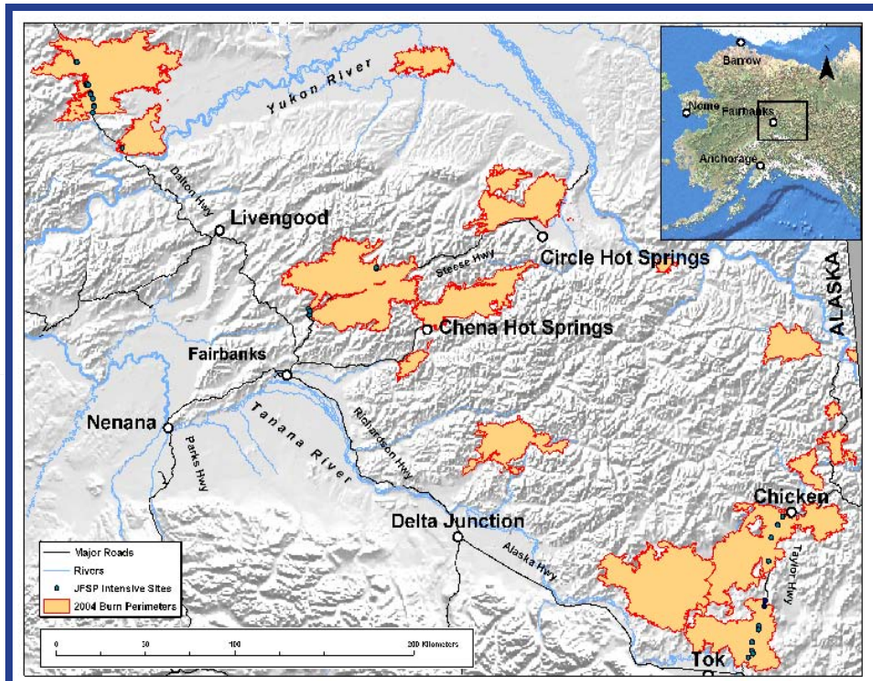
Linking the Past to the Future

Detailed vegetation research was conducted in the study area during the 3 years prior to the fire. This research provides a rare opportunity to directly assess relationships between pre- and post-fire vegetation and will provide new insights into the effect of pre-fire vegetation in driving patterns of fire behavior, fuel consumption, and post-fire vegetation recovery in Alaska's flammable black spruce forest.

Post Fire Vegetation Recovery

To look at patterns of early post-fire vegetation recovery, we are monitoring seed germination and the growth and survival of natural and transplanted tree seedlings. Some of the seedlings are being protected from grazing animals by small exclosures made of chicken wire. This will allow us to assess the potential impacts of herbivory on post-fire tree establishment. Germination, survival, and growth of tree seedlings will be monitored in 2006 and beyond. The establishment of planted tree seedlings will be compared with measurements of natural tree seed fall and recruitment to assess the relative importance of seed availability and post-fire site conditions in driving patterns of vegetation recovery from fire.

Terry Chapin inspects a burn site.



JFSP Interior Alaska Research Sites: Dall City Fire, Boundary Fire, and Taylor Complex

2004 Record Breaking Fire Season

In the summer of 2004, over 6.7 million acres of forest burned in Alaska. This was the largest Alaskan fire year in recorded history and left a strong imprint on the landscape, economy, and communities of Alaska. The size of the 2004 fires in Alaska and their proximity to existing road networks allows unprecedented access to a wide variety and extent of recently-burned forest.

Above and Below Ground Fuel Consumption

How do you measure something that isn't there? To quantify burn severity and consumption, we are measuring the size of the remaining tree trunks and soil and estimating how much of the needles, cones, branches and moss layer burned. In this way we can determine what the forest looked like before the fire, and how much it was burned by fire. In an unburned black spruce forest, thick layers of sphagnum moss and other feather mosses blanket the forest floor, sometimes as much as a foot or more thick. Intense wildfires will burn all of this layer, while other fires will burn only a small amount. After the fires, we can measure what was left over from this layer and compare this to trees where the moss and organic soil

Survey Line Fire, June 2001

Conifer seedlings awaiting transplant

layer burned away. By careful inspection, one can see where little 'adventitious' roots have grown out from the tree trunk some distance above the main root base. This tells us the depth of the moss layer before the fire because we know the little roots were growing in the moss layer before the fire. Putting the height of the adventitious roots together with measurements of remaining organic soil depth let us estimate how much of the forest floor layer was consumed by fire. The pattern and severity of these burn effects will help us understand and predict what the future forest will look like in 20, 30, 40 or even 50 or more years.

The Big Picture

In this project, we use ground-based measurements at each site to test predictions derived from remotely-sensed (satellite imagery) burn severity. In this way, we will evaluate whether remotely-sensed indices of vegetation and burn severity can be used to predict early post-fire trajectories of vegetation change on a large spatial scale. This information is critical for fire managers to make informed decisions regarding such issues as the creation of wildlife habitat and natural fuel breaks.

Jill Johnstone transplanting after a fire

Wildfire in Alaska's Boreal Forests

Wildfires cause large-scale disturbance in Alaskan boreal forests. Variations in local topography, soil moisture, and vegetation type all interact with weather conditions to influence the intensity, severity, and spatial configuration of a burn. Highly flammable black spruce forests cover over 40% of interior Alaska and these forests can sustain severe, extensive, and persistent fires under the right weather conditions. In the boreal forest, black spruce stands are highly flammable because of the large amounts of fine twigs and needles, high resin content, low moisture content, and large quantities of fine ground fuels that are connected to the canopy by low-lying tree branches (ladder fuels).

The high flammability of these forests, high frequency of natural fire ignitions (lightning strikes), large extent of remote forested areas, and small human population base make fire management in Alaska unique and difficult.

Traditional approaches to fuel reduction have limited effectiveness and fire suppression programs are costly. At the same time, fires create important subsistence and economic forest uses and generate crucial habitat for many wildlife species. Land managers in Alaska are thus faced with the challenge of managing fire in a way that preserves human life and property while conserving the key ecological processes driven by fire.

In contrast to black spruce forests, stands composed of hardwood species are generally less flammable because of the increased moisture content of the fine fuels, and reduced ground and ladder fuels. The potential for these deciduous stands to act as fire breaks makes transitions from conifer- to deciduous-dominated stands one of the main goals for fire hazard reduction in boreal forests.

David Verbyla measures ground conditions

Joint Fire Science Program

The Joint Fire Science Program (JFSP) is a partnership of six Federal wildland and fire research organizations that was established to provide scientific information and support for fuel and fire management programs. This JFSP project aims to predict future changes in stand flammability based on burn severity from the 2004 Alaska wildfire.

Exclosures protect seedlings from herbivores

For Further Information

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Managing Fire with Fire in Alaskan Black Spruce Forests