

**The Decline of Pacific Madrone
(*Arbutus menziesii* Pursh):
Current Theory and Research Directions**

**Proceedings of the April 28, 1995 Symposium
Held at the Center for Urban Horticulture
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& Subsequent Research Papers**

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Save Magnolia's Madrones
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The Decline of Pacific Madrone (*Arbutus menziesii* Pursh):
Current Theory and Research Directions
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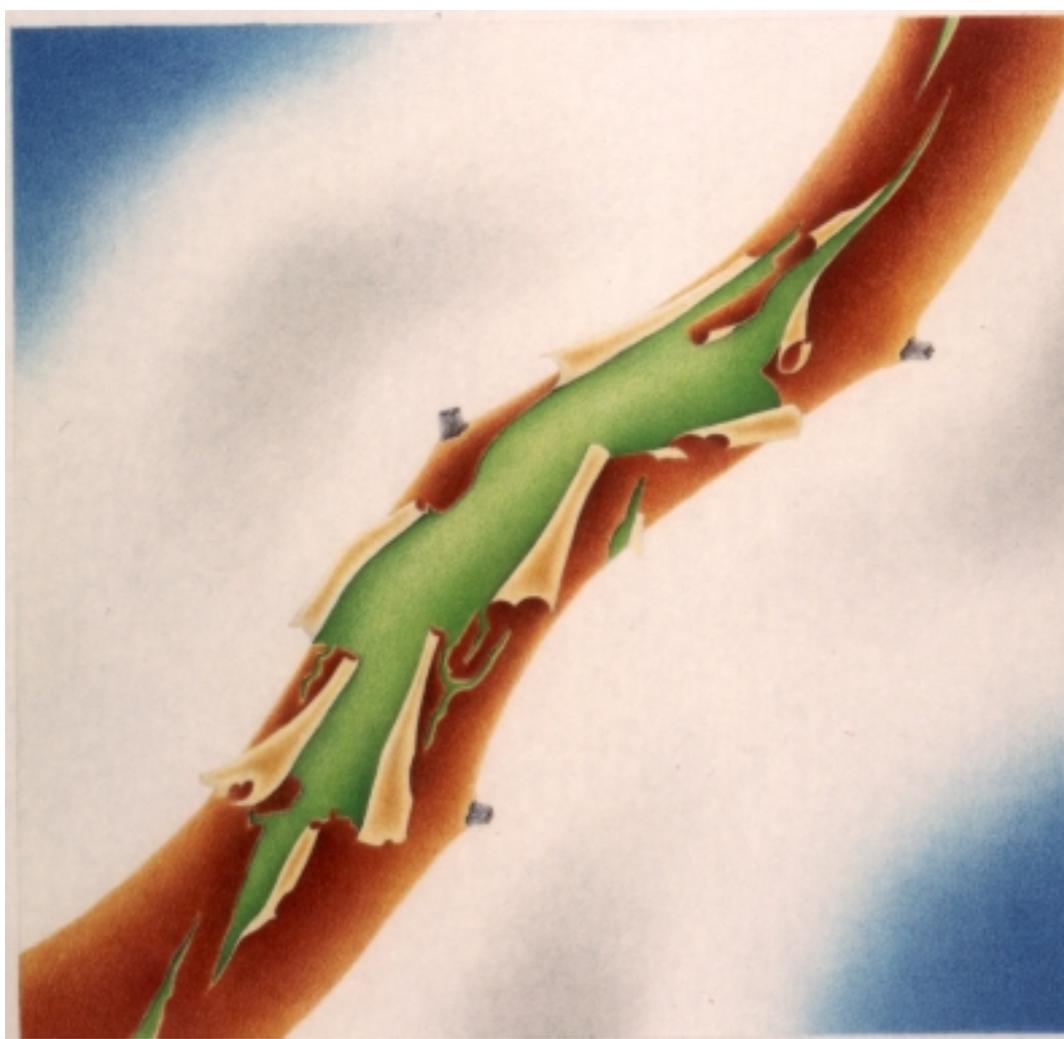
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Sandra Dean / exfoliating bark of *Arbutus menziesii* branch

