Cultivated Eucalypts of Seattle and the Greater Pacific Northwest: A Field Guide

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Preface

When I applied to the University of Washington's Masters of Environmental Horticulture program in the fall of 2016, my statement of purpose included a quote from Dr. Doug Tallamy: "We have to raise the bar on our landscapes. In the past, we have asked one thing of our gardens: that they be pretty. Now they have to support life, sequester carbon, feed pollinators and manage water." Bridging the gap between ecology and horticulture was a central theme of my statement of purpose and I concluded my statement by saying that we must demand more of our landscapes and the plants therein.

I have been a gardener in Seattle for nearly seven years and my interests have vacillated across a spectrum of topics that fall under the ecological horticulture realm. My graduate project ideas have been many and varied, with ideas ranging from a *Pollinator Vision Plan* for municipalities to an *Evaluation of Plants Suitable for Tree Root Competition* (the latter project as an excuse to work with a couple of my favorite plant genera: *Heuchera* and *Carex*). My varied interests have always been directed by a passion for plant-driven design, photography, ecology, ornamental horticulture and gardening. I became interested in *Eucalyptus* while working my way through Sean Hogan's *Trees for All Seasons* and walking my way through Arthur Lee Jacobson's *Trees of Seattle*. And so, somewhere under the outstretched limbs of a contorted Seattle Snow gum, this project began to take shape.

A February 2019 UW Botanic Gardens plant profile of *Eucalyptus gunnii* written by Ray Larson, Curator of Living Collections, hinted at a more layered history of *Eucalyptus* cultivation in Seattle than I had even considered (Figure 1). The writing of this plant profile also coincided with the Washington Park Arboretum's planned development and expansion of the Australia Forest. I hoped the questions that I had begun to ask and the answers to these questions might lend themselves to a project that might prove to be both a timely and enduring resource for the gardening community of the Pacific Northwest.

In the 1935 publication, *Pacific Coast Trees*, the authors (McMinn and Maino) wrote that "The climatic conditions of Oregon, Washington, and British Columbia are not suitable for the successful growing of eucalypti" and yet my copy of Trees of Seattle listed twenty-six different species of *Eucalyptus* growing in Seattle. I began by asking "What has changed in the time period from 1935 until now? How is it that twenty-six different tree species have been documented growing in Seattle? How can I know what species might prove to be successful in the Pacific Northwest? How can they be identified?", and perhaps most importantly, "Given the controversy surrounding *Eucalyptus* trees and what we know about California's experience with eucalypts should we even be trying to grow them in Seattle?"

With these questions in mind, a central aim of my project was to create a field guide to *Eucalyptus* in Seattle and to take a "deep dive" into the cultivation history of the region. I set out to follow the spread of a species, once deemed unsuitable for cultivation in the Pacific Northwest, from the favorable climate of California to the streets and gardens of Seattle and if only in some small way, to bring objectivity to the subjective act of planting a garden, shopping at nursery, and the discussion of *Eucalyptus* in Seattle and the Pacific Northwest. It is my belief that the genus *Eucalyptus,* though controversial in many ways*,* has much to offer to the gardens of the Northwest. As climate change forces gardeners to critically evaluate and demand more from the plants that are cultivated within our gardens, I believe eucalypts are well-suited to meet the demands of more resilient gardens; gardens that embrace a palette of plants that are both well-sited and well-suited to thrive in the summer dry and winter wet regions of the West Coast.

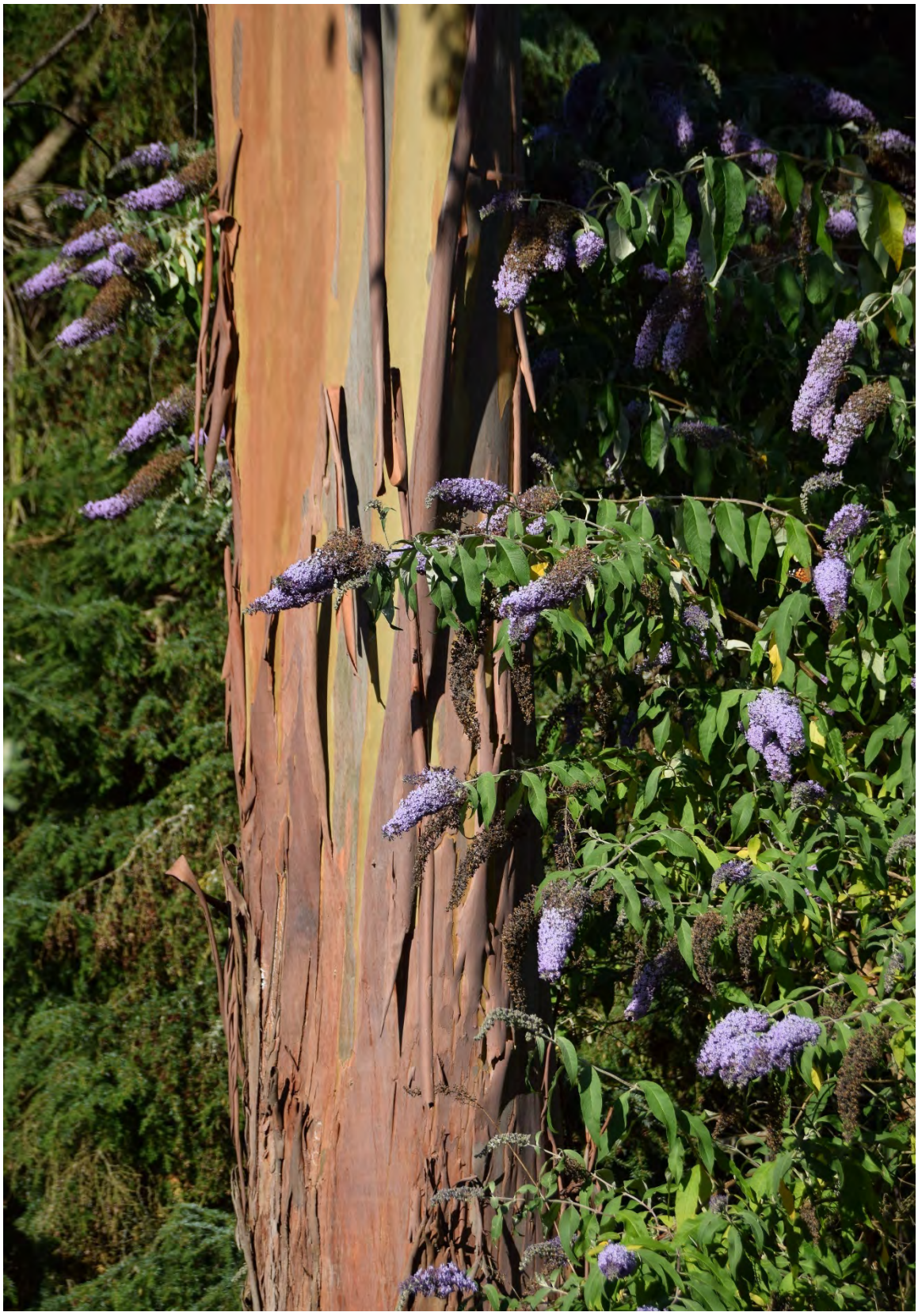

Figure 1: The layered bark and trunk of *Eucalyptus gunnii* enveloped by the cascading blooms of Buddleja 'Lochinch', Washington Park Arboretum, Seattle

Acknowledgements

This project would not have been possible without the guidance, expertise, and direction of many who knowingly and unknowingly played a part in its inspiration.

I would like to thank my graduate committee for their support and guidance throughout the duration of my master's program and project.

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The generosity of many capable and considerate plantspeople made the work of this project an enthusiastic endeavor.

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Ian Barclay for his support with time and answering many questions. His work and contributions to the cultivation of *Eucalyptus* in the PNW was critical in developing this project.

Mike Lee for contributing his time and thoughts, both of which helped to shape this project.

Sean Hogan for his generous correspondence, conversation and expertise in all things "broad-leaf ever-blue."

Stephen Munro for his tolerance of my trampling through the botanical gardens in the pursuit of @eucsplorations_nw.

Tyson Kemper for his support of my master's program and project and for allowing the project to extend into the grounds of the UW Bothell campus and to my fellow gardeners at UWB who helped with watering and care of nursery seedlings and garden plantings.

Dr. Matt Ritter, whose work made this project infinitely more feasible, for his correspondence, time and interest during this project.

The numerous Northwest gardeners who spoke with me about the *Eucalyptus* trees in their yards and allowed me to make closer inspections of the trees.

To my partner in life:

Stacia for her enduring commitment to supporting and encouraging me in this project during the many (five to be exact) seasons of this project and the many more of school and work: Thank you.

Cultivated Eucalypts of Seattle and the Greater Pacific Northwest: A Field Guide

Robert Wrench

Abstract

The cultivation of *Eucalyptus* has left a profound ecological legacy upon California and the west coast region of the United States. The story of their introduction into California is an essential starting point for following the northward migration of a genus once deemed unsuitable for cultivation in the Pacific Northwest into the gardens of Seattle. The field work and research of this project has resulted in the creation of a field guide to aid in the identification of commonly cultivated *Eucalyptus* of Seattle and the greater Pacific Northwest. The project elucidates and synthesizes regional cultivation history of the genus in Seattle, considers the ecological implications of *Eucalyptus* cultivation, and discusses the possible implications of repeated purposeful introductions. A central focus of *Cultivated Eucalypts of Seattle and the Greater Pacific Northwest: A Field Guide* is to bring objectivity to a genus that has in many ways become inseparable from the subjective emotions that accompany its name. This guide and history give critical thought into the cultivation of the genus in the Pacific Northwest acts as a regional resource to aid in the proper identification of species and enables gardeners, nurseries, and land managers to make informed decisions about the role of eucalypts in Northwest parks, campuses, and gardens.

Notes for the reader:

- All photography, artwork, diagrams, and maps are by the author, unless otherwise noted and referenced.
- Some outdated species names are used in this paper as they were referenced from historical literature sources. For example, *Eucalyptus parvifolia* is written multiple times in the introduction to the paper. *Eucalyptus parvifolia* was originally published in 1895 for a fossil species and the name can no longer be used for the more recently discovered species (Euclid CSIRO). The current nomenclature for the species is *Eucalyptus parvula* (L.A.S.Johnson & K.D.Hill, Telopea 4:233, 1991). A reference table is included, with updated nomenclature based on recent taxonomic work, on page twenty.

Introduction and Cultivation History

"The climatic conditions of Oregon, Washington, and British Columbia are not suitable for the successful growing of eucalypti." – Howard McMinn & Evelyn Maino, An Illustrated Manual of Pacific Coast Trees (1935)

Much has been written about the cultivation of *Eucalyptus* species outside their natural range. The genus *Eucalyptus* can elicit a negative response in the minds of many when considering their now conspicuous presence in the many places where they were once, and in many cases still are, extensively planted. *Eucalyptus* are grown for erosion control, as a source for timber, firewood, pulpwood, for essential oil production and for ornamental purposes (Grimshaw & Bayton 2009).

The first recorded botanical collections of *Eucalyptus* by European botanists and scientists were made in the early 1770s. A specimen of *Eucalyptus obliqua*, collected by David Nelson in 1777 on the third voyage of Captain James Cook, became the type specimen for the genus (Brooker & Kleinig 1983). The name *Eucalyptus* was coined by the French botanist Charles Louis L'Héritier de Brutelle in 1788 in his description of *Eucalyptus obliqua* published in *Sertum Anglicum* (Figure 2). The generic name Eucalyptus comes from the Greek roots *eu* and *calyptos* meaning "well" and "covered" in reference to the operculum or calyptra of the flower bud (Brooker & Kleinig 1983).

Figure 2: *Eucalyptus obliqua* specimen plate from Sertum Anglicum

The continual planting of *Eucalyptus* plantations is prompted by their undeniable utility, but their capacity for environmental damage is unnerving due to the destructive ecological legacy of the genus outside of its native range. In considering the cultural significance of *Eucalyptus* in North America, California is the central figure in the history of *Eucalyptus* cultivation. It is in the history of the "Golden State" that one begins to follow the spread and propagation of the "Gold Rush Tree." This paper is concerned with understanding that period of time, from 1935 to the present, and it seeks to follow the spread of a species, once deemed unsuitable for cultivation in the Pacific Northwest, from the favorable climate of California to the streets and gardens of Seattle (McMinn & Maino 1935, Figure 3).

Before embarking on a history of *Eucalyptus* cultivation in the Pacific Northwest, it is necessary to have some understanding of *Eucalyptus* cultivation in California. The ecological legacy of *Eucalyptus* plantings in California and beyond will be discussed. The past must be understood if current and future horticulturists and foresters are to make careful and informed decisions about the continued cultivation of *Eucalyptus*. I set out to build upon the work of past horticulturists, growers, *Eucalyptus* enthusiasts and regional historians. The creation of a field guide to commonly cultivated eucalypts of Seattle and the greater Pacific Northwest was a primary directive of my project. A cultivation history and ecological considerations are included as a supplement to the field guide in order to provide a more holistic context for the inclusion of more than twenty described *Eucalyptus* species and to provide a synthesis of important work up until this point in time. It is my hope that *Cultivated Eucalypts of Seattle and the Greater Pacific Northwest: A Field Guide* might serve as a useful tool for horticulturists, nurseries, land managers, urban foresters and anyone interested in the worthy story of *Eucalyptus* trees in the Pacific Northwest.

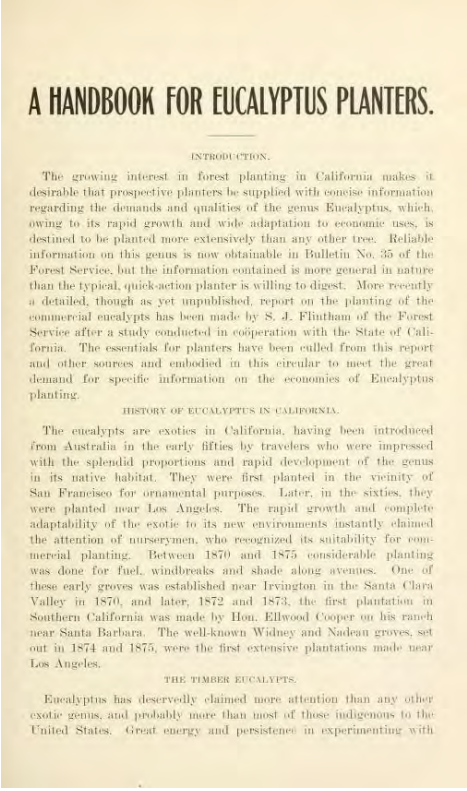
Figure 3: Snow Gum limbs arch over a West Seattle avenue

The Gold Rush Tree

Eucalyptus trees arrived in California from Australia in the 1850s during the Gold Rush. The Gold Rush created a high demand for wood for construction and fuel, and it was at this time that *Eucalyptus* seeds were just a part of feeding the greater demand for any and all trees that would grow in the coastal extremes of California settlements, like San Francisco (Farmer 2013). In the same way that the forty-niners put their hopes in the dream of striking it rich in California's Gold Rush, *Eucalyptus* trees stirred the hopes of many shortly after their arrival from Australia (Figure 4). The rise and fall of *Eucalyptus* in California has been described as that of a tree of promise to a tree of disapointment and ultimately of disdain (Santos 1997). *Eucalyptus* trees were just one of the many trees tested for cultivation success by nineteenth century horticulturists in California, but eucalypts were ultimately singled out for their amazingly rapid growth properties (Farmer 2013). Golden Gate Nursery of San Francisco is credited with first offering Antipodean trees for sale and the first successful planting of *Eucalyptus* in California has been traced back to the San Francisco nursery in 1853 (Nance 2014; Farmer 2013). The similar Mediterranean climates of California and Australia provided an easy transition for the Australian transplants.

Figure 4: *Eucalyptus*, the Miracle Tree (Los Angeles Herald, 1909)

It would not be until the 1870s that eucalypts would be planted with capital gain in mind. Early European-American settlers to California brought with them mental images of their tree covered homelands and the dry, seemingly barren coastal scrub and shrublands of California were a stark contrast to the hope that the Gold Rush of the 1840s and 50s promised. Many early accounts by European-American settlers describe the "scattering" of oaks and the "sparseness" of trees in California. An 1863 publication entitled *Resources in California* says, "The valleys are mostly bare of timber, with here and there a grove of oaks, and lines of trees and bushes along the water courses" (Santos 1997).



A HANDBOOK FOR EUCALYPTUS PLANTERS.

INTRODUCTION.

The growing interest in forest planting in California makes it desirable that prospective planters be supplied with concise information regarding the demands and qualities of the genus Eucalyptus, which, owing to its rapid growth and wide adaptation to economic uses, is destined to be planted more extensively than any other tree. Reliable information on this genus is now obtainable in Bulletin No. 35 of the Forest Service, but the information contained is more general in nature than the typical, quick-action planter is willing to digest. More recently a detailed, though as yet unpublished, report on the planting of the commercial eucalypts has been made by S. J. Flintham of the Forest Service after a study conducted in coöperation with the State of California. The essentials for planters have been culled from this report and other sources and embodied in this circular to meet the great demand for specific information on the economics of Eucalyptus planting.

HISTORY OF EUCALYPTUS IN CALIFORNIA.

The eucalypts are exotics in California, having been introduced from Australia in the early fifties by travelers who were impressed with the splendid proportions and rapid development of the genus in its native habitat. They were first planted in the vicinity of San Francisco for ornamental purposes. Later, in the sixties, they were planted near Los Angeles. The rapid growth and complete adaptability of the exotic to its new environments instantly claimed the attention of nurserymen, who recognized its suitability for commercial planting. Between 1870 and 1875 considerable planting was done for fuel, windbreaks and shade along avenues. One of these early groves was established near Irvington in the Santa Clara Valley in 1870, and later, 1872 and 1873, the first plantation in Southern California was made by Hon. Ellwood Cooper on his ranch near Santa Barbara. The well-known Widney and Nadeau groves, set out in 1874 and 1875, were the first extensive plantations made near Los Angeles.

THE TIMBER EUCALYPTS.

Eucalyptus has deservedly claimed more attention than any other exotic genus, and probably more than most of those indigenous to the United States. Great energy and persistence in experimenting with

Figure 5: A 1908 Eucalyptus handbook (CA State Board of Forestry, 1908)

Initial plantings of *Eucalyptus* were more often used to afforest the "treeless" landscape of California and to provide for the shortage of fuel and simple construction materials. The healthy and resilient trees did in turn inspire a planting boom in the 1870s when speculators saw *Eucalyptus* trees as an opportunity for timber production (Nance 2014).

There were many individuals, agencies, and commercial groups who advocated for the planting of *Eucalyptus* in California (Figure 5). One of the most well-known early supporters was Ellwood Cooper. Cooper actively sought to enlighten landholders to the many virtues of the *Eucalyptus* tree. He delivered lectures on eucalypts and published *Forest Culture and Eucalyptus Trees* in 1876. His book states on the title page that it is "The only Complete and Reliable Work on the Eucalpyti published in the United States" (Santos 1997). A great portion of his publication consisted of reprinted material from Ferdinand von Mueller, an early Australian authority on the genus (Farmer 2013). The State Board of Forestry was created in 1885 to help guide the forestry activities of nineteenth century

California. The board would later offer seedlings of a variety Australasian trees at a discounted price to land owners in exchange for progress reports (Farmer 2013). The board founded experimental stations on donated land in 1887 and as the State Board of Forestry was later disbanded in that same year, UC Berkeley's College of Agriculture took up the mantle as the state authority (Santos 1997). *Eucalyptus* seedlings were sold or given away to the public by various agencies and municipalities in the hundreds of thousands through the end of the 19th century. The frenzied planting that was undertaken in California in the nineteenth century drastically increased in the first two decades of the 1900s. In 1907 the Forest Service, then led by Gifford Pinchot, issued an alarm about an impending "hardwood famine" (Farmer 2013, Santos 1997). The Forest Service predicted that the timber reserves of the eastern hardwood of forests of the Appalachian region would last only fifteen years without scientific forestry intervention (Farmer 2013). The California climate and its vigorous *Eucalyptus* trees were seen as the would-be answer to the United States' looming timber crisis. The commercially-driven cash crop plantings that ensued were comparable to the frenzy of Tulip mania that had earlier swept seventeenth-century Holland (Farmer 2013). Speculators and investors set out to monetize the looming hardwood famine with the planting of "instant industrial forests" composed of Blue

Ours by Adoption

BUT THE EUCALYPT'S ALMOST A "NATIVE"

By Alice Koons

Eucalyptus viminalis, with its white bark and graceful form, is a striking tree. This fine specimen is at Inglewood. To the center is E. corymbifer, the sugar gum. The tree shown is on the ocean bluffs above Santa Monica Canyon.

CALIFORNIA without eucalyptus trees is a picture hard to imagine. So completely have these Australians come to dominate our landscape that it seems natural to think of them as native here. Yet, less than sixty years ago, all of the hills and valleys now covered with these trees were bare, boasting of no arboreal vegetation on their sunny surfaces. On the edges of the desert, in the hot interior valleys, and along the ocean front the present picturesque eucalypts were lacking.

Today, the eucalyptus is more widely planted than are any of our native trees. This adopted child, too, is more precious than the real children. The different species have proved adaptable to nearly all of the widely differing climates in California. In many spots certain eucalypts have outstripped all of the natives of the district in vigor and grace. In the desert region windbreaks of eucalyptus have long sheltered crops and the ideal considered a most serviceable tree under high temperatures has yet to display them to many areas.

When we consider the marvelous transformation of the landscape which has taken place since the introduction of this denizen of the southern hemisphere, we are split almost to reverse the numerous species. This

One of our fine street trees is Eucalyptus polyanthema, pictured here. Its small grey-green leaves and persistent bark make it a general favorite.

eucalypts have been invaluable in adding interest to our skylines, in providing forms against the horizon where before monotonous horizons existed. The trees are equally useful planted on a large scale as windbreaks or as specimen trees in city back yards. The criticism often directed against eucalyptus trees—that they exhaust the soil—is usually exaggerated. The trees planted for ornamental effect give back in beauty far more than they ever use in nutrition belonging to other plants. If there is danger that they may rob choice plants around them of food, additional fertilizer can be added each year to make up for their drain on the soil.

Some of the most effective gardens which I have ever seen have relied upon eucalypts to furnish a background. From a distance they add charm to the skyline and close up they cast interesting shadows upon the lawn. Right at their feet fine flowers and shrubs grow in luxuriance, requiring only a little extra care due to fallen leaves and depleted soil conditions. As specimen trees, a number of eucalyptus species are worthy of a place in the finest gardens. Eucalyptus citriodora, for instance, with its stony trunk and feathery clusters of foliage at the ends of wide-flung branches, commands attention wherever grown. Eucalyptus rudis is a more sturdy way provides interest in many landscapes. Then, too, the red and pink-flowering species are conspicuous for their bloom.

NEVER LOSES GRACE

Although the fine form and lines of the eucalyptus are best witnessed in single specimens grown here and there in the garden, the grace of the tree is not lost in timber plantings. In the past when large tracts of land were being turned over to such purposes in various promotion schemes entered to reap fortunes from timber. These schemes fell flat in the course of time, disappointing many a landowner and investor, but the plantings have added immeasurably to the beauty of many communities. They have shown us what may be accomplished in foresting certain areas.

The mature beauty of eucalypts is seldom seen. Most of our plantings of today are still young. Those planted forty or more years ago have all too often been cut down either for timber or to make room for civic improvements. Take the case of Melrose avenue in Los Angeles, for instance. In the past this street was noted for magnificent blue gums which met in a vast arch overhead. These giants were cut down to make way for a widening of the street, much to the distress of horticultural-minded persons of the city. Today a dozen years later, they have not been replaced by any tree nearly approaching them in majesty and beauty. One wonders whether such trees could not just as well have been spared, another street being selected for widening. On Robertson Boulevard, between Pico and Wilshire, there remains one tree of another old planting, a single sentinel showing the enormous proportions which the blue gum is capable of attaining.

Most persons underestimate the number of species found in the genus eucalyptus. There are over 200 recognized species in Australia, although somewhat less than 100 have been introduced into California. It is not to be expected that all of the members should be adapted to our conditions, or be even desirable trees here. Nevertheless, there are several scores of the trees which are admirable and well worth growing. Some of the species which are scarcely known in California make beautiful trees in the garden. They do not possess the extreme vigor of the blue gum, which makes it a boon to persons in rigorous climates, but they stand much more refined than do our common garden trees. Eucalyptus erythrocorys, for example, with its bright red cups over the flower buds and its showy sulphur-yellow flowers two and one-half inches across, affords an illustration of the exotic beauty found in some of the species, as yet planted only in one or two places. Eucalyptus megacarpa, with red blossoms five inches across, is an unusual member of this group.

THE COMMONER ONES

Although around ninety per cent of all the eucalypts grown in California are blue gums, there are about a dozen other species found in gardens rather frequently. Eucalyptus resinifera, with its beaked flower buds and reddish cast to the foliage is probably the species next in prominence to the blue gum. It has a smooth or slightly rough trunk which often shows a mottled effect. It does not lose its bark in long strips, as does the blue gum.

Eucalyptus sideroxylon and its variety, rosea, are excellent trees for the garden with their dark brown or black bark and drooping branches. They produce an abundance of showy flowers in the spring and grow to be large trees. Where a tree with a fine form is desired, a better subject than this species would be difficult to find. E. sideroxylon has the same narrow leaves and showy flowers as E. sideroxylon but is conspicuously different in its bark, which is light colored. The "swamp mahogany," E. robusta, is a fine shade tree, possessing large shiny leaves of a dark green color. It has strongly dark brown bark and is well adapted to California.

Eucalyptus pulverulenta, with small rounded leaves of a gray-green color, becomes a fine street tree in a short time. Eucalyptus rudis has been used considerably for the same purpose, but should not be planted where there is a strong wind as its foliage becomes whipped into pieces easily. Eucalyptus viminalis is desirable where a large tree is needed, since it supersedes the blue gum in height. It has whitish bark, and wider spreading branches than the blue gum. Its leaves and flowers are much smaller also.

NOT ALL GIANTS

Although many persons think of eucalypts as trees of immense eventual height, such a conception is inaccurate. Certain species are good substitutes for small trees such as the olive, especially where a fast-growing subject is desired. Eucalyptus cornuta and E. platypus, although not frequently encountered, are fine trees for such situations. Eucalyptus leucoxylon and E. ficifolia, the flaming eucalyptus, also are small trees of a desirable spreading habit. Eucalyptus ficifolia, with its brilliant flowers varying from pink to deep red, is becoming quite popular in Southern California, but the other three trees are as yet found in

The characteristic drooping branches and dense foliage of Eucalyptus robusta, the red gum, are illustrated here. The tree is particularly adapted to dry locations. This husky stands by the highway near North Hollywood.

very small numbers. Eucalyptus amygdalina macrantha is an extremely interesting tree with spreading branches and extremely fine foliage. The grain of its trunk and branches is twisted, giving it a unique appearance. A fine specimen of this tree may be seen at the Pasadena park grounds at Colorado and Orange Grove avenues, labeled by its old name, E. tenuis.

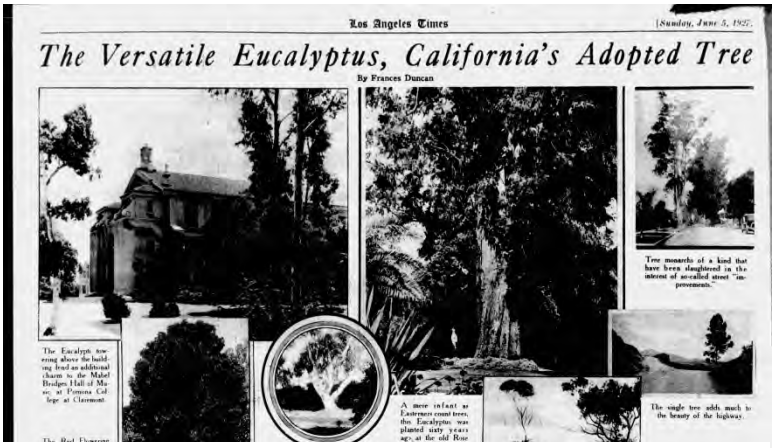
Eucalyptus cornuta makes an interesting tree, with its bark resembling that of an elm and its unusual flower clusters forming a spiked ball. It has been used effectively as a street tree on Seventh street in Santa Monica, alternating with the blue gum. Eucalyptus occidentalis, found among the wealth of eucalypts at the Children's Ranch in Rustic Canyon, Santa Monica, is a fine tree for home planting. Eucalyptus ficifolia creates pleasing proportions, also, and may be seen at the same location. With the great variety found in eucalyptus trees it seems that there is a species for every purpose. I have located about fifty species in the territory from Santa Barbara south through Los Angeles county. In studying the different kinds, I have come to the conclusion that an acquaintance with the members of this genus invariably leads to a deep appreciation of their value here in California.

A glimpse of Eucalyptus cornuta among other desirables of the species found in the old forestry planting at the Children's Ranch near Santa Monica.

Figure 6: "Almost a Native" (LA Times, 1933)

gums and Red gum (Farmer 2013). Many of the *Eucalyptus* groves and trees seen in California today can be attributed to the *Eucalyptus* "boom" of 1907-1913 (Santos 1997). Heading into the "boom" period of *Eucalyptus* planting, most people were certain of the usefulness and economic value of Gum trees and an enormous amount of hype literature can be found from "Euc boosters," investors, and speculators from this time period. Eucalyptus boosters touted gum trees as the hardwood of the future and the king of hardwoods (Farmer 2013). A brochure produced by The Mahogany Eucalyptus and Land Company of Oakland, CA lauded eucalypts and stated that "This tree at this particular moment is in many instances the most valuable one on the face of the globe. Maturity is in a decade or two. No Teak, Mahogany, Ebony, Hickory or Oak was ever tougher, denser, stronger or of more glorious hardness . . . " (Santos 1997, St. George 2016). In the industrial age of wood, many goods, like toys and coffins, were made of lumber and the primary building materials for foundations, walls, ceilings, roofs and floors all came from trees (Farmer 2013). It was Eucalyptus wood that was prepared to fill void left by the depleted hardwood forest of Appalachia.

The "boom" became a "bust." The *Eucalyptus* boom fizzled as it was found that *Eucalyptus* wood could not meet the demands that it had been advertised as meeting (Santos 1997). Ultimately, it was that discovered that the projected timber yields would take too many years to be realized. Eucalyptus wood could not be seasoned properly to be used as the wood warped, cracked, twisted and became too tough once cured (Santos 1997). A 1910 public advisory issued by Chief Forester Henry Graves spoke to the exaggerated predictions of Eucalyptus companies and made allusion to studies undertaken with the University of California (Farmer 2013). The experiments


Los Angeles Times

The Versatile Eucalyptus, California's Adopted Tree

By Frances Duncan

Figure 7: California's Adopted Tree (LA Times, 1927)

indicated that young eucalyptus wood tended to shrink, warp and check and details from Australian lumber practices revealed that eucalypts under thirty years old were never cut (Farmer 2013). The details of the study revealed Australian lumber practices that put ideal harvest practices at closer to sixty years and up and the answer to the "hardwood famine" was in the end resolved by the industrial use of steel, cement, and rising use of oil, gas and electricity (Santos 1997, Farmer 2013). The Tasmanian Blue Gum (*E. globulus*) was by far the most widely planted eucalypt in the California and accounted for an estimated 90 percent of all eucalypts in the state according to a 1913 issue of *Hardwood Record* (Tiemann 1913). *Eucalyptus* plantations and nurseries were largely abandoned after 1913, and a 1924 investigation estimated that California contained 40,000 to 50,000 acres of solid stands of *Eucalyptus*, with 80 percent of these stands being Blue Gum (Farmer 2013, Figure 7). In 1985 the total area occupied by blue gum in California was estimated at 198,000 acres (FAO 1985; Roberts 2016).

Through much of the first half of the century *Eucalyptus* continued to be celebrated in California. Many other species beyond the now defamed blue gum continued to play a role in parks, street plantings, public and private gardens. A 1927 Los Angeles Times article wrote that eucalypts "seem more essentially California than many a native plant; so completely has it adopted California, and so entirely has California adopted it, that without its sheltering beneficence our droves and vineyards would be like Home without a Mother" (Farmer 2013, Figure 6). Nonetheless, the tides of sentiment for Eucalyptus in California would change in the coming years with a string of fires. A 1972 freeze led to widespread fear that the fires from accumulated leaf litter and debris would prove to be disastrous for the East Bay area, and federal disaster funding was granted for removal of the debris (Santos 1997). The 1970s can be seen as the time of change in status for blue gums in California "…from welcome to unwelcome, from adopted to disowned" (Farmer 2013). The storied Berkeley Hills "Tunnel Fire" of 1991 can be seen as the final swing in the pendulum that is the eucalypts fall from favor in California (Farmer 2013). The fears

that preceded a fiery disaster in 1973 were finally realized in 1991 in the Oakland-Berkeley Hills firestorm, a wildfire event that would, for its time, become the third most costly conflagration in U.S. history (The costs associated with wildfire events of the 2000s have for the most part eclipsed the Oakland-Berkeley Hills fire event) (Farmer 2013). A number of different factors helped to facilitate the inferno, with several years of drought and a hard freeze in the previous year causing a profusion of limb failures and litter buildup (Farmer 2013). There were many who blamed the blazes on the Blue Gum groves planted through the hills of the East Bay, and article headlines from the years following the fire encapsulate the contention surrounding the causes of the fires (Santos 1997, Farmer 2013).

The East Bay area has a history of grass and forest fires, even before large groves of Blue Gum were planted in the first decade of the twentieth century. A 1923 report from the State Board of Forestry wrote that the bare slopes of the Oakland and Berkeley hills were prone to grass fires, suggesting that the canopy cover afforded by groves of *Eucalyptus* trees helped to prevent the igniting of dry grass fires (Santos 1997). The nonnative annual grasses that covered treeless hillsides magnified the effects of the fire, but the accumulation of *Eucalyptus* debris contributed an estimated seventy percent of the fuel load; it is certainly as Jared Farmer writes in *Trees of Paradise* saying: “While gums hardly caused the catastrophe, they certainly made it worse” (Farmer 2013).

The cultural and ecological legacy of *Eucalyptus* in California is complicated to say the least. While California has its own story with *Eucalyptus*, one that has ended with its fall from favor, it is a tree that is widely cultivated worldwide and will continue to be grown (Farmer 2013). The California archivist Bob Santos concludes the historical section of *The Eucalyptus of California* by saying, “There are environmental and cultural concerns to address. It is for certain though, like it or not, the eucalyptus will always be a tree of the future because it has so much to offer humanity” (Santos 1997). The skylines of

many a California coastal hill and valley will continue to carry the looming silhouettes of towering Gum trees for the foreseeable future, the arboreal pilings of a once hopeful and promising “California Dream” grown awry (Figure 8).

Table 1. Nomenclature of Species

Outdated names and synonyms are used in this paper when referencing historical sources. As taxonomic work continues and species relationships are better understood, species names are revised. The “Authority” column is in reference the researchers connected to the most recent nomenclature revision for a species (Euclid CSIRO). This reference table gives the currently accepted species name, authority and synonyms that have been used in some sections of the paper.

