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Research Note

Grazing Protection Influences Soil Mesofauna in Ungrazed and Grazed Riparian and Upland Pastures

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Abstract

The influence of grazing protection caused by streambank fencing on soil mesofauna density is unknown. Our objective was to determine if grazing protection (ungrazed vs. grazed), location (upland vs. riparian pasture), and seasonal (spring vs. fall) treatment effects associated with streambank fencing had a significant influence on soil mesofauna distribution and density. We collected five intact soil cores (0–5 cm depth) in June and October of 2012 from within four treatments consisting of ungrazed and grazed riparian and upland pastures associated with streambank fencing along an 800-m reach of the Lower Little Bow River in southern Alberta, Canada. Soil mesofauna were extracted and densities of *Acari* (mites) taxa, *Collembola* (springtails) taxa, and other mesofauna were determined. Grazing protection resulted in a significant ($P \leq 0.05$) negative response of *Astigmata* mite densities for the upland pasture, and a positive response for *Oribatida* mites and total *Collembola*, and *Hypogastruridae* and *Onychiuridae* springtails for both pastures. Location and season had a significant influence on *Acari* and *Collembola* taxa, but the effects were dependent on interaction effects. We conclude that grazing protection influenced certain soil mesofauna in pastures associated with streambank fencing, and this may influence decomposition of soil organic matter, nutrient cycling, and soil structure in associated pastures.

Key Words: *Acari*, *Collembola*, grazing, soil invertebrates, streambank fencing

INTRODUCTION

Streambank fencing is used to protect rivers, streams, water quality, and their riparian zones from cattle grazing on adjacent upland grassland pastures. Depending on location of streambank fencing, ungrazed and grazed upland and riparian pastures are created when streambank fencing is installed. Cattle grazing can influence soil mesofauna by the indirect effects on soil properties such as nutrient inputs via feces and urine, soil compaction, and litter removal (Bardgett and Cook 1998; Battigelli et al. 2003). Grazing by cattle causes soil compaction and reduces total pore space, which impedes the movement of soil mesofauna (Hopkin 1997; Battigelli et al. 2004; Schon et al. 2012). Grazing also reduces the litter or surface mulch by trampling, which pulverizes and incorporates the litter into the surface soil, stimulating decomposition (Dormaar et al. 1989); and by removing herbage that cannot then enter litter (Bardgett and Cook 1998).

Most studies have reported a positive response of soil mesofauna to reduced grazing (Bardgett and Cook 1998; Clapperton et al. 2002; Schon et al. 2008, 2010, 2011, 2012). However, some found only minor effects of grazing intensity on soil mesofauna (Leetham and Milchunas 1985) or found a negative response to reduced grazing (Bardgett et al. 1993). Most studies of grazing impacts on soil mesofauna have focused on upland pastures (Behan-Pellier and Kanishiro

2010), and we are not aware of any studies that have examined soil mesofauna in ungrazed and grazed upland and riparian pastures associated with streambank fencing. The objective of our study was to determine if grazing protection, location, and seasonal treatment effects associated with streambank fencing in southern Alberta had a significant influence on soil mesofauna distribution and density.

MATERIALS AND METHODS

Study Site

The study site is located within the Lower Little Bow (LLB) watershed in Alberta, Canada (Miller et al. 2010). The dominant vegetation is wheat grass (*Pascopyrum* sp.) species [*Pascopyrum dasystachyum* or northern wheatgrass, *Pascopyrum smithii* (Rydb.) Á. Löve or western wheatgrass] as well as needle and thread grass (*Stipa comata*). The soils are medium to moderately coarse-textured dominantly Aridic and Typic Bolls, with significant Entisols.

Streambank Fencing History and Implementation

The streambank fencing with cattle crossing BMP was established in 2001 (Miller et al. 2010). The total potential grazing area is about 184 ha and the area of the fenced riparian pasture is approximately 10 ha. The stocking rate was 0.50 animal unit month (AUM) ha⁻¹ from 2001 to 2003, and it was reduced to 0.40 AUM ha⁻¹ from 2004 to 2007. Cattle grazed (June–August) the riparian pasture prior to fencing in 2001 and were excluded from the riparian pasture since 2001. Permanent fencing with a

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