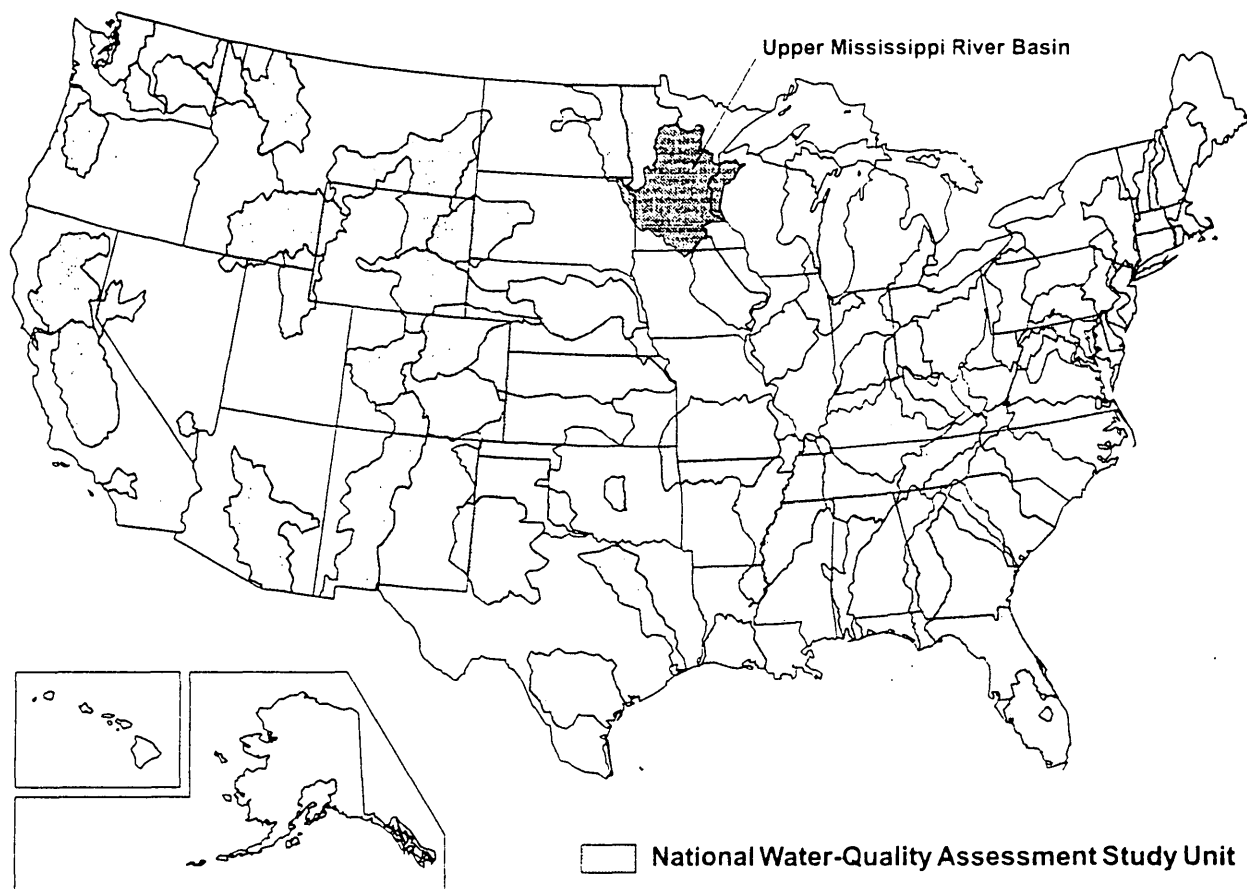


# Water-Quality Assessment of Part of the Upper Mississippi River Basin, Minnesota and Wisconsin— Compilation of Related Literature

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U.S. Geological Survey Open-File Report 96-579



Contribution from the National Water-Quality  
Assessment Program



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**By J.R. Stark, and G.L. Amos**

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**Contribution from the National Water-Quality  
Assessment Program**



**Mounds View, Minnesota  
1996**

**U.S. DEPARTMENT OF THE INTERIOR**

**BRUCE BABBITT, Secretary**

**U.S. GEOLOGICAL SURVEY**

**Gordon P. Eaton, Director**

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## Foreword

The mission of the U.S. Geological Survey (USGS) is to assess the quantity and quality of the earth resources of the Nation and to provide information that will assist resource managers and policy makers at Federal, State, and local levels in making sound decisions. Assessment of water-quality conditions and trends is an important part of this overall mission.

