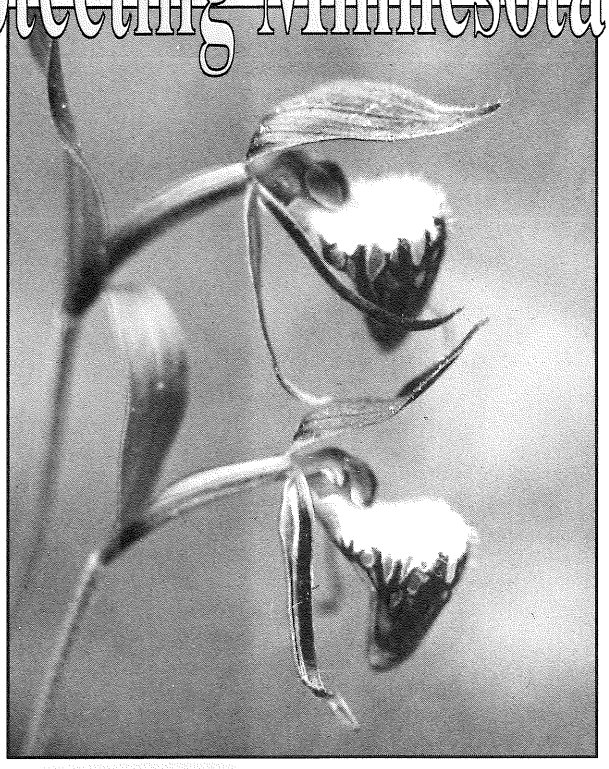
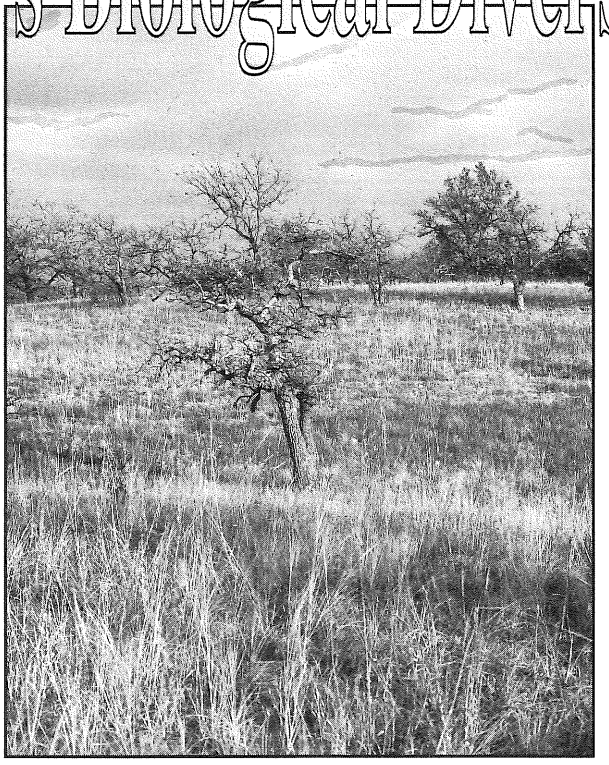
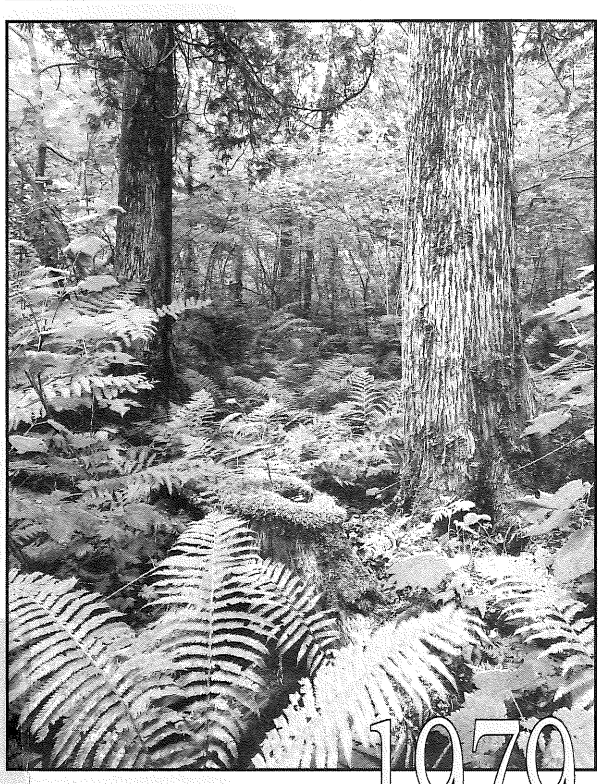
N A T U R A L H E R I T A G E P R O G R A M

Protecting Minnesota's Biological Diversity



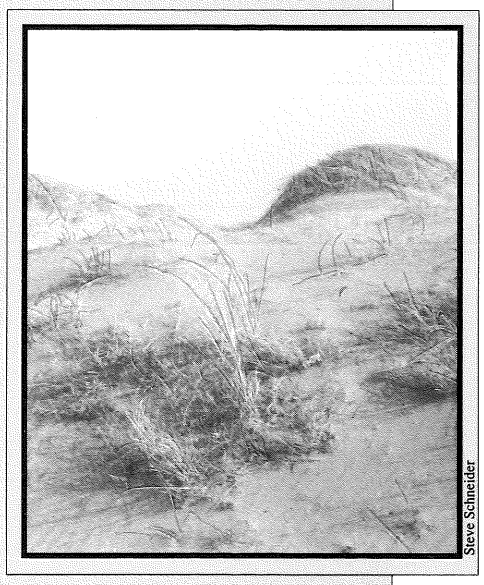




1979-1989

A R T M E N T O F N A T U R A L R E S O U R C E S

From the Commissioner's Office


Steve Schneider

Protecting our natural environment has become increasingly complex as we confront acid rain, toxic wastes, global warming and other environmental threats. Preventing the further erosion of biological diversity - the full spectrum of living organisms and the ecosystems in which they occur - will not be easy. Despite the magnitude of these problems, a renewed commitment toward environmental stewardship has emerged worldwide.

In Minnesota, our contribution to preserving biological diversity is reflected in the department's mission statement: "... to professionally manage our rich heritage of fish, wildlife, waters, wetlands, forests, prairies, minerals, public lands and other natural resources, in order to preserve and enhance our environment...." To accomplish this requires a growing understanding of environmental interrelationships and more comprehensive, integrated management strategies.

Ten years ago, the Natural Heritage Program's small staff of botanists and ecologists joined the department, bringing new tools for protecting rare plants and threatened ecological communities. They also brought a new management philosophy: protecting biological diversity by managing and preserving whole biological communities. This concept is now being successfully incorporated into our traditional natural resource management programs.

We are proud of the department's progress in integrating varied resource management goals while serving the interests of diverse groups. The Natural Heritage Program, as a key component of the department's endangered resource management effort, plays an important role in helping to balance management priorities.

Joseph N. Alexander

Joseph N. Alexander, Commissioner, Department of Natural Resources

From the Section of Wildlife

Since 1979, the Natural Heritage Program has worked to identify and protect Minnesota's rare native plants and threatened natural communities. By establishing conservation priorities, inventorying the state for rare features, gathering and storing statewide ecological information, and recommending tracts of native habitat for protection, it serves as the guardian of Minnesota's most vulnerable living creatures and native communities.

The Natural Heritage Program's presence within the Section of Wildlife encourages a broader vision of wildlife protection. Resource managers have begun to consider the impact of conservation actions on entire landscapes and watersheds: an evolution from single-species management to conservation of entire biological communities.

The Natural Heritage Program works with the Nongame Wildlife and Scientific & Natural Areas programs, and the rest of the Section of Wildlife, to protect Minnesota's most endangered resources. Their expertise on the state's rare features is critical to developing appropriate resource management actions. For example, information from the Natural Heritage database has been instrumental in compiling state park and state forest plans. And the expertise of program botanists and plant ecologists has been integral in developing an ecosystems-level understanding of natural resource management.

The increased public and professional concern for conserving Minnesota's biological diversity is exciting. The recent expansion in funding for the County Biological Survey, critical for assessing where key parcels of habitat remain, illustrates strong public and legislative support for endangered resource management.

The Natural Heritage Program's goals for the future include completing an assessment of each Minnesota county's rare features by the year 2000 and emphasizing the management of Minnesota's more common native plants and natural communities — before they become endangered.

