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HOME | About the Library | Ask A Librarian | Services A-Z | Libraries In System | Interlibrary Loan | Events

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pinelands guide



Guide to New Jersey
PINELANDS

Fire Effects in New Jersey's Pine Barrens by Silas Little

Large forest fires in the New Jersey Pine Barrens frequently take newspaper headlines in the spring, and sometimes in summer or fall, but hundreds of small fires throughout the year attract little attention. Fires are not rare in this section. Indians burned the woods extensively to improve hunting conditions. Ever since the first white men settled in New Jersey, fires have been common in the Pine Barrens.

Effects of these fires are all too frequently overlooked or misjudged-partly because new growth quickly masks the burns, partly because there are many differences in possible effects. The principal effect of fires has been on the vegetation, especially on the above-ground parts. On upland sites, most the root systems are in mineral soil which is heated appreciably by any type of forest fire. In addition, studies have indicated that forest fires have relatively little effect on upland soils.

LIBRARY RESOURCES

- Canoe Rentals
- Cranberries in New Jersey
- Dominant/Distinctive Vertebrates Listing
- Fact Sheet
- Fire in the Pinelands
- History of the Pinelands
- Library Materials & Holdings
- National Reserve Profile
- Reading List
- Related Terms
- Speakers Directory
- Surface Water in the Pinelands
- Vegetation of the Pinelands
- Vertebrates of the Pinelands

LOCAL & STATE RESOURCES

- Batsto Village
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- Cranberry Recipes
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- Pinelands National Reserve
- Pinelands Preservation Alliance
- Pinelands Recreation Guide
- Pineylore
- Pineypower
- Plants of the Pinelands
- Tree Frogs in the Pine Barrens

FACTORS MODIFYING FIRE EFFECTS ON UPLAND SITES

Succession

If fires are kept out and there are no other disturbances such as cutting, the usual forest growth that develops on cleared land in the Barrens follows this pattern: first, a pine stand develops; then hardwoods, chiefly oaks, seed under the pines. Later, as the pines mature and die, hardwoods dominate the stand. The succession from pines to hardwoods is due to two factors:

- (1) hardwoods can live and grow under more shade than pines, and
- (2) hardwood seeds, being bigger, can become established in the thick cover of dead leaves that accumulates under unburned stands.

Species Susceptibility

Pines and oaks differ in their susceptibility to fire. Oaks have thinner bark than the pitch and shortleaf pines of the Barrens, so less heat is needed to kill their cambium. However, pine crowns are burned far more frequently than the crowns of oaks because most fires occur when oaks are leafless. Most of the fire damage to oaks is through killing of the cambium near the base. When only part of the cambium is killed, the tree usually lives but an open wound develops. When all of the cambium is killed, the stem dies but sprouts may start from buds just underground.

On pitch and shortleaf pines, fires usually damage the foliage and well-developed buds first. More heat is needed to kill the basal cambium, particularly of large trees. Thus, these pines may have only their foliage killed they may also have their major buds and branches killed, yet live through forming new crown sprouts from dormant buds. If the part above ground dies but sprouts arise, they usually arise from protected dormant buds. A tree is completely killed if no sprouts develop.

Tree Size

Large trees have thick bark and crowns farther from the ground so they tend to suffer less damage than small trees. Certain fires have killed back all pines 1 to 4 inches in diameter (at breast height), but no pines with a breast height diameter of over 13 inches. Less intense fires have killed back all oaks 1 to 4 inches in diameter, but only 12 percent of the oaks larger than 13 inches. (A tree is "killed back" if the part above ground is dead, but the root is still living and can produce sprouts. A tree is completely killed if the root, too, is dead.)

- Wharton State Park
- Whitesbog Village

Effects of Heat

The temperature of a fire varies within its various sections, its size and its burning conditions. In some large fires, the head-fires have killed 68 percent of the pine stems 5 to 8 inches in diameter while the less intense side-fires killed no pines of that size. Small fires are usually less intense and cause less damage than large ones. When air temperatures are low, heat is more quickly dissipated and more fire is needed to raise the temperature of plant tissues to the killing points. Thus, fires do less damage at low winter temperatures than in spring or summer. The intensity of a fire is also affected by fuel conditions. When the debris on the ground is dry only on top, fires may start and spread but they cannot create as much heat as when all the debris burns. Similarly, where there is less fuel, the fire will be less intense.

