LTRMP-Scope of Work
Fiscal Year 2003

2 MONITORING AND ANALYSIS

2.1 Vegetation Component

As core activity in FY03, the Vegetation Component of the LTRMP will conduct data analyses and complete two reports – the annual report of vegetation sampling conducted in 2002 and a 10-year report that includes the results from outpool sampling conducted in 2002. Expected funding ranges for LTRMP in FY03 will result in minimal collection of vegetation monitoring data in 2003.

In addition, we will investigate potential options and provide recommendations for restructuring monitoring designs in FY04 and beyond.

Objectives

1. Complete data entry, analyses, and reporting of vegetation data collected in FY02.
2. Conduct limited sampling of submersed aquatic vegetation in Pools 8 and 13.
3. Complete a 10-year report including results from outpool sampling conducted in 2002.
4. Conduct discussions and analyses as needed to support restructuring of the component and program and provide recommendations.

Methods

Objective 1. To process the sampling data collected in FY02. Data QA/QC and reporting will follow protocols and formats established in previous years.

Objective 2. Sampling will be conducted using the standard LTRMP procedures described in Yin et al. (2000). We will sample 400 and 410 sites in Pools 8 and 13, respectively, in the impounded and backwater strata. This will allow us to continue the tracking of a distinct pattern of a decline in submersed aquatic vegetation in Pool 8 and a distinct pattern of an increase of submersed aquatic vegetation in Pool 13 from 1998 to 2002. Also, continuation of Pool 8 SAV sampling allows evaluation of drawdown effects.

Objective 3. This task is to provide a synthesis of findings of the LTRMP submersed aquatic sampling from 1991 to 2002, including data from key pools and outpools. The information will be used to guide future sampling design of the vegetation component.

Objective 4. This task is reserved for providing scientific and technical input in support of the restructuring of the LTRMP.

Products

1. Complete data entry, QA/QC of 2002 SAV data, and vegetation component annual report.
2. Collect one increment of data for the impounded and contiguous backwaters of Pools 8 and 13.
3. Create a 10-year report of LTRMP vegetation monitoring and out-pool sampling.

Milestones

December 1, 2002 – Complete year 2002 aquatic vegetation data quality checking and entry into the LTRMP database.
January 15, 2003 – Complete statistical analyses of year 2002 aquatic vegetation data.
February 15, 2003 – Complete DRAFT year 2002 Aquatic Vegetation Monitoring Section of the LTRMP year 2002 Summary Report.
March 30, 2003 – Complete FINAL year 2002 Aquatic Vegetation Monitoring Section of the LTRMP year 2002 Summary Report.
April 15, 2003 – Complete DRAFT 10-year report including outpool sampling results.
June 30, 2003 – Final submission of the 10-year and outpool sampling report.
September 1, 2003 – Complete field sampling in Pools 8 and 13.

Personnel

Dr. Yao Yin will be the principal investigator in charge of LTRMP vegetation monitoring.

2.2 Fisheries Component

Expected funding ranges for LTRMP in FY03 will result in reduced collection of fisheries monitoring data in 2003. In FY03, the fisheries component will collect data from Pools 8, 13, and 26 to continue a data string in at least one location within the upper and lower sampling reaches and to support Asian carp research initiatives. Collections will be made under LTRMP standard protocols, but will be limited to day electrofishing during period 3 (Sept 15–Oct 31, 2003).

In FY03, we will conduct data analyses and complete two reports – the annual report of fish sampling conducted in 2002 and a summary report of synoptic fish information collected from 1993 to 2002 (Fish Component 10-year report). We will also continue analyses begun in FY02 on relations of fish with other habitat and biotic variables.

In addition, we will investigate potential options for restructuring monitoring designs in FY04 and beyond. We will analyze LTRMP fisheries data from a community perspective including defining fish assemblages associated with different habitats and identifying key species within those assemblages. We will also analyze the information obtained by sampling fish during period 3 only.

Objectives

Objective 1. Finish collection and analyses of fish data in six LTRMP pools for 2002. Complete field sampling for FY03 in Pools 8, 13, and 26; period 3, electroshocking gear only.

Objective 2. Analyses of monitoring data.
   a. Develop a 10-year synoptic report of fisheries in the UMRS based on data from LTRMP sampling.
   b. Model relations between fish metrics and physical and chemical predictor variables.
   c. Analyze LTRMP fish component data from a community perspective, including basic community metrics, different fish assemblages associated with different habitat features, and identification of key species within those assemblages.
   d. Assess the information obtained using LTRMP fish component sampling from the third period only (September 15 – October 31).

Methods

Objective 1. Refer to Gutreuter et al. (1995) for a detailed description of the stratified random sampling protocol and to Ickes and Burkhardt (2002) for sampling design modifications implemented in 2002.

