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Subwatershed contributions to an urban drinking water reservoir

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A comprehensive watershed-scale research program began in the winter of 2003 on Eagle Creek Watershed. This program was developed to evaluate water quality issues threatening an Indianapolis drinking water reservoir, Eagle Creek Reservoir. Eagle Creek Watershed is the catchment basin draining approximately 420 km^2 (162 mi^2) into Eagle Creek Reservoir. Pressures from agriculture, urban development, and increasing population demands threaten the sustainability of the watershed and reservoir for recreational use, aquatic life, and as a drinking water supply. The watershed is negatively impacted by sedimentation from streambanks, cropland, construction sites, and ditches. Excessive nutrients from agricultural production, inadequate septic systems, animal waste, residential area runoff, point source discharges and uncontrolled storm water also degrade water quality in tributary streams and in the reservoir. Furthermore, these nutrients promote high algal productivity that can further degrade water quality through the release of nuisance taste and odor compounds or algal toxins.

To determine problematic areas and subwatersheds in critical need of attention, samples were collected quarterly throughout the watershed during base flow and event (runoff) flow in 2003. Sample sites were determined based on subwatershed boundaries. Water samples were analyzed for total suspended sediment, total nitrogen, total phosphorus, and *E. coli*. Findings concluded that load contributions of nutrients and suspended sediment varied with respect to land use in subwatersheds. Nutrient and sediment loads show that some subwatersheds in areas undergoing development contribute disproportionately higher sediment while subwatersheds in areas that are predominantly agricultural contribute higher nutrient loads. For example, Eagle Creek-Jackson Run and Little Eagle Branch-Woodruff Branch subwatersheds (54% agricultural, 12% urban), which have experienced increased development, contributed 50% of the total suspended sediment yet contributed only 30% of the water contribution to the reservoir. These subwatersheds together, however, only contributed 16% of total nitrogen loads. Conversely, subwatersheds that are predominantly agriculture and have little development such as Mounts Run-Neese Ditch, Eagle Creek-Dixon Branch, and Eagle Creek-Kreager Ditch subwatersheds (82% agriculture, 2% urban), contribute less total suspended sediment (16%) and more total nitrogen (43%) compared to their total reservoir water contribution of 25%. Analysis of subwatershed nutrient and sediment contributions compared to water contribution suggests subwatersheds with land use perturbation contribute higher sediment and subwatersheds with mostly agricultural land use contribute higher nutrients. As a result of these analyses, subwatersheds of concern have been targeted allowing the research program to begin focusing on the specific sources of contaminants having the most negative impacts.