Cape Cod's Atlantic White Cedar: Managing a Unique, Natural (?) Community

By Glenn Motzkin and William A. Patterson III

Cape Cod National Seashore (CCNS) contains the only NPS administered Atlantic white cedar (AWC; *Chamaecyparis thyoides*) wetlands (NPS internal documents). Although AWC occurs in four locations at CCNS, the 5-hectare Marconi Atlantic White Cedar Swamp (MAWCS) is the largest and most significant site, containing one of the few examples of an old-growth AWC stand in the northeastern United States. Management of the MAWCS poses unique challenges because the Swamp lies in a rapidly developing landscape that is substantially altered from its presettlement condition.

Atlantic white cedar is an early successional species that requires some form of disturbance to become established. In the absence of disturbance, it is thought to be replaced by more tolerant hardwood species (Buell and Cain, 1943; Little, 1950). The MAWCS is currently protected from fire and timber cutting and therefore is potentially threatened by these successional trends. We investigated both modern and prehistoric vegetation and disturbance patterns at MAWCS to determine the processes that have controlled vegetation development over the past thousand years. In this paper we present the results of this investigation and discuss management alternatives in the context of NPS objectives and cultural constraints.

Cedar first arrived at the Marconi site approximately 3000 years ago and has persisted in varying abundance since (Belling, 1977). Fine-resolution pollen and charcoal analyses of peat representing the last 1000 years of the Swamp's history indicate that fires, many of which probably were set by Indians (Patterson and Sassaman, 1988), were frequent in and around the Marconi site in the centuries prior to European settlement (Figure 1). Most fires probably ignited in the highly flammable oak-pitch pine forests on the upland and burned as intense surface or crown fires until they entered the Swamp. Cedar pollen percentages during this period appear closely linked to fire occurrence, suggesting that fires burned through the Swamp destroying existing cedar stands and regenerating new ones.

Past Fire Frequency Higher

Periods of dense shrub, herb, and moss cover, as evidenced by high pollen percentages for these taxa, suggest that open cedar stands unlike the one encountered today regenerated after presettlement fires. When increasing cedar pollen percentages indicated closing canopies, fires burned through the Swamp and initiated a new cycle of cedar regeneration. At no time in the several hundred years prior to European settlement did cedar pollen percentages reach the sustained levels (80-90%) that are evident since settlement.

Significantly, the high post-settlement percentages of cedar pollen are accompanied by low charcoal values, suggesting that few if any fires have burned in the Swamp since the time the surrounding uplands were settled (about 1650 A.D.). Higher fire frequency prior to European settlement apparently prevented the development of mature, dense cedar stands at MAWCS, whereas a lack of fire since settlement has allowed the current mature stand to develop.

Plots that we sampled within the MAWCS currently are dominated by cedar, with ratios of cedar to red maple basal area typically exceeding 4 to 1. Age-structure analyses of the modern vegetation indicate that AWC and red maple both occur in distinct age cohorts, with establishment of both species limited to episodes of recruitment associated with timber harvesting (Motzkin, 1990).

Most of the Swamp is dominated by a 100- to 150-year-old cedar stand, with red maple stems scattered throughout. In portions of this stand, little or no establishment of tree stems has occurred in the last 80 to 90 years. Elsewhere, light selective cutting 10 to 50 years

