

# Natural Vegetation of Minnesota

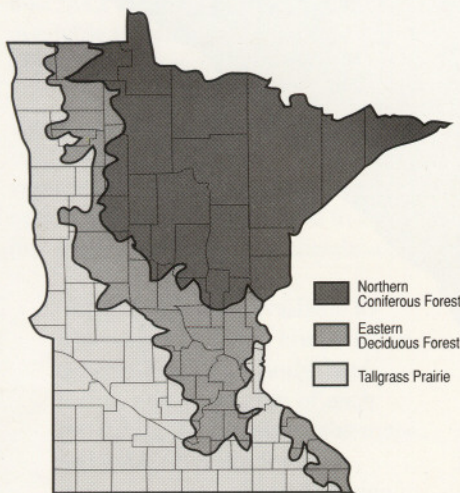
At the Time of the Public Land Survey  
1847-1907





**P**resettlement Minnesota. Imagine. "...rolling prairies... undulation upon undulation as far as the eye can reach ...a view of peculiar sublimity..." wrote H.D. Ruggles of the western Minnesota landscape in 1835. Early accounts of the towering pines in the north abounded with equally vivid impressions. And in the south, French explorers extolled the vast forests of maple, basswood, and elm, calling them the "Big Woods."

The early European settlers had described, in astonished detail, the three major biomes that meet in Minnesota: tallgrass prairie, northern coniferous forest, and eastern deciduous forest.



The vegetation types that defined these biomes were distributed on the landscape according to climate, soil, and landform patterns. Natural disturbances such as fire, severe drought, windstorm, and insect outbreaks modified the vegetation on a local and regional scale. Of these, fire was the most important disturbance agent.

Frequent fires—started by lightning and by Indians for hunting and other purposes—helped to maintain the species composition and treeless structure of the tallgrass prairie. Where fires were less frequent or intense, trees invaded the prairie in scattered groves to form woodland and parkland communities. This created a vegetational ecotone known as the prairie/forest border. Within the deciduous forest biome, where firebreaks such as rivers, lakes, and rough

topography prevented the spread of fires, a dense forest of maple, basswood, and elm developed. Within the coniferous forest biome, fires created a mosaic of forest types from young postfire stands of aspen-birch and jack pine, to old-growth stands of white and red pine, spruce-fir, northern white cedar, and maple-basswood-yellow birch forest. This complex interaction of fire with climate, soils, and topography created a dynamic landscape—a constantly shifting mosaic of vegetation types.

## Vegetation Types of the Prairie and Deciduous Forest

### Upland Prairie and Prairie Wetland

Tallgrass prairie, at the time of the public land survey in the 1850s, covered one-third of the state. It occupied a wide variety of landforms, including beach



Prairie Coteau Scientific and Natural Area, Pipestone County

ridges and swales, glacial lake beds, morainic hills, steep bluffs, and rolling till plains. Along these landforms, important differences occurred in the plants and animals that compose the prairie ecosystem. The most striking indicator was the predictable change in dominance of a few major prairie grasses. The distribution pattern of these grasses coincided with differences in soil moisture levels related to topography. In general, prairie cordgrass and bluejoint dominated the wet lowlands; big bluestem and Indian grass occupied the deep fertile soils of the moist uplands;

and little bluestem and sideoats grama occurred on the thin soils of dry uplands.

Throughout the prairie biome, numerous wetland communities dominated by sedges and rushes, rather than grasses, were interspersed with upland prairie. The glacial moraine landforms of the prairie region were ideally suited for wetland formation; their hilly knob and kettle-type topography abounded with prairie pothole marshes.

### Aspen Parkland

The aspen parkland formed an ecotone between the prairie and coniferous forest of extreme northwest Minnesota and



Dittmer Wildlife Management Area, Mahnomon County

adjacent Canada. It covered vast acreages within the poorly drained flatlands left by Glacial Lake Agassiz. Sometimes referred to as brush prairie, the aspen parkland was a fire-maintained mosaic of wet prairie, sedge meadow, shrub thicket, and aspen groves.

