

## Wisconsin's Biological Forest Resources

The climate, soils, glacial and geologic history of Wisconsin combine to provide examples of a great many forest types. To facilitate discussion of Wisconsin's biological forest communities, we can divide the state into two large regions, one on each side of the *Tension Zone*. We will refer to these two forest regions throughout the Assessment of Need as the *northern mixed forest* and the *southern broadleaf forest*.

These two forest regions are further divided into forest types. The dominant species or mixed species in Wisconsin are classified as maple, basswood, aspen, oak-hickory, pine, spruce, northern white-cedar, and tamarack (Schmidt, 1997). We have data from forest surveys and inventories from 1898, 1936, 1956, 1963, 1983, and 1996 that is used to classify and assess changes in the forest types. Other studies, such as Finley's description of pre-settlement vegetation based on early surveyors' records and Curtis' historical studies of Wisconsin's vegetation provide data that go back to at least the 1850's. The most numerous species based on the count is considered the dominant one. There are usually many other species represented in these dominant groupings, typically in a predictable manner. For example, the maple-basswood forest type, also, usually nurture many individual aspen trees (Schmidt, 1997).

### *Tension Zone*

Stretching across Wisconsin from northwest to southeast is an S-shaped area called the Tension Zone. The Tension Zone represents the northernmost or southernmost boundary of adaptation by plants and animals. The Tension Zone divides the state into two major ecological regions. The southern ecological region is warmer and is generally considered closer, ecologically, to the forests of Ohio and Indiana. The northern ecological region is more closely related to the forests of northeastern Minnesota, northern Michigan, southern Ontario, and New England. The Tension Zone is a fascinating area, where representative plant and animal species from both the northern mixed forest and the southern broadleaf forest types can be found, and a significant shift in vegetation type is apparent (Curtis, 1959).

### *Ecosystem Diversity*

Both the species composition and relative proportion of presettlement forest types have been greatly altered by humans. The mixed coniferous-deciduous forests have, with few exceptions (e.g. the Menominee Indian Reservation), lost their coniferous component. Hemlock occurs sporadically in second-growth hardwood stands, but white pine is virtually absent in many areas.

Early logging in the north focused on white pine, and to a lesser extent, red. The white pine seed source was dramatically reduced, and the slash left on the ground after logging fueled intense fires, eliminating what little regeneration there was. Most of the area that was white pine forests before the intense harvests of the late 19th century is today covered in red oak, red maple, white birch, and/or aspen. Until recently, white pine regeneration was severely limited. However, there is currently evidence to suggest that white pine may be recovering to some extent.

Hemlock was harvested in a second wave of logging to provide the tanning industry with bark for processing hides. Much of the hemlock component was removed from the northern forests, and now only occurs sporadically in second growth hardwood stands.

In addition to the pine and hemlock, hardwoods were also removed during the cutover era. Although clearcutting and high-grading were practiced, hardwood seeds' germination requirements are less demanding than conifers', and they were able to regenerate more successfully. Many hardwood species also have the ability to sprout new growth from their roots, unlike the conifers.

The relative importance of hardwood species has also changed significantly in many stands. While sugar maple has retained its dominant position, yellow birch is much less common than it once was. On the other hand, basswood and white ash are now the most important associates of sugar maple, although they were seldom listed as such by early land surveyors.

Seral stage distribution has also been significantly altered by human impact. Seral stage refers to the stages of development of an ecosystem, from very early pioneer plant and animal communities to older, later successional communities. For example, aspen, an early successional species, currently covers over 18% of the forestland in the state, most of which is in the north. In early surveyors' work, it is scarcely mentioned. The seral stage of an ecosystem has a profound influence on the type of habitat it provides, separate from species composition. If we want to maintain the diversity of plant and animal habitat within Wisconsin, disturbances of some type are necessary. Disturbance will have to be part of the Forest Legacy Tract management in many instances where early successional stage habitat is the desired condition.

### *Plant Diversity*

The vegetation of northern Wisconsin is a primary source of the state's biodiversity. Of the state's estimated 2300 vascular plants, about 1800 occur in the northern forest region. Statewide, approximately 22% of plant species are introduced exotics. Thus, there are about 1400 native plant species that occur in the northern forest region. Important plant families in the north include lilies, sedges, composites, roses and cherries, buttercups, honeysuckles, orchids, ferns, and grasses (DNR, 1995).

