SERDP Strategic Environmental Research and Development Program

Improving Mission Readiness Through Environmental Research

Using Remote Sensing to Detect and Monitor Change on Military Lands

Conservation CS-1098

Background:

The current and future training and testing needs of Department of Defense (DoD) lands are expected to generate requirements for ecosystem repair and maintenance that may well exceed the current estimated annual costs of $56 million. The DoD needs more efficient and accurate tools, models, and techniques that better characterize and quantify the training and testing capacities of the land's resources and that support more effective use and recovery planning.

Objective:

Researchers are endeavoring to stratify the landscapes of individual military ranges using contemporary and emerging remote sensing technologies to identify the fundamental vegetation and soil attributes of military ranges. The planned work will identify the spatial, spectral, and temporal attributes of remote sensing systems necessary to identify ecotones, distinguish along environmental and disturbance gradients, and develop methods for scaling indices between coarse and fine resolution imagery.

Summary of Process/Technology:

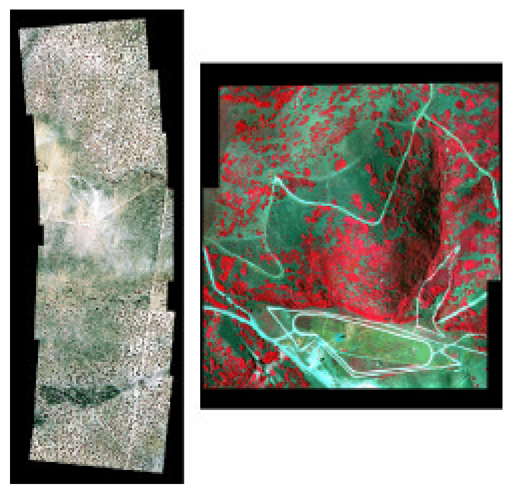
This project will map selected installations to identify areas of known change or disturbance from training or testing operations. The mapping will cover both peak wet and dry seasons. High resolution systems will be assessed to identify the sensor attributes necessary to monitor changes in species composition along disturbance gradients and plant succession stages. The two levels of classification to be tested are: seral stages within a plant community and plant cover. Vegetation maps will be generated for Camp Williams, UT, and Fort Bliss, TX, and algorithms have been developed for improved and more efficient image processing. Ground calibration will be conducted, and relationships will be established to the soil-adjusted vegetation index. Lastly, spatial accuracy/uncertainty analysis will be undertaken to include the selected sites, sensors, and techniques.

Benefit:

This project will provide DoD managers with efficient models and techniques to better characterize and quantify the military training and testing carrying capacity of land resources. Managers will be able to predict the impacts of land use, understand the risks associated with use, and weigh decisions to provide training flexibility versus environmental or ecological damage.

Accomplishments:

A range of spectral, spatial, and temporal attributes of airborne and satellite sensors have been evaluated for their capability to differentiate features in the landscape and the effects of military training and testing. Image processing algorithms were developed to standardize and atmospherically correct historical imagery. GIS algorithms were developed to calculate site-water balance at different spatial and temporal scales, calculate and optimize vegetation indices, and retrospectively evaluate impacts of anthropogenic and climatic disturbances. Correlations from multiple regressions indicate that image biophysical variables can predict vegetation cover in arid soils with a high degree of accuracy. Tutorials have been developed and placed on linked web sites.



Through the use of remote sensing, as shown here at Fort Bliss, TX, and Camp Williams, UT, we can identify areas that are being severely impacted by continued military training and other uses.

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