# THE BOGS OF ROOSEVELT CAMPOBELLO INTERNATIONAL PARK

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## Bogs are a type of wetlands

A variety of wet environments including coastal and inland marshes, wet meadows, mudflats, ponds, bogs, bottomland hardwood forests, wooded swamps, and fens, common throughout Canada and the United States, are encompassed by the term "wetlands." Wetlands are dynamic, ever-changing landscape features. They range from single bodies of open water to complex isolated areas of occasionally dry surfaces a few inches thick resting on saturated peat that stand as "islands" above flooded surroundings. These "island" wetlands are raised bogs made of peat. Wetlands containing peat are sometimes called peatlands.

## Character and location of raised bogs

Peatlands, both flat and raised, occur throughout the world in temperate and tropical latitudes. The raised bog variety on our continent stretch across Canada and northern United States but are most spectacular for their heights in the Canadian Maritime Provinces and Quebec, and in Maine.

Roosevelt Campobello International Park affords opportunity to study peat "in the making" and bogs in their developmental stages. Roughly one-third of the 2,800-acre Natural Area in the Park (fig. 1) is composed of raised heath-covered bogs. The best known are called Abrahams Plains Bog, Lower Duck Pond Bog, Corn Heath, and Basket Heath. Other wetlands include flat marshes or fens covered with grass or brush. All of the wetlands are located on the map of surface geology (fig. 1, page 2).

You may think of a bog as a giant sponge; when saturated, the pores are completely filled with water so that additional rainfall is released only when it is completely saturated and can hold no more. The drier crests of bogs are surrounded by wetter edges that often have standing or slowly moving streams; some are surrounded by moats, which collect water flowing from bog crests and from slopes of the basin or valley in which the raised bog is situated.

FIG. 2

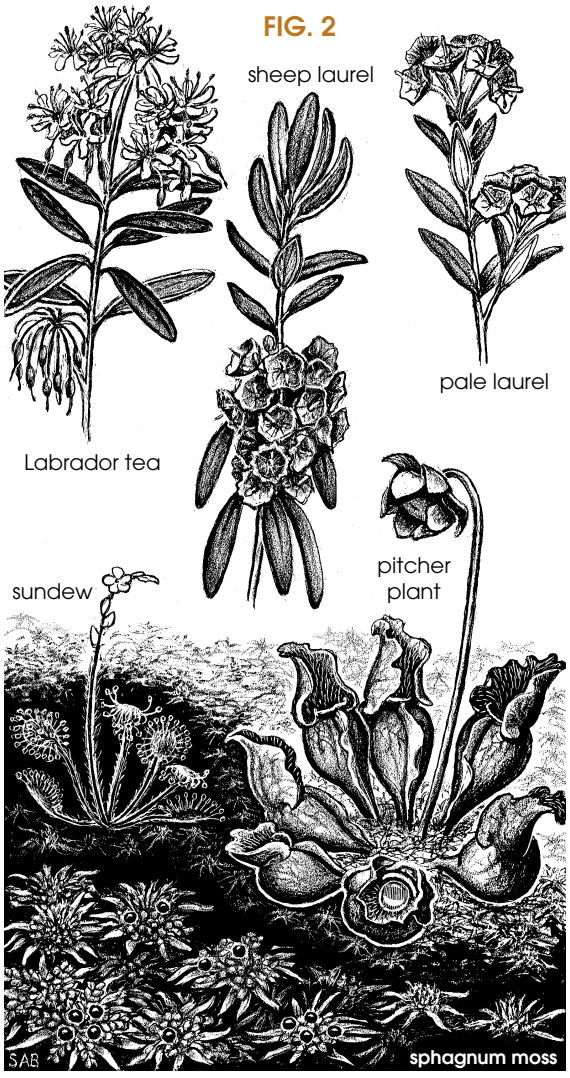



Illustration by Shirley A. Briggs

## Bogs have many values

The peat moss you buy at the supermarket to put on your garden comes from bogs. Peat is mostly used in North America as a soil amendment, as an ingredient for commercial potting soils, and in the nursery business. It is also used for golf greens, in mushroom beds, and as an earthworm culture medium. Specialty applications include the use of peat as a filtration medium for the removal of toxic materials and odors associated with mine, industrial, and municipal waste; for oil absorption, humic acid extracts, seed inoculants, and hygienic products.

