

Evaluating trembling aspen seedling stock characteristics in response to outplanting and competition

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Abstract

Trembling aspen is commonly used in the afforestation of boreal forest reclamation sites; however, the presence of vegetation competition can reduce growth and establishment success. This research examines how initial morphological characteristics influence the above and belowground growth of aspen seedlings planted on sites where vegetation competition could act as a barrier to establishment. In the first study, aspen seedlings were planted in three plots with similar soil conditions but different levels of competition to determine which morphological characteristics were correlated with increased growth. Results show that a high initial root-to-stem ratio is beneficial for improved height growth in plots where competition is removed prior to planting. A high initial root-to-stem ratio did not benefit height growth in the grass treatment which had a high amount of belowground competition. Improving root egress (root development into the surrounding soil) is beneficial for seedling establishment, as there was a significant relationship with height growth. In a second study, seedlings were planted on three reclamation sites with contrasting soil conditions and vegetation features in northwestern Alberta. Seedlings with high root-to-stem ratios outgrew seedlings with low root-to-stem ratios on all three sites, which indicates that a high root-to-stem ratio is an important aspect of early establishment success over a range of site conditions. At an agricultural field where soil moisture was not limiting and competing vegetation was low, morphological characteristics of seedlings had less of an influence on performance. In sites where aboveground competition was tall, seedling height also became a factor for improving growth as tall seedling stock types with a high root-to-stem ratio performed the best. At a site where water and competing vegetation were both limiting factors, stress was likely too high as overall performance was poor across all stock types. The results from this thesis indicate that establishment success can be improved by using aspen with a high root-to-stem ratio in conjunction with the periodic control of competing vegetation; however, if site conditions are extremely poor, the effects of higher seedling quality will be outweighed by the poor site conditions.