FINAL REPORT

AUG 2 1 2001

1999 Project Abstract
For the period Ending June 30, 2001

TITLE: Minnesota County Biological Survey-Continuation
PROJECT MANAGER: Carmen Converse
ORGANIZATION: Department of Natural Resources (DNR)
ADDRESS: Box 25, 500 Lafayette Road
St. Paul, Minnesota 55155
WEB SITE ADDRESS: www.dnr.state.mn.us
FUND: Environment and Natural Resources Trust Fund
LEGAL CITATION: ML 99, Chap. 231, Sec.16, Subd. 12(b).

APPROPRIATION AMOUNT $ 1,600,000

Overall Project Outcome and Results

The Minnesota County Biological Survey (MCBS) is a systematic survey of rare biological features. The goal is to identify significant natural areas and to collect and interpret data on the distribution and ecology of rare plants, rare animals, and native plant communities. The Survey uses a multi-level procedure, beginning with the evaluation of existing inventory data, followed by an assessment of the quality and condition of selected areas using air photos and ground surveys. Field work also includes the collection of vegetation data and specialized surveys of selected rare species.

Since July, 1999 surveys were completed in fifteen counties: Benton, Blue Earth, Brown, Chippewa, Grant, Kanabec, Mille Lacs, Nicollet, Pine, Redwood, Renville, Sibley, Stevens, Swift and Yellow Medicine counties. Surveys were also completed in the Red River Prairie portions of Becker and Otter Tail counties. In 2000, field survey work began in Douglas, Kandiyohi, and Pope counties and air photo interpretation in McLeod and Meeker. Surveys continue in Aitkin, Carlton, and Crow Wing counties. Surveys began and continue in the North Shore subsection (portions of St. Louis, Cook and Lake counties) and in Itasca County.

Data are entered into DNR's Natural Heritage Information System that includes a Geographic Information System. New records of 1,459 locations of rare features were added to the Rare Features Database since July, 1999. Since MCBS began in 1987, surveys have been completed in 50 counties and 12,781 records have been added to the Rare Features Database by MCBS. Since 1987, MCBS has documented fourteen species of native plants and two species of amphibians not previously recorded in the state.

In cooperation with other survey and classification efforts, vegetation data on forest types were compiled and analyzed leading to the revision of the forest types in *Minnesota's Native Vegetation: A Key to Natural Communities Version* 1.5. Vegetation data used in the classification are stored in the Relevé Database that currently includes 6,505 Minnesota vegetation samples (42% of the relevés collected by MCBS).

Project Results Use and Dissemination:

There are now maps displaying the results of MCBS for 24 counties with the publication of maps of Stearns County and Marshall County during this project period. Map files of selected counties are available on the DNR Web site. Since 1987, MCBS has produced 56 publications, including one book, *Minnesota's St. Croix River and Anoka Sandplain: a guide to native habitats.*

Recent examples of MCBS data use: Renville and other MN River Valley counties in assessment of the mineral and rare resources associated with the rock outcrops, Sibley County Planning, Stearns County comprehensive planning/park planning, active railroad prairie rights-of-way management, prairie acquisition by Pheasants Forever and The Nature Conservancy, DNR Park management, landscape level management in the North Shore Highlands as part of the Manitou Collaborative, trail planning in NE MN and along the MN River Valley, assessments by the Northeast Landscape Committee of the Minnesota Forest Resource Council.

Date of Report : July 1, 2001

AUG 2 1 2001

LCMR Final Work Program Report

Project Completion Date: This workprogram outlines activities and products to be completed during the two ear duration of this funding (ending June 30, 2001). This is a continuation project so data generated from activities of the Minnesota County Biological Survey (MCBS) in previous biennia will be applied to the proposed outcomes, and data and procedures derived from work this biennium will be applied to future surveys and products.

LCMR Work Program 1999

I. PROJECT TITLE: B02 Minnesota County Biological Survey-Continuation

Program Manager:	Carmen Converse
Affiliation:	Department of Natural Resources
Mailing Address:	Box 25, 500 Lafayette Road St. Paul, Minnesota 55155
Telephone Number:	(651) 296-9782
E-mail:	carmen.converse@dnr.state.mn.us
FAX:	(651) 296-1811

Web Page address: www.dnr.state.mn.us

Total Biennial Project Budget: $1,600,000

$ LCMR:	**$1,600,000**
-$ LCMR Amount Spent:	**$1,600,000**
=$LCMR Balance:	**$ 0**

A. Legal Citation: ML 99, Chap. 231, Sec.16, Subd. 12(b).

Appropriation Language: (b) Minnesota County Biological Survey-Continuation.

$800,000 the first year and $800,000 the second year are from the trust fund to the commissioner of natural resources for the seventh biennium of a 12 biennia project to accelerate the survey that identifies significant natural areas and systematically collects and interprets data on the distribution and ecology of natural communities, rare plants, and animals.

B. Status of Match Requirement: N/A

II. & III. FINAL PROJECT SUMMARY

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IV. OUTLINE OF PROJECT RESULTS:

Result 1: The status and distribution of rare resources will be identified providing a basis for the maintenance of Minnesota's biological diversity through ecological management, planning, research, monitoring, and critical habitat acquisition.

Procedure: A multi-level survey process is followed. This begins with the review of existing related natural resource data by plant ecologists, botanists and zoologists. Data from other sources are reviewed and useful information is incorporated into electronic databases often using Geographic Information Systems. Examples of these data include forest inventories, wetlands inventories, wildlife habitat inventories, parks surveys, soil surveys, land use data, historical public land surveys, biophysical surveys, academic research, and records from museum collections. The review of existing data is followed by the interpretation of aerial photography or other imagery for the identification of significant potential natural areas or areas representative of ecological landscapes at the Landtype Association level of the DNR's Ecological Classification System (ECS). This is followed by landowner contacts and aircraft and ground surveys to assess natural area and native plant community quality and condition. Ground surveys include the collection of vegetation samples using relevés (as described in *A handbook for collecting relevé data in Minnesota* 1987 Draft) in coordination with other sampling (soils, water chemistry etc.), when possible. Additional specialized techniques are used during following field seasons to survey selected rare species or groups of species (e.g., vascular plants, birds, mammals, reptiles, amphibians). Regional coordination with other divisions within the DNR, universities, counties, municipalities, tribal governments, watershed districts, federal natural resource agencies, conservation organizations, corporations, individual landowners and others is critical to the success of data consolidation and field surveys.

Scope of Work and Completion Dates (also see map): Field surveys that began in the previous biennium will be completed by August 1999 in nine counties bordering the Minnesota River (Swift, Chippewa, Renville, Redwood, Yellow Medicine, Brown, Sibley, Nicollet and Blue Earth).

