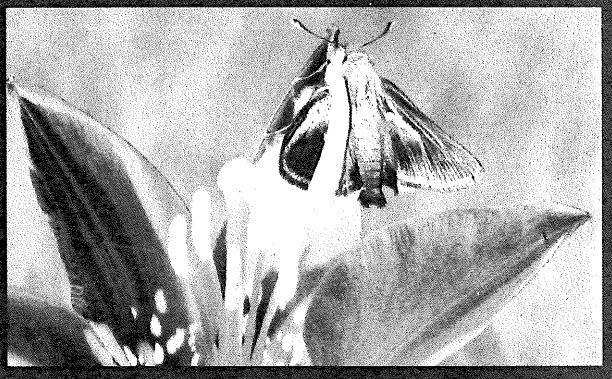
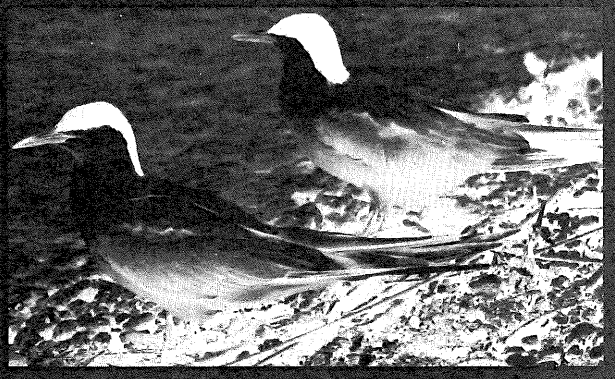
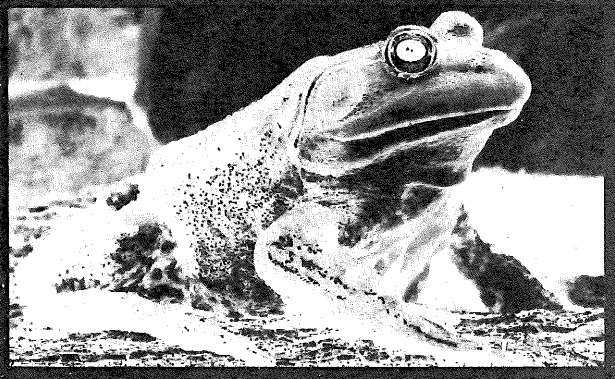
The Uncommon Ones:
Minnesota's Endangered Plants and Animals







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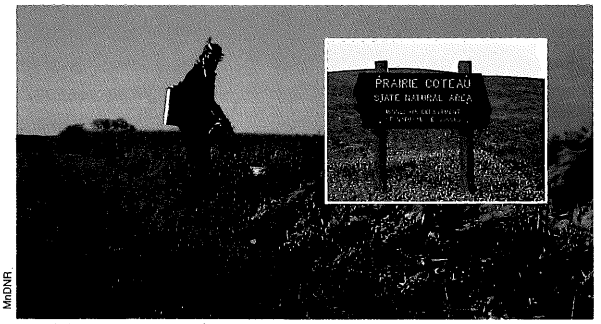
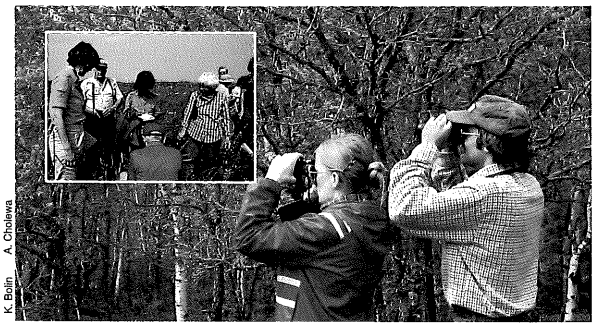


MnDNR

Prairie management burn.
Inset: Scientific and Natural Area entrance sign.


C. Converse

Field drawing rare plants for research and education.


K. Bolin A. Cholewa

Public assistance in monitoring bird populations.
Inset: Nature observation and study.

A New Challenge

Conservation, as an official activity of state government, is more than a century old in Minnesota. It began in the 1870s with a tiny trout and salmon hatchery; since then, it has come to include both management and preservation of nearly all of our natural resources.

As times change, new conservation needs and problems arise. To meet these challenges, programs of the Department of Natural Resources are expanding in new directions.

Today one of our greatest challenges is to address the need to protect less common plants and animals. In the past little attention and consideration were given to such species, other than minimal legal protection for some nongame birds and wildflowers.

Now we are taking a closer look at the status and the future of these neglected biological citizens of Minnesota. We have already lost some of them, and with them, part of our living heritage.

This loss must not continue, for these plants and animals have many values—biological, ecological, genetic, educational, and esthetic. We must not ignore them because of the increasing pressures for intensive land and water use. Practical considerations concerning the protection and management of these species must be a part of all decision-making that affects our natural environment.

Successful implementation of conservation measures depends on public support. The purpose of this pamphlet is to strengthen that support by providing Minnesotan's with the story of how and why some of our natural heritage has already been lost; and why—if we do not continue to address the new challenges that await us—we may be in jeopardy of losing even more.

The Natural Heritage, Nongame Wildlife, and Scientific and Natural Areas programs are responding to this challenge. Protection of endangered species through natural habitat management is the primary focus of these three new DNR programs.

Together they represent a comprehensive effort to promote a new philosophy of natural resource management that includes all of Minnesota's plants and animals. These programs are the foundation of Minnesota's endangered species effort.

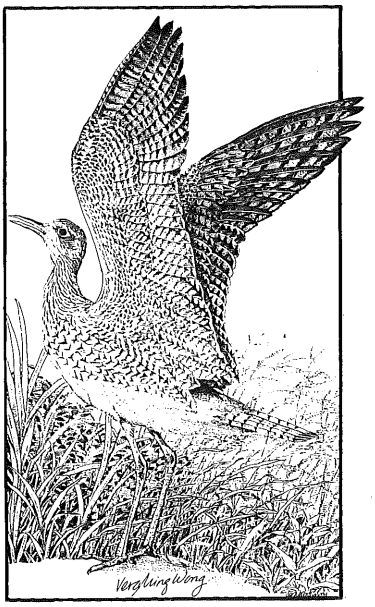
"Minnesota must act now to protect its endangered plants and animals and their critical habitats. We are all stewards of Minnesota's tomorrow!"

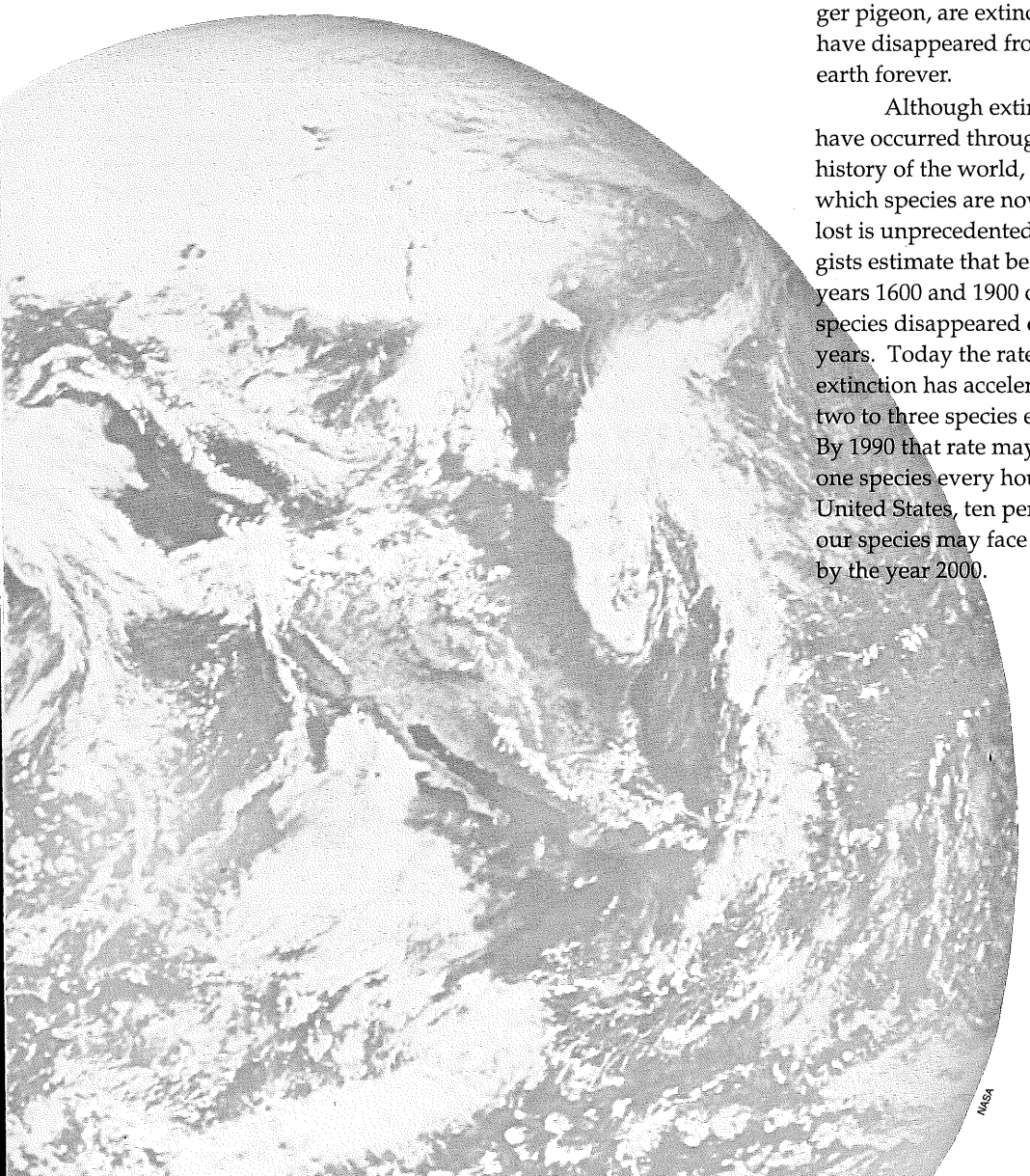
Governor
Rudy Perpich
1989

Extinction: A Global Crisis

"To recite the history of the upland plover (upland sandpiper) *is to tell a sad tale of the wanton destruction of a valuable and once-abundant bird that resulted in its almost complete extermination. Sixty years ago it was present in the open country in countless thousands. Now it is a question whether the remnant can be saved even with careful protection."*

T. S. Roberts, 1932





NASA

Why Be Concerned?

