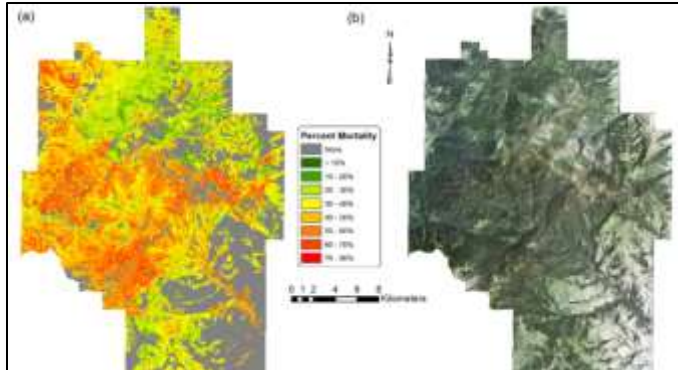




MONTANAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



MAPPING BARK BEETLE INFESTATIONS IN MONTANA'S FORESTS



(a) Map of the estimated percent mortality in the Helena National Forest made using a Landsat-8 image from July 18, 2013, and (b) high-resolution aerial imagery for the same area. The central and west-central regions of the study area tend to have the highest levels of mortality, whereas the northern and north-eastern portions are characterized by low-density mortality.

Bark beetles have ravaged large swaths of Montana's forests, and accurately mapping the presence and spread of the resulting mortality is critical for effective forest management. Previous practice used by management agencies using aerial surveys, however, has suffered from (1) coarse detail, (2) poor locational accuracy, and (3) failure to specify the percent of mortality, and thus the severity of damage.

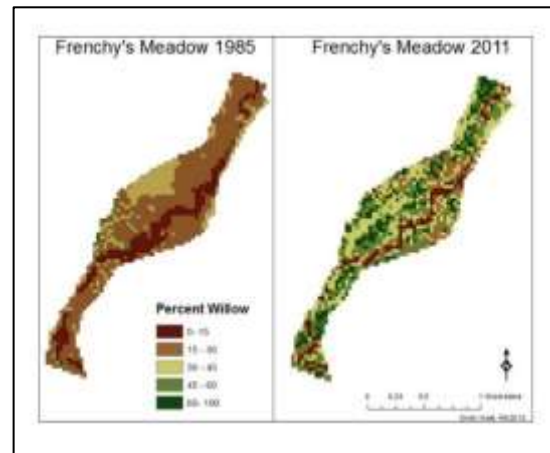
Researchers at Montana State University, with support from AmericaView and the U.S. Department of Agriculture, developed an approach to overcome these shortcomings and tested the approach on a portion of the Helena National Forest at the northern end of the Elkhorn Mountains. The approach used the OLI instrument on Landsat 8 and approximately 400 reference sites across the region. A two-step modeling approach was implemented, where first a series of statistical algorithms were evaluated to determine the presence of mortality, and a second analysis was used to measure percent mortality where it was present.

Results were excellent, with the average difference between modeled and observed mortality for independent validation data ranging from 0.1% to 2.4% (depending on the statistical methods used). 95% confidence intervals were similarly impressive, ranging from 3.6% to 9.0%

SUPPORTING STUDENT SERVICE LEARNING

Service learning is an important educational tool where students conduct real-world projects for agencies, non-profit organizations, and others. MontanaView supported students conducting service learning projects at Montana State University, Montana Tech, Salish Kootenai College, and the University of Montana.

Dionne Zoanni, a Native American student at Montana State University, completed a project for the Fort Peck Indian Reservation entitled "A Study of the Effect of the Reintroduction of Bison to Grazing Unit Vegetative Heterogeneity on Fort Peck Reservation using NDVI". Smith Wells at Montana State University completed a study for the U.S. Forest Service, "Willow Response to Beaver Reintroduction in the Absaroka-Beartooth Wilderness". Bryan Dupuis at Salish Kootenai College conducted a "Remote Sensing and Land Use Study of Flathead Lake" for the Flathead Lakers non-profit. Annalisa Ingegno at the University of Montana conducted her study on "Estimating Detection Probability for *Botrychium* sp. in Lincoln County, MT", while Hannah Kuehl at the University of Montana completed "An Analysis of Socioeconomic Influences on Health Care Seeking Behavior in Humla, Nepal", using remote sensing to analyze transportation routes for mobile medical units.



Smith Wells, a student at Montana State University, worked with Dan Tyers at the USGS Northern Rockies Science Center, to map changes in willow coverage in an area north of Yellowstone National Park. Landsat imagery for 1985 and 2011 was used to demonstrate how the reintroduction of beaver has coincided with significant willow response.



BENEFITS TO MONTANA

Traditional approaches to mapping bark-beetle infestations have limited utility for site-specific forest management, because they lack sufficient specificity with respect to intensity of the mortality. Mapping percent mortality using freely available Landsat data will enable improved forest management, and on-going research is applying these maps to specific issues facing Montana, including:

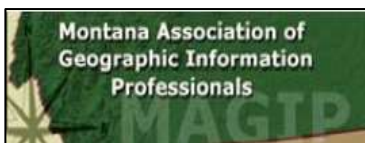
- Accurately mapping endangered Canada lynx habitat; and
- Evaluating the potential for converting beetle-killed trees to biofuels.

MontanaView's education efforts are fulfilling a critical goal for remote sensing in Montana. Last year, five students at three institutions had the opportunity to complete real-life remote sensing projects with tangible results for government agencies and non-profit organizations. As a result, Montana is gaining an experienced, well-prepared workforce.



Bark beetles have ravaged large areas of Montana's forests. All stages of bark-beetle attack can be seen in this scene of the East Garnet Range of Montana. Photo: Peter Kolb, Montana State University Extension Forestry.

MONTANAVIEW CONSORTIUM MEMBERSHIP



Federal consortium members identified above do not receive funding from AmericaView.

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