Surveys will be completed in at least four of the seven counties that make up most of the Mille Lacs Uplands and Glacial Lake Superior Plain ecological subsections (Aitkin, Benton, Carlton, Crow Wing, Kanabec, Mille Lacs, Pine). Proposed for completion by June 2001 are Benton, Mille Lacs, Kanabec and Pine. In order to complete the animal surveys in other counties in this landscape, work will extend into the next biennium. As indicated on the map, all of Crow Wing, Aitkin and Carlton counties are included as part of the survey of the Mille Lacs Uplands and Glacial Lake Superior Plain, including those portions located partially within other subsections.

Surveys will begin and are scheduled for completion by June 2001 in the remaining unsurveyed portions of the Red River Prairie subsection. Surveys will include portions of Becker and Ottertail and all of Stevens and Grant counties.

Surveys will begin in the northern portion of the Minnesota River Prairie subsection and portions of the Hardwood Hills subsection (Douglas, Kandiyohi, McLeod, Meeker and Pope counties). Surveys will not be completed until the next biennium.

In northern Minnesota, surveys will begin in Itasca County and in the North Shore subsection (portions of St. Louis, Cook and Lake counties), and will not be completed during this biennium.

Survey highlights since July, 1999:

Surveys were completed in 15 counties: Benton, Blue Earth, Brown, Chippewa, Grant, Kanabec, Mille Lacs, Nicollet, Pine, Redwood, Renville, Sibley, Stevens, Swift and Yellow Medicine counties. The Red River Prairie portions of Becker and Otter Tail counties was completed Field surveys began in Douglas, Kandiyohi, Pope, McLeod and Meeker counties. Survey work continues in Aitkin, Carlton, and Crow Wing counties. Surveys began in the North Shore subsection (portions of St. Louis, Cook and Lake counties) and in Itasca County. (See also map on page 18).

State records and other notable species locations. (species never previously documented in the state): A location of spotted salamander (*Ambystoma maculatum*) was recorded by MCBS in Pine County, and additional locations of the four-toed salamander (*Hemidactylium scutatum)*, first located in 1994 were documented (There are now seven known species of salamanders in the state). Several state record plants recently documented by MCBS botanists and plant ecologists included: alpine bluegrass (*Poa alpina*), rough-fruited fairybells (*Disporum trachycarpum*), upswept moonwort (*Botrychium ascendens*), green violet (*Hybanthus concolor*), Case's ladies'-tresses (*Spiranthes casei*), and Robbin's spike-rush (*Eleocharis robbinsii*). Another species, Ashy witlow-grass (*Draba cana)* collected on an offshore island spring 2001 in Lake Superior appears to be yet another state record, pending confirmation. In addition to the state records, a new location of the endangered Western Jacob's ladder *(Polemonium occidentale* var. *lacustre)* was recorded in Itasca County (six known locations world-wide, four in Minnesota and two in Wisconsin). In the Minnesota River Valley, twelve new locations of a crustose lichen, *Buellia nigra* were recorded. It was previously known only from three sites in North America.

Native plant community classification. In collaboration with the Natural Heritage Program and the Ecological Classification Program, the analysis of the forest vegetation samples in the Relevé Database has been completed and revised keys are in progress. MCBS has contributed to the collection of relevé data, database design and maintenance, and the analysis and development of keys. The project is now entering the review stage.

Northern Minnesota Highlights

Northern Coordinator: Lawson Gerdes was hired during this project period as a Northern Coordinator and plant ecologist for MCBS working primarily out of Isabella. Her work has already improved internal communication and coordination between MCBS staff working in Two Harbors, Hovland, Finland, Isabella, Aitkin and St. Paul, and between MCBS and interdisciplinary departmental forest management and planning teams. She and the plant ecologists located in northern Minnesota have increased the frequency of MCBS communications with the Forest Resources Council, NRRI, DNR's Ecological Classification System program, the Superior and Chippewa National Forests, DNR Forestry, DNR Parks, the counties, and forest industry. Many of these entities manage natural resources data that Lawson is evaluating to determine their utility in planning and executing MCBS in northern Minnesota.

Some examples of data exchange, compilation:

Northeast Landscape Committee of the Minnesota Forest Resources Council. The NE MCBS Coordinator and a MCBS northeast plant ecologist attended meetings of this committee and participated in the assessment and monitoring aspects of the committee as related to the Northeast Landscape Plan. They coordinated with the work of the Natural Resources Research Institute (NRRI) with the regional committee to assist in characterizing the **Range of Natural Variability (RNV)** as it relates to existing forest conditions in the Northern Superior Uplands Ecological Section. The RNV model helps guide the development of collaborative goals and objectives

for desired future forest conditions for sustainable forest management in the Northern Superior Uplands (e.g. State Forest Regional management planning, Manitou Collaborative, Wolf Ridge ELC management plan, MN FRC Northeast Landscape Planning).

Manitou Collaborative. Lawson worked with Tom Martinson, Lake County Land Commissioner, to review available data layers for assessment of the Manitou landscape as part of their contribution to the project.

Spatial Analysis Project. Lawson continued to participate on a collaborative technical team designed to improve understanding of past, present, and future forest landscape conditions as a guide for forest planning and management strategies in Minnesota.

Minnesota's National Forests. MCBS and the Superior and Chippewa National Forests entered into a cooperative agreement to pursue work of mutual interest. One portion of the agreement was related to the assessment of impacts of forest management on bryophyte (mosses and liverworts) species. This project includes an assessment of which species of mosses and liverworts are rare, and sampling of bryophyte assemblages within native plant communities on the Superior National Forest. The agreement also provided for expanded surveys for rare salamanders in the Superior and Chippewa National Forests. The first state record of the rare four-toed salamanders was documented by MCBS and the Forest Service in the Chippewa National Forest in 1994. Additional locations were found in spring 2001. Digital Land Type Phase data was obtained from the Superior National Forest to assist in the evaluation of native plant communities.

Wolf Ridge Environmental Learning Center. MCBS trained ELC staff in the selection of sampling sites for vegetation and soils and in how to collect releve data at the ELC. Wolf and Raven Lakes were also visited with staff to create plant lists of aquatic plants.

Fond du Lac Reservation. MCBS staff attended the Wild Rice Management Conference at the to become familiar with the issues related to wild rice ecology, native and commercial management practices, and Fond du Lac Reservation efforts to restore drained wild rice lakes.

St. Louis River CAC's Habitat Plan. MCBS coordinated with The Nature Conservancy (TNC) and Wisconsin DNR on mapping vegetation in the St. Louis River estuary for the St. Louis River Habitat Plan. They reviewed the potential native plant community types in the estuary area, and prepared a list of those to map, using the National Vegetation Classification types to ensure consistency in delineation of communities.

