# Forest disturbance history through stand-level analysis of LiDAR data

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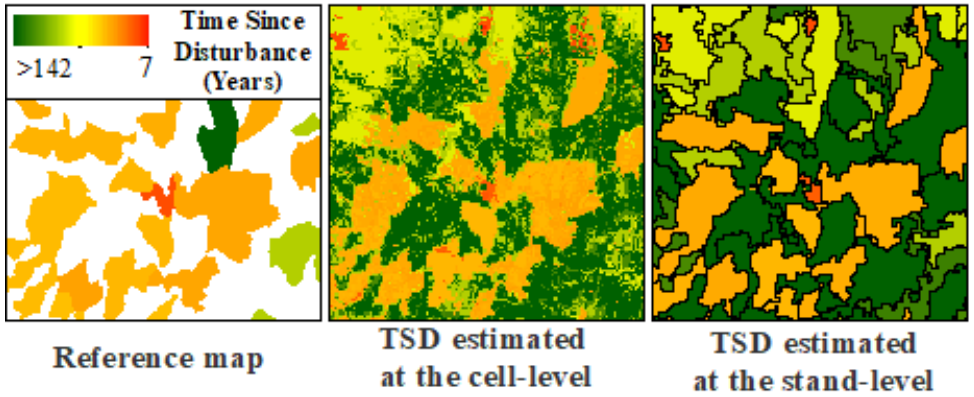
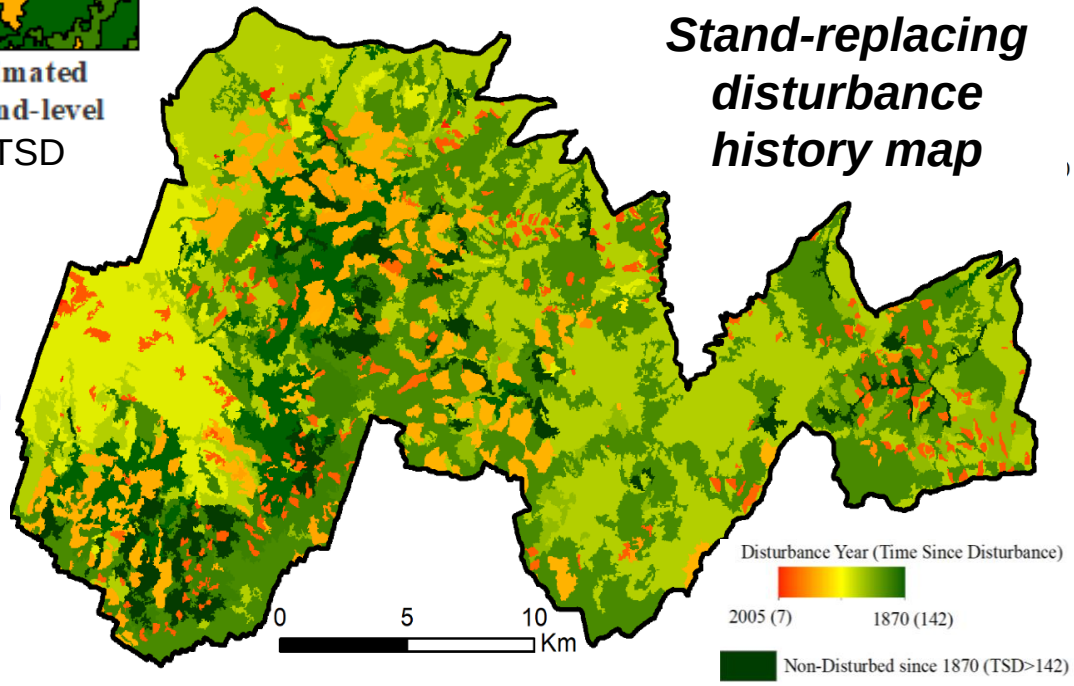
**Background**: Maps of Time Since the last stand-replacing Disturbance (TSD) are valued for ecosystem modelling. While satellite data are mainly used to map disturbances that have occurred since the beginning of the satellite record (in 1972), disturbances legacies persist for decades to centuries as distinct horizontal and vertical forest structure features. Hence, we propose to reconstruct the disturbance history of a forest through stand-level analysis of airborne LiDAR data, which are highly sensitive to the three-dimensional forest canopy structure.




Reference data of stand-replacing disturbances; TSD estimated at the cell-level, and at the stand-level.

**Analysis**: Cell-level TSD is estimated using airborne LiDAR metrics as predictors in Random Forest; stand-level TSD is then calculated from the cells enclosed within the forest stand perimeters. Reference data for a period of **142 years** were available for training and validating the workflow.

***Stand-replacing disturbance history map***




**Results:** The root mean square difference (RMSD) between predicted and reference TSD was 17.5 years, BIAS was 0.8 years; and on 72.8% of the stands predicted TSD was less than 10 years apart from the reference.

**Significance:** Airborne LiDAR data have enough explanatory power to reconstruct the long-term stand-replacing disturbance history of temperate forested areas at regional and decadal scales.