

**Long Term Resource Monitoring Program
Scope of Work–FY2004**

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TOTAL LTRMP FUNDING	\$ 4,397.9	

Aquatic Vegetation Component

The objective of the LTRMP Aquatic Vegetation Component is to collect quantitative data on the distribution and abundance of aquatic vegetation in the UMRS for the purpose of understanding its status, trends, ecological functions, and responses to natural disturbances and anthropogenic activities. Data are collected within five LTRMP study reaches in the UMRS (Pools 4, 8, 13, and 26 on the Upper Mississippi River and the La Grange Pool on the Illinois River). Data entry, quality assurance, data summaries, standard analyses, data serving, and report preparation occur under standardized protocols.

Methods

Aquatic vegetation sampling will be conducted following the LTRMP aquatic vegetation standard sampling protocol (Yin et al. 2000). Three thousand and fifty sites will be surveyed in FY04, including 650 in Pool 4, 650 in Pool 8, 650 in Pool 13, 550 in Pool 26, 550 in La Grange Pool (Table 1). The presence/absence and abundance of aquatic plant species at each site will be measured and recorded. Pool-wide estimates of abundance and percent frequency of occurrence will be derived by pooling data over all strata.

The Web-based Annual Component Update shall contain a summary of aquatic vegetation data collected in 2003.

The final draft version of the multi-year synthesis report on aquatic vegetation monitoring data will be completed and include a discussion on the results from the 2002 outpool sampling. Monitoring data from 1991 to 2002 will be used to describe the status and trends of aquatic vegetation resources in the UMRS for each of the five study areas (Pools 4, 8, 13, 26, and La Grange Pool).

Products and Milestones

Products	Milestones
Complete data entry, QA/QC of 2003 data; 1250 observations.	30 December 2003
Submit final draft LTRMP report titled: "A multi-year synthesis of aquatic vegetation data from 1991 to 2002 for the Long Term Resource Monitoring Program on the Upper Mississippi River" to COE and USGS.	1 July 2004
Submit final draft of WEB-based annual Component Update with 2003 data to COE and USGS.	30 July 2004
Complete aquatic vegetation sampling for Pools 4, 8, 13, 26, and La Grange Pool (Table 1)	31 August 2004

Personnel

Dr. Yao Yin will be the principal investigator.

Literature Cited

Yin, Y., J. S. Winkelman, and H. A. Langrehr. 2000. Long Term Resource Monitoring Program procedures: Aquatic vegetation monitoring. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin. April 2000. LTRMP 95-P002-7. 8 pp. + Appendixes A–C.

Fisheries Component

The objective of the LTRMP Fisheries Component is to collect quantitative data on the distribution and abundance of fish species and communities in the UMRS for the purpose of understanding resource status and trends, ecological functions, and response to natural disturbances and anthropogenic activities. Data are collected within six LTRMP study reaches in the UMRS (Pools 4, 8, 13, 26, and Open River Reach on the Upper Mississippi River and La Grange Pool on the Illinois River). Data entry, quality assurance, data summaries, standard analyses, data serving, and report preparation occur under standardized protocols (Gutreuter et al. 1995; Ickes and Burkhardt 2002).

Data analysis and modeling, initiated in FY02, including work by the fish ecology team, exotic species team, and life history team, will continue in FY04 and staff will produce reports and manuscripts.

Methods

Fish sampling will be conducted following the LTRMP study plan and standard protocols (Gutreuter et al. 1995), as modified in 2002 (Ickes and Burkhardt 2002). Species abundance, size structure, and community composition and structure will be measured over time. Between 250 and 400 samples will be collected in each study area (Table 1). Sample allocation will be based on a stratified random design, where strata include contiguous backwaters, main channel borders, main channel wingdams, impounded areas, and secondary channel borders. Tailwaters in the impounded reaches and tributary mouths in the Open River will be sampled under a fixed site design. Sampling effort will be allocated independently and equally across 3 sampling periods (June 15–July 31; August 1–September 15; September 16–October 31) to minimize risks of annual data loss during flood periods and to characterize seasonal patterns in abundance and habitat use. Pool-wide estimates of abundance will be derived by pooling data over all strata.

