Impacts of bison reintroduction on soil geochemistry and microbial communities in a tallgrass prairie

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Tallgrass prairies have been reduced in area by over 90% and are therefore one of the most threatened ecosystems in the world. Nachusa Grasslands, located in Franklin Grove, IL, USA, is a successful long-term effort of restoring agricultural land to mosaic tallgrass prairies. More than 30 bison (sp. *Bison bison*) were reintroduced into 500 acres of enclosed prairie in November 2014 to reinstate integral grazing regimes to the landscape. The goal of this study was to understand how nutrient influx and microbial communities in bison feces affect the microbial community of prairie soil. Newly-reintroduced bison have access to restored prairies that were re-planted at nine different time-points over the last 16 years, including remnant prairies that were never used for agriculture. Manipulative field experiments were used to explore the direct interactions between bison dung and various aged prairie soil, with bulk soil from both bison-exposed and bison-free treatments sampled biweekly in summer 2015. We sampled soil along transects away from undisturbed fecal patties during a 3-week period to examine their direct impact on soil geochemistry and microbial diversity. Soil and fecal geochemistry and 16S rDNA were analyzed to quantify microbial community and nutrient fluxes. Initial analyses suggest that feces inputs drive an increase in easily cultivable, acidophilic Acidobacteria Groups 1 and 3 in old and remnant prairies, but decrease these groups in newly-planted prairies. Conversely, uncultured, neutrophilic Acidobacteria Groups 6 and 16 show the opposite trend, suggesting that pH and nutrient concentration may have drastically different effects on different-aged prairies. Further analyses of soil geochemistry and the reconstruction of microbial metabolism will determine if bison-mediated increases in nitrogen and carbon are directly responsible for these community shifts. Continuing studies at Nachusa Grasslands will establish whether changes in geological and microbial structure due to fecal deposits are temporary or have long-term impacts on both the prairie soil and higher trophic levels. Ecosystem restoration is a critical component of managing sustainable biogeochemical cycles in the Anthropocene, and characterizing the microbial contributions will be critical to improving success rates for future restoration efforts.