

Curtis Woodcock, PI



Active Monitoring of Disturbance, Seasonality & Greenness for ABOVE from Landsat

Project code (e.g. Woodcock-02)

Mark Friedl, Co-investigator

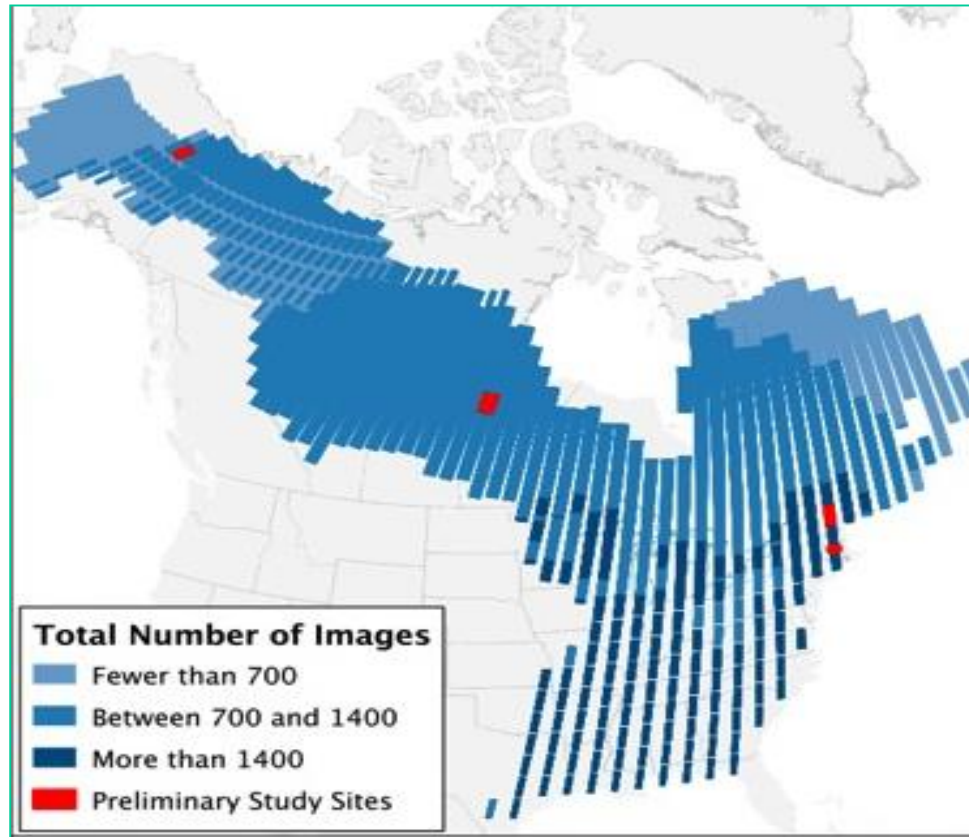
Motivation

Boreal & arctic ecosystems are highly dynamic, heterogeneous, and are changing rapidly in response to climate change.

Understanding these changes requires information at spatial scales that are ecologically meaningful, and historical information that provides context for evaluating changes relative to historical variability.

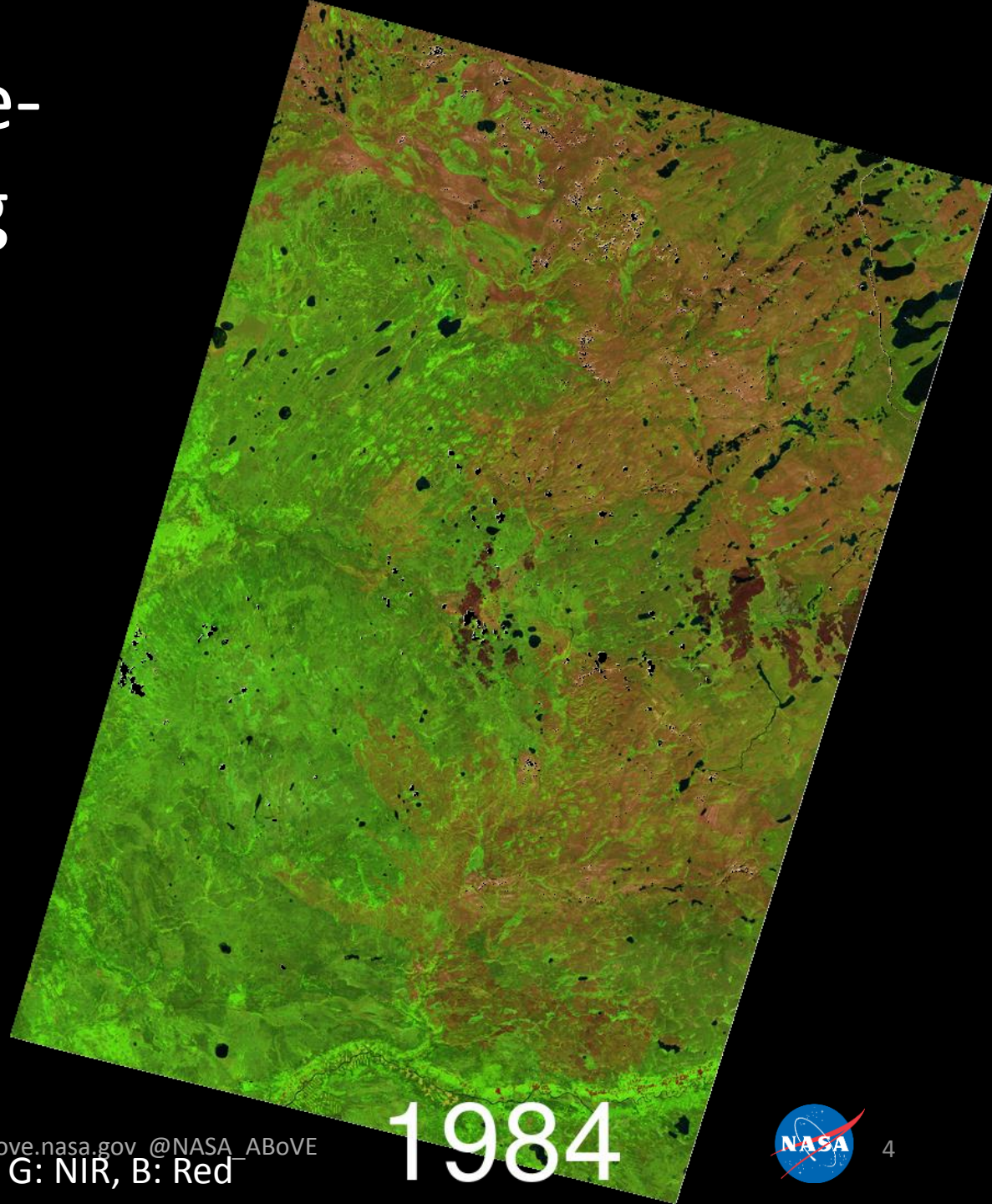
Landsat, which provides an archive of 30+ years and an ongoing record of well-calibrated multispectral observations at 30 meter spatial resolution is ideally suited for this purpose.

