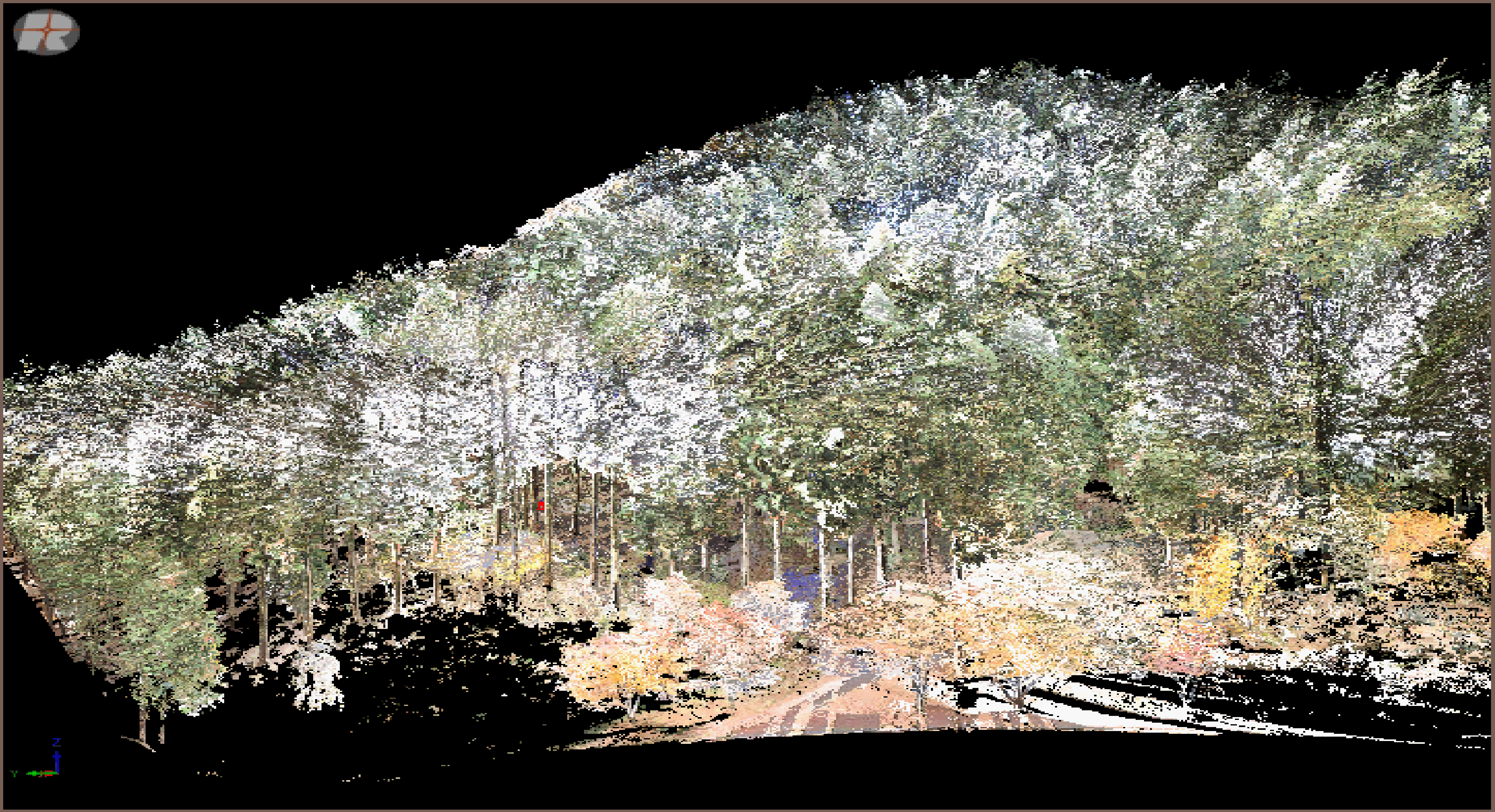


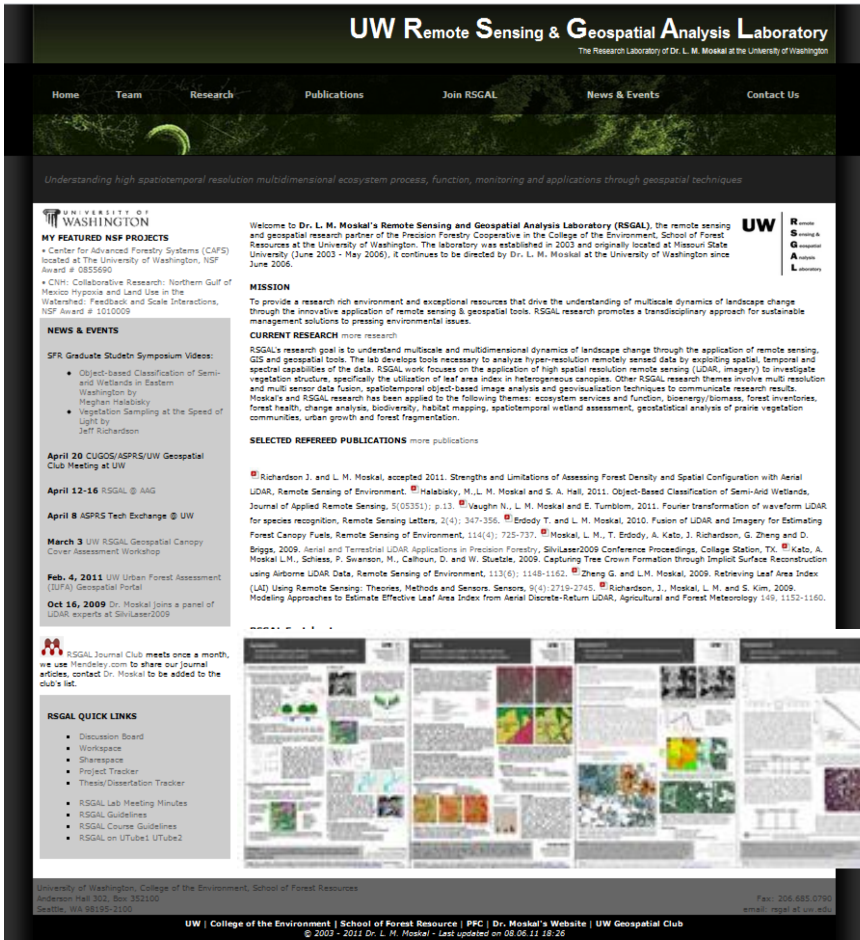
REMOTE SENSING, LIDAR AND WETLANDS

L. Monika Moskal

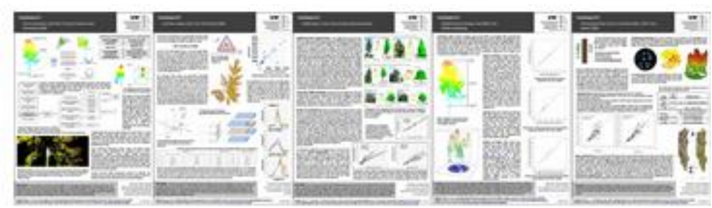
Assistant Professor, of Forest Resources, University of Washington

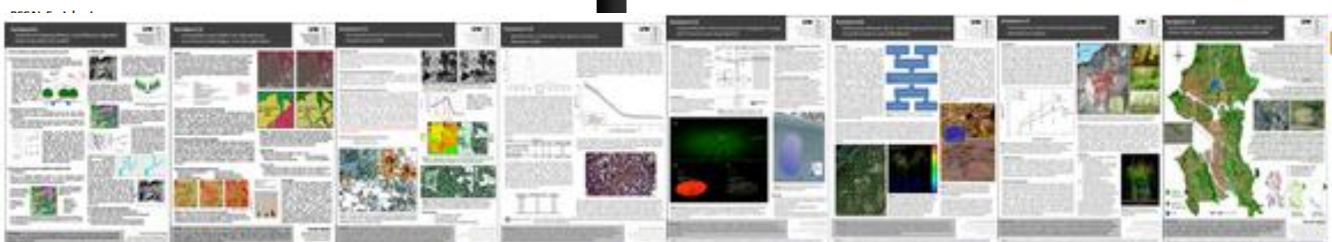
UW Remote Sensing & Geospatial Analysis Laboratory

