Two decades of post-disturbance land cover changes in Arctic and boreal ecosystems of North America

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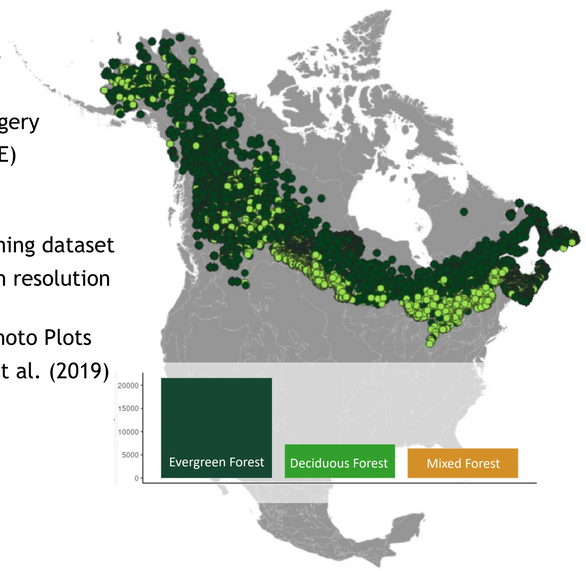
Introduction

Arctic and boreal ecosystems are experiencing the most rapid and pronounced climate change on the planet. Disturbance processes such as fire are pivotal agents that shape how climate change is affecting vegetation dynamics at high latitudes. Recent studies have suggested that intensification of disturbance regimes is driving systematic changes in the distribution and abundance of key plant functional types; for example, some models project that early successional deciduous forests will expand at high latitudes due to more favorable climate conditions and more frequent disturbance events. Despite the rapid rates of change and importance of Arctic and boreal ecosystems in the global climate system, our ability to characterize and quantify trends in high latitude land cover and vegetation composition is incomplete. To address this, we used the GLobal Land Cover and Estimation (GLanCE, https://sites.bu.edu/measures/) product, which provides annual land cover data from satellite remote sensing data, to quantify land cover changes, especially evergreen, deciduous and mixed forests, at medium spatial resolution (30 m) from 2001 to 2019 across all of Arctic and boreal Canada and Alaska (roughly 1.2×10^7 km^2).

Data / Study Region

- Study Region
  - Arctic and boreal Alaska and Canada
- Data
  - Landsat 4, 5, 7, & 8 Collection 2 imagery
  - Global Land Cover Estimation (GLanCE) project Level 1 Land Cover product
- Land Cover & Plant Functional Type Training dataset
  - Manually interpreted points using high resolution imagery
  - Canadian National Forest Inventory Photo Plots
  - Land cover training data from Wang et al. (2019)
  - 33,000+ total points
- Fire history
  - Alaskan Large Fire Database
  - Canadian Fire Database



Citation:
Wang, J.A., D. Sulla-Menashe, C.E. Woodcock, O. Sonnentag, R.F. Keeling, and M.A. Friedl. 2019. ABoVE: Landsat-derived Annual Dominant Land Cover Across ABoVE Core Domain, 1984-2014. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1691