The Web-based Annual Component Update shall contain a summary of fisheries data collected in 2003.

The final draft version of the multi-year synthesis of fisheries monitoring data will be completed. Monitoring data from 1993 to 2002 will be used to describe the status and trends of key fishery resources in the UMRS for each of the six study areas.

In addition to standard monitoring products, we will submit several additional products based on multi-year analyses begun in FY2002. Specific products are briefly described below:

- Spatial structure and temporal variation of fish communities in the Upper Mississippi River— This study will be an integrative study that explores inter-annual variation in fish community structure and correlates patterns to annual hydrology and vegetation presence and abundance. Our work will include methods development for a multi-gear index of community structure that can be used within a reach through time. We will investigate shifts in community structuring patterns 1993 through 2002 and relate these shifts to fish component vegetation observations, vegetation component data, and annual hydrology.
- Non-native fishes in the UMRS—This work will synthesize LTRMP data and peer-reviewed literature sources on 14 non-native fish taxa that have been collected in LTRMP monitoring efforts between 1989 and 2002. Information on native range and biology, introduction pathways, distributions in and across LTRMP study reaches, habitat and gear associations, species associations, trends in abundance, and ecological and economic impacts will be discussed.

Products and Milestones

Products	Milestones
Complete data entry, QA/QC of 2003 fish data; ~1,590 observations	1 April 2004
Submit final draft LTRMP report titled: "A ten-year synthesis of fisheries data from 1993 to 2002 for the Long Term Resource Monitoring Program on the Upper Mississippi River" to COE and USGS.	1 June 2004
Submit final draft of WEB-based annual Component Update with 2003 data to COE and USGS.	30 August 2004
Submit final draft LTRMP report titled: "Spatial structure and temporal variation of fish communities in the Upper Mississippi River" to COE and USGS.	1 August 2004
Submit final draft LTRMP report titled: "Non-native fishes in the Upper Mississippi River System: A Synthesis of Information from the Long Term Resource Monitoring Program" to COE and USGS.	1 August 2004
Complete fisheries sampling for Pools 4, 8, 13, 26, the Open River Reach, and La Grange Pool (Table 1)	30 September 2004

Personnel

Mr. Brian Ickes will be the principal investigator.

Literature Cited

- Gutreuter, S., R. Burkhardt, and K. Lubinski. 1995. Long Term Resource Monitoring Program procedures: Fish monitoring. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1995. LTRMP 95-P002-1. 42 pp. + Appendixes A–J
- Ickes, B. S. and R. W. Burkhardt. 2002. Evaluation and proposed refinement of the sampling design for the Long Term Resource Monitoring Program's fish component. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin, October 2002. LTRMP 2002-T001. 17 pp. + Appendixes A–E. CD-ROM included. (NTIS #PB2003-500042)

Macroinvertebrate Component

The objective of the LTRMP Macroinvertebrate Component is to collect quantitative data on the distribution and abundance of select macroinvertebrates in soft substrate in the UMRS for the purpose of understanding resource status and trends, ecological functions, and response to natural disturbances and anthropogenic activities. Data are collected within five LTRMP study reaches in the UMRS (Pools 4, 8, 13, and 26 on the Upper Mississippi River and La Grange Pool on the Illinois River). Data entry, quality assurance, data summaries, standard analyses, data serving, and report preparation will occur.

Methods

Macroinvertebrate sampling will be conducted, following the LTRMP study plan and standard protocols (Thiel and Sauer 1999). Benthic macroinvertebrates will be sampled by Ponar dredge and screened (1.18 mm) in the field. Approximately 125 macroinvertebrate samples will be collected in each study area (Table 1). Sample allocation will be based on a stratified random design, where strata include contiguous backwaters, main channel borders, impounded areas, secondary channels, and tributary delta lake. All sites will be sampled in spring to characterize the benthic community before the emergence of adult mayflies. Pool-wide macroinvertebrate densities will be derived by pooling data over all strata.

The final draft version of the multi-year synthesis of macroinvertebrate monitoring data will be completed. Monitoring data from 1992 to 2002 will be used to describe the status and trends of select macroinvertebrate resources in the UMRS for each of the six study areas.