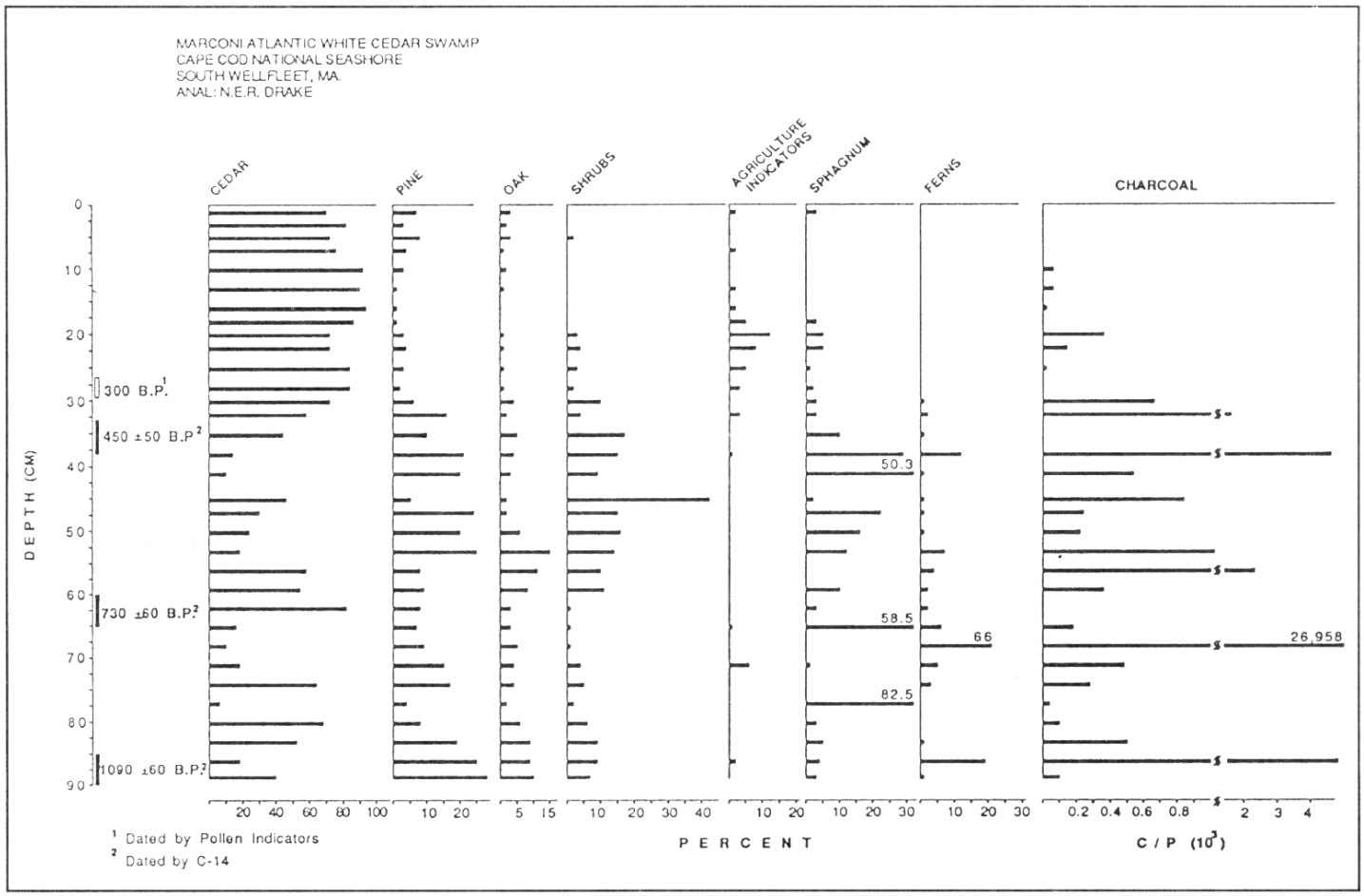

Figure 1. Pollen and Charcoal profiles for the Marconi Atlantic White Cedar Swamp, Cape Cod National Seashore.

How Does One Maintain An Early Successional Species?

prior to establishment of CCNS (in 1962) allowed cedar and, especially red maple, to regenerate. A few small, dense stands of young and intermediate aged cedar regenerated after more intensive cuts. In none of our plots did cedar or red maple continuously establish to form all-aged populations.

Disturbance-dependent Recruitment

Results of our investigation of both current and past vegetation indicate that disturbance factors have strongly influenced vegetation patterns at MAWCS. Establishment of cedar and maple occurs during distinct episodes of recruitment associated with disturbance events. In the past 80 years, timber cutting has been the primary factor influencing regeneration, with light thinnings favoring red maple and more intensive cutting favoring cedar. Prior to 1650 A.D., fires destroyed existing cedar stands but allowed for subsequent cedar regeneration. Fire frequency prior to settlement apparently was high enough to prevent development of dense stands of mature cedar like the one that currently occupies the site.

In the absence of disturbance it is unlikely that significant amounts of cedar or maple will regenerate beneath the existing mature stand. As this stand ages and canopy gaps are created by death of individual trees, portions of the stand lacking young maple or cedar but with abundant shrubs probably will experience increases in shrub cover. Subsequent regeneration of either cedar or maple at these shrub-dominated sites probably will depend on gap size and local site conditions.

Because light thinnings in the past favored establishment of maple over cedar throughout much of the Swamp, maples may increase gradually in importance relative to cedar as the existing stand breaks up. Cedars are likely to outlive red maples, however (Fowells, 1965), so cedar may again increase in importance as the young stems of both species age and maples die at a younger age.

A Future of Dense Shrubs

Such a scenario eventually would lead to a Swamp dominated by scattered old cedar above a dense stand of shrubs. Although cedar dominance may be greatly reduced in the Swamp as a whole, the presence of several small, 30- to 70-year-old stands suggest it is unlikely that cedar will be completely extirpated from the Marconi site within the next few centuries.

