The Nature Conservancy

Protecting nature. Preserving life.™

©M.W. Nelson, MA NHESP

# The Pine Barrens of Southeast Massachusetts

©M.W. Nelson, MA NHESP

# Pine Barrens of Southeast Massachusetts

Found only in scattered locations from New Jersey to Maine, pine barrens are characterized by sandy soils that are poor in nutrients and prone to drought. They have a long history of relatively frequent fire and harbor highly specialized plant and animal species, many of which are adapted to fire for their survival.

Two of Earth's largest remaining pine barrens are found in southeast Massachusetts: one is found on and around Myles Standish State Forest in Plymouth, Carver and Wareham; and the other is located on and around the Massachusetts Military Reservation in Bourne and Sandwich. Both of these large forests feature a mosaic of pitch pine and scrub oak woodlands, with embedded ponds that harbor rare species and help protect the critical freshwater resources of this rapidly growing region.

Frost Bottom in Myles Standish State Forest

The term "pine barrens" refers collectively to several variations of plant communities, distinguished from each other by their relative proportions of two defining trees: pitch pine and scrub oak. In some areas, pitch pine forms a dominant overstory that shades the ground, resulting in a fairly open understory. In other areas, dense thickets of scrub oak dominate. And in others, a mixture of pitch pine and scrub oak occurs.

Pine barrens also give rise to unique ecological features like "frost bottoms." Formed by chunks of ice left to melt in place as the last glacier retreated, these depressions act as sink holes for cold air, often creating such sharp gradients in temperature that vegetation near the bottom of these depressions experience frost even in warm months of the year. Frequent frosts kill back young trees, benefiting species like scrub oak, lowbush blueberry and herbaceous plants that re-sprout readily in the open sun. These plants then provide tender new leaves to animals when other vegetation is scarce.

Because the pine barrens of southeast Massachusetts are still relatively uninterrupted by roads and development, one can find a rich mosaic of plants, insects, birds, amphibians, reptiles and mammals here. Many of them are rare, and many of them are adapted to this habitat. We encourage you to learn more about this remarkable place and explore it for yourself. Please remember to **Leave No Trace.**

# Plants of our Pine Barrens

## Pitch Pine – *Pinus rigida*

A defining plant of the pine barrens, pitch pine is able to grow in very dry environments where most other trees cannot survive. Its three- to six-inch long needles occur in clusters of three, and numerous pine cones can often be seen hanging from its twisted branches. The plant is highly flammable but well adapted to survive fire. Unlike some of its competitors, such as white pine and scarlet oak, it has thick bark that protects its living tissue and buds. After a fire, dormant buds produce sprouts of needles that grow directly out of the trunk and branches, allowing photosynthesis and cone production to continue. Pitch pine is the only conifer in the eastern U.S. that sprouts in this way.

©Venessa Salvucci, TNC

Pitch pines can also produce a special type of cone that is adapted for areas where fire is frequent. These *serotinous* cones are sealed with resin, and their seeds often take years to fully develop. When a hot fire burns through a forest, the seeds of other species may be damaged by intense heat, but the resin of a serotinous cone protects the pitch pine seeds inside. As the heat slowly melts the resin, the cones open, and the mature seeds fall to the ground where they can take root in the freshly exposed mineral soil. Thus, black fire scars on the bark of mature pitch pines are actually evidence of a healthy pine barrens system. Pitch pine supports unique communities of moths, leafhoppers and other insects.

