Bombay Hook National Wildlife Refuge
2591 Whitehall Neck Road
Smyrna, DE 19977-6872
302/653 9345
Email: fw5rw_bhnwr@mail.fws.gov
http://bombayhook.fws.gov

Federal Relay Service
for the deaf and hard-of-hearing
1 800/877 8339

U.S. Fish & Wildlife Service
1 800/344 WILD
http://www.fws.gov/

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U.S. Fish & Wildlife Service

Bombay Hook

National Wildlife Refuge

Saltmarsh Boardwalk Trail



AUTHENTICATED U.S. GOVERNMENT INFORMATION GPO

Welcome



This goose, designed by J.N. "Ding" Darling, has become the symbol of the National Wildlife Refuge System.

Welcome to Bombay Hook National Wildlife Refuge and to the Boardwalk Trail. This trail offers the visitor the only opportunity to study the tidal salt marshes that cover eighty percent 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 on to a boardwalk over the high salt marsh before reentering the woods and returning to its point of origin, a total distance of about one-half mile. Ten numbered guideposts are located along the trail corresponding to descriptions in this brochure.

Members of the Youth Conservation Corps built the Boardwalk Trail in 1973. It is currently maintained with the help of volunteers.

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 slacks to ward off mosquitoes and ticks.

1 Further information about birds, other animals and plants that inhabit the refuge is available in the Visitors Center. The Center also has information about recreational opportunities and how to become a volunteer at the refuge.

The refuge has 503 acres of forest, and most are in small woodlots. 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.

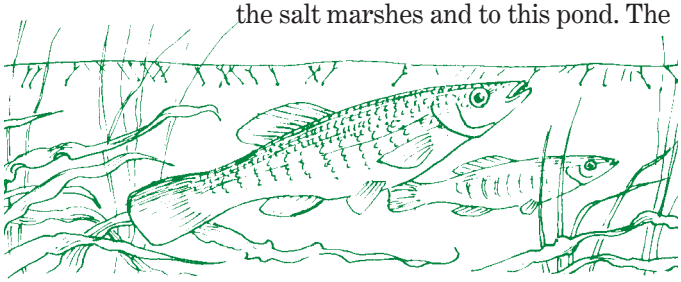


In this immediate area most of the trees are sweet gums, identified by five pointed leaves that turn red, yellow, and orange in the fall, by rough gray bark with deep fissures, and by brown seed pods in the shape of a prickly golf ball. American goldfinches, Carolina chickadees, and other small seed-eating 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.

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, sheeps-head 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 one-fourth ounce per quart of water. Salt water in the ocean is thirty-five parts per thousand or about one ounce per quart.

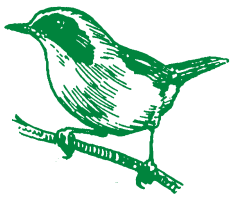


In the spring and summer, tree swallows swoop low over the pond feeding on the hoard of mosquitoes rising from the water. At the same time the sheeps-head minnows and mummichogs are feasting on the mosquito larva swimming near the surface. No matter, some mosquitoes manage to escape!

Now and then great egrets, snowy egrets, and great blue heron can be seen looking for fish along the edges of the pond.

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 nonbreeding 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, all 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. Downey and red-bellied woodpeckers, as well as northern flickers can be heard pounding holes in the dead snags anytime of the year.

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 many dead persimmon and sweet gum trees in this section of the woods also are a result of saltwater intrusion. The number of dead and dying trees seems to correlate with draught conditions recorded in recent summers. This has further 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) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or 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.

5

Here the woods are markedly different. The large trees along 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.