DNR Parks. Collaboration with Parks resulted in a proposal for additional vegetation sampling as part of a "Shoreline Plant Community Inventory" that focuses on quantitative sampling of Lake Superior-influenced plant communities near the shore and the impact of visitor use on those communities. The project to begin July 1, 2001 includes sampling lichens and mosses, contracts with bryophyte and lichen taxonomists to confirm identifications, and the comparison of vegetation patterns in high, moderate, and low use areas. The Two Harbors City Council, Lake County Historical Society, and Superior Hiking Trail Association, Grand Marais City Council and the Cook County SWCD were contacted by MCBS staff about this work and are project supporters. Also in collaboration with DNR Parks, vegetation mapping and sampling projects continue at Jay Cook State Park, Caribou Falls Wayside, Gooseberry Falls State Park, Split Rock Lighthouse State Park.

DNR's Ecological Classification System. In the spring of 2001, MCBS collaborated with the ECS program to identify plots for sampling of both vegetation (relevés) and soils. Locations were identified in the Manitou and Pettegouche Landscape Study Areas (LSAs), and these were transferred digitally to Dan Hanson (ECS) who contracted with a soil scientist to collect data at the same locations.

Landscape Study Areas. Field surveys of 25 Landscape Study Areas continued in the North Shore Highlands using a refined approach to MCBS surveys first developed in the Mille Lacs Uplands portion of the state. These LSAs are intended to reflect the ecological landscape and related processes such that MCBS surveys will provide ecological data to support informed sustainable management plans for these areas in coordination with a number of landscape level planning efforts currently in progress in this region. As an example of the preparation work required for work in LSAs the work in Temperance, Brule, and Sawtooth LSAs required copying and transcribing portions of the Public Land Survey line notes onto working maps for GIS and site database work and researching to find out addresses of private landowners in the Cook County assessor's office. Descriptive information was entered into a site database and related GIS files. These data combined with vegetation samples (relevés) and better documentation of the distribution of the flora of the region were key elements of the field seasons. The development of a new native plant community classification and the reduction of information management staff in the Division of Ecological Services have created some obstacles in accomplishing this work due to the need for a review of mapping conventions and the need to update out-of-date computer programs.

Cliffs and Lake Superior Shoreline Features. Botanical surveys were conducted in the often largely inaccessible moist cliffs and gorges of rivers such as the Manitou, Little Manitou, Beaver River valley west of Beaver Bay, and the Caribou River of the North Shore subsection. This resulted in the identification of new populations of rare plants: alpine woodsia *(Woodsia alpina),* smooth woodsia *(Woodsia glabella)* and long-leaved arnica *(Arnica lonchophylla).* Black hawthorn (*Crataegus douglasii*) was found at five locations along the banks of the Manitou and Caribou Rivers. In addition, some of these sites also contain significant stands of native white & red pine, some impressive dry south- and west-facing cliffs, dry talus communities and adjacent undeveloped lakes. Cliff features of the Lake Superior shoreline and offshore islands present logistical and sampling challenges that continue to be addressed. Two specific staff workshops directed at sampling techniques and classification of shoreline and cliff communities are planned for July 2001 and will be directed by two staff plant ecologists who have extensive previous work experience with these types in the Great Lakes region. Cliffs and shorelines are notable for their diversity and rare species. Some new locations of rare species include maidenhair spleenwort (*Asplenium trichomanes*), encrusted saxifrage (*Saxifraga aizoon*), knotty pearlwort (*Sagina nodosa*), neat spike-rush (*Eleocharis nitida*), rock whitlow-grass (*Draba arabisans*), creeping juniper (*Juniperus horizontalis*), butterwort (*Pinguicula vulgaris*), Hudson Bay eyebright (*Euphrasia hudsoniana*). Several collections of members of the bluegrass group of grasses (*Poa* spp) and the clubmosses (*Huperzia* spp) have been referred to taxonomic experts in these groups working with the **Flora of North America** project (Coordinated out of the Missouri Botanical Garden).

Rare aquatic plant surveys. Surveys were conducted at 102 sites in the St. Louis County portion of the North Shore subsection, several lakes in Lake County and 101 lakes in Itasca County. Thus far, 650 lakes have been surveyed in the state by MCBS for aquatic plants. Landowners are contacted to obtain access and interested individuals are provided a copy of a list of plants observed that includes common and botanical names and their life form (free-floating, shoreline, submerged etc.). Oake's pondweed *(Potamogeton oakesianus)* was located at two sites in St. Louis County (only two other locations are known in Minnesota). In Itasca County, the lavender flowered bladderwort (*Utricularia resputinata*) was found in a new habitat for the species in the state which also represents an extension of the known range of this species 100 miles south and west of previously know locations. Duplicate collections of aquatic plants were sent to The Olga Lakela Herbarium in Duluth (UMD) and to an aquatic collection in Brainerd DNR for use by Fisheries and Aquatic Plant Management staff.

Animal Surveys. In Pine County, the Kettle River surveys for Louisiana waterthrushes (*Seiurus motacilla*) resulted in 15 new locations representing a northern extension of the known range of the species in the state. Four-toed salamanders were recorded in over twenty new locations mostly in Aitkin County in east-central Minnesota, with other locations including a county record in St. Louis County and several in the Chippewa

National Forest. Animal surveys are still underway in east central Minnesota. A collaboration with the Science Museum will provide for some assistance from their staff in the collection of some of the animal data in north-central Minnesota.

West-Central Minnesota and the Minnesota River Valley Highlights

Native Plant Communities In West-central Minnesota the survey was completed in Benton County and in the prairie portions of Becker and Otter Tail counties. Native plant community field evaluations began in Kandiyohi and Pope counties. Two plant ecologists working in this region left the program, in part due to the funding uncertainly, requiring hiring and training a new plant ecologist in the spring 2001. Surveys focused on the prairie region of the two counties lying within the Glacial Lakes region (Alexandria moraine), and on the dry prairie, mesic prairie and poor fen areas. A staff workshop in June 2001 was held to review the new forest types of the Prairie/Forest border that were part of data analysis project leading to review of the native plant community classification.

Some examples of important locations of native plant communities in the Minnesota River Valley region identified during the final MCBS assessment of this region include a calacareous seepage fen in western Yellow Medicine County, several good examples of lowland hardwood forest along the Blue Earth and Cottonwood Rivers in Blue Earth and Brown counties, rock outcrops and dry-mesic prairies in Renville County, and a small but good quality mesic prairie near Walnut Grove.

Over sixty vegetation samples (relevés) were collected at selected prairie locations primarily in southern Minnesota. These were entered into the Relevé Database in preparation for a future analysis of the prairie types to update the native plant community classification.

