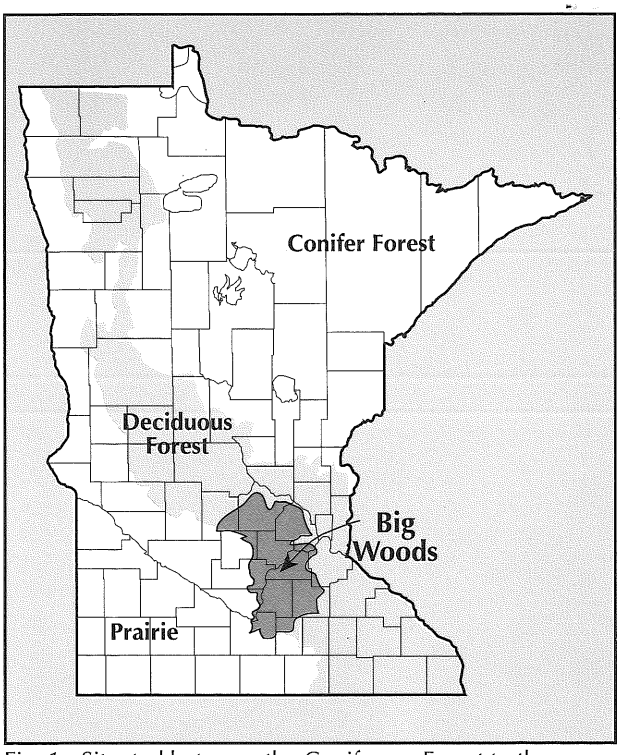
Managing Landscapes in the Big Woods Ecosystem



Minnesota DNR

Fig. 1 Situated between the Coniferous Forest to the northeast and the Prairie to the southwest, the Big Woods formed part of the central strip of Deciduous Forest in Minnesota.

Acknowledgements:

This booklet reflects the efforts of many individuals involved with The Big woods Project. Dan Milbert, Faribault, was the principal writer. The project directors were Nancy Falkum of The Nature Conservancy (TNC) and Richard Peterson of the Minnesota Department of Natural Resources (DNR). The following provided valuable assistance in developing and reviewing the text: Lance Sorensen, DNR Forestry; Jeanine Vorland, DNR Wildlife; Christy Nixon, DNR Fisheries; Chris Robbins, Canon River Watershed Partnership; Doreen Lynch, Volunteer, The Nature Conservancy; Rick Erpelding, DNR Wildlife; and Sandy Prinzing, Cannon River Watershed Partnership, Typist. Graphic Design layout: Jean Miller, DNR Bureau of Information and Education. Illustration, pages 6, 9, 11-16, 18, 20 and 24 by Dan Milbert.

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Cover photo credit DNR File photo.

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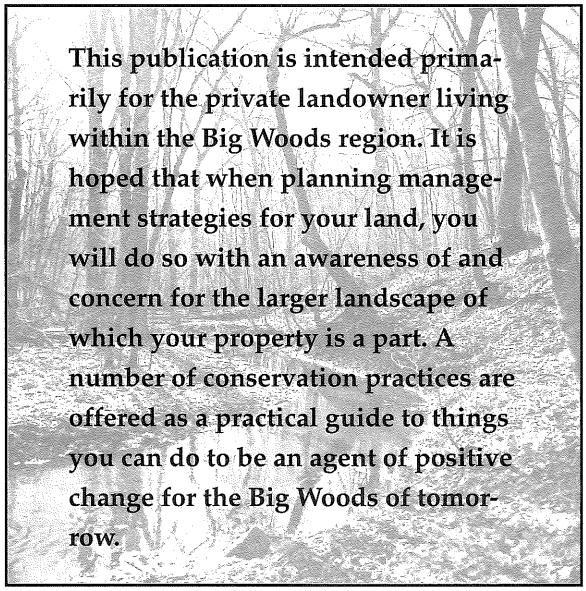
INTRODUCTION

The name "Bois Grand" or "Big Woods" was given by the seventeenth century French explorers to a unique section of dense maple-basswood forest they encountered in south-central Minnesota. Extending between present day Faribault and St. Cloud, this 3,000 square mile area formed part of the band of hardwood forests running the length of the state (figure 1). The Big Woods was distinct, both in being the largest continuous stand of maple-basswood forest along this band, as well as in its often abrupt separation from surrounding open woodlands and prairies. Along its southern margins, especially where the Cannon and Minnesota rivers acted as barriers to the frequent prairie fires, the Big Woods forest in all its fullness rose from the sun-drenched expanses like a great dark wall.

Within the shady interior of the maple -basswood forest, a multi-leveled network of niches was home to a rich variety of plant and animal life. One could travel for miles within this protected world before encountering an opening - a lake perhaps, or wetland, or on drier sites the park-like partial openness of an oak woodland. Along major streams and rivers, the sugar maple and basswood gave way to flood tolerant species such as silver maple and cottonwood. The entire mosaic of vegetation types in this region - not just the dominant maple-basswood forest - made up the Big Woods ecosystem, and contributed to its species richness, or biological diversity.

The Big Woods ecosystem has always been in a state of flux. Fires, windstorms, disease, and changes in climate have all impacted the region and altered its biological composition over time. With Nineteenth Century settlement however, the pace of change increased dramatically. Within a few decades, most of the forests were converted to cropland and urban uses. What remained of the maple-basswood forest has since been fragmented into ever smaller, more widely separated woodlots. Wetland acreage and diversity have also been reduced. The kinds of plants and animals that can live in this simplified landscape become more and more restricted.

Change in the Big Woods ecosystem is inevitable. Prior to the mid-1800s the changes were mainly a result of natural events. Since then change has been chiefly human related and probably will be from now on. We can use our understanding of the historical ecosystem to make the best possible land use and management decisions for the future. The wisest decisions will embrace a full range of quality of life values, as they protect and enhance the natural wealth of this unique part of Minnesota's natural heritage.



This publication is intended primarily for the private landowner living within the Big Woods region. It is hoped that when planning management strategies for your land, you will do so with an awareness of and concern for the larger landscape of which your property is a part. A number of conservation practices are offered as a practical guide to things you can do to be an agent of positive change for the Big Woods of tomorrow.

HISTORY

A basic knowledge of the history of the Big Woods geographical area will help you make wise management choices today.

Pre-1850s

The moist, dense forests of sugar maple and basswood that we associate so strongly with the Big Woods ecosystem are actually of fairly recent origin. It was only a few hundred years ago that climatic conditions became favorable for their establishment.

Between 2 million and 12,000 years ago, glaciers scoured the Big Woods region. With the final retreat of the ice, an irregular layer of glacial till was deposited, forming the hodge-podge of hills and depressions characteristic of the area.

A forest of spruce was first to clothe this new landscape (figure 2). As the climate became warmer and drier, oak forests advanced through the region. For long periods, prairie dominated. Not until 400 to 500 years ago, when the climate cooled again somewhat, did the Big Woods ecosystem as we know it develop. Factors in addition to climate controlled its precise form.

Fig 2. Sequence of major vegetation types in Minnesota from 11,000 years ago to the present. The maple-basswood forest that characterizes the Big Woods became established only a few hundred years ago. Redrawn from H.E. Wright, Jr., et al., 1992, "The Patterned Peatlands of Minnesota", University of Minnesota Press, Minneapolis.

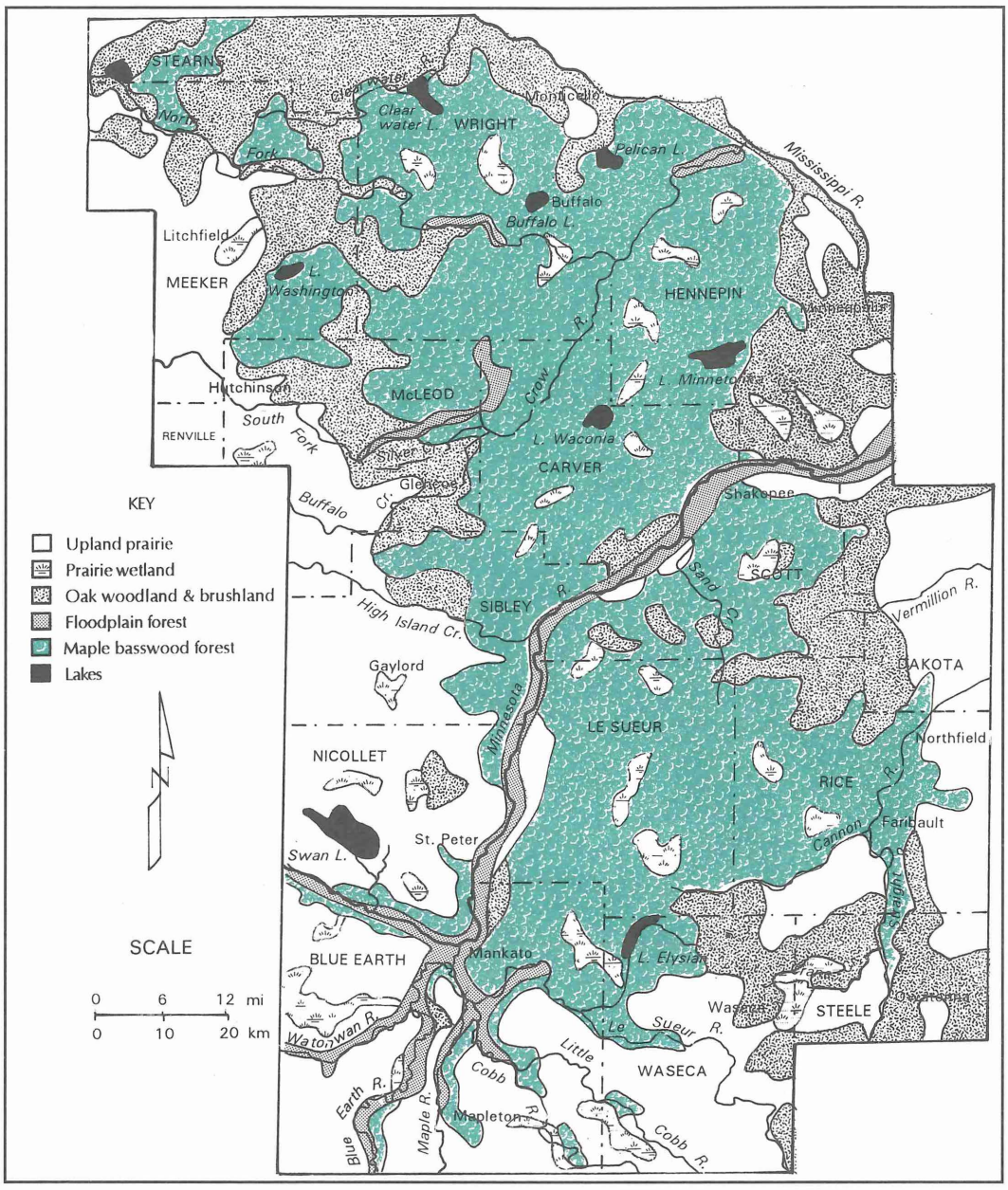


Fig. 3 The boundaries of the Big Woods were determined mainly by the degree of protection from fire. Note how natural features and fire tolerant oak woodland and brushland influenced boundary locations.