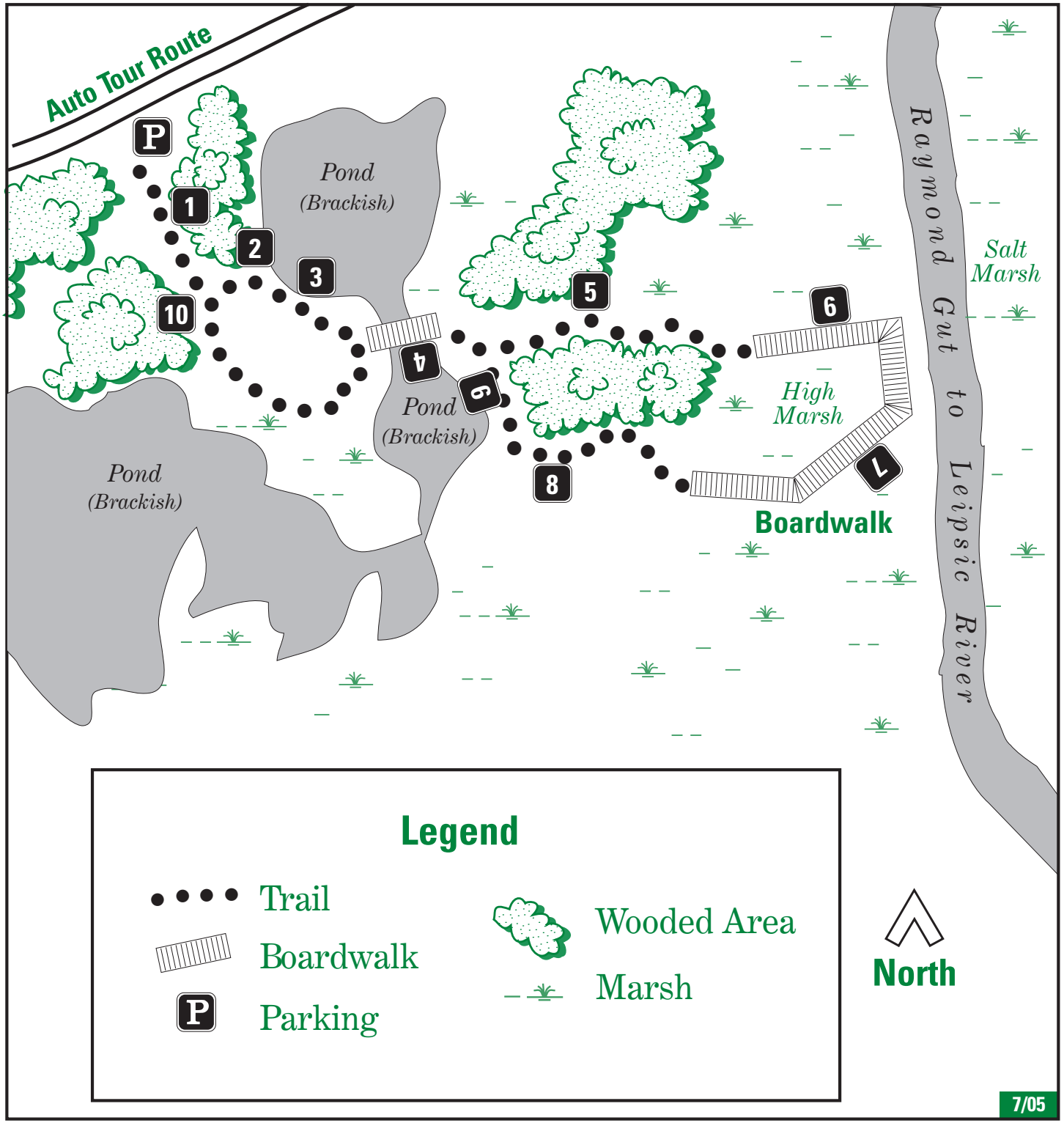


This is a good place to look for brown thrashers during the warmer months. Brown thrashers are long-tailed, striped-breasted brown birds related to mocking birds and catbirds. They sometimes are confused with another forest dweller, the wood thrush, slightly smaller with a shorter tail and spotted breast. 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 and shrub forms can be seen all along the Boardwalk Trail, and good examples of the vine form are seen growing on the trees at the beginning of this section of the trail. Although it grows in almost any habitat, it is one the plants characteristic of upland areas that adjoin salt marshes in Delaware. 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


Auto Tour Route
P
1
2
3
10
Pond
(Brackish)
Pond
(Brackish)
Pond
(Brackish)
4
9
8
5
6
L
High
Marsh
Boardwalk
Raymond Gut to Leipsic River
Salt
Marsh
Legend
Trail
Boardwalk
P
Parking
Wooded Area
Marsh
North
7/05

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.