### Oak Woodland and Brushland

The oak woodland and brushland was a common ecotonal type between the prairie and deciduous forest. Fire, more than landform type or climate, was the significant factor influencing the position and extent of this community.

The oak woodland and brushland vegetation type has often been referred to as savanna. However, in Minnesota the image of a tallgrass prairie dotted with trees to create an orchard-like appearance is more myth than fact. Careful study of the original public land survey records has led to a new interpretation. The oak woodland and brushland ranged from small groves of trees intermixed with open prairie to a chaparral-like commu-





Cedar Creek Natural History Area, Anoka County

nity of scrub forest and dense shrub thicket. The structure of the community was largely determined by soil conditions and fire frequency. The oaks, especially bur oak and northern pin oak, were the dominant trees. In the southeast, white oak and black oak were also common.

### Floodplain Forest

Floodplain forests occupy both major and minor water courses throughout the state. They are especially well developed in the valleys of the Mississippi, Minnesota, and Red rivers. The lowland sites occupied by these forests are subjected to periodic flood and drought. Spring



St. Croix River, Chisago County

floodwaters enrich the soil as they deposit silt over the forest floor. Silver maple, American elm, green ash, black willow, and cottonwood are the dominant trees and poison ivy and stinging nettle the characteristic understory plants.

### Maple-Basswood Forest

Minnesota's maple-basswood forests, dominated by elm, basswood, sugar maple, and red oak, occur at the western edge of the deciduous forest biome of eastern North America. The largest continuous area of maple-basswood forest in Minnesota at the time of the

original public land survey covered over 3,000 square miles in the south-central part of the state. The early settlers called this area the "Big Woods." Smaller areas of maple-basswood occurred in the rugged, stream-dissected lands of southeastern Minnesota and in the west-central part of the state. The boundaries of this forest were in large part controlled by the frequency of fire. The dominant



Wolsfeld Woods Scientific and Natural Area, Hennepin County

trees are highly fire-sensitive and were restricted to areas where natural fire-breaks such as rivers, lakes, and rough topography prevented the spread of fire from the adjacent prairie lands.

## Vegetation Types of the Conifer Forest

### Northern Hardwood Forest

In Minnesota, the northern hardwood forest is dominated by sugar maple, basswood, yellow birch, and red oak. Conifers, particularly white pine, northern white cedar, and balsam fir are often found scattered through the forest. Due to the fire-sensitivity of the dominant trees, this forest association was



Tettegouche State Park, Lake County

relatively rare in the state. It was generally restricted to rich, morainic soils where fire frequencies were low. The most conspicuous area of northern hardwoods was the narrow belt along the North Shore Highlands that stretches from Duluth to the Canadian border. It was also found in fire-protected pockets across north-central Minnesota, as far west as Cass Lake.

### Great Lakes Pine Forest

The Great Lakes pine forest occurs in Minnesota primarily on thin glacial till



Boundary Waters Canoe Area, Cook County

over bedrock in the Canadian-Minnesota border lakes area and in the gravelly moraines and sandy outwash plains in the north-central part of the state. This forest is defined by its characteristic trees—eastern white pine and red pine.

Historically, tree composition and age structure of the pine forest were largely determined by natural fire cycles. Fires of varying frequency and intensity created a dynamic ecosystem composed of early postfire stands of jack pine and red pine and mature old-growth stands of white pine. In general, red pine was more abundant than white pine and occurred on coarsely-textured, dry sites prone to fires. White pine stands occurred on the mesic sites of lake margins and lower slopes less subject to fires.

### Jack Pine Forest

This forest community occurs on the driest, least fertile soils of the pine region. It is especially prevalent on sandy outwash plains in north-central Minnesota and on bedrock outcrops north of Lake Superior. Jack pine grows in





Boundary Waters Canoe Area, Lake County

pure stands or in mixtures with aspen, northern red oak, and red pine. Most natural stands originate following fire. Fire opens the habitat to direct sunlight and exposes a mineral soil seedbed—both requirements for jack pine reproduction. The dry, open conditions under the jack pine canopy allow for a variety of understory plants. Ericaceous shrubs such as wintergreen and blueberry are especially common. On deeper soils, hazel may form impenetrable thickets, whereas on rocky balds, a dense blanket of feather mosses may be the only understory.

