Investigation of common milkweed spreading using LUCAS and hyperspectral data

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Abstract

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The wildlife and richness of species in Hungary is greatly endangered by invasive plants mostly coming from other countries and continents. These invasive plants are spreading aggressively and they are taking over massive territories. One of the biggest ecological risk is caused by the common milkweed (Asclepias syriaca), which is spreading unstoppably in the sand ridges of the Duna-Tisza Interfluve in Hungary, harming the native flora and the agricultural plough fields. This massive spreading is causing serious nature conservational harm as well as economical problems. It's very important to continuously monitor this invasive species, to map the ways of spreading, and to terminate the infected and the potentially compromised territories. This ecological problem has not yet been examined via a combination of GIS and remote sensing tools and methods. Using the LUCAS dot based land use and land cover database, made by Eurostat, spreading of the milkweed on the southern territories of the Great Hungarian Plain was identified and categorised by measure of infection. The outcome was correlated with the genetic soil maps of the region. Furthermore as part of the research a mobile application was created with a real time map on ArcGIS Online platform, based on VGI (Volunteered geographic information) data collection of the topic. With this solution fast, accurate and up-to-date data can be provided from greater regions, consuming minimal time and energy. This method is indispensable to monitor these rapid and dynamic ecological changes. Simultaneously with the fieldworks, from an UAV (unmanned aerial vehicle) platform high resolution hyperspectral aerial images with 138 spectral bands were taken. Spectral information from the visible and near infra-red range enabled to specify the spectral characteristics of common milkweed. Using field training and validation data different classification methods (Spectral Angle Mapper, Support Vector Machine, etc.) were tested with a best Producer accuracy of 76%. However false positive results were also appeared on open grassland areas, which problem have to be solved in the future.