INTRODUCTION

James L. Sherald
Center for Urban Ecology, National Park Service
4598 MacArthur Blvd., N.W., Washington DC 20007 USA (Jim_Sherald@nps.gov)

The American chestnut (*Castanea dentata* (Marsh.) Borkh.) once accounted for a quarter of the hardwood trees throughout the eastern deciduous forest and in some locations in the southern Appalachians, its density reached 70-85%. A rapid, dramatic decline in the species dominance began around 1900 with the introduction from the Orient of the chestnut blight fungus, *Cryphonectria parasitica* (Murrill) Barr. In spite of early efforts at eradication, within 30 years the fungus had spread throughout the chestnut's entire native range, which extends from Maine to Georgia, Alabama, and Mississippi and west to eastern Michigan and southern Illinois. By 1940 practically all of the chestnuts throughout the range were dead or infected.

As the chestnut declined, the eastern deciduous forest dramatically changed. Other species filled the void, principally oak, hickory, and pine in the southern Appalachians creating the Mixed Oak, Oak-Pine, Mixed Mesophytic, and Oak-Hickory Forest associations and hemlock, sugar maple, and beech to the north in the Allegheny Mountains, which is primarily the Beech-Maple Forest association. While the chestnut has relinquished its dominant role, its legacy continues through its regenerative capacity to resprout from the roots of long infected trees. The American chestnut exists today largely as a clonal understory sapling or pole tree, rarely living longer than 10 to 40 years. However, some of these sprouted trees are able to set fruit before succumbing, but the new seedlings rapidly become infected. The importance of this sexual reproduction cannot be underestimated when thinking in terms of evolutionary time. Someday, long in the future, there may be successful seedling recruitment.

Few ecological disasters have generated as much interest as chestnut blight. Shortly after the disease was first recognized in New York in 1904, research endeavored to understand every aspect of the disease and its exotic causal agent. Over the years much has been learned. In recent decades significant progress has been made in several areas, including the selection and breeding for blight resistance and the discovery and enhancement of fungal hypovirulence. Hypovirulent strains of *C. parasitica* contain infectious cytoplasmic viruses that reduce the ability of the pathogen to cause cankers. Much of this research has captured the interest of the public renewing hope that this iconic American species will eventually reappear in the eastern deciduous forest. The National Park Service, which manages many parks throughout the former chestnut domain, will undoubtedly be expected to engage these advances and fulfill this dream. While these developments may still be several or many years away from practical application, the prognosis for eventually managing chestnut blight is promising. Consequently, the National Park Service must begin to fully understand the promise and pitfalls of these advances and to explore the limitations and consequences of restoration.

This series of presentations and the following discussion are intended to assist the National Park Service in fulfilling three objectives:

Our first objective is to develop a comprehensive understanding of all the science and technology that hold significant promise for restoring the American chestnut. Hopefully, through these presentations we will be able to assess the feasibility and potential for success as well as the long-term consequences these advances could impose on the ecosystem. The significant areas of interest include biocontrol through the use of hypovirulence, the selection and breeding of naturally-occurring putative resistant American chestnuts, back crossing the American chestnut with the resistant Chinese chestnut, and transgenic approaches to enhance host resistance and to debilitate the pathogen, as well as the potential for combining these technologies into an integrated program.

Our second objective is to define our goals for American chestnut restoration. We recognize that these technologies promise a range of restoration possibilities, from the minimal establishment of demonstration plantings to the incorporation of resistant selections and biocontrol agents into major reforestation projects. While these technological advances are driving our immediate interest in restoration, our decisions must also be guided by an understanding and appreciation of the ecological consequences posed by restoration choices. The National Park Service must have a thorough discussion as to whether our restoration goals and the technologies we select to achieve these goals are compatible with our policies, management objectives and most importantly our resources.

Based on the status and feasibility of the technology and our restoration goals, the third objective is to prescribe how the Service and the parks should proceed. What are the acceptable choices today, what promising technologies will we endorse in the future, what policy issues must we address, what research do we believe is still necessary on unanswered questions or issues, and how can the National Park Service assist? The implementation of some technology, such as the use of transgenic chestnuts or bioengineered hypovirulent strains for biocontrol, may necessitate policy decisions. Decisions relating to transgenic organisms are also relevant to other restoration and management issues affecting the Service and are under discussion now. Other approaches, such as the planting of hybrids may soon be available. However, this option, like all tree planting efforts, has long-term consequences and the decision to proceed should be well founded. We may decide that the research findings are premature or inconclusive, the long-term prospects uncertain, and additional study is necessary before we begin to engage in large scale restoration programs. While understandably, parks may differ in their restoration objectives; their decision process must be consistent and based on the best available science. The visiting public has always been interested in the ecological and cultural heritage of the American chestnut in their National Parks. Consequently, the National Parks will present the most visible and critiqued application of chestnut restoration technology. The public fully and rightfully expects us to understand and support the decisions we make.