We in Minnesota are fortunate. The upland sandpiper can still be seen today in open grasslands across the state.

We have not been so fortunate with many other species. Animals such as the brown bear, bison in the wild, the passenger pigeon, and as many as 50 species of plants have been lost from Minnesota since European settlement.

Although no longer present in Minnesota some of these species, such as the whooping crane and long-billed curlew, are still found in other portions of their range.

Others, like the passenger pigeon, are extinct—they have disappeared from the earth forever.

Although extinctions have occurred throughout the history of the world, the rate at which species are now being lost is unprecedented. Biologists estimate that between the years 1600 and 1900 one species disappeared every four years. Today the rate of extinction has accelerated to two to three species every day. By 1990 that rate may reach one species every hour. In the United States, ten percent of our species may face extinction by the year 2000.

Most of us have few opportunities to see a rare plant or animal and, if we do see one, we probably don't realize it. Of what value is a peregrine falcon? What difference would it make if a plant such as prairie bush clover disappeared from the earth?

It is imperative that we—the stewards of the Earth—understand that *all* living things are part of a natural order. This natural order is a vast, complex, delicately balanced interrelationship. Sometimes this balance is clear and easily understood, sometimes it takes years—even decades—of careful study to trace and understand one small aspect of it.

For example, we now understand that the loss of the generally maligned and misunderstood predator, the little brown bat, could increase the population of its favorite food— the mosquito. One bat will feast on nearly its own weight in mosquitoes each night. Consider a 150 pound human consuming 150 pounds of a favorite food every day.

We understand that the loss of an insect pollinator could end the reproductive cycle of a plant. Many of the world's most beautiful orchids, for example, depend upon specific kinds of moths for successful propagation.

We understand that the forest canopy regenerates and protects the soil, controls the water cycle, and produces the oxygen we breathe. What will be the global result of dividing, settling, and cutting huge tracts of tropical rain forests? Will we discover too late their vital connection with all other ecosystems of the earth?

The direct connection between our everyday life and the natural world is one we often overlook. Each species contains its own unique inheritance or genetic pool which can prove beneficial to us in any number of ways.

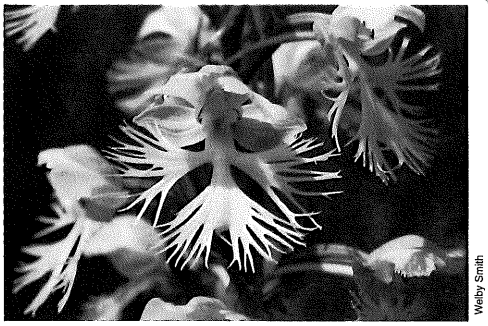
Cultivated crops, such as wheat and corn, have been developed and improved by using wild plants as breeding stock. Many of the complicated organic compounds manufactured by living things have also become the foundation for a host of beneficial chemical products, including insecticides, anticancer drugs and muscle relaxants.

All Minnesotans have a responsibility—call it an obligation—to help preserve the wonderfully diverse forms of life that comprise our natural world.

Biologist Paul Ehrlich likens the earth to a spaceship and its inhabitant species to the rivets holding the ship together. Every extinction, he says, is like one of those rivets popping loose. The loss of a single rivet seems insignificant, considering how many thousands there are. But how many rivets can be lost before the ship is seriously, perhaps irrevocably damaged?

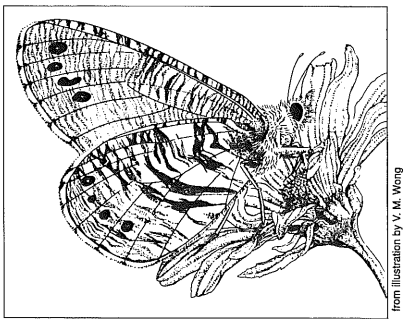
R. Hamilton Smith

Cultivated crops, such as wheat and corn, have been developed and improved by using wild plants as breeding stock.



Welby Smith

Many of the world's most beautiful orchids depend upon moths for successful propagation.

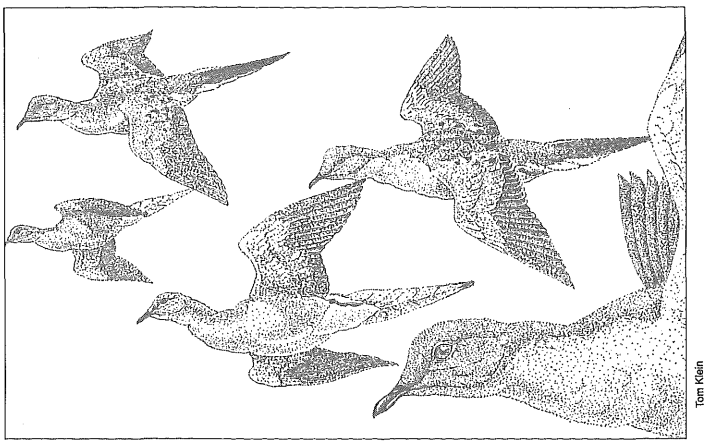


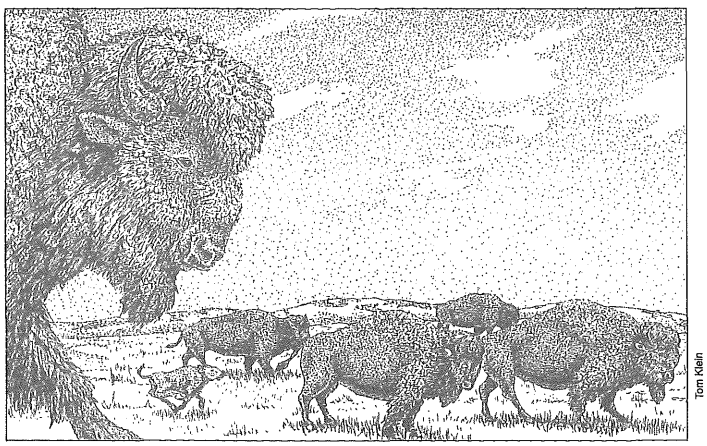
from illustration by V. M. Wong

The loss of an insect pollinator could end the reproductive cycle of a plant.

Kevin Winker

The forest canopy regenerates and protects the soil, controls the water cycle, and produces the oxygen we breathe. What will be the global result of dividing, settling, and cutting huge tracts of tropical rain forests?





	Number of Species	Number of Listed Species			
		E	T	SC	Total
Animals					
Mammals	81	-	1	16	17
Birds	242 *	6	2	19	27
Reptiles & Amphibians	48	1	2	14	17
Fish	149	-	-	16	16
Mussels	60	2	-	2	4
Butterflies	145	3	3	9	15
Subtotal	**725**	**12** (2%)	**8** (1%)	**76** (10%)	**96**
Plants					
Vascular Plants	1500	38	40	96	174
Lichens	550	6	1	7	14
Mosses	380	1	-	2	3
Subtotal	**2430**	**45** (2%)	**41** (2%)	**105** (4%)	**191**
Total Animals & Plants	**3155**	**57**	**49**	**181**	**287**

* Number of regularly breeding species

Table 1. Minnesota animals and plants that are listed as state endangered (E), threatened (T), or special concern (SC).

Minnesota's Endangered Species Law

During the late 1800s, the loss of the bison as a free-ranging animal and the extinction of the passenger pigeon were accepted by many as the inevitable effect of human progress. But in the early part of this century, in response to the imminent extinction of the whooping crane, the first efforts directed toward the preservation of a species began.

Whooping cranes and other animals in jeopardy began to be recognized as "endangered" species. Efforts to protect them were entirely voluntary. Individuals, conservation groups and state agencies working to save these species had no assurance that their work would not be undone by a developer or other profit-making project.

In 1973 this situation changed with the passage of the federal Endangered Species Act. This piece of legislation provides the legal framework for species' protection by mandating the development of a national list of endangered and threatened plants and animals. Extensive inventories and a thorough review of each species are required before it is placed on the federal list.

Once listed, the act prohibits the killing of federally listed animals wherever they occur and the destruction of federally listed plants whenever they are threatened on areas under federal jurisdiction.

The federal list includes only those species that are endangered or threatened nationwide. Nine Minnesota species are on the federal list. The peregrine falcon, fat pocketbook freshwater mussel, Higgins eye freshwater mussel, and dwarf trout lily are federally endangered; the gray wolf, bald eagle, prairie bush clover and western prairie fringed orchid are federally threatened; and the piping plover is federally threatened in Lake of the Woods and federally endangered in Duluth.

More than 25 states have also adopted endangered species laws and have developed lists of endangered species. Minnesota's list was established in 1984 when the State Endangered Species Act (M.S. 84.0895) was amended. A committee of 30 prominent biologists reviewed the status of our rare species by evaluating population size, distribution, and threats to survival. Each species that qualified for protection was assigned an official status—endangered, threatened, or special concern. Minnesota law makes it illegal to take, import, transport or sell state endangered or threatened species.

The chart on the left cites the number of species in each biological group that is included on Minnesota's list.

Status Definitions

Federal List

Endangered
A species threatened with extinction throughout all or a significant portion of its range

Threatened
A species likely to become endangered within the foreseeable future

Minnesota List

Endangered
A species threatened with extinction throughout all or a significant portion of its range, or

A species threatened with extirpation from Minnesota and dependent on a scarce, sensitive, and/or exploited habitat in Minnesota and neighboring states

Threatened
A species likely to become endangered within the foreseeable future

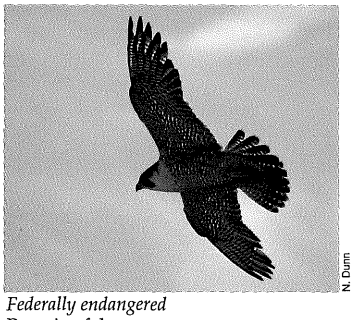
Special Concern
A species that, although not endangered or threatened, is extremely uncommon in Minnesota or has unique or highly specific habitat requirements, or

A species whose breeding biology is affected by human activities.