Objective 2. We will compile a ten-year synoptic report using data collected from the LTRMP fish component from 1993–2002. Monitoring data from 1993 to 2002 will be used to describe the status and trends of key fishery resources in the Upper Mississippi River System (UMRS) for

each of the six study reaches in the LTRMP and to synthesize observed patterns across the six study reaches and through time. The central goal of this effort will be to establish diagnostic benchmarks for fish populations. Future monitoring data can be compared against these benchmarks to identify resource management issues and develop scientific hypotheses to investigate the causes of observed trends or changes.

Analyses begun in FY02 to model relations between fish metrics and physical and chemical predictor variables were viewed as a multi-year effort and will continue in FY03. The analysis of spatial and temporal variance structure in fish metrics was substantially completed in FY02. We will finish those efforts, then look for explanatory factors operating at similar scales and begin developing integrated models to predict changes in fish abundance. Data sources external to the fish component will be canvassed for likely explanatory variables, and then appropriate species-specific datasets will be derived. Potential sources of auxiliary data include complementary LTRMP component data (vegetation, water quality, invertebrates), UMRS spatial data (raw bathymetry, land-use/land-cover, aquatic area data, spatially derived metrics such as shoreline development indices), and data from other agencies (e.g., USACE hydrologic data, NOAA climatologic data).

Questions such as "What habitat characteristics are associated with diverse fish assemblages?" and "Have recent exotic species introductions in the UMRS altered fish community structure?" are examples of basic research questions that have significant applied management consequences. We will investigate such questions by framing them in a fish community context.

Under expected funding levels in FY03, resource monitoring will be reduced. At their November 2003 meeting, the A-Team forwarded a suggestion that we investigate the consequences of restricting fish monitoring to Period 3 (September 15 – October 31). We will review analyses and reports from the past several years to investigate the information produced by sampling in Period 3 only.

Products

1. Process fish samples, complete data entry, QA/QC of 2002 fisheries data, and fisheries component annual report.
2. Collect one increment of data for Pools 8, 13, and 26 using day electrofishing during Period 3.
3. Develop standardized 10-year databases and analytical modules for analyzing 1993 to 2002 LTRMP fish data and disseminate to each field station.
4. Create a 10-year report of LTRMP fish monitoring.
5. Statistical models relating fish population and community metrics to various habitat metrics.
6. Develop a technical report based on the findings from multivariate analyses of UMRS fish communities.

Milestones
November 30, 2002 – Develop standardized 10-year databases and disseminate to each field station.

December 15, 2002 – Develop standardized analytical modules for analyzing 1993 to 2002 LTRMP fish data and disseminate to each field station.

December 31, 2002 – Complete analyses for the 10-year report.

January 31, 2003 – Submit a briefing paper on the scientific consequences of restricting LTRMP fish component monitoring effort to Period 3.

February 1, 2003 – Complete year 2002 fish data quality-checking and entry into the LTRMP database.

March 30, 2003 – Complete statistical analyses of year 2002 fish data.

March 30, 2003 – Submit a draft 10-year report on LTRMP fish monitoring.

April 30, 2003 – Complete DRAFT year 2002 Fish Monitoring Section of the LTRMP year 2002 Summary Report.

May 30, 2003 – Complete FINAL year 2002 Fish Monitoring Section of the LTRMP year 2002 Summary Report.

June 30, 2003 – Submit draft technical report, "Habitat associations of UMRS fish assemblages across geomorphic and anthropogenic disturbance gradients."

September 15, 2003 – Initiate fish community sampling in Pools 8, 13, and 26 using day electrofishing.

September 30, 2003 – Submit a draft progress report summarizing results of variance decomposition and habitat modeling efforts.

Personnel

Mr. Brian Ickes will be the principal investigator in charge of the LTRMP fisheries component.

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. 42pp. + Appendices A-J.

Ickes, B. S. and R. Burkhardt. 2002. Evaluation and Proposed Refinement of the Sampling Design for the Long Term Resource Monitoring Program's Fish Component. Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin, September 2002. LTRMP 02-P001-1.

2.3 Macroinvertebrate Component

As core activity in FY03, data collection for macroinvertebrate monitoring will take place in LTRMP key Pools 8 and 13 following the LTRMP study plan and standard protocols (USGS 1999c, Thiel and Sauer 1999). With a reduction in funding for FY03, only these pools were selected for monitoring with an emphasis on maintaining the current data string and enhancing the model being developed on mayfly and fingernail clam abundance as related to habitat features (See Task 2.6, Statistical Evaluation of Monitoring Data). Data entry, analyses, and summaries for FY02 and FY03 sampling, and preparation of the annual reports (Web-based) will be completed.

In addition, we will investigate potential options for restructuring monitoring designs in FY04 and beyond. A report will be produced for the Macroinvertebrate Component Workshop, held in September 2002, discussing partner and client input on objectives for the component, the current sampling design, and recommendations on potential changes or new directions for the component. Integrated into this report will be summaries of discussions and analyses to support restructuring of the component and a review of data and information obtained over the last 10 years.

