

Environmental Management Technical Center

Strategic Plan

with implementation objectives for the period 1998-2002



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July 1998

U.S. Geological Survey
Environmental Management Technical Center
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Onalaska, Wisconsin 54650-8552

Overview

Mission

Provide information needed to support the sound management of the Mississippi River.

Vision

To be recognized as a “Center of Excellence” in large river sciences—supporting natural resource management activities on the nation’s largest floodplain river.

Guiding Principles

In fulfilling its mission, the Environmental Management Technical Center (Center)

1. recognizes the Congressionally authorized Upper Mississippi River Environmental Management Program as the **primary focus** of Center activities;
2. shares the common U.S. Geological Survey goal of providing the nation with reliable, impartial information to describe and understand the Earth;
3. understands that sound river management requires accurate and unbiased information;
4. recognizes that establishing partnerships with other research and management agencies is critical to achieving Center objectives;
5. works to ensure that science activities remain relevant to management questions; and
6. strives for excellence in its research, monitoring, spatial analysis, and information sharing activities through internal quality control and external peer review.



The Environmental Management Technical Center conducts monitoring and analysis on over 1300 miles of the Upper Mississippi River System.



The river system contains hundreds of thousands of acres of prime wetland habitat.

Goals

In support of its mission, the Center has six goals closely matching those of the authorizing legislation and the U.S. Geological Survey. The goals include the following:

1. Develop a better understanding of the ecology of large rivers
2. Monitor resource change
3. Support the planning, implementation, and evaluation of management actions
4. Facilitate the integration of natural resources science throughout the Upper Mississippi River basin
5. Support natural resource management through geospatial technologies and analysis
6. Support decision making through sound data management and information sharing

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Section I - Introduction

Background

The Environmental Management Technical Center (Center) located in Onalaska, Wisconsin, is a U. S. Geological Survey (USGS) science center. The Center was established in 1988 as an office of the U. S. Fish and Wildlife Service (USFWS), specifically in response to the Water Resources Act of 1986 (Public Law 99-662). In this legislation, Congress recognized the Upper Mississippi River System (UMRS) as a nationally significant ecosystem and a nationally significant commercial navigation system. Congress defined the UMRS as the commercially navigable portions of the Mississippi River north of Cairo, Illinois, and the Minnesota, Black, Saint Croix, Illinois, and Kaskaskia Rivers. The act authorized a series of elements known as the Upper Mississippi River System Environmental Management Program (EMP) and provided funding through the U.S. Army Corps of Engineers (Corps) budget process.

Key elements of the EMP include the Long Term Resource Monitoring Program (Monitoring Program), the Computerized Inventory and Analysis System (Information Management), and the Habitat Rehabilitation and Enhancement Program (Habitat Program). Whereas the Corps was assigned responsibility for overall program management and for implementing the Habitat Program, Congress clearly indicated (through legislative history, authorizing language, and the recommendations in the Master Plan) that the Monitoring and Information Management elements be implemented by the Department of the Interior (DOI). These roles are spelled out in a memorandum of understanding between the two departments.

The functional roles and spatial scope of the Center have evolved and expanded since establishment. The Center's role in the DOI changed as biological science and research responsibilities were consolidated under one departmental organization. The spatial scope of the Center's applied river science is expand-

ing in response to USGS authorizations and programs that support watershed science. Although not supported through the Monitoring Program, this externally funded work appropriately links the Center's focus on the river to the influences of the river watershed.

Purpose

The purpose of this strategic plan is to describe to the management partners, the scientific community, and the general public, the strategic direction the Cen-



The Environmental Management Technical Center.

ter will follow during the period 1998 through 2002. This plan includes information on the following:

- Center mission, vision, and guiding principles
- Center goals and 5-year objectives
- Science capabilities
- Means to promote quality science
- Processes for conducting science
- Performance measures
- Forces that may influence success

The format of this plan is consistent with the planning guidance of the USGS and the Government Performance and Results Act of 1993. The content of this plan will be reviewed periodically and adjusted or supplemented as necessary to reflect a 5-year planning horizon.

Mission

The mission of the Center is to provide information needed to support sound management of the Mississippi River.

The Center is the only organization in the United States conducting long-term resource monitoring activities using consistent sampling protocols over geographically broad reaches of the Mississippi River. It is also the only organization serving as a clearinghouse for biological, physical, and chemical data concerning the Upper Mississippi River.

The Center has established a solid scientific reputation that has led to a growing demand for its research and analysis capabilities. The Center's geospatial technologies, mapping, and analysis capabilities are increasingly sought by DOI land management agencies and other government agencies having responsibilities within and beyond the UMRS. The Center's automation support and information transfer capabilities have been sought to support USGS National Biological Information Infrastructure efforts.

The Center is the only organization in the United States conducting long-term resource monitoring activities using consistent sampling protocols over geographically broad reaches of the Mississippi River.

Controlled growth for the Center, fostering high quality and relevant scientific research on the Mississippi River, will enhance our contribution to natural resource management and society. New programs will build upon, improve, or complement the Center's basic legislative mission.



Congress has recognized the Upper Mississippi River System as a nationally significant ecosystem.

Vision

Our vision is to be recognized as a “Center of Excellence” in large river sciences—supporting natural resource management activities on the nation’s largest floodplain river.

Guiding Principles

In fulfilling its mission, the Center

1. recognizes the Congressionally authorized Upper Mississippi River Environmental Management Program as the **primary focus** of Center activities;
2. shares the common U.S. Geological Survey goal of providing the nation with reliable, impartial information to describe and understand the Earth;
3. understands that sound river management requires accurate, timely, and unbiased information;
4. recognizes that establishing partnerships with other research and management agencies is critical to achieving Center objectives;
5. works to ensure that science activities remain relevant to management questions; and
6. strives for excellence in its research, monitoring, spatial analysis, and information sharing activities through internal quality control and external peer review.

Center Goals

The Center has established six goals in support of its mission. These goals closely match those of the authorizing legislation, the Long Term Resource Monitoring Program Operating Plan, and those of the USGS. The goals are

1. Develop a better understanding of the ecology of large rivers
2. Monitor resource change
3. Support the planning, implementation, and evaluation of management actions
4. Facilitate the integration of natural resource science throughout the Upper Mississippi River Basin
5. Support natural resource management and science through geospatial technologies and analysis
6. Support decision making through sound data management and timely information sharing

Historical Foundations

Environmental Management Program

The Center and its six field station offices employ a variety of scientific and technical skills to help create the information needed to assess the long-term status and trends of the UMRS and to help resolve river resource management conflicts. The Center concentrates on scientific approaches to producing information, recognizes the necessity to serve management information needs, and understands that interagency partnerships can achieve more than a single agency can acting independently.

The Monitoring Program has influenced the design of Center and field station infrastructure and many of the Center's functional roles. The Monitoring Program will remain the Center's primary emphasis. The existing authorizing language of the Monitoring Program, however, limits Monitoring Program involvement in large river science in two ways. First, by defining its spatial scope as including only the

floodplains and channels of six navigable rivers within the UMRS, important river monitoring and research activities outside of the floodplain cannot be accomplished under the Monitoring Program. Second, the primary activity of the Monitoring Program has been defined as long-term resource monitoring, thereby limiting the ability of the Center to conduct valuable applied research in response to specific management needs.

To address these limitations, the Center has employed several strategies to ensure information gathering, analysis, and reporting activities more fully meet management agency objectives. For instance, to broaden the spatial scale of the Program's science information, watershed and landscape initiatives have been pursued with competitive external funding, additional personnel, and cooperative programs. Additional scientific analysis and applied research capabilities are being pursued through a merger with another nearby USGS Science Center and through a variety of cooperative university and other agency programs. The Center is encouraging management agencies such as the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS), the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (USFWS), the U.S. Army Corps of Engineers (Corps), and others to place personnel at



Habitat improvement projects are developed to enhance biological resources.



Congress has recognized the Upper Mississippi River System as a nationally significant commercial navigation system.

the Center. On-site representatives coordinate, integrate, and leverage their management information needs with the Center's capabilities to enhance agency objectives. In this role, the Center serves as a platform to integrate multiagency science information needs within the basin.

Agency Reorganization

In 1993, Secretary of the Interior Babbitt combined the biological science resources of several Department of the Interior bureaus, including the U. S. Fish and Wildlife Service, into the National Biological Survey (*Survey* was later changed to *Service*). This reorganization included the Center and was intended, in part, to enhance the objectivity of science within the Department. It also broadened, with additional funding, the spatial scope of studies that could be undertaken by the Center.

In October 1996, a merger with the U.S. Geological Survey resulted in the National Biological Service becoming the Biological Resources Division (BRD) of the USGS. The merger provides for increasing interactions in the biological sciences with existing USGS divisions (Water Resources, Geology, and Mapping). From a Center perspective, the merger helps emphasize objective and timely science. The merger also provides considerable opportunities for collaborative efforts over broader spatial scales and for the

leveraging of agency resources, thereby enhancing EMP activities.

Center Merger

The Environmental Management Technical Center and the Upper Mississippi Science Center will be administratively merged in the near future. These USGS science centers are located close to each other and have missions that, while different, are complimentary in some areas. A merger, therefore, offers opportunities to streamline management support functions and leverage scientific

and technical capabilities to give maximum support to customers and other interested parties. It also provides the opportunity for the USGS to provide financial resources in support of the Center mission and Mississippi River management agencies information needs. To facilitate an orderly merger, a *Merger Transition Plan* is needed to address key issues regarding funding, partner information needs, organization, core scientific and technical capabilities, space requirements, and the leveraging of staff skills and capabilities. The plan should address short- (1 year), mid- (2–4 years) and long-term (beyond 4 years) planning horizons.

Related Plans

The national USGS and BRD Strategic and Implementation plans provide important guidance for conducting scientific studies at all 17 USGS science centers. Guidance includes activities related to performance measures and indicators, research planning, and promotion of quality scientific research through peer review, competition, and a suitable awards program. Center agreement and compliance with this guidance (which has been incorporated into a series of Center standard operating procedures) is a prerequisite to implementation of this plan. In addition, the Monitoring Program's original operating plan provides important guidance on process, procedures, and emphasis.

