Assessing canopy and understory in Loblolly plantations with Google Earth Engine

CAFS.21.87

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7 June 2022

Remote Sensing Can Inform Forestry Decisions

- Need for an **Accurate, Flexible, Accessible** tools to assess canopy and understory
- Current approaches pose barriers to forest practitioners
- Canopy LAI is critical for stand and sub-stand level management
- Understory LAI is critical for vegetation control decisions

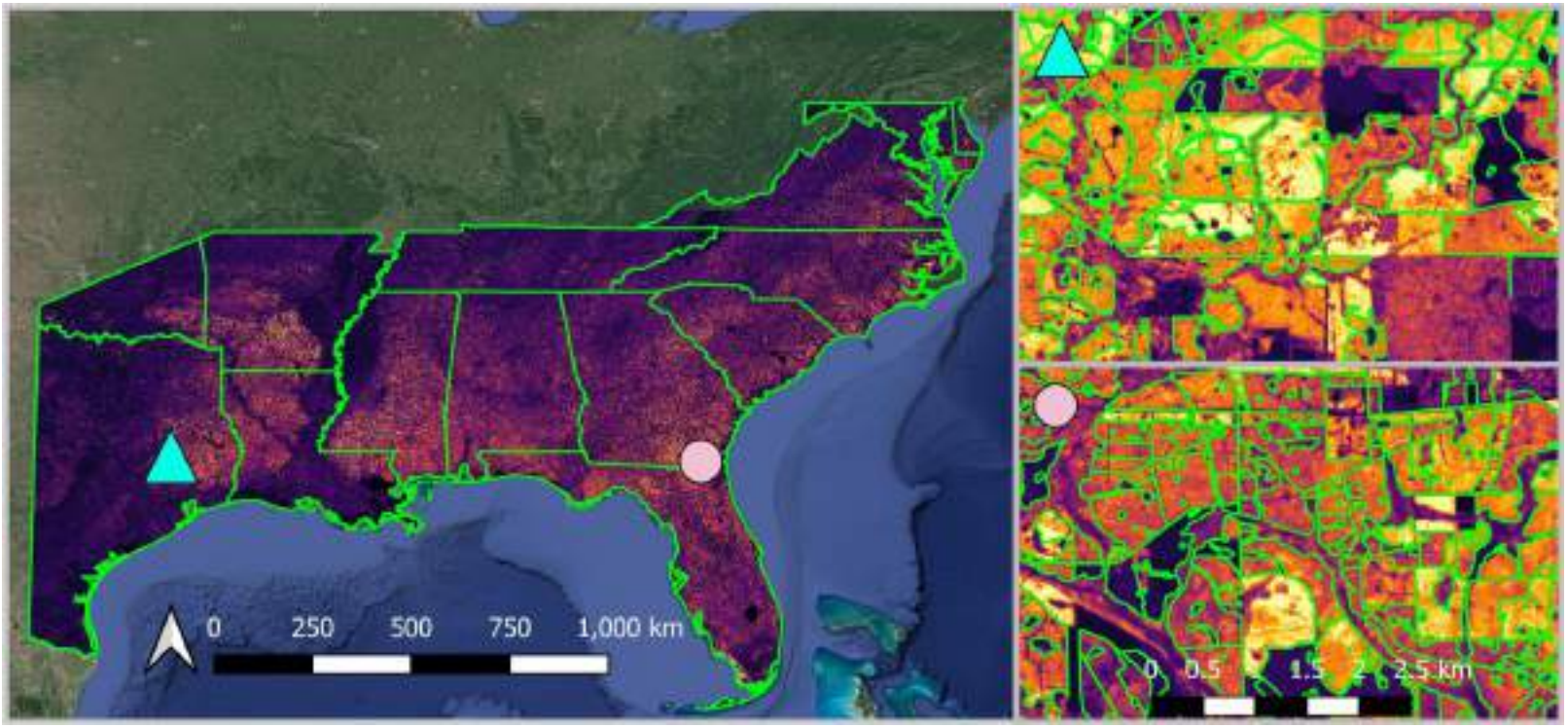
Hypotheses or Objectives

Use satellite data to estimate stand conditions

Leaf Area Index (LAI): Leaf area per ft^2

- Aerial LiDAR, ground surveys time consuming and costly
- Need a method for getting routine, affordable, accessible spatial info on Canopy + Understory status
- LAI can provide key information for timber management
  - Canopy LAI: Future growth potential, fertilizer need
  - Understory LAI: Competition control