Roger Holmes

Roger Holmes, Chief Section of Wildlife

CONTENTS

Ten Years in Review	3
Establishing Conservation Priorities	4
Inventory: Endangered Species & Threatened Natural Communities	6
Monitoring and Research	8
Data Management	9
Protecting Minnesota's Endangered Resources	10
Strategy for the Future	12
Selected Publications	14
Budget	15

Cover Photos:
Welby Smith-ram's-head lady's-slipper (u. l.); Craig Thiesen-oak savanna (u. r.); Steve Schnieder-northern hardwoods-conifer forest (l. l.); Richard Smith-prairie grasses and forbs (l. r.).

Ten Years in Review

Ten years ago the Natural Heritage Program, a small staff of four biologists and a data manager, began the task of identifying, inventorying and protecting Minnesota's rare species and threatened natural communities. The Nature Conservancy (TNC) and the Legislative Commission on Minnesota's Resources (LCMR) joined private and public dollars to initiate this effort within the Minnesota Department of Natural Resources, adding to a growing network of TNC-initiated natural heritage programs across the United States, Canada, and South America.

We can appreciate the foresight of those who initiated the Minnesota Natural Heritage Program a decade ago as the protection of our world's rich biological diversity becomes a priority for the 1990s. The Natural Heritage Program has already made significant contributions to preserving the state's rich natural diversity.

Conservation Priorities. Natural Heritage and Nongame Wildlife staff helped establish the state's first official list of endangered species in 1984. This list, together with the Natural Heritage Program's threatened natural community list, has enabled both private and public conservation groups to set priorities for endangered resource protection.

Inventory. Natural Heritage Program staff have identified valuable remnants of our state's rarest community types, such as old-growth northern hardwoods and virgin native prairie. They have located plants, like bog bluegrass, not previously known to occur in Minnesota, and other plants, such as the small white lady's-slipper, once thought to be rare but now known to be more common.

At first, our staff conducted statewide inventories focused on one species or community type. In 1987, a second commitment of TNC and LCMR funds helped Natural Heritage and Nongame Wildlife staff initiate the Minnesota County Biological Survey, a county-by-county inventory of rare features. As a result, the number of known rare feature occurrences in the first seven survey counties more than doubled. Of the 1,062 potential natural areas inventoried, 64 sites (6 percent) received priority for immediate protection.

Monitoring and Research. Botanists monitor six of Minnesota's rarest plants—dwarf trout lily, prairie bush clover, western prairie fringed orchid, ram's-head lady's-slipper, kittentail and ginseng—on an annual basis, hoping the data they acquire will help ensure the long-term survival of these priority species.

Rare Features Database. After 10 years, a database that began as a collection of historical records is now rich with up-to-date information from many successful field seasons. Ten thousand entries (including the location of rare orchid sites, bat caves, and old-growth forests) serve more than 500 user requests a year, ranging from routine review of residential development projects to detailed comments on the endangered features of an entire DNR forest area.

Protecting Biological Diversity. The true success of the Natural Heritage Program is best measured by evaluating the progress it has made in protecting Minnesota's endangered resources. Staff have initiated communication with all major public landowners in Minnesota: DNR Forestry and Parks, the U.S. Forest Service, and the U.S. Fish & Wildlife Service. Recommendations by our staff have resulted in the dedication of 41 new state Scientific and Natural Areas, 28 Natural Heritage Register sites, 3 federal Research Natural Areas, and more than 100 private Nature Conservancy Registry sites. The development of new legislation (e.g., the Prairie Landscape Reserve Bill), evaluation of more than 5,000 environmental review projects, and the publication of educational materials are other ways in which the Natural Heritage Program participates in protecting the state's endangered resources.

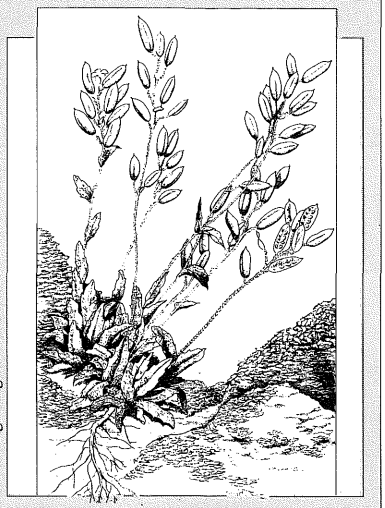
The Future. Funding, staffing and the complexity of our responsibilities have increased dramatically in these first 10 years, but we still fall short of meeting the needs of Minnesota's endangered resources. Recent surveys show that the public's concern with protecting the state's biological diversity is escalating, yet opportunities to protect significant natural remnants become fewer and fewer. Our task for the future becomes increasingly urgent.

Barbara Coffin, Coordinator
Natural Heritage Program

1979-1989:

Recommendations made in 1979... accomplished 10 years later

- **Take action to ensure that the NHP becomes a permanent part of the DNR.** The NHP became a permanent part of the DNR in October 1980.
- **Initiate a comprehensive field inventory of the state's rare features.** The MN County Biological Survey was initiated in July, 1987. After two years, 7 counties are completed and another 13 begun.
- **Recognize the need for staff botanists and plant ecologists within the DNR.** Heritage staff botanists and plant ecologists provide technical expertise department-wide.
- **Develop new legislation that would provide protection to MN's endangered species.** A revision of MN's endangered species law in 1981 required the establishment of MN's first official list of state endangered species.
- **Create a landowner notification program.** A program was initiated in 1983 to inform public land managers of the occurrence of endangered species and/or habitats on their land. Using NHP data, a sister effort was started at the same time by the MN Chapter of The Nature Conservancy, to inform private landowners.
- **Coordinate the activities of the Natural Heritage, Nongame Wildlife, and Scientific & Natural Areas programs.** All three programs were moved together into the Section of Wildlife in 1982. These programs represent the DNR's commitment to a comprehensive and coordinated strategy to save MN's endangered species and threatened natural ecosystems.



Norwegian draba (*Draba norvegica*), a state endangered species confined to rocky ledges, is disjunct hundreds of miles from its primary arctic habitat.

Golden-seal (*Hydrastis canadensis*), a state endangered species, is rare in Minnesota because of over-collecting for folk medicinal uses.

Wild quinine (*Parthenium integrifolium*), a state endangered species, is found only in the nearly extinct tallgrass prairie of southeast Minnesota.

ESTABLISHING CONSERVATION PRIORITIES

The first State Endangered Species List and a new Natural Community Classification and Ranking Scheme have established clear statewide protection priorities.

The First State Endangered Species List

In 1981, an amendment to the State Endangered Species Act gave legal clout to the protection of rare plant and animal species. It mandated the establishment of an official state list of endangered species.

The timing was perfect. Natural Heritage biologists had just completed two years of gathering data on the state's rare species from museum records, scientific reports, and knowledgeable individuals. They (in cooperation with Nongame Wildlife staff) were in a good position to guide the assessment of legal status for each of the state's rarest species.

The 1981 amendment called for the formation of a volunteer 30-member technical advisory committee. For 18 months, this committee, coordinated and partially staffed by the Natural Heritage Program, worked to compile the state's first official list. Natural Heritage botanists helped to assess the status of more than 2,000 plant species. By the time the committee was finished, the proposed list contained 287 species of plants, mammals, birds, fish, amphibians, reptiles, molluscs, butterflies, and other invertebrates. A status sheet included for each species delineated its federal status, basis for the state status, and recommendations for protection. In 1984, the proposed list, with only a few minor changes, became official.

The list gives legal status to the species Natural Heritage Program staff work to protect. It clearly shows the link between species decline and habitat loss. It reveals gaps in existing knowledge, demonstrating the need for research on the distribution and habitat requirements of individual species. It demonstrates to the public the reality of species loss and shows that we must act now to preserve Minnesota's natural heritage.

Minnesota's Endangered Flora and Fauna, a comprehensive volume co-edited with Nongame Wildlife staff and partially authored by Natural Heritage Program staff, uses materials compiled by the original technical advisory committee to outline the current status of each of the state's rare species.

	Number of Species in Minnesota	Number of Listed Species
Animals		
Mammals	81	17
Birds	242	27
Reptiles & Amphibians	48	17
Fish	149	16
Mussels	60	4
Butterflies	145	15
Subtotal	**725**	**96 (13%)**
Plants		
Vascular Plants	1500	174
Lichens	550	14
Mosses	380	3
Subtotal	**2430**	**191 (8%)**
Total Animals & Plants	**3155**	**287 (9%)**

Table 1. Number of Minnesota plant and animal species listed as state endangered, threatened, or of special concern.