Section II - Center Capabilities

The Center employs scientific and technical professionals with expertise in

- **applied river ecology** to describe ecosystems, collect data, analyze trends, forecast conditions, evaluate habitat restoration and recommend management alternatives;
- **geospatial technologies** to build spatial databases, develop land cover/land use maps, conduct landscape analysis and modeling, provide Geographic Information System (GIS) training, and perform cartographic services; and
- **data and information management** to provide quality control and public access to data, develop decision-support tools, and produce scientific and technical reports.

Scientific and Technical

Ecological Research and Analysis

The Center employs scientists in the physical, biological, and chemical sciences to conduct data collection, analysis, and research on a wide range of ecological topics such as basic and applied research on species, populations, and ecosystems. They develop predictive studies and models; collect data on long-term status and trends of important plants, animals, and ecosystems; provide technical assistance; and carry out ecological assessments.

Ecological Monitoring and Data Collection

Center staff members oversee the collection of a variety of environmental data through six strategically located field stations operated in cooperation with the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. These field stations are responsible for annual monitoring and analysis activities relating to fish, water quality, aquatic vegetation, and macroinvertebrates.

Ecological Database Development

Center and field station staff have developed a large array of ecological databases relating to fish, water quality, macroinvertebrates, vegetation, water levels and flows, sediments, and land cover and land use. Data collected from aerial photos and other base map manuscripts are digitized for inclusion in the master database for preservation, display, and subsequent evaluation. Bathymetric data are developed using land-based

and hydrographic surveying equipment. Metadata (data about the data) has been developed which explains the nature of each database.

Laboratory Analysis

The Center operates analytical and bio-

Scientific and Technical Specialties

botany
 cartography
 computer science
 contract administration
 database management
 digital image processing
 ecology
 entomology
 fish biology
 forestry
 geography
 graphic design
 hydrology
 information transfer
 laboratory analysis
 landscape ecology
 limnology
 network administration
 photo interpretation
 publication management
 technical editing
 telecommunications
 web technology
 wildlife biology

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logical laboratories. The analytical laboratory uses state-of-the-art equipment, including atomic absorption and ion chromatography. Analyses are conducted using a high level of automation. The biological laboratory is used for enumeration, aging, and identification of fish, benthic macroinvertebrates, and aquatic and terrestrial plant species.

Ecological Analysis Using Spatial Data

Center staff members use ARC/INFO GIS software to process and analyze spatial data. Surfacing and modeling are performed using custom interfaces using a suite of software tools. ArcView software is also used by Center and field station staff for data visualization.

Accessing Ecological Data Over the World Wide Web

The Center established a World Wide Web site in November 1993 (<http://www.emtc.usgs.gov>) and provides free access to data and information about the UMRS and related areas in seven adjoining Midwestern states. This Web site offers more than 8,200 files on fish, vegetation, macroinvertebrates, water quality, water levels, aerial photography, satellite imagery, scientific publications, and geographic information system data.



Automation support staff ensure that Center personnel have access to dependable computing equipment and software.

The Web site has been visited by individuals from all 50 states and more than 70 foreign countries. Almost 3 million visits have been recorded since May 1995 and more than 1 million visits were recorded during calendar year 1997.

Long-term Monitoring Using Aerial Photography

Annual aerial photo missions are undertaken using sophisticated flight planning software and a high-resolution camera (the camera is shared and installed in a USFWS [Region 3] airplane). Center and field station staff members perform detailed photo interpretation and transfer the resultant data into a GIS. These data are analyzed to determine plant species abundance, detecting changes and patterns in land cover and land use, and in mapping aquatic habitat changes over time.

Scientific and Technical Report Production

The Center has extensive report production capabilities. Technical editors support researchers, scientists, and technical staff in writing a variety of products. Products include technical reports, articles for peer-reviewed journals, project status reports, popular articles, training manuals, standard operating procedures, and outreach documents such as press releases, fact sheets, and brochures. The Center also provides desktop publishing, graphic, photographic, and printing support to staff and partners.

Ecological Analysis Using Remote Sensing

Satellite images are processed using ERDAS software (a commercial image processing software) to produce classified scenes of land cover for the floodplain of the UMRS. Landsat Thematic Mapper, Landsat Multi-spectral Scanner, SPOT (a French satellite system), and Advanced Very High Resolution Radiometer (AVHRR) data are used in trend analysis and change detection.

Resource Management and Decision Support

Center staff members support managing agency efforts through the production of custom cartographic products including maps, charts, posters, and slides. Strict quality assurance/quality control procedures are adhered to in product development.

GIS Training

Training manuals and structured courses have been developed by Center staff members in the use of ARC/INFO and ArcView GIS software. Classes are conducted in the Center's on-site training and meeting facilities. Staff experts also provide training in the use and application of the state-of-the-art hardware and software decision-support tools.

Infrastructure

Environmental Management Technical Center

The Center occupies 22,000 ft² of office, laboratory, conference, and shop space and 4,800 ft² of storage space in a General Services Administration leased facility in Onalaska, Wisconsin.

The Center has a well-equipped laboratory and the necessary equipment (hydrolabs, autoanalyzer, etc.) to collect and analyze a variety of field data. Center resources provide scientists with tools to perform inventory and monitoring activities, multitemporal and multispatial scale research, and to assess status and trends using remote sensing, geographic information systems, and global positioning systems (GPS). Automation equipment includes Unix file servers, workstations, and personal computers interconnected by a local area network with access to the Internet. In addition, sophisticated digitizing, scanning, duplicating, and plotting equipment enhance Center research capabilities. A variety of image processing and GIS software packages are available to Center researchers.

The Center uses a positioning system, an innerspace transducer, computer software, and a chart recorder to collect hydrosurvey field data. The data are edited and translated into GIS coverages using the latest in computer software. Positioning for sampling sites has become an important part of most Center stud-

ies and sophisticated equipment is used to perform real time positioning.

The Center has the necessary equipment to meet the various field conditions found during open-water, freeze-up, and iced-over conditions on a large river. For the open-water season, conventional or specialty boats are available for regular open-water and vegetation sampling, hydrosurveys, and electrofishing. For sampling during iced-over conditions, snowmobiles and all-terrain vehicles are available.

Field Stations

Six cooperative state owned and operated field stations (Lake City, Minnesota; Onalaska, Wisconsin; Bellevue, Iowa; Alton and Havana, Illinois; and Cape Girardeau, Missouri) have been established for field data collection, analysis, quality assurance, and applied research.

The Mississippi and Illinois Rivers can be separated into distinct river reaches based upon common floodplain geomorphic structure. The field stations that collect the Monitoring Program biological, chemi-



Center and Field Station Locations

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cal, and physical data are located on these river reaches. Three field stations are in the upper impounded reach of the UMRS, one within the lower impounded reach, one in the impounded lower Illinois River, and one in the Open River reach.

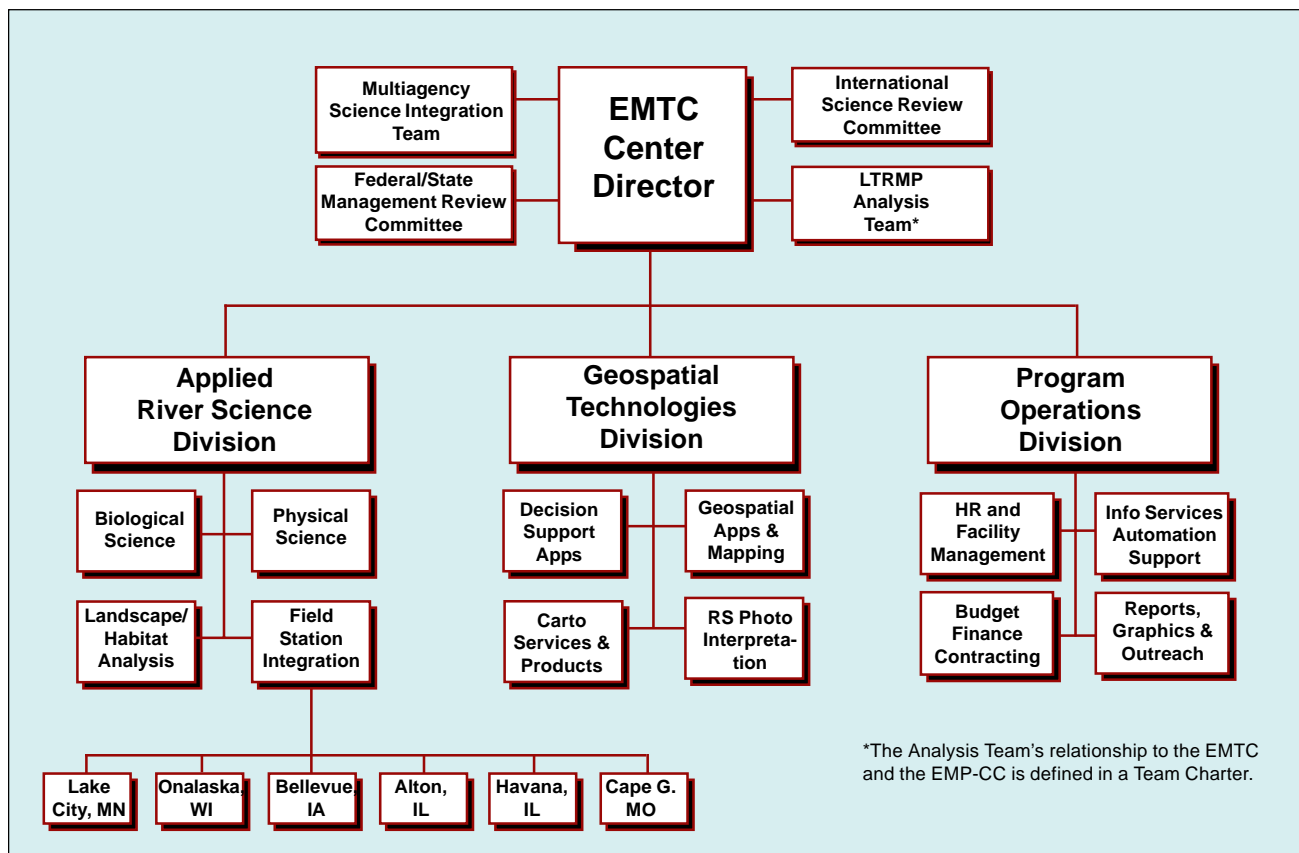
A field station team leader is responsible for the overall operation, management, and quality assurance/quality control (QA/QC) of station activities. A crew leader is responsible for each data collection crew, accuracy of data collected, and the proper transcription of raw data to a digital format. Field station staff provide input on sampling methods and protocols, support data management and transfer, and day-to-day support to monitoring activities.

