

1993 Project Abstract

FOR THE PERIOD ENDING JUNE 30, 1995

This project was supported by MN Future Resources Fund.

JUL 05 1995

Title: Mississippi Headwaters River Inquiry and Education Project
Program Manager: Molly MacGregor
Organization: Mississippi Headwaters Board
Legal Citation: M.L. 93 Chpt. 172, Sect. 14, Subd. 6(d).
Appropriation Amount: \$75,000

Statement of Objectives

Natural, cultural, scenic, scientific and recreational values of the first 400 miles of the Mississippi River were assessed and investigated. A program of management guidelines for private property owners and local land use decision makers was developed, based on geographically homogeneous regions of the Mississippi Headwaters.

Overall Project Results

Biological habitat was assessed and macroinvertebrates sampled and analyzed at four representative locations; nine fisheries managers in government and academe were surveyed regarding fish habitat and community characteristics and management concerns; literature on archaeology and cultural history was reviewed and collected into an essay, a bibliography of source material produced, known cultural sites in the river corridor and the eight member counties assembled, three sites were analyzed for the location of potential cultural sites, especially dating from PaleoIndian and Archaic periods, and field survey work began at one site; topographic landform assemblages were delineated on U.S.G.S. 7.5 minute topo maps; groundwater flow regimes modelled; groundwater and surface water chemistry analyzed; a ranking system for assessing natural, cultural, scenic, scientific and recreational values was developed and nine river sections analyzed; management guidelines developed, and a River Protection Manual was produced summarizing research, values assessment and management guidelines.

Project Results Use and Dissemination

Results have been presented at seven public meetings in the region (MHB's Advisory Committee); to local water planners at a state meeting in July 1994; to local water planners and county staff at a regional meeting in April 1995; to 150 individuals attending two workshops during Minnesota Archaeology Week in May 1995; distributed to 1,000 individuals on the MHB's newsletter, and to personnel participating in the research efforts. Two master's theses were written for the geological component and both will be published in academic journals. Approximately 2,000 copies of the Mississippi Headwater River Protection Manual will be printed and distributed to Mississippi Headwaters region property owners; staff of the eight member counties of the Mississippi Headwaters Board; government personnel working or with responsibilities in the Mississippi Headwaters region; to the libraries of north central Minnesota, and as requested, as copies are available.

July 1, 1995
LCMR Final Workprogram Update Report

I. **Project Title:** Mississippi Headwaters River Inquiry and Education Project

Program Manager: Molly MacGregor
Agency Affiliation: Minnesota Department of Natural Resources
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Walker, MN 56484
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A. **Legal Citation:** M.L. 93 Chpt. 172, Sect. 14, Subd.6 (d).

Total Biennial LCMR Budget: \$75,000
Balance: \$ 0

Appropriation Language: This appropriation is from the future resources fund to the commissioner of natural resources for a contract with the Mississippi Headwaters Board to provide for the investigation of river corridor biology, hydrology and cultural issues, training of local government officials and public education on river protection strategies.

B. **LMIC Compatible DATA Language:** Not applicable.

C. **Status of Match Requirement:** Not applicable.

II. **Project Summary:**

This project hypothesizes that values related to the Mississippi River in north central Minnesota can be used to develop long-term protection strategies that define human use of the river and its shorelands within the capabilities of the ecosystem. This project provides two levels of activity: the first is a critical inquiry into specific values that MHB is mandated to protect; and the second activity is the development of guidelines and prescriptions that translate river values into tools for protecting the river itself.

III. **Statement of Objectives:**

- A. Survey and assess biological, cultural and hydrogeological issues
- B. Evaluate and classify values.
- C. Develop management guidelines and prescriptions to protect values.
- D. Prepare River Protection Manual, reporting on values survey, evaluation process and management guidelines and prescriptions.