NPS management policies (NPS, 1988, p 4:2) note the importance of change as "an integral part of the functioning of natural systems," stressing also that "ecological processes altered in the past by human activities may need to be abetted to maintain the closest approximation of the natural ecosystem where a truly natural system is no longer attainable." Current Seashore policies of wildfire suppression and preservation of existing plant communities rule out fire and timber cutting as factors likely to influence future vegetation development in MAWCS. Because outer Cape Cod is now densely populated and highly developed, recreation of the pre-settlement disturbance regime of frequent, catastrophic fires would be impractical. The NPS might, however, adopt one of several management practices for this site, recognizing that none of them will duplicate pre-settlement conditions.

If current protection is continued, there probably will be a reduction in the importance of AWC relative to red maple and shrubs in the next century. The dense, old-growth character of the present mature stand will disappear. If NPS chooses to maintain a cedar-dominated stand at MAWCS, human intervention probably will be required. As the existing stand breaks up, small clear-cuts could be established to regenerate dense, young stands of cedar (Roman et al, in press).

Management Options

In evaluating management options, the cultural and ecological value of maintaining a cedar-dominated stand should be considered. The Marconi Atlantic White Cedar Swamp is valued as one of the best remaining examples of the Coastal AWC vegetation type on Cape Cod. With good public access provided by a raised boardwalk, the Swamp is visited annually by many who appreciate its aesthetic qualities, including the dense, old-growth aspect of the cedar-dominated vegetation. Our results suggest that this stand is, in fact, unlike that which existed prior to settlement, and that, in the absence of disturbance, its long-term maintenance is in doubt. This site thus presents the interesting paradox of a highly valued resource that is in one sense "unnatural" while at the same time difficult to maintain in its present condition.

We have demonstrated that cedar is not immediately threatened by a management strategy that favors protection over active management. In fact, cedar trees probably will survive for a very long time at Marconi, but in a community that is different in structure, species abundances, and ecosystem processes than the one existing at the site prior to European settlement.

A similar conclusion may apply to many natural areas preserved for the unique species or communities they contain. Management of these areas must take into consideration not only current vegetation dynamics, but those of prior communities occupying the site as well. However, complex ecological processes and modern constraints to management may limit our ability to achieve the objective of maintaining a "close approximation of natural ecosystem processes."

Patterson is a professor and Motzkin is a Departmental Assistant with the U/MA Department of Forestry and Wildlife Management.

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letters

To the Editor:

This is with reference to "A Commentary on Visitor Statistics" (***Park Science***, Spring 1991, p. 17).

I did not expect to read an ode to killing under the above title. Surely Mr. Lovaas, as a Regional Chief Scientist, is far from needing the flesh of pristine wildlife to feed himself, no matter how tender the flesh of the creatures he kills.

Did it ever enter his mind that reveling in "being alive," flexing his muscles, etc., might have been equally enjoyed by the "fine bull moose" he killed? Not only does he verbally exult over what he destroys, he vicariously exults over what he might have killed – "a gorgeous, rolicking grizzly bear."

Such sentiments are philosophically out of context for the National Park Service. Such self-congratulatory prose and policies cause the public to question whose hands the fate of our wildlife is in, as they are increasingly doing with the so-called National Wildlife Refuge System.

Sincerely,
Mary Kelly Black
Park Service Employee

Al Lovaas Replies

Hunting is not philosophically out of context for the National Park Service, at least not on millions of acres where it is legally mandated. Ms. Black aims her anti-hunting sentiments at the wrong target; I don't make the rules.

Ms. Black obviously cares deeply for wildlife and I am disturbed she apparently believes I do not. I was trying to convey my respect, admiration, and love for wildlife and its habitat, to which I have devoted a long career, and I regret I was unable to express those feelings adequately.

Taking wildlife for food only deepens my respect. During every meal of moose flesh my thoughts return to the wild spirit of the animal I killed and of the wilderness which nurtured it. The previous year I contemplated similarly the deer I had killed in the old growth forests of the Tongass near Sitka. To tell the truth, however, I was never really sure just which of the six was represented on the platter at any particular meal. (The season bag limit was reduced to five in 1990 and four in 1991 because the population decreased after two tough winters and overbrowsed range).

As for the National Wildlife Refuge System, it was initiated in 1903 by President Theodore Roosevelt, a mighty hunter.

'Partners' Workshop

A workshop entitled "Partners for Research and Resource Management was presented to the NPS Resource Management Trainees class in Denver on March 11 by Dr. Sarah G. Bishop, President of Partners in Parks.

Dr. Bishop and the NPS Training Division are preparing a training package on the subject of building partnerships. It will consist of a reference manual and guidelines for presenting the information in a workshop or training course. Class evaluation of the course will be incorporated into the final version of the reference manual, which will be completed by June 1991.

The work of Dr. Bishop's organization is to find opportunities for individuals and organizations to assist National Park research and management programs through ongoing partnerships.