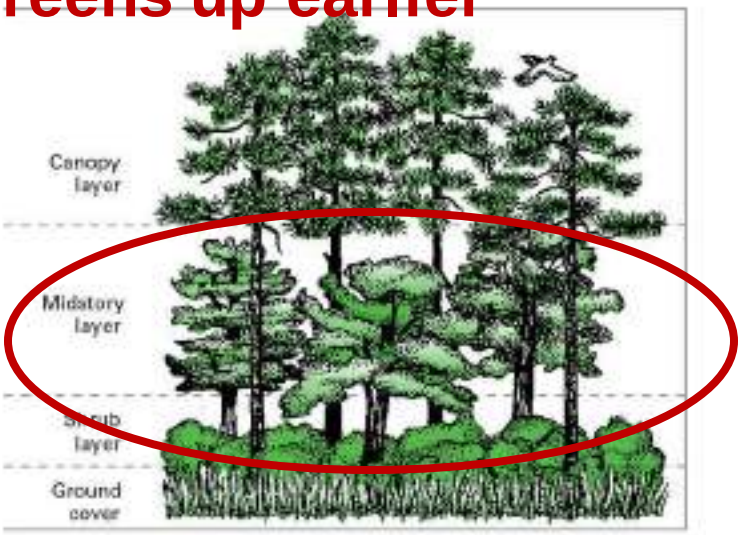
Canopy LAI

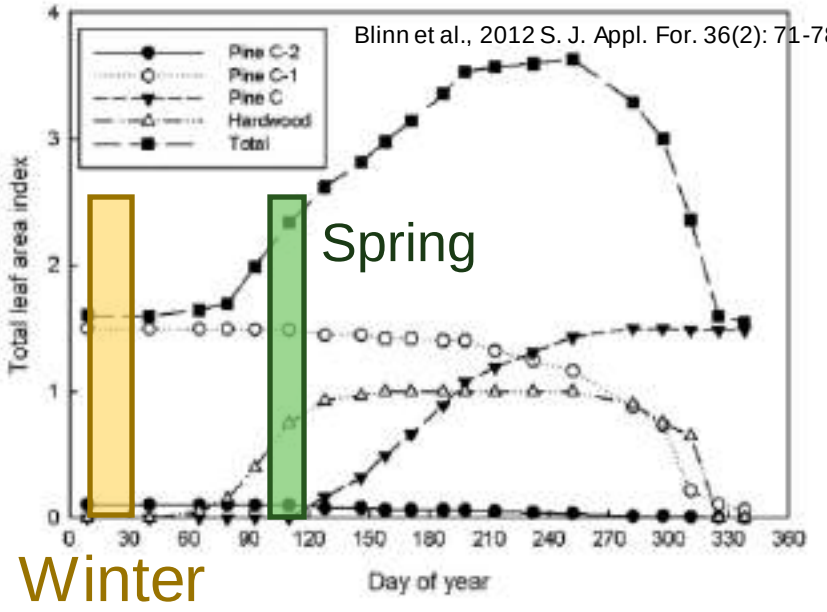


- Google Earth Engine processing: Sentinel-2 based, 20 m entire SEUS, annual 2019-2022