Landsat Archive Density

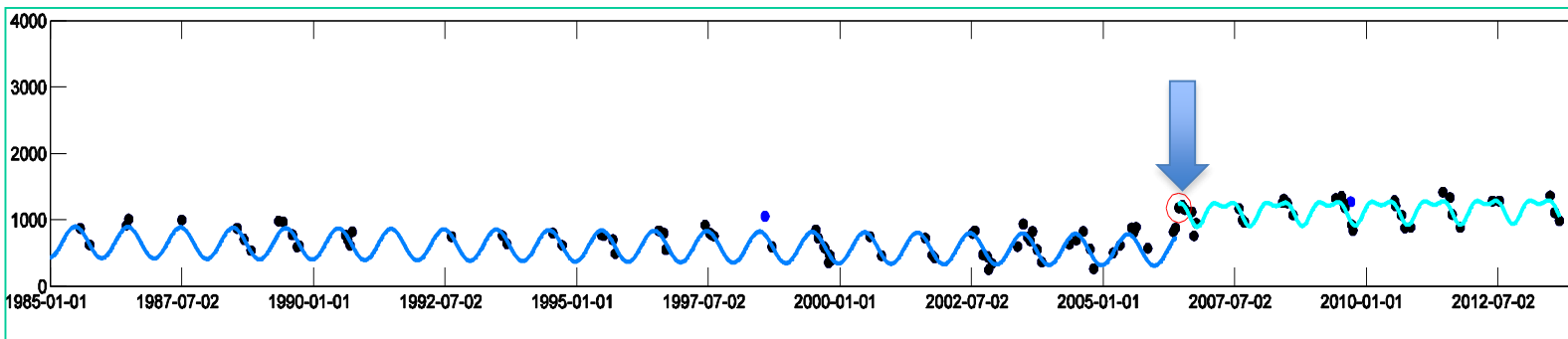
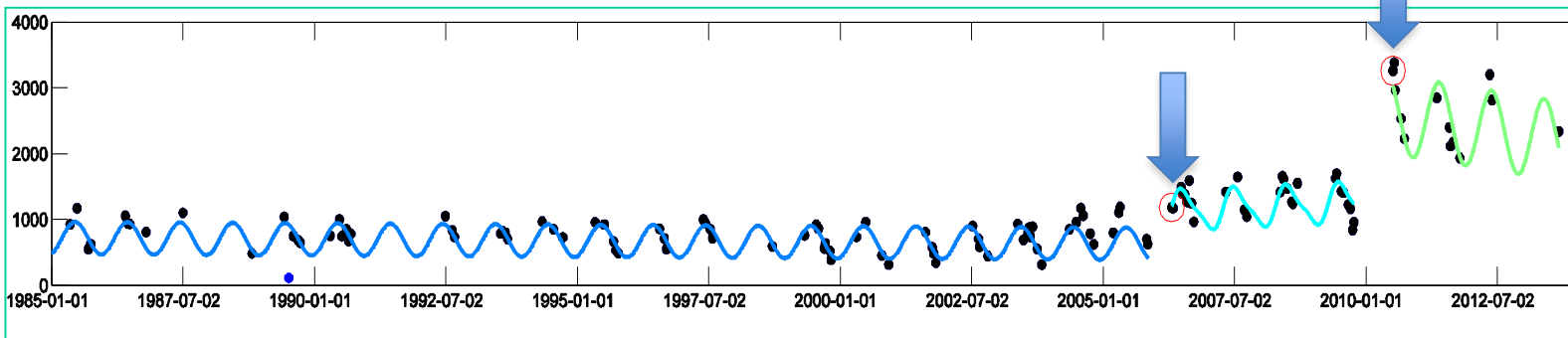
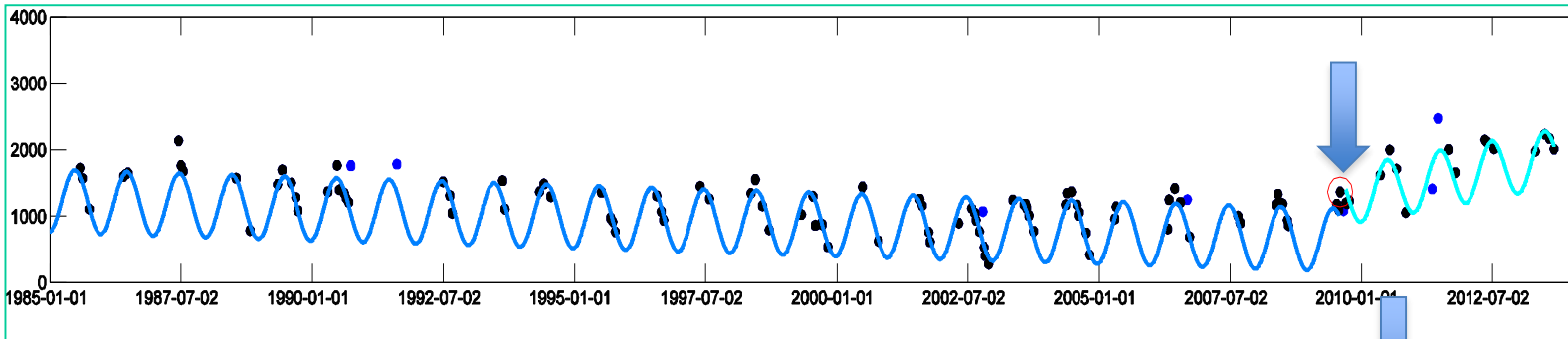


Landsat Pre-Processing

1. Atmospheric correction
 - LEDAPS
2. Cloud screening (FMASK)
 - Including cloud shadows
 - Snow
 - Water
 - Smoke, haze still a challenge



