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## **Burning Questions: What is the Cumulative Effect of Different Natural Disturbances?**

If the cumulative effect of man-caused disturbances is difficult to pinpoint, natural disturbances paint an even less clear picture. Unfortunately, the cumulative effects of natural disturbances on the Alberta foothills have not been substantially quantified, at least not independently. Recent work with the Foothills Model Forest, Jasper National Park and the Canadian Forest Service attempts to prod some of these relationships and begin to sort through the effects of each disturbance on the montane ecosystem.

We already know a few park management issues. Ungulate populations, especially elk, are very high. Recent fire return intervals, relative to historical estimates, are unnaturally low and yield abundant old growth forests. Consequently, forest pests such as bark beetles thrive in these environments, and shorter-living tree species such as aspen begin to disappear. Reasons for this are still unclear.



**Aspen regeneration in a fenced plot burned in 1998.**

Our experiment applied two fire intensities (high and low) to a lodgepole pine – grassland forest (with some patches of aspen) surrounding the Jasper airstrip. In each burn intensity, fenced and unfenced plots were established in both open and closed canopy forest.

What have we learned? For the low intensity fire, open pine forest tree mortality was greater than 90%, while closed canopy pine forest tree mortality was only 60%. Our results suggest this is primarily associated with tree crowns closer to the ground and a proportional increase in crown scorch in the open pine forest. This provides an excellent example of the subtle differences forest

cover can make in post-fire stand structure. Interestingly, the effect of forest cover had almost no effect on forb and grass cover and diversity following the second year post-burn, and consequently problems with non-native invaders (weeds) have been avoided. While fire itself did not seem to have any influence on elk populations, fenced plots have provided very convincing evidence of the effect of herbivory on biomass accumulation and aspen regeneration, as seen in the picture above taken 3 years after a fire.

While few of our findings are particularly surprising, they begin to shed light on the complex interactions of the various natural disturbances, and the balance among them. Furthermore, management strategies that are targeted at very specific goals, such as wildlife habitat, can be perceived as man-caused disturbances of their own. Future work with the Foothills Model Forest will continue to quantify these relationships and follow the effects of fire severity and ungulate herbivory on vegetation dynamics.