



## HOW CLEAN IS THE MISSISSIPPI RIVER?

The Upper Mississippi River, which extends from Lake Itasca in northern Minnesota to the Ohio River confluence on Illinois' southern border, is a nationally recognized river. It drains the agricultural heartland of the country and serves the needs of a number of metropolitan areas along its banks. As a border along five states—Minnesota, Wisconsin, Illinois, Iowa, and Missouri—the river is governed by a variety of standards and regulations. The quality of the river's waters is of concern to those who live along its shores, those who rely on it for drinking water and economic production, and those who live downstream.

## WHAT IS WATER QUALITY?

Water quality is a measure of the physical, chemical, and biological characteristics of water. Physical characteristics of water include water temperature, color, and clarity. Water temperature is one of the more important physical characteristics of water since water has different properties at different temperatures. For instance, higher levels of oxygen can be dissolved in cold water than in warm water. Water clarity can be affected by high levels of sediment in the water. The chemical elements and compounds that are dissolved or suspended in the water can determine the water's color and taste, the types of aquatic life that can be supported, or the toxicity of the water. Chemical components of water include naturally occurring elements like iron, mercury, and phosphorus and man-made substances like pesticides and cleaners. The biological characteristics of water such as bacteria and algae can affect the safety of the water for human use or its aesthetic appeal. The combination of all these factors make up the water quality of a water body.

## HOW IS WATER QUALITY EVALUATED?

Water quality evaluation is difficult since individual perceptions of "clean" and "polluted" vary. To eliminate some of this subjectivity, states set standards for each different use of a water body. For example, there is one set of water quality standards for recreation, another set of standards to protect a drinking water supply, and another set of standards for protection of aquatic life. These standards are used as a basis for evaluating water quality and implementing protection programs. The standards vary in strictness, since some uses require higher quality water than other uses.

The standards applicable to the Mississippi River vary because each state bordering the river may designate different uses for the river. The only use that all five states designate for the river is support of aquatic life. Since the standards applicable to the river vary by state, the water quality of the same stretch of the Mississippi River may be described differently by the two bordering states.

All five states have standards for conventional water quality parameters such as water temperature, pH, and dissolved oxygen and for metals such as cadmium and lead. The states of Missouri and Wisconsin also have standards for organic substances, such as pesticides and synthetic cleaners.

Water quality also can be determined through indirect measures. For example, fish in sections of the Mississippi River contain elevated levels of organic compounds such as PCBs or the pesticide chlordane. These compounds are derived directly or indirectly from the water and/or the sediment in the water. Thus, the study of fish tissues or the presence of state advisories on fish consumption can provide clues to the quality of the water. In addition, looking at the quality of sediments on the river's bottom can tell us something about the water's quality. Contaminants in the water column can be removed by attachment to sediment particles. Conversely, disturbance of contaminated sediment can cause a release of contaminants from the sediment into the water column. The quality of one part of the river resource can provide information on the quality of the rest of the resource.



## WHAT IS THE QUALITY OF THE RIVER?

While the Mississippi River is not a pristine river, the good news is that the water quality has improved or at least stayed the same over the last ten to fifteen years. There is no evidence that water quality in general has degraded.

Despite the fact that there has been an overall improvement in many of the indicators of water quality, a number of specific problems remain on the Upper Mississippi River. It is difficult to make generalized statements about these water quality problems because certain types of data are only available for specific stretches of the river. However, by combining various pieces of information on water quality, the fishery resource, and sediment quality, it is possible to form a composite picture of the water quality of the river.

Approximately 583 miles (69 percent) of the river have water quality problems based on a combination of exceedances of standards, fish consumption advisories, the presence of contaminated sediment, and the states' judgment of whether the river supports fishing and swimming uses. The majority of the problems are concentrated near the major metropolitan areas of Minneapolis-St. Paul and St. Louis and near the confluences of the Minnesota, Illinois, and Missouri Rivers. The longest river section with no observed water quality problems is the 118 mile stretch from Davenport, Iowa to Keokuk, Iowa. The map on page 4 illustrates the water quality problems.