Landsat Time Series, British Columbia



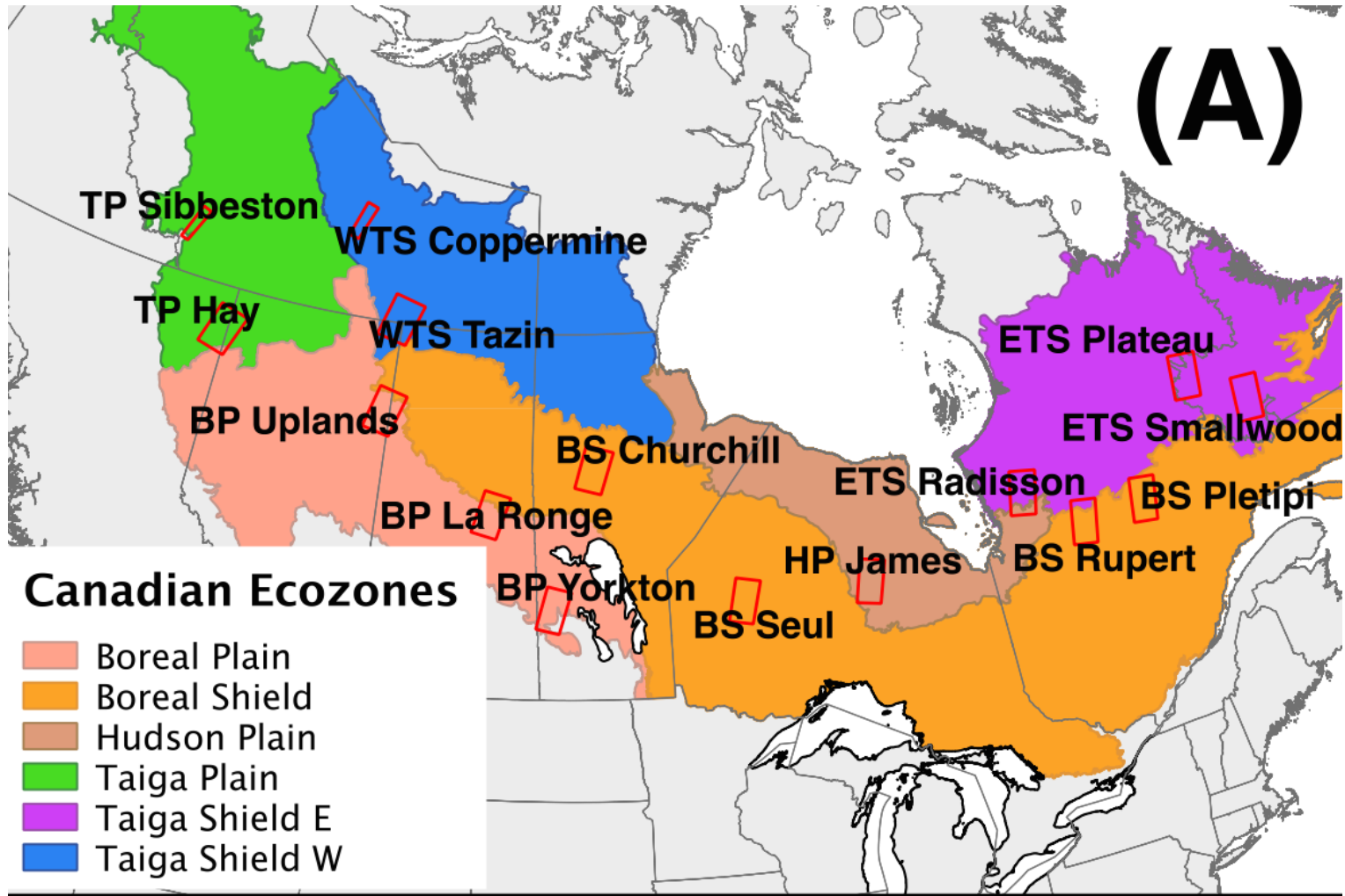
Science Questions

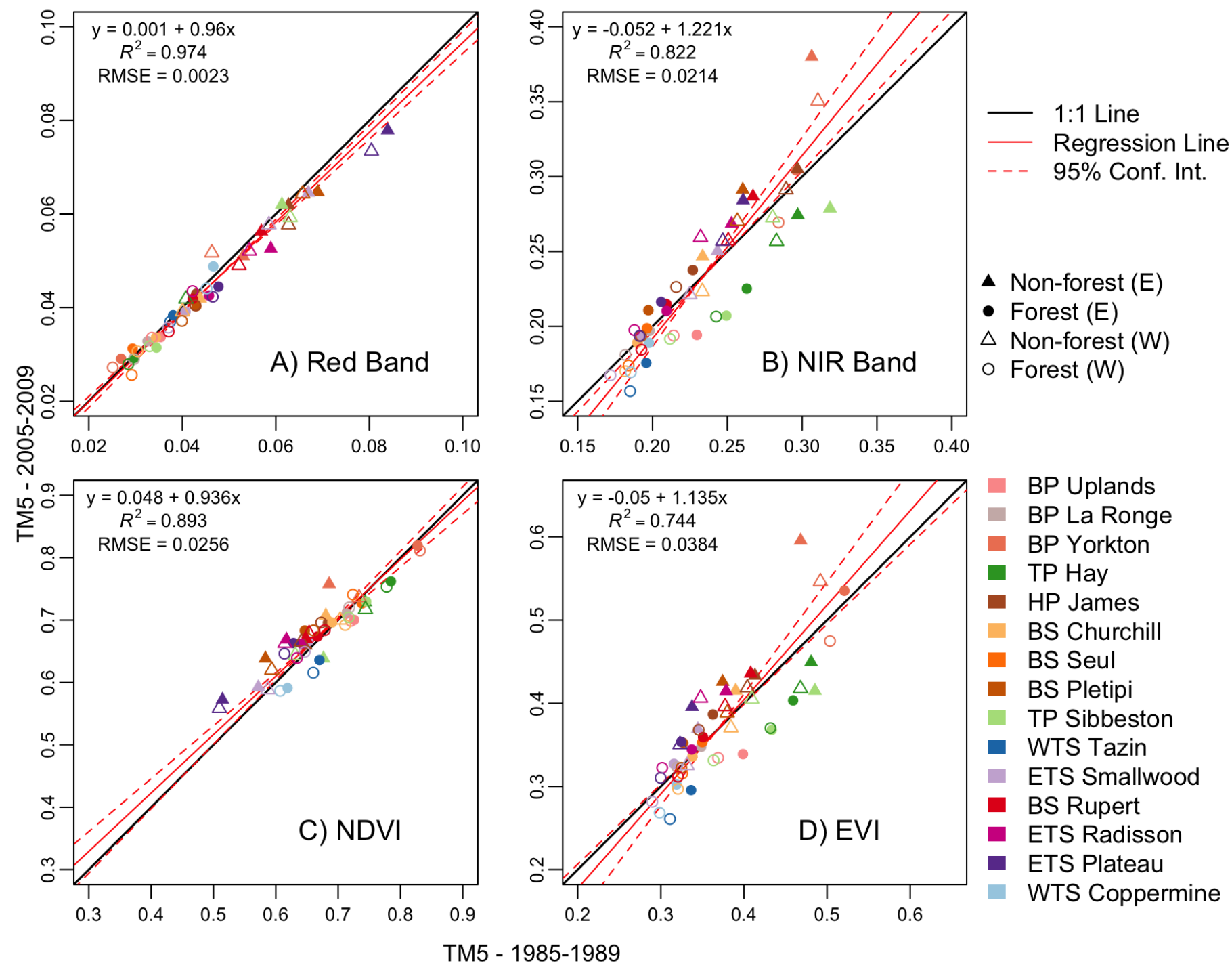
- Tier 2 Science Questions addressed:
 - “How are flora and fauna responding to changes in biotic and abiotic conditions, and what are the impacts on ecosystem structure and function?”
 - “What processes are contributing to changes in disturbance regimes and what are the impacts of these changes?”
 - “Determine the causes of greening and browning trends and their impacts on ecosystem form and function?”