Objectives

1. Complete data entry, quality assurance, data summaries, standard analyses, and report preparation for FY02 sampling.
2. Complete field sampling, data entry, quality assurance, data summaries, standard analyses, and report preparation for FY03 sampling, Pools 8 and 13.
3. Develop a report on the Macroinvertebrate Component Workshop.
4. Conduct discussions and analyses as needed to support restructuring of the component and program.

Methods

Analyses of data from FY02 will follow standard LTRMP procedures. For FY03, sampling will be restricted to Pools 8 and 13, and will follow the LTMRP standard protocols for those pools (Thiel and Sauer 1999).

Products

1. Complete data entry, QA/QC of 2002 & 2003 macroinvertebrate data, and macroinvertebrate component annual reports.
2. Collect one increment of macroinvertebrate data for Pools 8 and 13.
3. Final workshop report discussing objectives for the component, with recommendations on potential changes or new directions for the component. Includes 10-year summary report.

Milestones

January 31, 2003 – Complete quality checking of macroinvertebrate data for the year 2002, calculate summary statistics, and enter data into LTRMP database.
March 10, 2003 – Complete draft workshop report including recommendations on restructuring and 10 year review.
March 31, 2003 – Complete 2002 Annual Status Report.
April 30, 2003 – Complete final workshop report including recommendations on restructuring.
April 30, 2003 – Complete draft year 2002 Macroinvertebrate Monitoring Section of the LTRMP year 2002 Summary Report.
August 30, 2003 – Complete quality checking of macroinvertebrate data for the year 2003, calculate summary statistics, and enter data into LTRMP database.
September 30, 2003 – Complete draft of 2003 Annual Status Report.

Personnel

Ms. Jennifer Sauer will be the principal investigator in charge of LTRMP macroinvertebrate monitoring.

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

2.4 Water Quality Component

This section describes activities proposed as part of the core funding for LTRMP water quality in FY03. The priority limnological issues within the UMRS include sedimentation, decline in aquatic species, and loss of habitat due to sedimentation, nutrient enrichment, and physical changes associated with natural processes, navigation, and management actions.

As core activity in FY03, annual reports (Web-based) and a general summary for sampling completed in the previous year (FY02) will be produced. The procedures manual that documents methods used from 1993 to 2002 will be published, as will the findings of the external review committee that met in the last quarter of FY02. Expected funding ranges for LTRMP in FY03 will result in minimal collection of water quality monitoring data in 2003. Data collection in FY03 will be limited to sampling of light regime in support of aquatic vegetation modeling in Pools 8 and 13, and sampling at fixed sites in the 5 upper pools for nutrients and suspended sediment.

In addition, we will investigate potential options for restructuring monitoring designs in FY04 and beyond, including using data from fixed sites to predict results of stratified random sampling and using dissolved oxygen as a system indicator. We will also provide water quality data to update the LTRMP data query tool.

Objectives

1. Complete sample analyses, data entry, and data processing for samples collected in FY02.
2. Perform summary analyses on the collected data to be presented in six field station reports published on the Web and included in the annual LTRMP summary.
3. Conduct analyses and provide scientifically sound alternatives for conduct of LTRMP program and Water Quality Component.
4. Conduct analyses to examine the potential to use a reduced set of sampling locations to capture a majority of the trend information now obtained from stratified random sampling.
5. Complete a 10-year analysis and interpretation report based on LTRMP water quality monitoring, including use of dissolved oxygen as a system indicator.
6. Contribute water quality analysis and interpretation to an annual summary of LTRMP findings for 2002.
7. Collect light regime data to support aquatic vegetation modeling for Pools 8 and 13.
8. Collect fixed-site data using LTRMP protocols at a selected subset of locations (tributaries and main channel) in Pools 4, 8, 13, La Grange, and the Illinois River from 21 April to 29 Sept 2002.
9. Contribute water quality data for an update to the LTRMP data query tool.

Methods

Water quality data and samples collected in FY02 will be processed to completion following LTRMP procedures. Laboratory analyses will be performed following LTRMP protocols and Standard Methods (American Public Health Association, 1992).

Water quality reports for the six field stations will be published in web-based form only. Because only three quarters of 2002 will be represented by the collected data, statistical adjustments and other alterations from previous summaries will be required. Highlights from the 2002 water quality field collection and the 1991–2002 period of record will be extracted and reformulated to provide a concise contribution to the 2002 LTRMP summary report.

Statistical analysis of existing data will explore the use of selected fixed sites to obtain significant parts of the water quality status and trend information now provided by stratified random sampling. The goal is to find ways to preserve some of the existing trend record with reduced data collection. In addition, discussions and analyses will be conducted detailing recommendations for restructuring of the component and program in a scientifically defensible manner.

Field teams and UMESC staff will collaborate on statistical summary and interpretations of the water quality monitoring data obtained from 1992 to 2001. This report will include a review of previous LTRMP work on dissolved oxygen as a systemic indicator of habitat quality.

