Using Landsat TM Imagery To Monitor Spatial Changes Of Waterhyacinth After Broadcast Herbicide Application

W. Robles and J. D. Madsen

Mississippi State University, GeoResources Institute
Box 9652, Mississippi State, MS, 39762-9652

Waterhyacinth is an invasive aquatic species that chokes water bodies and affects ecological interactions. Chemical control has been the most commonly-used tool in successfull management of this plant. However, the evaluation of herbicide efficacy has always required ground-truth data to confirm if areas covered by waterhyacinth have been controlled after herbicide application. In order to measure spatial changes of waterhyacinth, two satellite images from Landsat 5 TM (900 m^2 pixels) were acquired before and after herbicide application over Lake Columbus, MS in 2005. The herbicide used was 2, 4-D amine applied by helicopter at a rate of 1 gallon/acre. Sprayed areas were digitized from an aerial image taken previously and used as ground-truth data. An unsupervised classification of each satellite image was performed in ERDAS – Imagine software to separate vegetated areas from non-vegetated areas. The remaining analytical procedures were performed in ArcMap-ArcGIS software with Spatial Analyst. The evaluation of waterhyacinth coverage was performed pixel by pixel using a Boolean operator. Sprayed areas (waterhyacinth coverage) were converted in pixels of 900 m^2 and reclassified into 0 = non-sprayed and 1 = sprayed in order to evaluate them against non-vegetated areas = 0 and vegetated areas = 1 from the pre-herbicide application classified satellite image. The analysis of each output consisted in total pixel counts per class multiplied by 900 m^2 and dividing it by 4,046 to get acreage cover. The total acreage of pre-herbicide application coverage (PreHAC) for the waterhyacinth coverage class was 88 acres. A total reduction of 31 acres was detected on post-herbicide application coverage (PostHAC). As a result, a 35% of waterhyacinth cover was diminished by a broadcast application of 2, 4-D. These results suggest that the use of Landsat imagery to evaluate the efficacy of large-scale herbicide applications and track aquatic plants spatial changes is feasible.