**Temporal dynamics and forest succession: national annual mapping of tree species in Canada using Landsat time series from 1984 to 2022.**

Mapping tree species and changes in species distribution over time allows monitoring of successional processes and linking species distributions to regional, climatic, and disturbance processes. This knowledge is important for understanding the impacts of climate change and forest disturbance on tree species distributions and successional processes. Landsat satellites provide medium spatial resolution imagery suitable for mapping tree species over large areas and long periods of time. We used time-series Landsat imagery to produce annual maps of dominant tree species from 1984 to 2022 at 30-m spatial resolution for the 650 Mha of Canada’s forested ecosystems. Landsat imagery and related spectral indices, geographic and climate data, and elevation derivatives are used as predictor variables trained with calibration samples from the Canadian National Forest Inventory (NFI) using a Random Forests machine learning algorithm. Based on prior knowledge of tree species distributions, classification models were implemented on a regional basis so that only those tree species expected in a given mapping region were modeled using local calibration samples. Modeling resulted in class membership probability values for each regionally relevant tree species for all treed pixels, as well as an attribution confidence indicator derived from the distance in feature space between the two leading classes. Preliminary annual results were informed by disturbance events to ensure the temporal consistency of tree species transitions in the time-series maps. The results of this study highlight the overall stability of tree species composition in Canada’s forested ecosystems over the past nearly four decades, as well as the short-term dynamism of areas affected by disturbance events. The majority of Canada’s forests were undisturbed during the study period, and therefore these areas may be composed of climax species or in advanced successional stages. Following stand-replacing disturbances, time is required for tree establishment and for young forests to transition to other species as part of successional processes. This temporal and spatial complexity underscores the importance of continuous monitoring of tree species. Annual wall-to-wall maps of tree species distribution from time series of remotely sensed data allow these trends to be mapped and represented, providing insight into the effects of environmental change on tree species composition, which is key to informing conservation and management policies.