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Research Brief for Resource Managers

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Prescribed fire effects: Aspen's varied response

Perala, DA (1995) ***Quaking aspen productivity recovers after repeated prescribed fire.*** *Research Paper NC-324. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station, 11 p.*

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Management Implications

- Aspen stands subjected to prescribed fires may display different short-, medium-, or long-term responses.
- Effects of prescribed fire may diminish after 40 years.
- More research on aspen/fire interactions is needed in our region.

Ever wonder what would happen if you lit a prescribed fire once or twice, then left the forest alone for 25 years? Or 40 years? Silviculturalist Don Perala set out to discover exactly that in 1965. He studied the short- and long-term effects of prescribed fire on recently harvested aspen-dominated stands in north-central Minnesota. Perala began one of the few long-term fire-and-aspen experiments in the country.

In 1965, he created twelve, 2.5-acre plots in a quaking aspen (*Populous tremuloides*) stand that had been commercially logged. These plots were split into four categories: C (control/no burn), B1 (burned once in spring 1967), B2 (burned once in spring 1967 and spring 1969), and B3 (burned once in spring 1967 and once in the fall of 1970). He monitored tree, shrub and forest floor species and growth yearly until 1977, then on a five-year rotation until 1990.

The 1969 spring re-burn was only nominally successful, but the fall 1970 re-burn was almost uncontrollable, creating patches of mineral soil where aspens seeded and re-sprouted vigorously. Perala reported early in the study (1974) that aspen in the one-time burned plots (B1) had 28% lower aboveground biomass, whereas the re-burn plots (B2, B3) demonstrated partial or complete recovery. For the 25-year revisit to the sites, Perala found that once-burned plots (B1) exhibited a reduction in tree productivity, whereas the twice-burned plots with fall re-burn (B3) actually increased their tree productivity to 111% over pre-harvest amounts. Shrub productivity, on the other hand, increased by 31% in once-burned plots (B1) and stayed the same in the twice-burned plots (B2, B3) 25 years after the burn.

Perala also found that tree size in the burned plots depended mainly on tree size in the parent stand before the harvest and burn treatments were conducted. Strikingly, a 40-year follow-up on these same sites conducted in 2007 showed no significant differences in

species diversity or tree size (Dhar et al 2016). However, the number of trees in the fall re-burn plot was higher than the other plots.

The fact that the burns initially reduced biomass in once-burned plots (B1), then increased biomass after 25 years in twice-burned plots (B2, B3), before leveling out on all plots after 40 years shows that management objectives are a key aspect of any prescribed burn effort.

Understanding that burn severity and intensity play a huge part in recovery over the short term, but may not play as large of a role over the long-term, may be important in aspen stands. There are no known aspen/fire studies in the North Atlantic region at this time; therefore, this long-term study in a neighboring region gives us insight into how our own aspen stands could respond to certain types of prescribed fire.