

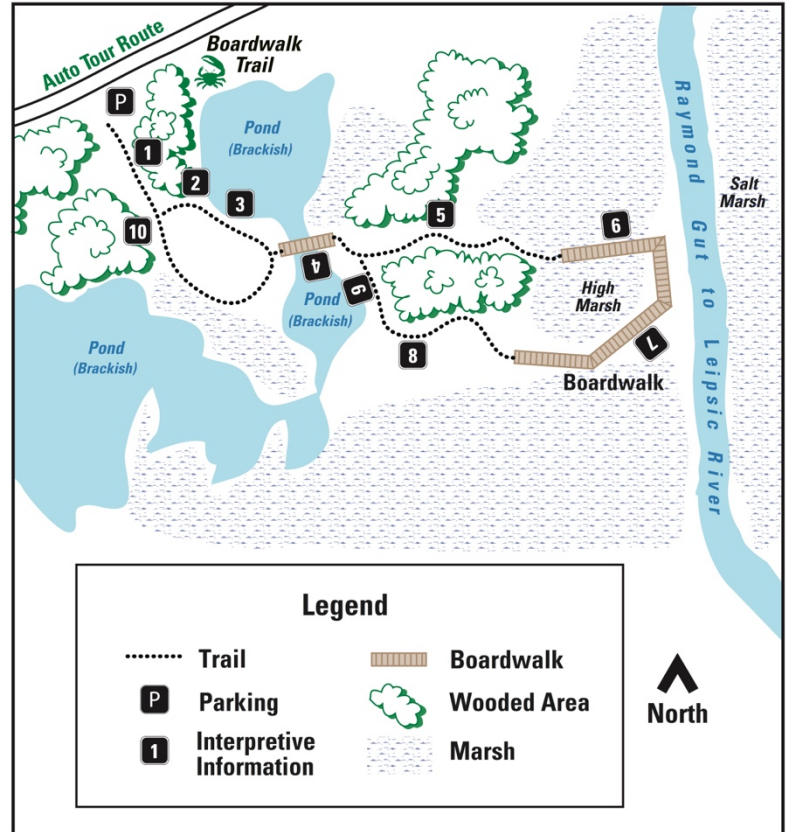


## Welcome to the Saltmarsh Boardwalk Trail at Bombay Hook!

This trail offers the visitor the only opportunity to study up close the tidal salt marshes that cover 80% of the refuge and that are among its most important assets. The walking trail begins in a small upland woodlot bordered by brackish ponds, and then emerges onto a boardwalk over the high salt marsh before reentering the woods and returning to its point of origin, a total distance of about ½ mile. Ten numbered guideposts are located along the trail corresponding to descriptions in this brochure.

Some of the wooded portions of the trail are bordered by heavy growths of poison ivy. Therefore, it is best to stay in the middle of the trail and to avoid brushing against the vegetation. Also, during warmer months it is advisable to use insect repellent and to wear long-sleeved shirts and pants to ward off mosquitoes & ticks.

Binoculars and birding field guides are handy tools to view wildlife and are available on loan at the visitor center. The Center also has information about recreational opportunities and how to become a volunteer at the refuge. Lists of bird, reptiles/amphibians, fish, mammals, trees and wildflowers found on the refuge are also available at [https://www.fws.gov/refuge/Bombay\\_Hook/visit/brochures.html](https://www.fws.gov/refuge/Bombay_Hook/visit/brochures.html). As this is a National Wildlife Refuge, collecting, disturbing, feeding, injuring or damaging animals and plants is prohibited.



### STOP 1 - These woods at the Boardwalk Trail are in the first stage of forest succession.

Forest succession is the gradual change in vegetation that occurs when cleared fields are abandoned. Grasses and herbaceous plants are first replaced by woody plants, then by shrubs and trees such as [sweet gums](#), [winged sumac](#) and also in this case [persimmon](#) and [wild cherry](#). Following this first stage, [maples](#) and [beech](#) may gradually appear, followed by [oaks](#) and [hickory](#) that are characteristic of the mature forest. The refuge has 1000 acres of forest, and most are in small woodlots.

In this immediate area most of the trees are sweet gums, identified by five pointed leaves that turn red, yellow, and orange in the fall, by rough gray bark with deep fissures, and by brown seed pod in the shape of a prickly golf ball. [American goldfinch](#), [Carolina chickadees](#), and other small seed-eating birds sometimes can be seen wrapped around these balls, digging out the seeds. In spring and summer this is a good place to look in the treetops for [Baltimore orioles](#) and in the understory for [eastern towhees](#). [Gray catbirds](#) frequently join visitors as they move down the path.