Species Name (Current Accepted Name)	Authority	Synonyms	Common Name
E. camaldulensis	Dehnh.	*E. rostrata*	River red gum
E. delegatensis	R.T.Baker	*E. gigantea*	Alpine ash
E. parvula	L.A.S.Johnson & K.D.Hill	*E. parvifolia*	Small-leaved gum
E. pauciflora ssp. debeuzevillei	L.A.S.Johnson & Blaxell	*E. debeuzevillei*	Jounama gum
E. pauciflora ssp. niphophila	L.A.S.Johnson & Blaxell	*E. niphophila*	Alpine snow gum
E. lacrimans	L.A.S.Johnson & K.D.Hill	*E. niphophila ‘Pendula’*	Weeping snow gum
E. johnstonii	Maiden	*E. muelleri*	Tasmanian yellow gum
E. gunnii	Hook.f.	*E. whittingehamei*	Cider gum
E. globulus ssp. bicostata	Maiden, Blakely & Simmonds	*E. bicostata*	Southern blue gum

Figure 8: Blue Gum grove (*E*. *globulus*) at UC Berkeley

Cold Hardy Eucalyptus

Eucalyptus were cultivated in the northerly latitudes of the United Kingdom long before they reached northern latitudes of the Pacific Northwest, beginning with the introduction of *Eucalyptus obliqua* in 1774 (Ritter 2014, Elliot & Jones 1980). Those species successfully cultivated in the in the temperate oceanic climate of the United Kingdom have proven to be successful, in many cases, in the mild climate of the Pacific Northwest. Plantings of *Eucalyptus pauciflora, E. gunnii, E. perriniana, and E. glaucescens* have been well established, and there is a considerable amount that has been written about Eucalyptus cultivation in the United Kingdom (Elliot & Jones 1980). The suite of species that are commonly cultivated in colder temperate climates is often not well known or often cultivated in California (Jacobson 1996). Many eucalypts were attempted in Britain, with a great number of collections having been made and introduced during the Victorian era. The number of species that proved to be sufficiently hardy to be planted throughout Britain proved to be a fairly small number of species, but time with experimentation have enabled collections of 20 to 30 *Eucalyptus* species to become established in mild maritime locations along the coasts of Scotland and England (Grimshaw & Bayton 2009).

It had long been known that one of the primary limiting factors in the cultivation of various *Eucalyptus* species was temperature. The California State Board of Forestry's 1908 publication, *A Handbook for Eucalyptus Planters,* gives the following words for would-be eucalypt growers:

> *Temperature: No one factor has so much influence in governing the extension of Eucalyptus as* temperature. The fact that its planting range is practically restricted to California is wholly attributable to the frost-tenderness of the genus. During the seedling years the danger from frost is greatest. The susceptibility of the sugar gum seedlings to frost injury is particularly marked.

> Thermometer readings of temperature are not always true indices of the influence of frost on a tender plant. Much depends upon the condition of the plant at that particular time. If a period of warm weather is followed by a sudden drop in temperature, the plant suffers more than it would if an equally low temperature had come gradually. The exposure of the plantation is likewise important. If the plantation has an eastern exposure where it is reached by the first rays of the sun, the damage will be greater than if it remains in partial shade while the temperature ascends slowly. (Lull 1908)

There are other factors to consider in cultivating eucalypts, such as soil type, water availibilty, and sun exposure, but the first factor that must be met is that of temperature. The State Board of Forestry explicated to California foresters that the optimal development of a species was contingent upon meeting the ecological demands of a species (Lull 1908.) The cultivation of eucalypts would continue to be limited to the range of ecological tolerances expressed in the species most commonly cultivated by the California timber industry (Red, Grey, Manna, Blue, Sugar and Lemon Gum). With such a large genus of plants, with trees that can be found occupying an extreme range of niches from lowland coastal rainforests to subalpine granite outcroppings, it would be expected that suitably cold tolerant plants could be found whose ecological demands could be satisfied within the cool temperate oceanic climates of the United Kingdom and the Pacific Northwest. In a 1983 workshop on *Eucalyptus* in California, a presentation on the *Adaptability of Some Eucalyptus Species in Southwest Oregon* was presented by private consulting forester, Lee O. Hunt. The presentation details the results of Hunt's research and trialing of various eucalypts in southwest Oregon. Even in 1983 there was a misconception that there are no *Eucalyptus* species suitably hardy enough to be cultivated north of California, let alone commercially cultivated from the perspective of the timber industry. Hunt (1983) says, "There is a common attitude that there are no cold tolerant Eucalypts and thus they won't grow in Oregon." The primary concerns of foresters are with those timber trees that can be deemed highly productive, but the curiosities of horticulturists and gardeners are more concerned with ornamental presentation than the practicalities of production, and it is here, in the gardens of curious cultivators, that the gnarled

windswept forms of alpine Snow gums and obscure Omeo gums find a suitable substrate within which to root.

Even within the less rigorous confines of the home garden setting, practicality has its place. Cold hardiness is a recurring and central theme in any and all books, articles or conversations that chance upon the cultivation of *Eucalyptus* in northern latitudes. And yet, as H.J. Elwes expressed in the 1912 publication of *The Trees of Great Britain & Ireland*, it may be that they are "so easy to raise from seed, that the certainty of their death after a few years will not deter gardeners from planting them" (Elwes & Henry 1912, Grisham & Bayton 2009). At the time of writing in 1912, Elwes and Henry give account of thirteen species, including *Eucalyptus obliqua*, that have been trialed in the United Kingdom but are not worth further attention outside of the "glass house" in temperate gardens (Elwes & Henry 1912). The authors also provide a botanical key based on foliage characteristics that will help the reader to distinguish the thirteen species in cultivation that may be encountered in "the open air of Great Britain and Ireland" (Elwes & Henry 1912, Figure 9). The descriptions of *Eucalyptus* trials and species accounts detailed in the *Trees of Great Britain & Ireland* were largely drawn from personal communications with early twentieth century gardeners who shared their experiences with *Eucalyptus* cultivation. The importance of personal communications and correspondence between eucalypt enthusiasts and horticultural centers, such as gardens and universities, can be seen throughout the many publications that seek to provide a synthesis of the

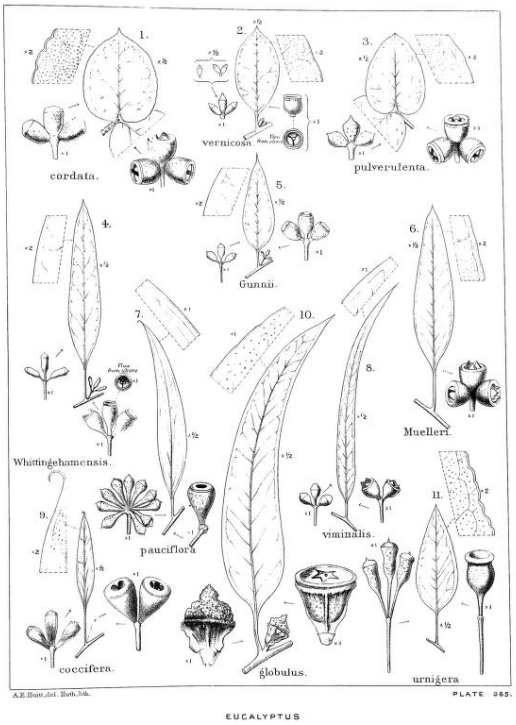


Figure 9: Identification Plates (Trees and Shrubs of Great Britain & Ireland, 1912)

current state of *Eucalyptus* successes and failures. The most current synopsis of "hardy" *Eucalyptus* cultivation can be found in *New Trees*, where its "account of the genus describes 54 species currently established in cultivation, adding to the 17 described in full by Bean" (Grisham & Bayton 2009). As of 1912, the species that were considered to have proven hardy by the Eucalyptus accounts in *Trees of Great Britain & Irelan*d were *Eucalyptus vernicosa, E. gunnii, E. coccifera, E. cordata, E. muelleri and E. urnigera* (Elwes & Henry 1912, Figure 10). In the first edition of *Bean's Shrubs and Trees*, the assistant curator at the Royal Botanic Gardens gives species descriptions for only three eucalypts but says that only *Eucalyptus gunnii* can be considered "really hardy" in London's Kew Gardens (Bean 1914). It would be a number of years before additional records of *Eucalyptus* cultivation would be written, but in that time the planting palette for temperate gardens would continue to grow in size and diversity.

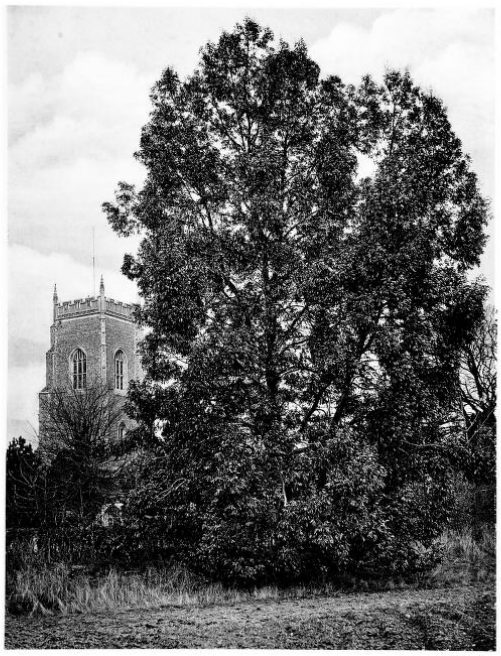


Figure 10*: Eucalyptus gunnii* (The Trees and Shrubs of Great Britain & Ireland, 1912)

Eucalyptus Suitable for the Sound

"Discovered Eucalyptus Suitable for Sound" is the title of a brief article that appears in the June 1910 issue of the *San Juan Islander*. After having spent several years investigating eucalypts in Australia on behalf of the US Forest Service, a Mr. R. Webb, an acquaintance of Gifford Pinchot, is reported to have "urged the introduction of *Eucalyptus*" trees into the Pacific Northwest. Webb said that he had found *Eucalyptus* varieties that would grow in the cool coastal climate of the Puget Sound region. Webb made seed collections of *Eucalyptus delegatensis* and *E. amygdalina* saying, "I found while

in Australia two very valuable *Eucalyptus* growing in the higher altitudes, from 4,000 to 6,000 feet, where zero weather is often experienced and where heavy snow falls prevail during many of the winter months" (San Juan Islander 1910). Mr. Webb is just one of the many eucalypt enthusiasts who would seek out high elevation trees with the hope that these seed collections would prove to be hardy in temperate gardens, a practice that still continues to this day (Grisham & Bayton 2009). A knowledge of seed provenance is fundamental to the success of eucalypts in temperate gardens. The authors of *New Trees* say, "The importance of selecting seed from such locations cannot be overemphasized, as it can make a significant difference to the winter temperatures a tree can withstand…. In the past this effect was not so widely appreciated as it is now, and seed collections were often made at the first point of contact with a species – usually therefore at the lower end of its altitudinal range" (Grisham & Bayton 2009). In researching the history of *Eucalyptus* cultivation in Seattle, it is helpful to divide the time periods into different sections, all of which are central to the testing and experimentation of those *Eucalyptus* species that can be considered suitable for the Sound.

Eucalyptus for the Washington, Oregon, Vancouver Seaboard Region (1940s – 1970)

A February 1941 issue of *The Arboretum Bulletin* advertises an upcoming two-day garden course with a registration fee of $1.50. Included in the list of speakers and topics is a presentation by Duane O. Crummet, the then superintendent of green houses at the University of Washington arboretum, entitled "The Eucalyptus in the Puget Sound Region." The focus of Crummet's presentation will be to "discuss the several kinds [*Eucalyptus*] which are already growing here and will introduce you to other types which have definite possibilities." Crummet was a plantsman in California who brought his experience with horticulture north to Seattle. The contents of the presentation are not known, but it seems clear

that at the time of the 1941 gardening course there were *Eucalyptus* trees growing within the Seattle area.

A walk through the UW Medicinal Herb Garden today may be just as surprising to observant individuals as it would have been back in 1949. Ludwig Metzger, a former supervisor of the "drug gardens" at the UW Seattle campus, wrote an article in the 1949 fall *Arboretum Bulletin* to report on the status of "unusual trees and shrubs" that had been listed in the fall 1946 issues of the *Arboretum Bulletin*. Metzger was optimistic about the diversity of plants that could be grown in the Puget Sound region. He made records of winter temperatures and trends and might be described as a gardener practicing "zonal denial" by today's garden vocabulary (OGW 2020). Metzger noted his surprise that many plants that he considered to be tender came through a consecutive string of severe winters from 1946 to 1949 "in better shape than was expected." In talking about Seattle winters, Metzger said, "The winters in the Puget Sound are not severe and the temperature seldom goes down below 25 degrees above zero, and then only for a few days. My records show that every fifteenth or twentieth year the winter is more severe and we have more snow" (Metzger 1949). The list of plants, which includes Japanese Loquat and Giant Evergreen Chinkapin, that are recorded as growing in the U.W. Medicinal Garden would certainly be coveted by the keenest Northwest "plantsperson" even today. The list describes the condition of the plants in May, 1949. Seven species of *Eucalyptus* are listed in "Behavior of Plants from Foreign Countries" (Metzger 1949, Table 2):

Table 2. Eucalyptus trees included in Metzger's plant damage report.

This table has been adapted to include only Eucalyptus species listed in the plant damage report include in "Behavior of Plants from Foreign Countries" (Metzger 1949).

Species	Common Name	Damage
E. amygdalina	Peppermint Eucalyptus	Leaves and twigs killed
E. macarthurii	MacArthur Eucalyptus	Leaves killed
E. rostrata	Red Gum Eucalyptus	Leaves killed
E. viminalis	Manna Gum	O.K.
E. globulus	Tasmanian Blue Gum	Leaves and young twigs killed
E. pulverulenta	Dollarleaf Eucalyptus	O.K.
E. gigantea	Delegate Eucalyptus	O.K.

In the winter of 1950, the Washington Arboretum Director, Brian Mulligan, compiled a detailed account of winter damage to plants in the arboretum. Mulligan wrote that the month of January and into early February would log as one of the coldest and snowiest ever recorded in Seattle and ten single digit readings were recorded in the arboretum from January 14th to February 4th. The winter lows of January 1950 still stand as the worst winter recorded in Seattle, with eight days from the January and February of 1950 occupying spaces on a listing of the *Top 10 Coldest Days in Seattle* (1948-2013) as recorded from the Sea-Tac weather station (Seattle Weather Blog). In the "Arboretum Effects of Winter on Trees and Shrubs", Mulligan states that all *Eucalyptus* were either killed or cut to the ground, though young plants of *E. coccifera, E. gunnii, E. parvifolia* and *E. perriniana* survived in the cover of the nursery and grew vigorously through the summer (Mulligan 1950). An article written in 1953, *Report on Gray-leaved Plants*, recommends "that astonishing eucalyptus, *Eucalyptus pulverulenta*, the silver-dollar tree… that fairly stops the passer-by and commands attention" (Frye 1953). It is clear that by the 1950s northwest

gardeners were finding success with certain hardy species of eucalypt and that some are recognizable within the horticultural community of the Seattle area.

The fall 1954 issue of the *Arboretum Bulletin* marks the most substantial compilation of details regarding *Eucalyptus* cultivation in the Puget Sound region. Its writing and presentation come at a time of infrastructure growth in the region, with the Washington State Toll Bridge Authority's formal selection of Evergreen Point and Madison Street for a proposed second Lake Washington bridge. *Eucalyptus for the Washington, Oregon, Vancouver Seaboard Region* was written for the Arboretum Bulletin by D. Martin, the Officer-In-Charge of the Tasmanian Regional Laboratory CSIRO, at the request of arboretum director, Brian Mulligan. Martin had recently made a survey of *Eucalyptus* cultivation in the British Isles and the information that is relayed in his article is largely based upon his recent travels, correspondence with local eucalypt enthusiasts in the Puget Sound region and on his ecological studies in Tasmania (Martin 1954). The focus of the article pertains to the successful cultivation of eucalypts in cool temperate climates. Martin begins by addressing the temperature as the first criteria that must be met, but then lists three other conditions that will play a role in the success or failure of a planting. According the Martin, the first condition that must be met is that "drainage must be perfect." He also states that eucalypts hybridize freely and this habit can often lead to "disappointing hardiness." The third point discusses the growth rate and habit of *Eucalyptus* in cultivation outside of Australia. Martin says, "Species I have known all my life here have presented a quite unfamiliar appearance when encountered abroad" (Martin 1954). Martin attributes the vigor of eucalypts cultivated outside of Australia to the more fertile soils of the northern hemisphere and the removal of eucalypts from their faunal associations, which "makes them top heavy and alters their typical shape." Martin encourages readers to plant eucalypts in poor rocky soil and to prune back the excessive growth of the trees. The vigorous

growth rate of *Eucalyptus* trees is always a point of discussion for authors describing eucalypts in cultivation. In *New Trees* the authors write:

> The point is that in 'a few years' most Eucalyptus will make a substantial tree of great beauty. Its loss would be regretted, but not nearly so much as if, like an oak, it had taken decades to reach that stature. The growth rate of some species, even in apparently less than ideal situations, can be staggering" (Grisham & Bayton 2009).

In his description of the *Eucalyptus* suitable and "most useful" for cultivation in the Pacific Northwest, Martin divides the species into three groups:

(a) Those which have survived 0° F. sometimes and seem little affected by 5° F.

(b) A similar 5° F., 10° F. group.

(c) A similar 10° F., 15° F. group.

These groupings could also be classified using the 2012 USDA Plant Hardiness Zones as 7a, 7b and 8a (https://planthardiness.ars.usda.gov/PHZMWeb/).

Group **(a) – USDA Zone 7A –** ***Eucalyptus gunnii***

Eucalyptus gunnii, the Cider Gum, is the only species described by Martin. At the time of writing in 1954, the oldest tree outside of Australia was a Cider Gum that had been planted at Whittingehame Castle in East Lothian, Scotland in 1853. It is also clarified by Martin that the species *E. whittinghamensis* is the same as *E. gunnii*. The author says that the Cider Gum's virtues are its attractive juvenile foliage, but the adult leaves have a somber appearance.

Group **(b) – USDA Zone 7B –** ***Eucalyptus coccifera, E. niphophila, E. subcrenulata (=E. johnstonii, E. muelleri), E. vernicosa, E. parvifolia, E. urnigera*** **and** ***E. aggregata***

Martin describes the species listed and also notes that species that have been described as *E. johnstonii* and *E. muelleri* are synonyms for *E. subcrenulata*.

Group **(c) – USDA Zone 8A –** ***Eucalyptus perriniana, E. cordata, E. dalrympleana, E. gigantea (syn. delegatensis), E. pauciflora***

Figure 11: *E. perriniana* in the arboretum nursery (Arboretum Bulletin Vol. 17: no. 3, 1954)

Eucalyptus perriniana is perhaps the most well-known eucalypt in this group and Martin describes the use of its connate juvenile foliage for floral arrangements made at the Government House in Hobart, Tasmania (Figure 11). In describing *E. pauciflora,* Martin says, "There is one with very pendulous branches like a weeping willow, but it has proved to be very tender." This weeping form of the Snow Gum is now recognized as a distinct species, *E. lacrimans,* and it is currently regarded as one of the most cold-tolerant eucalypts for cultivation in the Pacific Northwest (Haskins 2013, Miller 2016). Martin notes that the often shrub-like *E. pulverulenta* and *E. cinerea* could be included in this group, but their inclusion did not seem warranted when considering their similarities to heart-leaved *E. cordata*.

Figure 12: *E. lacrimans* weeping figure in a Seattle garden

The writing and inclusion of *Eucalyptus for the Washington, Oregon, Vancouver Seaboard Region* marks the end of the first important period of *Eucalyptus* cultivation history in Seattle and the Pacific Northwest. Martin's important article would be reprinted in future issues of *The Arboretum Bulletin*, even into 1960. The experiences of growers, gardeners and ecologists in the United Kingdom and Australia are understood as the authority in this time period because of the limited experience with eucalypts in the cool temperate regions of the United States. A 1963 issue of *The Arboretum Bulletin* describes the arboretum's work with Eucalyptus *cultivation* as having "provided a challenge for more than twenty years" (Mulligan et. al 1963). The writing and distribution of *The Arboretum Bulletin* at this time period is important for early eucalypt enthusiasts and gardeners because it enabled them to make thoughtful and informed decisions about the cultivation of *Eucalyptus* regionally. The next important period of cultivation history is marked by a shift in which Seattle eucalypt enthusiasts and gardeners transitioned from learning from external authorities to learning from local authorities, fellow gardeners, and regional nursery people.

Trial by Frost (1970s -1985)

"It is clear, however, that excessive dependence on English work and that of other arboreta in plant exploration, screening, and improvement is no longer appropriate. Responsibility for the development of new materials for western Washington should pass to the hands of local gardeners." – The Frost Hardiness Research Project, 1975

The winter 1974 issue of *The University of Washington Arboretum Bulletin* includes two articles that usher in a period of time that would certainly see the continued interest in the cultivation of hardy eucalypts "pass to the hands of local gardeners." *A Report on the Hardiness of Eucalyptus in the Pacific Northwest* chronicles the *Eucalyptus* cultivation trials of Wallace "Mack" Ruff, a University of Oregon professor, plantsman and landscape architect (Renfro 1974). Mack made seed and plant collections while traveling internationally in the early sixties. Papua New Guinea would become a major focus of his

life's work, but his travels also extended to other regions, including Australia, where he would make alpine seed collections of eucalypts, a collection process guided by his feelings that ideal seed collections should be "collected from the coldest, most severe, climate the tree can tolerate" (Renfro 1974, PCAD 2020). His trials in Eugene during a period of close to ten years beginning in 1962 resulted in a ranking of the hardiest eucalypts that were trialed (Renfro 1974).

In order of hardiness, with notes from "Mack" (Temperature recorded to 1 F in Eugene,OR):

E. niphophilla – slight leaf burn

E gunnii – slight leaf burn

E. perriniana – slight leaf burn

*E. neglecta** – slight leaf burn (Figure 13)

E. parvifolia – slight leaf burn

E. vernicosa – varies in hardiness

E. subcrenulata – varies in hardiness, most regenerated

E. urnigera – froze to the ground, regenerated

E. nova-anglica – froze to the ground, regenerated

E. pulverulenta – froze to the ground, regenerated

E. ovata – froze to the ground, regenerated

E. coccifera – froze the ground, no regeneration

E. pauciflora – froze to the ground, no regeneration

E. gigantea – froze to the ground, no regeneration

E. dalrympleana – froze to the ground, no regeneration

E. rubida – froze to the ground, no regeneration

E. alpina – froze to the ground, no regeneration

E. bicostata – froze to the ground, no regeneration

Figure 13: *E. neglecta*, upper canopy at the Pt. Defiance Park Rose Garden in Tacoma, WA

*A Google Street View search of Wallace "Mack" Ruff's former home address in Eugene, OR shows a tropically tinged urban garden with bamboo groves, a Windmill Palm, and a *Eucalyptus neglecta* (Figure 14).

Figure 14: The rise and fall of a *Eucalyptus neglecta* visible on Google Street View image captures from 2008 to 2019 at Wallace Ruff's former home garden located at 1873 Garden Avenue, Eugene, OR (Google 2020).

From this list, a common trend of trees freezing to the ground quickly becomes apparent. The author, Don Renfro, who was an associate of Wallace Ruff, notes that Mack stressed the importance of a lignotuber, citing a lignotuber as the key to survival for eucalypts in the Pacific Northwest and that he responded to the freezing of a 40-foot tree with "good nature" (Renfro 1974). Mack's detailed cultivation notes include yearly winter temperature records and growth rates following freezes up into 1972 as well as his lessons learned from nearly a decade of *Eucalyptus* cultivation in Eugene, OR:

1. If a known freeze is coming, turn the sprinkling systems on, watering the trees and plants. The ice insulates the plants, protecting it from chilling winds.
2. Never crowd the roots of the eucalypt or allow it to become rootbound. The root system will not develop. Winds will blow the tree over.
3. Never stake a eucalypt, however great its seeming need. A staked tree will not develop sufficient strength to stand by itself.
4. Always plant the smallest tree possible, especially if it is a young, vigorous seedling. A young tree will "catch up" to an older tree, and will be stronger over the years.
5. Mulch the tree as thickly as possible. Older trees can have as much as two feet of mulch around them. This insulates and protects the lignotuber.
6. *Eucalyptus* seed does not store food. A newly germinated seed must find food and moisture immediately or it will die.

7. Eucalypts are not competitive as seedlings, and weeds can easily choke them out. Clear and mulch a three-foot circle around the tree for the first year.
8. Summer heat can actually be more harmful to some species than winter frosts. Mulching will keep the soil from drying out. (Renfro 1974)

Eucalyptus in the University of Washington Arboretum, reports on the health and status of eucalypts in the arboretum with notes and records having been made in September of 1973. Eucalypts are grouped into three categories based on their health condition and notes regarding seed sourcing are included (Mulligan 1974):

"Alive and in fair to good condition"

1. *E. coccifera*.
    a. From Australian seeds, source unknown, 1968; plants 3.5 ft. tall.
    b. From seeds collected at Breona, Tasmania, 1970; plant 3 ft. tall. Earlier plantings grew to 20 ft. or more before being killed by cold.
2. *E. gunnii*
    a. From seeds collected on Mt. Arrowsmith, Tasmania, 1956. Reached 15-16 ft. by December 1970. Killed to ground in 1964; now 10-20 feet tall.
    b. Seeds from Botanic Garden, Canberra, Australia, 1957. One plant remains out of three; now 6 ft. tall. One other elsewhere sprouting at base.
3. *E. niphophila*
    a. From seeds from Botanic Garden, Adelaide, South Australia, 1958. Tallest tree now 39 ft.; d.b.h. 10 inches.
    b. Plants received from U.S.D.A., 1956. One plant 25 ft. tall, one 9 ft. Three others killed to ground, sprouting from stumps.
4. *E. parvifolia*
    a. Seed from England, 1948. One weak tree remains in nursery. Killed to ground 1968-1969. Now 10 ft. tall. Was 15 ft. tall. December 1970.
5. *E. pauciflora*
    a. Raised from seeds from Tasmania, 1963. Killed to ground, 1968-69. Now about 40 inches tall.
    b. Plants received, raised from Australian seeds; planted May 1969. Grew to ten feet, then died to base, August 1973.
6. *E. perriniana*
    a. From seeds from Randwick, Australia, 1966; planted 1968. One plant now 7.5 ft tall, budded.
    b. Seedlings received from Cornell University, raised from Australian seeds, 1968. One plant grew to 22 ft., but was killed by cold weather of 1971-72 and 1972-73. Two smaller plants remain, planted June 1969, now 7-9 ft.

7. *E. urnigera*
    a. Seedlings collected in mountains of Tasmania, 1969. 3 planted May 1970. One remains, now 15 ft. tall.
    b. Other plantings of 1958 and 1968 from Australian seeds have all been killed by cold weather.

"Severely damaged by cold weather, but alive at the base."

1. *E. moorei*
    a. Seed from Canberra, Australia, 1965. Planted May 1966.
    b. One plant only, was 9 ft. tall; killed to ground 1968-69 and subsequently.
2. *E. nicholii*
    a. Seedlings from Cornell University raised from Australian Seed, 1968.
    b. Killed to ground 1971-72; again 1972-73, One plant crown sprouting.
3. *E. nova-anglica*
    a. Seed from Victoria, Australia, 1971. Killed to ground, 1972-73.
4. *E. ovata*
    a. Raised from seeds from Tasmania, 1963; planted May 1964. Killed to ground several times. Two plants still alive.

"**Species killed during recent winters"**

1. *E. amygdalina*
    a. Seeds from Tasmania. Planted 1965.
2. *E. cinerea*
    a. Seeds from N.S.W., Australia. Planted 1970
3. *E. glaucescens*
    a. Seedlings received from Cornell University; raised from Australian seeds. Planted May 1969; grew 12-14 ft. tall by December 1970. Damaged by 1971-72 winter; killed in following winter.
4. *E. johnstonii*
    a. Seeds from Canberra, Australia. Planted 1965.
5. *E. pulverulenta*
    a. Seeds from Canberra, Australia. Planted 1970.
6. *E. viminalis*
    a. Seedlings from the mountains of Tasmania. Planted 1970.

In reading this list, it soon becomes clear that the arboretum's experience with *Eucalyptus* cultivation up to this point in time would seem to be just as the *Arboretum Bulletin* had described in 1963, as having "…provided a challenge for more than twenty years" (Mulligan et. al 1963). Fast forward into 2020 and a looming 80-foot *Eucalyptus gunnii* stands prominently in Washington Park Arboretum, and—having

endured freezing winters and less than ideal soil conditions—, it now strikes an imposing silhouette in the future footprint of the "Australian Forest" (Larson 2019).

Figure 15: *Eucalyptus niphophila* (UW Arboretum Bulletin, Vol. 37:no. 4, 1974)

The fall 1974 issue of the University of Washington *Arboretum Bulletin* features a photo of a branch of *Eucalyptus niphophila* (Figure 15). The cover story details the results of a landscape tree evaluation program started at Oregon State University's North Willamette Experiment Station in 1965. OSU's landscape evaluation trials are well-known by Pacific Northwest horticulturists today, especially their trials of *Arctostaphylos* and *Hebe*. Dr. R.L. Ticknor, a professor of horticulture and the director of the North Willamette Experiment Station, shares landscape performance evaluation records for "thirty-six of the most interesting trees" out of more than three hundred trees that had been evaluated for their performance. Three *Eucalyptus* species are included in the list of trees shared from the OSU evaluation trials. *Eucalyptus perriniana* (called the Spinning Leaf Snow Gum) and *E. niphophila* (called the Snowland Eucalyptus) are placed in the 20-30 feet group of trees and *E. gunnii* is placed in the 75-100 feet group. An adaption (selecting only *Eucalyptus*) of Dr. Ticknor's Table II from "Landscape Tree Evaluation in Oregon" is below (Table 3):

Table 3. **Landscape Performance of Selected Trees in Several Height Categories at North Willamette Experiment Station, Aurora, Oregon**

This table has been adapted to show only details regarding Eucalyptus species that were evaluated during the course of Oregon State University's evaluation of landscape trees for Oregon. All measurements are recorded in feet and were taken over the course of five growing seasons.

Botanical and Common Name	Ultimate **Height**	**Height** at Planting	**Height** After 5 years	Width at Planting	Width after 5 years	Defoliation	Remarks
Eucalyptus niphophila **Snowland Eucalyptus**	20	1.1	15.3	0.9	13.5	Evergreen	Evergreen. Gray foliage. Hardiest Eucalypt in trial. Killed to ground by extended 5°F.
Eucalyptus perriniana **Spinning Leaf Snow Gum**	27	3.6	23.6	1.9	16.4	Evergreen	Only minor foliage burn at 8°F. Grey, green evergreen leaves. Killed to the ground by extended 5°F.
Eucalyptus gunnii **Cider Gum**	90	1.8	27.0	1.6	17.0	Evergreen	Blue-green leaves. Top injury 8°F. Killed to ground at 5°F.

Figure 16: *E. perriniana* blooming in the Mulligan's home garden, Photo by Brian Mulligan (UW Arboretum Bulletin, 1978)

The fall 1978 issue of the *Arboretum Bulletin* features an article by the arboretum's former director, Brian Mulligan. In 1972 Mulligan retired from his position as arboretum director, but he remained involved with the arboretum as the director emeritus and a volunteer throughout his life. An enthusiastic and respected plantsman, Mulligan discovered and introduced *Gaultheria x wisleyensis* 'Wisley Pearl' and identified a new species of rose that would later be named *Rosa mulliganii* in his honor (Felt, Miller Library). *Growth of a Collector's Garden*, penned in 1978, gives an account of the development of Margaret and Brian Mulligan's Seattle-area garden. The garden included a large number of native plants and unique ornamental collections. Mulligan writes about a *Eucalyptus perriniana*, planted along the south side of the house, that had been frozen to the ground twice, but at the time of writing stood ten feet above the roof of the

house and had flowered annually (Mulligan 1978, Figure 16). In the arboretum's annual report in this same fall issue of the *Arboretum Bulletin*, Joseph Witt, the Curator of Plant Collections, writes about the arboretums continued involvement with The Frost Hardiness Program. This program tested several *Eucalyptus* species for cold tolerance in the laboratory of Dr. Hubertus Kohn, a plant physiologist at Western Washington State College's Department of Biology. In "A Strategy for Introducing New Plant Materials to the Arboretum", Dr. Hatheway, a Professor of Forest Resources at the University of Washington, references Dr. Stan Gessel's attempts to introduce half-hardy species to the University of Washington Campus, Gessel's successes with cultivated eucalypts on the UW campus, and the frost tolerance tests undertaken in Dr. Kohn's laboratory (Hatheway 1978).

In the fall of 1975, the announcement of the arboretum's involvement in the *Frost Hardiness Research Program* was detailed in the *Arboretum Bulletin.* The goal of the program can be summed up in this passage from the abstract of the article:

> What is needed is a method of screening plants for their frost or cold tolerance. Such a screening procedure could not only warn us of what species might never be expected to survive in the northwest but could select hardier individuals from species long thought to be borderline and even test the ability of potential new ornamentals to cope with our climate. This would avoid the trauma and expense of growing plants for several years only to find that nature does the selecting for us. (Hatheway et. al 1975)

At the center of this project, the researchers hoped to reduce local gardeners dependency upon the work of gardens and horticulturists in the United Kingdom and other areas outside of the Pacific Northwest. This project is central in the shift from authority being found in non-local experiences and experiments. The responsibility "for the development of new materials for western Washington should pass to the hands of local gardeners" (Hatheway et. al 1975). The way that the researchers proposed that this responsibility be passed into the hands of local gardeners was fourfold:

A more ambitious arboretum introduction program should include:

1 . acquisition of collections which encompass a broad range of variability in key species instead of only one or two ecotypes, as is often the case at present;

2. observation, selection, and breeding to obtain new materials especially well adapted to our region;

3. application of modern techniques for rapid, efficient determination of hardiness and other aspects of adaptation;

4. basic studies on the physiology of hardiness, especially in broad-leafed evergreen ornamental shrubs and trees. (Hatheway et. al 1975)

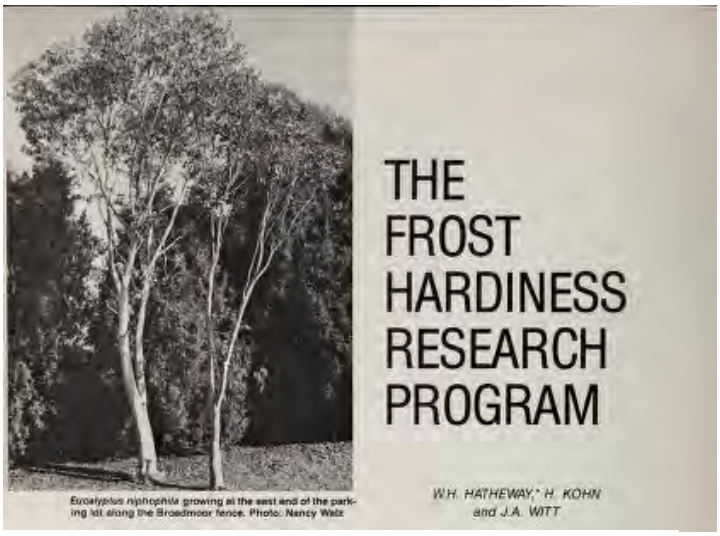


Figure 17: The Frost Hardiness Research Program with *E. niphophila* pictured (Arboretum Bulletin, 1977)

The authors note that this, plant introductions and evaluation, had been the work of the arboretum for many years (1936-1974), but that the nature of this work had been largely observational and limited in its scope due to budget limitations. This project was not limited to the genus *Eucalyptus*, it also included other taxa well represented in Pacific Northwest Gardens such as *Rhododendron*, *Pieris, Gaultheria, Hydrangea* and *Buddleja.* In 1977, *The Frost Hardiness Research* group presented a follow-up paper to their 1975 research proprosal, describing the results of their work up to that point (Figure 17). *Eucalyptus niphophila* was chosen as one of the test plants during the first year of research. The authors state that the object of much frost hardiness work is simply to determine the minimum temperature a plant can withstand once it has been suitably hardened, but more thorough studies show how frost tolerance varies throughout the year (Hatheway et. al 1975). All of the plants that were investigated by the research group found that a period of fall “hardening off” led to a frost tolerance maximum between

January and February with a subsequent decline in early to late spring. *Eucalyptus niphophila* specifically displayed a moderate frost tolerance of between 10°F and 6°F (Figure 18).

