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GREEN-DUWAMISH WATERSHED MICROBIAL SOURCE TRACKING STUDY

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ABSTRACT: The Green-Duwamish River watershed, located in King County, Washington, has several stream sections listed on the state's 303(d) list of impaired water bodies for fecal coliform bacteria. In 2003, King County implemented a microbial source tracking (MST) study to address bacterial contamination in the watershed and to better understand the relationship between land use and bacterial loadings. A molecular ribotyping technique was applied to a total of 1,503 E. coli isolates obtained from 564 water samples. The water sample isolates were compared to known animal and human sources in the ribotype library, and only 5 percent of isolates did not match a known source. Generally, E. coli bacteria concentrations were significantly higher during storm flow than base flow, and exceeded the EPA water quality criterion at all but one station during base flow and all but two stations during storm flow. Bacteria concentrations increased significantly from upstream to downstream, reflecting the increased amount of development and agricultural land use from upstream to downstream. The highest fecal coliform bacteria concentrations were observed in subbasins with the most development and agricultural land use, while the lowest concentrations were observed at the subbasin with forested conditions. Bacteria source percentages generally did vary with the land use present in the drainage basin. Human sources comprised less than 5 percent of all bacteria present and were most prevalent in areas of low density development (i.e., septic systems). Canine/feline sources represented 12.5 percent of all sources and were most prevalent in areas of high density development. Livestock sources represented 7.1 percent of the total isolates and were most prevalent in agriculture areas. Proportions of bacteria sources generally did not vary consistently among stations in terms of environmental variables (hydrology or season). Avian bacteria sources represented the largest percentage (26.1 percent) of all ribotypes, and were the predominant source at eight of the nine stations. Rodent/beaver sources were the second most prevalent source observed (16.6 percent). Deer/elk and raccoon sources were observed at a moderate frequency (9.3 and 7.5 percent, respectively). Bear, bobcat, coyote, muskrat, skunk, and squirrel were rarely observed (less than 1 percent).

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