Each field station has similar complements of staff and equipment. Between five and seven permanent staff members including a Team Leader, component Specialists (Water Quality, Fisheries, and Vegetation), and several technicians comprise the team. Temporary staff are added as needed.

Equipment at field stations consists of several boats designed for various types of sampling during all seasons (i.e., an electrofishing boat, airboat, hovercraft, canoes, and various flat-bottomed boats and motors), various types of nets and seines, and electronic equipment including water quality meters and GPS. In addition, office equipment (computers, printers, copy and fax machines, etc.) sufficient to operate a typical field office is available.

Center Organization

The Center is structured around its core scientific capabilities and strengths through the Applied River Science, Geospatial Technologies, and Program Operations Divisions as shown below. The Center's organization includes four external advisory committees that perform science review, agency science integration, programmatic review, and coordination of agency information needs.



Environmental Management Technical Center Organizational Structure

Section III - Process for Conducting Science

Strategic Planning

The Center considers strategic planning but one part of the planning process. Planning is not a static or occasional event, but rather a dynamic and inclusive process that forms the basis for the Center's short- and long-term activities. Three planning practices are critical to the Center's success, (1) involving shareholders; (2) assessing the internal and external environment; and, (3) aligning Center activities, core processes, and resources to support agency mission-related outcomes. As a nonadvocacy biological science and technology center, the Center works to provide data and information to resource managers, decision makers, and civil authorities in support of their missions.

To meet the Center's legislative goals and objectives, a process of comprehensive science planning has been established. The process includes extensive communication for identifying and prioritizing management information needs. Also, regular, formal meetings are held with partners to discuss and reach consensus on priorities. A series of planning documents record decisions, define specific tasks and products, estimate costs, and set work schedules.



Staff members are trained in the use of a wide variety of equipment.

Involving Shareholders

Management of the Upper Mississippi River is the responsibility of several independent Federal and state agencies. Although communication among these various agencies and groups has been extensive, few actual collaborative programs that share objectives, resources, and results have been established.

The Center focuses on particular geographic ecosystems, and its scientific and technical strengths derive from a breadth of disciplines rather than a focused strength on any one discipline. Therefore, the Center relies to a great degree on cooperative relationships with a variety of scientific institutions, universities, and other agencies to address complex natural resource issues. Much of the applied research conducted by the Center is done in collaboration with scientists from a variety of institutions. This allows the Center to assemble the best and most relevant expertise needed for any given issue and greatly leverages the Center's available resources.

Partnerships

Partnerships are a special emphasis of the Center mainly because the Center and its six field stations were established in response to specific legislative mandates and client needs. These mandates and needs overlap a large geographic area involving several state, Federal, and local jurisdictional entities and involve a variety of private and nonagency public interest groups. This has produced a rich "partnering" tradition and established a fundamental way of conducting the Center's day-to-day business as well as providing a unique communication link to partner agencies.

Advisory Bodies

Consensus building has always been and continues to be critical to successful Monitoring Program implementation. The Upper Mississippi region has a rich tradition of interagency partnerships, and many of the long-standing interagency organizations have provided convenient forums for coordination.

U.S. Army Corps of Engineers

The Mississippi Valley Division has overall program management responsibility for the EMP and receives policy guidance from the Headquarters office of the U.S. Army Corps of Engineers. The St. Paul, Rock Island, and St. Louis Districts are responsible for the planning, design, construction, and monitoring of habitat projects within their respective UMRS Districts.

Upper Mississippi River Basin Association

The Basin Association, as directed by Congressional legislation, provides policy oversight of the EMP and ensures EMP coordination with basin issues. Members include the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. Federal advisory members include the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the U.S. Geological Survey, the U.S. Environmental Protection Agency, the U.S. Department of Transportation, and the Natural Resources Conservation Service.

Each state conservation agency is actively involved in the identification, selection, planning, and design of habitat projects within its jurisdiction. They often participate in the planning of projects in adjoining states. Each state funds 25% of the cost of any project within its borders not on land managed as a national refuge. Upon completion of construction, the respective state is responsible for 100% of the operation and maintenance of projects on lands that it manages. Each state, by cooperative agreement and funds transfer, operate a Monitoring Program field station.

Environmental Management Program Coordinating Committee

For the specific purpose of providing interagency coordination of various elements of EMP implementation, the U.S. Army Corps of Engineers established

Partner Support Activities

The Center supports river scientists, natural resource managers, and decision makers by

- conducting data collection, analysis, research, and modeling regarding floodplain elevation, water quality, fishes, sedimentation, and invertebrates;
- investigating linkages between geomorphic and biological processes and the ecology of large rivers;
- determining effects of water levels and flows on the River ecosystem;
- studying effects of navigation on selected River components and processes;
- investigating processes affecting aquatic vegetation changes;
- using aerial photography and satellite imagery to gather land cover and land use data;
- constructing multi scale, basin-wide databases of land cover, ownership, land management status, and species distribution;
- using data and analytical tools for decision support efforts;
- developing databases and user interfaces for emergency response activities;
- conducting training courses in GIS applications, photo interpretation, Internet access, and computer applications; and
- planning, designing, and testing innovative ecosystem management techniques for maintaining and restoring large river ecosystems.



Sediment sampling activities.

the EMP Coordinating Committee (EMP-CC) in 1987. The EMP-CC is the primary consultative body used to seek consensus on EMP budgetary and policy issues. Members include the same states and agencies previously listed for the Basin Association.

Long Term Resource Monitoring Program Analysis Team

To provide technical advise on implementing the Monitoring Program (that combines the authorized monitoring and computerized information and analysis system elements of the EMP), an interagency committee called the Analysis Team was formed by the Center. This team presently works with the Center on Monitoring Program goals and objectives, setting priorities, defining products, and reviewing progress. Members include the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the U.S. Geological Survey, the U.S. Environmental Protection Agency, and the Natural Resources Conservation Service. This team will soon be merged with the EMP-CC and have a formal charter defining roles and responsibilities.

U.S. Fish and Wildlife Service

The Region 3 office has lead USFWS responsibility for participating in the planning and design of

habitat projects both on and off national wildlife refuge lands. The USFWS is also responsible for operation and maintenance of projects on lands it manages and for satisfying requirements of the Fish and Wildlife Coordination Act with respect to all habitat projects.

Federal and State Partner Missions

Each of our primary Federal and state partners have different but related missions within the UMRS. The following paragraphs summarize their responsibilities within the UMRS:

- **U.S. Army Corps of Engineers** - constructs, operates, and maintains flood control and river and harbor facilities and installations. Environmental restoration is an emerging activity.
- **U.S. Fish and Wildlife Service** - conserves, protects and enhances fish and wildlife and their habitats for the continuing benefit of the American people.
- **The National Park Service** - is responsible for preserving unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations.
- **The U.S. Geological Survey** - provides the Nation with reliable, impartial information to describe and understand the Earth.
- **The U.S. Environmental Protection Agency** - protects human health and safeguards the natural environment — air, water, and land — upon which life depends.
- **The Natural Resources Conservation Service** - provides leadership in a partnership effort to help people conserve, improve, and sustain our natural resources and environment.
- **The Iowa Department of Natural Resources** - manages, protects, conserves, and develops Iowa's natural resources in cooperation with other public and private organizations and individuals.
- **The Minnesota Department of Natural Resources** - works with the people of Minnesota to manage the state's diverse natural resources for a sustainable quality of life.

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- **The Missouri Department of Conservation** - protects and manages the fish, forest, and wildlife resources of the state; serves the public and facilitates their participation in resource management activities; provides opportunity for all citizens to use enjoy, and learn about fish, forest, and wildlife resources.
- **The Wisconsin Department of Natural Resources** - to protect and enhance Wisconsin's natural resources; to

provide a clean and abundant out-of-doors and a full range of outdoor recreational experiences; and to remember the future and those who will follow us.

- **The Illinois Department of Natural Resources** - promotes an appreciation of the state's natural resources and works to protect and manage those resources to ensure a high quality of life for present and future generations.



Boating opportunities abound within the Upper Mississippi River System.

Section IV - Implementation Objectives for the Period 1998-2002

Identifying and Prioritizing Management Information Needs

Identification Process

The scientific and technological activities of the Center *will continue to be influenced by the informational needs and expectations of the management agencies along the Mississippi River*. The process of basing Center science on management needs began during the early planning phase of the Monitoring Program. Three committees made up of scientists and management agency staff collaboratively wrote plans for monitoring Mississippi River natural resources. They identified and prioritized resource problems and recommended a computer system for development of geographic information system capabilities and to assist in analyzing, managing, and distributing the resulting data.

Recommended procedures for identifying management information needs related to the EMP involves participation by two multiagency committees, the Monitoring Program Analysis Team and the Environmental Management Program Coordinating Committee (EMP-CC). The Analysis Team is responsible for compiling the many management agency needs that relate to the Mississippi River and presenting collaboratively developed information needs and priorities to Center scientists. The EMP-CC may either concur with the stated information needs or recommend modifications. These two committees will soon be merged with a formal charter defining roles and responsibilities. The recommended work activity process and general roles of the different advisory committees and the U.S. Army Corps of Engineers is provided in Appendix A.