Protocols provided by the vegetation component and developed in collaboration with vegetation and water quality specialists will be used to obtain light regime information for the modeling of submersed vegetation in Pools 8 and 13. Sampling will occur weekly at about 25–30 sites per pool from May 1 to July 15. Measurements will include light extinction (depth penetration of photosynthetically active radiation), turbidity, Secchi disk transparency, and grab samples for lab estimates of light extinction where field measurements are not practical.

Water quality sampling at 4-week intervals will be conducted at major tributary inflows and selected main-channel sites in Pools 4, 8, 13, 26, and La Grange from 21 April through 29 September using modified LTRMP protocols. Chemical parameters will be limited to total nitrogen, total phosphorus, suspended solids, and suspended chlorophyll. USGS sampling under the NASQAN program will be substituted for main-channel sampling by LTRMP near Grafton, Illinois and in the Open River reach. NASQAN data will not be included in the LTRMP database, but are available from USGS as needed.

Products

1. Complete data entry, QA/QC of 2002 water quality data. Analytical results for water quality samples collected in FY02. Six Web-based annual reports including summary statistics for calendar year 2002 water quality data.
2. Draft 10-year report of LTRMP water quality monitoring.
3. Water quality data and samples collected and analyzed for nutrients at a selected subset of fixed sites for the period 21 April 2003 to 29 September 2003 (analyses will extend into the first quarter of FY04).
4. Light extinction and turbidity data obtained from selected tributary, mainstem, and off-channel sites in Pools 8 and 13, and entered into an electronic database in support of vegetation modeling.
5. Project Status Report summarizing statistical analyses that examine potential of fixed sites as predictors of the water quality status and trend information from stratified random sampling.

Milestones

January 1, 2003 – Complete data entry to LTRMP database for fixed-site sampling and stratified random sampling (Objective 1).
February 1, 2003 – Complete analysis and error checking of 2002 water quality laboratory Samples (Objective 1).
March 1, 2003 – Complete verification of 2002 field data and transfer of calendar year 2002 analytical data from laboratory database to LTRMP database (Objective 1).
April 1, 2003 – Complete draft of alternatives for restructuring water quality monitoring in FY04 (Objective 3).
April 1, 2003 – Complete initial statistical examination of fixed sites as replacements for random sampling in each of the six LTRMP study reaches (Objective 4).
April 1, 2003 – Complete first draft of tables and figures for 10 year report, distribute to authorship team for review and comment (Objective 5).
April 15, 2003 – Complete transfer of water quality data to for inclusion in spatial query tool (Objective 9).
May 1, 2003 – Complete statistical analysis of fixed site as replacements for random sampling for each of the six LTRMP study reaches (Objective 4).
June 15, 2003 – Complete water quality section of the 2002 LTRMP monitoring summary report (Objective 6).
July 1, 2003 – Complete first draft of 10 year report, circulate for internal review (Objective 5).
July 1, 2003 – Complete PSR that summarizes findings on the use of fixed site sampling instead of random sampling (Objective 4).
July 30, 2003 – Complete Web-based reports summarizing water quality data for each of the six study areas during the 2002 calendar year (Objective 2).
Sept 1, 2003 – Complete internal review of 10 year report, begin revisions (Objective 5).
Sept 29, 2003 – Complete collection of light regime data in Pools 8 and 13, in support of vegetation modeling (Objective 7). Complete collection of fixed-site sampling data (Objective 8).

Personnel

Dr. David Soballe will be the principal investigator in charge of LTRMP water quality monitoring.

References

APHA (American Public Health Association). 1992. Standard methods for the examination of water and wastewater. 18th edition. American Public Health Association, 1015 15th Street, NW, Washington, D.C. Variously paged.

2.5 Annual LTRMP Summary 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 annually in a format that is easy to read and widely available.

Objective

Complete and distribute the annual report summarizing LTRMP accomplishments and interpreting ecological conditions in the UMRS during the year 2002.

Methods

A Web-based report will be produced that summarizes, synthesizes, and highlights the accomplishments of the LTRMP for FY02 and shows how these accomplishments are important to river management. Types of information that may be included are monitoring efforts, applied research results, analyses, GIS tools and products, data syntheses and interpretations, 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. The report will concentrate primarily on system-level information, although noteworthy accomplishments at smaller scales will be included. The report will build on previous annual summary reports, the *LTRMP Report to Congress*, and the *USGS Status and Trends report* (Wiener et al. 1998) and will become the basis for contributions to the next Report to Congress.

Products

Annual summary report for the UMRS for the year 2002.

Milestones

June 30, 2003 – Draft report submitted for USGS review.
September 15, 2003 – Final draft report completed and submitted to COE.

Personnel

Dr. Pat Heglund will be the principal investigator responsible for the LTRMP annual summary report.