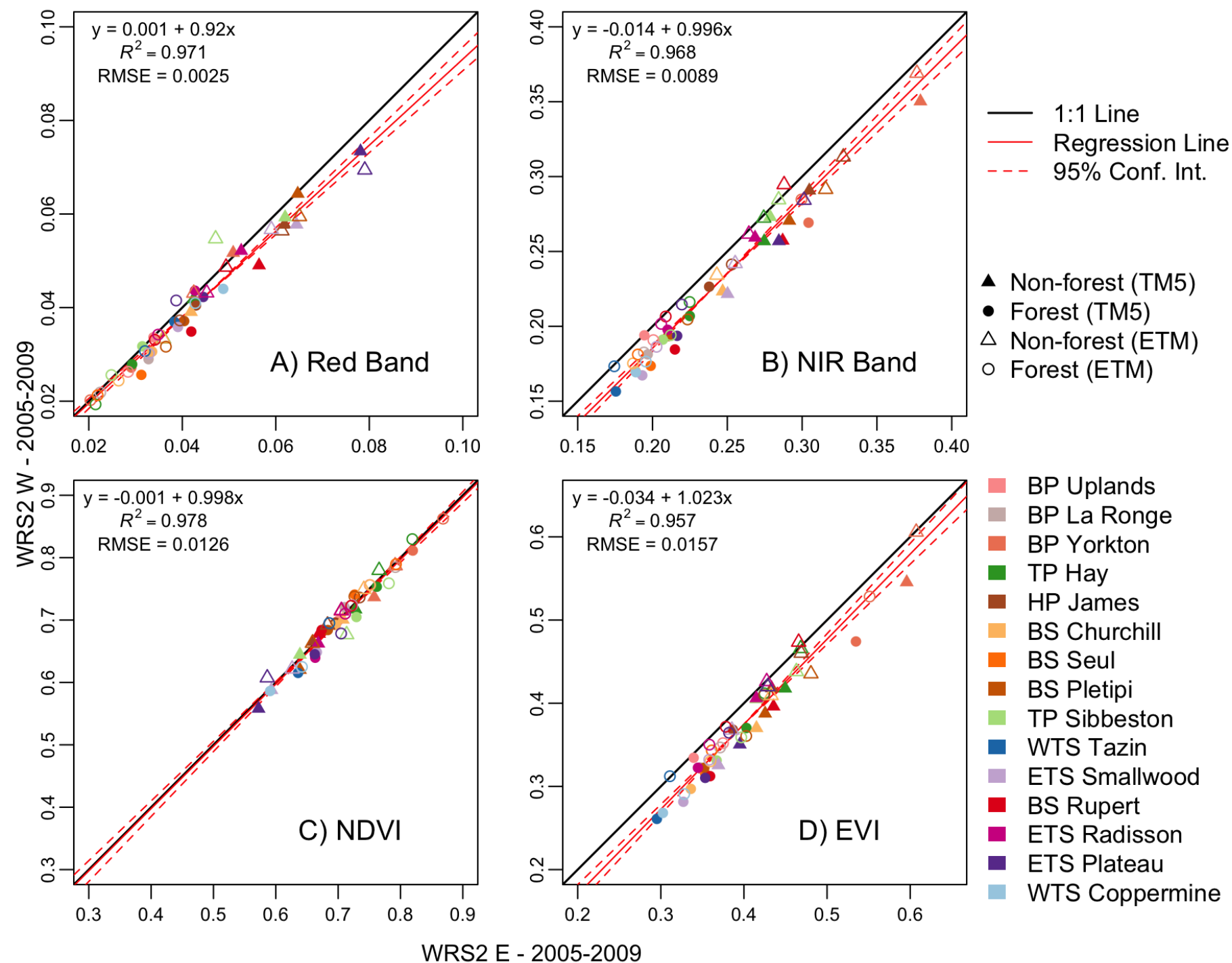
Science Objectives

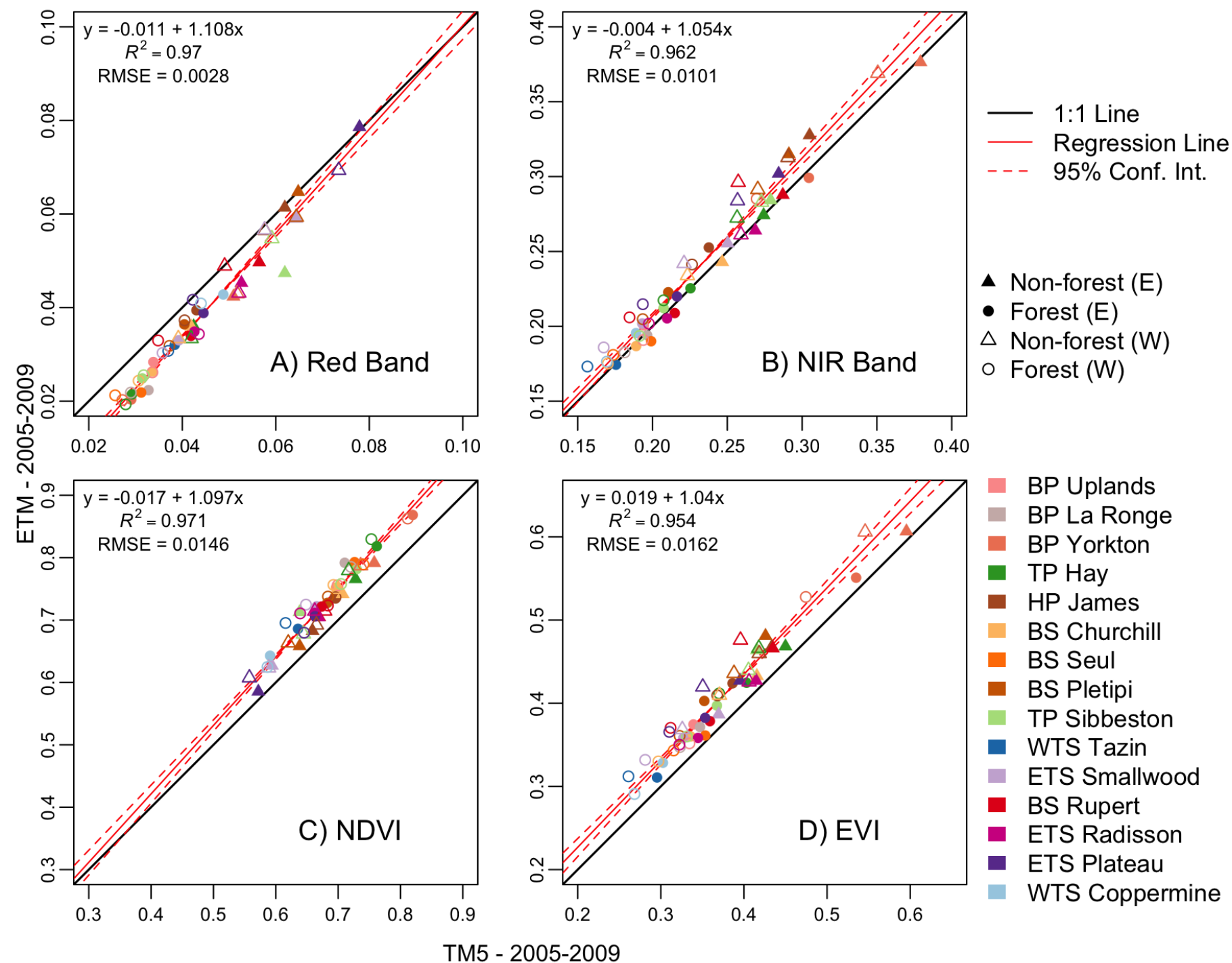
- Tier 2 Science Objectives: Ecosystem Dynamics
 - 3-Decade history, ongoing monitoring of
 - Disturbance & land cover change events
 - Patterns in “greening” and “browning”
 - Changes in growing season
 - For the ABoVE Domain
 - At Landsat spatial resolution

