



**Understanding Forestry Concepts:
A Forest Ecology Series for Loggers,
Landowners and Foresters**

UNIT TWO

MICHIGAN STATE
UNIVERSITY
EXTENSION

SITE CONDITIONS AND FOREST COVER

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- UNIT 1 Forest Terminology and Ecological Systems
Extension Bulletin E-2635

- UNIT 2 Site Conditions and Forest Cover
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Introduction

This bulletin series is designed to introduce information that loggers, landowners and foresters should know to properly manage forest lands while understanding how forest systems work and interact so that long-term forest productivity is maintained. These bulletins are not an exhaustive discussion of important forest ecology topics. Instead, they are a brief introduction to the depth and breadth of knowledge that is necessary to manage forest stands properly. This second bulletin provides some basic understanding on how site conditions affect tree distribution across the Great Lakes states.

Trees grow in a variety of areas all across the Lake States region. We find them growing in some of the most unlikely places, such as between rocks, and wonder how they ever survive. Although trees are found in a variety of locations, each tree species is best adapted to certain kinds of environmental conditions (3, 4). When a species tries to become established within an area that does not meet its optimal environmental conditions, another species may outcompete it (e.g., leave it with less sunlight or water). In some cases, it may not

survive this competition. For instance, some tree species such as cedar, alder and willow survive and grow very well in wet soils, while others such as jack and red pine survive and grow quite well on dry sands.

There are also subtle environmental differences on each site that can affect which, where, and how well trees survive and grow (9). For example, in the northern reaches of the Lake States (e.g., Upper Peninsula of Michigan) spruce, fir and hemlock tend to occur on slopes facing northerly directions (direction of the slope is called aspect), while sugar maple, yellow birch and beech tend to occur on southerly facing slopes (southern aspects) (Fig. 1). In the lower reaches of the Lake States, (e.g., southern Wisconsin and Michigan) this same sugar maple tends to be found on northerly facing slopes and oak-hickory species tend to be found growing on the southerly facing slopes (1). The change in preferred aspect for sugar maple is related to temperature and soil moisture at the respective sites (7). In southern parts of the Lake States, northern facing slopes are cooler and more moist than southerly facing slopes (Fig 1) (9) and oak-hickory species tend to be much more competitive on the drier and warmer southerly facing sites. In the northern part of the Lake States, northerly aspects tend to be too cold for the sugar maple and beech to compete with the spruce, fir and hemlock found on those sites (1, 9).

