

Regeneration dynamics of seedling origin aspen: Working towards resiliency in forest restoration

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Abstract: Aspen (*Populus tremuloides* Michx.) is a foundational tree species, native to large areas of North America. The resilience of aspen forests can be attributed to the species' ability to regenerate vegetatively after aboveground disturbance, where new shoots can be produced from its large clonal root system and from retained stumps. More recently, aspen of seedling origin has been planted on many boreal forest reclamation sites. In this situation seedlings are genetically independent and have self-reliant root systems. It is unclear how these seedling origin aspen stands will respond to aboveground disturbance, and whether they provide enough suckering to successfully regenerate to forests via clonal propagation. Our research aims to understand the extent of clonal regeneration in 8 to 12-year-old aspen trees, and to determine how this is related to disturbance type, planting density, and root system characteristics. Selected aspen trees were cut at either 0 cm or 25 cm stump height, left standing but with their roots severed, or were left as an untreated controls (n=80). The type and amount of regeneration for each tree was assessed at the end of the summer. In 2016 all remaining trees (n~1700) were removed from the sites, and regeneration was assessed. Trees cut at 0 cm produced on average 7.5 suckers per individual root system compared to 2.5 suckers in the 25 cm cut and severed root treatments. Small diameter trees produced more stump sprouts than large diameter trees. In 2016, trees planted at a lower density and possessing larger individual root systems produced more suckers than smaller diameter, higher density stands. The results indicate that stands originating from planted aspen seedlings have the ability to recover from disturbance, but this is dependent on individual root system size and planting density, suggesting that individual root systems maintain independence and are competing for resources.

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