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| **Drone based, multispectral photogrammetric point clouds to classify fire severity at differing canopy height strata** |
| Utilizing drone digital aerial photogrammetry (dDAP), also sometimes referred to as structure from motion, we generated three-dimensional photogrammetric point clouds to quantify the effects of fire at various canopy height strata. Our research was conducted during prescribed surface burns at Fort Jackson, South Carolina, where we collected both RGB and multispectral imagery pre- and post-fire at five plots, as well as at two control plots that were not burned. The replicate plots measured approximately 0.2 ha in size. Three-dimensional photogrammetric point clouds were generated from the multispectral and RGB imagery, and NDVI values were calculated for each point using the NIR and red reflectance values. Point clouds were normalized by removing elevation determined from airborne lidar digital terrain models and were then divided into 2-meter height stratum layers. This allowed for the comparison of point NDVI values for different canopy height strata pre- and post-fire, as well as generating orthoimages of the ground and surface vegetation only, tree canopy only, and top-down elevated view. Our results showed that the prescribed fire had a very large effect size on NDVI values up to 6 m in height, with only small effects above 6 m and within the control plots. We were also able to classify ground cover under the canopy in areas that would normally be occluded from overhead imagery, with 87% accuracy. Finally, we demonstrated that the digital removal of occluding tall vegetation increases dNDVI values and can produce a more accurate assessment of fire effects on ground and understory vegetation compared totTwo-dimensional satellite imagery that is limited to top-down (nadir) views and cannot separate understory fire effects from overstory fire effects. |

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