OVER–TARGET SCOPES OF WORK FY 2001
For Implementation of the Long Term Resource Monitoring
Program (LTRMP) Element of the
Upper Mississippi River System–Environmental Management Program

HNA Models and Tools

The recently completed EMP Habitat Needs Assessment was conducted to provide a uniform systemic analysis of land cover, geomorphic areas, and potential guild/species habitat. The systemic requirement resulted in the development of a new systemic land cover/use theme and an Arcview script, the HNA Query Tool. In addition, the Query Tool has been distributed with an immense number of spatial coverages and much of the current LTRMP component data. Mississippi River biologists and planners will be able to use enhancements in the types of data (i.e., bathymetry, topography, hydraulic models, and organismal and water quality point data) for a wide range of activities. This scope of work will provide for the continuation and enhancement of the HNA approach, especially regarding the development of Pool Level Plans, planning of HREP projects, and development of spatially explicit models for key species or guilds.

Objectives and Methodology
The Center has a unique role to play as a catalyst to effectively use the LTRMP information to assist the HREP program evolve into a more effective and cost-efficient management program based on a systemic river perspective. The key to attaining this objective is to look at problems at the appropriate scale and take advantage of all of the available data. The HNA tools and models will facilitate this approach using two methods, 1) continuation of data preparation and 2) dedication of key staff who are trained and made available to provide tactical support for multi-agency projects. New data (i.e., FY2000 LCU, LIDAR, and bathymetry coverages are being acquired within the LTRMP base and over target study plans) will be programmed into the Query Tool.

Porting the HNA Query Tool to Visual Basic
The HNA Query Tool needs to be translated from Avenue (ArcView's macro language) to Visual Basic (VB). This will free the HNA Query Tool from its dependence on ESRI's ArcView. Therefore customers without ArcView would still be able to use the tool. By converting to VB the HNA Query Tool will be able to utilize raster data. Raster data will allow the tool to perform true modeling. Raster data is necessary to perform analyses that incorporate multiple GIS data layers. Converting to a VB environment will also open the architecture of the tool in a way that will allow the tool to model outside the Upper Mississippi River System. To facilitate updates, maintenance and code sharing the HNA class libraries and possibly component libraries will be created. Class libraries and component libraries makes the code for the HNA Query Tool reusable. If an additional application needs a function that the HNA Query Tool possesses it can

use the libraries already created. This will greatly diminish the time and cost of creating other spatial applications.

Products
1) Presentations and query tool demonstrations at regional natural resource professional meetings will be conducted to disseminate information about the HNA and the HNA Query Tool. The Upper Mississippi, Illinois, and Missouri River Association (Feb. 2001), Upper Mississippi River Conservation Committee (March 2001), Illinois Natural Resource Conference (March 2001), and Mississippi River Research Consortium (April 2001) will be targeted as venues to make platform presentations, present posters, and conduct demonstrations. A HNA Query Tool demonstration will also be added to the UMESC ArcView training classes to show how GIS can be applied to natural resource research and management.
2) Provide technical support regarding the utility of the HNA Query Tool to aid restoration planning and prioritization for Habitat Rehabilitation and Enhancement Projects. The schedule for this task will be determined by COE District needs and priorities.
3) Validate Habitat Needs Assessment Query Tool potential fish occurrence model estimates for 12 common species using LTRMP fisheries data. Work will be scheduled to provide a Project Status Report in May 2001.
4) The HNA Query Tool will be ported to a stand-alone Visual Basic application. Create raster-formatted data from the data that is packaged with the HNA Query Tool. HNA class modules and/or HNA component libraries will be created and made available to interested partners.   An HNA Internet homepage will be served, updated and maintained by the Upper Midwest Environmental Sciences Center.

Milestones
May 31, 2001 – Project status report on HNA validation
September 31, 2001 – Complete porting of the Query Tool to Visual Basic

Funding $150K (Federal)

Principal Investigator   Linda Leake

Bathymetric Mapping of the UMRS

The proposed work is a continuation of LTRMP bathymetric surveys that began in 1988. Pool-wide GIS data sets have been completed for 8 pools and extensive surveys initiated in one other pool. In addition, an inventory of USACE data is to be completed in FY2001, and these existing data will be used whenever possible. The GIS coverages created by this work unit will compliment any surveys completed through the HREP surveys work unit and contracted surveys under a separate work unit.