Climate created the potential for a broad area of maple-basswood forest development in southern and west-central Minnesota. Due to fire, topography, and soil factors a narrower band of discontinuous forests actually developed. The annual fires within the neighboring prairie region to the west - many started by American Indians - swept across the grasslands and helped maintain their treeless character. Where natural firebreaks such as rivers blocked the spread of fires, a mature forest of fire-sensitive maple, basswoods, and elm (the Big Woods) developed without transition. Where fires were less effectively blocked, a transition of fire-tolerant oaks and aspens separated the prairie from the Big Woods. Dry, sandy soils limited the expansion of the Big Woods on the north and east (figure 3).

The region was first settled by American Indians following the retreat of the glaciers. By the time the French explorers arrived, the Dakota lived in the Big Woods region, mainly in villages around its edges. They hunted game, fished, cultivated corn, beans, and squash, and harvested wild rice and other plants and plant products from the ecosystem (figure 4).

Post-1850s

When southern Minnesota was opened to homesteading in the 1850s, these settlers also were attracted to the richness of the Big Woods, chiefly its fertile soils. As these soils were utilized for agriculture through the cutting of the forests, geological changes - mostly the erosion of topsoil and its effects on waterways - were accelerated.

Within thirty years the transformation of the Big Woods to a primarily agricultural landscape had occurred. With the changes in vegetation came the loss of habitat for elk, bison, bear, cougar, and even for a time, deer. Less conspicuous species also disappeared. Although a few edge species (such as deer) were eventually favored by the changes, a general reduction in biological diversity accompanied the fragmentation of the Big Woods forests (figure 5).

As new technologies developed, the land was further impacted. Large scale draining of the wetlands began in the 1920s. Farm tractors became widely available in the 1930s and the use of agricultural chemicals has become prevalent since World War II.

Much of the wood that was cut to make room for cropland was simply burned. Only after most of the clearing had taken place did a market for oak and maple sawlogs develop. Basswood was used to make agricultural containers. For a time ginseng was gathered in great quantities and sold to Asian markets. Before the development of other sources of sugar, residents of the Twin Cities relied on the remaining tracts of maple-basswood forest for their sugar and syrup.

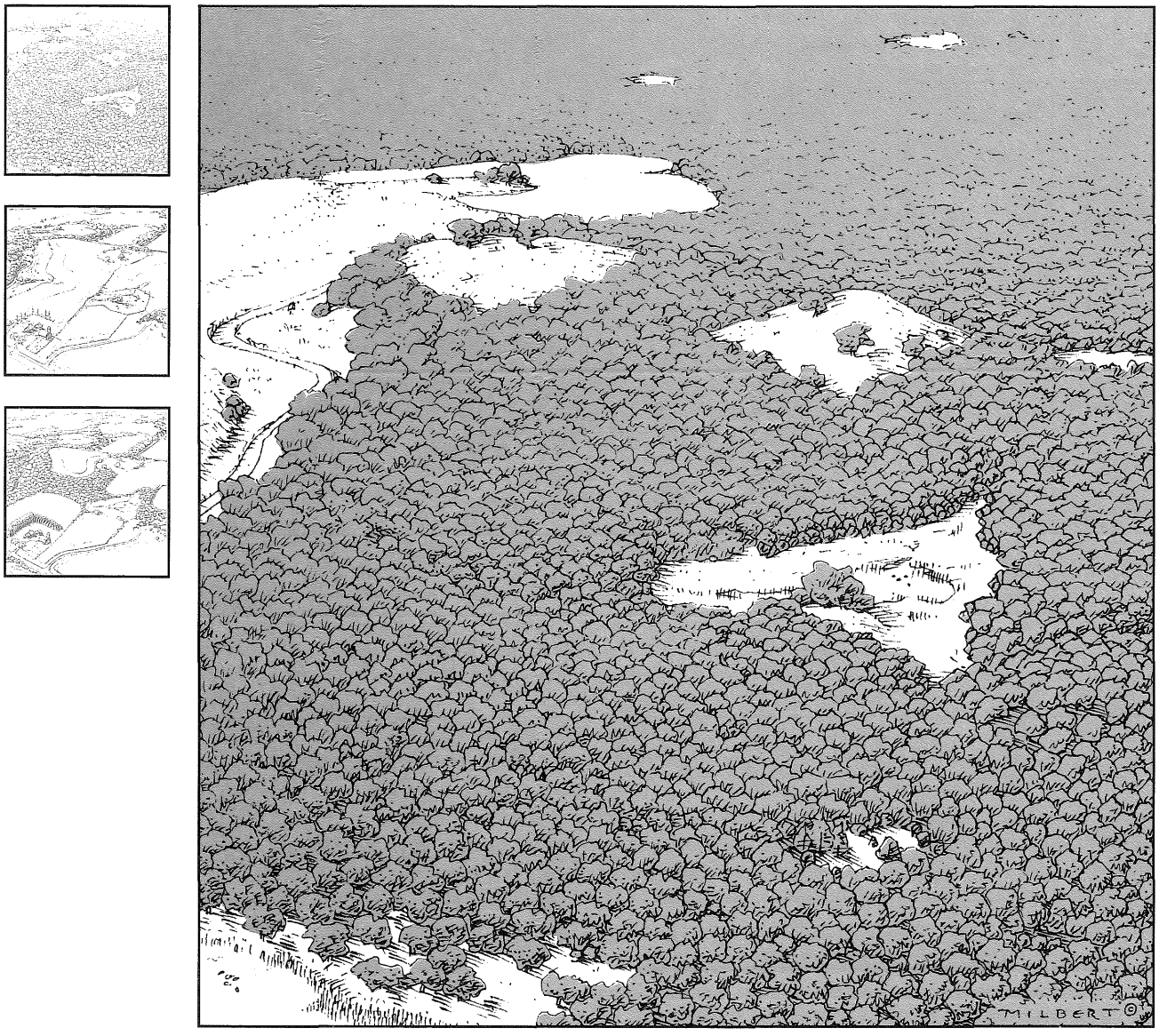


Fig. 4 The Big Woods was dominated by nature maple-basswood forest, punctuated by wetlands, lakes, and oak woodlands. An outside edge of the Big Woods is shown in the upper left, where a river and lake prevent the advance of prairie fires.

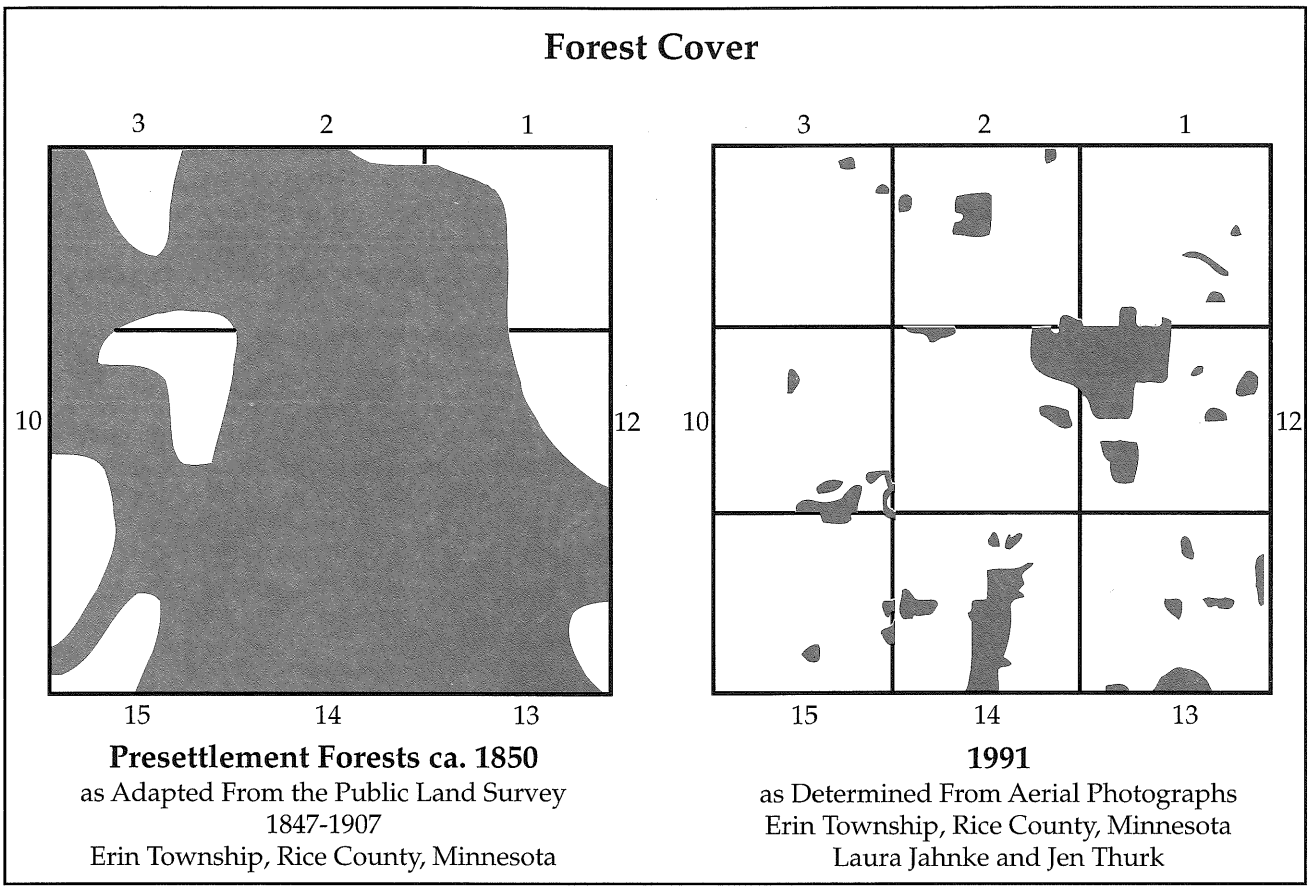


Fig. 5 Instead of a continuous forest cover, the landscape of the Big Woods now has a different appearance. The former regional forest now exists as forest islands set in a sea of agriculture and urban development.

Landscape Ecology

The concept of landscape ecology refers to a different way of viewing nature. Instead of managing individual woodlots separately, the landscape ecology approach also views the isolated woodlot as part of a larger forest ecosystem, whose plant, animal, land, water, and human components are interconnected.