©Alexey Zinovjev and Irina Kadis

©Robert C. Conway

## Scrub Oak

Scrub oak is a general term for oaks that do not grow large enough to be considered conventional trees. It is also the common name for a particular species: *Quercus ilicifolia*. In southeast Massachusetts, *Quercus ilicifolia* is the most common "scrub oak" species and is sometimes referred to as "bear oak." Rarely exceeding 10 to 15 feet in height, its leaves are usually two to five inches long and one to three inches wide, with a shape that is similar to, but more variable than, leaves of large oak trees. The leathery leaves are dark green above and covered in fine pale hairs below. Scrub oak does well in nutrient-poor, sandy soils, and is adapted to thrive in disturbed areas. It needs sun and will disappear from the forest if there is too much shade. With large root reserves that allow it to quickly re-sprout, scrub oak is often found in areas recently disturbed by fire, clearing or storm damage. Scrub oak is an important food source for many mammals and insects. Its leaves are the primary food for 16 of the 56 moths and butterflies of conservation concern that inhabit pine barrens in this region. Its acorns are an important food source for white-tailed deer, squirrels and wild turkeys.

©Alexey Zinovjev and Irina Kadis

## Dwarf Chestnut Oak or Dwarf Chinkapin Oak – *Quercus prinoides*

Less prevalent in the region than *Quercus ilicifolia*, dwarf chestnut oak is also considered a scrub oak, though it can grow up to 20 feet in height. Its leaves have four to eight shallow lobes that end in sharp teeth, giving a wavy appearance to the leaves. Dwarf chestnut oak can form large colonies by sending out shoots that grow horizontally along the ground. It can be found in the same dry, nutrient-poor soils as bear oak. Fire often invigorates this species: it will sprout readily after a fire has burned it to the ground and may even produce more acorns after fire. The acorns take one year to mature and are a key food source for many mammals.

## Hillside and Lowbush Blueberry – *Vaccinium pallidum* and *V. angustifolium*

©Dennis Curtin

Hillside and lowbush blueberry can be difficult for the casual observer to tell apart. To make things even more difficult, both plants are often found with black huckleberry, which also looks similar. Both species of blueberry produce small, white, bell-shaped flowers that are an important source of nectar for insects early in the season. In the fall, the leaves of both species turn a beautiful red.

While the fruit of hillside blueberry is considered bland-tasting, lowbush blueberries are delicious and grown commercially. Both plants are well-adapted to survive fire and will sprout from the base. In fact, periodic burning is a standard management method for commercial lowbush blueberry cultivation. The fruit is an important food source for many kinds of birds and mammals such as eastern towhees, ruffed grouse, squirrels and foxes. The leaves are also an important food source for the caterpillars of slender clearwing sphinx.

## Black Huckleberry – *Gaylussacia baccata*

©Alexey Zinovjev and Irina Kadis

Because of its simple oval leaves and black or blue berries, black huckleberry is easily confused with blueberry. The best way to distinguish it is to look for small yellowish dots on both surfaces of its leaves and the ten large seeds found in its berries. Black huckleberry often grows alongside blueberries in the pine barrens. The plant regenerates primarily by sprouting from its rhizome (horizontal underground stem) roots.

©Robert C. Conway

### Bearberry – *Arctostaphylos uva-ursi*

Bearberry is a low-growing evergreen shrub with trailing stems and simple leathery leaves that are about a half-inch long. It flowers in May and early June and produces red berries. The fruit remains on the plant for a long time, providing food for animals even in the winter. Bearberry needs sun and is found in areas of the pine barrens with open canopy, such as frost pockets. It can survive low intensity fires and sprouts vigorously from buds at the base of the plant. Its seeds are also fire resistant. Bearberry is sometimes called "kinnikinnick," which means "mixture" in Algonquian. The Algonquians smoked bearberry mixed with other plants in ceremonies. Bearberry has many medicinal uses.

©Robert C. Conway

### Broom Crowberry – *Corema conradii*

Broom crowberry is one of several members of the heath family found in the pine barrens. The plant is always low-growing and reaches a maximum height of about 20 inches. While individual plants are small, broom crowberry can grow in large colonies: one colony on Nantucket is 40 acres in size. Broom crowberry retains its needle-like leaves through the winter. In March, small purplish flowers appear at the ends of its branches. Broom crowberry is a rare plant in Massachusetts, in part because it requires a high frequency of disturbance, such as fire. With increasing fire suppression, these plants have been overtaken by competitors. Broom crowberry is listed as a *Species of Special Concern* in Massachusetts due to its rarity and threats from development and habitat succession.

