

Damage caused by wind poses a significant threat to the economic management of forests. In recent times, large storm events such as the 1999 Lothar storm and January 2005 gales have caused significant economic damage to areas of forest across Europe. However, wind damage also occurs at a smaller scale that may be harder to detect. Traditionally, vertical or oblique aerial photography has been the main method used to assess extent of new wind damage. Smaller areas of localised damage may not even be detected until the area is ready for harvest. The aim of this paper is to evaluate a variety of remote sensing systems as sources from which windblow can be both i) interpreted manually by operators, and ii) semi-automatically delineated by segmentation techniques. In theory wind damage (or windblow) results in areas of trees that have different, textural or spectral characteristics than their neighbours and should therefore be identifiable. In practice however, the spectral and spatial resolutions of the sensors as well as the knowledge and skill of the individual interpreting the image will all impact upon the practical use of each data source. A series of 8 images from a variety of remote sensing systems were acquired and co-registered over a 2km x 7km focus area just south of Kielder Water in Kielder Forest District for which ground truth was available. The images were acquired between 13th March 2002 and 14th May 2003 and cover at eight different spatial resolutions from 0.25m (Aerial Photography) to 30m (Landsat) in size. The experiment was designed to test the ability of interpreters with different levels of experience to detect windblow using each sensor. The selected interpreters included professional foresters (all with varying levels of experience in forest management, aerial photography and image interpretation) and a control group of non-foresters (with little experience of forestry or image interpretation). Subjects were asked to mark each of 24 potential windblow sites within the focus area on a four-point scale from 0 (definitely no windblow) to 3 (definite windblow) for each of the 8 images. The results show the influence of spatial resolution and spectral information on image interpretation. High spatial resolution appears very important for identifying internal wind damage while spectral information is more important within the 0.25-5m spatial resolution range. The results also illustrate the importance of training in image interpretation and of local knowledge. Finally the results of the manual interpretation were then compared with a second semi-automated method of highlighting wind damage by applying image segmentation algorithms to a high resolution LiDAR scan of the study area.