Fire Severity Filters Regeneration Traits to Shape Community Assembly in Alaska's Boreal Forest[1]

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Hearing about climate-driven plant community changes takes on new meaning when they name names of the passengers who might not be boarding the flight to the future. A recent paper by Hollingsworth et al. (2013)[1] does just that, analyzing fire severity and post-fire physical environments with species response to name species that may fare better or worse with predicted changes in Alaska's fire regime.

Fire Severity Trumps Environmental Factors

A combination of site conditions and stochastic processes--such as disturbance and propagule dispersal--determine which species occur in a given time or place in the forest. Hollingsworth *et al.* conclude that conclude that in boreal Alaska the regeneration strategy of a plant is the most influential factor determining post-fire composition. This trumps site conditions such as soil acidity, elevation, or soil moisture. However, they are also quick to point out that fire severity at a given site is linked to site conditions. Their study is notable for both the large number (*n*=87) and broad geographical distribution of forest study plots observed across the central/eastern interior of Alaska. The findings are important in the context of interior forests responding to a climate warming signal since the 1950's that is unprecedented in at least 400 years[2]. Many scientists believe will this result in larger and more severe fires.

Low severity burns:
- **dwarf birch**
- **cloudberry**

High severity burns:
- **quaking aspen**
- **fireweed**

How Does Fire Severity Shape Forests?

Burn severity has a surprisingly large influence on post-fire communtiy composition over time relative to other factors. Burn severity, measured by variables like depth of residual organic material or a combined index of burn factors accounted for 42% of the variance in vegetation patterns in this study. Acidity influenced the vegetation pattern independently of burn severity and accounted for about 20% of the variance in contrast. Regeneration strategy was the key to why burn severity had such a strong influence. In post-fire communities, the authors found 40% of the species present across all sites were "re-sprouters" while about 20% were "colonizers" from seed. It appears that as long as fire does not burns too deep into the duff layer, burning favors species that are good at re-sprouting quickly from well-protected underground structures like roots and rhizomes. However, as burn severity increases, more of the underground structures are at risk so the table tips toward the colonizers.

Fireweed two years after high severity fire in the White Mountains (*Photo by R. Jandt*)

CITATIONS

1. Hollingsworth TN, Johnstone JF, Bernhardt EL, Chapin FS III. 2013. Fire Severity Filters Regeneration Traits to Shape Community Assembly in Alaska's Boreal Forest. PLoS ONE 8(2): e56033. doi:10.1371/journal.pone.0056033
2. Wolken JM *et al*. 2011. Evidence and implications of recent and projected climate change in Alaska's forest ecosystems. Ecosphere 2(11): 124. doi: 10.1890/ES11-00288.1

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