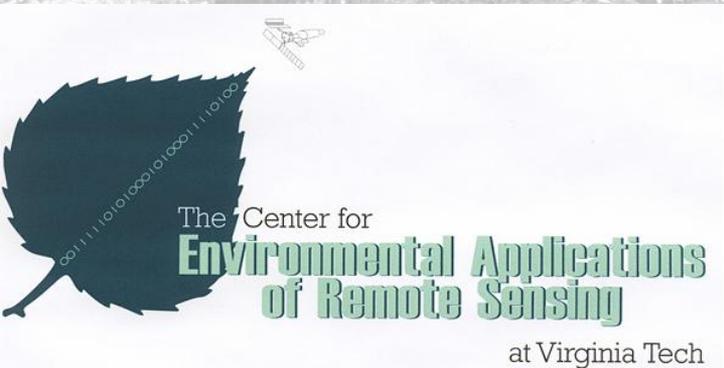


# Forestry Applications of Remote Sensing for LDCM: Focus on US Southeast

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# Key Co-Is

- Chris Potter, NASA Ames
- Xue Liu, GMU
- Jim Ellenwood, USDA Forest Service  
FHTET
- Christine Blinn, Carl Zipper, & John Seiler,  
VPI&SU

# Overall Objective

- R&D in support of increased utilization of Landsat data for forest science and management, with particular focus on US Southeast, including forest industry

# Update Summary

- IGSCR in support of USDA Forest Service FIA Phase I in areas of rapid change (mid-NLCD cycle, indiv. scenes or mid-decadal)
  - Imagine automation complete (Musy et al. 2006; ASPRS Leica paper award)
  - Shared memory parallelization complete and publicly available (Phillips et al. 2007)
  - Parlayed this success into NASA proposal to parallelize LEDAPS surface reflectance protocol (no news yet)

# Update Summary II

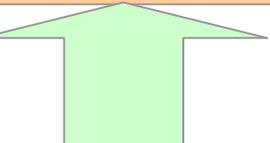
- Remote Sensing for Forest Carbon Management
  - Landsat EVI downscaling prototype complete for first study area, though awaiting comparison with Goddard MODIS ACCESS product stream
  - Region wide CO<sub>2</sub> efflux and LAI acquired at network of monospecific sites with alternative forest management strategies
  - Assessment of VI's empirical relationship with LAI within and across years



# Decision Support for Forest Carbon Management: From Research to Operations

## MODELS

- ESE
  - NASA-CASA
  - GYC
  - PTAEDA 3.1
  - FASTLOB
- USDA Forest Service
  - FORCARB



## ESE MISSIONS

- Aqua
- Terra
- Landsat 7
- ASTER
- Analysis Projects**
  - IGBP-GCTE
  - IGBP-LUCC
  - USDA-FS FIA
  - USDA-FS FHM
- Ancillary Data**
  - SPOT
  - AVHRR NDVI
  - Forest inventory data
  - VEMAP climate data
  - SRTM topographic data

Information Products, Predictions, and Data from NASA ESE Missions:

- MODAGAGG
- MOD 12Q1
- MOD 13
- MOD 15A2
- ETM+ Level 1 WRS
- AST L1B and 07

## DECISION SUPPORT:

### Current DSTs

- **COLE (county-scale)**
- **LobDST (stand-scale)**
  - Growth and yield
  - Product output
  - Financial evaluations
- **CQUEST (1 km pixels)**
  - Ecosystem carbon pools (g C/m<sup>2</sup>)
  - Partitioned NPP (g C/m<sup>2</sup>/yr)
  - NEP (g C/m<sup>2</sup>/yr)

### Linked DSTs and Common Prediction Framework (multiscale)

- Growth
- Yield
- Product output
- Ecosystem carbon pools
- Partitioned NPP
- NEP
- Total C sequestration
- Forecasts and scenarios