**STOP 2 - This brackish pond is a favorite site for school groups studying saltwater environments.** They use dip nets to scoop up the inhabitants of the pond - [grass shrimp](#), [sheepshead minnows](#), killifish, and [mummichogs](#) - and compare them to their catch in the freshwater impoundments. In freshwater they find frogs, tadpoles, mud minnows, and various aquatic insects. Here in the brackish pond they also look for [blue crabs](#) hiding in the grasses.

This water is brackish or slightly salty. Currents on the rising tide carry water from Delaware Bay through the salt marshes and to this pond. The salinity of the pond water depends on how much rain has diluted it. During periods of draught, salinity is higher; after heavy rains it is lower. The plants and animals that live in this habitat, therefore, must be able to tolerate variations in salinity. On average salinity here is about seven to ten parts per thousand, or approximately ¼ ounce per quart of water. Salt water in the ocean is thirty-five parts per thousand or about one ounce per quart. In the spring and summer, tree swallows swoop low over the pond feeding on the hoard of mosquitoes rising from the water. At the same time the [sheepshead minnows](#) and [mummichogs](#) are feasting on the mosquito larva swimming near the

surface. No matter, some mosquitoes manage to escape! Now and then [great egrets](#), [snowy egrets](#), and [great blue herons](#) can be seen looking for fish along the edges of the pond.

**STOP 3 - In the spring and fall these woods are one of the best places on the refuge to see migrating wood warblers.** These small insect eating birds are in brightly colored breeding plumage in the spring, but much harder to identify in their rather plain fall non-breeding garb. They usually are found flitting around in the tops of trees. Among the most common species found on the refuge during the spring and fall migrations are [chestnut-sided warblers](#), [magnolia warblers](#), [palm warblers](#), [black and white warblers](#), [yellow-rumped warblers](#), and [American redstarts](#).

Most of the warblers spend the winter months in South America and breed elsewhere in northern United States and Canada, only passing through Bombay Hook. Two of the species that remain here through the summer and nest on the refuge are [yellow warblers](#) and [common yellowthroats](#). Both are very common on the Boardwalk Trail. Yellow warblers are small, yellow birds. Seen up close, the male has red streaks on his breast. While the female common yellowthroat is rather plain, the male's yellow throat and his black "bandit" mask make him easy to identify. And unlike most of the other warblers, common yellowthroats are often found close to the ground in the understory.

Of course, not all birds here are warblers. In the summer, [house wrens](#) and [eastern wood-pewees](#) are common. There also are a number of year round residents: [northern cardinals](#), [blue jays](#), [Carolina wrens](#), [American goldfinches](#), and [Carolina chickadees](#). [Downy](#) and [red-bellied woodpeckers](#), as well as [northern flickers](#) can be heard pounding holes in the dead snags anytime of the year.

**STOP 4 - Edge areas are those places where different habitats come together**, where here on the Boardwalk Trail, upland forest meets brackish ponds and the tidal salt marsh. The abundance of such edges is one of Bombay Hook's most important assets.

These edges are a favorite place for all kinds of wildlife because they offer the advantages of more than one habitat in a single location. One habitat may offer food, the other shelter. For example, when a forested area adjoins a cultivated field of clover, [deer](#) can graze the field, but be within a single bound of the cover offered by the woods. Here a dead [persimmon](#) tree on the edge provides a perch for a [belted kingfisher](#) from which he can swoop down on a fish in the brackish pond. Predators love edges; the [red fox](#) uses the undergrowth of a wooded edge to sneak up on a [rabbit](#) feeding in the warm season grasses.

But there is another important characteristic of edge areas. The habitats in these locations also are modified. For example, the edges of forests, because they get more sunlight, tend to have more and denser undergrowth than in the deeper forest. The brackish pond has less salinity because of the run off from bordering upland. And here there is evidence of saltwater intrusion from the marsh and the brackish pond into the upland area. The heavy shrubs along the edge of the pond and marsh are [groundsel bushes](#), a plant that thrives in a saline soil and is commonly found in such border areas. In mid-summer it is identified by its small white flowers and in the fall by its cotton-like seeds.

It has been theorized that the dead [persimmon](#), [wild cherry](#) and [sweet gum](#) trees in this section of the woods also are a result of saltwater intrusion. Past drought conditions have affected this wooded area, allowing in more sunlight and, in turn, more undergrowth made up of woody plants, shrubs, and saplings.

