

Detecting land use and land cover changes in reindeer pastures using multi-source remote sensing and GIS data

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We are investigating land use and land cover changes and their effects on reindeer husbandry in the Lappi reindeer herding district in eastern Lapland over the past six decades. Forestry, hydropower construction, tourism, nature conservation, and recently mining are major drivers of land use/cover changes in the research area. There have been conflicts between other land use forms and reindeer husbandry because of resource utilization for different purposes and subsequent adverse effects on each other. A series of Landsat MSS, TM and ETM+ images (1972, 1987, 1993, 2005, 2011) and Corona images (1977) were used to detect land cover changes in a study area of 4553 km². More detailed analyses of land cover changes were carried out in three locations within the study area using a series of aerial photography from late 1950's to 2000's. Information on forest logging history were gained from Forest Government (Metsähallitus) logging plans (1950's) and follow up maps. This data was transformed into GIS database. Information of reindeer herding system and its changes in the study region were derived from old maps and interviews with reindeer herders.

The results highlight various changes in land cover/use resulting from clear-cutting, road construction, use of herbicides and the construction of artificial lakes. The area of young forests had significantly increased in the landscape. Old forests were mainly found in protected areas (national and nature parks, wilderness areas). Further, the density of the road network had noticeably increased as a result of the construction of forestry roads and tourism. From the reindeer husbandry viewpoint the number and the extent of disturbances in the landscape have increased during the past decades. Forestry has mainly negative effects on reindeer husbandry through the reduced amount of ground-growing and arboreal lichens. Artificial lakes have reduced the area of suitable pastures and disturbed pasture rotation system. Further, increased tourism in the vicinity of Saariselkä skiing resort park have disturbed reindeer herding in fjell areas. Cumulative impacts of land use and land cover changes are reflected to the spatio-temporal land use of reindeer husbandry as reindeer herding system tries to adapt to new conditions and shrinking pasture land