The set of completed coverages have been used as a layer for habitat inventories and habitat use studies, and used for modeling physical processes of the river (i.e. hydrodynamic modeling, sediment transport modeling). These data have been used for evaluation of management alternatives (e.g. drawdown) and modeling studies (e.g. Navigation Feasibility Study) in the past. In the future, replication of these surveys will provide needed information on sedimentation patterns in the UMRS. In FY2001, several investigations using these data will be continued through funding from this work unit, in coordination with other work units.

Objectives
The long-term objective is to create a systemic GIS coverage of bathymetry for the UMRS. In the short term, additional pool-wide coverages can be used to perform analyses similar to what is currently being conducted in the completed portions of the UMRS.

Methods
No major changes to the existing methodology used in the past by LTRMP are anticipated. Detailed specifications have been included in a scope of work for contracting surveys of this type. The data collection methods are designed to produce data suitable for generating a pool-wide GIS coverage using interpolation between sample points. Pools are selected for survey on the basis of river resource manager needs and availability of main channel data from the USACE.

Products
       1. Post-processed data and Arc/Info GIS coverages (grids and shapefiles)
       2.Standard set of products (i.e. data, images) for completed pools available through the UMESC bathymetry web pages.

Milestones
August 31, 2001 - Complete bathymetric surveys.
September 29, 2001 - Complete update of the UMESC bathymetry web pages.

Funding $300,000 ($50,000 Federal / $250,000 Contract)

Principal Investigator Jim Rogala

Monitor Sedimentation and Erosion Along Transects in UMRS Backwater Areas

Sedimentation is a major concern of resource managers on the UMRS. The sedimentation rates obtained from river bed elevation transect surveys, and understanding of sediment erosion and deposition processes, is critical information needed for forecasting future conditions of UMRS backwaters.

The proposed work is a continuation of surveys along some of the river bed elevation transects that have been established by the LTRMP. Transects were established in 1989 and surveyed most years until 1996. New transects were established in 1996 with a design that provides unbiased estimates of annual sedimentation rates in backwaters. Additional transects are surveyed at selected HREP sites and in the La Grange pool of the Illinois River. The annual surveys suggest casual relationships that can not be determined from changes detected over long time periods (e.g. > 3 years). Other transects were recently established in the impounded areas of Pools 8, 9, 11, and 13 for survey with less precise methods with an automated survey boat. These transects are surveyed at 3-5 year intervals.

Objectives
The objectives of this work are to determine backwater sedimentation rates through repeated riverbed elevation transect surveys and to gain information on sedimentation and erosion processes in UMRS backwater areas.

Methods
No major changes to the existing survey methodology are anticipated. The methods are designed to precisely measure bed elevation along transects in backwaters using leveling, taping, and direct water depth measuring. Less precise surveys in the impounded areas of selected pools are conducted with an automated survey boat. In FY2001, all transects established in 1996 will be surveyed in Pools 4, 8, and 13. Transects in these same pools that were established in 1989 and surveyed until 1996 will not be surveyed in FY2001. Transects that have been surveyed in selected HREP project site will be surveyed in FY2001. Transects in impounded areas of selected pools will not be surveyed in FY2001.

Products
1. Bed elevation data will be entered into the database for all completed surveys.
2. Graphics illustrating change will be served on the Internet.

Milestones
February 28, 2001 - Complete winter surveys.
July 31, 2001 - Complete summer surveys.
September 29, 2001 - Complete update of database and web pages.

Funding $50,000 (Federal)

Principal Investigator Jim Rogala

Year 2000 Land Cover/Land Use and Aquatic Areas GIS Database, Task B: Year 2000 Non-Key Pool Photo Mosaics

Aerial photographs of the entire UMRS were collected in color infrared (CIR) and True Color (TC) in July, August and September of 2000 at 1:24,000 and 1:16,000 scales respectively. The CIR photos will be used to generate land cover/land use (LCU) datasets. The TC aerial photos will be scanned, rectified, mosaicked, compressed, and served via the UMESC Internet site. The LCU and photos will share the same projection.

Objectives
Scan, rectify, mosaic, and serve the 2000 TC aerial photography for selected non-key pools of the UMRS.