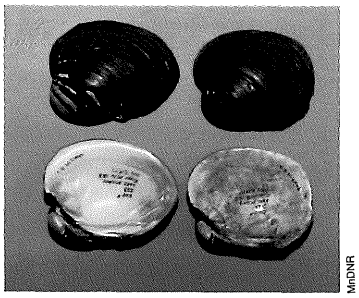
Species on the periphery of their range in Minnesota, but not listed as threatened or endangered and species that were once threatened or endangered but now have increasing, protected, or stable populations may be included.


W. Smith

Federally endangered
Dwarf trout lily


N. Dunn

Federally endangered
Peregine falcon


MnDNR

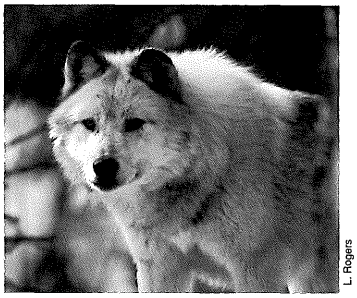
Federally endangered
Higgin's eye freshwater mussel


S. Haig

Federally threatened
Piping plover


W. Smith

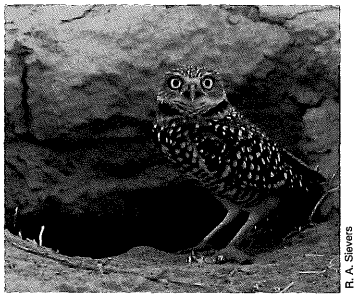
Federally threatened
Western prairie fringed orchid


L. Rogers

Federally threatened
Gray wolf


W. Smith

State endangered
Kitten-tails


R. A. Sievers

State endangered
Burrowing owl


©VIREO H. Cruikshank

State endangered
Chestnut-collared longspur


O. S. Pettingill Cornell Laboratory of Ornithology

State threatened
Loggerhead shrike


A. Weber

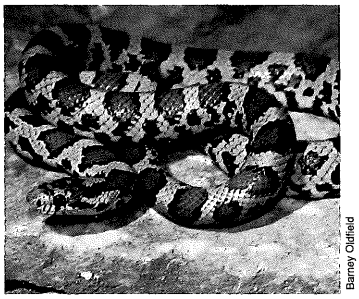
State threatened
Karner blue


K. Rustenholz

State threatened
Twinleaf


L. Rogers

State special concern
Mountain lion


Barney Oldfield

State special concern
Milk snake


L. Rogers

State special concern
Pine marten

Why Species Become Endangered

Habitat Loss and Degradation

Species become endangered for a variety of complex reasons.The primary causes in Minnesota include:

- *Habitat loss and degradation*
- *Environmental contamination*
- *Exploitation and collection*
- *Unregulated hunting*
- *Unique biological requirements*
- *Misunderstanding*

Over the past two centuries loss of habitat has become the single most important factor threatening the survival of species. More than sixty percent of the federally listed species are in danger of extinction because of habitat alteration or destruction.

In Minnesota the most significant habitat loss has been due to the conversion of native prairies, woodlands, and wetlands to agriculture. The vast native grasslands that once covered a third of the state—more than eighteen million acres—have been reduced to a few thousand acres. The "Big Woods"—the climax deciduous forest that was present over much of south-central Minnesota—is now restricted to small, scattered islands or narrow, winding ribbons bordering the rivers and streams that cut through a sea of cropland. Statewide more than nine million acres of wetlands have been drained or filled. Though slowed somewhat, the losses continue today. Very few areas of the state remain untouched by human development.

Habitats need not be completely eliminated to become unsuitable for resident species. Fragmentation of the landscape by farming, logging, or other development can create patches of natural habitat too small to be used by animals needing large home ranges. Those animals that do remain in restricted habitats may be prone to local extinctions.

Habitat degradation can be as critical to the survival of a species as total habitat destruction. Some logging practices for example, remove old-growth timber that is a critical component of the habitat of certain plants and animals. Several rare plants, including Carolina spring-beauty and Chilean sweet cicely, are restricted to old-growth forests along the North Shore of Lake Superior.

Flood control projects that convert slowly meandering river beds into wider, deeper and straighter channels result in the loss of sandbars that provide loafing and nesting sites for turtles. Agricultural erosion and runoff can bury freshwater mussel beds with heavy loads of fine silt.

The elimination of natural processes is another form of habitat degradation. Fire played an important role in maintaining Minnesota's presettlement landscape, particularly the grasslands and pineries. Suppression of wild fires in pine forests in the 1900s resulted in their conversion to a mixture of hardwoods and conifers other than pine.

On the prairies, fire suppression allowed the growth of oak and aspen suckers. As these trees matured, prairie habitat was destroyed and prairie species were lost. Today controlled burns are regularly used by public and private land managers to restore and maintain prairie vegetation. Without such management, many of our remnant prairies would soon grow to brush and woodland.

R. H. Smith

R. H. Smith

MnDNR

Environmental Contamination

Contamination of the environment by chemical pollutants is another form of habitat degradation. These pollutants include pesticides, emissions from automobiles and industry, and inadequately treated wastewater.

In many cases contamination is misunderstood or unintentional, however, the results can be devastating. The best documented case of unintentional destruction occurred in the 1950s and 1960s with the widespread use of DDT as a pesticide. There followed a sudden and dramatic decline in the population of birds of prey. After careful study, it was determined that DDT residues accumulated in the fatty tissues of organisms throughout the food chain, reaching high concentrations in the prey of peregrine falcons, bald eagles, and osprey. The DDT residues didn't seem to affect the birds outwardly, but internally the DDT interfered with calcium metabolism. As a result their eggs were laid with shells too thin to support the weight of the incubating adult. With few eggs hatching, populations dropped suddenly and dramatically.

Fortunately, the connection between pesticide use and nesting failure was discovered and documented in time to halt population losses. A combination of banning the use of DDT in 1972 and intensive reintroduction efforts has resulted in increased populations of all three bird species. Although regulatory safeguards are in place today to help prevent similar abuses, chemical contamination remains an important factor in the decline of some species.

Lynn Rogers

Bald eagle.

Acid rain— rapidly becoming a household word— is another example of the impact that environmental contamination has on our plants and animals. Globally, it is among the greatest threats to the health of our environment.

Acid rain is the product of a complex chemical process in the atmosphere. It begins with emissions from power plants and motor vehicle engines burning fossil fuels, and ends with the production of sulfuric and nitric acids in the upper atmosphere. These acids fall to the earth in rain and snow, raising the natural acidity of our soils and water.

In southern Norway, northern England, and the Adirondacks of New York, many lakes have experienced major disruption of their aquatic ecosystems.

In the most severe instances, the most obvious change is the total loss of fish populations. However, many other more subtle—in many cases, poorly understood—changes occur too.

In Minnesota, acid rain has not caused large scale damage. But our aquatic and terrestrial ecosystems are potentially sensitive and we must be watchful.

Acid rain is just one example of an environmental contamination that can impact large scale geographic areas and with that, endanger many species.

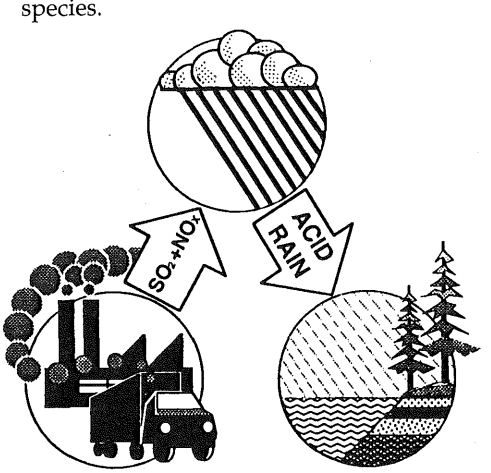


Diagram of the production of acid rain.

Exploitation and Collection

The story of the ginseng plant illustrates the decimation of a species by direct exploitation. For centuries the ginseng root was the mainstay of Chinese and Korean folk medicine. The name, ginseng, comes from the Chinese characters meaning *likeness of man.* The more closely the root resembled a human form, the more valuable it was. The Chinese species was nearly eliminated by the 1600s and the discovery of the new world led to a brisk trade in American ginseng. By the early 1800s, ginseng was depleted from the eastern deciduous forests of North America. Ginseng traders reached Minnesota in 1859, on the heels of European settlers. Within six years, what appeared to be an inexhaustible supply was nearly gone.

Today, very few native North American plants and animals are subject to such extreme exploitation. But the ginseng example typifies a pattern of exploitation that is still a problem worldwide—whether the target is snakes and parrots for the pet trade, or carnivorous plants, cacti, and orchids for rare plant enthusiasts. The National Geographic Society estimates that the illegal international wildlife trade involves over five billion dollars each year.

To prevent the extinction of marketable species, international trade is regulated by the Convention on International Trade in Endangered Species of Fauna and Flora (CITES). Endangered species cannot be exported from any country or state unless it can be demonstrated that the harvest is not adversely affecting the species.

To help forestall its possible extinction in the United States, ginseng is now regulated by the CITES treaty. Ginseng diggers in Minnesota are being asked to cooperate with the study and management of existing colonies to ensure that overharvesting does not occur.

Despite the fact that many species are protected by the CITES treaty, some still slip through the cracks, especially when destined for domestic markets where they escape inspections that occur at international borders. Enforcement of laws that protect endangered species continues to be difficult.

The harvest of a ginseng digger in the early 1900s.

Ginseng.

Unregulated Hunting

In the past irresponsible and excessive hunting and trapping have spelled the demise of several species. The best known of these are bison and the passenger pigeon.

The passenger pigeon was a colonial bird; its colonizing instinct made it particularly vulnerable to hunting and other disturbances. The largest recorded flight was estimated to contain 2,230,270,000 birds. The largest recorded nesting site covered 850 square miles and consisted of approximately 135,000,000 birds. The impact of these colonies was devastating. Large areas looked as though they had been laid to waste by a tornado. Tree branches broke from the birds' weight. Dung accumulated to a depth of several inches beneath the nesting sites. The food supply of an area was totally consumed leaving nothing for other wildlife.

It is difficult to understand how a species that existed in such huge numbers could become extinct in such a short period of time.

In the 1800s, market hunting of the passenger pigeon began. The pigeon was considered to be a special delicacy and soon market hunting became a profitable business. The development of the railroad and telegraph greatly facilitated the shipment of birds to lucrative markets in the East. It also helped spread the word of newly discovered nesting sites.

