

A Fire Risk Assessment Tool for Ft. Huachuca

Using remote sensing to monitor the environment

by Susan McGinley

To prevent unintended fires during military operations, Ft. Huachuca and the University of Arizona are collaborating on a remote sensing project to identify environmental fuel risks across the U.S. Army's training facility in southeastern Arizona.

The types of vegetation present affect the intensity and duration of fires such as this one.

J. Harrison



Arizona Remote Sensing Center (ARSC)

Since 1971, ARSC has used remote sensing technology to solve agricultural and natural resource problems in arid areas. ARSC research has proceeded along three parallel lines: 1) developing a better understanding of data produced by satellite and aircraft sensing systems; 2) investigating the problems of using conventional remote sensing techniques in arid lands; and 3) developing and applying innovative techniques to solve the practical problems of managing agriculture and natural resources in arid lands.

ARSC has evaluated remote sensing systems and has applied expert systems to image analysis and the development of integrated remote sensing data analysis work stations. New agricultural and natural resource assessment methods combining inexpensive images from aircraft with satellite data have also been developed. ARSC has conducted projects throughout the American Southwest, in Mexico, western and southern Africa, the Middle East, South Asia, and China.

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This project is part of a larger effort to create geographic information systems (GIS) tools to help manage the base, according to Phil Guertin, an associate professor in the School of Renewable Natural Resources in the College of Agriculture and Life Sciences. Guertin and Steven Yool, an assistant professor in the UA Department of Geography, are using satellite and weather data to map and monitor fuel characteristics across the base and to develop a computer model that will eventually predict areas of greatest fire risk on a daily basis.

The scientists are cataloguing different types of vegetative fuel on the base, including grass, downed trees, pine needles and other plant matter, and determining the spatial distribution of each. "We're monitoring the total biomass, the patchiness

of the fuel, its pounds per acre, and how it's distributed across the base," Guertin says.

"At higher elevations there's more leaf litter," Guertin explains. "Thick mats of needles don't burn very readily. Oak litter doesn't burn very fast either—it almost acts as a barrier."

Yool and Guertin have begun to map this fuel distribution using Landsat and IKONOS, two remote sensing tools that map an area on 30 x 30 meter and 4 x 4 meter cells, respectively. Once they have a base measurement, they will begin to map fuel characteristics over time, including the percentage of live versus dead fuel.

They will take into account the winter and summer "green-up" periods and the area's two dry periods. Yool is using data from a NASA satellite that assesses square kilometers of vegetation that are alive or dead and relates that to thermal data to predict green-up and weather over time.

"We'll be using weather information to predict daily and diurnal moisture cycles," Guertin says. "We'll also be looking at rainfall patterns at the beginning of the monsoon."

Ft. Huachuca can use this system to locate military maneuvers away from places most at risk for fire on any given day or at a given time of day, according to Guertin. Although this system monitors a fairly small area, he believes it has applications the Bureau of Land Management will be able to use down the line to monitor conditions over a larger geographic area.

"No one wants to ignite fires that could jump boundaries and injure wildlife, structures or humans," Guertin says. "We're building the basic modeling tool using historical information to predict fire risk for ecosystems in southeastern Arizona. Eventually we'll build a computer application that will use GIS and get the results in real-time." ♦