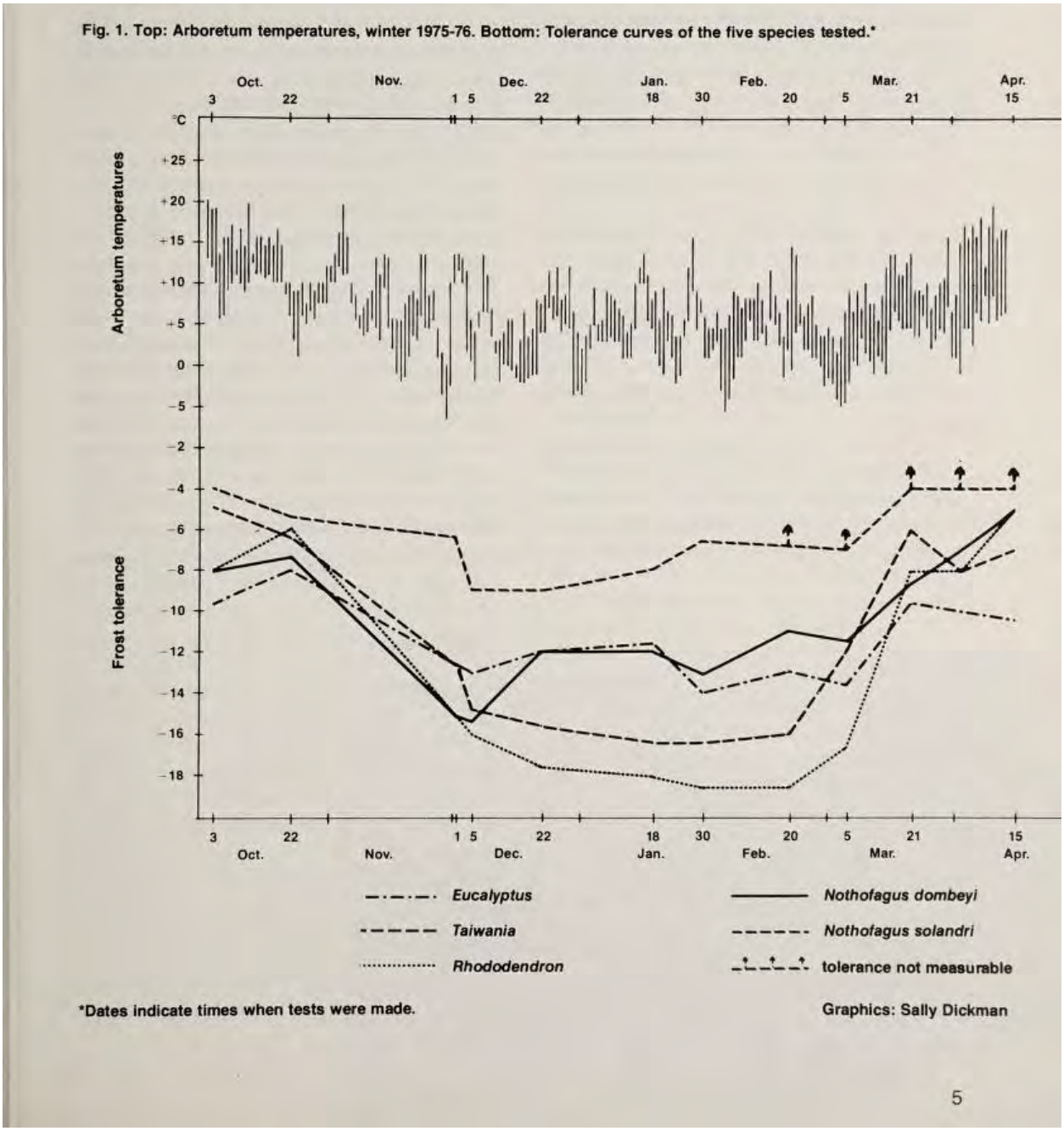


Figure 18: Figures from the Frost Hardiness Research Program (Hatheway et. al 1977)

From their initial research, the group speculated that *Eucalyptus* seemed to belong to a group of plants that have the capacity to slow the de-hardening process or even to re-harden in response to cold spells

interrupting the warming process of spring. In 1978, Dr. Hatheway detailed his personal interest with plant introductions into Seattle gardens and his work with the *Frost Hardiness Research* group by saying that "the wide range of environmental conditions inhabited by individual plant species and the exploitation of this variability should be seen as the central theme around which a modern program of plant introduction is developed" (Hatheway 1978).

Attempts to Grow Eucalyptus

"…I believe that there are species of Eucalyptus, and certainly strains, locally already growing within species, which have the adaptability to enrich the gardens of the Pacific Northwest." – Dr. Stan Gessel, 1985

The work of Professor Stanley Gessel, a colleague of Dr. Hatheway's in the College of Forest Resources at the University of Washington, has proved to be significant to the continued development of *Eucalyptus* cultivation in the Pacific Northwest. Dr. Gessel had been a professor at the University of Washington since 1948 and his 1985 article *Attempts to Grow Eucalyptus in the Pacific Northwest,* in which he details his "dappling" with *Eucalyptus* cultivation, is central to this period of *Eucalyptus* cultivation history in Seattle and the greater Pacific Northwest. Gessel begins by saying that growing eucalypts in the Seattle area is not a new idea and that by this point in time attempts to grow eucalypts had been well documented within the region. Gessel became interested in the genus in 1970 and he began "extensive travels" in the early 70s up until the time of writing in 1985. He worked with the CSIRO Seed Laboratory in order to arrange for specific seed sources to be sent to him and he also made personal seed collections from "what appeared to be very cold hardy selections" and arranged for them to be sent to him in Seattle (Gessel 1985). The species that Gessel tested in Seattle, many of them

planted around the College of Forest Resources building and on the surrounding University of Washington campus, are listed in the figure (19) below:

Species I Have Tested

The following lists consist of the different species, separated by years in which the seed was received and tested:

1976 source: CSIRO
Eucalyptus dives
E. johnstonii
E. coccifera
E. nitida

1979 source: CSIRO
Eucalyptus dalrympleana
E. viminalis
E. delegatensis
E. johnstonii
E. coccifera
E. pauciflora ssp. *niphophila*
E. stellulata

1981 source: CSIRO
Eucalyptus gunnii
E. glaucescens
E. delegatensis
E. nitens
E. coccifera
E. urnigera
E. viminalis
E. dalrympleana
E. pauciflora subs. *pauciflora*
E. campbora
E. stellulata
E. cinerea
Personal Collection:
Eucalyptus pauciflora (high altitude)
Eucalyptus macarthuri

1983 source: CSIRO
(These are under test by Crown Zellerbach.)
Eucalyptus viminalis
E. nitens
E. gunnii
E. bicostata
E. urnigera
E. dalrympleana
E. delegatensis
E. glaucescens
E. stellulata
E. fraxinoides
E. fastigata
Personal Collection:
E. pauciflora (good form)
E. coccifera
E. nitens
E. ovata
E. stellulata
E. nova-anglica

1984-85 source: CSIRO
(Germinated in spring of 1985, now in seedling stage.)
Eucalyptus urnigera
E. pulverulenta
E. cinerea
E. alpina
E. delegatensis
Personal Collection:
E. urnigera
E. cinerea
E. alpina
E. pulverulenta
E. obliqua
E. neglecta

Figure 19: *Eucalyptus* species tested with source information (Gessel, 1985)

Gessel germinated seed collections in the University of Washington Botany greenhouse and outplanted seedlings at his Seattle home or in campus areas adjacent to the Forestry buildings. He also gave extra seedlings to interested individuals, including fellow professors and colleagues in the forestry industry. Gessel described his experience with eucalypt planting as "erratic" and contributes the success or failure to:

1) *"My own time. I was frequently away after outplanting and therefore could never follow development of the plants systematically. As a result, many died from lack of early care or identification was lost.*

2) *Areas to plant. My most successful plantings have been in my own yard as might be expected, but space is a severe limitation. Many of the trees planted around the Forestry buildings have been lost because of lack of water or grass-mowing activities.*
3) *Accurate reports on success or reasons for failure. In many cases, because of my absence from Seattle, I was unable to determine the cause of the loss."* (Gessel 1985)

Like the many writers before him, Gessel cites cold hardiness as the first of three major problems with introducing *Eucalyptus* into the Seattle area. In his travels through Australia, he made made collections of species that experience varying degrees of below freezing temperatures. The second major problem that Gessel makes note of is the relationship of the root and top. The healthy foliage of *Eucalyptus* trees in cultivation outside of Australia is often noted by acquainted observers and Gessel says, "Most Australians who have viewed some of the vigorous trees on the campus comment that they look quite different than the same species in their native habitat because of the full foliage totally untouched by insects" (Gessel 1985). As Gessel laments, the shallow rooting of many eucalypts planted around the Forestry building indicates that the soil conditions were far from the "perfect drainage" prescribed by Dr. D. Martin in 1954 (Figure 20). The third major problem in limiting the success of Gessels plantings was human interference, stating that seedlings and identification tags were often removed. He also cited the negative affects of weed and grass competition upon *Eucalyptus* seedlings. (As a gardener at the University of Washington-Bothell, I can personally relate to these external selection pressures enacted by both humans and rabbits upon recently planted *Eucalyptus* seedlings.) Dr. Gessel's testing of various eucalypts began in the early 1970's and he cites some of his earliest plantings as having been very successful, in that they grew to be tall trees, including a *Eucalyptus delegatensis* that reached upwards of seventy feet (Gessel 1985). During the more than one decade that


Eucalyptus *at Forestry buildings in 1978.*
photo: B.O. Mulligan

Figure 20: *Eucalyptus* plantings around UW's School of Forestry buildings, 1970s (Arboretum Bulletin, 1985)

Gessel experimented with eucalypts on the University of Washington campus and his Seattle garden, severe winter freezes occurred in 1974-'75, Christmas 1983 and the winter of 1984-'85. On December 23, 1983, Seattle temperatures reached a single-digit low of 9°F (Sistek 2013). It was the winter of 1983 that killed many of the Eucalyptus planted at Gessel's home garden and on the University of Washington campus. In a 1983-'84 trip to Australia, Gessel focused on collecting eucalypts from high elevation and cold-pocket areas. He was also able to select specific species with known provenance from the CSIRO seed laboratory. Gessel regarded *Eucalyptus delegatensis, E. viminalis, E. gunnii, E. pauciflora and E. johnstonii* as being the hardiest of the eucalypts that he had trialed. The hardiest of these aforementioned species came from seed that Gessel himself had collected in his travels through Australia:

> "The most cold hardy eucalypts I have found in the Seattle environment developed from the seed of Eucalyptus pauciflora that I collected myself on the upper slopes of Mt. Kosciusko in New South Wales. These were in an area of snow cover for a good part of the year and with freezing temperatures likely to occur anytime. Seedlings started from this collection and outplanted in early 1983 survived the cold periods of 1983 and 1984 essentially undamaged; the specimens at my home are now about five feet tall and growing well. They tend to be more shrublike, instead of having a single stem axis, but they are of good ornamental form." (Gessel 1985)

Those same *Eucalyptus pauciflora*, originally standing at a mere five feet, can now be found standing tall and still growing in front of Stan Gessel's former North Seattle home (Figure 21). They have continued to endure Seattle's winters and have been the parent seed source for many enduring Seattle Snow Gums. Early in the process of working on this project, I met with Michael Lee, of the former Colvos Creek Nursery, to discuss eucalypts in Seattle. He inquired if I had yet seen the Snow Gums planted by Stan Gessel and shared with me that he had made seed collections from these trees for Colvos Creek Nursery (Lee 2019, pers. communication, Wingate 2003). Dr. Stan Gessel's efforts to grow *Eucalyptus* in Seattle, with all his successes and failures, has contributed a great deal to the state of *Eucalytpus* cultivation as it exists today in Seattle and the Pacific Northwest (Gessel 1985). His *Attempts to Grow Eucalyptus* marks

the transition to a new period of *Eucalyptus* cultivation history in the Pacific Northwest: a period marked by continued development and experimentation, in the hands of local gardeners and their gardens, and a period of time that realizes the hopeful proposition that had been expressed by Dr. Hatheway in 1975.

Figure 21: Snow Gum, Planted in front of Stan Gessel's former Seattle neighborhood home near Latona Ave NE and NE 85th St.

Figure 22: A Jounama Snow Gum with spring flowers in a Seattle garden *(Eucalyptus pauciflora ssp. debezuevillei).*

For Northwest Gardens

The fall 1984 issue of the Arboretum Bulletin included an article written by Michael Lee entitled, "The Appropriate Eucalyptus Hardy Species for Northwest Gardens." The introduction by the editor, Nancy Pascoe, states that, "His enthusiasm and opitimism may eventually result in the introduction into the Seattle area of a larger number of eucalypts than are presently being grown" (Lee 1984). Lee, a landscape architect, was an owner and founder of the Vashon Island based Colvos Creek Nursery. The mission of Colvos Creek can best be described with this text from their 1983 nursery catalog:

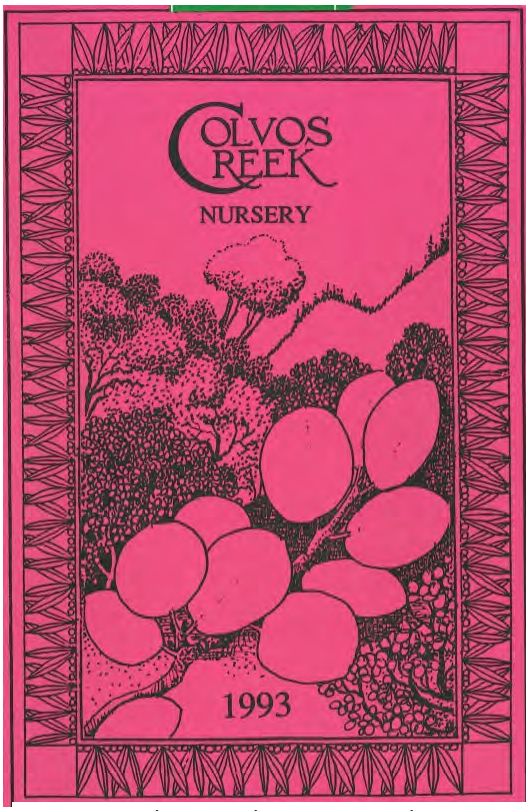
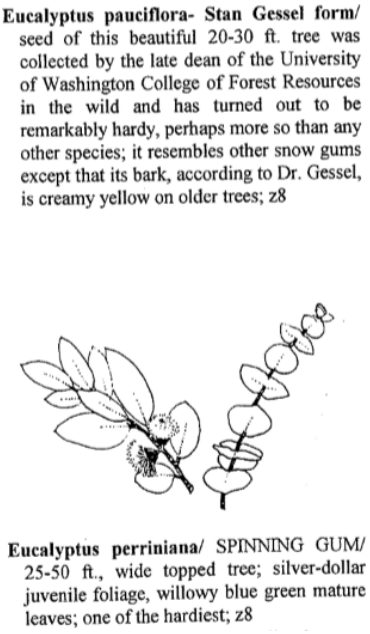


Figure 23: Colvos Creek Nursery catalog, (Drawings by Michael C. Lee, 1993)

"We have never been satisfied with the same predictable plants in every landscape, nor have we been happy with the persistent lack of such essentials as broadleaf evergreen trees and nursery-grown natives. Ours is one of the best horticultural climates in the world, and we want to exploit it thoroughly, providing a source for the many uncommon trees, shrubs and perennials that could contribute so much to Northwest plantings."(Bender 1984).

Lee's enthusiasm for the genus *Eucalyptus* is clear in Colvos Creek Nursery catalogs and his *Arboretum Bulletin* contributions and it could, at one time, be seen from the thriving plantings of *Eucalyptus archeri*, *E. pauciflora*, and *E. perriniana*, among many other native and exotic broad-leaf evergreens, in the gardens of Colvos Creek (Bender 1984, Figure 22, 23). In "The Appropriate Eucalyptus Hardy Species for Northwest Gardens," Michael Lee shares his experiences as both a gardener and grower to help inform the inquiring gardening community of the Pacific Northwest. This is a trend that would continue and much of what can be considered a regional resource for the Northwest's gardening public today comes from the trials and experiences of Pacific Northwest nursery men and women. In this

article, Lee seeks to shed a positive light on a group of plants dismissed as “not hardy here” (Lee 1984). He suggests that a selection process utilizing locally collected seed could yield a number of eucalypts thoroughly hardy in the region and that these hardy selections could make a number of ornamental contributions to the landscapes of the Northwest. Lee provides a list of suitably hardy species for northwest landscapes. It is a list that includes the usual contenders, but the mentions of *Eucalyptus neglecta, E. mitchelliana, E. dalrympleana, E. nitens* and *E. stellulata* are of note. The 1993 Colvos Creek mail order catalog listed twenty-one species of *Eucalyptus* for sale, including the strikingly blue *Eucalyptus gunnii var. divaricata* and *E. niphophipla* ‘pendula’, now recognized as *E. lacrimans*. Ten years later, Colvos Creek listed forty-one different species of *Eucalyptus*. Many of these (*E. kitsoniana*, *E. caleyi*, *E. leucoxylon*, among others) were untested in Northwest gardens, but others, such as *Eucalyptus pauciflora* ‘Stan Gessel form’, were selections from locally hardy strains (Figure 24). Steamboat Island Nursery, Cistus Nursery, The Desert Northwest, Xera Plants and ForestFarm are other regional nurseries whose contributions have been instrumental in the initial and continued dispersal of eucalypts into Northwest gardens.


Eucalyptus pauciflora- Stan Gessel form/ seed of this beautiful 20-30 ft. tree was collected by the late dean of the University of Washington College of Forest Resources in the wild and has turned out to be remarkably hardy, perhaps more so than any other species; it resembles other snow gums except that its bark, according to Dr. Gessel, is creamy yellow on older trees; z8

Eucalyptus perriniana/ SPINNING GUM/ 25-50 ft., wide topped tree; silver-dollar juvenile foliage, willowy blue green mature leaves; one of the hardiest; z8

Figure 24: Excerpt from Colvos Creek Nursery catalog (Colvos Creek, Michael C. Lee, 2003)

Steamboat Island Nursery, run by Laine McLaughlin and Duane Heier, was a south sound nursery “specializing in native and uncommon plants” that carried a selection of hardy eucalypts. A Seattle Times profile of the nursery, entitled “All Things Unusual”, begins, “The clean pungent scent of eucalyptus tickles your nose as you step out of your car at Steamboat Island Nursery. Rustling eucalyptus trees wreath the parking lot, lending a feel of Australian outback to a gravel parking lot a few miles south of Olympia” (Easton 2007). In response to the question, “How many Eucalyptus are truly hardy here?”

Laine McLaughlin stated that twenty-five species were reliably hardy with *E. glaucescens* being regarded as the most cold hardy.

Cistus Nursery in Portland, Oregon is owned and operated by Sean Hogan. His book *Trees for All Seasons: Broadleaved Evergreens for Temperate Climates* is certainly the most comprehensive regional resource for hardy eucalypts, as well as many other broad-leaved evergreens, for the Pacific Northwest gardener. A visit to Cistus Nursery on Sauvie Island is a worthy trek for anyone interested in broadleaf evergreen trees in Northwest gardens (Figure 26). A Portland Parks and Recreation publication from 2016, *Irivington Broadleaf Evergreen Tree Walk*, highlights the diversity of broadleaf evergreen trees in the Irvington neighborhood's right-of-way. Central to the tour is a pair of Silver-leaf Oaks (*Quercus hypoleucoides*) outside of Hogan's former Portland home.

Figure 25: Omeo Gums (*E. neglecta*) growing in air pruning pots and trained for form in one of Cistus Nursery's row houses

*"*Irvington has some of the biggest, most beautiful, and ecologically significant broadleaf evergreen trees in Portland. Nurseryman Sean Hogan, who lives in Irvington, has long championed the use of evergreen trees in Portland, believing them eminently suited to our mild Pacific maritime climate. Since the 1990s he has been introducing to his neighbors' yards and planting strips many species of broadleaf evergreens completely new to Oregon. As a result, Irvington has become a showcase for promising tree species seldom seen in the United States." (Gersbach & Key 2016)

Of the twenty-three trees included in the tour, three species of *Eucalyptus* can be found growing in the right-of-way. The City of Portland has shown interest in the potential use of the bold-leaved Omeo Gum (*Eucalyptus neglecta*) as a possible street tree and public park planting (Hogan 2019, pers.

communication). During a visit to Cistus Nursery in 2019, I was able to see the nursery's process (a process commended by the authors of *New Trees*) of growing eucalypts and several other broadleaf evergreen trees up to caliper size for use by Portland Parks & Recreation (Hogan 2019, pers. communication, Figure 25). Cistus Nursery has grown and sold many species of *Eucalyptus* throughout their time in business, but they have in recent years begun to limit their production focus to species that endure Portland's recorded low temperatures in their own native habitats. In this way they are limiting their selection of species to those eucalypts that are reliably hardy in Portland and the greater Pacific Northwest (Hogan 2019, pers. communication). Hogan's experiences with various eucalypts are frequently referenced in *New Trees* and he makes up one part of the panel of *Eucalyptus* enthusiasts, known as the "Gum Group," who have helped to shape the species accounts in *New Trees* (Grimshaw & Bayton 2009). In *Trees For All Seasons*, Hogan writes that there are at least thirty species that can be considered reasonably hardy for Zone 8 climates and the species descriptions of eucalypts within the book encompass those species that Hogan feels "possess the best combination of frost hardiness and reasonable size for most gardens and aesthetics." (Hogan 2008).

Figure 26: E. glaucescens stretches over the entry drive into Cistus Nursery.

Another individual whose experiences are frequently referenced in *New Trees* is Ian Barclay, owner of the Sequim, WA based nursery **The Desert Northwest.** Mike Lee (Colvos Creek) notes that Barclay has

Figure 27: *E. camphora* flower buds in Ian Barclay's garden, Olympia, WA

probably trialed more *Eucalyptus* species than Colvos Creek has ever tried (Lee 2019. pers. communication). The Desert Northwest nursery website and the *Hardy Eucalyptus Page* are both maintained by Barclay, and he also frequently contributes to the Facebook group, *Cold-Hardy Australian Plants*. All of these webpages are excellent resources in regards to *Eucalyptus* cultivation in the Pacific Northwest. Ian worked with Steamboat Island Nursery before starting The Desert Northwest nursery and he states that he maintains "a 1.3 acre research garden in Olympia, which contains the largest collection of Eucalyptus species in the United States outside of California, and many other rare species" (Barclay 2004, *Hardy Eucalyptus Page*). The Desert Northwest grows drought-tolerant plants that are well adapted to summer dry climates and it is a goal of Barclay to have people be aware of where their garden plants are coming from (Easton 2011). The nursery offers unique *Eucalyptus* plants and seeds, many of which are not offered at other regional nurseries (Figure 27). I was able to visit Barclay's trial garden in Olympia and personally witness the remarkable variety of eucalypts growing not far from the former gardens of Steamboat Island Nursery. Barclay shared the results of his trials with various *Eucalyptus* species and hybrids on the *Cold-Hardy Australian Plants* Facebook page, a series of posts that detailed nearly 100 different "hardy eucalypts" (Barclay 2019). In total, Barclay has trialed upwards of 130 different *Eucalyptus* species and hybrids in the Puget Sound region (Barclay 2002).*The Hardy Eucalyptus Page* species index describes "the appearance, needs and uses of every *Eucalyptus* species that might possibly grow in USDA Zone 8 or colder"(Barclay, Hardy Eucalyptus Page). Arthur Lee

Jacobson gives credit to Barclay for help with the *Eucalyptus* section of *Trees of Seattle* and he is also credited with correctly identifitying *Eucalyptus rodwayi* (sold by Colvos Creek Nursery, labeled as the "Mystery Euc", and accessioned as E. rodwayi in 2019) at the Carl S. English Jr. Botanic Gardens (Jacobson 2006; Munroe 2019, pers. communication).

The genus *Eucalyptus* has garnered the enthustiastic attention of many cool-climate gardeners over their many years in cultivation. The contributions of the aformentioned invididuals have been impactful within the context of the gardens of the Pacific Northwest, and there are doubtless many more individuals who have played a role in the continued increase of *Eucalyptus* cultivation knowledge within the horticultural community of the Pacifc Northwest.

Figure 22: The lofty limbs of *Eucalyptus rodwayi* reaching towards the Ballard Locks, Carl S. English Jr. Botanical Garden

Figure 29: A Jounama Snow Gum (*E. pauciflora ssp. debeuzevillei*) in the Good Shepherd Center gardens, Wallingford, Seattle

Methods

In creating a regional guide to the *Eucalyptus* species cultivated in Seattle, I needed to determine those species that have successfully been cultivated in gardens and can be considered "established." Much of the work in determining the species that would be included in the field guide came from the observation of living trees in Portland, Seattle and Vancouver, B.C (Figure 29) . The evidence for successful cultivation was also determined by accounts in regional literature and from personal communications.

My primary starting point in locating *Eucalyptus* specimens within the Seattle area was Arthur Lee Jacobson's *Trees of Seattle.* Many more specimens that I photographed and identified for use in the creation of the field guide were found by communication with friends, fellow gardeners, acquaintances and a great deal of walking through many Seattle neighborhoods in search of *Eucalyptus* trees (Figure 30).

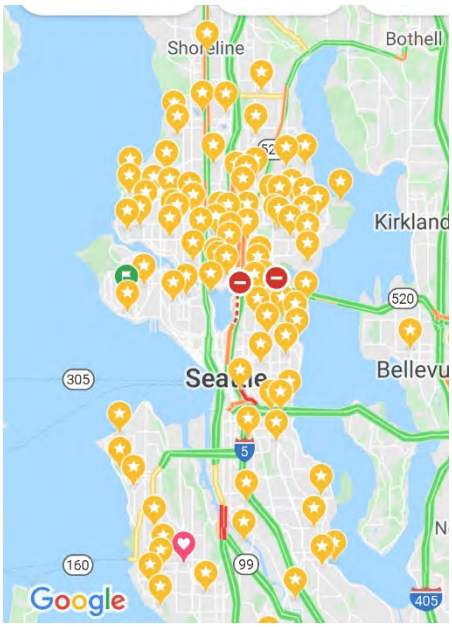


Figure 30: A screenshot of the author's mapped tree visits, compiled from Trees of Seattle, neighborhood walks/drives, and "tree tips" from social media posts/messages/blog posts

Locating and observing eucalypts in the Seattle area was one part of confirming their cultivation in the region. Being able to properly identify this genus of plants was critical to the eventual creation of a guide to their identification. The identification of *Eucalyptus* trees is not easy and as the authors of New Trees say, "it requires both practice and the presence of fertile material" (Grimshaw & Bayton 2009). The majority of the eucalypts that I encountered were found outside of botanical gardens or arboretums and were therefore not conveniently labeled, and their identification was not known to the large majority of homeowners that I spoke with. I encountered *Eucalyptus* trees in parks, home gardens, traffic circles, p-

patches, public plantings and in the right-of-way (Figure 32). *The Field Guide to The Cultivated Eucalypts and How to Identify Them* by Dr. Matt Ritter is a California-focused guide and was an invaluable resource that aided in the identification of regional specimens, and *EUCLID Eucalypts of Australia, CSIRO* served as the authoratative source used to ultimately identify locally encountered eucalypts (Ritter 2014, Euclid CSIRO).

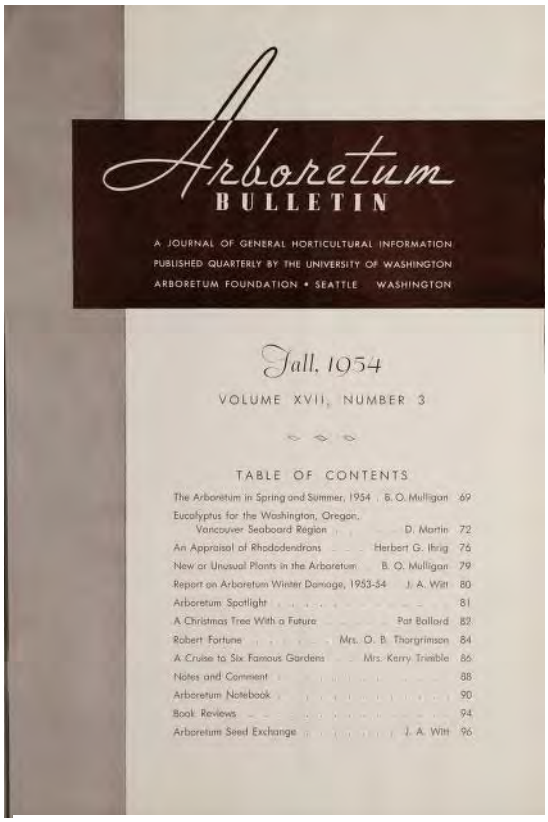

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Figure 31: *Eucalyptus* for the Washington, Oregon, Vancouver Seaboard Region (Fall, 1954, Arboretum Bulletin)

Cultivated eucalypts of Seattle and the greater Pacific Northwest region are the focus of the field guide. To better understand the journey of *Eucalyptus* cultivation into the Pacific Northwest, it is necessary to have some knowledge of the ecology of eucalypts in their native habitat as well as the cultivation history of the genus as an exotic species. This ecological and historical literature provides a context for understanding the eventual successful cultivation of *Eucalyptus* in Seattle (Figure 31). Research into the ecological impacts of *Eucalyptus* cultivation is also important as the role of the genus in landscapes of the Pacific Northwest is considered now and into the future. Reviewing the archives of regional horticulture publications, such as the *Washington Park Arboretum Bulletin* helped to layout important time periods of *Eucalyptus* cultivation in the Seattle area, and publications by regional nurseries and horticulturists were used for specific case studies as well as in the creation of species accounts and descriptions within the field guide pages.

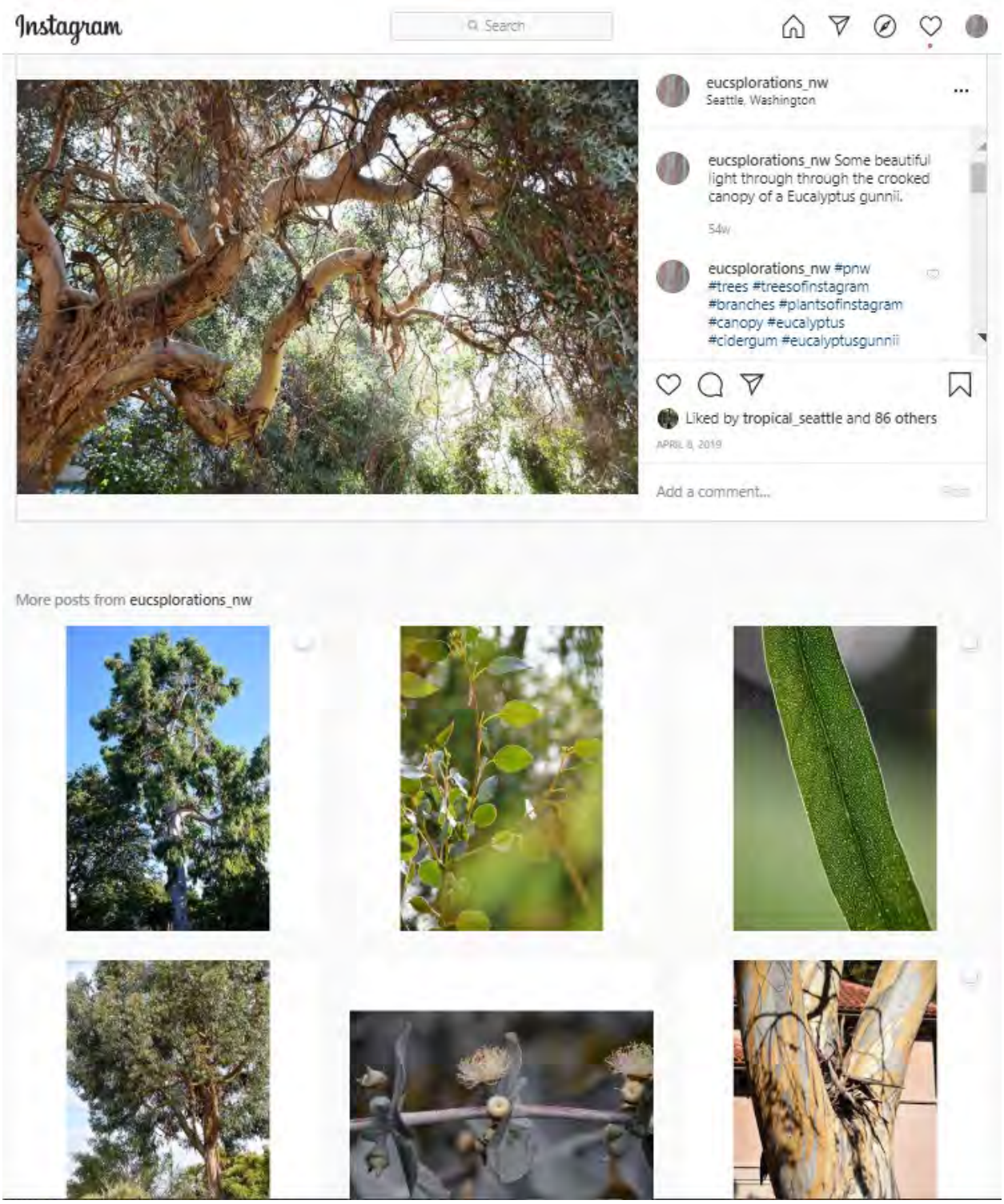


Figure 32: Modern methods; *The author's digital collection of field work in Seattle and the West Coast, 2019/2020

Ecological Impacts

"Eucalyptus is a genus that arouses strong emotions. Its members evoke the sun-drenched Australian landscape, more perfectly than any other combination of tree and location, and they carry the redolence of the outback with them – even if many hardy species come from rain-soaked parts of Tasmania! They can be productive timber and firewood trees, yet are reviled by environmentalists for the damage that plantations of them can sometimes cause to water catchments and native vegetation" – Grisham & Bayton, New Trees (2009)

Invasion and Naturalization

California has a higher proportion of naturalized non-native exotic plant species than any other state, and 25% of the flora is composed of non-native exotic plant species (Coates 2006). It is also home to one of the nation's strongest native plant movements, and the *Eucalyptus* tree stands as a polarizing figurehead that represents the threat of all foreign plant invaders to California's native flora and fauna (Coates 2006). An important consideration when it comes to the continued cultivation of eucalypts, both those in trial and those considered to be "tried and true," is the potential for their spread beyond the garden and naturalization. In Seattle there is anecdotal evidence that *Eucalyptus* seedlings have germinated and, in

Figure 33: Young *E. perriniana* trees growing between Woodland Park Zoo and Aurora Ave., Seattle

Figure 34: An established seedling at the base of a mature *E. dalrympleana*, Arthur Lee Jacobson's garden, Seattle

some cases, become established in proximity to the parent tree. In *Trees of Seattle*, Arthur Lee Jacobson writes of *Eucalyptus perriniana*, "In Seattle, many of our larger and older eucalypts are of this kind, and reseeding has occurred" (Jacobson 2006). After visiting Woodland Park Zoo to photograph some of the eucalypts in the gardens, I noticed what appeared to be naturalizing eucalypts growing on the English ivy-covered greenbelt space between the zoo and Aurora Ave. The eucalypts on the hillside turned out to be *Eucalyptus perriniana* upon closer inspection and they can be seen along the hillside behind the Facilities maintenance yard (Figure 33). In a conversation with Mike Lee, he described the health of a *Eucalyptus dalrympleana* and briefly, in passing, the "seedling" next to the parent tree in the garden of Arthur Lee Jacobson (Lee 2019, pers. communication, Figure 34). Jacobson himself said that, "the only cultivated species I have seen making seedlings in gardens are: *Perriniana, neglecta* and *dalyrmpleana*" (Jacobson 2019, pers. communication, Figure 35).

Figure 35: *E. dalrympleana* in Arthur Lee Jacobson's former Montlake garden, Seattle

The seedling of one of the first eucalypts that I planted on the UW Bothell campus came from a Facebook posting for the Seattle-area from the group *Cold-Hardy Australian Plants* (Figure 36).

Figure 36: A screenshot of the author's social media *Eucalyptus* exploits

After quickly responding to the post, I went over to the garden of the *Cold-Hardy Australian Plants* group member and dug up the *Eucalyptus archeri* seedling from the sandy sun-drenched soil of his Fremont-neighborhood garden. When asked if he had found *Eucalyptus* seedlings in his garden before, the fellow gardener told me that he'd had many seedlings appear before and that they tended to show up in the bare, well-drained, and recently cultivated areas of his garden (Mathes 2019, pers. communication). The UW Botanic Gardens February 2019 blog post, written by UW Botanic Gardens curator Ray Larson, profiles an 80-foot tall *Eucalyptus gunnii* planted in 1957 in the Washington Park Arboretum. In describing the monolithic presence of this towering Cider Gum, Larson (2019) writes:

> "Part of its longevity and good performance is also likely due to its provenance. Eucalyptus are generally grown from seed, and seed from higher elevation trees have proven to be much hardier. Another reason is likely the warming temperatures of the Seattle metropolitan area in recent decades, including warmer winter temperatures. We just aren't getting as cold as we used to in the early days of the Arboretum. The cold temperatures we do experience are often of shorter duration. (Larson 2019)"

While walking through the Arboretum I found a *Eucalyptus gunnii* seedling growing not far from the towering canopy of this Cider Gum in the arborist mulch of the Arboretum's New Zealand garden (Figure 37).

