ESA 2015 ABSTRACT – DRAFT – Contributed oral presentation

# High and dry: Large stand-replacing burn patches and postfire drought reduce postfire resilience in subalpine forests of the US Northern Rocky Mountains

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**Background/Question/Methods:**
Wildfire is a key ecological process that shapes forests worldwide, but a warming climate may alter postfire forest resilience by changing fire severity patterns (and increasing distance to seed sources in larger patches) and causing greater drought stress on postfire tree seedlings. Such effects may be most pronounced in high-elevation or high-latitude forests that are adapted to reproduce quickly following stand-replacing fires. We examined postfire tree regeneration in stand-replacing burn patches in upper-montane and subalpine forests of the US Northern Rockies. We collected field data from 184 plots in Glacier National Park and Greater Yellowstone, where recent forest fires were followed by varying postfire climate conditions. We characterized temporal patterns of postfire tree establishment, then asked how postfire tree establishment varied with (a) distance to seed source and (b) postfire drought severity. We tested for effects on total postfire tree establishment (all species) and on species that varied in strategies of postfire regeneration. Distance to seed source was expected to negatively affect species that rely on seed dispersal (e.g., non-serotinous or non-re-sprouting species) and have no effect on serotinous or re-sprouting species. Postfire drought severity was expected to negatively affect all tree species.
(193 words)

**Results/Conclusions:**
Postfire tree seedling establishment varied substantially, spanning four orders of magnitude, and establishment of most species peaked by 3-5 yr postfire. Total postfire tree seedling establishment was unrelated to distance to seed source but declined sharply with greater postfire drought severity. Total postfire tree establishment also was greater on cooler/wetter aspects, which may provide local refugia during regional postfire droughts. Effects of distance to seed source varied among species. Seedling establishment declined sharply with increasing distance to seed source for higher-elevation conifers that rely on seedling establishment for postfire regeneration (lodgepole pine, Engelmann spruce, and subalpine fir). For lower montane species (Douglas-fir, quaking aspen) or species with protracted postfire establishment (whitebark pine), postfire tree establishment was not related to distance to seed source, and these species were not affected by drought severity. Our findings suggest that wildfire patterns and postfire climate conditions projected for this century could substantially reduce postfire establishment of species that currently characterize upper-montane and subalpine forests. These reductions are unlikely to be offset by modest gains from other tree species currently in warmer/drier elevations below the subalpine zone, potentially resulting in reduced extent and increased patchiness of these high-elevation forests.
(194 words)