

OTHER FORESTS THAT NEED RESTORATION

Listed below are examples of additional native forests that are being lost or substantially altered. These forests provide opportunities for restoration where the need is most critical. They are all fire forests, forests sustained historically mainly by a combination of Native American fires and subsistence practices, and lightning fires. That makes this list particularly important because fire forests represent most native forests in the United States. Detailed descriptions of these historic forests and California's historic forests are in *America's Ancient Forests: from the Ice Age to the Age of Discovery* (John Wiley & Sons, Inc., Copyright 2000. 594 pages, ISBN 0-471-13622-0).

Pacific Douglas-fir forest

The historic Pacific Douglas-fir forest occupied a broad belt that extended from southern British Columbia to below Cape Mendocino in northern California, covering about 19 million acres. Massive fires burned through the wet northern part of the historic forest about 233 to 392 years apart. These fires created huge openings where young Douglas-fir trees could regenerate and replace those that were lost in the flames. Some of the dead trees provided a little shade for the young Douglas-fir trees and made it a better place for them to grow. Thus, the amount of old forest represented in the whole forest mosaic varied between 42 percent and 60 percent.

Only about 4 percent of this forest escaped burning for prolonged periods. Shade tolerant trees usually replaced Douglas fir in these protected areas. The remainder of the forest consisted of earlier successional stages, including freshly burned openings filled with seedlings. Historically, fires burned an average of every 16 years in the drier southern part of the Douglas fir forest and 36 years in white fir forests in this area. The median fire size was 860 acres. Usually, these were a mixture of light and hot surface fires, with occasional flare-ups of crown fire in small patches of old multilayered forest, or in heavy accumulations of downed trees. Little of the Douglas-fir forest retains its historic characteristics.

Efforts to preserve the older parts of the Douglas fir forest in reserves will fail to restore the forest to its historic diversity because reserves exclude all earlier successional stages. In addition, reserves dominated by old Douglas fir will gradually change into uniformly thick, multilayered forests of shade-tolerant species. In general, western hemlock will replace Douglas fir in wetter areas in the North and white fir will replace it in the drier southern areas. These artificially thick forests will be less diverse than the original native forests, which contained a mosaic of all stages of successional development, especially old growth Douglas fir, and many will be lost to large catastrophic fires.

Restoration forestry provides a viable alternative to reserves because it would create dynamic, diverse, sustainable, and less dangerous forests with all successional stages, including old multilayered forests and abundant Western red cedar, in proportions similar to those that existed in the historic forest. This will benefit Native people, such as the Cowlitz Indian Tribe, who care about these forests, especially restoring Western red cedar trees that are important to their culture. It also will benefit native wildlife that we all cherish because a majority of the birds and

mammals living in this forest require a fragmented landscape composed of a variety of species and successional stages.

Northern Oak Woodlands

Pacific oak woodlands covered over 10 million acres in California, and they extended northward between the Coast Range and the Cascade Range to southern Canada. These include coastal woodlands, valley woodlands, foothill woodlands, and northern woodlands. These oak woodlands are all in danger from invasion by shade tolerant species, disease, and parasitic plants such as mistletoe. Among these, the northern oak woodland is in the greatest need of restoration because Douglas fir is invading and replacing it in many areas of northern California and Oregon.

A restoration forestry program to remove understory and emerging Douglas-fir trees before they shade out the oaks could produce dramatic results in a short period. However, current forest practice rules in California favor the Douglas fir, not the oaks. Time is short and restoration of this important native forest is urgently needed to retain representative examples of northern oak woodlands.

Aspen Forest

Patches of open aspen with a grassy understory were common throughout the historic forests of the high mountain west. Scattered groves of aspen and cottonwood made up nearly 2 percent of the forests in the northern Rocky Mountains where they grew mostly in canyons and valleys. However, aspen covered much larger areas in the central and southern Rocky Mountains.

Historically, each aspen grove occupied about an acre, although a grove could cover more than 100 acres. Today, because of increases in the density of pine, fir, and other conifers, aspen forests in Arizona and New Mexico decreased by 46 percent, and they are rapidly disappearing as a distinct forest type throughout their range. A recent study on the Targhee National Forest in Idaho showed a 90 percent decrease in aspen since 1900.