IV. **Research Objectives:**

- A. **Title of Objective:** Survey and assess biological, cultural and hydrogeological issues.
- A.1. **Activity:** This activity assumes that comprehensive protection of a river corridor

requires identification and investigation of issues related to biological, cultural and hydrogeological values of the river.

A.1.a. **Context within the project:** MHB is mandated to protect natural, cultural, scenic, scientific and recreational values of the river corridor. MHB does not have the ability to evaluate how its rules and guidelines can be used to protect the other values named in its mandate: the cultural, scenic, scientific and recreational values.

Biological Component: MHB requires framework for assessing the biological health of the river in order to evaluate water quality results according to known information about the biological condition of the river corridor.

Cultural Component: These sites are nonrenewable resources that once disturbed by human activity cannot be reconstructed or reclaimed. There is a need to evaluate areas adjacent to rivers and lakes for the presence of important sites. There is also a need to develop a method to identify sites that may have been established on shorelines that existed before the current shorelines were established and that have not been identified in surveys of cultural sites.

Hydrogeological Component: The relationship of groundwater and surface water is not known in morainal areas, such as the area that the Mississippi Headwaters lies in. Yet, that relationship has implications for quality and quantity of both ground and surface water.

Specific activity within this objective is directed at representative locations within the river corridor. However, the methodology employed at each site can be duplicated at other locations within the river corridor.

A.1.b. **Methods:**

Biological Component: Two methods from the U.S. Environmental Protection Agency's "Rapid Bioassessment Protocols for Use in Streams and Rivers" (May 1989) will be utilized.

Cultural Component: Geomorphic characteristics of the river corridor since glaciation will be reviewed and two or three homogenous areas will be selected for analysis. Current or proposed development at the candidate river sites will also be a consideration in selection of sites. Aerial photographs, soil surveys and topographic maps will be used to analyze sites further. A geomorphic model will be constructed to predict site locations. A literature review will be conducted for these sites.

Hydrogeological Component: To accomplish the goal of determining how the hydrogeology interacts with the surface water, investigators will attempt to characterize recharge areas and the chemistry of the groundwater in such areas. This information will be used to construct models of groundwater flow. Chemical analysis of surface and groundwater will be conducted.

A.1.c. **Materials:** MHB currently conducts macroinvertebrate program and has the materials for the macroinvertebrate work of this project. MHB will develop a questionnaire for the survey of resource managers, following the EPA's publication. MHB has the necessary maps, and access to aerial photographs and soil surveys to conduct the geomorphic analysis for cultural sites. MHB will work in association with Leech Lake Tribal College's Heritage Sites Program to conduct the literature review. Materials required for the hydrogeological work are in the possession of the principal investigator.

A.1.d. **Budget:**

- a. Amount budgeted: \$35,000 (\$5,000 for the biological component; \$5,000 for the cultural component, and \$25,000 for the hydrogeological component).
- b. Balance: \$0

A.1.e. **Timeline:** 7/93 1/94 6/94 1/95 6/95

Biological		
RBP I	*****	*****
RBP IV		*****
Cultural		
Select Sites	*****	
Geomorphic	*****	
Lit review		*****
Hydrogeological		
Select sites	*****	
Collect info	*****	
Construct model		*****

A. Status:
Biological component:

Four reference sites have been identified and two sets of samples taken. A third set of samples will be taken in Spring 1994. Samples have been sorted, identified and keyed to family, per the protocol of EPA Rapid Bioassessment I. Problems: Extremely high water levels delayed sampling six weeks, until late September 1993.

Third set of samples was taken, per EPA Rapid Bioassessment Protocol I, with results sorted, identified and keyed to family. Preliminary results indicate that the greatest diversity and densities of macroinvertebrate orders came from Site Number 4, Belle Prairie Rapids, located just north of Little Falls. This site has the greatest diversity of habitat types (with boulders, rubble, sand and organic debris represented). Diversity of the site is shown in the analysis. The greatest number of families were found at this site, and the largest number of stoneflies were present at this site.

