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Close-range imaging of peatland vegetation via phone and drone-based RGB data

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Peatlands are globally distributed wetlands that have a critical role in the global carbon cycle as well as providing a hydrologic regulation role in the associated aquatic ecosystems and providing key habitat for obligate species. Due to their fragile soils and reliance on stable water sources, peatlands are highly susceptible to climate change and habitat degradation. Listed as a 'critically endangered' ecosystem and comprised of a community of threatened and endangered species, peatlands in the Australian Alps (aka. 'Australian alpine *Sphagnum* bogs and associated fens') require urgent monitoring and conservation efforts (Environmental Protection and Biodiversity Act, 1999). Due to their inaccessibility and fragility, high resolution mapping of long-term vegetation changes over time has not been conducted, and effective methods are still under development. Remote-sensed based monitoring approaches provide a potentially low-impact method of data collection compared to ground-based field work. In this study we have applied Red-Green-Blue (RGB) imaging techniques to differentiate dominant vegetation taxa in the Australian alpine peatlands, using both mobile phone and drone-based imaging.

Five (5) dominant Australian alpine peatland species (*Dracophyllum* continentis, *Emposidma minus, Epacris paludosa, Poa costiniana,* and *Sphagnum* sp.) were assessed. Close-range RGB imaging of target taxa was collected via smartphone camera. Site wide images were captured via drone imaging. Captures were done over three timepoints in the growing season: early summer (November-December), late summer (January-February), and Autumn (March-April). RGB reflectance values were used to differentiate target taxa, as well as assess the phenological change in relative reflectance. Analysis of phenological changes in vegetation reflectance was used to assess the optimal temporal window to differentiate between target taxa. Close-range images were analysed using Phenopix R package to extract average relative RGB reflectance values of vegetation. Site-wide images were processed though QGIS, in which polygons of target vegetation were labelled and RGB values extracted. Reflectance values of each target plant were used to train a predictive learning model capable of remapping vegetation across Australian alpine peatlands. This approach provides a foundation for long term monitoring of vegetation, helping to assess changes in peatland health and function over time.