One of the greatest challenges faced by water-resources scientists is acquiring reliable information that will guide the use and protection of the Nation's water resources. That challenge is being addressed by Federal, State, interstate, and local water-resource agencies and by many academic institutions. These organizations are collecting water-quality data for a host of purposes that include: compliance with permits and water-supply standards; development of remediation plans for a specific contamination problem; operational decisions on industrial, wastewater, or water-supply facilities; and research on factors that affect water quality. An additional need for water-quality information is to provide a basis on which regional and national-level policy decisions can be based. Wise decisions must be based on sound information. As a society we need to know whether certain types of water-quality problems are isolated or ubiquitous, whether there are significant differences in conditions among regions, whether the conditions are changing over time, and why these conditions change from place to place and over time. The information can be used to help determine the efficacy of existing water-quality policies and to help analysts determine the need for and likely consequences of new policies.

To address these needs, the Congress appropriated funds in 1986 for the USGS to begin a pilot program in seven project areas to develop and refine the National Water-Quality Assessment (NAWQA) Program. In 1991, the USGS began full implementation of the program. The NAWQA Program builds upon an existing base of water-quality studies of the USGS, as well as those of other Federal, State, and local agencies. The objectives of the NAWQA Program are to:

- Describe current water-quality conditions for a large part of the Nation's freshwater streams, rivers, and aquifers.
- Describe how water quality is changing over time.
- Improve understanding of the primary natural and human factors that affect water-quality conditions.

This information will help support the development and evaluation of management, regulatory, and monitoring decisions by other Federal, State, and local agencies to protect, use, and enhance water resources.

The goals of the NAWQA Program are being achieved through ongoing and proposed investigations of 60 of the Nation's most important river basins and aquifer systems, which are referred to as study units. These study units are distributed throughout the Nation and cover a diversity of hydrogeologic settings. More than two-thirds of the Nation's freshwater use occurs within the 60 study units and more than two-thirds of the people served by public water-supply systems live within their boundaries.

National synthesis of data analysis, based on aggregation of comparable information obtained from the study units, is a major component of the program. This effort focuses on selected water-quality topics using nationally consistent information. Comparative studies will explain differences and similarities in observed water-quality conditions among study areas and will identify changes and trends and their causes. The first topics addressed by the national synthesis are pesticides, nutrients, volatile organic compounds, and aquatic biology. Discussions on these and other water-quality topics will be published in periodic summaries of the quality of the Nation's ground and surface water as the information becomes available.

This report is an element of the comprehensive body of information developed as part of the NAWQA Program. The program depends heavily on the advice, cooperation, and information from many Federal, State, interstate, Tribal, and local agencies and the public. The assistance and suggestions of all are greatly appreciated.

Robert M. Hirsch  
Chief Hydrologist

## Contents

Abstract.....	1
Introduction.....	1
Alphabetical listing by author.....	4
General hydrology .....	144
Geology and ground water .....	153
Surface water and water quality .....	206
Biology .....	248
Miscellaneous .....	266

## Illustrations

Figure 1. Location of the Upper Mississippi River Basin NAWQA study unit, focused study area, hydrography, selected towns, and major cities .....	3
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# **Water-Quality Assessment of Part of the Upper Mississippi River Basin, Minnesota and Wisconsin— Compilation of Related Literature**