Methods
UMESC has the capability to reference, compress and mosaic high-resolution (2-3 meter) scans of the TC aerial photography. These georeferenced photos would provide a base map on which existing LCU data and future LCU data could be overlaid. These photos also offer the ability to do visual-based land use or habitat analysis that digital orthophotos can't provide since they are created from black-and-white aerial photographs collected in spring. These photos will be made available, by pool, through UMESC's internet home page.

Products

> **Task B**: Georeferenced digital TC photo mosaics for one-half of the LTRMP non-key pools (to be determined by the USACE) and served via the UMESC Internet site. Non-key pools include Pools 1-3, 5-7, 9-12, 14-25; Open River North; Illinois River Pools - Alton, Peoria, Starved Rock, Marseilles, Dresden, Brandon, and Lockport.

Milestones
July 31, 2001 – Complete georeferenced photo mosaics for one-half of the LTRMP non-key pools.

Total Funding $25,000 (Federal)   Unfunded: $25,000.00

Principal Investigator Larry Robinson

Year 2000 Land Cover/Land Use and Aquatic Areas GIS Database, Task D: Year 2000 LCU GIS Database for the Alton and Peoria Pools of the Illinois Waterway

Development of a new LCU GIS database for the Illinois Waterway (IWW) would provide an 11-year time step since the 1989 IWW coverage, allowing examination of changes resulting from flooding, HREP projects, and the continued development and urbanization of the Illinois River floodplain. The photointerpretation for the 2000 La Grange Pool photos is in progress. This scope of work covers the following IWW pools:

Alton	~305 square miles
Peoria	~205 square miles
Total	~510 square miles

Objective
Complete floodplain photointerpretation of the Alton and Peoria pools using the Year 2000 1:24,000 scale color infrared aerial (CIR) photos and the attached photointerpretation classifications and protocols.

Methods
- **Photointerpretation -** Aerial photographs of the entire UMRS were collected in color infrared (CIR) in August and September of 2000 at a scale of 1:24,000. Upon completion of on-site training at UMESC, the CIR aerial photos (approximately 240) will be interpreted and edge-tied using a 31-class LTRMP vegetation classification (see Attachment A) and a two-acre minimum mapping unit. Initial interpretation of quality assurance/quality control (QA/QC) will be performed by the contractor with periodic and follow up quality control completed by UMESC. Interpretation that does not adhere to or meet UMESC standards will be reinterpreted at contractor's expense.

- **Automation of the Alton and Peoria Pools of the Illinois Waterway** - Begin automation of the interpreted 2000 aerial photography. Year 2000 land cover/land use will be completed under the supervision of UMESC staff using documented standard operated procedures and will be subject to rigorous QA/QC assurances (NBS, 1995).

Products

> 1. A set of UMESC QA/QC-inspected and approved photointerpreted acetate overlays for the Alton and Peoria pools.
> 2. LCU GIS datasets for the Alton and Peoria Pools.

FY 2001:

> Task 1: Photointerpretation of the Year 2000 1:24,000 scale CIR photos for Alton Pool (see Attachment C for pool locations and photo centers).
>
> Task 2: Photointerpretation of the Year 2000 1:24,000 scale CIR photos for Peoria Pool.
>
> Task 3: Data automation of interpreted photography and data serving for the Alton and Peoria Pools via UMESC's web site.

Milestones

June 30, 2001 – Complete photointerpretation for Alton Pool.
August 31, 2001 – Complete photointerpretation for Peoria Pool.
2001 **-** Alton Pool LCU GIS dataset will be completed and ready to serve three months after interpreted photography is delivered.
2002 – Peoria Pool LCU GIS dataset will be completed and ready to serve three months after interpreted photography is delivered.

Total Funding $150,000.00 (Contract)
$100,000.00 (Federal)