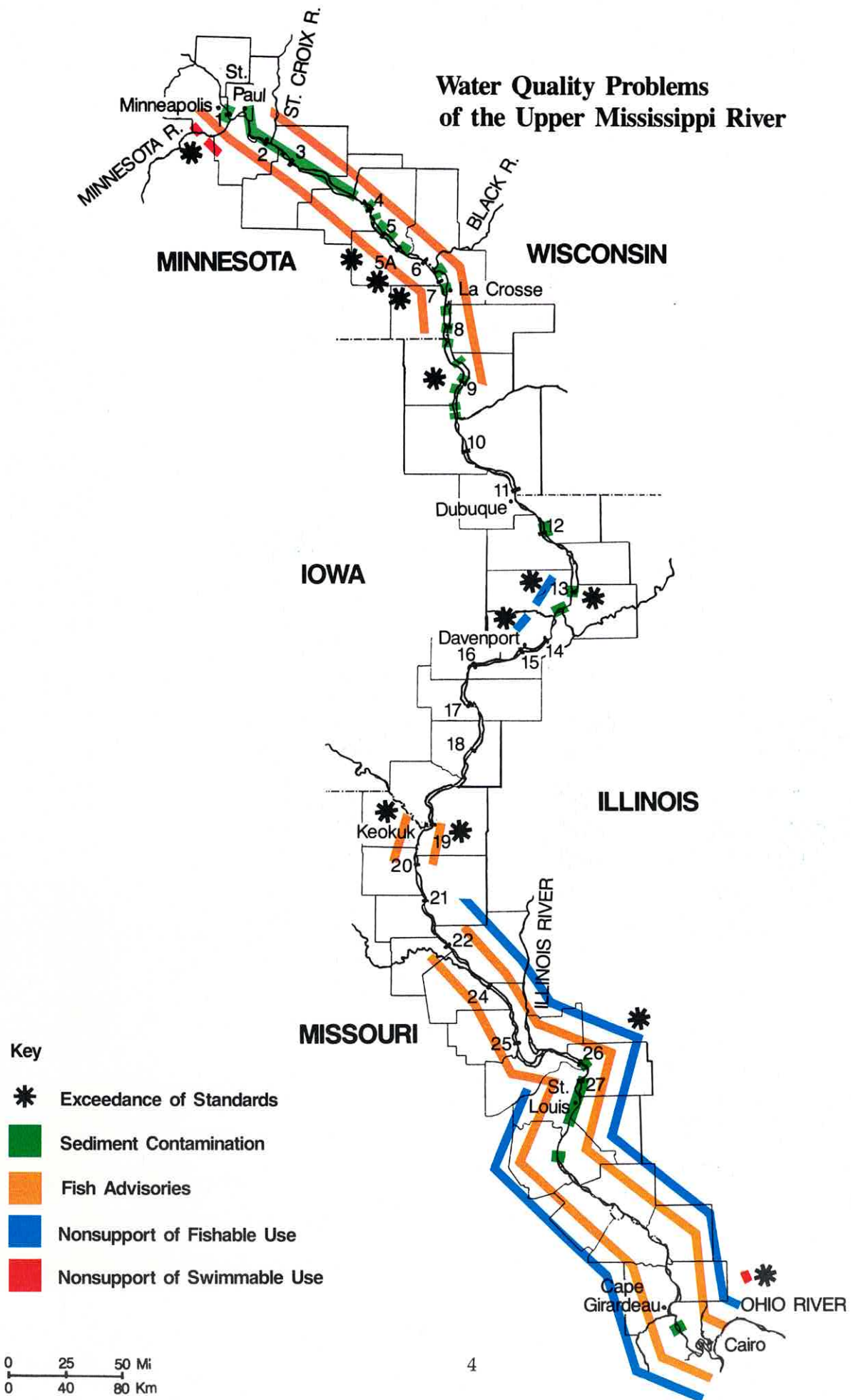


The following types of water quality problems occur in the Upper Mississippi River:

- Three of the five states bordering the Upper Mississippi River (Minnesota, Illinois, Iowa) use exceedances of water quality standards to evaluate the water quality of the river at ten designated monitoring stations on the river. Water samples are systematically collected and examined at these stations. The water quality standards which have been exceeded are discussed below.
  - High fecal coliform bacteria levels continue to be a problem at all ten stations on the river. Fecal coliform bacteria inhabit the intestines of warm-blooded animals. The occurrence of these bacteria in water is a sign that disease-producing bacteria or microorganisms may also be present in the water, and that a significant amount of human or animal wastes may be entering the river.
  - Low dissolved oxygen levels occur from 1 to 5 percent of the time at monitoring stations in the Illinois and Iowa portion of the river. Dissolved oxygen is necessary to support aquatic life.
  - pH values that exceed the pH standard occur periodically at the Minnesota and Iowa river stations. pH levels that are below or above the acceptable range can alter the form of inorganic chemicals making them toxic to aquatic life.
  - High levels of metals such as cadmium, copper, or mercury are sometimes found at various monitoring stations along the river. In high enough concentrations the metals can be toxic to aquatic life.
- The most pervasive water quality problem on the river is the degradation of the fishery resource as evidenced by the 519 miles (61 percent) of the river with fish consumption advisories. The fish advisories for the Minnesota-Wisconsin stretch of the river are due to the PCBs in fish tissue. The fish advisories for the Illinois-Missouri stretch of the river are due to high levels of the pesticides chlordane and/or dieldrin in fish tissue and fish eggs. Consumption advisories have been issued for fish in the river from Minneapolis to approximately Lynxville, Wisconsin; from Keokuk, Iowa to Lock and Dam 21; and from Lock and Dam 22 south of Hannibal, Missouri to the confluence of the Ohio River. (See map.)
- Of the 850 miles of the Upper Mississippi River, 63 percent have not been examined for sediment quality. As a result, little is known of the sediment quality downstream of Clinton, Iowa. However, of the 316 miles for which evaluations have been done, 47 percent (17 percent of all river miles) have contaminated sediment due to high levels of ammonia, metals, nutrients, and PCBs. The metals and ammonia can be toxic to aquatic life and can be released into the water if the sediment is disturbed. The nutrients include nitrogen and phosphorus which can contribute to excessive weed growth and algae problems. Sediment may be the source of the PCBs that have bioaccumulated in aquatic life causing Minnesota and Wisconsin to issue fish consumption advisories. Areas with known sediment contamination primarily are in the Minnesota-Wisconsin stretch of the river and around St. Louis, Missouri.
- The fishable and swimmable uses of the river are not considered to be supported by adequate water quality in 40 percent and 3 percent of the river respectively. The 40 percent of the river that is not considered to support fishing is near Clinton and Davenport, Iowa and downstream of Lock and Dam 21 near Hannibal, Missouri. The 3 percent of the river that is not considered to support swimming is in the St. Paul metro area and at Thebes, Illinois.
- The uses which the states designate for the Mississippi River are overall only partially supported. This means that uses such as recreation or protection of aquatic life are impaired due to various water quality problems. Since 61 percent of the river has fish advisories the aquatic life use is definitely impaired in these river sections. River stretches that have high levels of fecal coliform bacteria have an impaired recreational use.

One of the major difficulties in describing the water quality of the river is the differences among the bordering states in their approaches to evaluating and protecting water quality. Each state independently sets standards, issues fish advisories, and determines whether the fishable and swimmable uses are supported. Therefore, two states sharing the same stretch of river may describe the quality of the river differently. The map on page 4 graphically illustrates this situation. For example, the map shows that Wisconsin has issued fish consumption advisories for the river upstream of Lock and Dam 9 near Lynxville, but Iowa has no advisories for this same stretch of river.