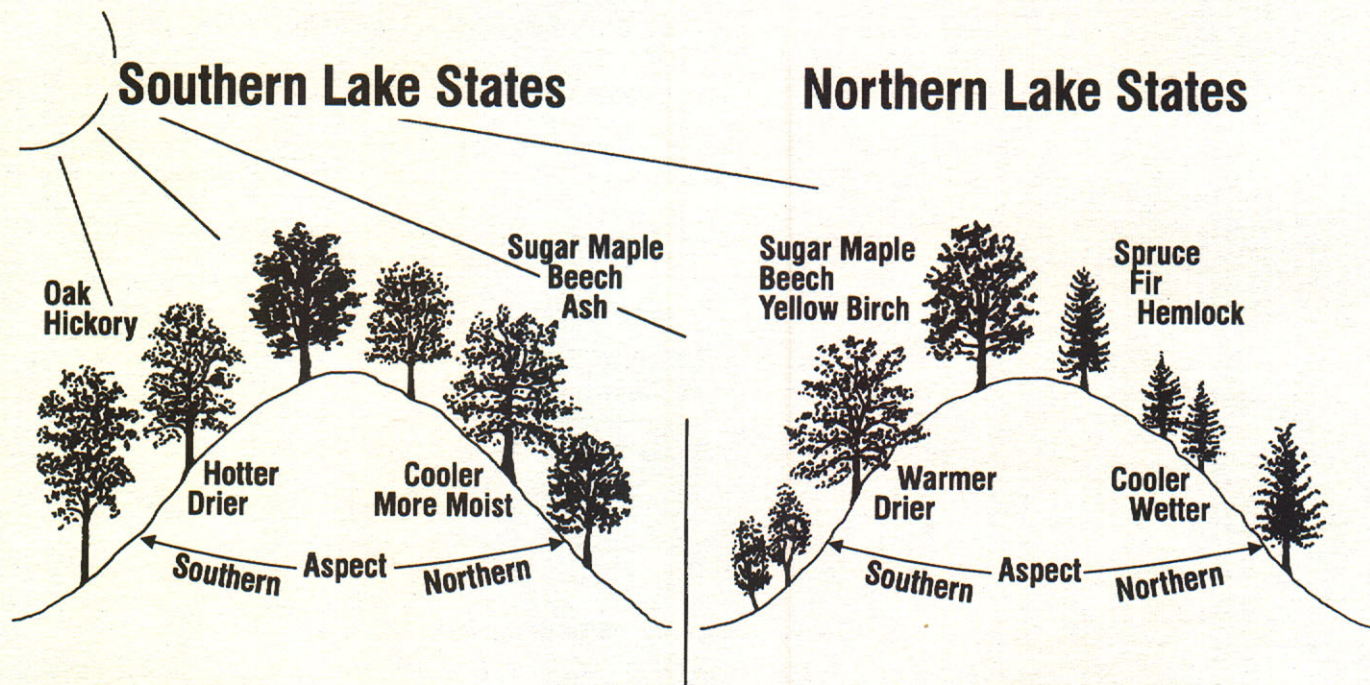


Figure 1: Effect of aspect and slope on tree species location in some areas of the Lake States. Northern aspects are cooler and more moist compared to warmer and drier southern aspects. This change in temperature and moisture is sufficient to affect the tree species which grow on these slopes within different areas of the Lake States region.

Elevation and depth to water table also affect the competitive ability of tree species (9). Higher elevations are more exposed to cold and wind, and soil depth is frequently less than the optimum needed for survival and sustained growth. With regards to depth to water table, (Fig. 2) (5, 9), a high water table restricts the rooting zone, and tree species that are adapted to wet conditions, such as cedar and willow, dominate the site. If the water table is too deep, such as on deep dry sands, tree species adapted to drier growing conditions, such as oak and jack pine, dominate the site (9).

Consequently, combinations of aspect, soil type, slope, and elevation create sites that are better for the establishment and growth of some tree species as compared to others (1, 9). However, two sites that appear to be similar in most characteristics may not support the same tree species to the same extent. Subtle differences in depth to water table or soil texture can affect site productivity and influence the type of tree species dominating the site (9). For instance, on sandy sites, an area containing finer textured soils within the soil profile can enhance water and nutrient holding capacity, thereby increasing site productivity. The many potential combinations of site factors creates a multitude of different sites on which trees compete, grow and form plant communities. Depending upon the competitive ability of the plant species on the many different sites, there are a variety of combinations of plant communities that develop.

Summary

Some trees are adapted to similar growing conditions and are often found growing together on similar sites. These unique combinations of tree species are referred

to as forest communities (1) and are mapped by foresters as cover types (Fig. 3). Examples of major forest types in the Lake States region include jack-red-white pine, spruce-fir-cedar, oak-hickory (northern red oak, black oak, pin oak and/or hickories), elm-ash-cottonwood-soft maple, maple-basswood-birch (Northern hardwoods), and aspen-birch (8). Information about preferred growing conditions (silvics) for individual tree species has been compiled into manuals which are listed in the reference section (3, 4).

Acknowledgment

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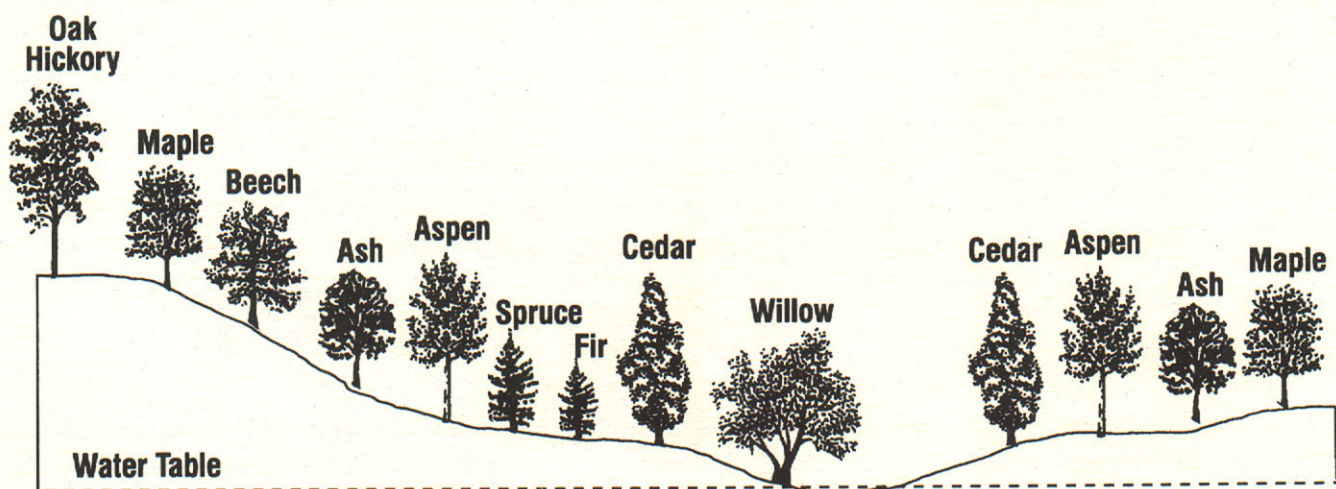