Trees, being the dominant life form of any forest, are crucial to the forest's biodiversity. There are approximately 30 tree species that occur in the northern forests of Wisconsin, although no more than about 10 are found together in any given ecological community.

### *Animal Diversity*

Of the 327 vertebrate species present in Northern Wisconsin, over 273 are believed to have secure futures in the state; fifty-four are believed to require management to protect and preserve them into the future (DNR, 2000). Most of the danger to vertebrate species comes with loss of habitat. Animals evolved to fit particular niches within particular ecosystems. When those niches are less abundant, the animals that filled them also become less abundant.

### *Rare Species and Communities*

Human activities since Euro-American settlement have dramatically altered the distribution and abundance of many species. As of 1998, there were 241 species listed on the state's endangered or threatened list, and 15 on the federal endangered or threatened list (11 species appear on both lists). At least 28% of the plant species listed are forest species. All of the listed mammals are forest species, at least 50% of listed bird species are forest species, and 40% of listed reptiles and amphibians are forest species.

Two species were hunted to extinction — the passenger pigeon and the Carolina parakeet. Other species were extirpated from the state. Some remain extirpated — bison, wolverine, woodland caribou, Eskimo curlew, and whooping crane. Six have been reintroduced with varying degrees of success — elk, fisher, American marten, trumpeter swan, peregrine falcon, and wild turkey. Two species, moose and timber wolf, have returned to Wisconsin of their own volition. There have also been a few sightings of cougar in northern Wisconsin, although it is thought these animals are probably escapees from domestication.

There are also those species that have increased in number and influence on Wisconsin's forests. With the increased fragmentation of the forests as well as an overall younger forest as compared to pre-European settlement, there is more edge and early succession habitat. Many invasive or exotic plants have gained a foothold in the state because of this increased habitat. Some animal populations have also increased dramatically, sometimes to a level that may compromise the ability of other species to compete.

There are estimated to be about 2300 species of vascular plants in the state of Wisconsin. There are 59 plants in the northern forest region that are endangered, threatened, or species of concern. These plants will likely require some management attention in order to preserve them within Wisconsin.

About 1800 of these are native to the state, 22% are believed to be introduced exotics. About 40 distinct Wisconsin terrestrial communities were described by John Curtis in the 1950's (Curtis, 1959). Most of these are intact. However, savanna and barrens have experienced striking decline. Both savanna and barrens communities are listed on the globally recognized Nature Conservancy's list of most threatened ecosystems.

Pine and oak barrens are easily damaged through fire suppression, agriculture and conversion to other intensive uses. The fragmentation and isolation of remaining pieces has also led to losses of biological diversity.

Old forest is also increasingly rare. In 1995, Frelich estimated that 58,500 acres, less than .4%, of Wisconsin's forests had not experienced severe human disturbance since European settlement. Seventy-nine percent of this area is white-cedar forests; another 10% are black spruce-tamarack forest.

### *Other Life*

Although there is near universal acknowledgment of their importance, non-vascular plants, fungi, bacteria, and other small species have been largely overlooked in most of the research and planning regarding biodiversity. It is estimated that fungi alone may account for 12 - 30 thousand species in Wisconsin, few of which have been described. Fungi are extremely important in recycling nutrient matter in a forest and it is just beginning to be understood how important the mutualistic symbioses they form with roots in the soil are to ecosystem functioning.

Except for pest species, little research has been directed at forest invertebrates. Lack of knowledge in this area is a serious concern since invertebrates are a very diverse group and perform important ecosystem functions, such as the breakdown of dead vegetation, soil formation, and predator-prey interactions. There has been even less research directed toward non-vascular plants and protozoa.

It is hoped that by preserving ecosystems, plants, and animal species, that these associated less known and understood organisms will also be preserved. However, it is clear that more research is needed to better understand the diversity and function of these organisms in Wisconsin's forests. Protecting large blocks of intact forest is one of the best ways we have to protect these species we know so little about.