The final draft version of the evaluation of the Macroinvertebrate Component will be completed. Data from a Web-based survey and workshop of resource managers will be compiled to assess general support and identify issues or concerns about the component.

Products and Milestones

Products	Milestones
Submit final Web-based annual Component Update with 2003 data to COE and USGS	30 October 2003
Submit final draft report titled: "Multi-year Synthesis of the Long Term Resource Monitoring Program's Macroinvertebrate Component (1992-2002)" to COE and USGS.	1 June 2004
Submit final draft report titled: "Evaluation of the Long Term Resource Monitoring Program's Macroinvertebrate Component" to COE and USGS.	15 June 2004
Complete macroinvertebrate sampling for Pools 4, 8, 13, 26, and La Grange Pool (Table 1)	30 June 2004
Complete data entry, QA/QC of 2004 data. (~625 observations)	1 September 2004

Personnel

Ms. Jennifer Sauer will be the principal investigator.

Literature Cited

Thiel, P. A. and J. S. Sauer. 1999. Long Term Resource Monitoring Program Procedures: Macroinvertebrate monitoring. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin, Revised May 1999. LTRMP 95-P002-2 (Revised 1999). 7 pp. +Appendixes A-H

Water Quality Component

The objective of the LTRMP water quality component is to obtain basic limnological information required to (1) increase understanding of the ecological structure and functioning of the UMRS, (2) document the status and trends of ecological conditions in the UMRS, and (3) contribute to the evaluation of management alternatives and actions in the UMRS.

Data are collected within six LTRMP study reaches in the UMRS (Pools 4, 8, 13, 26, and Open River Reach on the Upper Mississippi River and La Grange Pool on the Illinois River). Data entry, quality assurance, data summaries, standard analyses, data serving, and report preparation occur under standardized protocols (Soballe and Fischer in press).

Methods

Limnological variables (physicochemical characteristics, suspended solids, chlorophyll *a*, phytoplankton [archived], and major plant nutrients) will be monitored at both stratified-random sites (SRS) and at fixed sampling sites (FSS) according to LTRMP protocols. The sampling allocation will be the same as FY02 beginning 1 April 2004.

Fixed site sampling

LTRMP water quality fixed site sampling for FY2004 from 1 October 2003 through 31 March 2004 will remain at the same sites and effort level conducted in FY2003 (4-week intervals at major tributary inflows and selected main-channel sites in Pools 4, 8, 13, 26, and La Grange. In the Open River Reach, NASQAN sampling near Grafton, Illinois, will substitute for main-channel sampling by LTRMP). Beginning 1 April 2004, fixed site sampling will be increased to levels conducted in FY2002 (2-week intervals at all FY2002 fixed sites).

Stratified random sampling

Stratified random sampling will be conducted at full effort levels for winter, spring, and summer episodes. SRS will not be conducted in fall 2003.

In situ data collection

For both FSS and SRS *in situ* data will be collected on physicochemical characteristics per the standard protocols (Soballe and Fischer in press).

Laboratory analyses

Samples for laboratory analysis will be collected at all fixed sites and at approximately 35% of all stratified random sampling locations as specified in the sampling design. Sampling and laboratory analyses will be performed following LTRMP protocols (Soballe and Fischer in press) and Standard Methods (American Public Health Association 1992). For water samples collected from 1 October 2003 through 31 March 2004, laboratory analyses will consist of total nitrogen, total phosphorus, chlorophyll, and total and volatile suspended solids. Beginning 1 April 2004, analyses will be expanded to add dissolved N, dissolved P, ammonia N, and silica. Thus, in FY2004 we will not collect data on major cations and anions in water samples.

A Web-based Annual Report shall contain a summary of limnological data collected in 2003.

The final draft version of the multi-year synthesis of limnological monitoring data will be completed. Monitoring data from 1993 to 2001 will be used to describe the status and trends of limnological variables in the UMRS for each of the six study areas (Pools 4, 8, 13, 26, Open River Reach, and La Grange Pool).