## VALUE & BENEFITS

Improve the rate of C sequestration in managed forests

Decrease the cost of forest carbon monitoring and management

Potentially slow the rate of atmospheric CO<sub>2</sub> increase

Enhance forest soil quality

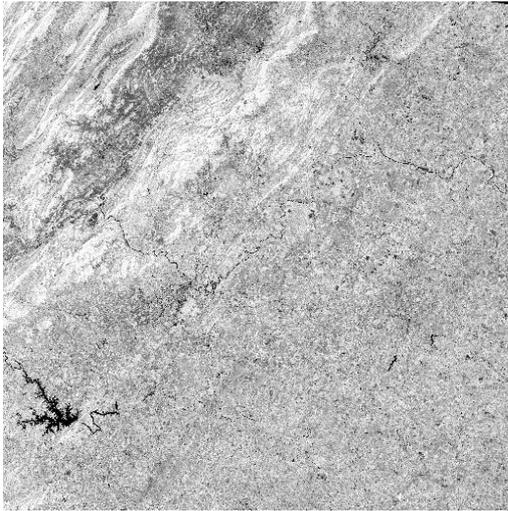
Inputs

Outputs

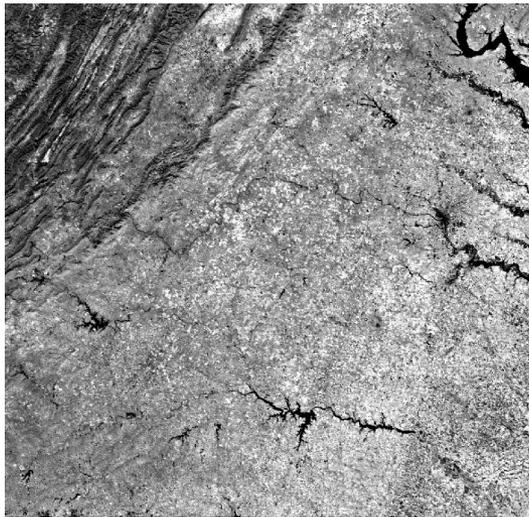
