Estimating Stand Structure Using Ground Data, Forest Cover Polygons, and Landsat Imagery

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Abstract: In forest landscape level analyses, forest information is often represented by separate polygons, defined by differences in species composition, stand structure, crown closure, and productivity. These polygons are delimited on medium level photography (e.g., 1:15,000) by a photo-interpreter, familiar with the inventory area. The forest cover maps of these polygon data are used for multiple purposes, including timber and habitat supply analyses, and carbon inventories, at a regional or management unit level. They are also used in more local operational level planning, and in research to identify particular types of forests prior to experimental and/or observational studies. For timber, habitat, or carbon analyses at the regional or management unit level, the simplest approach to projecting the land base over time using these polygon data is to create an aggregated yield table (volume per ha and other attributes by age class), weighted by area of each stand type (groups of polygons with similar attributes). At the other end of complexity in possible analysis approaches, the attributes of each polygon, usually a tree-list (stems per ha by species and size) and other elements, are projected forward using a particular management pathway. As information needs increase for land management, the trend has been toward the more complex approach to landscape level analysis. However, the detailed data required as an input to more complex forecast models is often not available for every polygon in the land base. Improved linkages over a variety of data sources may help to increment analyses toward the projection of individual elements of polygons. This study presents an approach for combining information from a systematic (grid) ground survey, forest cover (polygon) data, and Landsat TM imagery using nearest neighbour methods as a means of providing polygon-level attributes. The approach was applied to a 5,000 ha area (about 1,000 polygons) of high productivity, mountainous forests located near the Pacific Coast of British Columbia, Canada. Based on ground plot-clusters measured in 1989, the average per cluster volume was 394 m^3/ha, the maximum was 1128 m^3/ha, and the average mean annual volume increment was 6.35 m^3/ha/year. Steps used to combine these sources are described, along with a discussion of difficulties encountered, both for the particular application area, and more generally for other forest land areas.

Key Words: grid sampling, variable-space nearest neighbour analysis, landscape level analysis, linkages across scales

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