### Birds-foot Violet – *Viola pedata*

©Alexey Zinovjev and Irina Kadis

Often considered one of the most attractive violets, birds-foot violet is grown commercially for gardeners but is relatively uncommon in the wild. The violet grows four to ten inches high, and its purple flowers can be seen from April to June. It is distinguished from other violets by its leaves, which are deeply divided into three to five lobes that resemble the toes on a bird's foot. The violet is not adapted to fire but thrives in the pine barrens' dry sandy soils and open woods. Birds-foot violet has an unusual method for dispersing its seeds: when the seeds fall to the ground, they emit a sugary solution that attracts ants, which carry the seeds off to new locations.

## Birds of our Pine Barrens

### Eastern Towhee – *Pipilo erythrophthalmus*

The eastern towhee is a common sight in the pine barrens of Massachusetts. The bird is often heard and seen using a double hop as it rustles leaves and forages for insects on the forest floor. Because they prefer open woodlands—like those that result from periodic fires—populations of eastern towhee decline as a forest matures. One study in Plymouth, Massachusetts showed that suburban development within the pine barrens has decreased populations of the eastern towhee by 50 percent.

### Eastern Bluebird – *Sialia sialis*

©Gail Hansche Godin

Eastern bluebirds were among the species devastated by the use of DDT before it was banned, and they provide a wonderful example of how humans can aid in the recovery of declining wildlife populations. Special nest boxes installed by hundreds of concerned citizens helped increase the population of this species by replicating tree cavities that were lost to logging or development. In southeast Massachusetts, eastern bluebirds can find natural cavities in pitch pine after fire has burned an area. These burned areas also create the open spaces that bluebirds need for foraging.

### Pine Warbler – *Dendroica pinus*

The pine warbler nests in large pitch pine forests with tall trees. The number of pine warblers has been declining in southeast Massachusetts since the 1940s and 50s as both development and succession have decreased the size of the pine barrens. The male pine warbler defends his treetop nest through persistent singing and fighting. While caterpillars and other insects are the bird's favorite foods, the pine warbler is the only warbler species that consumes a significant amount of seeds as part of its normal diet.

### Prairie Warbler – *Dendroica discolor*

Pine barrens are the favored habitat in Massachusetts for this warbler, which typically breeds in shrubby habitats such as overgrown fields, young pine thickets and open or disturbed woodlands. Breeding surveys have found that Myles Standish State Forest harbors more prairie warbler pairs than anywhere else in the state, with the highest density observed in areas that burned ten to 20 years previously. The prairie warbler constructs its nests with an outer shell of plant materials and fibers. In this region, nests are typically found between one and ten feet up in the forks or lateral branches of low shrubby trees—especially scrub oak.

### Whip-poor-will – *Caprimulgus vociferus*

Though not exclusive to pine barrens, whip-poor-wills are ground nesting birds that need dry open woodlands. Because they are nocturnal and rarely seen, they are most frequently identified by the call of "*whip-poor-will*," for which they are named. They forage by perching on the ground and flying up to catch passing insects. Whip-poor-will populations decline when an absence of disturbance results in a maturing forest that is less open. Myles Standish State Forest has one of the largest remaining whip-poor-will populations in Massachusetts.

