LCMR Project Abstract
For the period ending June 30, 1995
This project was supported by the Environment and Natural Resources Trust Fund

Title: Minnesota County Biological Survey-Continuation
Program Manager: Carmen Converse
Organization: Minnesota Department of Natural Resources
Legal Citation: Legal Citation: M.L. 93, Chpt. 172, Sec. 14, Subd. 6(a)

Appropriation Amount: $ 900,000

Statement of Objectives: To identify significant natural areas and to systematically collect, distribute, and interpret data on the distribution and ecology of natural communities, rare plants and rare animals. This information serves as the foundation for the management and conservation of areas of ecological significance.

Overall Project Results: The Minnesota County Biological Survey (MCBS) was completed in Cass, Dakota, Houston, and Winona counties, and began in five new counties: Fillmore, Pine, Olmsted, Mahnomen, and Wabasha. New locations of 2636 rare features were added to the Natural Heritage Information System since July 1993.

Since the project began in 1987, MCBS has completed inventory in 24 counties and has recorded over 7000 new locations of rare features. This represents 34% of the total statewide records in the Rare Features Database. In 16 of the 24 counties, the number of documented locations of rare species has more than doubled from the information known prior to the Survey. In addition, eight species of native plants and two species of amphibians not previously documented in Minnesota were recorded by MCBS.

Project Results Use and Dissemination: The Survey results have contributed to the knowledge of the status and distribution of the state's flora, fauna and natural communities. This information is now being used to update Minnesota's List of Endangered, Threatened and Special Concern Species, and *Minnesota's Native Vegetation: A Key to Natural Communities version 1.5.* Data are maintained and distributed as part of the Department of Natural Resources Natural Heritage Information System that now includes twenty-two databases and the mapping capabilities of ARC/INFO GIS.

Data are used to maintain and manage Minnesota's biological diversity through processes such as environmental review, forest and wildlife planning, appropriate urban and recreational development, Scientific and Natural Area and other nature preserve acquisition. The interpretation of these endangered resources is provided through maps, publications, and presentations. Examples are listed below:

* Eight sites recommended by MCBS staff became Scientific and Natural Areas.

* Interagency coordination meetings for Glacial Lake Agassiz were held to interpret results of the Survey, and to discuss implications for the management and protection of areas of high biodiversity within four counties of northwestern Minnesota (Wilkin, Clay, Norman, and Polk counties).

* *Minnesota's St. Croix River Valley and Anoka Sandplain: a guide to native habitats*, was published in 1995 by the University of Minnesota Press, and is available at area bookstores along with a set of companion color wall maps published by the DNR (*Minnesota's St. Croix River Valley and Anoka Sandplain: maps of native habitats*). The book contains a landscape history of the area, and detailed descriptions and maps of 39 natural community types found within the region. Much of the information contained in the book was recently collected by MCBS in six counties. It contains a guide to 35 sites accessible to the public where those interested in the natural history of the region can visit examples of native habitats. It is intended for landowners who want to gain better understanding of the native habitats on their land, and for use by government planners, resource managers, and students.

* Maps of rare features in Chisago, Isanti, Anoka and Ramsey counties were published. A total of eight county maps displaying rare features are now available. Maps of Rice, Goodhue, Winona, and Houston counties are scheduled for publication in the next six months. Summaries of Survey results were published for Cass, Dakota, Goodhue, Houston, Olmsted, Pine, Polk, and Wabasha, and Winona counties.

July 1 1995

LCMR Final Workprogram Update Report

I. Project Title: Minnesota County Biological Survey - Continuation

Program Manager: Carmen Converse

Agency Affiliation: Department of Natural Resources

Address: Box 7, 500 Lafayette Road
St. Paul, Minnesota 55155

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A. Legal Citation: M.L. 93, Chpt. 172, Sec. 14, Subd. 6(a)

Total Biennial LCMR Budget: $ 900,000 Balance: $ 0

This appropriation is from the trust fund to the commissioner of natural resources to continue the Minnesota county biological survey of systematic collection ($432,000) and management of data on the distribution of rare plants, animals and natural habitats ($288,000), and to provide for distribution and integration of rare features information ($180,000).

B. LMIC Compatible Data Language: (not applicable)

C. Status of Match Requirement: (not applicable)

II. Narrative:

The Minnesota County Biological Survey (MCBS) was initiated in 1987 in response to the need to determine the status of biological diversity in Minnesota. MCBS continues to collect biological information on the distribution and status of rare plants, rare animals, and natural communities. During FY94-95, surveys will be completed in five counties and will begin in five new counties. Ecological data collected by MCBS is entered into the Natural Heritage Information System, Minnesota's most comprehensive repository of rare natural features information.

Minnesota County Biological Survey results are used for environmental review, forest and wildlife planning, urban and recreational development planning, nature preserve acquisition, and public education.

III. Statement of Objectives:

A. Collect information on Minnesota's rare natural resources by using a systematic county-by-county inventory.

B. Expand and improve the Natural Heritage Information System in order to effectively integrate Minnesota County Biological Survey data with other natural resource data.

C. Facilitate the implementation of the findings of the Minnesota County Biological Survey by providing high quality products that promote the protection and management of Minnesota's endangered natural resources.

IV. Objectives:

A. Title of Objective: Collect information on Minnesota's rare natural resources by using a systematic county-by-county inventory.