UW-Remote Sensing and Geospatial Analysis Laboratory

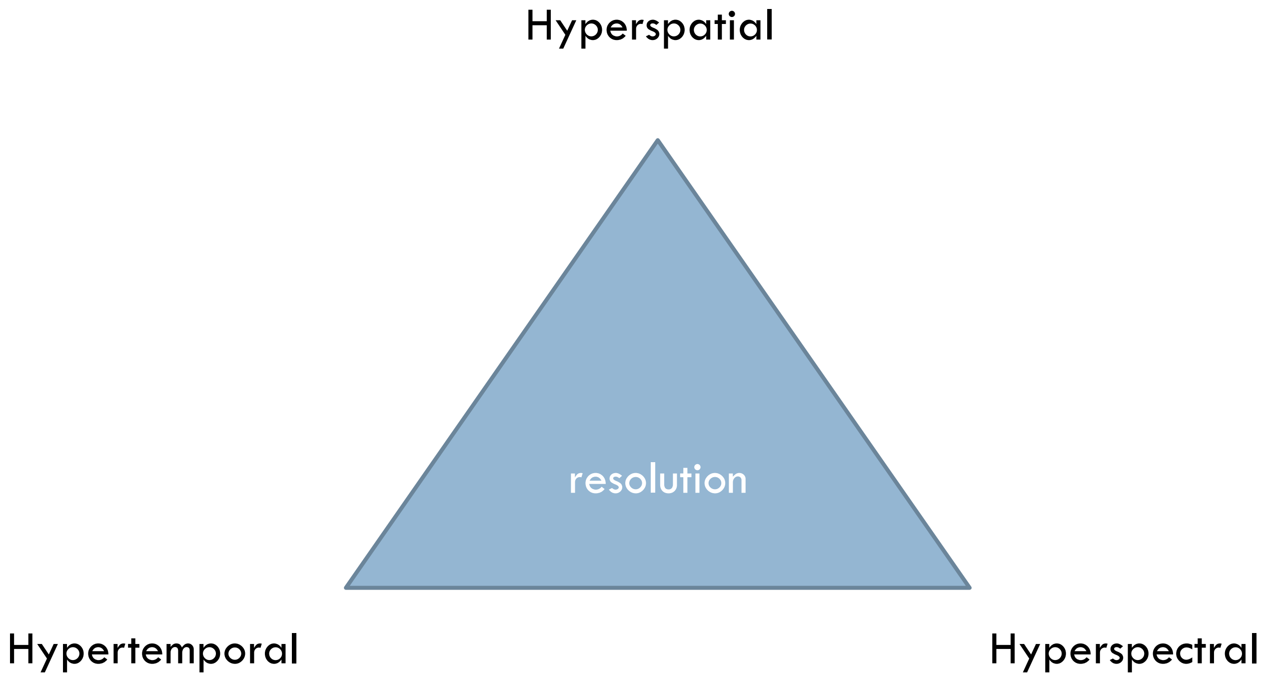


http://depts.washington.edu/rsgal/





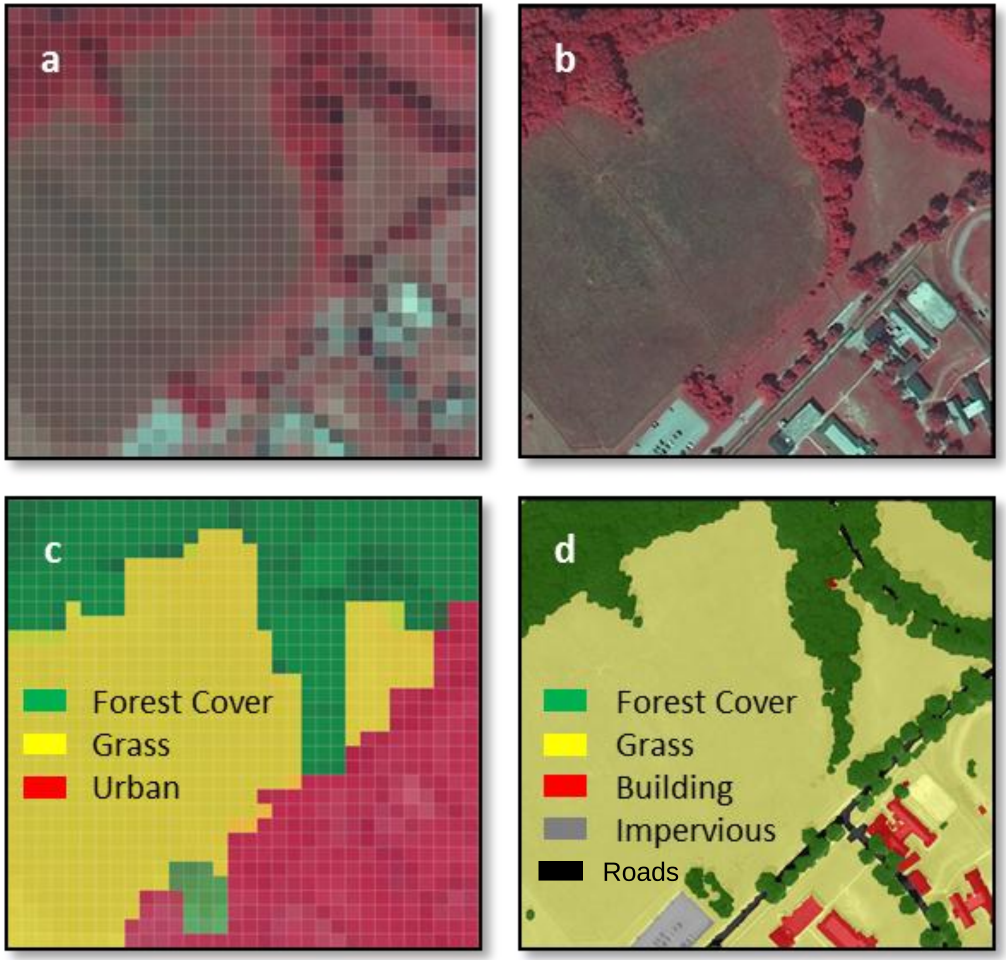
Hyper-resolution Remote Sensing Technology




WENGER

Land Use/Land Cover Mapping - Key Issues

- Coarse Resolution: Landsat (a) vs. Hi-res: NAIP (b)
- Per-pixel (c) vs. Object Based Image Analysis (OBIA) methods (d)
- Myint et al. 2011 – Per-pixel Accuracy 67.6% vs. OBIA Accuracy 90.4%
- Implications to field sampling campaigns



Remote Sensing Approach

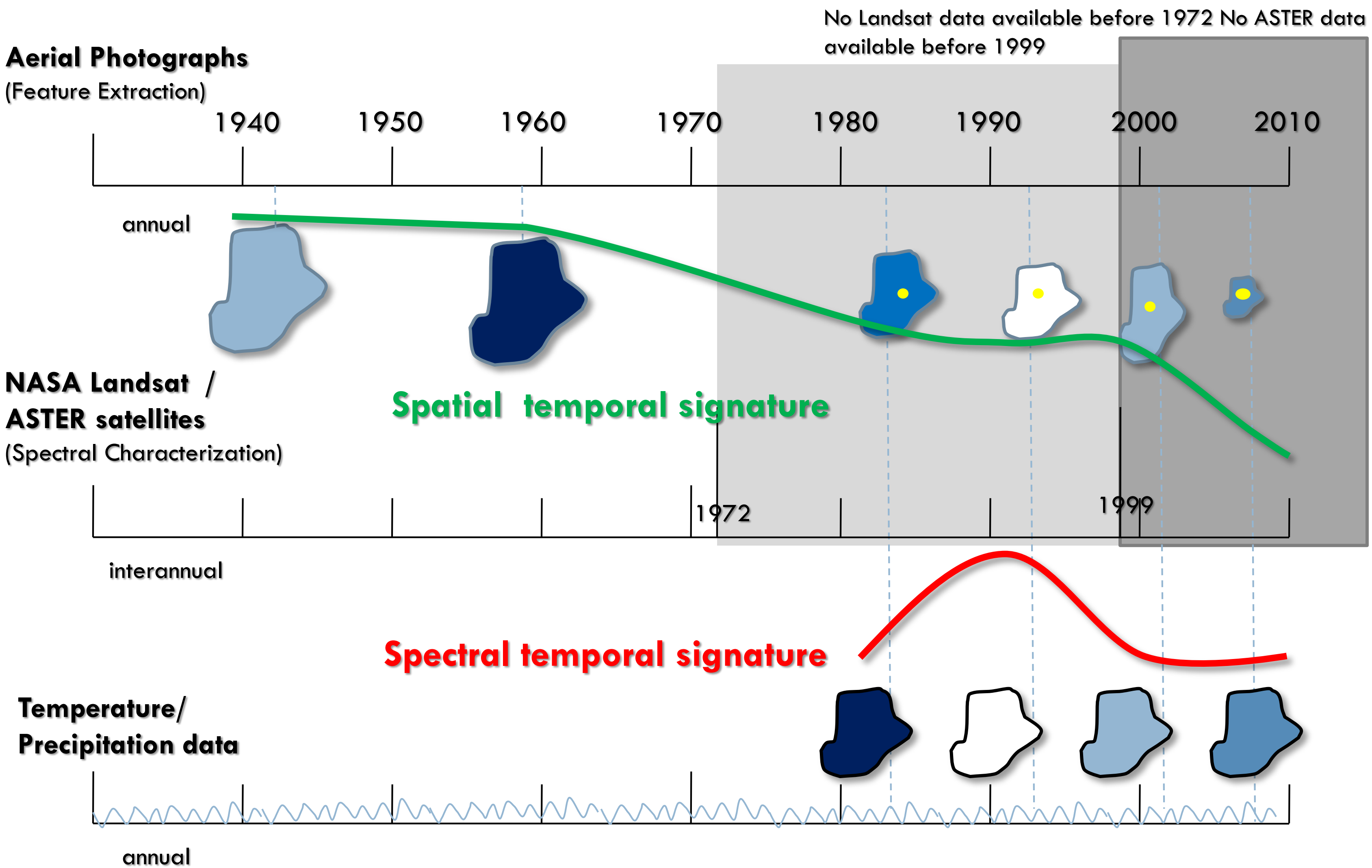
Remote Sensing Approach

Remote Sensing Approach

Remote Sensing Approach

Remote Sensing Approach

Monitoring the spatiotemporal heterogeneity of arid wetlands: A three-tiered approach

