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Ecological Assessment Team (EAT) February 1989

Ecological Analysis Team Meeting Minutes Long Term Resource Monitoring Program (LTRMP)

February 22 and 23, 1989

A meeting of the Ecological Analysis (formerly Advisory) Team (EAT) was held on February 22, 1989 at the Holiday Inn, La Crosse, Wisconsin and on February 23, 1989 at the Environmental Management Technical Center (EMTC), Onalaska, Wisconsin. The morning of the first day was a joint meeting with the Computerized River Information Center Analysis Team (CRICAT). The attendance list is attached to their minutes. The agenda (attachment 1) and attendance list (attachment 2) for the second day are attached to these minutes.

The purpose of the joint EAT/CRICAT meeting was to discuss spatial data guidelines and data base acquisition priorities for the geographic information system. Joe Wlosinski started the meeting by stating that the policy of the CRIC is to purchase only systemic data. He also said that any data purchased will require verification by field managers at no cost to the LTRMP. At this time the extent of field manager involvement and expertise required is unknown.

Discussion then ensued regarding the operation of the CRIC, potential services to be offered, and possible data themes that could be acquired (attachment 3). It was concluded that themes of greatest importance are land cover, aquatic areas, and bathymetry. These three form the basis for the majority of applications envisioned by resource managers and planners.

For FY89, the joint group recommended that both current LANDSAT and aerial photography of the UMRS be acquired. A small task force of CRICAT members will be appointed to evaluate and select a classification system. It was also concluded that additional strategic planning for data acquisition will be accomplished by CRIC staff.

Norm Stucky, chaired the EAT meeting that began in the afternoon. He began the meeting by stating that a number of concerns had been expressed to him by other team members. He recommended that these concerns be aired so that each could be addressed during the meeting. In the words of Winston Churchill, "a problem well stated is a problem half-solved."

Perceived Problems

The following were listed as perceived problems in implementation of the LTRMP:

1. Corps meddling in day to day affairs of EMTC hinders the progress of the program.

2. The roles, responsibilities, and accountabilities, of the oversight and support groups need to be well defined and adopted in practice.

3. The relationship of the EAT and EMTC needs to be discussed.

4. The relationship of the Habitat Rehabilitation and Enhancement Program

(HREP) and EMTC needs to be clearly defined.

5. The biological monitoring of HREP projects needs to be resolved.

6. There needs to be more time allowed for review of proposed scopes of work.

7. Which LTRMP work and products should be reviewed?

8. What does the Corps require regarding quality and content of scopes of work?

9. There is a need to speed up development and completion of scopes of work so that FY91 scopes are approved by October 1, 1989.

10. Who should coordinate review of scopes of work?

11. EMTC needs assistance to speed up development of scopes of work.

12. Funding should be made available to obtain assistance needed.

13. What if a HREP project significantly modifies the baseline?

14. How are EMTC priorities readjusted?

15. Have the CRIC needs of the Ecology Section been defined?

16. What are the criteria used to allocate funding between the resource trends analysis and the problem analysis?

17. Is there concurrence on the flowchart for LTRM Program Development?

18. Time constraints imposed for budgeting, contracting, and field work make planning difficult.

19. How is technical support sought and when?

20. Contracting policies and procedure are constraining.

21. What should be the level of detail accomplished during the review process?

Of the above items, the Team concluded that two major problem areas needed to be addressed immediately: 1) role of the EAT in providing assistance to the EMTC and relative to other oversight and support groups (#2, #3, #6, #7, #14 and #21), and 2) the need to catch-up the problem analysis component to be ready for high funding levels expected in FY91 (#6, #8, #9, #10, #11, #12, #16, #18, #19, #20, #21).

USFWS ROLE

Joe Scott addressed concerns that have been raised regarding the Fish and Wildlife Service (FWS) relationship with the Corps and administration of the Program. He provided the team with attachment 4 as a summary. Questions were raised regarding the FWS 38% overhead. Joe stated that this amount is necessary for administrative purposes. The amount is broken down as follows: 10% to EMTC direct administrative overhead; 15% to Regional Office for contracting, personnel, and technical input; 9% to Denver Finance Center for centralized accounting system and bill payment; and 4% to Washington Office for various centralized services such as telephones, payroll, and rental payments. For money that is passed through to States in support of field stations, 17.6% overhead is charged which is distributed to the Denver Finance Center, Washington office, and Regional Office.