Figure 37: A small seedling near a mature *E. gunnii*, WPA, Seattle

The exuberant gardens of Jungle Fever Exotics nursery in Tacoma have been planted with numerous eucalypts over the years. The plantings have been thinned out by frosts and construction, but a mature *Eucalyptus glaucescens* has lived long enough to produce a juvenile tree at the base of the parent tree (Jerry Cearley 2019, pers. communication, Figure 38). These anecdotal accounts of seedling establishment seem to make it clear that *Eucalyptus* seeds can successfully germinate in our Northwest gardens, but seeds that do germinate do not appear to spread far beyond the crown of the tree.

In a Portland Parks and Recreation Urban Forestry Blog article highlighting cultivated eucalypts in Portland, they are described as having "Low Invasive Potential":

"In considering growing any tree foreign to Oregon, one should carefully consider the tree's potential for invasiveness. Our experience with English holly *(Ilex aquifolium*) and tree of heaven (*Ailanthus altissima*) being two notorious examples of what can happen when trees reproduce out of control into natural areas.

California has seen a few eucalyptus species, notably the blue gum E. globulus, become naturalized. This is due in large part to those species' ability to quickly reproduce and regenerate after California's frequent fires, which open up vast areas ripe for colonization. I'm unaware of any problems with *E. pauciflora* or its subspecies reseeding here. Despite its quick growth rate, the tree's absolute requirement for full sun and low maximum height should severely limit its ability to compete with natives in Oregon's taller-growing Oregon hardwood and softwood forests of Northwest Oregon." (Portland Parks & Rec., Gersbach 2014).

Figure 38: *E. glaucescens* at Jungle Fever Exotics Nursery, Tacoma, WA

I spoke with Ian Barclay of The Desert Northwest about his thoughts on the invasive potential of eucalypts in the pacific northwest and his response was as follows:

"I'd be even more surprised if you found any evidence of Eucalyptus reseeding in the Seattle area. The concerns …. are based on the bad habits of two species, primarily, that aren't hardy here. The only exception is I have very rarely seen *E. perriniana* reseed itself, and then only if there is very good soil below it" (Barclay 2019, pers. communication)

Barclay's statement that the concerns around the invasive potential of eucalypts are largely "based on the bad habits of two species, primarily, that aren't hardy here" is reiterated often and largely in reference to *Eucalyptus globulus*. The Tasmanian Blue Gum, the most widely planted eucalypt in California, repeatedly described as "absolutely not hardy," has "unfairly given the whole genus a bad name" (Jacobson 1996, 2006). *Eucalyptus globulus* has naturalized in regions of California, the Canary Islands, China, Hawaii, India, Jamaica, Peru, the Mediterranean Basin, Southwest Australia, South Africa and Zimbabwe (Ritter 2014). In milder coastal regions of the Ireland and Great Britain, *Eucalyptus globulus* is noted as freely seeding (Johnson & More 2004). In temperate climates like the British Isles, the smaller *Eucalyptus gunnii* is the most commonly cultivated hardy eucalypt and it is described as having "freely naturalized," being found in woodlands and along roadsides in Southeast England (Brooker & Evans 1983, Jacobson 1996, Johnson & More 2004, OABIF). In fact, five *Eucalyptus* species are listed in the *Online Atlas of British and Irish Flora* as having been recently recorded from the wild as naturalized cultivation escapes (OABIF 2020). Those species are *Eucalyptus globulus, E. gunnii, E. pulchella, E. urnigera and E. viminalis* (OABIF 2020).

In California, three species of *Eucalyptus* are listed in the California Invasive Plant Council's inventory, but only *E. globulus* and *E. camaldulensis* are listed as "invasive" (Cal-IPC 2020). Eucalypts are described

as being less successful invaders than other tree species commonly planted for use in plantations, such as pine species, other species within the *Myrtaceae* family, and Fabaceous tree species (Ritter 2014). *Eucalyptus globulus* initially received a "moderate" invasive rating under the Cal-IPC inventory listing, but in 2014 it was reevaluated and given a "limited" rating within the state of California (Wolf & DiTomaso 2015, Cal-IPC). It is noted by Cal-IPC that the reason for this change is in large part due to the evaluating *E. globulus* across the entire state, whereas earlier assessments focused on coastal areas where *E. globulus* most successfully regenerates (Yost 2018, Wolf & DiTomaso 2016, Figure 39). Region-specific management is advocated by Wolf and DiTomaso (2016) due to climatic differences within California, and this certainly applies to the climatic differences between the maritime regions of the Pacific Northwest and California. When paired with evaluation tools, like the "Decision tree for evaluating invasive potential of introduced plants" (Reichard 1996), the research that has been done in the United Kingdom and California, as well as regional anecdotal evidence, helps to provide a preliminary framework for a more thoughtful and informed evaluation of the role of eucalypts in Northwest gardens and landscapes.

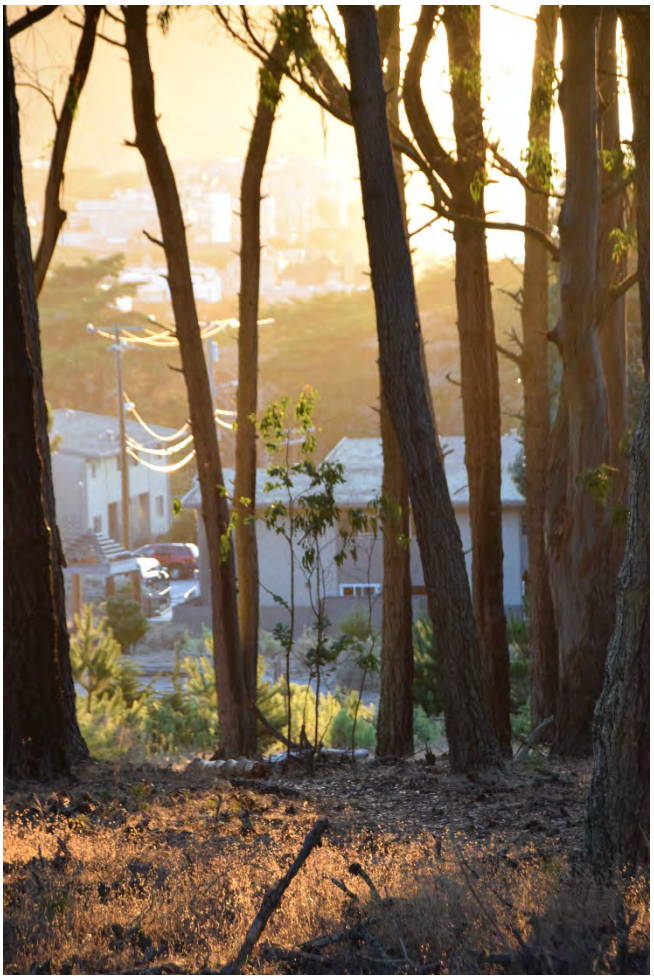


Figure 39: *E. globulus* seedlings beneath a novel forest of Blue Gum and Monterey Cypress, The Presidio, San Francisco, CA

Recent work by Matt Ritter and Jennifer Yost (2009) looks at the breadth of cultivated *Eucalyptus* diversity in California to assess which species are spontaneously reproducing or have the potential to reproduce in California. The results of their research, based on five years of field observations, field collections and examination of herbaria records, provide a significant increase in the knowledge of eucalypts as currently represented in cultivation within California (Ritter & Yost 2009, Figure 40). In this study *Eucalyptus* species were considered naturalized if the species had established new self-perpetuating populations, undergone widespread dispersal and had become incorporated within the resident flora (Richardson et. al 2000, Ritter & Yost 2009). The study found that different eucalypts are spontaneously reproducing at different rates and this was not entirely related to how frequently the different species were planted. Ritter and Yost (2009) suggest that, "The degree of spontaneous reproduction in different species may correlate with the taxonomic subgenus and section to which they belong, and therefore future invasions could possibly be predicted for closely related yet uncommonly planted species." Ritter and Yost (2009) found that of the eighteen taxa of eucalypts that have become naturalized in California, only three of these do not occur in the subgenus *Symphyomyrtus* (Pryor & Johnson 1971) and of those naturalized eucalypts within this subgenus, seven of these fall within the section *Maidenaria.* Eucalypts are generally recognized as being "poor performers" as weeds,

TABLE 1. COMMON *EUCALYPTUS* SPECIES IN CALIFORNIA. A. Taxa naturalized in California. B. Commonly planted taxa that would be expected to reproduce if planted more frequently, based on taxonomic similarity to reproducing species and reports from other areas with similar climates. C. Commonly planted *Eucalyptus* species for which there is no evidence of reproduction.

Naturalized (A)	Expected naturalization (B)	No evidence of naturalization (C)
E. camaldulensis	*E. amygdalina*	*E. calophylla*
E. citriodora	*E. blakelyi*	*E. cornuta*
E. cladocalyx	*E. botryoides*	*E. erythrocorys*
E. conferruminata	*E. dalrympleana*	*E. ficifolia*
E. fastigata	*E. dives*	*E. leucoxylon*
E. globulus	*E. gunnii*	*E. macranda*
E. grandis	*E. maculata*	*E. melliodora*
E. kitsoniana	*E. neglecta*	*E. nicholii*
E. macarthurii	*E. nicholii*	*E. pauciflora*
E. mannifera	*E. paniculata*	*E. preissiana*
E. ovata	*E. radiata*	*E. pulverulenta*
E. parvula	*E. regnans*	*E. punctata*
E. polyanthemos	*E. resinifera*	*E. rudis*
E. pulchella	*E. rubida*	*E. spathulata*
E. robusta	*E. rudis*	*E. torquata*
E. sideroxylon	*E. saligna*	*E. diversicolor*
E. tereticornis		*E. megacornuta*
E. viminalis		

Figure 40: Common eucalypts in California (Referenced from Ritter & Yost 2009, Courtesy of Matt Ritter)

owing to the limited dispersal of their small exalbuminous seeds, as well as low levels of seedling recruitment (Ritter 2014). The research of Ritter and Yost enables a more informed decision-making process about those species that may exhibit increased performance as weeds, in that they exhibit a tendency to naturalize more readily than their eucalypt counterparts.

Water Usage

The impact of intensive *Eucalyptus* cultivation upon hydrology cannot be ignored when considering the ecological implications of the genus in cultivation. Research regarding the water usage of eucalypts is largely centered around large-scale plantations, and the effects of these plantations on natural ecosystems, biodiversity, wildlife and ecosystem services continues to be debated (Ritter 2014). They have historically been promoted for their ability to drain swamp lands and have been subsequently recommended for their ability to grow in waterlogged soils (Elliot & Jones 1980). In the nineteenth-century, Blue Gums helped, indirectly, to sanitize the low lying Roman Campagna of the malaria that plagued the land and helped to transform the Abbey of Tre Fontaine in Italy into a “smiling oasis” by way of its “adventurous roots” that sucked up the swampy breeding grounds of mosquitos (Draper 1881, Coates 2006). Many other countries would follow this example, and eucalypts became a necessary tool employed in the fight against malaria (Santos 1997, Coates 2006). The rapid growth or “productivity” that many cultivated eucalypts are valued for comes at a price, as this rapidity is dependent upon the availability of "extreme” amounts of water (Santos 1997).

A recent U.S. Forest Service study compares the water usage between short-rotation *Pinus taeda* and *Eucalyptus benthamii* trees and it addresses the tension of plantation productivity and ecological impact that is closely tied to *Eucalyptus* culture. The recent development of hybrid eucalypts and the

identification of frost-tolerant species suitable for the USDA Plant Hardiness Zone 8b has made widespread *Eucalyptus* cultivation in the southern United States a real possibility (Maier et. Al 2017). The possibility of widespread cultivation in the southern United States presents several environmental considerations, including water use (Maier et. Al 2017). The researchers knew that intensively managed forest plantations generally use more water than less intensively managed systems or native forests, but it was unknown if *Eucalyptus* plantations would use more water than intensively managed pine *(P. taeda, P. ellioti*) plantations in the southern US. The objective of the study was to compare tree water use and water use efficiency (WUE: biomass growth per unit water transpired) over the course of one year in adjacent nine-year-old stands of *E. benthamii* and *P.* taeda plantations growing in the Coastal Plain of South Carolina. The researchers hypothesized that *Eucalyptus* would have higher sap flux and tree water use, but because of greater growth and efficient stomatal regulation, Eucalyptus trees would have greater WUE. (Maier et. Al 2017). It was found that *Eucalyptus benthamii* used almost a third more water than *Pinus taeda* over the observation period, but that *E. benthamii* had forty percent greater water use efficiency (Myers 2017). On an annual basis *Eucalyptus* benthamii used 32% more water than pine, but it was observed that *Eucalyptus* used less water than Loblolly Pine to produce the same amount of woody biomass (Myers 2017, Maier et. al 2017). *Eucalyptus* will produce more wood than Loblolly pine plantations, but it will also use more water. The question of the researchers now asks if the greater overall water use by commercially planted *Eucalyptus* could have negative impacts on the environments where they are planted. The study concluded that at a small scale, commercial *Eucalyptus* plantings would have minimal impacts upon regional water supplies, but the higher absolute water-use by intensively managed *Eucalyptus* forests could have negative local scale impacts on water supplies (Maier et. al 2017). When asked about the possibly negative effects of *Eucalyptus* plantations upon water resources, Chris Maier's response echoes the statements of a 1985 publication by the Food and Agriculture Organization entitled, *The Ecological Effects of Eucalyptus*. Maier says, "The keys are locating

intensively managed Eucalyptus in areas where water availability or sensitive wetland species are not a concern and limiting plantation size to avoid major impacts to the water table" (Myers 2017).

Again, at a large scale, the impacts of widespread intensive *Eucalyptus* cultivation upon hydrology cannot be ignored when considering the ecological implications of the genus in cultivation. What does this mean when it comes to planting a *Eucalyptus* tree in a small residential garden, as a street tree, or in a park or campus setting? At this smaller scale there are considerations that can and should be kept in mind. I had the opportunity to visit a member of the Northwest Horticultural Society's exceptionally planted home garden. It was a carefully curated collection of creative plantings that included towering *Tetrapanax*, interesting broad-leaved evergreens, unique garden decor and a few mature *Eucalyptus* trees. I was shown where the roots of a large *Eucalyptus glaucescens* had done their part to destroy an underground irrigation line. The roots of the tree were cut, and the irrigation line was redirected. In a post-garden tour discussion on the topic of eucalypts, I asked the gardener if they would plant *Eucalyptus* trees as they had in the past and their response to this question was a flat and simple "no." It is certain, that for some species of *Eucalyptus*, their roots are aggressive (Figure 41). Their roots can spread great distances laterally and can cause problems when planted near buildings, facilities, cisterns, pipes and septic tanks (Santos 1997). However, the same can be said of our native Bigleaf maple (*Acer macrophyllum*), Cottonwoods (*Populus sp.*), and Willows (*Salix sp.*), of which many are prohibited from being planted as street trees by both the City of Seattle and the City of Tacoma (SDOT 2017, City of Tacoma EvergreenTacoma). A recent PlantAmnesty article entitled, "The Ups and Downs of a Eucalyptus", chronicles a local gardener's complicated relationship with their *Eucalyptus glaucescens*. The front-page article features a drawing of a gardener being swallowed by the tree and its leafy debris as well as the "predatorial" roots, depicted as sharks, devouring the piped irrigation below the tree. As the author says, "I loved my Eucalyptus" (Lagozzino 2019). In time, the author became aware that the

tree was becoming too large for its space and it had in a sense outgrown its welcome. The roots of the tree that had been planted over irrigation pipes ultimately broke the pipes in search of water (Lagozzino 2019). The once towering Gum tree was finally reduced to a "living snag" with the help of a local arborist.

Stories like this are unnerving, to say the least, but they can be avoided by recognizing the realities of what one is planting. There are certainly many Eucalyptus species that can and will use a lot of water if given the chance. This is a reality that must be recognized. On a small scale, like a home garden, irrigation systems can be modified, rerouted and even removed. That does not make eucalypts suitable for every situation, but after watering the first year for establishment many species do not need supplemental water to endure and thrive in the summer-dry climate of the Pacific Northwest. Xera Plants, a Portland-based nursery that promotes fully hardy, carefree *Eucalyptus* species, recommends initially watering *Eucalyptus* plantings through their first summer for establishment and says that, "In subsequent years it will be completely drought tolerant" (Xeraplants.com 2020). Similar recommendations for water requirements for hardy eucalypts, with some exceptions for species that perform best with summer irrigation, in the Pacific Northwest are made by Sean Hogan of Cistus Nursery, Ian Barclay at the Desert Northwest and Michael Lee of Colvos Creek Nursery. A local street tree and right-of-way planting program that I worked with was dismissive of plants groups native to the western united states like *Ceanothus*, *Arctostaphylos* and *Arbutus* because they "died too quickly." These are plant groups that often quickly decline in response to summer watering, but are well adapted to take the summer droughts of the Pacific Northwest in stride, with minimal supplemental summer water. Eucalyptus are utilized as street trees and urban infrastructure plantings in California, but they are thoughtlessly dismissed for use in the urban centers of the Pacific Northwest because they "will clog

Figure 41: The pearly white limbs of a Jounama Snow Gum (*E. pauciflora ssp. debeuzevillei)* stretch over powerlines, pedestrians and the occasional Prius as a right-of-way street tree in Tacoma, WA.

pipes and damage irrigation systems (Figure 41, 42)." In a 2015 *Pacific Horticulture* article entitled, "Oaks are The Answer", Sean Hogan writes:

> "The Willamette Valley has a thriving export nursery industry. But most of that inventory is grown and bound for points east where cold winters and wet summers prevail. Plant those trees here in our mild winter, dry summer climate and the result is the drought-shocked urban canopy that can be seen around Portland and other western cities." (Hogan 2015)

In the face of climate change it is perhaps time for the municipalities of the Pacific Northwest to face the realities of our summer-dry climate and to address the urban infrastructure systems and water usage needed to maintain the extreme overuse of tree species, liked Red Maples, Sweetgums, Tulip Trees, Lindens and Birches, native and adapted to the summer wet climates of the eastern United States and Asia. Hogan proclaims that "Oaks are the answer!" (Hogan 2015). I thoughtfully propose that *Eucalyptus* (along with native Oaks of the Western United States, *Arbutus*, *Arctostaphylos*, *Ceanothus*, and plants native and adapted to Mediterranean climates) is just one genus of trees who have much to offer to the region as we truly come to grips with realities of our climate. *Eucalyptus*, when paired with other regionally adapted plants, is just one genus that can play a role in shaping more resilient Northwest gardens and landscapes; landscapes defined by a palette of plants well-suited to thrive in the winter-wet and summer-dry regions of the West Coast.

Of the innumerable eucalypts planted in California, Bob Santos says that, "Of the *Eucalyptus* species blue gums were first used, but their size and aggressive root system made them more of a liability than an asset. Their roots tore up sidewalks and streets. They were too big to prune, and dripping water from them made the graveled roads muddy. Many were removed. It was simply a problem of finding the proper species. Today smaller and less aggressive *Eucalyptus* are used" (Santos 1997). In many ways, the genus has been unfairly maligned by the behavior of a small number of species whose damaging ecological legacy could not exist without human action. It would be a disservice to the urban landscapes

of the Pacific Northwest to unfairly dismiss the entire diversity of Eucalyptus as “giant weeds” because of past mistakes largely driven by human error and hubris. As ecologically informed horticulturists, planners, arborists and so on, it is our responsibility to be cognizant of that so often quoted phrase, “right plant, right place”, and in doing this, those more appropriate *Eucalyptus* species can successfully be adapted to our Northwest gardens, parks, and public spaces as assets. The concluding statements made by the Food and Agriculture Organization in their 1985 document, *The Ecological Effects of Eucalyptus*, when applied to the discussion of planting eucalypts in northwest gardens provide gardeners with a thoughtful approach to the many considerations that should be weighed and balanced:

> “Having reviewed the evidence very thoroughly, we must stress that there can be no universal answer, either favorable or unfavorable, to the planting of eucalypts. Nor should there be any universal answer: each case should be examined on its individual merits. We cannot see how further general research, however detailed, can alter this conclusion. We stress that eucalypts should not be planted, especially on a large scale, without a careful and intelligent assessment of the social and economic consequences, and an attempt to balance the advantage against the disadvantages.” (FAO 1985, Santos 1997)

While this statement made by the FAO is primarily concerned with the large-scale commercialization of eucalypts, I assert that eucalypts should not be planted without an informed assessment of the role that they will play in one's garden and the greater ecosystem. Their role should be carefully considered in an attempt to balance the advantages against the disadvantages in order to utilize their strengths and utilities as assets and not liabilities.

Figure 42: *E. glaucescens* in a narrow right-of-way planting strip, Wedgewood, Seattle

Selected Species: A Discussion of Purposeful Introduction and a Changing Climate

The *Eucalyptus* species included in this guide roughly match those species included in the second edition of *Trees of Seattle* and correspond with the roughly 30 species that have proven hardy for cultivation in Zone 8 conditions of the Pacific Northwest (Grisham & Bayton 2009, Hogan 2008). Other potentially hardy (*Eucalyptus pulchella, E. nova-anglica, E. scoparia, among others*) or historically proven eucalypts (*E. urnigera*) were not included if they were not encountered during the course of the author's field research. For example, a young Wallangarra white gum (*Eucalyptus scoparia,* another member of the *Maideneria* section of the subgenus *Symphyomyrtus*) from the Desert Northwest Nursery was planted last year near the ARC building on the University of Washington-Bothell campus and it is growing well, but it will be some time before it can be considered established. Mail-order nurseries like One Green World, Forest Farm and SouthernEucs offer a varying rotation of eucalypts from year to year. Some of the offerings, like *Eucalyptus moorei*, *E. macarthurii, E. nova-anglica, E. elliptica*, *E. gregsoniana,* and *E. pulchella* were not encountered, but may certainly find future success in the USDA Zone 8b gardens of the Pacific Northwest. Some of the included eucalypts may have only been encountered one time in the Pacific Northwest, like *E. bridgesiana*, which was encountered only at the Carl English Botanical Gardens in Seattle. Other eucalypts, like *E. gunnii* and *E. pauciflora*, account for the a disporportionately high number of the cultivated eucalypts in our region. Every effort was made to include a group representative of the cultivated *Eucalyptus* of Seattle and the greater Pacific Northwest. With the understanding that eucalypts will continue to be introduced and cultivated within gardens of the maritime Northwest, the included *Eucalyptus* species encountered have been categorized by their potential to naturalize within the Pacific Northwest. *Eucalyptus globulus* and *E. camaldulensis* were included in the guide for their cultural, historical and ecological significance in the West Coast region. This preliminary categorizing of our cultivated eucalypts is based upon the research of naturalized

eucalypts in California (Ritter & Yost 2009), evidence for naturalization or invasion in other regions and anecdotal evidence with observations of seedling establishment in the Seattle area gardens.

Table 4. A Process for Evaluating the Naturalization Potential of Commonly Cultivated Eucalypts of the Pacific Northwest

In this table, the first three columns regarding naturalization in California are direct references to the research of Ritter and Yost (2009). Column four is a reference from the *Online Atlas of the British and Irish Flora.* The evidence for column five, *Anecdotal Evidence of Seedling Establishment in Seattle Area Gardens* is detailed in pages 61-69. The columns regarding taxonomic classification are discussed on page 83. The final columns regarding naturalization potential was determined by the consideration of a species naturalization history in California, in other countries where it is cultivated and its taxonomic placement. The colored headings correspond to specific species if they fall under one of two classifications. The color used for the taxonomic grouping columns is used in the field guide pages to notify the reader that a specific Eucalyptus species belongs to the *Maideneria* section of the subgenus *Symphyomyrtus*. As an example, *Eucalyptus gunnii* is marked for *Expected Naturalization in California*, *A History of Naturalization in other countries where cultivated*, *Anecdotal Evidence of Seedling Establishment in Seattle area gardens* and it belongs to the *Maideneria* section of the subgenus *Symphyomyrtus*. Based on these combined attributes, I have made a preliminary determination that *E. gunnii* has the potential to naturalize in the Pacific Northwest. In the case of the closely related *Eucalyptus archeri*, I have made the same determination even though it is not included in the California naturalization or naturalization in other countries columns because seedling establishment in Seattle has been documented and *E. archeri* was formerly regarded as a subspecies of *E. gunnii*. Some of the many factors that ultimately contribute to naturalization are further discussed.

Eucalyptus sp.	Naturalized in California	Expected Naturalization in California	No Evidence of Naturalization in California	A History of Naturalization in other countries where cultivated	Anecdotal Evidence of Seedling Establishment in Seattle area gardens	Belongs to the Subgenus Symphyomyrtus	Belongs to the Maideneria section of the Subgenus Symphyomyrtus		Potential to Naturalize in the Pacific Northwest	No Evidence to Suggest Naturalization Potential
E. globulus	X			X		X	X		X	
E. camaldulensis	X			X		X				
E. gunnii		X		X	X	X	X		X	
E. perriniana					X	X	X		X	
E. pauciflora			X							X
E. lacrimans										X
E. cinerea						X	X			
E. dalrympleana		X			X	X	X		X	
E. bridgesiana						X	X			
E. subcrenulata						X	X			
E. pulverulenta			X			X	X			
E. mitchelliana										X
E. nichollii		X	X			X	X		X	
E. kybeanensis										X
E. rubida		X				X	X			
E. parvula	X					X	X		X	
E. nitens						X	X			
E. archeri					X	X	X		X	
E. glaucescens					X	X	X		X	
E. stellulata										X
E. coccifera										X
E. camphora						X	X			
E. rodwayi						X	X			
E. neglecta		X				X	X		X	
E. viminalis	X			X		X	X		X	

Prediction of invasiveness is unclear at best, but there are questions that can help researchers to make informed decisions regarding the possible introduction of plant species. A tool used to aid in the prediction of woody plant species (*Decision tree for woody North America invasive species*) begins by first asking, "Does the species invade elsewhere, outside of North America?" (Reichard 2006). If the answer to this question is "yes," then the next question is, "Is it in a family or genus with species that are already strongly invasive in North America?" A plant species history in cultivation elsewhere is a strong indicator of its capacity to find ecological success outside of its native range. It is for this reason that the first seven columns in Table 1 aid in the categorization of the commonly cultivated eucalypts of the Pacific Northwest. The first three columns (*Naturalized in California, Expected Naturalization in California, No Evidence of Naturalization in California*) are directly referenced from research of *Eucalyptus* naturalization in California (Ritter & Yost 2009). The fourth column (*A History of Naturalization in Other Countries where Cultivated*) is referenced from flora records from the *Online Atlas of the British and Irish Flora*. The climate of the martime Northwest shares many similiarities with the climate of the British Isles, making records of plant naturalization and spread in the Ireland, Scotland and England pertinent for horticulturists and ecologists in the Pacific Northwest region of the United States (Hall 2009).

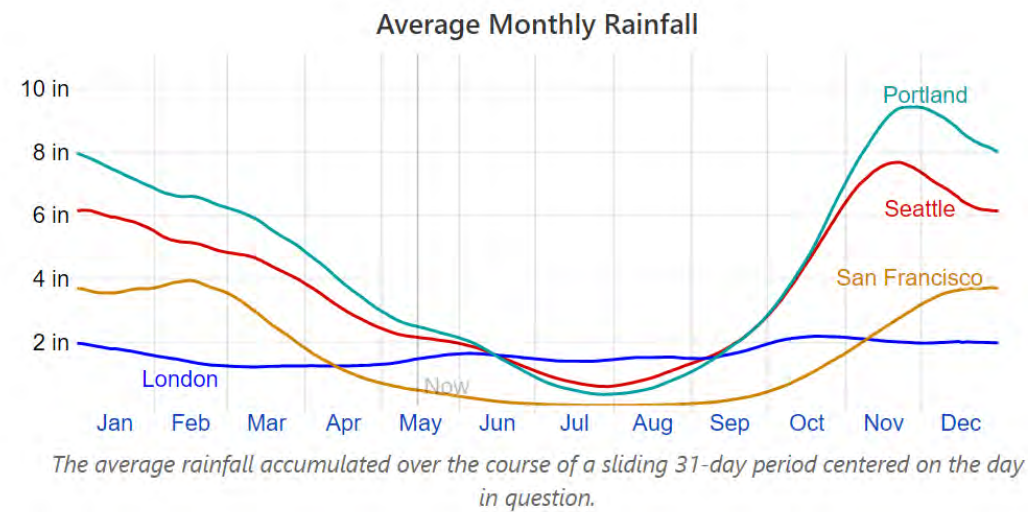


Figure 43: Average monthly rainfall comparison between Portland, Seattle, San Francisco and London (WeatherSpark 2020).

Yet, the summers of Seattle and Portland are marked by extended periods of drought not experienced by many regions of the British Isles (Hall 2009, Figure 43). The summer-dry, medditeranean climate conditions of California, Oregon, Washington and British Columbia do share some similar and predictable climatic patterns with notable variations accompanied by changing latitude (Hall 2009).

The primary pursuit of this project was to create a field guide, and the accompanying text is meant to serve as a supplement to the guide. The determinations that I have made to provide some predictive thought towards the categorization of our commonly cultivated eucalypts and their potential to naturalize in this region is severely limited without the additional weight of the accompanying columns referenced from the the work of Ritter and Yost (2009). The determinations made by Ritter and Yost (2009) from their research on Eucalyptus naturalization in California were guided by the definition of naturalization as defined by Richardson, et al., 2000, whereby "species establishes new self-perpetuating populations, undergoes dispersal, and becomes incorporated into resident flora." I want to recognize and acknowledge that plant species "seeding into" and establishing in the favorable setting afforded by the fresh mulch and finely cultivated beds of a garden does not necessarily equate to naturalization. In my seven years as a gardener in Seattle-area residences, campuses and streetscapes I have made note of many plants that successfully establish in the highly modified landscapes of Seattle's urban gardens, but have not necessarily naturalized. I have observed that Northern Red Oak (*Quercus rubra*), English Oak (*Q. robur*) and evergreen Holm Oak (*Q. ilex*) seedlings are often abundant in Seattle gardens in close proximity to mature street trees. California Bay Laurel (*Umbellularia californica*) seedlings are primed to establish a new successional forest at the Washington Park Arboretum if garden management were to cease, and the area under the Narrow-leaved lacebarks (*Hoheria angustifolia*) in the New Zealand garden (a species regarded as not reliably hardy in frost, Hogan 2008) is littered with

germinating seedlings. The nearly-native Incense Cedar (*Calocedrus decurrens*) and not-even-close-to-native Deodar Cedar (*Cedrus deodara*), both widely planted, can produce an abundance of seedlings in the leaf-litter fallen from their coniferous canopies. Copper beech (*Fagus sylvatica* 'Purpurea') and Japanese maple (*Acer palmatum*) seeds can germinate prolifically in response to irrigation and an application of compost. Strawberry trees (*Arbutus unedo*) are by and large infinitely more abundant than our native Madrone (*Arbutus menziesii*) in Seattle area gardens and their seedlings are plentiful on the University of Washington campus. In addition, the uncommonly cultivated Chilean Myrtle (*Luma apiculata*) and a deciduous Photinia (*Photinia beauverdiana var. notabilis*) produce an abundance of seedlings around the base of the plants in the Good Shepherd Center gardens in Wallingford, Seattle. Seedlings from Chinese Windmill Palms (*Trachycarpus fortunei)*, a palm that has proven to be quite capable of naturalizing in other regions where it is cultivated (Fehr & Burga 2016), can be found in plenitude under mature plantings at Seattle University, and they can be seen establishing some distance from mature specimens at the Carl English Botanical Gardens (Figure 43). The highly modified landscapes of an urban setting like Seattle and the plants that find ecological success therein can not be entirely predictive of what plants may eventually become naturalized, but they may prove to be useful observations for the future as our landscapes continue to be modified by development and climate change.

Figure 44: Chinese Windmill Palm on the Seattle University campus with racemes of ripened fruits. The recent research detailing the spread and establishment of *Trachycarpus fortunei* into the deciduous forests of southern Ticino, Switzerland may be of interest for those wishing to further follow this phenomenon.

It may be that with time plant species can cross some threshold, surpassing the boundary of a garden setting and becoming incorporated into the resident flora.

It is worth noting that *Eucalyptus nicholii* is listed for both *Expected Naturalization in California* and *No Evidence of Naturalization in California* (Table 3). *Eucalyptus nicholii* is widely planted in California and has become a common feature of many coastal California gardens and landscapes. Some might even suggest that it has become "too common" (Hogan 2009). *Eucalyptus nicholii* belongs to the section *Maideneria* in the subgenus *Symphyomyrtus,* which is a group of eucalypts that may show some tendency to naturalize and possibly more so with increased planting (Ritter & Yost 2009). It would seem *Eucalyptus nicholii* would begin to show some signs of seedlings establishment and naturalization because it is so widely planted, but even though it is widely planted Ritter and Yost (2009) found that it apparently rarely or never reproduces, while the closely related *E. mannifera, E. macarthurii* and *E. parvula* reproduce extensively. Their research (Ritter & Yost 2009) shows that a correlation exists between the commoness of which a species is planted in California and the number of observations of spontaneous reproduction and naturalization, but cases like that of *Eucalyptus nicholii* and a eucalypt's taxonomic grouping raise more questions about naturalization potential and these are questions requiring further study. It is suggested that the degree of spontaneous reproduction in different species may correlate with the taxonomic subgenus and section to which they belong, and therefore future invasions could possibly be predicted for closely related yet uncommonly planted species (Ritter & Yost 2009). A disproportionate amount of the hardy eucalypts cultivated in Pacific Northwest gardens belong to the *Maideneria* section of the *Symphyomyrtus* subgenus and so the relationship between naturalization potential and taxonomic subgenus and section is deserving of further study.

Cultivation records for *Eucalyptus* in the Seattle area date back as far back as the 1930s and into the 1850s for California (Larson 2019, Farmer 2013). It has been observed that some non-native species only become invasive after a long lag time, after their initial introduction (Ritter & Yost 2009, Ellstrand & Schierenbeck 2000). Eucalypts are primarily raised from seed and asexual propagation is largely limited to large-scale forestry operations (Barclay Hardy Eucalyptus Page, Hogan 2008). The research of Ellstrand and Schierenbeck (2000) is particularly thought-provoking when considering that distribution of eucalypts in the horticulture trade relies upon sexual propagation. In considering non-native plant introductions, lag time and invasion, the researchers suggest that, "Hybridization between species or between disparate source populations may serve as a stimulus for the evolution of invasiveness…The observed lag times and multiple introductions that seem a prerequisite for certain species to evolve invasiveness may be a correlate of the time necessary for previously isolated populations to come into contact and for hybridization to occur (Ellstrand & Schierenbeck 2000)." Invasive plants are often cited as predictable for the many ways that they successfully reproduce, but the researchers pose an important question, "Are invasives 'born' (that is, are they released from fitness constraints) or are they 'made' (that is, do they evolve invasiveness after colonization)? (Ellstrand & Schierenbeck 2000). The release of cultivated *Eucalyptus* from the fitness constraints of their native locale is repeated time and again as onlookers note their incredible growth rates, unblemished foliage and overly leafy canopies when compared to their native counterparts. It might be said that they are "Eucalyptus on vacation!"(a proclamation made by an Instagram follower from Australia upon viewing the pristine leaves of Eucalyptus pauciflora ssp. debezuevillei (Figure 45).