This site also had the most consistent dissolved oxygen (DO) levels, due to the large surface area and the large areas of rapids. Oxygen gives water its ability to dissolve other substances. All plants, animals and people must have food dissolved to absorb nutrition. The presence or absence of oxygen largely determines if, how much, and where aquatic life is found in a lake. This is true for all forms of aquatic life, from tiny microscopic creatures known as zooplankton, to plants and fish. Waters of consistently high dissolved oxygen are usually considered healthy and stable aquatic ecosystems supporting many different kinds of aquatic organisms.

Fluctuations in dissolved oxygen levels at the other three sites may reduce diversity of aquatic organisms. The other sites are smaller in area than the Belle Prairie Rapids, which limits the oxygen content of the area.

It is important to remember that the overall habitat of the site is the key to a healthy and diverse macroinvertebrate community. Habitat is composed of suitable substrate and water quality. Chemical parameters indicate that the water quality is better at sites No. 1 and No. 2 (Coffee Pot and Mississippi Rapids); however, site No. 4 combines excellent substrate with good water quality.

It appears that a suitable substrate is the limiting factor in relation to the diversity of macroinvertebrate populations in the Mississippi Headwaters region.

Fish assemblage questionnaire, EPA Rapid Bioassessment Protocol IV, has been submitted to review to area DNR fisheries and other fish managers in the region. Interviews will be collected in July; results tabulated in August; report complete in September 1994.

Questionnaire for regional fisheries managers was developed and administered this

quarter. A copy of the questionnaire is attached. Results will be reported in June 1995.

Survey of regional fish managers, from state and federal agencies and academic institutions indicates that the Mississippi Headwaters has an average ability to support a diverse and healthy fishery. This conclusion is based on the river's natural conditions, which are somewhat limiting for fishery, especially game fishery, and the impact of human-based development, including input of nutrients and fluctuations in water levels. There has been no comprehensive survey of the entire Mississippi Headwaters and the most recent extensive survey (Lake Itasca to Lake Winnibigoshish) is 15 years old. Fish managers met with MHB's Advisory Committee June 26th and identified how local use land managers can protect uplands and critical habitat areas for the river's fishery in current decision-making. These concepts will also be applied to the ongoing Mississippi Headwaters River Watch Project. Specific recommendations for action include a comprehensive survey of fisheries habitat and community structure for the Mississippi Headwaters; identification of critical habitat areas; dissemination of procedures to protect critical habitat areas, and recommendations for small research projects, such as community dynamics of baitfish populations.

Cultural component:

Literature review of geomorphic analysis of cultural sites, cultural sites in the Mississippi Headwaters region and available computer modeling is complete. Three areas have been selected to serve as the pilot for the predictive model. Sites are the Mississippi River channel between Wolf Lake and Lake Andrusia, Beltrami County; Sandy River confluence with the Mississippi River, Aitkin County; confluence of the Pine River and the Mississippi River, Crow Wing County, and confluence of the Nokasippi River and the Mississippi River, Morrison County. These areas were chosen for the likely presence of cultural sites, the geomorphicological characteristics, the proximity to new and future residential development, and to represent the geographic and ecological diversity of the Mississippi Headwaters. Problems: There have been no problems in completion of this objective to date. Raising funds to conduct summer field work will be a problem.

Literature review of sources for archaeological, cultural and historic sites in the eight county Mississippi Headwaters region has been completed. Sources used are: State Historic Preservation Office files; State Archaeologist files; Section 106 Compliance Reports; U.S.D.A. Forest Service files; U.S. Army Corps of Engineers files and historic records.

