Edge proximity influence on radiance at forest edges on a very high resolution IKONOS winter satellite image

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In increasingly fragmented forest landscapes the influence of edges is significant. Edge effects usually consist of altered conditions of canopy openness and microclimatic conditions compared to the interior of the stand. Significant differences in tree growth, seedling establishment and ecosystem composition have been described associated with distance from stand edges. The forest edges have been treated as a function of distance from edge and the cardinal direction of the forest edge facing the open area.

The effect of forest stand edge on radiance patterns in the northern temperate forests in Estonia was studied. Radiance data were derived from very high resolution IKONOS satellite images. Our objective was to characterize the radiance contrast at the forest edges in the visible and near infrared IKONOS images. The magnitude of the effect of distance from edge was quantified as a radiance gradient that could range from steep and short (large magnitude, small distance) to shallow and long (small magnitude, large distance) in interaction with cardinal direction (solar illumination azimuth). We considered only anthropogenically created forest to non-forest edges whether maintained artificially or left for forest regeneration. Sampling consisted of transects perpendicular to well established forest edges. Forest to non-forest boundaries included in the analysis were those running more or less straight with apparently the same stands along the whole run of the transects. Forest stands more than 30 years of age were selected for this study to ensure that interior conditions of stand would be realistic for forest community. 350 edges were analyzed. Stand edges were sampled with block transects of pixel arrays parallel to the stand boundary running from 30 metres in the centre of each clearcut or open area and to 30 m deep into the forest.

The analyses of radiance contrast at non-forest to forest edges revealed the effects of stand parameters, time since edge creation (clearcut age) and azimuthal exposure on magnitude and distance of edge influence. The study points on the importance of considering specific edge effects and boundary area in landscape-scale estimations of forest change. The results are used in forest area change studies.