Fire Frequency

Frequent killing fires keep an area covered with small sprouts. Severe fires at fairly frequent intervals (less than 20 years) eventually eliminate species that do not bear seed at an early age—the apparent reason why shortleaf pine and black, white, and chestnut oaks are absent from existing stands of pitch pine and scrub (bear) oak.

ROLE OF FIRE IN SHAPING UPLAND STANDS

Most of the effect of fire on present forests of the Pine Barrens has come from large, very hot fires.

Plains Stands

Low growth of pitch pine and scrub (bear and blackjack) oaks, such as that found near the Burlington-Ocean County line along Route 72, is due chiefly to repeated killing fires that keep sprouts young and small. These sprouts' growth is retarded by the age of the stumps from which they grow and by competition among large numbers of sprouts—as many as 249 one-year-old sprouts have been counted in a single clump. Recent studies indicate that the Plains stands' fire history has favored a race of pitch pines that is relatively slow-growing, develops a mature form relatively early and has a crooked form and serotinous cones. (Serotinous cones are pitchy enough to stay closed, at least for several years, unless opened by a fire's heat. By these mechanisms, fire produced the "miniature forest" that was once considered such a mystery.

Pitch-Pine-Scrub Oak Stands

Stands similar in composition to those in the Plains arise from slightly less frequent or less intense fires which give the pines more growing time. However, these pines are usually slow-growing for two notable reasons: (1) many stems probably started as sprouts and (2) many of the pines lived through one or more fires that killed their crowns.

Oak-Pine Stands

These usually have a dense understory of oak (black, white, chestnut, etc.) sprouts with some scattered pine sprouts, both having started after the last severe fire. Over this understory is a scattering of large pines that survived the last and, often, earlier fires. This composition apparently results from severe fires at intervals of possibly 30 to 40 years, certainly at longer intervals than in the pitch pine-scrub oak areas. In the oak-pine stands, large pines have usually been deformed by past fires and if any oaks survived the last fire, they will probably have basal wounds.

FIRE EFFECTS OF SHRUBS AND HERBACEOUS VEGETATION

Just as a history of fire can alter the composition of a forest, it can also affect the undergrowth. On upland sites, an undergrowth of huckleberries and low-bush blueberries prevails under climax hardwoods and most oak-pine stands. Frequent light fires tend to reduce the shrub cover and favor herbaceous plants, especially along roads or under open stands. Severe fires can also reduce the shrub cover,

especially of huckleberries. On sandy sites, severe fires favor such species as golden-heather until they are once again crowded out by the spread of blueberries and huckleberries.

Pine Stands

Foresters believe park-like stands of pine prevailed in the original forest, due to the frequent fires the Indians set, mostly in the fall and winter. Similar stands with mature trees reaching heights of 65 to 100 feet are apparently favored by frequent light fires. Prescribed burning, as used in the Pine Barrens by foresters in recent years, calls for setting light fires, mostly in the winter, to reduce accumulation of fuel. Although this is mainly done to reduce the wildfire hazard, prescribed burning tends to create pine stands of seedling or seedling-sprout origin and to permit trees to develop without the deformities created by severe fires.

FIRE'S EFFECTS ON LOWLAND SITES

On lowland sites -- both the pine stands of poorly drained soils and the white-cedar stands of the swamps -- the effects of fire are just as varied as they are on upland sites. For example, deep-burning fires the organic soils of swamps can create (1) ponds, flats with a shallow layer of water covered by leatherleaf (2) flats with a shallow layers of water covered by leatherleaf or (3) meadows containing a wide variety interesting herbaceous plants. Killing fires that do not burn deeply enough to create any of the above conditions can result in forests of white-cedar, of swamp hardwoods, or of a mixture of cedar and hardwoods.

SUMMARY

On upland sites, all of the various combinations species occur on a wide variety of soils, so fire history has been more important in shaping the present-day forest than soil differences. Though the organic content and drainage has created difference in the vegetation of the pinelands and swamps, here too, fire has been the overriding factor in shaping both the lowlands and swamps.

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Library Catalog & My Account | Research Center | Reading Room | Business Gateway | Kids Page | Te
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burlington county library system

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PINELANDS NATIONAL RESERVE: Our Country's First National Reserve

A Million Acres in Size. . .

The New Jersey Pinelands covers over a million acres of the southeastern part of the state. The Pinelands includes portions of seven southeastern New Jersey counties and is inhabited by nearly 500,000 people. Designated as a National Reserve in 1978 and an International Biosphere Reserve in 1983, it contains towns and villages; farms; vast unbroken forests of pine, oak, and cedar; and the Pine Plains, the most extensive pygmy forest of its type in the country.

