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Microbial water quality in streams as affected by high flow events

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Bottom sediments in surface water sources were shown to serve as reservoirs of pathogen and indicator microorganisms. Resuspension of these sediments during the high flow events strongly modifies microbial quality of recreation and irrigation waters. Therefore, changes in microbial water quality are expected due to climatic changes that affect the precipitation frequency-duration-intensity relationships. The objective of this work was to summarize results of three years of artificial high flow experiments at the perennial first-order creek in riparian zone. The artificial high flow events were created at the USDA-ARS OPE3 research site by releasing 80T of tap water with tracers in four allotments during 20 min and monitoring streamflow, and *E. coli* and PFBA tracer concentrations at four stations with automated refrigerated samplers along the 630 m stream reach. Sediment texture and *E. coli* concentrations were measured before the event and on the next day. The *E. coli* concentration in stream water during and after the event far exceeded the limits recommended for recreation and irrigation waters. Based on bacteria mass balance, *E. coli* were released on average from the top 5 mm of the sediment layer. *E. coli* concentrations in sediments were one order of magnitude larger days after the experiment than before the event. Semivariograms of *E. coli* concentrations before events were periodic indicative to the extreme patchiness, whereas no spatial structure was found in *E. coli* concentrations day after the event. Tracer breakthrough concentrations suggested a slow return of bacteria from stagnant zones near stream banks to the flow zone in the creek. On one of the years, A high concentration of streambed *E. coli* ("hotspot") resuspended within the first reach caused a pulse of high *E. coli* concentrations that propagated along the creek without substantial attenuation. Functioning of environmental reservoirs of *E. coli* such as bottom sediment, bank soils, periphyton, and algae will change as the climate changes, and this change needs to be understood to foresee the changes in microbial quality of irrigation and recreation waters.