A.1. Narrative: Data collection will be completed in five of the counties where the inventories began in the previous biennium. Surveys in five new counties will be implemented.

A.2. Procedures: A multi-level survey process is followed. This consists of interpretation of aerial photography for identification of potential natural areas - remnants of natural vegetation that have escaped significant human alteration. This is followed by aircraft and ground surveys to assess natural area and natural community quality and condition. Additional specialized techniques are used during the second and third years to survey selected rare species or groups of species (e.g., vascular plants, birds, mammals, reptiles and amphibians). As a part of the process, data are incorporated from other existing surveys such as forest inventory, minerals surveys, wildlife habitat inventories, metropolitan parks surveys, soil surveys, specimens from museum collections and geographic files stored at LMIC.

A.3. Budget $432,000 Balance: $0

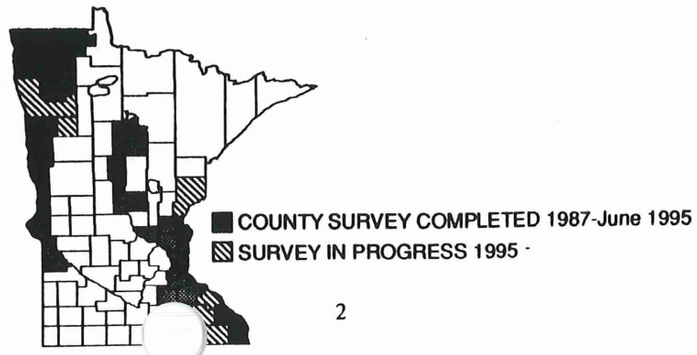
A.4. Timeline:

	7/93 1/94	6/94 1/95	6/95
Planning/Review existing data	*****	*****	
Airphoto interpretation	*****	*****	
Aerial Survey	**		
Natural Community Survey	****	****	****
Rare Plant Survey	****	****	****
Rare Animal Survey	****	****	****

A.5. Status:

The Survey was completed in Cass, Dakota, Houston, and Winona counties, and began in five new counties: Fillmore, Pine, Olmsted, Mahnomen, and Wabasha. Survey will be completed in Polk and Mahnomen counties at the end of the 1995 field season. New locations of 2636 rare features were added to the Natural Heritage Information System since July 1993.

Since the project began in 1987, The Survey has completed inventory in 24 counties and has recorded over 7000 new locations of rare features. This represents 34% of the total statewide records in the Rare Features Database. In 16 of the 24 counties, the number of documented locations of rare species has more than doubled from the information known prior to the Survey. In addition, eight species of native plants and two species of amphibians not previously documented in Minnesota were recorded by MCBS.



The Survey results have contributed to the knowledge of the status and distribution of the state's flora, fauna and natural communities. This information is now being used to update Minnesota's List of Endangered, Threatened and Special Concern Species, and *Minnesota's Native Vegetation: A Key to Natural Communities version 1.5*. For example, MCBS staff analyzed releves (vegetation samples) in order to contribute to the development of criteria for calcareous fens by a technical advisory committee. The systematic regional approach to inventory, the work of qualified and committed staff, the effective review of existing data, the exploration of new survey technology, and successful cooperative efforts, have been instrumental to the success of the Survey. These are described below.

Systematic Regional Survey

The single most important feature of the success of the Survey is the availability of qualified and committed staff. Furthermore, the establishment of field stations, and the concentration of staff efforts in ecological regions for systematic inventory is valuable both in increasing communications with local residents and land managers, and in reinforcing the staff expertise and understanding of the regional landscape and the related habitats of rare flora, fauna, and natural communities. The examples below demonstrate how since 1993, the Survey has provided for a significant acceleration of data collection compared to methodology used prior to 1987.

* As a results of focused botanical surveys in the Chippewa National Forest, 139 locations of rare plants were recorded during the Survey between 1992 and 1994; 14 locations were known prior to that time.

* In Fillmore County, 68% of all of the rare plant locations recorded in the Rare Features Database were collected by MCBS during one field season (1994). This included two new populations of the sedge, *Carex careyana*, first identified as a state record by MCBS in the adjacent Houston County.

* In northwestern Minnesota, MCBS located 51 populations of the federal candidate species, Cooper's milkvetch (*Astragalus neglectus)*. 91 locations were known in the state prior to this systematic search, so this represents over half of the known locations in the state, and has implications for the Federal listing process.

* During June 1995 evening and night surveys in Polk County, 50 locations of Yellow Rails (*Coturnicops noveboracensis*) were recorded. This represents 28% of the known locations statewide.

* One of the two state records of salamanders (the four-toed salamander *Hemidactylium scutatum*) was located in the Chippewa National Forest where MCBS staff and Forest Service staff coordinated habitat sampling.

* The portion of the Whitewater Wildlife Management Area that lies within Olmsted County was identified as the largest natural area in the county. Staff described a diverse range of natural communities including fine examples of maple-basswood forest, oak forest, white pine hardwood forest and bluff prairie. Along the Whitewater River, this WMA also contains a massive , dolomite cliff, known as a maderate cliff, where cold water seeps out of cracks in the dolomite during much of the growing season. This cliff harbors one of Minnesota's four populations of Leedy's Roseroot (*Sedum integrifolium ssp. Leedyii*), an endangered plant.