Principal Investigator Larry Robinson

ATTACHMENT A

LTRMP 31-Class General Vegetation Classification, Version 4.3

CODE	CODE DESCRIPTION	HYDRO	HYDROLOGY DESCRIPTION	USNVC	USNVC DESCRIPTION
OW	Open Water	1	Permanently Flooded Non-Forest	n/a	Open Water; Default to Anderson Classification
RFA	Rooted Floating Aquatics	1	Permanently Flooded Non-Forest	V.C.2.N.a.	Permanently flooded temperate or subpolar hydromorphic rooted vegetation
SV	Submerged Aquatic Vegetation	1	Permanently Flooded Non-Forest	V.C.2.N.a.	Permanently flooded temperate or subpolar hydromorphic rooted vegetation
DMA	Deep Marsh Annual	2	Semipermanently Flooded Non-Forest	V.A.5.N.l.	Semipermanently flooded temperate or subpolar grassland
DMP	Deep Marsh Perennial	2	Semipermanently Flooded Non-Forest	V.A.5.N.l.	Semipermanently flooded temperate or subpolar grassland
MUD	Mud	3	Seasonally Flooded Non-Forest	VII.C.4.N.c.	Seasonally/Temporarily flooded mudflats
SMA	Shallow Marsh Annual	3	Seasonally Flooded Non-Forest	V.A.5.N.k.	Seasonally flooded temperate or subpolar grassland
SMP	Shallow Marsh Perennial	3	Seasonally Flooded Non-Forest	V.A.5.N.k.	Seasonally flooded temperate or subpolar grassland
SM	Sedge Meadow	4	Temporarily Flooded Non-Forest	V.A.5.N.j.	Temporarily flooded temperate or subpolar grassland
WM	Wet Meadow	5	Saturated Soil Non-Forest	V.A.5.N.m.	Saturated temperate or subpolar grassland
DMS	Deep Marsh Shrub	6	Semipermanently Flooded Shrubs	III.B.2.N.f.	Semipermanently flooded cold-deciduous shrubland
SMS	Shallow Marsh Shrub	7	Seasonally Flooded Shrubs	III.B.2.N.e.	Seasonally flooded cold-deciduous shrubland
WMS	Wet Meadow Shrub	8	Temporarily Flooded Shrubs	III.B.2.N.d.	Temporarily flooded cold-deciduous shrubland
SS	Shrub/Scrub	9	Infrequently Flooded Shrubs	III.B.2.N.a.	Temperate cold-deciduous shrubland
WS	Wooded Swamp	10	Semipermanently Flooded Forest	I.B.2.N.f.	Semipermanently flooded cold-deciduous closed tree canopy
FF	Floodplain Forest	11	Seasonally Flooded Forest	I.B.2.N.e.	Seasonally flooded cold-deciduous closed tree canopy
PC	Populus Community	11	Seasonally Flooded Forest	I.B.2.N.e.	Seasonally flooded cold-deciduous closed tree canopy
SC	Salix Community	11	Seasonally Flooded Forest	I.B.2.N.e.	Seasonally flooded cold-deciduous closed tree canopy
LF	Lowland Forest	12	Temporarily Flooded Forest	I.B.2.N.d.	Temporarily flooded cold-deciduous closed tree canopy
CN	Conifers	13	Infrequently Flooded Forest	I.A.8.N.b.	Rounded-crowned temperate or subpolar needle-leaved evergreen forest
PN	Plantation	13	Infrequently Flooded Forest	I.A.8.C.a.	Plantation
UF	Upland Forest	13	Infrequently Flooded Forest	I.B.2.N.a.	Lowland or submontane cold-deciduous closed tree canopy
AG	Agriculture	14	Infrequently Flooded Non-Forest	V.C.2.N.b.	Annual row-crop forbs or grasses
DV	Developed	14	Infrequently Flooded Non-Forest	n/a	Developed; Default to Anderson Classification
GR	Grassland	14	Infrequently Flooded Non-Forest	V.A.5.N.a.	Tall sod temperate grassland
LV	Levee	14	Infrequently Flooded Non-Forest	n/a	Levee; Default to Anderson Classification
PS	Pasture	14	Infrequently Flooded Non-Forest	V.A.5.C.a.	Perennial Grass Crops
RD	Roadside Grass/Forbs	14	Infrequently Flooded Non-Forest	n/a	Roadside Grass/Forb; Default to Anderson Classification
SB	Sand Bar	4	Temporarily Flooded Non-Forest	VII.C.1.N.a.	Temporarily flooded sand flats
SD	Sand	14	Infrequently Flooded Non-Forest	VII.C.1.N.a.	Dunes with sparse herbaceous vegetation
NPC	No Photo Coverage		n/a	n/a	No Photo Coverage; n/a

Vegetation Modifiers

Density	A = 10-33%	B = 33-66%	C = 66-90%	D = > 90%
Height*	1 = 0-20 ft.	2 = 20-50 ft.	3 = > 50 ft.	

