

# Introduction

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**T**he purpose of this report is to present, analyze, and discuss information about the ecological condition of the Upper Mississippi River System (UMRS). The report includes, but is not limited to data and results from the initial years of the Long Term Resource Monitoring Program (LTRMP), the largest river monitoring program in the country. The mission of the LTRMP is to provide decision makers with information they need to maintain the UMRS as a sustainable large river ecosystem given its multiple-use character.

## **Value of River Ecosystem Status and Trend Information**

Science-based ecological status and trends information is increasingly valuable as society recognizes the need to conserve the quality of its natural resources. This is especially true for natural resources whose recreational, cultural, and ecological values have at times been overshadowed by economic development.

The UMRS is an excellent example of a system with such conflicting values. The

channels of this river system have been engineered to support commercial navigation. The river floodplains have been developed in varying degrees for agricultural, urban, and industrial use. Incidental effects of waste treatment and agricultural runoff have further constrained the quality of the river system ecology.

The rivers retain many features of ecological value, but others have been degraded or lost. Some of these can be restored, but restoration requires public support and sound scientific information.

## **Uses and Organization of the Report**

Accurate, objective status and trends information supports river management in three specific areas: (1) ensuring that scientific information is available so society can understand the basis of resource management decisions; (2) forecasting the direction of ecological change; and (3) providing guidelines and evidence to establish ecological objectives.

This report is intended to assist in each of these areas but the primary emphasis is on presenting facts. The ability to forecast

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ecological river conditions is limited by many factors, and river managers are just beginning to establish ecosystem objectives. For each potential use of this report, expanded below, it is important to recognize limitations imposed by available information, the state of the science, or current river management.

**Basing Perceptions on Facts**

Perceptions are simple, easily understood, and memorable concepts. Common and long-held perceptions about the river are of

- legendary streams whose river boats opened up the heart of America to European colonization;
- principal trade arteries that connect the Midwest grain belt to a hungry world;
- places to watch birds, to camp, fish, hunt, boat, water ski, and swim;
- polluted channels that receive and carry away wastes from major cities and industries;
- enormous conveyors of floods that threaten and sometimes destroy towns and farms; and
- linear refuges for native animal and plant species in a Midwest landscape that has lost much of its ability to support them.

These and other perceptions reflect human values as well as facts, and they greatly influence how and to what extent the river community or its representatives manage the river system. Scientists are challenged with ensuring that, as much as possible, the community's perceptions about the river's natural resources are indeed based on facts. By doing so, problems can be objectively screened, ranked, and acted upon in the most appropriate and effective way.

Most ecologists see the UMRS as an altered ecosystem. For the public to understand and accept this concept, the scientific community must describe habitat features, species, and ecological processes that have changed as a result of the alterations. The LTRMP has provided some of the most consistent, comprehensive data available for presenting UMRS status and trends information, but the LTRMP data collection only began in the early 1990s. As this report demonstrates, many data sets—especially those necessary to compare present and past conditions—are limited. A secondary purpose of this report is to point out when data are insufficient to support perceptions.

**Forecasting Trends**

One of the most important roles of environmental science is to forecast the likely consequences of society's actions. This role is especially critical when decisions have the potential to affect the value of natural resources for future generations. Forecasting river conditions, however, is difficult at best because of the many unknowns. Our understanding of basic ecological processes such as the ecological sequences stimulated by an annual flood pulse is limited, as is our ability to predict our own actions. We can only estimate, for example, how the need for commercial navigation or recreational access might grow.

The many relations that link ecological quality with the economy of the rivers are not fully understood. We do not know, for instance, at what point declining natural resource values might result in reduced tourism for local river towns. Recently, these and other unknowns have been recognized as important reasons for taking a more adaptive approach to river management whereby iterative cycles of learning and action replace long-term commitments to a single river use that may have unin-

tended ecological consequences. This, in turn, places greater emphasis on the use of monitoring results to assess unintended and unanticipated effects of human activity.

Unknowns limit the ability to make detailed forecasts of the future of the UMRS. It would be irresponsible, however, not to point out some important trends that likely will continue.

### **Defining River Ecological “Health”**

If all river ecosystem features and processes were known; if the knowledge of causal relations made it possible to predict how the river would respond to a specific natural event or human activity—the river community still would face two fundamental questions:

- Is the present and predicted future ecological health of the river acceptable?
- If the ecological health of the river is not acceptable, what should we do about it?

Answers to these questions require more than accurate facts and predictions. They require sound judgment and collaborative agreement by all community interests about what is acceptable. Human needs and ecosystem health are not only related to, but depend on each other. The community’s definition of “acceptable” cannot be formulated in isolation from economic or cultural needs.

The desire to balance the ecological and economic health of the UMRS was reflected in the words of Congress in the Upper Mississippi River Management Act of 1986:

“To ensure the coordinated development and enhancement of the Upper Mississippi River system, it is hereby declared to be the intent of Congress to recognize that system as a nationally significant ecosystem and a nationally significant commercial navigation system.”

This view was reaffirmed by participants at a 1996 River Summit, a meeting intended to establish a working dialog and promote collaborative actions among widely divergent river interests. Participants adopted a common vision to seek long-term compatibility of the economic and ecological integrity of the Upper Mississippi River.

Advances in the field of river ecology over the last two decades and information generated by the LTRMP make it possible to begin, with this report, implementing a more adaptive and collaborative river management process. The report includes a set of criteria for defining river ecological health. The criteria are based on the knowledge and experience of scientists from many different floodplain river systems. These criteria are used in a status report table format to synthesize facts into an assessment of ecological health and trends for four river reaches (see Chapter 2 for definition of river reaches). Because these initial criteria address broad ecological concepts, they are difficult to quantify numerically. Instead, the status report table uses gauges to identify where a river reach falls along a scale of ecological health. The table itself, however, is a work-in-progress. As additional information and facts become available, we will adopt specific metrics to better quantify the criteria.

This report then, should be considered an initial assessment step in an evolving adaptive river management strategy being developed by scientists, natural resource managers, river engineers, and the public. Future status and trends reports, anticipated at 6-year intervals, will summarize monitoring data, provide greater understanding of how the river ecosystems respond to natural events and human activity, and improve the yardsticks by which the river community can judge the need for future action.

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### **Format of Report**

The first three chapters of this report are devoted to introducing the ecology of the UMRS, the concept of river ecological health, and the effects of human presence. Chapters 4 through 13 focus on individual ecosystem components. Chapters 14 and 15 present case histories of the Illinois River and the UMRS flood of 1993. Chapter 16 includes a summary and a description of trends.