Greening/Browning - Preliminary Work

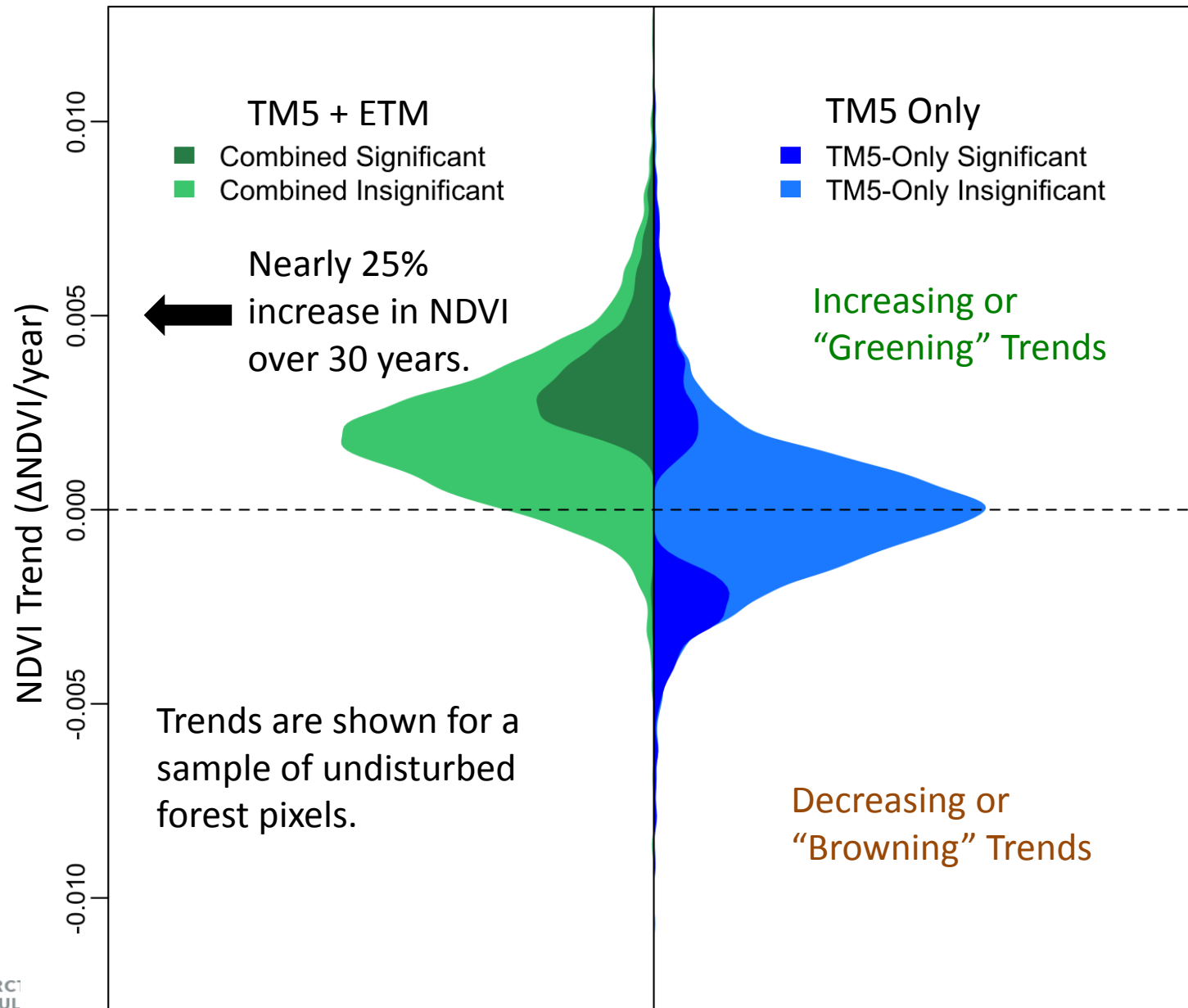




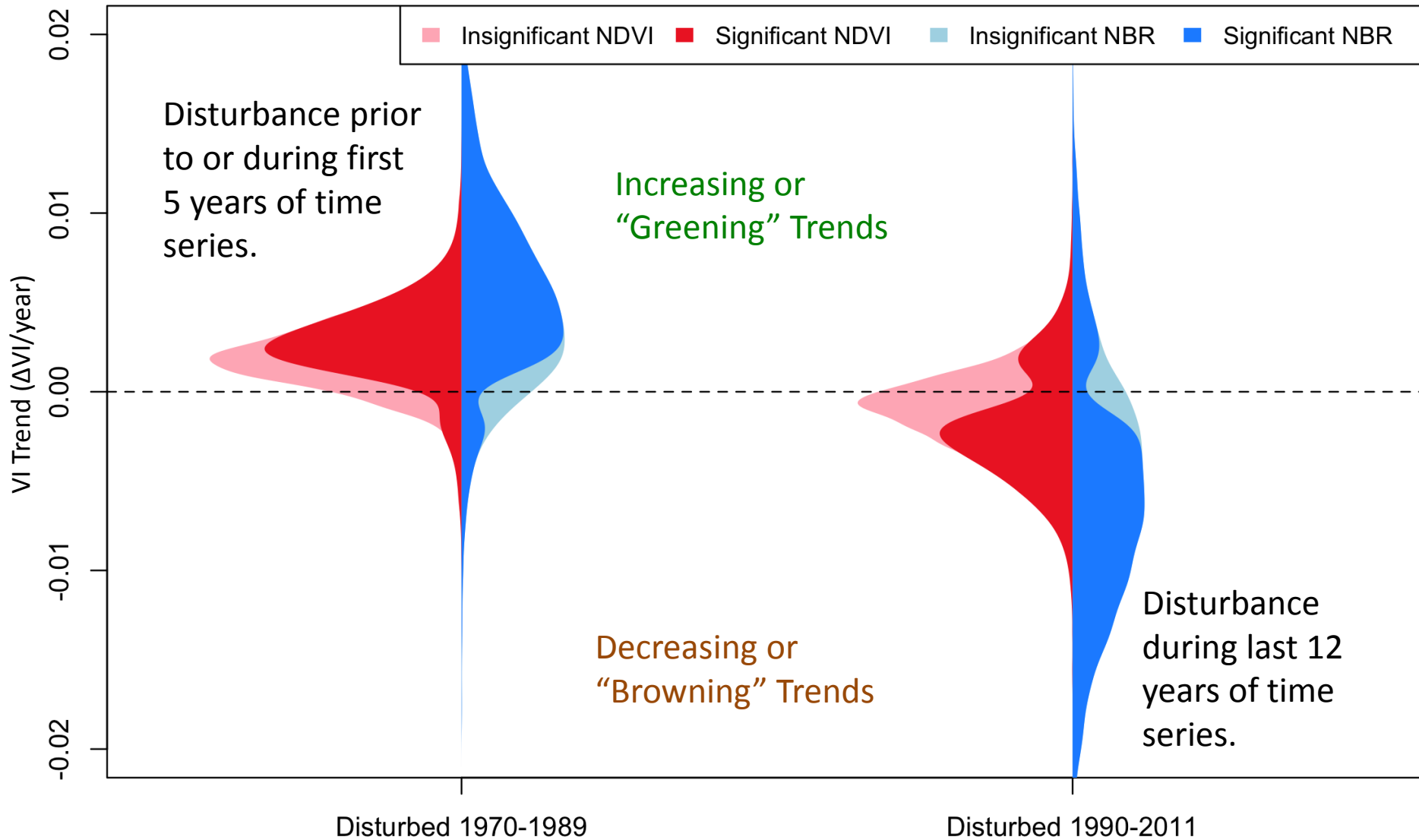




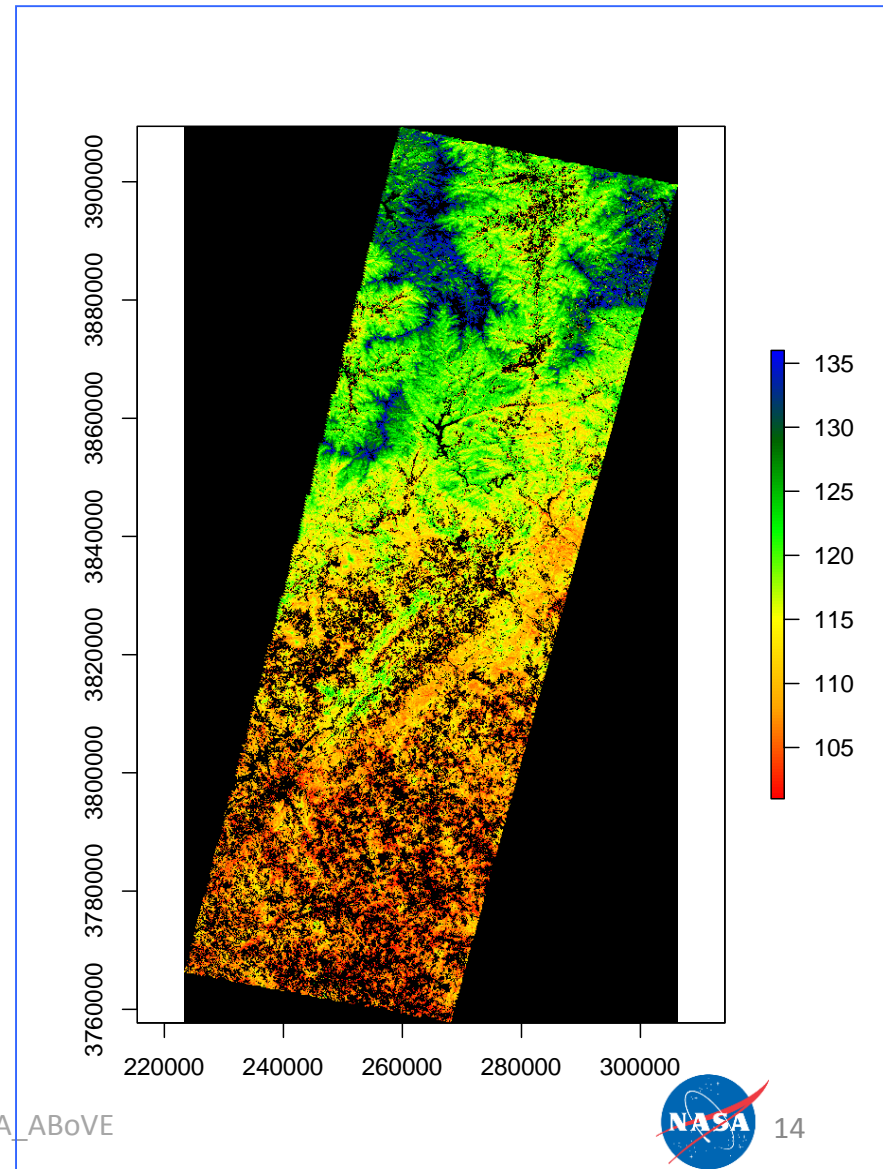
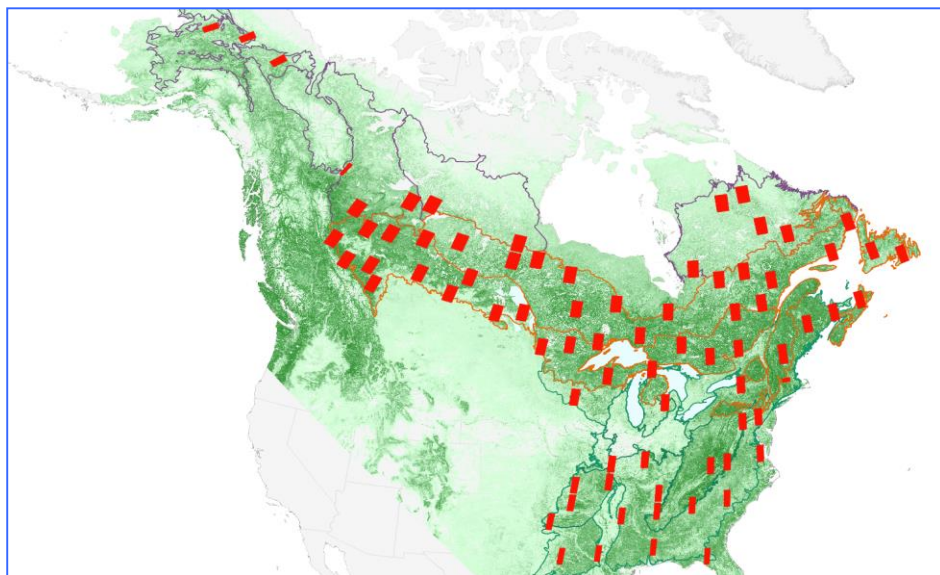
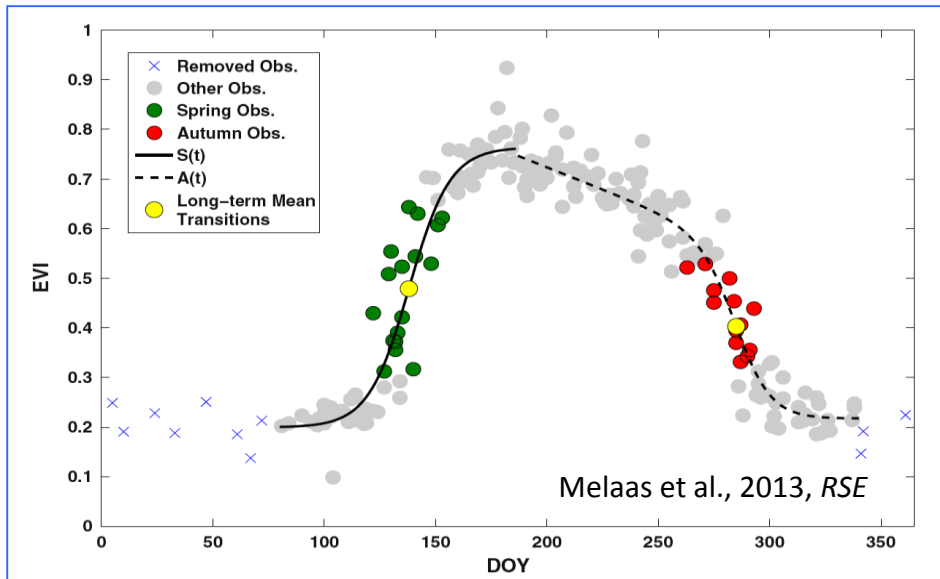
