

# Analysis of High Resolution Satellite Images to Characterize Vegetation on Reclaimed Surface Mines

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## *Cooperative Agreement Between West Virginia DEP and OSM Charleston Field Office*

### *Project Goal:*

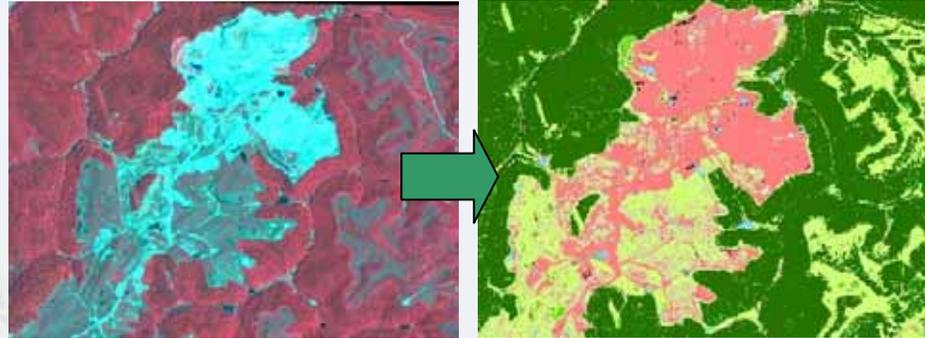
*Assess techniques for analyzing high-resolution images to characterize vegetation on Reclaimed surface mines*

### *Driving Factors:*

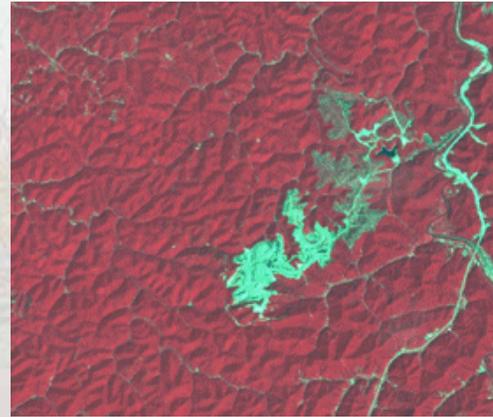
- 1. Larger Surface Mines*
- 2. Higher Resolution Images*
- 3. Increasing Availability*