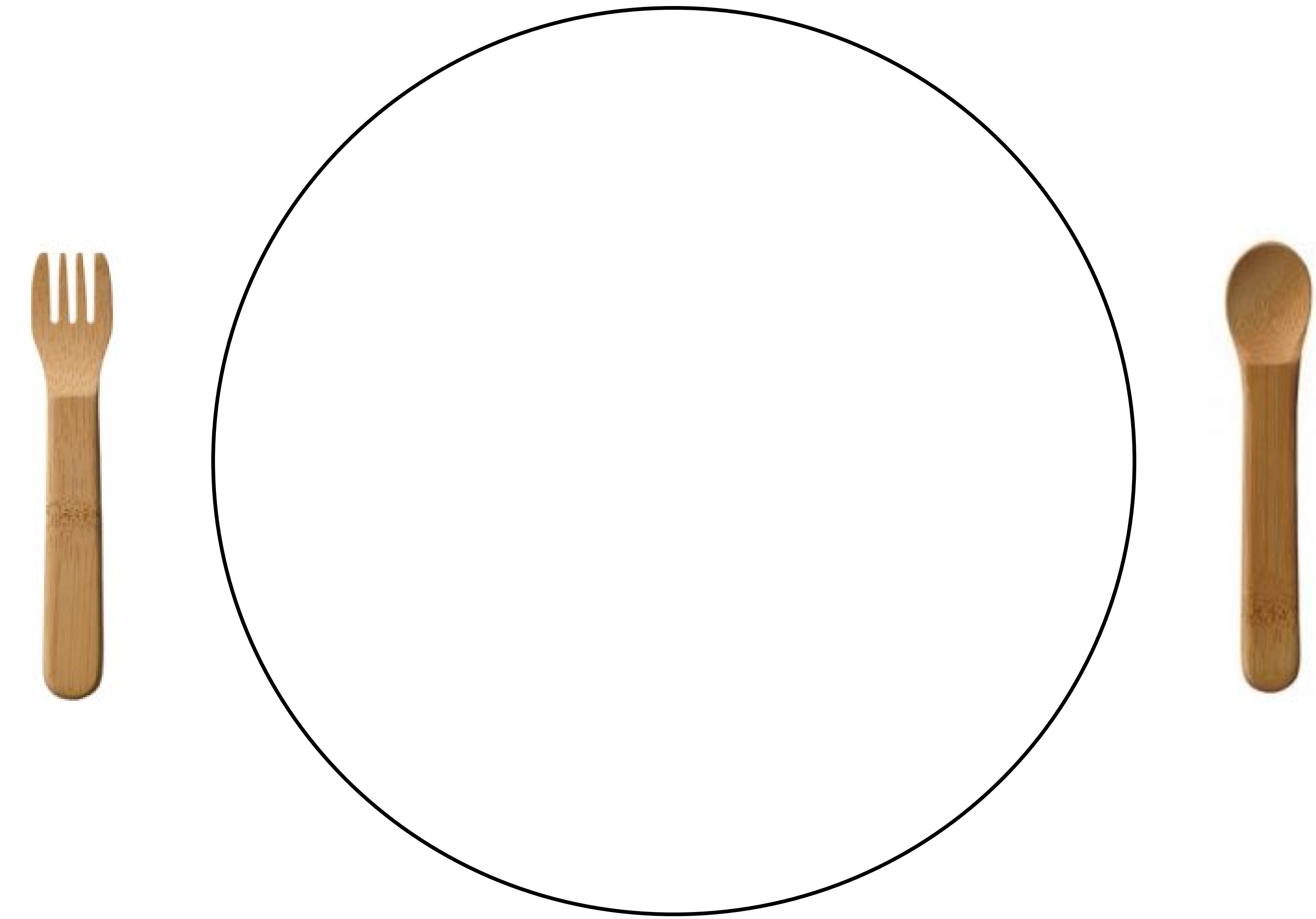


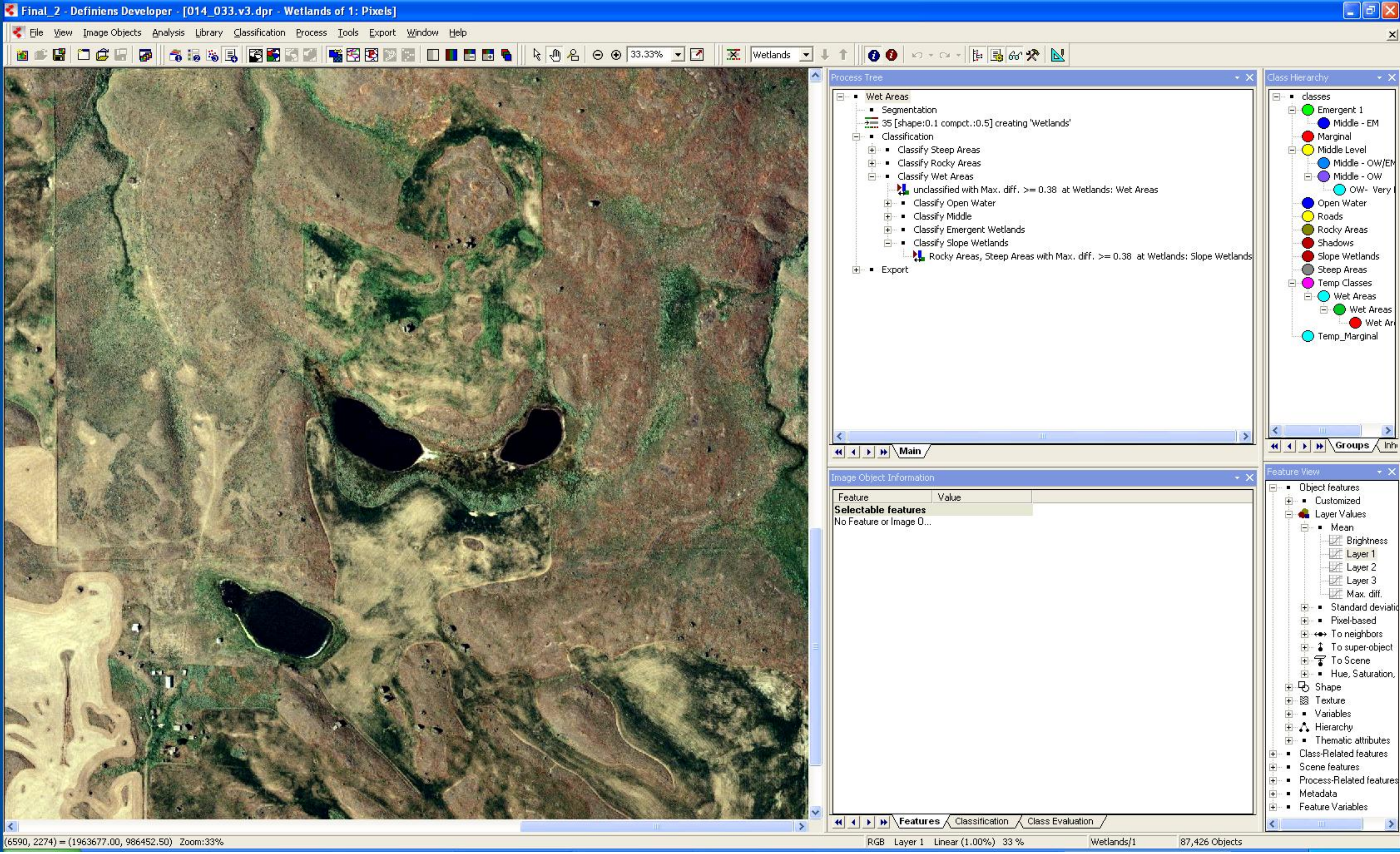
PHASE 1

Object Based Image Analysis (OBIA)

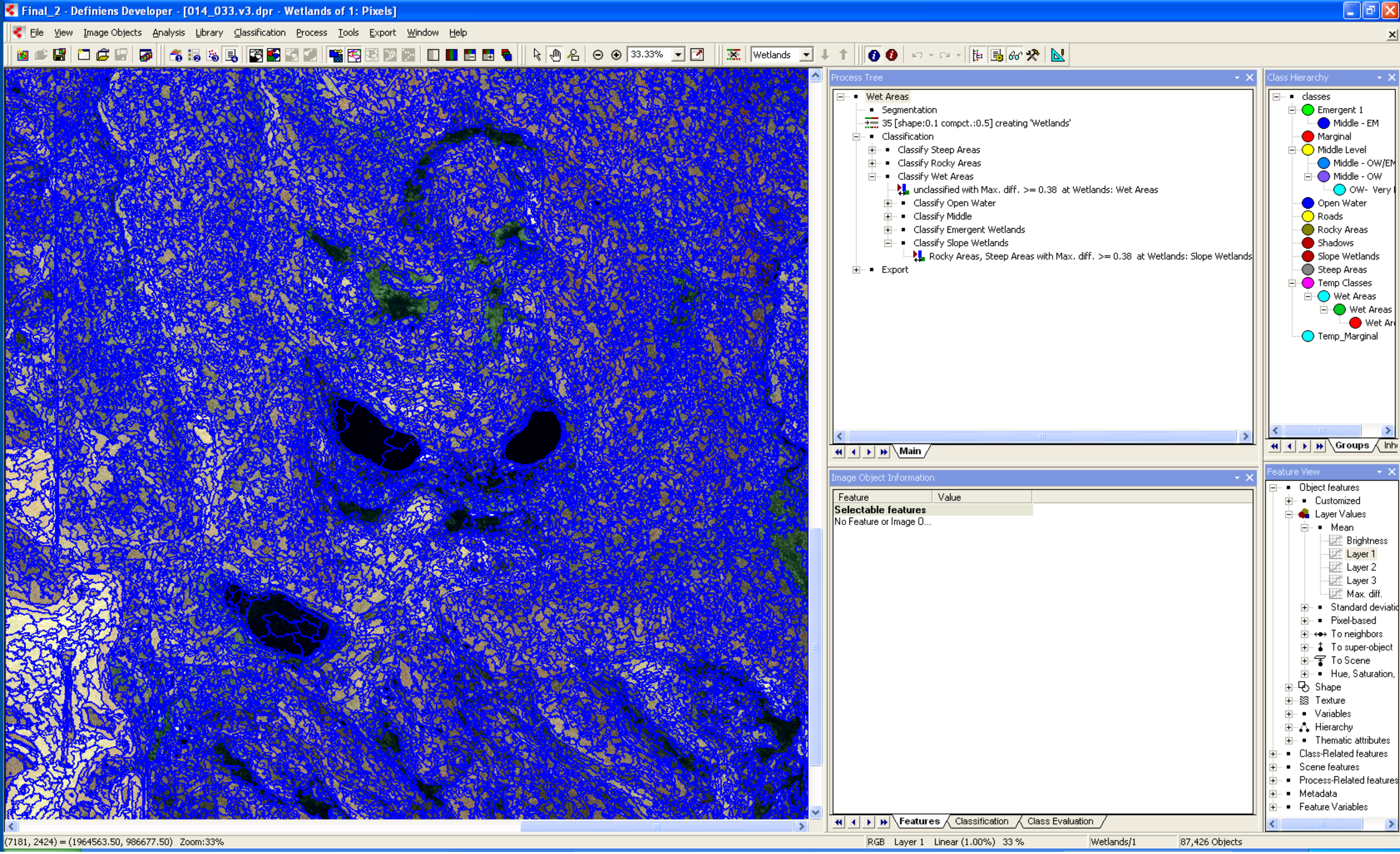
- This object based image classification method is fundamentally different form per-pixel-classifier approach because it utilized the spatial association and contextual information associated with the object (class) of interest