Stucky expressed concern that the overhead charges should be used in some way to benefit the UMRS. He reminded the FWS members that the States are paying their own way to assist in development and coordination of the Environmental Management Program. Their decision to do this was to allow for greater dollars for Program implementation not federal administrative overhead.

A Corps representative commented that the Waterways Experiment Station overhead was about 50%. Also, it was pointed out that neither administrative overhead nor inflation were specifically considered when the URMBA Master Plan legislative package was developed.

Joe Scott continued by summarizing a meeting between General Vander Els, North Central Division, and Regional Director Jim Gritman, FWS. At this meeting, the agencies agreed that the Corps has overall management responsibility for the EMP. They agreed in concept that the LTRMP program development was an operational responsibility of the FWS. They stated that each agency needs to be flexible, remain partners, and continue with up front planning.

They also agreed that the EMTC was responsible for the management and direction of the operation of the LTRMP including day to day operational responsibilities (hiring and acquisition). There is nothing to prohibit any public or private entity from providing scientific assistance.

Role of the Corps in LTRMP

Bill Schmitz presented the Corps' LTRMP review criteria. These are: 1) clear objectives; 2) relationship to identified problem area and specific subproblem; 3) scientific soundness, 4) cost per product; 5) schedules, including interim, draft, and final products, as appropriate. The Team agreed that the criteria are important to Program development. However, some members expressed concern that the EMTC also have management flexibility, especially in the area of acquisition. The Corps is concerned with their accountability to Congress.

Bill Schmitz presented the Corps Standard for Performance for the LTRMP: "The program must generate high quality technical information that is capable of definitively answering specific resource management questions regarding the Upper Mississippi River System." The Team members agreed that scientific soundness is important to the Program. In order to accomplish this, they recommended that there be more up front review time and that EMTC staffing be increased. Concern was expressed over the time and organization of Corps reviews. The Corps members would like to see more detail in scopes of work (i.e. objectives, study design, and products to be realized). The Team recommended that EMTC set a goal of 30 calendar days for requests for review. All Team members should respond as soon as possible including a letter of no comment. Review periods will be evaluated on a case by case basis and extended if necessary. Team members agreed to facilitate Team interactions by sending copies of their review comments to all Team members.

The LTRMP Development flowchart was briefly reviewed. Bill Schmitz stated that the chart was not meant to be all inclusive. Its primary purpose is to show the relationship of the FWS and Corps per the Department of the Army and the Department of the Interior Memorandum of Agreement.

Bob Whiting raised a concern over the annual management reports of the field stations and the potential need to change the Operating Plan or Procedures Manual as a result of field experience. The Team agreed that if the EMTC found it necessary to make a major changes or deviations from the Procedures Manual, the EMTC should request Team review. At this time, the Team agrees that the Procedures Manual chapters reviewed to date have an adequate level of detail and have been adequately coordinated for implementation by the EMTC.

Role of the Team

The role of the Team is presented on page 16 of the Operating Plan. The Team agreed that no changes were necessary to this description. The Team will continue to meet on an as needed basis.

Funding Participation

The Corps has requested an additional \$40,000 of LTRMP funds (total request is \$115,000) to complete their technical assistance to the Program. The State members again expressed their reluctance to reduce Program funding for planning and review participation. The State and Service members indicated that they will continue to bear internally the burden of providing the EMTC assistance and will not request Program funding. These Team members will hold the Corps accountable for their spending request.

Scientific Review Committee

The Scientific Review Committee will be established by the EMTC to provide additional insurance for scientific soundness of the Program. There has been world-wide solicitation for members. Only scientists who have been involved in UMRS research and planning were excluded from this search. Benefits of the committee include broad expertise, additional credibility for the Program, exposure outside the region, and possible bridges to other scientific investigations.

