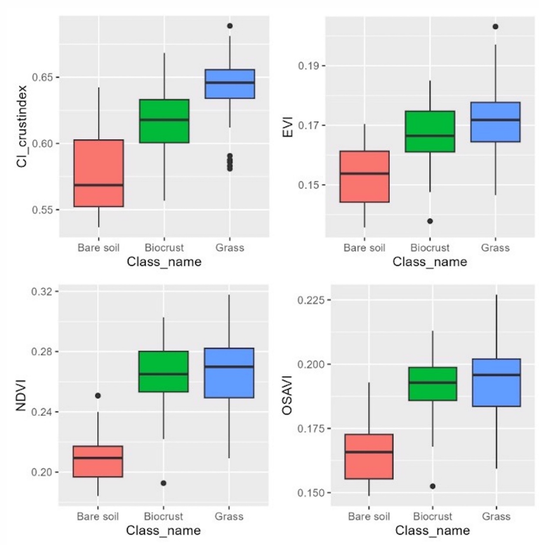

Figure 2. Spectral Response of Ground Cover Classes Before the Fire

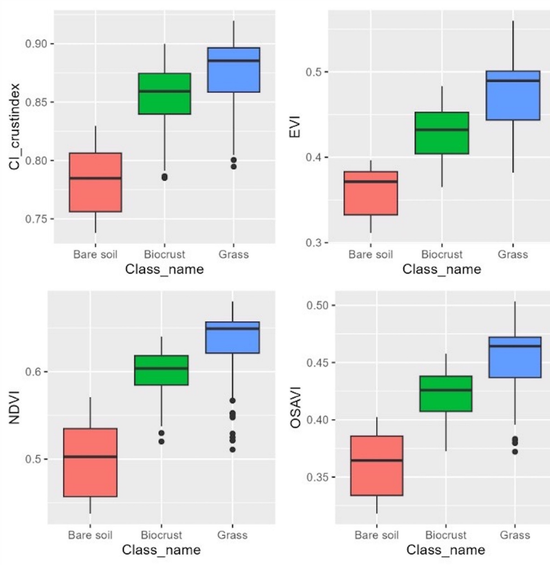

Figure 3. Spectral Response of Ground Cover Classes Post the Fire

References

Williams, W.J., Schmidt, S., Zaady, E., Alchin, B., Myint Swe, T., Williams, S., Dooley, M., Penfold, G., O'Reagain, P., Bushell, J., Cowley, R., Driscoll, C., Robinson, N., 2022. Resting Subtropical Grasslands from Grazing in the Wet Season Boosts Biocrust Hotspots to Improve Soil Health. Agronomy 12, 62. https://doi.org/10.3390/agronomy12010062.

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