USE OF VERY LARGE SCALE AERIAL (VLSA) DIGITAL PHOTOGRAPHY TO MONITOR VEGETATION AT CORONA RANCH

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Introduction

The investigation of landscape-scale processes involving semiarid woodland dynamics has been hindered by lack of effective methods for making fine-scale measurements across extensive areas in a cost-effective and timely manner. Very large scale aerial (VLSA) imagery has been used to conduct fairly detailed vegetation monitoring over extensive areas of Wyoming, Nevada and South Dakota. We are currently testing its usefulness in piñon juniper woodlands of Corona Ranch.

Objectives

This project's objectives are to: a) evaluate woodland responses to past thinning treatments; b) explore juniper sapling-herbaceous understory relations; c) study focal research areas (cattle grazing exclosures, targeted grazing plots); and d) collect preliminary data to conduct tree biomass estimates for future bio-fuel applications.

Materials & Methods

Two digital cameras mounted on a small airplane were used to take photographs at approximately 2,500 stations located at 150-m intervals along EW flight lines spaced 600 m apart over the entire 11,330 hectares of CRLRC (Figure 1). Digital cameras captured geocoded pictures with field-of-view of 36x24m and 3x4m and resolutions of 7.2 mm and 1.1 mm ground sample distance, respectively (Figue 2). Acquired images are being analyzed using "Sample Point" and "ImageMeasurement" software developed by USDA-ARS.

Figure 1 Light weight aircraft used to survey vegetation of Corona Ranch. Joe Nance, aircraft pilot and owner, is landing on a gravel county road close to CRLRC's North Camp.

Figure 2: Close up of aircraft. Note digital cameras in the foreground. Sam Cox is programming flight lines on one of the 2 on-board laptop computers.

Materials and Methods

Figure 3: Corona Ranch VLSA photograph survey flight transects. Colored are on the map indicates pastures with piñon juniper woodlands

Figure 4: Screen with flight lines used by the aircraft pilot during flights. Each photograph is geo-coded, and stamped with date and flight altitude.

Results

Figure 5: Digital image covering a 36x24m area with a 10-mm/pixel resolution. Images were taken at each point on the map above (Figure 3)

Figure 6: Nested digital image covering an area of 3x4 m with a 1 mm/pixel resolution. These images are analyzed to determine vegetation cover.

Results

Figure 7: Screenshot of *Sample Point*, an ARS-developed software that is being used to analyze vegetation cover in the 3x4m images. Crosshairs are randomly generated by this software and used to record point intercept canopy cover data on each image.

Figure 8: Screenshot of *Image Measurement*, another ARS-developed software that is being used to record juniper sapling dimensions and distances to closest neighbors.

Image analysis is currently being conducted at two locations. At NMSU in Las Cruces (NM), basic cover measurements are being recorded on a subset of images containing live and dead (snags) one seed juniper saplings. At the USDA_ARS High Plains Grasslands Research Station in Cheyenne (WY) analysis of a subset of stereo images is being conducted which will allow the calibration of algorithms to determine woody biomass from 3-D images. Such algorithms are being developed jointly between USDA-ARS HPGRS and a division of USDI-BLM Denver office.

Potential Applications

Once calibrated, this monitoring technique could have important practical applications in woodland management decisions. Prescription of fire or alternative thinning programs (chemical, mechanical, biological), evaluation of harvestable biomass for small energy plants, assessments of habitat quality for deer and livestock, are only a few of the potential applications.

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