A Geomorphology and Paleoenvironmental Model was developed for selected sites in the Mississippi Headwaters region. The model has been used to assess three of five selected locations for the potentiality of cultural sites. Analysis was completed for the confluence of the Mississippi and the Swan Rivers, Aitkin County; the confluence of the Mississippi and the Pine Rivers, Crow Wing County; and the confluence of the Mississippi River and the Swan River, Morrison County. Priority One Survey areas, that is, areas likely to contain the most readily available site locations were mapped at each location. Sites located in these areas will often be large and represent a long history of use or intact sites of the earlier occupations of the region. Fundraising for Summer 1995 fieldwork will begin this quarter.

Hamline University Archaeology Summer Field School began surveying suspected cultural sites identified through geomorphic modeling at the confluence of the Swan River and the Mississippi River near Jacobson, Aitkin County. Ten students and three faculty lead the investigation. Citizens residing near Jacobson are be providing housing and meals for the field school personnel and participating in excavations. The cost of this survey work is not being paid

through this appropriation, but represents a continuation of this work.

Hydrogeological component: Sites for monitoring water quality were selected. Monitoring was not conducted in the 1993 field season. A model of the surficial aquifer and bedrock hydrogeology was constructed.

Accomplishment of the January to July 1994 Quarter are the geomorphological mapping of 35 topographic quadrangles; field reconnaissance of 12 topographic quadrangles; digitizing of the 12 completed quadrangles; preliminary field reconnaissance of 23 additional topographical quadrangles; description of 1001 field observation sites; collection of 521 sediment samples, analysis of 200 sediment samples, determination of hydraulic conductivity for 131 sediment samples, input of parameters to numerical simulations, groundwater modeling (known as inverse groundwater modeling; model is MODFLOW) and estimation of spatial distribution of recharge.

As part of the ongoing investigation an additional 124 observation sites were visited during the 1994 field season. Water samples were collected at 118 localities and 149 samples were analyzed. These sampling sites included wells, springs, and surface water locations. Several water chemistry parameters were measured in the field. These measurements included pH, temperature, conductivity, redox potential and dissolved oxygen. Samples were then collected and returned to the laboratory for further analyses, which included alkalinity and major cations and anions. Additional samples were collected at 15 sites for groundwater dating. Nine of these samples were submitted for enriched tritium analysis to estimate groundwater age.

Preliminary results indicate that two groundwater regions within the Itasca moraine can be defined, areas near or a few kilometers either side of the crest of the moraine and the north and south flanks 10 or more kilometers from the moraine crest. Within the moraine groundwater flow is complicated. High tritium values in wells and springs indicate that water within shallow groundwater flow systems in the moraine was recharged recently. The general chemistry of these waters also suggests a rather short residence time. The waters have high dissolved oxygen and low concentrations of dissolved constituents. Deeper wells have slightly different chemistry, containing more dissolved materials, particularly iron and low dissolved oxygen values. These results suggest that, as speculated in the original proposal, the moraine serves generally as an important groundwater recharge area.

In contrast, the wells (shallow and deep) and springs along the flanks of the moraine are characterized by very low dissolved oxygen, high dissolved iron, and tritium ages that suggest long groundwater residence times. Such characteristics imply that these areas are groundwater discharge zones. The spring waters were all characterized by iron stains. The iron is present because the water has low dissolved oxygen content, this tends to indicate an extended time of groundwater circulation. All of the water samples were essentially neutral with pH values that ranges from 7.31 to 7.70. The pH indicates that the dominant carbonate form is bicarbonate (HCO₃). In these discharge areas the groundwater temperatures are very cold, again, this is consistent with upwelling of deep groundwater.

The results obtained in the study area are directly applicable to other glaciated regions in northern Minnesota. With this investigation as a guide, delineation of landform assemblages in the office by examination of topographic maps and aerial photos can be used to estimate groundwater recharge rates. Limited field investigations can be used to test and refine the office estimates.