- Image analyst training and skills make this method a powerful new analysis tool for high spatial resolution data

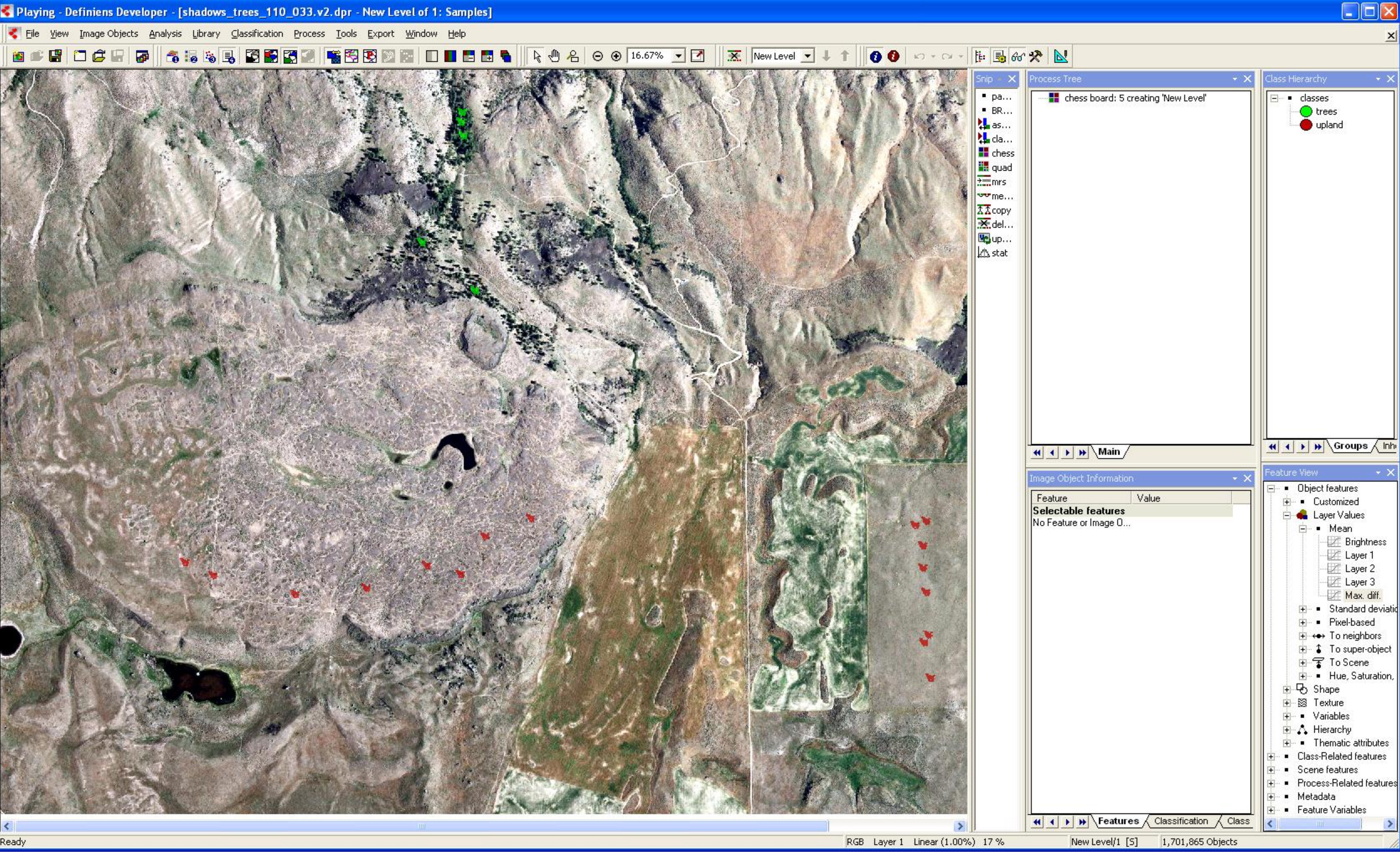




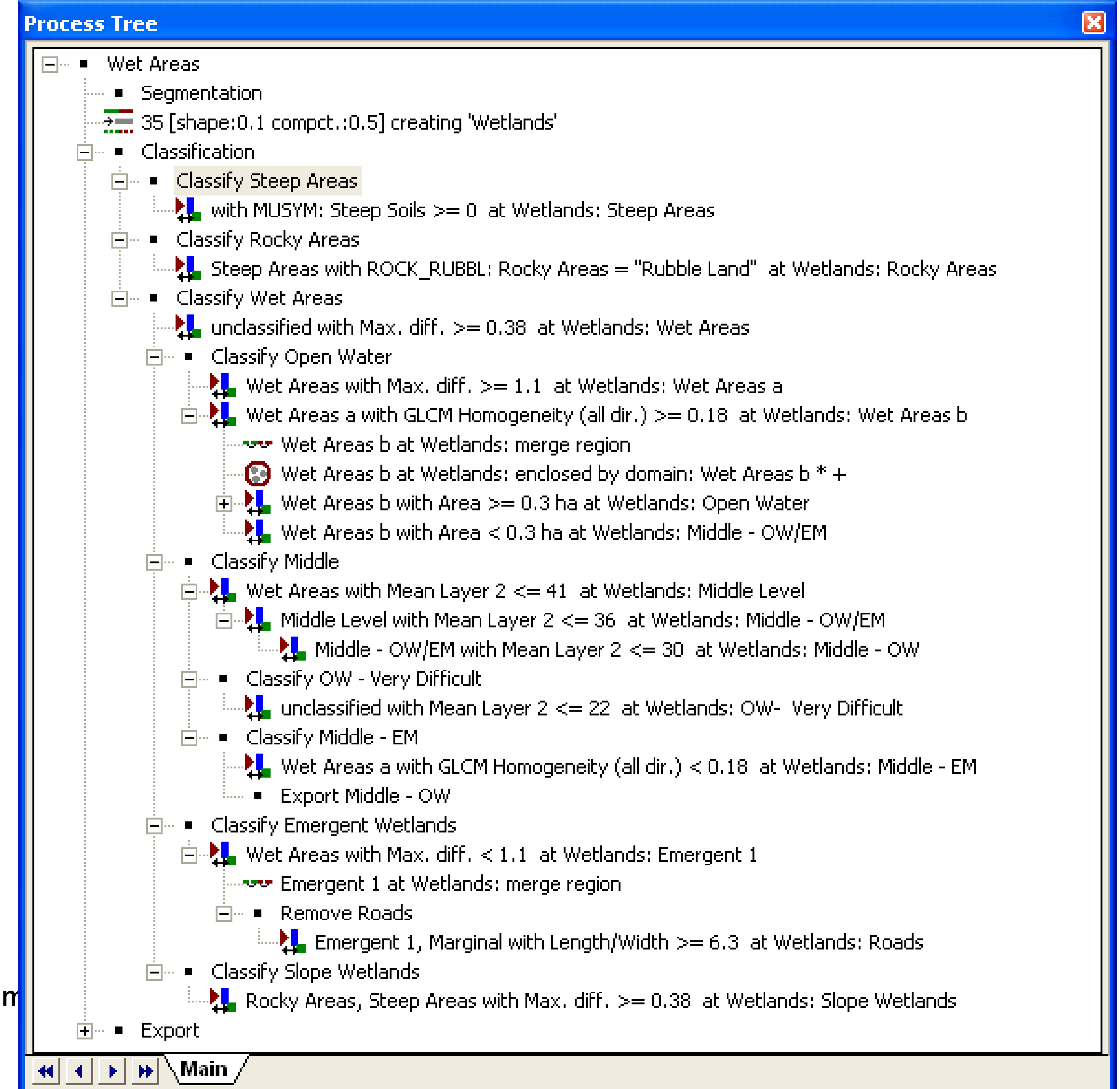
Get data, pre-process, georectify…



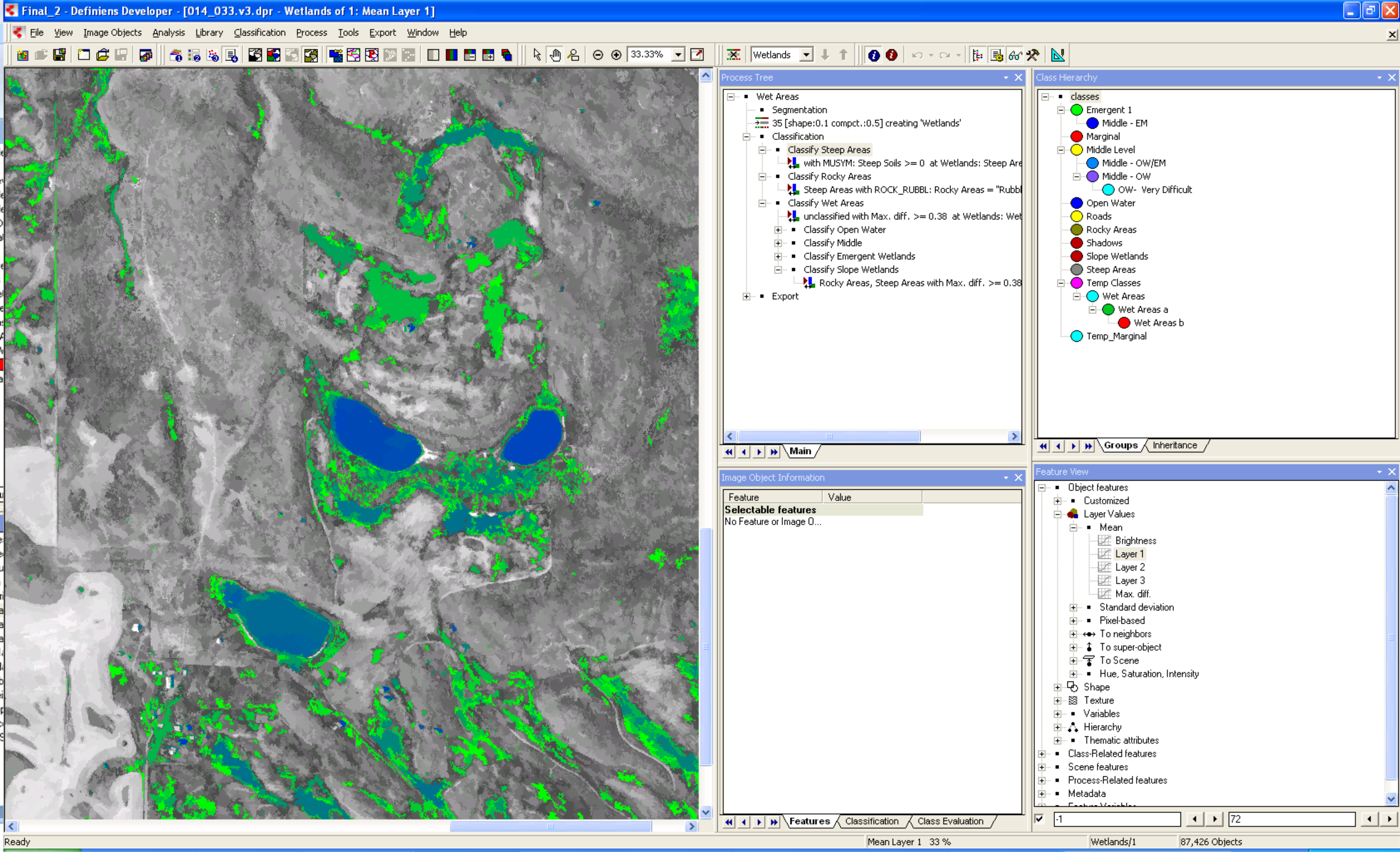
Segmentation…



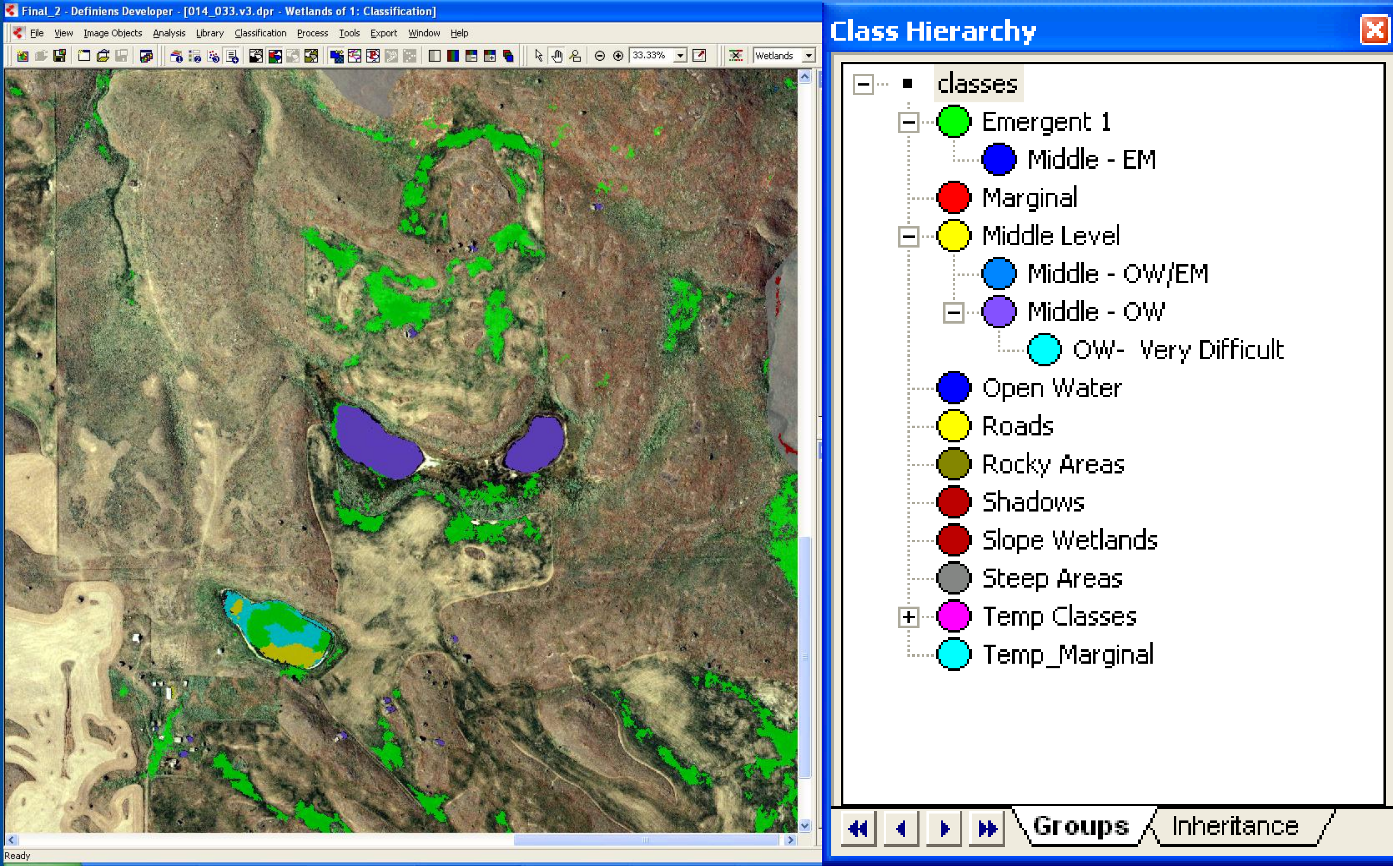
Algorithm training…


Process Tree
Wet Areas
Segmentation
35 [shape:0.1 compct.:0.5] creating 'Wetlands'
Classification
Classify Steep Areas
with MUSYM: Steep Soils >= 0 at Wetlands: Steep Areas
Classify Rocky Areas
Steep Areas with ROCK_RUBBL: Rocky Areas = "Rubble Land" at Wetlands: Rocky Areas
Classify Wet Areas
unclassified with Max. diff. >= 0.38 at Wetlands: Wet Areas
Classify Open Water
Wet Areas with Max. diff. >= 1.1 at Wetlands: Wet Areas a
Wet Areas a with GLCM Homogeneity (all dir.) >= 0.18 at Wetlands: Wet Areas b
Wet Areas b at Wetlands: merge region
Wet Areas b at Wetlands: enclosed by domain: Wet Areas b * +
Wet Areas b with Area >= 0.3 ha at Wetlands: Open Water
Wet Areas b with Area < 0.3 ha at Wetlands: Middle - OW/EM
Classify Middle
Wet Areas with Mean Layer 2 <= 41 at Wetlands: Middle Level
Middle Level with Mean Layer 2 <= 36 at Wetlands: Middle - OW/EM
Middle - OW/EM with Mean Layer 2 <= 30 at Wetlands: Middle - OW
Classify OW - Very Difficult
unclassified with Mean Layer 2 <= 22 at Wetlands: OW- Very Difficult
Classify Middle - EM
Wet Areas a with GLCM Homogeneity (all dir.) < 0.18 at Wetlands: Middle - EM
Export Middle - OW
Classify Emergent Wetlands
Wet Areas with Max. diff. < 1.1 at Wetlands: Emergent 1
Emergent 1 at Wetlands: merge region
Remove Roads
Emergent 1, Marginal with Length/Width >= 6.3 at Wetlands: Roads
Classify Slope Wetlands
Rocky Areas, Steep Areas with Max. diff. >= 0.38 at Wetlands: Slope Wetlands
Export
Main

