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U.S. Fish & Wildlife Service

# Rachel Carson

*National Wildlife  
Refuge*

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*Trail Guide*



## Welcome

Welcome to Rachel Carson National Wildlife Refuge. We hope you will take time to walk our trail and explore an environment that is relatively uncommon in Maine — salt marsh.

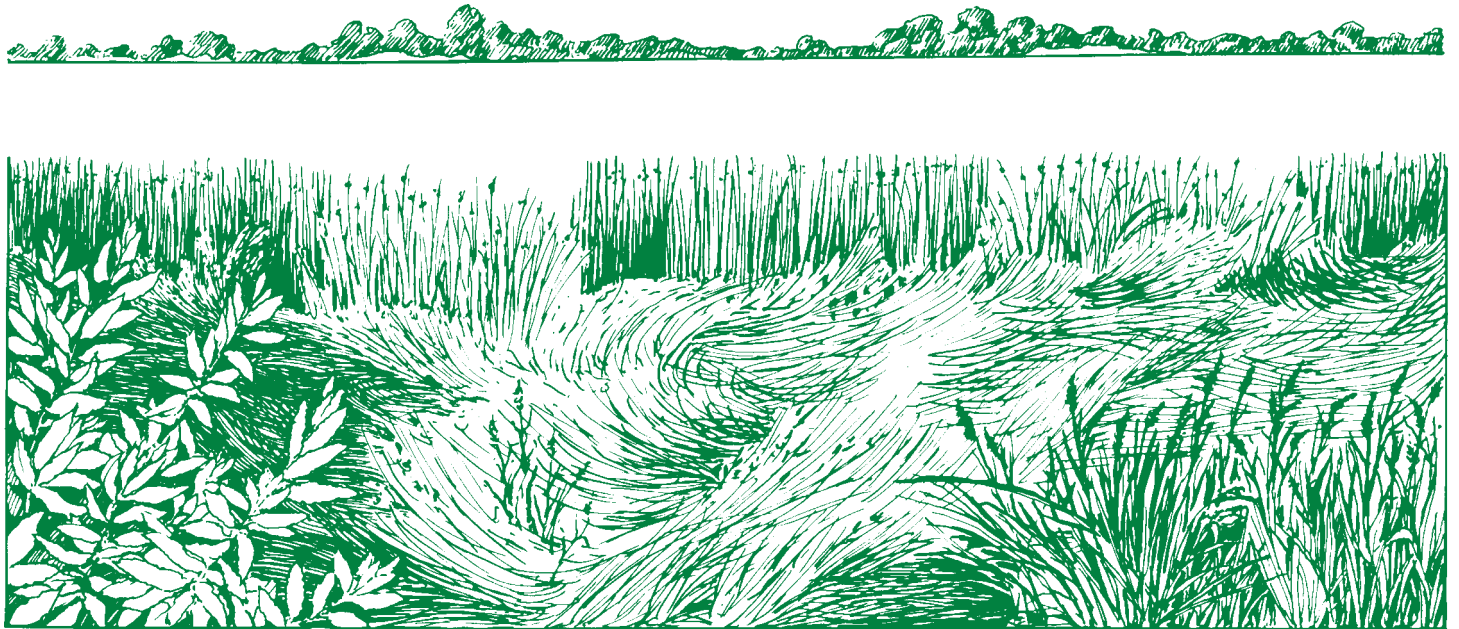
Salt marshes are not as common in Maine as they are further south. Maine's rugged coast has few sheltered bays where waves slow to ripples and cordgrass can take root and build a marsh. Marshes occur mostly along the southern coast, including the fine example protected here by the national wildlife refuge.