The committee will meet twice a year and will provide an overall review and advice on the Program. They will not be requested to provide operational or budget input. Seven candidates for the committee have been identified. It is expected that the selected individuals will begiven 1 year contracts for \$2000 per year and will be reimbursed for travel expenses. The need for the committee will be re-evaluated after one year.

The first meeting of the committee will be this June. The Team recommended that the first meeting include a joint meeting with the CRICAT and the EAT to

discuss the history and basis for decisions made to date on the Program.

Summary of Annual Report

The Annual Report was completed by the EMTC in January and is currently being printed for distribution. Jerry Rasmussen summarized the following accomplishments for 1988:

Program Management

-EMTC moved into permanent facilities. -A biometrician, QA/QC coordinator, aquatic ecologist, bathymetric specialist, computer equipment specialist, geographer, and biologist were hired. -\$3.16 million were expended in FY1988.

Resource Trend Analysis

-Coop agreement signed with Iowa, Illinois, and Wisconsin. Field stations established and staff hired.
-Water and sediment monitoring initiated.
-QA/QC procedures established.
-Bathymetric survey established.
-Habitat classification initiated.

Problem Analysis

-Literature search on effects of suspended sediments.
-Feasibility study on the effects of shading.
-Literature search on techniques to evaluate sedimentation and suspended sediment.
-Navigation physical effects studies.
-Barge fleeting study.

Rasmussen indicated that they have received requests for bathymetric data. These requests are being prioritized. Currently, the Corps is considering possible funding to the States for HREP monitoring. He indicated that major revisions to the Operating Plan that are included in the Annual Report are primarily due to the reduced role of LTRMP in HREP monitoring and analysis. He stated that any 1988 data would be provided upon request. He also indicated a willingness to incorporate data of others if the datasheet LTRMP QA/QC standards.

Joe Wlosinski stated that the CRIC had made all major hardware purchases in 1988. Some software packages were also purchased. They had initiated work on the data set inventory with the UMRCC, evaluated data purchase needs and applications, and conducted field station computer training.

FY89 Activities

Work in Resource Trend Analysis will include: 1) initiate bathymetric data collection, 2) continue habitat classification, 3) continue water and sediment monitoring, 4) initiate fisheries monitoring, 5) initiate vegetation monitoring, 6) work with CRIC on land use/land cover data. Problem analysis

work proposed to date for FY89 was discussed in detail:

Sedimentation:

1. EMTC is waiting on the literature review report to evaluate recommendations for possible development of a scope of work. There is \$72,000 reserved for work in this area.

2. Several Team members raised the issue again on the need to monitor HREP projects under this resource problem. It was agreed that the Team was not the forum for this discussion and that it should be raised at the upcoming EMP-Coordinating Committee meeting. Al Behm advised each project sponsor to request the District Engineers to incorporate project biological monitoring with the District HREP program.

The Team concurred with the decision to eliminate the key project concept from the LTRMP. They agreed that there was no need to reconvene the Problem Solving Work Group.

3. Carl Korschgen presented the scope of work that he has proposed to define the threshold at which suspended sediments become limiting to a submerged aquatic plant. This will be simulated by shading plants to between 1% and 10% photic zones.

Dan Wilcox recommended that the scope be modified to focus on the limitations where the greatest affects have been noted. Also several questions were raised regarding evaluation of pulsed events, the likelihood of shade cloth being representative of natural conditions, successional density, and need to evaluate other plants.

The Team concurred with implementation of the work at the \$20,000 funding level.

4. Joe Wlosinski presented the results of the satellite remote sensing literature survey. The survey found that temporal images are very expensive and that spatial analysis could be field intensive and have high error.

The Team wondered if this type of data was a good buy, if professional judgement to identify backwaters of concern was about as accurate, and if remote sensing could even address original study objectives. The Team agreed that remote sensing should not be pursued. Instead, the Team recommended that EMTC focus on specific areas as needed and use an alternate aerial system that is not dependent on satellite schedules.

The Team recommended that the \$24,000 reserved for continuing this study be redirected to other LTRMP needs.

Navigation Effects:

1. Ceil Strauss presented a proposal to evaluate the wave effects of recreational craft on the shoreline. Completion of the study will aid the States in possible regulation of recreational use particularly on the St. Croix River.