The basic goal of the landscape ecology approach is to maintain ecosystem integrity, sometimes referred to as ecosystem health. Some characteristics of healthy ecosystems include:

- Normal levels of plant productivity
- High levels of native plant and animal diversity
- Natural (usually very low) levels of soil erosion and nutrient loss
- Clean water and healthy aquatic communities.

Where natural conditions have been substantially altered by people, such as in the Big Woods ecosystem, maintaining ecosystem health requires careful planning and management. Important ecosystem management objectives usually include:

- Conserving the full range of habitat types of the region to assure survival of all plant and animal species that make up the region's biodiversity
- Developing and maintaining corridors that will connect habitat areas to each other
- Protecting waterways with adequate buffers that will filter contaminants and maintaining normal water levels
- Beginning a program of ecological restoration in areas where the existing habitats are inadequate.
- Accommodating human use and providing for a sustained yield of renewable natural resource.

By considering the broad landscape context in which a particular woodlot or land parcel exists, a healthier Big Woods ecosystem can be sustained.

BIOLOGICAL DIVERSITY - WHY IS IT IMPORTANT?

Biological diversity (or biodiversity) refers to the number of kinds of living organisms - from herons to oaks to bacteria - native to a given area. The variety within each plant or animal population and the complex interactions between species is also implied (figure 6).

Biological diversity is biological wealth. It is a wealth of species and interconnections which is productive, resilient, aesthetically pleasing, and necessary.

A certain variety of living organisms is needed for the natural environment to fully function. When an ecosystem is fragmented, or when some of its components are removed, it may continue to exist in a partial or simplified way - at least for a time. At some point, however, if too much diversity is lost, the ecosystem effectively collapses, no longer able to regenerate its species, habitats, or soils. As more woodlots, wetlands, and prairie areas are affected, eventually whole regions, and ultimately the entire natural system can be weakened.

Biological diversity means more than just a greater variety of birds at our feeders, more than new drug discoveries from unnamed tropical plants. Ultimately, it means survival: the survival of the earth's ability to renew itself - its atmosphere, its soils, the cycling of nutrients through food chains... the natural processes on which all species including our own, depend.

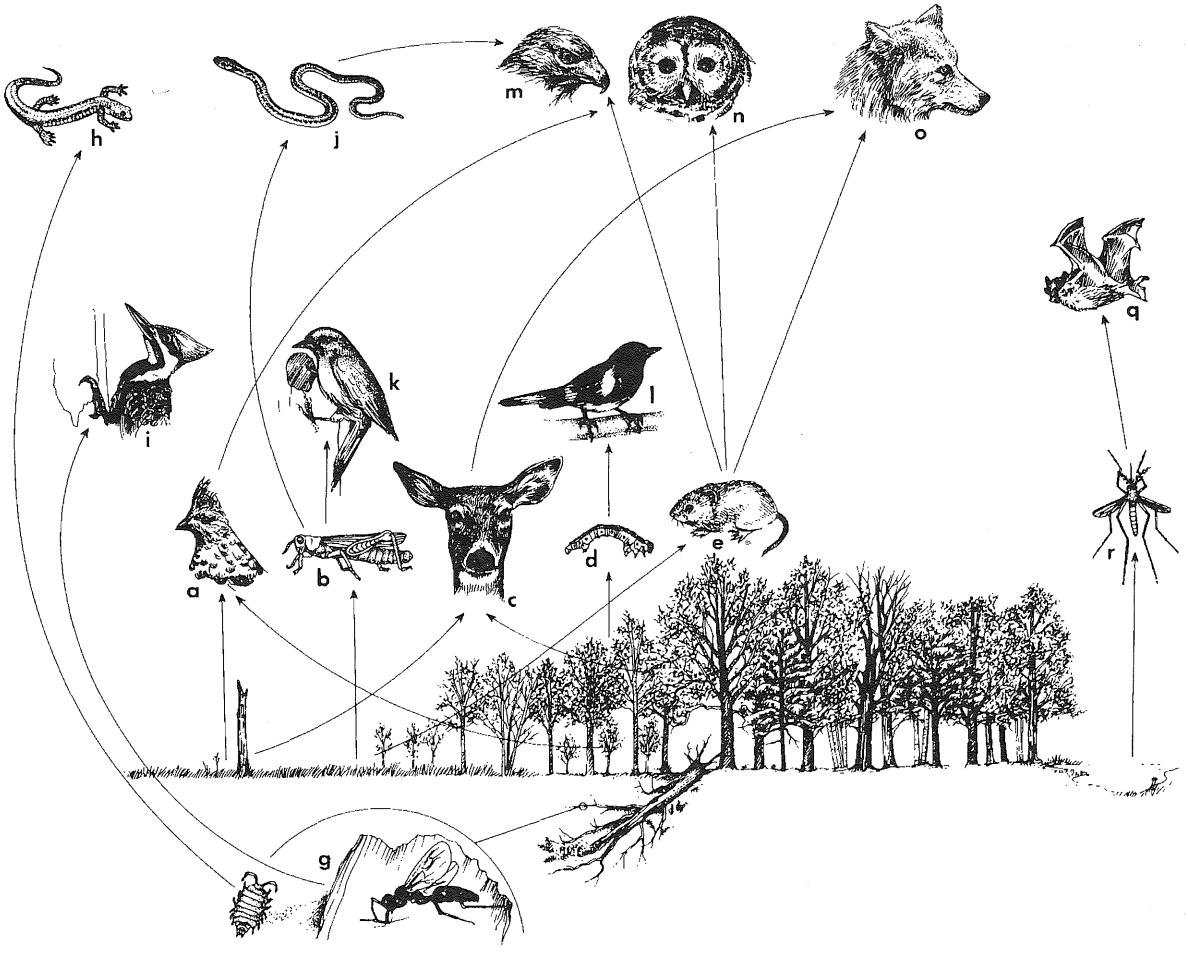


Fig. 6 A representative food web in a typical hardwood forest. The plant-produced organisms are consumed by herbivores such as ruffed grouse (a), grasshoppers (b), white-tailed deer (c), insect lavae (d), red-backed voles (e). Decomposers of plants include sowbugs and carpenter ants (g), which are preyed upon by salamanders (h) and pileated woodpeckers (i). Herbivorous insects are consumed by garter snake (j), eastern bluebird (k), and redstart (l) among others. Vertebrate herbivores are consumed by carnivores such as broad-winged hawk (m), barred owl (n), coyote (o). Bats (q) consume mosquitos and other insects (r).
From: New England Wildlife: Management of Forested Habitats. R.M. DeGraaf, et.al. (U.S. Dept. of Agric., Forest Service)

Land Use and Ownership

The Big Woods ecosystem of the 1850s was comprised of approximately 80 percent forests and woodlands, with lakes, wetlands, and prairies making up the rest. Today many of the woodlands, wetlands, and prairies are gone, and less than 10 percent of the original forestlands remain. The region has been converted to an agricultural landscape (figure 7).

Due to the nearness of the Twin Cities Metropolitan Area, urban land use is increasingly significant as well (figure 8). As the suburbs continue to expand, and as the last wooded acreages within commuting distance of the Metro Area continue to be developed into rural residences, it is important that these land use groups, as well as farmers, understand how best to manage their property from a Big Woods ecosystem perspective.

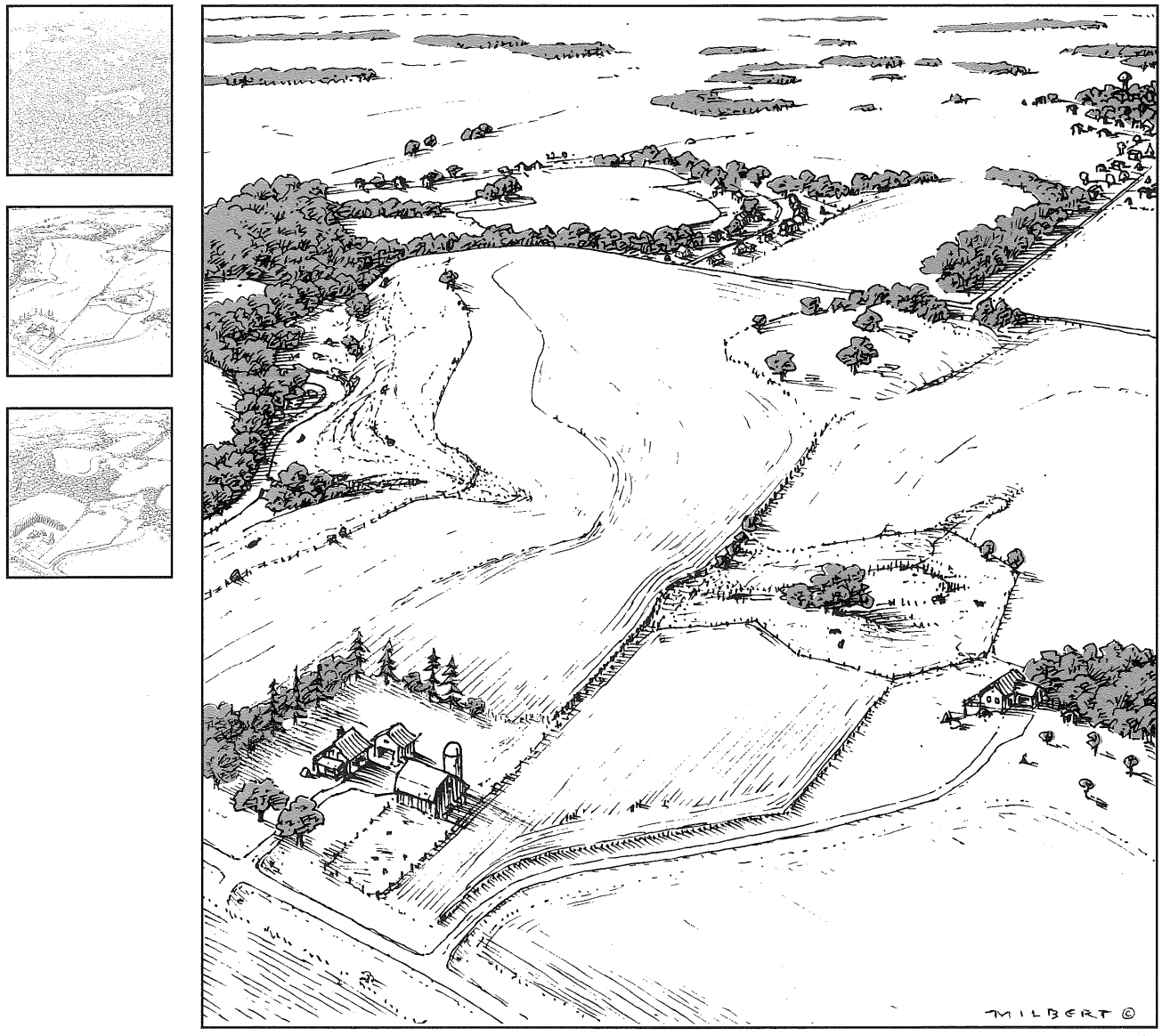


Fig. 7 The present day Big woods landscape has been dramatically altered by forest removal. The region is now dominated by agriculture.

