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Pitch pines cling to the edge of Pinnacle Rock in Connecticut's Central Valley.

PITCH PINE—SCRUB OAK BARRENS

BY EMERY GLUCK

Those who walk on Connecticut's Blue-Blazed Hiking Trails may know the pitch pine, which grows on some of the ledges—at least for now. But in most areas of the state, you could walk all day or take a decent road trip without seeing one. In Connecticut, the conifer is also found on ledge outcrops where there is enough soil in the cracks to support them away from their competitors (hardwoods and white pine). Pitch pine is found on Lantern Hill in North Stonington, Pine Ledge in Chester, White Bluff in Plymouth, the ledges on the way up to Bear Mountain in Salisbury, and on a ridge top south of Candlewood Road in Groton.

The historic pine with the alligator scale-like bark would be at home in parts of the Quinebaug and Connecticut River valleys, where glaciers deposited outwash sand and gravel. But today, just remnants of this ecosystem's previous self can be found southwest of Bradley International Airport along Route 20. The largest Connecticut River Valley stand left today grows on the Montague Plains in Massachusetts.

Seeing large stands of pitch pine today usually means going out of state. On the outer portions of Cape Cod, it is often the most common tree. It dominates southern New Jersey's Pine Barrens, which covers approximately 1 million acres and where forest fires persist. In 1957 in Plymouth, Massachusetts, a sea of pitch pine fueled a 15,000-acre wildfire that stopped only when it reached Cape Cod Bay. Scattered pitch pines grow near Lake Champlain, north of Burlington,

Vermont. Pitch pine clings to the ledges on the southern Maine coast and climbs partway up Cadillac Mountain in Acadia National Park.

*Connecticut's
13 Imperiled
Ecosystems*

FIRST IN
A SERIES

Sandy Soil: Attractive to Pitch Pines — and Developers

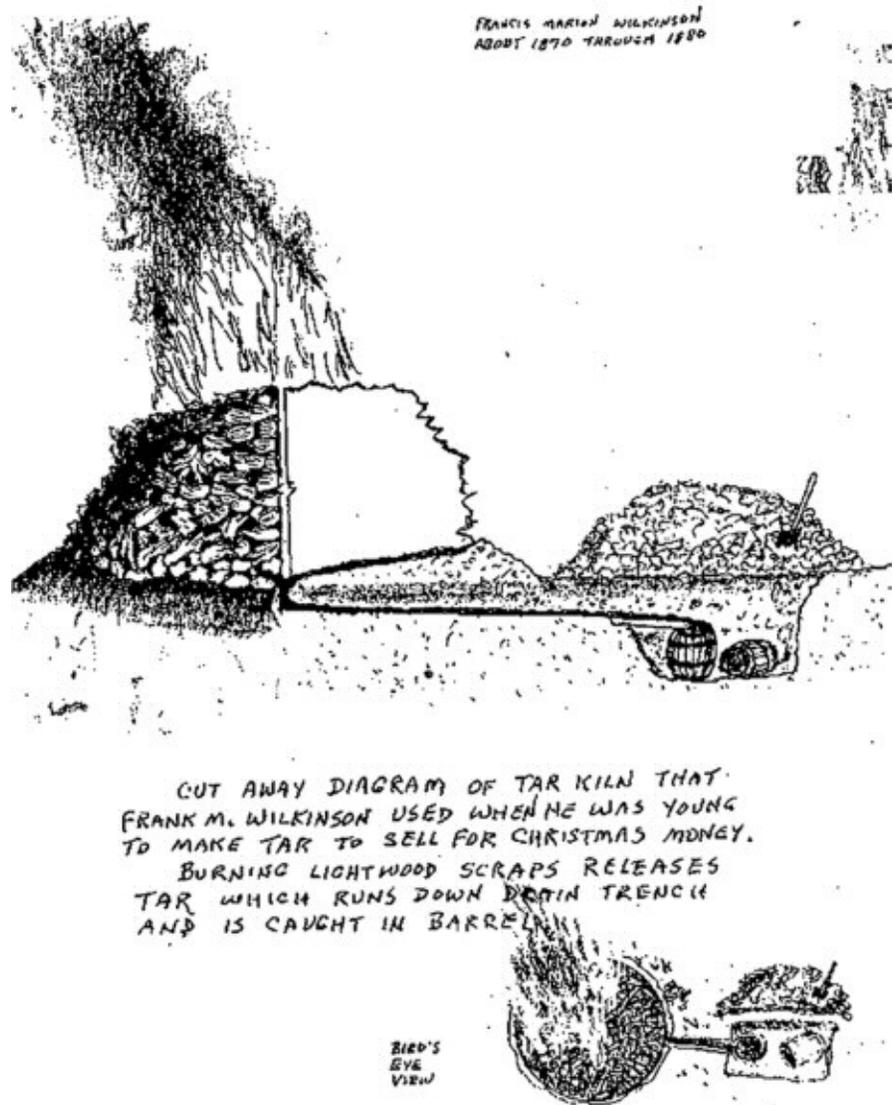
Connecticut's sand plains were once occupied by pitch pine and scrub oak as well as grasslands. Short trees and occasional openings were characteristics of the barren sand plains, though taller pines could grow in most areas in the absence of fire. Over time, sand plains were carved up for gravel pits and development.