Outcomes

Impacts

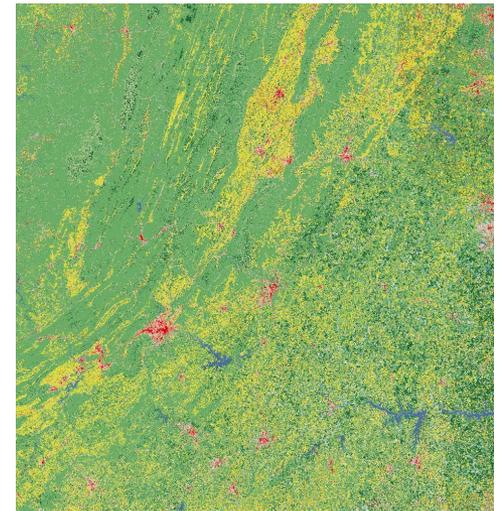
**30m Landsat EVI**



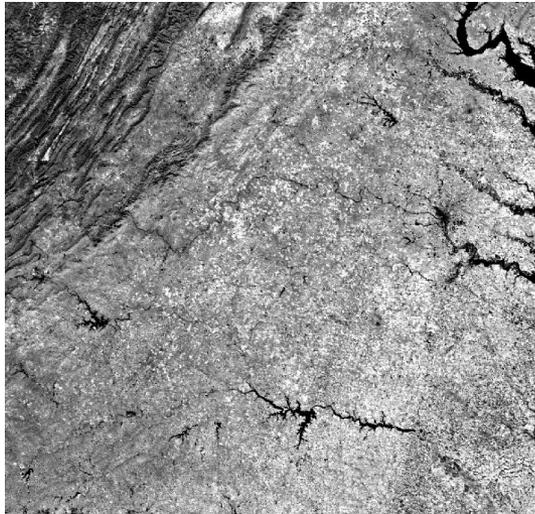
**250m MODIS EVI**



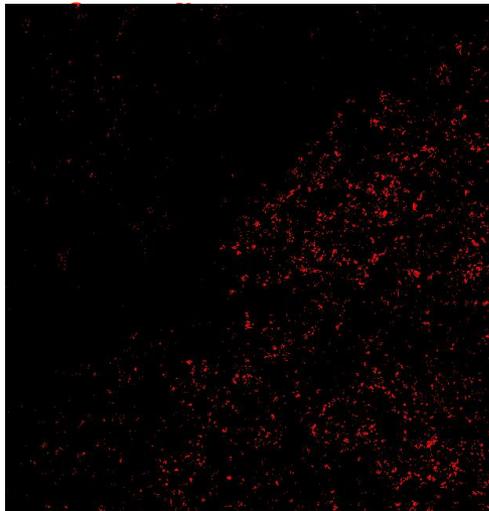
**NLCD 2001 Land Cover**



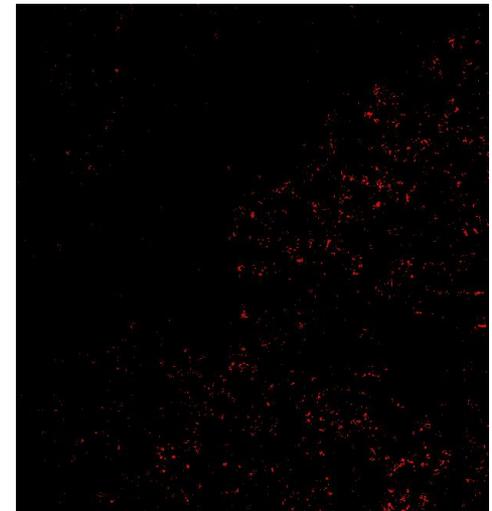
**MODIS EVI**



**Pine coverage  
thresholding  
(10448 pixels)**