Bogs in their natural state have other valuable uses. They serve as water absorption and storage reservoirs that help reduce flood hazards and the amount of free-flowing silt-laden water. The presence of peat improves water quality by filtering the load of nutrients, pollutants, and sediments. This filtering process is vital to the survival of wildlife and people living in and on the larger water bodies that receive peatland discharge. The vegetation that the peatland supports is valuable for wildlife conservation, which in turn has values for us.

## A variety of plants grow on the Park's bogs

A bog resembles a garden. It contains mosses, lichens, ferns, nonwoody flowering plants, shrubs, and small trees. It often appears to be walled in by the tall trees of the surrounding forest. Bogs on both the mainland and the islands including Campobello are called heaths after the heath family of plants to which many of the most common shrubs belong (fig. 2 - top three plants).

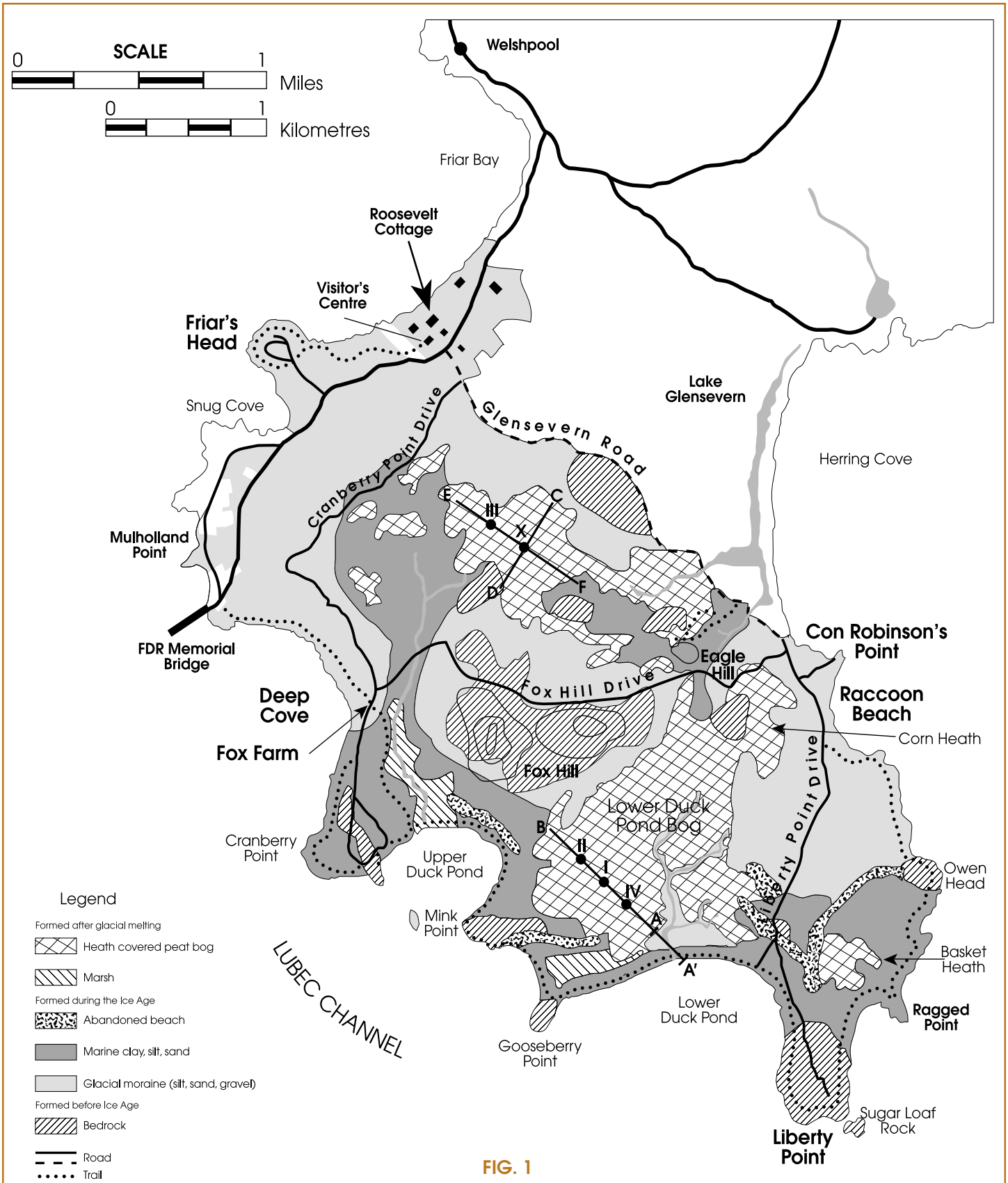
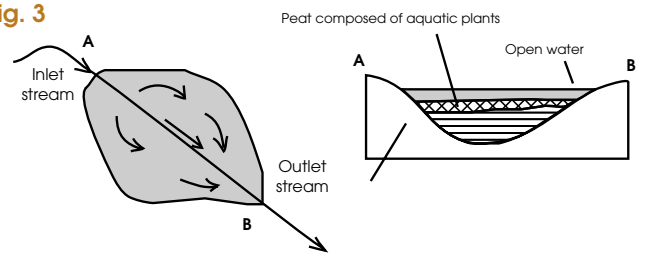