Even early farming took a crack at the sand plains. Connecticut Governor John Winthrop visited the Royal Society in London in 1670 with the tangled roots of a dwarf oak (presumably scrub oak from sand plains) and plump Indian maize. They represented the before and after in his apparent pitch to finance missionaries to convert the Natives so their labor could be used to expand agriculture and other enterprises. Sand plains in North Haven, Suffield, and Windsor were cleared for agriculture in the 18th century. Agriculture on North Haven's sand plains was largely abandoned in the first half of the 19th century. Much of the land has since been developed. It is estimated that 95 percent of the state's pitch pine-scrub oak barrens have been lost, making their landscape the most decimated upland ecosystem. The losses have occurred in Massachusetts, too. The largest pitch pine forest known in the Connecticut River Valley once occupied approximately 20 square miles in Springfield and Chicopee, covering over one-third of those two municipalities.

The sand plains barrens, along with ridge top pitch pine-scrub oak barrens and heathland, are the most important shrubland habitat for rare moths and butterflies such as the buck moth (*Hemileuca maia maia*) and Gerhard's underwing (*Catocala berodias*). Scrub oak is the primary host for many of these rare *Lepidoptera*. Unfortunately, the small remaining habitat probably does not support many of more specialized species. The remnants are now overrun with taller white pines (*Pinus strobus*) and other hardwoods; fire is no longer prevalent to keep the invaders at bay.

Pitch Pine in Sun and Shadow

The traprock ledges in the center of Connecticut and many smaller ledges provide limited sanctuary for pitch pines and scrub oaks because they get the sun they need. In lower areas, adjacent hardwoods close in, casting deadly shade. Ordinary forests are



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This sketch is of a North Carolina tar kiln, similar to those used to extract tar from pitch pine bark.

generally too choked for pitch pines' offspring to thrive but are loaded with competing trees' broods, as Henry David Thoreau noted in *Faith in a Seed* (Island Press, 1993):

To my surprise I find that in the pretty dense pitch pine wood . . . where there are only several white pine old enough to bear . . . yet there are countless white pine springing up under the pitch pines (as well as many oak) and very few or scarcely any little pitch pines and they are sickly.

Not only do the seedlings wither in the shadow of others. Carcasses of older pitch pine can be found littering the forest floor where other trees overtopped them, squeezing the life out of them as they spent their last years grasping for sunlight.

U.S. Forest Service Forest Inventory and Analysis data corroborate the absence of new generations of pitch pine seedlings in Connecticut and a substantial mortality rate of older trees. Pitch pine-scrub oak ridge top and sand barrens are down to 0.04 of 1 percent of the Connecticut forest, and the conifer now composes less than 1 percent of all the pines that grow in the state.