I will discuss a few considerations as they relate to the introduction of eucalypts as horticultural plantings. It was found by a German researcher that from 184 invasive woody species into Brandbenburg, Germany with known dates of first cultivation, the mean delay in invasion was 131 years for shrubs and 170 years for trees (Ellstrand & Schierenbeck 2000, Kowarik 1995). It is well-documented that multiple introductions of a species are often correlated with the success of non-native species. Interestingly, the European Starling and House Sparrow required multiple introductions before finding success as introduced species (Ellstrand & Schierenbeck 2000). It is well worth a thoughtful deliberation

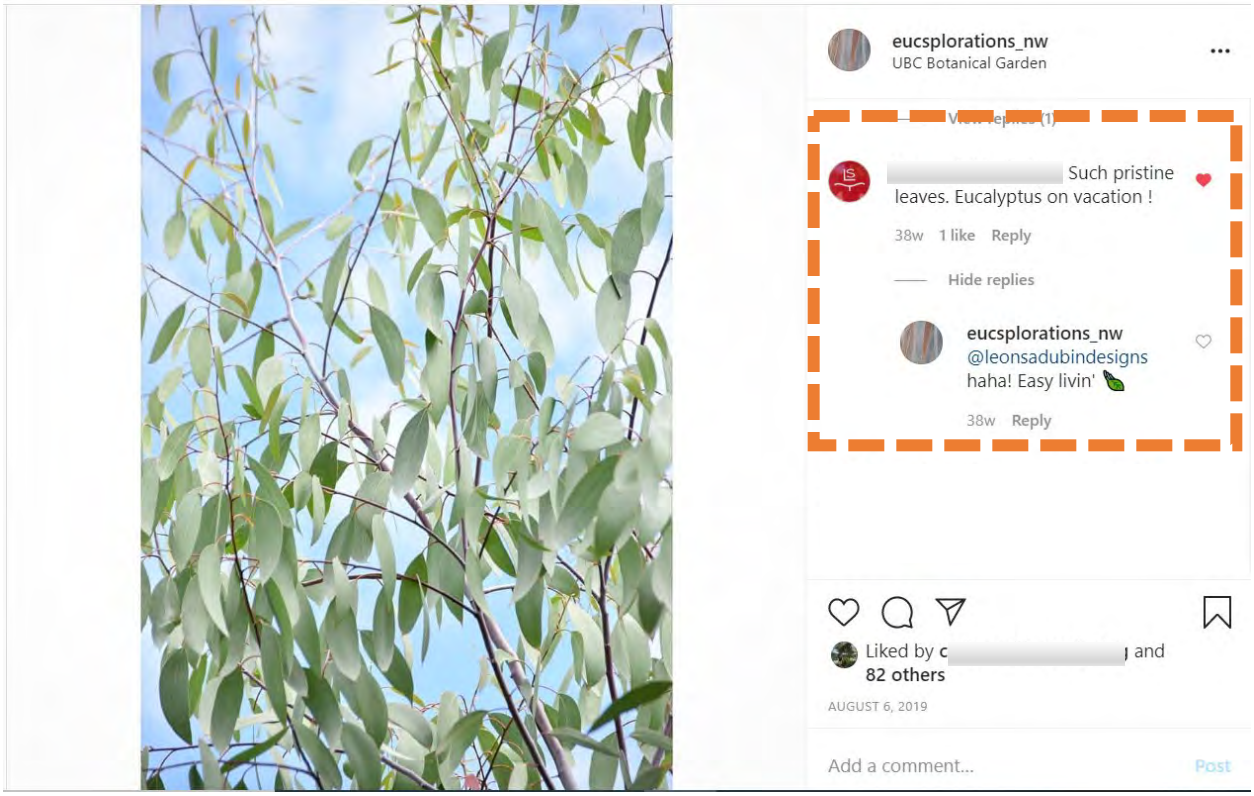


Figure 45 “Eucalyptus on vacation!”(*E. pauciflora ssp. debeuzevilleii* at the UBC Botanical Garden)

of the genus Eucalyptus as it pertains to their cultivation in the maritime Northwest, as their intensive and purposeful introduction into California has allowed some species to become ecologically successful as non-native naturalized species (Ritter & Yost 2008). In 1935 it was said, "The climatic conditions of Oregon, Washington, and British Columbia are not suitable for the successful growing of eucalypti" (McMinn & Maino 1935). It is certainly true that the present success with the growing of eucalypts in Oregon, Washington and British Columbia cannot be attributed solely to more ameliorable climatic conditions. The efforts of *Eucalyptus* enthusiasts and plant collectors to collect seeds from distinct provenances in Australia and Tasmania, as well as cultivated strains from hardy and enduring local specimens may bring together populations that were previously isolated from one another by geography (such as seed collections from Australian mainland forms of *E. perrinana* and Tasmanian seed collections) (Ellstrand & Schierenbeck 2000). In *Trees for All Seasons*, Sean Hogan says of eucalypts, "In recent years much practical research has been undertaken on cold hardiness in areas outside their native habitat in order to extend the range of their cultivation and availability for gardeners (Hogan 2008)." Hogan notes that multiple factors contribute to the potential success of a particular species in cultivation, citing a wide range in elevation and geography inhabited by some species, stressing the importance of seed collections from high elevations and cold air drainages (Hogan 2008). Grimshaw and Bayton (2009) reiterate this thought by saying that "enthusiasts are constantly scouring Australia for the coldest or highest provenances of each species." The authors remark that the updated account of cultivated Eucalyptus included in *New Trees* includes 54 established "hardy" eucalypts, adding to 17 described by W.J. Bean in 1981. They state that the increase can be attributed to two factors: "First, the quest for the hardiest provenances has enabled several species to become established where previous introductions had failed, and secondly, the steadily rising temperatures being experienced worldwide have given just sufficient leeway and encouragement for devotees to experiment ever more widely" (Grimshaw & Bayton 2009). It is interesting to consider that the purposeful introduction of seed

collections of eucalypts from varying provenances may result in critical evolutionary changes that create opportunities for increased invasiveness and that the introduction of previously isolated populations with very different genetic systems of adaption may lead to new adaptive systems and adaption to new ecological niches (Ellstrand & Schierenbeck 2000, Stebbins 1954).

Eucalypts are often regarded as not hardy and treated as ephemeral figures in landscapes and gardens in the colder climes of northern regions and on more than one occasion I have heard their sometimes borderline hardiness cited as a reason for why they are unlikely to become naturalized or invasive in the Pacific Northwest. *Rhododendron ponticum* is a related and interesting example of a plant in which repeated purposeful introductions and hybridization has been a stimulus for the evolution of invasiveness in the species outside of its native range of Iberia (Ellstrand & Schierenbeck 2000, Dehnen-Schmutz & Williamson 2006). *Rhododendron ponticum* is the most expensive alien plant conservation problem in both Britain and Ireland and a 2017 article by *The Guardian* referred to the plant as a "spectacular thug" (Simons 2017). It was initially introduced in the eighteenth century and it was described as unreliably hardy (a saying all too familiar in regards to hardy *Eucalyptus*) (Dehnen-Schmutz & Williamson 2006). Propagule pressure is described as one of the key variables to explain biological invasions as populations and introductions increase: "With increasing propagule pressure there is an increasing probability of species establishing. Propagule pressure depends generally on human activity and so is a socio-economic and historical variable" (Dehnen-Schmutz & Williamson 2006). In exploring how a not fully hardy plant species became one of the most troublesome invasive plant species in Britain and Ireland, the authors explain that these *Rhododenron ponticum* populations are genetically, ecologically and generally morphologically distinct from other populations, with their ancestry being composed of mainly *R. ponticum* from the Iberian peninsula and of minor contributions from *R. maximum*, *R. catawbiense* and other *Rhodondendron* species resulting from the hybridization work of

persistent horticulturists intent on improving the hardiness of *R. ponticum* (Dehnen-Schmutz & Williamson 2006). The "ease of propagation" that accompanied *Rhododendron ponticum* and excited seventeenth and eighteenth century plant collectors and gardeners in the British Isles is in many ways quite similar to the "ease of propagation" that incited and enabled 19th century "euc boosters" to thoroughly transform the landscapes of California with the seeds of *Eucalyptus globulus* and other early introductions.

The attention given here to *Rhododenron ponticum* and its history as not a fully hardy plant, that, through selection and hybridization for hardiness, has become damaging to a region by its purposeful and repeated introductions is in no way meant to distract from the genus *Eucalyptus*, but rather to illustrate the human dimension of non-native plant introductions (Dehnen-Schmutz & Williamson 2006). Dehnen-Schmutz and Williamson say that "while it is often possible to explain invasions, 'explanation is not prediction.' We hope that these considerations will bear on other cases and may even be a step towards reliable prediction" (Dehnen-Schmutz & Williamson 2006).

It is also worth considering the latter part of Grimshaw and Bayton's statement regarding the increase of hardy eucalypts included in *New Trees*: "…the steadily rising temperatures being experienced worldwide have given just sufficient leeway and encouragement for devotees to experiment ever more widely" (Grimshaw & Bayton 2009). I earlier stated that the present success with the growing of eucalypts in Oregon, Washington and British Columbia cannot be attributed solely to more ameliorable climatic conditions, but the reality is that a changing climate will have impacts on the plants that inhabit our gardens, landscapes and natural areas in the future. In 2012 the USDA unveiled its updated Plant Hardiness Zone Map (updating a useful tool for gardeners and researchers for the first time since 1990 with greater accuracy and detail) and many regions shifted one 5-degree Fahrenheit half-zone warmer

than they had previously been designated as throughout much of the United States (Kaplan 2012). With this unveiling, Seattle's hardiness zone designation shifted from USDA Zone 8a (10°F to 15°F) to Zone 8b (15°F to 20°F). The USDA Plant Hardiness Zone Map designations:

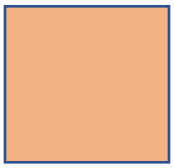
"…represent the average annual extreme minimum temperatures at a given location during a particular time period. They do not reflect the coldest it has ever been or ever will be at a specific location, but simply the average lowest winter temperature for the location over a specified time. Low temperature during the winter is a crucial factor in the survival of plants at specific locations." (Kaplan 2012)

Projections based on analysis by the National Oceanic and Atmospheric Administration (NOAA) reveal that hardiness zones "are creeping north systemically" to higher latitudes and elevations (Popovich 2019). Predictive climate maps show that from 2010 to 2040 the USDA Zone 8 region of Western Washington will expand to include a much larger area and that by 2040 Seattle's hardiness zone designation will fall within USDA Zone 9 (20°F to 30°F) (Popovich 2019). Cider gums and Snow gums are the hardiest eucalypts in the Northwest and their success has long been documented but with changing climate zones the palette of *Eucalyptus* suitably hardy for gardens and landscapes of the Pacific Northwest could perhaps double. In response to the trend of warming winter temperatures, Dr. Russel Vose of NOAA, says Warming minimum temperatures "might mean I can safely grow things now that I didn't grow before, but by extension there may be some species that start to naturally grow where I live that didn't used to grow there…"(Popovich 2019). With the recognition that climate change will have impacts on our landscapes, gardens and the plants that inhabit them, I believe we must lend a critical eye to the expanding role that *Eucalyptus* might inhabit in Seattle and the greater Pacific Northwest. Eucalyptus have been cultivated here for more eighty years, more than one-hundred species have been trialed, and mail order nurseries make the availability of various species more immediate than ever. Many species are hardy, many more will find success and I don't believe that we can continue to approach eucalypts as ephemeral features of the landscape so that we don't have to be thoughtful about the where, how and why of *Eucalyptus* cultivation in Seattle. As Seattle sees the expansion of the

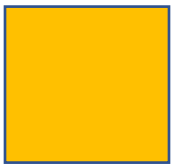
Washington Park Arboretum's Australian Forest and climate change necessitates a thoughtful confrontation with the realities of our summer-dry climate, we are at a stage in the history of Eucalyptus cultivation in the Pacific Northwest to begin making critical judgments about what species might play a role in the future of Seattle's landscapes and which are to be rejected.

With this project I have sought to provide a synthesis of cultivation history in California, the Seattle area, and the greater Pacific Northwest. In a *Pacific Horticulture* article, "Small Eucalyptus for Western Gardens" (2009), Dr. Matt Ritter says, "The idea that these trees are all massive, fire-prone exotics—aggressive growers that overwhelm native plants and lower the water table—has made them so unpopular that they have almost completely disappeared in recent years from nurseries in the West." It is certain that the beauty and utility of the incredibly diverse *Eucalyptus* genus have much to offer as garden plantings and they "deserve an opportunity to enhance the gardens, parks, and public landscapes of the Western United States" (Ritter 2009). I do not seek to place criticism upon the genus *Eucalyptus*, but rather to elucidate the critical role that human activity has upon the too-often unfortunate colonization of non-native plant species. The work of this project acknowledges the tensions that can exist between horticulture and ecology, the pursuits of which I know and inhabit as a gardener and a student of ecology. This project has helped me to find a balance in the sometimes-conflicting duality of these two roles through the active and conscious pursuit of ecologically informed environmental horticulture. This guide and history give critical thought into the cultivation of the genus in the Pacific Northwest and acts as a regional resource to aid in the proper identification of species. It is my hope that this guide can serve as a useful resource to enable enthusiasts, horticulturists, hobbyists, nurseries, land managers and gardeners to make informed decisions about the role of Eucalyptus in the parks, gardens, campuses and public spaces of Seattle and the greater Pacific Northwest.

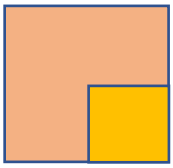
The included species descriptions have been labeled with a colored-marker that corresponds to the categorizations from Table 4. A description of the colored square is described below:



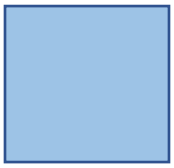
Potential to Naturalize in the Northwest: This grading is based upon the research of naturalized eucalypts in California (Ritter & Yost 2009), evidence for naturalization or invasion in other regions, and anecdotal evidence with observations of seedling establishment in the Seattle area gardens. Prediction of biological invasion has been described as "intrinsically unpredictable" (Williamson 1999). This is meant to give some pause to the user of this guide and allow them to consider the specific situation that their *Eucalyptus* will be placed in (urban or rural setting? A public space managed by garden staff? Close proximity to natural areas?). The species with this marker have displayed a capacity for ecological success as non-natives in other regions where they are cultivated, have been marked for expected naturalization in California or have naturalized in California (Ritter & Yost 2009), and anecdotal evidence and observation of seedling establishment exists within the Seattle area.



The species with this marker fall under the *Maideneria* section of the *Symphyomyrtus* subgenus. There is some research to suggest that the degree of spontaneous reproduction in different species may correlate with the taxonomic subgenus and section to which they belong, and therefore future invasions could possibly be predicted for closely related yet uncommonly planted species (Ritter & Yost 2009). Observation of seedling establishment has not been observed during the course of this project, nor has literature review described seedling establishment in the Pacific Northwest. This is not a hard and fast rule, there are exceptions showing that certain species closely related to naturalized non-native eucalypts exhibit no inclination toward an invasive nature. This is meant to draw attention to the reality that a large majority of our commonly cultivated eucalypts fall within the *Maideneria* section of the *Symphyomyrtus* subgenus, a subject that is worthy of further study.



This symbol signifies that the labeled species is marked as having "potential to naturalize in the northwest" and that its taxonomic grouping is within the *Maideneria* section of the *Symphyomyrtus* subgenus.



These species are exceptions to the taxonomic grouping that so many of our "hardy" eucalypts fall into. The results of my research, as limited in time and scope as it may be, has revealed no evidence to suggest that these species exhibit naturalization potential as cultivated *Eucalyptus* in the Pacific Northwest. Further observation, trials and study may reveal more about specific species capacity for ecological success as non-native plant introductions in Seattle and the greater Pacific Northwest.

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A FIELD GUIDE TO CULTIVATED EUCALYPTUS OF THE PACIFIC NORTHWEST

BY ROBERT WRENCH

Identification and Taxonomy

The genus *Eucalyptus* is a large and diverse member of the Myrtaceae family. Like any specific group of plants, such as sedges or grasses, a distinctive vocabulary is necessary to define those traits that distinguish one species from another. There are many published works that aid in the identification of this notoriously difficult-to-identify genus of plants (Grimshaw & Bayton 2009, Euclid CSIRO). Known provenance of the species is often important in many *Eucalyptus* guides. The most useful guide to identification of cultivated *Eucalyptus* species is one that relies upon morphological characteristics, as the specific provenance is not known and is as such of little import (Ritter 2014, Euclid CSIRO). A *Field Guide to Cultivated Eucalypts and How to Identify Them* (Ritter 2014) is the most useful starting point when working towards the identification of cultivated eucalypts because it "relies entirely upon morphological characteristics and prioritizes non reproductive structures that are perennially present" (Ritter 2014). An introduction to the characteristics that will aid in the identification of cultivated *Eucalyptus* species will be useful in conjunction with the field guide pages.

When inspecting a *Eucalyptus* specimen for identification it is important to observe the whole of the plant, taking note of the growth habit, bark, juvenile and adult leaves, flower buds and fruit (More & Johnson 2004, Euclid CSIRO). The process of identification starts with a broad assessment of the plant and ends with the detailed examination of the characteristics that can be said to have the most reliability (Euclid CSIRO).

It is helpful to consider the relative value of characters as follows (Brooker 1981):

Absolute – presence or absence of an operculum scar (**S** – Visible scar, Eucalyptus dalrympleana)

High – bud numbers (**S**- Three buds of E. dalrympleana)
opposite juvenile leaves
connate juvenile leaves
parrallel leaf veination (**N** – parallel leaf veination, E. pauciflora)

Medium – dimensions, shape and sculpture of any organ (**R** - "Barrel shapped fruit, E. glaucescens)
prominently square stem of seedlings

Low – habit (**A** – Mult-stemmed "mallee" habit, **J** – Weeping habit of E. lacrimans)
bark color and type (**E** – smooth bark with peeling, decorticated strips in the upper canopy, E. nobilis)

Habit

The cultivated eucalypts of the Pacific Northwest can be grouped into trees or mallees (multi-stemmed trees), but it is often the case that what may grow as a single-stemmed tree in one garden can freeze or be cut back, only to resprout as a "mallee" (**S**). The act of coppicing or pollarding trees in order to perpetuate the juvenile foliage of certain eucalypts may make the certainty of identification to species more difficult for some plants than for others. The presence of a persistent lignotuber may be clearly visible and for other eucalypts a lignotuber may be "outgrown" as it reaches reproductive maturity.

Bark

Ironbark, Stringybark, Tesselated, Box and Ribbon are terms for groupings of eucalypts generally seperated by the appearance of their bark. The yearly growth of living bark results in shedding bark of many eucalypts and smooth bark, the shedding of ribbons (**E**), the persistence of rough bark to the base of the tree or to the branches (**B**), and the glaucous bloom of the branches or branchlets (**T**) are among the many important bark characteristics to observe. The bark is often a striking feature of hardy eucalypts when paired with the coniferous backdrop of many northwest gardens.

Leaves

The leaf stages of eucalypts are termed seedlings, juvenile (**L**), intermediate (**N**) and adult (**O**). As eucalypts develop their growth stages are characterized by changes in leaf development and morphology. It is the juvenile leaves of many eucalypts that are often on display in florist arrangements (**K**) and are therefore quite familiar to even the most casual observer. As a whole, adult leaf shape is a character of low reliability for identification, but juvenile leaf shape, attachment and arrangement can be a useful characteristic (Euclid CSIRO). Juvenile leaves can be found on seedlings, young plants, as regenerative growth from cut stems or as shoots from the lignotuber of the tree. Adult leaf shape is typically lanceolate or falcate (**O**) and flowering usually does not occur until adult foliage has matured, but the persistence of juvenile leaves with reproductive structures is a distinctive feature with some hardy eucalypts in our region, notably the florist favorites *Eucalyptus perriniana* (***O***), *E. pulverulenta (**W**)* and *E. cinerea*. In adult leaves, leaf veination, reticulation and oil gland categorization can be useful to determine groups of eucalypts, e.g., the parallel leaf veination of the Snow Gum group (*E. pauciflora)* or the Black Sallee (*E. Stellulata*) or the "mostly island" oil glands of the Black Gum (*E. aggregata*) when compared to the closely related Swamp Peppermint (*E. rodwayi*).

Inflorescences: Buds,flowers and fruit

The infloresence arrangement of most eucalypts are as axillary unbranched umbels with flower buds in groups of 1, 3, 7, 11 or more (**Q**, **S**, **T**). It is useful to note that the bud number is always an odd number and inflorescences found with even numbers have aborted buds. In this case, an examination of the peduncle will bear a scar revealing the loss of the pedicel to which the bud is attached. Some infloresence arrangments are terminal in highly branched and many-budded panicles, but no such species are included in this guide. The peduncle (the main stalk of the infloresence) can be round, elliptical or flattened and strap-like.

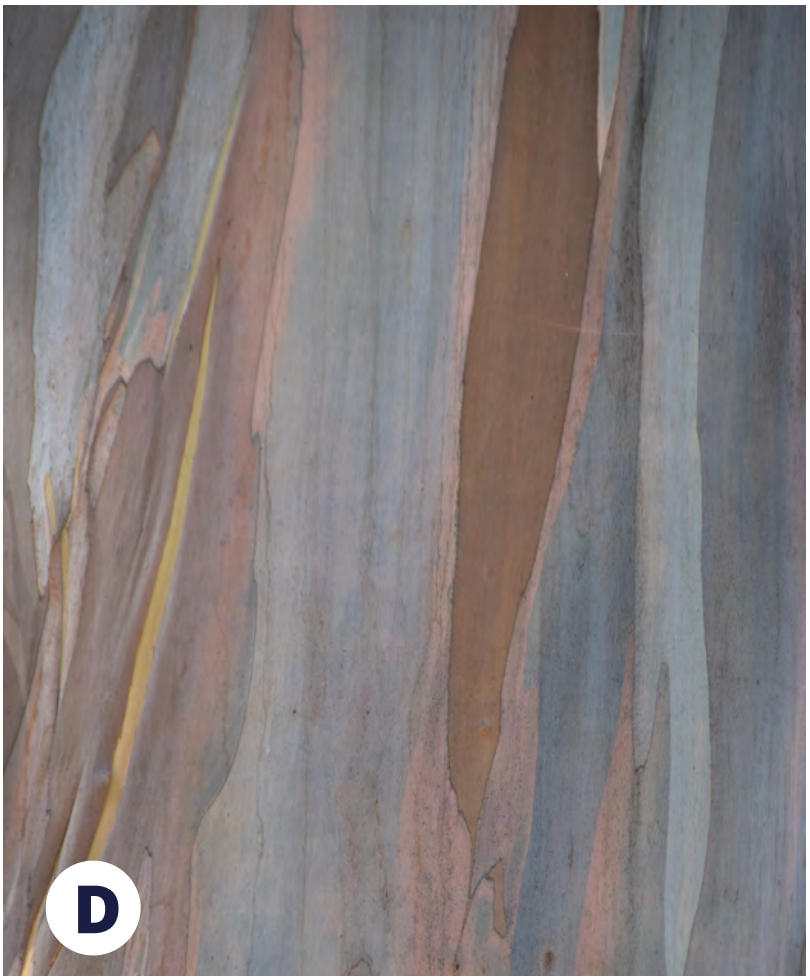
The flower buds have two operculum (sometimes referred to as calyptra; Grisham & Bayton) from the united sepals (**U** - outer operculum) and united petals (**V** - inner operculum) of the flower. It may be helpful to observe the familiar flower structure of the California Poppy to illustrate the modified sepal structure that is a calyptra (**X**) or the outer operculum. In many of the commonly cultivated eucalypts suitable for gardens of the martime Northwest, the outer operculum often sheds in early development and leaves a ring-shaped operculum scar, but there are those with only one operculum and therefore no scar will be present. The expanding flower stamens force the inner operculum off the flower bud as it develops (**U**,**V**,**W**) and the hypanthium ring to which to the stamens are attached is visible on the fruit or "gum-nut." The operculum shape is variable, but it is an important feature of the bud morphology. The highly modified perianth leaves the "showy" floral features composed of numerous stamens. The arrangement of the stamens and their possession of anthers can be distinctive of certain groups or species of *Eucalyptus*.

The fruits (**R –** 3 valves) of eucalypts are thick-walled, woody capsules that do not decompose quickly and can often be found in leaf litter and debris at the base of the tree. The capsule splits open (the roof of the ovary radially deshices) into three, four or five valves at the top of the fruit and the number of valves corresponds with the number of ovary chambers. The valves may be sunken below the rim of the fruit (enclosed), at or near rim level, or exserted beyond the rim. The hypanthium disc is where the stamens were attached during flowering. A flat or ascending disc will produce a thick-rimmed fruit and a descending disc will appear thin and sharp. The mature fruit can be pedicellate or sessile and can be categorized by their range of shapes, from urceolate to cupular.


A


B


C


D


E


F

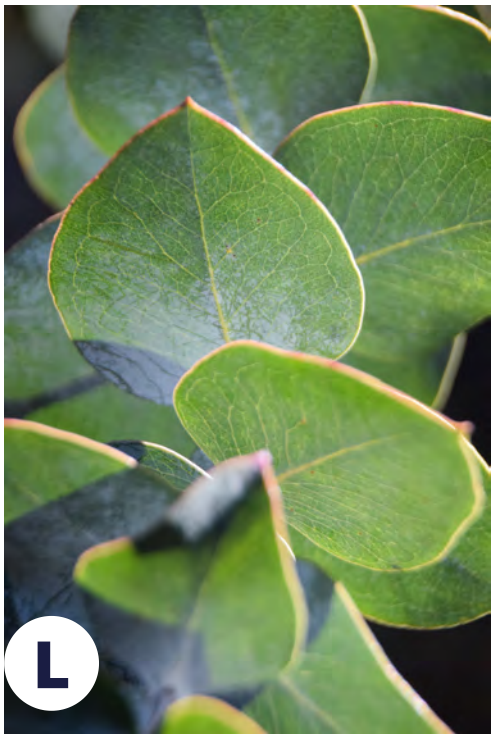

G


H


I


J


K


L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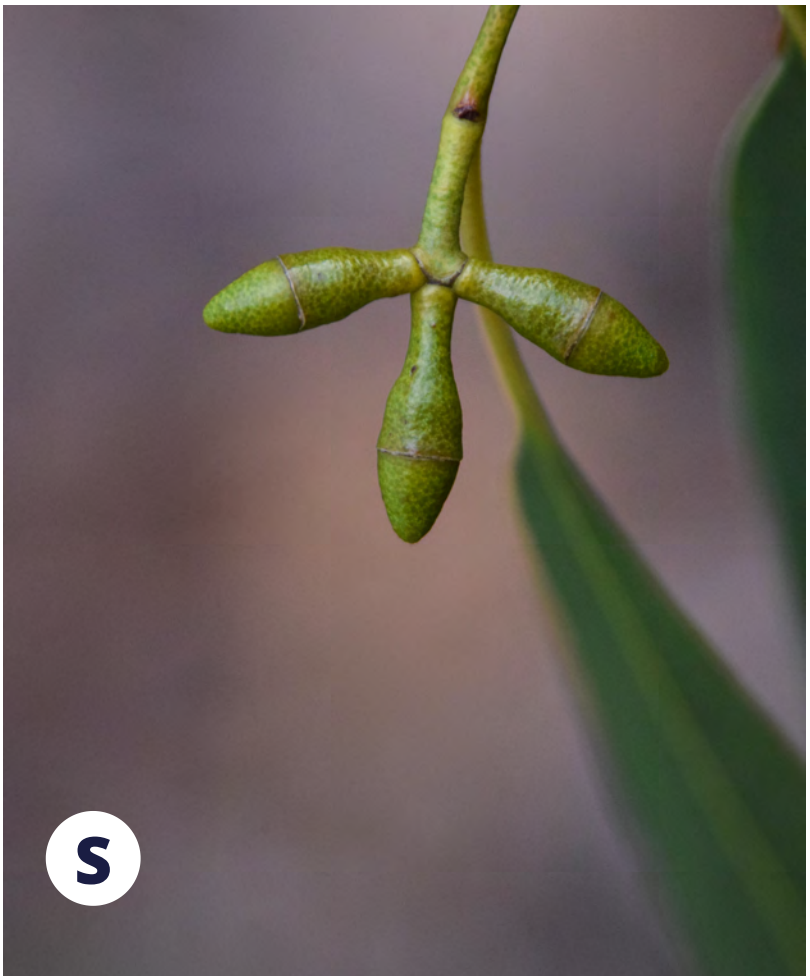
Q


R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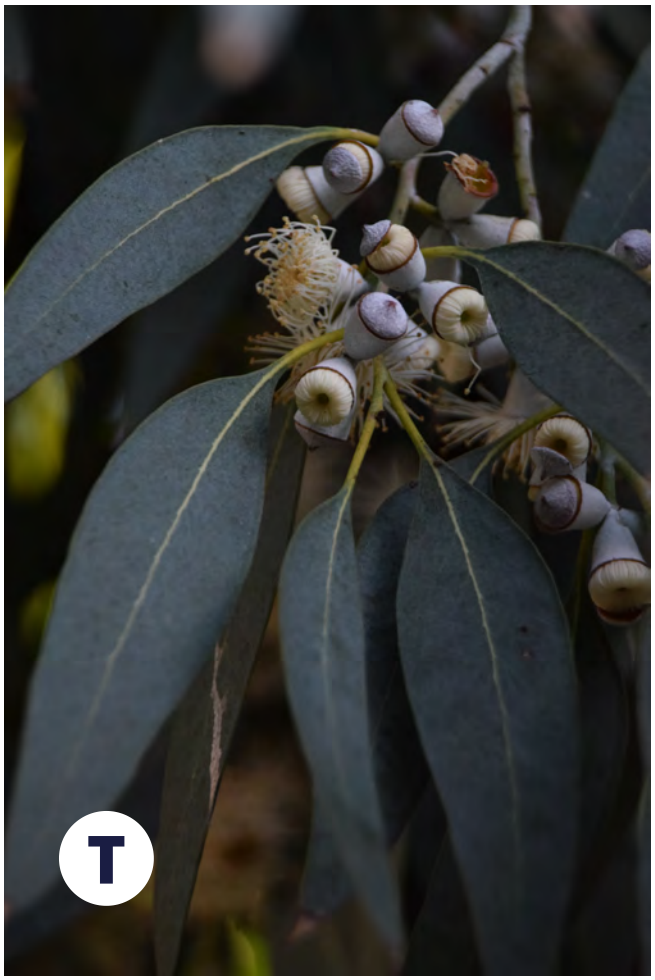
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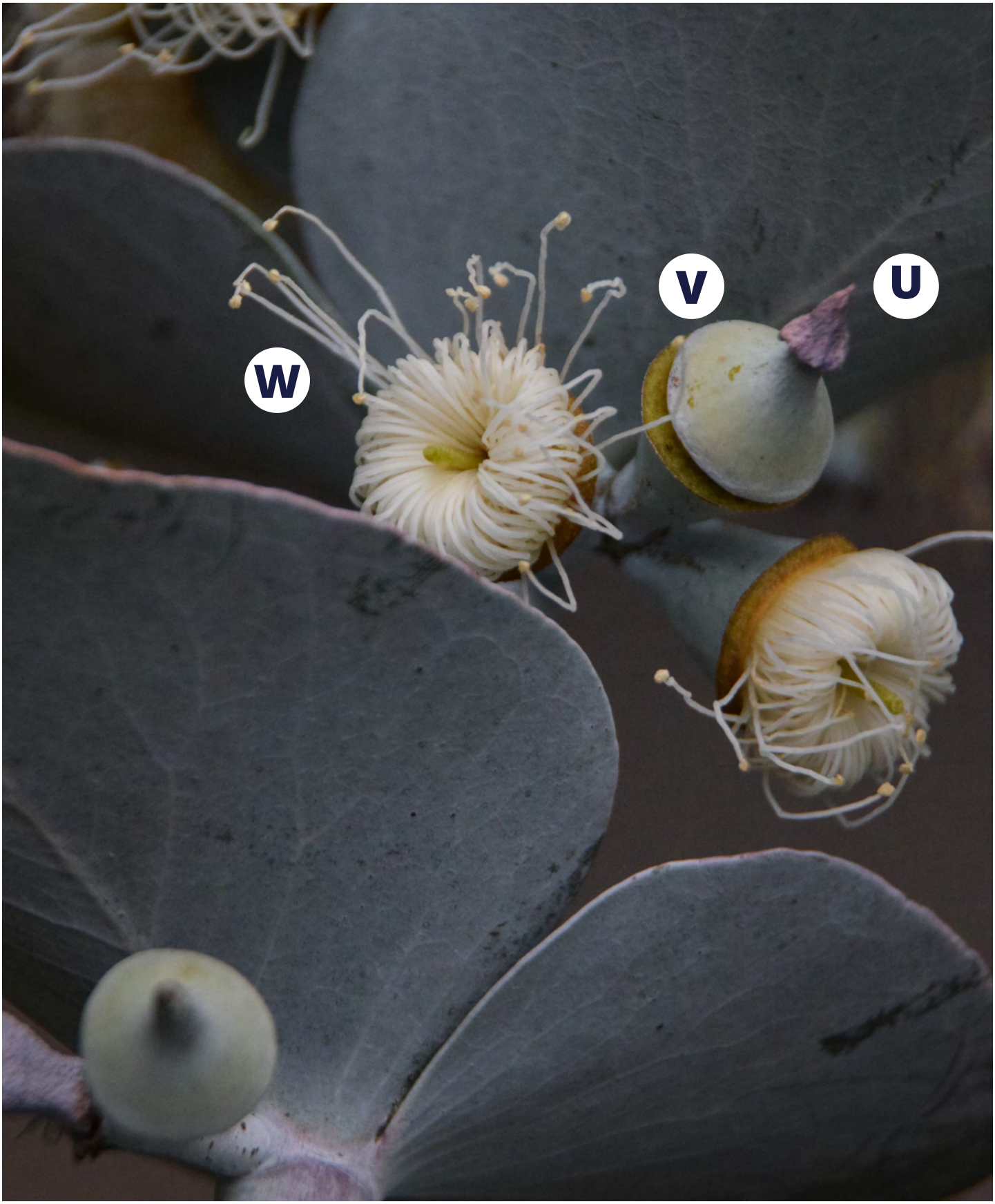

W
V
U


X
Y

EUCALYPTUS IDENTIFICATION KEY

Group 1: Trees or Shrubs with persistent juvenile leaves present

Group 2: Flower buds solitary or in groups of 3

Group 3: Flower buds in groups of 7 or more

Group 1

1a. Juvenile leaves connate, orbicular, fused around stems ..... *E. perriniana* (Spinning Gum)
1b. Juvenile leaves free 2
2a. Leaves narrow-lanceolate to lanceolate, glossy, green; bark mostly smooth ..... *E. viminalis* (Manna Gum)
2b. Leaves ovate to orbicular, green or glaucous 3
3a. Juvenile leaves green; trees or mallees 4
4a. Leaves ovate to elliptical, dull, pale to blue-green, Bark smooth, white ..... *E. dalrympleana* (Broad-leaved Ribbon Gum)
4b. Leaves glossy, green 5
5a. Juvenile leaves ovate to orbicular, Glossy, crenulate, thick ..... *E. subcrenulata* (Alpine Yellow Gum)
5b. Leaves shortly petiolate, ovate to Spathulate, emarginate ..... *E. camphora* (Broad-leaved Sallee)
3b. Juvenile leaves glaucous or grey-green; shrubs, mallees or trees 6
6a. Bark rough, fibrous, red to brown, Leaves broadly elliptical to ovate 7
7a. Buds in groups of 3 ..... *E. cinerea* (Argyle Apple)
7b. Buds sessile, in groups of 7 or more ..... *E. neglecta* (Omeo Gum)
6b. Bark smooth, at times flaking 8
8a. Shrub to small, rangy tree with persistent juvenile glaucous foliage orbicular to ovate, stems round in cross section ..... *E. pulverulenta* (Silver Mountain Gum)
8b. Small to tall trees* (pale shoots from coppicing/pollarding may be present, juvenile leaves orbicular) 9
9a. Juvenile leaves crenulate or entire, orbicular to ovate, leaves to 4.5 cm long and 4 cm wide, buds and fruits pedicellate 10
10a. (If present) Buds and fruit, glaucous, peduncles shorter than buds, to 0.9 cm, erect ..... *E. gunnii* (Cider Gum)
10b. (If present) Buds and fruit green, not glaucous Peduncles to 0.7 cm ..... *E. archeri* (Alpine Cider Gum)
9b. Juvenile leaves crenulate or entire, orbicular and often broader than long, leaves to 7 cm long and 8 cm wide, buds and fruit sessile or nearly so, usually glaucous ..... *E. glaucescens* (Tingiringi Gum)

*** A note on identification by juvenile leaves**: A brief comparison of juvenile leaf material from *Eucalyptus glaucescens*, *E. gunnii* and *E. archeri* will reveal that crenulate and entire juvenile leaves may be found on the same plant, or that emarginate or acuminate tips can be found on the same plant as well. Brooker (1983) splits *Eucalyptus gunnii/archeri* from *E. glaucescens* by saying that the juvenile leaves of *E. gunnii/archeri* are "crenulate," whereas the leaves of *E. glaucescens* are "entire." *Eucalyptus gunnii* juvenile leaves in Ritter (2013) are described as "entire." These are opposite statements and absolute identification of the species can not be made without comparison of the fruits, which may not be present on an immature specimen.

