



Water-Quality Conditions, and Constituent Loads and Yields in the Cambridge Drinking-Water Source Area, Massachusetts, Water Years 2005-07

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The source water area for the drinking-water supply of the city of Cambridge, Massachusetts, encompasses major transportation corridors, as well as large areas of light industrial, commercial, and residential land use. Because of ongoing development in the drinking-water source area, the Cambridge water supply has the potential to be affected by a wide variety of contaminants. The U.S. Geological Survey (USGS) has monitored surface-water quality in the Hobbs Brook and Stony Brook Basins, which compose the drinking-water source area, since 1997 (water year 1997) through continuous monitoring and discrete sample collection and, since 2004, through systematic collection of streamwater samples during base-flow and stormflow conditions at five primary sampling stations in the drinking-water source area. Four primary sampling stations are on small tributaries in the Hobbs Brook and Stony Brook Basins; the fifth primary sampling station is on the main stem of Stony Brook and drains about 93 percent of the Cambridge drinking-water source area. Water samples also were collected at six secondary sampling stations, including Fresh Pond Reservoir, the final storage reservoir for the raw water supply. Storm runoff and base-flow concentrations of calcium (Ca), chloride (Cl), sodium (Na), and sulfate (SO₄) were estimated from continuous records of streamflow and specific conductance for six monitoring stations, which include the five primary sampling stations. These data were used to characterize current water-quality conditions, estimate loads and yields, and describe trends in Cl and Na in the tributaries and main-stem streams in the Hobbs Brook and Stony Brook Basins. These data also were used to describe how streamwater quality is affected by various watershed characteristics and provide information to guide future watershed management. Water samples were analyzed for physical properties and concentrations of Ca, Cl, Na, and SO₄, total nitrogen (TN), total phosphorus (TP), caffeine, and a suite of 59 polar pesticides. Values of physical properties and constituent concentrations varied widely, particularly in samples from tributaries. Median concentrations of Ca, Cl, Na, and SO₄ in samples collected in the Hobbs Brook Basin (39.8, 392, 207, and 21.7 milligrams per liter (mg/L), respectively) were higher than those for the Stony Brook Basin (17.8, 87.7, 49.7, and 14.7 mg/L, respectively). These differences in major ion concentrations are likely related to the low percentages of developed land and impervious area in the Stony Brook Basin. Concentrations of dissolved Cl and Na in samples, and those estimated from continuous records of specific conductance (particularly during base flow), often were greater than the U.S. Environmental Protection Agency (USEPA) secondary drinking-water guideline for Cl (250 mg/L), the chronic aquatic-life guideline for Cl (230 mg/L), and the Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs drinking-water guideline for Na (20 mg/L). Mean annual flow-weighted concentrations of Ca, Cl, and Na were generally positively correlated with the area of roadway land use in the subbasins. Correlations between mean annual concentrations of Ca and SO₄ in base flow and total roadway, total impervious, and commercial-industrial land uses were statistically significant.

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