*Trees only

ATTACHMENT B

UMESC Photointerpretation Protocols

A one week preparatory field trip (including travel time) to UMESC is highly recommended to train contractor personnel in UMESC photointerpretation protocols. As part of that training process, contractor personnel will review and delineate IWW photo signatures on Color Infrared and True Color photos with assistance from UMESC staff. It is also recommended that contractors doing the photointerpretation spend approximately one week in the field ground truthing photo signatures and making field notes on vegetation.

A. Photo Preparation: Each photo contained within the floodplain must be interpreted and have work areas (neat lines) delineated using a 00/0.3mm technical pen on clear acetate overlays. Work areas should be tied to adjacent photo(s) to ensure complete coverage and matching attributes. Neat lines should cover the innermost portion of the photo (see figure 1) to minimize displacement and edge distortion. Photo fiducial marks, photo number, and photo year will be written on each acetate overlay just below the actual photo number to assist in re-registration of the overlay to the photo.
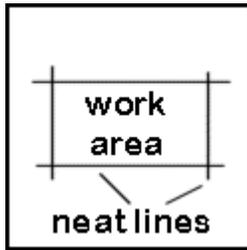

Figure 1. Example of work area delineation on a 9X9 photo.

B. Photointerpretation: All LCU delineations must be drawn on clear acetate using a 4x0.18mm technical pen. Delineations should extend approximately one-quarter inch beyond the neat lines to ensure adjacent photos are properly edge-tied to each other. The edge-tie will be noted on the acetate by writing "tied to photo #" just outside the neat lines. Linework will be consistent, smooth, and clearly legible. All delineated vegetation units will be closed and have one unique label. Larger vegetation units may have the unique label written in several places for ease of identification.

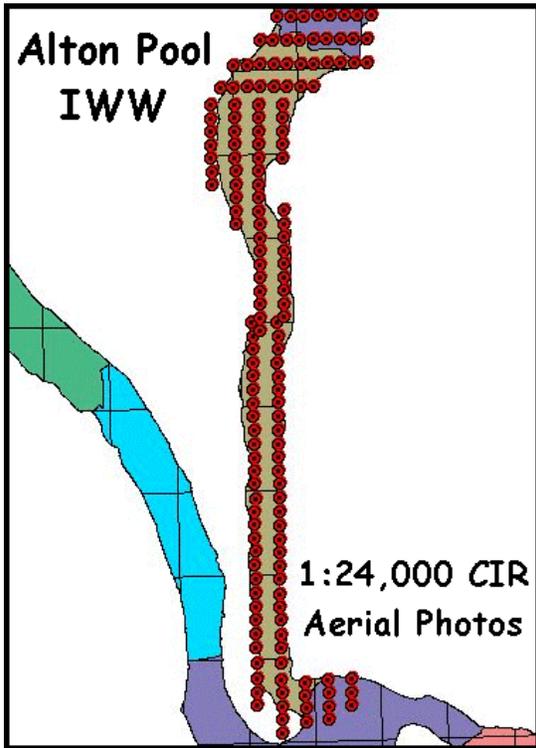**Pool Locations and CIR Photo Centers for the Upper Illinois Waterway**
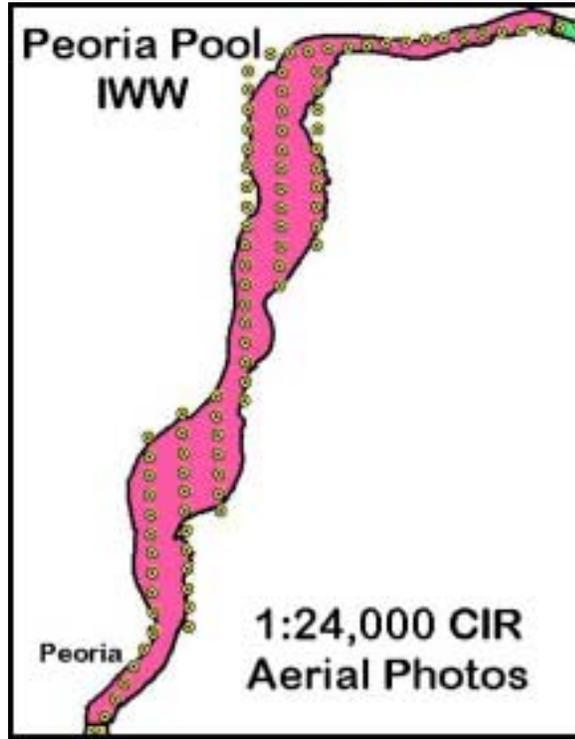

Figure 1. Alton Pool has ~140 photos.