Forest Composition

Traveling through the Big Woods region today, one might notice that the forests which remain are concentrated in certain kinds of terrain. Hilly, rocky land, steep slopes, wet sites, and low floodplains are more likely to have been left undisturbed than level, accessible, deep soil areas, most of which have been converted to agricultural fields. One effect of this is that the elm-ash-cottonwood bottomland forest type has been altered far less than upland forests.

A small but distinct part of the original Big Woods ecosystem was the tamarack swamp forest. Because it grows in wet basins unsuited to agriculture, it survives as a thin sprinkling of native coniferous forest throughout the present day landscape.

Beginning in the 1970s, Dutch elm disease had virtually eliminated mature elms from all forest canopy. Once the most common tree species of the maple-basswood forest, the American elm now persists mainly as an understory element.

During the last few decades another forest composition shift has been noted in upland forests. Since 1950 maple-basswood forest types have increased 75 percent, while oak forests have decreased by nearly 25 percent. The loss of oak forests may largely be due to a maple-basswood "take-over" as shade tolerant sugar maple and basswood naturally replace aging oaks in a fire free landscape.

Land Cover in the Big Woods Landscape

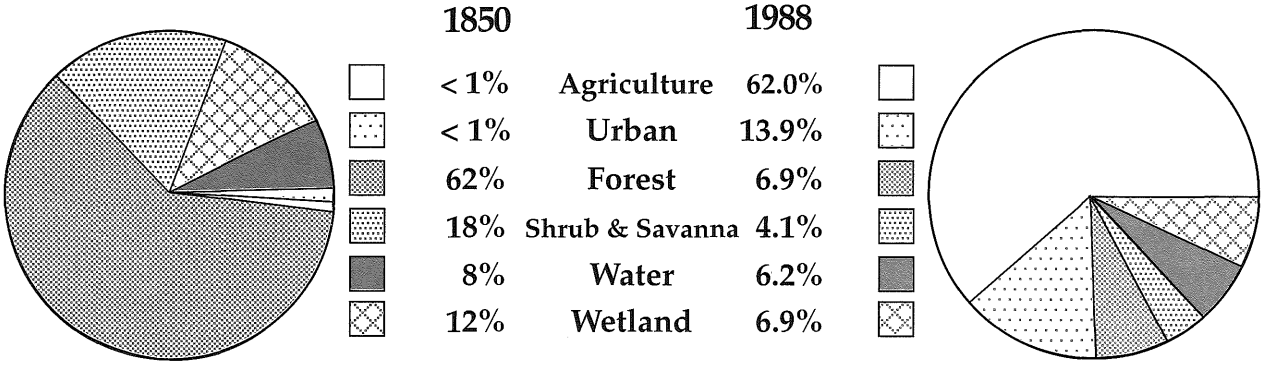


Fig. 8 1988 From Metro Region Forest Resources Management Plan 1994. 1850 Estimates based on original land survey notes.

Forest Benefits

The forests of the Big Woods region provide a variety of benefits. Landowner goals might include the following:

1) To maintain forest communities, providing habitat for native trees and wildflowers.
2) To provide habitat for wildlife, especially those species dependent on native forests (forest fragmentation has had generally negative implications for wildlife, especially certain migrant songbirds that require large blocks of forest to successfully nest).
3) To produce timber products.
4) To protect soils and water quality (forest vegetation does a better job of protecting against soil loss than crop, hay, or pastureland uses; Forests prevent excess water runoff and deliver clean water to streams and aquifers).
5) To conserve energy (forests modify wind velocity, snow accumulations, and temperature extremes).
6) To create recreational and scenic values.

The diagram on the next two pages (figure 9), a transect of an actual portion of the Big Woods, depicts many plant communities in the ecosystem and suggests how they fit together in the landscape. What follows are brief descriptions of the major communities.

Maple-Basswood Forest

This was the most common forest type in the Big Woods. Sugar maple, basswood, and (before Dutch elm disease) American elm were the most abundant trees. Red oak, red elm, green and white ash, butternut, bur oak, bitternut hickory, and ironwood were also frequently present. The maple-basswood forest prefers moist, well-drained soils. On wet sites it can blend into lowland hardwood forests with elm and ash dominant. On drier sites, oaks often predominate.

Mature maple-basswood forests usually consist of several layers: a dense canopy layer, an understory of immature trees (mostly maples) and small trees such as ironwood, a scattered shrub layer, and a lower layer of mostly spring-blooming wildflowers. Many species of wildlife, especially songbirds, make their homes in this rich forest environment.

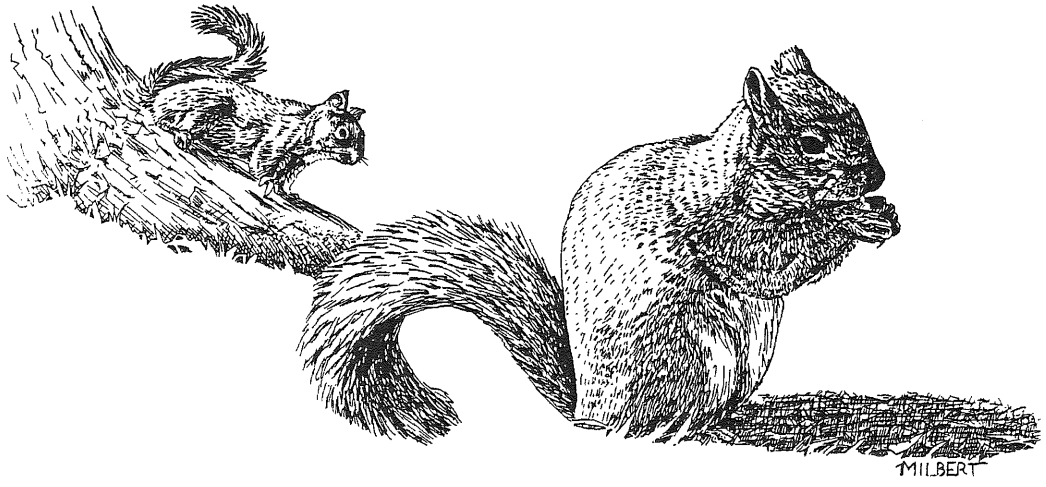
Pristine stands of maple-basswood forest are rare today. Less then ten sites over 250 acres in size are left in the whole state. Early settlers in the Big Woods knew that the soils on which this forest grew were very productive, and so most of it was cleared for cropland. The few areas remaining have in many cases been used for pasture, which has destroyed the understory plants.

Oak Forest

In the pre-settlement Big Woods, oak forests were most common at the margins of the region, occupying a zone between the maple-basswood forest and the prairie. Typically, the canopy is relatively open, which allows for the development of a dense shrub layer. The understory is variable; on moist sites it may resemble the maple-basswood forest understory with an abundance of spring wildfowers and a sparser shrub layer; on dry sites shrubs often dominate the understory.

A variety of oaks are present including red, bur, white, and northern pin oaks. Other common tree species include aspen and black cherry. The shrub layer usually contains gray dogwood, brambles, hazelnut, prickly ash, and exotic species (species not native to this area) such as European buckthorn and Tartarian honeysuckle. Squirrels, wild turkeys and other acorn eating animal species are common in this forest type.

Like maple-basswood forests, oak forests on the best sites have been converted to agricultural fields, or more recently, used for rural home sites and housing subdivisions. Due to succession to maple-basswood forests and their value for timber products, the oak forests are decreasing in relative abundance in the Big Woods region.



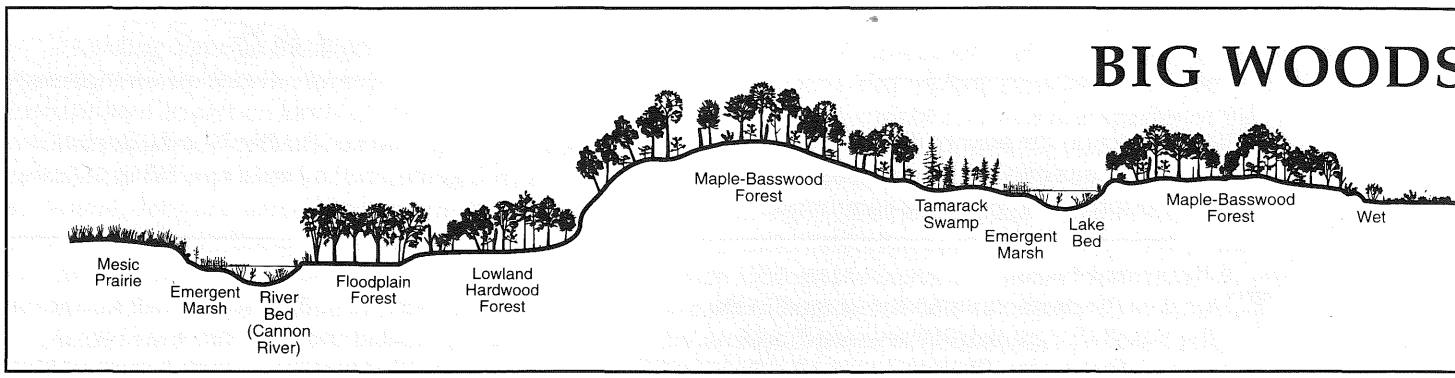
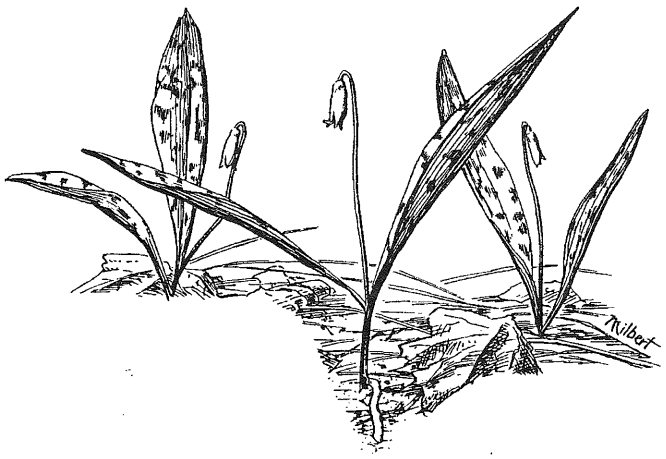


Fig. 9 Big Woods Transect. Tom Klein for Minnesota County Biological Survey, MN DNR.