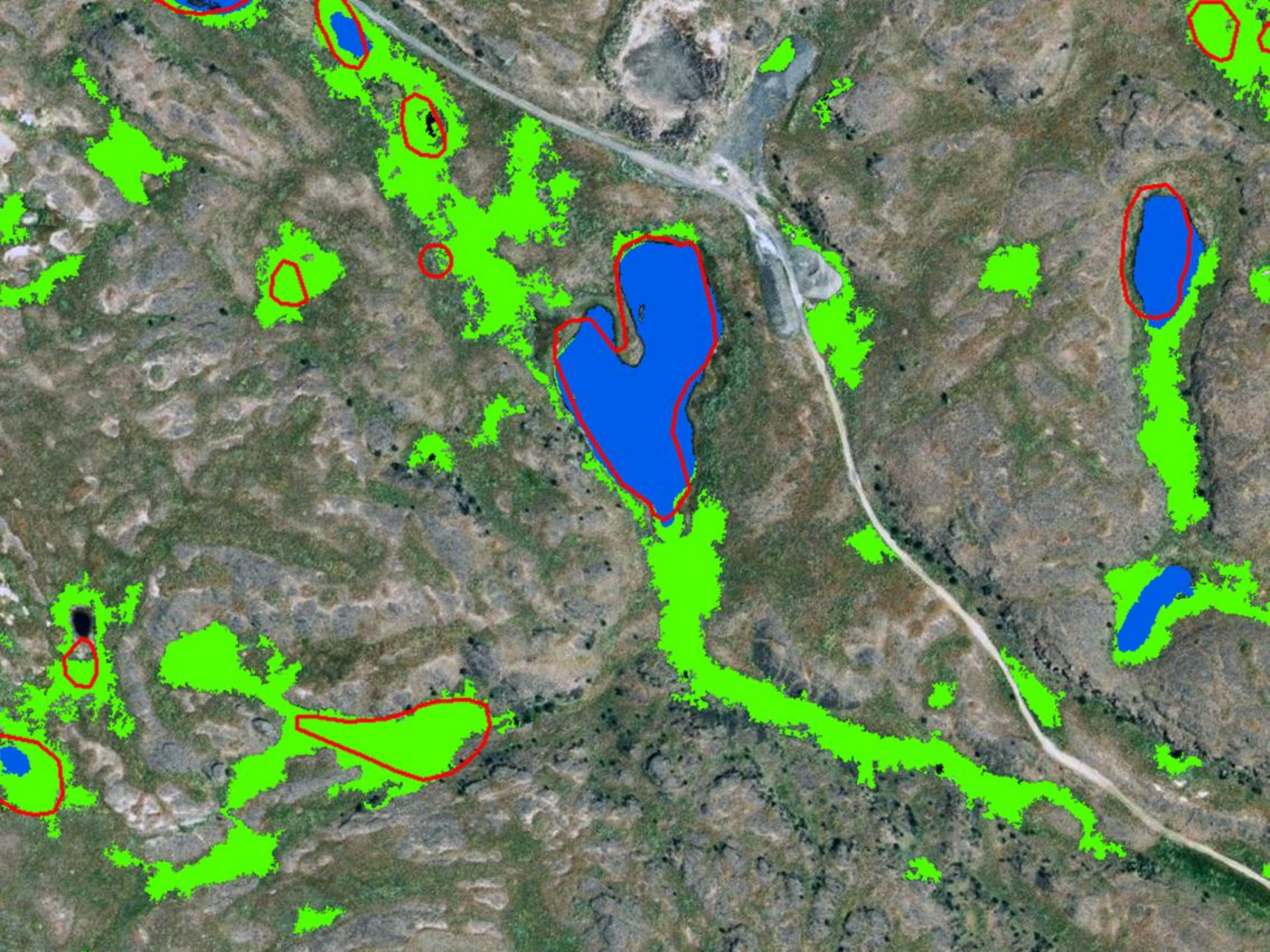
Optim



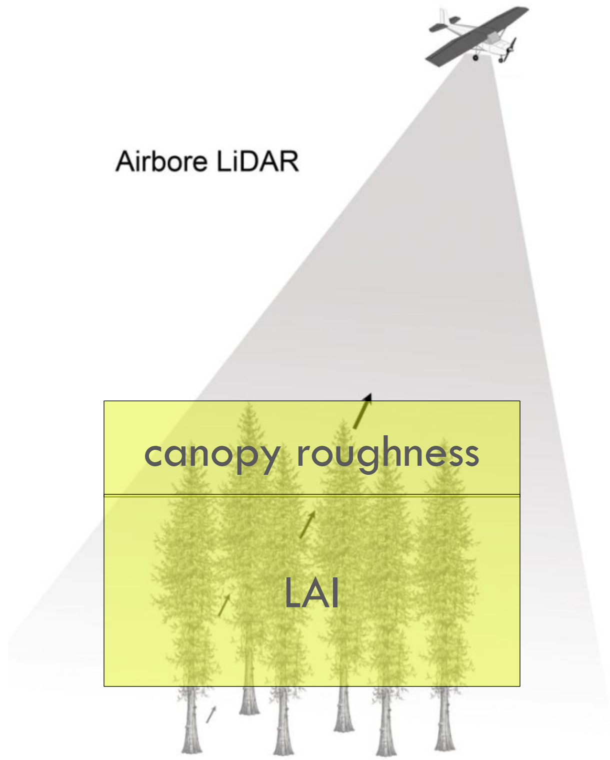
Thresholding…

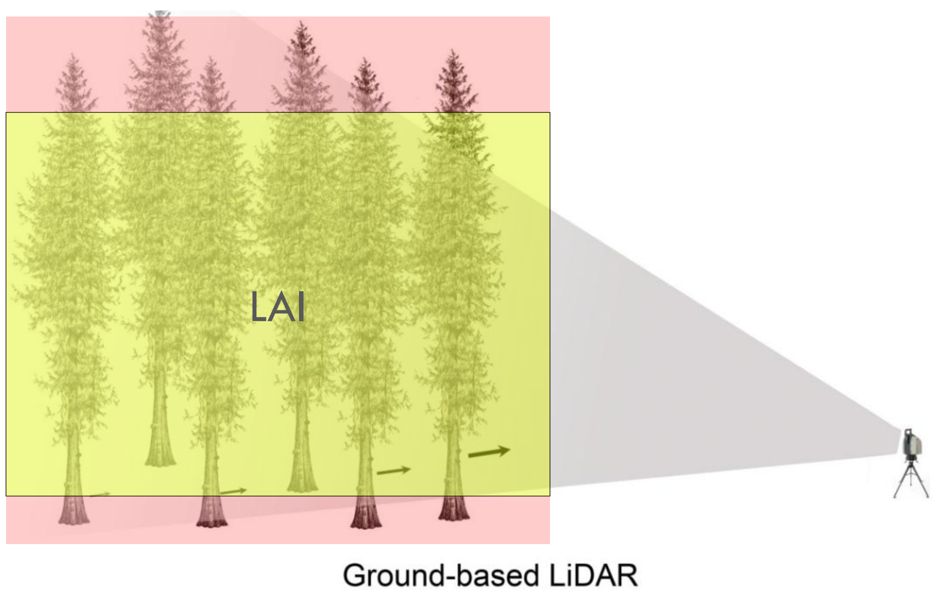


Final Hierarchical Classification…



LiDAR

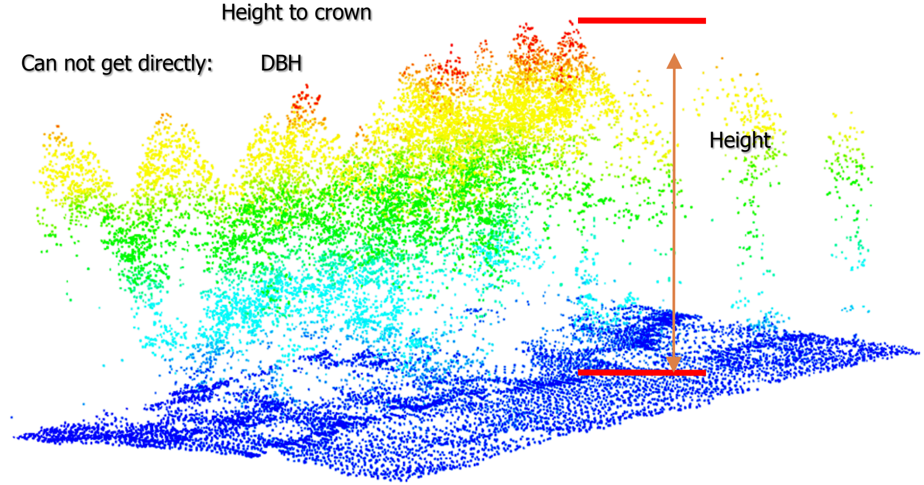


