

Fire Ecology at Cape Cod and Acadia

By Mary K. Foley

Fire always has been an important natural environmental disturbance factor. It not only alters the physical, chemical and biomass accumulation characteristics of an ecosystem but also directly and indirectly influences the species composition, abundance, and diversity of the plant community. This in turn affects the abundance of wildlife habitats and animal diversity and population dynamics. Yet up until a few years ago the fire management policy throughout the National Park Service was one of total fire suppression. And although natural fire and prescribed fire management practices now are being implemented with increasing frequency Servicewide, total fire suppression is still the standard fire management policy in all North Atlantic Regional Parks.

With the impetus from *Guidelines for the Preparation of Fire Management Plans*, NPS 18, and assistance from our Office of Scientific Studies, several parks in the North Atlantic Region have begun to examine the role of fire in the development of forests, the impact of fire suppression activities on plant community dynamics, and related processes such as fuel accumulation.

The first of these research projects was undertaken via a Cooperative Agreement with the US Forest Service. Dr. William A. Patterson, forest ecologist at the University of Massachusetts-Amherst, his student Karen Saunders, and L. John Horton of the USFS, examined fire regimes for two North Atlantic Region parks, Acadia National Park and Cape Cod National Seashore. They recently completed a report of their findings which have major fire management implications for these areas.

For each area, information on historical fire occurrence, fire weather, fuels and fire-vegetation interactions was collected. They sampled 20-30 stands (5-10 acres each) in dominant vegetation types in each park to provide information on past fire occurrence, plant species composition, and the amount and kind of fuel.

Several methods were used to reconstruct pre-settlement and post-settlement fire histories and associated vegetation changes. Written records plus dendrochronologies were examined to learn where and when fires occurred during the past two centuries (i.e. the post-settlement period). Reconstruction of pre-settlement fire patterns is difficult in areas such as Acadia and Cape Cod where few virgin stands remain. For these earlier times the charcoal and pollen content of sediments from the Bowl, a small deep pond in Acadia NP and Duck Pond in Cape Cod NS were examined to determine if, and how often, fire was present in the pre-settlement forests.

The results of Patterson's pollen and charcoal analyses for the Bowl are summarized in a pollen diagram (Fig. 1). High pollen percentages of agricultural herbs (e.g. *Ambrosia*, *Rumex*, and GRAMINEAE) at 20-23 cm in the sediment indicated the time of European settlement (1760-1800 A.D.). This date and others were verified by Pb 210 dating. The size of the individual charcoal fragments was estimated and a ratio of charcoal to pollen was used as an indicator of fire activity.

The charcoal profile shows evidence of a fire at about 30 cm, dated at 1550 A.D., and another at 28

cm, dated at 1670 A.D. These indicate a natural fire frequency of approximately 100-200 years. An examination of available climatic records and historic fire records indicate that at Acadia there have been very few lightning-caused fires. This suggests to Patterson that most of these fires were Indian caused. Charcoal sedimentation patterns for Duck Pond also suggests that Indian burning was important in the forest of Cape Cod NS.

Patterson attributes the charcoal peak at the time of settlement (20-23 cm) to land clearing activities and the large increases in charcoal values at 20 cm to widespread post-settlement burning. The Bar Harbor fire of 1947, which burned nearly 30 percent of the parklands on Mt. Desert Island and two-thirds of the island, is represented in the top of the charcoal profile.

At Acadia, post-settlement forests have created a mostly even-aged red spruce forest. The area burned by the Bar Harbor fire has regenerated to aspen-birch with a dense red spruce understorey. The remaining areas are predominantly red spruce of 100-140 years. Although fuel loadings are typically low in most areas of the park, Patterson believes that as these spruce stands mature they will become increasingly susceptible to wind damage. The high fuel loads that result from blowdown will pose a serious fire hazard. It has been estimated that as much as 70 percent of the park is composed of maturing red spruce which will present significant fire management problems in the next 50 years.

Large post-settlement fires and agricultural land use patterns have shaped much of the forest of Cape Cod. Although fuel loadings were found to be generally low, highly flammable huckleberry occupies much of the understorey vegetation. Huckleberry, other ericaceous shrubs (with their aromatic oils and low moisture content) and beach grasses pose fire hazards unique to our eastern national seashores.

In both areas fuel accumulation has been identified

as the major fire management concern; however, several problems remain to be addressed before a fire management plan, which provides solutions to these problems, can be written and implemented.

For example, as in many national park areas, Acadia and Cape Cod have confusing landownership patterns complicating fire management planning efforts. Although fuels have been identified to be of major concern for both areas, Acadia's complex boundary and scattered parklands and Cape Cod's numerous inholdings would certainly eliminate the implementation of a prescribed natural fire program. Also, in Acadia, island residents remember the 1947 fire too well to be immediately receptive to the need for a fuels reduction or vegetation management program which involved controlled burning. At Cape Cod, too little is known of the effect of fire on huckleberry populations to consider utilizing fire to control them at this time.

There is also the controversial issue of the role of pre-settlement burning in park fire management plans. Although it appears burning by Indians may have been a significant factor in the pre-settlement coastal New England forests, the question of whether such burning should be simulated in park areas, where feasible, has yet to be resolved.

The fire management implications of these studies were presented by Patterson at the Wildfire Symposium, at the University of Montana-Missoula in November and cosponsored by the National Park Service. The reports, *Fire Regimes of the Coastal Maine Forests of Acadia National Park* and *Fire Regimes of Cape Cod National Seashore* are available and will be circulated among park science and resource management personnel in the next few weeks.

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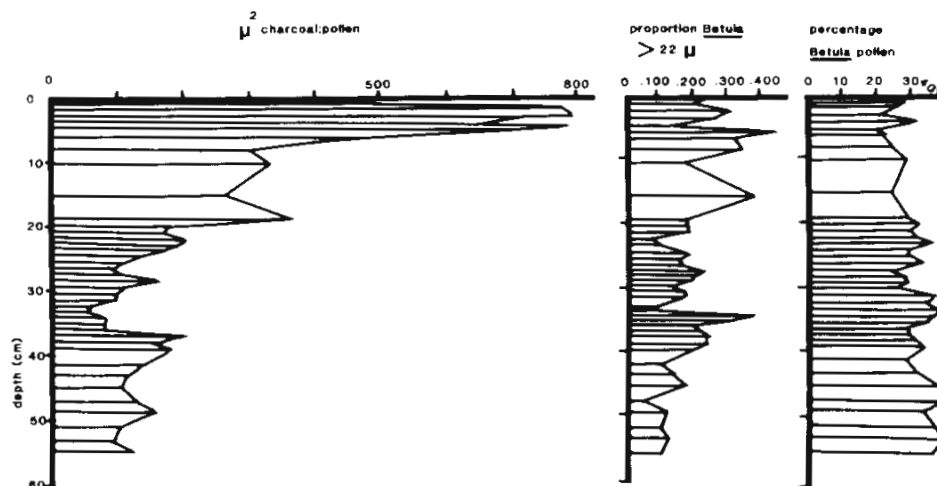


Figure 1

Profiles for charcoal content, proportion of *Betula* pollen types and total *Betula* pollen percentages for the the Bowl.

Source: Patterson, Horton and Saunders (1983)