Reference

Wiener, J. G., C. R. Fremling, C. E. Korschgen, K. P. Kenow, E. M. Kirsch, S. J. Rogers, Y. Yin, and J. S. Sauer. 1998. Mississippi River. Pages 351-384 in M. J. Mac, P. A. Opler, C. E. Puckett Haecker, and P. D. Doran (editors), *Status and Trends of the Nation's Biological Resources, Volume 1*. U.S. Geological Survey, Reston, Virginia.

2.6 Statistical Evaluation of Monitoring Data

The current LTRMP includes ongoing studies and new investigations that involve synthesis, analysis, or modeling of LTRMP and other UMRS data. Other LTRMP studies are examining the program's sampling framework or planning systemic analyses to characterize resources or habitats of the UMRS. Program partners have also recommended including investigations of other biotic groups, such as mussels, wildlife, and imperiled species, into the LTRMP resource-analysis framework. In addition, during FY03, a variety of analyses will be conducted regarding potential changes in monitoring designs under a severe budget reduction.

The above efforts involve application of statistical theory and methodology for sampling design, estimation, hypothesis testing, and predictive modeling. This project will provide statistical expertise to enhance the scientific defensibility and efficiency of LTRMP monitoring components and investigative studies. Such information will provide needed statistical input during programmatic planning efforts and will facilitate the timely completion of planned products. In addition, we will engage in specific analyses to model the abundance of mayflies and fingernail clams based on habitat predictors.

Objectives

1. Provide statistical support on both planned and as-requested bases for ongoing and developing studies. This support will include guidance on monitoring and study design, data synthesis, quantitative analysis, and modeling.
2. Model mayfly abundances within and across LTRMP pools as a function of habitat predictors.
3. Model fingernail clam abundances within and across LTRMP pools as functions of habitat predictors.

Methods

Objective 1. Statistical guidance will be provided to LTRMP investigators at appropriate stages of study planning and execution. Statistical contributions will include active participation in project planning, review of written study plans, evaluation of proposed and existing sampling designs, and provision of guidance on proposed methodologies for statistical estimation, hypothesis testing, and modeling. In FY03, a portion of the effort for this objective will be directed toward analyses for restructuring monitoring designs.

Objective 2. In 2002, LTRMP mayfly data from Pool 13 were modeled as functions of biological and environmental predictors. These models assume mayflies follow a count distribution with "extra zeroes." A written report on this analysis will be completed. The methods will also be applied to the analysis of mayfly abundance data from Pool 8.

Objective 3. In 2002, LTRMP mayfly data from years 1993 through 2001 were modeled as functions of biological and environmental predictors. These mayfly models will be elaborated and adapted for use with another important macroinvertebrate, the fingernail clam. Fingernail clams are an important food source for a variety of fish and waterfowl species. As with

mayflies, we will look at within- and across-year variability. We plan to model fingernail clam data from Pools 4, 8, and 13.

This study plan represents a continuation of the effort to provide the full level of statistical support needed for programmatic planning, critical evaluation of proposed and existing sampling designs, and statistical support of LTRMP projects.

Products

1. Final report summarizing mayfly abundance model results for Pool 13 (Objective 2).
2. Final report summarizing mayfly abundance model results for Pool 8 (Objective 2).
3. Final report summarizing fingernail clam modeling results (Objective 3).

Milestones

December 31, 2002 – Complete fourth quarter activity highlight report (Objectives 1–3).
February 28, 2003 – Complete Pool 13 mayfly abundance report (Objective 2).
March 31, 2003 – Complete first quarter activity highlight report (Objectives 1–3).
March 31, 2003 – Complete Pool 8 mayfly abundance report (Objective 2).
June 30, 2003 – Complete second quarter activity highlight report (Objectives 1–3).
August 30, 2003 – Complete draft fingernail clam abundance model report (Objective 2).
September 30, 2003 – Complete final fingernail clam abundance model report (Objective 2).
September 30, 2003 – Complete annual (FY 2002) activity highlight report (Objectives 1 and 2).

Personnel

Dr. Brian Gray will be the principal investigator in charge of statistical evaluation of monitoring data.

2.7 Bathymetric mapping of the UMRS

This is a continuation of some tasks contained within previous bathymetric mapping projects funded by LTRMP. Resource managers have in the past, and again recently, identified bathymetric data as one of the primary data needs for the UMRS. Although the U.S. Army Corps of Engineers completes surveys of the main channel, the highly ecologically productive off-channel areas of the river have gone largely unsurveyed. Bathymetric data are needed to quantitatively and qualitatively assess the suitability of essential aquatic habitats (e.g., backwaters and side channels). Such information is also critical for the spatial and temporal trend analysis of aquatic habitat modification. The bathymetric GIS data set generated in this project will provide the opportunity to assess pool-wide habitat conditions (e.g., Habitat Needs Assessment), and also be used to detect changes from both historical maps and maps generated in the future.