Although hundreds of millions of birds were harvested, over-harvesting was not directly responsible for the passenger pigeon's extinction. It was caused instead by the disruption of the nesting colonies by market hunters who indiscriminately took nestlings and generally harassed the colonies. Because most birds laid their eggs on the same day and laid only one egg per nest, disruption of a nest site had a devastating effect on the population, often resulting in abandonment of the site.

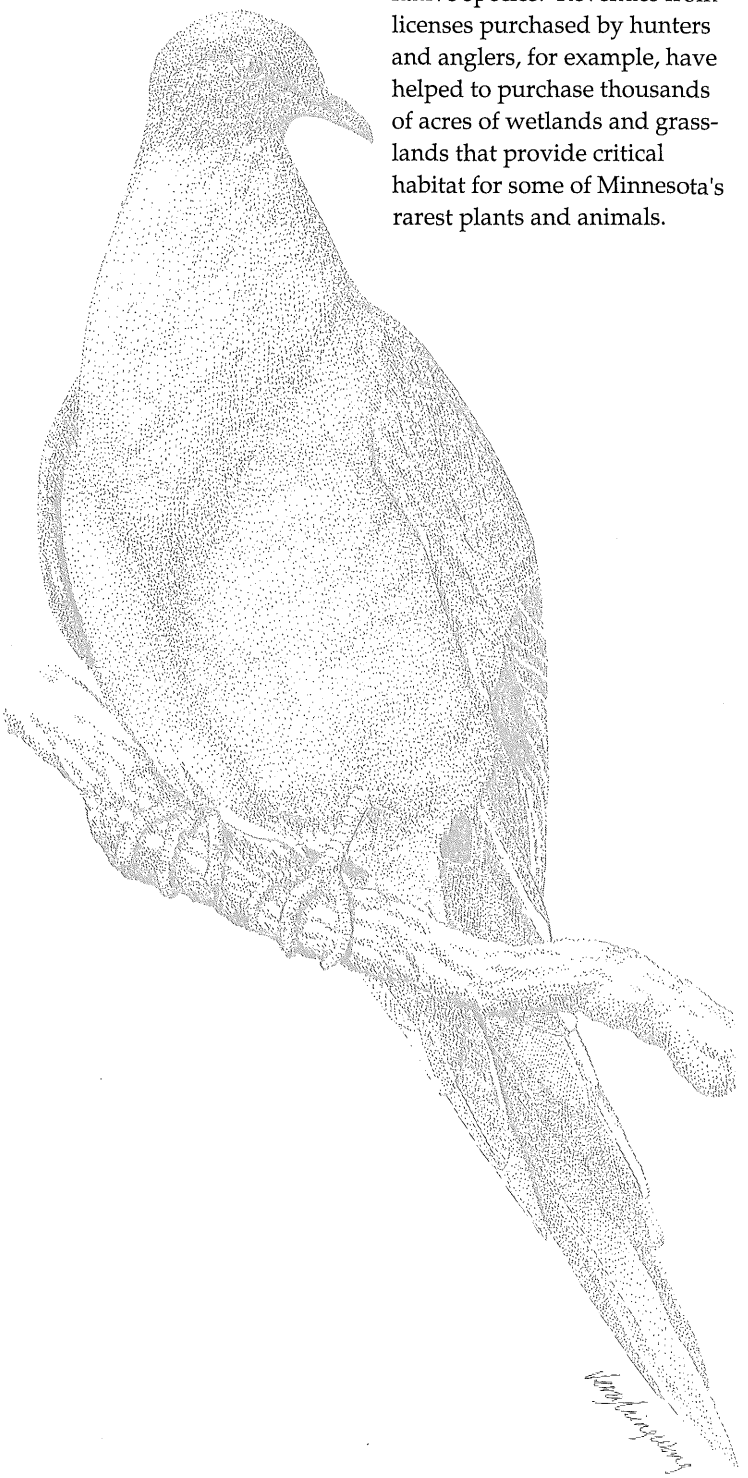
As a result, by the 1870s the number of passenger pigeons began to decline. Only forty years later, in 1911, there was no evidence of their existence in the wild. The last passenger pigeon, Martha, died in the Cincinnati Zoo shortly thereafter.

The fate of the bison was similar. Shooting the animals from trains was considered a fashionable sport and hunting bison only for their hides was a profitable endeavor. They were killed by the thousands. It took less than 100 years to totally wipe out this huge lumbering creature from its native habitat.

Other animals have suffered severe declines. Many large wading birds, for example, were once threatened because of their highly prized plumage. Beautiful, ornate feathers, such as the long, white, feathery plumes that adorned the egret during its breeding season, were valued in the millinery business. Feathers from other water birds were used to stuff pillows, mattresses and sleeping bags. Until regulations were enacted and enforced, the numbers of these beautiful birds fell to dangerously low levels.

Fortunately, market hunting and other unbridled hunting and trapping of wildlife is largely a thing of the past. Extensive education and regulation efforts have greatly improved the wise use and protection of our natural world.

Today the efforts and contributions of sportsmen have helped to protect many native species. Revenues from licenses purchased by hunters and anglers, for example, have helped to purchase thousands of acres of wetlands and grasslands that provide critical habitat for some of Minnesota's rarest plants and animals.



Unique Biological Requirements

Rarity is a general term that may be used in a number of ways. It refers to a species with a small population size, a scattered distribution or a distribution that is limited geographically. Rarity does not necessarily lead to extinction, although rare species are more at risk than common ones.

Some species seem to have always been rare, often because they require habitats that are rare. Cliffs, caves, rock outcrops, sandy beaches, and dunes are examples of rare habitats that may harbor a whole suite of unusual species. Leedy's roseroot is an example of a plant restricted to a rare habitat. It grows only on the face of limestone cliffs where it is believed to be a relict of prehistoric vegetation, having survived the Ice Age glaciers. It is known to exist on only four sites in the United States—three are in southeastern Minnesota and one is in western New York. These cliffs also provide habitat for several rare land snails.

R. Hamilton, Smith

Granite outcrops along the Minnesota River provide habitat for the five-lined skink.

Other species are considered rare because they are at the edge of their range in Minnesota (peripheral). The five-lined skink reaches the northern and western limit of its range on limestone bluffs in southeastern Minnesota and on isolated granite outcrops of the upper Minnesota River valley. Five-lined skinks are classified as endangered in Minnesota and are declining or threatened in several adjacent states. They are more common, however, in the southeastern United States.

Barney Oldfield

Five-lined skink.

Some species have ranges in Minnesota that are isolated (disjunct) from other portions of their range. For example, the golden saxifrage is an endangered species that is restricted to the southeastern corner of the state, an area separated by hundreds of miles from the main portion of its range to the north, in western Canada.

Minnesota also has one endemic species—a species found only in one specific location and nowhere else in the world. It is the dwarf trout lily. Dwarf trout lilies occur only in a few river valley locations in Rice and Goodhue counties. The unusual biology of this plant is responsible for its restricted range. In spring, before the trees leaf out, a small proportion of dwarf trout lilies produce pinkish, sterile flowers. Reproduction occurs only by vegetative shoots produced by the flowering plants —a reproductive process that is inherently slow. Because of its rarity the trout lily was recently added to the federal endangered species list. Protection of the remaining sites from unintentional destruction, housing development, agricultural expansion and horticultural collection is essential.

Misunderstanding

Among the most misunderstood and maligned species are snakes and bats. Only two of Minnesota's ten snake species are venomous. They are the timber and the massasauga rattlesnakes. Even the latin name of the timber rattler suggests human opinion of it—*Crotalus horridus*. They are found along the limestone bluffs in southeastern Minnesota.

Into 1989 several counties continued to offer a bounty on the rattler, despite the fact that the incidence of rattlesnake bite has been extremely low. Each year since 1980 an average of two to three rattlesnake bites has been reported. Only four of these bites were inflicted by native rattlesnakes and only two occurred naturally, with no intentional handling of the snake. All the others involved snakes which were imported into the state and handled improperly.

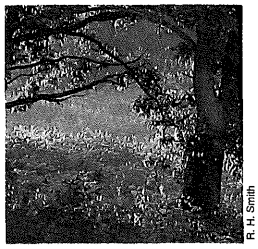
Folklore and literature have also been unkind to the helpful little flying predator—the bat. When confronted with this creature as it hangs from a cave wall or ceiling in sleep, most humans will shudder in disgust and fear. Contrary to popular belief, bats do not attack people, nor are they significant carriers of disease; less than one half of one percent ever contracts rabies. Rabid dogs are a much more serious threat to humans than rabid bats.

Bats navigate in the dark by a complex system of echo-location, consuming thousands of insects on the wing. Unfortunately, human ignorance, pesticides, and habitat degradation continue to threaten this beneficial mammal.

Merlin D. Tuttle, Bat Conservation International

Northern myotis


R. H. Smith


R. H. Smith


Keith Wendt


R. H. Smith


Barbara Coffin


R. H. Smith


Peter Buesseler

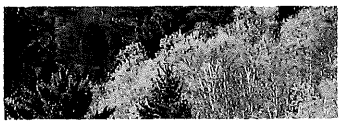
Habitat Preservation—the Key to Endangered Species Protection

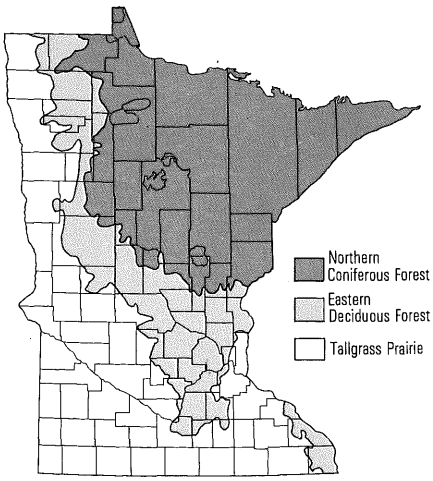
The future survival of Minnesota's endangered species depends upon adequate habitat preservation. Dwarf trout lilies cannot survive without a hardwood forest canopy; crystal darters cannot survive without a clear water stream.

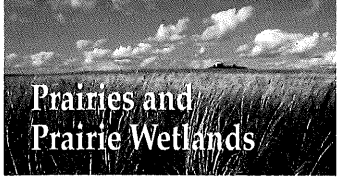
Successful habitat protection can only occur if we have an understanding of the diverse array of habitats found in Minnesota. This diversity is the result of the meeting of three major biomes—northern coniferous forest, eastern deciduous forest, and the tall grass prairie.