*“Where, O where, shall he begin
Who would paint thee, Harlequin?
With thy waxen burnished leaf,
With the branches’ red relief,

With the poly-tinted fruit,
in thy spring or autumn suit, --
Where begin, and O, where end, --
Thou whose charms all art transcend?”*

Bret Harte

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FOREWORD

The Pacific madrone (*Arbutus menziesii*) with its unique red peeling bark and majestic form has long evoked strong feelings among people. The following pages embody not only scholastic endeavors, but also the spirit of community involvement and personal passions. The symposium was the direct outgrowth of a group of people who observed these trees' decimation and was spearheaded by Save Magnolia's Madrones (SMM) committee. This group came together after a lengthy community battle was settled with Metro's (a regional governmental agency) plan to enlarge a sewage treatment plant below Seattle's Discovery Park. Mitigation funds from this settlement of Metro expansion were awarded to 4 civic groups: Friends of Discovery Park, Legal Advocates of Washington, Magnolia Community Club and Puget Sound Water Quality Defense Fund. Legal Advocates of Washington pledged their portion of the funds toward saving the Magnolia madrones. The other 3 organizations agreed and together organized SMM. The members are determined to save the beautiful and historic Pacific madrones on Magnolia Boulevard.

Presently, the trees are confronted with challenges to their survival—fungal diseases, vandals who ring trees with chain saws, bad pruning and mowing practices, and a lack of basic information about madrones themselves. The city spoke of replacing the madrones with another species. We oppose this plan.

Why are these trees of such importance to the Magnolia community? Madrones have been prominent landmarks for at least 200 years. A navy geographer mistook the madrones to be magnolia trees in the mid 1800's and misnamed the Magnolia community in Seattle. Their form graces the letterhead of the community council and the local newspaper. The specific epithet of the Latin name *Arbutus menziesii* was in honor of Archibald Menzies, a surgeon and botanist in the English Royal Navy who sailed into Puget Sound with Captain George Vancouver in 1792. Their splendor frames their famous boulevard, a latent sector of the Olmsted park plan approved by the city at the turn of the century. SMM believes that we must preserve them, the beauty they bring to the city and the history which they represent.

Save Magnolia's Madrones has several goals: we wish to collect the body of existing scientific studies about madrones; to fund research to determine the human and biological factors leading to their decline; to find the best ways to propagate healthy and viable madrone specimens; and, with this, to work with government organizations which have direct bearing on the trees ability to survive in an urban setting. There has been little study done on madrones. Additionally, individuals attempting to study or preserve

the madrones are unaware of other studies or individuals who are also attempting to save the trees.

The need for a symposium was apparent. It was a mechanism to bring together all existing knowledge; to meet and focus on areas of current and future research; and, to bring together those who were either scientifically or personally involved with these trees. SMM suggested a seminar to the University of Washington Center for Urban Horticulture (CUH). The great interest, enthusiasm and organizational skills of CUH and its staff gave us support to ensure success of the symposium. Ecosystems Database Development & Research helped coordinate the symposium and organized collection and peer review of all the manuscripts following the proceedings. The symposium needed and received full support of the Seattle Parks Department. With everyone working together, the symposium and subsequent papers became a reality.

With the successful symposium behind us, we now offer this book as another step for those who want to continue their study of Pacific madrone. Papers from the symposium plus solicited papers are included. We intend to serve as a clearing house for the exchange of ideas and information pertinent to the trees.

September 1996 brought national recognition of the Magnolia Boulevard madrones, highlighting their importance in the life of the community and to urban wildlife, their value as a visitor destination, and their historical significance. A representative of American Forests Famous and Historic Trees came from Florida to Seattle to present a scroll to the City Council President. It named a magnificent boulevard madrone as an American Forests' "Famous and Historic Tree." Today the scroll hangs in the Seattle City Council chambers to remind our elected officials of our determination. Save the Magnolia Madrones continues to protect and enhance the presence of these unique trees so that their intrinsic beauty and natural function will continue to grace our urban neighborhoods.

