

MAPPING INVASIVE SPECIES IN MĀKAHA VALLEY, O‘AHU USING FINE
RESOLUTION SATELLITE IMAGERY

A THESIS SUBMITTED TO
THE GLOBAL ENVIRONMENTAL SCIENCE
UNDERGRADUATE DIVISION IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

BACHELOR IN SCIENCE

IN

GLOBAL ENVIRONMENTAL SCIENCE

MAY 2006

By
Michele R. Harman

Thesis Advisor

Tomoaki Miura

ABSTRACT

The invasion of natural communities by introduced species constitutes a major threat to global biodiversity and ecosystem functioning. In 2003, the Hawai‘i state legislature found that invasive species were the “single greatest threat to Hawai‘i’s economy and natural environment and to the health and lifestyle of Hawai‘i’s people.” It is widely recognized that remote sensing analysis is important in the effort to manage invasive species and guide sustainable land management. The primary objective of this study was to understand the degree of infestation of alien invasive species in Mākaha Valley in support of native plant species conservation and sustainable land management. This required a detailed assessment of the current spatial distribution of invasive species throughout the valley. Thus, the secondary objective of this research was to generate a predictive vegetation map which depicts the degree to which native communities have been invaded by alien plants. We assessed the degree of invasion using fine spatial resolution satellite imagery augmented by intensive field survey. A 4m multispectral IKONOS satellite image was used to derive quantitative information, whereas a color NIR aerial photo and a pan-sharpened, pseudo-1m true color IKONOS image were used to visually identify plant communities and inspect their spatial distributions. Despite challenges in producing a detailed vegetation map with well-defined class labels, this study was successful in producing an interpretive map which will aid in the understanding of the degree of invasion by alien species in the Mākaha subwatershed. The challenges faced during classification were typical of those found by other researchers working in heterogeneous tropical areas and those working with high spatial

resolution satellite imagery. Procedures exist which can refine the initial vegetation classification, including texture analysis and segmentation, and future work will most likely yield results even more useful to resource managers.