

Library Reference 11.10.3**New York Water Science Center****Simulation of Flow and Water Quality by a Precipitation-Runoff Model of the Onondaga Lake Watershed, Onondaga County, New York****Cooperators -**

- Onondaga Lake Partnership, a collaborative of Federal, State, and local (Onondaga County and City of Syracuse) agencies

Problem - During 2003-07, a precipitation-runoff watershed model with water-quality components was developed to assess pollutant sources and loadings to Onondaga Lake, and to assist water-resources managers in making decisions regarding the selection and location of mitigative measures to maximize load reduction for a given effort. In the absence of chemical loading rates that were specific to the Onondaga Lake Basin, the model was calibrated to estimated loading rates that were derived from a review of scientific literature. During 2005-08, an intensive water-quality study of the basin was conducted to provide basin-specific data that, among other uses, could be incorporated into the watershed model and provide more accurate and realistic results than were possible with the original model.

Objectives - To use newly acquired streamflow and water-quality data to recalibrate the precipitation-runoff model of the Onondaga Lake Basin and to use the calibrated model to analyze the effects that proposed best-management practices (BMPs) in the basin are likely to have on loads of phosphorus and nitrogen entering the lake. Simulations of land-use changes, implementation of BMPs, flood-control strategies, and detention facilities will assist water-resources managers and planners to assess progress toward achieving water-quality targets for Onondaga Lake.

Benefits - Onondaga Lake has received national notoriety as one of the most polluted lakes in the United State. Many county, state, and federal agencies, and concerned environmental entities have official, mandated, or altruistic interests in the ecological well being of Onondaga Lake. The proposed watershed model would provide a tool that water-resources managers could use to identify general sources of constituent loads and enable informed and focused efforts to mitigate loads at their source. The information gained during this study will also meet several USGS goals, including

- advancing knowledge of regional hydrologic systems and processes;
- providing water-resource information that will be used by multiple parties to meet the intent of court decrees and congressionally mandated studies, and to assist these parties in the remediation of Onondaga Lake and its watershed, and in the development of future water-resource management plans; and
- contributing to the national data base that will be used to advance the understanding of regional and temporal variations in hydrologic systems.

Approach - The computer model, Hydrologic Simulation Program – FORTRAN (HSPF), was used

to simulate flows and chemical loads in the Onondaga Lake basin from October 1997 through September 2003. Hydrologic, water-quality, and meteorological data will be compiled to extend the model simulation period through September 2008. The hydrologic components of the model will be recalibrated to measured or estimated flows from 16 additional streamflow sites. The water-quality components of the model will be recalibrated to measured concentrations of suspended sediment and total phosphorus from 25 additional sites. Scenarios of land-use changes, BMPs, CSO control measures, and detention basins will be generated and the probable hydrologic and water-quality effects of these measures will be assessed.

Related Publications

- [Coon, W.F., and Reddy, J.E., 2008, Hydrologic and water-quality characterization and modeling of the Onondaga Lake basin, Onondaga County, New York: U.S. Geological Survey Scientific Investigations Report 2008–5013, 88 p.](#)
- [Coon, W.F., 2008, Simulation of streamflow and selected water-quality constituents through a model of the Onondaga Lake Basin, Onondaga County, New York—A guide to model application: U.S. Geological Survey Open-File Report 2008–1188, 27 p., online only.](#)
- Coon, W.F., Hayhurst, B.A., Kappel, W.M., Eckhardt, D.A.V., and Szabo, C.O., 2009, Water-quality characterization of surface water in the Onondaga Lake basin, Onondaga County, New York, 2005–08: U.S. Geological Survey Scientific Investigations Report 2009–5246, 68 p.
- [Kappel, W.M. and Yager, R.M., 2008, Ground-Water-Flow Modeling of a Freshwater and Brine-Filled Aquifer in the Onondaga Trough, Onondaga County, New York—A Summary of Findings: U.S. Geological Survey Open-File Report 2007-1409, 12 p.](#)

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