

Preliminary Investigation

Richard B. Powell, Nancy H.F. French, Lucas P. Spaete

Michigan Tech Research Institute, Michigan Technological University, Ann Arbor, Michigan

Assessment of the spatial patterns of fire severity in relation to vegetation structure can help quantify fire emissions for carbon cycle studies. In a study funded by NASA, we are investigating the use object-based classification techniques to develop a method of assessing the spatial patterns of fuel consumption. The method we develop will be implemented at fire sites across Northern and Western North America to assess how fuel consumption varies.

We present the preliminary results of an object-based image analysis conducted within one fire complex from the 2004 Alaska fire season. The Boundary Complex covers a 203,703-hectare area located northwest of Fairbanks. The site includes a variety of fuel conditions and burn severity levels.



Figure 1. Study area

Pre-fire and post-fire Landsat TM scenes and an Aspect layer derived from a Digital Elevation Model are segmented into homogeneous image objects using the eCognition software package.

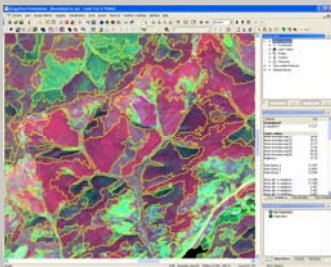


Figure 2. Image Objects

Image objects are classified into pre-burn vegetation classes using the pre-burn Landsat scene with a sample-based nearest neighbor classifier and class membership functions based on the slope layer.



Figure 3. Pre-burn Landsat image subset Bands 6,4,3

In previous Alaska land cover projects, pixel-based statistical classifiers often confused terrain shadow found on north facing slopes with dense needleleaf forests. Colder north slopes typically cannot support this type of vegetation.



Figure 4. Sparsely vegetated slope

We used object-based class inheritance and membership functions which precluded north slopes from being classified as dense needleleaf forests.

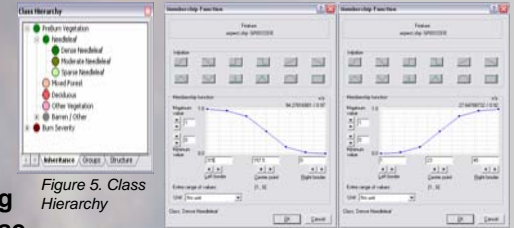


Figure 5. Class Hierarchy

Figure 6. Class membership functions identifying north facing slopes.

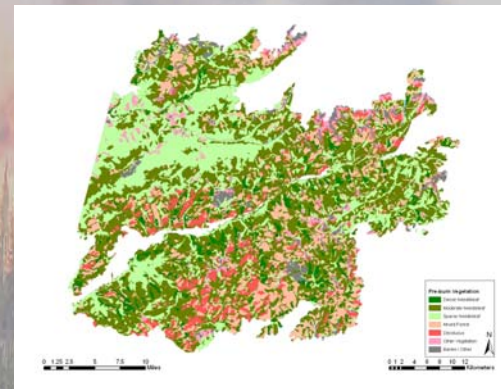


Figure 7. Pre-burn vegetation classification

The image objects are then classified into burn-severity classes using the post-burn Landsat scene with a sample-based nearest neighbor classifier supported by burn severity field data.

The next steps in this ongoing project are:

- Assess the accuracy of the land cover classification.
- Assess the accuracy of the burn severity classes
- Analyze the relationships between pre-burn vegetation, post-burn severity, elevation, slope and aspect.

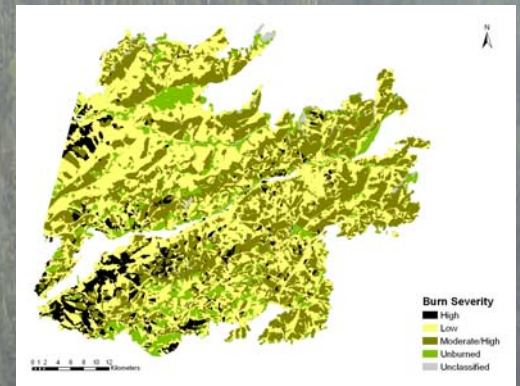


Figure 8. Burn severity classification