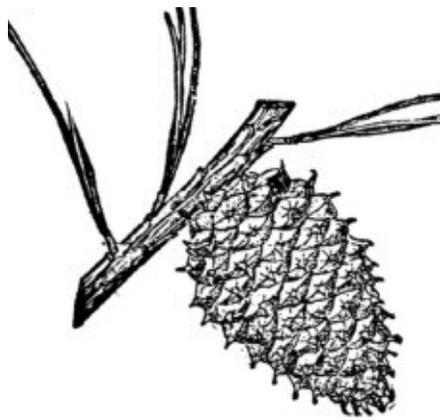
Our Pitch Pine Heritage

Dr. Charles Cogbill's study of "witness trees" in 389 towns in New England and New York paints a picture of the forest before Colonial settlement. He studied deeds of early landowners, which included surveys of trees that marked the corners of the properties. Overall, 18 percent of the

pinus in the entire study were recorded as pitch pine, but half the pine recorded in the deeds did not specify white or pitch, so the pitch pine component could be substantially higher. In some areas of Connecticut, a maximum of 40 percent of the trees were pine and as many as 60 percent of those were pitch pine, according to the study.

Early colonists called pitch pines “candlewood,” although other species, particularly in the South, also had that nickname. The settlers found it valuable for providing light because they lacked tallow for candles. Settlers burned the pitch pine knots (the most resinous part where the trunk meets the limbs) and shivers. Mr. Winthrop wrote in the 1660s that pine knots were often all that remained from generations of fallen trees in fields burned clear by the Indians. Families would gather pine knots and deadwood from the pine plains—as Mr. Winthrop wrote, the knots were “provided without any labour but the gathering together.” A Springfield historian in 1828 noted, “A prudent farmer would almost as soon enter upon the winter without hay, as without pine.” Many of Connecticut’s landmarks such as Candlewood Mountain in New Milford, Candlewood Hill in Haddam, and Candlewood Ledges in Lyme bear witness to their namesake. A hill and ledge in Ridgefield were previously called Candlewood Hill and Ledge. Also, the lumber was used in barns and for floorboards. Pitch pine floorboards were identified in a house built in 1744 in Haddam.

New England colonists in the 17th century started to produce pine tar, which was crucial for the shipbuilding industry, from pitch pine. The tar was used as a preservative for the rigging and probably for oakum, a fibrous material that was caulked between ship planks to make the ship watertight. Connecticut had oakum mills in Higganum and Middle Haddam. The latter has an Oakum Dock Road. Tar was made by burning logs, stumps, and deadwood in an earthen kiln. A sloped gutter at the bottom of the kiln directed the oozing tar to a collection barrel. One cord of pitch pine was estimated to make 40 to 60 gallons of tar. Pitch, which is boiled down tar that hardens when spread out, was used to protect ships’ hulls and make them more watertight. It was said that ships never left port without a barrel of tar for use during the voyage. Tar was also used for axle grease and to tar and feather a scoundrel.



FOREST TREES OF CONNECTICUT- CFPA

Pitch Pine (*Pinus rigida*).

England, which was largely deforested by the 1700s, needed shipbuilding material and tar to expand and maintain its merchant fleet and navy. Her Majesty’s Navy’s traditional source was northeastern Europe. But when the Baltic Sound, the narrow waterway between Sweden and Denmark, was closed by the Dutch and Danes during the First Dutch War, England started importing tar and masts from the colonies. But the colonists also needed tar as they ramped up their own shipbuilding industry, which thrived in nearly all of the towns on the Connecticut coast and the navigable part of the Connecticut River. New England established itself as the dominant shipbuilding area of the colonies.

Tar production, which began in Connecticut around 1643, was called the colonies’ first industry. Business partners John Griffin and Michael Humphreys made it in Windsor and worked their way up the Farmington River (then called the Tunxis River) cutting the surrounding pine plains in North Bloomfield, East Granby, and Simsbury (then called Massaco). Above the gorge at Tariffville, Mr. Griffin and Mr. Humphreys found a broad open savannah on the west bank, and (as an old history reports) “back of the savannah were great ranges of stately primeval pines, and straightway John Griffin, trader at Windsor, began to utilize them in the making of tar, pitch, turpentine and candlewood.”