Classifying and Ranking Natural Communities

Plants and animals do not exist in isolation; they are components of larger interactive communities. These communities represent intricate webs of relationships between the physical environment (soil, climate, landform) and living organisms. This complexity gives natural communities their stability, and it allows them to function as self-regulating support systems for a full complement of species, both common and rare.

Today only small remnants of most of Minnesota's natural communities remain in relatively pristine condition. Their degradation and loss is by far the most important factor contributing to the decline of Minnesota's native species. Because of this, Natural Heritage Program staff in 1979 began to develop a classification scheme for identifying and cataloguing the state's natural communities. Natural Heritage ecologists have continuously adjusted and refined the scheme as they've learned more about the dynamics of the natural environment through inventory. The classification scheme is now indispensable for achieving the department's goal of developing a system of reserves protecting examples of all of Minnesota's native communities.

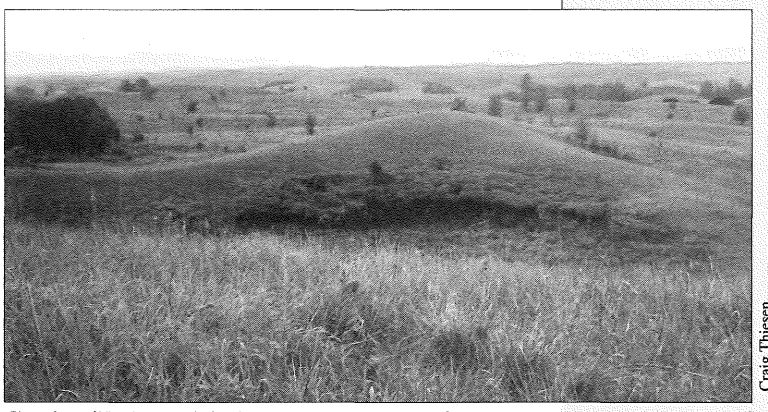
The present classification system characterizes and names natural communities by a combination of their most prominent habitat features, including vegetation, topography, hydrology, substrate, and soils. Glacial till hill prairie, northern hardwood-conifer forest, and Minnesota River granite outcrop community are examples of natural community types in Minnesota. Their names contain distinctive information about the community's structure and ecology, and stress easily identifiable features of the landscape.

By 1986, Natural Heritage Program staff had identified 56 natural community types within the state. Using statewide inventory data, they ranked each community type according to its relative rarity. Of the 56 types, they designated 12 communities as state-endangered and 20 as state-threatened. Although these rankings do not afford legal protection as they do for state listed rare species, they do provide the Natural Heritage Program with an objective mechanism for establishing habitat protection priorities.

To further assist the department-wide effort to protect and manage the state's most threatened natural communities, Natural Heritage Program staff are producing status sheets that document each community's ecology, distribution, abundance, condition, and protection needs. Ultimately, a complete series of status sheets will be compiled into book form.

"The dreamers are the realists. They are the ones who look through all the facade to all the things that we're doing to our environment and see the end result as it affects humanity. We are asking ourselves a great question...What kind of world do we want?"

Sigurd F. Olson
San Francisco, 1965

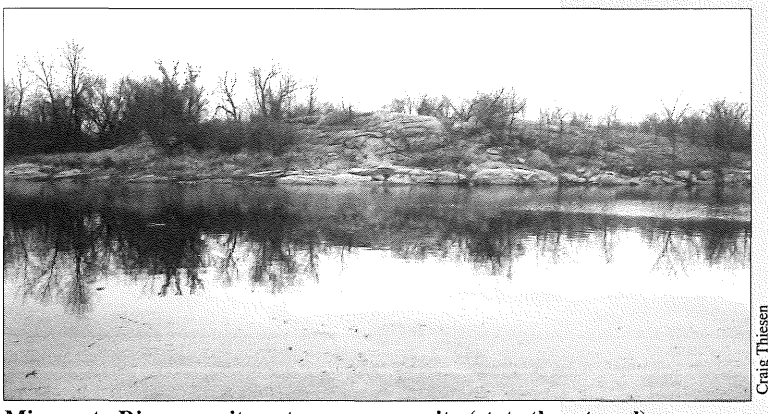


Craig Thiesen

Glacial till hill prairie (state threatened) is found along the steep slopes of rivers and drainageways in south-central and western Minnesota.

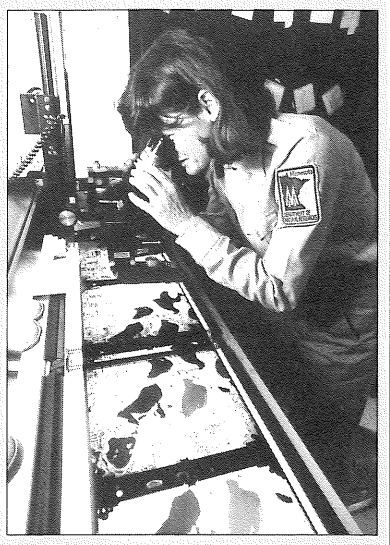
Steve Schneider

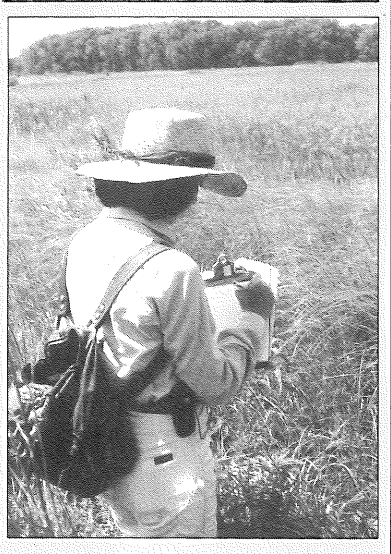
Northern hardwood-conifer forest (state threatened) is characterized by old-growth sugar maple, yellow birch, and basswood, with occasional white pine and white cedar.



Craig Thiesen

Minnesota River granite outcrop community (state threatened) harbors a distinctive group of rare species, including the pincushion cactus and the five-lined skink.





INVENTORY: ENDANGERED SPECIES & NATURAL COMMUNITIES

Aerial photo interpretation, aerial reconnaissance, and field survey are the essential tools used by Natural Heritage Program biologists to identify the location, abundance, and condition of endangered species and threatened natural communities.

Species Inventory

A diminutive plant with tiny yellow-green flowers and a delicate spray of leaves barely emerges from the broken rock tumbling down a north-facing slope. The slope extends from the mouth of an ice cave ringed by boreal species, left behind when the glaciers retreated 15,000 years ago. Cool, wet air draining from the cave keeps the temperature below 16° C (61° F) year round, even in the hot summers typical of southeastern Minnesota.

The plant, golden saxifrage (Chrysosplenium iowense), is restricted to this unique habitat—algific (cold-producing) talus slope—found only in Iowa and Minnesota. Before 1982, only two populations of the species were known to occur in the state. But 1982 and 1988 statewide inventories conducted by Natural Heritage Program botanists revealed five additional occurrences, all in Fillmore County at Minnesota's southern border.

With supplemental funding from the U.S. Fish and Wildlife Service's Office of Endangered Species, Natural Heritage Program botanists have carried out similar inventories, called status surveys, of 14 other species. All were candidates for the federal endangered species list. Of the 14 species inventoried, two have received federal listing: the dwarf trout lily (endemic to Minnesota) and prairie bush clover. A third, the prairie white-fringed orchid, will be listed within the next year.

Plant species receive special protection with federal and/or state listing. The law forbids the taking, selling, or transporting of these species and mandates, with federal listing, the development of recovery plans (management strategies that typically specify the number of populations that must be protected to ensure the survival of the species).

With information from Natural Heritage Program status surveys, officials can better determine the national and state status of rare plant species, including the golden saxifrage.

Community Inventory

Just outside the little town of Morristown in Rice County is a small patch of forest called Townsend's Woods. It looks unimpressive at first glance, just a slight depression surrounded by cornfields. But something happens as you walk in. The ground softens. The temperature drops. A scarlet tanager flits back into the deep green leaves. As you make your way down the gentle slope, the forest seems to expand then deepen into something from which you will not emerge for days.

