

Red Pine Management Guide

A handbook to red pine management in the North Central Region



This guide is also available online at:

<http://ncrs.fs.fed.us/fmg/nfgm/rp>

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Ecology

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Historically, red pine was abundant in the North Central region, making up about a third of the 22 million acres of pine forest in Minnesota, Wisconsin, and Michigan. The amount of red pine in the contemporary landscape of these three states has been greatly reduced from this total and today covers around 1.9 million acres. Opportunities exist to restore red pine to appropriate sites and to manage red pine stands in ways that enhance wildlife habitat, native species richness, and ecological characteristics. This section outlines the concepts and information you need to understand red pine ecology and to establish and manage this species with ecological objectives in mind.

We also refer you to the Silvics of North America manual; specifically, the Red Pine section.



Map of red pine range in Northern United States. The source for this map and more information can be found at the Silvics Manuals of the Forest Service.

Site characteristics

Red pine typically occurs on well-drained, acidic, dry sandy soils. These sites include outwash plains, ice contact features, rock outcrops, and dunes. The species grows best on well-drained sandy to loamy sand soils, but does not compete well with hardwoods on better sites. Red pine is intolerant of high water tables and poor aeration. Site indices of natural red pine sites range from 45 to 75 feet in height at 50 years of age.

Though red pine does prefer sandy soils it does not grow well on excessively drained, very nutrient poor sites. These sites would more likely be classified as jack pine sites. Red pine growing on these sites are very prone to pest problems such as Diplodia.

If you are unsure whether red pine is an appropriate species for your site, you can consult regionally appropriate guides for determining habitat type, native ecosystems, or native plant communities Wisconsin Forest Habitat Type Classification System (PDF, 146K) and Minnesota Native Plant Communities can be useful for determining your site potential from the standpoint of native plant communities, successional development, and natural disturbances.

Young red pine can be very prone to frost injury and pest problems in frost pockets. Saratoga spittlebug damage and scleroderris canker are two pests often encountered in frost pockets. In many areas, frost pockets can simply be large or small landscape depressions where cold air pools.

The botanical range of red pine is centered on the northern Lake States. Trying to grow red pine outside of its range is likely to result in pest and weather related problems.

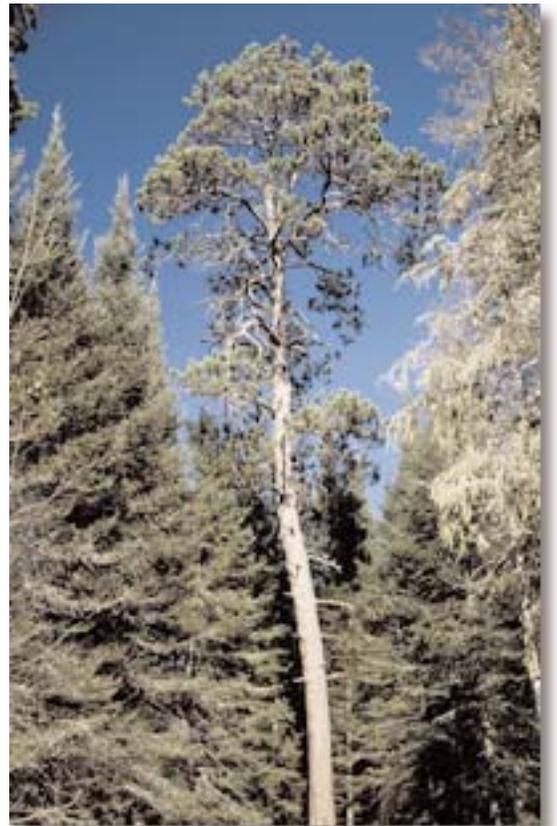
Species characteristics

Red pine is a shade intolerant, long-lived species and is one of the most genetically uniform forest trees. Seedlings usually grow slowly in the wild, especially if they are shaded. Growth begins to increase by age 4-5, but seedlings usually take 4-10 years to reach breast height (4.5 ft).

Individual trees can reach 400 years of age. Individual stands of up to 200 years of age are not uncommon. The species is best described as mid-successional. It often replaces early successional species such as jack pine and aspen. Without significant stand disturbance to allow red pine regeneration, it is in turn replaced by later successional species such as eastern white pine and hardwoods.



