

Overcoming Arrested Succession and Invasive Species on Older Reclaimed Surface Mines ¹

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Abstract: Coal mines in the eastern USA that were reclaimed between 1977 and 2010 were commonly compacted tailings planted with non-native grasses and legumes. Natural succession on these sites is greatly delayed with limited tree and shrub establishment even after 30 years, and without efforts to mitigate compacted soils, competitive herbaceous vegetation, and browsing by wildlife, tree growth and establishment is often poor. We reduced soil compaction on 10 ha in 2015 and another 9 ha in 2017 by using a sub-soiler to loosen soils to a depth of 1.2 m. A variety of native trees and shrubs were planted on a 2.4 by 3 m spacing. To re-establish native herbaceous species, we tested two seed mixtures along with unseeded control plots in 2015. In 2017 we tested 9 fast-growing annual species for their ability to replace persistent invasive grasses. Disturbance alone reduced the dominance of herbaceous perennials: on all sites, including unseeded controls, the cover of invasive species decreased from >90% to less than 50% in the first year, and herbaceous vegetation was quickly dominated by native perennials. Planted annual species performed poorly, but many planted herbaceous perennial species established well and increased the diversity of the site. Autumn olive (*Elaeagnus umbellata*) spread quickly once control was discontinued. Hardwood establishment was slow, likely due to heavy deer browse, however on the older site, overstory species are now emerging on areas over which a dense shrub layer had established. The development of vegetation in this area is highly variable, and strongly influenced by site and micro-site factors.

Additional Key Words: reforestation, community composition, legacy mines.

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 3. Work reported here was conducted near 36°32'07" N; 83°51'50" W and 36°31'18" N; 83°51'40" W.