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# Filter Strip Length and Fecal Bacteria Trapping from Poultry Waste - An Update

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## FILTER STRIP LENGTH AND FECAL BACTERIA TRAPPING FROM POULTRY WASTE— AN UPDATE

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Cheap, efficient, and environmentally sound waste disposal will be needed as Kentucky's broiler industry expands. The filter strip length needed to protect water resources from contaminants in surface runoff is a pressing issue in waste management and water quality. In a previous *Soil Science News and Views* (Vol. 15, No. 8) we reported that grass filter strips as short as 15 feet can trap over 90% of the fecal bacteria eroding from land-applied and incorporated poultry waste during runoff following rainstorms. In this update, we provide some additional

information and conclusions from that study on filter strip length, based on comparisons of filter strips receiving equal amounts of surface runoff.

### Surface Flow, Sediment Runoff, and Fecal Bacteria Trapping

Grass filter strips promote surface water infiltration. During simulated rainstorms, 15 and 30 foot filter strips, on 9% slopes, trapped an average of 76% and 85% of the surface runoff, respectively. Filter strips effectively reduced sediment concentrations in runoff by 79 to 86% (Table 1) with the

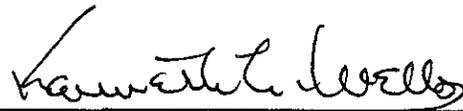
total sediment loss decreasing by at least 95% even in 15 foot filter strips (Table 2).

Fecal coliforms were trapped significantly better than fecal streptococci (Table 2) and increasing the filter strip length from 15 to 30 feet increased the mean trapping efficiency of the filters for both fecal bacteria. Greater than 90% of the fecal bacteria mass was trapped in some cases (Table 2). However, the average flow-weighted fecal coliform and fecal streptococci concentrations always exceeded 100,000 CFU/100 ml once runoff occurred (Table 1). These concentrations are at least 1000 times higher than the standard for fecal contamination of primary contact water in Kentucky (200 fecal coliforms/100 ml). The flow-weighted mean concentration of bacteria leaving filter strips can be higher than that entering them because the filter strip abutting the waste-amended soil becomes a reservoir for sediment-bound fecal bacteria trapped from surface runoff. These bacteria are released by the mechanical action of rainfall and lateral

surface flow the longer that runoff occurs.

### Conclusions

Our data, based on intensity and duration of rainfall greater than that likely to occur under natural events, suggested that the benefit of doubling the filter strip length to 30 feet was small in this well-drained soil. Although fecal bacteria mass was significantly reduced, their concentrations exceeded primary water quality standards when runoff occurred. The criterion for assessing fecal contamination of water is based on concentration, not mass. Grass filter strips longer than 30 feet, greater intervals between the time of application and rainfall, or prior treatment of wastes before application, would be necessary to prevent fecal contamination of adjacent waters based on a concentration criterion.



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Table 1. Flow-weighted mean concentrations of sediment and fecal bacteria in surface runoff entering and leaving two lengths of grass filter strips during rain simulations.

Filter strip length (feet)	Plot	Sediment (g/L)		Fecal coliforms		Fecal streptococci	
		inflow <sup>†</sup>	outflow	inflow	outflow	inflow	outflow
----- Millions of CFU <sup>‡</sup> /100 ml -----							
15	1	8.3	1.7	3.2	5.6	4.7	10.4
	2	6.4	1.3	15.4	6.7	53.4	37.1
30	3	4.3	0.7	23.8	8.7	11.0	16.6
	4	3.5	0.4	0.6	0.8	1.4	3.8

<sup>†</sup> Inflow refers to surface runoff entering the filter strips; outflow refers to surface runoff leaving the filter strips.

<sup>‡</sup> CFU = Colony Forming Units

Table 2. Trapping efficiency, based on the same loading rates, of grass filter strips for sediment, fecal coliforms, and fecal streptococci during rain simulations.

Filter strip length (feet)	Plot	Sediment	Fecal coliforms	Fecal streptococci
----- % Trapping efficiency -----				
15	1	95	55	42
	2	98	95	93
	Avg. <sup>†</sup>	96 ± 2	75 ± 28	68 ± 36
30	3	97	92	67
	4	99	89	80
	Avg.	98 ± 2	91 ± 2	74 ± 9

<sup>†</sup> Average ± one standard deviation

