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Jack Pine Ecosystem

We often think of forests as stable, mature communities of very large, old trees, rich with life. We may think of other natural communities which lack the towering trees and thick green mantle of the mature forest as less rich or less productive. But this is not the case.

In both the northern Lower and Upper Peninsulas of Michigan, you can find a forest ecosystem which has always contained few large trees and little or no old growth. A forest where soils are dry and the vegetation sparse, it is called a *barrens*. A forest periodically swept by raging fires, only to spring back, fresh and revitalized. A forest which is amazingly productive and biologically diverse, providing homes for numerous plants and animals, many of them nowhere else on Earth. That is the **jack pine** ecosystem.

Today, more than ever, we are part of the jack pine ecosystem, seeking to extract its resources, enjoy its beauty, explore its secrets, and preserve its life. The jack pine forests can exist, only if we care.

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Natural History

As plants and animals followed the northward retreat of the glaciers 12,000 to 16,000 years ago, they formed a variety of natural communities. The warm climate and moist, rich soils of the southern half of the Lower Peninsula (LP) eventually fostered the growth of deciduous forests. Farther north, as the Wisconsin ice sheet melted, it deposited a glacial till and left a sandy outwash plain which was dry and nutrient poor. The plants and animals which came to dominate this large area formed the coniferous forests. One of the most fascinating of these northern forests is the jack pine ecosystem.

The jack pine ecosystem is characterized by dense stands of relatively young trees interspersed with small grass and sedge openings and is often called the jack pine "plains" or "barrens." Except for lowland areas of aspen, birch, maple, or cedar and spruce, its vegetation is dry and sparse. This ecosystem experiences extreme temperature and dryness and is prone to fire. The jack pine ecosystem is extremely well adapted to fire so well adapted that it is dependent upon fire for its very existence.

Succession is the process by which early, pioneering plant communities are replaced, or succeeded, by later communities. While we often think of forests as progressing toward "climax" communities of very large, old trees, the jack pine forest contains few old trees. On these sandy plains, the jack pine represents both the early and late successional stages. All of the native wildlife species are adapted to a dynamic, ever changing landscape perpetuated by the recurrence of fire. Early successional plant communities, such as jack pine forest, actually have greater productivity than mature systems, because they capture the sun's energy more efficiently and produce plant and animal material (biomass) at a faster rate than mature forests.

The jack pine forest is amazingly diverse, forming a rich mosaic of habitats including prairie or grassland species, coniferous and deciduous forest species and enough mixing of these habitats to support "edge" species. Many of the plants and animals found here are endangered, threatened, or rare, and some, such as the Kirtland's warbler, are found nowhere else on earth. Taken together, the jack pine ecosystem is anything but "barren"!

Today, we play an active role in the jack pine ecosystem, resulting in conflicts between the competing needs of wildlife and the various human uses of the forest. To appreciate and enjoy the unique jack pine ecosystem, we need to understand it.

Forest History

Among all Michigan tree species, the jack pine (*Pinus banksiana*) is uniquely adapted to exist and reproduce on the hottest and driest sites in Michigan. It thrives on dune sand and on the sandy glacial plains, where it often occurs in dense stands. It is called a "fire species" because wildfires sweep through jack pine stands, killing the trees and preparing the ground for a new stand, as well as releasing seeds from its cones.

Prior to European settlement, the outwash plains, with their plant communities of jack pine and associated species, were hot, dry places during the summer months. Once in a while, lightning would start a fire that would smolder in an old pine stump for a few days or weeks until finally, on a hot windy day, it would be fanned into a raging fire that roared across the land leaving everything behind it blackened and desolate. Native Americans, either accidentally or intentionally, also caused fires in the jack pine.

The desolation was only temporary. Soon the jack pine seeds would flutter to the ground, and, in only a few weeks, the area would be green with new growth. This process was repeated every 30 to 100 years, and the jack pine continued to dominate these fire prone areas.

When Europeans arrived to clearcut the white and red pine that grew near the jack pine plains, large amounts of slash were left after logging. Thus the stage was set for an expansion of the jack pine community through huge forest fires that burned millions of acres.

In response to the loss of Michigan's forests and the continued threat of forest fire, the Department of Conservation (now called the Department of Natural Resources) was formed in 1920. One of its purposes was to bring the forest fire problem under control. These efforts were quite successful, and as a result, the area occupied by jack pine and its community began to decline to its historical ranges.

Pine plantations, especially red pine, were also established throughout much of the historic pine plains. Forest fires were prevented and controlled in the jack pine plains, too, and the jack pine community began to be replaced by tree species more tolerant of shade.

One species that suffered from this reduction and maturing of jack pine communities was the Kirtland's warbler (*Dendroica kirtlandii*). This endangered bird builds its nest on the ground under young jack pine trees, where they occur in dense clusters. The conditions were typically created by a forest fire.

Fire Dependency

Fire has shaped the Michigan landscape for thousands of years. Remnants of fire can be found as charcoal in bogs and glacial deposits. Historically, forests cycled because of wind, insect outbreaks, and fires, which occurred naturally and were not controlled by fire suppression programs. Fires kept Michigan's jack pine forests at age levels that provided an abundance of desirable nesting sites for the Kirtland's warbler and a diverse mix of other wildlife and plants.

Fire prevention programs reduced the frequency and size of fires in the jack pine ecosystem, which had a direct impact on the population of the Kirtland's warbler. Without fires, nesting habitat became scarce.

Jack pines do not grow in the shade and are fire dependent. Without fire (or commercial timber harvest) to create sunlit areas, competing species such as oak or cherry would soon dominate the stand.

Habitat Management

Forest managers are using methods that mimic historical forest recycling patterns and processes in the management of the endangered Kirtland's warbler.

Commercial timber cutting, prescribed fire, and jack pine planting and seeding are the major management "tools" used to provide the young quality of the forest, which is necessary for Kirtland's warbler nesting.

The Kirtland's warbler prefers nesting areas of at least 80 acres in size with thickly branched jack pine trees at least five feet high. This occurs when stands are about eight years old. Nesting will continue in jack pine forests until the trees begin losing their lower branches, at about 20 years of age. Jack pine plantations are cut at stand maturity (about 50 years of age). This reduces mortality caused by the jack pine bud worm and other factors. This ecologically narrow band of relatively young jack pine forest is essential for the survival of the Kirtland's warbler. A reliable nesting stand is dependent on forest manipulation which includes cutting and burning.

This exciting complex restoration program has evolved, through scientific research, into a precise design which has succeeded in restoring habitat for the Kirtland's warbler in Michigan.

The future of the Kirtland's warbler is dependent on the continued funding of this ecologically based habitat management program.

Animals and Plants of the Jack Pine

Alleghany Plum	Hoary Puccoon
Ants	Jack Pine
Badger	Kirtland's Warbler
Big Bluestem	Lichens
Black Bear	Little Bluestem
Black Cherry	Northern Pin Oak (Hill's Oak)
Black-backed Woodpecker	Pale Agoseris
Blueberry	Red Pine
Bluebird	Red-tailed Hawk
Bracken Ferns	Rough Blazing Star
Brown headed Cowbirds	Rough Fescue
Butterfly-weed	Snowshoe Hare
Chickadee	Spruce Bud Worm
Common Crow	Spruce Grouse
Common Raven	Stinkhorn Fungus
Coyote	Sweet Fern
Cylindrical Blazing Star	Upland Sandpiper
Fritillary	White Pine Weevil
Green Snake	White-spotted Sawyer
Harebells	White-tailed Deer
Hill's Thistle	Willow

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