Topographic relief, hydraulic conductivity, and groundwater recharge characteristics can be the basis for management classifications. The results of this investigation can be greatly

simplified as follows. Two major classifications of landforms are used in determining resource management. Landforms made up of low permeability sediment such as the till plains and those made up of permeable sediments such as outwash fans and outwash plains. Each landform can be further divided into areas of high relief and low relief. In general, areas of high relief have high runoff to infiltration ratios, while areas of low relief have lower ratios of runoff to infiltration.

This landform based approach can be used to address forestry, agriculture and domestic septic system loading. Additional information is provided in the Mississippi Headwaters River Protection Manual.

B. Title of Objective: Evaluate and classify values.

B.1. Activity: MHB will use its investigation of biological, cultural and hydrogeological issues to evaluate opportunities for protecting the natural, cultural, scenic, scientific and recreational values of the river corridor through management of human activities.

B.1.a. Context Within Project: This step of evaluation and classification lays the ground work for developing management guidelines. The evaluation and classification of values establishes a rating system that can be used for planning purposes, or to guide decision making. The evaluation and classification process provides an agreement of where to start protection efforts.

B.1.b. Methods: A technical committee will be assembled to review the results of the previous objective.

B.1.c. Materials: Materials required to complete this objective are being prepared by MHB now (River Resources Inventory) or would be completed through Objective A.

B.1.d. Budget:

a. Amount Budgeted: \$10,000

b. Balance: \$ 0

B.1.e. Timeline:	7/93	1/94	6/94	1/95	6/95
Convene tech committee			*****		
Review river inventory			*****		
Evaluate values				*****	
Classify					*****

B. Status:

Initial meeting was held 6/24/94 to review values ranking scheme. A value statement was developed for each of the five values MHB is charged with protecting -- natural, cultural, scenic, scientific and recreational. Each value statement included a variable that can be controlled by local land use managers, usually removal of vegetation and changes in topography.

An inventory of natural, cultural, scenic, scientific and recreational values of the Mississippi Headwaters has been completed. Values were evaluated and classified in this document. The evaluation and classification system has been discussed in committee meetings.

Mississippi Headwaters Guide Book, which contains an inventory of resources of the river corridor, organized as natural, cultural, scenic, scientific and recreational values; the value were classified and applied to nine river sections, was published May 1995.

The values assessment system is presented in that document and the Mississippi Headwaters River Protection Manual.

C. Title of Objective: Develop management guidelines and prescriptions to protect values.

C.1. Activity: MHB is mandated to protect certain values of the river corridor. After identifying, evaluating and classifying values, MHB must then incorporate appropriate management strategies, which are feasible, efficient and capable of reasonable administration.

C.1.a. Context Within Project: Management strategies developed to achieve MHB's mission will be one of three specific types of management activities: designation of an area requiring protection, which may involve development of best management practices; limitations of human activity, which requires adoption of appropriate rules by county government, and acquisition of a piece of property.

C.1.b. Methods: Basic method for achieving this objective is the use of a technical committee and the MHB's Advisory Committee, composed of citizens and professionals. Staff will develop a range of management options, which will be selected and finalized by the committee. All management strategies will then be offered for review and comment at public meetings within the eight member counties of the MHB.

C.1.c. Materials: No unusual materials required.

C.1.d. Budget:

a. Amount Budgeted: \$10,000

b. Balance: \$ 0

C.1.e. Timeline:	7/93	1/94	6/94	1/95	6/95
Convene committee			*****		
Management options			*****		
Select options				*****	
Public meetings					***

C. Status:

Based on the MHB's evaluation and classification of river values, three general management directives, with specific actions for implementation, have been developed and reviewed by committee and board. Public discussion on the concepts will begin in Winter 1995.

MHB held seven meetings from September 94 through June 95 to review the values classification and management prescriptions. Citizen representatives of the eight member counties, special interest groups, staff of the eight member counties, state and federal agencies attended these meetings.

Management prescriptions were based on the values ranking, as follows:

Natural values are complex for the entire 400-mile Mississippi Headwaters region. Protecting the present level of natural diversity should be a goal for all resource managers. Retaining a vegetated corridor that shades the water is one way managers can accomplish that goal.

