APPLICATION OF HYPERSPECTRAL IMAGING TO SURVEY FOR EMERALD ASH BORER

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Abstract

The emerald ash borer (EAB) (*Agrilus planipennis* Fairmaire) was first discovered in the Detroit metropolitan area in the summer of 2002 and has been found subsequently throughout southern Michigan. As a killer of ash trees, the borer is already having severe impacts on urban and natural forests. Because conventional ground survey is laborious and time-consuming and the early stages of infestation are difficult to detect, survey for new infestations using remote sensing technology—especially, hyperspectral imaging (HSI)—holds great promise. Because of its wide spectral range and narrow resolution, HSI has the potential to detect the subtle spectral differences that may characterize individual tree species and trees exhibiting stress symptoms resulting from insect damage. We are exploring the twofold application of HSI to mapping distributions of ash trees and locations of EAB-infested hosts in various stages of decline over wide areas. Our work consists of four components: image acquisition, collection of spectral signatures for ashes and other tree species, collection of ground truth information on ashes and other species, and image analysis and classification of land cover.

The imaging flight was made on 17 September 2003. Images were acquired at 4-m resolution. The study area encompassed about 5 km by 2 km around Brooklyn, MI. The Probe 1 hyperspectral sensor recorded 128 bands spanning the EM spectrum from visible light through infrared. At the same time, reflectance characteristics of ash trees in various states of health were collected on the ground with a handheld spectrometer. Readings were made above tree crowns around midday so as to approximate the conditions recorded by the airborne sensor. Additional ash trees in various states of health and trees of other species were examined and georeferenced on the ground under the flight path of the imaging aircraft to provide ground truth information. Image analysis is under way at Clark University in Worcester, MA. Spectrometer readings and reflectance characteristics of ground truth trees will be used to develop spectral signatures—combinations of several spectral bands that characterize individual tree species and health classes—which in turn may be used to classify the hyperspectral images so as to produce maps of EAB host trees for use in the survey program.