The reeds growing on the edge of the marsh are [phragmites](#), also known as common reeds. Phragmites are an invasive plant that crowds out more desirable marsh plants and has little value for wildlife. An invasive species is a species that is 1) nonnative (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause environmental harm to the ecosystem. They grow in both fresh and saltwater marshes and other wet spots, usually on borders where the ground has been disturbed. Efforts are made to control phragmites through a combination of herbicides and burning.

**STOP 5 - Here the woods are markedly different.** The large trees along the left side of the trail are [wild cherries](#), identified by their dark brown, shaggy bark. Many birds favor the fruit. Here there is also less sunlight and, consequently, less undergrowth. In the late spring and summer marsh ferns grow profusely on the forest floor.

This is a good place to look for [brown thrashers](#) during the warmer months. Brown thrashers are long-tailed, striped-breasted brown birds related to [mockingbirds](#) and [catbirds](#). They sometimes are confused with another forest dweller, the [wood thrush](#), slightly smaller with a shorter tail and spotted breast. Usually brown thrashers are seen close to or on the ground.

This portion of the trail is also a good place to observe the several forms of [poison ivy](#). Poison ivy grows as a plant, a shrub, and as a vine. The plant form can be seen along the Boardwalk Trail in the wooded areas, and good examples of the vine form are seen growing on the trees at the beginning of this section of the trail. Birds eat the white berries produced by poison ivy in the fall and winter, and some birds have been observed using the fine hairy roots of the vines as lining for their nests. On the other hand, most humans develop a severe rash on contact with any part of the plant.

[Japanese honeysuckle](#), introduced into the United States in 1898, is found in patches along this section of the trail. This plant spreads rapidly and can dominate and shade out native plants. The flowering vine and its berries, however, are a good source of food for game birds, songbirds, rabbits and deer.

**STOP 6 - Tidal salt marsh covers 13,000 acres of the 16,251 acres that make up Bombay Hook National Wildlife Refuge.** Salt marshes are coastal wetlands that are flooded by salt water brought in by the tides and are drained as the tides recede. The salt marsh under the boardwalk, between the woods and Raymond Gut (the tidal stream at the edge of the boardwalk) is high marsh. High marshes flood only during spring tides, usually two times a month, and at other times of unusually high tides, such as occur during storms. Across Raymond Gut is the low marsh stretching all the way to Delaware Bay. Low marshes flood twice every day on the normal high tides; they drain on the low tides.

Raymond Gut is one of the many tidal streams (called "guts") that meander through the marsh and connect with larger bodies of water, in this case Leipsic River. These guts facilitate the tidal flow in and out of the marsh and make the marsh accessible to fish species that spawn in salt marshes, such as [white perch](#) and [striped bass](#). The small wooded area in the distance across the low marsh is George's Island, a hummock or small upland area rising above the marsh. It serves as a refuge for deer, other mammals and birds.

On the edge between the upland wooded area and the marsh, where the boardwalk emerges, there are heavy growths of [groundsel bushes](#) and [phragmites](#); further along the boardwalk is [marsh elder](#), also called high tide bush. There are several types of cordgrass found in the marsh area:

- [Salt meadow cordgrass](#) (*Spartina patens*) grows to a height of about two feet and is the major grass in the high marsh.
- [Salt marsh cordgrass](#) (*Spartina alterniflora*) grows to a height of eight feet and is the primary grass growing in the low marsh.
- [Big cordgrass](#), also called salt reed grass (*Spartina cynosuroides*) grows to about the same height as the phragmites and is found close to the boardwalk.
- [Saltgrass](#) (*Distichlis spicata*) does not grow straight, but rather forms dense mats and also can be seen along the boardwalk.

Salt marshes produce more total vegetation per acre than almost any other habitat, more than the rain forests. At the end of the growing season each fall this huge plant biomass turns brown, dies off, falls down in the marsh, and begins a decaying process. One result is the familiar smell of marsh gas. Another is the detritus, a combination of dead plants and decomposing organisms that form the base of the estuarine food chain. Then each spring the marsh again turns green as new grasses spring up, also fed by nutrients from this detritus.

Marsh grasses serve as filters to remove silt and contaminants as bay waters flow through them on the rise and fall of the tides. They also serve to dampen storm surges and protect inland areas from flooding. While the salt marsh is seen as a vast unbroken sea of glass, actually it is more diverse with winding guts, here and there hard ground, salt ponds, and mud flats exposed at low tide, submerged when the tide is high.