Figure 2. Peoria Pool has ~100 photos.

Year 2000 LCU and Georeferenced Aerial Photography for HREP Project Areas

Year 2000 aerial photo mosaics and land cover/land use (LCU) GIS datasets will be developed for 10-12 selected high-priority EMP HREP project areas (see Attachment A for priority HREP locations). The projects are in the planning stages and in need of current baseline vegetation information. This study will establish that vegetation data layer for future comparisons and evaluations of land cover change within these HREP project areas.

Objectives
Develop year 2000 true color aerial photo mosaics and LCU GIS datasets for high priority EMP HREP project areas.

Methods
Color infrared aerial photography obtained in year 2000 will be interpreted, and digitized to produce LCU datasets for each of the selected HREP project areas. All HREP LCU datasets will be mapped using the 31-class general vegetation classification system. Digital, rectified aerial photo mosaics will also be produced using 2000 true color aerial photography as a background data layer and for visual comparisons in future years. Brief reports containing a summarization of the vegetation information for each HREP and a graphical representation of that HREP's location and current vegetation composition. The aerial photos, GIS datasets, and reports will be made available via the UMESC Internet site.

Products
1. Downloadable georeferenced true color photo mosaics of selected HREP sites on the UMRS.
2. 2000 LCU GIS datasets from photo interpreted color infrared aerial photography for selected HREP sites in UMRS, available via the UMESC Internet site.
3. Brief reports on each of the selected HREP sites with internet links to the USACOE HREP Project Fact Sheets.

Milestones
August 31, 2001 – Complete photo mosaics, LCU datasets, and reports for HREPs that fall within Pools 5-12.

December 31, 2001 – Complete photo mosaics, LCU datasets, and reports for HREPs that fall within Pools 17-26.

Funding $25,000 (Federal)

Principal Investigator Larry Robinson

ATTACHMENT A: HREP Example Photos and Highest Priority Site Locations
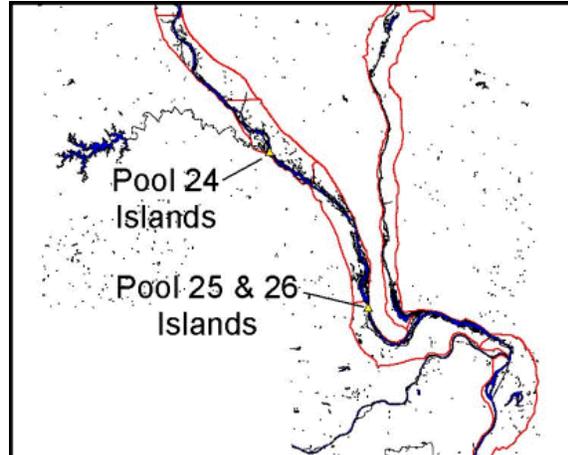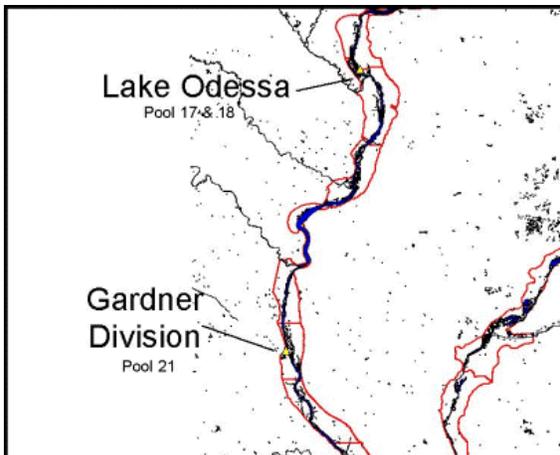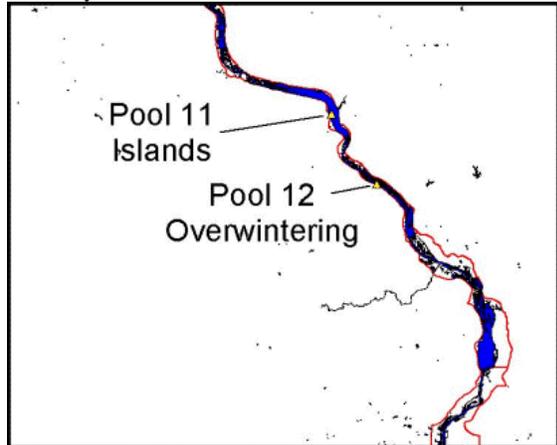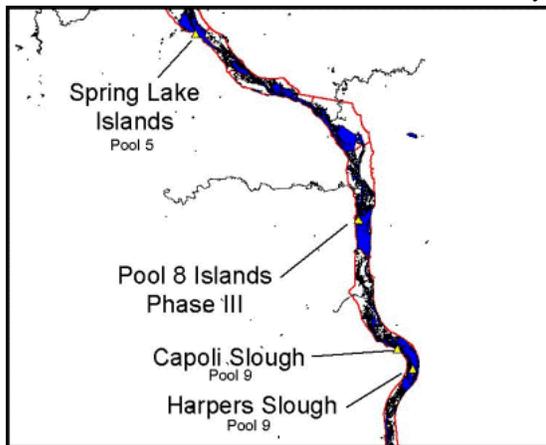
Pool 9 Islands - 1996   Pool 9 Islands - 1999