Results

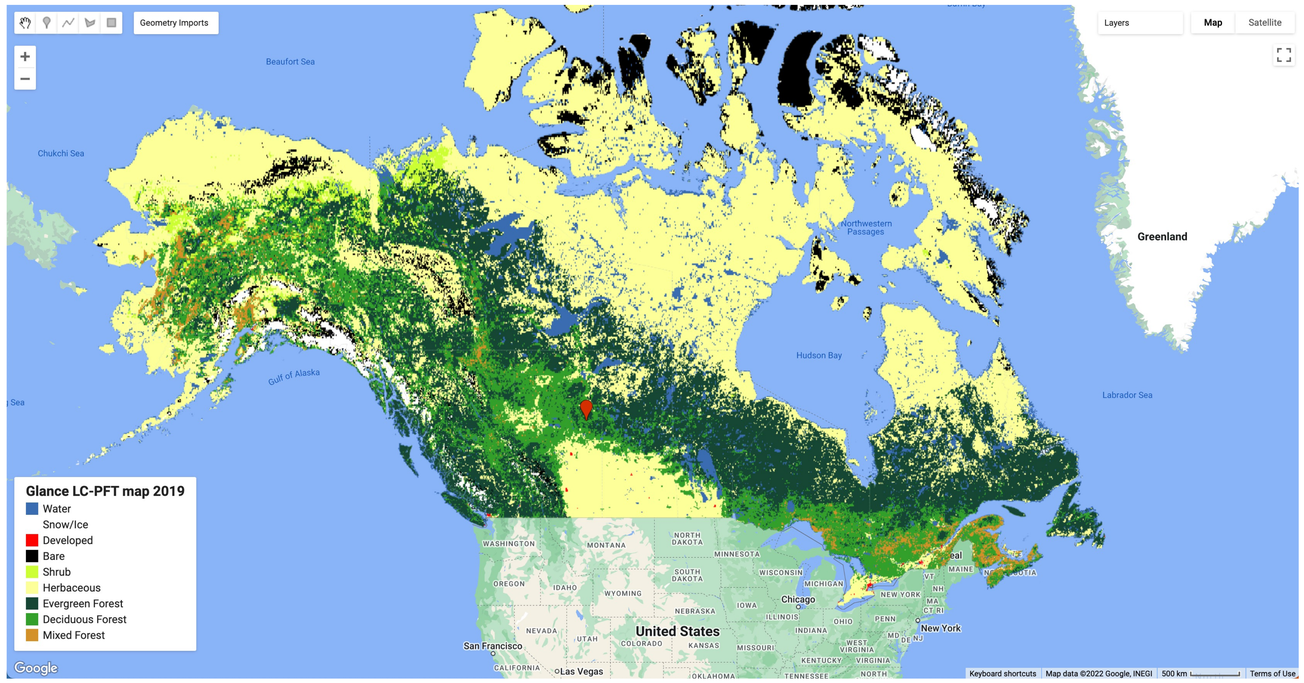


Figure 1. Initial land Cover map results for Alaska and Canada in 2019 in Google Earth Engine. Figure 3 shows a zoom in and time series of land cover change for the area in the red box above.

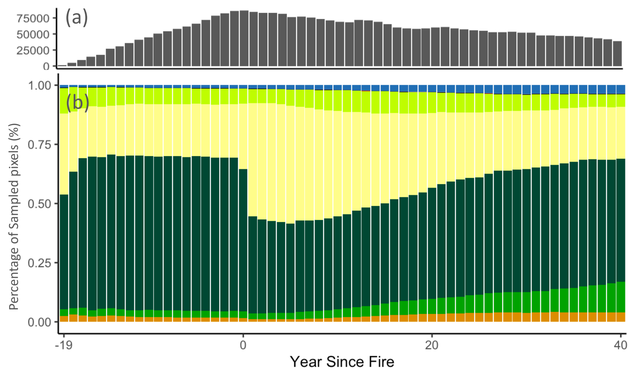


Figure 2. (a) Histogram showing the number (out of 255,000 randomly sampled pixels located within fire polygons through time. (b) Land cover distribution from 2001 to 2019 before and after wildfire events. Legend shown in Figure 3.

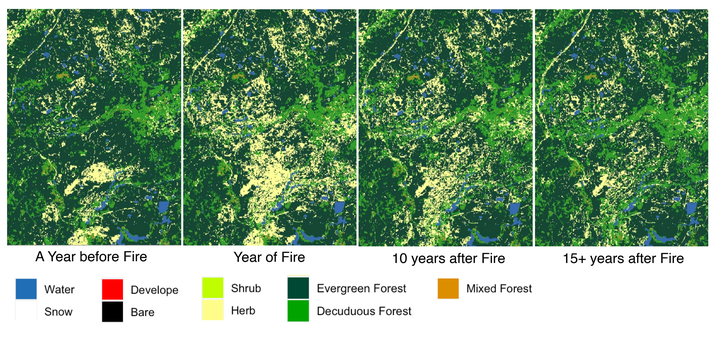


Figure 3. Sample results showing sequence of land cover transitions before and after a wildfire event in 2002 for the location identified in Figure 1.

Acknowledgements

- The work was supported by NASA grant number 80NSSC18K0994. We gratefully acknowledge the work of the GLanCE team at Boston University, whose efforts made this work possible.