This publication was prepared by the Minnesota River Data Review Team. Additional review was provided by the Minnesota Department of Health.

The data review team is coordinated by the Minnesota River Basin Joint Powers Board. Members include:

- Minnesota Department of Health
- Minnesota Pollution Control Agency
- Minnesota Department of Agriculture
- Minnesota Department of Natural Resources
- Minnesota Board of Water and Soil Resources
- University of Minnesota
- Natural Resources Conservation Service
- Minnesota River Citizens Advisory Committee
- Coalition for a Clean Minnesota River
- Mankato State University
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- U.S. Army Corps of Engineers
- Metropolitan Council.

Sponsored by

Minnesota Pollution Control Agency

Minnesota River Basin Joint Powers Board

November 1998
The Minnesota River flows 335 miles through some of the state’s richest agricultural land from its source in Big Stone Lake on the Minnesota/South Dakota border to its confluence with the Mississippi at Fort Snelling. The river’s basin drains 16,700 square miles, including all or parts of 37 counties, with a population of about 700,000. The Minnesota River is the state’s largest tributary to the Mississippi.
and the septage applied to land in a manner that minimizes the potential for surface runoff.

Feedlot location and land application of manure are of particular concern to livestock operators. If a feedlot is located close enough to a stream or drainage ditch to pose a pollution threat, a manure storage system such as an earthen storage basin or pit must be installed. Manure should be applied in such a manner as to prevent runoff (or discharge) to any water body. Both applying manure far enough away from surface water and incorporating it into the soil reduce the potential for surface-water contamination. In addition, properly utilizing manure as a crop nutrient reduces the potential for water pollution.

For more information

For more information on bacteria in the Minnesota River, please contact your local county environmental services office, University of Minnesota Extension Office, the Minnesota Pollution Control Agency (651/296-6300 or 800/657-3864), or the Minnesota River Basin Joint Powers Board (651/361-6590).

References

Septic System Owners Guide
Guidelines for Land Application of Manure for Water Quality Protection
Running Your Feedlot
Minnesota River Basin Water Quality Overview
Cryptosporidium
BEACH Program
Bacterial Contamination in Lakes, Rivers and Streams

To order call:
University of Minnesota Extension Service,
(612) 624-4900 or (800) 876-8636
Minnesota Pollution Control Agency,
(651) 296-6300 or (800) 657-3864
Minnesota Pollution Control Agency,
(651) 296-6300 or (800) 657-3864
University of Minnesota Extension Service,
(612) 624-4900 or (800) 876-8636
Minnesota Department of Health,
(651) 215-0700
Environmental Protection Agency,
(312) 353-6704
Minnesota Department of Health,
(651) 215-0700

Check the MPCA’s site on the worldwide web, at www.pca.state.mn.us.
The water resources of the Minnesota River basin offer tremendous potential for fishing, swimming, drinking, and wildlife habitat. Unfortunately, as a result of many types of pollution, the draining of most wetlands, and the impacts of our uses of urban and agricultural land, much of that potential remains unfulfilled. In addition, pollution from the Minnesota degrades the potential uses of the Mississippi River to Lake Pepin and beyond, potentially as far as the Gulf of Mexico.

The basin’s water resources encompass rivers and smaller streams and lakes, and ground-water aquifers. Its streams range from rippling trout streams to turbid tributaries and a muddy main-stem river that contributes most of the annual suspended sediment load in the Mississippi River upstream of Lake Pepin. Lakes tend to be deep and relatively clear in the wooded northern parts of the basin, and shallow or even marsh-like and clouded in the intensively farmed southern region.

One of the most serious pollutants affecting these waters is bacteria. This booklet focuses on the problem of bacterial contamination of rivers and streams in the Minnesota basin — its extent, how it’s measured, where it comes from, what it means, and how to reduce it. Although significant progress has been made in reducing many of the sources of bacterial contamination, water-quality monitoring indicates the problem remains widespread throughout the basin. This situation raises public concern over the safety of recreational activities in bacteria-contaminated streams and rivers.

Reasons for concern

Bacteria come from a variety of sources, including agricultural runoff, inadequately treated domestic sewage, even wildlife. Some of these bacteria may cause disease. Other potentially disease-causing agents from these sources include viruses, protozoa, and worms. But it’s bacteria which cause the most problems; of greatest concern are bacteria from human fecal material.

Available monitoring tools make it difficult to determine whether bacterial contamination in a water body is from human or animal sources. It is, however, possible to determine whether the bacteria originated in the intestinal tract of a mammal. This kind of bacteria is called fecal coliform. If fecal coliform bacteria

Bacteria can get into the river from runoff entering ditches and tributaries

Wildlife also may contribute bacteria to the Minnesota River and its tributaries. However, in most locations the contribution from wildlife is relatively minor.

How can we keep bacteria out of the river?

There are a number of safeguards and management practices we can use to keep human and animal waste, and therefore bacteria, out of the river. Some are mandated by law, others are required in permits, still others are voluntary. Following are some of the regulations and voluntary practices used to meet the fecal coliform standards. Space limitations preclude a listing of all the regulations or best management practices for wastewater treatment plants, septic systems, or feedlots. For this information, please refer to the publications listed at the end of this document.