Millions of years ago, melting glaciers and ocean waters washed sand and gravel over this region. The forces of nature slowly created a relatively level landscape crisscrossed by winding streams and rivers. Through the centuries, sandy soils, acid water, and frequent fires formed a unique environment. Only plants and animals which adapted to these conditions were able to live in the environment. People called the area the Barrens because the unique environment made it hard for them to farm in the usual way.

Although many of man's activities are compatible with the land, some are not. Scattered developments have been steadily breaking up the forests, slowly destroy natural habitats and threatening the water supply. Wetlands have been drained and filled in an effort to make them suitable for building. This makes wetlands unsuitable for wildlife habitats and destroys their ability to maintain water quality. If the quality of Pinelands water is changed or pollution enters the aquifer, animals, plants, and even people, who cause the pollution, will suffer. Because of these threats, the state and federal governments have passed legislation to **protect New Jersey's Pinelands** and its water resources.

Animal Life in the Pinelands. . .

More than 1,200 plant and animal species are found in the Pinelands, almost 100 of which are threatened or endangered. The three-inch-high curly grass fern grows on in shady cedar swamps. It looks more like a grass than a fern. Long Island is the only other place in the United States where curly grass fern is found.

On late spring evenings in the bogs, a chorus of Pin Barrens tree frogs can be heard. The colorful tree frog, like the curly grass fern, is among Pinelands plants and animals which are threatened or endangered. Clearly, protection of Pinelands wetlands is important.



Wetland soils and vegetation play an important role in New Jersey's Pinelands ecosystem. They help to maintain the natural acidity and high quality of the water. The quality of this water is important even for the survival of life in the marshes and bays of southern New Jersey's coast where the food chain begins. Pinelands river water flows into these areas where countless millions of fish, crabs, clams, and

other ocean creatures start their lives. Changes in the quality or quantity of Pinelands water flowing into the bays can harm this important food source and seriously affect New Jersey's shellfishing industry.

Kirkwood-Cohansey Aquifer. . .

Beneath the surface of New Jersey's Pinelands is a vast quantity of water in the sand

LIBRARY RESOURCES

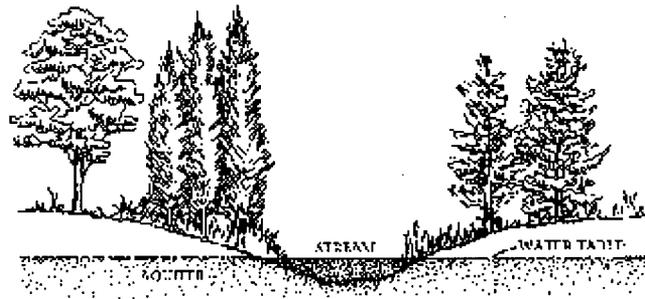
- Canoe Rentals
- Cranberries in New Jersey
- Dominant/Distinctive Vertebrates Listing
- Fact Sheet
- Fire in the Pinelands
- History of the Pinelands
- Library Materials & Holdings
- National Reserve Profile
- Reading List
- Related Terms
- Speakers Directory
- Surface Water in the Pinelands
- Vegetation of the Pinelands
- Vertebrates of the Pinelands

LOCAL & STATE RESOURCES

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- Cranberry Recipes
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- Jersey Devil Legend
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- Pinelands Commission
- Pinelands National Reserve
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- Pineypower
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This sand formation, called the Kirkwood-Cohansey Aquifer System, contains 17-trillion gallons of water and is replenished annually by approximately 45-inches of rain.



Rain percolates through the predominant porous, sand soil to replenish the aquifer below. Unfortunately, uncontrolled pollutants can reach the water supply in the same way. The Kirkwood-Cohansey

Aquifer supplies half a million South Jersey residents living in Pinelands communities with some of the purest drinking water in the world. It also feeds the rivers and streams of the Pinelands. Where underground water reaches the surface, "wetlands" are found. Wetlands that cover about one-quarter of the Pinelands, include rivers, streams, bogs, hardwood and cedar swamps.

Wetlands Habitats. . .

Wetlands provide habitats for eighty percent of the Pinelands rare plants and animals. Wetlands maintain water quality, and affect life in the marshes and bays of southern New Jersey's coast where the food chain begins. Pinelands river water flows into these areas where countless millions of fish, crabs, clams, and other ocean creatures start their lives.