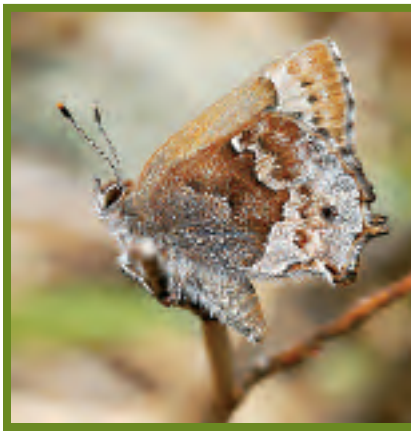
# Insects of our Pine Barrens

**Persius Duskywing –**
***Erynnis persius persius***

©M.W. Nelson, MA NHESP

The Persius duskywing butterfly is found in pine barrens and dry, open oak woodlands, particularly in disturbed areas within these habitats. Adult butterflies can be seen in May and early June. In their search for females, males often frequent hilltops, and both males and females perch on the ground or on low twigs. Females lay their eggs on plants like wild indigo (*Baptisia tinctoria*). The caterpillars then feed on these plants and make nests out of their rolled up leaves before spending the winter buried in the leaves on the ground. The Persius duskywing is listed as an *Endangered* species in Massachusetts. The pine barrens of Plymouth and Wareham harbor the only known population of this butterfly in the state. It can be difficult to distinguish from more common duskywing species, five of which occupy similar habitat in the region.

**Frosted Elfin –**
***Callophrys irus***



©M.W. Nelson, MA NHESP

Open areas in the pine barrens are favored by this butterfly, the larvae of which feed on wild indigo growing in open, sandy soils. Adults fly from late April to mid-June. In May, you may observe newly emerged adults in courtship flights over their preferred open habitat. Two other elfin species have similar white, frost-like scaling on their hind wings, but the frosted elfin is distinguished by a distinct dark spot along its wings' outer margins. The frosted elfin occurs across the eastern U.S., but colonies are scarce and highly localized. It is listed as a *Species of Special Concern* in Massachusetts.

©M.W. Nelson, MA NHESP

### Slender Clearwing Sphinx – *Hemaris gracilis*

This moth is found in a variety of habitats including pinelands, rocky summits and wetlands. The adults can be seen during the day from May to June. With a wingspan up to 1¾ inches, they are often mistaken for hummingbirds as they fly from flower to flower in search of nectar. The caterpillar looks similar to a small tomato hornworm and feeds on lowbush blueberry. There are currently only four known populations of this insect in the state. It is listed as a *Species of Special Concern* in Massachusetts.

©M.W. Nelson, MA NHESP

### Barrens Buck Moth – *Hemileuca maia*

The barrens buck moth is a large (wingspan 2½ inches) day-flying moth. The adults are often spotted by hunters in the fall, hence the name barrens buck moth. The females lay their eggs on the twigs of scrub oak. Upon hatching in May, the black caterpillars feed on the tender young leaves and often form large groups on the twigs. Frost bottoms are important for this species because the cold causes leaves to come out later in the season. The caterpillars grow larger more quickly feeding on tender young leaves than if they were to feed on older leaves. The caterpillars pupate in the soil and, if conditions are dry, may remain in the ground for up to four years. In Massachusetts, the barrens buck moth is found primarily along the southeast coast and on Martha's Vineyard and Nantucket. It is listed by the state as a *Species of Special Concern*.

### Melsheimer's Sack-Bearer Moth – *Cicinnus melsheimeri*

©M.W. Nelson, MA NHESP

In Massachusetts, the Melsheimer's sack-bearer moth is associated with bear oak and frost bottoms. The adults are seen flying in June and July. In late summer the caterpillars can be seen feeding on bear oak and sewing together oak leaves to make a sack-like shelter. The caterpillars carry these sacks with them and will tie them to twigs when at rest. Caterpillars spend the winter in their sacks and become adults in the spring. Massachusetts lists this moth as a *Threatened* species.