A hundred and forty years ago, a person could travel six days on foot from Le Sueur to Wright County and never leave the forest. Early explorers called this vast expanse of maple, basswood, and elm the Big Woods. Waterways serving as natural firebreaks kept the woods from reverting to prairie.

But with European settlement, the graceful maple-basswood canopies succumbed to the axe and plow. In time, only a few tiny islands of this unique community remained.

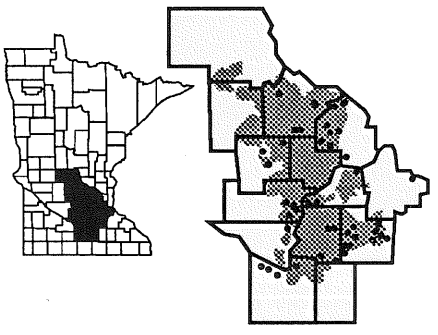


Table 2. Presettlement distribution of maple-basswood forest and examples remaining today.

In 1982, Natural Heritage Program biologists identified Big Woods forest as a priority for inventory. Using aerial photographs and topographic maps, they located sites likely to be undisturbed by logging, grazing and/or development. In the field, they ranked each site according to its natural area quality (the degree to which it retained its presettlement characteristics). This assessment was made after collecting data on the site's tree composition, structure, and age, and understory species composition and diversity. The highest quality sites were further characterized by collecting relevé samples (concise semi-numerical descriptions of vegetation units). Finally, Natural Heritage Program staff recommended highly ranked sites for protection as Scientific and Natural Areas, Nature Conservancy preserves, or registered lands.

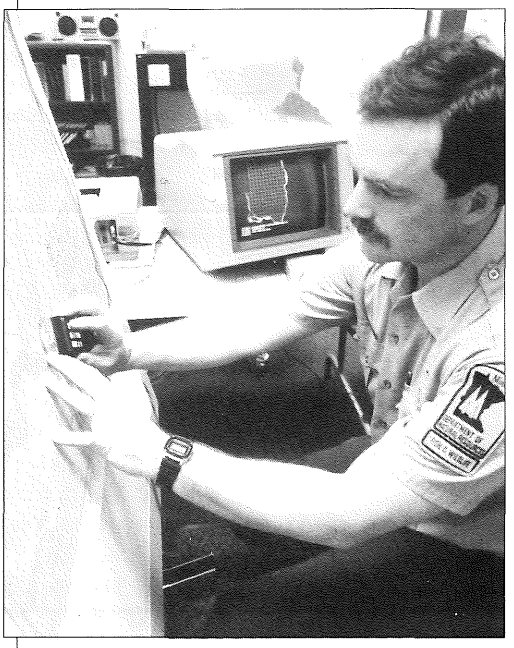
Natural Heritage Program biologists have inventoried the state for other natural communities, such as old-growth northern hardwood forests, Sioux quartzite prairies, algific (cold-producing) talus slopes, and calcareous fens (rare, mineral-rich wetlands). Today, staff ecologists are continuing their study of old-growth, forests that have escaped fire, logging, grazing, and other catastrophic disturbance for more than 120 years. With a more complete picture of what exists, scientists can help protect these threatened habitats. Like Townsend's Woods, each site preserved is a journey into the past—and a banner of hope for the future.

"The bottom line is that you can't protect endangered species unless you know where they are."

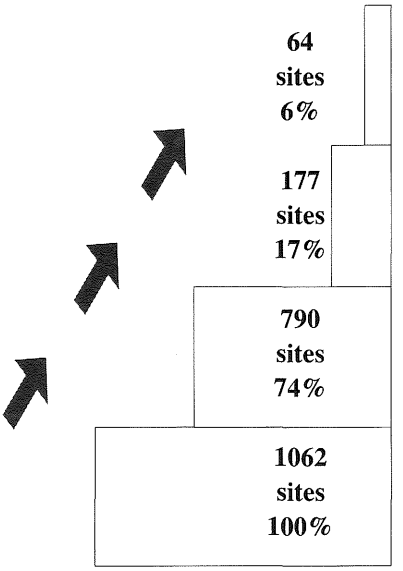
Wall Street Journal
May 24, 1989

The Minnesota County Biological Survey: A New Inventory Strategy

In 1987, Natural Heritage and Nongame Wildlife staff initiated a new approach to the inventory of rare plants, animals, and habitats: the Minnesota County Biological Survey. While statewide inventories targeting individual species and communities remained useful, staff hoped to accelerate the rate of data accumulation by systematically surveying whole counties for the rare features they contained.



Surveyor uses digitizer to record natural areas identified by the Minnesota County Biological Survey on computerized maps.



Finally, outstanding sites are recommended for nature preserve dedication.

Next, selected sites are recommended for conservation action such as private land registry and prairie tax credits.

Biologists then conduct on-site field survey of qualifying sites.

Potential sites are identified by aerial-photo interpretation and evaluated by low-altitude flight.

Table 3. A systematic method of selecting areas of natural habitat for protection and preservation (data from first seven survey counties).

Survey biologists used public land survey records from the 1850s, satellite imagery, color infrared photography, and visual searches by air and on foot to identify natural communities still functioning as they did when Europeans first settled Minnesota. By the end of the second field season (1988), they had identified 1,062 potential natural sites, of which 64 were eventually given priority for protection. With 386 rare plant populations, 368 rare animal occurrences, and 478 undisturbed natural communities newly identified, the number of known rare feature locations in the first seven survey counties nearly doubled.

This year staff targeted 13 additional counties for inventory. Data from the survey counties will be added to the Natural Heritage Database, a repository of statewide information on rare features. Via a computerized Geographical Information System, the data can be used to produce customized maps showing the locations of rare features in reference to powerlines, waterways, state forests, and other landmarks. These maps can be made available to planners, researchers, developers, educators, and others concerned with the protection of rare species and natural communities.

Luckily, most counties still contain remnants of native habitats and the rare plants and animals they support. By the year 2000, the County Biological Survey crew hopes to have inventoried all 87 Minnesota counties.

MONITORING AND RESEARCH

Basic biological data acquired through rare plant population monitoring and natural community research is critical to the recovery of endangered species and the management of natural communities.

Monitoring

Botanists have known for a long time that the vigor and size of rare plant populations vary from year to year. Weather and other environmental factors appear to be responsible for some population changes, but the extent of the variation is often unknown.

In 1982, Natural Heritage botanists established an annual monitoring program for six priority rare species: kitten tail, ram's-head lady's-slipper, prairie white-fringed orchid, dwarf trout lily, prairie bush clover, and ginseng. Monitoring methods differ slightly from species to species but all make use of a special sampling device, a portable grid called the "Welby frame," designed by Natural Heritage botanist Welby Smith to locate individual plants from year to year without marking the plants themselves.

Welby Smith

Heritage staff use the "Welby frame" for annual population counts of prairie bush clover at Kilen Woods State Park.

Largely underwritten by funds from the U.S. Fish and Wildlife Service's Office of Endangered Species, the annual monitoring and research projects sometimes require a large number of workers for a very short time while each species is blooming. In 1989, the Natural Heritage Program initiated a volunteer botanical project to meet this need. This active volunteer program enables Minnesota citizens to become involved with the monitoring and stewardship of the state's rarest plants.

Steve Schneider

Natural Heritage staff collect relevé data in an old-growth northern hardwoods forest.

Relevé

The French word relevé means abstract or summary. Just as an abstract summarizes a book, a relevé plot sample gives a clear and concise summary of a unit of vegetation within a natural plant community.

On large vegetation plots of 100 to 400 square meters, scientists record the coverage (percent total area) of all plant species present and how they are distributed in vertical layers from canopy to ground.

Natural Heritage Program biologists are using relevé data to refine the community classification scheme they developed in 1982. Statistical techniques applied to relevé data help staff objectively determine criteria for distinguishing closely allied communities (e.g., the 16 types of native prairie) and their relative rarity.

Relevé data can also be used to:

- show changes in vegetation that occur as a result of management practices such as selective logging, prescribed burning, and pesticide application;
- compare present-day vegetation with that of presettlement times, to determine the effects of long-term human disturbance;
- contribute to the development of an ecological classification system, which considers abiotic features like soil and water chemistry as well as existing vegetation in determining an area's potential vegetation.