The wetlands even contribute to medical research. Bristol-Myers Squibb Company scientists have isolated a compound that forms the basis for a new class of antibiotics called monobactams. This compound is produced by an organism discovered in these wetlands.

Insect-Eating Plants. . .

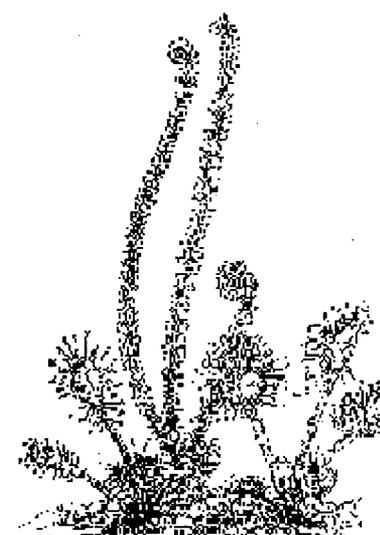
Wetland soils, although high in iron content, are low in minerals and nutrients. Several insect-eating plants have developed unique adaptations in order to survive here. For example, the pitcher plant has hollow leaves which contain water and digestive juices. Insects that enter these inviting traps are slowly digested by the plant. The tiny sundew is another insect-eating plant. Its sparkling, sticky droplets catch and hold insects as the plant digests them.

Local Craftsmen. . .

People fish, hunt, and trap in New Jersey's Pinelands. Longtime residents still practice trades and folk arts handed down to them. A sneakbox, a small boat shaped like a melon seed, is an example of local craftsmanship. It is designed for fishing and hunting in the shallow inlets and bays of southern New Jersey.

Bog Iron Ore. . .

The unusual reddish brown color of Pinelands water is caused by decomposed plant material and dissolved iron. Where water is still, a thin film of rust forms on its surface. This rust forms when naturally occurring iron in the soils and water reacts with oxygen and floats on the surface. The rust, or iron oxide as it is called, combines



with sand and gravel to form a low-grade iron ore which is deposited along stream banks. During the seventeen and eighteen hundreds, colonists used this bog iron ore to conduct a major iron industry in the Pinelands. Today visitors can see bog iron ore at the restored iron-making village of Batsto in Burlington County where cannons were tested and cannon balls were made for the American Revolution.



Early Industry. . .

In the early seventeen hundreds European settlers moved into New Jersey's Pinelands. They saw the sand, water, and forests as raw materials for making a living and started thriving industries related to the natural resources. They cut the vast forests for fuel and lumber and built great ships of the rot-resistant cedars. By 1800, the shipyards of southern New Jersey supplied vessels needed for

commerce in the Philadelphia area. Later, in the 18th and 19th centuries, company towns like Batsto and Esplanville were the sites of prosperous iron and glass industries. They mined the plentiful sand and melted it to make glass. When glass making became a major industry, settlers melted the abundant sand together with soda ash and lime using fuel from nearby forests. The first mason jar was made in Pinelands near Green Bank in Burlington County.

First Inhabitants. . .

When Indians first came to the region ten thousand years ago, their way of life made few changes in the natural environment. They traveled across New Jersey's Pinelands to gather shellfish from the bays and they hunted, fished, and trapped in the forest. Archaeologists have discovered more than a thousand Indian sites in the Pinelands, including a burial ground at Savich Farm in Marlton.

Cranberries and Blueberries. . .



Starting in the late eighteenth hundreds Pinelands farmers began to cultivate berries which grew naturally in the special conditions of the area. Today New Jersey ranks third among cranberry-producing states. Cranberry farmers need open bogs and an abundant, pure water supply to grow and harvest their crop.

Pinelands Plan. . .

The Pinelands Plan forges a public-private partnership that protects the region's natural resources while permitting development and industry in long established communities and designated growth areas. Fifty-three municipalities join in the effort to guide the location and amount of Pinelands development, protect wetlands, and safeguard water quality by preparing master plans and zoning ordinances consistent with the regional Plan. Development proposals are then reviewed locally and monitored by the Pinelands Commission.

Nearly 40 percent of the Pinelands is publicly owned and our state's Department of Environmental Protection continues to work with the Commission to acquire environmentally-sensitive lands with federal and state funding. Other important areas are protected through the Pinelands Development Credit program, the first regional development transfer program in the United States. By purchasing development rights from owners of valuable farmland and natural areas, developers are able to increase the number of homes to be built in less sensitive areas on the region's periphery.

The Commission...

