

HERBICIDES: Narrative for simple conceptual diagram

Anthropogenic activities and sources can supply streams with high concentrations of herbicides and their metabolites, which can lead to lethal and sub-lethal effects on aquatic biota. Sources associated with urban development (e.g., wastewater treatment plants) and industry (e.g., herbicide manufacturing plants) may discharge effluents containing herbicides into streams. Herbicides are used to control undesired plants on farms, in commercial forests, and on lawns and managed landscapes. In some cases, herbicides are applied directly to surface water for aquatic weed control. Typically herbicides are applied to soil or terrestrial vegetation, which can increase herbicides in groundwater discharge, atmospheric deposition, and stormwater runoff. The extent to which herbicides reach streams depends on factors such as precipitation patterns, timing and rates of application, and environmental persistence of herbicides and their metabolites.

In streams, herbicides may be dissolved in the water column or bound to sediments, and their impact depends on the medium in which they occur. Exposures may be episodic (e.g., occurring during precipitation events) or continuous (e.g., exposure to herbicide contaminated bed sediments). The bioavailability, uptake, and toxicity of herbicides vary with environmental conditions (e.g., pH).

Increased herbicides in streams can adversely affect stream flora and fauna via several mechanisms, including reduced growth, condition, and reproduction; increased mortality; and changes in behavior. These effects can result in biologically impaired macrophyte, periphyton, phytoplankton, fish, and invertebrate assemblages, which in turn can contribute to changes in community structure and ecosystem function.