Review/New Technology

As MCBS continues to survey areas in northern Minnesota, the evaluation of existing related resource data and the application of new survey technologies is a critical part of the Survey process. A plant ecologist with significant computer skills has been assigned to review the existing inventories, and to track the progress of related inventory projects to assess their utility for MCBS in the identification of important areas of biodiversity. These include the traditional resources inventories (soils, timber, wildlife etc.), the remote sensing vegetation analysis associated with the Forest Songbird Project, and the image processing protocol being developed by DNR's Forestry Assessment as part of a national GAP Analysis effort of the National Biological Service. Coordination with the Ecological Classification Systems of the U. S. Forest Service and the DNR is also a part of this review.

A experimental data analysis project using Cass County data is an example of the possible utility of reviewing existing related datasets. A MCBS plant ecologist is preparing a crosswalk of the natural community classification (used by MCBS) with DNR's Cooperative Stand Assessment cover types, Cass County cover types, Chippewa National Forest stand data, and cover type data maintained by the Leech Lake Reservation Division of Resources Management. This "crosswalking" is achieved through comparison of dataset attributes. Using computer programming and GIS, the ecologist is developing a reclassification of the various datasets to one vegetation classification that is an approximation of the natural community classification. The proposed product is a Cass County map displaying a single vegetation layer for those areas mapped by the various resource agencies. This is in part, in response to the requests of local land managers who have found it awkward to use multiple maps of various forest vegetation classifications while developing landscape level plans.

If the outcome of this crosswalking is useful, a similar procedure, combined with the analysis of remote sensing classification, and the more traditional review of low-level photography, hopefully will expedite the future selection by MCBS staff of the most significant sites for more detailed field inventory within a northern Minnesota landscape area. The Mille Lacs Upland Subsection as defined in the DNR's Ecological Classification System (ECS), is an example of such a landscape area. For more details see the 1995 LCMR Work Program approved in June 1995.

Cooperative Efforts

Participation in cooperative efforts in the survey of rare features has been time-consuming but worthwhile in generating additional data, providing opportunities for exchange of ideas and concerns surrounding biodiversity issues, generating baseline data for additional survey and research, and developing pathways for further protection and management planning that are the outcome of the Survey effort. The following is a sampling of various data collection coordination efforts:

Within DNR MCBS is part of a Natural Resources Inventories Communication Committee established as an outcome of a workshop held in Grand Rapids in February 1995. Specific areas of MCBS coordination within DNR have been in the development of an ECS, coordination with the Forest Inventory Module, and cooperative agreements with the Division of Parks and Recreation for more intensive survey work in selected state parks (Southeast, Metro). Specific activities included developing survey protocol for mapping territory of rare birds at Beaver Creek Valley SP, providing training and coordination of bat surveys at Mystery

Cave, coordinating Spotted skunk (*Spilogale putorius*) surveys with Wildlife Managers and USFWS personnel in NW MN, discussing remote sensing vegetation classification with participants in the Forest Songbird project, and evaluating how the Section of Fisheries current aquatic vegetation sampling methods might apply to rare aquatic plant inventory.

Counties MCBS routinely contacts each county board at the onset of the Survey of each county. In some cases this involves a presentation, or a follow-up meeting with specific county staff. In Olmsted County, a Memorandum of Understanding exists between MCBS and the South Zumbro Watershed Joint Powers Board for survey work in the county. The county is providing logistical support in the form of vehicles and data management (GIS). Cass County provided access to natural resource files and assistance with GIS map products. A meeting was held with St. Louis County to discuss possible future coordination of resource inventory work. A recent meeting with Hennepin County Parks assisted with the identification of possible significant natural areas of interest to the Park System.

Colleges and Universities MCBS met with University of Minnesota-Crookston concerning training and coordination of bird surveys in Polk County. MCBS ecologists provided sites for additional wetlands work to the University of MN-St. Paul for the "Assessing Wetland Quality with Ecological Indicators" LCMR project, and discussed the use of releve sampling methodology. MCBS uses the University of Minnesota Herbarium, recently computerized, to developed lists of targeted species to add to county checklists.

Federal MCBS animal survey methodologies were demonstrated to Minnesota's wetland management districts (USFWS), and MCBS conducted bird surveys in the Detroit Lakes Wetland District. Surveys were also coordinated within the National Wildlife Refuges in the Minnesota River Valley, and the Mississippi River. MCBS completed its participation in a cooperative agreement with the Chippewa National Forest where the ecologist assisted with the collection of vegetation samples for the development of an ECS in the Forest. Workshops were conducted by MCBS staff to train Chippewa National Forest staff in mammal trapping, and bat, reptile and amphibian survey techniques, and in plant identification. MCBS botanists coordinated their plant inventory work along the St. Croix River (Pine County) with that of the National Park Service to assure data exchange and a more comprehensive understanding of the flora of the St. Croix River Valley.

MCBS coordinated, and advised on plant survey work in the Leech Lake Reservation Division of Resources Management (Cass County). Staff also met with biology staff of the White Earth Reservation (Mahnomen County) to describe Survey techniques-one biologist conducted Red-shouldered hawk (***Buteo lineatus***) surveys with MCBS staff.