The loss of aspen in the Southwest and throughout the Rocky Mountains is particularly serious because such forests provide habitat for 77 bird species and 56 species of mammals. Aspen also provides an effective barrier to the spread of wildfire. Furthermore, since aspen can continue to sprout for thousands of years, perhaps tens of thousands of years, some of these forests probably date back to the Ice Age.

Fortunately, this historic forest can be restored relatively quickly in many places through understory thinning and prescribed burning. Still, aspen forests are in serious decline and older forests composed of clones from ancient root systems can never be replaced when lost.

Ponderosa Pine Forest

Historic ponderosa pine forests covered 57 million acres that spread over lower mountain slopes throughout the Inland West and California. This was the most widely dispersed pine forest in North America. These were open, patchy, forests with a grassy understory sustained by frequent light surface fires set by American Indians and lightning.

Surface fires kept historic forests open, and they sharpened the boundaries between patches. They burned in the same part of the forest about once each 5 to 18 years, but the frequency was highest near Indian villages.

Overall, patches of old ponderosa pine forest probably made up less than 40 percent of historic ponderosa pine forest mosaics. More commonly, they covered only 25 percent to as little as 17 percent of the mosaic. The remainder consisted of young and middle-aged patches of trees, and grassy openings that varied in proportions due to sporadic events such as fires, insects, disease, and droughts. Shrubs also grew in openings within the historic ponderosa pine forest in many areas.

Today these native forests are in serious and rapid decline. For example, between 1952 and 1987 the acreage of ponderosa pine forest in Idaho decreased by 44 percent, largely due to the replacement of ponderosa pine by such shade tolerant trees such as Rocky Mountain Douglas fir and grand fir. The same thing is happening in eastern Washington and California.

In the Southwest, modern ponderosa pine forests are 31 times denser than historic forests. These ponderosa pine forests are becoming so thick with small trees that grass and wildflowers can no longer grow within them and streams are drying. Such tree densities also fuel massive wildfires that add to the destruction, as well as unnatural outbreaks of bark beetles, especially during droughts, and widespread infection by dwarf mistletoe.

Restoration forestry could stop these losses and gradually rebuild ponderosa pine forests that look and function much like the historic forests that inspired Lewis and Clark and many other early explorers.

Western White Pine Forest

Western white pine grows along the Pacific coast from high in the southern Sierra Nevada of California northward to the coast of southern British Columbia, and it extends eastward through Washington, Oregon, Idaho, and western Montana. Historically, the largest expanse of western white pine forest grew in the Inland West.

These historic forests consisted of mosaics of relatively large patches, some covering thousands of acres. A mixture of large stand-replacement fires that occurred at a given location at 150 to 250 year intervals and hot surface fires that occurred at about 60 to 85 year intervals sustained the mosaics. These lighter fires reduced undergrowth and probably opened small gaps in the forest. Thus, large patches of 200 year or older trees were common, as well as large and small patches of earlier successional stages. Shade tolerant trees such as western red cedar, western

hemlock, or grand fir invaded the older forests and gradually replaced western white pine in a few wet areas that escaped burning.

This was a magnificent forest, but it has been ravaged by white pine blister rust, accidentally introduced in 1910, and mountain pine beetle attacks. The lack of fire to thin undergrowth and create openings for regeneration also degraded this forest. Only about 10 percent of the original 5 million acres of historic western white pine forest still exists in the Inland West. Restoration forestry could gradually expand the area of this historic forest and bring it back to something like its original condition.

Lodgepole Pine Forest

The lodgepole pine forest was a forest of jagged mountains, thin soils, and harsh weather. So, the trees were small but the forest was vast, spreading over western North America in a great arch that covered high plateaus and wrapped around upper mountain slopes. A fringe of spruce-fir and other upper sub-alpine forests grew above it. These shade tolerant spruce and fir trees also invaded patches of lodgepole pine that escaped fire for several centuries.

The historic lodgepole pine forest occupied about 18 million acres in the United States and about 49 million acres in Canada. Lightning fires were less common in historic lodgepole pine forests than in any other evergreen forest in the Northern Rockies. However, Indians such as the Blackfeet set many fires in this forest.