**Statistical testing (4541  
pure pine pixels found)**

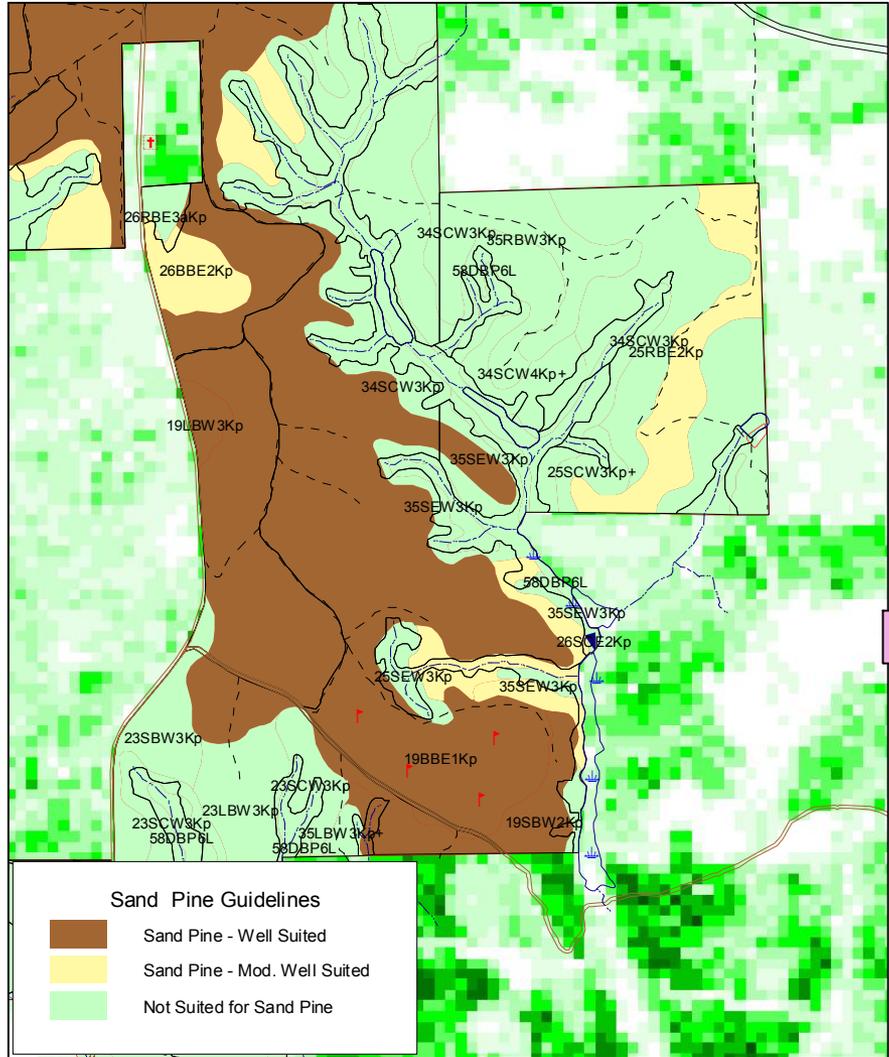


# LAI (Leaf Area Index):

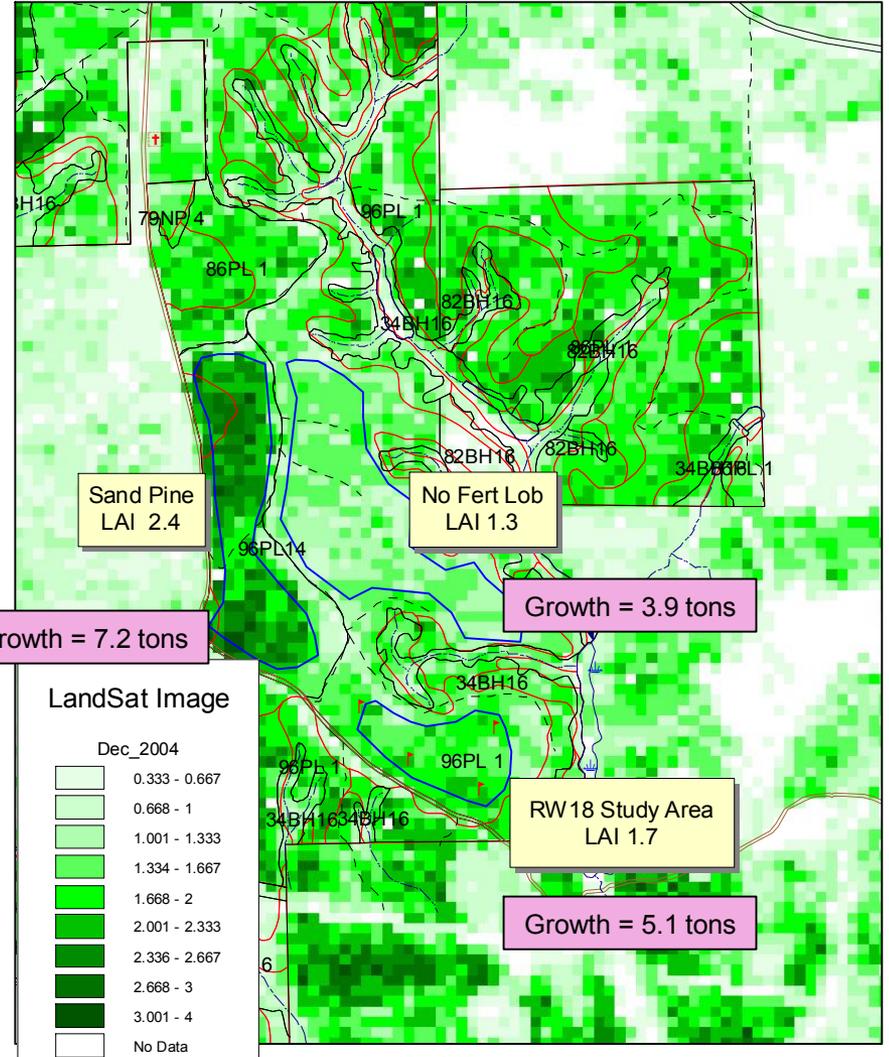
- stand stratification for inventory
- identification of poor-performing stands for early harvest
- identification of stands with high levels of competition