Within these three biomes, there are seven major habitat types in Minnesota—prairies and prairie wetlands; brushlands and parklands; hardwood forests; northern forests; peatlands; lakes, rivers, ponds and open water marshes; and the primary communities—cliffs, outcrops, sand dunes, and lakeshore. These habitats support an impressive diversity of species—over 2000 species of vascular plants and vertebrate animals. Protection of these habitat types will ensure the survival of their associated plant and animal species.

The hope for survival of all species lies in enlightened resource management and an enlightened public. We all must play a role in protecting and conserving the health and diversity of our natural world.



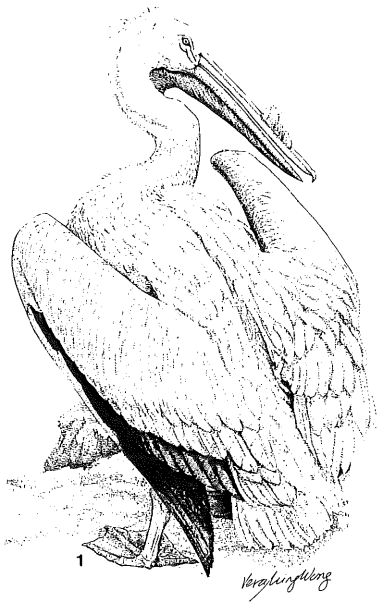




Prairies and Prairie Wetlands

Over eighteen million acres of prairie once extended from the northwest to the southeast corners of the state. This landscape was a mixture of dry hills and bluffs and wetland swales and potholes. It provided habitat for an abundance of wildlife. The dry uplands were dominated by little bluestem and sideoats grama. The fertile soil of the moist uplands supported big bluestem and Indian grass, often reaching a height of six feet. On the wet lowlands, prairie cordgrass and blue joint flourished with sedges and reeds in the marshy areas.

Nearly all prairie habitat in Minnesota has been destroyed. Less than one percent of the original prairie survives. Because prairie and prairie wetlands have suffered the greatest alteration of all Minnesota's habitats, its indigenous species are under the greatest threat. More than one-third of the plants and animals on the state list inhabit the prairie ecosystem.



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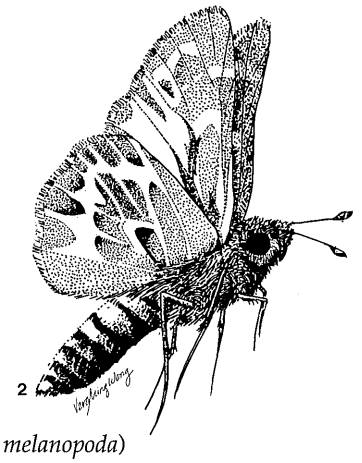


2

Endangered

Birds

Baird's sparrow
Burrowing owl
Chestnut-collared longspur
Sprague's pipit

Butterflies

Assiniboia skipper
Uhler's arctic
2 Uncas skipper*

Plants

A species of quillwort (*Isoetes melanopoda*)
Bladderpod (*Lesquerella ludoviciana*)
Cross milkwort (*Polygala cruciata*)
Eared gerardia (*Gerardia auriculata*)
Kitten-tails* (*Besseya bullii*)
Narrow-leaved milkweed (*Asclepias stenophylla*)
Prairie bush clover (*Lespedeza leptostachya*)
Rough-seeded fameflower (*Talinum rugospermum*)
Sweet-smelling Indian plantain (*Cacalia suaveolens*)
Tall nut-rush* (*Scleria triglomerata*)
Tubercled rein-orchid (*Platanthera flava*)
Western prairie fringed orchid (*Platanthera praeclara*)
Wild petunia* (*Ruellia humilis*)
Wild quinine (*Parthenium integrifolium*)
Wolf's spikerush (*Eleocharis wolfii*)

Threatened

Birds

Loggerhead shrike*

Reptiles and amphibians

Blanding's turtle*

Butterflies

Dakota skipper
Karner blue*
Ottoe skipper

Plants

3 Ball cactus (*Corypantha vivipara*)
Green milkweed (*Asclepias hirtella*)
Hall's sedge (*Carex hallii*)
Holboell's rock-cress* (*Arabis holboellii*)
Illinois tick-trefoil* (*Desmodium illinoense*)
Northern androsace* (*Androsace septentrionalis*)
Red saltwort (*Salicornia rubra*)
Round false foxglove (*Gerardia gattingeri*)
Slender plantain (*Plantago elongata*)
Sullivant's milkweed (*Asclepias sullivantii*)
Three-flowered melic (*Melica nitens*)
Tuberous Indian-plantain (*Cacalia plantaginea*)
Twisted yellow-eyed grass (*Xyris torta*)
Valerian (*Valeriana edulis*)
Whorled nut-rush (*Scleria verticillata*)

Special Concern

Birds

American bittern*
1 American white pelican*
Common moorhen*
Forster's tern*
Greater prairie-chicken
Henslow's sparrow*
Horned grebe*
King rail*
Marbled godwit
Sandhill crane*
Sharp-tailed sparrow*
Short-eared owl*
Upland sandpiper
Wilson's phalarope*
Yellow rail*

Plants

Thirty-five species.
See *Checklist of Endangered and Threatened Animal and Plant Species*, MnDNR, 1986 (Hereafter referred to as *Checklist*.) for a complete list of species of special concern.

Mammals

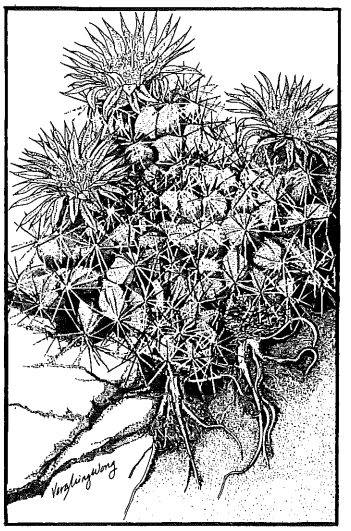
American elk*
Eastern spotted skunk*
Least shrew
Northern pocket gopher
Prairie vole

Reptiles and Amphibians

Gopher snake*
Lined snake
Racer*
Western hognose snake*

Butterflies

Poweshiek skipper



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* Indicates species that occurs in more than one habitat type.

Brushlands and Parklands

Oak brushlands and woodlands of central and southern Minnesota occurred as small groves of trees intermixed with open prairie or as a scrub forest with dense shrub thickets. The aspen parkland of northwestern Minnesota, often referred to as brush prairie, was a mosaic of wet prairie, sedge meadow, shrub thicket and aspen groves.

These habitats occurred as an ecotone between the prairie ecosystem to the west and the deciduous and coniferous forest ecosystems to the east. Fire played an important role in maintaining the shifting mosaic of open and wooded areas.

Once widespread, the brushlands and parklands of Minnesota have been severely diminished by agricultural activities and fire suppression. Today remnant examples of this habitat are restricted to sandy, droughty soils of dunes and sand plains that are unsuitable for cultivation.

1

Endangered

Butterflies

Uncas skipper*

Plants

Kitten-tails* (*Besseya bullii*)
Wild petunia* (*Ruellia humilis*)

Threatened

Birds

1 Loggerhead shrike*

Reptiles and Amphibians

Blanding's turtle*

Butterflies

Karner blue*

Plants

Illinois tick-trefoil* (*Desmodium illinoense*)

Special Concern

Birds

Henslow's sparrow*

Plants

Three species (See *Checklist.*)

Mammals

American Elk*
Eastern spotted skunk*
Mule deer*

Reptiles and Amphibians

Gopher snake*
Western hognose snake*

* Indicates species that occurs in more than one habitat type.

Hardwood Forests

Before settlement, a broad belt of hardwood forest stretched from the southeastern corner to the west-central part of the state. In the uplands these forests were dominated by elm, basswood, sugar maple and red oak. In the lowlands, floodplain forests of silver maple, elm, black willow and cottonwood were common.

The original upland hardwood forest has been profoundly altered by agricultural development and urban growth. Today, remnant stands occur only as small, isolated fragments surrounded by cropland. On the other hand, because of the low development potential of floodplain habitats, the original distribution of this forest type has not been greatly modified. Intact floodplain forests are often the only large pieces of native habitat that remain in heavily cultivated areas.

Endangered

Reptiles and Amphibians

Five-lined skink*

Plants

Bog bluegrass (*Poa paludigena*)
Dwarf trout lily (*Erythronium propullans*)
3 Glade mallow (*Napaea dioica*)
Golden-seal (*Hydrastis canadensis*)

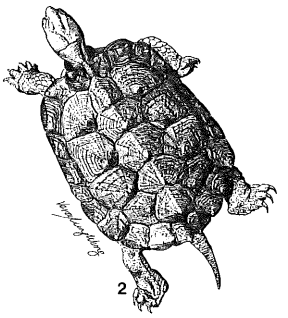
Threatened

Birds

Bald eagle*

Reptiles and Amphibians

Blanding's turtle*
2 Wood turtle*



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Plants

Davis's sedge (*Carex davisii*)
Jointed sedge (*Carex conjuncta*)
Twinleaf (*Jeffersonia diphylla*)
Wild onion (*Allium cernuum*)

Special Concern

Birds

Louisiana waterthrush
Red-shouldered hawk

Plants

Twenty-four species (See *Checklist.*)

Mammals

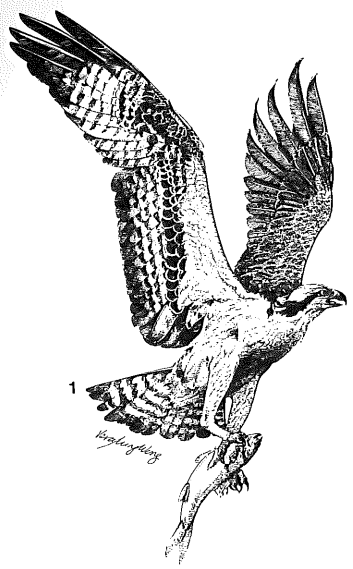
Eastern pipistrelle*
Eastern spotted skunk*
Mule deer*
Northern myotis*
Woodland vole

Reptiles and Amphibians

Eastern hognose snake
Fox snake
Massasauga*
Milk snake*
Northern cricket frog*
Racer*
Rat snake
Timber rattlesnake*

3

Northern Forests



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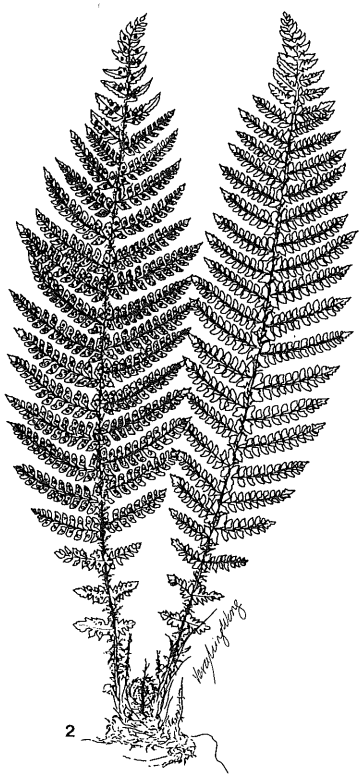
Majestic pines, boreal spruce-fir stands, gnarled old cedars, and the contrasting white of a hillside of aspen and birch characterize what most people think of as Minnesota's northern forest. Historically, natural fires created a mosaic of these forest types, ranging from early postfire stands of aspen-birch, to old-growth stands of pine, spruce-fir, and white cedar.