Understory LAI

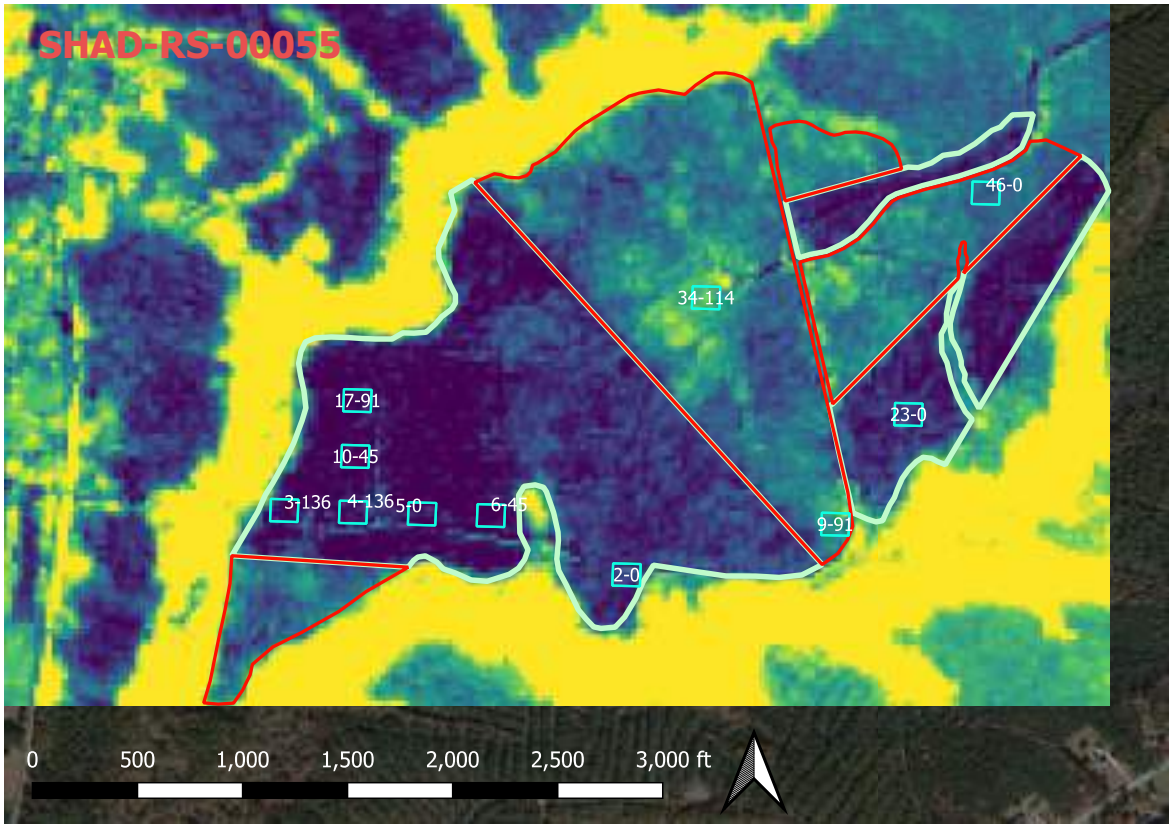
Greens up earlier





Method for Sentinel-2:
Spring greenness – Winter greenness = relative amount of hardwood understory

Major Findings



- Test plots in NC Herb/noHerb
- Used CLAI to set N+P rate
- Leaf-On LiDAR for validation soon
- Possible with complete image archive in GEE → phenology

Deliverables

- Offering all-SEUS CLAI maps to FPC members as part of larger ArcGIS Online dashboard.
- First trials in broad-scale understory retrieval for select FPC collaborating members (June-July 2022)
- CLAI in other systems difficult to develop due to availability of detailed ground data in other forest types
- Understory method looks promising and could be adapted to other systems
  - Ground-truth data extremely scarce!

Summary

- The data archive + computing power available in Google Earth Engine adds exciting new capabilities for continuous routine monitoring of forest stands
- Barriers to entry include coding interface and technicalities of using RS data
  - Possible to write web-app interfaces
- Still possible to adapt these methods to other systems – we just need the research and ground data to make it happen