JFSP 2004 Principal Investigator Workshop

Project Title: Assessing the Causes, Consequences and Spatial Variability of Burn Severity: A Rapid Response Proposal, JFSP project 03-2-1-02

Project Location:

University of Idaho, Latah County, Moscow, ID, First Congressional District

Forestry Sciences Lab, Rocky Mountain Research Station, USDA Forest Service, Moscow, ID, Latah County, Moscow, ID, First Congressional District

Fire Science Laboratory, Rocky Mountain Research Station, USDA Forest Service, Missoula, MT, First Congressional District

Data were collected from fires in Montana, California and Idaho this year.

Principal Investigators:

Penelope Morgan, Dept. Forest Resources, University of Idaho, Moscow, ID 83844-1133

Andrew Hudak, Rocky Mountain Research Station, Moscow, ID 83843

Pete Robichaud, Rocky Mountain Research Station, Moscow, ID 83843

Kevin Ryan, Fire Science Laboratory, Rocky Mountain Research Station, Missoula, MT 59807

Contact Information (Phone, e-mail):

Penelope Morgan, pmorgan@uidaho.edu, Phone: 208-885-7507, Fax: 208-885-6226

Andrew Hudak, ahudak@fs.fed.us (208) 883-2327

Pete Robichaud, probichaud@fs.fed.us 208 883-2349

Kevin Ryan, kryan@fs.fed.us 406-329-4807

Description of Project:

In this rapid response project, we are collecting fire behavior, fire effects and fuels data from at least two 2003 and at least four 2004 wildfires across the US. We use field and remotely sensed data collected during and soon after wildfires burn to quantify the interactions and spatial variability in fire effects, fuels, fire behavior, local weather and topography and to assess the accuracy of current and alternative image analyses for remote sensing of burn severity. We coordinate our work, share data, and will share improved fire severity assessment approaches with Fire Management Teams (e.g. Incident Command and Burned Area Emergency Rehabilitation teams), other managers, scientists, and others. Our efforts complement ongoing research and management applications by comparing alternative remote sensors and analysis approaches across a diversity of soils, vegetation, and fire conditions, and by explicitly linking fire behavior, fuels and fire effects to quantitative indicators of burn severity that can be assessed in the field, predicted from fire effects models and mapped. We will also organize research and applications workshops for researchers and applications specialists from multiple federal agencies to synthesize and recommend methods for quantitative field measurement and remote sensing of burn severity. We will share our results with end users through training, on the FIREMON (http://www.fire.org/firemon/) and FRAMES (www.frames.gov) websites, and with the USFS Remote Sensing Applications Center staff to improve procedures for mapping fire effects. The data will be useful to those developing the next generation of fire effects models. This project is linked with the JFSP-funded project led by Colin Hardy and Phil Riggan. The resulting data for fire behavior and fire effects sampled from the same points during and after fires in the field and remotely will be shared publicly.

Deleted: ,

Status Report:

We have completed 12 months of a 3-year project. Our accomplishments to date are:

- Detailed sampling of burn severity on fires to date: Porcupine, Chicken (both in Alaska), Roberts, Wedge, Cooney Ridge, Black Mountain (all in Montana), Simi and Old (both in California) and Flannigan (Idaho). These 2003 and 2004 wildfires had fire severities ranging from none (some areas were unburned), to low, moderate and high. Spatial variability was high. Areas burned most severely are relatively uniform, while the spatial heterogeneity of moderate and low severity burns is respectively high and higher. Observed burn severity was most uniformly high in an area that had been recently heavily logged.
- Hyperspectral imagery was obtained on eight fires: Porcupine, Chicken (Alaska 2004) Roberts, Wedge, Cooney Ridge, Black Mountain (all in Montana 2003), Simi and Old (both in California 2003) fires. These very high-resolution data are being used to explore fine scale patterning in vegetation and soil severity.
- A spectral data library is being compiled from low, moderate, and high severity, and from unburned sites collected. These data will be used to improve interpretation and application of the remotely sensed data from airplanes and satellites.
- We participated in two database design workshops held in July 2003 and March 2004 to coordinate data sharing between our rapid response project and the JFSP-funded projects being conducted by Mark Finney, and by Colin Hardy and Phil Riggan. The first had 18 participants, the second had 14.
- Our project web site (http://www.cnr.uidaho.edu/burn_severity) provides information on our objectives, methods, products, and pictures. We periodically update this site.
- Two papers have been accepted for publication in proceedings

  Hudak, A., P. Robichaud, T. Jain, P. Morgan, C. Stone, and J. Clark. 2004. The relationship of field burn severity measures to satellite-derived burned area reflectance classification (BARC) maps. *ASPRS Annual Meeting*, April 2004.