Historic lodgepole pine forests did not all burn the same way or at the same frequency. Fast moving crown fires were most common, but hot and light surface fires also crept through the forests. These cooler fires usually burned in valley bottoms and open forests with little fuel. Some surface fires also spread from the edge of crown fires. Crown fires and surface fires, or a combination of the two, occurred in the same few hundred acres as often as four times in a century in parts of the Northern Rockies. They were somewhat less frequent on the east side of the Cascades in southern Oregon.

However, the average interval between fires was over a century in the entire Inland Northwest. Most fires probably burned less than 10,000 acres, with the majority of these covering a few hundred to a few thousand acres. This created a mosaic of small to large patches of various shapes. Most of these patches were in earlier stages of development. About 30 percent of the patches in the historic forest mosaic contained old multilayered forest. Today, some lodgepole pine forests consist of 65 percent old multilayered forest. Such a large area of flammable forest poses a serious fire hazard and reduces wildlife habitat. It also leads to unnaturally large infestations of Mountain Pine Beetles.

Restoration forestry would approximate and then sustain the historic proportions of successional stages on the landscape, including aspen, which was an important part of this forest.

Red Pine and Eastern White Pine Forests

Historic Great Lakes pine forests concentrated in the northern half of Michigan, Wisconsin, Minnesota, and southwestern Ontario. They probably represented about two-thirds of the 16 million acres of eastern white pine, red pine, and jack pine forests in the United States. The rest were in the Northeast. Oak, hemlock, and beech, were not as prominent here as they were in northeastern pine forests.

Red pine and eastern white pine forests were the most impressive of the ancient Great Lakes pine forests. Lightning ignited most fires in the Great Lakes pine forests, and Indians started the rest. The many lakes and ridges that cut through the landscape played a key role in determining how often and how severely a patch of forest would burn. Light surface fires that burned about once in 20-40 years kept most of northern Minnesota's red and white pine forests clear of small trees, shrubs, and debris. However, lethal fires still ravaged red and white pine forests about once in 100-300 years. Some fires covered large areas, up to 200,000 acres. Therefore, the mosaic consisted of large patches, although most covered tens or hundreds of acres.

Fires were so frequent that only a small portion of the forest mosaic supported shade tolerant forests. Therefore, pioneer species that thrived after fire especially pine, as well as aspen and paper birch, dominated the largest portion of the historic forest mosaic. This was especially true in northern Minnesota. Here white pine and red pine averaged about 55 percent of the patches in the mosaic, jack pine averaged about 23 percent, and aspen, paper birch, spruce, balsam fir, and northern white cedar made up the remaining 22 percent of the mosaic.

On the other hand, around the Great Lakes, white pine forests were often a temporary part of shade tolerant beech-maple and maple-basswood forests. A large patch of white pine would emerge in a fresh clearing somewhere in these forests and then disappear, only to reappear somewhere else. A large windfall usually created the clearing that white pine invaded, especially if the dead trees burned and exposed the soil. They could also invade aspen if it arrived in a clearing first, and then take over when the aspen died. Small groves of white pine also grew in places where soils were disturbed often, such along streams and lakes, and on rock outcrops. White pine forests that started in windfalls could not sustain themselves without fire, and fires were very rare in beech-maple and maple-basswood forests. Furthermore, it might take 1,500 years or longer for a major windstorm to strike the same place, and then it might not burn afterward. So, patches of white pine slowly dissolved into the surrounding shade tolerant forest as they aged.

Consequently, restoration forestry treatments should differ in the two zones of this forest.

Oak-Hickory Woodlands and Savannas

The historic oak-hickory forest was immense and spectacular. This was not a forest of lofty trees with great trunks. Some trees were indeed large, but it was mostly a forest of relatively small trees in open woodlands or scattered through grasslands. This was the second largest forest in North America, covering 132 million acres of the center of the continent.

The great size of this forest was not its most striking attribute. It teemed with wildlife, such as elk, bison, and deer, as well as gray wolves, black bears, coyotes, foxes, wild turkeys, prairie chickens, and beaver, because the trees stood apart and it was spacious and sunny. Hickories were less plentiful than oaks in the historic forest because their thin bark made them vulnerable to fire, and fires were very frequent and light. Indians set most of these fires.