# LAI plus GE (Growth Efficiency)

Provides ability to estimate stand-level response to silviculture: (fertilization, release, tillage)

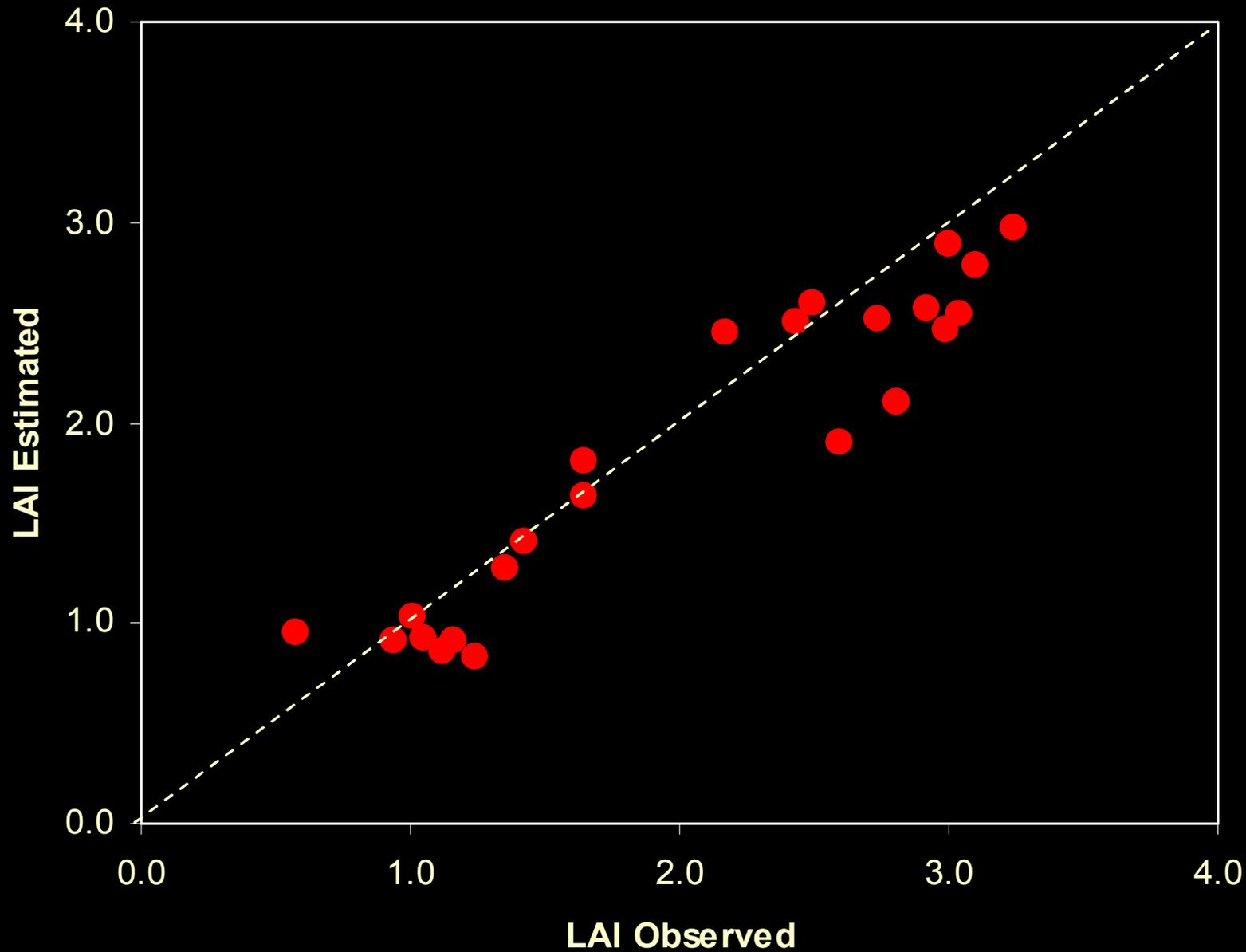


Map: 24004A  
 Lat: 32° 10.5  
 Long: 84° 37.9  
 1:12118

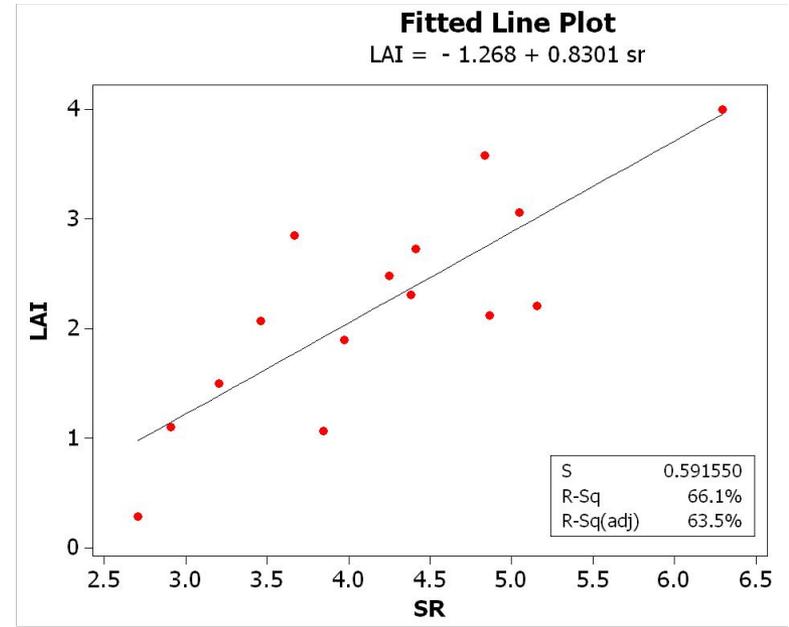
