Abstract

Increased urbanization in the United States and the rest of the world, has led to more research on the effects it has on the local ecology. Urbanization can be defined as the creation of impervious cover in areas previously covered by natural vegetation (forest, grassland or farmland) as well as the potential influence of sewage treatment plants. Small increases in impervious cover can cause noticeable changes in stream chemistry. The goal of this study is to quantify the impact of smaller industrial cities on water and sediment geochemistry in a largely agricultural watershed. The study area is in east-central Indiana along the west fork of the White River and includes the cities of Winchester, Muncie and Anderson. This area is dominated by agriculture and the impact of cities in the region on water chemistry has not been studied. To evaluate this impact, sampling sites were selected up- and downstream of the three cities to characterize White River water chemistry before and after it flows through the cities as well as sewage treatment plants. Sampling was done over the course of one year to obtain samples characteristic of high and low flow river conditions. Samples were analyzed for major cation and anion concentrations as well as total suspended solids. Metals data was also obtained in sediments, although sampled only twice throughout the study. Results show that sediment load, on average, increases on the downstream side as the river flows through urbanized areas. Chemical analyses show that major cations and anions, Na, K, SO$_4$ and Cl, have distinct spikes in concentration on the downstream side of the cities, as well. Na and Cl are specifically linked to human and urbanized activity, and were up to four times higher downstream of urbanized cities. The concentration of other major ions, including Ca, Mg and NO$_3$, was mostly due to agricultural land use and local bedrock
geology. Trace metals characteristic of pollution from automobiles, including Cd, Cr and Zn, showed large increases downstream of urban areas as well. This indicates that even in an area that is largely dominated by agriculture, smaller cities have a quantifiable impact to White River water quality.