Other Organizations Various organizations and individuals have assisted MCBS. For example, the Agassiz Environmental Learning Center in Polk County collected roadside data on locations of selected rare orchids in conjunction with the Survey. Several excellent volunteers have assisted with the location and photography of rare plants, and with data management.

Midwest Regional Coordination Ecological boundaries do not correspond with state boundaries, yet to properly assess the biodiversity within the state, the regional context is important. MCBS ecologists participated in the development of a regional natural community classification system in cooperation with the Midwest Natural Heritage Regional Office of The Nature Conservancy. Most recent efforts have been in the refinement of the classification of the Great Plains communities.

Continued coordination is regarded as important to develop a reasonable product for the Upper Midwest. Staff ecologists participated in discussions of regional classification, ECS, data management, and species surveys at a regional meeting in Grand Island NB. Ecologists also participated in an Upper Great Lakes meeting in St. Paul to discuss coordination of ECS in Wisconsin, Michigan, and Minnesota. A survey for wood turtles (*Clemmys insculpta*) on the Zumbro River, and discussion of the proposed protection status involved regional experts from WI DNR, the USFWS, and Minnesota.

MCBS contributed to a proposal for the assessment of the biodiversity of the Upper Midwest. This proposal included inventory work potentially to be conducted in coordination with the National Biological Service. This proposal, *Priority procedures for biodiversity assessment in Minnesota* was submitted to NBS. Another proposal for funding of work on the north shore of Lake Superior as part of a regional effort in the Great Lakes Basin was submitted to the Great Lakes Program of the Environmental Protection Agency. Neither proposal resulted in additional MCBS funding.

Conclusions/Problems

Qualified staff are essential to the success of the Survey. MCBS has encountered an ongoing demand for ecological expertise and training in most counties surveyed. Assistance has been provided on a limited basis, or has been volunteered by MCBS staff. There is a continued need for ecologists in the counties after the Survey is completed. Often the MCBS plant ecologists are contacted for assistance several years after the Survey was completed in a county. Hopefully, various ecologist positions approved by the State Legislature in 1995 will satisfy some of the demand.

The Report of the Timber Harvesting GEIS Implementation Strategy Roundtable (Nov 16, 1994) recommended that funding should be increased for county biological surveys. This recommendation is especially relevant to MCBS work in northern Minnesota. Funding of MCBS was not a part of the final GEIS legislation, but fortunately, the current level of funding was maintained for FY 96-97 by the Legislature as recommended by LCMR.

In FY 96-97, focal areas for MCBS inventory are the Minnesota River Valley, and the northern forested region. As the Survey expands in the north, the review of the extensive existing resource data for the selection of the high priority areas of biodiversity is essential. This process will continue to involve the use of improved computer technology, and strategies to work cooperatively with existing inventories. There is an effective long-term benefit to coordinating MCBS inventory with other surveys although this is very time-consuming during the Survey. The two year funding process impairs the ability to prepare a long term plan for completion of the Survey, sometimes to the frustration of potential cooperators. Coordination of MCBS work with projects funded by the federal government will probably be limited in the near future due to federal budget cuts. More demands on state staff to provide regional ecological context is a possible outcome. More likely, there will be more focus on coordination within Minnesota, and the regional context will be neglected.

A.6. Benefits: The distribution and status of Minnesota's most endangered resources are identifie providing a basis for the maintenance and enhancement of Minnesota's biological diversity throug processes such as environmental review, forest and wildlife planning, appropriate urban an recreational development, Scientific and Natural Area and other nature preserve acquisition.

B. Title of Objective: Expand and improve the Natural Heritage Information System in order to effectively integrate Minnesota County Biological Survey data with other natural resource data.

B.1. Narrative: The Natural Heritage Information System continues to expand through the addition of new and updated data on the distribution of rare natural features located by MCBS. Existing information networks and Geographical Information Systems (GIS) are being improved to provide for increased access to data and for flexibility in the display and integration of data to meet diverse needs of users. In addition, the computerization of other incidental data collected during the survey supplements the goals of related projects (e.g., original public land survey records, vegetation databases).

B.2. Procedures: All data collected by MCBS are entered into the related map, manual and computerized files that make up the Natural Heritage Information System. Data collected by MCBS are entered into the following computerized databases: Rare features (geographic), Releve' (vegetation samples), County flora check-list, MCBS site, Eagle, Colonial waterbird, and Bearing tree (from Public Land Survey notes 1847-1907). Locations of rare features are mapped on U.S.G.S. topographic maps, and both site and rare features data are digitized using an ARC/INFO GIS.

All plant and animal specimens are identified, prepared for permanent storage and deposited in appropriate repositories at the University of Minnesota. Photographic vouchers are identified, labelled and stored at the DNR, St. Paul. Field data sheets are filed manually in preparation for archiving. Color slides, video tapes, and other photography are catalogued. All MCBS data are indexed for accession in order to easily produce maps and reports.

The structure of the Information System has been recently improved to provide for more efficient data management through the use of related databases, laptop computers, multiuser systems and GIS. Staff biologists can now directly enter their own data in the field. Continued development of these systems is essential to achieve MCBS goals.