# Water Quality Problems of the Upper Mississippi River





## WHAT ARE THE MAJOR SOURCES OF POLLUTANTS TO THE MISSISSIPPI RIVER?

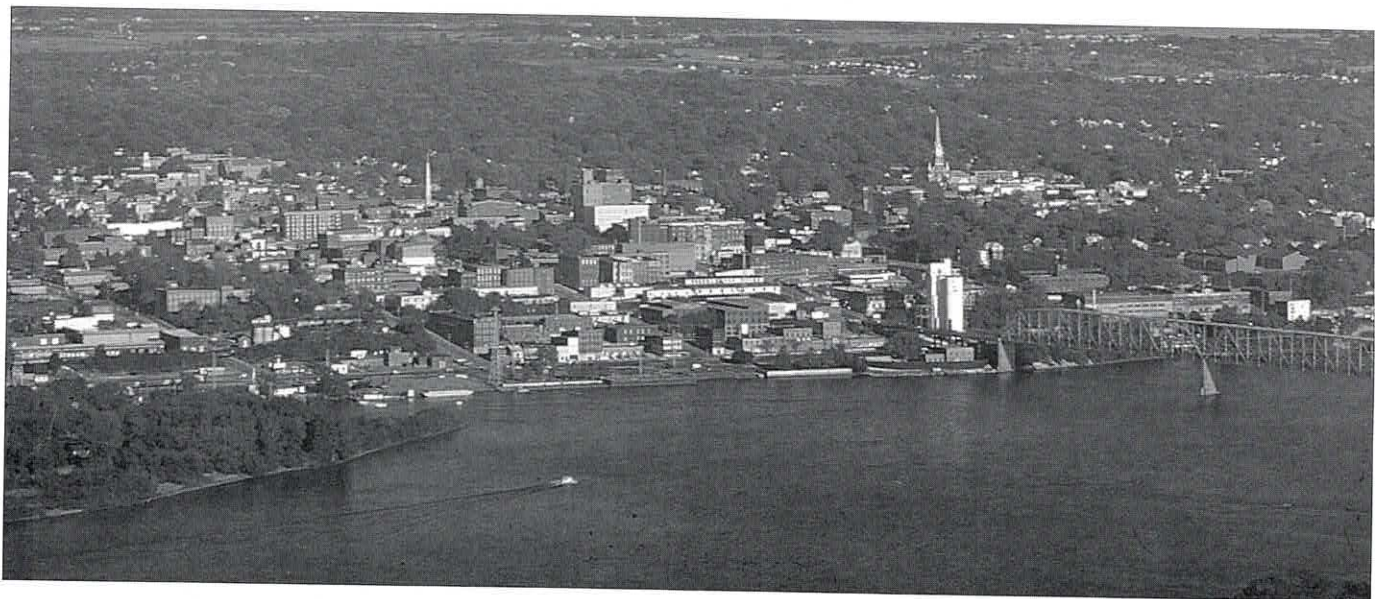
Nonpoint pollution is considered to be the major source of water quality problems on the river. Nonpoint sources include such things as agricultural runoff, urban runoff, and deposition from the atmosphere. All five states which border the river have identified runoff from agricultural lands as a major source of nonpoint pollution to the river. Soil contaminated with fertilizers and pesticides can be washed into the Mississippi River or the many streams and tributaries which flow into the river. In addition, oil, grease, and other contaminants can enter the river in storm runoff from urban areas. Deposition from the atmosphere has been shown to be a source of metals such as lead and organic substances such as dioxin.

Nonpoint sources of pollution are particularly difficult to control because there is no single location where pollutants are entering the river. Decreasing runoff from agricultural lands for instance requires changing agricultural practices in widespread areas, employing measures such as diversion channels or detention basins, or removing lands from production. The vast land areas requiring treatment make such efforts extremely difficult and costly.