# Research Areas

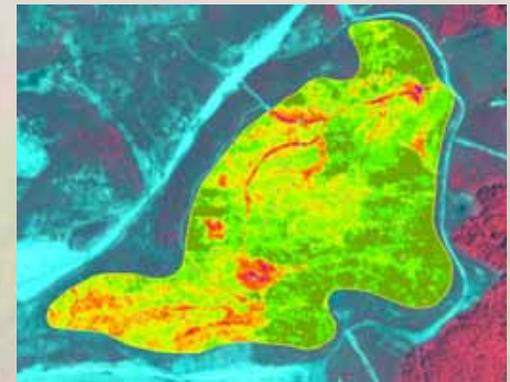
1. Landcover mapping



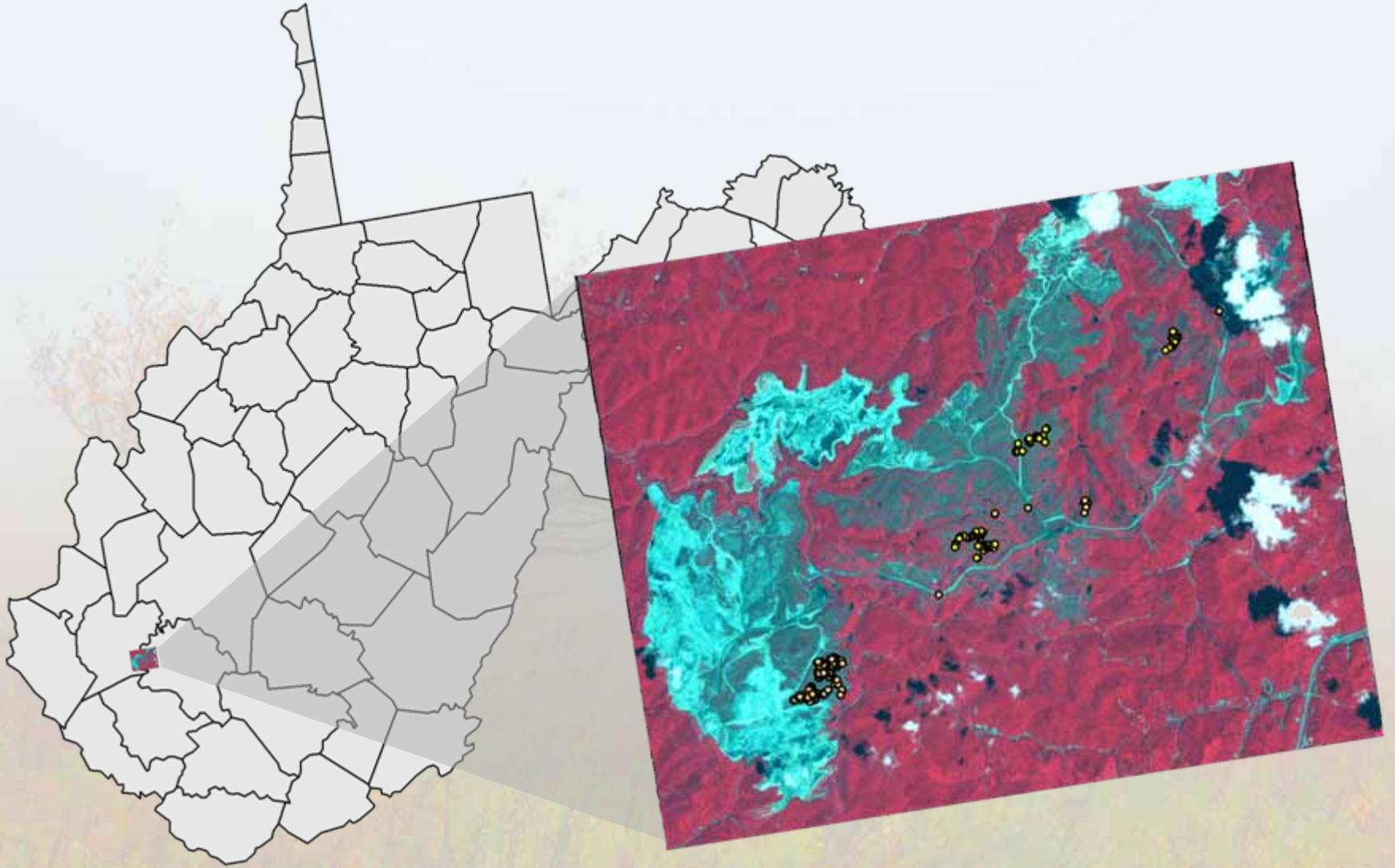
2. Change detection



