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Estimation of deer feeding damage area by remote sensing

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The damages to the forests caused by deer has become serious issues all over the Japan. Especially in Hokkaido, the amounts of agricultural damages by deer exceeded more than one hundred million yen in 1976. Deer area is spreading and along with it, its abundances are increasing these years. However, we don't have the specific way to know its exact range of habitats and abundances except for counting the captured number by traps or hunting now. And also, though natural forests account for 68 percent of all forests in Hokkaido, research for its damages is more difficult than artificial forests, so we don't know how the damages become worse. The final goal of this study is to classify forests into damaged or not ones by using the spectral information from image data taken by Landsat.

We did two approaches for that. First, we estimated the feeding damages from the change in each year of the underlying distribution of sasa (bamboo grass). It is because feeding damages occur when deer finish eating all sasa in forests. In this research, we used one mixed pixel which includes both sasa and betula ermanii areas for estimating ratio of sasa area in the pixel.

Second, we distinguished feeding damages directly from spectral change of forests in snow season. In this research, we used the data of area which is damaged or not. The data come from direct investigation of feeding damage of Hokkaido university Nakagawa Experimental Forest and we examined the differences in spectral changes by using the photo data taken by 830 nanometers. In research of sasa, we gauged the spectrum of sasa grasslands, betula ermanii forest, sasa and betula ermanii mixed forest in Teshikaga. Then we estimated the percentage of sasa in sasa and betula manii mixed forest Mixel to be 64% from others. This was almost the same as the percentage that was estimated from a higher resolution of Google earth's three colors image.

And in snow season research, we search for Landsat-5TM images in February 11th in 1989, March 17th in 1990, March 31st in 1992, March 13th in 1997 ,March 7th in 2004 of the three areas, damaged area in Nakagawa Experimental Forest, non-damaged area in Tomamae, the field covered with snow in Nakagawa. We found that the amount of change in each year of the damaged area is larger than non-damaged one.

Keywords: deer, damage, remote sensing