Proposed tasks for FY03 include processing the data collected late in FY02, and creating GIS coverages of the data gaps. Data processing includes generation of GIS point coverages for all data, and GIS bathymetric surfaces for Pools that are nearly complete. With the FY02 data included, eight pools (Pools 4, 7, 8, 9, 13, 21, 26, LaGrange) will be completed and nine pools (Pools 5, 5A, 10, 11, 15, 17, 18, 20, Peoria) will be over 50% completed (some over 80% completed). In addition, the Middle Mississippi Reach will be over 90% completed. The map of the status of the pool-wide GIS coverages will be updated on the UMESC Web site (http://www.umesc.usgs.gov/aquatic/bathymetry/status.html). Web-based data and related products (e.g., images of maps) will be updated for pools that are nearly completed and be available at www.umesc.usgs.gov/aquatic/bathymetry.html. Detailed descriptions of data gaps and completed pools can also be found at this Web site. GIS point data for incomplete pools will be available from UMESC by request. UMESC personnel will continue to coordinate with the respective districts of the U.S. Army Corps of Engineers to identify LTRMP needs, and identify bathymetric surveys conducted by the Corps that may meet those needs. There will be no additional surveys conducted in FY03 under LTRMP base funding.

Objective

Complete additional pool-wide surveys to expedite the completion of a systemic GIS bathymetric data set for the UMRS.

Methods

No major changes to the existing methodology used in the past by LTRMP are anticipated. The methods for bathymetric surveys by boat are designed to produce data suitable for generating a pool-wide GIS coverage using interpolation between sample points.

Products

1. Updated GIS coverages of data gaps for pools that are incomplete.
2. Standard set of products (i.e., data, images) available through the UMESC bathymetry Web pages for completed pools.

Milestones

January 31, 2003 - Processing of FY2002 data completed.
February 28, 2003 - Updated GIS data gap coverages and standard set of Web-based products.

Personnel

Mr. Jim Rogala will be the principal investigator in charge of processing bathymetric data and GIS database generation.

3 APPLIED RESEARCH: LANDCAPE & HABITAT ANALYSIS

3.1 Automation of 2000 Land Cover/Land Use and Vegetation Change Analysis

This scope continues the development of a systemic year 2000 Land Cover/Land Use (LCU) GIS database for the Upper Mississippi River System. This database would provide an 11-year time step since the 1989 systemic coverage, allowing examination of changes resulting from the 1993 flood and HREP projects. Year 2000 LCU for the trend pools was completed in FY01. In FY02 Pools 5–7, 9–12, 24, 25, the northern Open River reach, and the Illinois River's Alton and Peoria Pools were completed. In FY03, the funding for the LTRMP has been substantially reduced and this is reflected in this Scope. Priority will be given to completing a contiguous LCU dataset for the main stem of the Mississippi River with Pools 14–21 (Fig. 1) to be completed in FY03.

High-resolution aerial photography will be acquired for Pools 4, 8, and 13 in late summer of 2003. These 1:15,000-scale color infrared photos will be used in the future to develop a genus-level LCU dataset that can be used in detailed analyses of vegetation changes in the upper trend pools. Year 2000 systemic LCU coverage was shot at 1:24,000, but high-resolution (1:15,000) photography has not been collected since the mid-1990s and significant flood and drawdown events have occurred in the interim. A detailed LCU data set will be produced in the future from this photography using the 150-Class Wetland Vegetation Classification System. The 150-Class system classifies vegetation to the genus level and is the top tier in hierarchical LTRMP vegetation classification system. It crosswalks directly to the Generalized 31-Class Vegetation Classification System, the HNA Vegetation Classification System, and the National Vegetation Classification System.

In addition to the LCU work, we will analyze changes in vegetation patterns that have occurred between 1989 and 2000. This will include a description and breakdown, by pool, of areal coverage by vegetation classes in both years and a summary of changes in vegetation coverage. In at least one key pool (Pool 13), an in-depth analysis of vegetation change will be conducted to identify specific areas with high rates of change and to identify the most appropriate methods for highlighting and detecting transitional areas. If additional funding were available, the intensive analysis of vegetation change could be expanded to the rest of the key pools. This analysis would include a comparison of rates of change across different geomorphic regions.

Objectives

1. Complete year 2000 LCU database for Pools 14–21.
2. Acquire high resolution (1:15,000) color infrared aerial photography for Pools 4, 8, and 13.
3. Analyze changes in vegetation and land cover patterns that have occurred between 1989 and 2000.

Methods

Objective 1. Completion of 2000 LCU database for Pools 14–21. Aerial photographs of the entire UMRS were taken in color infrared (CIR) at 1:24,000-scale in the late summer of 2000. Aerial photos will be scanned, rectified, and served via the UMESC Internet site. 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 operated procedures and will be subject to rigorous quality control assurances (NBS, 1995). All LCU data sets will be provided in NAD27 and NAD83 and in both Zone 15 and 16 where necessary. In addition, since many analysts are converting their spatial databases to the more current North American Datum of 1983, UMESC will serve legacy LCU and 2000 aerial photo mosaics for trend pools in both datums over the Internet by the end of the fiscal year. These legacy LCU data sets are from 1890, 1975, and 1989.