Partner Needs and Expectations

Periodically, the Center and the Analysis Team initiate a process by which UMRS resource agencies define and prioritize their resource management informational needs. The individual identified needs were re-

cently summarized by the Analysis Team into the following overall management information themes:

1. Describe and explain the effects of navigation and agricultural development, operation, and maintenance, on the physical and biological habitat in the UMRS.
2. Describe and explain how the hydrology and geomorphology of the UMRS has changed and how those changes have affected biological habitat and water quality.
3. Describe species abundance and distribution both spatially and temporally.
4. Describe how different ecosystem components interact and how they have been affected by physical, chemical, and biological changes in the UMRS.
5. Describe future conditions under different management scenarios including the current system.
6. Provide the scientific support needed to complete a habitat needs assessment for the UMRS.

These management information themes, which include previously identified priority needs, Upper Mississippi River Master Plan Recommendations, and items specified in existing memorandums of agreement, formed the basis for identifying the EMP objectives listed in this plan.



Quality assurance/quality control activities in support of Vegetation mapping.

Reporting Performance

Several key documents are linked to and complement this strategic plan. These documents include the Annual Performance Plan and the Annual Performance Report.

Annual Performance Plan

Annual performance plans will be directly linked to this strategic plan. The goals and objectives in this strategic plan set the framework for developing annual performance plans. These performance plans are incorporated as abbreviated study plans in the USGS Science Information System (SIS) and include quantifiable, and measurable performance objectives to be achieved in a given fiscal year. The purpose of the SIS is to provide a comprehensive scientific information database comprising summary documentation of the objectives, location, funding amount and source, project description, approach, anticipated application of research, products, duration, progress, and results of USGS scientific and technical efforts.

Annual Performance Report

Within four months after the close of each fiscal year, the Center submits to the Corps and other Program Partners a report on program performance for the fiscal year just ended. This report will review the Center's success in achieving the performance goals for that fiscal year. Where the annual goals have been achieved, the underlying assumptions and strategies will be examined to ensure that these goals and associated performance measures have continued applicability. If any of the performance goals are not met, the Center will conduct an analysis of why they were not met and what actions are necessary to meet these goals in the future. If the analysis should indicate that the performance goal is impractical or not feasible,

the performance report will document the reasons and recommend further action.

Objectives

The following objectives are organized by major program support area and subdivided by Center goal within each program area. The identified objectives

The goals and objectives in this strategic plan set the framework for developing annual performance plans.

are based on information contained in Public Law 99-662, the Long Term Resource Monitoring Program Operating Plan, UMRS Partner expectations, the Bureau Information Needs (BIN) process, and specific priority requests from client agencies.

The stated objectives vary with respect to magnitude of effort necessary, specificity of implementation requirements, and resulting products. The objectives in this plan, therefore, merely set the framework for developing specific plans of study (scopes of work) for incorporating into the USGS SIS. The scopes of work and SIS will include specific implementation information including products, research questions, time frames, and budgets.

Support to the Environmental Management Program

Long Term Resource Monitoring and Computerized Inventory and Analysis Program Objectives

Goal 1 Objectives (Develop a better understanding of the ecology of large rivers)

(L01) Quantify the temporal and spatial dynamics of aquatic vegetation, with emphasis on plant response

The scientific and technological activities of the Center will continue to be influenced by the informational needs and expectations of the management agencies along the Mississippi River.

to the hydrologic regime, sediment, bathymetry, and water quality (nutrients and suspended material), and the effects of plants on invertebrates, fishes, birds, and other species.

Aquatic vegetation is vital to the ecological quality of UMRS backwaters. This objective addresses the need to explain how aquatic vegetation interacts with physical, chemical, and biological variables. Products developed under this objective include evaluations of monitoring data, tests (laboratory and field) of hypotheses that relate aquatic vegetation to other factors, and models to assist with the design of future management actions intended to modify aquatic abundance and species composition of the aquatic plant community.

(L02) Quantify the ecology and limnology of off-channel areas, with emphasis on predicting and quantifying winter conditions and their linkage to the abundance and distribution of selected fish populations.

Off-channel areas in the UMRS provide important aquatic habitat and are a focal point of ecological functions (and restoration efforts) within the system. This objective addresses the need to promote more effective management within these areas by developing a clearer understanding of their limnological and ecological relations. Work under this objective began by addressing a priority management issue (availability of over-wintering habitat)

that requires fundamental information on physical-chemical limnology and fisheries biology. Products developed under this objective include large- and small-scale field assessments and predictive models of habitat availability. We will link winter habitat availability and suitability both to over-winter survival and observed changes in fish populations over 5–10 years .

(L03) Initiate an assessment of the ecological importance of the annual flood pulse to aquatic and terrestrial productivity and diversity.

The annual flood pulse in a given river reach affects sediment and nutrient fluxes, energy cycles, fish spawning, and the suitability of habitat conditions for many aquatic and terrestrial species. This objective addresses the need to quantify selected relations between the flood pulse and river habitats, species, and ecological processes, and to describe how the flood pulse in different UMRS reaches has been modified by navigation and agricultural development. Products developed under this objective include evaluations of historical changes in flood pulse characteristics, analyses of flood zone extent and duration, and models of selected relations between the flood pulse and species abundance and community diversity. The models will be designed to help forecast ecological benefits of restoring floodplain connectivity in selected river reaches.



More and more cities are recognizing the importance of the river to their local economies.



Converting data to electronic format for a geographic information system.

(L04) Apply forest succession and dynamic bird models to floodplain lands managed by the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers to identify optimal timber-cutting strategies for vegetation diversity and bird habitat suitability.

The size, fragmentation, community composition, and age structure of UMRS forests affect their value as habitat for migrating birds. This objective addresses the need to quantify the relations between selected forest features and bird habitat suitability. Products developed under this objective include models of causal relationships to assist the development of effective timber cutting strategies within the UMRS floodplains.

(L05) Develop a model to predict how water quality, hydrologic regime and substrate factors control the abundance and distribution of mayflies and fingernail clams.

Mayflies and fingernail clams are important, and in some cases critical, food items for river fish and migrating waterfowl. This objective addresses the need to quantify relations between physical water and substrate variables and invertebrate populations. Products developed under this objective include analyses that document the ranges of water and substrate conditions necessary to support high densities of invertebrates, and predictive models that can be used to design habitat projects or other management strategies to sustain invertebrate populations at levels required by fish, migrating waterfowl, and other species.

(L06) Quantify morphometric and limnological effects associated with changes in bathymetry, elevation, impoundment, levee construction, island loss and

channel training structures and quantify the ecological effects of these changes.

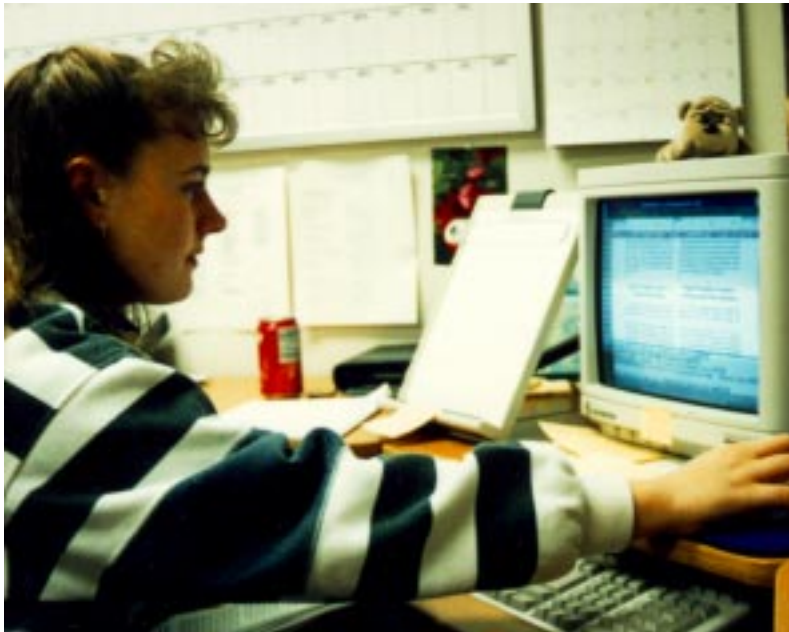
The morphometry of the UMRS floodplains has changed in response to a variety of human activities, especially channel training, impoundment, and levee construction. Morphometry is fundamental to the system's ecological structures and functions. Changes in morphometry over time have altered the system's habitats, species, and ecological processes. This objective addresses the need to quantify basic physical changes that have taken place over time at several spatial scales and to estimate their ecological consequences. Products developed under this objective include change maps, frequently at decadal intervals; tabulations of physical changes at different points in time; and reports on ecological consequences.

(L07) Forecast future morphometric and ecological conditions within the UMRS.

Some changes in the morphometric condition of UMRS floodplains are ongoing and expected to continue. Forecasts of some of the changes are possible, and are already under way as part of the Navigation Feasibility Study, the Adaptive Environmental Assessment Exercise, and the River Summit efforts. Forecasts are especially valuable to establish long-term ecological objectives for the system. This objective addresses the need for Monitoring Program information to be used in developing the most scientifically-based forecasts possible. Monitoring Program forecasting work will be based on internal activities described under the other objectives and will continue to build on the work of external studies as they come to completion. Specific work will address future trends associated with pool aging



LTRMP portable display used at meetings, conferences, and symposia.



Technical reports provide a proven method for sharing scientific accomplishments.

(sediment build up, continued loss of bathymetric diversity, estimates of time to reach pool sediment equilibrium). Habitat suitability models for species or guilds will be used to estimate how forecasted physical changes will affect plants and animals. Products developed under this objective include tabular forecasts, spatial maps, and reports of likely associated impacts to species or guilds.