The Natural Heritage Vegetation Database, especially designed to manage relevé data, contains 500 entries and is growing quickly as County Biological Survey samples are added. Natural Heritage staff have developed data-entry software and a *Handbook for Collecting Relevé Data in Minnesota* to help build the database and encourage standard methodology in collecting relevé data. With more comparable data available, scientists can make better decisions about classifying, managing and preserving Minnesota's natural communities.

DATA MANAGEMENT

A unique, continually updated database provides a centralized source of ecological information on Minnesota's endangered resources.

> **"To conserve biological diversity... requires a great deal of basic knowledge about species, their biology, their ecology, and their interrelationships with other organisms."**
>
> **Robert E. Jenkins**
> **Vice President,**
> **Science Programs**
> **The Nature Conservancy**

Natural Heritage Database

As Natural Heritage Program field botanists and ecologists gather new information on rare species and native habitats, they enter it into computer files, manual files, and topographic maps: collectively, a system for organizing and storing data called the Natural Heritage Database. The database, maintained by both the Natural Heritage and Nongame Wildlife programs, contains more than 10,000 entries, including information on 500 natural features —from rare prairie plants and colonial nesting bird sites to remnant tracts of old-growth forest and rare calcareous fens.

When the Natural Heritage Program first began, there was a rapid input of data as all existing historical records were compiled. Between 1980 and 1987, the gradual increase in the total occurrences in the database reflects results of summer field surveys by a relatively small number of field biologists. With the advent of the Minnesota County Biological Survey in 1987, the rate at which data accumulated accelerated markedly; 3,825 records were added between 1987 and 1989 alone.

Information in the database—including exact locations of rare populations and communities, ownership of the land on which they occur, their degree of endangerment, their size, and the surrounding topography and vegetation—is available to land managers, developers, planners, educators, researchers, and private individuals. It is used most often in three ways:

- Land conservation programs such as the Department of Natural Resources' Scientific & Natural Areas Program or The Nature Conservancy choose sites containing high-quality native habitat or rare plant populations for acquisition.
- Other Department of Natural Resources divisions (such as Forestry or Parks and Recreation) and federal agencies (such as the U.S. Forest Service and the U.S. Fish & Wildlife Service) use the data to avoid harm to sensitive species and habitats while making land management decisions.
- Early notification of rare species or habitat occurrences on potential development sites encourages private planners and developers to consider alternative sites.

Natural Heritage Program staff are working to merge their database with other Department of Natural Resources databases. In cooperation with the Division of Forestry they've initiated efforts to develop a system of flagging sites on forestry-owned lands where threatened species or communities occur. Plans are also underway to establish computer linkups with Department of Natural Resources offices in out-state areas.

Forty-nine other states, two Canadian provinces, and eight South American countries are part of a network of natural heritage databases developed under the tutelage of The Nature Conservancy. With a network of information on this hemisphere's endangered resources, resource managers can gain a better perspective on the global impact of their management activities.

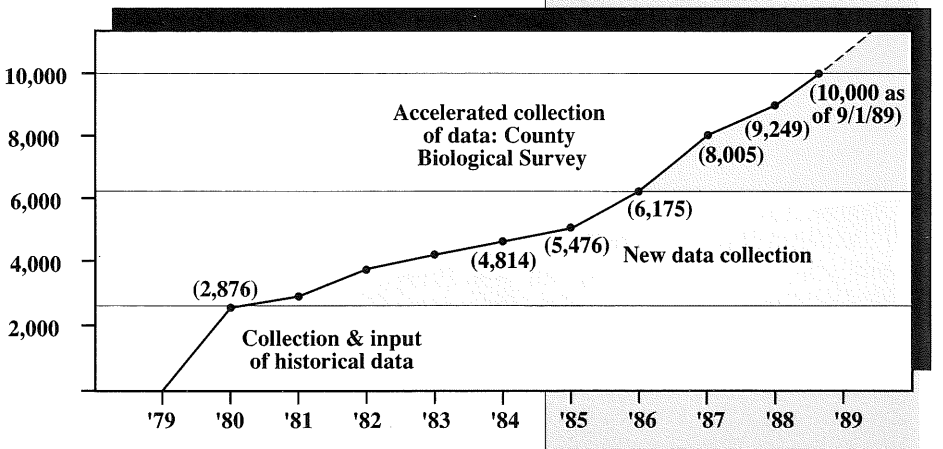


Table 4. The number of rare feature entries in the Natural Heritage Database presented by calendar year (January 1-December 31).

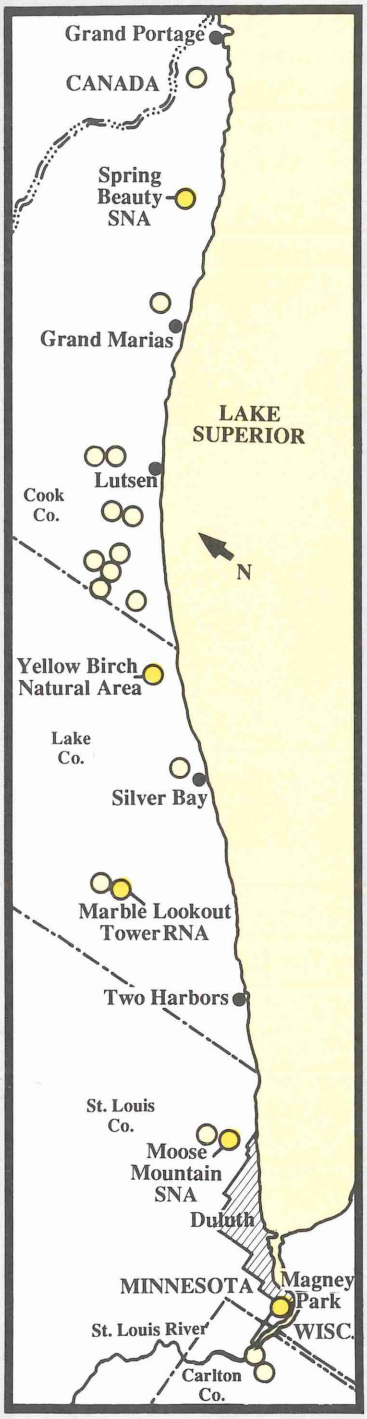


Table 5. ○ **Old-growth northern hardwood sites inventoried and** ● **sites protected.**

PROTECTING MINNESOTA'S ENDANGERED RESOURCES

Natural area site assessment, special legislation, environmental review, and cooperation with public land managers are some of the ways in which Natural Heritage Program staff participate in protecting Minnesota's endangered resources.

Natural Area Protection

An 80-foot-high canopy of sugar maple, basswood, and yellow birch shades the quiet forest floor of Moose Mountain Scientific & Natural Area on the northern edge of Duluth. That quiet has remained unbroken since pre-settlement times, before the first Europeans arrived in the mid-nineteenth century. Miraculously, this 55-acre tract of northern hardwoods forest has escaped development, fire, selective logging, and other practices that have significantly altered the condition of this habitat elsewhere.

Between 1982 and 1984, Natural Heritage Program staff inventoried a ribbon of land bordering the North Shore above Duluth for this rare natural community. Of 22 sites inventoried, five eventually received special protection.

Two sites, including Moose Mountain, were acquired and preserved by the Department of Natural Resources' Scientific and Natural Areas Program. A third site, Magney Park, is under consideration as a Scientific & Natural Area or city of Duluth Natural Area. A site in Crosby-Manitou State Park, Yellow Birch Natural Area, has been listed with the Natural Heritage Register, a non-binding agreement with public land managers to manage and preserve the rare habitats and species on their lands. A final site, Marble Lookout Tower, is protected as a Research Natural Area owned and maintained by the U.S. Forest Service.

Natural Heritage Program staff have also helped to preserve the finest examples of a host of other natural communities: native prairie, Big Woods forest, calcareous fens, and others. Since the Natural Heritage Program began in 1979, 41 of the sites its staff evaluated have been dedicated as Scientific & Natural Areas. Of these 41 sites, 21 were new discoveries made by Natural Heritage staff during field surveys. Twenty-eight additional sites now appear on the Natural Heritage Register and more than 125 areas have been protected by The Nature Conservancy, U.S. Forest Service, and other public and private organizations based on Natural Heritage Program recommendations.

Helping to preserve Minnesota's rare natural communities and their associated species is what the Natural Heritage Program is all about. With its help, the quiet on Moose Mountain will remain unbroken for generations to come.