Work this year will complement recreational use surveys to be done by Minnesota this summer. In addition, a cost savings can be realized by piggy backing this work to the last year's navigation effects contract.

The team agreed in concept to the study proposal at \$40,000. Specific comments are due by March 15. In addition, the possibility of obtaining useful information on recreational effects from the impacts of recreation economics study will be investigated by the EMTC.

2. No specific work is proposed for this year on the barge fleeting study recommendations. Comments on the draft final report are due March 15.

3. Leslie Holland-Bartels presented a proposed study to evaluate fish larvae composition and distribution in the main channel and main channel border of Pools 8 and 19. This data could be used with future laboratory work on the effects of propeller turbulence. It could also be useful to the reduced fisheries populations resource problem component.

The Team raised concerns on limiting data collection to main channel and main channel border habitats, the uncertainty of simulating turbulence in the laboratory, the pools selected for study, the potential to evaluate stress instead, the possibility of the field stations collecting samples to reduce costs, and future integration to the St. Louis District Plan of Study effort.

The Team agreed that the proposed work should be deferred until there was a better understanding of the impact to be evaluated and the ultimate use of the data to evaluate the overall health of the fishery population. They recommended that instead a portion of the funds reserved for this work (\$21,000) be used to develop in more detail several scopes of work that address the incremental effects of tow passage, the overall effects on the fishery population, and study needs for the fisheries resource problem component.

Since the St. Louis District is addressing the incremental effects portion, less emphasis should be in this area. Instead integration of the 2 studies should be evaluated.

Water Level Fluctuations:

1. This proposal is to document Corps operational constraints at the dams and to identify possible management flexibilities to enhance fish and wildlife habitat. This scope of work is being handled by the Corps North Central Division Hydraulics Branch. Current status is unknown.

The Team recommended that a short report be prepared in layman's terms to summarize operating requirements at each of the dams, operating constraints, and possible recommendations on flexibility for habitat management (changes as small as 0.1 foot should be considered). In addition, the scope of work should be expanded to evaluate the potential to manage tailwater releases at each of the dams to improve aquatic habitat. Mike Cockrill will coordinate these recommendations with NCD.

Reduced Fisheries Populations:

1. See discussion under navigation effects.

The Team recommended that work on the representative fish list, species for further study, and study reaches be incorporated into the comprehensive scope of work recommended above.

Summary

It was agreed that the greatest concern of the Team members with regard to the initial list of concerns was the need to accelerate development of the Problem Analysis scopes of work in the next 6 months. A primary goal of the EMTC should be to be complete FY90 scopes and have drafted FY91 scopes by October 1. If need be, additional assistance should be sought to accomplish this goal. The Team concurred that a portion of the FY89 Problem Analysis budget should be used to hire or contract for completion of the FY90 and FY91 scopes of work.

Norm Stucky concluded the meeting by sating that he felt the team had a good interchange. He encouraged team members to work more closely together and will work to schedule meetings periodically to continue positive interactions.

Minutes prepared by:

Gail Carmody, USFWS, Rock Island, Illinois

Minutes approved and circulated by:

Norm Stucky, Chairman, Missouri DOC, Jefferson City

THEMES FOR THE UMRS GIS

	THEME	ROUGH ESTIMATE OF OH		
High	IMPORTANCE	\$ /		
	Land cover (fall '87 or '88, using LANDSAT)	22,000		
1	Land cover (rest of Meyer, only covers the Mississippi)	75,000		
	Land cover (Pools 4-14)	30,000		
٦	Aquatic areas (using aerial photography)	160,000 - 3 pools only		
	Bathymetry (Brown Survey)	150,000		
	Bathymetry (Easement Survey)	150,000		
\sim	Bathymetry (current field crew collection, estimate for CRIC only)	4,000		
	Elevation (+/- 5 ft.)	600,000		
	Elevation (+/- 2 ft.)	9,000,000		
	Land use (current)	28,000		
	Land use (Pools 4-14)	30,000		
	Transportation & Hydrography (1:100,000)	purchased		
	Transportation & Hydrography (1:24,000)	450,000		
	Soils (current)	700,000		
	Soils/Geology (Pools 4-14)	30,000		
	Institutional features/Ownership	35,000		
	Dams, levees, & other structures	28,000		
	Endangered species (if data is available)	14,000		
	Loosestrife distribution (assuming LANDSAT algorithm possible)	6,000		
	Hydrology (Pools 4-14)	30,000		
	Hydrology (other)	250,000		
	Ownership, boundaries	190,000		

