

SHALLOW GROUNDWATER QUALITY IN THE VILLAGE OF PATCHOGUE, SUFFOLK COUNTY, NEW YORK

Irene J. Abbene
U.S.G.S
New York Water Science Center
2045 Route 112, Bldg 4
Coram, NY 11727

The U.S. Geological Survey (USGS), in cooperation with the Village of Patchogue and the New York Department of State, collected water quality samples from 10 shallow wells within the village to document the effects of onsite wastewater disposal on groundwater that discharges to the Patchogue River. The onsite disposal of wastewater within the Patchogue River basin—a riverine estuary that discharges into Great South Bay, Suffolk County, Long Island, N.Y. —has adversely affected water quality and aquatic habitats within both the tidal and non-tidal portions of the river. Of particular concern are increases in nutrient concentrations (nitrate, nitrite, ammonia, and phosphorus), which can lead to eutrophication in receiving waters. Among the undesirable effects of eutrophication are an increase in water turbidity, odors at low tide, algal blooms, and a decrease in dissolved oxygen concentration, which can result in fish and shellfish mortality. In response to increased development within the approximately 14 square-mile basin, the Village of Patchogue has begun to develop a Local Waterfront Revitalization Plan that will guide efforts to improve water quality of the Patchogue River and the adjacent Great South Bay estuary.

Groundwater samples were analyzed for physical properties, nutrients, organic carbon, major ions, trace elements, and stable isotope signatures of nitrogen ($\delta^{15}\text{N}$). Results were compared with data from previous studies completed in nearby areas to reveal possible trends in the concentrations of groundwater quality parameters. The chemical signature of effluent plumes from onsite wastewater-disposal systems in sandy glacial aquifers has been studied in detail and is typified by elevated concentrations of most major ions, by nitrate, and possibly phosphorous, depending on the age of the septic system. Total nitrogen, sulfate, and potassium concentrations from this study were similar to areas classified as medium to high density residential land-use areas in previously reported studies on Long Island. Measured calcium and chloride concentrations were higher in this study in comparison to nearby areas, which may be attributed to the Village of Patchogue's proximity to the saltwater body, the Great South Bay. The stable isotope signature of nitrogen ($\delta^{15}\text{N}$) in sampled groundwater can be used to distinguish potential sources of nitrate in the water-table aquifer. Previously reported nitrogen-isotope signature ranges for Long Island indicate septic waste has a typical $\delta^{15}\text{N}$ signature between 7 and 12 parts per thousand (‰) whereas nitrate from chemical fertilizer has a range between 1 and 7 ‰. Nitrate isotopes revealed that the groundwater in this study is influenced by several sources, i.e. fertilizer, septic waste, waterfowl, and pets.