  Stone, C., A. Hudak and P. Morgan (2004). Forest harvest can increase subsequent forest fire severity. In: *International Symposium on Fire Economics, Policy and Planning: A Global Vision*, April 2004.

  Hudak, A., J. Evans, P. Robichaud, J. Clark, K. Lannom, P. Morgan, and C. Stone. Field validation of burned area remote classification (BARC) products for the purpose of rapid response. USFS Remote Sensing Workshop, April 2004.
- Four presentations were made on research results:

  USFS Remote Sensing Workshop, Salt Lake City, UT, April 2004

  ASPRS (American Society of Photogrammetry and Remote Sensing) Annual Meeting, April 2004.

  International Symposium on Fire Economics, Policy and Planning: A Global Vision, April 2004, Cordoba, Spain

  Fire Symposium, University of Idaho, Moscow, ID, September 25, 2004.

For this rapid response project, we sampled large fires that burned in 2003 and 2004. Our fire effects samples are taken within two weeks and then again within 1 year after fires burned. For all of the locations we sample, we ensure that we have detailed maps of pre-fire fuels and vegetation maps, fire behavior observations during the fire, and measures of the effects of fire on tree mortality, vegetation, and soils, including infiltration and water repellency. The latter measures are used to assess hydrophobicity, which is related to potential for soil erosion post fire. We explicitly link fire behavior, fuels and fire effects to quantitative indicators of burn severity that can be assessed in the field, predicted from fire effects models, mapped quickly and accurately, and scaled.

This project is yielding valuable information for improving fire behavior and fire effects assessment and models. In part, this is because our project is so tightly integrated with other ongoing research efforts. Hardy and Riggan are conducting another rapid response project designed to collect heat flux and other fire behavior information during fires from some of the same fires for which we subsequently collect fire effects information. This project is also closely linked with three ongoing research projects focused on burn severity and remote sensing. Terrie Jain and others are quantifying burn severity as a function of pre-wildfire forest structures for many 2000, 2001 and 2002 wildfires. Pete Robichaud and others are evaluating hyperspectral imagery for evaluating post-fire erosion potential, and Carl Key and others are testing the efficacy of remote sensing for mapping post-burn severity. We share data, expertise, personnel, and results among these projects to facilitate interpretation and utility of the results to land managers and others. In 2004 in Alaska, we sampled jointly with two other JFSP-funded projects focused on characterizing fuels, vegetation, consumption, and smoke production.

Our project is designed to compare the accuracy and applicability of alternative remote sensing approaches for mapping burn severity across a diversity of soils, vegetation, and fire conditions. We will recommend indicators of burn severity that are readily mappable and scalable – that is measurable on the ground as well as remotely. Our project will thus improve the assessment of the severity of post-fire effects, including the potential for erosion and sedimentation, and thus the strategic effectiveness of post-fire rehabilitation. This information will be shared with many different users, including managers, researchers, and others. We will work to develop a rapid yet consistent burn severity mapping approach that is applicable to different types of imagery (depending on which is available at the right time). We will share our results at Burned Area Emergency Rehabilitation training, on the FIREMON (http://www.fire.org/firemon/) and FRAMES (www.frames.gov) websites, and with the USFS Remote Sensing Applications Center staff to improve procedures for mapping fire effects.

Issues/Concerns affecting the project:

Our project has already exceeded expectations. We sampled eight fires when our proposal committed us to sampling two. We obtained hyperspectral imagery for six instead of the one fire we originally proposed. Our preliminary results are promising, and we are hard at work analyzing them to make any additional adjustments needed in sampling.

We decided not to hire a PhD student at the University of Idaho. Instead, we hired Sarah Lewis. She had just completed her MS project on a closely related topic. She will work with full-time with the Rocky Mountain Research Station on this project doing field work and satellite imagery analysis. Leigh Lentile, our postdoctoral research scientist, has been working with us since April. She is leading field data collection and analysis this year. We also have GIS analyst working full-time with us, and we have hired 6 different undergraduate students to assist us in the field during the summer.

We are working closely with Incident Command Teams and Geographic Area Coordinating Committees for next year.

In short, things are going better than originally planned.