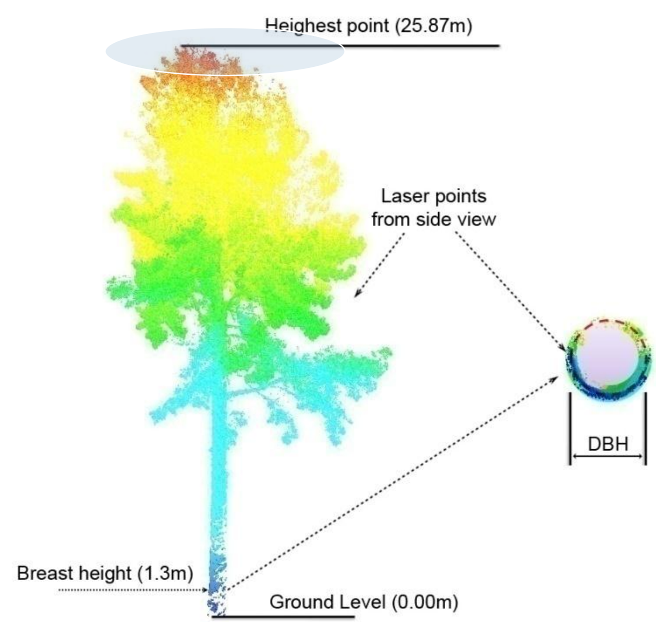


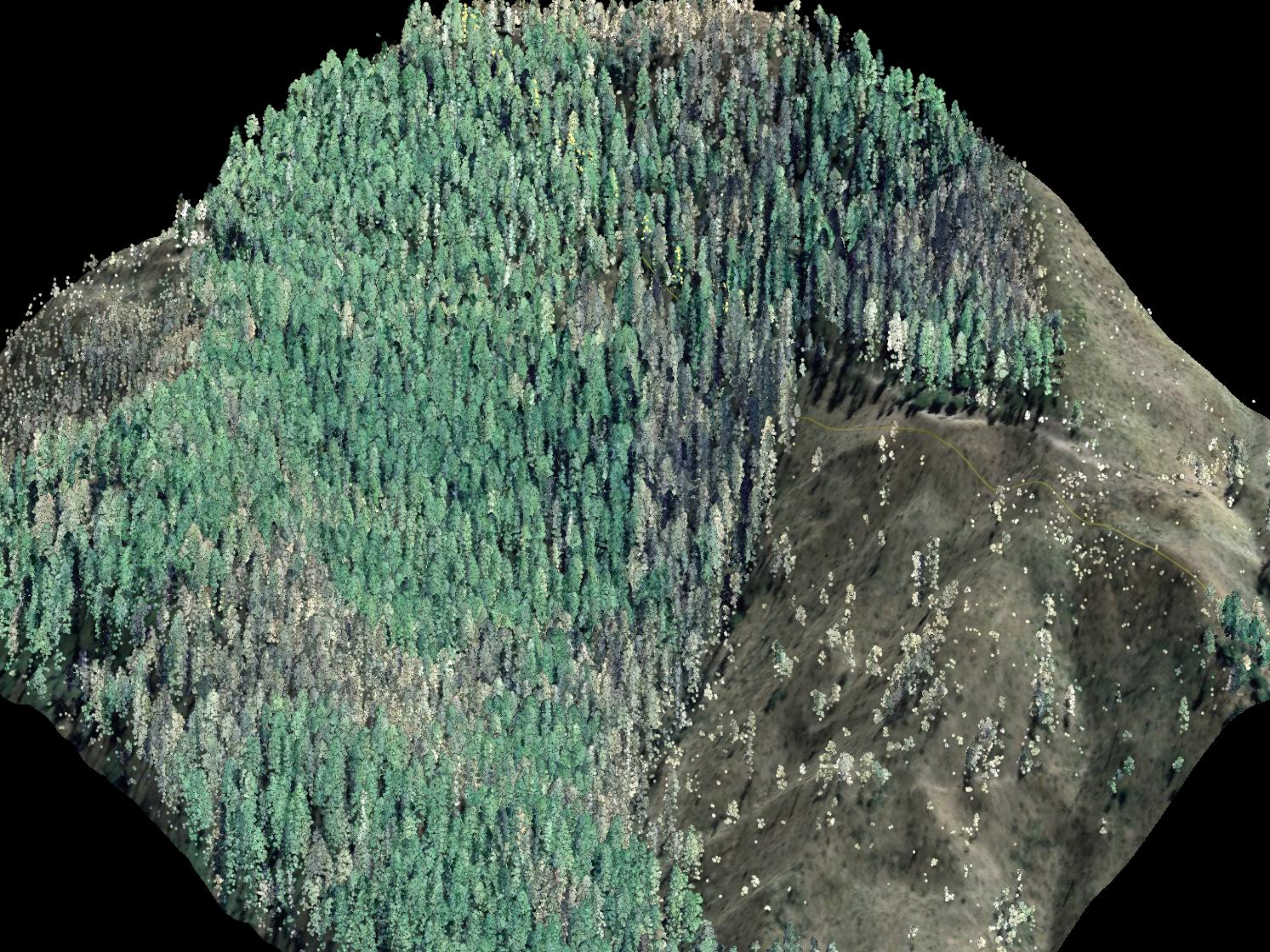
Easy to get: Stem location
Height
Density

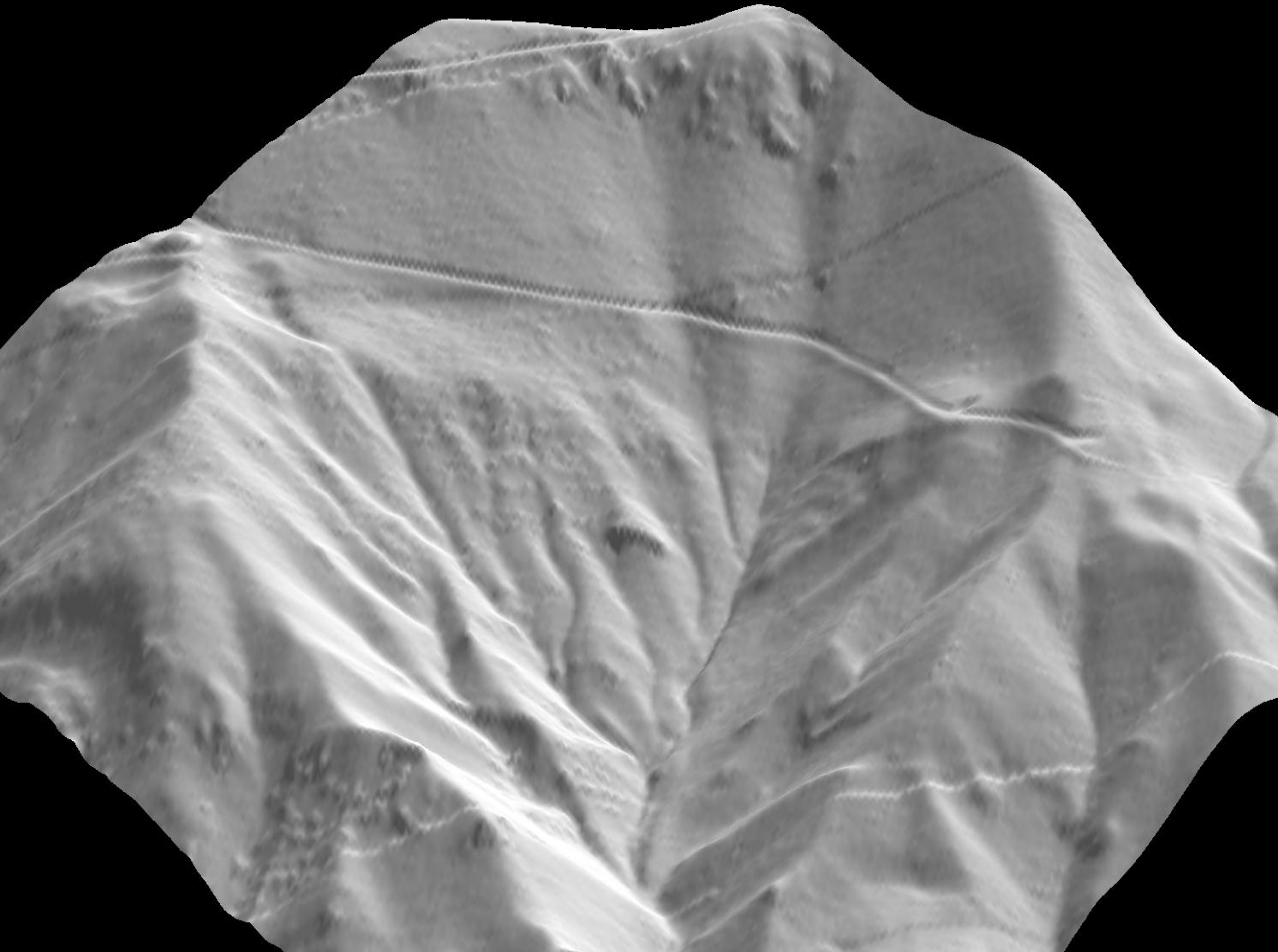
Harder to get: Species
Crown diameter
Height to crown

