MAPPING AND MODELING OF INVASIVE SPECIES USING REMOTE SENSING AND GIS

Sunil Narumalani
University of Nebraska, USA
Email: vsnarumalani1@unl.edu

ABSTRACT

Geospatial technologies are increasingly important tools used to assess the spatial distributions and predict the spread of invasive species. Four dominant invasive plant species were mapped and quantified along the flood plain of the North Platte River corridor in Nebraska, USA. The species included saltcedar, Russian olive, Canada thistle and musk thistle. Using the Airborne Imaging Spectroradiometer for Applications (AISA) hyperspectral imager (from Visible to Near Infrared), this research evaluated an image processing technique known as Spectral Angle Mapping (SAM) for mapping the invasive species distribution. A Minimum Noise Fraction (MNF) algorithm was used to remove the inherent noise and redundancy within the dataset during the classification. The classification algorithm applied on the AISA image revealed five categories of invasive species distribution including (a) saltcedar, (b) Russian olive, and a mix of (c) Canada and musk thistle, (d) thistle and reed canary grass, and (e) thistle, saltcedar and reed canary grass. Validation procedures confirmed an overall map accuracy of 74% with saltcedar and Russian olive classes showing very high producer's (96% and 100% respectively) and user's accuracies (93% and 91% respectively), when compared to the three mixed classes. After classification, a predictive habitat model, MAXENT was used to predict the distributions of the five invasive plant species. Projections for each species were highly accurate, with elevation and distance from river being the most important variables for each species. Saltcedar and phragmites appear to have restricted distributions in the study area, whereas Russian olive and thistle species were broadly distributed. The immediate benefit of this research has been to provide improved information on the spatial extent, density, and potential sites of invasive species to land managers for the effective implementation of management programs.

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