EUCALYPTUS IDENTIFICATION KEY

Group 2: Flower buds solitary or in groups of 3

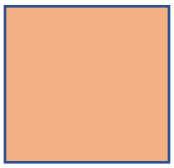
1a. Buds single, glaucous, warty ..... *E. globulus* (Tasmanian Blue Gum)
1b. Buds in 3s 2
2a. Operculum flattened, distinctly ribbed, warty, scar absent .....
..... *E. coccifera* (Mt. Wellington Peppermint)
2b. Shrub or small to tall tree, operculum smooth or warty 3
3a. Valves of mature fruit exserted, fruit disk raised,
at or near rim level to descending..... 4
4a. Buds, fruit and juvenile leaves, glaucous to very glaucous
..... 5
5a. Small to tall tree, foliage maturing to
adult leaf shape, fruit disk raised ..... *E. rubida* (Candlebark Gum)
5b. Sprawling, rangy shrub or mallee,
buds sessile or nearly so,
persistent juvenile foliage..... 6
6a. Bark smooth, shedding,
branchlets glaucous ..... *E. pulverulenta* (Silver-leaved Mountain Gum)
6b. Bark rough, furrowed,
retained on trunk to upper limbs,
often coppiced or rangy, can become
tree-like if well sited..... *E. cinerea* (Argyle Apple)
4b. Buds and fruits green (not waxy) 7
7a. Fruit disk level or descending,
juvenile leaves ovate to orbicular,
glossy, crenulate, thick..... *E. subcrenulata* (Alpine Yellow Gum)
7b. Fruit disk raised 8
8a. Juvenile leaves lanceolate, glossy, green ..... *E. viminalis* (Manna Gum)
8b. Juvenile leaves ovate to elliptical,
dull, green to blue-green ..... *E. dalrympleana* (Broad-leaved Ribbon Gum)
3b. Valves of mature fruit or level with rim;
fruit disk descending or flat..... 9
9a. Buds and fruits sessile or pedicellate to 0.2 cm or less 10
10a. Juvenile leaves connate; fruit 0.5-0.8 cm wide..... *E. perriniana* (Spinning Gum)
10b. Juvenile leaves free, fruit 0.8-1.2 cm wide ..... *E. glaucescens* (Tingiringi Gum)
9b. Buds and fruits pedicellate..... 11
11a. Buds and fruit not glaucous,
Green, often only central bud pedicellate ..... *E. archeri* (Alpine Cider Gum)
11b. Buds glaucous to slightly glaucous,
buds weathering to green..... *E. gunnii* (Cider Gum)

EUCALYPTUS IDENTIFICATION KEY

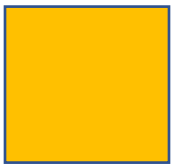
Group 3: Flower buds in groups of 7 or more

1a. Buds in groups of more than 7 (sometimes only 7 present) ... 2
2a. Adult leaves with parallel leaf venation or nearly parallel to the midrib ... 3
3a. Buds in stellate clusters of many more than 7, operculum sharply conical ... 4
4a. Leaves prominently 3-veined, fusiform, scar absent ... ***E. stellulata*** (Black Sallee)
4b. Leaves with side-veins acute and nearly parallel to the midrib ... ***E. mitchelliana*** (Mount Buffalo Gum)
3b. Buds in loose clusters of 7 or more, angled or not, operculum hemispherical to shortly conical ... 5
5a. Buds distinctly angled, often glaucous ... ***E. pauciflora ssp. debeuzevillei*** (Jounama Snow Gum)
5b. Buds without angles, clavate ... 6
6a. Tree habit distinctly weeping, with pendulous branches and branchlets ... ***E. lacrimans*** (Weeping Snow Gum)
6b. Habit not as above, mallee habit to single-trunked tree ... 7
7a. Adult leaves to 20 cm long, sparse on branchlets ... ***E. pauciflora ssp. pauciflora*** (White Sallee)
7b. Adult leaves, broad-lanceolate, often uncinate, to 10 cm long, crowded along branchlets ... ***E. pauciflora ssp. niphophila*** (Alpine Snow Gum)
2b. Adult leaves with distinct midrib and side veins at an angle to midrib ... 8
8a. Crown wholly of or with many opposite glaucous juvenile leaves, leaves broadly elliptical, bark rough, buds sessile ... ***E. neglecta*** (Omeo Gum)
8b. Crown of mostly adult leaves; buds and fruit green or glaucous ... 9
9a. Operculum distinctly beaked, green to yellow, smooth, scar present, ... ***E. camaldulensis*** (River Red Gum)
9b. Mature buds warty ... 10
10a. Adult leaves thick, glossy, veins obscure, held more or less erect on branchlets, operculum rounded to flattened, scar absent ... ***E. kybeanensis*** (Kybean Mallee Ash)
10b. Operculum flattened, distinctly warty, scar absent leaves often prominently uncinate ... ***E. coccifera*** (Mt. Wellington Peppermint)
1b. Buds in groups of 7 (sometime more), side veins angled to midrib, not as above ... 11
11a. Operculum flattened, distinctly ribbed, warty, scar absent, adult leaves uncinate ... ***E. coccifera*** (Mt. Wellington Peppermint)
11b. Operculum hemispherical to conical, smooth to wrinkled, not conspicuously warty, adult leaves green to blue-green ... 12
12a. Bark rough, fibrous, rough to the smallest branches or not ... 13
13a. Bark rough, red-brown, fibrous, furrowed, disk level to raised, valves slightly exserted, adult leaves dull green to blue-green ... ***E. nicholii*** (Willow Peppermint)
13b. Bark rough on trunk and larger branches, fibrous (box-type), crumbling on outer layer, valves near rim level, adult leaves glossy, green ... ***E. rodwayi*** (Swamp Peppermint)
12b. Bark smooth, peeling in ribbons, rough at the base or not ... 14
14a. Juvenile leaves persistent on mature tree, often opposite and sessile, or sub-opposite and shortly petiolate ... ***E. parvula*** (Small-leaved Gum)
14b. Leaves on mature tree alternate, pendulous ... 15
15a. Adult leaves to 30 cm, lanceolate to falcate, juvenile leaves opposite and sessile, ovate, operculum conical ... ***E. nitens*** (Shining Gum)
15b. Juvenile leaves usually emarginate, leave petiolate, elliptical to ovate ... ***E. camphora*** (Swamp Gum)

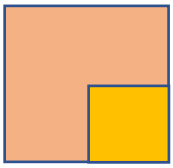
The included species descriptions have been labeled with a colored-marker that corresponds to the categorizations from Table 4. A description of the colored square is described below:



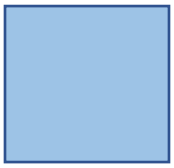
Potential to Naturalize in the Northwest: This grading is based upon the research of naturalized eucalypts in California (Ritter & Yost 2009), evidence for naturalization or invasion in other regions, and anecdotal evidence with observations of seedling establishment in the Seattle area gardens. Prediction of biological invasion has been described as "intrinsically unpredictable" (Williamson 1999). This is meant to give some pause to the user of this guide and allow them to consider the specific situation that their *Eucalyptus* will be placed in (urban or rural setting? A public space managed by garden staff? Close proximity to natural areas?). The species with this marker have displayed a capacity for ecological success as non-natives in other regions where they are cultivated, have been marked for expected naturalization in California or have naturalized in California (Ritter & Yost 2009), and anecdotal evidence and observation of seedling establishment exists within the Seattle area.



The species with this marker fall under the *Maideneria* section of the *Symphyomyrtus* subgenus. There is some research to suggest that the degree of spontaneous reproduction in different species may correlate with the taxonomic subgenus and section to which they belong, and therefore future invasions could possibly be predicted for closely related yet uncommonly planted species (Ritter & Yost 2009). Observation of seedling establishment has not been observed during the course of this project, nor has literature review described seedling establishment in the Pacific Northwest. This is not a hard and fast rule, there are exceptions showing that certain species closely related to naturalized non-native eucalypts exhibit no inclination toward an invasive nature. This is meant to draw attention to the reality that a large majority of our commonly cultivated eucalypts fall within the *Maideneria* section of the *Symphyomyrtus* subgenus, a subject that is worthy of further study.



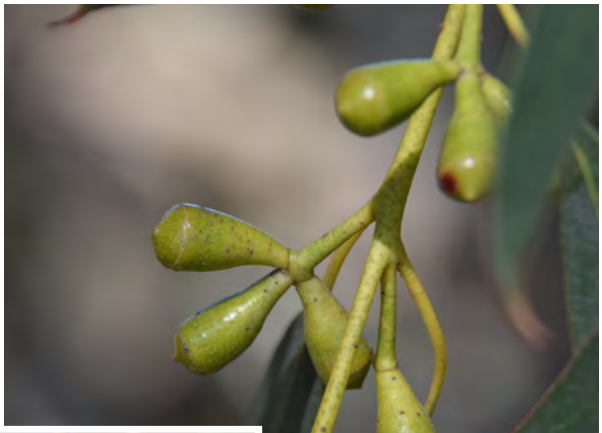
This symbol signifies that the labeled species is marked as having "potential to naturalize in the northwest" and that its taxonomic grouping is within the *Maideneria* section of the *Symphyomyrtus* subgenus.

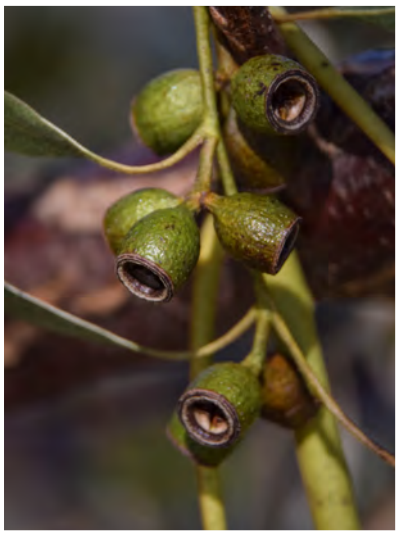


These species are exceptions to the taxonomic grouping that so many of our "hardy" eucalypts fall into. The results of my research, as limited in time and scope as it may be, has revealed no evidence to suggest that these species exhibit naturalization potential as cultivated *Eucalyptus* in the Pacific Northwest. Further observation, trials and study may reveal more about specific species capacity for ecological success as non-native plant introductions in Seattle and the greater Pacific Northwest.

EUCALYPTUS ARCHERI

ALPINE CIDER GUM





DESCRIPTION
A tree or mallee to 12 m and forming a lignotuber

BARK
Smooth bark; greyish, white or brown with peeling strips

LEAVES
Juvenile leaves opposite, sessile and orbicular for at least 25 nodes; Adult leaves alternate, petiolate, lanceolate to elliptical, 4-9 cm long and 0.9-3 cm wide, glossy, green to grey-green, oil glands scattered and intersectional

FRUIT
Sessile, barrel-shaped to obconical, green, disc descending with 3 or 4 valves near rim level or enclosed

INFLORESCENCE
Axillary unbranched, peduncles 0.1-0.7 cm long, buds 3 per umbel, sessile or pedicellate to 0.2 cm (often only central bud pedicellate); mature buds oblong to ovoid, 0.5–0.7 cm long, 0.3–0.4 cm wide, green to yellow-green, operculum conical or slightly beaked, scar present

EUCALYPTUS ARCHERI

ALPINE CIDER GUM

NOTES

Eucalyptus archeri is often recommended for its smaller stature than the closely related, Eucalyptus gunnii. The characteristics that distinguish E. archeri from E. gunni are somewhat obscure at first glance, but the green, non-glaucous buds and fruits are distinctive of the Alpine Cider Gum. This is a very hardy tree and there are a number of mature specimens throughout the Seattle area, many having become quite large specimens. Some older references may refer to the Alpine Cider Gum as a subspecies of Eucalyptus gunnii, but current work recognizes Eucalytpus archeri at the species level.

HARDINESS: ZONE 7B

NATURAL HISTORY

Eucalyptus archeri **is a small tree or mallee endemic to Tasmania, where it grows in poorly-drained alpine sites near rocky outcrops. At lower elevations the "E. gunnii - E. archeri complex" becomes more difficult to differentiate. Eucalyptus archeri is named after William H. Archer (1829-1874), a secretary of the Royal Society of Tasmania. William H. Archer collected botanical specimens from Western Tasmania that would become the type specimen.**

CULTIVATION

In cultivation the Alpine Cider gum can become a large tree and it appears that many in the Seattle area have become quite large. The juvenile foliage is attractive and the tree can be coppiced on a rotation to maintain the orbicular leaves. Seed of this species germinates easily and garden seedlings have been reported in the Seattle area.

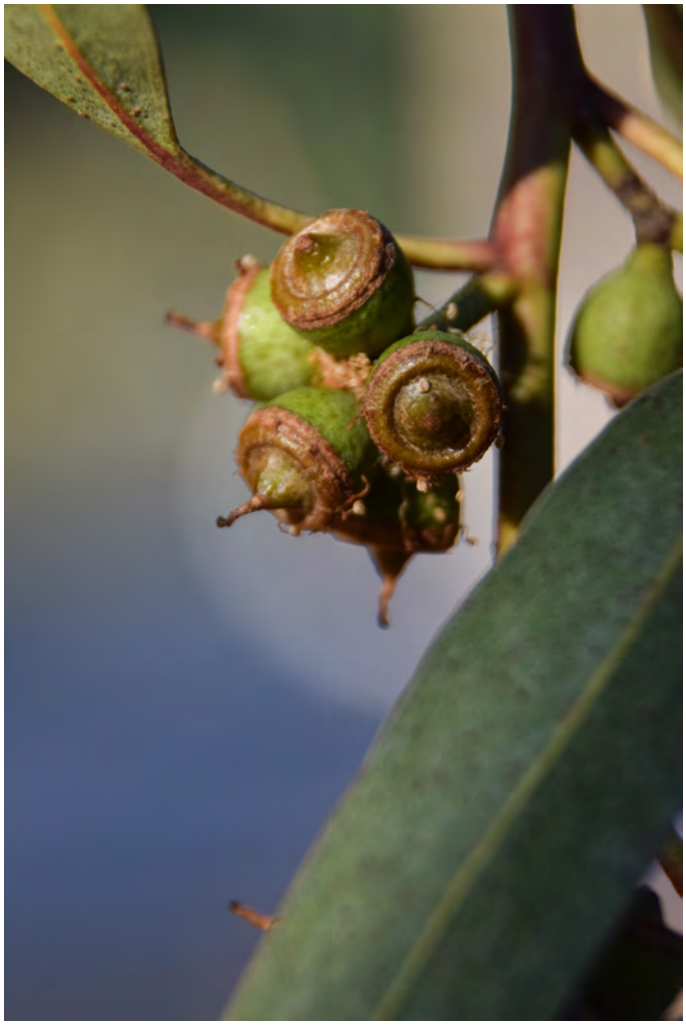
EUCALYPTUS BRIDGESIANA

APPLE BOX

DESCRIPTION
A tree to 25 meters tall, forming a lignotuber

BARK
Rough over whole trunk and larger branches, fibrous, flaking; new bark and young shoots smooth, glaucous

LEAVES
Juvenile leaves opposite, sessile on glaucous stems, becoming shortly petiolate and disjunct, blade cordate, base amplexicaul or lobed, margins crenulate, glaucous; Adult leaves alternate; petiole 1.2-3.5 cm long, blade lanceolate, 12-20 cm long, 1.5-2.5 cm long, glossy, new growth flushing pink



INFLORESCENCE
Axillary, unbranched, peduncles to 1.5 cm long, buds 7 per umbel, pedicels 0.1-0.5 cm long, Mature buds ovoid, scar present, operculum beaked or conical

FRUIT
Pedicellate, rarely sessile, 0-0.3 cm long, hemispherical, disc raised annular, valves 3 to 4, exserted

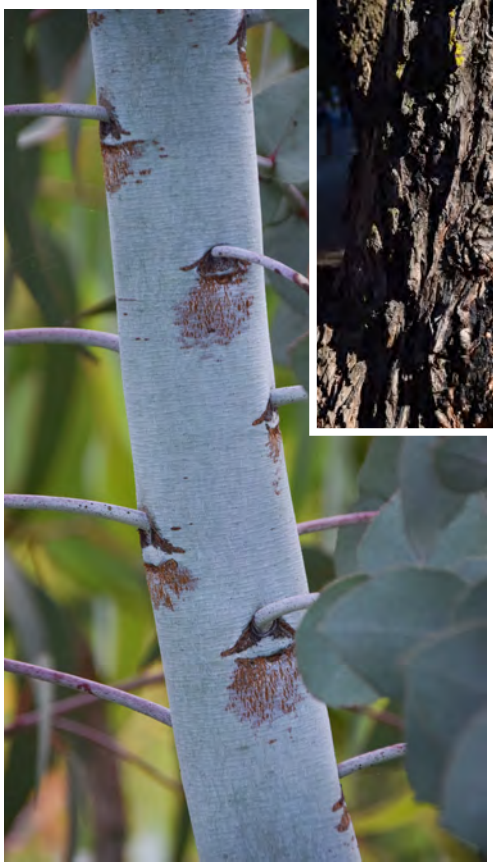
EUCALYPTUS BRIDGESIANA

APPLE BOX

NOTES

The distinctive juvenile foliage and the rough "box" type bark of Eucalyptus bridgesiana is somewhat unique among the hardy Eucalyptus capable of growing in the Pacific Northwest. The Apple Box can be regularly coppiced to encourage the consistent display of its beautiful juvenile foliage. The new shoots of mature leaves emerge pink and fade to blue-green throughout the summer. Mature specimens growing on the Stanford University campus are reminiscent of the wide-spreading canopy of a Black Walnut or Oak tree. The only specimen I have encountered in Seattle is planted at the Carl English Botanic Gardens near the Eucalyptus rodwayi. Eucalyptus bridgesiana is hardy into the low teens.

HARDINESS: ZONE 8A



NATURAL HISTORY

Eucalyptus bridgesiana is a small to medium-sized tree of open grassy woodlands from central and eastern Victoria to the far southeast of Queensland. It is well regarded for its use in honey production. Eucalyptus bridgesiana is named for Frederick Bridges (1840-1904), an education officer in New South Wales.

CULTIVATION

Eucalyptus bridgesiana will grow best in an open sunny exposure. The flowering season of the Apple Box begins in late summer and extends into fall. The Apple Box is capable of growing much larger in cultivation than in its native habitat, but mature specimens will display a broad-spreading and contorted crown if planted in an open setting. This species has been offered for sale by both Forestfarm and The Desert Northwest.

EUCALYPTUS CAMALDULENSIS

RIVER RED GUM

DESCRIPTION

A tree to 45 meters tall, the lignotuber is often absent

BARK

Smooth to small branches, with rough loose basal slabs of bark, smooth bark white to cream with yellow, pink or brown patches

LEAVES

Juvenile leaves always petiolate, opposite for 4 to 7 nodes, becoming alternate, lanceolate; Adult leaves alternate, petiole 0.8-3.3 cm long, blade lanceolate to falcate, 5-30 cm long, 0.7-3.2 cm wide, glossy or dull, green to grey-green, oil glands island

INFLORESCENCE

Axillary unbranched, peduncles 0.5-2.8 cm long, pedicellate buds in groups of 7, 9 or 11, pedicels 0.2-1 cm long; Mature buds ovoid to globular, green to yellow, smooth, scar present, operculum usually prominently beaked

FRUIT

Pedicellate, pedicels 0.3-1.2 cm long, hemispherical, disc raised, convex to almost vertical, valves 3 to 4, strongly exserted

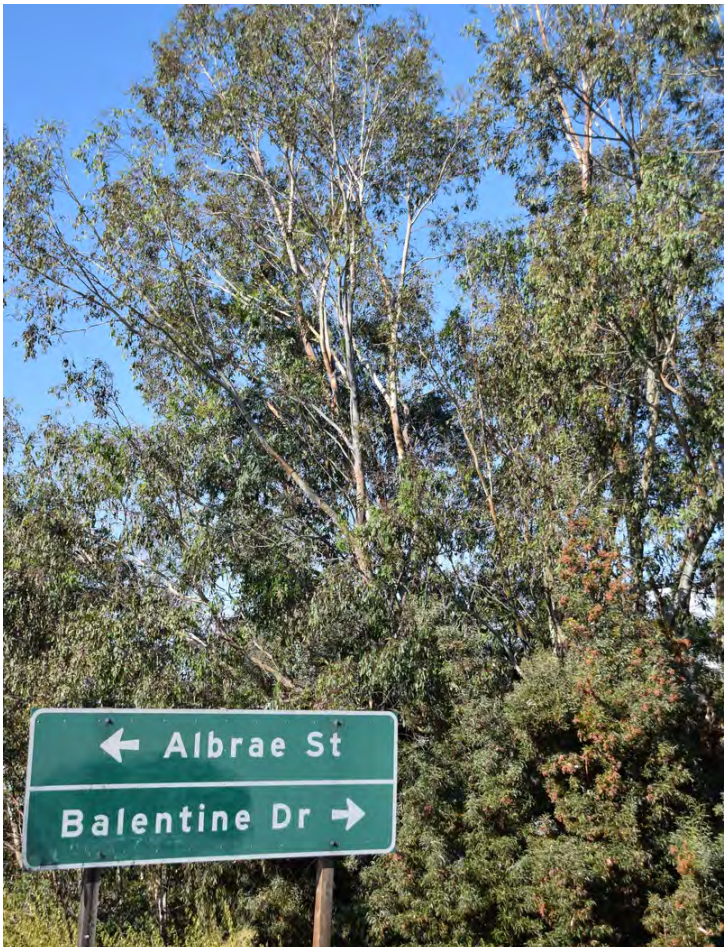
EUCALYPTUS CAMALDULENSIS

RIVER RED GUM

NOTES

The River Red Gum is the most widespread Eucalyptus species in Australia. It occurs in every mainland state where it can be found growing along riparian corridors. It is a highly variable species and seven subspecies have been described and accepted by the Australian Plant Census. The Eucalyptus camaldulensis complex is under revision and more conservative approaches to the variability observed in the River Red Gum recognize three varieties or subspecies (var. camaldulensis, var. obtusa, subsp. simulata). Eucalyptus camaldulensis has been declared "invasive" in California, South Africa, Jamaica, Spain and Hawaii. Its tolerance of extreme conditions make the River Red Gum a common sight along highways in California.

HARDINESS: ZONE 8A



NATURAL HISTORY

The River Red Gum is widespread in Australia and it is a familiar site along inland water courses. Eucalyptus camaldulensis, along with Eucalyptus globulus, is one of the most commonly cultivated Eucalyptus worldwide. In South Africa it is classified as a category 2 invader capable of transforming habitats, colonizing water courses. The species is named after an Italian district, Camalduli, where a tree growing in a private estate in the early 19th century provided the source material for Frederick Dehnhardt's description of the species in 1832.

CULTIVATION

The primary limiting factor to the success of cultivating E. camaldulensis in the Pacific Northwest is more likely to be from a lack of heat than from cold temperatures. The cultivation of Eucalyptus camaldulensis is cannot be advised when considering its history of invasiveness worldwide.

EUCALYPTUS CAMPHORA

BROAD-LEAVED SALLEE

DESCRIPTION

A small to medium-sized tree or mallee forming a lignotuber

BARK

Smooth throughout or partly rough on trunk with age, greyish brown to almost black; branchlets reddish-orange to yellow

LEAVES

Blue-green juvenile leaves petiolate, orbicular to elliptical, leaf apex emarginate; adult leaves broadly ovate to broadly lanceolate, lateral veination distinct, apex rounded or emarginate, petioles 0.5 cm to 2.5 cm long

INFLORESCENCE

Axillary unbranched umbellasters, 7 buds per umbel, mature buds diamond-shaped with conical operculum, operculum scar present; on peduncles 0.4 cm to 1.8 cm long, pedicels 0.2 cm to 0.4 cm

FRUIT

Pedicellate to rarely sessile, obconical shaped, disc raised-convex or level, valves 3 or 4, slightly exserted or near rim level

EUCALYPTUS CAMPHORA

BROAD-LEAVED SALLEE

NOTES

Eucalyptus camphora is known as the Broad-leaved sallee or Mountain Swamp Gum. The Broad-leaved sallee is a small to medium-sized tree of low lying areas in high plains and valleys. The species epithet, *camphora,* refers to the essential oils in the leaves. Eucalyptus camphora is hardy in zone 8 and can form a small tree and it may resprout from the base into zone 7.

HARDINESS: ZONE 8A

NATURAL HISTORY

The Broad-leaved sallee is endemic to south-east Australia, with sporadic distribution from Southern Queensland through New South Wales and Victoria. There are two recognized subspecies of Eucalyptus camphora with some sources describing additional subspecies. Eucalyptus camphora forms part of the ten members of the *Foveolatae* series.

CULTIVATION

Eucalyptus camphora will tolerate clay and poorly drained soils, but it will grow best in an open exposure and will tolerate well-drained soils. The attractive juvenile foliage makes lovely cut foliage and makes this species useful as a coppiced specimen. This species is not commonly seen for sale in this region, though it has been offered for sale by The Desert Northwest in the past. Plants are offered for sale by Southern Eucs, a Georgia mail-order grower of Eucalytpus species.

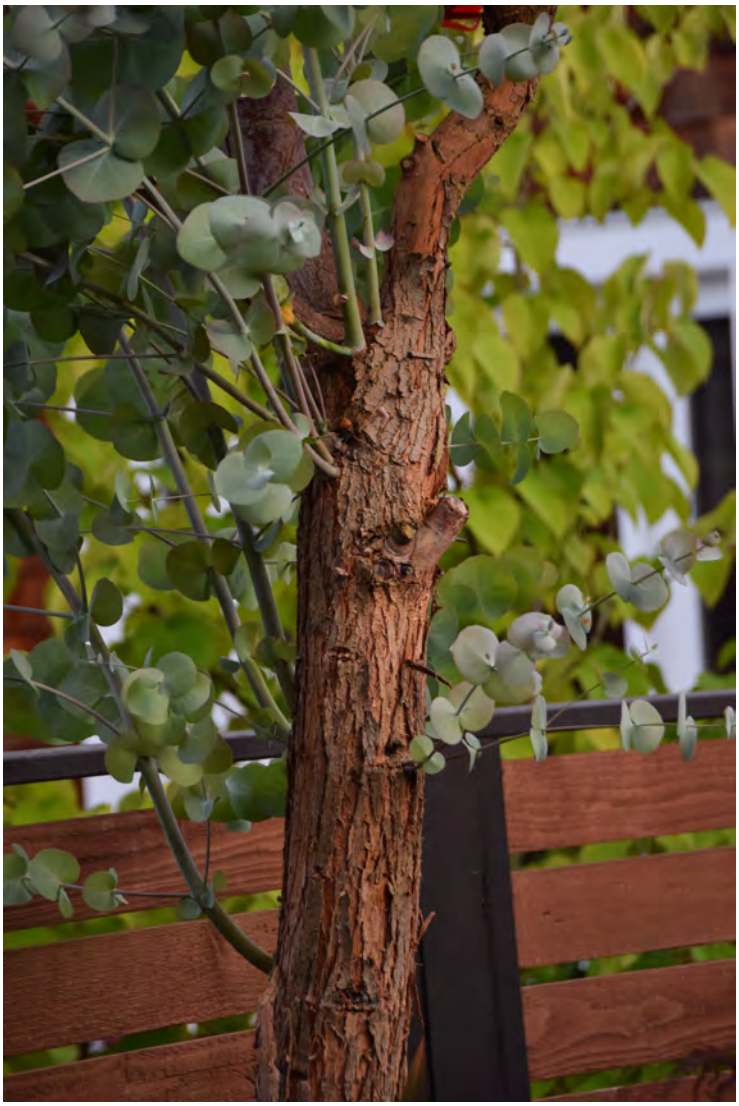
EUCALYPTUS CINEREA

ARGYLE APPLE

DESCRIPTION
A tree to 15 meters tall, forming a lignotuber

BARK
Rough to small branches, thick and fibrous with longitudinal furrows, reddish brown

LEAVES
Juvenile leaves opposite and sessile for many pairs, orbicular to broadly ovate, base amplexicaule, lobed or rounded, apex rounded or pointed, glaucous; Intermediate leaves opposite and shortly petiolate, ovate to lanceolate; The rarely formed adult leaves are alternate, petiolate, lanceolate to falcate, dull, grey-green to glaucous



FRUIT
Sessile or on pedicels to 0.2 cm long, obconical to campanulate, disc raised annular, valves 3 or 4, rim level or slightly exserted

INFLORESCENCE
Axillary unbranched, peduncles 0.2-0.9 cm long, buds 3 per umbel, sessile, central bud sometimes shortly pedicellate; Mature buds diamond shaped, glaucous, scar present, operculum conical

EUCALYPTUS CINEREA

ARGYLE APPLE

NOTES

The Argyle Apple or Silver Dollar Gum, as it is often sold as, is closely related to Eucalyptus pulverulenta. When both species are young they can look similar, but the smooth bark and mallee habit is persistent in Eucalyptus pulverulenta and E. cinerea outgrows both of these features. It is often sold as an annual for use in container displays as the juvenile foliage of the Argyle Apple is striking. The Argyle Apple is regarded as being quite hardy, but mature trees were photographed in Fremont, CA. I only encountered young specimens in the Seattle area, but *Trees of Seattle* records several tree sized Argyle Apples. Seeds or plants sourced from known provenances are more likely to be successful long-term plantings than those purchased from the herb section of the local hardware store.

HARDINESS: ZONE 8B

NATURAL HISTORY

Eucalyptus cinerea is a small tree species with a sporadic distribution across the tablelands of southeast Australia. It rarely forms adult leaves and a mix of juvenile and intermediate foliage is often present on mature trees. The species epithet comes from the latin cinereus, ashen, in reference to the waxy bloom of the leaves, buds and fruit.

CULTIVATION

This species is certainly recognized and grown for its juvenile foliage, but it also makes a beautiful grey headed tree with time. The appearance of a mature Eucalyptus cinerea is quite similar to the silver shimmer of naturalized Russian Olives along the Yakima River. Arthur Lee Jacobson reported that E. cinerea is "...commonly planted here, but not reliably cold-hardy." The Argyle Apple will grow best in a hot southern exposure. It can also be coppiced to maintain the shrub-like display of juvenile foliage, but it may not reliably return after a harsh winter.

EUCALYPTUS COCCIFERA

MT. WELLINGTON PEPPERMINT

DESCRIPTION

A Tree, to 15 m, or mallee to 5 m tall and forming a lignotuber

BARK

Smooth throughout with gray basal slabs, bark decorticating in long strips, revealing cream to yellow and pinkish colorations, weathering to grey

LEAVES

Juvenile leave opposite for many pairs, sessile, elliptical to cordate, blue-green; adult leaves alternate, petioles 0.8 cm to 2.2 cm long, lanceolate, 5-10 cm long and 1-2 cm wide, prominently uncinate, intramarginal vein parrallel to and well-removed from margin

INFLORESCENCE

Axillary unbranched umbels, peduncles 0.4 --1.2 cm long, 3, 7 or 9 shortly pedicellate buds per umbel; buds obovoid, operculum distinctly warty, scar absent

FRUIT

Sessile or shortly pedicellate, obconical, hemispherical or cup-shaped, sometimes glaucous, valves 3 or 4, near rim level or enclosed, disc slightly raised-convex or near rim level

EUCALYPTUS COCCIFERA

MT. WELLINGTON PEPPERMINT

NOTES

Sometimes called the Tasmanian Snow Gum for the similar alpine habitat and contorted habit as that of the true Snow Gum group (E. pauciflora and ssp.). Eucalyptus coccifera is a prized garden tree for its fragrant peppermint-scented foliage, striking bark and twisted branching habit. Seed provenance is important with this species and lower altitude collections have not proven to be hardy in our region. There is a fantastic specimen at the UBC Botanical Garden. A floriferous specimen at the Washington Park Arboretum, while labeled as Eucalyptus coccifera, lacks the conspicously warty operculum and seems to abort all fruit after flowering.

HARDINESS: ZONE 8

NATURAL HISTORY

Eucalyptus coccifera is a small to medium sized tree endemic to Tasmania where it occupies high altitude montane regions from 2,500 ft to tree line at around 4,500 ft, from Mt. Wellington to the Central Plateau. The species epithet, *coccifera*, comes from the latin words *coccus* and *fera* and means pill or grain bearing.

CULTIVATION

The Mt. Wellington Gum will grow best in full sun and appreciate well-drained soil. The combination of beautiful bark, fragrant foliage and a picturesque growth habit make this a worthy specimen tree. This species is not commonly offered for sale by any regional nurseries, but it is worth seeking out. Eucalyptus coccifera has been sold by the Desert Northwest and described as combining "...the best ornamental features of all Eucalyptus."

EUCALYPTUS DALRYMPLEANA

BROAD-LEAVED RIBBON GUM

DESCRIPTION

A tree to 40 meters tall, forming a lignotuber

BARK

Smooth throughout, pale white to cream, grey shedding in patches, branchlets non-glaucous with mottled patches

LEAVES

Juvenile leaves opposite for many nodes, orbicular, ovate to elliptical, green to grey-green; Adult leaves on petioles 1.2-3.5 cm long, blade lanceolate to falcate, 8-22 cm long, 1-4 cm wide, glossy, green, oil glands island to obscure

FRUIT

Sessile or on pedicels to 0.4 cm long, cup-shaped to campanulate, disc raised annular or convex, valves 3 or 4, exserted

INFLORESCENCE

Axillary unbranched, peduncles 0.3-1.2 cm long, buds 3 per umbel, sessile or on pedicels to 0.3 cm long; Mature buds ovoid, green to yellow, scar present, operculum conical to rounded

EUCALYPTUS DALRYMPLEANA

BROAD-LEAVED RIBBON GUM

NOTES

Eucalyptus dalrympleana is regarded as the largest hardy Eucalyptus that can be grown in the Pacific Northwest. A specimen planted by Arthur Lee Jacobson in his former Montlake garden is measured at 117 feet tall. There is some confusion between three closely related species (Eucalyptus dalrympleana, E. viminalis, and E. rubida) and in W.J Bean's *Trees and Shrubs Hardy in the British Isles* he says that, "Seeds received from Australia under the name E. dalrympleana sometimes produce E. viminalis." The Broad-leaved Ribbon Gum is a striking tree with glossy green leaves that hang gracefully against a backdrop of powder white bark. The Broad-leaved Ribbon Gum is certainly hardy in Seattle, provided that E. viminalis seedlings are not labeled and sold as E. dalrympleana.

HARDINESS: ZONE 8A

NATURAL HISTORY

***Eucalyptus dalrympleana* is a medium-sized to tall tree species that grows on mountain slopes and plateaus in southeast Australia and Tasmania. Eucalyptus dalrympleana is named for Richard Dalrymple Hay (1861-1943), an officer appointed to lead a first group organized to monitor forest conservation within the Forest Department of New South Wales.**

CULTIVATION

The Broad-leaved Ribbon Gum will grow best in a full sun situation with fertile soils. This tree should be planted where space allows for its ultimately immense size and proportions. The orbicular juvenile foliage is diagnostic in differentiating Eucalyptus dalrympleana from E. viminalis in the seedling stage. Seed that I collected from an established E. dalrympleana growing in Seattle's Phinney Ridge neighborhood produced seedlings with orbicular leaves. A dalrympleana specimen that I purchased at a local Seattle nursery exhibited juvenile leaves indicative of Eucalyptus viminalis. The Broad-leaved Ribbon Gum is a beautiful tree best suited for a park, campus or large garden setting.

