Georeferencing to Unlock the Potential of Aerial Images to Inform Natural Resource Management.

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Introduction

Ecological monitoring and management require detailed information over broad spatial scales. Historically, such information was often acquired through manual interpretation of aerial photographs. Aerial photographs are ideal for mapping small ecosystems and fine-scale landscape features, such as riparian areas or individual trees, vegetation cover and condition because they often possess a high level of spatial and radiometric detail. Aerial photographs also provide the longest- available, temporally continuous, and spatially complete record of landscape change. Limitations in the use of aerial images occur when the location information delivered with them is inadequate and the data does not align properly with other data layers, such as topo maps. Therefore, to effectively use raster datasets (such as aerial photographs) in conjunction with other spatial data layers, a process of geo-referencing or geo-rectifying is required. This project outlines that process as well as suggests some applications for this technique as a tool for natural resource managers.

Methodology

A geodatabase was created to manage data from all sources and outputs. Data included: 8-Band Satellite Imagery, Shapefiles of Waikamoi Boundary and Historic aerial photographs.

Results & Discussion

Use of Aerial photographs to help answer many current and pressing ecological questions is considerable. Geo-referencing a remotely sensed raster image enables resource managers to:

- View, query, and analyze the images with other geographic data.
- Reconstruct historic ecosystem conditions from archived aerial photography to characterize the historic range of variability within ecosystems.
- Monitor landscape and ecosystem change, such as tracking declines in foundation species and anthropogenic impacts.

There are specific challenges for using remotely sensed images: Manual interpretation requires highly trained individuals with past personal experience. (Morgan, 2010). There is a need to provide training to bridge the traditional methods of aerial photograph analysis with its emphasis on local knowledge with the more advanced analysis capabilities and broad spatial coverage provided for by the evolving use of GIS.

I met with Mark White and Kerry Fay of The Nature Conservancy (TNC), Maui to discuss options for using GIS techniques and analysis to address some issues with management of the newly expanded Waikamoi Preserve. Specific questions regarding the management plan for Waikamoi which could be informed by geo-referencing historic images include:

1. Identification of type and range of weed coverage
2. Changes in vegetation over time
3. Mapping the spread of specific plant species, such as uluhe (Dichanthepsis linearis)
4. Documenting human impacts within Preserve boundary over time.
5. An additional goal of the project is to identify sources of remotely sensed images taken f areas within reserve boundaries in order to build a historic reference point form a “mosaic” of historical images with added geospatial data.

Identification of type and range of weed coverage is a major management focus of the newly expanded Waikamoi Preserve. Monitoring and eradication of invasive species such as the Axis deer along the fence line of Waikamoi Preserve. Remote sensing can be a rapid way to detect invasive species and monitor their spread. UAV technology can be used to detect invasive species in remote areas. Waikamoi Preserve is a major management focus to control invasive species.

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