TESTING THE UTLITY OF MAPPING *ACACIA MEARNSII* USING EO-1 HYPERION HYPERSPECTRAL DATA

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Most invader plant species have been introduced to their new environment, either accidentally, or for purposes of promoting human endeavour. *Acacia mearnsii* is a native Australian plant, introduced to the former Natal, and subsequently commercialised for the production of tannic acid and timber for pulp, firewood, and mining industries. Although a species of great economic value to the commercial forest industry, *A. mearnsii* is also a significant invader of grassland, indigenous bush, roadsides, and riparian zones, having dramatic impacts on water availability and runoff, with concomitant negative effects on biodiversity and ecosystem functioning. In a biodiversity-rich and water-scarce country such as South Africa, it is imperative to curb and ultimately avert the threat posed by such species.

The effective management and control of invasive non-indigenous plant species relies on the acquisition of accurate and timely spatial information; providing for monitoring the efficacy of current management and control strategies, monitoring of possible future invasions, as well as identifying target species and areas for future clearing operations. Given its many advantages, remote sensing has been recognised as a tool to measure and map vegetation, and subsequently, invasive alien plant species. Digital remote sensing has since been widely applied, offering automated image processing and large spatial coverage.

The precise assessment of an invading species, particularly at low density, is fundamental to their effective management, control, and eradication. Although multispectral imagery has been widely applied in the characterisation and mapping of vegetation and ecosystems, similar spectral responses in the visible and near infrared wavelengths, coupled with an inherent limitation of low spectral resolution, makes mapping with multispectral imagery difficult,

particularly in heterogeneous landscapes.

Unlike traditional multispectral data, hyperspectral imagery allows for the extraction of more detailed information. Hundreds of narrow contiguous wavebands, coupled with the unique phenological, spectral, and structural traits of invasive alien plant (IAP) species, allows for their distinguishing characteristics from other vegetation. This clearly illustrates the advantage of using hyperspectral data for vegetation, analysis and mapping, and species discrimination.

This research forms part of a wider study which investigates the potential of multispectral and hyperspectral remote sensing, for the mapping of selected IAP species in South Africa. This article thus examines the potential of hyperspectral data, in particular the use of EO-1 Hyperion data, for the identification and mapping of *A. mearnsii* in the KwaZulu-Natal midlands of South Africa. An orthorectified Hyperion strip was acquired in September 2007, atmospherically corrected using FLAASH, and transformed using minimum noise fraction analysis, prior to classification. Spectral data together with the spectral angle mapper (SAM), spectral feature fitting (SFF), and matched filtering (MF) algorithms, were tested in the classification and mapping of the target feature. The standard supervised classifier, Maximum Likelihood, as well as an unsupervised algorithm, specific to hyperspectral data, was also incorporated into the classification.

The overall classification results proved to be satisfactory, with some variation between the various classifiers. From the positive results of this research, the authors strongly recommend the utilisation of hyperspectral remote sensing to IAP species mapping and its operationalization in management and control programmes. The results of this study will certainly contribute to the further development of the management plan of the Working for Water Programme.