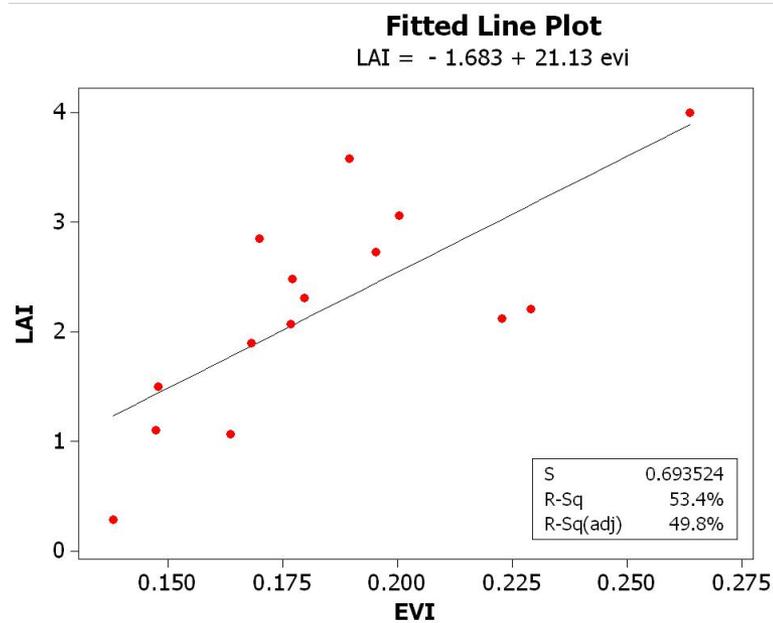
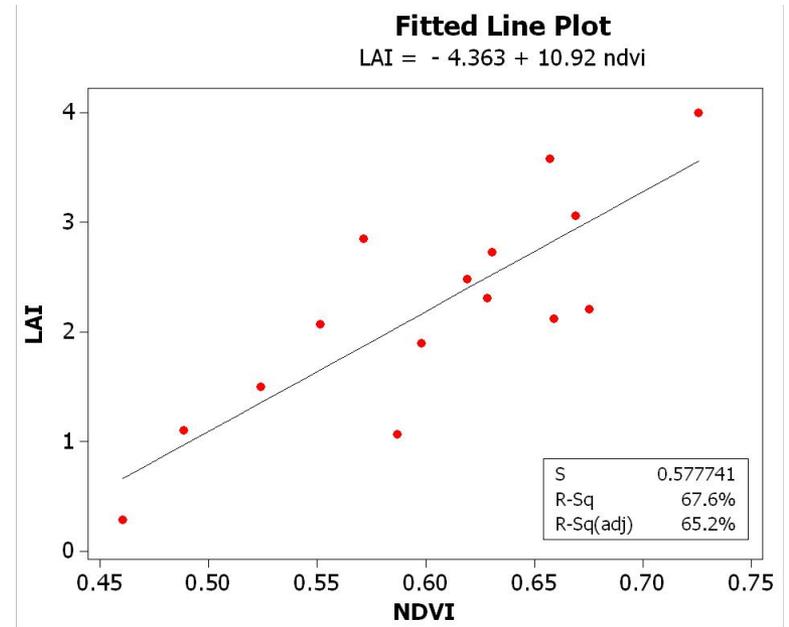
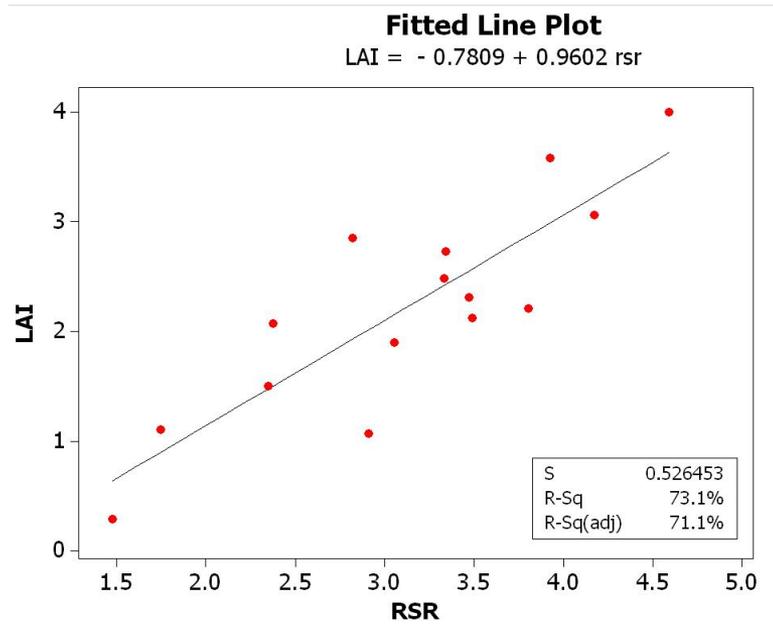