Save Magnolia's Madrones

Mark Bloome (Chair)

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Seattle, Washington

January 1999

PREFACE

The purpose of this book is to bring together information and knowledge on *Arbutus menziesii* Pursh. Pacific madrone extends northward to British Columbia and southward to California; however, most of the work found herein focuses on the urban decline of Pacific madrone within the Puget Sound region. The initial source for the book is the 1995 Symposium Proceedings held on the campus of the University of Washington. Each presentation given at the symposium is represented in this book as a chapter. The symposium was not an end in itself, but rather served as a catalyst for new opportunities and research on this marvelous plant. In realization of this fact, additional papers in areas in which research is developing (wildlife utilization of the tree, pathology, soils and slope stabilization) are included. The first 4 sections of the book follow a logical sequence from natural habitats, to pathology, management and restoration. The soils section was placed at the end because it represents the most recent research.

As the program for the symposium was prepared, there was concern about whether or not people were interested in this tree; and, if so, to what extent they would support our efforts. When an overflow crowd of more than 200 people attended the symposium, these worries were laid to rest. Another important issue was then addressed—that of objectivity in the presentation of information on Pacific madrone. To satisfy this concern each paper was subjected to peer review, and additional information was requested from the authors.

Evolution is not foresighted, nor is Mother Nature always nurturing; thus, it is not possible to predict the ultimate outcome of the purpose (preservation of madrone as a viable component within both urban and natural ecosystems of the Pacific Northwest) that this book represents. Nevertheless, good intent coupled with harmonious objectivity often lead to positive solutions. To this end, the book is the product of the union of community concern and spirit with scientific objectivity. The people who worked to assemble the book never questioned their common goal of saving this species from urban extirpation. Whatever the outcome, the process that brought about this collection of papers is unique. Hopefully, other urban ecological problems can be addressed with the same sense of urgency, understanding and cooperation.

A.B. Adams

Seattle, Washington
August 1999

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INTRODUCTION

Clement W. Hamilton and Paul West

The past several years have seen increasing interest, on the part of the horticultural public as well as landscape professionals, in the health of the Pacific madrone (*Arbutus menziesii*). Several general trends—such as the desire for more broad-leaved evergreens in urban landscapes, the growing appreciation of native plants of ornamental and ecological value and ever-augmented plant-physiological stress due to urbanization—converge on the madrone. People are almost unanimous in their praise of the tree's desirability for urban landscapes and also unanimously puzzled about what might be causing its apparent decline in urban areas of the Pacific Northwest.

More than 200 researchers, professionals and interested public gathered at this symposium to share their knowledge and perspectives. They sought to determine whether any common understandings could be reached and what future research might be of greatest help to the madrone. Two questions underlay the 12 presentations and ensuing discussions: 1) what are the nature and causes of the decline of *Arbutus menziesii* in urban environments of the Pacific Northwest; and, 2) how can the madrone be propagated, restored and managed in urban landscapes?

At the beginning of the symposium, Christopher Chappell and Gregory Ettl spoke of the natural context of madrone, Chappell noting the apparent importance of fire in the establishment and persistence of plant associations in which madrone predominates. Fairly dry, sunny sites with shallow, well drained soil seem to be prime madrone habitat. Ettl found high variation in widths of growth rings, suggesting that madrone is very sensitive to environmental changes from year to year.

The use of madrone by birds is addressed in 2 papers. The first by Martin Raphael, was contributed to this volume subsequent to the symposium; he found that, in California, cavity-nesting birds utilize the madrone to a significant degree. Janita Gurung, *et al.* found similarly suggestive results for madrones in the Magnolia neighborhood of Seattle.

Ralph Byther, Richard Hunt and Marianne Elliot described the pathological aspects of the madrone's decline. Byther addressed all its diseases, noting that Phytophthora rot and Natrassia canker are likely more damaging than the many foliar diseases. Richard Hunt considers

that a particular growth characteristic of madrone actually may accelerate its decline. When the tree becomes stressed, it flowers more prolifically, which in turn detracts from the resources available for new shoot and leaf growth. As flowering increases and leaf production declines, the tree may begin to lack the vigor necessary to defend itself against the canker-causing diseases. Elliott, in a paper contributed after the symposium, reviewed the varied fungi pathogenic to madrone, and their effects.