### Boreal Hardwood-Conifer Forest

The boreal hardwood-conifer forest in Minnesota is a southern extension of the large boreal forest of Canada. This forest type occupies much of northern Minne-



Suzy Island Preserve, Cook County

sota—a region characterized by a short, moist growing season and deep snow. The dominant tree species, balsam fir, white spruce, black spruce, trembling aspen, and white birch occur in pure or mixed stands.

Species composition varies considerably in response to differences in site conditions and natural fire cycles. Balsam fir, owing to its great shade tolerance, tends to form extensive stands in the absence of frequent fires. Natural disturbances, including fire, wind, and spruce budworm epidemics often result in extensive areas of even-aged stands of spruce-fir or aspen-birch forest. Far less extensive, and found mainly in extreme northeast Minnesota, old-growth white cedar forests occur on fire-protected uplands.

### Peatland

Extensive peatlands blanket the nearly flat landscape left when the waters drained from the ancient glacial lakes of north-central Minnesota. Scattered throughout northern Minnesota, smaller



Winter Road Lake Peatland, Beltrami County

peatlands occur in the basins of glacial moraines. Although there were several attempts—mostly unsuccessful—to drain the largest peatlands, the vegetation mosaic of these areas is relatively unchanged since presettlement times.

The extensive peatlands that developed in ancient glacial lake plains exhibit a variety of bog, fen, and swamp vegetation. Bogs are forested with black spruce or tamarack, or are open and dominated by sphagnum mosses, sedges, and low ericaceous shrubs. They occur on nutrient-poor, acid peat deposits. In

contrast, fens and swamps develop on mildly acid to highly alkaline peat deposits affected by mineral-rich groundwater. Fens are composed of grasses and sedges, while swamps are dominated by woody plants—either coniferous trees (e.g., northern white cedar) or deciduous trees (e.g., black ash).