Oak woodlands are open forests sprinkled with small isolated prairies. They are the opposite of oak savannas. Most of the woodlands were in the hilly country toward the East because rainfall was higher and fires burned less often than in the West. However, even in the rugged highlands of the Ozark Plateaus and Ouachita Mountains, the average time between fires may have been only 27 years.

Oak savannas were prairies sprinkled with isolated patches of woodland. Savannas burned an average of once every three years. They only made up about one quarter of the historic oak-hickory forest. However, this varied from place to place. For example, about 45 percent of southern Wisconsin consisted of oak savanna in the early 1800s. Prairies made up 20 percent of the area, and oak woodland only covered 10 percent. The remaining 25 percent consisted of maple and floodplain forests.

Regardless, savannas extended along the entire length of the western side of the oak-hickory forest, from Minnesota to Texas. They also extended eastward up to Detroit Michigan and into Ohio. A long belt of post oak savanna also existed along the east side of the Blackland Prairies of east-central Texas. Oaks are in serious decline in these forests because of insects and disease, and the lack of fire that oak needs to regenerate. Likewise, agriculture and urbanization have greatly reduced oak savannas.

The restoration of these forests will add immeasurably to recovering America's natural heritage. However, it will require an innovative approach that includes regenerating oaks and native grasses, and reintroducing native wildlife. Forest products will generate funds to help pay the cost of restoration in oak woodlands, but tourism will probably provide much of the revenue in oak savannas.

Oak-Chestnut Forest

The historic oak-chestnut forest covered over 84 million acres, the largest forest of the original colonies. It extended from southern New England southward along the Appalachian Mountains to as far south as northern Alabama. From there, it extended southwestward through Pennsylvania, eastern Ohio, Kentucky, and Tennessee to the Mississippi Valley.

Areas with deep moist soils supported a wide variety of hardwoods, including some chestnut and such shade tolerant species as maple and beech. Oaks tended to dominate upper slopes with well-drained and drier soils, and chestnut grew there as well. This arrangement of trees held true throughout much of the oak-chestnut forest. Still, oaks and the American chestnut defined the historic forest because they were widespread and prominent.

The American chestnut was abundant in the historic oak-chestnut forest, constituting 25 to 40 percent of the trees. Patches of chestnut were scattered throughout the forest, but it also grew in nearly pure groves in the southern Appalachian and northern Blue Ridge Mountains. These groves made a spectacular display in early summer when their flowers gave hillsides the look of a recent snowfall. Chestnut trees also produced a heavy crop of nuts every year that furnished a dependable food supply in the fall for bear, deer, wild turkey, squirrels, and Indians.

The American chestnut had a commanding presence in the forest. It gained the title of “The Redwood of the East” because of its great size, dark brown-fissured bark, and resistance to decay.

Indians burned this forest regularly. Therefore, the dominant trees were often large and free of branches to a great height, and few trees and shrubs grew in the understory.

Oak and chestnut seedlings can grow in light shade under larger trees, but they cannot survive dense shade. However, oak and chestnut rely primarily on sprouting to replace themselves. Likewise, they both need fire to reduce competition from other plants. That means it took a special combination of fire and shade to maintain the historic oak-chestnut forest. This forest consisted of a mosaic of different successional stages in a wide range of sizes. Large patches of trees that covered hundreds of acres were probably rare because crown fires were rare. Those covering more than an acre occurred more often, and those covering an acre or less were probably the most numerous.

Oak still thrives in the oak-chestnut forest, although it is declining in abundance because of the lack of fire. Sadly, the American chestnut tree that helped define this forest has nearly disappeared, the victim of a fungus that entered the United States before 1900. By 1950, nearly all the chestnut trees were dead. What remains are sprouts that keep growing from old seedlings and the stumps only to die back as saplings.

There is hope. Scientists are close to breeding resistance into the American chestnut. Even so, restoration forestry can start by bringing back oak and then chestnut, and someday this historic forest will resume its rightful place as one of the hallmarks of America’s landscape.

Eastern White Pine Forest

In the Eastern Region, the historic eastern white pine forest concentrated in central New England. It occurred in southern New Hampshire and Maine, eastern Massachusetts, the Champlain valley in Vermont, the Connecticut River Valley, and the eastern slopes of the Adirondacks in New York. Lesser amounts of white pine extended southward into Pennsylvania and the southern Appalachian Mountains, where it grew at higher elevations.