**By James R. Stark, and Ginger L. Amos**

## **Abstract**

The U.S. Geological Survey began full-scale implementation of the National Water-Quality Assessment (NAWQA) Program in 1991. The purposes of NAWQA are to describe the status and trends in the quality of the Nation's water resources and aquatic ecosystems, and to determine factors affecting water quality at local, regional, and national scales. The Upper Mississippi River (UMIS) NAWQA study unit, which includes all of the surface drainage to the Mississippi River Basin upstream from Lake Pepin, encompasses 47,000 mi<sup>2</sup>. The study characterizes the geographic and seasonal distribution of water quality and aquatic biota in relation to anthropogenic activities and natural features. The initial phase of the UMIS study, during 1994-99, is focused on an area in Minnesota and Wisconsin that includes the seven-county Twin Cities (Minneapolis and St. Paul) metropolitan area. This report is a compilation of selected sources of information that are being used to aid in understanding water-quality issues and processes that form the basis of the sampling design for the study. This literature review includes sources of information about geology, surface- and ground-water hydrology, water quality, and aquatic biology and ecology.

## **Introduction**

The U.S. Geological Survey (USGS) began full scale implementation of the National Water Quality Assessment (NAWQA) Program in 1991. The purposes of the NAWQA Program are to describe the status and trends in the quality of the Nation's water resources and aquatic ecosystems, and to determine factors affecting water quality. Study-unit investigations are significant components of the program. Study units are made up of hydrologic systems that include parts of most major river basins and aquifer systems in the United States.

The Upper Mississippi River (UMIS) NAWQA study unit includes all of the surface drainage to the Mississippi River Basin upstream from Lake Pepin and encompasses 47,000 mi<sup>2</sup> (fig. 1). The Upper Mississippi River Basin was selected as a study unit because water quality of the Mississippi River, the largest river in the Nation, is of national concern.

The purposes of the UMIS NAWQA study are to describe the status and trends in quality of water resources and to provide an understanding of factors affecting water-quality and ecosystem status within the study unit. During the initial phase of the study (1994-99), emphasis is focused on a 19,500 mi<sup>2</sup> area in Minnesota and Wisconsin that includes the seven-county Twin Cities (Minneapolis and St. Paul) metropolitan area. The study area includes the UMIS drainage from Lake Pepin upstream to include all of the St. Croix River Basin and to points on the Minnesota (Jordan, Minnesota) and Mississippi (Royalton, Minnesota) Rivers where long-term water-quality data are available (fig. 1). During the initial phase of the study, the focus is on the most prominent water-quality and ecosystem issues, principally the effects of the Twin Cities metropolitan area on water quality and aquatic ecosystems. The study characterizes the geographic and seasonal variations of water quality, aquatic biota, and aquatic-habitat conditions in relation to anthropogenic activities and natural features. Pesticides, nutrients, volatile-organic chemicals, and biological conditions are of specific interest to NAWQA from a national perspective.

This report is a compilation of selected published information on the geology, surface- and ground-water hydrology, water quality, and aquatic biology and ecology of the UMIS study unit. Water quality in the study unit is affected by natural and anthropogenic factors. Natural factors include climate, physiography, geology, soils, topography, vegetation and aquatic biology. Anthropogenic factors include hydrologic modification, point- and nonpoint-source contaminant discharges, and changes to land use and to land cover.

Water-quality issues of local importance, and important to the program at a national level, have been defined by the study's liaison committee composed of representatives from Federal, state, and local agencies, private industry, and by NAWQA Program leadership. These issues have guided the literature review. Important sources of information include the Metropolitan Council Environmental Services, Minnesota Department of Agriculture, Minnesota Department of Health, Minnesota Department of Natural Resources, Minnesota Geological Survey, Minnesota Pollution Control Agency, University of Minnesota, U.S. Geological Survey, Wisconsin Department of Natural Resources, and Wisconsin Geological Survey. The list of publications completed for this effort consists of approximately 2,000 citations. Literature data bases searched include Aquatic Sciences and Fisheries Abstracts, Biosis, Compendex Plus, Dissertation Abstracts, Enviroline, Georef, Pollution Abstracts, and Water Resources Abstracts. The list of citations is available at the UMIS Home Page on the World Wide Web at: "<http://www.mn.cr.usgs.gov/umis/index.html>".