The widespread logging of the late 1800s and the decrease in natural fires due to fire protection policies of the 1900s has changed the pre-settlement composition of northern forests. The great stands of white and red pine that once defined much of the north woods were largely eliminated by 1900 and replaced by aspen and birch—now the most common forest type. Jack pine forests increased with the many slash fires that followed logging, but later decreased due to policies that prevented natural fires.

In contrast to the many changes that have occurred in Minnesota's pine forests, large relatively natural stands of spruce-fir and white cedar are still fairly common. Large public land holdings, particularly within the Boundary Waters Canoe Area Wilderness, have helped to protected these forests.



2

Endangered

Plants

A species of lichen* (*Pseudocyphellaria crocata*)
2 Braun's holly fern (*Polystichum braunii*)
Chilean sweet cicely (*Osmorhiza chilensis*)
Ram's head lady's-slipper (*Cypripedium arietinum*)

Threatened

Birds

Bald eagle*

Mammals

3 Gray wolf*

Plants

A species of lichen* (*Lobaria quercizans*)

Special Concern

Birds

1 Osprey*

Plants

Ten species (See *Checklist*.)

Mammals

Caribou*
Heather vole
Marten
Mountain lion
Northern myotis*
Rock vole
Wolverine

3

Nan Kane

Peatlands

Extensive peatlands blanket the nearly flat landscape which was left when the waters drained from the glacial lakes Agassiz, Upham, and Aitkin, of north-central Minnesota. Although there were several attempts—mostly unsuccessful—to drain these lands, the vegetation mosaic is nearly the same as it was in presettlement times.

Scattered throughout northern Minnesota, smaller peatlands occur in former lake basins of the hilly topography left by the glaciers.

Together these large peatlands of the ancient glacial lakes and the lake-basin peatlands exhibit the full range of vegetation types typical of peatlands—bogs, fens, and swamps.

The vast, continuous peatlands of northern Minnesota are the state's last remaining intact ecosystem. Despite drainage efforts of early settlers, this system, unlike any other ecosystem in Minnesota, remains large enough to provide viable habitat for its full range of native plants and animals.

Endangered

Plants

A species of lichen* (*Pseudocyphellaria crocata*)
Bog adder's-mouth (*Malaxis paludosa*)

Threatened

Mammals

Gray wolf*

Plants

A species of lichen* (*Lobaria quercizans*)
Beaked spike-rush (*Eleocharis rostellata*)
1 Cloudberry (*Rubus chamaemorus*)
English sundew (*Drosera anglica*)
Hair-like beak-rush (*Rhynchospora capillacea*)
Linear-leaved sundew (*Drosera linearis*)
Olivaceous spike-rush* (*Eleocharis olivacea*)
Sterile sedge (*Carex sterilis*)
Twisted yellow-eyed grass (*Xyris torta*)

Special Concern

Birds

American bittern*
Sandhill crane*
Sharp-tailed sparrow*
Short-eared owl*
Wilson's phalarope*
2 Yellow rail*

Plants

Fourteen species, (See *Checklist.*)

Mammals

Caribou*
3 Northern bog lemming

Butterflies

Bog copper
Bog fritillary
Disa alpine
Dorcas copper
Freija fritillary
Frigga fritillary
Jutta arctic
Red-disked alpine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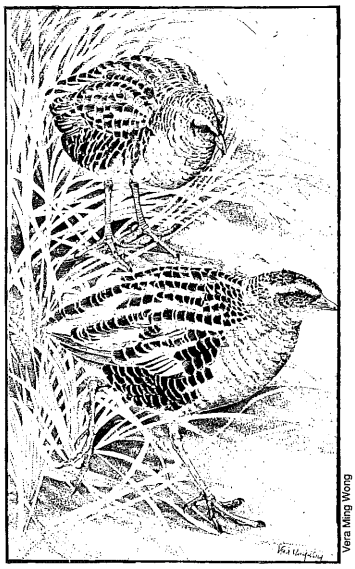
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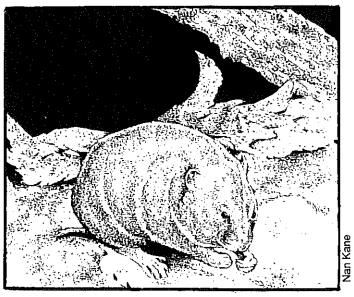

3 Nan Kane

* Indicates species that occurs in more than one habitat

Minnesota, the land of 10,000 lakes, is actually the land of more than 15,000 lakes and over 13,000 miles of rivers and streams. Aquatic habitats here refer to the state's lakes, streams, and rivers and are characterized by open or running water. Aquatic areas dominated by emergent, floating or standing vegetation are considered to be prairie wetland or peatland types.

The small number of aquatic species on the state endangered species list is as much a reflection of gaps in our knowledge of the distribution of aquatic organisms as it is a reflection of the health of this environment. There has been very little inventory of the distribution and habitat preference of aquatic plants, most aquatic invertebrates, and even fish other than game species.

The greatest threats to aquatic habitats in Minnesota are agricultural runoff, siltation, flow interruption by dams, shoreline development, and most recently acid rain.


1 from illustration by V. M. Wong

Endangered

Freshwater Mollusks
Fat pocketbook
Higgin's eye

Plants
American shore-plantain (*Littorella americana*)
Awlwort (*Subularia aquatica*)
Clustered bur reed (*Sparganium glomeratum*)
One-sided pondweed (*Potamogeton lateralis*)

Threatened

Birds
Bald eagle*

Reptiles and Amphibians
Blanding's turtle*
Wood turtle*

Plants
Olivaceous spike-rush* (*Eleocharis olivacea*)
5 Small white water-lily (*Nymphaea tetragona*)

Special Concern

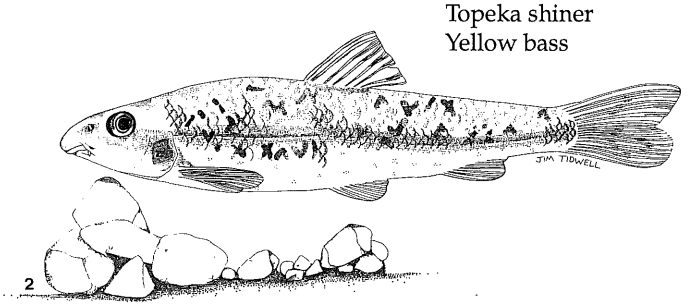
Birds
3 American bittern*
American white pelican*
Common moorhen*
Forster's tern*
4 Horned grebe*
King rail*
Osprey*
Sandhill crane*

Plants
Six species (See *Checklist.*)

Reptiles and Amphibians
Bullfrog
Massasauga*
1 Northern cricket frog*
Pickerel frog
Snapping turtle

Freshwater Mollusks
Ebony shell
Elephant ear

Fish
American brook lamprey
Black redhorse
Blue catfish
Blue sucker
Bluntnose darter
Crystal darter
2 Gravel chub
Lake sturgeon
Paddlefish
Pallid shiner
Plains topminnow
Pugnose minnow
Shovelnose sturgeon
Slender madtom
Topeka shiner
Yellow bass



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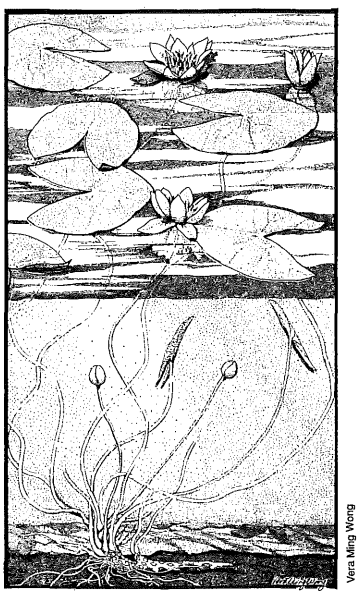
3 Vera Ming Wong


4 Don Luce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Threatened

Mammals

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Plants

Fourteen species, (See *Checklist*.)