B.3. Budgeted amount: $288,000 Balance: $0

B.4. Timeline:

	7/93 1/94 6/94 1/95 6/95
Data entry and analysis of new MCBS records	**********
Multiuser and GIS system development	**********
Integration of MCBS data within DNR and with other agencies and organizations	**********
Field survey forms archived	**********

B.5. Status:

New locations of 2636 rare features were added to the Natural Heritage Information System since July 1993. Since 1987, MCBS has contributed 34% of the total records in the Natural Heritage Rare Features Database. Since 1987, 1133 releves (natural community vegetation samples) were added by MCBS to the Releve Database. This represents about 30% of the total records in that database. These releves are analyzed to assist with the refinement of the natural community classification. Data are also maintained for each site identified as a potential natural area for survey in each county in the Site Database. This database is used by surveyors to track their progress, to provide summaries of findings, and to

produce maps displaying areas of biodiversity significance. The Site Database is relational to the Rare Features Database. Finally, the computerization of the statewide bearing tree data (2764 townships) from the Public Land Survey Records of 1947-1907 nears completion. All of the above databases have a geographic component, and output can be generated using ARC/INFO GIS.

Networks and GIS

The implementation of networks in the DNR has been a major undertaking during the past year. Some of this has been related to the implementation of the Statewide Systems Project (SSP), and other development is related to the need for improved communications within and outside of the Department.

The use of GIS (ARC/INFO and ARC/VIEW) within the Department has also rapidly accelerated, and is providing an excellent tool for communicating and displaying MCBS results. The Natural Heritage and Nongame Wildlife Program is participating in the development of a GIS database infrastructure. The objectives of this infrastructure are to facilitate data access, reduce storage redundancy, establish a core set of base maps and thematic data, promote integration with other information sources, and promote awareness within the DNR GIS user community. Several of the MCBS ecologists have received limited training in the use of geographic systems such as ARC/VIEW, but there is clearly a need for more DNR staff time dedicated to the development of protocol and the delivery of map files and map products that include Survey data. The spatial display of MCBS data using GIS has thus far been one of the most effective outcomes of investment in Information Systems development.

Cooperative Data Management

MCBS relies on the University of Minnesota-St. Paul for the curation of plant and animal specimens. MCBS is currently providing staff assistance and materials to the University to assist with the processing of biological specimens collected by MCBS. DNR student interns and temporary staff have provided the major assistance. These repositories include the Bell Museum of Natural History and the University of Minnesota Herbarium. The University has computerized most of the Minnesota collections. Training for MCBS staff on access to the Herbarium database took place in January 1995, and will assist with the preparation of county checklists of plants. Access to most of data files at the Bell Museum is less direct.

Data Access

Access to the Natural Heritage Information System within the DNR remains mostly in the form of requests, and through periodic updates (hardcopy) delivered to natural resource managers. Direct access by selected staff is available in three of six DNR regions. The use of ARC/VIEW by resource managers in decision-making is becoming widespread in the DNR. The Natural Heritage and Nongame Research Program is participating in the development of protocol for data exchange to minimize misinterpretation of data, and destruction of rare resources (see above). MCBS staff are directly involved in developing interfaces with the MCBS Site Database and Forestry datasets as part of the Forest Inventory Module. This is intended to provide for more informed decisions on forest management. Some other examples of DNR use of MCBS data follow:

* The Minerals Division is developing maps in ARC/VIEW displaying both prairie and gravel resources on the Beach Ridges of Glacial Lake Agassiz to assess resource conflicts.

* The Division of Parks and Recreation is compiling a series of GIS generated Park maps that will include MCBS data to assist with resource planning. (Beaver Creek Valley State Park is an example).

* The bearing tree GIS layers are being used in the refinement of Subsection and Land Type Association boundaries that are part of DNR's ECS development.

Access to the Natural Heritage Information System by users outside of the Department is through User Requests or through participation in a license agreement administered by the Natural Heritage and Nongame Wildlife Research Program. Various counties and agencies have received electronic files by participating in this agreement. For example, the Superior National Forest has recently requested bearing tree data mapped by the Superior's ECS units.

On the national level, the Association for Biodiversity Information has been established to promote the network of Natural Heritage Programs. One of the more immediate outcomes would be the establishment of a "Home Page" on Internet that would notify users of the existence and attributes of the Minnesota Natural Heritage Information System.

Conclusions/Problems

MCBS is investing more time in data management. For example, an ecologist has recently been assigned to manage the Releve Databse, and the associated checklist of Minnesota plants in order to accelerate data entry, and perform the data analysis needed to update the natural community classification. Opportunities for access to other datasets has greatly expanded over the past few years, yet time is required to distill these data and rectify inevitable formatting problems, so that high quality, well-documented data are procured. An example of this is the analysis of datasets for the northern portion of the state discussed in Objective A. This effort requires the data management skills of another ecologist, who very likely will be responsible for updating the structure of the Site Database, and coordinating with related DNR Systems changes such as the Forest Inventory Module.

Recent upgrading of the Natural Heritage Information System to be part of a DNR Network will hopefully improve the System's ability to provide data to clients. Developing a fully functional network, and implementing SSP will be time-consuming, and delay updates in computer programming that are more directly related to the Natural Heritage Information System. The DNR has made significant progress in GIS development, yet the demands of the DNR Information System staff to develop data standards, to address data security issues, and to deliver data in useful formats is limited. The most immediate need in terms of delivering MCBS data is in GIS staffing.