Conservation Through Special Legislation

Stretching across the gravelly ridges and depressions left by Glacial Lake Agassiz when it receded 10,000 years ago, Felton Prairie harbors a rich diversity of habitats: from dry prairie to wet prairie to rare calcareous fens (mineral-rich wetlands). It shelters species like the chestnut-collared longspur and Dakota skipper butterfly, rare throughout their Minnesota ranges; and species like the prairie chicken and short-eared owl, dependent on large and diverse expanses of prairie habitat for their survival.

In 1980 and 1987, the Minnesota Legislature, with Natural Heritage Program staff assistance, drafted and passed three new bills to protect native prairie. Two bills provide for the Native Prairie Tax Credit and Prairie Bank programs, offering financial incentives—property tax exemptions or conservation easements—to private landowners for

maintaining native prairie on their lands. The third bill provides for a Prairie Landscape Reserve program, requiring Department of Natural Resources' staff to help plan for the protection of prairie tracts large enough (2000+ acres) to support species dependent on a diversity of habitats for their survival.

Natural Heritage Program staff have targeted Felton Prairie as one of the state's potential landscape areas. Much of the land is already enrolled in the Prairie Bank and Prairie Tax Credit programs, or has been acquired and preserved by The Nature Conservancy or the Department of Natural Resources' Scientific and Natural Areas program. These agencies, individuals, and programs cooperate to manage the reserve, helping to prevent further loss of this critically endangered habitat and the rare species it supports.

Prairie preservation legislation provides Natural Heritage Program staff with legal authority and guidance in protecting this resource. Future legislation may help them better protect other threatened ecosystems.

Implementing Federal Regulations

In the deep shade of Minnesota's mature deciduous forests, a small plant launches a whorl of leaves and a cluster of scarlet berries from the tip of its stem. To the initiated, this rare plant harbors a valuable secret: its thick, gnarled root reaching deep into the earth.

Dried and ground to a powder, the ginseng root reputedly yields mysterious curative powers prized by the people of the Orient. Its earthy, bittersweet taste is in demand by American consumers as well. But intensive harvesting—and loss of its old-growth forest habitat—are depleting supplies of this exploited species.

In 1977, ginseng (*Panax quinquefolium*) received legal protection under the Conference on the International Trade in Endangered Species of Flora and Fauna (CITES). The treaty requires participating countries to carry out research and monitoring programs necessary to ensure the continued survival of listed species. Because Natural Heritage Program botanists had particular expertise in managing rare species, the Department of Natural Resources assigned them the responsibility of fulfilling this federal mandate.

In 1982, Natural Heritage Program botanists began to develop a Ginseng Conservation Program. Via questionnaires mailed to more than 1,000 diggers, they collected data on the abundance and distribution of wild ginseng. They set up research plots to study the biology (life cycle and environmental requirements) of the species, and to observe the effects of digging on populations. With time, the verdict became clear: the slow-growing plant does not reproduce fast enough to match the rate at which it is harvested.

Restrictions on harvesting—including a shorter digging season, required dealer licensing, age limits on legally harvestable plants, and required replanting—can slow or even reverse this decline. But so far compliance with the law is meager. Without strictly enforced intervention, the mysterious ginseng may yet vanish from the forests of the earth.

Like ginseng, the dwarf trout lily, prairie bush clover and other rare plants are monitored and managed by Natural Heritage Program staff in cooperation with federal agencies. By complying with federal mandates, Natural Heritage Program staff help ensure the survival of these nationally threatened species.

"The last word in ignorance is the man who says of an animal or plant: 'What good is it?'...If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering."

Aldo Leopold
Sand County Almanac
1949

Other Protection Tools

Environmental Review — By law, federally funded development projects must be assessed for their possible impact on endangered and threatened species. The Natural Heritage Program participates by handling more than 500 requests for environmental review per year. Information from the Natural Heritage Database helps Natural Heritage Program staff determine whether powerlines, highways, boat ramps, housing, and other development projects should be rerouted to avoid harm to sensitive species and habitats.

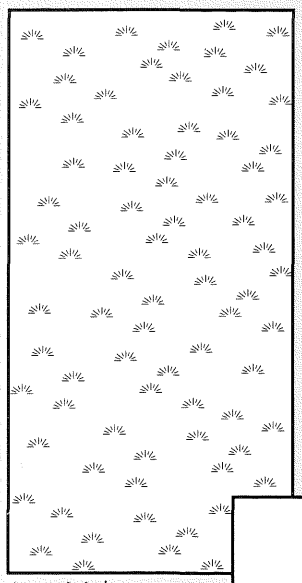
Cooperating with other Department of Natural Resources Divisions — Natural Heritage Program staff have participated in planning for state forests and state parks. At William O'Brien State Park, staff informed managers of a rare population of grape fern *(Botrychium dissectum)* that occurred on park lands. To avoid harm to the rare plants, state park managers changed their plans for building a new campground at that location.

Today Natural Heritage Program staff are participating in a department-wide task force to establish guidelines for managing Minnesota's old-growth forests.

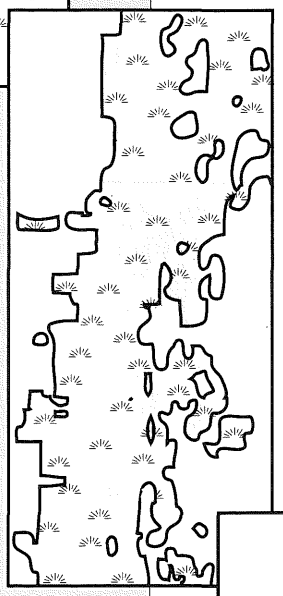
Increasing Public Awareness — As information in the Database accumulated, Natural Heritage Program staff recognized the need to share it with the public. In 1984, they finished their first major publication: *A Guide to Minnesota Prairies.* In the past 10 years, they have published more than 90 brochures, pamphlets, reports, posters, and books; have spoken to numerous environmental, conservation, and educational organizations; and have set up a portable display about biological diversity and the Minnesota County Biological Survey at more than 52 locations.

STRATEGY FOR THE FUTURE

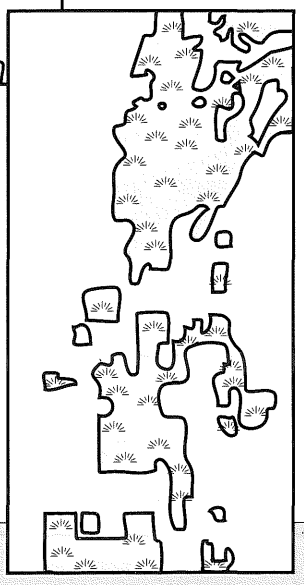
As opportunities to protect ecologically significant remnants of Minnesota's biological diversity become fewer and fewer, the task of the Natural Heritage Program becomes ever more urgent.



A prairie/wetland landscape in the 1850s



Remaining native habitat in 1965



Remaining native habitat in 1987

Felton Prairie Landscape Area, Clay County, Minnesota

5 miles

Much has been accomplished in the Natural Heritage Program's first 10 years, but the needs of the state's endangered resources are still not fully met. To successfully protect Minnesota's biological diversity requires an openness to new approaches in natural resource management and the full support of an informed public. Some of the challenges of the next decade include promoting conservation of entire landscape systems, renewing efforts to coordinate Natural Heritage Program activities with other resource management priorities, completing the biological survey of all Minnesota counties, and expanding the role of the Natural Heritage Program to include the protection of more common native plants and community types before they become endangered.

Promote conservation at the landscape or watershed level

Fragmentation of habitats is causing serious problems for the survival of many species. Effective preservation of Minnesota's biological diversity will require conservation at the landscape level in combination with the preservation of small remnants of pristine habitat.

Conservation at the landscape level was first formalized in Minnesota in a 1987 legislative directive to establish Prairie Landscape Reserves. This strategy of conservation includes protecting degraded as well as high quality habitats and requires the cooperation of public and private landowners.

The Natural Heritage Program will seek to identify key areas in the state where landscape level conservation is the appropriate strategy to protect species and ecosystem processes that can't survive in island remnants of natural habitat.

