Abstract

Paper birch (*Betula papyrifera*) is a dominant specie within Northern Minnesota's Laurentian mixed forest. Though these trees are common place, paper birch populations have been in decline for the past couple decades along Lake Superior. Due to the reduced replacement rate of this specie, organizations are implementing management strategies to promote healthy forests. This thesis investigates remote sensing techniques to predict paper birch locations remotely. The thesis tests individual specie level spectral signature effectiveness to classify community level data of the same informational group. The project uses hyperspectral Airborne Visible/ Infrared Imaging Spectrometer (AVIRIS) flights data for its imaging platform. Two spatial resolution scenes were classified for this project. A 4.3 m pixel resolution image was used for defining spectral signatures based on ground truth data. Then a lower resolution 16.5 m image was used to apply the produced paper birch signature as a classifier to test functionality of these methods on known paper birch communities. Pixels were used as the final classification unit. A linear unmixing soft classification was utilized to produce percent signature contained within pixels. The classification resulted in ~93% of forest plots containing some pixels with 95% similar spectral signatures to paper birch. Total classified coverage of validation forest plots was low with only ~30% covered with 75% similar signature or greater. The long-term objective for this project is to automate specie identification to monitor trees. Further research is needed to streamline classification and refine procedures, yet current findings can help forest managers and conservationists identify priority sites to both map current specie distribution and implement restoration activities.