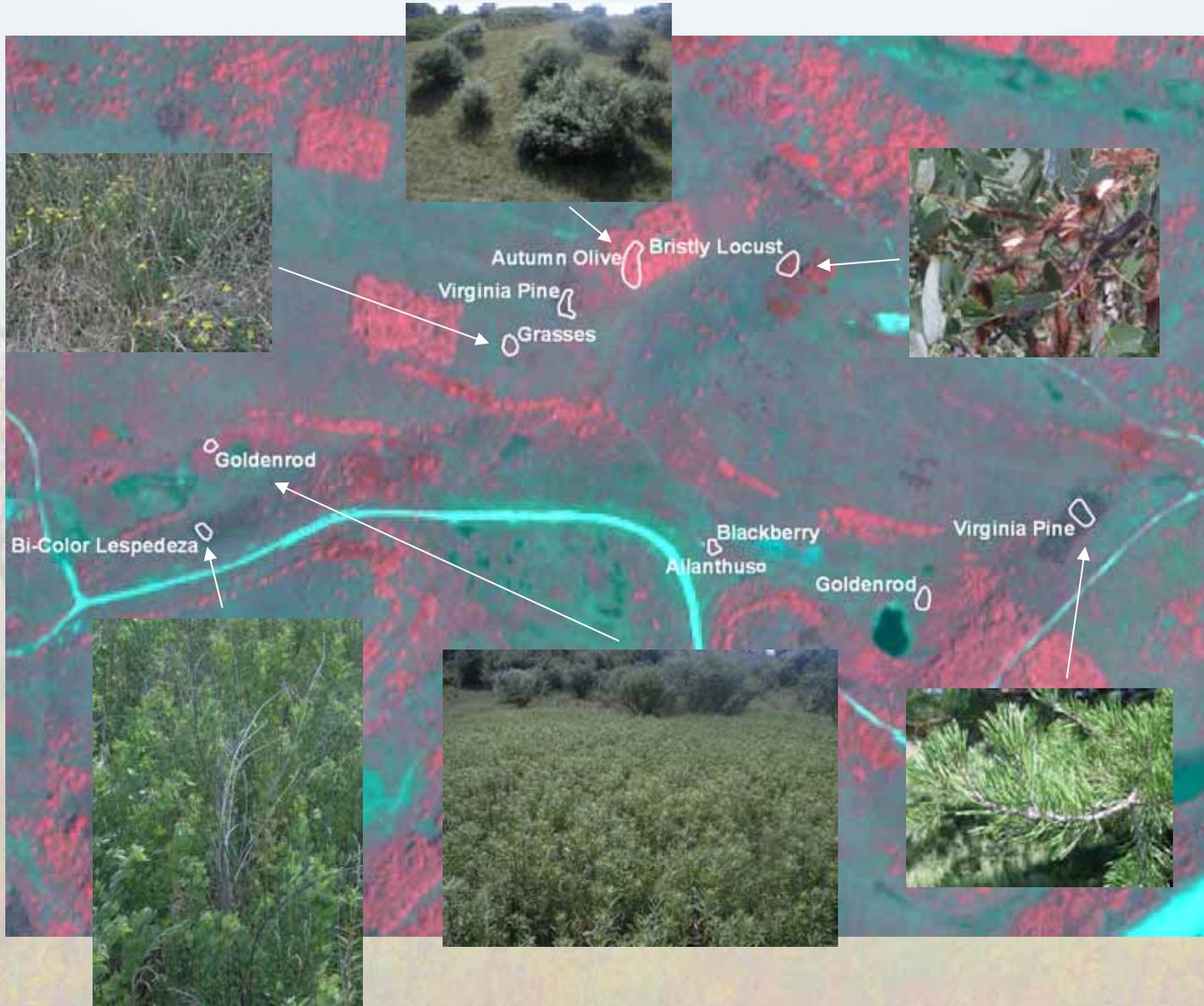
3. Vegetation cover estimation



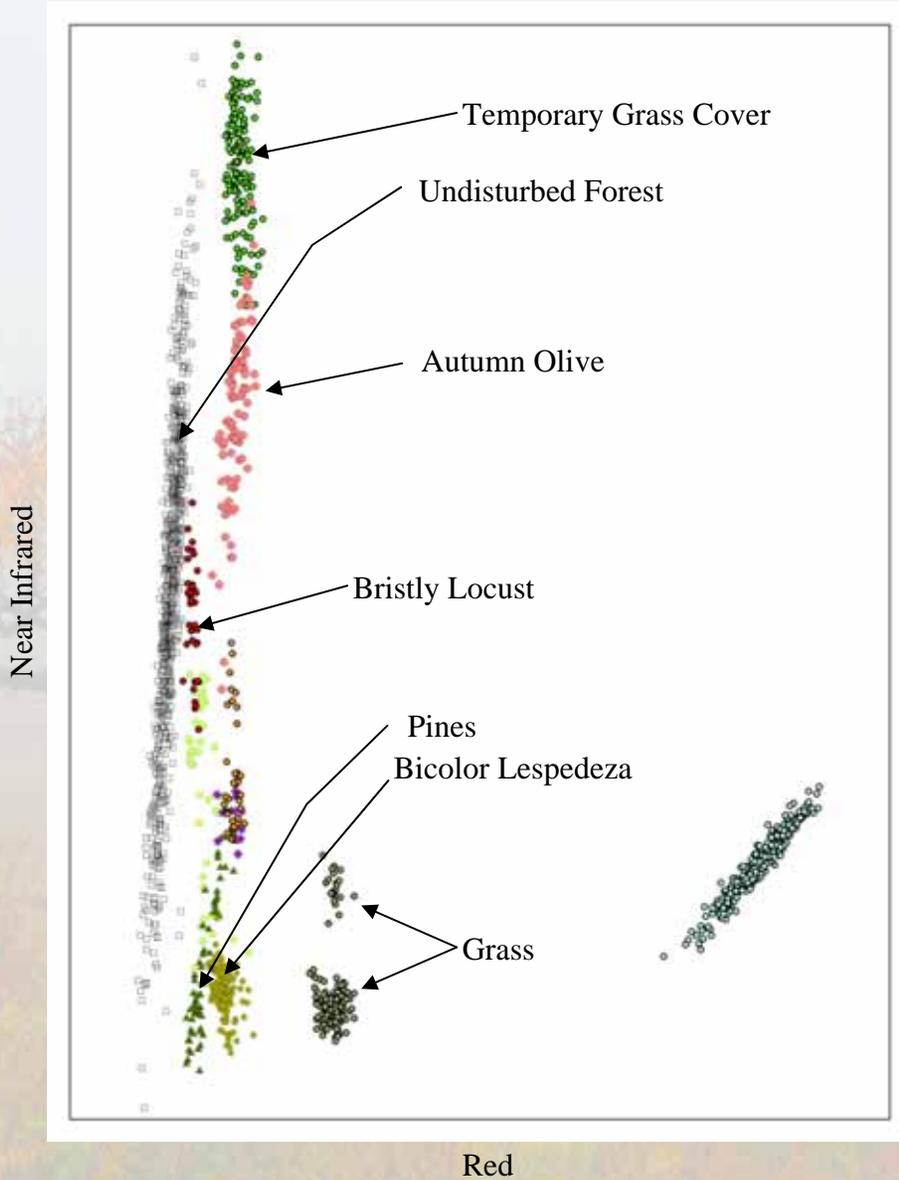
*Study Area—Hobet Mining Complex, Southern West Virginia*



