

ILLUSTRATIVE USES OF CONTINUOUS ESTIMATES OF FOREST PARAMETERS DERIVED FROM SATELLITE DATA

Heather REESE, Per SANDSTRÖM, Mats NILSSON, and Håkan OLSSON
Remote Sensing Laboratory
Department of Forest Resource Management and Geomatics
Swedish University of Agricultural Sciences (SLU)
Umeå, Sweden
Heather.Reese@resgeom.slu.se

KEY WORDS: applications, satellite data, forest inventory, continuous estimates, kNN, planning, habitat

ABSTRACT

Continuous estimates of forest parameters such as total wood volume, wood volume by species, stand age and above-ground tree biomass have been made for several areas within Sweden by combining data from the sample plot based Swedish national forest inventory, satellite imagery (both Landsat and SPOT), and map data. Four different projects are discussed here with study areas ranging from central to northern Sweden where the vegetation is typified by managed boreal forest.

Field data from the forest inventory plots ranging from a five to nine year time span were used to aid in making the estimates. The method for estimation was a "*k*-Nearest Neighbor" algorithm, in which forest variables were calculated as weighted means of *k* spectrally nearby samples. The output grids contain pixel level continuous estimates for each of the variables, which were volume, volume by species, stand age and above-ground tree biomass. Validation results show that accuracy of the estimates for all parameters is low at the pixel level (approximately 55-75% RMSE), with a tendency toward the mean, and an underestimation of higher values while overestimating lower values. However, when the estimates were aggregated to larger areas (e.g., 20 ha and larger), accuracy has been improved to give lower errors, ranging from 30%-10% RMSE depending on aggregation area and method of estimation.

These estimations represent a database which can give a landscape view of parameters normally collected as spatially intermittent plot data. Due to the results of these projects, estimates for other areas in Sweden have been requested by agencies such as county forestry boards, county administrative boards, university researchers, and others. As interest grows, it is useful to examine how these data can be used. Examples of ongoing and potential applications for these estimates are presented, such as a moose habitat use study, county level planning activities, use as input to prognostic programs, and for computation of statistics within drainage basins and smaller land holdings. These examples illustrate how other end users in Sweden might apply estimation data such as these.