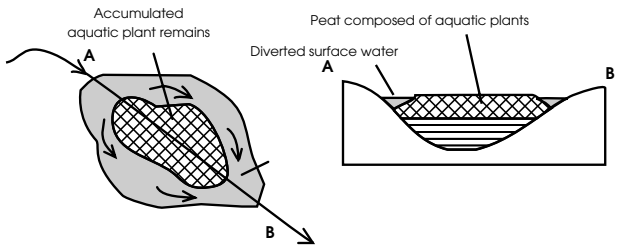

FIG. 1

# Map of Surface Geology

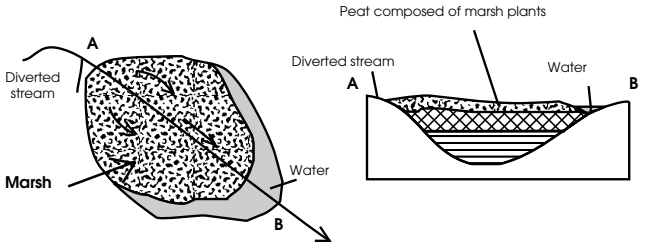
Fig. 3



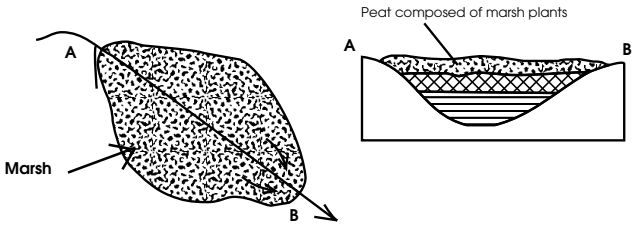

**Stage 1** – Stream flowing into pond deposits sediment and organic material



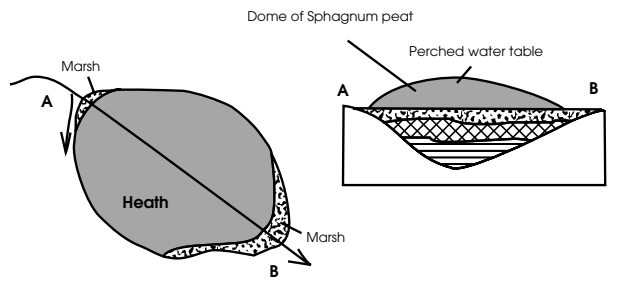

**Stage 2** – Accumulated aquatic plant remains divert surface water flow.




**Stage 3** – Remains of marsh plants gradually fill in the basin.




**Stage 4** – Marsh plants spread out beyond the edges of the original basin.




**Stage 5** – Heath-covered Sphagnum dome forms with perched water table

*The best place to see a heath-covered surface of a bog is from the boardwalk reached from Glensevern Road near the tiny stream flowing into Lake Glensevern (see map fig. 1).* Here the plants are identified. Plants peculiar to Campobello's bogs and to others on the mainland within reach of the frequent fogs that roll in from the sea are cloudberry, crowberry, and a grass called deer hair. Other oceanic species include bog goldenrod and, among the mosses, two species of Sphagnum (fig.2), namely S.flavecornans and S.imbricatum.