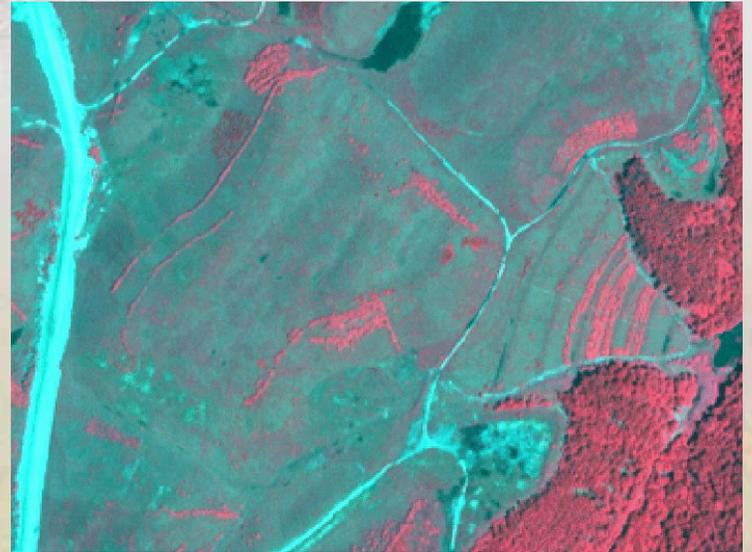
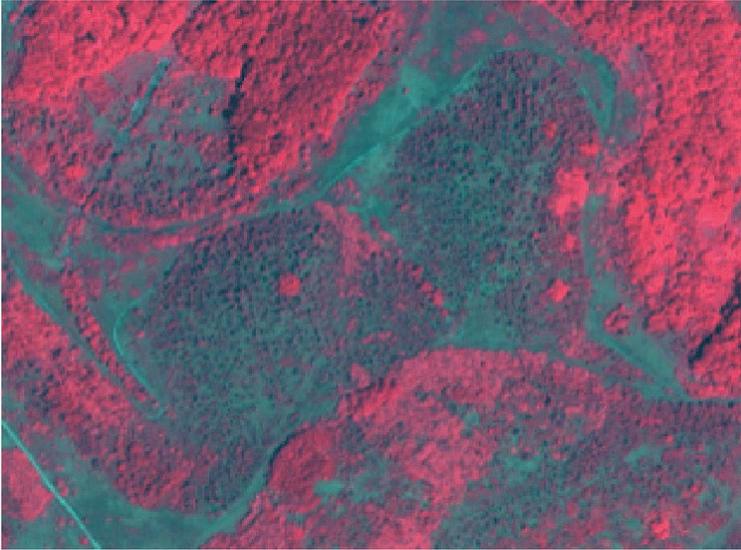
*Research Area– landcover mapping*



