WATER-BORNE AND SEDIMENT-BORNE CONTAMINANTS IN THE LAKE ERIE-LAKE SAINT CLAIR DRAINAGES, 1996-98

DONNA N. MYERS and DANIEL T. BUTTON; U.S. Geological Survey, Columbus, Ohio and Jeffrey W. Frey, U.S. Geological Survey, Indianapolis, Indiana

Water quality in the Lake Erie–Lake Saint Clair Drainages is greatly influenced by land use and human activities. A major pathway for contaminant transfer from the land surface to streams is storm runoff from urban and agricultural areas. As a result of herbicides in runoff, concentrations in streams were in the top 25 percent of streams nationwide and many public-water supplies must treat streamwater to reduce herbicide concentrations. As a result of nutrients in runoff, concentrations of total phosphorus and nitrate in some small streams and in major rivers were in the top 25 percent of streams nationwide. Concentrations of nitrate, although elevated relative to many other streams in the nation, were infrequently greater than the drinking-water standard of 10 milligrams per liter. Contamination of the bed sediments of small streams and major rivers by persistent and bioaccumulative contaminants was prevalent. The highest concentrations of PCBs (polychlorinated biphenyls) and mercury were found in streams draining highly populated urban and mixed land-use areas. Detections of contaminants in fish tissues indicate bioaccumulation; in fact, bioaccumulation of PCBs and DDT in some fish species presents a health risk to fish-eating wildlife.

The pesticides detected most frequently were among those applied in the greatest quantities to agricultural and mixed-use lands. The herbicides atrazine, acetochlor, cyanazine, metolachlor, and simazine were detected in 50 to 100 percent of stream samples. Several heavily used herbicides and insecticides were detected in spring and summer at or above a standard for drinking water or a guideline for aquatic life. Elevated pesticide concentrations in streams persisted for 4 to 6 weeks after applications in agricultural and mixed-land-use areas. Annual average concentrations of total phosphorus were greater than the U.S. Environmental Protection Agency desired goal for the prevention of plant nuisances at 8 of 10 streams. Most affected were small streams and major rivers draining agricultural and mixed-use land. Major rivers flowing through agricultural and mixed-use land are major pathways of phosphorus to Lake Erie.

Contaminants detected most often in the bed sediments of small streams and major rivers were arsenic, cadmium, copper, lead, mercury, zinc, PCBs, and PAHs (polycyclic aromatic hydrocarbons). The concentrations of mercury, PCBs, and PAHs were equal to or greater than sediment-quality guidelines, indicating probable adverse effects on aquatic life, in about 11 to 30 percent of samples, respectively. The most frequently detected contaminants in fish were highly persistent contaminants–DDT, chlordane, dieldrin, PCBs, and mercury. Except for mercury, use of these compounds in industry and agriculture in the United States was discontinued 15 to 25 years ago.

The major Influences on surface-water quality and aquatic biota are storm runoff, land use and chemical releases, and bioaccumulative and persistent contaminants.