As you walk through the bogs of the Natural Area, you encounter masses of leatherleaf, sheep laurel, pale laurel, bog rosemary, Labrador tea, winterberry and sweetgale as low shrubs among the many Sphagnum mosses. At the bog borders hoary alder and rhodora grow within the ring of tall spruce and balsam trees. Among the shrubs, and particularly in the wetter places, are cranberries, pitcher plants and sundew (fig. 2), cotton grasses, sedges, and orchids. Where it is drier, lichens are abundant, especially reindeer moss and red-tipped moss.

## Peat bog evolution on Campobello began around 10,000 years ago

All of the bogs in the Natural Area formed since the close of the last Ice Age. We know this because they lie on materials laid down during the Ice Age. Gravel and boulders scraped from the solid earth and transported both by the ice and melting water were left as a veneer over the uneven surface of bedrock that crops out at the surface on Fox Hill, Liberty Point and other headlands projecting into the sea. It is thick in some places, thin in others. Some of the dark bare bedrock show the marks of the boulder-shod ice that passed over their scratched and polished surfaces. The weight of the giant ice mass was so great that the crust of the earth bent down. Clays, silts, and sands were also dumped by the melting ice into the partly ice-free sea 18,000 to 12,000 years ago. Fox Hill, the highest point in the Natural Area towering over the entire landscape at an elevation of 200 feet, was beneath the level of the sea as we know it today.

After the glacier melted, the earth's crust rebounded and sea level retreated rapidly from the Park. Beaches were formed when sea level was higher than it is today and abandoned (see map, fig. 1). By 9,000 to 10,000 years ago the rate of sea retreat due to release of glacial weight balanced the rate of advance due to release of glacial melt water to the sea. By this time the site of Lower Duck Pond Bog was a wet surface with some standing water. Depressions were common on the very irregular rock, sand and gravel surface of the Natural Area, and became bog sites.

## The cycle of bog development

During the cycle of bog development, a pond may become a marsh or fen, which in turn may change through rapidly growing Sphagnum moss to a raised bog, or through the growth of trees, to a forested swamp, which may later be overcome by moss. The diagrams (fig. 3) show how a

stream-fed pond changed to a marsh and then to heath-covered bog. Ponds that have not been stream fed tend to fill up from the sides rather than from the center. Bog development continues regardless of how the pond filled.

Several stages of bog development in the Natural Area are recognized. These include beaver ponds, grassy marshes or fens, brushy marshes, all on their way to becoming bogs if progress is not interrupted by flooding, draining, or burning. *We begin our study by visiting the stream that empties into Upper Duck Pond (see map, fig. 1).* It is reached by following the trail southward from Cranberry Point Drive. Beavers have built dams along this stream creating ponds in which water lilies, pond weeds, and rushes have taken root in the mud of the pond bottom, and algae and other aquatic plants float unattached in the water above. The debris of dead stems and leaves collect with the muddy sediments as generation after generation of aquatic and semiaquatic plants live and die. The pond becomes increasingly shallow until what was once the surface of the water is now an expanse of wet meadow covered with grasses and sedges. The pond has given way to another type of wetland called a marsh, or a variety of marsh-like wetland called a fen.

If a marsh or fen is not drowned by the creation of a new pond, Sphagnum moss will grow over the marsh surfaces crowding out the grasses and sedges. The mosses appear along with a heath-dominated flora of shrubs and stunted trees. They in turn build upward until the bog is raised above the surrounding ground surface. Now the wetland has changed from a marsh to a bog.

## A bog grows

Peat accumulation can take place only as long as the rate of growth exceeds the rate of decay. Decay is caused by the respiratory activity of aerobic bacteria. These bacteria must have oxygen. There are many factors that reduce the aerobic microbes' ability to destroy organic matter, but lack of oxygen is perhaps the dominant reason peat forms in nature. If dead plants fall on a water-logged surface, they fall where aerobic bacteria are largely deprived of oxygen. A climate with high rainfall and cool summers promotes raised bogs, and the dense fogs from the sea that frequently move across the Natural Area also contribute to the water-logging that preserves peat and helped to form the high domes and plateau of its bogs.