**STOP 7 - The marsh is home to many wildlife species**, and some can be seen from the boardwalk. The [fiddler crab](#) makes the many holes in the mud bank along Raymond Gut. The male of this crustacean species, which measures up to about one inch in size, has one large claw and one small one (the female has two small claws). They hide in their holes at the slightest provocation. Two other species of crabs inhabit the gut along its banks, the [marsh crab](#) and the [blue crab](#). [Raccoons](#) are rarely seen in the daytime, but their scat or droppings on the boardwalk and footprints in the mud verify their presence.

[Muskrats](#) also are rarely seen, but their house of mud and piled up marsh grasses attest to their presence. [Deer](#) can sometimes be seen swimming across the gut or in the marsh. [Snowy](#) and [great egrets](#), along with [great blue herons](#) often are seen flying over the marsh or wading along the banks of the guts, searching for fish and crustaceans.

[Northern harrier](#) patrol the marsh in low, quartering flights in search of [rice rats](#), [meadow voles](#), and other small mammals that inhabit the marsh. These proficient hunters use facial disks, similar to those found in owls, to capture

sounds of these prey as they scurry through the grasses, as well as acute eyesight to spot them. They are seen mostly in the fall, winter, and spring.

Three small birds are common on the boardwalk in spring, summer, and fall. They are the [seaside sparrow](#), [salt marsh sparrow](#) and the [marsh wren](#). [Seaside sparrows](#) are identified by their all-over gray appearance. They seldom sit still, and disappear quickly into the salt meadow grass of the high marsh.

The [saltmarsh sparrow](#) is very quiet, having a wheezy quality to its song. This sparrow has a cream-colored breast with dark streaks and a white throat/belly.

The [marsh wren](#), on the other hand, is heard more often than seen. These perky little birds with tails raised over their backs scold anyone nearing their nests. The nests are round, about the size of a softball, and made of grasses. The male builds a number of crude nests to attract females; the female then finishes the chosen nest by lining it with feathers and fine plant material. Look for these nests in the [big cordgrass](#) and [phragmites](#) at both ends of the boardwalk and in the small bushes along it.

**STOP 8 - The [whitetail deer](#) is the largest mammal on the refuge**, and of the larger mammals it also is among the more numerous. There are about two thousand acres of deer habitat on the refuge itself, although deer move freely to the agricultural lands surrounding the refuge. It is noteworthy that there is no record of whitetail deer on the refuge prior to 1941, when in that year four deer were found. Deer from nearby woods and fields travel along this edge area, cross the high marsh, swim Raymond Gut, and cross the low salt marsh to get to their destination, George's Island.

The wooden structure is a deer stand. Deer hunting on the refuge is done from stands like this. There are a total of 110 stands and they are assigned by a lottery system. Hunters participating in the refuge hunting program help stabilize but will not deplete the herd. Deer hunting meets another objective of the National Wildlife Refuge System: namely to provide wildlife-dependent public recreational opportunities when appropriate and within the overall mission of the System.


**STOP 9 - This is the second brackish pond that borders this upland, but it is surrounded by more salt marsh than the one on the other side.** It is also more isolated, and therefore it seems to be more attractive to wildlife. [Willetts](#), rather large, heavy-set shorebirds, are sometimes seen on the edges of the pond or in the adjacent salt marsh from mid-March to mid-September. They are easily identified in flight by a white pattern in the wings. Willetts are one of the few shorebirds known to nest in the salt marshes of the refuge.

[Greater](#) and [lesser yellowlegs](#) also frequent this pond. They also are shorebirds, not quite as large and much more slender than the willetts. Greater yellowlegs are seen from mid-March through mid-December, the lesser from March through May and July through November. Ducks seen here are among those that nest on the refuge: [mallards](#), [black ducks](#), [gadwalls](#), and [blue-winged teal](#).

**STOP 10 - Here the shrubs, bushes, and saplings in the understory are quite diverse and a mixture of native and nonnative plants.** These include [American holly](#), [sassafras](#), and [winged sumac](#), as well as [sweet gum](#), [persimmon](#), [cedar](#) and a few oak trees. [Autumn-olive](#), an introduced and invasive species, has pink to red, rather translucent berries in the fall. It borders the trail in much of this area.

There are four other walking trails on the refuge. Parson Point Trail is one mile round trip in length and goes through mixed habitats from freshwater marsh bordering Sheariness Pool to mature forest. Bear Swamp Trail is handicapped accessible and leads to an observation tower and floating observation. It goes through an edge habitat between forest, freshwater marsh and freshwater impoundment. Walking trails to observation towers at Raymond and Sheariness pools go through edge habitats that often have interesting bird life.

***We hope you have enjoyed your visit to the Boardwalk Trail and realize that wetlands have many values and provide benefits for everyone. Please do your part to protect them!***

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