(L08) Assemble and evaluate existing nutrient, sediment, and flow data for mainstem and tributaries of the UMRS to develop loading estimates and assess sources, sinks, transports, and transformations in the UMR floodplain.

Constituent and flow data are required to quantitatively evaluate or model the movement, fate, and effects of material delivered from the UMRS drainage basin into the stream network. Stream flow and concentrations of nutrients and suspended sediment in the mainstem and tributaries of the UMRS are measured by several federal and state agencies at a large number of locations. This objective addresses the need to assemble and evaluate the flow, nutrient, and suspended sediment data from these differing sources. The data are and will continue to be used to estimate material transport (loads) to the River mainstem from tributaries and at monitoring points on the main channel. An important aspect of this objective is that the compiled data (constituents and flows) and loading estimates be made available in a consistent, usable, and documented form.

(L09) Develop a model that evaluates the relative nutrient and sediment contributions to the UMR from major tributaries and relates these to subbasin landscape conditions.

Ecological conditions in the UMRS river floodplains are greatly dependent on the amount and timing of water, sediment, and nutrient inputs from mainstem tributaries. This objective addresses the need to understand how tributary contributions are controlled by geologic, landscape, and land use features within each basin. Analysis will be in detail on selected subbasins and on a coarser scale on all subbasins. Products developed under this objective include spatial analyses of the relationships between selected basin features and material loading, and models of load reductions that could be achieved if selected land management practices were implemented.

Goal 2 Objectives (Monitor resource change)

(L10) Complete and summarize 5 annual increments of monitoring data for water quality, fish, vegetation, invertebrates, and bathymetry.

Annual monitoring of water quality, fish, vegetation, invertebrates, and bathymetry is a vital function of the Monitoring Program. The work is accomplished by staff at the Center and six state-operated field stations. This objective addresses the need to continue making consistent, standardized observations of physical-chemical conditions and species across the UMRS through time. Products developed under this objective include annual increments of data, annual data summary reports, an annual state of the river report, and synthesizing observations into an Ecological Status and Trends Report of the UMRS after 5 years.

(L11) Analyze existing monitoring data to address long-term and longitudinal trends in limnological conditions and linkages to riverine biota with emphasis on aquatic vegetation and selected fish species.

During the initial years of Monitoring Program, the emphasis was on establishing monitoring methods, developing data quality control measures, and procedures for management and reporting. With these functions operational and a multiyear database established, a relatively greater proportion of staff time can be allocated to analyzing the patterns that are becoming apparent in the databases. This objective addresses the need to evaluate trends of spatial and temporal relations between the

Strategic Plan

components being monitored. Products developed under this objective include trend and correlation analyses, spatial analysis of individual components, recommendations for improving the effectiveness of the monitoring program, hypotheses about causal relations that can be tested in association with objectives L01-L09, and the monitoring reports listed under L10.

(L12) Estimate sedimentation rates and changes in bathymetric diversity in off-channel areas of the UMRS.

Within a floodplain reach, varying habitat conditions (channel gradient, water depth, velocity, fetch) control the rate at which sediment is deposited and resuspended. Upland soil erosion and impoundment have contributed to greater deposition rates in backwaters and impounded areas immediately above dams. Loss of water depth and bathymetric diversity in these areas threaten their habitat suitability for a variety of species. This objective addresses the need to evaluate the long-term stability of habitat conditions within the UMRS and to quantify where and how fast habitat suitability is declining. Products developed under this objective include selected reach or pool bathymetric maps, historical change maps, and analysis of sedimentation rates along fixed transects in impoundments.

(L13) Complete sediment budgets for six key trend analysis areas.

Sediment loading and transport are among the most important hydrologic processes that have and will continue to affect habitat quality within the UMRS. This objective addresses the need to understand how specific reaches are impacted by sediment loading, to compare conditions among different river reaches, and in combination with work under L08, L09, and L12, to estimate how quickly river reaches are approaching sediment equilibrium. Products developed under this objective are data sets for each Monitoring Program trend analysis area that quantify sediment loadings and outputs over a 3-year period.

Goal 3 Objectives (Support the planning, implementation, and evaluation of management actions)

(L14) Continue to develop and evaluate alternatives for water level management within impounded reaches of the UMRS.

Increasingly, river managers are exploring water regulation alternatives to

improve the ecological quality of the UMRS. Ongoing plans call for testing alternatives at local and navigation pool spatial scales. This objective addresses the need to adequately plan such experiments to maximize ecological benefits, and learning, and to evaluate the short- and long-term ecological effects of the experiments. Work done under this objective requires extensive coordination with management partners. Products developed under this objective include spatial maps of areas likely to be affected by the experiments, study designs, and pre- and post-project analyses of floodplain habitats and populations.

(L15) Document, evaluate and model fish passage opportunities and constraints at UMRS locks and dams, and recommend management alternatives intended to improve fish passage.

Locks and dams are known to affect fish passage. However, the magnitude of such impacts at specific locks and dams on the UMRS, and their consequences to local or systemic fish populations and communities, with the exception of some specific cases, have not been quantified. The opportunity for upriver passage of adult migratory fishes through each UMR dam is being examined under LTRMP. A report in progress on the subject describes previous fish mark-recapture and telemetry studies, hydraulic conditions at UMR dams, and the swimming performance of UMR fishes. A variety of management alternatives have been proposed to reduce existing fish passage constraints (e.g., modifying locking procedures to enhance fish passage through locks; modifying gate opening combinations to create more effective passage zones). LTRMP staff will work with partners to better determine hydraulic constraints at



Laboratory staff processing field samples.

UMR dams, to design and conduct field experiments to test the effectiveness of management alternatives, and to develop models to understand the consequences of restricted movements on UMR fish populations. Products developed under this objective will include evaluations and predictive models of fish response to water regulation alternatives, and potential consequences to river fish populations and communities.

(L16) Provide data, analyses, and models necessary to plan and design selected Habitat Rehabilitation and Enhancement Projects.

A habitat needs assessment for the UMRS will be conducted over the next 2 years. The needs assessment will provide guidelines, at several spatial scales, for future habitat rehabilitation projects. This objective addresses the need to base the assessment on the most recent and accurate spatial information available, and a collaborative consensus on what constitutes acceptable river ecological health within different floodplain reaches, both now and in the future. This objective also addresses the need to use the ecological knowledge being generated by Monitoring Program research and monitoring activities to set systemic objectives and design individual habitat projects. Monitoring Program spatial databases, in a variety of formats, will be presented for use during the assessment. The Monitoring Program staff will also work with management partners and the public to continue to elaborate a set of criteria to assess river ecological health. Products developed under this objective include sections of habitat needs assessment planning documents and maps and coverages to be used during planning processes.



Center staff use aerial photography to monitor vegetation.

(L17) Evaluate the physical and ecological effects of selected Habitat Rehabilitation and Enhancement Projects.

Habitat projects can be considered large scale experiments that provide the opportunity to learn how habitats, species, and ecological processes respond to specific management actions. This objective addresses the need to design and implement scientific studies associated with selected habitat projects. The results of the studies will help to demonstrate which projects are most successful at achieving individual and systemic habitat objectives. Products developed under this objective include comparisons of pre- and post-project conditions and analysis of the causal mechanisms involved.

Goal 4 Objectives (Facilitate the integration of natural resource science throughout the Upper Mississippi River Basin)

(L18) Facilitate annual, multi-agency science-based workshops to foster coordinated natural resource management and establish a common set of ecological goals for the UMRS.

The Environmental Management Program, in addition to supporting ecological monitoring and habitat rehabilitation, has helped to strengthen communication among different river interests and organizations. Federal and state agencies and advocacy groups have expressed increasing interest in jointly developing systemic ecological objectives for the UMRS. They have also indicated that such ecological objectives, based on science, might lead to greater progress and efficiencies among the many agencies responsible for river management. This objective addresses the need to facilitate continuing discussions intended to establish systemic UMRS ecological goals and subsequent clarification of ways by which those goals can be accomplished. Products developed under this objective include annual workshops, associated reports, and increased use and understanding of the data being generated under the Monitoring Program.

Goal 5 Objectives (Support natural resource management and science through geospatial technologies and analysis)

(L19) Establish a geographic information center to serve as a centralized repository and analysis facility for systemwide spatial data and information.

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Accomplishment of this objective is measured by the continuous operation of the GIS Center developed under the provisions of the Water Resources Development Act of 1986 (Public Law 99-662). The Center will continue as a leader in providing centralized and consistent base mapping and GIS analysis capabilities for several ongoing multi-partner activities. Products include completion of the detailed land cover/land use data layers for approximately 75 different areas within the UMRS; production of high quality cartographic map products (200+ yearly); development of digital spatial data sets for use by partners (100–300 files per year); annual spatial data collection, storage, and display (30–50 events); technical support for the analysis and modeling of Monitoring Program data (75–100 events); and, conducting training activities in the use of spatial analysis software and technology (3–6 classes annually).

(L20) Conduct a coordinated remote sensing program to obtain aerial photography and satellite imagery for use in monitoring aquatic and terrestrial vegetation patterns and land use within the UMRS.

Work under this objective involves planning and conducting aerial photography missions, cataloging acquired photographs, and periodically acquiring selected satellite scenes. Products include five annual collections of aerial photographs for six key pools and selected areas, systemic (1300 river miles) aerial photography coverages every five years (1989, 1994, 1999, 2004), and the acquisition of selected satellite data (average 1–2 scenes per year).