6 Tidal salt marsh covers 13,100 acres of the 15,978 acres that make up Bombay Hook National Wildlife Refuge. 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 2 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.

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.

The major grass in the high marsh is salt meadow cordgrass (*Spartina patens*) that grows to a height of about two feet; the primary grass growing in the low marsh is salt marsh cordgrass (*Spartina alterniflora*) that grows to a height of eight feet. Two other marsh grasses can be seen from the boardwalk trail. 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.

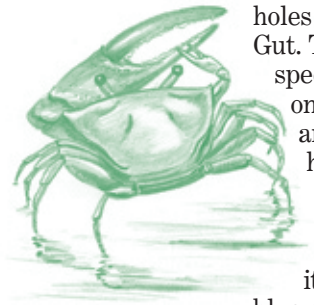
Salt marshes produce more total vegetation per acre than almost any other habitat, more than the rain forests. At the end of the growing season each fall this huge plant biomass turns brown, dies off, falls down in the marsh, and begins a decaying process. One result is the familiar smell of marsh gas. Another is the detritus, a combination of dead plants and decomposing organisms that forms 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 grass, 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.

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 bands, the marsh crab and the blue crab.

Deer can sometimes be seen swimming across the gut or in the marsh. Although rarely seen in the daytime, their scat or droppings on the boardwalk and footprints in the mud verify the presence of raccoons. Muskrats also are rarely seen, but their house of mud and piled up marsh grasses attest to their presence.

Snowy and great egrets, along with great blue heron often are seen flying over the marsh or wading along the banks of the guts, searching for fish and crustaceans. During fall and winter, large flocks of snow geese feed and rest on the marsh and its mud flats. Ducks, particularly black ducks that nest in the marsh, can be seen anytime during the year diving into the cover of the marsh.



Northern harriers 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; however, they are known to have nested in the salt marsh, so also may be seen during the summer.

Two small birds are common on the boardwalk in spring, summer, and fall. They are the seaside sparrow and the marsh wren. Seaside sparrows are identified by allover gray appearance. They seldom sit still, and disappear quickly into the salt meadow grass of the high marsh.

The marsh wren, on the other hand, is heard if not 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 phragmites at both ends of the boardwalk and in the small bushes along it.



8 The whitetail deer is the largest mammal on the refuge, and of the larger mammals it also is among the more numerous. It is estimated that the current herd numbers between six and seven hundred individuals. There are less than 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 one. There are a total of one hundred and eleven stands, including six reserved for wheelchair hunters. Stands are assigned by a lottery system.

Hunters participating in the refuge hunting program take between one hundred fifty and one hundred eighty deer annually, a number that helps to stabilize but does not reduce the size of 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.

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.

Willets, rather large, heavy-set wading birds, 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. Willets 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 wading birds, not quite as large and much more slender than the Willets. Greater yellowlegs are seen from mid-March through mid-December, the lesser from March through May and July through November.

The fall and winter bring Canada and snow geese that are sometimes seen in this pond. Ducks seen here are among those that nest on the refuge: mallards, black ducks, gadwalls, and blue-winged teal.

10

Here the shrubs, bushes, and saplings in the understory are quite diverse and a mixture of native and non-native plants. These include American holly, sassafras, and winged sumac, as well as sweet gum and a few oak saplings. 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 two other walking trails on the refuge that often have interesting bird life. Parson Point Trail, closed seasonally to protect nesting bald eagles, is one mile round trip in length and goes through mixed habitats from freshwater marsh bordering Shearness 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.



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.