

Effects of Biochar, Fertilizer and Shelter Treatments on the Vegetation

Development Following Coal Mine Reclamation

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Abstract

Poor quality cover soil, a lack of propagules, and availability of suitable microsites can be serious challenges in the re-vegetation success of surface mines. In my thesis research, I examined the response of total cover, species richness and community composition of colonizing vegetation on a harsh coal mine reclamation site in Alberta, Canada to the presence of planted aspen seedlings and amendment with biochar and fertilizer. Additionally, I explored the effects of shelter type (wood vs. brick), along with the effects of aspect and distance from shelter on survival and growth of four seeded native species and on density of volunteer vegetation. Results suggested planted aspen seedlings and fertilizer increased both cover and richness of colonizing vegetation in the first growing season, but increasing the amount of fertilizer did not result in additional effects. The application of biochar did not influence the cover of colonizing vegetation but did result in decreased richness; no synergistic effects of biochar and fertilizer were found. The provision of shelter generally improved survival of seeded species and density of volunteer species although effects differed somewhat among species and with aspect and distance from shelter. Lastly, within the short timeframe of this study there was no clear evidence that either type of shelter was preferable. These findings emphasize the importance of planting aspen, amending with use of fertilizer and using shelter as means to improve poor cover soil quality, create suitable microsites and encourage natural re-vegetation on challenging reclamation sites. Continued research regarding biochar use and its combined effects with fertilizer on poor substrates is needed.