# Research Area– landcover mapping



*Research Area – change over time*



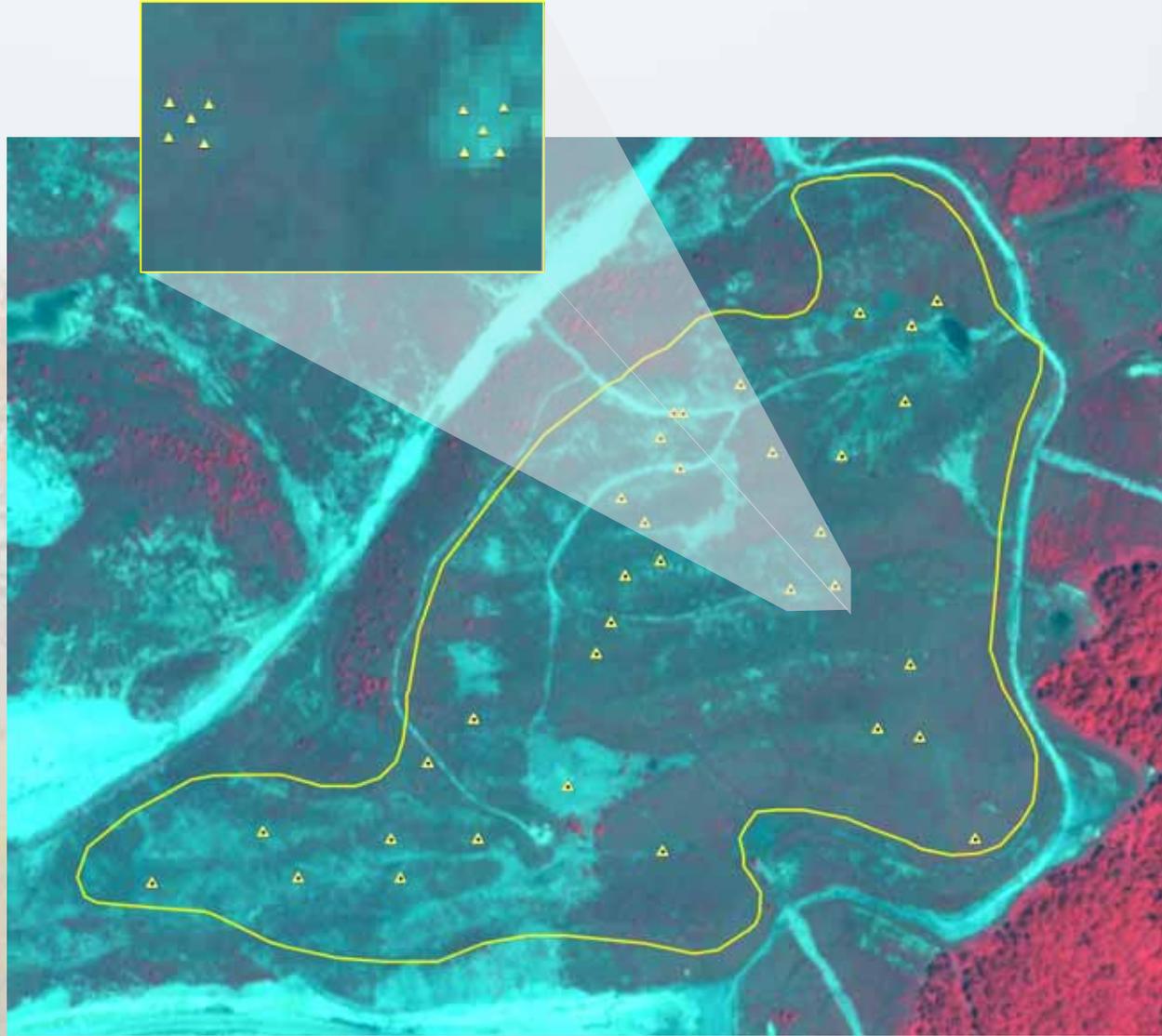
## *Research Area – estimating vegetation cover*

- Includes “*tree canopy, shrub and herbaceous cover, and organic litter.*”
- Used as a standard for bond release eligibility
- Examples from West Virginia Surface Mining Reclamation Rules (38CSR2):

*“Where post mining land use requires legumes and perennial grasses, the operator shall achieve at least a ninety (90) percent ground cover... Substandard areas shall not exceed one-fourth (1/4) acre in size nor total more than (10) percent of the area seeded”*

*“On areas to be developed for forest land and/or wildlife use... (m)inimum standards for woody plants shall be seventy percent (70%) ground cover... Substandard areas shall not exceed one-fourth (1/4) acre in size nor total more than twenty percent (20%) of the area seeded or planted.”*