EUCALYPTUS GLAUCESCENS

TINGIRINGI GUM

DESCRIPTION
A small to medium sized tree or mallee to 50 meters tall, forming a lignotuber

BARK
Bark pale grey or grey-brown on the lower trunk, shedding in ribbons from upper branches; branchlets usually glaucous

LEAVES
Blue-grey or glaucous juvenile leaves opposite and sessile for many pairs, orbicular, margins crenulate, apex often emarginate; adult leaves concolorous, alternate, lanceolate, 6-17 cm long and 1.2-3.5 cm wide, petiole 1-3 cm long, glossy green or dull blue-green, side veins greater than 45° to mid-rib

INFLORESCENCE
Axillary unbranched umbels, 3 buds per umbel, sessile or nearly so, mature buds cylindrical to elongated diamond-shaped, usually glaucous, operculum scar present, operculum conical to beaked

FRUIT
Sessile, cylindrical or barrel-shaped fruit, 0.7–1.2 cm long, 0.8–1.2 cm wide, usually glaucous, disc raised-convex or level, or nearly-so cup-shaped fruit, disc raised-convex annular, valves 3 or 4, enclosed or near rim-level,

EUCALYPTUS GLAUCESCENS

TINGIRINGI GUM

NOTES

Eucalyptus glaucescens is a popular hardy Euc for the Pacific Northwest region. Like Eucalyptus gunnii, the Tingiringi Gum is confidently cold-tolerant, but Eucalyptus glaucescens might be described as a more refined Gum for the garden. White barked young trees grow quickly and mature into large and imposing trees with time. Eucalyptus glaucescens is one of the hardiest Eucalyptus species in cultivation, surviving temperatures down to 0 °F. Established specimens can be seen near Jungle Fever Exotics Nursery in Tacoma and just inside the driveway entrance of Cistus Nursery on Sauvie Island. More than one grand Eucalyptus glaucescens can be found on the streets of Seattle.

HARDINESS: ZONE (7B) 8A

NATURAL HISTORY

The Tingiringi Gum is a tree or mallee from Southeastern Australia where it grows in well-drained situations in high country. Eucalyptus glaucescens was first formally described by Joseph Maiden and William Blakely from a specimen collected on Tingiringi Mountain. *Glaucescens* means "becoming blue-grey or blue-green," an unmistakable feature when the new leaves emerge in the warmth of spring and summer.

CULTIVATION

Eucalyptus glaucescens is intolerant of shade and will grow best in an open exposure with well-drained soil. This species is commonly sold by retail nurseries in late spring and summer and is often offered by more specialized regional mail-order and retail nurseries. The juvenile foliage of Eucalyptus glaucescens is strikingly glaucous and attractive, but in my opinion it makes too beautiful a mature tree to keep it cut low for long. Plant this,eventual, large tree with the space it requires in mind.

EUCALYPTUS GLOBULUS

TASMANIAN BLUE GUM

DESCRIPTION

A tall tree, reaching 70 m and forming a lignotuber

BARK

Smooth, large strips and slabs of shedding bark, ribbons of decorticated bark in the upper branches, bark colored white, cream, grey, yellow and pink

LEAVES

Discolorous juvenile leave opposite for many pairs, sessile, oblong to elliptical, becoming ovate, lower surface of leaf white-waxy; adult leaves concolorous, alternate and lanceolate to falcate, glossy, green, side veins greater than 45° to mid-rib

INFLORESCENCE

Axillary unbranched, peduncles absent or nearly so, buds solitary, mature buds glaucous, warty, ribbed longitudinally, operculum flattened and umbonate, scar present, flowers white

FRUIT

Sessile, hemispherical or obconical, longitudinal ribs visible, disc raised convex with lobes extending over the valves, valves 4 or 5, near rim level

EUCALYPTUS GLOBULUS

TASMANIAN BLUE GUM

NOTES

Eucalyptus globulus is gigantic, as a tree and in terms of its significance in cultivation. This tree needs little introduction and it is likely to be known for at least one of its many uses as a timber tree, an ornamental, and for the production of essential oils. It is hardy into the high teens, with certain provenances and subspecies being more cold tolerant than others. It has been grown in Seattle, with trees ultimately succumbing to winter freezes. The Tasmanian Blue Gum is largely responsible with the negative connotations associated with the genus *Eucalyptus* and yet it is a beautiful and impressive tree with a complicated cultural and ecological legacy in California and the West Coast.

HARDINESS: ZONE 9A

NATURAL HISTORY

The Tasmanian Blue Gum is a forest tree species found in southeast Australia and Tasmania. *Eucalyptus globulus ssp. bicostata* is a high-elevation species restricted to montane habitats in southeast Australia. The species epithet, *globulus*, is latin for globe in reference to the fruit shape.

CULTIVATION

Eucalyptus globulus thrives in the coastal fog belt of California's Bay Area, but it is adaptable to a range of situations in cultivation. This species is not currently commonly sold by regional nurseries, but it has been sold in the past and seed is certainly not hard to come by. The massive size and the rapid growth rate make Eucalyptus globulus a poor choice for a home garden setting. It is not hardy in Seattle, but it can reach inconvenient heights before dying from a winter freeze. Eucalyptus globulus ssp. bicostata is a hardier subspecies that has been offered for sale by the Desert Northwest.

EUCALYPTUS GUNNII

CIDER GUM

DESCRIPTION

A Tree to 25 meters tall, forming a lignotuber

BARK

Smooth throughout with flakes and strips of shedding bark, revealing pale cream to yellow colorations, aging grey to brown

LEAVES

Juvenile leave opposite and sessile for at least 40 nodes, broadly orbicular to cordate, grey-green and glaucous, margins entire to crenulate; adult leaves alternate, petioles 0.9-2.3 cm long, blade lanceolate to ovate, 4-9 cm long and 1.2-3.5 cm wide, dull grey-green to blue-green, oil glands intersectional or obscure; crown often has conspicuously glaucous new growth

INFLORESCENCE

Axillary unbranched, peduncles 0.3-0.9 cm long, 3 buds per umbel, sessile or on pedicels to 0.4 cm long, mature buds obovoid to ovoid, glaucous to slightly glaucous, operculum slightly beaked to conical, scar present

FRUIT

Sessile or shortly pedicellate to 0.3 cm, cylindrical to barrel-shaped, glaucous to non-glaucous, disc descending, valves 3 or 4, near rim level or enclosed

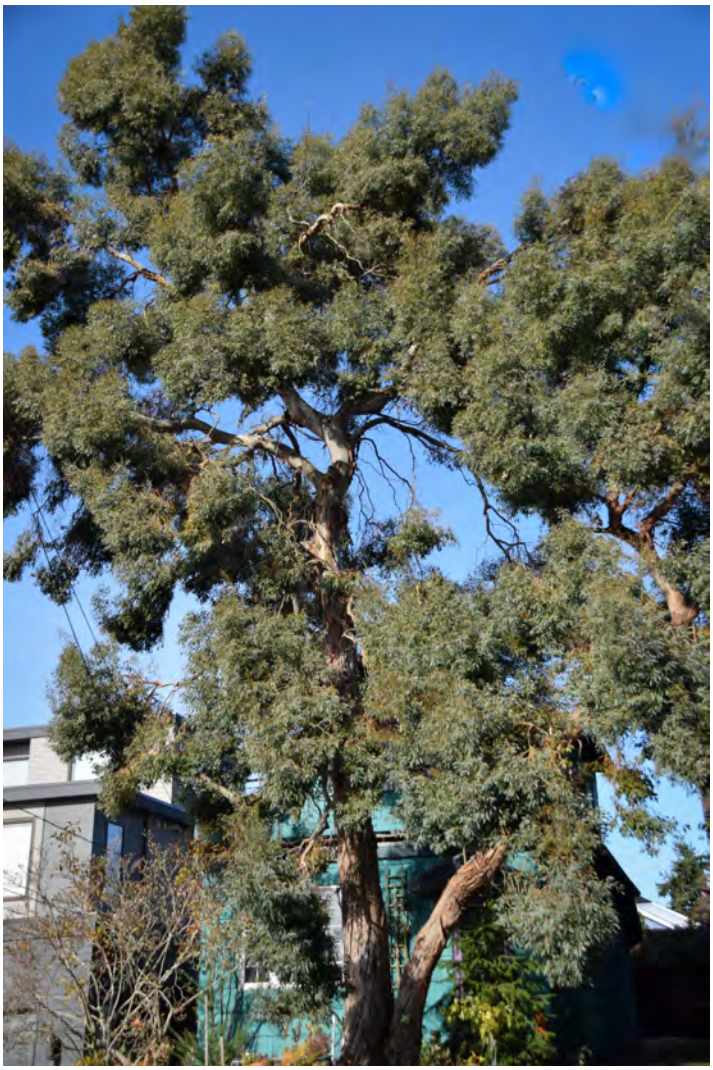
EUCALYPTUS GUNNII

CIDER GUM

NOTES

The Cider Gum is the most frequently encountered Eucalyptus in Seattle, with many specimens having endured record colds to reach impressive heights. The morphology and growth habit of Eucalyptus gunnii is quite variable and this variability is likely indicative of provenance. The gradiation of Cider Gum forms is recognized in the E. gunnii- E. archeri complex. Eucalyptus gunnii is very hardy and it, with the E. pauciflora group, is the base line to which all other hardy Eucalyptus are measured. A towering specimen stands at eye-level with mature Douglas firs in the Washington Park Arboretum. One need not walk far through a Seattle neighborhood before stumbling upon at least one Cider Gum.

HARDINESS: ZONE 7A



NATURAL HISTORY

Eucalyptus gunnii is a small to medium sized tree endemic to Tasmania where it occupies poorly drained sites in cold upland areas from 2,000 to 3,500 feet. The species epithet, *gunnii*, is named for Tasmanian botanist, Ronald Gunn. Eucalyptus gunnii ssp. divaricata was championed as a recognizable taxon in the early 2000's. It is recognized by its more glaucous buds, fruit, branchlets and smaller leaves.

CULTIVATION

The Cider Gum will grow best in full sun and appreciates well-drained soil, but it is also quite tolerant of more poorly drained sites. Eucalyptus gunnii is a reliably hardy tree for the Pacific Northwest and it certainly does make a beautiful mature tree. The juvenile foliage is often used in floral arrangements and the Cider Gum can be coppiced to maintain the interesting leafy shoots. It can often be found for sale at local nurseries in the spring. The ssp. divaricata is worth seeking out for its particularly glaucous appearance.

EUCALYPTUS KYBEANENSIS

KYBEAN MALLEE ASH

DESCRIPTION

A small tree or mallee to 4 m tall forming a lignotuber

BARK

Smooth, white to cream, copper, brown or greyish with bark shedding from the upper branches

LEAVES

Juvenile leave opposite, subsessile for 2-3 nodes, becoming alternate, petiolate, lanceolate to falcate; Adult leaves are held more or less erect, petioles 0.3-0.8 cm long, leaf blade 5-11 cm long, 0.5-1.5 cm wide, glossy, green, leaf veination obscure, oil glands island

INFLORESCENCE

Axillary unbranched umbels, peduncles 0.1-0.5 cm long, buds 7, 9 or 11 per umbel, sessile or nearly so; Mature buds obovoid to oblong, greenish to yellow to red, smooth or warty, scar absent

FRUIT

Sessile, obconical or hemispherical, disc raised or level or slightly desending, 4 to 5 included valves, at or near rim level

EUCALYPTUS KYBEANENSIS

KYBEAN MALLEE ASH

NOTES

The Kybean mallee ash is named for its multi-stemmed growth habit. It is recommended by regional nurseries for its slow-growth habit and small size. The maximum growth of Eucalyptus kybeanensis is likely yet to be seen in the climate of the Pacific Northwest, but it does seem to be a species well suited to the smaller home garden. The multi-stemmed habit, smooth taupe bark and stiffly held leaves make for an elegant garden specimen. In its native habitat it grows in the company of Snow gums so good provenance seed collections should be well suited to cultivation in the Pacific Northwest.

HARDINESS: ZONE 8A (7B)

NATURAL HISTORY

Eucalyptus kybeanensis is a small tree or mallee restricted to high elevations in the sub-alpine country of south-eastern New South Wales and eastern Victoria (Mt. Wellington). The Kybean mallee ash is named for the town of Kybean, New South Wales.

CULTIVATION

The slower growth rate of the Kybean mallee ash make this a valuable species for cultivation in the smaller home garden. While it would seem that this species combination of good traits would make it more common in our region, I have not yet encountered it outside of the Portland area. Xera Plants lists Eucalyptus kybeanensis on their list of Eucalyptus trees recommended as "Climate Adapted Plants for Gardeners in the PNW." Eucalyptus kybeanensis is offered for mail-order purchase by Portland based nursery, One Green World.

EUCALYPTUS LACRIMANS

WEEPING SNOW GUM

DESCRIPTION
A tree to 12 meters, forming a lignotuber

BARK
Smooth, white bark with patches of cream, grey and orange; branchlets glaucous

LEAVES
Blue-green juvenile leaves, petiolate, opposite for 5-6 pairs, becoming alternate, ovate to lanceolate; adult leaves alternate, narrowly lanceolate to falcate, 7-18 cm long and 0.7-3 cm wide, leaf petiole 0.5-2.5 cm long, parrellel-veined

INFLORESCENCE
Axillary unbranched umbels, peduncles 0.3-1.2 cm, 9 to 15 buds per umbel, sessile or with pedicels to 0.3 cm, mature buds obovoid to globular, green and red, operculum rounded to conical, scar absent

FRUIT
Sessile or pedicellate to 0.3 cm, cup-shaped to barrel-shaped fruit, glaucous or non-glaucous, disc level, valves 3 or 4, enclosed

EUCALYPTUS LACRIMANS

WEEPING SNOW GUM

NOTES

Eucalyptus lacrimans is a graceful Snow Gum relative with what can be a striking form. Lacrimans, the latin for weeping, refers to the pendulous habit of the branches and branchlets. In the past it has been described as a Snow Gum variety, but it is a distinct species. New Trees says that, "Opinions on its attractions vary, some finding its sparse weeping habit attractive, while others consider it gawky." A well sighted mature specimen of this hardy eucalypt is quite impressive in my experience.

HARDINESS: ZONE 7A

NATURAL HISTORY

The Weeping Snow Gum grows as a small, slender trunked tree with a sparse crown in the high plains of subalpine New South Wales, Australia. Eucalyptus lacrimans was first formally described in 1991 by botanists Laawrie Johnson and Ken Hill.

CULTIVATION

Eucalyptus lacrimans will grow best in sunny exposure and appreciates well-drained soil. This species should be sited with its weeping habit in mind. I have seen graceful and well-sited specimens in Seattle area gardens, but I have also seen cramped and awkward looking trees that seem to have been planted without a thought given to the pendulous branches and form. The Weeping Snow Gum is not commonly offered by nurseries, but it is worth seeking out for its distinctive habit.

EUCALYPTUS MITCHELLIANA

MOUNT BUFFALO GUM

DESCRIPTION

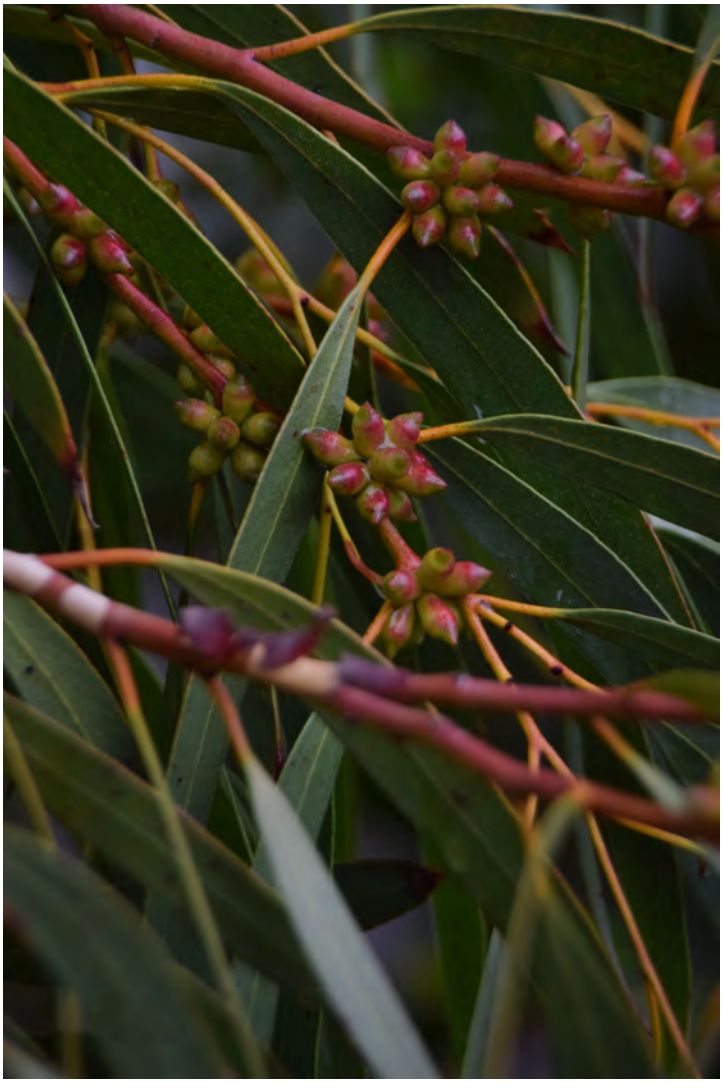
A tree or mallee to 15 meters tall, forming a lignotuber

BARK

Smooth throughout, pale white, grey bark shedding in patches, branchlets reddish-orange

LEAVES

Juvenile leaves opposite and sessile, elliptical, becoming alternate and lanceolate, shortly petiolate; Adult leaves glossy, green, linear to lanceolate, petioles 0.8-2.1 cm long, blade 7-15 cm long, 0.6-2 cm wide, oil glands island



FRUIT

Sessile, cup-shaped, disc level or descending, valves 3 or 4, near rim-level or enclosed

INFLORESCENCE

Axillary unbranched, peduncles 0.1-0.5 cm long, buds 7,9 or 11 per umbel, sessile in stellate clusters; Mature buds fusiform, scar absent, operculum conical to horn-shaped

EUCALYPTUS MITCHELLIANA

MOUNT BUFFALO GUM

NOTES

The Mount Buffalo Gum grows in a restricted range in Southeastern Australia, notably the Mt. Buffalo Plateau. It grows in the company of Snow Gums and is closely related to Eucalyptus stellulata and E. moorei. In the 2nd Edition of Trees of Seattle (2006), Arthur Lee Jacobson lists only one occurrence of Eucalyptus mitchelliana. For its combination of beauty and hardiness, the Mount Buffalo Gum is still undeservedly rare in Pacific Northwest gardens. The specimens that I encountered in this region were grown in the gardens of Ian Barclay (The Desert Northwest) and Michael Lee of the former Colvos Creek Nursery. Eucalyptus mitchelliana is worth seeking out as a striking specimen for the Pacific Northwest garden.

HARDINESS: ZONE 8B

NATURAL HISTORY

Eucalyptus mitchelliana **is a small tree endemic to the Mount Buffalo Plateau where it grows on granite outcrops. It is rare due to its limited distribution, but it is locally common within the range of Mount Buffalo National Park. Eucalyptus mitchelliana is named for Major Sir Thomas Livingstone Mitchell (1792–1855), Surveyor-General of New South Wales from 1828 - 1855.**

CULTIVATION

In cultivation the Mount Buffalo Gum grows fairly quickly to become a small multi-stemmed tree or it can be easily trained as a single trunked tree. Glossy pendulous leaves held on burnt orange petioles and branchlets stand out against the smooth white bark of the Buffalo Gum and make for a graceful specimen. Both Cistus Nursery and The Desert Northwest have offered Eucalyptus mitchelliana for sale in the past.

EUCALYPTUS NEGLECTA

OMEO GUM

DESCRIPTION

A Tree or mallee to 7 m tall forming a lignotuber

BARK

Rough, fibrous; longitudinally fissured bark, grey to brown on trunk

LEAVES

Juvenile leave opposite, sessile, elliptical to ovate, red mid-rib; adult leaves simple, alternate, lanceolate about 8-15 cm long and 2.5-4 cm wide, flattened leaf petiole 12-20 mm long

INFLORESCENCE

Axillary unbranched umbels, 7 to 15 buds per umbel, sessile, ovoid, glaucus with operculum scar present, flowers white

FRUIT

Sessile cup-shaped fruit, valves 3 or 4, exserted or near rim-level,

EUCALYPTUS NEGLECTA

OMEO GUM

NOTES

The Omeo gum is one of the most widely grown Eucalyptus species in the U.S. Eucalyptus neglecta is tolerant of both cold and the summer heat and humidity of the Southeastern U.S. It has been cultivated in Cincinnati, Knoxville, and North Carolina. This Eucalyptus casts more shade than many other species that can be grown in the Pacific Northwest and its broad handsome foliage blends well into the evergreen landscapes of Seattle parks and gardens.

HARDINESS: ZONE 7

NATURAL HISTORY

Eucalyptus neglecta is a small tree endemic to Victoria, Australia. This small tree or mallee grows along river courses. The latin *neglecta* comes from the suggestion that the tree was not considered to be distinct upon first discovery.

CULTIVATION

The Omeo Gum is more tolerant of shade than many Eucalyptus species appropriate for the Pacific Northwest and it will tolerate moist soils, but it will grow best in open sun and appreciates well-drained soil.

EUCALYPTUS NICHOLII

WILLOW PEPPERMINT

DESCRIPTION

A tree to 15 meters tall, forming a lignotuber

BARK

Thick, fibrous, longitudinally furrowed, gray to gray-brown when young, beoming reddish-brown with age, bark rough into small branches

LEAVES

Juvenile leaves linear to narrowly lanceolate, sessile or nearly so; Adult leaves alternate, petioles 0.5-1.5 cm long, blade narrowly lanceolate, 6-14 cm long, 0.5-1.2 cm wide, leaves take on a purple hue with cold winter temperatures

INFLORESCENCE

Axillary unbranched umbels, peduncles 0.3-0.8 cm long, 7 buds per umbel, pedicels 0.2-0.4 cm long; Mature buds ovoid, smooth, scar present, operculum conical

FRUIT

Pedicellate, 0.1-0.3 cm long, hemispherical to campanulate, disc level or disc raised-convex, valves 3 or 4, slightly exserted

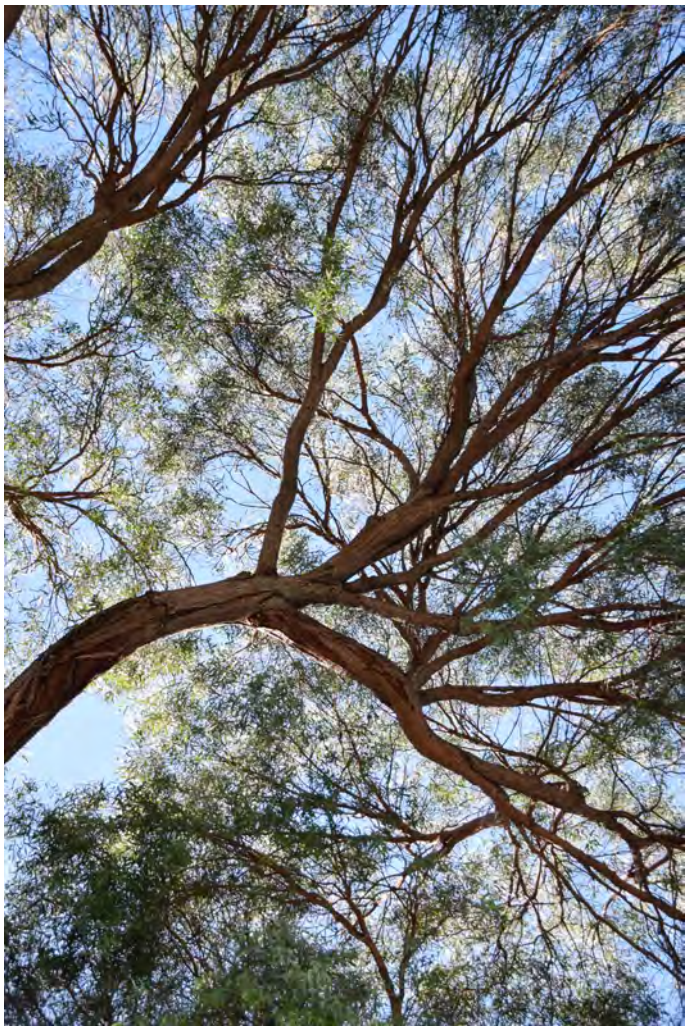
EUCALYPTUS NICHOLII

WILLOW PEPPERMINT

NOTES

Eucalyptus nicholii, known as the Narrow-leaved peppermint or Willow peppermint, is a valuable tree in the urban forests of several major cities in California. The striking form of Eucalyptus nicholii graces the cover of Matt Ritter's book, *A Californian's Guide to the Trees Among Us*. The Willow peppermint is valued as an ornamental for its aromatic foliage, high spreading crown and rough furrowed bark. It is hardy into the low teens, but good seed provenance is important. The ultimate height of this tree in our zone 8b climate remains to be seen.

HARDINESS: ZONE 8A



NATURAL HISTORY

Eucalyptus nicholii is a small to medium-sized tree found in the Northern Tablelands of the New South Wales where it grows on shallow, infertile soils. The conservation status of E. nicholii in Australia is listed as vulnerable. Eucalyptus nicholii was named for Richard Nichol, a staff member at the Sydney Botanic Gardens.

CULTIVATION

Eucalyptus nicholii will grow best in a warm southern exposure and appreciates well-drained soil. This tree makes an impressive specimen in California. A lovely tree in the parking strip of Jungle Fever Exotics nursery in Tacoma has yet to reach the stature of a Bay Area street tree, but it is a beautifully textured tree well on its way into the overhead power lines. Another young Peppermint Willow can be seen on a stroll around Green Lake. This species is sold by Forestfarm nursery and it is worth growing as a specimen in a mild location.

EUCALYPTUS NITENS

SHINING GUM

DESCRIPTION

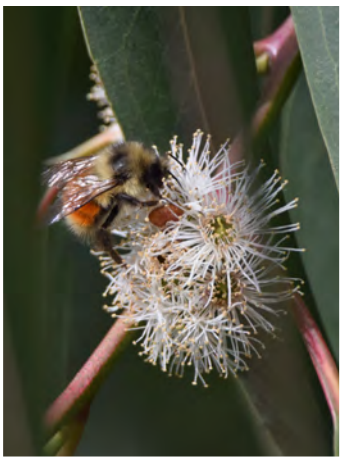
A tall tree, reaching 70 m (recorded to 90 m), without a lignotuber, but forming epicormic buds

BARK

Smooth, greyish bark with patches of white and pinkish red branchlets

LEAVES

Blue-green juvenile leave opposite for many pairs, sessile, broadly lanceolate to ovate; adult leaves concolorous, alternate and lanceolate to falcate, 10-30 cm long and1.5-4 cm wide, leaf petiole 1-4 cm long



INFLORESCENCE

Axillary unbranched umbels, peduncles 0.5 cm to 1.5 cm, 7 sessile buds per umbel, mature buds oblong to ovoid, green and pink, with conical operculum, operculum scar present

FRUIT

Sessile, cup-shaped to barrel-shaped fruit, disc descending, valves 3 or 4, slightly exserted or near rim level

EUCALYPTUS NITENS

SHINING GUM

NOTES

Eucalyptus nitens is noted as being a straight-trunked species capable of achieving tall tree status quite quickly in cultivation. Nitens, latin for shining, refers to the shining leaves, flower buds, fruit and bark of this striking tree. It is hardy to at least 10° and established trees to perhaps 5°. A younger specimen can be seen at the Edmonds Marina Beach Park with a profusion of flowers visible from late May into June.

HARDINESS: ZONE 8A

NATURAL HISTORY

The Shining Gum is a tall tree of high mountain slopes with a wide range in SW Australia, from New South Wales to Central Eastern Victoria. It is an important timber tree in Victoria and Southern New South Wales. It is an important plantation tree in Tasmania along with Eucalyptus globulus and pinus radiata.

CULTIVATION

Eucalyptus nitens will grow best in sunny exposure and appreciates well-drained soil. This species is not currently commonly sold by regional nurseries. This tree will become quite large with time and is better suited to park or campus settings where it can be allowed to grow to lofty heights. Growth rates of up to twenty feet in two years have been reported in the Seattle area.

EUCALYPTUS PARVULA

SMALL-LEAVED GUM

DESCRIPTION

A small tree, 30 to 50 feet tall and nearly as wide, forming a lignotuber

BARK

Smooth, greyish brown to orange; bark shedding from upper branches in ribbons

LEAVES

Blue-green juvenile leave opposite for many pairs, sessile, elliptic; adult leaves concolorous, alternate and lanceolate about 3-8 cm long and 0.5-1.5 cm wide, more or less flattened leaf petiole

INFLORESCENCE

Axillary unbranched umbels, 7 buds per umbel, mature buds ovoid with conical operculum, operculum scar present; on peduncles 0.2cm to 0.7 cm, flowers white

FRUIT

Sessile or nearly-so cup-shaped fruit, disc raised-convex annular, valves 3 or 4, enclosed or near rim-level,

EUCALYPTUS PARVULA

SMALL-LEAVED GUM

NOTES

Eucalyptus parvula was formerly known as Eucalyptus parvifolia, meaning small-leaved. The Small-leaved Gum is an elegant, small statured tree with a broad spreading crown that with time can grow to be quite large. Eucalyptus parvula is one of the hardiest Eucalyptus species in cultivation, surviving temperatures down to 0 °F. An established specimen can be seen at 24th Ave E & Boyer Ave E close to the Washington Park Arboretum.

HARDINESS: ZONE 7B

NATURAL HISTORY

The Small-leaved Gum is naturalized in California and native to New South Wales, where it is restricted to a narrow locality and is listed as endangered in NSW. It grows at 3,500 to 5,000 feet in acidic soil on cold wet grassy flats.

CULTIVATION

The Small-leaved Gum is intolerant of shade and it will tolerate many soil types including those that are poorly drained soils, but it will grow best in an open exposure and appreciates well-drained soil. This species is commonly sold by regional nurseries like Xera Plants and Forest Farm. I have planted Eucalyptus parvula on the UW Bothell campus bought from Forest Farm and seedlings grown from locally collected seed.

EUCALYPTUS PAUCIFLORA
SSP. DEBEUZEVILLEI

JOUNAMA SNOW GUM

DESCRIPTION
A tree to 10 meters tall, often forming multiple trunks, forming a lignotuber

BARK
Smooth, white, cream, grey to light brown, peeling in patches, branchlets usually glaucous

LEAVES
Juvenile leaves opposite, shortly petiolate for approximately 5 nodes, becoming alternate and petiolate, ovate to broadly lanceolate, dull, blue-green, glaucous; Adult leaves alternate; petiole 1.2-2.5 cm long, blade broadly lanceolate, 7.5-18 cm long, 1.6-5 cm wide, glossy, green to blue-green, parrallel veined, oil glands island

INFLORESCENCE
Axillary, unbranched, peduncles 0.4-1.3 cm long, buds 9 to 15 per umbel, sessile or shortly pedicellate (to 0.2 cm long), Mature buds clavate to oblong, sharp longitudinal angles, usually glaucous, warty, scar absent, operculum conical

FRUIT
Sessile or with pedicels to 0.2 cm long, barrel-shaped to obconical, sometimes with persistent longitudinal angling, usually glaucous, disc level, valves 3 or 4, enclosed or near rim level

EUCALYPTUS PAUCIFLORA
SSP. DEBEUZEVILLEI
JOUNAMA SNOW GUM

NOTES
The Jounama Snow Gum is distinguished from the Alpine Snow Gum by its larger blue-green leaves that appear to hang heavily from glaucous branchlets . The sharply angled and glaucous flower buds give the crown of the tree a distinctly bluish cast. The Jounama Snow Gum is well adapted to freezing winds and the branches bend to shed snow. It grows in south east New South Wales, inhabiting peaks from Mt. Franklin to the Jounama range. It well suited to cultivation in the Pacific Northwest and it is just as hardy as the Alpine Snow Gum or nearly so. It often reaches heights of about 35' or so, but well-sited specimens may reach heights of 60'. Eucalyptus pauciflora ssp. debeuzevillei is a graceful hardy Euc for PNW gardens.

HARDINESS: ZONE 7B

NATURAL HISTORY
Eucalyptus pauciflora ssp. debeuzevillei is a mallee or small tree that is locally abundant, but restricted to a few mountain peaks in southeast Australia. The subspecies is name for Wilfred de Beuzeville (1884-1954),a botanist and ecologist who authored several papers and the book, *Australian Trees for Australian Plantings* (1947).

CULTIVATION
The Jounama Snow Gum will grow best in an open exposure with good drainage. It does not grow as quickly as other hardy eucalyptus, but growth rate will increase with summer water. The habit of the Jounama Snow Gum is variable and it will often grow as a single trunked specimen. The Jounama Snow Gum is a beautifully textured tree well-suited as a focal point in the low water garden. A favorite tree grows at the Good Shepherd Center Gardens in Seattle's Walllingford neighborhood.

EUCALYPTUS PAUCIFLORA
SSP. NIPHOPHILA
ALPINE SNOW GUM

DESCRIPTION
A tree, often multi-trunked, from 9 to 15 meters tall with age, lignotuber present

BARK
Smooth, white to cream, mottled with grey patches from shedding bark, branchlets glaucous

LEAVES
Juvenile leaves opposite for 4 to 10 nodes, becoming alternate and petiolate, ovate, blue-green to glaucous; Adult leaves with parallel leaf veination, blade lanceolate to ovate, glossy, green to blue-green, oil glands island

INFLORESCENCE
Axillary unbranched, peduncles 0.5-1 cm long, buds 9 to 15 per umbel, shortly pedicellate (to 0.4 cm long); Mature buds obovoid to clavate, scar absent, operculum rounded to beaked, flowers white

FRUIT
Sessile or pedicellate to 0.3 cm, cup-shaped to hemispherical, glaucous, disc level or descending, valves usually 3, near rim-level or enclosed

EUCALYPTUS PAUCIFLORA
SSP. NIPHOPHILA

ALPINE SNOW GUM

NOTES

The Alpine Snow Gum is well represented in Seattle gardens with many specimens having withstood many a memorably cold Pacific Northwest winter. Dr. Stan Gessel wrote, "The most cold hardy eucalypt I have found in the Seattle environment developed from the seed of Eucalyptus pauciflora that I collected myself on the upper slopes of Mt. Kosciuszko in New South Wales." Eucalyptus pauciflora ssp. niphophila is the Snow Gum subspecies that grows at the highest elevations on Mount Kosciuszko, growing up to the tree line. Dr. Gessel's Alpine Snow Gum plantings at his Seattle home garden would become the parent trees to many seedlings raised and sold by Colvos Creek Nursery.

HARDINESS: ZONE 7A

NATURAL HISTORY

Eucalyptus pauciflora ssp. niphophila is a small, twisted and densely stunted tree restricted to the alpine tree lines of the Australian Alps. The Alpine Snow Gum is distinguished from other subspecies by the more delicate, pedicellate buds and smaller leaves. The subspecies name, *niphophila*, means "snow-loving," in reference to its alpine habitat.

CULTIVATION

The Alpine Snow Gum will grow best in an open exposure with good drainage. It does not grow as quickly as other hardy eucalyptus, but growth rate will increase with summer water. The beautifully smooth and mottled bark is multiplied by this trees habit of growing as a multi-trunked specimen. The leaves of the Snow Gum group lack the familiar eucalyptus fragrance, but gardens will be rewarded with clusters of snow white blooms from December to February.

