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Pine Beetle Outbreaks: Spatial Analysis And Pheromone Population Control

The mountain pine bark beetle epidemic has infected over 5 million acres of forest in Colorado. Remote sensing techniques were used to determine geographic features that correlate with susceptibility to beetle infection. Following the identification of high susceptibility regions, beetle populations were controlled through the use of the anti-aggregation pheromone, verbenone. A quantitative algorithm was developed to distinguish beetle-infected (“red-attack”) trees from live trees using the attributes associated with each pixel in a satellite image. Once tree status was determined for each pixel, the status was correlated with geographic characteristics (e.g., aspect, elevation, slope). Based on these correlations, geographic regions were identified as high or low susceptibility to mountain pine bark beetle attack in Grand County, Colorado. The most susceptible regions in the study sites were ridge top elevations, steep slopes (30% slope), and south facing aspects. Two distinct forest regions were selected for the pheromone study; one highly susceptible and one less susceptible to pine beetle attack, based on the remote sensing results. Verbenone pheromone was applied in the two forest study sites (Site 1: 9000 foot elevation, north facing aspect; and, Site 2: 10,000 foot elevation, south facing aspect). As compared to equivalent control sites, verbenone pheromone decreased one-year beetle infection rates in high susceptibility regions from 16% to 6%. The susceptibility of geographic regions to beetle attack may influence the expected outcome of beetle control methods.