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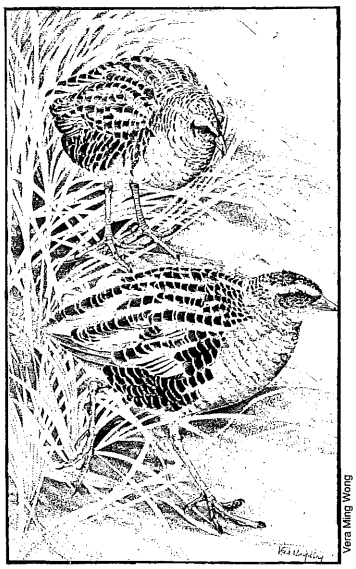
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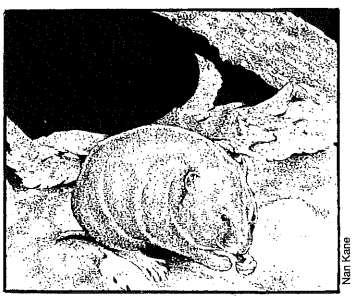
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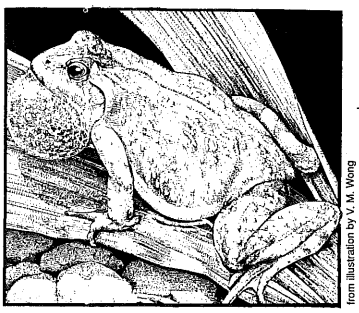
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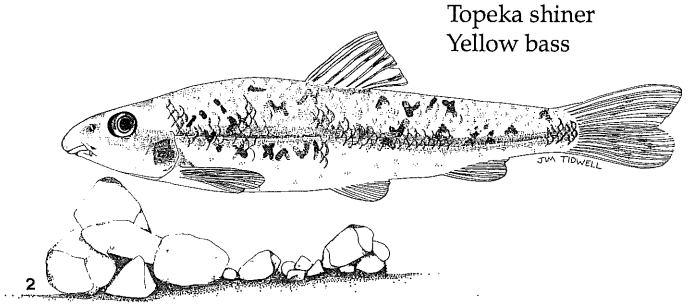

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3 Vera Ming Wong


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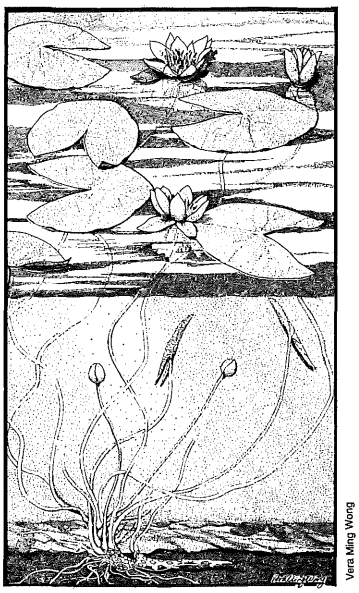
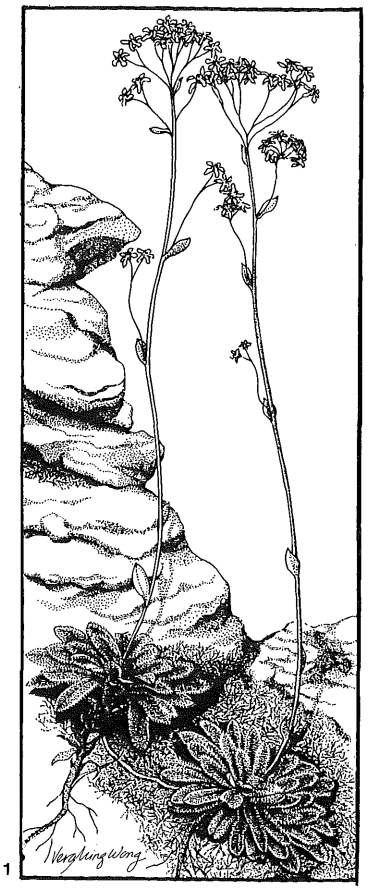

5 Vera Ming Wong

Primary Habitats

Primary habitats occur in limited areas across the state. All share a common feature: they are found on stressed environmental sites that have little or no true soil development. These sites range from loose sand to bare rock. Four types of primary habitat occur in Minnesota: cliffs, rock outcrops, sand dunes, and lakeshore. Although these habitats are uncommon and extremely localized in distribution, they harbor a disproportionately large number of the state's rare species.

Primary habitats play a significant role in Minnesota's ecology by providing habitat for specialized groups of plants and animals characterized by relict, disjunct, and peripheral species. These species are rare because the amount of suitable habitat (typically micro-habitats) is naturally limited, not because of human-induced distubances or habitat destruction. The extreme conditions found in primary habitats afford few opportunites for commercial or residential development, hence, unlike most natural communities in the state, their distribution today is probably similar to their presettlement range.



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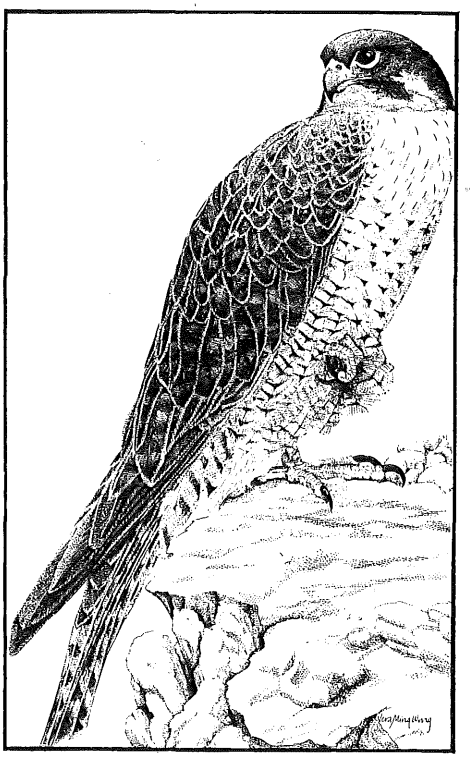

2

Endangered

Birds

2 Peregrine falcon
Piping plover

Reptiles and Ampibians

Five-lined skink*

Vascular Plants

A species of golden saxifrage (*Chrysosplenium iowense*)
A species of lichen (*Buellia nigra*)
A species of lichen (*Dermatocarpon moulinsii*)
A species of lichen (*Leptogium apalachense*)
A species of lichen (*Lobaria scrobiculata*)
A species of lichen (*Parmelia strictica*)
A species of moss (*Schistostegia pennata*)
A species of purslane (*Montia chamissoi*)
Indian ricegrass (*Oryzopsis hymenoides*)
James' polanisia (*Cristatella jamesii*)
Knotty pearlwort (*Sagina nodosa*)
Leedy's roseroot (*Sedum integrifoleum*)
Nodding saxifrage (*Saxifraga cernua*)
Norwegian draba (*Draba norvegica*)
Purple crowberry (*Empetrum atropurpureum*)
Reniform sullivantia (*Sullivantia renifolia*)
Rough-seeded fameflower (*Talinum rugospermum*)
Small false asphodel (*Tofieldia pusilla*)
Tall nut-rush* (*Scleria triglomerata*)

Threatened

Plants

Alpine bilberry (*Vaccinium uliginosum var. alpinum*)
Annual skeleton-weed (*Lygodesmia rostrata*)
Arnica (*Arnica chionopappa*)
Beach grass (*Ammophila breviligulata*)
1 Encrusted saxifrage (*Saxifraga aizoon*)
Holboell's rock-cress* (*Arabis holboellii var. retrofracta*)
Large-leaved sandwort (*Arenaria macrophylla*)
Maidenhair spleenwort (*Aspelnium trichomanes*)
Marginal shield-fern (*Dryopteris marginalis*)
Northern androsace* (*Androsace septentrionalis var. puberulenta*)
Prairie sedge (*Carex praticola*)
Purple cliff-brake (*Pellaea atropurpurea*)
Rock clubmoss (*Lycopodium porophilum*)
Rocky Mountain woodsia (*Woodsia scopulina*)
Smooth woodsia (*Woodsia glabella*)

Special Concern

Birds

Common tern

Plants

Thirty species (See *Checklist.*)

Mammals

Eastern pipistrelle*
Northern myotis*

Reptiles and Amphibians

Milk snake*
Timber rattlesnake*

* Indicates species that occurs in more than one habitat type.

Summary

The protection and management of Minnesota's endangered species is an exciting challenge for the Department of Natural Resources. As part of our living heritage, these uncommon plants and animals enhance the beauty of the natural world around us. Each is an essential link in the web of life that binds and supports us. Each is a treasure of biological information that may help to unravel future technological problems.

Some species, such as the bison and passenger pigeon, have been lost forever from Minnesota's landscape. Others, such as the Baird's sparrow and golden seal, are on the brink of extirpation. Their continued contribution to our state's natural heritage is no longer guaranteed.

Although relatively small in number, Minnesota's 287 listed species are a critical indicator of the health of our natural environment. Focused protection and management efforts to ensure their continued existence are essential.

Minnesota's endangered species law (MS 84.0895) is a strong means of recognizing and protecting our less common inhabitants. Habitat preservation is another. The destruction and degradation of our natural environment is the single most important factor in the decline and loss of our native flora and fauna. The table and graph below summarize the major habitats found in Minnesota along with the numbers of endangered, threatened, and special concern species associated with each.

The large scale conversion of native prairie to farmland is reflected in the disproportionate number of listed species found in this habitat. Clearly, preservation of remaining native prairie tracts is a high priority for conservation programs.

Primary habitats, such as cliffs, rock outcrops, and beaches also support a large number of listed species. These habitats are limited in distribution and extent, thus the species dependent upon them are rare.

Minnesota's forests have been the least impacted. However, even in our forested habitats certain species need to be the focus of more directed conservation measures.

Habitat preservation, enforcement of endangered species laws, and public education and support are critical components of our endangered species protection effort. Minnesota's Department of Natural Resources is committed to a strong endangered species program.

	Status	Birds	Mammals	Amphibians and Reptiles	Fish	Mollusks	Butterflies	Plants	Total
Prairie	E	4	-	-	-	-	3	15	22
	T	1	-	1	-	-	3	15	20
	SC	14	5	4	-	-	3	34	60
Brushland & Parkland	E	-	-	-	-	-	1	2	3
	T	1	-	1	-	-	2	1	5
	SC	1	3	2	-	-	-	3	9
Hardwood Forest	E	-	-	1	-	-	-	4	5
	T	1	-	2	-	-	-	4	7
	SC	2	5	8	-	-	-	24	39
Northern Forest	E	-	-	-	-	-	-	4	4
	T	1	1	-	-	-	-	1	3
	SC	1	7	-	-	-	-	10	18
Peatland	E	-	-	-	-	-	-	2	2
	T	-	1	-	-	-	-	9	10
	SC	7	2	-	-	-	8	14	31
Aquatic	E	-	-	-	-	2	-	4	6
	T	1	-	2	-	-	-	2	5
	SC	8	-	5	16	2	-	6	37
Primary	E	2	-	1	-	-	-	19	22
	T	-	-	-	-	-	-	15	15
	SC	1	2	2	-	-	-	30	35

Table 2. Minnesota species that are listed as state endangered (E), threatened (T), and special concern (SC) summarized by habitat type. (Some species occur in more than one habitat type.)