Floodplain Forest

This forest type occurs mostly along major rivers on soils that are seasonally flooded. A mixture of silver maple, green ash, and cottonwood is typical. Basswood, hackberry, black willow, and immature American elm are common associates. The floodplain understory is often fairly open, with nettles dominating the ground layer. Vines are common, especially wild grape and Virginia creeper. Some of the many wildlife species include wood ducks, owls, herons, many songbirds, and a variety of amphibians and reptiles, including the rare wood turtle.

Because seasonal flooding limits agriculture and houses, floodplain areas offer some of the best opportunities for forest restoration.



Oak Woodland-Brushland

This plant community, too open to be considered oak forest, nevertheless was made up of many of the same species. It occurred on more fire prone sites, and (together with the even more open, prairie-understoried oak savanna) completed the transition between forest and prairie at the edge of the Big Woods. Historically far more common than today, this type often succeeds to oak forest in the absence of fire.

Prairie

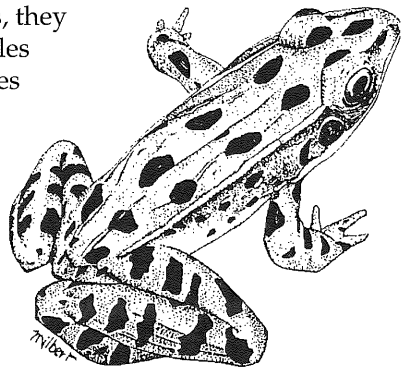
Prairie grasslands were present on the terraces of the Minnesota River and on small prairie openings within the oak woodland-brushland areas. They usually consisted of a great variety of forbs as well as the dominant grass species.

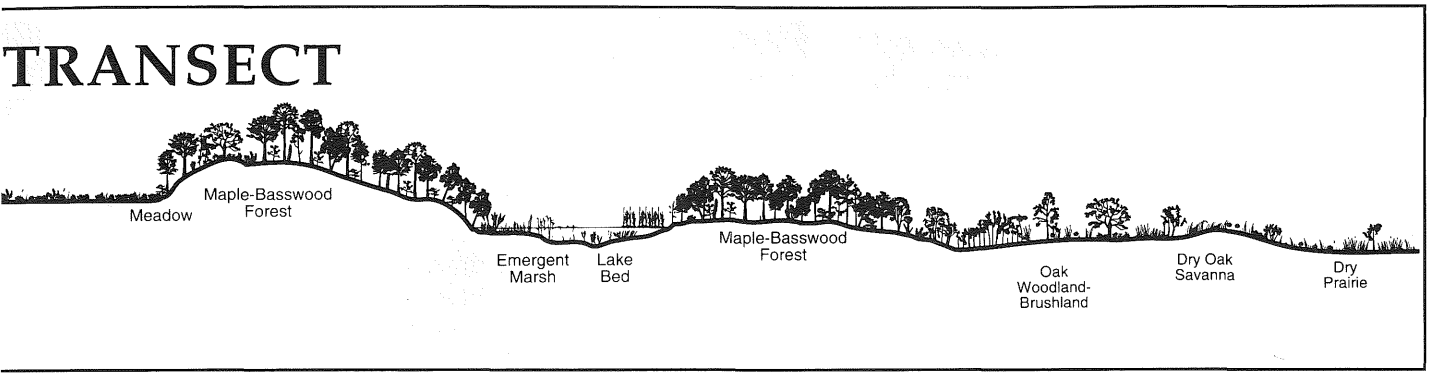
Virtually all native prairies areas within the Big Woods have been eliminated due to conversion to other land uses. To a certain extent grain fields, haylands, pastures, fencerows, and roadsides took the place of prairies in the ecosystem, but more recently even these are disappearing, and with them pheasants, meadowlarks and other grassland dependent wildlife species.

Wetlands

Wetland communities support more in species per acre than any other plant community in the Big Woods ecosystem. Wetlands of many types were present; meadows, marshes, swamps, and fens - both temporary and permanent. Many species of fish and wildlife species utilize wetlands at some period in their life cycles.

In addition to the biological diversity wetlands add to the Big Woods, they also play vital roles in the water cycles of the region. With their draining and filling in modern times, flooding has increased in severity at substantial cost to society.





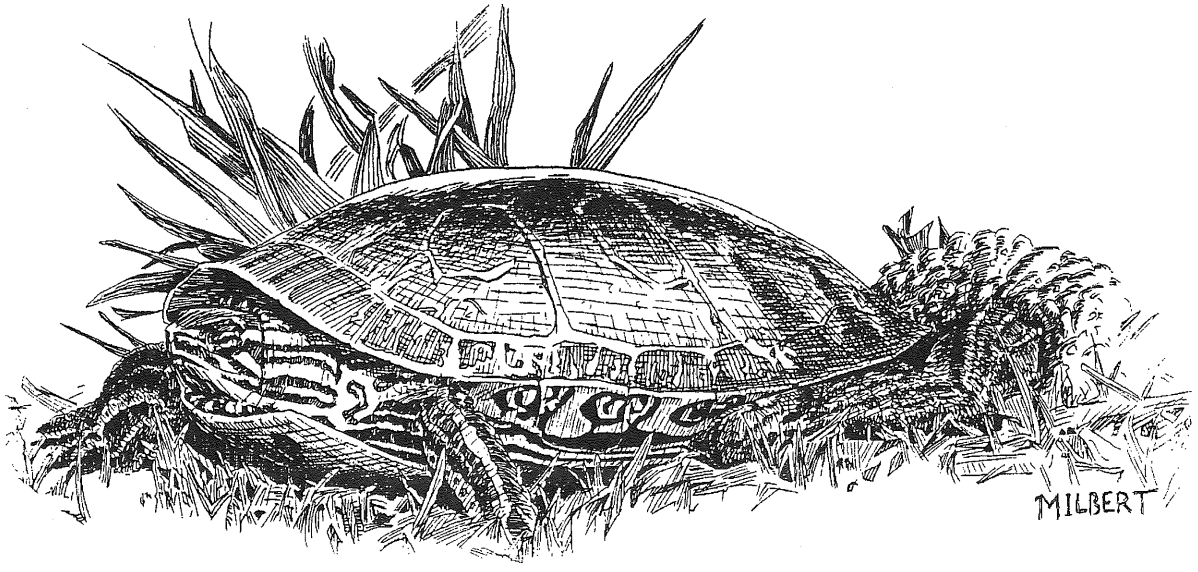
Rivers and Lakes

The aquatic environments, too, were essential threads in the tapestry of the Big Woods ecosystem. Parts of three rivers flow through the region: the Minnesota, the Cannon, and the Crow. Lakes vary in size from small ponds to Lake Minnetonka. Northern Pike, walleye, bass, panfish, and bullheads, as well as various rough fish are some of the principal inhabitants.

Altering adjacent land areas has increased sediments and nutrients in rivers and lakes, with a resulting loss in the diversity of native aquatic plants. Migratory water bird populations have in turn been affected by loss of food and habitat. The introductions of exotic species such as carp and curly leafed pondweed have had a significant impact as well.

A Note on Natural Communities

The natural communities described here are not equally specific. "Wetlands" is a general heading for at least half a dozen distinct natural communities which occur in the Big Woods region. Prairies come wet or dry, or mixed with brush. For lack of space, other special communities of cliffs, rock outcrops, and beaches are not even mentioned. Keep in mind also that the lines between the parts of an ecosystem are not hard and fast. You may encounter slightly different natural community concepts and names as you study further.



LOOKING AHEAD

The Big Woods of the future - what will it be like? Each parcel of land has an impact on the larger landscape. When a fencerow is removed, a wildlife corridor may be severed; when a woodlot is opened to grazing, certain plants may lose their last foothold for miles around; when a new home is built in a forest interior, the long driveway may provide predator access to the nesting sites of regionally rare songbirds.

On the other hand landowners can make management decisions which connect or enlarge forest fragments, improve the biological diversity within existing plant communities on their land, or instituite practices having a positive affect on water quality in their area (figure 10).

What follows are a number of practical suggestions for managing that portion of the Big Woods ecosystem that is currently in your care.

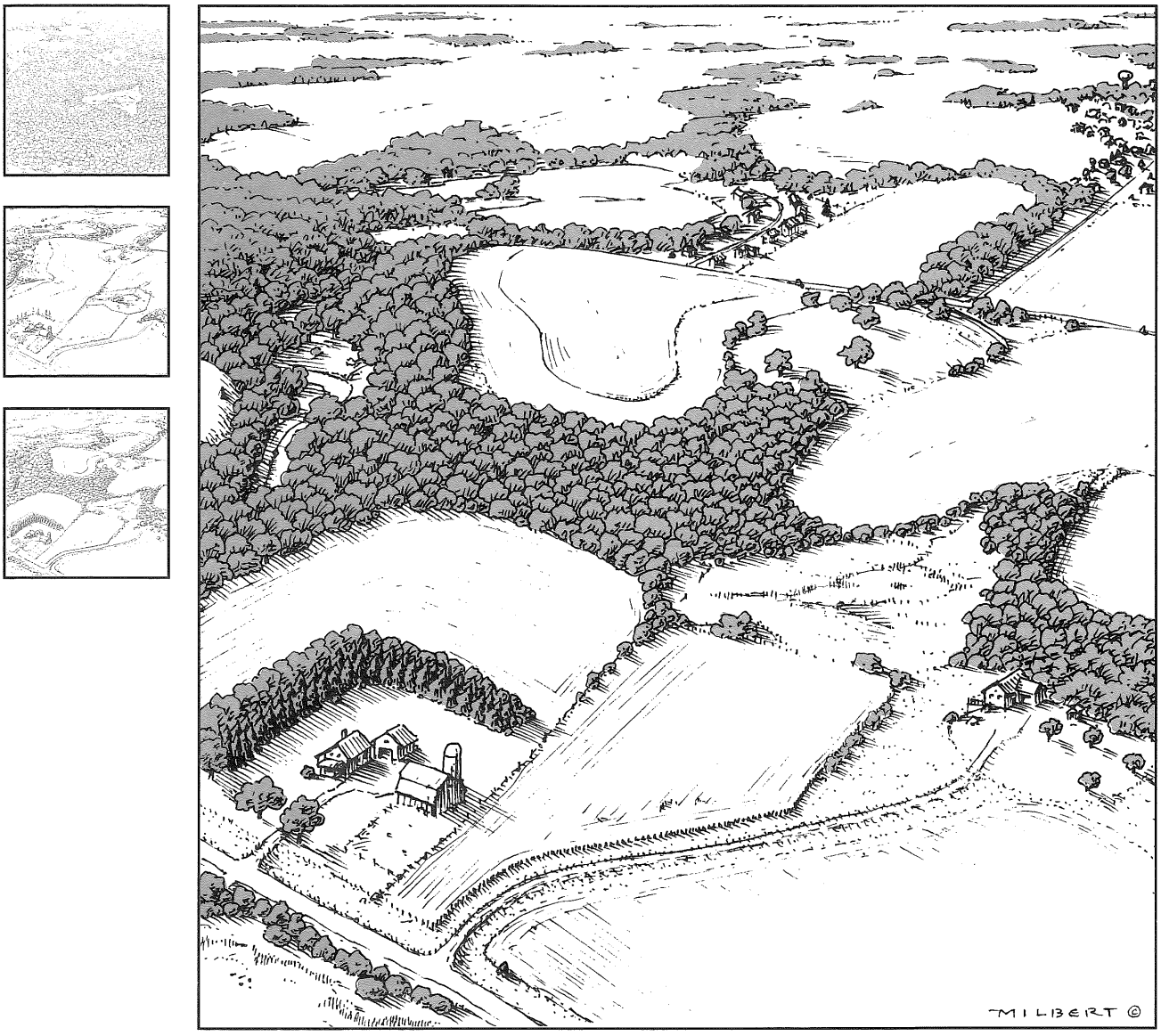


Fig. 10 A vision of a future Big Woods landscape. Forest fragmentation has been reversed to increase biological diversity and hold vulnerable soil, but sustainable agricultural use is still prevalent.

