SCCWRP Annual Report 1999-00

Anthropogenic versus natural mass emission from an urban watershed

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ABSTRACT

Accounting for naturally occurring constituents of concern, such as trace metals, is a problem that frequently occurs when trying to estimate stormwater mass emissions. The objective of this study was to comprehensively measure runoff from an urban watershed to assess the total pollutant load, then estimate what proportion of the total load was attributable to natural versus anthropogenic sources.

Over 1,700 samples were collected approximately every 15 min during every sampleable storm during the 1997/98 water year from the last gaging station on the Santa Ana River. Every sample was analyzed for total suspended solids (TSS) and approximately 10% of the samples were analyzed for total organic carbon, total nitrogen, cadmium, chromium, copper, iron, lead, nickel, and zinc. We used iron as a conservative tracer of natural contributions and to assess anthropogenic enrichment.

Every trace metal showed some level of anthropogenic enrichment. Cadmium, copper, lead, and zinc showed the greatest levels of enrichment (33-63% of total concentration), while chromium and nickel showed the least (<1% of total concentration). Trace metal enrichment was also found during every storm.

Over 90% of the total annual load occurred during less than 10% of the water year. The loading was disproportionate among sources of runoff discharge. For example, 74% of the runoff volume occurred as a result of dam releases, but these discharges accounted for less than 40% of the trace metal emissions. In contrast, runoff from the local urban surfaces below the dam accounted for 9% of the discharge volume, but accounted for 34 to 41% of the trace metal emissions, depending upon the metal. Nearly all of the nickel and chromium emissions and approximately two-thirds of the copper, lead, and zinc emission, were of natural origin.

Full Text

ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/AnnualReports/1999AnnualReport/05_ar35.pdf