Results: Effects of Red Band Bias



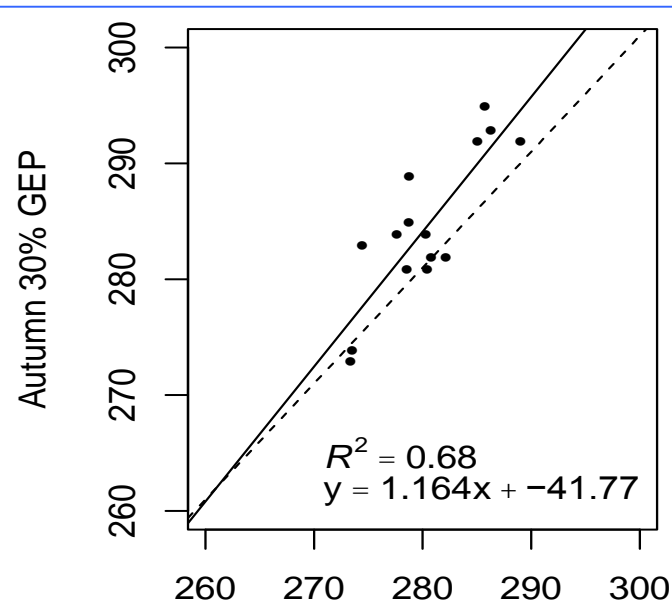
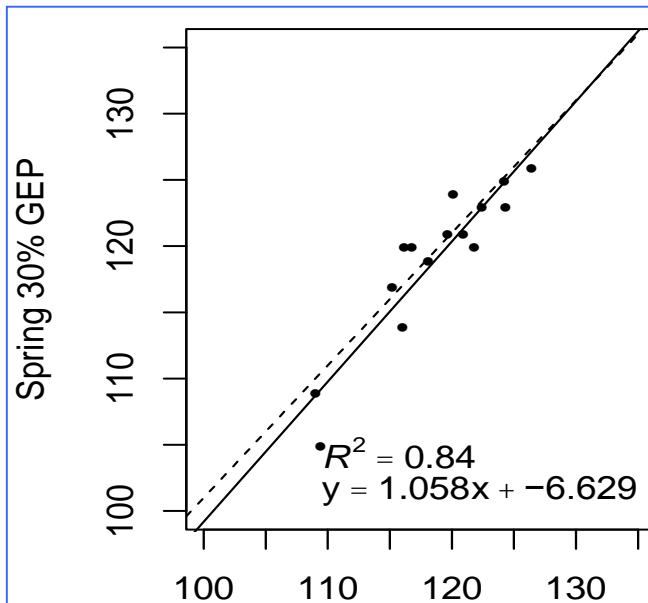
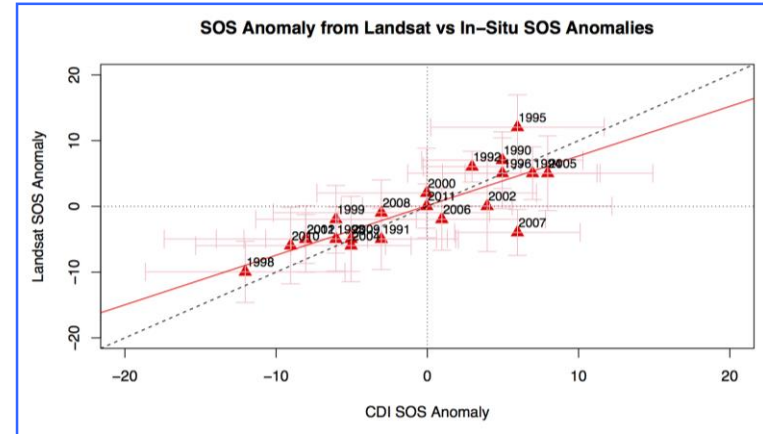
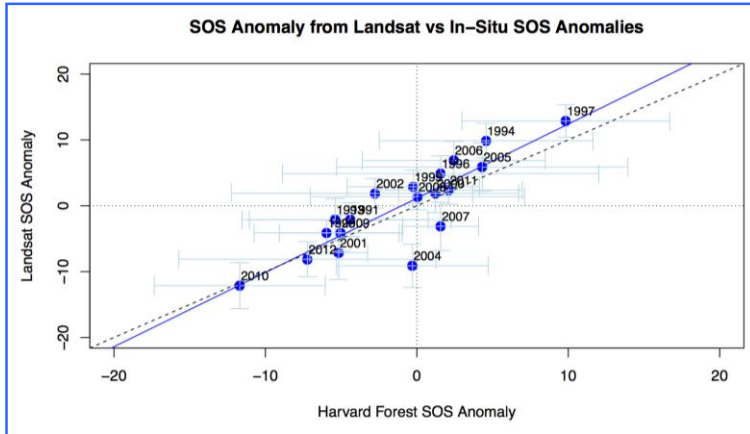
Results: Disturbance