Cultural values are dynamic for the 400-mile Mississippi Headwaters region. At present, development is limited to the area around five towns -- Bemidji, Grand Rapids, Aitkin, Brainerd and Little Falls -- each of which are growing. Residents and visitors say that the woods and water environment brought them or keeps them in the region. Managers should assure that future develop does not compromise the region's natural values. Land use management decisions should also consider the impact of development on archaeological sites.

Scenic values are associated with the natural values of a river section. Land managers can now incorporate aesthetics in decision-making by assuring that continuous vegetative cover is maintained. Some groups are publishing guides to scenic spots, or spots where visitors can view wildlife or plants. This type of information can acquaint residents and visitors with unique

visual resources of the Mississippi Headwaters.

Scientific inquiry should be a priority for river sections where complex cultural values or significant private land ownership suggest that these opportunities could be lost. A county biological survey is nearly complete for Cass and Morrison counties and is beginning for Crow Wing County. The surveys should begin in the MHB's other five member counties. DNR should update its fisheries surveys, last completed on the Mississippi Headwaters 20 years ago. Cultural resource sites should be identified and surveyed systematically.

Recreational values are defined by natural conditions and human infrastructure. Land managers should restrict additional recreational developments in areas where natural conditions, such as channel depth, limit recreational use. Land managers should promote recreational use suitable for river conditions from Grand Rapids to Brainerd (the longest stretch of unpounded river). Land managers should monitor recreational use to evaluate the impact of conflicts near Bemidji, Grand Rapids and Brainerd.

D. Title of Objective: Prepare River Protection Manual

D.1. Activity: Production of an attractive manual, which is useful to a variety of users interested in river protection, from individual property owners to county government personnel, covering both the methods used for investigating specific issues, results of specific investigations (well-illustrated by maps and drawings) and also listing the management strategies adopted by the project. This manual will become a companion to other manuals produced by the MHB, including "User's Guide to Shoreland Development", which is an introduction to limnology and the interaction of land use and water quality; "Shoreland Zoning Manual", which introduces how local land use regulations work to protect water resources, and the "River Resources Inventory", which is a listing of the natural, cultural, scenic, scientific and recreational values by river segment.

D.1.a. Context Within Project: Dissemination of information generated by this project is critical to its success. First, methods used in the inquiry portion for investigating critical biological, cultural and hydrogeological issues can be duplicated in other areas. Second, management strategies proposed in response to investigation of specific river values must be circulated to river property owners, county government officials and others interested in participating in river protection on the Mississippi Headwaters. MHB also assists other communities in developing river protection programs on other rivers. This manual will be written with consideration for potential users from other communities.

D.1.b. Methods: Copy will be drafted by MHB and given to the technical committee and MHB Advisory Committee for review and comment. Manual will be professionally designed, to make it as user-friendly as possible. It will include maps of the study areas and appropriate illustrations.

D.1.c. Materials: No unusual materials required.

D.1.d. Budget:

a. Amount Budgeted: \$20,000

b. Balance: \$0

D.1.e. Timeline:	7/93	1/94	6/94	1/95	6/95
Draft copy				*****	
Graphic production				*****	
Review copy				*****	
Publish manual					**

D. Status: Mississippi Headwaters Guide Book was published May 1995. This publication includes:

*System to assess status of natural, cultural, scenic, scientific and recreational values of the Mississippi Headwaters;

*Assessment of each value for each of nine river sections;

*Maps and illustrations of nine river sections;

*Summary of current and previous research for each river sections, and

*Management guidelines for each river sections.

Mississippi Headwaters River Protection Manual was written in June 1995 and includes summary of the research completed for this project and the following information:

Values summary: Natural, cultural, scenic, scientific and recreational values of the Mississippi Headwaters were defined, and a ranking system developed to be used to determine presence or absence of these values. Nine river sections were evaluated according to the system and a guide to the values produced by MHB.