### Gerhard's Underwing – *Catocala herodias gerhardi*

©M.W. Nelson, MA NHESP

In Massachusetts, the Gerhard's underwing moth is found in pine barrens that have an open canopy with bear oak underneath. They are found in Plymouth, Wareham, Cape Cod and the offshore islands. To startle predators such as birds, the hindwings of adults display a red and black pattern that mimics an eye. In the spring, the caterpillars are found feeding on the catkins and new leaves of scrub oak. Frost bottoms are important habitat for these moths because their "leaf out" occurs later in the season. The caterpillars take about four weeks to mature and pupate in the leaf litter. Adults can be found flying late at night in the months of July and August. They lay their eggs on the stems of scrub oak, and the eggs remain there over winter. Gerhard's underwing is listed as a *Species of Special Concern* in Massachusetts.

### Barrens Tiger Beetle – *Cicindela patruela*

The 5/8-inch long adult barrens tiger beetle has a striking iridescent green back with a white pattern along the edges that extends toward the center of its body. It is sometimes mistaken for the six-spotted tiger beetle (*Cicindela sexguttata*), which has white dots along the edges of its back. The barrens tiger beetle can be found in open, sandy areas in pine barrens that are free of vehicle traffic. The beetle has a two-year life cycle. In the spring and early summer, the adults lay eggs that hatch quickly. The larvae then construct burrows in the sand. Like their parents, the larvae are predators that eat other insects. The larvae spend the first winter in their burrows and become adults in late summer of the following year, spending their second winter in the ground. The following spring, they lay their eggs. The pine barrens of Plymouth and Wareham are the only place in Massachusetts where this beetle is known to occur; it is listed by the state as an *Endangered* species.

©M.W. Nelson, MA NHESP

### Antlion – family *Myrmeliontidae*

The adult antlion has a long slender abdomen that makes it look very much like a damselfly. However, antlions are weak fliers and are sometimes attracted to lights. The immature antlion, or "doodlebug," is better known than the adult. They make cone-shaped pitfall traps in sand. These pitfall traps can often be seen along the edges of trails or underneath bushes in areas of exposed sand. The antlion makes the cone by using its head and mouth parts as shovels and walking backward. The antlion will then bury itself at the bottom of the pit to await its prey. When an unsuspecting ant or other small insect falls into the pit, the antlion grabs it in its powerful jaws, thrashes it against the sides of the pit and pulls it beneath the sand to eat it. If one is careful not to scare the doodlebug, it can be observed in action by dropping small ants into its pits. Antlions can be found in a variety of habitats and are common in the pine barrens' sandy soils.

# Reptiles of our Pine Barrens

### Northern Red-bellied Cooter – *Pseudemys rubriventris*

©Venessa Salvucci, TNC

Formerly known as the Plymouth redbelly turtle and considered a separate species from populations found from New Jersey southward, the northern red-bellied cooters found in Plymouth County are now considered to be a sub-population long isolated from their southern cousins. The cooter's black head has yellow or ivory lines, but lacks the yellow spot behind the eye that is seen on the more common painted turtle (*Chrysemys picta*). Adults range from 10-15 inches in size, with upper shells that are mostly black to mahogany. Ponds surrounded by undeveloped sandy soils like those found in and around Myles Standish State Forest are the cooters' favored habitat. They overwinter at the bottom of these ponds, emerging in late March to raise their body temperature by basking on logs and woody debris in the water. Listed as *Endangered* in Massachusetts, the northern red-bellied cooter is threatened by development of its pondfront habitat, an increase in skunks and raccoons that raid its nests and the suppression of fires that historically maintained openings in the forest canopy to warm favored nesting areas.

### Eastern Box Turtle – *Terrapene carolina*

A terrestrial turtle with a hooked "beak" and an adult length of less than seven inches, this species draws its name from the hinged lower shell that allows it to fully enclose its head, tail and legs when threatened. In northern climates, the turtle overwinters in upland forests by burrowing under leaves and into soft ground. In fire-adapted systems, eastern box turtles have been observed to survive an approaching fire by burrowing underground until flames have passed. Adults are most readily seen on summer mornings and evenings, particularly after a rain. Eastern box turtles occur in many types of habitats across Massachusetts, but are most heavily concentrated in the southeastern part of the state. With populations affected by road mortality and loss of habitat to development, the eastern box turtle is listed as a *Species of Special Concern* in Massachusetts.