Rare Plants Six of the ten Minnesota populations of the state endangered plant, eared false foxglove (*Agalinus auriculata)* and two populations of the state threatened plant, short-pointed umbrella-sedge (*Cyperus acuminatus)* were documented on rock outcrops associated with the Minnesota River Valley near New Ulm and in Yellow Medicine County. In Blue Earth County, searches for snow trillium (*Trillium nivale*) by volunteers resulted in the discovery of two new large populations. In the Minnesota River Valley, twelve new locations of a crustose lichen, *Buellia nigra* were recorded. It was previously known only from three sites in North America. In the Glacial Lakes area, new populations of small white lady's-slipper (*Cypripedium candidum*), ginseng, and Hill's thistle (*Cirsium hillii*) were identified. A botanist working with an intern from St Cloud State University located several new populations of prairie moonwort (*Botrychium campestre*), a difficult species to search for due to its small size and ephemeral nature. These populations more closely link the range of western Minnesota populations with the single known population in southeastern Minnesota.

Rare Animals. In the Red River prairie region of Becker County, populations of prairie vole (*Microtus ochrogaster*) and plains pocket mouse (*Perognathus flavescens*) were documented. In Otter Tail and Becker counties, the rare fishes, least darter (*Etheostoma microperca*) and pugnose shinner (*Notropis anogenus*) were located in several lakes. Preliminary data from prairie butterfly surveys in Pope County confirm that Glacial Lake State Park and the nearby Glacial Lakes Waterfowl Production Area are important sites for populations of the rare Dakota skipper (*Hesperia dacotae*). Both of these sites also contain populations of the regal fritillary (*Speyeria idalia*), arogos skipper (*Atrytone arogos*), and the poweshiek skipper (*Oarisma poweshiek)*. Butterfly survey work within the Glacial Lakes Area required coordination with DNR Parks and the Fish and Wildlife Service.

LCMR Budget: $ 617,867
Balance: $ 0

Result 2. The Natural Heritage Information System will be expanded by additions to the component databases, including entry of information into a Geographic Information System. This will result in the distribution of information to individuals, organizations, and agencies having diverse natural resources goals.

Procedure: All data collected by MCBS are entered into the related map, manual and computerized files that make up the Natural Heritage Information System. Databases include: rare features (geographic), releve´ (vegetation samples), county flora check-list, MCBS site, eagle, animal aggregations and bearing tree (from Public Land Survey notes 1847-1907). Locations of rare features are mapped on U.S.Geological Survey (USGS) 1:24,000 topographic maps, and both site and rare features data are digitized using ARC/VIEW or ARC/INFO GIS. The structure of the Information System continues to be improved to provide for more efficient data management through the use of related databases, networks, laptop computers, multi-user systems, global positioning systems, and GIS. MCBS cooperates in DNR's efforts to develop data and mapping standards, as well as national efforts, including NatureServe, the Biological Research Division of USGS, and The Nature Conservancy. Internet connections and transfer of selected digital files are being developed in coordination with the Natural Heritage and Nongame Research Program. Continued development of these systems is essential to achieve MCBS goals, and requires ongoing investment to satisfy the increasingly complex and diverse demands of users and the related needs for data standards, data security, documentation, specialized formats, data synthesis and analysis, and interpretation.

All plant and animal specimens are identified, prepared for permanent storage and deposited in appropriate repositories at the Bell Museum of Natural History, University of Minnesota. Photographic vouchers, color slides, video tapes and other photography are identified, labeled and stored at the DNR, St. Paul. Field data sheets are filed manually in preparation for archiving.

Completion Dates: Data from all areas typically are entered into the Information System following each summer field season. Periodic summaries of data entry progress and information system developments will be provided in reports identified in IX.

Information Systems Information System development continues to require substantial amounts of time. Field staff have assumed a greater role in information management and continue to balance this work with the time needed to conduct field surveys. Ecologists and biologists currently have access to databases and ARCVIEW at their desktop computers and enter much of the data they collect and assist with the development and documentation of new procedures and databases. Much of their responsibilities now include mapping prior to and after field work. The multiple layers provided through a GIS are useful for evaluation in preparation for field work. In utilizing other data to guide MCBS mapping, field biologists work with data management staff to ensure that DNR data standards are consistently applied. Exchange of large datasets for collaborative efforts such as those described in Result #1 have required significant data management time to receive, convert and/or deliver electronic files due to different formats, space limitations, insufficient metadata and legal or political reasons.

In order to provide support to remote locations of telecommuters, Ecological Services information system managers have had to provide applications and enhancement of hardware to accommodate storage requirements that are beyond the support capacity of the DNR Management of Information Systems (MIS) group. The benefits of telecommuting are greater than the costs of remote computer support.

A problem encountered at the end of 2001 was the departure of the GIS specialist (who worked with the Natural Heritage and Nongame Research Program). The position was not filled by Heritage due to budget constraints, resulting in delays in the publication of maps and a reduction of GIS oversight. The GIS specialist was also was coordinating some of the data standards used by staff in producing ARCVIEW files and aerial photo

rectification work needed to use photos for computer mapping. Many of these responsibilities have been transferred to another GIS staff person who is only partially funded by MCBS. Future work planning will require that some responsibilities are assigned to another employee, re-directed or curtailed.

Products such as compact discs (CD's) and Web site access are more frequently being requested. For example, DNR Parks requested and received data collected by MCBS at Mille Lacs Kathio SP and St. Croix SP in a CD format. A successful pilot displayed in the Web site of a Stearns County map file displaying the contents of a published MCBS map has led to the release of similar map files for Carver, Hennepin, Scott, Traverse and Wilkin counties. Metadata have been developed for the native plant community data and the site data so that GIS files can be more readily delivered to clients using CD's and via the DNR website.

Examples of recent data management activities

New records of 1459 rare features were entered into the Rare Features Database. Most of these records were of rare plants and rare animals. Since 1987, 12,781 records have been entered into this database by MCBS.

Entry, quality control and editing of data entered into the Relevé Database (vegetation samples) has required 25% of a plant ecologist's time because these relevés were required for data analysis related to revision of the native plant community key. Of the total number of relevés in the statewide database, 2766 of the samples (42%) have been provided by MCBS.

The development and documentation of a MCBS site database especially as related to modifications for work in northern Minnesota included the conversion of the site database into an Access version. An animal database for common species is being developed in conjunction with this database, currently focusing on bird distributions.

A MCBS Web site was developed in conjunction with the Division of Ecological Services and MIS. Staff are providing brief periodic updates on recent findings of MCBS. MCBS, Heritage and MIS are developing metadata sufficient for the release of native plant community and site data for counties having published maps. GIS data and selected attributes will be available on DNR's Data Deli October 1, 2001.

Access tables were developed containing current lists of Minnesota plants used by MCBS, the Flora of North America provided on a CD by Kartesz (1999), and the University of Minnesota herbarium. Development of consistency (or cross-walks) in plant nomenclature was essential for the relevé data analysis that has been a major part of the revision of the key to native plant communities. A standard state list of common names of plants is also in progress. A new data system was developed to produce labels for plant collections.

