Natural Vegetation of Minnesota
At the Time of the Public Land Survey
1847-1907

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Presettlement 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.

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 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 side oats 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 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 thickets, 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-
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 trees are highly fire-sensitive and were restricted to areas where natural firebreaks 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 historically 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.

**Great Lakes Pine Forest**

The Great Lakes pine forest occurs in Minnesota primarily on thin glacial till 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...
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-
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 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 pre-settlement 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.

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Notes on the History of the Map


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, landforms, 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.

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### Marschner's Map

#### 1974 Version

- **Grassland**
  - Prairie
  - Wet Prairies, Marshes & Sloughs

- **Brushland**
  - Brush Prairie
  - Aspen-Oak Land
  - Oak Openings and Barrens

- **Hardwood Forest**
  - Big Woods
  - River Bottom Forest
  - Aspen-Birch (Hardwoods)

- **Pine Forests**
  - Aspen-Birch (Conifer)
  - Mixed Hardwood and Pine
  - White Pine

- **Bogs and Swamps**
  - Conifer Bogs and Swamps
  - Open Muskeg

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### Marschner's Map

#### Adapted 1988

- **Vegetation Types of the Prairie & Deciduous Forest**
  - Upland Prairie
  - Prairie Wetland
  - Aspen Parkland
  - Oak Woodland and Brushland
  - Maple-Basswood Forest
  - Floodplain Forest

- **Vegetation Types of the Conifer Forest**
  - Boreal Hardwood-Conifer Forest
  - Northern Hardwood Forest
  - Great Lakes Pine Forest
  - Jack Pine Forest
  - Peatland

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.