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Water Quality of the Flint River Basin, Alabama and Tennessee, 1999-2000

Water-Resources Investigations Report 01-4185
National Water-Quality Assessment Program

U.S. Department of the Interior
U.S. Geological Survey

Cover photos: Top photo is aerial view of the Flint River flood plain near Owens Crossroads, Alabama; photograph taken by Tennessee Valley Press, Inc., Decatur, Ala. Bottom photo is the Flint River at Highway 72, Alabama, courtesy of Susan Weber, Flint River Conservation Association.

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U.S. GEOLOGICAL SURVEY

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Information regarding the National Water-Quality Assessment (NAWQA) Program is available on the Internet via the World Wide Web. You may connect to the NAWQA home page at: http://water.usgs.gov/nawqa/nawqa_home.html

FOREWORD

The U.S. Geological Survey (USGS) is committed to serve the Nation with accurate and timely scientific information that helps enhance and protect the overall quality of life, and facilitates effective management of water, biological, energy, and mineral resources. Information on the quality of the Nation's water resources is of critical interest to the USGS because it is so integrally linked to the long-term availability of water that is clean and safe for drinking and recreation and that is suitable for industry, irrigation, and habitat for fish and wildlife. Escalating population growth and increasing demands for the multiple water uses make water availability, now measured in terms of quantity *and* quality, even more critical to the long-term sustainability of our communities and ecosystems.

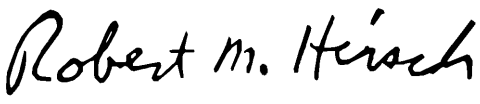
The USGS implemented the National Water-Quality Assessment (NAWQA) Program to support national, regional, and local information needs and decisions related to water-quality management and policy. Shaped by and coordinated with ongoing efforts of other Federal, State, and local agencies, the NAWQA Program is designed to answer: What is the condition of our Nation's streams and ground water? How are the conditions changing over time? How do natural features and human activities affect the quality of streams and ground water, and where are those effects most pronounced? By combining information on water chemistry, physical characteristics, stream habitat, and aquatic life, the NAWQA Program aims to provide science-based insights for current and emerging water issues and priorities. NAWQA results can contribute to informed decisions that result in practical and effective water-resource management and strategies that protect and restore water quality.

Since 1991, the NAWQA Program has implemented interdisciplinary assessments in more than 50 of the Nation's most important river basins and aquifers, referred to as Study Units. Collectively, these Study Units account for more than 60 percent of the overall water use and population served by public water supply, and are representative of the Nation's major hydrologic landscapes, priority ecological resources, and agricultural, urban, and natural sources of contamination.

Each assessment is guided by a nationally consistent study design and methods of sampling and analysis. The assessments thereby build local knowledge about water-quality issues and trends in a particular stream or aquifer while providing an understanding of how and why water quality varies regionally and nationally. The consistent, multi-scale approach helps to determine if certain types of water-quality issues are isolated or pervasive, and allows direct comparisons of how human activities and natural processes affect water quality and ecological health in the Nation's diverse geographic and environmental settings. Comprehensive assessments on pesticides, nutrients, volatile organic compounds, trace metals, and aquatic ecology are developed at the national scale through comparative analysis of the Study-Unit findings.

The USGS places high value on the communication and dissemination of credible, timely, and relevant science so that the most recent and available knowledge about water resources can be applied in management and policy decisions. We hope this NAWQA publication will provide you the needed insights and information to meet your needs, and thereby foster increased awareness and involvement in the protection and restoration of our Nation's waters.

The NAWQA Program recognizes that a national assessment by a single program cannot address all water-resource issues of interest. External coordination at all levels is critical for a fully integrated understanding of watersheds and for cost-effective management, regulation, and conservation of our Nation's water resources. The Program, therefore, depends extensively on the advice, cooperation, and information from other Federal, State, interstate, Tribal, and local agencies, non-government organizations, industry, academia, and other stakeholder groups. The assistance and suggestions of all are greatly appreciated.



Robert M. Hirsch
Associate Director for Water

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CONVERSION FACTORS, VERTICAL DATUM, AND ABBREVIATIONS

Multiply	By	To obtain
inch (in.)	2.54	centimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
cubic feet per second (ft^3/s)	0.02832	cubic meter per second
ton per year (ton/yr)	0.9072	metric ton per year
ton per square mile per year [$(ton/mi^2)/yr$]	0.003503	metric ton per hectare per year
pound per day (lb/day)	0.4536	kilogram per day
pound per square mile per year [$(lb/mi^2)/yr$]	0.001751	kilogram per hectare per year

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

ABBREVIATIONS AND ACRONYMS

NAWQA	National Water Quality Assessment
U.S. EPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

WATER-QUALITY ABBREVIATIONS

col./100 mL	Colonies per 100 milliliters
NTU	Nephelometric turbidity units
mg/L	Milligrams per liter

GLOSSARY

Aquatic-life criteria. The level of a pollutant or condition necessary to protect fish and other aquatic life in a stream or lake. Aquatic-life criteria for pesticides specify a maximum concentration that should not be exceeded at any time, or that should not be exceeded beyond specified exposure periods.

Detection frequency. Calculated, for a set of samples, as the proportion of samples in which the concentration of a constituent is greater than or equal to a specified level, such as the detection limit for the analytical method, or a selected threshold of concentration.

Eutrophication. The adverse effects of excess nutrient input to a stream, including overgrowth of plant life and decline of the biological community.

Export. Equivalent to instream load, and used in place of that term in comparisons with input to a watershed. Unit-area export is equivalent to yield.

Flow-weighted mean concentration. The ratio of instream load of a constituent to the mean discharge during the period of transport (dimensions of mass per volume); and equivalent computationally to the flow-weighted mean of the model estimates of daily concentration. Expressed in units of concentration (mg/L). This quantity is used, in place of load or yield, for evaluating average water-quality conditions at the site, and to compare water-quality among sites with differing discharge characteristics.

Input. The mass of a constituent entering a watershed either by deposition on the land surface (land-phase input) or by discharge directly to the stream channel (such as wastewater discharges). Only a portion of the land-phase input reaches the stream channel by overland or subsurface transport processes. Unit-area input is the ratio of input to area of the watershed (dimensions of mass per time per area).

Instream load. The mass of a constituent moving past a specified point in a channel (for example, the mouth of a river basin) during a specified period of time. The instream load can be estimated by monitoring the concentration of the constituent periodically, and streamflow continuously, at the specified point.

Synergistic. Having a combined effect greater than the sum of individual effects.

Yield. The ratio of instream load of a constituent to the area of the watershed (dimensions of mass per time per area). This area-normalized load is used, in place of load, to compare instream loads among watersheds with differing drainage areas, and to compare with inputs to the watershed.