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| **Characterizing Community Fire Risk from Satellite Data and Multi-Temporal Lidar** |
| Rural communities in the west of Canada are exposed annually to a risk of wildfires. Assessing wildfire risks in advance allows communities to undertake mitigation actions such as prescribing fuel treatments. In this study, LiDAR data in combination with satellite is used to perform advanced fire risk assessment by generating fuel types and characterizing fire hazard at different spatial scales. Fuel attributes key to managing fire behaviour, including Canopy Bulk Density, Canopy Fuel Load, Stem Density, Canopy Base Height, and Canopy Height, were estimated using area based and individual tree-based techniques on LiDAR data at 5, 10 and 20m2 resolutions. An individual tree inventory (ITI) derived from the LiDAR provided the tree segmentation and was the data aggregated to the 3 different resolutions. Next, attributes such as Stem Density, Canopy height, Canopy Base Height, ladder fuel density, and vegetation types were computed based on 2014 and 2020 data. Fuel type data based on the ITI and Sentinel-2 Satellite were assessed using existing field plots. Using these outputs, several different fire models based on the generated fuel type data and fuel attributes were produced using Canadian Forest Fire Danger Rating System models. Finally, risk estimates derived from these fire models were generated for all buildings in the community based on radiation and ember density exposure, as well as proximity to other structures. The results show that a much more detailed map of fuel attributes and fuel types can be generated using LiDAR and satellite with R2 of 0.74 for lidar fuel types vs. an R2 of 0.56 for traditional inventory polygon approach. These maps can be used to identify structures with the highest wildfire hazard exposure as well forest areas containing the most hazardous fuel structures. Fuel management prescriptions can then be generated to target specific areas identified, enabling better use of funds to enhance the safety of the community |