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Small vegetation gaps increase reseeded yellow-flowered alfalfa performance and production in native grasslands

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Abstract

Reseeding yellow-flowered alfalfa (YFA) in degraded grasslands may require a vegetation-free microsite for germination and subsequent establishment. This study aimed to examine the role of microclimates of different-sized vegetation gaps on seedling performance and adult plant production of YFA. Field microsites were established in the meadow steppe of Hulunber, Inner Mongolia, China. Seedling performance, plant production, the microclimate within vegetation gaps, and soil nutrients (plant-available N, P, and K, total N concentration) were assessed at the end of each growing season from 2013 to 2015. Our results indicate light availability, and topsoil temperature of each gap were significantly increased as gap size increased, while topsoil moisture and air relative moisture were decreased in larger gaps. Small gaps (diameter $\leq$10 cm) improved seedling emergence, survival, biomass, and root nodulation, as compared with seedling performance associated with the larger gaps, presumably in response to increased shade and moisture. Additionally, large gaps (> 20 or > 40 cm) were characterized by significantly lower plant-available P, total N concentrations, plant-available K, and soil pH. However, root exclusion treatments did not improve overall seedling performance, plant production, or soil properties, as compared to corresponding microsites with root presence, regardless of gap size. Our