©M.W. Nelson, MA NHESP

**Eastern Hognose Snake – *Heterodon platirhinos***

Variable in pattern and coloration and generally under three-feet long in adulthood, the hognose snake is distinguished by an upturned snout that it uses to burrow in sandy and loamy soils. Though not poisonous to humans and unlikely to bite, a threatened hognose snake will flatten its head horizontally, raise its neck off the ground (somewhat like a cobra) and may make repeated hissing strikes. If the potential predator is undeterred, the snake will play dead by writhing onto its back with mouth agape and tongue lolling out, even emitting a foul order, fecal matter and droplets of blood. If rolled upright, the snake may roll right back over again, "insisting" it is dead. Its eyes, however, will remain on the predator. When it feels the threat has passed, it will right itself and slither away. Eastern hognose snakes are active in the daytime, hunting primarily for toads, but also for eggs, insects and mice.

## Mammals of our Pine Barrens

**Fisher - *Martes pennanti***

The fisher is a large dark-brown weasel. Males are 24-26 inches in total length, and females are 21-23 inches in total length. Fishers are generally shy and tend to be active from dusk to dawn. They can eat plant material such as blueberries, but generally prefer squirrels, porcupines, mice, voles, skunks, birds, fish, snakes, toads and carrion. Fishers are known for climbing trees and have a unique ankle that allows them to descend trees head first. Once eliminated from Massachusetts due to land clearing for agriculture, fishers have been moving back into the state as the amount of forest cover increases. Fishers are not restricted to pine barrens, but do best in unfragmented forests.

## Saving our Pine Barrens

Rapid development and suppression of fire have caused the pine barrens to decline dramatically across their range. Already, Massachusetts has lost 60–70 percent of its original pine barrens, and many remaining fragments are too small to accommodate the full mosaic of community types and the species that depend upon them.

©Eric Aldrich, TNC

We can prevent further loss and fragmentation of the pine barrens by working with landowners and communities to permanently conserve properties that may otherwise be developed in the future, and by working cooperatively with private and public landowners to allow the dynamic life cycle of pine barrens species and communities to continue. Periodic disturbance—optimally through the careful application of prescribed fire—is a critical part of that cycle.

## A Special Place for Fire

Fire-suppressed pine barrens are crowded and thick with vegetation. If the barrens remain undisturbed for long periods of time—with no major fire, storm damage, mowing or thinning—the ecosystem will begin to transition into a different type of plant community. Species such as white pine *(Pinus strobus)* and shade-tolerant hardwoods displace species that rely on pine barrens' conditions. Historically, wildfire and controlled burning by early inhabitants kept the region's pine barrens in balance, but denser human settlement has resulted in fire suppression.

©Eric Aldrich, TNC

Today, The Nature Conservancy works closely with partners to plan controlled burning operations that safely restore pine barrens dynamics, while simultaneously reducing the build up of dry leaves and woody debris that would otherwise increase the risk of catastrophic wildfire. Cutting and thinning can be important tools for the maintenance of pine barrens, and are an integral part of preparing a site for controlled burning, but fire provides benefits that cutting and thinning cannot. Controlled burning can be applied to areas that would be difficult to reach mechanically, and it is the only practical way to reduce accumulated leaf litter and organic material to expose the sandy, nutrient-poor soils that are critical to pine barrens species.

©Venessa Salvucci, TNC

The Nature Conservancy

Protecting nature. Preserving life.™

**The Nature Conservancy**
Southeast Massachusetts Program
204 Long Pond Road
Plymouth, MA 02360
(508) 732-0300
www.nature.org/massachusetts

The Nature Conservancy is an international conservation organization that works to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.



We wish to thank Ellen P. Bidlack and Michael W. Nelson for their editorial assistance.

printed on recycled paper