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SECONDARY IMPORTANCE

Water Quality Discharges (Waste treatment, industrial) Demographic information (population distribution) Waterfowl distributions Waterfowl use areas Refuge signs, improvements, and facilities (status) Project locations (EMP, IPW, COE, State and Local) Dredge Cuts and Dredge material placement sites Soil Erosion indexes Groundwater Depth, Quality, Geologic formation Watershed Management Programs Water Use Air Quality Land Values Section 10, 404(b), Barge Fleeting and other State Permits Contaminant Concentrations Refuge Management Programs Cultural and Historical Resources Geology-bedrock Geology-surficial Climate Precipitation River Stage Information Floodplain Zoning Groundwater Discharge Sites Groundwater Recharge Sites

FWS ROLES

- The EMTC receives no FWS funding. Our entire operation is supported entirely by Corps of Engineers reimbursable funding.
- The role of the FWS Regional Office is to provide Information Resource Management, Contracting and General Services, Personnel management, Safety and Occupational Health Services, Financial Services, Payroll Services, Human Resources (EEO) and Solicitor Services. Policy level overview and decisions are carried out at the Directorate level in the Regional Office.
- The role of the Division of Refuges and Wildlife in the EMP is primarily in the area of HREPs. The EMTC coordinates and informs Refuges of all of its activities.
- o The Denver Service Center maintains centralized accounting and finance records of the FWS. They process all financial transactions reported by the EMTC; maintain files of obligation and payment records; and examine and certify vouchers for payment by the U.S. Treasury. They accumulate and summarize data for preparation of agency level cash and budgetary reports.

EMTC RESPONSIBILITY IN LTRMP

- Provide management and direction in the operation of the LTRMP.
- o Provide administration of personnel, equipment and budgets.
- Provide management of office and facilities.
- Provide supervision of resource monitoring and research activities.
- Provide technical expertise regarding sampling design, data analysis and QA/QC for statistics and ecosystem modeling, fisheries and aquatic studies, water quality and limnological studies, aquatic and terrestrial vegetation studies, waterfowl and mammal studies and invertebrate studies.
- Supervision of the CRIC and assurance that CRIC activities are responsive to needs of the EMP.
- Proper operation of digitizing and satellite imagery activities.
- Provide products of the GIS, database management, modelling and statistical packages that are responsive to the needs of the EMP.

AHACHMENT 4

- Ensuring that all computer facilities and peripheral equipment are maintained.
- o Provide training to CRIC users.
- o Provide guidance and QA/QC advice to Field Stations.
- Coordinate with all EMP state and Federal partners and keep them informed of EMTC activities.

LTRM PROGRAM DEVELOPMENT

- On January 11, 1989 Regional Director Gritman, Assistant Regional Director Lowry and Joe Scott met with General Vander Els and North Central Division Planning staff to discuss OMR&R on HREPs and LTRM Program Development.
- Basic to the discussion on LTRM Program Development was the agreed to concept that the U.S. Fish and Wildlife Service has <u>operational responsibility</u> for the Long Term Resource Monitoring Program and the Corps of Engineers has <u>overall</u> <u>management responsibility</u> for the Environmental Management Program, including LTRM.
- R.D. Gritman, ARD Lowry and Joe Scott agreed cooperate with the Corps to make the LTRM Program Development scheme work. It was further agreed that Program Development would remain flexible; would allow for transition; and, would be administered in such a manner that the EMP "partnership concept" would not be upset by Corps approval of LTRM plans and tasks. The EMTC will support this effort.
- This Program Development scheme will require LTRM planning to meet the standards of having clear objectives and scientific soundness. We are already doing this. LTRM standard of performance is to provide high quality information for resource management on the Upper Mississippi River System.
- There is no doubt that some apprehension exists among out state partners and even in the FWS over this concept. However, the FWS intends to fully support the concept unless it proves unsatisfactory in the future. We haven't given the concept a chance to work yet.
- There is nothing in the LTRM Program Development scheme that prohibits any private or public entity capable of carrying out sound scientific investigations from doing so for the LTRMP.