River Management Directives

1. Identify development zones based on values assessment: River values assessment identified five river sections were natural, scenic and scientific values have not been diminished by cultural use. These sections should be designated as suitable for minimal development. River values assessment identified four river sections were cultural values are complex, but remain relatively balanced with natural features. These sections should be designated as suitable for development (in some, development might be limited). Encourage property owners/decision-makers to assure development is consistent with natural values of river section.

2. Retain vegetated riverbanks: Vegetated, stable river banks are the foundation of achieving river protection through land use management. Apply this concept to: residential land use, forestry, protection of certain values, such as cultural sites, sensitive species, old growth.

3. Use ongoing monitoring to assess health of river system: Water quality monitoring is used to assess health of river system. It can also suggest concerns that may require additional investigation. Parameters monitored are discussed, as is use of results.

4. Provide continuing information and education: Educate property owners about cultural use of Mississippi Headwaters and their responsibilities under state and federal law to protect cultural sites and artifacts. Education local land use decision makers about location and status of cultural sites. Continue cultural site survey work. Inform property owners about how land forms interact with groundwater. Inform local government officials about location of groundwater controlling land forms in counties.

5. Provide for additional investigations

Examples of needed investigation are: county biological surveys, county geological atlases, fish survey work, cultural site investigation.

The text of the River Protection Manual has been delivered to a graphic design production house for final production and printing, which will be complete by December 31, 1995.

V. Evaluation:

This project will be evaluated according to the MHB's ability to achieve three fundamental goals set forth in this project:

* Development of models that can be used to define issues related to specific biological, cultural and hydrogeological values of the river corridor;

* Creation of a process to be used in evaluating, classifying and managing biological, cultural and hydrogeological values of the river corridor; and

* Establishment of management strategies that deepen the current resources available to river managers.

An ultimate indicator of the success of this project is the acceptance and implementation of the management strategies; however, it is not possible to build this into the timeline of the current project. However, the MHB will be using this manual in its river protection and education efforts, beyond the June 30, 1995 conclusion of this project.

VI. Context within field:

When MHB was established in 1979, river management was guided by the National Wild and Scenic Rivers Act and the Minnesota Wild and Scenic Rivers Act. Management activities were restricted to a specific corridor and were generally geared to protecting the visual appearance of the corridor. At the same time, the federal and state law did mandate protection of a wide variety of values -- the "natural, cultural, scenic, scientific and recreational" are referenced in both laws, as well as the MHB's enabling legislation. Moreover, since 1979, river managers have recognized that effective protection must look beyond the corridor to the watershed. The mandate to protect a diversity of river values makes it easier for a corridor based river management group, such as MHB, to look at the river in a broader, and therefore more realistic, context. However, the MHB must develop corresponding management tools so that these values can be considered in a meaningful way by county government officials, educators and river property owners.

VII. Benefits:

This project offers methods and guidelines for developing more comprehensive river management that is responsive to a diversity of river values. This will assist efforts to protect the Mississippi Headwaters. It will create methods and guidelines that can be transported to other communities and other rivers.

VIII. Dissemination:

The information gained through this study will be disseminated to county government (namely: staff in land departments, highway departments, planning and zoning, local water planning and soil and water conservation districts; and to members of the related boards), educators participating in the Mississippi Headwaters River Watch Project and to property owners in the Mississippi Headwater region. Information will also be provided to popular and professional media. MHB reports routinely on its activities through a monthly newsletter, which will include reports on this project.

IX. Time:

July 1, 1993 -June 30, 1995

X. Cooperation:

All Nations Cultural Resources

Department of Geology, University of Minnesota - Duluth

XI. Reporting Requirements:

Semiannual status reports will be submitted not later than Jan. 1, 1994, July 1, 1994, Jan. 1, 1995 and a final status report by June 30, 1995.