Turpentine was another valuable product produced from pitch pine knots and by tapping the trees for sap. The sap was spooned out into a container in a process known (at least in the South) as “dipping gum.” Spirit of turpentine was the aromatic product produced by distillation and rosin was the dense,

waxy residue. Rosin was used for making adhesives, sealants, coatings, fluxes, printing inks, emulsifiers, and chewing gum. Turpentine was used in solvents, cleaners, antiseptics, insecticides, flavors and fragrances, and synthetic resins.

In the early 1700s, turpentine was shipped from Hartford to a distillery in Boston, and the Reverend Timothy Woodbridge sent five tons in a single shipment from the Simsbury, Connecticut, area to New York.

The demand for tar began to affect the forest. So much was made by the burning of pines along the banks of the Connecticut River that as early as 1650, the towns began prohibiting the use of candlewood for tar-making if gathered within 6 miles of the river. Families were allowed to use it for light and fuel. Tar burning was forbidden in Windsor in 1696, in Glastonbury by 1700, and in Hartford in 1709.

To conserve its source of tar, England imposed the Act of 1705 forbidding the colonists from the cutting of small pitch pine and tar trees not within any fence or actual enclosure until growth of 12 inches in diameter 3 feet from the ground and growing on un-granted lands (that is, forests that were reserved for the crown) from Nova Scotia to New Jersey.

But the same act encouraged production with a bounty of 4 pounds per ton of pitch or tar sold to the Royal Navy, and the English thought American tar was poor quality, so Her Majesty’s Oversea Civil Service appointed a Surveyor-General of the Woods for New England whose duties included teaching the colonists how to produce tar and pitch (and enforcing a statutory provision for the protection of the forests reserved for the crown). The preferred method of preparation for quality tar production included stripping almost all the bark from live trees a year before harvesting them, to allow pine sap to collect on the trunks. But then, the forest the surveyor-general was preparing, presumably for instructing the colonists, burned down. He blamed the colonists for the fire. (The colonists and England already were in conflict over the cutting of white pines for ship masts. Conflicts surrounding pine tree ownership appear to have contributed to the American Revolution.)

Tar production in New England dropped precipitously in the 1700s. Production increased in the South with its abundant longleaf and slash pineries and slave labor.

(Tar and turpentine production helped decimate the longleaf pine ecosystem.) New Englanders kept their hands in the trade because their ships transported much of the tar produced in the South. In this way, New Englanders were able to collect the bounty of 4 pounds per ton of tar or pitch, which was authorized only for colonies from New Jersey north. Ships from New London and Milford were among those that carried cargoes of tar.

Through the names it left behind, the industry left its legacy in New England. Though there is only one Tar Kiln Hill Road in Connecticut (Voluntown), there are others in Raymond, Maine, and New Bedford, Massachusetts. Other names in surrounding states remind us of the extent of the tar industry that the pitch pines fueled: Burrillville, Rhode Island, has a village of Tarkiln, a Tarkiln Road, and a Tarkiln Pond; Duxbury, Massachusetts, has the village of Tarkiln; and Tarkiln Hill stands in Wareham, Massachusetts.

Abandoned Farms: A Second Breath of Life

Pitch pine resurged following the widespread abandonment of farmland in the second half of the 19th century, especially on droughty outwash plains. The tree became large enough for logs in the early 20th century. In 1910, the Connecticut Agricultural Experimental Station reported 1.5 million board feet of the pine were cut that year. That's more pitch pine timber than existed in the entire state in 1998, according to the U.S. Forest Service. Pitch pine was ninth of all the species cut for lumber in 1910. (American chestnut was first.)

Thoreau's observations in *Faith in a Seed* are a reminder of the special conditions that pitch pines require:

It is mainly the little pitch pines that spread so fast into the pasture, then, and perchance have already extended the wood a dozen rods into the grass. The spreading is commonly not at all into the adjacent woods, but only in the open land. . . .

