Nenana Ridge Project Update—What have we learned so far?

The Nenana Ridge Experimental Fuels Treatment Research Project was funded by the Joint Fire Science Program and supported with additional contributions from local state and federal agencies. This project was designed to quantify the effects of fuels reduction treatments on fire behavior and post-fire vegetation dynamics in Alaska black spruce. The study began in 2006 with installation of four 1-acre treatment blocks. Two blocks were thinned to 8 x 8 foot spacing and limbed, one was shearbladed, and one was shearbladed and windrowed. These four blocks were replicated in the adjacent forest unit, with the intent to burn each unit separately.

Photo: Thinned treatment (8 x 8 foot spacing).

On June 17, 2009, a prescribed fire was ignited in one of the Nenana Ridge units to test the effectiveness of these treatments. The burn had marginal success in the lower, wetter half of the unit but picked up momentum as weather improved and ignitions proceeded up the slight slope. A crown fire was attained and impacted both shearbladed treatments and one of the thinned treatments.

Photos: (Left) Researcher installing a camera box to record fire behavior. (Center) Crown fire burning through the unit. (Right) Researcher measuring duff consumption.

Pre-fire vegetation data and fuel moistures were collected along with duff (forest floor) consumption measurements. Fire proof camera boxes and sensor packages, designed to collect data on air temperature, heat energy transfer, and air flow, were installed to monitor fire behavior in the treatments and in control areas (undisturbed forest). Portable weather stations were deployed to collect weather data. Aerial infrared images (which indicate heat intensity) were also collected from a helicopter during the prescribed burn.

Preliminary results from the thinning treatment revealed that the top moss and duff layers were drier than the control due to increased solar radiation and wind but less forest floor was consumed in the burn. The CONSUME Model was able to predict the amount of biomass consumed reasonably well. These results are important as forest floor biomass and moisture are key components of fire in boreal ecosystems and often drive fire behavior. The amount of duff or forest floor consumption directly impacts smoke, permafrost melting, erosion and vegetation succession.

Fire behavior data from the prescribed burn also provided key information on the effectiveness of thinning treatments. The active crown fire was indeed brought down to a surface fire, burning only 50 to 100 feet into the thinned treatment

after initial impact. The canopy tree density was not high enough to support a crown fire and the elimination of ladder fuels limited individual tree torching. Although the surface fire continued to smolder for several days, ground fuels were not sufficient to carry fire through the entire treatment and stopped 200 feet within the unit. Temperature sensors showed the peak temperature reached in the control area as the fire front passed was approximately 2200° F compared to only 158° F in the thinning from gusts of hot air (Figure 1). Researchers plan to use data collected by the sensor packages in the field in combination with spatial data collected from aerial infrared cameras to show what is actually happening at the ground level.

Photo (Above): Edge of thinned fuel treatment. The crown fire dropped from the canopy to the ground, only burning several feet into the treatment at this location. Photo from Robert Schmoll.

Virtually all of the remnant organic material in the shearbladed units were consumed after several days of smoldering. Although the shearbladed treatments were not intended to stop a fire, they will provide data on long term effects like stand type conversions from black spruce to hardwoods stands which are generally less flammable fuel types.

The 2009 Nenana Ridge Prescribed Burn proved to be a successful but complex operational and logistical accomplishment. Lessoned learned from the fire management perspective include effectiveness of the treatments, specifications for future fuel treatments, operational improvements, and sufficient funding needed for ideal burn implementation and the highest probability of success. The completion of this project and the results are very important to the fire management and research communities. Project investigators and collaborators are continuing to seek funding to burn the remaining research unit in 2011.

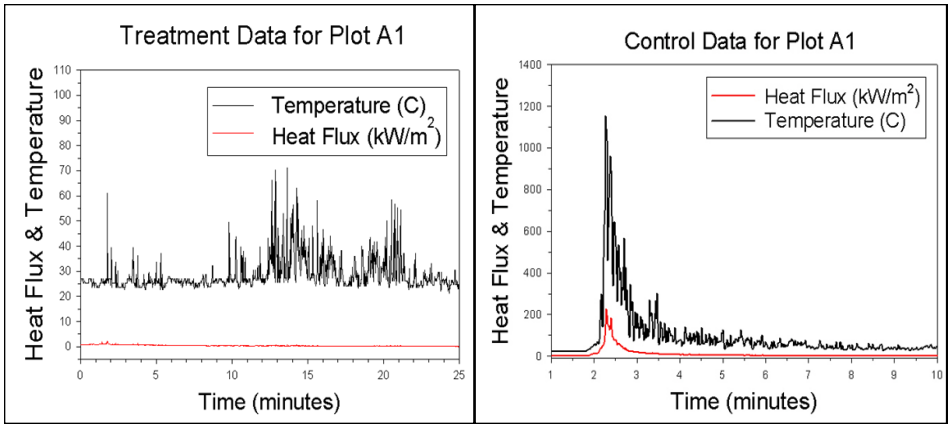

Figure 1 (Above): Heat flux and temperature readings collected as the fire front burned through the thinning treatment and the control (unaltered black spruce forest). Graphs by Bret Butler.

The content of this project summary was derived from presentations given by Scott Rupp (UAF), Bret Butler (USFS), Roger Ottmar (USFS), and Robert Schmoll (DOF). All of these presentations are available for download (links shown below).

More Information:

1. Presentations (slides and/or recordings):
   - 2010 Workshop Presentations: Project Overview by Scott Rupp, Structure & Cost by Robert Schmoll: http://frames.nbii.gov/alaska/consortium/workshops/oct2010
   - 2010 JFSP Board Presentations: Project Overview by Scott Rupp, Forest Floor Consumption by Roger Ottmar, Fire Behavior by Bret Butler: http://frames.nbii.gov/alaska/consortium/workshops
2. Nenana Ridge Project Proposal: http://depts.washington.edu/nwfire/proposal/06-2-1-39_proposal.pdf
3. Prescribed burn video by the USFS Rocky Mountain Research Station Fire Sciences Lab: http://youtu.be/1Qkia5n2g4k
4. Prescribed burn narrative with initial fire effects observations by Randi Jandt: http://frames.nbii.gov/documents/alaska/workshops/ENN_2009_RxB_Narrative_condensed_1_.pdf

For updated links, visit:
http://www.frames.gov/partner-sites/afsc/projects/nenana-ridge/
or contact Alison York at ayork@alaska.edu