# Percent Cover Estimation – Field Data Collection & Processing



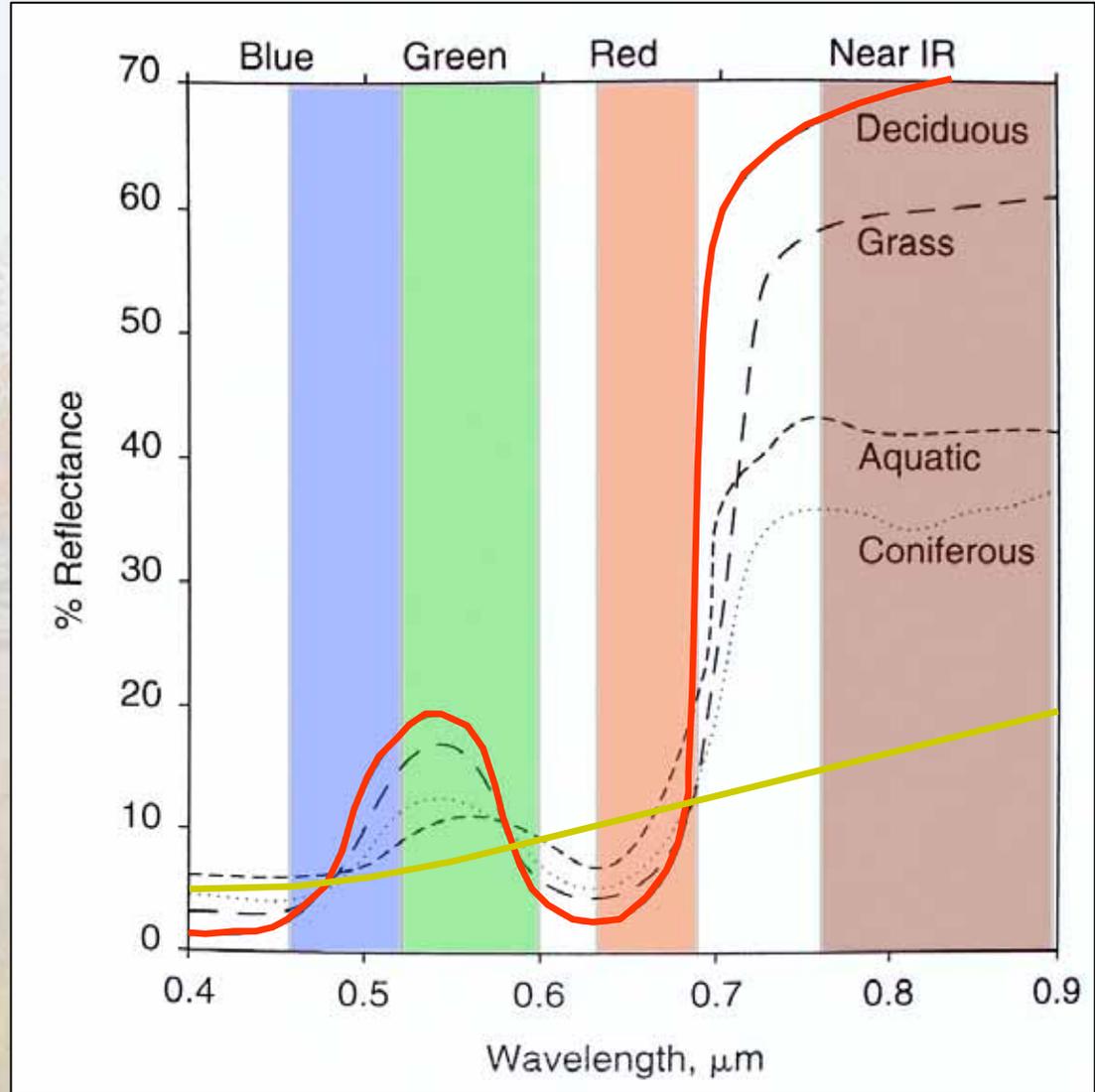
# Percent Cover Estimation – Normalized Difference Vegetation Index (NDVI)