Products and Milestones

Products	Milestones
Complete calendar year 2003 fixed-site water quality sampling	31 December 2003
Complete data entry, QA/QC of 2003 fixed-site data; ~1,060 observations.	30 May 2004
Submit final draft LTRMP report titled: "A multi-year synthesis of limnological data from 1993 to 2001 for the Long Term Resource Monitoring Program on the Upper Mississippi River" to COE and USGS.	15 July 2004
Submit first draft of Web-based annual report with 2003 data for review.	15 September 2004
Complete fixed site and SRS sampling for Pools 4, 8, 13, 26, Open River, and La Grange Pool (Table 1)	30 September 2004

Personnel

Dr. Jeff Houser will be the principal investigator.

Literature Cited

American Public Health Association, American Water Works Association, and Water Environment Federation. 1992. Standard methods for the examination of water and wastewater. 18th edition, American Public Health Association, Washington, D.C. 981 pp. + 6 color plates

Soballe, D. M., and J. R. Fischer. In press. Long Term Resource Monitoring Program Procedures: Water quality monitoring. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin, February 2004. LTRMP 2004-T001-1 (Ref. 95-P002-5). 73 pp. + Appendixes A-J.

Statistical Evaluation of Monitoring Data

This scope ensures statistical support to LTRMP personnel for analysis, synthesis, and modeling of LTRMP and other UMRS data. These efforts, by multiple investigators, yield status and trend estimates and potential insights into functional relations between biological outcomes and habitat conditions. In FY2004, LTRMP is also interested in exploring potential refinements to sampling designs to allow inferences on unsampled pools and at scales larger than pools.

Most of the work for this section is incorporated within the individual component sections of the budget. However, leadership needs in the development of analyses for the program as a whole and for restructuring are best managed as a separate entity in coordination with the “Assessment of Program Structure” scope. The individual analyses for specific components are a means to an end. Integrated information will be reported by individual components or the group as a whole as in cross-component analyses and/or in guidance for restructuring. This statistical support is viewed as requiring neither separate reports for each analysis nor a final report of analyses. Therefore, the LTRMP statistician leads/oversees analyses regarding restructuring and reports regularly to the LTRMP Management Team and the Planning Team in a myriad of ways (e.g., presentations to EMPCC, A-Team, Status and Trends, individual component reports, summary reports, etc.).

Methods

Statistical guidance will be provided to LTRMP investigators at appropriate stages of study planning, execution, and summarization throughout the year. Statistical contributions will include assistance with project planning, review of study plans, evaluation of proposed and existing sampling designs, and guidance on issues associated with statistical estimation, hypothesis testing, and modeling. All statistical analyses will be performed using standard methods or methods developed specifically for this program.

Products and Milestones

Products	Milestones
Provide statistical consultation and analyses to individual components and LTRMP management.	Ongoing

Personnel

Dr. Brian Gray will be the principal investigator.

Status and Trends Report

Communication is a cornerstone of the LTRMP. We must communicate the accomplishments of the program to partners, customers, decision makers, politicians, and the general public in a way that is simple and effective and that makes the program relevant to their needs. Each LTRMP project communicates its results in some form, which yields a variety of products available through various outlets. The program needs a single product that summarizes and highlights its accomplishments in a format that is easy to read and widely available.

Methods

An outline for the Status and Trends Report will be developed. Examples of topics to be included are a synthesis of monitoring efforts, applied research results, analyses, GIS tools and products, unusual or newsworthy events, lessons learned, efficiencies gained, substantive changes in operation/organization, updates to long-term ecological trends, and examples of how LTRMP information is making a difference. The aim will be to report accomplishments in an informative manner that relates science to management. We will concentrate primarily on system-level information, although noteworthy accomplishments at smaller scales will be included.

Products and Milestones

Products	Milestones
Develop outline of Status and Trends report	30 September 2004

Personnel

Dr. Leslie Holland-Bartels, Dr. Patricia Heglund, Dr. Barry Johnson, Ms. Linda Leake, and Dr. Bob Gaugush will be the principal investigators responsible for the LTRMP Status and Trends Report.

Processing of Land Cover/Land Use Data

An important aspect of the LTRMP has been to develop spatial data relating to land cover and use within the UMRS. LTRMP study activities rely heavily upon Geographic Information Systems (GIS) and remote sensing technologies to manage and analyze spatial datasets of varying sizes and types. This scope includes the continuation and completion of the 2000 Land Cover/Land Use GIS database for the Upper Mississippi River System.