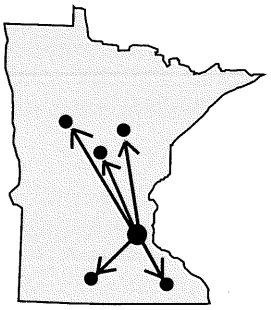
Examples of such areas include:

- prairie/wetland landscapes of western Minnesota
- patterned peatland complexes of northern Minnesota—the last undisturbed landscape system in the state
- forest landscapes of northern central and southeastern Minnesota
- landscape systems defined by watershed boundaries

Accelerate current efforts to protect Minnesota's biological diversity

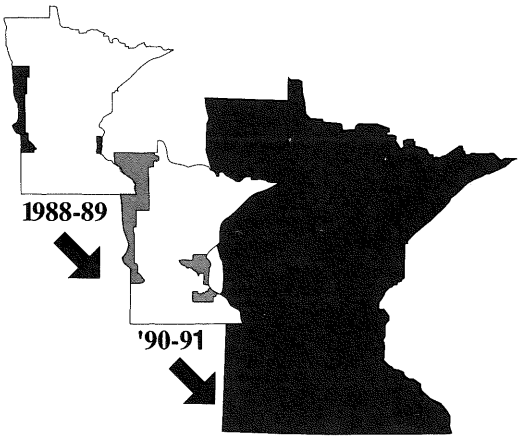
- More effectively integrate the management of endangered species, native plant species, and natural communities with the resource management priorities of other department divisions and other units of government
- Promote a philosophy of natural resource management that considers actions from an ecosystem perspective
- Pursue legislative initiatives that will support efforts to protect biological diversity (e.g. funding to staff the Ginseng Conservation Program or policy legislation such as the Prairie Landscape Reserve Bill)
- Continue inventory and research to promote recovery of endangered species and threatened natural communities

Make Natural Heritage Program staff and expertise more accessible to resource managers and the public



- Regionalize the Natural Heritage Program by placing staff botanists and plant ecologists in out-state offices
- Develop regional networks of volunteers to assist with Heritage inventory and monitoring efforts
- Make the Natural Heritage Program Information System more accessible to resource managers throughout the state by direct computer linkage. Accelerate the development of Geographic Information System (GIS) applications to facilitate the integration of Natural Heritage data with other disciplines

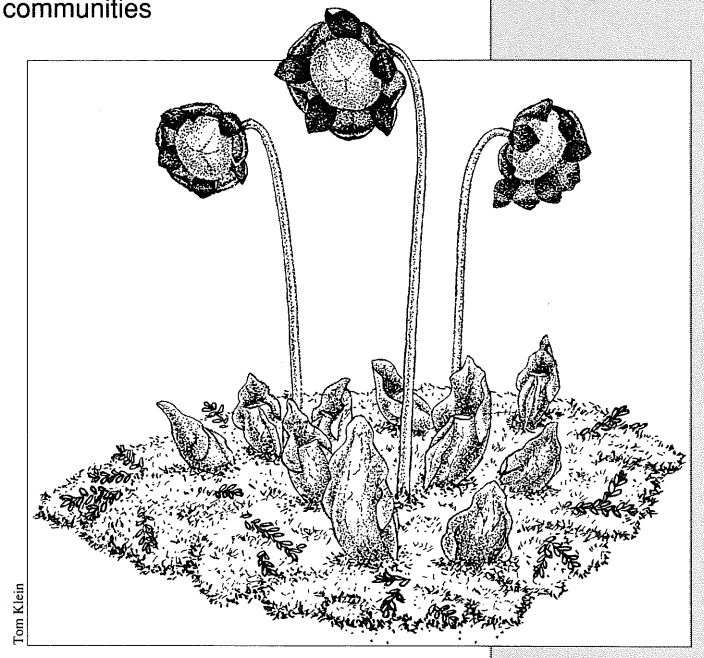
Complete the County Biological Survey by the Year 2000



Expand activities to include the protection and management of more common native plants and natural communities before they become endangered

Focus on developing educational materials that promote a better understanding of Minnesota's native plants and natural communities

For example:
- natural history posters
- booklets on prairie or forest plants and Minnesota's vegetation types
- slide shows and/or videos on Minnesota's native plants and natural communities



Tom Klein

"We are locked into a race: we must hurry to acquire the knowledge on which a wise policy of conservation and development can be based for centuries to come, before opportunities of unimaginable magnitude are closed forever."

E. O. Wilson
Harvard University
National Forum on Biodiversity, 1986

SELECTED PUBLICATIONS

Publications and other educational materials are an effective means for a small-staffed program to disseminate information to individuals and organizations throughout Minnesota.

Biological Report Series; Initiated by the Natural Heritage & Nongame Wildlife Programs in 1988

1. Natural Vegetation of Minnesota: At the Time of the Public Land Survey 1847-1907
2. Results of a Survey for *Sparganium glomeratum* (Clustered bur-reed) in the Chippewa National Forest
3. Status Report on *Poa paludigena* (Bog bluegrass) in Minnesota
4. Status Report on *Polemonium occidentale* (Western Jacob's ladder) in Minnesota
5. Old-Growth Forests in Minnesota-A Preliminary Report
6. Status Report on *Napaea dioica* (Glade mallow) in Minnesota
7. Status Report on *Chrysosplenium iowense* (Golden saxifrage) in Minnesota.
8. Minnesota County Biological Survey: Final Report for 1988 Bird Survey Work
9. Minnesota County Biological Survey: 1988 Herpetological Surveys
10. Minnesota County Biological Survey: 1988 Butterfly Surveys
11. Minnesota County Biological Survey: Small Mammal Studies of 1988
12. Prairie Bush Clover Inventory and Preserve Design
13. Minnesota Trout Lily: Inventory, Mapping, Census and Monitoring

Books & Booklets

Almendinger, J. A. 1988. A handbook for collecting relevé data in Minnesota. In Tested Studies for Laboratory Teaching, ed. R.W. Peifer, pp. 63-100. University of Minnesota, Mpls., MN.

Coffin, B. A. and L. A. Pfannmuller. 1988. Minnesota's Endangered Flora and Fauna. University of Minnesota Press, Mpls., MN. 473 pp.*

Pfannmuller, L. A. and B. A. Coffin. 1989. The Uncommon Ones: Minnesota's Endangered Plants and Animals. Department of Natural Resources. 21 pp.*

Wendt, K. M. 1984. A Guide to Minnesota Prairies. Department of Natural Resources. 71 pp.

Articles

Burkey, R. E. 1989. Ten years of endangered species and habitat protection. The Minnesota Volunteer 52(306): 30-41.

Coffin, B. A. and L. A. Pfannmuller. 1984. Identifying our vanishing plants and animals. The Minnesota Volunteer 47(276): 17-23.

Coffin, B. A. and D. Wells. 1985. Register sites protect rare flora and fauna. The Minnesota Volunteer 48(279): 54-57.

Sather, N. P. 1989. Botanists stalk prairie bush clover. The Minnesota Volunteer 52(305): 52-56.

Smith, W. R. 1981. Our perishing native plants. The Minnesota Volunteer 44(257): 54-61.

Smith, W.R. and G. B. Ownbey. 1988. New and noteworthy plant records for Minnesota. Rhodora 90(864).

Reports

Converse, C., K. Wendt, J. A. Almendinger, and R. Dana, 1988. Interim Report of the Minnesota County Biological Survey, 9 pp.

Smith, W. R., 1987. Studies of the population biology of prairie bush clover (*Lespedeza leptostachya*). In Conservation and Management of Rare and Endangered Plants, ed. T.S. Elias, pp. 359-366. California Native Plant Society. Sacramento, California, 1986.

Smith, W. R. and N. P. Sather, 1987. The dwarf trout lily *(Erythronium propullans)* recovery plan. U.S. Fish and Wildlife Service, Twin Cities, Minnesota, 31 pp.

Wendt, K. M. 1983. A preliminary classification and description of natural communities in Minnesota. Report of the Natural Heritage Program.

Wendt, K. M. 1988. The long-range plan for the protection and management of Minnesota's native prairie. Division of Fish & Wildlife Long Range Plan, Department of Natural Resources.

Brochures

Checklist of Endangered and Threatened Animal and Plant Species of Minnesota, 1986.*

Minnesota County Biological Survey, 1988.*

Minnesota Natural Heritage Program: Centralized Ecological Information, 1980.

Minnesota Natural Heritage Program: Executive Summary, 1979-1980.

Minnesota Natural Heritage Register, 1983.

Prairie Bush Clover (*Lespedeza leptostachya*): A Federally Threatened Midwestern Endemic, 1989.

Preserving Wild Ginseng in Minnesota, 1984.

