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Applications of Aerial Surveys to Landscape Issues of the Rock Creek Watershed in Northeastern Nevada

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Tools:

VLSA: Very-large scale aerial photography

We used a 600-lb aircraft carrying an 11.1-megapixel Canon 1Ds camera, laptop PC for storage, laser altimeter for altitude control and a Track'Air navigation system interfaced with a GPS. Typical flight altitude was 330 feet above ground level. Six hundred forty nine VLSA images were captured within the study area on a ¼-mile grid.

Laser Point Frame: A bar supported 3 ft above the ground with 10 vertical laser pointers was used to sample cover at 100 points/square meter on 50 plots.

SamplePoint is a software program that facilitates point-sampling of digital images with up to 92% accuracy. SamplePoint was used to measure bare ground, as well as other cover types, in all digital images.

Study Site: 25,000 acres in the Rock Creek Watershed, just south of Willow Creek Reservoir, northern Nevada

Typical VLSA image

GOALS:

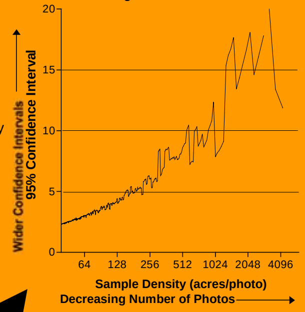
1. Bare Ground Measurements: Analyze VLSA and laser point frame (LPF) data and compare them for percentage bare ground as a means of assessing the accuracy of VLSA-derived bare ground measurements in an ecosystem heavily infested with cheatgrass.

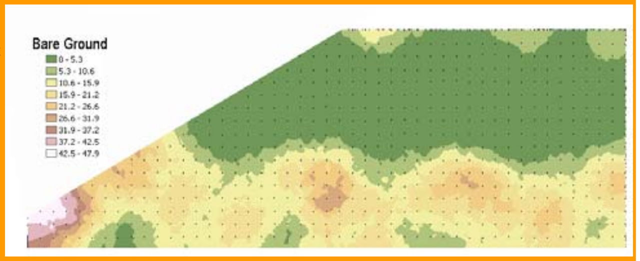
2. Species Identification / Cover Measurement: Attempt vegetation type identification from VLSA data and measure percent cover for identified plant species. Compare cover-by-species from VLSA imagery with the LPF cover-by-species.

3. Landscape Analysis: Examine the potential for landscape analysis by reference to topography, hydrology, soil type, fire history, roads, and land ownership and determine if information extracted from VLSA data is correlated with landscape features such as fire history.

Bare ground was measured approximately the same by the both the laser point frame and SamplePoint on 100m images. Therefore, we conclude that aerial sampling, by virtue of being much more time and cost efficient, is a more practical method for monitoring very large areas of rangeland. The map at right shows a geostatistical representation of bare ground based on 649 aerial sampling points, shown as dots on a 1/4-mile grid.

VLSA makes possible large data sets, which is beneficial to achieving high measurement precision. The graph at right shows the effect of decreasing sample density on the confidence interval for bare ground measurement.

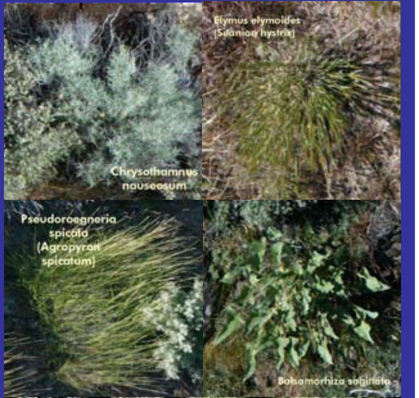


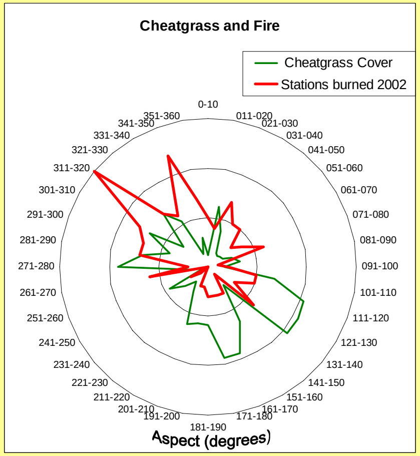


Method	n	Mean	95% CI
Laser Point Frame	50	18.8	7.5
SampePoint 100-m-AGL	649	21.7	2.3

Many species were not identifiable from VLSA imagery, so cover measurements were limited to functional group (grass, forb, shrub, etc.). Functional group SamplePoint measurements were not in high agreement with those made using the Laser Point Frame (R = 0.56). Some of this disagreement is likely due to the fact that the plots were not exactly paired.

Although many species were not identifiable from VLSA imagery, some were, including:
Artemisia tridentata
Lupinus argenteus
Chrysothamnus viscidiflorus
Chrysothamnus nauseosum
Leymus cinereus
Poa secunda
Purshia tridentata
Pseudoroegneria spicata
Bromus tectorum
Achillea millefolium
Festuca idahoensis
Elymus elymoides
Phlox hoodii
Balsamorhiza hookeri





Of all cover types, only cheatgrass showed any relationship to topography or fire. Overlaying cheatgrass cover with the 2002 burn on an aspect axis shows that cheatgrass has a strong preference for southeast-facing slopes that stay warmer in the winter and early spring when cheatgrass is actively growing, an affinity previously reported. However, high cheatgrass cover is not typical on northwestern slopes, as seen here. Cheatgrass is known to prefer burned areas. Only by overlaying cheatgrass cover with the 2002 burn is such a high cheatgrass presence explained.