As demonstrated above, MCBS has significantly accelerated data collection over that prior to 1987. However, the responsibility of ongoing data delivery, data analysis, and system documentation lies with the Natural Heritage and Nongame Research Program at the completion of MCBS. The current staff of that program is insufficient to properly manage the Information System. If this is not addressed, the benefits of accelerating the collection of rare resource data may ultimately be lost if the data cannot be delivered in useful formats.

B.6. Benefits: Diverse natural resource goals can be more effectively integrated through use of multi-user systems, GIS and vegetation databases. The ability to produce custom reports, maps and species checklists for distribution to organizations (e.g., environmental consulting firms, Upper Great Lakes Biodiversity Task Force) academic institutions, and agencies (e.g., Metropolitan Council, County Planning Commission, U.S. Fish and Wildlife Service, DNR Parks) is enhanced by the application of these advanced data management systems.

C. Title of Objective: Facilitate the implementation of the findings of the Minnesota County Biological Survey by providing high quality products that promote the protection and management of Minnesota's endangered natural resources.

C.1. Narrative: The recent increase in awareness of environmental issues related to endangered resources has resulted in greater demands by the public and natural resource professionals for interpretation of the ecological information collected by MCBS. Production of customized data summaries and maps of rare features, along with both technical and popular reports that summarize and interpret the survey results, is an essential response to meet the needs of this diverse audience

C.2. Procedures: The MCBS produces maps, technical and popular reports that describe methodology and survey results. Whenever possible, results are generated directly from the Natural Heritage Information System. Standard reports and maps are distributed to other agencies and organizations (schools, libraries, nature centers, universities, county boards, planning boards consulting firms). As needed, biologists also prepare written conservation and management recommendations for selected high quality sites in response to requests from within and outside the agency. Other requests are coordinated through the standard environmental review process of the Natural Heritage and Nongame Wildlife programs.

C.3. Budget $180,000 Balance: $0

C.4. Timeline:

	7/93 1/94 6/94 1/95 6/95
Complete technical and popular reports	**********
Produce county maps	**********
Site recommendations/ environmental review	**** ****

C.5. Status:

Publications

* ***Minnesota's St. Croix River Valley and Anoka Sandplain: a guide to native habitats*** was published in 1995 by the University of Minnesota Press, and is available at area bookstores along with a set of companion color wall maps published by the DNR (***Minnesota's St. Croix River Valley and Anoka Sandplain: maps of native habitats***). The book contains a landscape history of the area, and detailed descriptions and maps of 39 natural community types found within the region. Much of the information contained in the book was recently collected by MCBS in Anoka, Chisago, Isanti, Ramsey, Sherburne and Washington counties. It is guide for those interested in the natural history of the region, including landowners seeking more information about the prairie or woodland type on their land, and people interested in visiting places where certain habitats are found, including government planners, resource managers, and students. For each native habitat, there is descriptive text, photographs, line drawings, distribution maps, and

lists of associated plants and animals. It also contains a guide with directions and descriptions of 35 sites accessible to the public where native habitats can be explored. Response to this book will help direct future publication efforts.

* Maps of rare features in Chisago, Isanti, Anoka and Ramsey counties were published using a new process for directly creating layers from the GIS for the preparation of color separations, needed in the printing process Published maps of 8 counties are now available. Maps of Rice, Goodhue, Winona, and Houston counties are scheduled for publication in the next six months as part of a cooperative effort with the Division of Parks and Recreation.

* One to six page summaries of results from the 1993 or 1994 field season were published for Cass, Dakota, Olmsted, Pine, and Wabasha counties. Booklets were published and distributed for Polk, Goodhue, Houston and Winona counties. Almost the entire contents of the booklet, *Polk County: Summary of the 1993 Field Season*, was reprinted in the Fosston newspaper, *The 13 Towns* Vol. 112-No. 13. (Polk County).

* A report entitled *Inventory of Biological Features in Beaver Creek Valley State Park, Houston County Minnesota* was prepared for use by DNR Parks resource managers. Similar products are in progress for O.L. Kipp, Whitewater, John A. Latsch, and Ft. Snelling State Parks where inventory was intensified during the survey of the associated counties.

* A poster entitled *Distribution of prairie-associated small mammals and protection of rare natural features in southeastern Minnesota* was presented in June 1994 at the American Society of Mammalogists national meeting. It was also displayed at the Minneapolis North American Wildlife and Natural Resources Conference along with another poster entitled: *Areas of importance for native biodiversity in Wilkin, Clay, Norman, Polk, and Red Lake Counties with special reference to the Glacial Lake Agassiz Beach Ridge Landscape.*

* As a final product of the survey of Cass County, a looseleaf notebook of natural resource information related to the county's biodiversity is being prepared for distribution in late 1995. The Chippewa National Forest has requested assistance with a related project, the production of a series of sensitive and rare plant species identification field cards for use by resource managers working within the Forest. MCBS is assisting with their preparation, and has added Cass County rare plants not found in the Forest so that the cards are also useful to other resource agencies in the county.

* Notes on the state record salamander discoveries have been submitted for publication in the *Herp Review*. A similar report to be submitted to a botanical journal is underway for the eight state record plants documented by MCBS staff.

* Ecologists reviewed and provided photography of natural communities for the Upper Great Lakes Ecoregional map, scheduled for publication in the summer of 1995 by the U. S. Forest Service.

