HYPERSPECTRAL MAPPING OF THE INVASIVE SPECIES PEPPERWEED AND THE DEVELOPMENT OF A HABITAT SUITABILITY MODEL

Andrew Nguyen, San Jose State University
Alexander Gole, University of Redlands
Jarom Randall, Brigham Young University
Glade Dlott, California Polytechnic State University, San Luis Obispo
Sylvia Zhang, Yale University
Brian Alfaro, United State Fish and Wildlife Service, Fremont, CA
Cindy Schmidt, Bay Area Environmental Research Institute
J.W. Skiles, PhD, NASA Ames Research Center

DEVELOP NASA Ames Research Center
M.S. 239-20 Moffett Field, California 94035
Andrew.Nguyen@nasa.gov
Joseph.Skiles@nasa.gov

ABSTRACT

Mapping and predicting the spatial distribution of invasive plant species is central to habitat management, however difficult to implement at landscape and regional scales. Remote sensing techniques can reduce the impact field campaigns have on these ecologically sensitive areas and can provide a regional and multi-temporal view of invasive species spread. Invasive perennial pepperweed (*Lepidium latifolium*) is now widespread in fragmented estuaries of the South San Francisco Bay, and is shown to degrade native vegetation in estuaries and adjacent habitats, thereby reducing forage and shelter for wildlife. The purpose of this study is to map the present distribution of pepperweed in estuarine areas of the South San Francisco Bay Salt Pond Restoration Project (Alviso, CA), and create a habitat suitability model to predict future spread. Pepperweed reflectance data were collected in-situ with a GER 1500 spectroradiometer along with 88 corresponding pepperweed presence and absence points used for building the statistical models. The spectral angle mapper (SAM) classification algorithm was used to distinguish the reflectance spectrum of pepperweed and map its distribution using an image from EO-1 Hyperion. To map pepperweed, we performed a supervised classification on an ASTER image with a resulting classification accuracy of 71.8%. We generated a weighted overlay analysis model within a geographic information system (GIS) framework to predict areas in the study site most susceptible to pepperweed colonization. Variables for the model included propensity for disturbance, status of pond restoration, proximity to water channels, and terrain curvature. A Generalized Additive Model (GAM) was also used to generate a probability map and investigate the statistical probability that each variable contributed to predict pepperweed spread. Results from the GAM revealed distance to channels, distance to ponds and curvature were statistically significant ($p < 0.01$) in determining the locations of suitable pepperweed habitats.