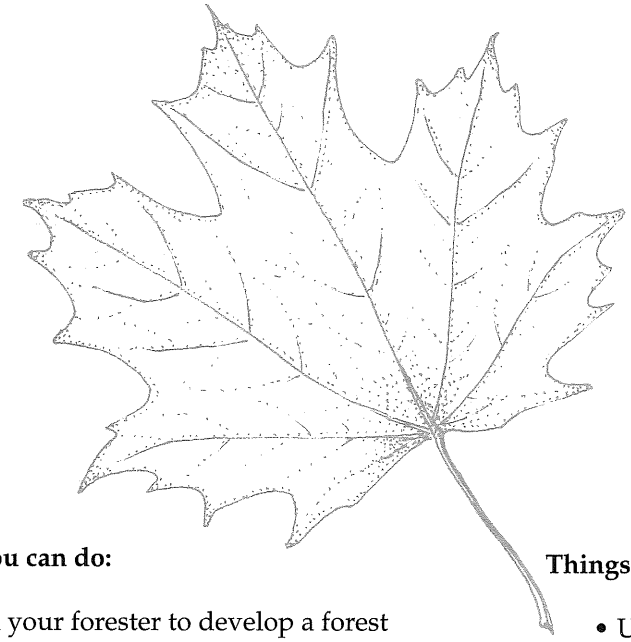
1. FOREST PRESERVATION

...protecting the integrity of unaltered forests and preventing further losses

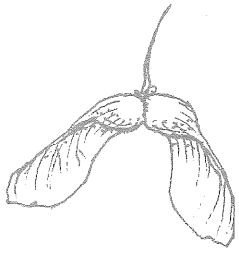
Pristine forests are made up of a great variety of plants, animals (including migratory songbirds), and microorganisms in a state of dynamic interrelationship. Very few tracts of truly pristine forests remain. Besides the educational and recreational opportunities they afford, pristine forests provide us with the opportunity to study the inner workings of intact historic plant communities, and to use the resulting understanding to help restore and better manage altered forests.

The combined effects of rural homebuilding, urban, suburban, and industrial expansion, highway and utility developments, livestock grazing damage, agricultural expansion, and improper logging practices are threats to the few fragments of pristine forest which remain.

CONTACT: Local Minnesota Department of Natural Resources (DNR) Forester



Sugar Maple



Things you can do:

- Call your forester to develop a forest stewardship plan for your property.
- Use County Biological Survey information for guidance.
- Retain all existing forest land. Prevent conversion to nonforest uses.
- Talk with local government officials about preserving pristine areas.

2. FOREST MANAGEMENT

...improving the quality and quantity of a broad range of forest benefits in existing forests

The Big Woods ecosystem cannot be conserved effectively in parks and protected preserves alone. Linking forest management on private lands with conservation of the ecosystem means protecting the forest environment while still meeting the landowner's need to use the forest to produce timber, fuelwood, and maple syrup. The sale of forest products can be a source of income for the landowner while helping to diversify the local economy.

Good forest management sustains a healthy forest with productive soils and provides for a variety of forest types, forest age classes, and wildlife habitat.

CONTACT: Local Minnesota DNR Forester, Forestry Consultants

Things you can do:

- Use Best Management Practices when harvesting, thinning, and planting to control erosion and protect waters.
- Manage for multiple species rather than a single species.
- Maintain a diversity of forest types and age classes.
- Think beyond the boundaries of your own woodlot and consider how it fits in with neighboring and regional forests.

3. FOREST RESTORATION...

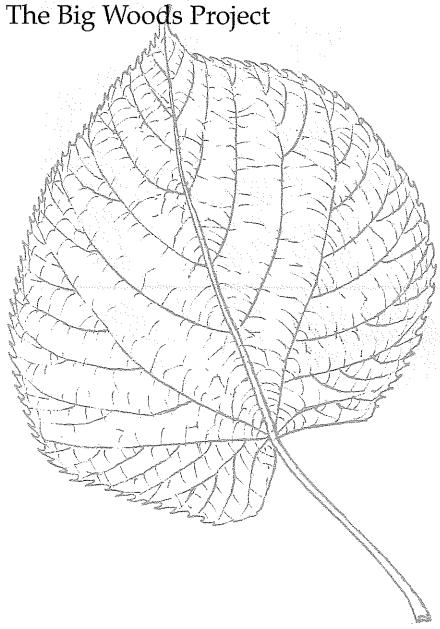
...assisting the return of historic forest communities where such forests formerly existed

A forest community type is matched to the soils and moisture conditions of an altered site. Trees and possibly shrubs and herbaceous plants are planted and cared for. Restoration is a long term process which includes both management activities and natural processes.

When choosing the site, consider the additional benefits forest restoration will produce for highly erodible lands and streamside locations. Try to close gaps within forests and connect forest fragments.

Many species in the Big Woods region that are considered endangered, threatened, or declining are restricted to specific forest type, or forests of a certain size. Forest restoration is one way to address these habitat concerns.

CONTACT: The Big Woods Project



Thing you can do:

- Contact your forester to develop a restoration plan which includes site selection and preparation, species selection, and maintenance.
- Study soil types, adjoining forests, and historical information for clues to the type of forest that will thrive in your area.
- Obtain native planting stock through the DNR nurseries, Soil and Water Conservation Districts, parks, and local nurseries.

4. UPLAND WILDLIFE HABITAT IMPROVEMENT

...protecting and managing oak savannas brushlands, and grasslands for wildlife

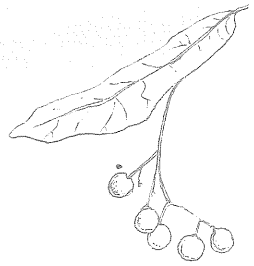
Oak savannas, thickets, and prairie grasslands were once a vital part of the Big Woods ecosystem. Today these plant communities are greatly reduced in extent, and with them, the upland wildlife dependent on this habitat type.

Upland wildlife habitat is maintained by rotational grazing, mowing, or controlled burning. Trees are a detriment to grassland wildlife as they provide perches for birds of prey. Native grasslands improve soil fertility, keep soil intact, and provide excellent pasturage and hay.

The few remaining upland habitat sites should be preserved, and in areas where they are no longer present, restoration should be considered.

CONTACT: Minnesota DNR Wildlife Biologist

American Basswood

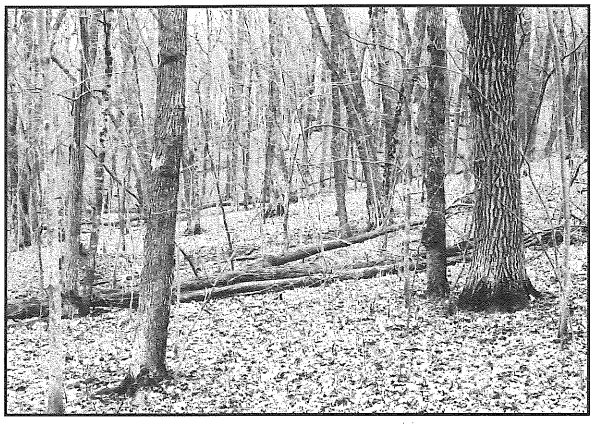


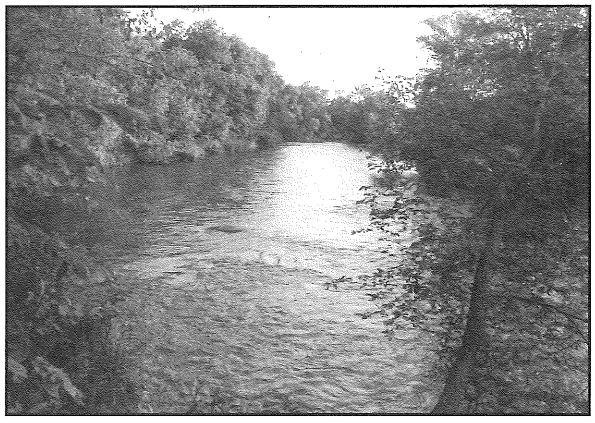
Things you can do:

- Inspect pastures, brushlands, and open woodlands to identify remnant prairies.
- Identify dry soils, steep slopes, roadsides, streamsides, and uplands adjacent to wetlands for restoration.
- Attend demonstrations on and implement prescribed burning and rotational grazing techniques.
- Avoid tree planting in or near grassland habitat.

5. WETLAND HABITAT MANAGEMENT

...protecting, restoring, and enhancing a variety of wetland habitats





Wetlands of many types and sizes were once abundant in the Big Woods. Their diversity ranged from wet meadows, fens, and swamps, to the more common cattail marsh. Temporary wetlands play important roles in fish spawning, amphibian reproduction, and shorebird and waterfowl migration. Wetlands store surface runoff, and reduce flooding damage. They provide food, shelter, and habitat for fish and wildlife, and offer numerous outdoor recreation opportunities. Wetlands enhance the natural beauty and the biological diversity of the Big Woods ecosystem.

CONTACT: Local Soil and Water Conservationist (Soil and Water Conservation District-SWCD)

Things you can do

- Reconsider any plans to tile wet areas.
- Plug drainage ditches and tiles to restore drained wetlands; build earthen dikes to impound water if necessary.
- Fence out livestock to improve a wetland's habitat value.
- Apply for financial and technical assistance to protect, enhance, or restore wetlands.