Goal 6 Objectives (Support decision making through sound data management and timely information sharing)

(L21) Develop and implement a management briefing and decision support system for the UMRS

Section (e)(1) of Public Law 99-662 (U.S. Congress 1986) authorized, as identified in the Master Plan, “. . . implementation of a long-term resource monitoring program; and . . . implementation of a computerized inventory and analysis system.” Two major goals outlined in the Master Plan include (1) develop an information transfer service to provide for identification and transfer of information and technology . . . and (2) develop a management briefing system to provide support information to resource management entities of the UMRS. Information transfer and management briefing are currently referred to as a “decision support system” that involves providing timely, cost effective, and easy-to-use hardware and software tools for the retrieval and analysis of Program data and information. Products include annual additions to the master Monitoring Program database (approximately a 10% annual increase); software products for analyzing and displaying data (3-5 specific applications); improved methods for distributing data and information (expanded use of CD-ROM and Internet technologies); providing database development

and maintenance solutions to meet the program needs such as budget tracking, project time management, property accountability, and mailing list; develop and execute annual maintenance contracts, annual preventative maintenance of equipment, plus periodic installation of hardware and software upgrades; and the timely replacement of faulty equipment and parts.

(L22) Develop an information transfer service to facilitate the sharing of information and technology needed for resource management and decision making.

This objective involves using the World Wide Web to ensure that resource managers, decision makers, civil authorities, and the general public can easily access and freely download existing data files. More than 17,000 existing files on fish, vegetation, invertebrates, water quality, water levels, aerial photography, satellite imagery, scientific publications, and GIS maps, spatial coverages, and applications will continue to be made available. Other products include a 15–20% annual increase in available data files and annual updating of existing clearinghouse web pages, operating and maintaining a National Spatial Data Infrastructure (NSDI) certified web site and Clearinghouse that allows public access to more than 15,000 existing files and increasing the number of files available by approximately 30% each year.

(L23) Publish study results in established report series, scientific literature, and popular publications.

This objective involves providing high quality and timely editing and graphic support in developing scientific, tech-



Training in the use of monitoring equipment and analyses tools is provided by Center staff to scientists and resource managers.

nical, programmatic reports, and related publications. Annual products include the production of more than 30 Monitoring Program Report Series publications, at least 15 Project Status Reports, 2–4 Program Fact Sheets, 3–6 issues of the River Almanac, and editorial support in the preparation of at least 10 manuscripts for publication in external peer-reviewed journals. All products are produced in accordance with established peer-review procedures.

Support to the Department of the Army

U.S. Army Corps of Engineers

Goal 4 Objectives

(A01) Determine biological and water quality impacts associated with navigation channel maintenance dredging activities.

Work under this objective involves monitoring and applied research in support of the Rock Island District's 9-



The EMTC operates a highly automated water quality laboratory.

ft navigation channel maintenance activities. The District's 404 permit, allowing channel maintenance dredged material to be placed on historic placement sites, is scheduled to expire on December 31, 1998. This permit was originally issued subject to several conditions being met. One of those conditions was that the Corps of Engineers, in cooperation with the appropriate federal and state resource management agencies, would commence collecting the natural resource data necessary to develop a scope of work to assess the impacts of dredged material placement on natural resources. Invertebrate sampling and associated research has been identified as crucial to meeting permit re-issuance requirements. The La Grange Pool of the Illinois Waterway was selected for initial invertebrate sampling due to the high level of dredging activity in that pool and the presence of an established monitoring program (the LaGrange Pool is an LTRMP trend pool) for that pool.

Additional sampling, to be funded by the Corps of Engineers, will be accomplished utilizing the EMTC's standardized sampling protocols, slightly modified to better capture dredged material placement sites, and the existing LTRMP field station resources. It is likely that additional sampling of various river system components at multiple locations will be pursued as part of this effort. It is expected that the capabilities of the EMTC and its field stations will be utilized in the implementation of the SOW developed as a result of these sampling and research efforts.

(A02) Define the existing conditions and future without condition for the Upper Mississippi River and Illinois Waterway System Navigation Study Environmental Impact Statement

Work under this objective supports efforts to describe, as part of the Upper Mississippi River and Illinois Waterway System Navigation Study EIS (Environmental Impact Statement), the existing environmental conditions of the UMRS and likely future system environmental conditions. In preparing an EIS consideration is given to what the current environmental condition is and what the future condition will be in the absence of any recommended change. Work accomplished under this objective will result in fuller integration of LTRMP data and information with other navigation study research and model development efforts.

Support to the Department of the Interior

National Park Service

(P01) Support National Park management efforts through the development of standardized vegetation data in selected National Parks.

Effective management requires up-to-date information on park vegetation patterns. Work involves producing baseline data on the composition and distribution of vegetation cover types in five selected National Parks. The work also involves sharing the results with National Park Service Partners for use in long-term vegetation monitoring, resources management, research, planning, interpretation, and operations.

U.S. Fish and Wildlife Service

(F01) Support U.S. Fish and Wildlife Service refuge management activities.

This objective involves providing analytical and technical services in support of refuge management activities. Products to be developed include (1) land cover/land use databases for 10 UMRS refuge areas, (2) development of analytical models for more than 50 wildlife species, (3)

Strategic Plan

supporting USFWS staff use of developed decision support tools by conducting 5 annual training courses.

U.S. Geological Survey

(G01) Support Partner information needs by coordinating the Upper Midwest Gap Analysis Program

Work involves coordination efforts designed to avoid duplicating efforts while meeting the diverse information needs of the participating state and federal co-operators. Products include (1) collaborating with state partners to map current land cover and predicted distribution of terrestrial vertebrates in the Upper Mississippi River basin, (2) cooperating with academic, state, and other federal partners, to compare and contrast models of pre-European settlement vegetation with maps of current land cover, (3) coordinating with state Department of Natural Resources (DNR) partners in Illinois, Michigan, Minnesota, and Wisconsin to produce seamless maps of public ownership and management status for the Upper Midwest, (4) collaborating with these state partners to classify satellite imagery to produce seamless current maps of land cover for the Upper Midwest, (5) serving as regional data clearinghouse for current land cover maps, predicted vertebrate distribution maps and public ownership maps, and, (6) serving as regional data clearinghouse for related region-wide natural resource GIS data produced by state, federal and academic cooperators.

(G02) Support Biological Resources Division information resources management activities.

Work involves providing generalized information resources management support to BRD National Office, Centers, field stations, USGS Cooperative Research (Co-op) Units. Products include (1) editorial support in the development of BRD IRM and Geospatial strategic plans; (2) providing technical support to BRD in developing, adapting, and refining spatial analysis capabilities needed to allow electronic access to widely distributed biological data; (3) supporting BRD efforts in cataloging and describing existing biological data and information to help government agencies and nongovernment organizations avoid costly duplicative data collection; (4) developing new software tools (MetaMaker and upgrades) for serving and accessing BRD biological metadata data and information over the Internet, (5) providing annual IRM contract support to BRD Centers on agency- and department-wide automation



Staff member servicing a Center air boat.

equipment and services contracts; (6) providing technical and operational World Wide Web support to 3–7 BRD Centers, field stations, and Co-op units; (7) coordinating IRM Council activities; and (8) providing technical support to BRD science centers in the development of 4-8 reports annually.

Support to the U.S. Department of Agriculture

Natural Resources Conservation Service

(N01) Provide support to NRCS on its watershed management efforts.

Work under this objective involves using Center geospatial capabilities, thematic mapping, hydrographic surveying, and chemical analysis to support watershed planning efforts. Products include (1) running the ADAPT (Agriculture Drainage and Pesticide Transport) field scale model, (2) identify land use patterns in the UMR basin that reduce nutrient and sediment loading into the Upper Mississippi River, (3) conduct watershed modeling of nutrient/sediment loading that incorporates physical and biological landscape features, farming practices, and socio-economic factors to direct mitigation efforts, and (4) develop a decision support system to identify watersheds to target Natural Resources Conservation Service (NRCS) efforts for further application of Best Management Practices (and funding). In the UMR floodplain we will evaluate nutrient retention and flux as a result of planned water-level manipulations and natural seasonal floods in selected reaches of

the Upper Mississippi River. Our specific objectives are to (1) determine the effect of water-level manipulations and flooding on nitrogen, phosphorus, and silica transport from river pools; (2) determine causal mechanisms for changes resulting from variation in water levels; and (3) create decision-support models for use by Refuge and river managers to predict best hydraulic practices to reduce nutrient transport from the Upper Mississippi. Results from this study will be used to assess the role of watershed management and floodplain functioning on biogeochemical cycles, and to evaluate the management strategies for reducing nutrient transport from the Upper Mississippi River to the Gulf of Mexico, for increasing regional benefits to humans, and for enhancing the river ecosystem.

(N02) Provide support to NRCS through collaborative efforts to assess project environmental benefits on natural resource conservation activities

Work under this objective involves providing water quality data, environmental assessment tools, long-term data sets, and assistance in designing future studies. Products in-

clude (1) Conducting long-term water quality monitoring on UMRS tributaries, (2) Assimilating water quality data from the five state region into a unified format that accommodates NRCS information needs, (3) Assisting state offices in determining water sampling needs, (4) Providing data in a useable GIS data format, and (5) Assisting NRCS with designing water quality monitoring procedures

Support to the U.S. Environmental Protection Agency

(E01) Provide support in the development of oil spill contingency plans and documentation of spill-sensitive resources.

Work under this objective includes providing technical support in the areas of GIS and automation technology in response to EPA requirements. Products include (1) Developing a geographic information system to spatially document sensitive resource areas within EPA Region 5, (2) Providing oil spill responders and the public access to the inland Waterways Spill Response Atlas through printed copy, CD-ROM, and the World Wide Web.



Recognizing the need to balance economic and environmental activities in the UMRS, Congress is currently considering reauthorizing the Long Term Resource Monitoring Program.

Section V - Promoting Quality Science

Peer Review

Peer review is the constructive evaluation of scientific proposals, products, and programs with the intent of ensuring the highest quality science. Peer review is an integral component of all science programs at the Center and all scientific activities are subject to either regular or periodic peer review. The peer review process at the Center conforms to all guidelines of scientific evaluation and review as identified in Department of the Interior, USGS, and BRD guidelines. Procedures for conducting peer review are outlined in a Center Standard Operating Procedure. In addition, an 11-member International Science Review Committee periodically reviews how science is conducted at the Center.