Dana Bressette and Clement Hamilton sampled individual madrone trees west of the Cascades, recording site conditions and grading tree health. Their preliminary results suggest that 2 characteristics correlate with decline: tall, single-stemmed growth habit and thin bark. This suggests that exposure of the stem is a primary causative factor. Bressette witnessed that bark exfoliation occurs more often on south sides of trunks, possibly implicating sun exposure as a direct cause of decline. Their observations complement a model of stand decline that A.B. Adams proposed. He noted that the trees studied in the landscaped area of Magnolia Bluffs exhibit more dieback and canker than do the trees in the natural setting of Thorndyke and Discovery Parks. This leads him to posit a positive feedback process whereby the disturbance and exposure created by landscape development causes a stress response in the tree. This may then predispose the tree to infection by pathogens, which accelerates their decline. As the tree canopy dies back and individual trees are lost, the exposure of the stand further increases, thus augmenting the potential for general decline.

Trees are dying, but these are typically remnant trees of former forest stands that are not able to adjust to changes (usually clearing) in the environment around them. In contrast young vigorous madrone trees are growing up along highways, in parking lot medians and in other urban situations. It appears, therefore, that madrones can thrive in a wider variety of conditions than found in their usual habitat, if they are established as juveniles within those same growing conditions. For instance, madrones grow at the edges of wetlands, in irrigated turf and under closed conifer canopy. This perspective holds promise that madrones can find new niches in many parts of the urban landscape.

This hope is fueled by great evidence that madrones can be propagated readily from seed. The work of Ray Maleike, Rita Hummel, Diane Winters and Rico Gonzalez indicates that container production is within reach using standard nursery practices. Another challenge is transferring the plants from the nursery into the landscape. Thus far,

the work of Hummel, Winters, Gonzalez and Tony Shoffner focuses on establishing one- to three-gallon sized material. Because madrone exhibits sensitivity to transplanting, smaller material offers more immediate potential. Working with small material presents special challenges to the landscape manager, however, requiring extra protection to environments with heavy traffic, careful monitoring for pests (notably, slugs and root weevils) and allowing the juvenile bushy habit and low branching to prevail in order to protect the trunk. The challenge does not end with establishment of the trees, as Phil Coker points out; proper arboricultural treatment depends on understanding the physiology of mature trees.

Tony Shoffner's experimental habitat restoration in Discovery Park in Seattle, revealed that young madrones grown in full sun grew the fastest; irrigation and addition of native soil also had positive effects. Kathy Parker and Clement Hamilton, in a post-symposium paper, reviewed research that demonstrated madrone's apparent efficacy for controlling erosion on steep slopes.

Finally, the last section of this book summarizes the most recent research on madrones. Indeed, it is the only research on madrone roots and soils. Barbara Selemon and Toby Bradshaw are currently attempting to root madrone cuttings using a bacterium to produce auxin endogenously. Steve Trudell and colleagues are describing associations of madrone with mycorrhiza and Douglas-fir. They consider fungal associations from the perspective of symbiosis rather than pathology. A.B. Adams is attempting to define soils upon which madrones grow. He relates soil chemical and physical properties to madrone pathology and fires (an idea initially proposed by Chappell and Giglio).

At the symposium's close, participants discussed over 20 areas of research that could benefit madrones, principally the following: 1) systematic study of the canker-causing organisms; 2) genetic study of disease resistance, coupled with a program of selecting, propagating and introducing desirable plants; 3) exploring the possible significance of mycorrhizal associations; 4) trial plantings in different types of urban sites; 5) determining the size and area of minimum viable populations in urban greenbelts; and, 6) comparative study of different arboricultural practices, such as pruning, and their effects on plant form.

Seldom does one plant species, outside of agriculture or production forestry, arouse such a high degree of concern as has *Arbutus menziesii*. Certainly we speak for everyone involved in the Symposium when we say that we hope this work has laid a significant foundation for a healthier future for the Pacific madrone.