•  $NDVI = (NIR - RED) / (NIR + RED)$

• *Range:* -1 .. 1

• *Non-vegetation* ~0

• *Vegetation* ~0.4+

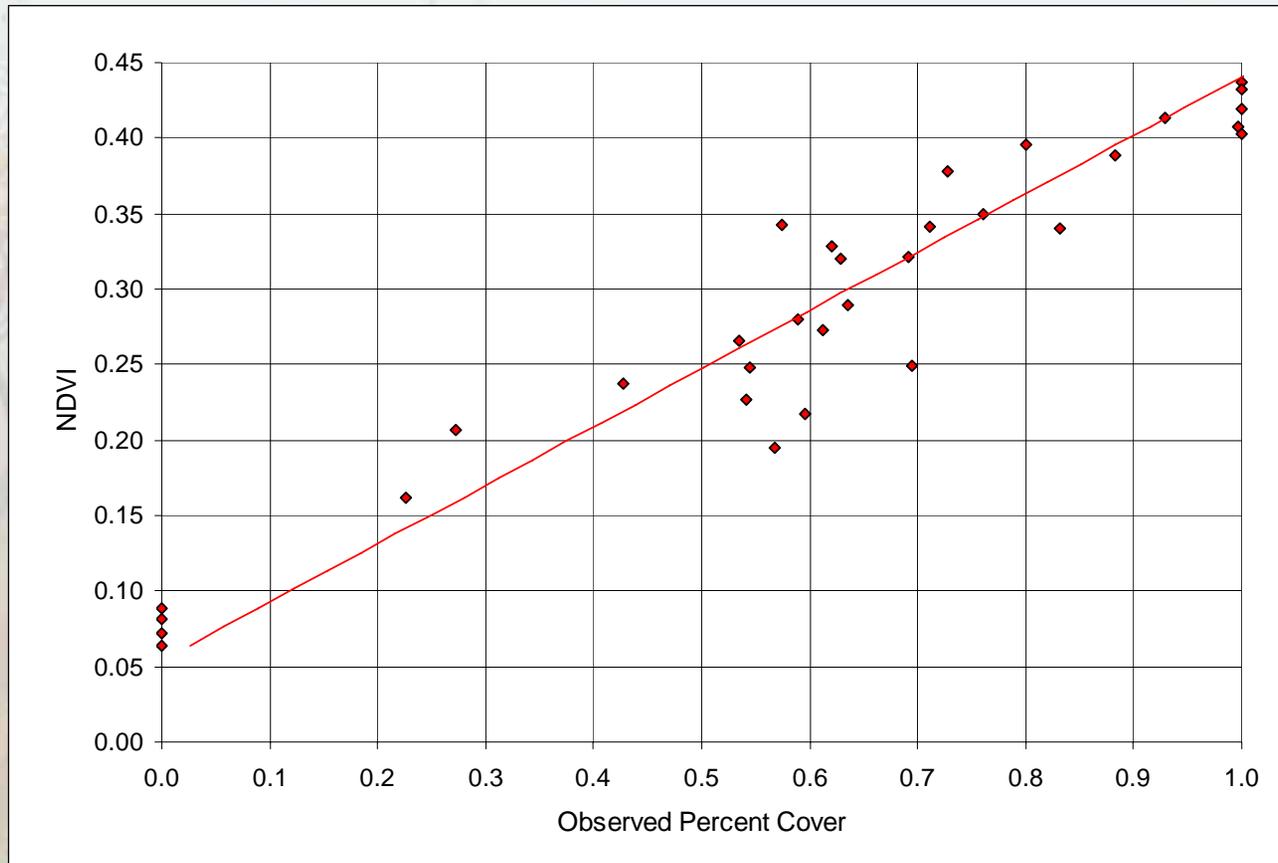


## Percent Cover Estimation – Correlation Between Percent Cover and NDVI

- $PCT\_COVER = -0.140224 + 2.5886 * NDVI$

- $R^2 = 0.9195$

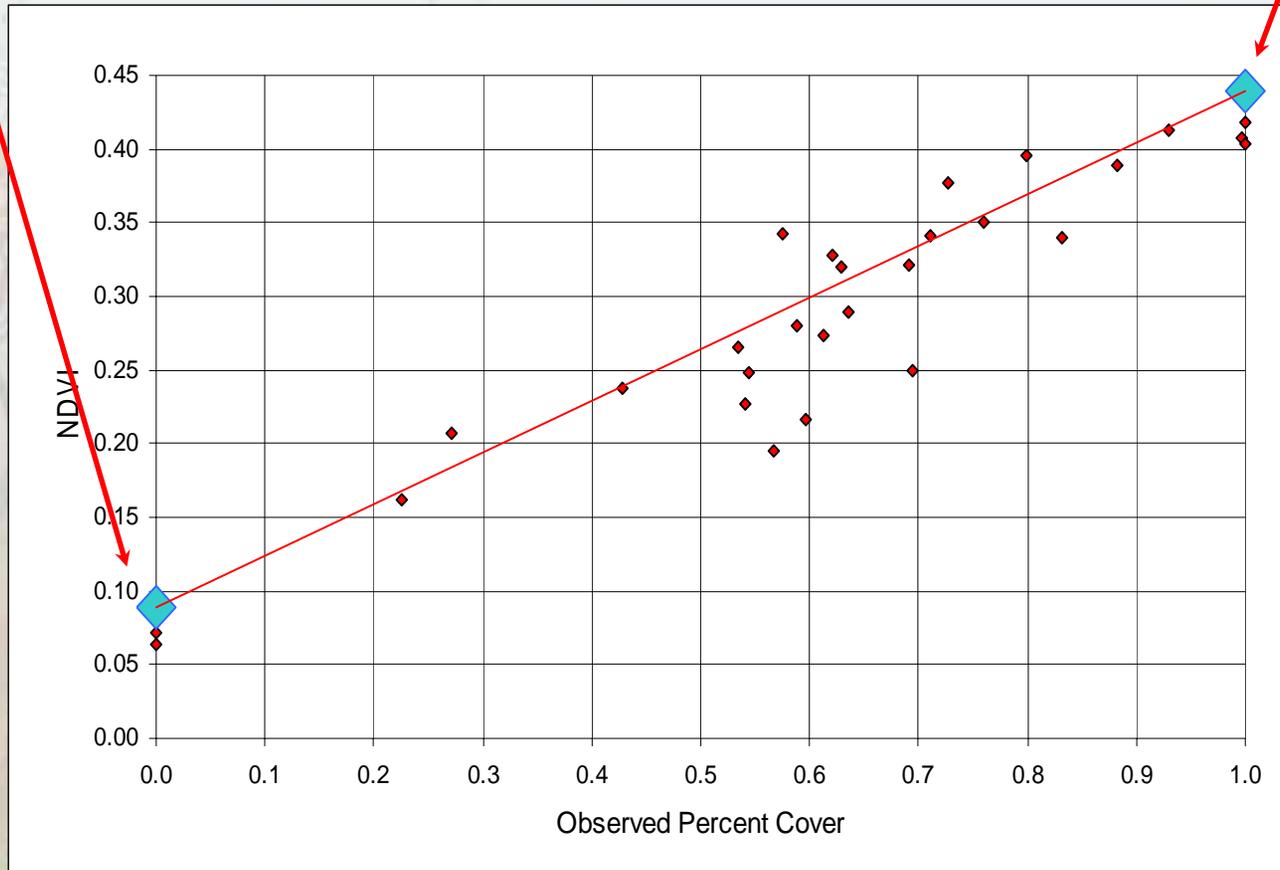