These eastern white pine forests differed in many ways from those that grew in Michigan, Wisconsin, Minnesota, and southwestern Ontario. The historic eastern white pine forest grew primarily on river terraces, lowlands, and mountain slopes below beech-maple forests. Eastern white pine is a pioneer, although it is intermediate in its tolerance to shade. Therefore, it must

have places with relatively bare and moist soil, adequate sunlight, and little competition from other trees for its seedlings to survive and grow. Therefore, large groves of nearly pure and large eastern white pine only grew where they did in the historic forest because of the abandonment of Indian croplands and hunting grounds, or wildfires.

In New England, such groves were less plentiful on uplands than on river terraces. This means that the period between large fires was longer than the 230-year average for white pine on parts of the uplands. These large fires most likely burned before the older first generation white pines died, which would be about 500 years.

White pine can survive in scattered places within shade tolerant beech-hemlock-maple forests. They normally grow in groups of 2-5 trees near charred stumps, places where a small surface fire flared up and cleared a patch of bare ground. However, clearings sufficiently large to regenerate white pine, about ¼ acre or more, are still limited in such a forest.

Oaks were the most common associates of eastern white pine in the historic forest. White pine can germinate and survive among oaks as long as the overstory trees are not too dense. They slowly grow up through the canopy until they eventually stand above the oaks. Many of the historic mixed forests of white pine and oak started this way. Surface fires burned these pine-oak forests more often than beech-hemlock-maple forests that contained a little white pine. They burned often enough to keep the ground underneath the trees free of deep litter. However, they seldom eliminated the oak seedlings growing in the understory.

Trees are becoming denser in eastern white forests, so stately groves of white pine no longer cover large areas, and few trees reach the great size of those that existed at the time of settlement. Colonists cut most of the large white pine centuries ago to use for ships masts and lumber. Today, shade tolerant sugar maple and red maple are taking over what is left of this forest.

Restoration forestry could recreate the historic groves of eastern white pine and pine-oak forests for this and future generations.

Longleaf-Slash Pine Forest

Southern pine forests spread across 125 million acres of the Southeast. They grew on a series of terraces that looked like steps leading from the sea to the Appalachian Mountains, as well as on the Ozark Plateaus and the Ouachita Mountains. By far the largest was the longleaf-slash pine forest. It covered about 74 million acres from southeastern Virginia down into the Florida peninsula, and westward to East Texas.

These vast forests of nearly pure longleaf pine covered the drier soils on ridges, plateaus, and south-facing slopes. Slash pine stayed on poorly drained soils around streams and wetlands near longleaf pine forests, but they did not range as widely in the South as longleaf pine.

The openness of historic longleaf pine forests with a carpet of grass and flowers underneath impressed most of the explorers who saw them. Piles of fallen pine trees also cluttered a few parts of this forest after being battered by hurricanes, tornadoes, and lightning.

The largest area of longleaf pine forest contained an understory dominated by wiregrass, especially in the East. Bluestem grasses grew in the East as well, but they were more prominent in the understory farther West. Even so, more than 200 other herbaceous plants, including over 50 grass species, lived under these forests.

The number of different kinds of plants growing in the understory of historic longleaf pine forests increased as the frequency of fires increased, reaching maximum diversity with annual light surface fires set by Indians and lightning. These surface fires burned frequently enough to keep oak, and shade tolerant species like magnolia and beech, from spreading into the pines and replacing them. They also created openings where longleaf pine could regenerate.

Most patches in the forest mosaic ranged from less than a tenth of an acre to several hundred acres. Patches of old trees covered up to 50 percent of the longleaf pine mosaic since this tree often reached 300 years of age, and matured at 150 years.

The vast longleaf pine savannas that spread over much of the South are nearly gone. This loss is especially tragic because the historic longleaf pine forest was not only beautiful but it also had the highest number of plant species of any forest in North America.

Restoration forestry could greatly expand the area of historic longleaf pine forest with all of its original beauty and diversity. This would also accelerate the recovery of the endangered red-cockaded woodpecker since it only lives in such open forests of large pine trees.