6. WATER QUALITY IMPROVEMENT

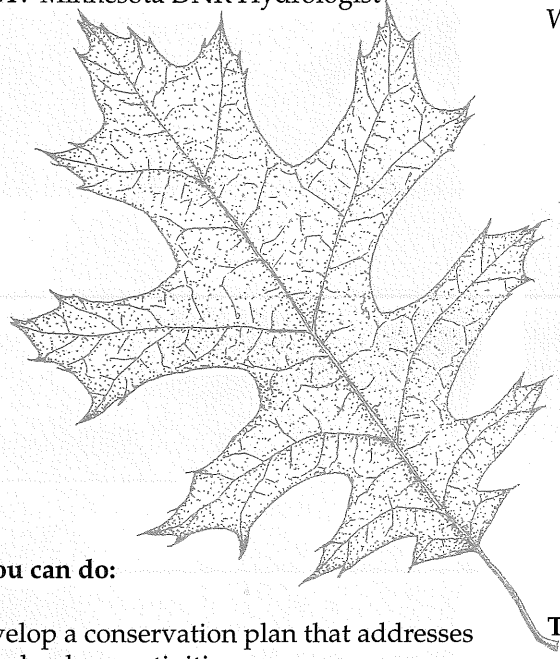
...using "Best Management Practices" (BMPs) to address pollution from each land use source

The rivers and lakes of the Big Woods are some of the region's greatest natural resources. High water quality depends on the use of BMPs by all citizens using land within the region. What is done on land affects area waters.

Agricultural and urban runoff contribute to water pollution more or less constantly. Construction activities and forestry practices can produce significant water pollution in a short period.

BMPs reduce pollution, improving water quality for consumption, recreation, and fish and aquatic habitat. Buffer zones of vegetation filter runoff, absorb nutrients, trap sediments, and provide cover and habitat for upland animals.

CONTACT: Minnesota DNR Hydrologist



Northern Red Oak

Things you can do:

- Develop a conservation plan that addresses your land use activities.
- Permanent vegetative filter strips are an important element of most plans.
- Adopt erosion control measures, especially on construction sites.
- Limit use of fertilizers, pesticides, and herbicides on all lands.
- Make sure animal feedlot operations and septic systems comply with laws and regulations.

7. COMPATIBLE USE FARMING

...conserving native plants and animals within agricultural land use areas

In agricultural areas, many native plants and animals live in small habitat patches along field edges and fencerows, within windbreaks, shelterbelts, and farm groves, in grass waterways and terraces, hayfields and pastures, and other "odd areas" of semi-natural habitat. These attractive areas enhance the recreational uses of your property. They provide for native plant and animal diversity. They protect erodible soils, buildings, and living areas from strong winds. Insect eating birds that live in windbreaks provide a natural biological control for crop pests.

CONTACT: District Conservationist (Soil Conservation Service-SCS)
Local Soil and Water Conservationist (Soil and Water Conservation District-SWCD)

Things you can do:

- Employ conservation and environmental farming practices.
- Begin by assessing plant and animal resources already present within the various habitat components.
- Develop a plan to protect and enhance the habitat value of each component.
- Favor native plant species that provide food and shelter for wildlife.

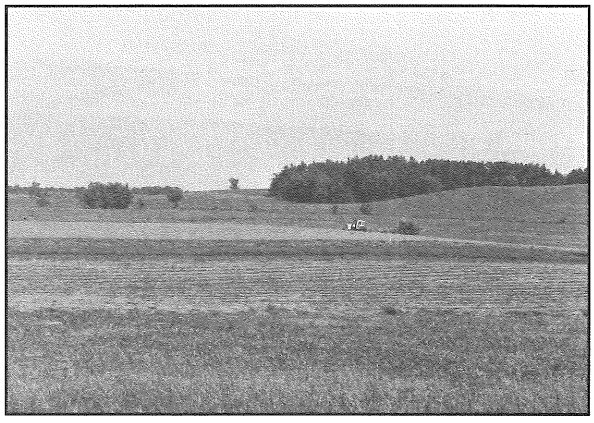
8. SUBURBAN AND RURAL HOMESITE DEVELOPMENT

...employing strategies for reducing the impact of development on the Big Woods ecosystem

The closeness of the Big Woods region to the Twin Cities, and the attractiveness of the remaining natural areas, creates pressure for residential development. Replacing native habitat with homes and lawns is obviously detrimental to the ecosystem. The driveways, powerlines, wider roads, and even outdoor pets which come along with new residences all increase the impact.

The benefits to those living close to nature include privacy, outdoor recreation and the enjoyment of wildlife. If no natural areas are destroyed, restoration efforts around a new homesite can add to adjacent forests (wetlands, grasslands, ect.) and have a net beneficial effect.

CONTACT: The Big Woods Project Volunteer



Things you can do:

- Select homesites at edge of woods or outside of woods.
- Leave as many trees as possible on your lot, along with the natural wildflowers growing beneath them.
- Protect the root systems of trees you wish to save during construction.
- Consider how the scenic values of the site - for yourself and others - will be affected by your building plans.
- Use native plants to blend your home landscape with the surrounding habitat.

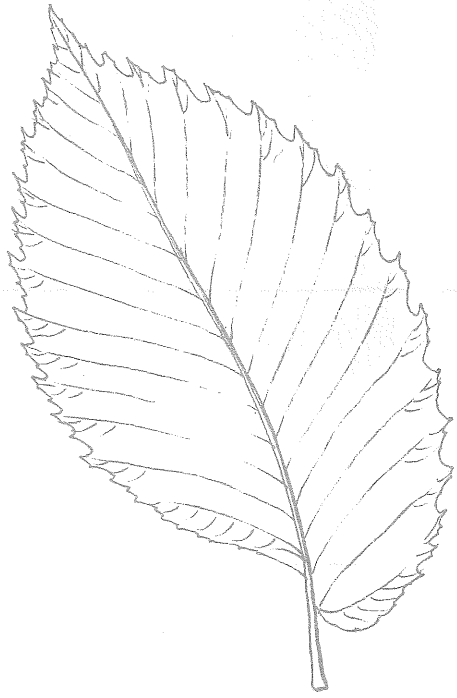
9. PROBLEM SPECIES CONTROL

...removing and preventing the introduction of problem species to encourage the health of historic plant communities

Problem species are usually exotics (species not native to the area) that spread aggressively. They can overtake forests, prairies, wetlands, and other habitats, displacing native plants and animals. The control of problem species preserves the biological diversity of the site and preserves the natural process of succession by native species. Native species also provide a wider range of food and cover for wildlife.

By preventing the introduction of problem species, the need for chemical or labor intensive removal techniques can be kept to a minimum.

CONTACT: Minnesota DNR Parks Resource Specialist



American Elm

Things you can do:

- Identify the problem species in your area, such as European buckthorn, Tartarian honeysuckle, purple loosestrife, milfoil, and carp.
- Monitor and control problem species as needed.
- Avoid using problem species in landscaping and plantings.

10. RARE SPECIES MANAGEMENT

...protecting rare species and enhancing their habitats to promote their stabilization and expansion

Species become rare primarily through loss of habitat, habitat degradation, exploitation, and over- harvesting. All species, whether rare or common, contribute to the biological diversity of the region, but rare species are of special concern because of the more imminent danger of their becoming lost.

The best places to look for rare species are where the land and vegetation have not been altered by plowing, grazing, heavy logging, or draining. Landowners can play an important role in conserving the natural heritage of the Big Woods region by searching for rare native species on their property, becoming informed about their habitat needs, then acting to protect them.

CONTACT: Minnesota DNR Non-game Wildlife Biologist

Things you can do:

- Check to see if a biological inventory of rare plants, animals, and habitats has been completed for your county.
- If rare species or habitats are present on your property, contact the DNR and the Department of Agriculture about implementing a plan to protect and maintain them.
- Contact local naturalists to help with identification.

11. ECOSYSTEM LEVEL STEWARDSHIP PLANNING

...fitting your land into the bigger picture and joining with others to protect and enhance larger or regionally significant areas

Stewardship planning is planning for the larger landscape - in this case the Big Woods ecosystem - by everyone having an interest in the area. Individual landowners seek to bring their management plans into harmony with the management plans for surrounding lands and with the historic conditions of the areas.

But they go further. They join with others in their township or county or region as a whole to identify and then work to protect remnants and rarities of the landscape shared by all. An example would be the establishment of larger blocks of forest, restoring rare forest interior habitats and their rare residents, such as the scarlet tanager.

The landscape stewardship approach gives a new level of value and clear direction to individual management efforts. A new sense of community with neighbors can emerge. And recreational opportunities can expand in public preserves created by joint effort.

CONTACT: Local Minnesota DNR Forester or Forestry Consultants

Things you can do:

- Work to bring ecosystem considerations into zoning ordinances.
- Help identify and work for public purchase of threatened remnants and other important habitats.
- Encourage and be an example to others of compatible development.
- Consider bonding as a way to preserve natural resource areas, for example: Voters in Eden Prairie recently approved bonding that will result in a $9.30 average increase in annual property tax per household in order to acquire nearly $2.0 million natural resource areas in the city.

Summary

The historical Big Woods ecosystem, though never static and much altered today, is the best point of reference for the stewardship of its region. The range of natural communities which made up the ecosystem, from forest to wetland, grassland to lake, had developed into a rich mosaic of interrelationships which produced a great wealth of biological diversity and environmental health. Its dominant community, the maple-basswood forest, is in itself a mosaic of levels - canopy, subcanopy, shrub, and herbaceous ground layers - each providing preferred habitat for a variety of birds, animals, insects, and microorganisms.

Private landowners are the chief stewards of the fragments which today remain. It is hoped that you will take an ecologically sound approach to your management activities in order to increase biological diversity. In doing so you will have more to enjoy and profit from, and the deep satisfaction that you have reversed the loss of our natural heritage within your control. You will have left your land a little richer for the future.

THE BIG WOODS PROJECT

In order to safeguard the Big Woods species and ecosystem, The Big Woods Project was formed. The goals of the Project include:

- **to protect the Cannon River Wilderness Area, Seven Mile Woods, Nerstrand Big Woods State Park, and other Big Woods remnants.**
- **to improve habitat for plant and animal species dependent upon the Big Woods ecosystem such as the scarlet tanager and other migratory songbirds.**

The Big Woods Project provides many opportunities for concerned citizens to become involved in helping to protect and promote the Big Woods ecosystem.

Recommended Reading

Daubenmire, R.F. (1936). The 'Big Woods' of Minnesota: its structure, and relation to climate, fire, and soils. *Ecological Monographs*, 6, 233-268.

Grimm, Eric C. 1983, Chronology and dynamics of vegetation change in the prairie-woodland region of southern Minnesota, U.S.A. New Phytologist 93:311-350

Grimm, Eric C., 1984, Fire and Other Factors Controlling The Big Woods Vegetation of Minnesota In The Mid-Nineteenth Century, Eric C. Grimm, Ecological Monographs, 54(3), 1984, pp.291-311

For Further Information

You can take an active role in protecting the Big Woods ecosystem by contacting The Big Woods Project, or your local Minnesota Department of Natural Resources area office, or the Minnesota Chapter of The Nature Conservancy.