Wastewater treatment plants, feedlots, and septic systems have different requirements which are designed to minimize the environmental effects of the wastes they discharge.

Wastewater treatment facility permits (renewed every five years) specify effluent limitations for a wide range of pollutants. Permits for mechanical plants require disinfection of waste. Monthly reporting of monitoring data ensures that any exceedences of fecal coliform effluent limits are identified and appropriate enforcement action taken if necessary.

State rules also apply to the design and function of septic systems. One of the most important is the requirement for soil treatment, typically a mound or drainfield. A septic tank should be checked at least every 3 years. If full, it must be pumped,
levels exceed state water-quality standards, it’s an indication that too much fecal matter is entering the stream. This indicates a potential threat to public health.

There are many types of fecal coliform bacteria, and not all of them cause disease in humans. But where there are coliform bacteria there may be other pathogens (disease-causing organisms) of concern. Thus, widespread violation of the fecal coliform standard in the Minnesota River basin indicates serious pollution and a possible health concern, but it doesn’t necessarily mean there is an immediate health threat in any particular area.

Fecal coliform bacteria are one of many types of organisms which may cause disease. To test for all of these possible organisms in a body of water would be impractical and expensive. It would be like asking the doctor to test you for every possible disease before you even knew if you were sick. A sensible doctor would first take the patient’s temperature, blood pressure, and other vitals. These simple tests serve to indicate if disease is present and additional tests are needed. Similarly, a positive fecal coliform test indicates that a variety of potentially harmful contaminants — not just fecal coliform — may be finding their way into a water body.

Streams and rivers of the Minnesota River basin are routinely monitored for fecal coliform. According to data from the last 10 years of monitoring, high fecal coliform levels are the most common reason for water-quality violations in the Minnesota River. In fact, during the decade 1987-1996, 20 of 35 water quality violations in tributaries and the main channel were caused by exceedences of the fecal coliform standard.

The standard

Water-quality standards for fecal coliform vary depending on the intended use of a particular water body.

Drinking-water supplies

Since fecal coliform can be an acute health risk to humans, the U.S. Environmental Protection Agency has established an enforceable requirement that samples from public drinking-water supplies contain no fecal coliform. All public water utilities are subject to this zero-tolerance standard.

Fecal coliform bacteria may be a problem in private water supplies too, especially in uncased shallow wells. Private well owners should periodically test their wells for coliform bacteria. If present, the wells should be disinfected.
**Surface water**

The state of Minnesota has established water-quality standards (based on federal criteria) which are designed to protect the state’s water resources for their officially designated uses, such as drinking, recreation or aquatic life support. The water-quality standard for fecal coliform is intended to protect surface-water quality for recreational purposes. Similar guidelines are used by the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers to help evaluate the safety of beaches for swimming (Minnesota and 10 other states are members of this group). Thus, surface waters which meet the standard are deemed to be safe for body-contact recreation. Those which fail to meet the standard may pose a health risk; however, additional tests will be needed to determine the source of contamination and whether pathogens are present among the fecal coliform bacteria.

**Bacteria trends in the Minnesota River**

In 1975, the MPCA prepared a detailed assessment of water-quality conditions in the Minnesota River basin. Most monitoring stations reported violations of the fecal coliform standard in at least 25 percent of samples; many reported violations of 50 percent or more; and several, such as the Maple and Le Sueur rivers, reported violations in 100 percent of the samples taken. Much of the river and its tributaries thus were unsafe for body-contact recreation. Sources of fecal coliform pollution were identified as: 1) communities supplying inadequate disinfection of treated wastewater; 2) animal feedlots and pastured animals; and 3) failing septic systems. The Minnesota River Assessment Project, from 1989-1994, showed continuing frequent violation of the fecal coliform standard under all flow conditions.

Since the early 1970s, most municipal sources have dramatically reduced fecal coliform in their wastewater effluent. More feedlots are obtaining permits, which should lead to improved water quality. And we now have a statewide system in place for licensing of septic-system contractors (installers, designers, pumpers and inspectors) and for providing county oversight, which is expected to greatly reduce this source of pollution in the future. Despite these types of improvements, recent monitoring data show that many portions of the Minnesota River and its tributaries still exceed the fecal coliform standard.

Most municipalities rely on wastewater treatment plants to remove pollutants from their wastewater. The two main types of treatment systems used are waste stabilization ponds and mechanical plants. In a pond system, the water is held for at least 180 days, during which it undergoes treatment by natural processes. This long detention time ensures that the discharged water will be very low in bacteria. In mechanical treatment plants, a disinfection process kills most bacteria before the treated wastewater is discharged. In both types of facilities, the processes used ensure that the discharge meets the state effluent limitation for fecal coliform. However, occasionally equipment malfunctions and the waste does not receive adequate treatment. In addition, wastewater treatment facilities sometimes become flooded, causing untreated waste to flow directly into a river.

Some small cities and settled areas in the Minnesota River basin do not have centralized wastewater treatment and instead rely on septic systems. The problem with this situation is that many septic systems in Minnesota do not provide adequate treatment of wastewater. In 1997, the MPCA conducted a state-wide county survey of known areas where wastewater problems were occurring.