

The Role of Ponds in Reducing the Threat of Pathogen Contamination from Livestock in Agricultural Watersheds

Michael B. Jenkins

USDA-ARS

Grant Number: 2005-35102-16374

Justification:

Outbreaks of gastrointestinal illness from exposure to pathogens in recreational and municipal drinking waters often focus public attention on animal agriculture as a potential source of contaminants in surface and ground water. Recent observations by researchers in Georgia have indicated that ponds with stream inflows and outflows reduce the concentration of fecal bacteria in downstream surface water. A systematic study, however, is needed to substantiate these observations and evaluate the utility of ponds for reducing concentrations of fecal bacteria in watersheds.

Objectives:

We have designed research to test the hypothesis that ponds downstream from a source of fecal pollution can reduce the load of fecal indicator bacteria (*E. coli* and fecal enterococci) and pathogen contamination (*Salmonella* and *E. coli* 0157:H7) of surface waters below ponds. Specific objectives are 1. determine the spatial and temporal distribution of fecal indicator bacteria and pathogens in inflow, within pond, and in outflow, 2. determine load reduction efficiency during base and storm flow, and 3. determine relationships between fecal indicator bacteria and the pathogens.

Progress to date:

Results of 31 months of baseflow sampling from Bishop Pond in Georgia's Southern Piedmont indicated a recurring pattern in which concentrations of *E. coli* and fecal enterococci in pond outflow were significantly reduced compared to pond inflow concentrations. This pattern of inflow/outflow concentrations of fecal indicator bacteria was also observed for two storm events at Bishop Pond. Inflow/outflow concentrations of *E. coli* 0157:H7 and *Salmonella*, however, did not follow the pattern of the fecal indicator bacteria. Because of drought conditions and lack of pond inflow and outflow such recurring patterns have not been observed for the two ponds in Georgia's Southern Plain. With modified MPN methods dilute concentrations of both *E. coli* 0157:H7 and *Salmonella* were determined for several samples assayed from the two Southern Plain ponds. Two *in situ* survival experiments with sentinel chambers were completed at Bishop Pond. Results of these experiments indicated that *E. coli* 0157:H7 survived twice as long as generic *E. coli* and more than 6 times longer than fecal enterococci. Unlike generic *E. coli*, *E. coli* 0157:H7 appeared to be immune to microbial predation.

Impacts:

Jenkins, M.B., D.M. Endale, and D.S. Fisher. 2008. Most probable number methodology for quantifying dilute concentrations and fluxes of *Salmonella* in surface waters. *J. Appl. Microbiol.* 104(6):1562-1568.

Jenkins, M.B., D.M. Endale, and D.S. Fisher. 2008. Most probable number methodology for quantifying dilute concentrations and fluxes of *Escherichia coli* O157:H7 in surface waters. *J. Appl. Microbiol.* (In press).