- $RMSE = 8.66\%$



# Percent Cover Estimation — Simple Linear Scaling Method

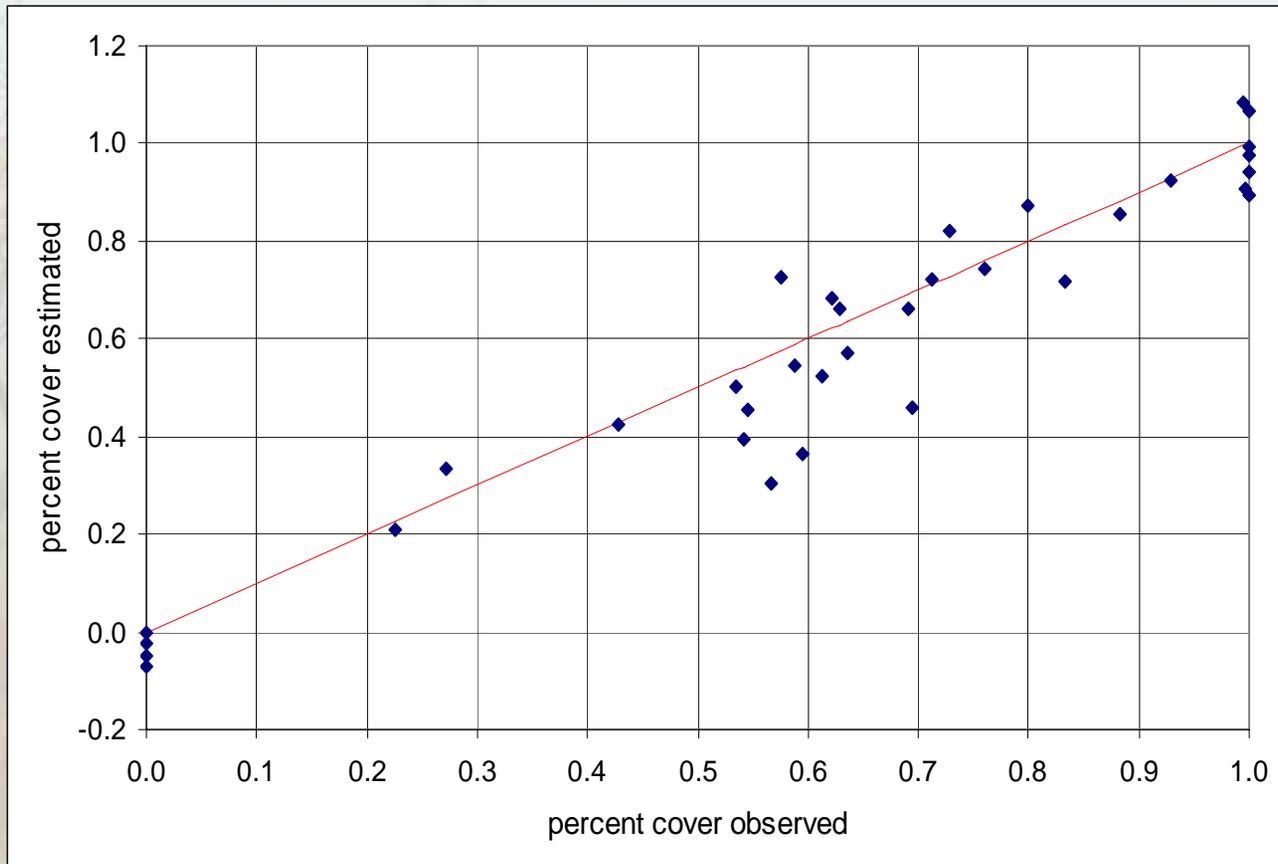
Mean value, barren area

Mean value, vegetated area



# Percent Cover Estimation — Simple Linear Scaling Method

•  $RMSE = 9.51\%$



# Percent Cover Estimation—Percent Cover Map

