Remote Sensing Brief

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Landsat Detection of Hardwood Forest Clearcuts

Clearcuts could be best detected using bands 5 or 7 winter images acquired during periods of snow cover.

Abstract: *In a study of hardwood forests in Pennsylvania, the detection of clearcuts by means of visual analysis of Landsat summer imagery was accomplished best using band 5 images; however, a higher percentage of clearcuts could be detected using bands 5 or 7 winter images acquired during periods of snow cover.*

Discussion

Investigators who have applied Landsat satellite data to monitor clearcutting of predominantly coniferous forests have emphasized the use of data acquired during the growing season (Murtha and Watson, 1975; Lee, 1976; Johnson *et al.*, 1979). In the summer, the spectral contrast among coniferous forest, recently cut (nonforested), and revegetated areas is normally observed best using Landsat band 5 (0.6 to 0.7 μm) images (Heller, 1975; Kalensky and Scherk, 1975; Lee, 1975; Hawley, 1979).

In this study of hardwood forest clearcutting in the Allegheny National Forest in Pennsylvania, the authors compared visual interpretation of Landsat imagery to harvesting records and selected field checks. Similar to other investigators, they found that detection of clearcuts with Landsat summer imagery was accomplished best using band 5 images (Figure 1). More significantly, they found a higher percentage of clearcuts could be detected with Landsat winter imagery, acquired during periods of snow cover, than with Landsat summer imagery (Figure 1). On the average, 74 percent of the clearcuts were detected with band 5 winter images versus 42 percent with band 5 summer images.

In essence, the spectral contrast between hardwood forest and clearcut areas is higher in winter (leafless trees versus open areas of snow) than in summer (tree foliage versus open areas of soil, grass, or brush). Moreover, in winter the spectral contrast was equally high with Landsat bands 5 or 7 (0.8 to 1.1 μm) images. Unless covered by meltwater, snow is highly reflective throughout the visible and near-infrared wavelengths, while the reflectance of leafless trees is comparatively low.

Forest managers who apply Landsat to monitor hardwood forest clearcutting can maximize the number of clearcuts detected by using winter images acquired during periods of snow cover. Such monitoring would follow a baseline inventory of cut versus uncut areas, which could be accomplished with Landsat imagery or, in much greater detail, with aircraft photography. In winter, Landsat images from bands 5 and 7, and probably band 6 (0.7 to 0.8 μm), are of comparable value. Although Landsat summer imagery is less effective, band 5 images will allow the detection of significantly more clearcuts than images from other spectral bands.

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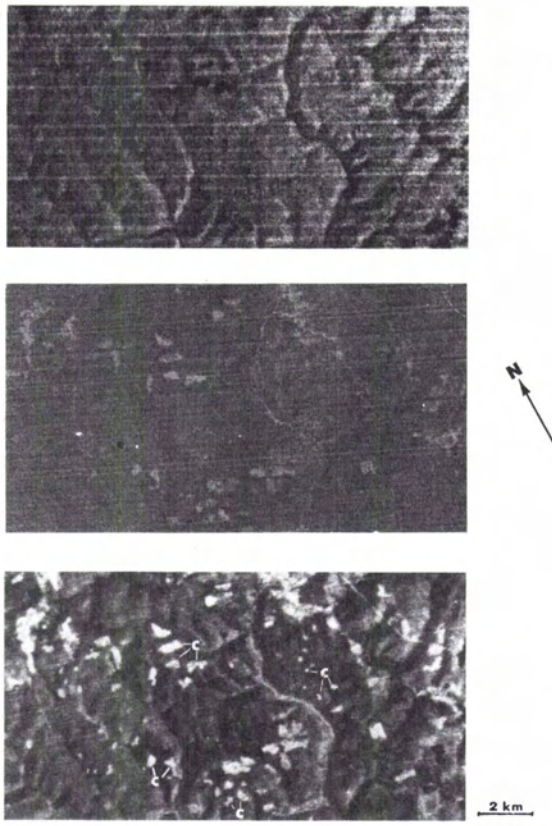

FIG. 1. Hardwood forested area with clearcuts (C) on portions of Landsat bands 7 (top) and 5 (middle) images, acquired during summer (17 August 1976), and on portion of Landsat band 5 (bottom) image, acquired during period of snow cover (22 February 1977).

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