It will be seen, then, that, generally speaking, pitch pines will not spring up numerously within a wood, though they may take advantage of any thinness or openings, and most of the large pitch pines we see within the woods are probably as old as the wood itself, having come up with it. . . .

Where then did the pitch pine stand before the Colonial settlers came—if there were any dense groves of it then? Who cleared the land for its seedlings to spring up in? Is it, perhaps, proportionally a more common tree now, being better able to survive cultivation and maintain its ground? . . .

Who knows but the fire or clearings of the Indians may have originated many of these bare plains, and so account for the presence of these trees there? We know that they not only annually burned the forest to expedite their hunting, but regularly cleared extensive tracts for cultivation. . . .

Fire benefits pitch pines not just on the plains, as Thoreau noted, but on ridge tops. The western ridge above Route 8 near the Beacon Falls–Naugatuck town line was undressed by recent fires allowing pitch pine (and scrub oaks) to grow in some areas. An 1,800-acre fire in May 1930 that roared over Bear Mountain in Salisbury probably helped repopulate the ridge top with those trees. But fire is not the only factor helping the trees. A study of dwarf pitch pine just across the Massachusetts state line from Bear Mountain found no evidence of fire for at least 300 hundred years.

Resetting the Ecological Clock

Almost none of Connecticut's pitch pine-scrub oak barrens are sustaining themselves under current natural conditions. A major reason is that today, wildfire in Connecticut is a faint flicker of its past self. Historically, fires were relatively frequent except in the hinterlands. When there was a fire epidemic in the early 20th century, as much as 1 of every 33 acres burned annually. Now, only 1 of approximately every 4,000 acres burns annually, and the fires are generally less intense.

The Connecticut Department of Energy and Environmental Protection Division of Forestry implements controlled burns and tree harvests to sustain pitch pine-scrub oak and other disturbance-dependent ecosystems. Severe fires create seedbeds for the pine by devouring pine duff and exposing mineral soil. Fire provides the forest openings such as those where Thoreau found the little pitch pines in the midst of woods. The harvesting of white pine timber makes the restoration of pitch pine with fire more feasible. Larger white pines accrue thick fire-resistant bark, so they generally do not succumb

to controlled burns. Additionally, their large crowns cast so much shade it is less likely that the pine duff will dry enough to burn well.

Pitch pine cones have historically required fire to open. But as fire becomes infrequent, the population adapts to open its cones without fire. This change provides foresters with an opportunity, because the pine can be sustained near a parent tree by scarifying the ground (usually with logging equipment) to expose mineral soil. The other trees are harvested, because the pitch pine seedlings will not tolerate shade. Where there are no parent trees, seeds can be shaken out of recently opened cones taken from other areas.

Besides the lack of new pines, there is another concern. The southern pine beetle, which has been affecting the Jersey Pine Barrens lately, recently has been found on Long Island. This could be bad news for the older stressed trees in Connecticut.

Creating Conditions to Help Pitch Pines

History describes a forest largely unfamiliar to Connecticut today. The conditions that established the pitch pine ecosystem no longer exist for the most part. It is easy to misunderstand what has been lost, or to miss the glacial pace of change in the forest. It is hard for some to accept that human-made disturbances such as judicious tree harvests or controlled fires are needed to sustain diverse forest ecosystems and habitats.

The slow displacement of these trees is a problem that generally does not show up on environmental "radar screens." But the pitch pine-scrub oak forests can be considered the proverbial canary in the coal mine—the sensitive species that detects something harmful happening. This ecosystem might be the first casualty of the Connecticut landscape. Without mindful intervention, other ecosystems too may slowly disappear.

Emery Gluck is a Connecticut state forester who has worked on tree harvests and controlled fires to provide openings on state lands for pitch pines. He wrote the article, "Confessions of a Pitch Pine Enthusiast," in our Winter 2008 issue. For a list of his sources for this article, contact the editor at chris@chriswoodside.com. Our series on 13 imperiled ecosystems is inspired by a 1998 report by Kenneth J. Metzler & David L. Wagner for the state's Blue Ribbon Task Force on Open Space.