* A thesis entitled *Private landowner values and perceptions of rare species and natural communities in a Minnesota county* was submitted to the University of Minnesota by graduate student, S.A. Buss. It reports on the findings from case study interviews with private landowners having a rare feature on their land that was identified by MCBS. It assesses landowner reactions to the MCBS, their

attitudes about natural communities and rare species and their interest in stewardship of these resources. Results indicate a need for local ecological expertise to follow-up on issues related to public understanding and stewardship of rare resources.

* MCBS was featured in over 47 periodicals or newsletters.

Custom Mapping

The much-improved text fonts of ARC/INFO, the access to LMIC, and DNR large-format plotters, and the investment in skilled computer cartographers have resulted in improved map products. The quality of the products has also resulted in increased demands for customized products that exceed the ability to produce them in a timely manner due to staff limitations. Selected examples of custom GIS products follow:

* A map of the Agassiz Beach Ridges (within the Northern Tallgrass Prairie of Minnesota) that displays managed areas and MCBS prairie sites prioritized for their biodiversity significance. Additional layers include roads, water features, county boundaries, and cities that are from TIGER files. Additional layers now being added are grassland polygons from the Land Use dataset and digital Conservation Reserve polygons as they become available from the Department of Agriculture. This map is being used in multi-agency planning meetings. (See protection section).

* A map of the Whitewater Watershed was prepared showing watershed boundaries and MCBS sites for use in integrated, multi-agency planning.

* GIS files of Bearing Tree data were transferred to an Ecological Classification System Team to prepare maps to assist with the refinement of boundaries of the Chippewa Plains Subsection.

Protection Activities

MCBS staff prioritizes areas surveyed according to their biodiversity significance. This information is communicated in the form of project evaluations for the highest priority sites, through maps, and through participation in meetings to discuss management and development issues. Plant ecologists, in particular are in demand for interpretation of rare resources, and management implications within an important site. This involves coordination within the Department and with other agencies, private citizens and local units of government.

Examples of protection activities are listed below:

* Staff from the Scientific and Natural Areas (SNA) program contacted over 158 landowners of 81 sites containing rare features. Of these, 8 sites recommended by MCBS have become SNA's or additions to existing SNA's: Boot Lake (Anoka), Gully Fen (Polk), Lake Alexander (Morrison), Lake Bronson Parkland (Kittson), North Fork Zumbro (Goodhue), Rice Lake Savanna (Sherburne) St. Croix Savanna (Washington), and Wykoff Balsam Fir (Fillmore).

* MCBS and Heritage staff worked with the SNA staff in preparing summaries, maps and interpretation of results in areas of high biodiversity within four counties of northwestern Minnesota (Wilkin, Clay, Norman, and Polk). These were presented at two interagency coordination meetings for Glacial Lake Agassiz held in late winter 1995. The outcome is that local staff have a better understanding of the results of the Survey, and are willing to modify their management practices and

recommendations. The presentation of data on a series of GIS generated maps was an especially useful tool in this process.

* At Beaver Creek Valley State Park, MCBS made recommendations for the placement of a proposed bike trail, and also discussed how stream improvement activities might affect rare animals. MCBS staff also participated in discussions concerning the management of jack pine community types in St. Croix State Park. This included discussion of jack pine barrens that are habitat for the Hill's thistle (*Cirsium hillii*), a rare plant observed in 1994 that had not been reported in the Park since the 1940's. Subsequent interdisciplinary team discussions led to the use of prescribed burning in management of jack pine types on a pilot basis.

* MCBS staff met with DNR and ASCS staff with jurisdiction in Winona County to present the results of the Winona County survey and to discuss management implications of the inventory. A similar meeting was held in Houston County.

* MCBS staff participated in selected meetings to prepare ten-year timber management plans (DNR Forestry).

* The Goodhue County Board recommended that the results of MCBS in that county be sent to the county's Planning Advisory Board as background information so that private landowners are provided the opportunity to protect sensitive areas.

* The City of Redwing Comprehensive Guide Plan includes specific reference to maintenance of biological diversity and rare features, with specific reference to data provided by MCBS.

* In Olmsted County private landowners with significant rare features on their land were notified of these locations by letter.

* In Anoka County, MCBS staff participated in the discussions of an open space plan for East Bethel.

* The Dakota County Planning Commission and the Metropolitan Airports Commission were updated on high priority conservation sites identified by the MCBS.

* MCBS staff prepared recommendations for seven candidate Research Natural Areas within the Chippewa National Forest.

* MCBS data was integrated into an University of Minnesota management research study of oak savannas at Whitewater Wildlife Management Area, and several meetings were held between DNR survey, research, and management staff to discuss management issues. This effort was later expanded to include participation in the discussions of management issues related to rare features within the Whitewater Watershed.

Examples of other Public information events (total of 151)

* Upper Mississippi River Nongame Wildlife Symposium, LaCrosse WI-presentations: 1) poster-"Survey Results of the 1993 field season for rare animals in southeastern Minnesota", and 2) presentation- "Conservation of important bat hibernacula in southern Minnesota and adjacent Wisconsin."

* Various presentations on results of the MCBS in Cass County and within the Chippewa National Forest including a day-long seminar that included various presentations on surveys and research in the Forest during 1994-attended by nearly 100 resource professionals.

