



**Remote sensing and GIS application for monitoring  
forest management operations**

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## ABSTRACT

Satellite data potentially provide a useful tool for estimating forest cover and monitoring changes. Traditional forest surveying methods involve time consuming measurements of a large number of trees. Remotely sensed data may enable forest cover changes to be estimated very rapidly over large areas and with a minimum of ground data collection. At present the role of forest management in Britain is expanding, so that looking at forest cover changes is extremely useful for management purposes.

The main task of this study was to detect plantation forest cover change information especially on thinned and clear cut areas. These changes were estimated using Normalised Difference Vegetation Index (NDVI) derived from SPOT HRV data, compared with Forestry Commission (FC) records and field investigations. To detect whether areas have been thinned and felled during the period of concern (1994-1997), three fundamental aspects were considered. First the pattern of forest cover was identified by using FC records and field investigations. This pattern was linked to SPOT data using NDVI. At this stage relationships between forest cover and structural variables (age, top tree height, mean diameter and basal area) were also examined. Second, changes over time were analysed by using NDVI measurements (1994-1997) and change detection methods, particularly to identify the pattern of felling. Third, pixel based forest cover changes in selected compartments were related and compared to FC thinning records and information collected by forest managers.

A number of points about the ability of remote sensing techniques to provide an estimate of forest cover for management operations emerged from this study. First, it was found that NDVI changed spatially with different forest cover; spatial patterns were mainly identified in areas where major management operations (thinning and felling) were carried out. Second, temporal patterns of forest cover change, mainly due to felling operations were identified. Finally with a detailed analysis of thinned compartments, this study recognised changing patterns of forest cover, which were related to management operations.

These findings should be very useful for operational planning in plantation forests. In particular, knowledge of spatial and temporal changes of forest cover may be useful in management operations where the availability of ancillary information is unreliable. These results appear to be sufficient for the initial stages of operational planning. However further investigations need to be undertaken to better understand a number of factors related to changes of forest cover.