Methods

Aerial photographs of the entire UMRS were taken in color infrared (CIR) at a scale of 1:24,000 in the late summer of 2000. These aerial photos will be interpreted using a 31-class LTRMP vegetation classification. Year 2000 LCU GIS databases will be prepared by or under the supervision of competent and trained professional staff using documented standard operating procedures and will be subject to rigorous quality control (QC) assurances (NBS 1995). All LCU datasets will be provided in NAD27 and NAD83 and in both Zones 15 and 16, where necessary.

Products and Milestones

Products	Milestones
Complete 2000 LCU for Pools 1–3.	31 March 2004
Complete 2000 LCU for the lower Minnesota and St. Croix Rivers	30 June 2004
Complete 2000 LCU for the upper Illinois River pools (Starved Rock to Lockport).	31 August 2004

Personnel

Dr. Kirk Lohman and Mr. Larry Robinson will be the principal investigators.

Literature Cited

National Biological Service. 1995. Standard operating procedures for spatial data processing. Report No. 95-P008. Environmental Management Technical Center, Onalaska, Wisconsin.

Assessment of Program Structure

Background

There are concerns that the LTRMP is a program encumbered by fixed costs that could not cover inflation or changing salary and operational costs. Over the last 5 years, decisions on program direction have increasingly been made on an annual basis, constrained by what could be accomplished given existing infrastructure and staffing patterns. Thus the resulting program has slowly evolved in a direction that may or may not be the strategic choice of individual partners or the partnership as a whole. The USGS together with the Corps of Engineers (COE) proposed that LTRMP's financial history and present Federal budget status is telling of at least its short-term, 5-year, future:

- The Program has averaged ~\$5 million annually over the last decade.
- It took 6 years (1986-1992) for appropriations to reach the original full authorization level;
- In large part due to Federal budget constraints, savings and slippage within the construction general budget category of the USACE has increased: —7% 1999, 16% 2000-2003, 22% 2004— and is unlikely to decrease in the foreseeable future.

Thus, it is appropriate for the partnership to plan for reduced funding in LTRMP for at least the next 5 years. The USGS and the COE recommended that the upcoming months be used to define and consider alternatives for a redesigned, balanced LTRMP; a program that could operate successfully under a static budget. The EMPCC supported these intentions and requested that USGS keep them informed as planning for FY05 and beyond proceeds under a restricted budget scenario. To begin this process, USGS and COE will conduct an assessment of the current program structure and partnership values with the following objectives in mind:

Objectives

1. Document for each partner their perspectives on critical elements required within a long-term monitoring effort of the UMR, including their perspective as to what components and what level of spatial inference, data analyses, data serving, product generation, etc. are needed.
2. Define level of confidence needed from the desired datasets to support and inform management actions (e.g., a 5% decline per year sustained over 5 years, 10 years?).
3. Determine and prioritize what is valued by the partners but might not fit into a smaller program box.
4. Define and describe the current program structure.
5. Define and describe the consequences of data losses resulting from changes in sampling and define the lost opportunities that could not be accomplished under a constrained budget.
6. Synthesize information, provide clear documentation, and develop potential program alternatives in a report provided to USGS and COE.
7. Based on this report, the partnership, lead by USGS and the COE, will develop a strategic plan for the program.

The process

In January 2004, a team was established, lead by Dr. Patricia Heglund from UMESC and includes Mr. Marvin Hubbell, COE, and Mr. Rick Frietsche, who is on developmental detail to LTRMP. Mr. Tom Boland, State of Iowa, has graciously agreed to provide historical documentation on the program to the team. The team will then continue to gather the information outlined in the objectives listed above. This information will be synthesized in a report provided to USGS and COE, who in turn will bring it before the partners for further consideration. The report will include information on the desired components and their priorities, spatial coverage, expected outcomes and products of the individual States and Federal agency partners. From this information, the team will form a series of draft program alternatives and provide supporting documentation on the benefits and consequences of each alternative. The full report, including potential alternatives, will be provided to the partnership by USGS and COE.