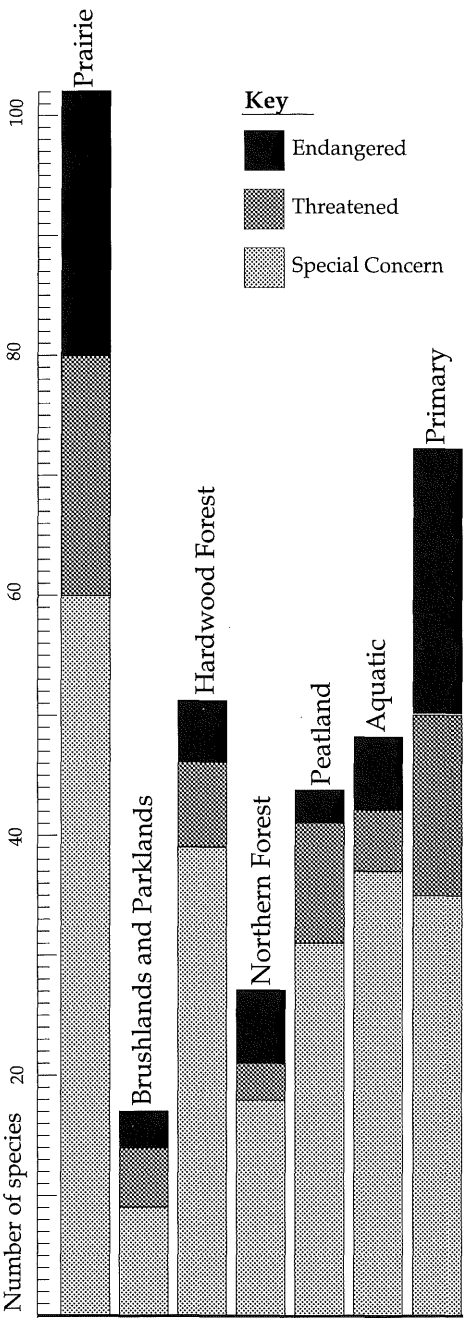

Table 3. Comparative bar chart of Minnesota species that are listed as endangered, threatened, and special concern.

Minnesota's Commitment

Together, the Natural Heritage, Nongame Wildlife, and Scientific and Natural Areas programs are implementing a comprehensive and coordinated strategy to save Minnesota's endangered species and sensitive natural habitats. This cooperative effort is focused on a four point strategy to maintain Minnesota's most threatened species and their habitats.

Identify priorities for conservation

Conducting and maintaining a comprehensive biological inventory of the state's rare species and their natural habitats is the first step toward protection.

Protect the best and the rarest

Ecologically significant lands that characterize Minnesota can be protected by creative partnerships between public agencies, private conservation organizations, and private landowners.

Maintain listed species and their habitats

Active management, including monitoring and restoration, is required to maintain ecological conditions necessary for the long term survival of listed species and their habitats.

Promote public awareness

Surveys show that 89 percent of Minnesotans believe the protection of endangered species is important, and 78 percent believe it should be one of the most important priorities of the new Environmental Trust Fund. Building on this public interest through education and information will increase support for conservation initiatives.

The Natural Heritage Program is responsible for field inventory, research, and promoting the wise stewardship of Minnesota's native plants and threatened natural communities.

Staff botanists and plant ecologists inventory and monitor rare species and endangered habitats so that conservation priorities and management strategies can be developed to protect them from destruction.

Protection of rare plants and threatened natural communities requires more than identifying location and monitoring health and vigor.

The next step is promotion. Through slide talks, publications, and cooperative work with resources managers, Natural Heritage scientists establish important avenues for reaching the public as well as other professional biologists.

The Natural Heritage Program and the Nongame Wildlife Program are responsible for maintaining a comprehensive database on all state and federally listed plants and animals. Detailed information on all occurences for each species is recorded in a computer file and mapped on USGS topographical maps. This database is indispensible for resource managers and developers in ensuring that development projects throughout Minnesota are responsive to the maintenance of a diverse, vigorous natural environment.

Minnesota's Nongame Wildlife Program has been entrusted with the responsibility of protecting and managing over 500 nongame wildlife species of birds, mammals, reptiles, amphibians, fish, and invertebrates. Strong citizen support via voluntary tax contributions has helped build the program's national reputation as a leader in nongame conservation.

A long range plan guides efforts in habitat management, endangered species restoration, public education, and research. Staff are working to restore endangered populations of trumpeter swans and peregrine falcons. Other projects target bald eagles, piping plovers, butterflies, mussels and crayfish. With support by the Nongame Wildlife Program, Project WILD, an interdisciplinary environmental education program for teachers, is now taught in schools throughout the state.

To integrate nongame wildlife concerns into traditional resource programs, Nongame Wildlife staff work closely with foresters, wildlife managers, park specialists, and hydrologists to manage public and private lands for the benefit of all Minnesota's wildlife.

The goals of the Scientific and Natural Areas (SNA) Program are to protect and maintain critical habitat for endangered species through a state system of natural areas. Acquisition, conservation easements, gifts of land and stricter protection of lands already owned by the state are some of the available options for protecting biologically significant sites.

Once a site is designated as a State Natural Area, it becomes the most strongly protected property in the state. Since its inception 16 years ago, the SNA Program has protected critical habitat for state and federally listed species such as the piping plover and prairie bush clover. In additional to protecting critical habitat, the SNA Program is entrusted with managing these lands. In many cases a policy of "letting nature take its course" is not sufficient for providing full protection to a species whose immediate future is in jeopardy.

The Minnesota County Biological Survey

Initiated in 1987 as a joint effort of the Natural Heritage and Nongame Wildlife programs, the survey is an excellent example of how endangered species information is collected. Ecological data is gathered systematically, county-by-county, on sensitive natural habitats and rare plant and animal species. Comprehensive biological data generated by the survey has already proven to be a sound foundation for developing clear conservation goals and strategies for maintaining and enhancing Minnesota's rare natural features.

For More Information

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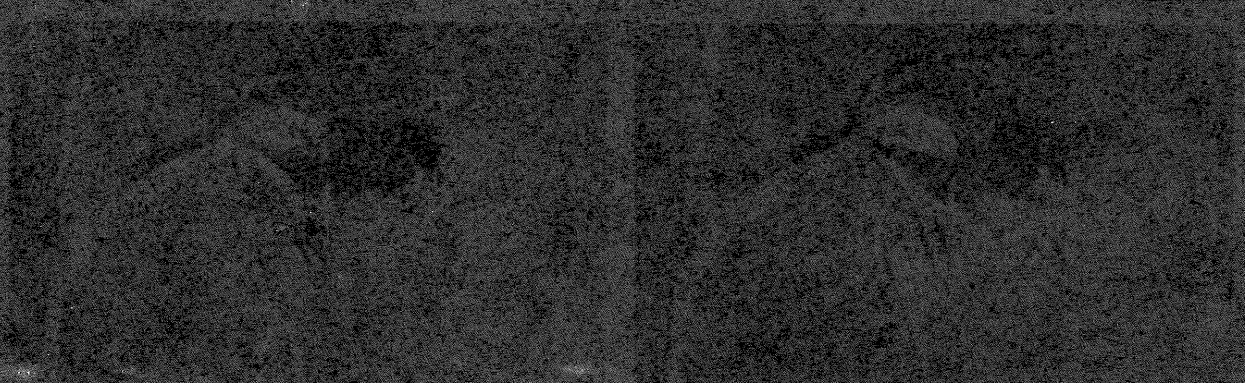

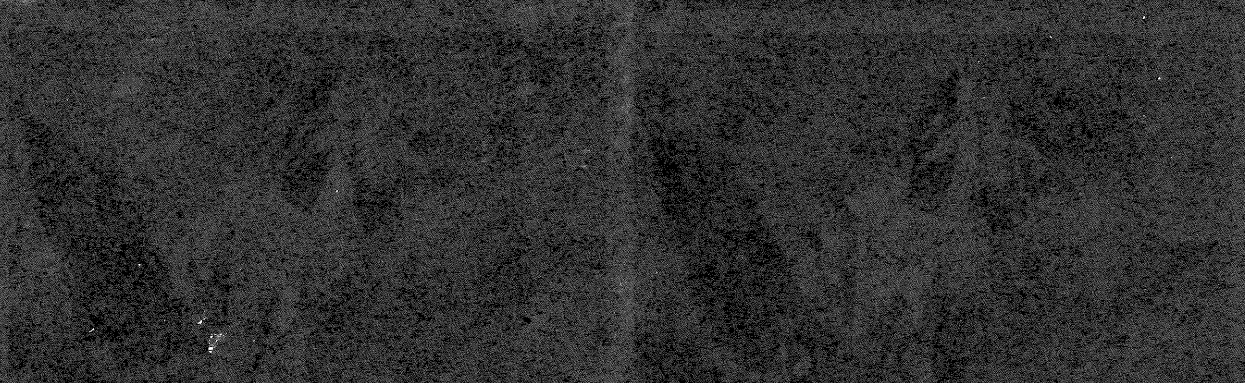

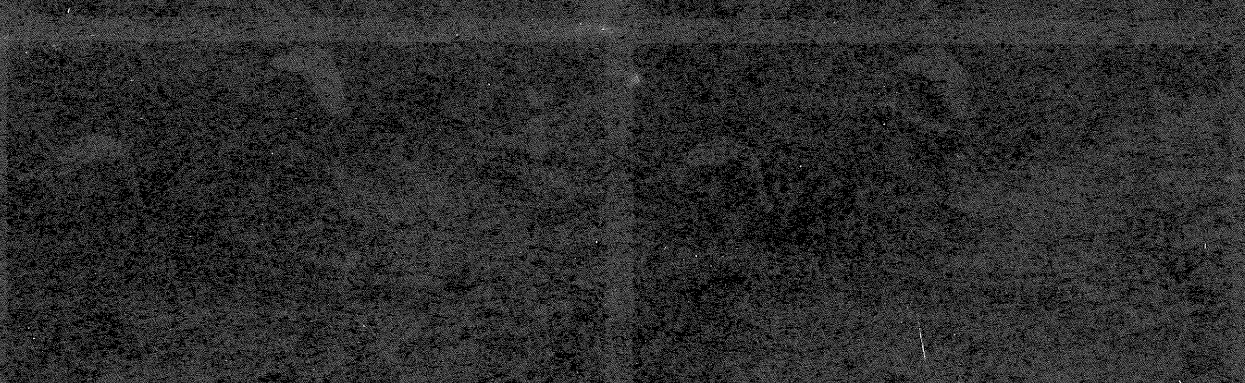

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