WILDFIRE EFFECTS ON RANGELAND ECOSYSTEMS AND LIVESTOCK GRAZING IN IDAHO

EXECUTIVE SUMMARY

SIGNIFICANT FINDINGS AND ACHIEVEMENTS

- Field sampling of rangeland vegetation for use in remote sensing studies needs to be scaled relative to the imagery used for classification.
- Field studies using multi-spectral imagery obtain better classification accuracies when vegetation is sampled categorically (chapters 1, 2, and 8).
- Trained field observers can reliably and consistently estimate the same percent cover as that calculated using high-spatial resolution (2.5mm/pixel) digital imagery (chapter 3).
- No difference was found in mean percent cover of shrubs, grasses, and bare ground in areas subjected to numerous years of fire, grazing, or fire and grazing treatments. *Note: treatments were not applied as part of this study, but rather referenced from management documents dating as far back as 1939* (chapter 9).
- The most accurate and reliable fuel load models utilize only three fuel load categories (<2 tons/acre, 2-4 tons/acre, and >4 tons/acre) for rangeland ecosystems of Idaho (chapter 8)
- Even when compared with recent fires (<3 years old), livestock grazing was found to be the most effective method to reduce fine fuel load in sagebrush-steppe rangelands (chapter 9).
- Fuel loads tend to recover to pre-fire levels within 10-12 years.
- Mountainous areas experience far higher rates of cloud-to-ground lightning strikes than rangelands of the Snake River Plain (chapter 6).
- Remote sensing imagery is a promising tool for predicting areas of potential landslide and soil erosion hazards as a result of wildfire activity (chapter 11).
- The two most applicable GIS data for landslide prediction are 1) high resolution multi-spectral imagery (e.g., IKONOS and/or Quickbird) and 2) 10mpp DEM's (e.g. USGS)(chapter 11).
- Landsat imagery, 30mpp USGS DEM's, and DEM's created from RADARSAT fine-beam imagery are too coarse for landslide and soil erosion modeling (chapter 11).
- Remote sensing imagery can reliably differentiate between burned and unburned patches of vegetation of the same species (chapter 14).
- Many Holocene millenial-scale climatic fluctuations recognized in other areas of the Northern Hemisphere are clearly visible in the regional pattern observed in this study (chapter 12).
- Within southeastern Idaho (and adjacent environs) the quantity of pine pollen in the recent past is at its highest level since human occupation 12,000 radiocarbon years ago, while the quantity of sagebrush and grass pollen is either at --or is approaching-- an all-time low (chapter 12).
- Successful M.S. thesis completion in the Department of Geology for Ms. Diane Wheeler.

In the summer of 2001, researchers at Idaho State University began an enthusiastic study to examine the effect of wildfire on Idaho's rangelands. Since that time, great strides have been made toward a better understanding of rangeland dynamics and wildfire impact. Further, new techniques and geotechnical best practices have been developed which can be implemented throughout this and other regions.

We developed an accurate and reliable fuel load model (73% overall accuracy, Kappa = 0.39) using geographic information systems (GIS), global positioning systems (GPS), and remote sensing. The fuel load model --along with other GIS datasets-- was used to develop a comprehensive wildfire risk model. These models provide land managers with a suite of tools, including predictive models of wildfire risk and identification of possible fuel load reduction areas. Local, regional, and federal land managers have benefited by using these models to proactively manage wildfire risk for communities in southeastern Idaho. This approach to wildfire management promotes rangeland sustainability and strengthens the economy of the state.

Various post-fire effects were also assessed using Geo-spatial maps and models. Landslide potential was examined using remote sensing and digital terrain modeling. Our study demonstrates that remote sensing is an effective tool to predict areas with increased landslide and erosion hazard. The tools developed by ISU researchers are particularly effective in areas with limited access. Land managers can implement remote sensing (e.g., IKONOS imagery) and digital terrain modeling (e.g., USGS 10mpp digital elevation models) techniques to rapidly and reliably predict landslide hazard following wildfire. These tools allow land managers to respond quickly and with appropriate landslide and erosion mitigation efforts.

We characterized historic vegetation patterns to better understand rangeland dynamics and better interpret historic wildfire records. Researchers found that sagebrush and grasses were more common in the past (approximately 12,000 years bp) than they are today. This finding is very interesting, especially when interpreted relative to the current wildfire focus of this study. With higher proportions of sagebrush and grasses present, we expect fuel loads would have been higher and with a greater fine fuel component. This scenario may have yielded more intense and severe wildfires. However, this speculation cannot be substantiated at this time. Indeed, with the presence of megaherbivores, it is just as likely that wildfire were rare and when they occurred, small and restricted to areas unsuited to grazing by megaherbivores.

Much progress has been made in this study and a better understanding of wildfire and its effects has been gained. At the same time, new questions have arisen that will surely yield new research directions for the scientists at Idaho State University.