The Big Woods Project, 328 Central Avenue, Faribault, Minnesota 55021 Telephone No. 507-332-0525

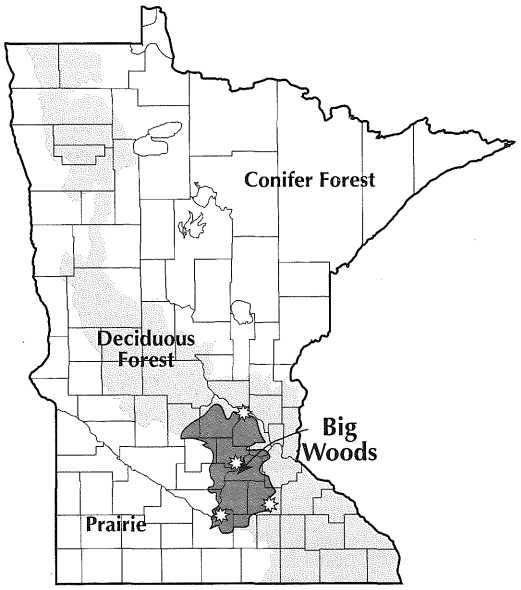
The Minnesota Department of Natural Resources 1-800-766-6000.

DNR Forestry
Faribault Area (Region 5)
1400 Cannon Circle
Faribault, MN 55021
Phone: (507)332-3247

DNR Forestry
Mankato Area (Region 4)
410 Jackson Street STE 180
Mankato, MN 56001
Phone: (507)389-6713

DNR Forestry
St. Cloud Area (Region 3)
3725 12th St. N.
Box 370
St. Cloud, MN 56302
Phone: (612)255-4276

DNR Forestry
West Metro Area (Region 6)
219 E. Frontage Rd.
Waconia, MN 55387
Phone; (612)442-2317



THE BIG WOODS FACT SHEET

Overview

Topography is characteristically gently to moderately rolling across this region. Soils were formed in thick deposits of gray calcium-rich till left by the retreat of the last glaciers. Elm, sugar maple, basswood, and red oak were dominant trees in this mostly forested region. Presently, most of the area is farmed.

Elevation

Elevation ranges from 750 to 1150 feet above sea level.

Area

1,978,584 acres or nearly 3100 square miles.

Climate

The annual precipitation ranges from 29 inches to 31 inches. Growing season in 145-150 days.

Bedrock Geology

Depth to bedrock is from 100-400 feet. Underlying rocks are sedimentary rocks that include dolomites, some sandstone and shale.

Landforms

The primary landform is an end moraine featuring rolling hills and many lakes and marshes. This feature was created along the margin of the ice sheet as it melted back over 10,000 years ago.

Soils

Soils are mostly loams, with textures ranging from loam to clay loam. Most are forest soils, although some prairie soils are also present.

Hydrology

The lower Minnesota (Mankato to the Mississippi River), the Cannon, and the Crow Rivers are the principal watersheds in this landscape. All are tributary to the Mississippi River. Many of the rivers played an important role as firebreaks in the presettlement Big Woods. Stream erosion is just beginning to establish a drainage pattern in this region, and numerous closed, undrained depressions still exist.

Presettlement Vegetation

Maple-basswood forest was the dominant presettlement vegetation and together with oak woodland made up 80% of the vegetation. Wetlands, lakes, and prairie made up the remaining 20% of the surface area. Maple-basswood forests were most common in sites well protected from fire; oak woodlands were most common on the margin of the Big Woods, between the maple-basswood forests and the prairie.

Natural Disturbance

Fire was the primary natural disturbance in the oak woodlands and prairie portion of the landscape, however it was less of a factor within the forested areas. Gap disturbance, the loss of one or a few trees in the canopy, due to insects, disease, or windthrow was the characteristic disturbance within the forest. Occasionally, a large scale windstorm opened larger portions of the canopy.

Boundaries

The boundaries of the Big Woods were determined largely by fire. Firebreaks, such as rivers, wetlands, and rough topography protected the Big Woods from fires emanating from the prairies.

Present Land Use

Over 60% of the present landscape is agricultural land. Forestland occupies about 7%, urban areas 14%, wetlands 7%, and permanent water 6%.

Rare Plants and Animals

Rare plants include the Minnesota dwarf trout lily, which is found in southeastern Minnesota and nowhere else in the world. Rare species in this landscape include 32 plants, 11 birds, 5 mammals, 4 fish, 9 reptiles and amphibians, and 6 invertebrates.

Natural Areas

Natural areas include Minnesota Valley Trail, Lake Maria State Park (SP), Sakatah Lake SP, Nerstrand Big Woods SP, Townsend Woods Scientific and Natural Area (SNA), Wolsfeld Woods SNA, Mary Schmidt Crawford Woods SNA, Savage Fen SNA. Many additional naural areas occur within county parks, especially within the Hennepin County Park Reserve District.

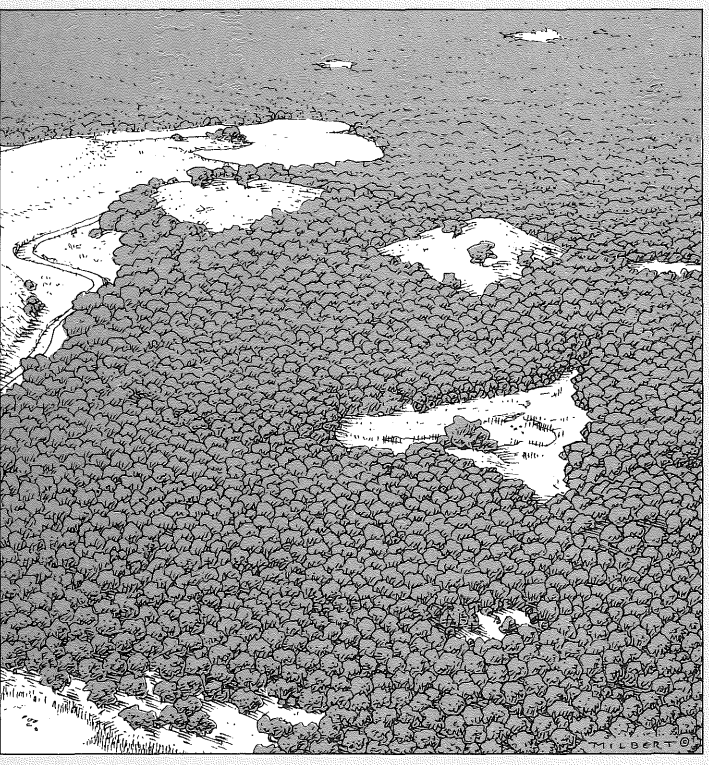
Wildlife Management Areas

There are over 45 State Wildlife Management Areas. Additionally, the Minnesota Valley National Wildlife Refuge and Recreation Area is located minutes away from downtown Minneapolis and St. Paul.

Conservation Concerns

The primary conservation concern is forest fragmentation and the loss of biological diversity. A related concern is continual development pressure on the remaining natural areas. Another concern is water quality in the rivers and lakes.

The Big Woods



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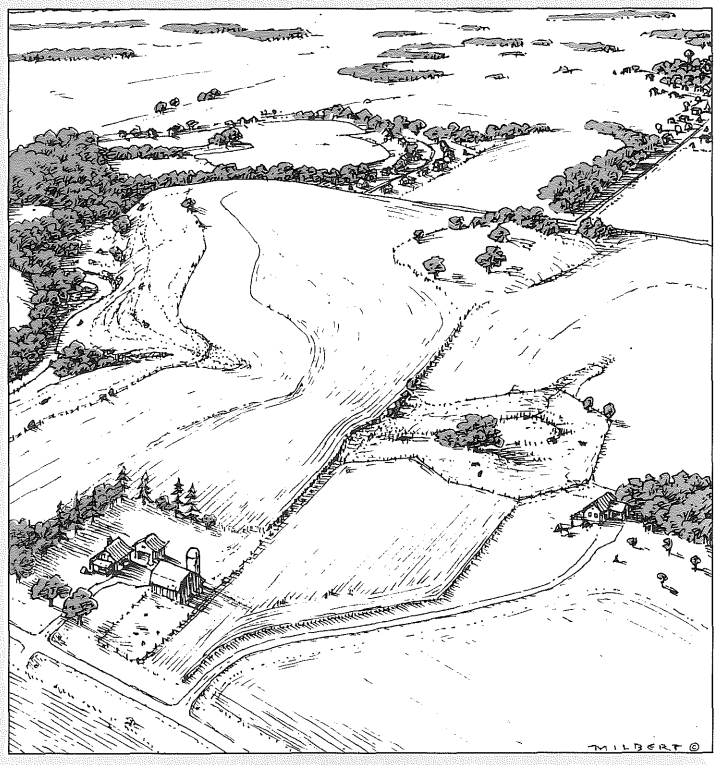

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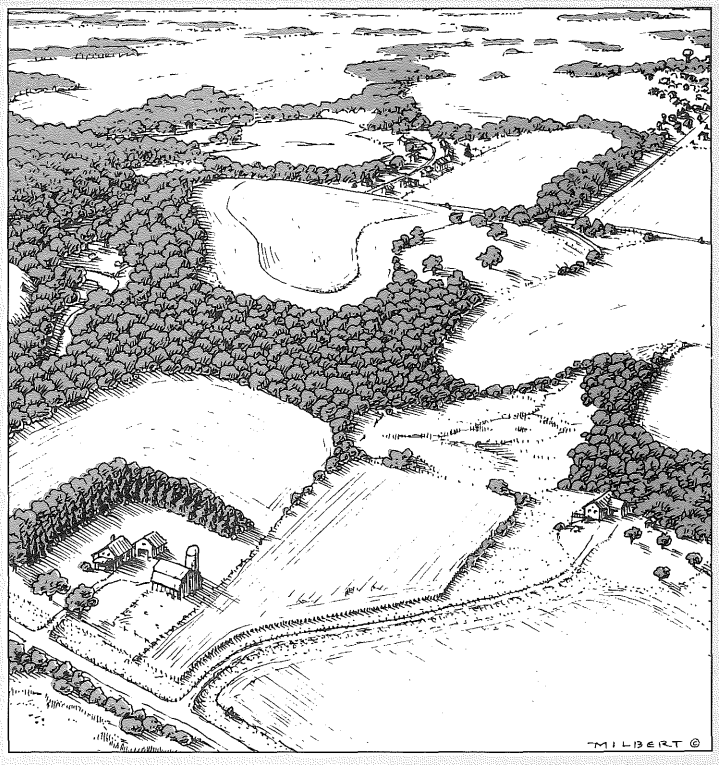

Tomorrow?