Plant ecologist/botanists compiled phenology and habitat data for plants into a concise table for field survey planning and to inform the state listing process.

MCBS coordinated with DNR's Ecological Classification System project on the initial stages of collection and computerization of Line data from the Public Land Surveys of the late 1800's.

Maintenance of the photo and slide collection included implementation of a scanning project for selected slides. A significant number of slides loaned to clients have not been returned over the past several years despite rather rigorous slide-library check-out procedures. As a substitute for slides, digital images, even of slightly poorer quality, might provide an adequate and more accessible format for many users without future loss of images from the program. Staff are also now evaluating the quality of a digital camera for recording some of the visual data.

A cooperative agreement with the University of Minnesota in the fall of 2000 provided for additional assistance with preparation of plant and animal collections at the Bell Museum of Natural History in exchange for assistance with lectures for their fall Mammalogy class.

A cooperative agreement with the herbarium at St Cloud State University has resulted in the assistance of an intern who is using the facilities at the university to prepare plant collections for curation. This supplements the similar cooperation ongoing at the Bell Museum.

LCMR Budget: $ 582,066
Balance: $ 0

Result 3. Private and public protection and ecological management of sites with rare resources identified by MCBS will be promoted through the distribution and interpretation of data, maps, and other publications.

Procedures: The increase in awareness of environmental issues related to endangered resources results in more demands by the public and natural resource professionals for interpretation of the ecological information collected by MCBS. Whenever possible, results are generated as summaries 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). Other requests are coordinated through the standard request procedures of the Natural Heritage and Nongame Wildlife programs.

Ecologists and biologists provide limited technical assistance and prepare written conservation and management recommendations for selected high quality sites and representative ecological landscapes in response to requests from within and outside the agency. This includes providing documentation for the highest quality sites that are often proposed for public protection as natural areas. Technical assistance includes consultations with local governments, public land managers, organizations and individuals concerning the integration of rare feature protection with other land management goals.

Specific Results and Completion Dates: Maps displaying results of MCBS for at least five counties will be published and distributed by June 2001. An updated version of the publication *Minnesota' native vegetation: a key to natural communities* that was revised in the last biennium will be distributed by February 2000. Work will continue on a book that incorporates and interprets the results of MCBS in two ecological subsections--the Blufflands and the Rochester Plateau. Publication is proposed prior to June 2001 contingent on the availability of additional funding.

Product examples

Wall-sized maps of Stearns and Marshall counties were published (MCBS Map Series Nos.19 and 20), displaying the results of MCBS. Maps are now available for the results of MCBS in 24 counties.

A looseleaf notebook, compiled in 2000 and updated in 2001 was prepared for DNR managers in southeastern Minnesota: *A summary of priority areas of significant biodiversity in southeastern Minnesota as determined by the Minnesota County Biological Survey.* Contents include a biodiversity map of the region and ecological evaluations of selected sites.

A summary of the finding of the four-toed salamander (*Hemidactylium scutatum*) in Minnesota was published in the *Herp Review* in the summer of 2000.

A submission by a MCBS contractor, Gerald A. Wheeler to the *Michigan Botanist* has been reviewed and approved for publication in Volume 38 at an uncertain future date: "New localities for *Buellia nigra* in Minnesota and the first report of the crustose lichen from South Dakota".

A CD containing a map of vegetation and descriptive information was delivered to DNR Parks for Mille Lacs Kathio State Park (2000).

A 62 page report, *Saint Croix State Park: native plant community and vegetative cover types* and CD was delivered to DNR Parks. It contains descriptions of map units of the 35,000 acre park that is included within a national scenic river corridor. The report was written to facilitate development of an ecological classification for the park while simultaneously documenting existing vegetation and the occurrence of rare features (2001).

Biological report No. 63, *Survey of Biological Features in Savanna Portage State Park: native plant communities and rare plants* was delivered to DNR Division of Parks and Recreation (2001).

A report was prepared for the Nature Conservancy entitled *Landscape Study Areas of the North Shore Highlands subsection: a preliminary assessment by the Minnesota County Biological Survey.* Biological Report No 68. March 2000.

Ecological evaluations for Dinosaur Island (Mille Lacs County) and the Ice Ramparts (Aitkin County) were prepared as for review (2001).

Old-growth evaluation report entitled: *Summary of Old-growth Forest Evaluation in Spirit Mountain Recreation Area, Magney-Snively Forest, Duluth MN,* Biological Report Series No. 66. The report includes two maps showing the boundaries of the Magney-Snively LSA, old-growth areas, the SNA proposed in 1986, and a proposed golf course area. This was delivered to the Duluth City Planning office before the city's Planning Commission held a public hearing on an EAW related to the proposed golf course on December 15, 2000.

As a follow-up to the Survey of Active Railroads project, notebooks containing maps of locations of prairie on active railroad rights-of-way and management guidelines was completed and delivered to the railroad companies: *Conservation of Minnesota's railroad prairies: a guide for working railroads* (Sept 2000).

Examples of articles in the popular press related to MCBS appeared in the *Outdoor News* (June 11, 2001) "Statewide survey catalogs Minnesota's natural diversity" and *The Kanabec County Times* (July 13 2000. Vol 115, No, 4) "Survey maps our rare animals and plants". MCBS was part of a featured section on the Minnesota River Valley that appeared in the December 12, 1999 Sunday edition of the *Minneapolis Star Tribune.* MCBS staff wrote articles for *The Wolf Ridge Almanac* (May 2001. Vol 11 No. 2) "Wolf Ridge supports biological survey of North Shore Highlands Landscape" and for *Natural Superior* (Summer 2000) "The Lake Superior Shore: Minnesota's Arctic Refuge".

The television show *Venture North*, and Media Rare (for the MN State Lottery's' *Environmental Journal*) videotaped surveys for four-toed salamanders in the Spring 2001. (Environmental Journal program #295). A Cook County radio station, WTIP taped segments of "A walk in the woods" to provide material for several short broadcasts on spring flora and plant communities of the area.

Two of the five proposed wall maps were published and data for most of the Minnesota River counties was recorded in ARCVIEW files. Work on a book on the Blufflands and Rochester Plateau was curtailed due to current funding limitations and the uncertainty of future MCBS funding. The revised native plant community classification and associated keys are now in a review process.

MCBS staff continued to work towards the protection and ecological management of sites with rare resources through interpretation, technical assistance and distribution of data. Some examples follow:

Northern Minnesota

Participated in the Assessment and Monitoring Workgroup of the Northeast Landscape Committee of the Forest Resources Council.

Collaborated on the Spatial Assessment project of the Laurentian Mixed Forest Province the purpose is to improve the understanding of historical landscape patterns and possible future conditions as a guide for forest planning and management strategies. The goal is to determine the value and limitations of spatial pattern data in developing science-based management strategies and in evaluating the consequences of alternative decisions.

