

# Changing Forests:

A remote sensing study of land cover classification and timber harvest detection in Northeastern Oregon from 1986-2011

## Study Background & Objectives:

Union and Baker counties, OR have seen significant changes in their timber resource economies in recent decades. Changes in overall harvesting totals coupled with differential land ownership class-specific timber management practices are changing the structure of the forested landscape. These changes can be readily identified from the remote perspective through the use of satellite image analysis. Accordingly, the primary objectives of this study were twofold: (1) to create a high-accuracy land cover map for 2011 and (2) to map changes in forest harvesting practices across different land ownership classes from 1986 to 2011. In doing so, a number of advanced remote sensing analytical methods and tools were empirically tested for their abilities to accurately classify land cover and detect changes the forested environment. Landsat 5 TM data served as the primary image source for this study.

## Methods & Results

### *Land cover classification*

In order to obtain the most accurate land cover classification, four different variables in the image classification process were tested using traditional and area-based accuracy assessments: (1) object-based versus pixel-based image analysis, (2) Bayes versus Classification and Regression Tree classification algorithms, (3) training sample segment size and (4) training sample segment shape. It was determined that pixel-based classification using a Bayes algorithm with segments created a scale parameter of 8 and shape parameter of 0.3 performed superiorly with an overall accuracy of 92.22% (See Figure 1 above). It was also found that area-based accuracy assessments consistently reported higher classification accuracies than traditional assessment methods.

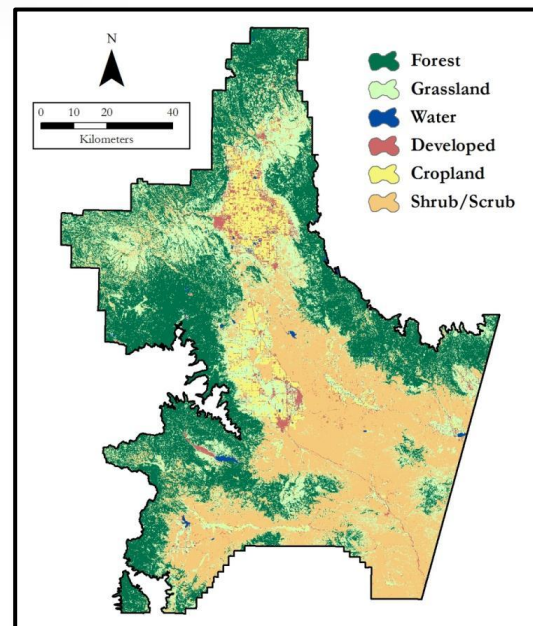


Figure 1: 2011 land cover classification

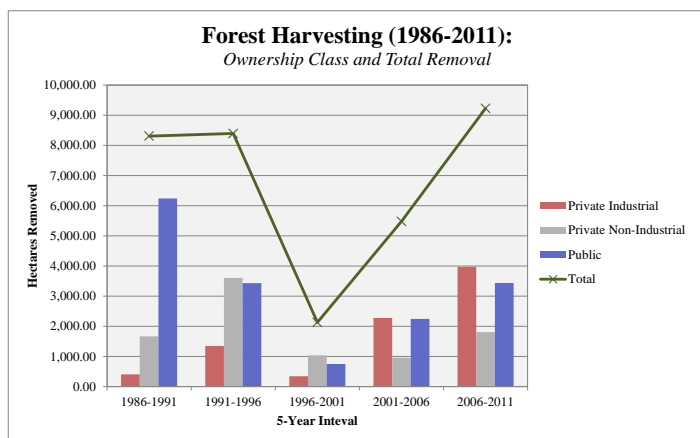


Figure 2: Ownership-specific and total forest harvesting trends, 1986-2011

### *Timber harvest changes*

Similarly, two different variables were tested for their ability to detect and classify changes in the forested environment. Following NOAA's C-CAP protocol tests were performed to determine: (1) the best spectral or derivative band for change detection and (2) the optimal threshold of change versus non-change classification. It was determined that Landsat 5 TM band 7 (shortwave infrared) at a change threshold of 1.75 SD was able to most accurately detect forest changes. These methods were applied at a 5-year interval from 1986-2011 and forest harvesting totals were computed across different land ownership classes. The results of these analyses can be seen in Figure 2 to the left.

## Acknowledgements

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### Contact information:

Email: Russ.Congalton@unh.edu

Phone: 603.862.4644

Mail: 114 James Hall | 56 College Road | Durham, NH 03824