

Grazing Management Effects on Pathogen Loading of Midwestern Pasture Streams

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Justification:

Improved grazing practices that control the temporal/spatial distribution of cattle in riparian zones may reduce pathogen loading of pasture streams by reducing manure deposition, maintaining vegetation, and minimizing hoof traffic near pasture streams.

Objective:

The objective of this project is to develop a risk assessment model of intestinal pathogen loading of Midwestern pasture streams as influenced by grazing management.

Progress to Date:

In biweekly water samples from 13 pasture streams in the Rathbun Lake watershed in 2007 and 2008, mean concentrations of fecal coliforms were 930 and 938 cfu/100 ml at upstream and downstream sites, but were not related to stocking rates. Mean incidences of bovine enterovirus (BEV), coronavirus (BCV), and rotavirus (BRV) in upstream and downstream samples were 4.67, 6.17; 1.97, 1.23; and 0.25, 0.25%. Incidences of BEV and BCV were greatest from July through October. Incidence of BEV, BCV or BRV in downstream water samples was not related to cattle presence on the day of sampling or three days before sampling. Mean incidence of *E coli* O157:H7 in fecal samples from 90 fall-calving Angus cows at a farm in the Willow Creek watershed in June/July, August and September was 2.4% in 2007 and 2008. Mean incidences of BCV and BRV were 0 and 0.37% in 2008. Using GPS collars, the probabilities of cows being within 30.8 m of a surface water resource in five pastures in the Rathbun Lake watershed in 2007 and 2008 increased with ambient temperature and were related to the proportion of the total pasture in the riparian area. Cows in pastures with continuous stocking with unrestricted (CSU) or restricted (CSR) stream access or rotational stocking (RS) in the Willow Creek watershed were within 33.8 m of the stream 11.4, 2.1, or 3.3% of the time. There was greater fecal cover within 33.8 m of the stream in CSU pastures than CSR or RS pastures in June through August. Runoff from 1.5-hour rainfall simulations on vegetated areas at 8.4 cm/hour were 41, 17, and 39% of applied precipitation in CSU, CSR and RS pastures and on bare areas were 72 and 69% of applied precipitation in CSU and RS pastures. However, *E coli* O157:H7, BCV, or BRV were not detected in any of the runoff samples.

Impacts:

Although fecal coliform concentrations might be high in pasture streams, the incidence of pathogenic viruses in pasture streams and fecal shedding of *E coli* O157:H7 are seasonal and transitory. Therefore, loading of pasture streams as well as exposure of a given herd with these bacterial and viral pathogens may be controlled through grazing practices that alter the temporal/spatial distribution of cattle in pastures. Presence of cattle in or near streams can be reduced by restricting access of grazing cattle to stabilized access points or through rotational grazing. However, because the cattle distribution is dependent on pasture size and shape, the efficacy of such practices will be site-specific.