Provided comments on the mapping project, *Mapping the range of natural variation ecosystem classes for the Northern Superior Uplands.*

Participated in the Manitou Collaborative, a public/private collaborative in the North Shore Highlands discussing ways to jointly manage a large forested area near Finland that include ownership by DNR, Lake County, TNC and several other private landowners.

Collaborated with Wolf Ridge ELC, University of Minnesota Extension, Lake County and others on management planning for Wolf Ridge.

Participated in a planning committee that is organizing a sustainable forest management workshop for private forest landowners entitled: *Succeeding as a Land Steward: Getting to know and working with your forest* scheduled for 28-29 September 2001 at Wolf Ridge ELC. Planning committee includes University of Minnesota Extension Foresters, DNR Div of Forestry, Program Forester , Lake County Land Commissioner, Wolf Ridge Environmental Learning Center Staff, MCBS Ecologist (Lawson Gerdes).

Attended a REMAP meeting coordinated by DNR Region 2. REMAP is an effort to share data and look for areas of overlap between the large landowners in northern Minnesota. Some other attendees included representatives from Blandin, Chippewa NF, and Cass County Land Department.

Participated in the DNR Forestry's subsection planning process with (Border Lakes, Mille Lacs Uplands, and North Shore). Provided ArcView shape files of Landscape Study Areas and MCBS site boundaries and comments about important sites as part of the DNR's Subsectional Forest Planning.

MCBS plant ecologists organized materials for, and provided leadership of a DNR interdisciplinary meeting (Grand Marais Area Forestry, Wildlife, SNA, MCBS) regarding conservation issues in South Fowl Cliff. Objectives were to have the significance of the cliff recognized, to address and resolve trail design problems that were having an impact on rare plant elements and sensitive habitats, to determine the appropriate long-term conservation designation for the area, and ultimately implement the strategy. Summaries were prepared and communicated to other interested parties (e.g., TNC, Rovers Outing Club, USFS, DNR Trails). MCBS coordinated work with MCC crew for two days to construct a reroute of the Border Route Trail at South Fowl Cliff. In conjunction with this work, staff organized and led two visits to the site for forestry and wildlife staff.

MCBS plant ecologist participated in the DNR Swamp River Outlet Structure and Road Project Team dealing with the river flow monitoring and modeling done in 2000, and worked with the group that decided on the outlet structure and road crossing design.

Provided data and reviewed TNC's EcoRegional Planning efforts in the Laurentian Mixed Forest Province.

Met with staff of the St. Louis County Land Department, including foresters, the land commissioner and his assistant commissioner to discuss MCBS work in St. Louis County. Delivered a report at the end of the 2000 field season on the progress of MCBS work in St. Louis County.

Met with biologists at Fond du Lac Reservation about forest and wetland conditions in their area.

Participated in discussions with Two Harbors area forestry and wildlife staff related to locational centers for designated old-growth forests on state lands. Provided input regarding old growth forests on state land in the Tamarack Lowlands subsection.

Region 3 DNR staff received updates of MCBS activities and products for the Mille Lacs Uplands Subsection. Various meeting were held with the area team, area foresters in Kanabec County, and wildlife managers at a regional meeting and at Mille Lacs Wildlife Management Area. They were provided county maps depicting state forest stands labeled by stand age and type along with locations of rare plants and animals. Within the Mille Lacs Wildlife Management Area, draft maps of native plant communities were delivered focusing on the Keintop area within a larger Landscape Study Area. The DNR Nongame wildlife specialist in Brainerd was given a MCBS site map of Crow Wing County displaying existing relevés, rare species locations, and descriptions of Landscape Study Areas and recorded observations.

An informal document was forwarded to Mille Lacs County Board with descriptions of wetland communities for their use in a county-wide wetland prioritization plan.

Staff led a field trip for Aitkin County foresters to a known population of blunt-lobed grapefern (*Botrychium oniedense)*, a state endangered plant that is part of a group of ferns generally difficult to identify. Searches for this group of ferns in the Mille Lacs Uplands over the past several years has greatly improved the understanding of their Minnesota distribution. However, these plants present some challenges for managers in their identification and management. This outing provided an opportunity for productive conversations and ideas related to forest management practices that would minimally impact *Botrychium oniedense*.

The MCBS aquatic botanist assisted with a Lakescaping for Water Quality workshop at Camp Bluewater in Itasca County where she helped lakeshore landowners in the identification of various groups of aquatic plants and their habitats.

Staff attended a population viability workshop in Duluth at the invitation of the US Forest Service to assess the status of several groups of species in the USFS Region 9.

West-Central MN and the Minnesota River Valley

Stearns County requested that MCBS work in the county so that the most recent data on rare species locations and potential natural areas would be available for the county comprehensive plan. The recently published wall map of Stearns County displaying results, along with data and technical assistance from MCBS have been central to decisions by Stearns County Parks in developing acquisition and management plans. Some areas include the Scientific and Natural Areas at Quarry Park and Nature Preserve, and Sedan Prairie, one of the few remaining prairies in the outwash plains in Western Stearns County. MCBS staff participated in the Sedan Brook Prairie SNA dedication in September 2000 by leading field trips followed by an interview with St. Cloud radio station KVSC.

An ecological evaluation for Avon Hills in Stearns County was presented to the Commissioner's Advisory Committee (CAC) as a potential natural area. This proposal encompasses a 1,900 acres area featuring mesic forest remnants in a rugged portion of the St. Croix moraine where they are the only remaining large patches in a quickly urbanizing area.

In Benton County, the plant ecologist located in Sauk Rapids Area Office visited sites with St. Cloud State University staff and students as part of developing local coordination with the University. This has improved the access to the herbarium and other resources due to good relationships with the staff.

Benton County planning staff have requested copies of a MCBS map file and interpretive assistance from the Natural Heritage Regional plant ecologist for use in their planning process as a follow-up to the completion of the Survey in the county. The regional plant ecologist will provide interpretation of the final map at a September 2001 meeting.

Staff attended a meeting organized by Nicollet County where they expressed interest in a final MCBS map for the county to complement a new map of aggregate resources created by DNR Minerals staff so that they can make better decisions about county resources.

In Redwood County, MCBS staff provided data and technical advice related to the potential impacts of a proposed township road on the rock outcrops, prairies and associated species in Cedar Rock Wildlife Management Area.

Staff provided a map to be used by the Minnesota Trails Initiative: a private, non-profit group that is planning a multi-use trail (paved for bikes with a soft track for horses) along the western part of the Minnesota River. They intend use the map to avoid sensitive areas and rare species populations for a segment between Redwood Falls and Granite Falls, and to provide points of interest for natural history. The current state trail system along the Minnesota River extends from the cities to just west of Mankato. They are working with or have the support of the Upper Minnesota Valley Rural Development Commission out of Appleton, local SWCD offices, Parks and Trails section of the National Park Service, and local county boards.