In contrast, point sources of pollution are easier to identify and control. Point sources include industrial

discharges, wastewater treatment plant discharges, and the overflow from combined storm/sanitary sewer systems. These combined sewer systems sometimes discharge untreated human wastes to the river during rainstorms when the combination of wastewater and stormwater exceeds the wastewater treatment plant capacity. Point sources are generally regulated by a system of permits that stipulate the concentration of pollutants which are allowed in the discharge.

Contaminants in the river may be from a combination of past and present sources. For example, the state of Minnesota and Wisconsin can find no one main source of the PCBs in fish and sediment. It is possible that PCBs are simply ubiquitous in our environment due to the past uses of these substances or that the states are not yet looking in the right places for their sources. The high levels of toxic metals found in some river sediments may be due to past discharges of pollutants when standards, and thus discharge restrictions, were not as strict. Even with today's stricter standards though, minute concentrations of contaminants which are within the standards for water quality, may accumulate over time and concentrate in the sediment to levels that may adversely affect aquatic life. Municipal and industrial sources may also discharge contaminants that are not regulated by discharge permits.





## WHAT PROGRESS HAS BEEN MADE?

The water quality of the Mississippi River has improved or at least stayed the same over the last ten to fifteen years thanks to concerted efforts by public agencies and the private sector to reduce pollution of the river.

While some of the water quality problems that occurred in the 1970's still occur in the 1980's, action has been taken to reduce the pollutant sources to the river. Multi-million dollar projects have been undertaken in Minneapolis-St. Paul and St. Louis to upgrade the wastewater treatment and collection facilities. These efforts will eliminate combined sewer overflow which has historically been a problem in these two metro areas. In addition, the states have adopted stricter and more comprehensive water quality standards to more adequately protect the river and other waters in the state. Wisconsin and Missouri have recently set new standards and both Illinois and Minnesota are currently in the process of revising their standards.

Although better treatment facilities and stricter standards can significantly improve water quality, it has long been recognized that nonpoint sources of pollution such as agricultural runoff, are the major cause of many of the river's problems. Various federal and state erosion control programs which may originally have been intended to protect productive croplands, also have a positive effect on water quality by reducing the amount of sediment entering the river. It is estimated that one of the major federal programs called the Conservation Reserve Program, will alone reduce erosion by 26 million tons per year thereby reducing sediment loads to the Mississippi River.

The river is on the rebound. But it will take a continuing commitment and increased cooperation among the states, the private sector, and citizens along the river to insure that the progress continues.

## WHO CAN YOU CALL FOR MORE INFORMATION?

Each of the five states bordering the river has an environmental management agency which deals with water quality issues. Agency staff can provide information on the river segment bordering their state. Following are the five agencies that can be contacted for more information.

**Illinois Environmental Protection Agency**  
2200 Churchill Road  
Springfield, Illinois 62706  
(217) 782-3362

**Iowa Department of Natural Resources**  
Wallace State Office Building  
Des Moines, Iowa 50319  
(515) 281-7706

**Minnesota Pollution Control Agency**  
520 Lafayette Road North  
St. Paul, Minnesota 55155  
(612) 296-7250

**Missouri Department of Natural Resources**  
P.O. Box 176  
Jefferson City, Missouri 65102  
(314) 751-7143

**Wisconsin Department of Natural Resources**  
3550 Mormon Coulee Road, Room 104  
La Crosse, Wisconsin 54601  
(608) 785-9004

The information in this brochure was derived from a June 1989 report by the Upper Mississippi River Basin Association entitled "How Clean is the River?". The report contains a detailed examination of the water quality of the Upper Mississippi River based on exceedances of standards, support of uses, quality of the fishery resource, sediment quality, and water quality trend analysis. Copies of the report are available from the Association office at 415 Hamm Building, 408 St. Peter Street, St. Paul, Minnesota 55102 (612) 224-2880.