FIELD SPECTROMETRY OF PAYRUS VEGETATION (*CYPERUS PAPYRUS L.)* IN SWAMP WETLANDS OF St LUCIA, SOUTH AFRICA

Elhadi Adam and Onisimo Mutanga*

University of KwaZulu-Natal, Discipline of Geography, P. Bag X01, Scottsville 3209, Pietermaritzburg, South Africa

Papyrus (*Cyperus papyrus L.*) is one of the most important species-rich habitats that characterise the Greater St Lucia Wetlands Park (GSWP) in South Africa. This paper investigates whether papyrus could be discriminated from its co-existing species using ASD field spectrometer data ranging from 300 nm to 2500 nm, yielding a total of 2151 bands. Canopy spectral measurements from papyrus and other three species were collected in situ in the Greater St. Lucia Wetlands Park, South Africa. A new hierarchical method based on three integrated analysis levels was proposed and implemented to spectrally discriminate papyrus from other species as well as to reduce and subsequently select optimal bands for the potential discrimination of papyrus. In the first level of the analysis using ANOVA, we found that there were statistically significant differences in spectral reflectance between papyrus and other species on 412 wavelengths located in different portions of the electromagnetic spectrum. Using the selected 412 bands, we further investigated the use of classification and regression trees (CART) in the second level of analysis to identify the most sensitive bands for spectral discrimination. This analysis yielded eight bands which are considered to be practical for upscaling to airborne or space borne sensors for mapping papyrus vegetation. The final sensitivity analysis level involved the application of Jeffries–Matusita (JM) distance to assess the relative importance of the selected 8 bands in discriminating papyrus from other species. The results indicate that the best discrimination of papyrus from its co-existing species is possible with six bands located in the red-edge and near-infrared regions of the electromagnetic spectrum. Overall, the study concluded that spectral reflectance of papyrus and its co-existing species is statistically different, a promising result for the use

of airborne and satellite sensors for mapping papyrus. The three step hierarchical approach employed in this study could systematically reduce the dimensionality of bands to manageable levels, a move towards operational implementation with band specific sensors.

*Corresponding author: Tel.: +27332605779; fax: +27332605344.
E-mail address: Mutangao@ukzn.ac.za