Federal legislation to help New Jersey protect the Pinelands was passed in 1978. The state's Pinelands Protection Act, one of the most unique land use laws in the nation

followed in 1979. The 15-member Pinelands Commission, consisting of seven members appointed by the Governor; seven appointed by each of the Pinelands counties (Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester and Ocean) and one member appointed by the U.S. Secretary of the Interior then prepared the Pinelands Comprehensive Management Plan. The Plan went into effect on January 16, 1981, following its approval by the Governor and U.S. Secretary of Interior.

In addition to implementing the Pinelands Plan, the Commission and its staff work with interested citizens, organizations, academic institutions and public officials. Important Pinelands research is conducted, education and interpretation programs carried out, and Pinelands protection policies are reflected in many state environmental and building programs.

Pinelands Information. . .

For more information about Pinelands protection, curriculum guides, audio-visual and other Pinelands educational materials, write to the Pinelands Commission, P.O. Box 7, 15 Springfield Road, New Lisbon, New Jersey 08064 or telephone 609-894-9342. Also, enroll in the annual spring Pinelands Short Course held on the Cook/Douglass Campus of Rutgers, The State University of New Jersey. This daylong event, sponsored by the Pinelands Commission and Cook College, Office of Continuing Professional Education, offers workshops led by experts on a variety of topics.

Teachers will find Pinelands curriculum workshops particularly helpful. For further information about this special opportunity, contact the Pinelands Commission or the Office of Continuing Professional Education, Cook College, P.O. Box 231, New Brunswick, New Jersey 08903 or telephone 908-932-9271.

If you would like to help in the efforts to protect the Pinelands, you may contribute the Kathleen M. Lynch-van de Sande Fund for the Reforestation of the New Jersey Pinelands. Please make checks payable to the Pinelands Commission Katie Fund at above Commission address.

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HOME | About the Library | Ask A Librarian | Services A-Z | Libraries In System | Interlibrary Loan | Events

burlington county library system

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Guide to New Jersey
PINELANDS

Words & Definitions related to the Pinelands

LIBRARY RESOURCES

- Canoe Rentals
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- History of the Pinelands
- Library Materials & Holdings
- National Reserve Profile
- Reading List
- Related Terms
- Speakers Directory
- Surface Water in the Pinelands
- Vegetation of the Pinelands
- Vertebrates of the Pinelands

LOCAL & STATE RESOURCES

- Batsto Village
- Cranberry Growing In Burlington County
- Cranberry Recipes
- Jersey Devil of the Pine Barrens
- Jersey Devil Legend
- New Jersey Pinelands
- Comprehensive Management Plan Summary
- Photos of the Pinelands
- Pinelands Commission
- Pinelands National Reserve
- Pinelands Preservation Alliance
- Pinelands Recreation Guide
- Pineylore
- Piney power
- Plants of the Pinelands
- Tree Frogs in the Pine Barrens

Pine Barrens was the name given by early settlers to more than a million acres of the Atlantic Coastal Plain in southern New Jersey. The settlers called the area the "barrens" because most agricultural crops could not grow in its sandy, nutrient-poor soil.

The Pinelands, a more recent name for the Pine Barrens, covers essentially the same geographic area as the Pine Barrens. The region is 1.1 million acres in size and includes portions of seven New Jersey Counties: Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, and Ocean.

The Preservation Area, whose boundaries are defined by New Jersey's Pinelands Protection Act, is the area of the Pinelands that has been least developed and it includes 368,000 acres of semi-wilderness. Most of the streams and rivers in this area are part of the Mullica River watershed.

The Protection Area, whose boundaries are defined by New Jersey Pinelands Protection Act, is the 565,000 acre area surrounding the Preservation Area. It is divided into six management areas where the use of land is determined by how it would affect the environmental resources.

The Pinelands National Reserve was established by Section 502 of the National Parks and Recreation Act of 1978. Generally, the Reserve includes the state designated Preservation and Protection Areas as well as certain coastal areas protected under New Jersey's Coastal Areas Facility Review Act. In a national reserve, local, state and federal governments cooperate to protect natural and historical resources and traditional lifestyles while providing for development in environmentally suitable locations.

Designated a "**biosphere reserve**" in 1983 by the United Nations Educational, Scientific and Cultural Organization (UNESCO), New Jersey's Pinelands contains a sparsely populated and forested Preservation Area surrounded by a more heavily populated Protection Area. Scientists from around the world plan to study the impact of human activity on the unique ecosystem of the Preservation Area.

- **Wharton State Park**
 - **Whitesbog Village**
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