Products and Milestones

Products	Milestones
Structural Assessment Team organized	January 2004
Team begins fact finding mission	March 2004
1. Survey of partner values	
2. Summaries of relevant research and monitoring findings	
3. Infrastructure details	
Develop alternatives based on results from fact finding mission	April 2004
1. Provide final draft report to USGS and COE	
Partnership meeting to discuss alternatives	May 2004
Present results of final plan to EMPCC	May 2004

Personnel

Dr. Leslie Holland-Bartels, Dr. Patricia Heglund, and Mr. Rick Frietsche will be the principal investigators.

Definitions

Final draft: The report is completely through the USGS review/revision process and is ready to go to the UMESC editorial group for production. It will also be sent to the COE at that time as a final draft for their use.

First draft: A draft that has been reviewed by a UMESC Branch Chief and is ready for review by USGS, COE, A-Team, or blind review, as needed.

Complete data entry, QA/QC ...: All QA/QC corrections are completed and the data have final approval from the Component Specialist to be promoted to the public database.

Table 1. LTRMP sample collection for FY04.

Component	Study Area					
	4	8	13	26	La Grange	Open River
Vegetation	650 stratified random sample sites over growing season.	650 stratified random sample sites over growing season.	650 stratified random sample sites over growing season.	550 stratified random sample sites over growing season. ¹	550 stratified random sample sites over growing season. ¹	N/A
Fisheries ²	250 samples; 3 periods over summer, 6 sampling gears. Mix of stratified random and fixed sample sites.	270 samples; 3 periods over summer, 6 sampling gears. Mix of stratified random and fixed sample sites.	300 samples; 3 periods over summer, 6 sampling gears. Mix of stratified random and fixed sample sites.	275 samples; 3 periods over summer, 6 sampling gears. Mix of stratified random and fixed sample sites.	400 samples; 3 periods over summer, 6 sampling gears. Mix of stratified random and fixed sample sites.	220 samples; 3 periods over summer, 6 sampling gears. Mix of stratified random and fixed sample sites.
Macroinvertebrates	125 stratified random and fixed sample sites in spring.	125 stratified random and fixed sample sites in spring.	125 stratified random and fixed sample sites in spring.	125 stratified random and fixed sample sites in spring.	125 stratified random and fixed sample sites in spring.	Not sampled ³
Water Quality ⁴	135 stratified random sites done in each episode (winter, spring, and summer); 22 fixed sites during fall 2003 and 24 fixed sites during 2004 (mix of biweekly and monthly)	150 stratified random sites done in each episode (winter, spring, and summer); 13 fixed sites during fall 2003 and 18 fixed sites during 2004 (mix of biweekly and monthly)	150 stratified random sites done in each episode (winter, spring, and summer); 10 fixed sites during fall 2003 and 26 fixed sites during 2004 (mix of biweekly and monthly)	121 stratified random sites done in each episode (winter, spring, and summer); 14 fixed sites during fall 2003 and 21 fixed sites during 2004 (mix of biweekly and monthly)	135 stratified random sites done in each episode (winter, spring, and summer); 11 fixed sites during fall 2003 and 13 fixed sites during 2004 (mix of biweekly and monthly)	150 stratified random sites done in each episode (winter, spring, and summer); 0 fixed sites during fall 2003 and 9 fixed sites during 2004 (mix of biweekly and monthly)

- Continued sampling of these two pools will be evaluated in 5-years (FY08) as per our discussion and pre-proposal by John Chick in FY2003 to assess the application of the existing protocol to these pools and the development of a modification to the approach if warranted. In FY2003, sampling did occur in these pools under drought conditions and was funded by the State of Illinois.
- Protocol last modified in FY2002 with fishery design change (Ickes and Burkhardt 2002).
- Protocol revised in FY2001 terminating invertebrate collections. Missouri developing recommended protocol for more effective assessment of macroinvertebrates in the Open River Reach.
- During fall 2003, water quality sampling will remain at the reduced levels used during FY2003 and stratified random sampling will not be conducted. This is necessary to allow the water quality laboratory and field stations to allow gearing up for full, standard sampling to begin in January 2004.