Can not get directly: DBH



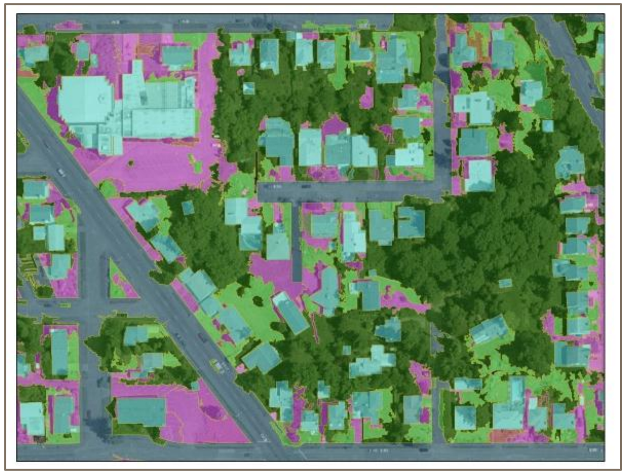




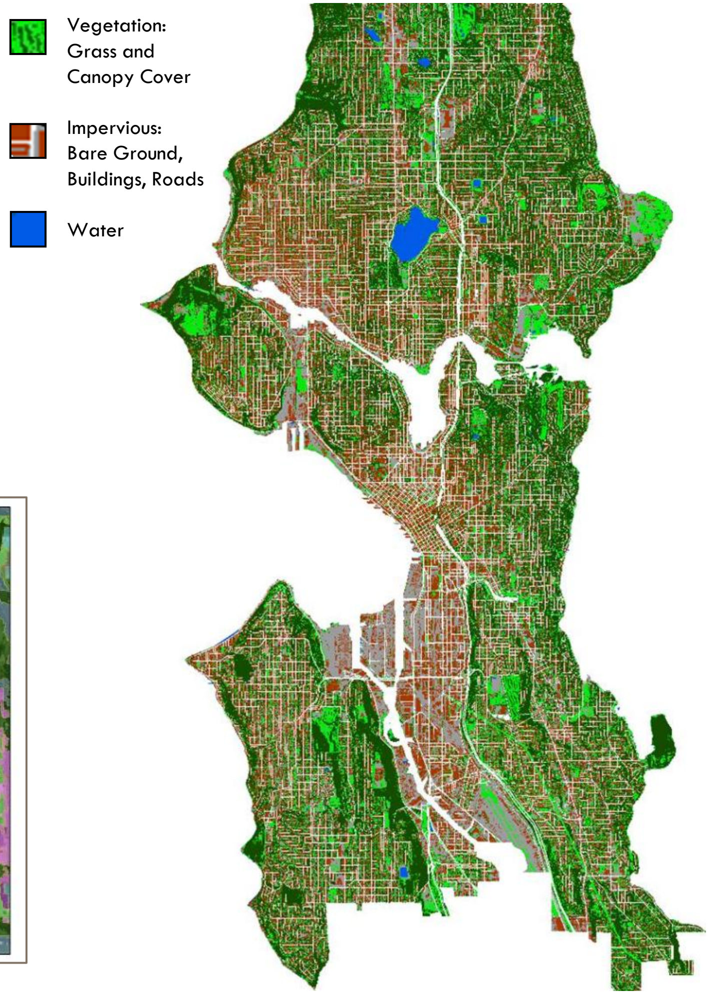


Aerial LiDAR and Imagery for LULC

2001 NLCD Canopy (30m) = 28.5% canopy

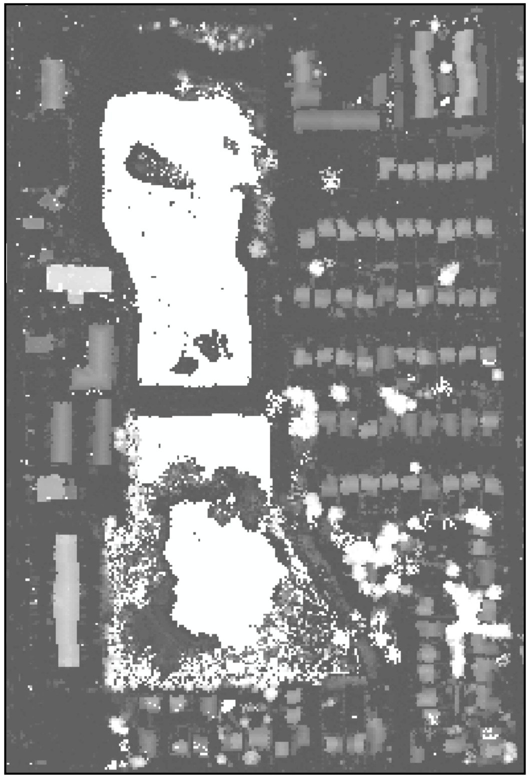


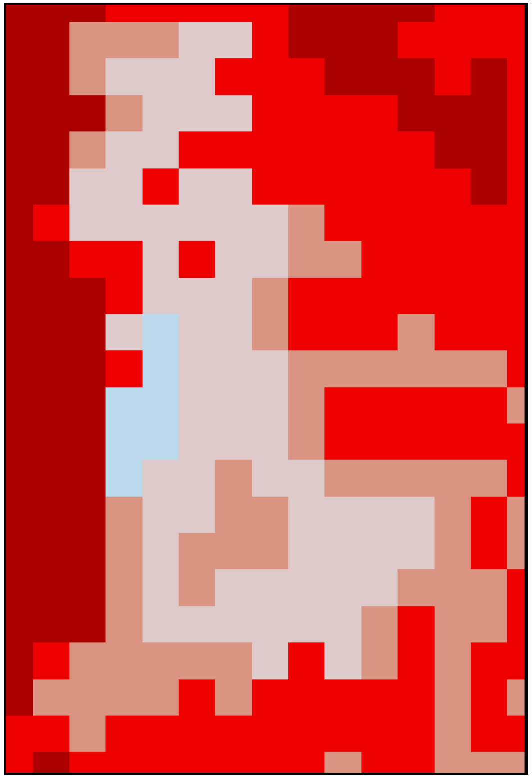
2009 RSGAL LULC (1m)
25.7% +/- 1.5 canopy



2009 NAIP and LiDAR Seattle LULC

What about forested wetlands?





Further research funded through the USDA McIntire-Stennis will commence in Fall 2011

Integrating LiDAR and Imagery for Mapping Forested Wetlands: an Object Based Approach

Simplified LiDAR Based Thermal Loading Model

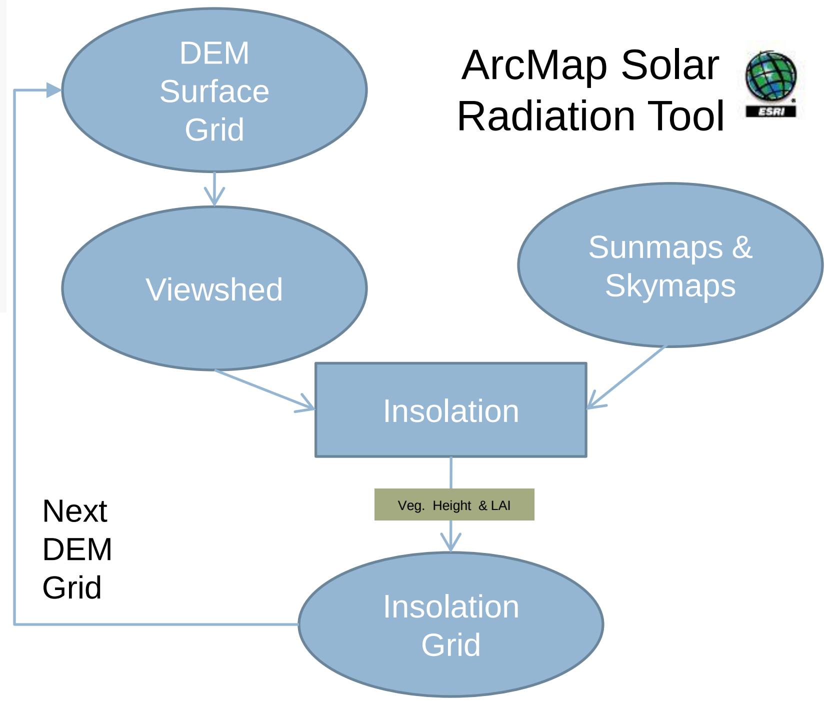
Schematic for obtaining solar energy attenuation from LiDAR. The LiDAR-based terrain model is used in conjunction with canopy density metrics to model solar conditions for 365 days out of the year. The 365 models are combined to produce a thermal loading potential surface. The same technique can be applied on spatial explicit watershed coverage provided by aerial LiDAR and to calibration sites from terrestrial LiDAR.

Source: Moskal and Park 2010

Solar Radiation Model Parameters:

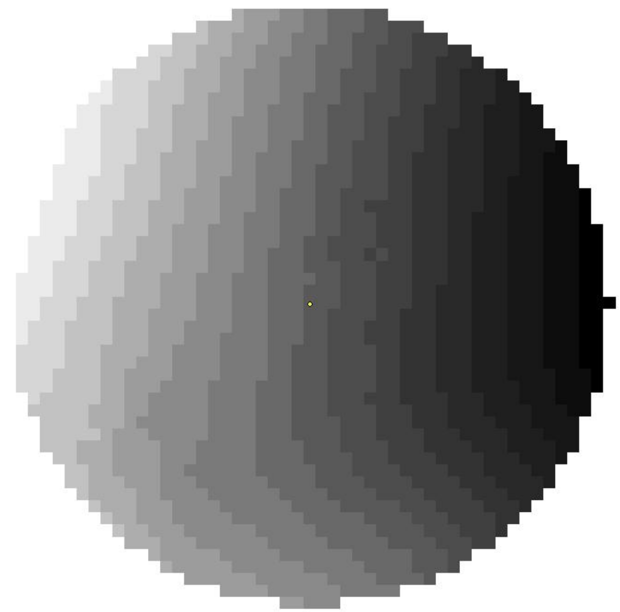
- LiDAR topographic shading
- LiDAR aspect
- LiDAR Vegetation height/canopy density (LAI)
- geographic location (latitude)
- resolution (data dependent)

Model output (watt/m2) is spatially continuous but can be buffered for streams and other features



Ground vs. Aerial DEM Surface

10 m



USGS DEMs will only have one value for the whole plot

Ground vs. Aerial Solar Radiation