Map: 24004A  
 Lat: 32° 10.5  
 Long: 84° 37.9  
 1:12118

# Remote Sensing Estimation of LAI



# LAI and VI Relationships



# Update Summary III

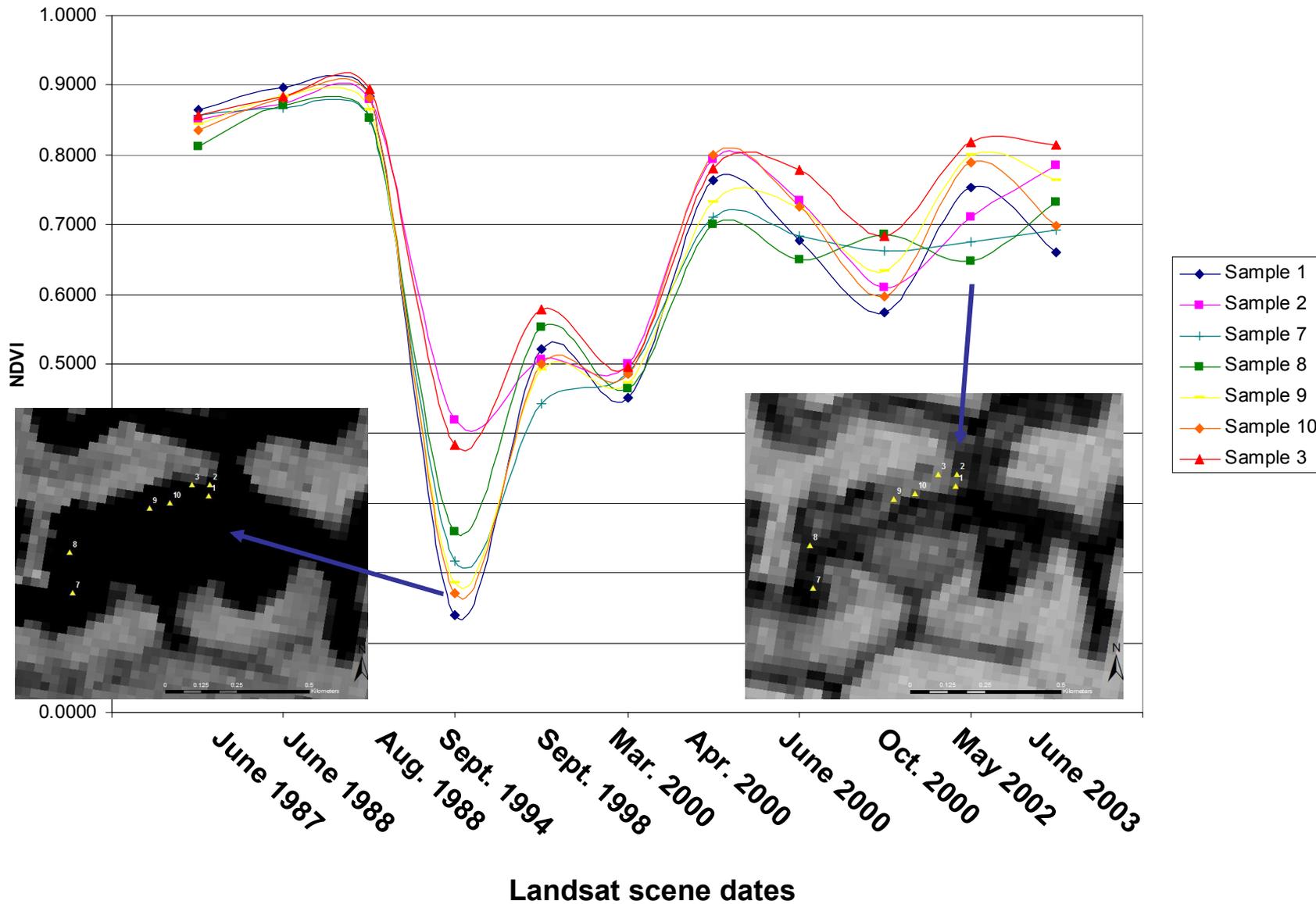
- Forest Health
  - Southern Pine Beetle hazard rating pilot (Landsat + NC Statewide Lidar)
  - Working closely with FHTET to use current scenes (rather than prior MRLC data from NLCD mapping regions) and FIA data to estimate key forest biophysical parameters using non-parametric approach
  - Also integrating forest age (up to 35 years...) into hazard rating (normalized approach, e.g., Browder et al. 2005, Healey et al. 2005)

# Update Summary IV

- OSM Abandoned Minelands Reforestation Pilot
  - Focus on WV and western VA
  - Detection of previously mined areas (first phase)
  - Assessment of reclamation quality



# WV site 3



# Thanks!