A map of MCBS showing native plant communities and rare species locations in Sibley County, as well as another map showing survey sites ranked according to "Biodiversity significance" indicating which are the most important sites for native species diversity was presented to the Sibley County Commissioners and the Sibley County Planning and Zoning staff in the spring of 2001. What remains in the county is mostly limited to forested ravines in the eastern end of the county and strips of prairie along highway 5 from Gaylord to Green Isle. Staff emphasized that two of the forested areas in the county, along High Island Creek and the Rush River, constitute two of the largest forest areas now remaining in the Big Woods.

As part of the Minnesota River Basin Joint Powers Board conference in July, plant ecologist Fred Harris presented a poster about MCBS and led tours to view nearby granite outcrops and associated rare plants. In 2000, Fred attended a number of meetings organized by Renville County focusing on the rock outcrop resources located in the Minnesota River Valley and provided data on the unique rock outcrop areas so that informed decisions can be made by the counties for conservation and permitting of mining in this region.

In Pope, Kandiyohi and Swift counties staff assisted with planning surveys related to a request by The Nature Conservancy for information on the Alexandria moraine complex region of central Minnesota related to their conservation planning efforts in the region.

In Swift County information on the Lund Prairie site was provided to the Wilmar Area DNR Wildlife Office,

TNC and to Pheasants Forever documenting the importance of the native prairie at the site and facilitating the acquisition of the area.

MCBS data were considered as part of the assessment of the potential impact of the proposed reroute of the DM&E railroad near Rochester.

LCMR Budget: $ 400,067
Balance: $ 0

V. DISSEMINATION:

The Natural Heritage Information System is the major repository of data collected by MCBS. *A user's guide to the Minnesota Natural Heritage Information System* is provided to those requesting data along with a user request form. A data request form and brief descriptions of the major component databases of this Information System are available through the DNR Web site listed on page one. GIS datasets are delivered to selected users (such as a county planning boards) through the Natural Heritage and Nongame Research Program.

Some of these data are also available as part of NatureServe, an international consortium of Natural Heritage programs and Conservation Data Centers. MCBS also shares data with cooperators at the University of Minnesota and with others in a particular ecological region where surveys are ongoing or completed. In addition to rare features data, some examples of data that have been exchanged during the survey process include the classified imagery developed though the GAP analysis project and the Forest Songbird Project, the National Wetlands Inventory data, bearing tree data, vegetation plot data from numerous individuals and academic institutions in the state, lakes data collected by the DNR Section of Fisheries, and forest stand data from the DNR Division of Forestry, the Chippewa National Forest, and various counties.

Physical collections are deposited at University of Minnesota repositories, primarily at the Bell Museum of Natural History, with some collections going to the Science Museum of Minnesota. As part of a larger network of museums and herbaria, these cooperators are essential to the documentation and sharing of MCBS results. MCBS and museum staff meet periodically to address curatorial, data management, and interpretive needs.

MCBS invests considerable time in publishing and distributing results of the Survey in a variety of formats for various audiences. The DNR and Legislative libraries and other local information repositories (such as libraries within counties) are routinely sent published products. MCBS staff also make presentations that describe the Survey goals, methodologies and results to a wide range of audiences that include county boards, local planning groups, citizen advisory groups, other biologists, land managers and students. Staff also lead or participate in technical workshops and field trips to exchange ideas on survey methodology. MCBS keeps records of Survey presentations and of recipients of published products.

A limited amount of time is invested in providing interpretation of rare features data and of MCBS products as they apply to specific local planning, land protection and management situations.

VI. CONTEXT

A. Significance:. As a result of a systematic survey, the relative importance of natural areas and representative ecological landscapes can be assessed. Increased knowledge of the status and distribution of rare species, native plant communities and representative ecological landscapes leads to more informed and appropriate resource management decisions and natural area acquisition. Prior to MCBS, much of the data that populated the Rare Features Database of the Natural Heritage Information System was based on existing collections of plant and

animal specimens stored in museums and herbaria. Most previous surveys that contributed information about 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. Increasing pressure for land development and lack of information to adequately evaluate impacts to natural features necessitated the accelerated survey provided by MCBS in order to ensure the protection of the state's biological diversity. Several other Midwestern states have previously conducted surveys similar to MCBS (Wisconsin, Illinois, Michigan, Missouri). MCBS adapted and expanded upon their survey techniques such that now MCBS is recognized nationally as a model systematic survey. Since 1987, MCBS has generated most of the state's new distributional information on rare features. MCBS also provides additional resources for the maintenance of the Natural Heritage Information System, produces and distributes interpretive products, and supplements the technical assistance capabilities of the DNR, specifically in the interpretation of MCBS findings and in the areas of botany, zoology and plant ecology.

The Natural Heritage and Nongame Research Program (NHNGR) manages the Information System, providing for the long-term maintenance and distribution of data generated by MCBS. NHNGR responsibilities include review of projects involving rare features, research and monitoring of rare features, and coordination of these efforts with other agencies and institutions. For example, NHNGR is a member of the NatureServe, an international consortium of Natural Heritage programs and Conservation Data Centers that provides coordination of the distribution of rare features information. NHNGR is also responsible for coordinating recommendations for revisions to the state list of endangered, threatened and special concern species, and along with the Nongame Wildlife Program, provides technical assistance for issues concerning rare ecological features (e.g., old growth forests, calcareous fens, DNR plans, recovery teams for federally-protected species).

B. Time: Future funding will be requested from the Minnesota Legislature (Through the LCMR process, the general fund, the Nongame Wildlife Program), the Division of Parks and Recreation and other local or regional cooperators with the goal of completing the Survey by 2017.

C. Budget Context: LCMR recommended partial funding for the establishment of the Natural Heritage Program in FY 78-79. The pilot phase of MCBS in FY 88-89 was supported by LCMR with matching private dollars, and has received ongoing support (see budget history). Past funding of MCBS stimulated various other cooperative survey efforts that included work with the Minnesota Army National Guard (Camp Ripley), the U.S. Forest Service (Chippewa and Superior National Forests), The Nature Conservancy, Aitkin County, Cass County, Olmsted County, Stearns County, the Metropolitan Airport Commission, the U.S. Fish and Wildlife Service, Minnesota's Lake Superior Coastal Program and the DNR's Division of Parks and Recreation and Division of Forestry.