Objective 2. Aerial photographs of Pools 4, 8, and 13 will be taken in color infrared (CIR) at a scale of 1:15,000 in late summer by a contractor.

Objective 3. Analysis of Vegetation Change. All pools for which the 2000 LCU has been completed will be compared to the 1989 LCU data set to determine areas that have experienced the most change in habitat composition over the past eleven years. This analysis can then be used to determine the status and trends for these particular areas of highest transition and provide insight into whether more focused research and detailed land cover information are needed to understand the mechanisms at work.

Products

1. Completion of LCU databases for Pools 14–21.
2. Photography for Pool 4, 8, and 13.
3. A report analyzing changes in vegetation patterns between 1989 and 2000.

Milestones

January 31, 2003 – Complete 2000 LCU for UMR Pools 20–21.
April 30, 2003 – Complete 2000 LCU for UMR Pools 18–19.
July 31, 2003 – Complete 2000 LCU for UMR Pools 14–17.
August 31, 2003 – Complete Vegetation Change Report.
September 30, 2003 – Acquire aerial photography.

Personnel

Mr. Larry Robinson will be the principal investigator in charge of developing the Year 2000 LCU GIS databases for the UMRS.
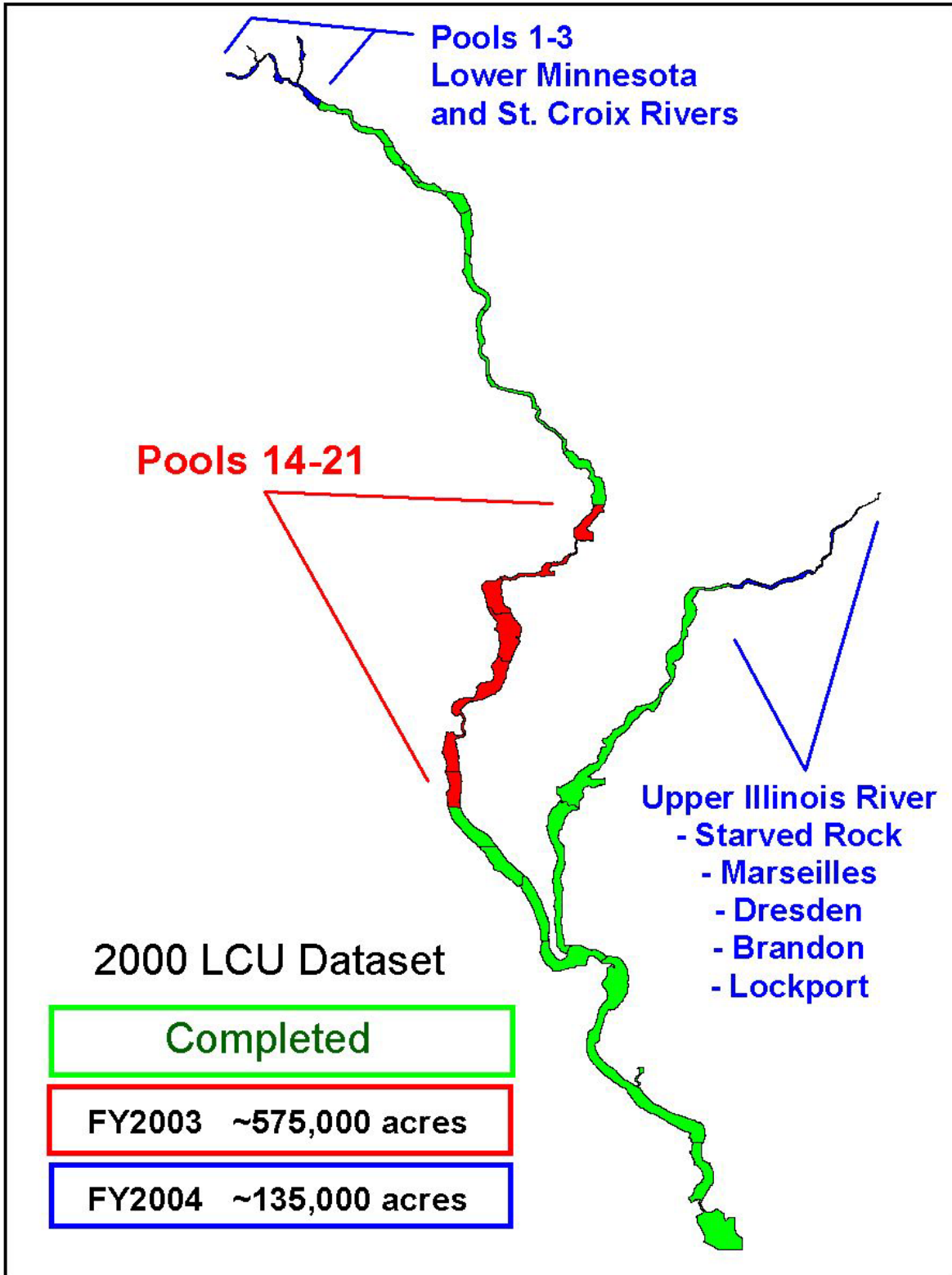
Pools 1-3
Lower Minnesota
and St. Croix Rivers

