2009 CSREES National Water Conference; St. Louis, MO

Investigation of roadside ditches as rapid conduits and reservoirs of bacteria, nutrients, and sediments to downstream drinking water supply systems.

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Abstract:

Although roadside ditches are ubiquitous, their contributions to stream flooding and water quality degradation have been largely overlooked. Recent research at Cornell University has documented that networks of roadside ditches (a) extend the natural stream channel networks by several-fold, (b) rapidly convey shallow runoff from ~20% of each watershed to streams, and (c) act as a source of sediment, especially when scraped by highway departments. This project expanded the investigation to evaluate the role of ditches as conduits of contaminants from agricultural lands to downstream water supply systems. The project is particularly focused on the transport of bacteria and pathogens in flow, and the potential for resuspension of bacteria residing in ditch bottom sediment. A total of five roadside ditches have been monitored continuously in three watersheds in the Finger Lakes region of New York since spring 2008. Three ditches are adjacent to agricultural lands where cow manure was spread in May, and two ditches adjoin forested land. ISCOTM automated water samplers are used to collect samples throughout storm events, and Tru-TrakTM automated gauges monitor ditch flow. Samples were kept on ice and then analyzed immediately for indicator bacteria (E. coli and total coliforms) using Idexx's ColilertTM/Quantitray method. Between storm events at approximately two week intervals, replicated samples of ditch sediment were collected, diluted and shaken to resuspend the bacteria, and similarly analyzed for indicator bacteria. Thus far, 374 water samples have been collected in association with 17 storm events. E. coli was detected in all samples although there were significantly higher levels associated with agricultural, than with forested landuse. Concentrations varied from 20.4 MPN/100 mL to 24,196 MPN/100 mL (detection limit) with gradual declines in concentrations over the 6 month period. Within a storm event, the E. coli levels declined and paralleled the trajectory of suspended sediment. E. coli was also consistently detected in roadside ditch sediments showing the potential for resuspension of bacteria during storm events. Data collection will continue through 2009 to gain an understanding of seasonal variations in roadside ditch transport of water pollutants. The findings thus far prove the importance of managing both agricultural fields and roadside ditches to minimize the contamination of drinking water supplies.

Impact Statement:

Not applicable. We are only in the first year of the project..

Category: Rural Environmental Protection
Type of Presentation: Poster Presentation