LTRM PROGRAM DEVELOPMENT

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- o FWS OPERATIONAL RESPONSIBILITY FOR LTRM
- O CORPS OVERALL MGMT. RESPONSIBILITY FOR EMP

EMTC OPERATIONS PROCESS

1ST QUARTER

- **o** IMPLEMENT APPROVED ACTIVITIES
- O DEVELOP & PRIORITIZE NEXT YEARS ACTIVITIES AND SUBMIT TO S.A.B.
- O BREAKDOWN NEXT 5 YEARS OF PROGRAM AND SUBMIT TO S.A.B.
- **O QUARTERLY EXPENDITURE REPORT**

EMTC OPERATIONS PROCESS

2ND QUARTER

- O PREPARE ANNUAL REPORT AND SUBMIT TO S.A.B.
- **o REVIEW S.A.B. RECOMMENDATIONS**
- **O PREPARE DRAFT OF NEXT YEARS PROGRAM**
- **o FINALIZE APPROVED NEXT YEARS PROGRAM**

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O QUARTERLY EXPENDITURE REPORT

EMTC OPERATIONS PROCESS

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3RD QUARTER

O DEVELOP SOWS AND PROCEDURES MANUAL FOR NEXT YEARS WORK AND SUBMIT TO S.A.B.

O QUARTERLY EXPENDITURE REPORT

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EMTC OPERATIONS PROCESS 4TH QUARTER

O FINALIZE APPROVED SOWS AND PROCEDURES MANUAL FOR NEXT YEARS WORK

- **o STATUS REPORT FOR EMP-CC**
- **o** EOY EXPENDITURES REPORT

CAUTIONS

- **o BE FLEXIBLE**
- O DON'T LET "CORPS APPROVAL" UPSET PARTNERSHIP CONCEPT

1

o ALLOW TRANSITION

COMPUTERIZED RIVER INFORMATION CENTER (CRIC) ADVISORY TEAM MEETING FEBRUARY 21, 1989

CRIC AND ECOLOGICAL ADVISORY TEAM (EAT) MEETING FEBRUARY 22, 1989

AGENDA

Tuesday, February 21

12:30 PM

Introductions Agenda Spatial data guidelines What else needs to be included? Specific comments Geographic conventions File documentation standards Aerial photography Aerial mapping Digital scanning Air photo interpretation Cartographic digital data Digital image processing Models Contracting Cooperative agreements CRIC update Personnel Building site Hardware/Software Applications GIS Waterfowl test Black tern test Forest management information Pool 8 Suspended solids problem Data set inventory Bibliography Budgets Other topics

Wednesday, February 22

Spatial data guidelines (Sections not discussed on Feb.21) Prioritize GIS data acquisition LTRMP Annual report Role of the Advisory Teams Science Advisory Board Role of the Corps in LTRMP management Other topics Hardware currently available or in the procurement process includes:

* Prime 9955MII super minicomputer 496 Mb drive and controller 770 Mb drive and controller 32 remote ports 1000 LPM printer Tape drive (800,1600,6250 bpi) and controller * IBM PC's (or compatible) * HP laser printers *

- IBM 8-pen color plotters
- * Tektronix color display terminal
- * Cal Comp 24" color electrostatic plotter
- * Pericom ink jet color copier
- * Dest scanner
- * Altek digitizing table
- * Graphon digitizer display

Major software packages for the Prime currently available or in the procurement process include:

* Primos operating system * Fortran 77 compiler and debugger * Prime Link (networking) * SAS (statistical analysis) * ARC (GIS) * INFO (GIS) * EPPL6 (GIS) * ERDAS (image processing)

Software packages which have been standardized for PC's within the LTRMP includes:

* DOS (operating system) Wordperfect (word processing) * * Lotus 1-2-3 (spreadsheet functions) * Procomm (communications) * WindowDOS (file management) * R:BASE for DOS (data base management) * PC-SAS (statistical analysis) * PC ARC (GIS)

^{*} EPPL7 (GIS)

COMPUTERIZED RIVER INFORMATION CENTER BUDGET BY MAJOR ITEM (\$000) AS OF FEB. 21, 1989

OVERHEAD	1.38	FY89 WITHOUT OVERHEAD	FY89 WITH OVERHEAD	FY90 WITHOUT OVERHAED	FY90 WITH OVERHEAD
PERSONNEL		191.00	263.58	267.00	368.46
HARD+SOFTWAR	Ε				
MICROCOMPUTERS		36.50	50.37		
CALCOMP PLOTTER		49.20	67.90		
ERDAS IMAGING		35.10	48.44		
TEKTRONICS DISPLAY		7.70	10.63		
PRIME DRIVE		17.70	24.43		
PRIME INTERFACE		3.50	4.83		
PRIMENET		4.20	5.80		
SOFTWARE		10.50	14.49		
SUBTOTAL		164.40	226.87	40.00	55.20
DATA					
LANDSAT		3.30	4.55		
LMIC		2.50	3.45		
USGS DLG'S		1.30	1.79		
CONTRACTS		90.00	124.20		
SUBTOTAL		97.10	134.00	160.00	220.80
ADVISORY TE	AM	3.00	4.14	3.00	4.14
PUBLISH		3.00	4.14	3.00	4.14
TEXT & JOUR	NALS	1.50	2.07	2.00	2.76
O&M		22.00	30.36	48.00	66.24
TOTAL		482.00	665.16	523.00	721.74

Potential GIS Data Layers for Refuge Applications

OWNERSHIP

- 1. FWS
 - 2. COE
 - 3. State
 - 4. County

 - 5. Local

POLITICAL JURISDICTION AND BOUNDARIES

- 1. Federal
- 2. State
- 3. County
- 4. Local

SIGNS

- Boundary and closed area signs 1.
 - location
 - date installed (generation of sign) 2. Kiosk
- Entrance or recognition signs 3.
- 4. Other regulatory or interpretive signs

PROJECT LOCATION

- 1. IPW (Proposed internally funded refuge projects)
- 2. EMP
- COE (including wing dams) 3.
- Other 4.
- HABITAT COVER TYPE
 - Update existing database
 - loosestrife, etc.
- FACILITIES
 - Access points 1.
 - FWS
 - COE (including cooperatively managed) State
 - County
 - Local
 - Private
 - Improvements or other facilities 2.
 - Roads
 - Buildings
 - Constructed islands and riprap

SURVEY, MANAGEMENT AND STUDY AREAS

- Rookeries
 Closed areas
- 3. Avoidance area
- 4. Survey transects or plots
- 5. Archaeological sites

BATHYMETRY

- 1. Depths
- Stump fields
 Old Sloughs
- 4. Water quality

- 6. Eagle/osprey nests
- 7. Forest management plot
- 8. Burning plots
 - 9. LUAP
- 10. Recreation beach site
- 5. Spawning areas/winte
- Flood plain
 Pool control points

- 6. Private
- 7. Survey needs areas
- Old Brown surveys 8.
- Plats 9.