UMRS Priority HREPs by District

Spring Lake Islands
Pool 5

Pool 8 Islands Phase III

Capoli Slough
Pool 9

Harpers Slough
Pool 9

Pool 11 Islands

Pool 12 Overwintering

Lake Odessa
Pool 17 & 18

Gardner Division
Pool 21

Pool 24 Islands

Pool 25 & 26 Islands

Restoration of funding for LTRMP-Base Projects

During development of the LTRMP base-funded SOW, a reduction in the total funding available required budget cuts for some individual projects. As a result, some expected products from those studies were delayed or eliminated. The purpose of this over-target proposal is to restore some of the funds lost in those budget cuts. These funds would be directed toward the following projects:

Numerical and Statistical Modeling of Aquatic Plant Biomass $ 30K (Federal)

This scope specifies that a spatial platform application of the models will be developed for 2 and possibly up to 3 UMR Pools under the full funding level. At the present funding level, such a spatial platform application can only be developed for one pool (Pool 8). With this partial restoration to this project, the spatial platform application of the models will be developed for two pools (Pools 8 & 13).   The third pool (4) planned will not be developed under this funding scenario.

Special Salary Rates for LTRMP Computer Specialist $ 25K (Federal)

The United States Office of Personnel Management has initiated a special salary rate for computer specialist series positions. The special rates are designed to help agencies address problems in recruiting and retaining workers in today's highly competitive labor market. This was an unforeseen and unplanned salary expense that affects the Information Management and GIS elements of the program.

Fishery Resources of Deep Channels $ 20K (Federal)

Restoration of base fund from over-target allocations would enable collection of data to test the null hypothesis that navigation traffic does not create a chronic denial of habitat for key channel-dwelling fishes. An annual increment of data will be collected from carefully matched segments of navigation channel, adjacent deep main channel outside the navigation channel, and large secondary channel in both a low- and high-traffic reaches of the upper Mississippi River. A preliminary analysis of these data will be performed to determine whether additional sampling, beyond FY01 efforts, will be needed to test this hypothesis, and a summary report of findings will be prepared.

Milestones
June 1, 2001 - Begin data collection
November 1, 2001 - Preliminary analysis and summary report

Geospatial and Computer Support to Science $40K (Federal)

Geospatial and Computer Support to science was reduced to accommodate the inclusion of the "Investigation of Remote Sensing Technology for Land Cover", in order to stay within the budget allocation. Center staff supports spatial data collection, storage, modeling, mapping, GIS analysis, technical support, training, information sharing, and desktop support. This reduction placed a burden on both the scientific and technology staff to meet the needs of the LTRMP.

Statistical Evaluation of Monitoring Data $35K (Federal)

Restoration of base funds for statistical analysis of LTRMP data will allow us to broaden the analysis of fish data collected in FY 2000 in non-focal pools (out-pool sampling) and to develop comparisons among the areas sampled. In addition, we will conduct an additional, system-wide analysis of the relationship of specific habitat features to abundance of centrarchid fishes and investigate the potential for habitat to limit centrarchid abundance.

Milestones (both analyses)
August 31, 2001 - Submit summary report of findings.

Funding $ 150K