Budget History:

	FY88-89	FY90-91	FY92-93	FY94-95	FY96-97	FY98-99
LCMR	171,500	150,000	1,000,000	900,000	900,000	1,200,000
TNC	171,500					
GEN		300,000	300,000	300,000	300,000	436,000
RIM		170,000	169,000	156,000	164,000	172,000
Nongame		100,000	80,000	80,000	69,000	70,300
Totals	343,000	720,000	1,549,000	1,436,000	1,433,000	1,878,300

Total=$7,359,300

1. FY00-01 Budget:

Personnel: (estimated cost is $1,600,000)

This estimate is based on existing and proposed staff. It is subject to change following a Hay Study to review classifications of positions in DNR's Division of Fish and Wildlife scheduled for completion during the1999 Legislative session. July 1, 2001 Update: All LCMR funds were expended on salaries.

Full time staff:
8 Natural Resource Specialist Senior (Wildlife Research Biologist)
3 Natural Resource Specialist (Wildlife Research Biologist)
1 Natural Resource Specialist Senior (Nongame)
2 Natural Resource Specialist Intermediate (Wildlife Research Biologist)

Part time staff:
2 Natural Resource Specialist Senior (Wildlife Research Biologist)
2 Natural Resource Specialist (Wildlife Research Biologist)

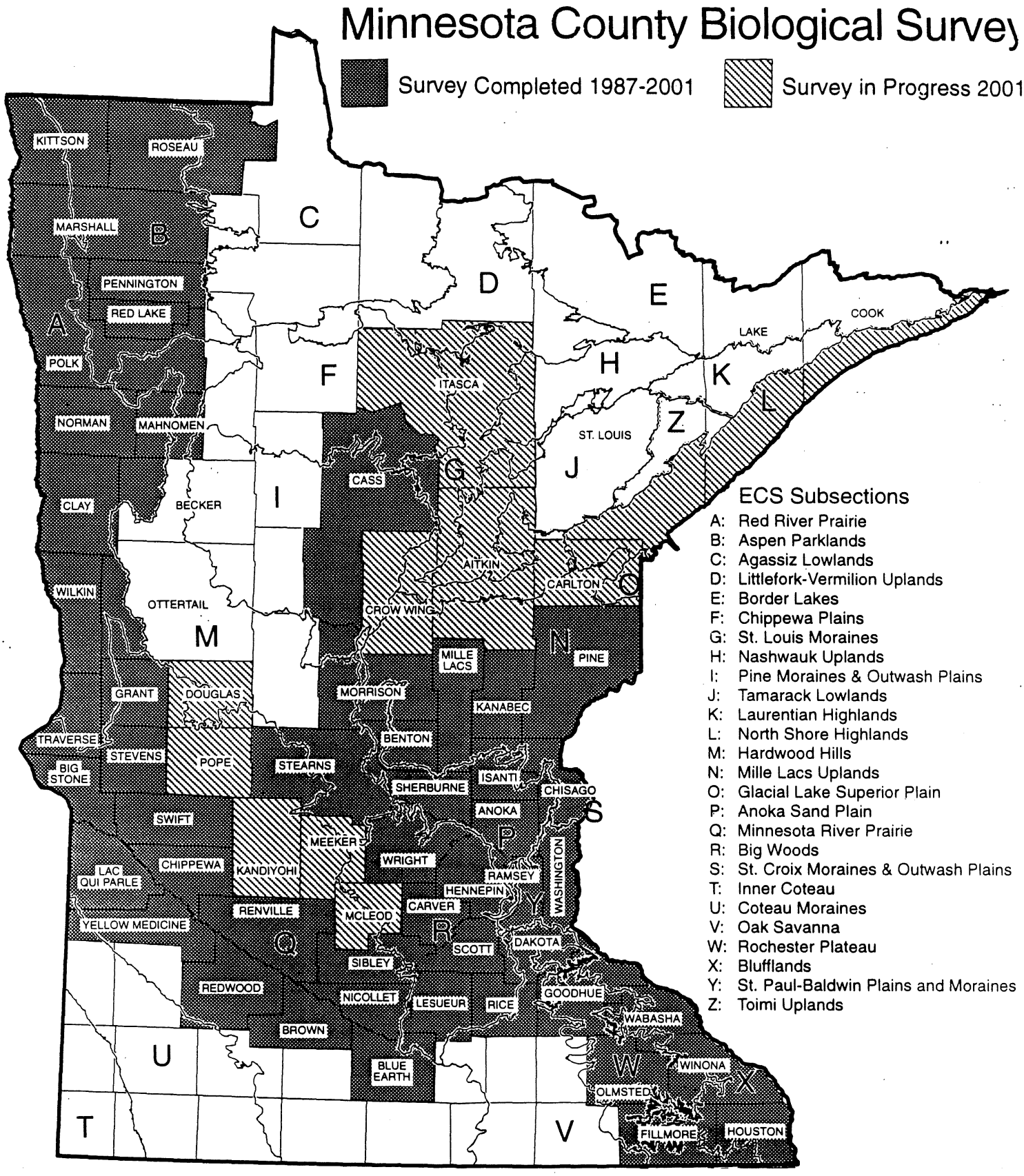
2. See Attachment A.

VII. COOPERATION:

University of Minnesota, Bell Museum of Natural History
Scott Lanyon, Director

Plant and animal specimens collected by MCBS are deposited at the Bell Museum. MCBS provides assistance in the preparation of specimens using methodology approved by the museum staff. The museum staff provides for access to the collection and direction as to the appropriate use of the facility. This effort represents a small portion of the museum staff time, yet the cumulative costs of long-term maintenance of the collections is considerable.

VIII. LOCATION:



Subsection map was developed as part of DNR's Ecological Classification System and is subject to change.

IX. REPORTING REQUIREMENTS: Periodic workprogram progress reports will be submitted not later than January 1, 2000 and January 1, 2001. A final workprogram report and associated products will be submitted by June 30, 2001, or by the completion date set in the appropriation.

X. RESEARCH PROPOSALS: N/A

Attachment A Deliverable Products and Related Budget (B02)				
LCMR Project Biennial Budget Wages, salaries and benefits	**Result 1. Field survey**	**Result 2. Data management**	**Result 3. Data interpretation**	**Totals**
(A) 40% of staff time Full time staff: 8 Natural Resource Spec Sr(WRB) 2 Natural Resource Specialist 1 Natural Resource Specialist Sr (Nongame) 2 Natural Resource Specialist Intermediate Part time staff: 2 Natural Resource Specialist Senior (WRB) 1 Natural Resource Specialist (WRB)	$612,800			$612,800
All staff in (A) 35% of their time 1 Natural Resource Specialist (100% time) 1 Natural Resource Specialist (25% time)		$464,000 $93,000 $ 20,000		$577,000
All staff in (A) 25% of their time 1 Natural Resource Specialist (75% time)			$335,000 $ 60,000	$395,000
Administrative costs	$5,067	$5,066	$1,177	$11,310
Other Misc. costs (printing, equip, travel)			$3,890	$3,890
Totals	**$617,867**	**$582,066**	**$400,067**	**$1,600,000**