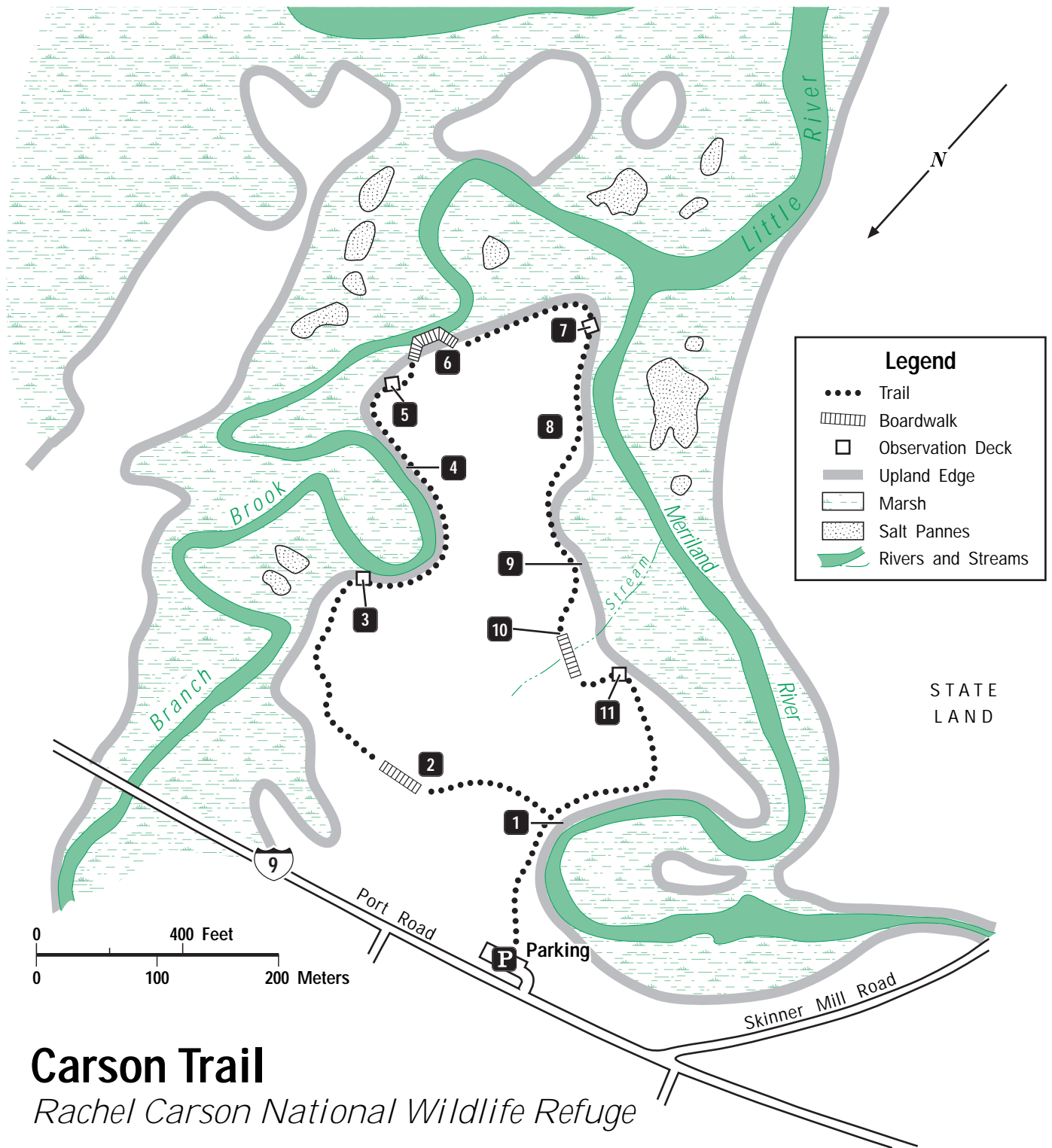
The Rachel Carson Trail is a one-mile walk along an upland edge which offers vistas and close-up views of one of southern Maine's most valuable ecosystems.

## The Edge of the Marsh

1

Salt marshes, like barrier beaches, are fragile and dynamic ecosystems. When we build on or dig into these habitats, we can adversely affect them in dramatic ways. The upland edge along marshes now seems to be more important than once thought. Undisturbed coastal wetlands that have natural vegetation along their edges produce dense meadows of grasses and other plants that support abundant wildlife. When marsh edges are cleared for buildings or otherwise disturbed, use of the marsh by wildlife declines.





## Hemlock Hollow

2

The coastal upland along this stretch of Maine's shore is evergreen. White pines and hemlocks dominate, with oaks and maples intermingled and a ground cover of ferns. Though out of sight of the marsh, this woodland is directly linked to it. Ground water carries nutrients from the forest's decaying leaves and needles out to the marsh. Many species of mammals and birds rely on both the marsh and upland for food, cover and breeding habitat.