### Changes in the Natural Vegetation Since Settlement

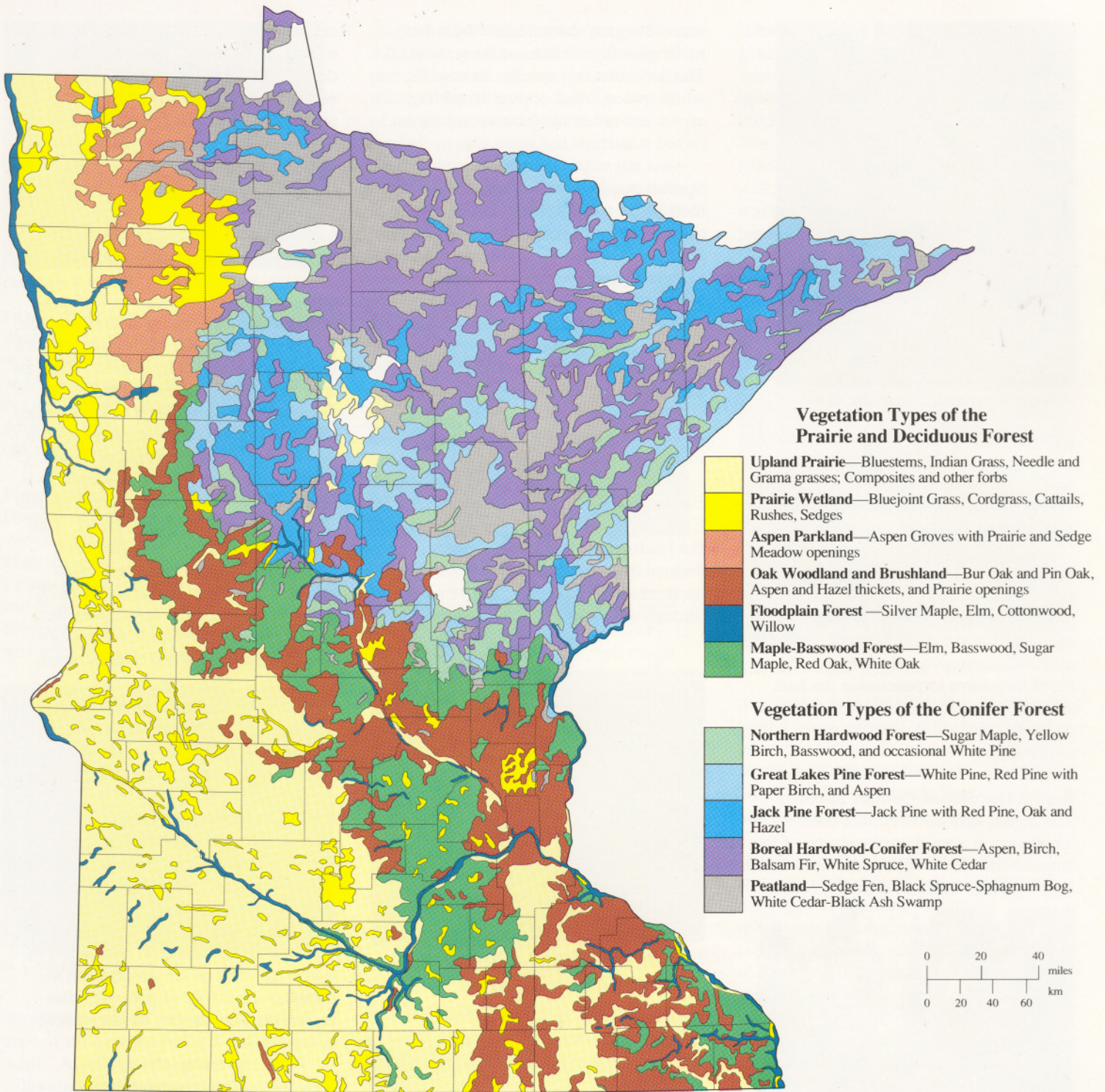
After more than a century of European settlement, nearly all the natural communities composing the three major biomes have been substantially altered. The vast tallgrass prairie that once covered one-third of the state has been reduced to less than one percent of its original expanse. The largest continuous area of climax deciduous forest—the “Big Woods”—is now restricted to small, scattered islands of forest surrounded by cropland. The great stands of virgin pine that once defined the North Woods have been replaced by essentially pure forests of aspen and birch. And throughout the state more than nine million acres of wetlands have been lost to agriculture.

Examples of the above vegetation types that still maintain their characteristic natural features are now uncommon on the Minnesota landscape.

Interest in protecting these natural environments as part of the state’s historical and biological heritage began in 1891 when Itasca State Park was established to preserve remnants of the primeval pine forest. Today, public resource agencies and private conservation organizations are cooperating to establish a network of preserves that represents Minnesota’s extant natural ecosystems.

Developing such a network depends on accurate ecological information. Comprehensive data on the distribution and status of intact biotic communities is now being compiled by the Minnesota County Biological Survey. Initiated in 1987, and conducted in cooperation with the Natural Heritage and Nongame Wildlife Programs, the survey systematically gathers, county-by-county, information on Minnesota’s rare natural habitats and the plants and animals they shelter. ■





## The Natural Vegetation of Minnesota at the Time of the Public Land Survey: 1847-1907

This map was adapted by Barbara Coffin of the DNR, Natural Heritage Program from *The Original Vegetation of Minnesota*, a map compiled in 1930 by F. J. Marschner from the U. S. General Land Office Survey Notes and published in 1974 under the direction of M. L. Heinselman of the U. S. Forest Service. It was produced by the Cartography Laboratory of the Department of Geography, University of Minnesota.