PIRE good growth. (B. Palik)



PIRE good growth. (B. Palik)

Red pine is a fire-adapted species. Historically, natural stands with a significant red pine component were disturbed by frequent surface fires and less frequent crown fires. In combination, these disturbances helped perpetuate the species by controlling competing understory vegetation, exposing mineral soil for favorable nature seedbeds, and opening the canopy to promote establishment and growth of seedlings to more advanced ages.

Red pine, in dense stands, prunes itself better than either white or jack pine. In more open sites lower branches will maintain themselves for many years.

Red pine flowers in the spring. Both male and female flowers are produced on the same tree. Cones ripen in the late summer to fall of the second year. Ripe seeds are dispersed from late summer in the year of cone ripening into the following summer. Good seed crops occur every 3 to 7 years. Timing seedbed preparation to match good seed years is requisite for achieving abundant natural regeneration of red pine. Red pine cone beetles can decimate large cone crops in some years and may cause regeneration failures.



PIRE good growth. (B. Palik)

Natural disturbance

Periodic fire was a natural disturbance event in red pine dominated forests prior to effective fire suppression. Infrequent, high intensity fires, occurring every 100-300 years, killed overstory trees and were important for opening the canopy, exposing mineral seedbeds, and facilitating regeneration of new red pine cohorts. More frequent, low intensity surfaces fires helped to thin dense stands of trees and reduced competition from shrubs, including hazel, and other competitors.

Red pine stands are also disturbed by infrequent high intensity windstorms and more frequent individual tree blowdown. A variety of insects and pathogens are natural disturbance agents of red pine.



Red pine stand with open understory after several surface fires. Itasca County, MN (B. Palik)



Large red pine blow down after a severe windstorm. Itasca County, MN (B. Palik)

Stand characteristics

Historically, the age class structure of red pine dominated stands ranged from largely even-aged stands, originating after a stand-initiating disturbance, to stands composed of two or more age classes. The latter results from heavy partial disturbances that kill groups of canopy trees and open stands for regeneration of young age class groups.

Most contemporary red pine stands in the Lake States are even-aged, having been established as plantations in the 1930-1960s. Uneven-aged stands are rare because 1) few naturally originating red pine forests remain and 2) two- or multi-aged stands have not been promoted silviculturally. The latter reflects the increased simplicity of managing even-aged plantations, as well as problems with several shoot blight diseases that make regenerating red pine near mature (infected) trees difficult.

The tree composition of naturally occurring red pine stands on drier sites range from nearly pure stands to mixtures with jack pine, eastern white pine, aspen, paper birch, and oaks. On somewhat more mesic sites, red pine is found growing with eastern white pine, red maple, red oak, balsam fir, and white spruce. In mixed-species stands, red pine normally succeeds less tolerant and shorter-lived associates, such as jack pine, paper birch, and aspen.

Most contemporary red pine stands are monospecific, largely because they have been planted that way. Sometimes even planted stands are mixed with naturally regenerating aspen.

Because red pine is a long-lived species, older stands will contain larger live trees (maximum size is related to the site quality), standing dead trees (snags), and dead trees in various stages of decay lying on the ground. Young stands that regenerate after stand-initiating disturbance, or younger patches within multi-aged stands, may have abundant snags or dead logs on the ground.

Older red pine-dominated stands, or older patches within multi-aged stands, that have not experienced recent surface fire may have a developing woody understory composed of more shade tolerant species, including eastern white pine, red maple, white spruce, or balsam fir. Young post disturbance stands will often have scattered older individuals that survived the last stand-initiating disturbance.

The horizontal structure of stands may range from relatively homogeneous, in even-aged, closed canopy red pine stands (add, e.g., an even distribution of similar sized and aged trees), to heterogeneous, in multi-aged, mixed species stands.



Presettlement stand after partial canopy disturbance. Cass County, MN



Even-aged red pine stand. Itasca County, MN (B. Palik)

Today, we have a large number of even-aged red pine plantations in the Lake States varying in age from 1-80 years. Many of these originated in large planting programs conducted in the 1930's (CCC era), and 1950's and 60's (Soil Bank era). Most of these were established as pure plantings of red pine, some were mixed with a jack pine or a white pine component. Some of these were established on very dry sites that are probably more appropriate for jack pine. These very dry sites are often where pest problems are frequent. Red pine plantations present great opportunities to restore more natural composition and structure, particularly when these plantations occur on sites where red pine was a natural component of the ecosystem.



Even-aged red pine stand. Itasca County, MN (B. Palik)