Pools 14-21

Upper Illinois River
- Starved Rock
- Marseilles
- Dresden
- Brandon
- Lockport

2000 LCU Dataset

Completed

FY2003 ~575,000 acres

FY2004 ~135,000 acres

Figure 1. UMRS Land Cover/Land Use Mapping Schedule for FY2001 - FY2004.

3.2 Science planning for the LTRMP

The current work planning process for LTRMP responds to annual budget variations, but is not based on a long-term plan for answering the science questions most critical to management of the UMRS. We need to (1) define the science questions that are critical for the Environmental Management Program to answer and, (2) develop a process to address these questions over time by breaking the large-scale questions into a series of smaller-scale questions that can be addressed more readily.

Having a prioritized, hierarchical list of questions will allow the LTRMP partners to develop annual projects and activities in a way that consistently strives toward addressing larger science and management issues within budgetary constraints and opportunities. Breaking larger issues down into constituent questions will help all partners and staff see how smaller projects and tasks fit into a coherent whole and how each project relates to a larger question. Each hierarchical set of questions should be considered a "living document" that is evaluated and updated as new information becomes available. The list will provide guidance for developing overtarget proposals and will allow for a more rapid and coordinated response when opportunities for new projects arise. This process will be an important step in implementing a 5-year planning horizon for LTRMP.

Objective

Define a set of science questions most critical to the EMP, then break selected questions down into a set of nested sub-questions that can be addressed at different levels of effort as EMP funding allows.

Methods

We will convene a working group chosen from the Analysis Team, field stations, Corps of Engineers, and UMESC to develop a prioritized list of large-scale science questions that are critical to improving our understanding of how the UMRS functions and thus to developing better management alternatives. Sub-groups of the working group will then take the highest ranking questions (probably 4 to 5 highest) and break them down iteratively into nested, constituent questions that involve smaller spatial scales and shorter time frames. These sub-groups may involve other subject matter experts as needed. Specific approaches for addressing each sub-question, along with data needs, potential problems, and sequencing issues will be noted when possible. A draft report summarizing the list of large-scale questions and the breakdown of the high priority questions will be developed and circulated to the partners for comment. A final draft will be presented to the EMPCC at their spring meeting (May 14, 2003) for their comments.

Products

Final report of the Working Group for Science Planning.

Milestones

January 15, 2003 – Working group meets to define large scale science questions and assign
     questions to sub-groups.
March 15, 2003 – Draft report circulated to partners for comment.
May 1, 2003 – Final draft submitted for comment.
June 30, 2003 – Final report completed and submitted to COE.

Personnel

Drs. Barry Johnson and Pat Heglund will be co-principal investigators in charge of science
planning.

3.3 Update of Spatial Query Tool

The Spatial Query Tool previously developed integrates the LTRMP component data with spatial data layers and allows the user to select sampling sites and their corresponding records. This tool will be expanded to incorporate additional water quality data and will be updated to include all data collected through 2002.

Objective

Update Spatial Query Tool through 2002, including additional water quality data, and distribute on CD.

Methods

This work will incorporate additional water quality data and update the Spatial Query Tool to include all currently available data. This will require modifying download scripts to include additional water quality variables, downloading all data and creating shapefiles, and updating application codes to accommodate new fields and additional years of data.

Products

An updated Spatial Query Tool which incorporates data collected through 2002.

Milestones

May 31, 2003 – Complete update of Spatial Query Tool.

Personnel

Mr. Douglas Olsen will be the UMESC principal investigator in charge of updating the Spatial Query Tool.

Table. LTRMP sample collection for FY03.

Component	Study Area 4	8	13	26	La Grange	Open River
Vegetation		Impounded/contiguous backwater (400 sites)	Impounded/contiguous backwater (410 sites)			
Fisheries		3rd Period (Electroshocking only)	3rd Period (Electroshocking only)	3rd Period (Electroshocking only)		
Macroinvert		Standard sampling (125 sites)	Standard sampling (125 sites)			
H_2O Quality	Fixed site	Fixed site & Light regime	Fixed site & Light regime	Some fixed sites; some NASQAN data	Fixed Site	Use NASQAN data
LC/LU	Acquire 1:15,000 photography	Acquire 1:15,000 photography	Acquire 1:15,000 photography			
Bathymetry						