Posters

"Have You Seen This Thistle?"— Hill's Thistle (*Cirsium hillii*), 1988.

Minnesota Native Prairie, Natural History Poster No. 4., 1989.

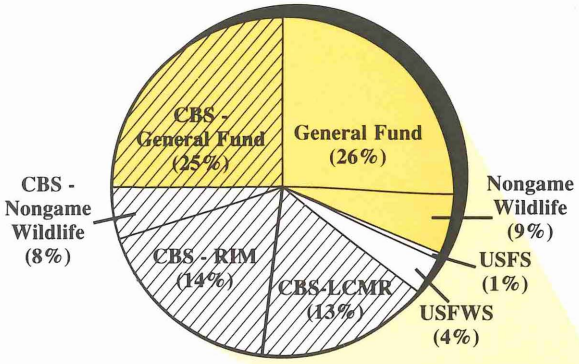
Minnesota Old-growth Forests, Natural History Poster No. 6., 1989.

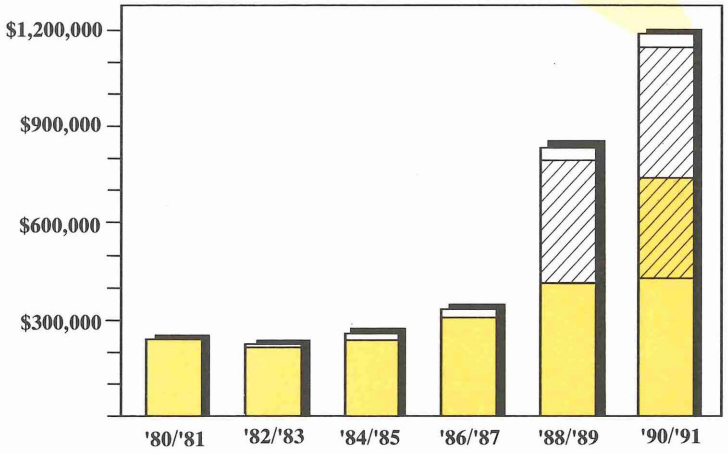
*publications produced in cooperation with the Nongame Wildlife Program

BUDGET

Recent budget increases accelerate the Natural Heritage Program's efforts to identify and protect endangered resources. Unfortunately, these increases are not adequate for meeting current goals, such as completing the County Biological Survey by the year 2000.

Source & Percentage of Program Funding Biennium 90/91



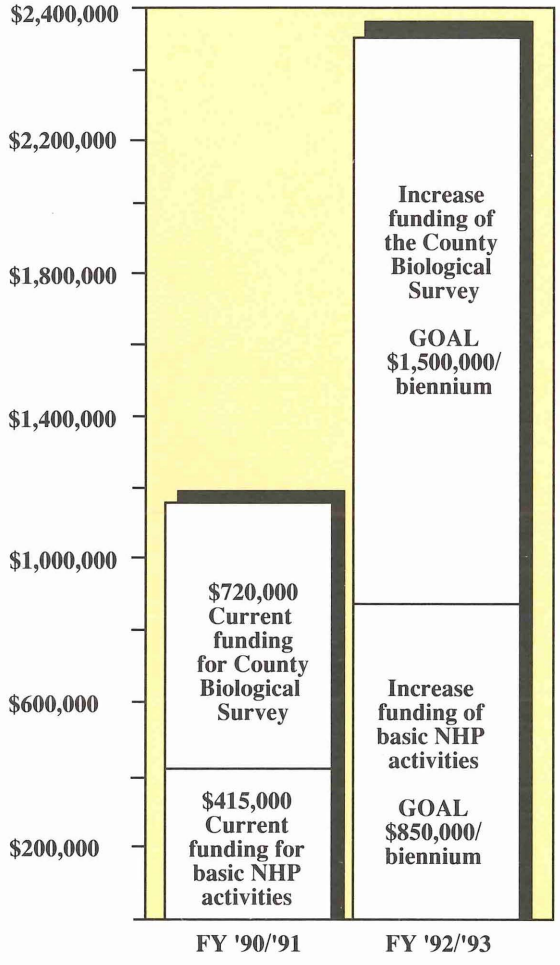


Natural Heritage Program: History of Funding*

- Base funding
- Special projects funding
- County Biological Survey (CBS)

*Figures shown represent actual dollars received; they do not illustrate loss in spending power due to inflation.

Future Funding Needs



To successfully accomplish the Natural Heritage Program's "Strategy for the Future" will require increased funding. An estimated budget of $1,500,000/biennium is needed to complete the survey of all Minnesota counties by the year 2000. An estimated $850,000/biennium is needed to continue existing efforts while initiating new strategies to protect Minnesota's biological diversity.

MINNESOTA
NATURAL HERITAGE
PROGRAM

Natural Heritage Program Staffing 1989

Barbara Coffin, Coordinator
Kurt Rusterholz, Plant Ecologist
Nancy Sather, Botanist
Welby Smith, Botanist*
Keith Wendt, Plant Ecologist

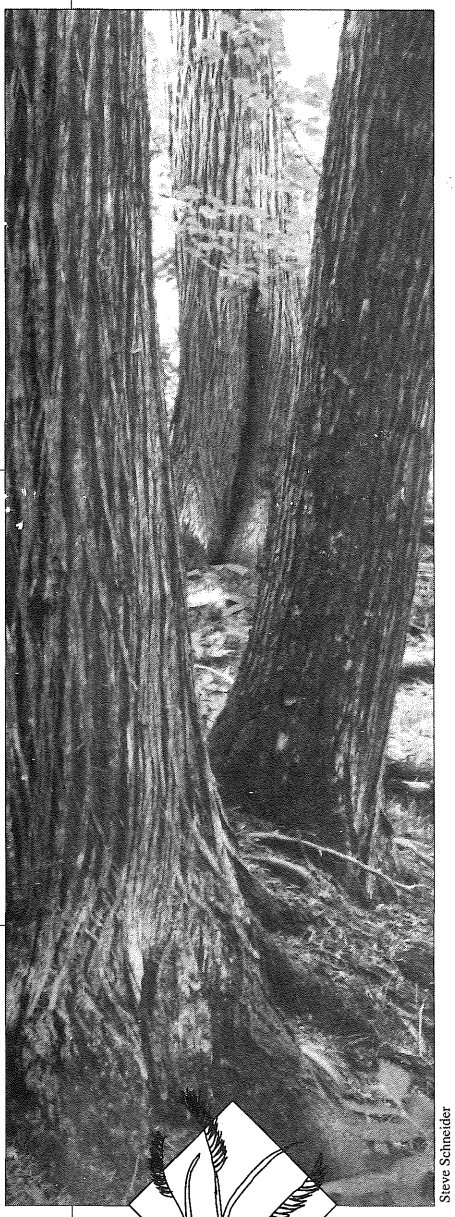
County Biological Survey
Carmen Converse, Coordinator
John Almendinger, Plant Ecologist
Robert Dana, Plant Ecologist
Barbara Delaney, Plant Ecologist
B.J. Farley, Public Rel./Admin. Assist.

Data Management*

Al Epp, Information Systems Manager
Mary Miller, User Request
Bonita Eliason, Environmental Review

*Positions jointly funded and/or supervised by Natural Heritage Program and Nongame Wildlife Research.

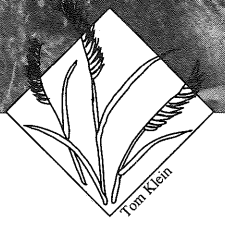
**Additional staff are employed as student interns or work on a seasonal basis.



Steve Schneider

Commissioner's Advisory Committee to the Scientific & Natural Areas, Nongame Wildlife and Natural Heritage Programs

Robert Binger, Chairman
Dr. David Bosanko
Edmund Bray
Dr. Walter Breckenridge
Dr. Edward Cushing
Dr. Adela Elwell
Janet Green
Arthur Hawkins
Dr. Frank Irving
Dr. Thomas Morley
Dr. Lewis Ohmann
Ann Marie Plunkett
Betty Savage
Dr. David Smith
Dr. Harrison Tordoff



Acknowledgements

Richel Burkey, a graduate student in journalism working for the Natural Heritage Program, is acknowledged as the primary author of this report.

Erin Carlin Schauer, of the Department of Natural Resources/Information & Education, is credited with the graphic design and layout of this publication.

This publication has been printed on recyclable paper.

Minnesota Department of Natural Resources