Does Pre-Existing Vegetation Make a Difference for Re-Establishing Native Shrubs?

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Introduction There exists within the Canadian prairies large areas seeded to monocultures of introduced grass species . Introduced species cover large areas of land in North America . Smooth brome grass (*Bromus inermis*) is one of the more plentiful . Chosen for agronomic reasons but is also known for its invasive potential for surrounding native grassland . This grass as a monoculture is susceptible to many of the shortcomings found with monocultures such as increased sensitivity to environmental events , low diversity in structure and species (fauna and flora) , and lower long term productivity . There exists a need to increase diversity by replacing and/or re-establishing native species to increase biodiversity both from an ecological perspective as well as sustainability perspective . This work has set out to determine the differences which occur between alluvial soils beneath stands dominated by smooth brome , native grass (dominated by *Agropyron* ssp .) and buffalo berry (*Sheperdia argentea*) for establishment of two native shrubs ; silver sage (*Artemisia cana*) and buffalo berry .

Materials and methods Topsoil was harvested from under stands of smooth brome (Br) , native prairie (N) and buffalo berry (Bb) . The soil was air-dried , large root fragments were removed , and then the soil was placed in 1 litre cardboard milk cartons . Seedlings of buffalo berry and silver sage were placed within individual cartons using a 2 by 3 factorial random complete block design with 10 replicates . Growing conditions within the greenhouse were : constant temperature of 21℃ with 12 hr of light . One centimeter of sand was placed on surface of the soils to eliminate the possibility of cross contamination from wind-blown or water-splashed soil among cartons . Water was applied daily . Soil microbial populations were characterized using phospholipid fatty acid analysis (PLFA) before and after plants were grown . Prior to germination seeds were surface sterilized . Plants were grown in cartons for a period of 4 months . Both above-and below-ground biomass data are presented and PLFA results . ANOVA for statistical analysis of biomass and discriminant analysis for PLFA results were done . A correlation matrix was calculated for plant variables and relative PLFA changes .

Results and discussion Buffalo berry seedlings initially showed a response to the Bb soil but final shoot biomass was not different ($P>0.05$) with a mean of 2 .9 g for all soil types . Root biomass did differ ($P<0.05$) with Bb soil having a root biomass of 1 . 1 g while Br and N both had 0 .8 g . Under buffalo berry most of the discrimination is explained by PLFA iso c17 :0 + c17 and c15 :0 . Also the changes occurring in c15 :0 and c16 :0 are important in distinguishing among soils . These phospholipids are abundant in bacteria of the genus *Frankia* , associated with the nitrogen fixing shrub buffalo berry . Sage seedlings differed in shoot biomass in all soil types ($P<0.05$) : Bb 1 .6g , Br 1 .1 g and N 0 .8 g . Sage root biomass was greatest ($P<0.05$) in Bb 1 .2 g while Br had 0 .6 g which did not differ from 0 .4 g obtained from N . The correlation matrix among plant variables and relative PLFA changes indicate that c15 :0 was the most influential PLFA signature in the soil . Plant biomass was negatively correlated with c15 :0 concentration across all soils . Bb soil contained the highest initial concentration of this marker suggesting that sage growth in this soil may have benefited from the presence of the nitrogen fixing bacteria associated with buffalo berry plants . Bb soil resulted in both shrub species having an initially greater ($P<0.05$) growth rate .

Conclusions Our results indicate what covers the soil originally has an effect in growth potential of re-established species . This difference is attributed to differences in soil microbial populations . The symbiotic relationship between *Frankia* and buffalo berry negated any advantage of soil type for this shrub's shoot biomass but a potentially higher initial concentration in Bb would appear to have benefited root growth . Response of species to soil type in this work was species specific .