Hypotheses

Analyses of Boreal Forest Normalized Difference Vegetation Index (NDVI) over the last 3 decades have indicated widespread canopy decline or “browning”. We compared the broadening trends in central Canada reported in the 8-km GIMMS3g NDVI dataset with those calculated from the 30-m Landsat record to address three hypotheses:

Hypothesis 1 The GIMMS3g NDVI broadening trend is robust and consistent with independent satellite records such as Landsat; the widespread boreal forest broadening trend cannot be explained as an artifact of the GIMMS record or by a “natural” pattern such as wildfire occurrence and recovery.

Hypothesis 2 NDVI broadening is occurring across the boreal landscape regardless of stand age.

Hypothesis 3 The rate, patterns and mean trajectory of boreal forest succession have remained constant over the last 30 years.

Approach

Focus on 800 km boreal forest transect through northern Saskatchewan and Manitoba. The eastern 150 km overlaps with the BOREAS NSA, a data rich area with many datasets from BOREAS and follow-on projects. Central Canada has good historical Landsat coverage. The transect samples a range of GIMMSS3g AVHRR NDVI trends.


ROIs for individual burn scars in Manitoba’s BOREAS NSA identified and checked using spring and summer MSS, TM and ETM+ images. NDVI, NBR and TIR deviation chronosequences compared as a function of observation year.

NDVI trends in northern Saskatchewan and Manitoba over the last 30 years

Key Findings and Future Directions

The Landsat boreal forest browning/greening trends are broadly similar to those seen in GIMMSS3g across SK and MB. Much of the browning/greening reflects recent fires, with apparent greening in ~1975-1995 burns and browning in post ~2000 burns (Fig. 2,3,4).

Not much evidence of browning after accounting for stand age, though larger sample size is needed. The rate, patterns and mean trajectory of boreal forest succession appear to have remained constant over the last 30 years (Fig. 5,6,7).

Key next steps: investigate and understand sensitivity to method used to calculate trends; improve understanding of fire history and increase sample size for chronosequence analysis; explore patterns of trends across landscape and possible effects of topographic position; explore possible decadal oscillation; better link Landsat signals to surface biogeochemical and ecological properties.