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| **Using terrestrial LiDAR to examine the effect of understory fuels management on forest heterogeneity in a northern California mixed hardwood forest** |
| **Introduction/Aim:**  Measuring forest structure after disturbance is integral to assessing forest health, wildlife habitat, and future wildfire behavior. Terrestrial LiDAR (TLS) can capture accurate and fine-scale stand measurements from which forest structural diversity metrics can be derived—including measures of canopy height, vegetation arrangement, canopy cover, structural complexity and leaf density. These TLS-derived metrics provide an opportunity for more objective quantification of forest structure which have been otherwise costly, time-consuming, or impractical to measure traditionally. For example, surface and ladder fuels, which are difficult to measure in the field, can have profound effects on localized fire behavior, as branches and leaves are considered fuel, but are often distributed in a heterogeneous way under the canopy. While ladder fuels can be indirectly measured using canopy base height, the vertical and horizontal distribution of the understory is often not described. One metric that could be used to characterize this distribution is lacunarity, a scale-dependent measurement of spatial heterogeneity. However, 3D lacunarity has not been widely estimated using TLS data due to the computational time investment of previous analysis approaches. Our study aims to quantify changes in sub-canopy forest structural heterogeneity with a focus on changes in fuel connectivity following understory fuels management after a natural wildfire.  **Methods:**  We collected TLS data from 20 plots representing several forest types in a northern Californian mixed hardwood forest before and after a low to moderate severity wildfire and post-fire understory fuels thinning treatment. Using voxelized TLS data and a newly developed R package “lacunr”, we calculated 3D lacunarity of all vegetation (dead and alive) under 8 meters to represent ladder and surface fuels.  **Results/Conclusion:**  Preliminary results show significant changes in lacunarity following both wildfire and post-fire thinning with a greater increase observed after understory thinning. This suggests that while wildfire can alter the distribution of understory fuels, the specific management approach used in these plots to reduce understory fuels <10 cm in diameter more effectively altered the arrangement of fuels and reduced connectivity. Importantly, our results support using 3D lacunarity calculated from LiDAR data as a metric to objectively quantify changes in the arrangement of fuels post-disturbance and evaluate management strategies. |