Published by the Natural Heritage Program, Minnesota Department of Natural Resources, 1988©



## Notes on the History of the Map

The map presented here is a modification of the 1974 published version of F.J. Marschner's map, *The Original Vegetation of Minnesota*. Marschner, a research assistant in the Office of Agricultural Economics, U.S. Department of Agriculture, Washington, D.C. compiled a vegetation map of Minnesota in 1929-30 from the U.S. General Land Office Survey Notes. M.L. Heinselman in his *Interpretation of Francis J. Marschner's Map of the Original Vegetation of Minnesota*, published by the U.S. Forest Service, North Central Forest Experiment Station, St. Paul, Minnesota, 1974, describes the sources of information available to Marschner and the methods of mapping he employed.

Unfortunately, as Heinselman points out in his description of the 1974 published version, Marschner did not leave detailed notes on the methods he used to construct this map. According to Heinselman:

"The information available to Marschner included brief written descriptions of the soils, land-forms, and vegetation of each township: the township plat maps; and location notes for each section corner, meander corner, quarter corner, or other monumented point on survey lines. Where trees were available, corners were usually identified by inscribing the corner's legal description on a deep axe-blaze on three 'witness trees' facing the actual monumented corner. Where witness trees were used, their species, diameters and compass bearings, and distances from the corner are given in the notes. The plat maps also may show lakes, streams, wetlands, etc. There may also be notes on the terrain and vegetation along section lines."

This 1988 version of Marschner's map is a direct generalization of the map published in 1974. It was determined that a vegetation map of Minnesota that could be produced in smaller format than

the existing 1:500,000 scale map would be useful to many. In order to accomplish this, the intricate detail of the original map had to be simplified.

In generalizing the vegetation types and simplifying boundaries, a new classification was developed (see cross-reference chart). Many of the decisions to combine types or to eliminate a geographically small occurrence of a type are not significant because this detail would be

lost in such a major reduction of Marschner's original map. However, a few changes were made to reflect new understanding of the distribution and composition of Minnesota vegetation types. ■

*We gratefully acknowledge the critical review of this 1988 version of the map by Drs. M.L. Heinselman, J.C. Almendinger, E.J. Cushing, E.C. Grimm, D.B. Lawrence, and L.F. Ohmann.*

### Marschner's Map 1974 Version

### Marschner's Map Adapted 1988

#### Vegetation Types of the Prairie & Deciduous Forest

#### Grassland

Prairie \_\_\_\_\_ Upland Prairie  
Wet Prairies, Marshes & Sloughs \_\_\_\_\_ Prairie Wetland

#### Brushland

Brush Prairie \_\_\_\_\_ Aspen Parkland  
Aspen-Oak Land \_\_\_\_\_  
Oak Openings and Barrens \_\_\_\_\_ Oak Wookland and Brushland

#### Hardwood Forest

Big Woods \_\_\_\_\_ Maple-Basswood Forest  
River Bottom Forest \_\_\_\_\_ Floodplain Forest  
Aspen-Birch (Hardwoods) \_\_\_\_\_

#### Pineries

Aspen-Birch (Conifer) \_\_\_\_\_ Boreal Hardwood-Conifer Forest  
Mixed Hardwood and Pine \_\_\_\_\_ Northern Hardwood Forest  
Pine Groves:  
White Pine \_\_\_\_\_ Great Lakes Pine Forest  
White and Norway Pine \_\_\_\_\_  
Pine Flats \_\_\_\_\_  
Jack Pine Barrens and Openings \_\_\_\_\_ Jack Pine Forest

#### Bogs and Swamps

Conifer Bogs and Swamps \_\_\_\_\_  
Open Muskeg \_\_\_\_\_ Peatland

#### Vegetation Types of the Conifer Forest

Text by Keith M. Wendt and Barbara A Coffin of the Natural Heritage Program, Section of Wildlife, Minnesota Department of Natural Resources, Designed by Linda J. McNary December 1988.

The photographs in this publication are of remnant natural vegetation types that have escaped significant human alteration.

#### Photo credits:

Richard Hamilton Smith, cover photos and 1, 3, 4, 7, 8; Keith Wendt, photos 2, 5, 6, 9; Barbara Coffin, photo 10.

