United States Department of Agriculture
Agricultural Research Service

High Density, Short Duration Grazing Impacts on Native Prairie Soil and Vegetation

Grazinglands Research Laboratory, El Reno, Oklahoma May 2017

Rationale: The Great Plains is one of largest expanses of prairie ecosystems in the world. Prairies, particularly tall grass prairies, have been predominantly converted to other land uses. The remaining prairie ecosystems can be productive for livestock grazing and provide numerous benefits of high carbon soils and sink for atmospheric carbon, clean water, and diverse habitat for avian, terrestrial, and aquatic species. Resource concerns on Great Plains native grazing lands include invasion of brushy species (e.g., Eastern redcedar, mesquite); low productivity land (e.g., highly eroded, former cropland returned to grassland after Dust Bowl and droughts in 1950s); and unstable stream networks (bank failure, gully erosion, headcuts) that may be associated with livestock traffic and loss of vegetative cover near steams. Grazing management systems need to be developed to address these concerns.

Objective: Determine if the impacts of short duration, intensive grazing (mob grazing) on soil and plant properties is comparable to that observed in continuous and rotational grazing.

What we are doing: Continuous and rotational grazing trials were established in native prairie pastures in 2009, with two replicates of each treatment (Fig. 1). One herd of cows is assigned to each continuous or rotational replicate. Exclosures are used to establish subplots within the continuous treatments (Pastures Ca and Cb, Fig. 1) to examine impacts of high stock density on vegetation and soil characteristics. Each site has a 1 acre and a 0.5 acre exclosure to provide different stocking densities.

Over a 3-day period each year, the 25-cow herds assigned to Pastures Ca and Cb are confined into a 1 acre subplot for 24 hours, returned to the continuous paddock overnight, and then confined into a 0.5 acre subplot for 24 hours. In 2017, this was the equivalent of 21, 782 lbs/acre stocking density for the 1acre plot and 43,565 lbs/ac for the smaller plot.

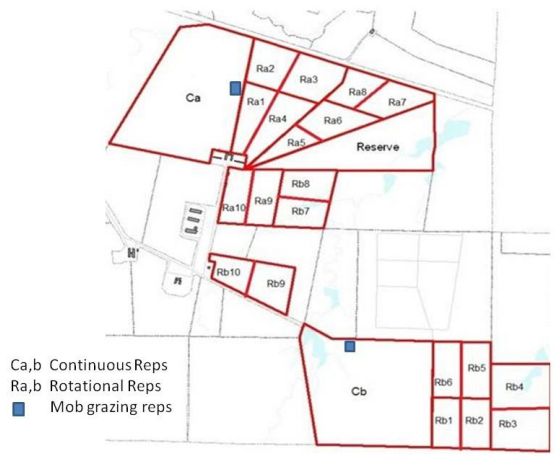

Fig. 1 Plot map for native prairie grazing study

Land Health Indicators of system performance

Vegetation indicators include biomass, basal area of perennial grasses and bare ground, and litter. Remote sensing methods will be applied in the future to determine greenness index over time and forage quality over time and space.

Productivity indicators include grazing days per unit area, body condition index, calving rate, and weaning weight.

Soil indicators include carbon and nutrient dynamics (**In collaboration with Dr. Alan Franzluebbers, USDA-ARS, Raleigh, NC**), aggregate stability, and aggregate size distribution. In the future, phospholipid fatty acid profile, soil respiration, soil greenhouse gas emissions, and infiltration will be determined.

Baseline soil samples were collected from each paddock in 2009 and again in 2012. Treatment effects on soil respiration and soil microbial biomass are shown at right (Fig. 2).

Sampling is planned in fall of 2017 to evaluate the longer-term treatment effects on soil, vegetation, and productivity indicators for the 2009-2017 period.

(See associated fact sheets enclosed herein that describe fluxes of nitrogen and phosphorus as a function of grazing management and location within pastures.)

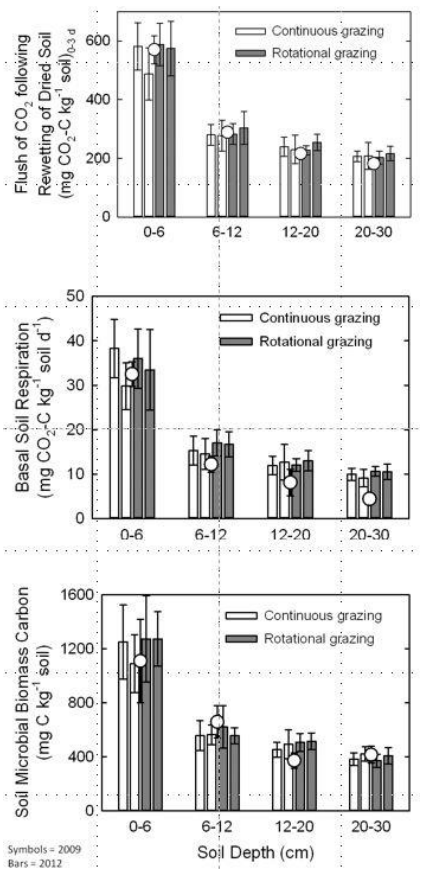

Fig. 2 Effect of 4 years of rotational and continuous grazing on soil (data from A. Franzluebbers.)

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