*Great blue heron*



## The Tidal Flux

3

Marshes are flooded and drained twice a day by meandering tidal creeks like the one before you. The tides bring sea water into the marsh, mix in fresh water from the upland, and carry organic nutrients from decaying marsh grasses back into the bay. This continual exchange of water and nutrients among the upland, marsh and ocean keeps the marsh thriving and helps support a complex marine food web.

## Meanderings

4

Tidal creeks twist and turn as they wander through a salt marsh. At any wide turn, or meander, tidal currents erode the outside bank as they build up the inside bank. Here the outside bank has cut into the upland edge, causing soil to slump into the creekbed. The creek will slowly carry the soil away, spreading it through the marsh.

## Salt Pannes

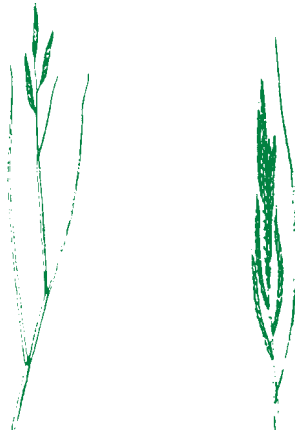
5

The small, ponded areas before you are another feature of the marsh: salt pannes. These low spots in the marsh hold salt water as the tide falls. The water evaporates, concentrating salt in the pannes. Only specialized, salt-tolerant plants like glassworts and sea-blite can grow here. The pannes nevertheless support populations of small invertebrate animals which make these ponds important feeding areas for water-fowl and shorebirds.

## Marsh-makers

# 6

Two grasses are responsible for both building a coastal salt marsh and making it one of the most productive ecosystems in the world. Saltwater cordgrass (*Spartina alterniflora*), a tall plant with stiff, pointed leaves, grows along the creek banks and in the low marsh. It has special adaptations to get oxygen to its roots when flooded during high tide. The shorter saltmeadow cordgrass or salt hay (*Spartina patens*) generally grows above mean high tide and forms the broad meadows of grass of the high marsh. Together the grasses can produce up to ten tons of organic (plant) matter per acre per year — as much as a prime Midwestern corn field.



*Salt hay grass or salt meadow grass*  
*Spartina patens*  
(Alt.) Muhl

*Smooth cordgrass or saltwater cordgrass*  
*Spartina alterniflora*  
Loiseleur

## Little River Overlook

# 7

Here Branch Brook merges with the Merriland River, creating the Little River, which flows to the ocean. The tranquil, nutrient-rich waters of the tidal rivers and marshes are nurseries for many of our shellfish and finfish. Mussels, soft-shelled clams, flounder, bluefish and striped bass all depend on this habitat during part of their life cycle. Abundant insects, worms, clams and fish in the marsh in turn attract flocks of feeding waterfowl, shorebirds and wading birds.



*Common goldeneye*

## Dedication Site

# 8

Rachel Carson worked for the U.S. Fish & Wildlife Service from 1936 to 1952, first as a biologist, then as a writer-editor. She spent summers in West Southport, Maine. Through her numerous books, Rachel Carson alerted the public to the link between human actions and their environmental effect.

From her books about the coast — *Under the Sea Wind* (1941), *The Sea Around Us* (1951), and *Edge of the Sea* (1955) — to *Silent Spring* (1962), which challenged the widespread use of pesticides, her writings fundamentally changed society's outlook on the environment.

## The Critical Edge

9

Critical edge is that portion of upland that runs along the border of the marsh. This buffer zone is part of the salt marsh system in that it sends fresh water into the marsh, provides food, cover, breeding habitat and travel corridors for wildlife that live in the coastal zone, and protects the marsh from the adverse impacts of human activities.

## Run-off

10

The intermittent stream below is one of the obvious links between the forested upland and the salt marsh. Clean water from the woodland seeps into the ground and then emerges in the stream. Fresh water flows into the marsh, mixes nutrients with seawater and helps keep the marsh productive.

## The Edge of the Sea

11

Here you can see all the parts of this coastal Maine salt marsh. From critical edge through creeks, salt pannes, marsh grass, beach and ocean, it is a network of soils, water, plants and wildlife that functions as a whole, forming a unique and fragile community. As Rachel Carson wrote, "All the life of the planet is inter-related...each species has its own ties to others, and...all are related to the earth." (*The Sea Around Us*)