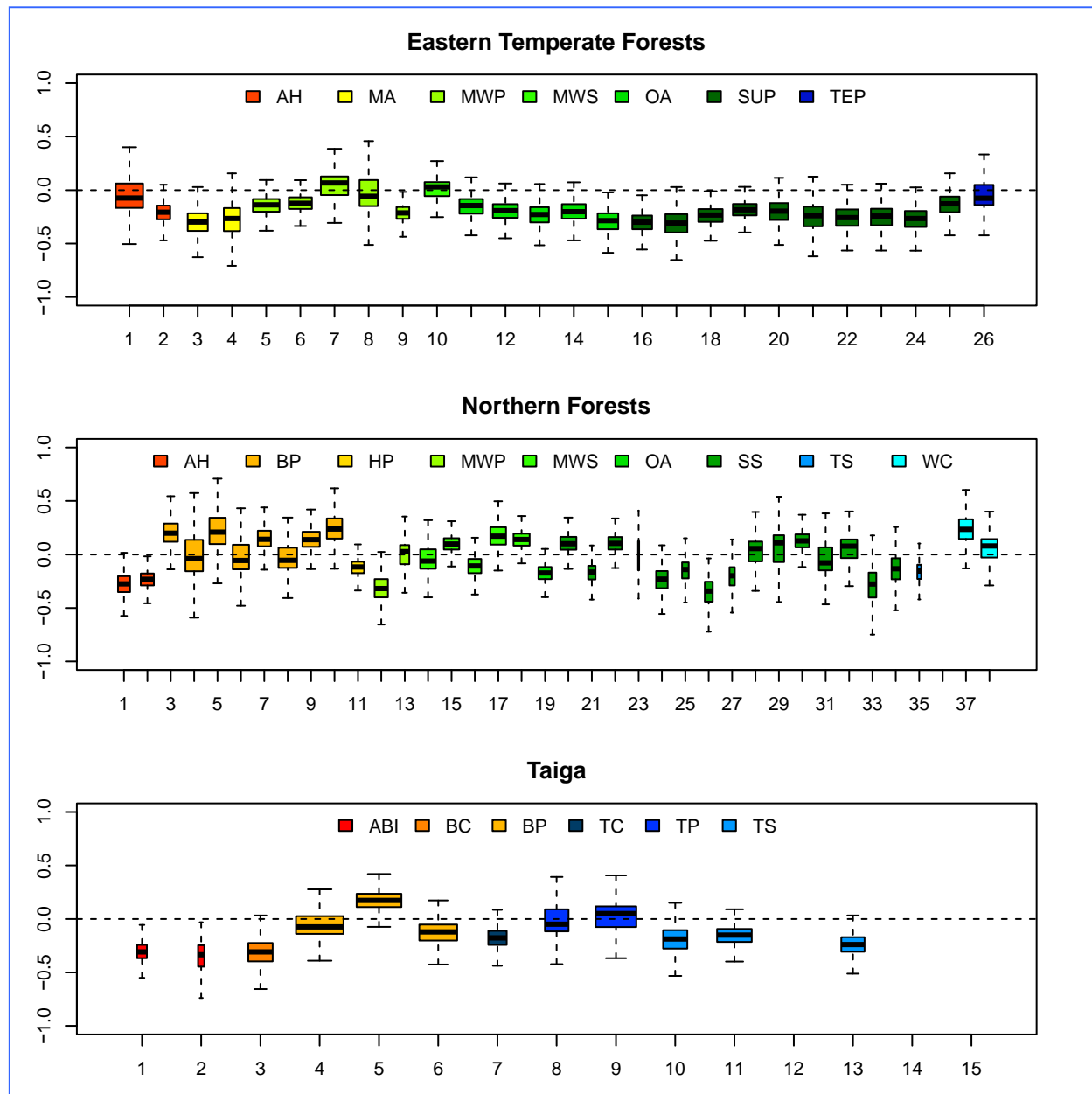
Prelim Work: Growing Season Length



Algorithm Assessment

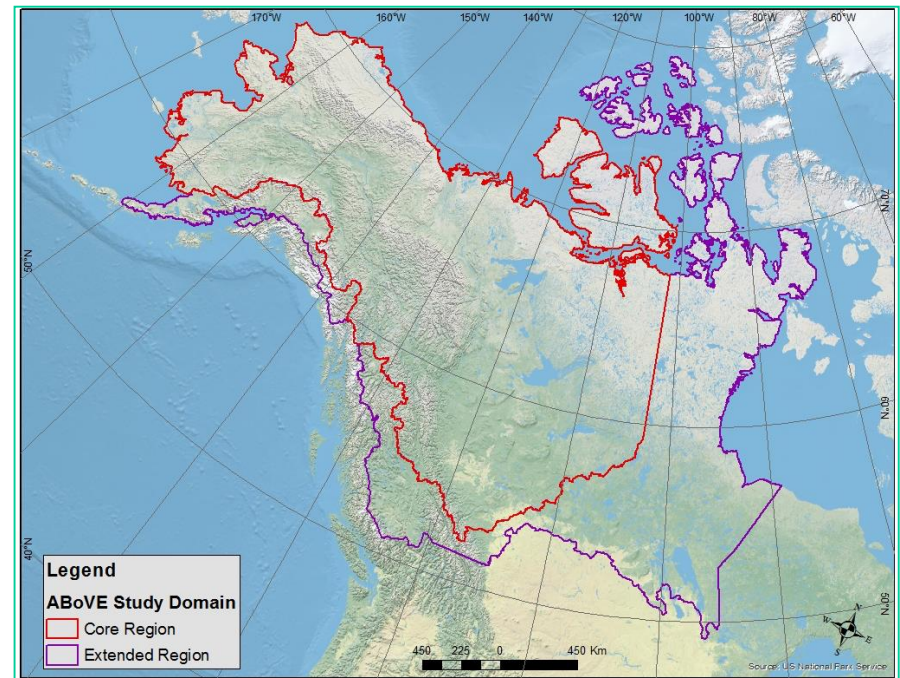


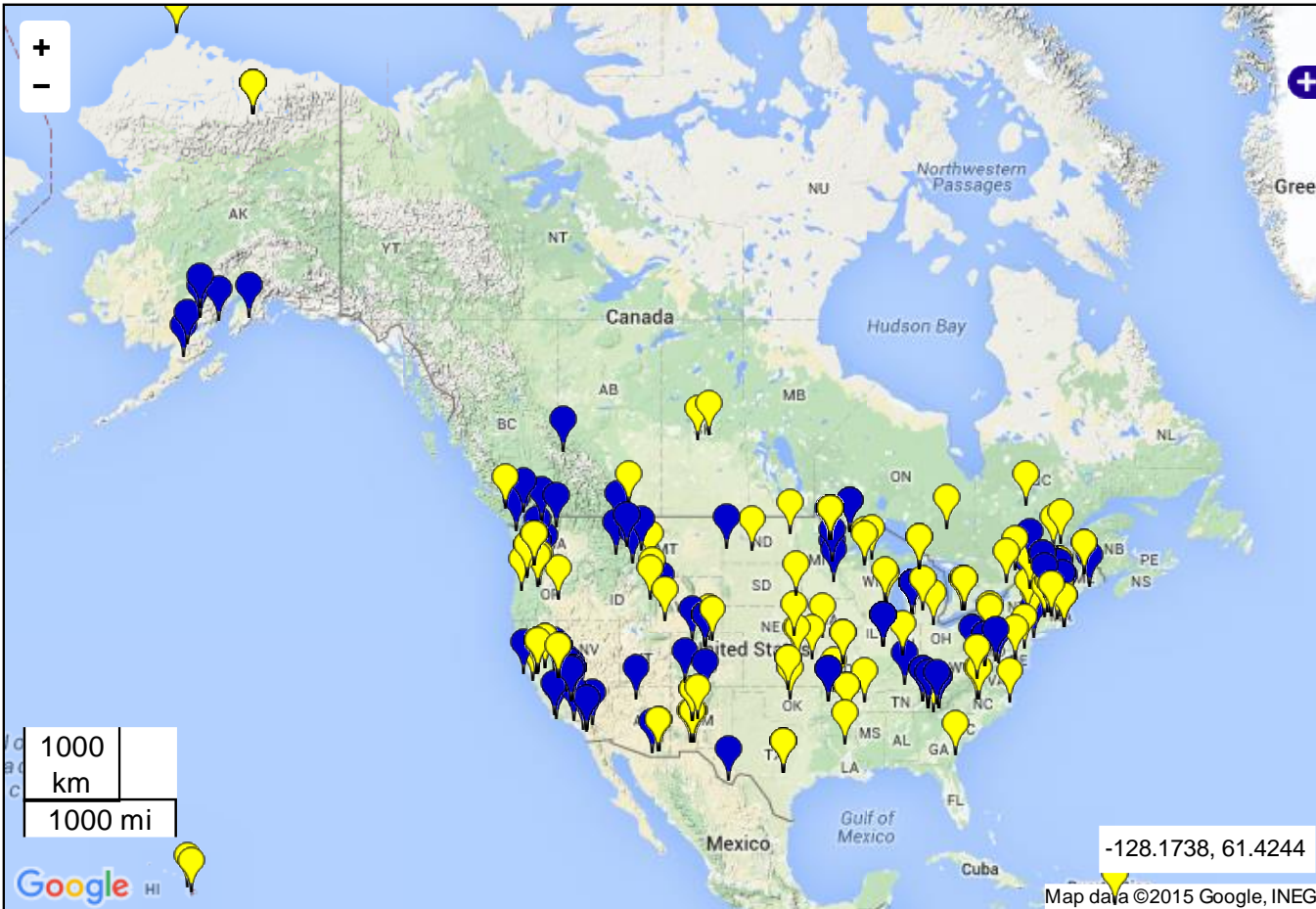
Trends in SOS Stratified by Site and Ecoregion



Field Studies – ABoVE Domain

Ultimate Goal is to provide wall-to-wall for ABoVE Domain
Short term goal: focus on (1) Landsat sidelap locations, (2)
priority sites for ABoVE Team





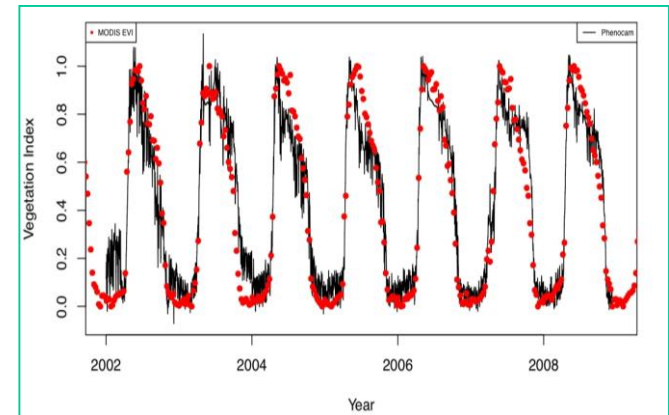
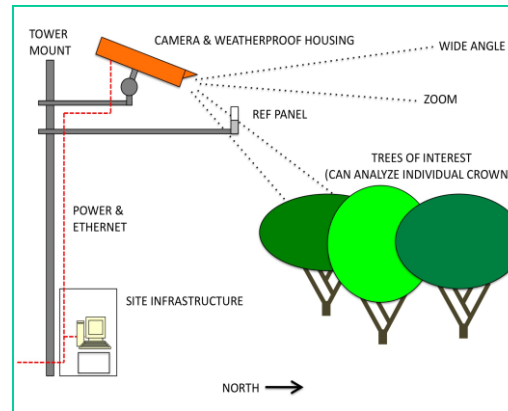
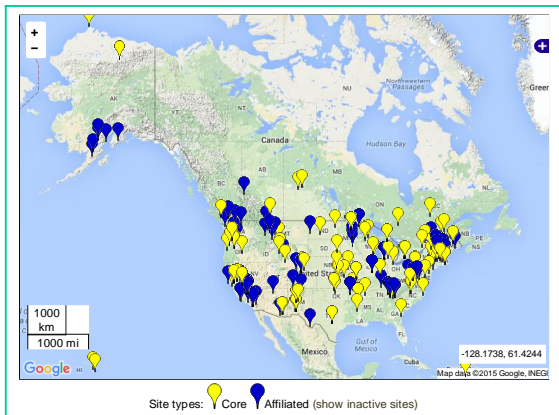
Site types:  Core  Affiliated (show inactive sites)

Spaceborne Remote Sensing

- Satellite sensing assets to be used:
 - ***Landsat 4, 5, 7, 8***
 - MODIS for cross comparisons, maybe upscaling or gap-filling
 - Sentinel 2, depending on data availability

Airborne Remote Sensing

- Existing airborne remote assets to be used
 - As available
 - Opportunistically for product assessment
- Also (not airborne): PhenoCam
 - <http://phenocam.sr.unh.edu/webcam/>



Geospatial Data Products

- Products:
 - Gridded, annual time series of SOS, EOS, “peak greenness”, land cover, disturbance and land cover change
- Geographic coverage:
 - Long term goal: ABoVE domain, wall-to-wall
 - Initial focus on sidelap
- Data formats, grids, and projections
 - GeoTIFF, Landsat WRS, 30-m UTM
- Temporal range: 1984-present; better density after 2000
- Stakeholder / user base: ABoVE science community