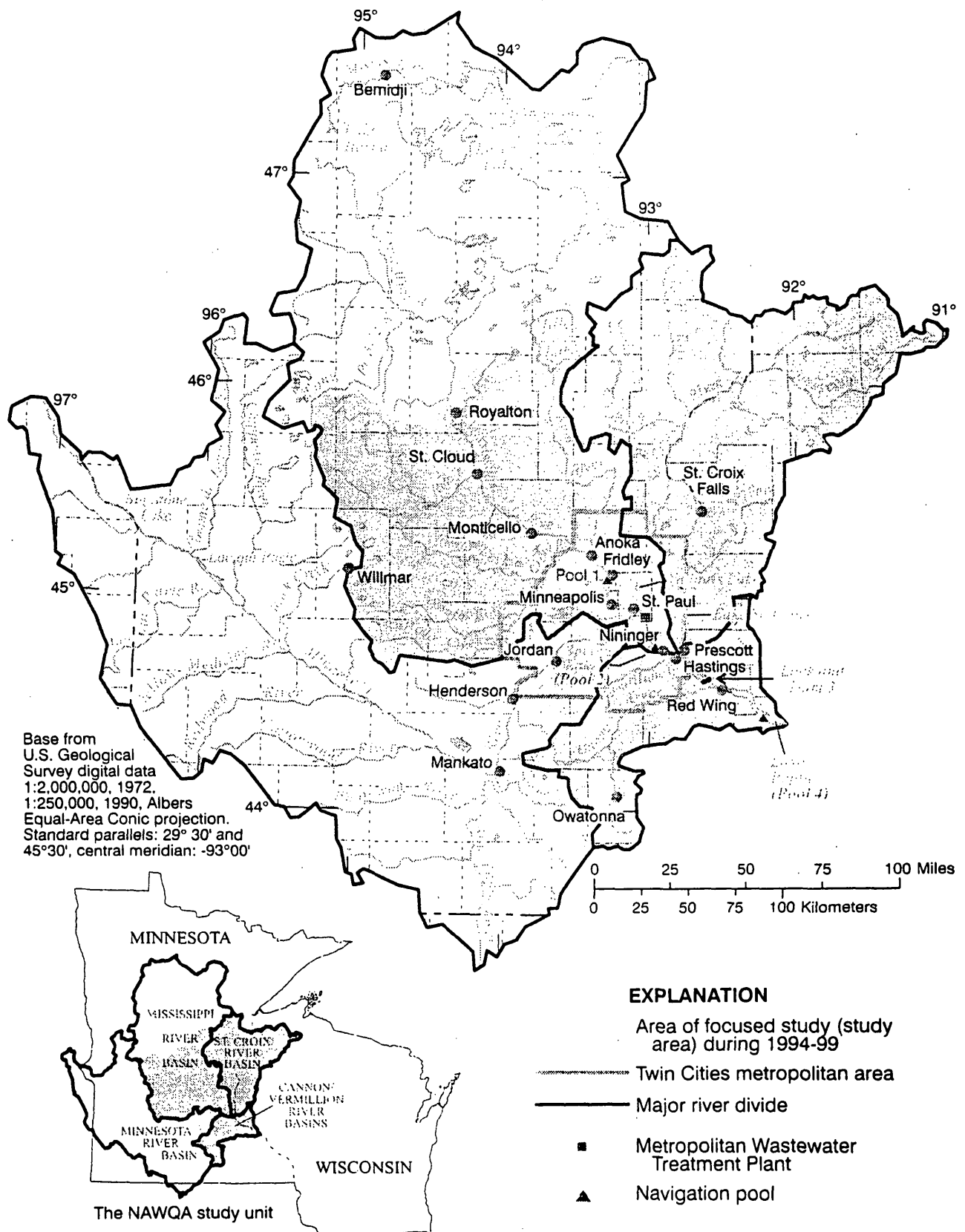


Figure 1.--Location of the Upper Mississippi River Basin NAWQA study unit, focused study area, hydrography, selected towns, and major cities.

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