GIS Applications and Themes for Mississippi River Resource Managers

I. Applicable Themes for the UMRS

- 1. Vegetative Cover Typing (Current and historic)
- 2. Soils/Geomorphology
- Elevation and Bathymetry (Current, Brown Survey, Easement Survey)
- 4. Hydrology (water surface profile per discharge)
- 5. Water Quality
- Transportation, boundaries, public land survey and hydrography (streams, marshes and lakes). Note, this is equivalent to four data layers.
- 7. Parks, recreation areas, access points
- 8. Ownership
- 9. Institutional features (cities, towns, villages)
- 10. Endangered species
- 11. Dams, levees, dikes, and other structural features
- 12. Discharges (Waste treatment, industrial, agricultural)
- 13. Demographic information (population distribution)
- 14. Suspended Solids
- 15. Habitat types (community definition)
- Groundwater Depth, Quality, Susceptibility to Contamination, Geologic formation, and Overlying material.
- 17. Watershed Management Programs.
- 18. Water Use.
- 19. Air Quality
- 20. GIS Data Coverage
- 21. Land Values
- 22. Section 10, 404(b), Barge Fleeting and other State Permits
- 23. Contaminant Concentrations
- 24. Refuge Boundaries
- 25. Refuge Management Programs
- 26. Waterfowl distributions
- 27. Waterfowl use areas
- 28. Habitat distribution per ownership (Federal vs Private)
- 29. Goose and swan nesting areas
- 30. Refuge signs, improvements, and facilities (status)
- 31. Loosestrife distributions
- 32. Project locations (EMP, IPW, COE, State and Local)
- 33. Soil Erosion indexes
- 34. Cultural and Historical Resources
- 35. Geology
- 36. Climate
- 37. Precipitation
- 38. River Stage Information
- 39. Ground Control Points
- 40. Floodplain Zoning
- 41. Groundwater Discharge Sites
- 42. Groundwater Recharge Sites
- 43. Dredge Cuts and Dredge material placement sites

II. Potential Applications (Numbers in parentheses refer to above themes).

- 1. EMP habitat analysis (1,2,3,4,5,14,15,19,27,29,30,33)
- EMP Impact analysis and alternative evaluation (all themes)
- 3. Evaluating future scenarios for habitat management and natural succession models (1,2,3,4,8,14,15,28)
- 4. Generating and monitoring refuge management plans (1,3,4,5,10,14,15,24,25,26,28,29,30)
- 5. Monitoring changes in the areal extent and species composition of vegetative communities (1)
- 6. Maintaining Endangered Species site location and site management database
 - (1,3,4,5,7,8,9,10,12,13,15,19,22,23,24,30)
- Development of a system wide classification system (1,2,3,4,5,11,12,30,33)
- 8. Maintenance of a wildlife species use per cover type database (1,15)
- 9. General impact analysis (all themes)
- 10. Recreation site planning
 - (1,2,3,4,5,6,7,8,9,10,12,13,14,19,21,23,26,28,32)
- 11. Forest management (1,3,4,6,7,10,11,15,24,25,30)
- 12. Water quality monitoring (flow, DO., turbidity) (5,12,14,15,18,23)
- 13. Floodplain delineation and studies (1,2,3,4,6,8,9,11,30)
- 14. Monitoring 404 permit activities (1,2,3,4,22,32)
- 15. Cultural resource database (2,26)
- 16. Economic flood damage assessment (real and modeled) (3,4,6,8,9,11,12,13,16,23,30,32)
- 17. Monitoring and evaluating specific fish, wildlife, and macrophytic studies (ie., distribution of nesting, feeding and loafing of various waterfowl species, or distribution and temporal variation in habitat preferences of various fish species) (1,3,4,5,8,10,12,14,15,17,18,22,23,25,31)
- 18. Cost functions. Analysis of various combinations of the above parameters and a spatial component. For example, an estimate of implementing a forest management program, completing a management prescription, sighting a boat landing, or locating a
- dredge disposal site. (All themes)
 19. Development of a shoreline zoning program
 (2,3,4,6,7,8,9,10,11,12,13,15,17,18,19,21,22,23,24,
 26,30,32,33,34)
- 20. Monitoring site specific changes in bathymetry and topography (3,4,30)
- 21. Monitor sediment transport and deposition in specific areas of the River (2,3,30)
- 22. Develop community specific successional trend models for specific areas of the River (1,2,3,4,5,15,30,33)
- 23. Develop species specific models correlated to successional trend models (1,2,3,4,15,30)
- 24. Identify and monitor unique or unusual vegetative communities (1,14,15)
- 25. Route/corridor selection
 (1,2,3,4,6,7,8,9,10,11,12,13,15,16,21,22,23,24,26,
 27,30,32)
- 26. Erosion potential forecasting (1,2,3,4,17,27,30,32)

27. Timber sale selection (1,3,4,6,7,9,10,11,15,24,30) Potential drainage detection (1,3,4,8,17,30)

28.