Study Planning and Approval Process

Scientific and organizational standards for development, review, and approval of study plans for research, monitoring, and technical development conducted by the Center and Program personnel are in place at the Center. The objectives of the standard operating procedures are to (1) provide guidelines for development of and approval procedures for research,

monitoring, and technical development study plans; (2) ensure that studies are relevant to the Center's mission and are scientifically, technically, and logistically feasible; and (3) define the roles of the Principal Investigator, Supervisor, Science Advisor, and Center Director in developing and approving study plans.

Monitoring and Spatial Data Processing

The Center has developed standard guidelines to ensure reliability of scientific and technical end products. These standard operating procedures (SOPs) cover all aspects of the Center's Long Term Resource Monitoring and spatial data processing activities. The individual SOP chapters receive peer review to ensure acceptance and high quality of the procedures and practices. Revisions are made as new techniques become known or relevant findings are incorporated into the program.

Evaluating Performance

The Center uses several formal mechanisms for evaluating performance. For instance, an International Science Review Committee has been established to periodically review overall science activities and performance. An interagency management review committee is established to periodically review management activities and ensure program efforts are effectively and efficiently meeting management agency information needs. In addition, the USGS conducts, on a 3-year cycle, reviews of Center administrative, financial, and scientific activities.

A formal system is in place to assess the performance of Federal employees under the Performance Appraisal System. Employees are evaluated by their supervisors during annual performance reviews and their Position



Recreation is a billion dollar industry within the UMRS.

Descriptions are reviewed to ensure they accurately reflect their duties and grade level.

The Center has adopted the Research Grade Evaluation Guide (RGEN) for Federal scientists at the Center. The RGEN is a government-wide grade classification system used to evaluate research projects of federal scientists.

In addition, ongoing evaluations of performance will focus on a balance of quality, productivity, and effect of the individual or team on the work. All BRD scientists, research and nonresearch grade staff, will be evaluated against the following indicators:

Application - The relevance of scientific results and science products to solve real world biological resource management problems.

Timeliness - The ability to consistently finish projects in a timely manner.

Quality - Quality of the science products, including their scope, originality, innovation, and independent recognition of the work.

Effect - The degree to which others might build upon the findings of the science.

Mission - The degree to which the effort supports the Center's mission, including enhancing the credibility and esteem of the USGS.

Rewarding Performance

The Strategic Science Plan for the BRD recognizes the critical importance of evaluating science activities and rewarding scientists, science teams, support staff, and administrators in a fair and consistent manner. Effective implementation of a reward system is an integral part of assuring that the BRD maintains a high quality work force that meets the needs of the resource management community.

Mechanisms for rewarding individual achievements are available at the Center and include the following:



Sediment samples being processed.

On the Spot Award: Used to immediately recognize achievements.

Special Thanks for Achieving Results (STAR) Award: Presented for achieving results that promote DOI programs.

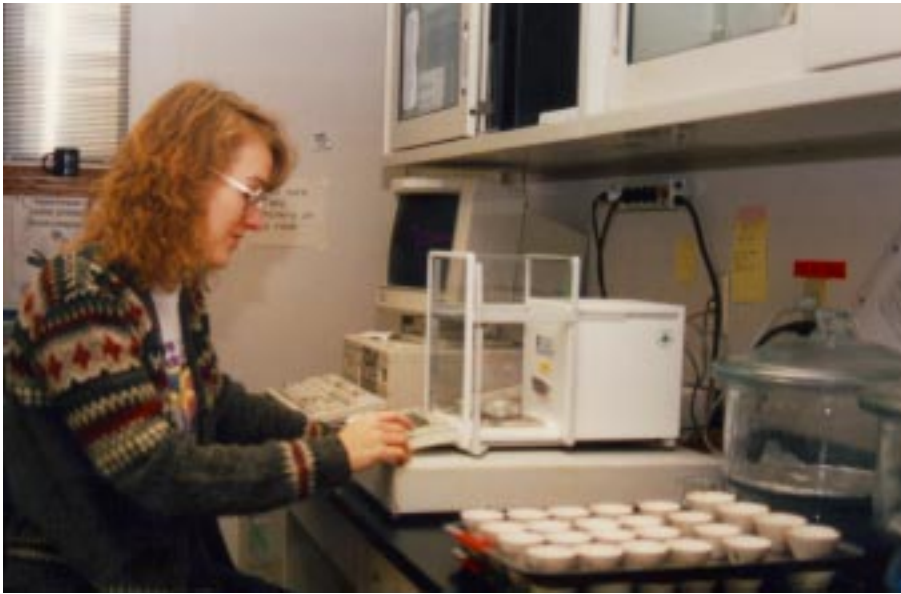
Time Off Recognition: Superior accomplishment of recurring assigned duties; noteworthy accomplishments over a sustained time period; exceptional achievement in project goals; or other specific contributions to the organizations mission.

Quality Step Increase: For sustained exceptional performance in achieving critical results with an expectation of continued high-level performance.

Interior Innovation Award: For reducing costs, reinventing work processes, and improving service to customers.

Suggestion Award: Used to immediately recognize beneficial suggestions.

These awards are presented when specific achievements deserve special recognition, not necessarily on an annual basis. Individuals may be nominated by any staff member. Nominations are approved by the appropriate supervisor and the Center Director.



The Center processes more than 60,000 water samples per year.

views to provide scientific, management, and administrative perspectives on Center effectiveness, weaknesses, and strengths. The reviews were conducted by an International Science Review Committee, an Interagency Management Review Committee, and a USGS Science and Administrative Review Committee. These reviews provided valuable recommendations relating to the general operation and management of the Center. For instance, a 1996 interagency management review team recommended

The Center has instituted a local awards program to further recognize outstanding scientific, technical, and administrative contributions. Excellence awards, including Outstanding Scientist, Outstanding Scientific Support, Outstanding Support, Outstanding Technical Service, Outstanding Customer Assistance, and Outstanding Publication or Product, will be established. An awards committee evaluates nominations based on criteria established for these awards and then forwards its recommendations to the Center Director for final approval.

Assessing Internal and External Environments

The Center will monitor both our internal and external environments on a continuous and systematic basis. This will help us anticipate future challenges and make adjustments so that potential problems do not become crises.

Internal Environment

The Centers internal assessment includes its culture, scientific and management practices, and business processes. The Center uses program evaluations, surveys, independent audits, and reviews of business processes to monitor internal operations.

In 1997, the Center used three comprehensive re-

- preparation of a strategic plan to articulate the Center mission, vision statement, goals, and objectives as a result of greatly expanded work activities at the Center over the past several years;
- provide a simplified “health of the river” report on an annual basis;
- increase the use of information sharing bulletins to expedite program findings to partners; and
- the Monitoring Program should continue beyond the current authorized period of FY2002 with a permanent authorization and cost indexed funds.

Some of the USGS Review Team Recommendations included

- the existing memorandum of understanding between the Department of the Army and Interior be revised with less burdensome interactions between the Army and the Center, including revising the fund transfer assessment levels;
- the Center should expand its mission beyond just the activities of the Monitoring Program to include becoming the data and science integration center for the entire Upper Mississippi River; and
- the Center should adopt and use the USGS Science Information System (SIS) and study proposal process to replace the current annual work planning process.

In addition, a number of the International Science Review findings directly influenced the mission, vision, goals, and objectives outlined in this strategic

plan. The following paragraphs summarize some of these key findings:

- The Center has successfully implemented a monitoring and research infrastructure that is operational and producing results that are relevant to management decision making. Analysis, synthesis, and modeling will become even more important functions for the Center in helping explain and understand reported trend findings.
- The Center has established an excellent information base for current and future decision making. In addition, these capabilities have been achieved by effective cooperation among several Federal agencies and five state partners so solutions to problems spanning several political and administrative units can be undertaken efficiently. The relevancy of the Center's work to important clients and partners is indisputable.
- The Center should consider expanding the scope of their efforts to include scientific modeling of the relationships between human and natural activities in the entire Upper Mississippi River drainage basin as they affect the ecological status of designated river reaches. Conditions in the river cannot be separated from conditions in the drainage basin that sustains it.
- In both organization and geographical focus, the work conducted through the Center is an important demonstration of how regional government responsibilities that transgress administrative

boundaries might effectively be discharged in the future.

- The Center is providing regional and national leadership in the implementation of high technology analytical tools and information management technology. The quality of data management, the availability of the data, and the mechanisms for the electronic transfer and dissemination of information are truly exceptional and a model for such long term data gathering programs.
- The Center's geographic information system (GIS), photo interpretation, and remote sensing efforts are excellent and should be continued. Resource managers and decision makers are finding the GIS maps and models to be of exceptional value to river planning.

External Environment

Assessing the external environment is particularly important, in part because so many forces beyond the Center's immediate influence can powerfully affect chances for success.

Partner Survey

Partners are periodically queried as to the level of client satisfaction with the relevance, quality, timeliness, and utility of Center products and services. Partners are also represented in formal reviews of program progress, quality of science, and relevance to conservation information needs. In 1996 the interagency Management Review Committee conducted a survey of Program partners. That survey concluded that nearly 94 percent of responding individuals believe efforts to implement the congressionally mandated Monitoring Program had been successful and nearly 79 percent of respondents were currently using Monitoring Program products in their activities.

Public Survey

Within the context of the Center's mission, a survey of 2500 individuals of the general public within the UMRB basin was conducted in late 1996 to assay river resource values and expectations. The survey response rate was 60% and the results are considered accurate to +/- 2%.



Center staff have access to up-to-date analytical tools.

Results (for all respondents combined) showed that citizens value and appreciate the Mississippi River in complex ways, and have diverse opinions about how the Mississippi River should be managed in the future. Water quality and pollution were overwhelmingly the biggest concerns held by citizens. Potential management actions related to these issues received the strongest support. Efforts to improve and increase habitat and the aesthetic quality of the River ranked next highest, followed by flood protection measures.