* MCBS staff made a presentation on the conservation and status of Minnesota's amphibians and reptiles as part of a meeting of herpetologists at the Bell Museum in the spring of 1995.

* Staff led various field trips e.g. Tympanuchus WMA, Gully Fen (Polk), the SE Blufflands (for the American Institute of Biological Sciences), Uncas Dunes (Sherburne) and Falls Creek SNA (Washington).

* An MCBS ecologist delivered a presentation on MCBS to a Carleton College class in Biodiversity.

Conclusions/Problems

Often there is interest in the protection of rare features, but inadequate interpretive information to guide landowners and other resource professionals who desire site specific interpretation. Hopefully some of the above activities will promote better understanding of rare resources MCBS staff participated in the preparation of a Ecosystem Investment Initiative, and an LCMR work program for a project that would deliver ecological information from the MCBS to local governments. Both efforts could lead to improved interpretation of data collected by MCBS. Regional ecologists have been approved for selected regions in the state, and the LCMR project received Legislative approval in 1995. MCBS will coordinate data delivery to assist in the success of these efforts.

C.6. Benefits: The distribution of results in standard formats in combination with the productio of customized computer products decreases staff time required to interpret data for each individu request, documents the survey results that serve as a benchmark, increases the public's awarene of Minnesota's endangered resources and biological diversity, and provides tools to facilita conservation action.

V. Evaluation:

MCBS can be evaluated by its ability to:

A. Develop and refine a cost effective inventory methodology.

B. Demonstrate a significant acceleration of data collection as compared to methodology used prior 1987.

C. Identify the highest quality natural areas and rare species habitats and provide documentation leadi to public or private acquisition or enrollment in land conservation programs (e.g., RIM, Prair Landscape Reserve Program, SNA dedication, private land registry).

D. Increase data integration and access to the Natural Heritage Information Management System throu multi-user systems and GIS.

E. Produce county maps displaying rare features in a standard format and publish technical and popul reports to increase public understanding of Minnesota's endangered resources.

F. Promote academic training in conservation biology and provide baseline data for additional resear on rare features.

VI. Context:

A. LCMR recommended partial funding for the establishment of the Natural Heritage Program in FY 1978-79. The pilot phase of MCBS in FY 1988-89 was supported by LCMR with matching private dollars. The success of the pilot effort led to continued support during FY 1990-91, and FY 1992-93 with the establishment of the environment and natural resources trust fund. In FY 1992-93, 65% of the project's funding was through the trust fund. MCBS is conducted by the Natural Heritage and Nongame Wildlife programs in concert with other research and inventory efforts. The ability to assess the status/distribution of rare features on a state or local level was not possible, prior to the survey.

B. Increasing pressure for land development and lack of information to adequately evaluate impacts to natural features necessitated the accelerated inventory of MCBS in order to ensure the protection of the state's biological diversity. As a result of a systematic inventory, the relative importance of natural areas can be assessed. Increased knowledge of the status and distribution of rare species leads to more informed natural area acquisition, and appropriate resource development and management decisions.

C. Most of the past surveys that reliably document Minnesota's significant biological features were conducted for a variety of objectives and were limited in scope, so therefore do not collectively provide for a uniform statewide perspective. However, data from these surveys are useful and are reviewed as part of the MCBS procedure, along with data from other resource inventories (e.g., soils, geology, timber, wildlife). Several other midwestern states have conducted similar inventories (Wisconsin, Illinois, Michigan, Missouri). MCBS has adapted and expanded upon their survey techniques such that now MCBS is recognized nationally as a model county survey. Since 1987 MCBS has recorded over 3000 new locations of rare features (23% of the statewide locations in the Rare Features Database), and completed surveys in 20 counties. This success is largely due to the legislative funding provided in response to LCMR recommendations. Details of the accomplishments of the MCBS are recorded in six-month progress reports submitted to LCMR beginning in January 1988.

This funding has in turn stimulated other cooperative inventory efforts with MCBS. Examples: the Minnesota Army National Guard (Camp Ripley), the U.S. Forest Service (Chippewa National Forest), the Mississippi River Blufflands Initiative (DNR Planning). Continued cooperation is anticipated with other LCMR recommended projects: Minnesota's Forest Bird Diversity Initiative, 6(b); Description and Evaluation of Minnesota Old Growth Forests 6(c); and Base Maps for 1990's 8(a).

Additional funding through the trust fund will be requested in the next biennium (FY 1996-97). At the current level of funding, the proposed completion of the MCBS is 2015.

Budget History

	FY88-89	FY90-91	FY92-93
LCMR	$ 171,500	$ 150,000	$ 1,000,000
The Nature Conservancy	171,500		
General Fund		300,000	300,000
Reinvest in Minnesota General		170,000	169,000
Nongame Wildlife Program		100,000	80,000
TOTALS	$ 343,000	$ 720,000	$ 1,549,000

Supplemental Funding	FY94-95
Reinvest in Minnesota-General	$ 169,000
General Fund	300,000
Nongame Wildlife Program	80,000
TOTAL	$ 549,000

VII. Qualifications:

1. Program Manager: Carmen Kay Converse

   a. Bachelor of Science, Natural Resources, University of Wisconsin, Madison 1975.

   b. Supervisor, Minnesota County Biological Survey, Section of Wildlife, Minnesota Departmen of Natural Resources
   1987-present.

VIII. Reporting Requirements:

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