

Using remote sensing for burn severity mapping

Background:

On August 24, 2002 a lightning strike ignited a wildfire that would eventually burn 12,146 acres of the Nature Conservancy's Red Canyon Ranch near Lander, Wyoming.

The Pass Creek Fire presented an interesting opportunity for researchers to study fire intensity and vegetation re-growth in relation to the grazing practices employed at the ranch. Red Canyon Ranch is a working cattle ranch managed to promote species diversity, riparian and wetland systems, sediment retention, and rangeland health.

Use of Data:

Landsat scenes were acquired before and after the fire. The normalized burn ratio (NBR) was used with Landsat scenes acquired August 8, 2002 (pre-fire) and October 19, 2002 (post-fire) to create burn severity maps (Figure 3). The NBR is an index of Landsat TM bands 4 and 7 that has been determined to be very useful in mapping burn severity

(<http://nrmsc.usgs.gov/research/ndbr.htm>). An NBR image (Figure 2) was calculated for both the pre-fire and post-fire images (Figure 1) and the two images were differenced to create a burn severity map.

The pixel values in the differenced image were then categorized based on the intensity of the fire. Ground truth data on burn severity were collected and associated with pixel values in the differenced image to create four classes of burn severity: high, moderate, low/unburned, and greener than pre-fire. A color table was then applied to the difference image based on data collected in the field.

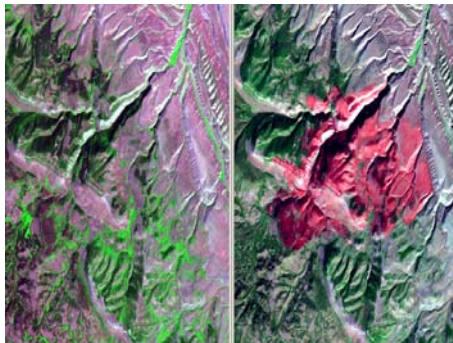


Figure 1. Pre-fire (left) and post-fire (right) Landsat scenes.

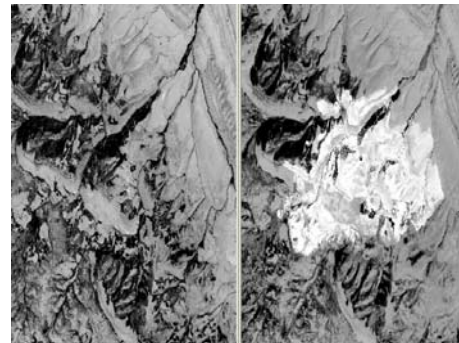


Figure 2. NBR images calculated from the pre-fire (left) and post-fire (right) Landsat scenes.

Economic and Environmental Benefits:

The Nature Conservancy is most interested in exploring the relationship between grazing management at Red Canyon Ranch and fire intensity. Conservancy scientists hypothesize that the management practices employed at the ranch caused the fire to be less destructive and closer to historic range of natural variability, than would have otherwise occurred under more typical cattle grazing operations. The Landsat scenes and post-processing provided by UMAC were critical in helping the Conservancy to rapidly assess the variability of fire intensity across the ranch.

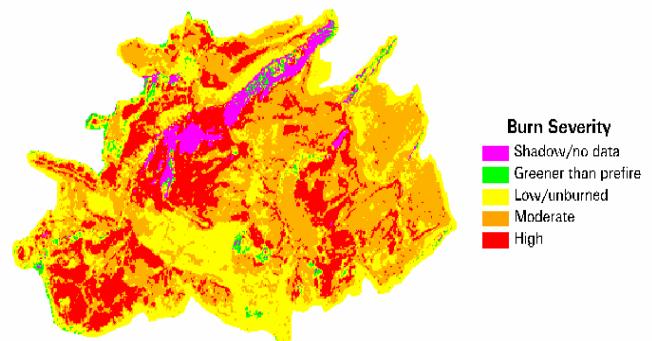


Figure 3. Burn severity map categorized according to thresholding of NBR difference image.