Below are some external forces that may affect or are affecting the Center's ability to succeed

- Public Law 99-662 authorizing the Monitoring Program and Information Management portions of the EMP requires a "Report to Congress" prior to 2002 on recommendations to continue, modify, or terminate the Program. The report is complete and recommends Program continuation and expansion, but authorization is beyond the Center's influence.
- Appropriated funding for the Monitoring Program comes through the U.S. Army Corps of Engineers appropriation process. The Department of Interior currently has no involvement in out-year budget requests. The inability of the USGS to plan for major funding changes causes major disruption in programs.
- The Monitoring Program has resided in three agencies within the Department of the Interior in nine years. The constantly changing administrative and management culture has disrupted science planning



Ecological analysis and resource management activities are supported through the development of spatial databases using state-of-the-art GIS tools.

and implementation in addition to causing poor agency support.

- The Monitoring Program's funds originate in one agency and are passed to another, and often to a third for actually conducting certain monitoring and research activities. Traditional agency assessment policies do not equitably apply in these situations, often resulting in a substantial portion of available funds being consumed in various cost recovery, and other overhead assessments.
- Funding passed from one agency to another seldom has associated personnel allocations, thus creating obstacles and higher costs associated with mission accomplishment.
- Funding levels for the Monitoring Program were established in the early 1980s and never cost indexed, resulting in a constant erosion of mission capabilities that are currently less than 50 percent of those originally planned. Partner expectations however, continue to rise.
- Obtaining agreement on information needs among often competing shareholders is difficult, especially during periods of declining resources.

Aligning Center Activities

The Center uses the results of reviews, surveys, audits, and evaluations associated with both external and internal assessments to align its resources, activities, and core processes to increase its efficiency and effectiveness in support of partner information needs. For example, recommendations of the three recent review committees have been or are being incorporated into the Center's operations. Some of these items include preparation of this strategic plan, completing a "health of the river" report, increasing the publication of Project Status Reports, revising the memorandum of understanding between the Departments of the Army and the Interior, adoption of the USGS Science Information System and Study Proposal Process to replace the present Annual Work Plan process, converting Center scientists to the Research Grade Evaluation Guide, and realigning the Center's organizational structure.

Results of the survey to assess public river resource values and expectations

will assist us in prioritizing Center activities. This process allows us to collect the information needed by management agencies to ensure that public values are met.

Many of the items listed under the external environment section—items that may affect or are affecting the Center’s ability to succeed—are being discussed in various negotiations. These negotiations involve revisions to the memorandum of understanding between the Departments of the Army and Interior; discussions with the Department of Interior’s Inspector General’s Office; and activities taking place within the legislative system.



Field station staff preparing for daily data collection efforts.

Section VI - Implementation Strategies

Administrative Support

All personnel and science study efforts require basic support services (space, equipment, supplies, mail, computing, communications, training, library, travel, payroll, records management, etc.) which are provided as a basic function of the Center. A prorated charge is assessed to each program area to cover the costs associated with these functions. This procedure will continue throughout the term of this strategic plan.

Basic Infrastructure

Existing Center and Field Station infrastructure (boats, motors, trailers, vehicles, sampling gear, laboratory equipment, office equipment, and computer technology) was initially acquired and installed assuming a 10-year Program life. Minor infrastructure adjustments (mostly for safety reasons) were made when the Monitoring Program was extended for five additional years. These vital infrastructure resources are nearing the end of their useful physical and technological life. Near-term efforts will address the need to fund infrastructure refreshment using standard life-cycle management procedures.

Plan Implementation

Included in Appendix B are short (1–2 year) and long term (3–5 year) strategies for implementing this plan. These strategies will be revised as required to account for changes in funding, staffing levels, and operational requirements.

Summary

- The format of this plan is consistent with the planning guidance of USGS and the Government Performance and Results Act of 1993.
- The content of this plan will be reviewed annually and adjusted and supplemented as necessary to reflect a five-year planning horizon.
- This plan provides the basis for the ongoing management of Center scientific and technical activities and serves as the basis for budget planning.
- Supporting documentation identified in this plan will be developed to more fully define specific work activities and to monitor Center accomplishments and performance.

Appendix A

Recommended Long Term Resource Monitoring Program Work Activity Process¹

STEP 1 - Draft list of recommended work activities are developed jointly with Long Term Resource Monitoring Program Partners (Environmental Management Program Coordinating Committee including the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin), Environmental Management Program Coordinating Committee Analysis Team, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, etc. and submitted to U.S. Army Corps of Engineers, Mississippi Valley Division for review and evaluation.

STEP 2 - U.S. Army Corps of Engineers, Mississippi Valley Division reviews and approves Draft Work Activity List and provides guidance on priorities.

STEP 3 - Environmental Management Technical Center and the U.S. Army Corps of Engineers, Mississippi Valley Division develop Final Recommended Work Activity List including priorities and probable products.

STEP 4 - Environmental Management Technical Center prepares Study Concept Proposals for Final Work Activity list items and provides these to Mississippi Valley Division.

STEP 5 - Final Recommended Work Activity List and companion Study Concept Proposals with information on priorities and probable products is distributed to Long Term Resource Monitoring Program Partners for review and comment.

STEP 6 - U.S. Army Corps of Engineers, Rock Island District and the Environmental Management Technical Center modifies final list, priori-

ties, and products (Based on input from the Long Term Resource Monitoring Program Partners) as necessary and submits to the U.S. Army Corps of Engineers, Mississippi Valley Division for evaluation, review, and approval.

STEP 7 - Environmental Management Technical Center prepares detailed scopes of work² and the Annual Performance Plan which include, products, schedule, and cost estimates based on final activity list and study concept proposals

STEP 8 - Annual Performance Plan is distributed to Long Term Resource Monitoring Program Partners for review and comment

STEP 9 - U.S. Army Corps of Engineers, Mississippi Valley Division and the Environmental Management Technical Center make final adjustments necessitated by comments received in Step 8.

STEP 10 - U.S. Army Corps of Engineers, Mississippi Valley Division reviews and approves Annual Performance Plan.

STEP 11 - Environmental Management Technical Center executes Annual Performance Plan, and the U.S. Army Corps of Engineers, Rock Island District and Program Partners monitor Annual Performance Plan execution.

STEP 12 - Environmental Management Technical Center prepares and distributes Annual Performance Report which reviews the Center's success in achieving the performance goals for the fiscal year.

¹ The identified steps are not intended to articulate internal agency actions relating to the Work Activity Process.

² Detailed scopes of work are only prepared for new starts. Ongoing studies already have detailed scopes of work.

Appendix B

Implementation Strategies

Underlying Assumptions

Both the short term (1-2 year) and longer term (3-5 years) implementation strategies assume that:

- 1) the fiscal year (FY) 1999–2002 appropriated funding levels do not fall below the proposed FY 1999 level for the Monitoring Program (\$5.618 million),
- 2) the current Report to Congress recommendations are authorized by the end of the 5-year planning horizon with increasing appropriation levels,
- 3) agency assessments are appropriately applied and used and do not exceed FY 98 levels,
- 4) The Center will continue to expand the spatial and temporal scales of data by leveraging external funding and by using cooperative approaches,
- 5) should funding levels during the 5-year planning horizon fall below the proposed FY 1999 levels and/or reauthorization does not occur, the USGS will work with partners to restructure the Monitoring Program to optimally fit the fund allocation, and
- 6) extramural funding associated with non-LTRMP but related projects (e.g. GAP Analysis, National Park Mapping, EPA Oil Pollution Control Act, and HREP Studies) will continue at or above existing levels.

Short Term (1-2 years) Implementation Strategy

- 1) Complete a revised Monitoring Program work priority process in conjunction with partner agencies.

- 2) Coordinate with the Environmental Management Program Coordinating Committee the development of a charter for the Monitoring Program's Analysis Team that clearly articulates member roles and responsibilities.
- 3) Complete a revision of the existing Memorandum of Understanding between the Department of Army (DOA) and the Department of Interior (DOI) to reflect current and revised roles and responsibilities.
- 4) Fill critical Center staff shortages as articulated in the Center's Position Management Plan.
- 5) Fully implement the USGS study planning process. This will include preparing study plans to cover the 5-year planning horizon for each of the priority objectives listed in this Plan.
- 6) Fully implement the USGS Science Information System (SIS) to provide electronic access to all Center studies.
- 7) Participate in developing a USGS Center (EMTC/UMSC) merger plan.
- 8) Fully implement any remaining review committee(s) recommendations.
- 9) Complete a statistical review of the Long Term Resource Monitoring Program data. This review will serve as a guide for potential changes in monitoring program data collection.
- 10) Apply remaining unexpended FY 1995 and FY 1996 Monitoring Program funds to initiation of a Habitat Needs Assessment (HNA).

- 11) Assist in completing a Habitat Needs Assessment.
- 12) Seek full restoration of any past excess assessments.
- 13) Develop individual plans with each Monitoring Program field station to expand the level of applied research and to encourage increasing the educational level requirements of certain field station staff to facilitate additional analysis and research capabilities.
- 14) Ensure Monitoring Program field station study and research activities are included in the USGS Science Information System.
- 15) Implement revised DOA to DOI Monitoring Program fund transfer by use of Department of Treasury Standard Form 1151 instead of the currently used Department of Defense Form 448.
- 16) Continue to seek extramural funding for projects that are consistent with identified center mission and objectives.

Longer Term (3-5 years) Implementation Strategies

- 1) Acquire additional critical staff positions as articulated in the Center's Position Management Plan.
- 2) Make changes in Monitoring Program data collection efforts as appropriate.
- 3) Implement any authorized Report to Congress recommendations.
- 4) Apply any restored assessment funds to Monitoring Program equipment replacement and priority data analysis and research efforts.
- 5) Continue to implement priority strategic plan objectives based on scopes-of-work covering the 5-year planning horizon.
- 6) Continue implementing Center merger plan.
- 7) Continue to seek extramural funding for projects that are consistent with identified center mission and objectives.

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