A bog continues to increase in height as long as plant material, e.g., Sphagnum moss and heath plants, continue to grow, die, and partially decay. The peat moss continues to collect and provide a rising foundation for the next generation of plants. Factors that promote vegetation growth and prevent peat decay control the future of the bog.

Abrahams Plain Bog is the best example of a domed bog that has not quite reached the limit of dome building. The other bogs are much "younger" meaning that they are comparatively rapid dome builders. Forests of tall spruce, fir, and larch, growing on the mineral soil full of plant nutrients, ring the margins of the bogs. Labrador tea and other heath shrubs (fig.2) may be waist high at the bog margin but only a few inches high near the bog center. Peat is shallow at the margins and shrub roots are close to the nutritive mineral soil. They are also well watered by the nutrient-rich water flowing from the mineral soil to the moat or depression between the mineral soil and the bog dome and also by the oxygenated water flowing down the sides of the dome. The oxygenated water keeps the peat shallow by promoting aerobic decay. Water and nutrients are less abundant toward the center of the bog, which is highest and has thickest peat through which plant nutrients move either not at all or with difficulty.

## Bogs reach "old age", decay, and grow again

If bogs survive droughts, fires, and floods, the domes reach an upward limit beyond which they no longer can rise. When this limit is reached, decomposition takes place faster than peat accumulation on the crests of the domes. Gullies form and rivulets flow down the sides of the domes. Thus decomposition and erosion are symptoms of "old age."

All the bogs in the Natural Area are thriving today except the highest part of Lower Duck Pond Bog. On the crest of the plateau in an area east of Mink Point, shallow pools are interspersed among depressions that have recently held water. These pools and depressions result from decomposition of peat at a speed that is greater than the rate of accumulation. Some of the pools are connected by gullies, and the draining further hastens peat decay. Shrubs do not grow here to provide roots that can support your weight. This is the kind of place in northern Europe, Asia, and Alaska, animals including man have been found during peat diggings, their bodies preserved in the peat date from the time of the Ice Age. Perhaps animals and maybe hunters have become mired in this bog, which also dates from the Ice Age. At any rate, this is a spot on Lower Duck Pond Bog to stay away from.

Through time, the environment of peat accumulation changes. Marshes may drain naturally and be replaced by swamp forests, which in turn may be reflooded and returned again to marshes. Even heath-covered raised bogs are subject to forest encroachment and drowning as regional water levels fall or rise, or streams cause flooding.

Once a peatland is destroyed, it does not return to it original condition but goes through new stages of development if conditions are favorable. Peat-forming plants accumulate at a relatively slow rate. Although no precise study on peat accumulation has been carried out, Belanger and others, working in Canada, estimated an approximate rate of peat accumulation of 100 centimeters per 1,000 years.

## Bogs are records of history

Slices through a bog, like slices through a cake, show that a bog consists of layers. But the layers are made of peat and commonly rest on layers of clay, silt, sand, or gravel. The oldest are on the bottom and the youngest are on top.