EUCALYPTUS PAUCIFLORA
SSP. PAUCIFLORA

WHITE SALLEE

DESCRIPTION
A tree or mallee to 30 meters tall, forming a lignotuber

BARK
Smooth, mostly white, cream and grey, with yellow patches; branchlets glaucous or not

LEAVES
Juvenile leaves opposite, sessile for 2 to 5 pairs, becoming alternate and petiolate, broadly lanceolate to ovate, dull, blue-green; Adult leaves alternate, petiole 0.8-3.3 cm long, blade falcate to lanceolate, 6-20 cm long, 1.2-5 cm wide, glossy, green, parellel veined

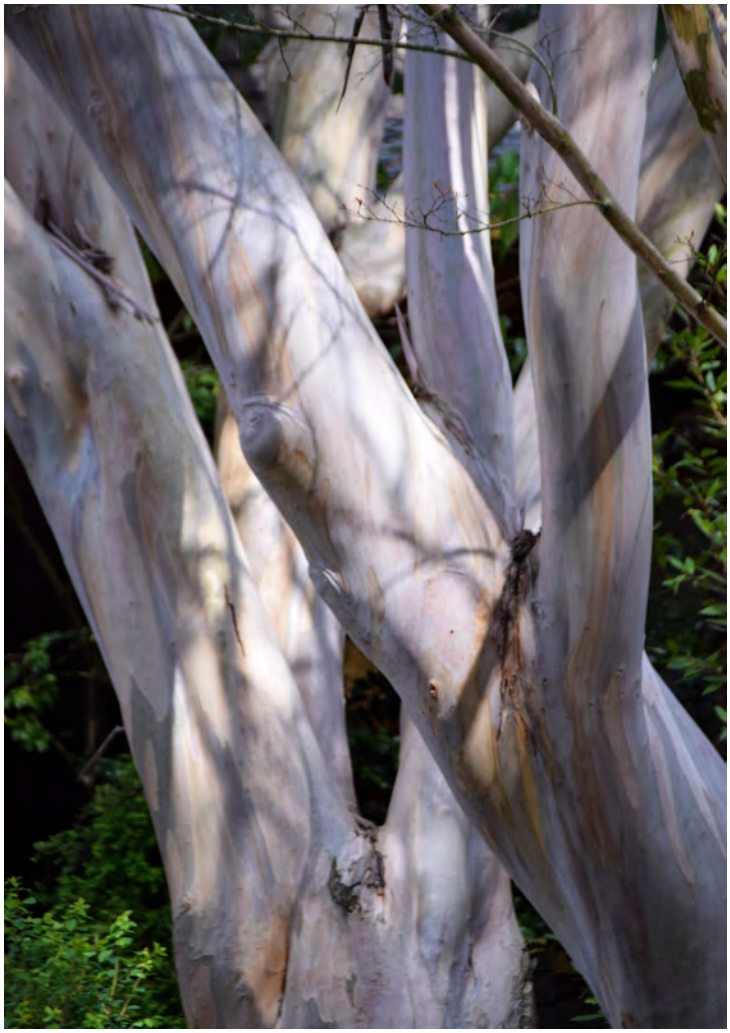
INFLORESCENCE
Axillary, unbranched, peduncles 0.3-1.5 cm long, buds 9 to 15 per umbel, pedicels to 0.6 cm long; Mature buds obovoid, green or yellow, red tinged, smooth or warty, scar absent, operculum conical to rounded

FRUIT
Sessile or on pedicels to 0.5 cm long, cup-shaped to hemispherical, glaucous or non-glaucous, disc raised-convex, level or slightly descending, valves 3 to 4, near rim level or enclosed

EUCALYPTUS PAUCIFLORA
SSP. PAUCIFLORA
WHITE SALLEE

NOTES
Eucalyptus pauciflora ssp. pauciflora is found across the whole geographic range of the species and almost the whole altitudinal range, growing from coastal lowlands in Victoria to high altitudes in the Australian Alps. The subspecies is extremely variable, but can be distinguished from ssp. niphophila by its shorter leaves that are described as being "crowded on branchlets" by the longer leaves more sparsely spread on the branchlets. The infloresence peduncles and pedicels are longer than both ssp. debezuvillei and ssp. niphophila and more closely resemble the umbellasters of Eucalyptus lacrimans. Good seed provenance is important when considering the wide geographic and altitudinal range of Eucalyptus pauciflora ssp. pauciflora.

HARDINESS: ZONE 8A



NATURAL HISTORY
Eucalyptus pauciflora grows as a robust tree or mallee on both mainland Australia and Tasmania. The latin pauciflora, meaning "few-flowered", is considered a misnomer that may have come from the collected specimen having lost its flower buds in transit. A blooming Snow Gum is anything but "few-flowered."

CULTIVATION
Eucalyptus pauciflora ssp. pauciflora will grow best in an open sunny exposure. This has been sold in the past in the PNW region and established specimens can be seen at the Woodland Park Zoo in Seattle and in Portland's Irvington neighborhood. The broad natural range of the species is better suited to the warmer coastal climes of California and it forms broad canopied trees at both the UC Santa Cruz arboretum and UC Berkeley Botanic Garden. Eucalyptus pauciflora ssp. pauciflora is offered for sale by One Green World nursery.

EUCALYPTUS PERRINIANA

SPINNING GUM

DESCRIPTION

A tree or mallee often with a crown of juvenile and adult leaves

BARK

Smooth throughout, light coppery to green or white, shedding in ribbons with glaucous branchlets, leaf ring scars usually persistent on branches

LEAVES

Juvenile leaves elliptical to orbicular, opposite, glaucous, fused into a ring (connate), dead juvenile leaves spin loosely around stems; Adult leaves alternate, petiolate, lanceolate to broadly lanceolate

FRUIT

Sessile or on pedicels < 0.2cm, cup-shaped or shortly cylindrical fruit, glaucous, 0.5 to 0.8 cm wide, valves 3 or 5, near rim-level

INFLORESCENCE

Axillary unbranched, peduncles 0.2 - 0.5 cm long, buds 3 per umbel, sessile or pedicellate to 0.2 cm long umbels, glaucous, smooth, rounded and slightly beaked with operculum scar present

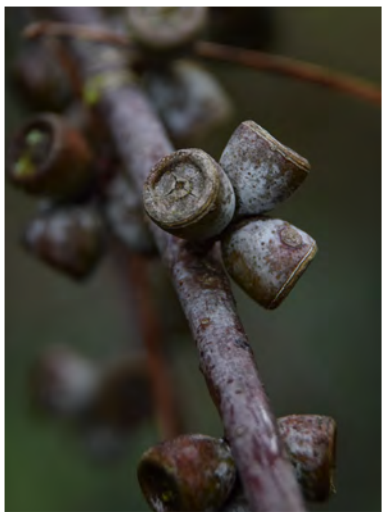
EUCALYPTUS PERRINIANA

SPINNING GUM

NOTES

The juvenile foliage of the Spinning Gum is popular for use as florist material and this is a species that is often coppiced or pollarded to retain the juvenile foliage. This is a very hardy tree and there are a number of mature specimens throughout the Seattle area. Arthur Lee Jacobson wrote that "Every large, old Eucalypt in Seattle is a Spinning Gum" and a specimen planted in 1968, that was removed to make way for the construction of State Route 520, was named a Hero of Horticulture in 2007 by the Cultural Landscape Foundation.

HARDINESS: ZONE 7A



NATURAL HISTORY

Eucalyptus perriniana **is a small straggly tree or mallee occuring in subalpine situations in south-eastern New South Wales into Victoria and at lower altitudes in Tasmania. In its native habitat this small tree may be confused with Eucalyptus glaucescens, which can be found growing in similar exposed rocky habitat situations. Eucalyptus perriniana is named after the Australian forester, George Samuel Perrin (1849-1900).**

CULTIVATION

In cultivation the Spinning Gum can become a large tree. The trees growth habit can be quite variable, from wide spreading to tall and straight or multi-stemmed, based on seed provenance. This is a popular annual in cooler climates that is grown for its distinctive juvenile foliage. Eucalyptus perriniana is commonly offered for sale in spring at local nurseries.

EUCALYPTUS PULVERULENTA

SILVER-LEAVED MOUNTAIN GUM

DESCRIPTION

A spreading mallee or shrub with a low canopy

BARK

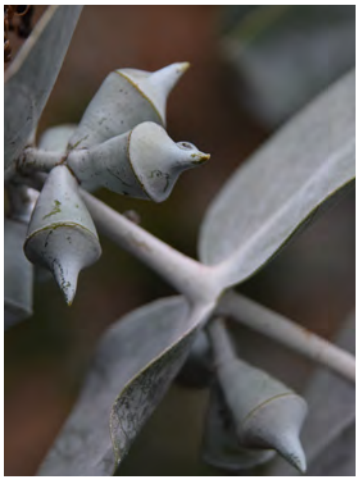
Smooth, shedding in ribbons with glaucous branches and branchlets, leaf scars persistent on branches

LEAVES

Juvenile leave opposite, sessile, orbicular ovate to nearly cordate, leaf base lobed, apex pointed; juvenile leaves persistent into mature plants, adult leaves are rarely produced

INFLORESCENCE

Axillary unbranched umbels, 7 to 15 buds per umbel, sessile, ovoid, glaucus with operculum scar present, flowers white



FRUIT

Sessile cup-shaped fruit, glaucous but weathering to non- glaucous, valves 3 or 4, exserted or near rim-level

EUCALYPTUS PULVERULENTA

SILVER-LEAVED MOUNTAIN GUM

NOTES

The foliage is of this Eucalyptus is most widely recognized for its use florist material. A named selection, Eucalyptus 'Baby Blue', is often sold at nurseries in spring. The Silver-leaved Mountain Gum grows as a straggly small tree or mallee in its native habitat and if left to grow without pruning in cultivation it will become a rangy and sprawling shrub. There is a very floriferous specimen behind Bloedel Hall on the University of Washington campus that flowers from roughly December to early May.

HARDINESS: ZONE 8A

NATURAL HISTORY

Eucalyptus pulverulenta is a small straggly tree or mallee occuring in scattered populations in New South Wales with disjunct populations west of Sydney in the Blue Mountains. This small tree or mallee grows in the understorey of grassy woodlands. The latin pulverulenta means powdered, referring to the white wax on the leaves, flower buds and fruit.

CULTIVATION

Silver-leaved Mountain Gum may be most useful as a foliage plant in the florist trade and in the garden where it can be regulary pollarded or coppiced for a profusion of fragrant blue leaves. It can also be grown as a striking specimen plant with its unique growth habit. Plants in the perrenial border at the Royal Botanic Gardens Victoria in Melbourne are coppiced annually to maintain the dense blue foliage.

EUCALYPTUS RODWAYI

SWAMP PEPPERMINT

DESCRIPTION

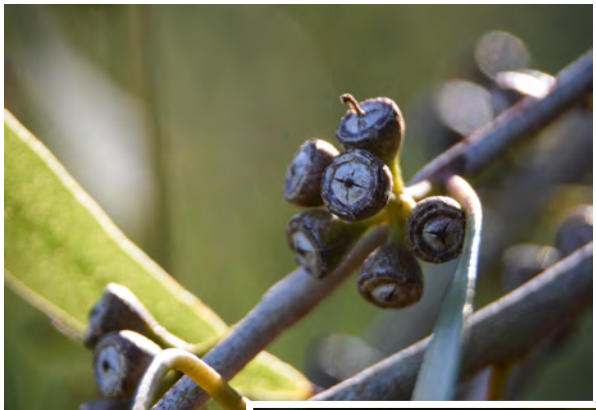
A small to medium tree, reaching 20 m and forming a lignotuber

BARK

Smooth and whitish on smaller branches, but becoming rough and fibrous on larger branches and trunk, bark described as "box-type", branchlets red

LEAVES

Green juvenile leaves opposite and sessile for 6 to 8 nodes,becoming subopposite to alternate, shortly petiolate, lanceolate to elliptical; adult leaves alternate and narrowly lanceolate to falcate, 5-13.5 cm long and 0.7 to 2 cm wide, leaf petiole 0.5 - 1.5 cm long; the intramarginal vein is parrallel to and just within the leaf margin



INFLORESCENCE

Axillary unbranched, peduncles 0.4-0.8 cm long, pedicellate buds in groups of 7, 9 or 11, pedicels 0.2-0.3 cm long; mature buds ovoid to diamond shaped,0.4–0.6 cm long and 0.2–0.35 cm wide, conical operculum with scar present

FRUIT

Sessile or pedicellate, pedicels 0-0.2 cm long, obconical to hemispherical fruit, 0.2–0.5 cm long and 0.4–0.6 cm wide, disc raised-annular or level, 3 to 4 valves near rim level or slightly exserted

EUCALYPTUS RODWAYI

SWAMP PEPPERMINT

NOTES

Eucalyptus rodwayi is described as being short-boled and its tendency to hold onto its lower limbs creates a wide-spreading and "substantial" tree. Eucalyptus rodwayi is named after Leonard Rodway (1853-1936), a hobby botanist whose notable botanical contributions include the publication of the *Flora of Tasmania*. Swamp Peppermint is hardy to under 10° and established trees to perhaps 0°. A formidable Eucalytus rodwayi can be seen at the Carl English Botanic Gardens where it frames the view out into Shilshole Bay. Eucalyptus rodwayi can also be seen at the UBC Botanical Garden in Vancouver.

HARDINESS: ZONE 8A

IDENTIFICATION TIP

Look for the "island and intersectional" oil glands of Eucalyptus rodwayi leaves as opposed to the mostly "island" glands of Eucalyptus aggregata.

NATURAL HISTORY

The Peppermint Gum is a small to medium sized tree endemic to poorly drained sites away from the coast. It is closely related to and often confused with Eucalyptus aggregata, a tree occuring in New South Wales and Woodend, Victoria. Eucalyptus rodwayi forms part of the series, *Foveolatae*, a group of swamp-dwelling gums with obconical fruits.

CULTIVATION

Eucalyptus rodwayi is described as being tolerant of a range of soil situations, even wet poorly-drained locations. Like most of the Eucalypts grown in our area, a sunny open exposure with well-drained soil is preferential. Trees and Shrubs Online states that some seed sources in United Kingdom consistently supply Eucalyptus aggregata sold as Eucalyptus rodwayi. This species is not currently commonly sold by regional nurseries, though the Desert Northwest has offered seeds for sale and ForestFarm offers Eucalyptus aggregata for sale.

EUCALYPTUS RUBIDA

CANDLEBARK GUM

DESCRIPTION

A tree to 20 meters tall, possibly taller in cultivation,and forming a lignotuber

BARK

Smooth bark; powdery and white to cream with reddish strips of bark peeling from the upper branches

LEAVES

Juvenile leaves opposite and sessile, orbicular to ellipitical, leaf bases truncate to amplexicaule, glaucous; Adult leaves alternate, petiolate, lanceolate to elliptical, 8-17.5 cm long, dull grey-green or glaucous, oil glands usually obscure

FRUIT

Sessile or on pedicels to 0.3 cm, barrel-shaped or hemispherical, glaucous, disc raised convex, 3 or 4 exserted valves

INFLORESCENCE

Axillary unbranched, peduncles 0.3-0.8 cm long, buds 3 per umbel, sessile or pedicellate to 0.4 cm; mature buds ovoid to fusiform, 0.5–0.9 cm long, 0.3–0.5 cm wide, often glaucous, operculum conical to rounded, scar present

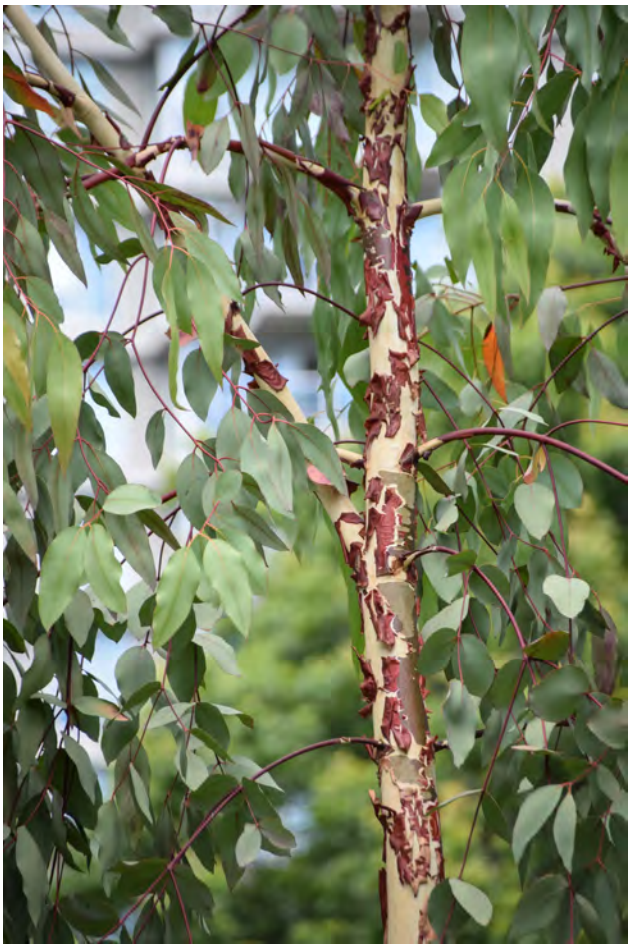
EUCALYPTUS RUBIDA

CANDLEBARK GUM

NOTES

Eucalyptus rubida is closely related to both Eucalyptus dalrympleana and Eucalyptus viminalis, both three-budded species. The strongly glaucous orbicular juvenile leaves and glaucous buds and fruits are key characteristics in distinguishing E. rubida from E. dalrympleana and E. viminalis. The Candlebark Gum is described as being somewhere between "very hardy" to "reasonably hardy", but there are few large examples in the Seattle area to verify these claims. A Candlebark at the UBC Botanical Garden, accessioned in 2013, displays beautiful peeling bark and grey-green intermediate leaves on burgundy branchlets. A younger Candlebark gum at the Washington Park Arboretum resprouted from the base after the 2018 winter in Seattle. The powder white bark and peeling strips of red make this a striking species worth seeking out.

HARDINESS: ZONE 8A



NATURAL HISTORY

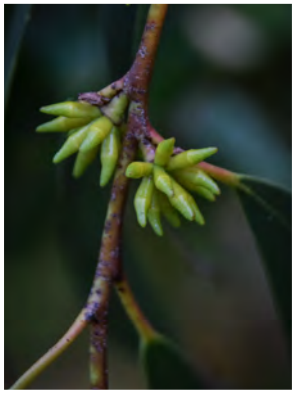
Eucalyptus rubida **is a medium sized tree found in both Southeast Australia and Tasmania, where it grows on poor, shallow soils. In its native habitat Eucalyptus rubida is recognized by the glaucous round juvenile leaves, white bark that sheds in brownish-red strips, poor growth form and horizontal black scarring on the bark from insect damage. Two subspecies of E. rubida are formally recognized, but up to four have been described. The latin *rubida* refers to the seasonally red bark of the Candlebark gum.**

CULTIVATION

In cultivation the Candlebark gum can become a large broad-spreading tree. The juvenile foliage is attractive, but the contrast of the smooth white bark peeling into strips of red is the main attraction of this tree. *Eucalyptus rubida* has been sold by local nurseries in the Seattle area in the spring. Seed of good provenance should be sought out and young plants should be purchased from nurseries that seek out high elevation seed collections, like the Desert Northwest.

EUCALYPTUS STELLULATA

BLACK SALLEE



DESCRIPTION

A tree or mallee to 15 m and forming a lignotuber

BARK

Smooth bark throughout, grey, brown to olive-green; bark rough fibrous at base

LEAVES

Juvenile leaves orbicular to elliptical or broadly ovate, opposite and sessile, becoming alternate and shortly petiolate; Adult leaves on petioles 0.4-1.3 cm long, blade lanceolate to elliptical, parrallel veined with three prominent veins, oil glands island

FRUIT

Sessile, cup-shaped or globular, disc level or descending with 3 valves near rim level or enclosed

INFLORESCENCE

Axillary unbranched, peduncles 0.1-0.6 cm long, stellate clusters of 9 to 15 buds sessile or nearly so; mature buds fusiform, green to yellow, operculum acutely conical, scar absent

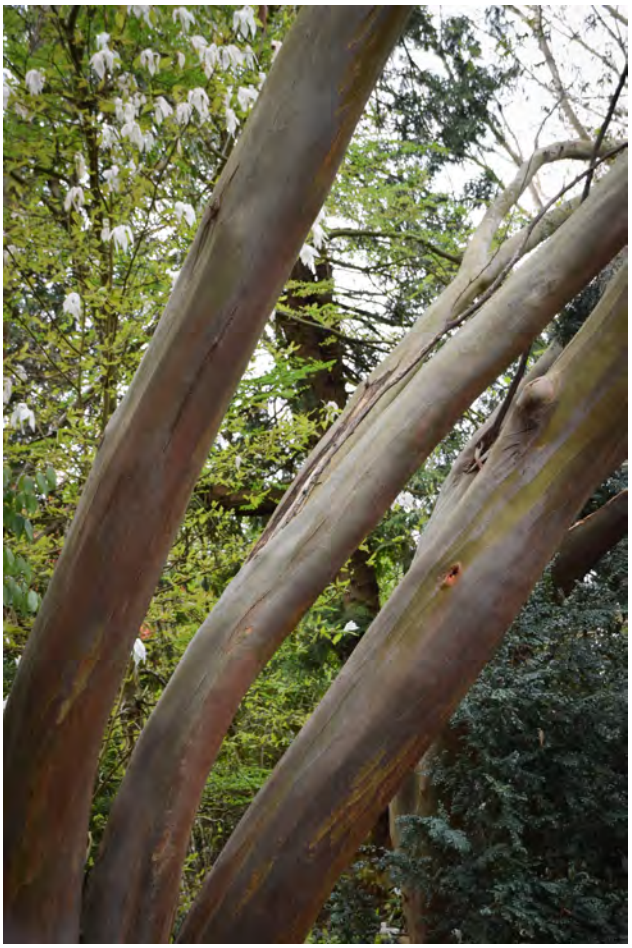
EUCALYPTUS STELLULATA

BLACK SALLEE

NOTES

Eucalyptus stellulata is regarded as being a slower grower than other Eucalyptus in cultivation. It is most often seen as a multi-trunked and low branching tree with a twisted growth habit. The smooth bark reveals a beautiful patchwork of olive green as it exfoliates. The parallel leaf veins are distinctive among Eucalyptus cultivated in the Pacific Northwest. The Snow Gum group shares this trait, but three prominent veins distinguish the leaves of Eucalyptus stellulata. The Black Sallee is nearly as cold tolerant as Eucalyptus pauciflora taxa and it should be a more commonly cultivated species in this region.

HARDINESS: ZONE 7B



NATURAL HISTORY

Eucalyptus stellulata **is a small tree or mallee found in South eastern Australia, where it grows in poorly-drained sub alpine woodlands and cold valleys. It is one of the three species in the *Longitudinales* section with the closely related Eucalyptus moorei and E. mitchelliana. The latin, *stellulata*, is in reference to the stellate or star-like arrangement of the flower buds.**

CULTIVATION

In cultivation the Black Sallee is described as slow growing to around 50 feet after many years. it may resprout from the base if it is damaged by cold, but a Eucalyptus stellulata at the Woodland Park Zoo has persisted for many years through low temperatures. The olive green bark and the broad framework of Eucalyptus stellulata makes a striking specimen up close and as a distant silhouette.

EUCALYPTUS SUBCRENULATA

ALPINE YELLOW GUM

DESCRIPTION

A small tree to medium-sized tree, to 20 meters tall, forming a lignotuber

BARK

Smooth, reddish or pale grey to brown; exfoliating bark revealing yellow patches on trunk and branches

LEAVES

Glossy green juvenile leave opposite and sessile for at least 25 nodes, orbicular to ovate with crenulate margins; adult leaves concolorous, lanceolate, 5.2-13.5 cm long and 2-4.5 cm wide, petiole 1.5-3.7 cm long, margin entire to subcrenulate, oil glands island intersectional with the intramarginal vein well removed from the margin

INFLORESCENCE

Axillary unbranched, peduncles 0.2-0.6 cm long, 3 sessile buds per umbel, middle bud sometimes shortly pedicellate, mature buds ovoid to obovoid, green to yellow and brown, operculum rounded to beaked, scar present on peduncles 0.2cm to 0.7 cm, flowers white

FRUIT

Sessile, hemisphaerical to campanulate, disc level or descending, valves 3 or 4, exserted or near rim-level,

EUCALYPTUS SUBCRENULATA

ALPINE YELLOW GUM

NOTES

Eucalyptus subcrenulata, also called the Tasmanian Alpine Yellow Gum, is an upright and rather narrow statured tree with a crown of dark glossy green foliage. Eucalyptus subcrenulata is unique among Eucalyptus grown in the Pacific Northwest for its truly green foliage. It is one tree that can truly be described as a broad-leaved evergreen, as opposed to the ever-blue or grey of other hardy Eucalyptus. It is considered hardy to about 5°F, although seems that specimens of varying hardiness have been sold in our area, but those grown from good provenance seed are certainly growing well in the Puget Sound Region.

HARDINESS: ZONE 7B

NATURAL HISTORY

The Alpine Yellow Gum is native to the highlands of central and western Tasmania. Subalpine woodlands of Eucalyptus subcrenulata and Richea pandanifolia in Mt. Field National Park make for a stunning google image search. It is closely related to Eucalyptus johnstonii and E. vernicosa and it forms a morphological continuum with E. johnstonii. The species epithet refers to the subcrenulate leaf margins.

CULTIVATION

Eucalyptus subcrenulata will grow best in an open exposure and appreciates well-drained soil, but it is adaptable to garen conditions. This species is not as commonly seen as other Eucalyptus in our region, but it makes a beautiful tree and its columnar crown of green foliage blends well into many northwest garden settings. One Green World Nursery in Portland, OR offers Eucalyptus subcrenulata for mail order purchase on their website and it is well worth seeking out. It is a unique hardy Eucalyptus species that should be grown more often in our region.

EUCALYPTUS VIMINALIS

MANNA GUM

DESCRIPTION
A tree to 90 meters tall, forming a lignotuber

BARK
Smooth over whole trunk, often with a thick stocking of rough bark from 2-6 meters above base, smooth bark powdery white to cream, conspicuous ribbons of decorticated bark on upper trunk and branches

LEAVES
Juvenile leaves opposite and sessile for many nodes, lanceolate, base rounded to amplexicaule, green; Adult leaves on petioles 1-2.5 cm long, blade lanceolate to falcate, 8.5-23 cm long, 0.8-3 cm wide, glossy or dull, green, oil glands mostly island

FRUIT
Sessile or on pedicels to 0.3 cm long, cup-shaped or hemispherical, disc raised convex, valves 3 or 4, strongly exserted

INFLORESCENCE
Axillary unbranched, peduncles 0.4-1 cm long, buds 3 per umbel, sessile or on pedicels to 0.5 cm long; Mature buds ovoid to fusiform, green to yellow, scar present, operculum conical to rounded or beaked

EUCALYPTUS VIMINALIS

MANNA GUM

NOTES

Eucalyptus viminalis is closely related to E. rubida and E. dalrympleana. It was and is widely planted in California where large specimens can be seen along major interstates. It is capable of reaching massive sizes on deep, fertile soils, but tolerates a variety of situations in cultivation. There is some confusion between three closely related species (*Eucalyptus dalrympleana*, E. viminalis, and E. rubida) and in W.J Bean's *Trees and Shrubs Hardy in the British Isles* he says that, "Seeds received from Australia under the name E. dalrympleana sometimes produce E. viminalis." A specimen planted at Jungle Fever Exotics Nursery froze to the ground in December of 1998, but resprouted from its lignotuber as a multi-stemmed tree. It is not as hardy as Eucalyptus dalrympleana or Eucalyptus rubida.

HARDINESS: ZONE 8B

NATURAL HISTORY

Eucalyptus viminalis is a small to very tall tree species that is widespread in parts of southeast Australia and Tasmania. Subspecies viminalis, often a component of mountain valleys, reaches its greatest size in wet areas of Tasmania and southeast Australia. The species epithet, viminalis, meaning "bearing shoots or ribbons for wicker-work" is in reference to the prominent ribboning of the bark. It is so referred to as the Manna Gum for the sugary substance produced by the exudation of the sap.

CULTIVATION

The lanceolate juvenile foliage is diagnostic in differentiating Eucalyptus viminalis from both E. dalrympleana and E. rubida. The Manna Gum has been grown in Seattle, but I did not encounter any enduring specimens (The photos were taken at the UC Santa Cruz arboretum). *Trees of Seattle* mentions just 3 trees growing in Seattle. In Dr. Stan Gessel's Eucalyptus trials on the University of Washington campus and his own garden, he wrote that, "Eucalyptus viminalis, although a very rapid grower, proved to be the most sensitive to severe cold periods and large trees up to 30 feet in height have been killed."

Eucalyptus Phylogeny: An adaption of Table 1 from (Thornhill et. al 2019),"A dated molecular perspective of eucalypt taxonomy, evolution and diversification", with Taxonomic classification based on (Nicolle 2015b), and adapted for the cultivated eucalpts of the Pacific Northwest.

Group Common name and genus	Subgenus	Section	Subsection	Series	Species number in total	Cultivated species included in field guide	Species not included in the guide, but likely successfully cultivated in the PNW (Not including subspecies)
Angophora					12		
Corymbia					90		
Eucalyptus					717	25	26
	Eucalyptus				124		
		Eucalyptus			99		
				Contiguae	1	*E. kybeanensis*	
				Longitudinales	3	*E. stellulata, E. mitchelliana*	*E. moorei*
				Eucalyptus	1		*E. obliqua*
		Cineraceae					
				Fraxinales	5		*E. delegatensis, E. fraxinoides*
				Regnantes	2		*E. fastigata, E. regnans*
				Pauciflorae	3	*E. pauciflora, E. lacrimans*	*E. gregsoniana*
		Aromaticas					
				Insulanae	7	*E. coccifera*	*E. pulchella, E. amygdalina, E. risdonii, E. tenuiraimis*
	Symphyomyrtus				563		
		Exsertaria			45		
				Rostratae	2	*E. camaldulensis*	
		Maideneria			79		
			Obscurae		2	*E.parvula*	
				Acaciiformes	9	*E. nicholii*	*E. acaciiformis*
				Argyrophyllae	5	*E. cinerea*	*E. nova-anglica*
				Bridgesianae	4	*E. bridgesiana*	
				Crenulatae	1		*E. crenulata*
				Foveolatae	10	*E. camphora, E. rodwayi*	*E. aggregata, E. brookeriana, E. macarthurii*
				Globulares	14	*E. globulus, E. nitens*	
				Microcarpae	5		*E. elliptica, E. scoparia, E. mannifera*
				Neglectae	1	*E. neglecta*	
				Orbiculares	9	*E. archeri, E. gunnii, E. pulverulenta, E. perriniana, E. glaucescens*	*E. urnigera, E. saxatilis, E. cordata, E. chapmaniana*
				Viminales	11	*E. viminalis, E. rubida, E. dalrympleana*	
				Semiunicolores	4	*E. subcrenulata*	*E. johnstonii, E. vernicosa*

- Table 1 from "A dated molecular perspective of eucalypt taxonomy, evolution and diversification" (Thornhill et. al 2019) is included in full for reference to the greater phylogenetic context of the eucalypts included in this field guide.

Table 1. The taxonomic classification of Nicolle (2015*b*) detailed with the current number of recognised species for each taxonomic group

Eucalypt subgenera are ordered by how closely they are related to each other in the maximum likelihood-1 (ML-1) phylogeny

Group common name and genus	Subgenus	Section	Series	Species number	Common name
Mesicalypt					
Allosyncarpia				1	
Eucalyptopsis				2	
Stockwellia				1	
Newcalypt					
Arillastrum				1	
Eucalypt					
Angophora				12	Apples
	Angophora			12	
		Angophora		12	
			Angophora	10	Rough-barked apples
			Costatitae	2	Smooth-barked apples
Corymbia				90	Bloodwoods
	Blakella			34	
		Abbreviatae		19	Paper-fruited bloodwoods
			Tessellatae	3	
			Scutiformes	16	
		Maculatae		3	Spotted gums
		Naviculares		11	Yellow bloodwoods
		Torellianae		1	Cadaghi
	Corymbia			56	
		Calophyllae		4	
		Corymbia		52	
			Terminalipterae	11	
			Dorsiventrales	16	
			Isobilaterales	22	
			Cymbiformes	1	
			Jacobsianae	1	
			Trachyphloiae	1	
Eucalyptus				717	
	Acerosae			1	Plunkett mallee
	Eudesmia			25	Eudesmids
		Complanatae		12	Tropical eudesmids
			Scutelliformes	1	Bailey's stringybark
			Miniatae	7	Orange-flowered gums
			Similes	2	Tropical yellowjackets
			Tetrodontae	2	Tropical stringybarks
		Limbatae		13	
			Heteropterae	12	
			Ebbanoenses	1	
	Cuboidea			1	Narrow-leaved white mahogany
	Idiogenes			1	Gympie messmate
	Eucalyptus			124	Monocalpyts
		Frutices		19	Monocalypt mallees
			Proximae	1	
			Preissianae	4	
			Diversiformae	6	
			Calcicolae	2	
			Muricatae	3	
			Insulares	1	
			Subereae	2	
		Longistylus		5	
			Pedaria	1	Rate's tingle
			Jacksoniae	1	Red tingle
			Occidentales	2	
			Patentes	1	Blackbutt
		Eucalyptus		99	
			White mahoganies	10	White mahoganies

Table 1. (*continued*)

Group common name and genus	Subgenus	Section	Series	Species number	Common name
			Pachyphloiae	29	Stringybarks
			Radiatae	15	Peppermints
			Psathyroxyla	10	
			Strictae	13	Mallee ashes
			Olsenianae	3	
			Fraxinales	5	
			Regnantes	2	
			Pauciflorae	3	Snow gums
			Longitudinales	3	Sallees
			Eucalyptus	1	Messmate stringybark
			Pseudostringybarks	2	
			Piperitales	1	
			Planchonianae	1	Needlebark
			Stenostomae	1	
		Primitiva		1	
	Cruciformes			1	Yellow tingle
	Alveolata			1	Tallowwood
	Symphyomyrtus			563	Symphyomyrts
		Bisectae		123	Mallees and mallets
			Halophilae	1	
			Heterostemones	8	
			Angustissimae	5	
			Balladonienses	2	
			Brockwayanae	1	
			Caesiae	1	
			Curviptera	30	
			Decurvae	2	
			Falcatae	18	
			Micrantherae	4	
			Porantherae	21	
			Salmonophloiae	1	Salmon gum
			Squamosae	2	
			Subulatae	27	
		Latoangulatae		22	
			Inclusae	1	Karri
			Connexentes	4	
			Lepidotae-Fimbriatia	4	Grey gums
			Pumilae	1	Pokolbin mallee
			Transversae	12	Mahoganies
		Domesticae		3	
		Equatoria		2	Rainbow gum
		Incognitae		3	
		Exsertaria		45	Red and white gums
			Erythroxylon	22	Eastern red gums
			Exsertae	6	Queensland red gums
			Rostratae	2	River red gums
			Subexsertae	15	Tropical white gums
		Maidenaria		79	Blue gums
			Kitsonianae	1	Gippsland mallee
			Sturgissianae	1	Ettrema mallee
			Acaciiformes	9	
			Argyrophyllae	5	
			Bridgesianae	4	
			Crenulatae	1	Buxton silver gum
			Foveolatae	10	Swamp gums
			Globulares	14	
			Microcarpae	5	Small-fruited white gums
			Neglectae	1	Omeo gum
			Orbiculares	9	
			Saxicola	4	Rock gums
			Semiunicolores	4	Yellow gums

Table 1. (*continued*)

Group common name and genus	Subgenus	Section	Series	Species number	Common name
			Viminales	11	White gums
		Platysperma		7	Snappy gums
		Racemus		1	Hillgrove gum
		Adnataria		106	Boxes and ironbarks
			Buxeales	15	
			Heterophloiae	9	
			Lucasianae	7	Western boxes
			Melliodorae	7	Boxes
			Rhodoxyla	11	Ironbarks
			Siderophloiae	24	Ironbarks
			Striolatae	17	Tropical boxes
			Subbuxeales	15	Southern boxes
			Submelliodorae	1	
		Sejunctae		1	Sugar gum
		Bolites		1	Tuart
		Dumaria		76	Mallets
			Dissonae	1	
			Furfuraceae	3	
			Merrickianae	3	
			Ovulares	10	
			Rufispermae	34	
			Tetrapterae	16	
			Torquatae	9	
		Glandulosae		94	WA Mallee and gimlets
			Accedentes	7	
			Clinatae	4	
			Contortae	8	Gimlets
			Cornutae	13	Yates
			Dundasianae	1	Dundas blackbutt
			Elongatae	5	
			Erectae	25	
			Kruseanae	1	Bookleaf mallee
			Levispermae	22	Wandoo group
			Loxophlebae	4	
			Obliquae	1	
			Stricklandianae	3	

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