Figure 2: Depth to water table can determine the tree species that establish and successfully dominate a site.

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Current Forest Types

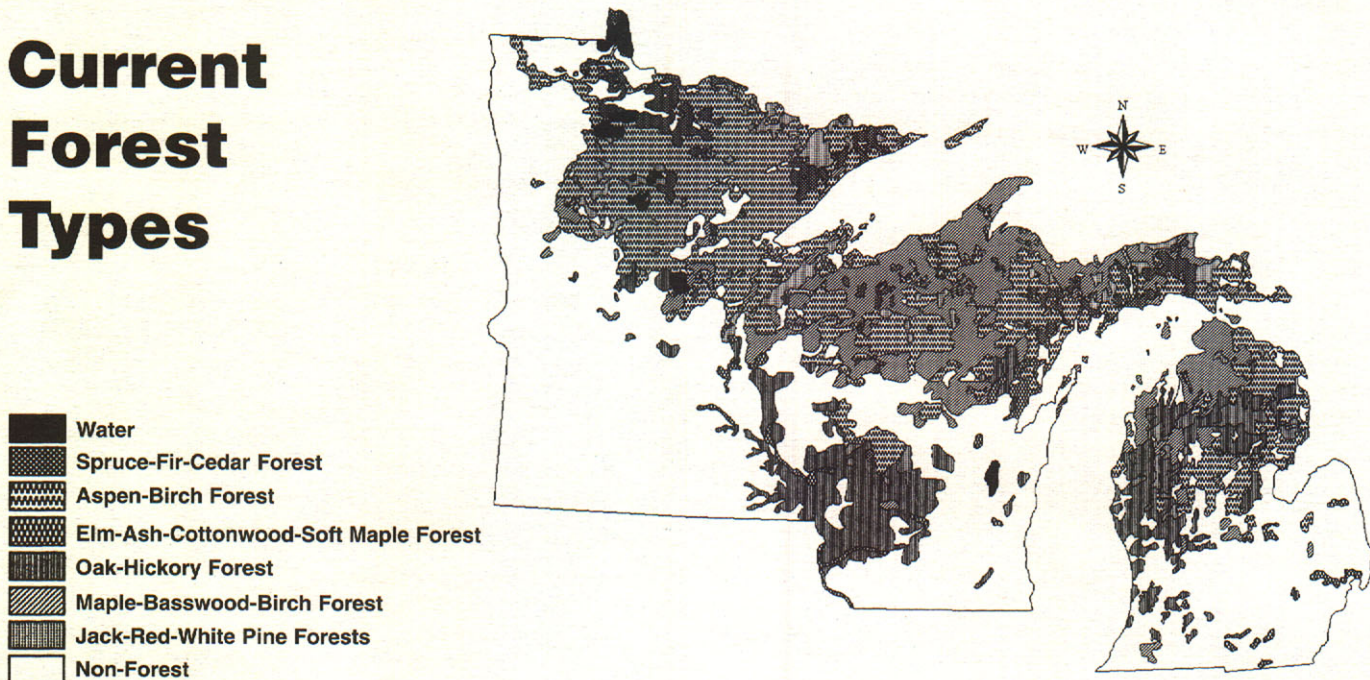


Figure 3: General forest cover type map for the Lake States region. Source: Fourth Forest Inventory 1977-1980-1983 North Central Forest Experiment Station. (Prepared by Forest Stearns and Glenn Gunten Spergen with the UWM Cartographic Laboratory, 1987, for the Conservation Foundation Lake States Governor's Conference on Forestry. Used with permission.)



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