Before we can interpret the layers of a bog, they must

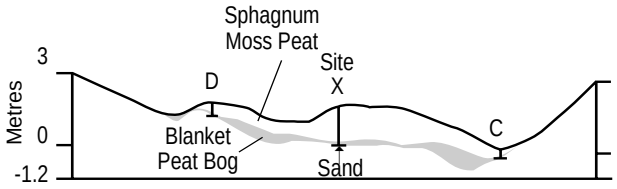



Fig. 4

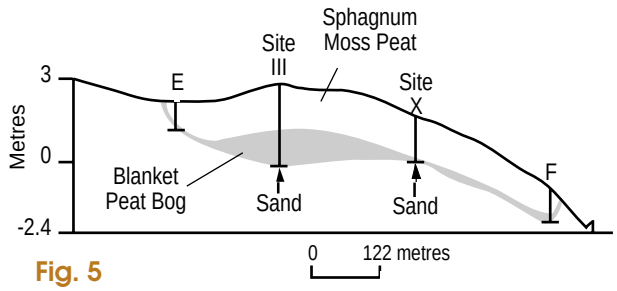



Fig. 5

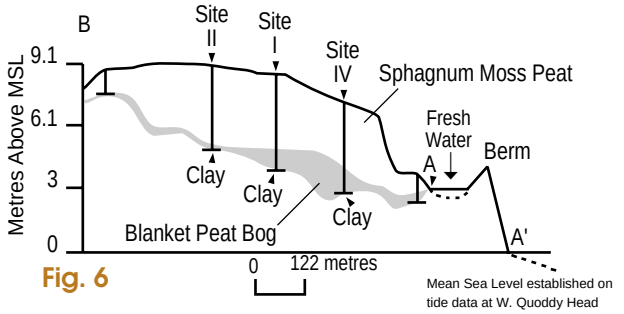



Fig. 6

be uncovered either by ocean waves cutting a sea cliff in a raised bog or by coring with a peat sampler at sites located along a traverse (lines D-C, E-F, and B-A-A' in figs. 4, 5 and 6).

The kind of vegetation that composes a peat layer indicates the environment at the site at the time those plants were living. Today the bog on which you are standing is covered with moss, heath shrubs, stunted black spruce here and there, and cranberries. Below may be the remains of grasses and sedges or even a forest that lived when this place was a marsh or a swamp. Under the grassy or woody peat may be the remains of pond weeds, water lilies, and other inhabitants of the pond long since filled with clay, silt, and the remnants of plants.

By interpreting the clues, e.g., identifiable plant fragments, seeds, cones, needles, pollen and spores, charcoal, location and degrees of peat decay, the environmental history of a bog can be read from its beginning to its present surface.

Charcoal layers are also clues to bog destruction. When the water level has been lowered beneath the surface, the bog is subject to burning by fires set by either people or lightening. Fires in bogs have been known to last for days, months, and even more than a year. Destruction continues downward to ground-water level at the time of burning.

Layers of silt among peat layers are clues to ancient floods, perhaps due to stream overflow from rains or melting snows or to ponding of streams by beavers. Some layers of silt are windblown and point to periods of dry climate long ago. The stratigraphy or the sequence of layers that compose the Park's bogs shows successions of peat forming environments and contain decomposition, charcoal, and silt clues.

## Bog conservation

Today we watch the same processes of bog formation and destruction in the Natural Area of the Park that are continuing from yesterday, last year and from previous decades and centuries. These same processes continue on into the future. From them we learn how to take care of our bogs. For example, if we lower the water table below the bog surface, aerobic bacteria in the presence of oxygen in the air that enters the pores will cause the peat to decay and bog destruction. Zones of peat decay are clues to activity of former aerobic bacteria. Change the hydrology and plant nutrient balances changes. Change the vegetation and soil and physiographic changes occur and will be reflected in the fauna.

Management of a wildlife habitat that includes a peatland must consider the various effects of natural and human disturbances to its water level. The rise and fall in water level in a region causes peatlands to become different environments. Cutting trees to excess and over-grazing also lower water level by increasing rate of runoff after rains.

Understanding of the ecology - the interrelationship of botany, geology, hydrology, pedology, and chemistry - permits nations to assess their peat resources and their peatlands in terms of making best choices.

## The Season

The Park opens the Saturday following Victoria Day (the Saturday prior to U.S. Memorial Day), and remains open through Canadian Thanksgiving (U.S. Columbus Day). Visiting hours are from 10 a.m. to 6 p.m. A.D.T. (9 a.m. to 5 p.m. E.D.T.) seven days a week. The last tour of the cottage is at 5:45 A.D.T. (4:45 E.D.T.). There is no admission charge. Although the Roosevelt Cottage is closed to inside tours after Canadian Thanksgiving/U.S. Columbus Day, the Park's Visitor Centre remains open through the end of october for the convenience of fall travelers. The Park's Natural Area is open year round.

Roosevelt Campobello International Park Commission website: http://www.fdr.net.

All inquiries should be directed to the Executive Secretary at 459 Route 774, Welshpool, N.B., Canada E5E 1A4 or P.O. Box 129, Lubec, Maine, U.S.A. 04652.

*In 1980, the Roosevelt Campobello International Park commission adopted a logo based on President Roosevelt's original design for his match book covers. The letters "FDR" for a sailboat, representative of his favourite pastime. The Commission added a star over the bow and a maple leaf over the stern to signify participation by the United States and Canada in joint operation of the Park, the only one of its kind in the world.*