The Broad-Leaf Paperbark: Friend or Foe?

Bethany Kidd and Sierra Roark

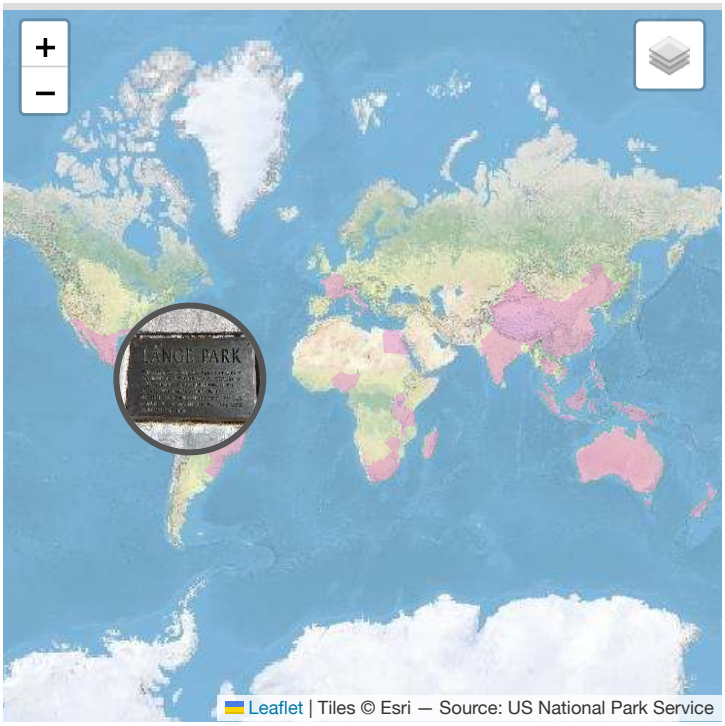
Cultural warning for Aboriginal and Torres Strait Islander people: This webpage contains images, voices, and names of deceased persons in photographs, film, and printed material.

Introduction: A Fall from Grace

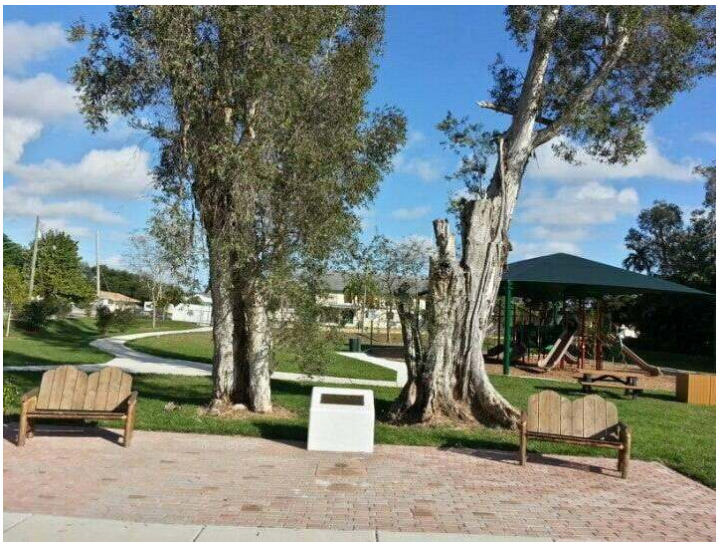
Australian paperbark trees line a main road, New...

Throughout the late nineteenth and early twentieth centuries, one could trace the expansion of colonial rule in Hong Kong (1841-1997) along its tree line. British accounts of the precolonial landscape abound with descriptions of its barrenness, of sun-scorched rocky topography divested of trees — and life in general. The land, increasingly inscribed with moralized ideals, was at best inhospitable and at worst "primitive."[1] The self-identified task of the British colonial government was to plant trees for multipronged effect: to cultivate shade and health in the dangerous tropical heat and to temper the barren wildness of the landscape, moving it toward an ideal imported from the forested English countryside.[2] The newly formed Botanical and Afforestation Department approached this assignment voraciously, planting hundreds of thousands of trees a year for much of the twentieth century.[3] Most of the species chosen to fill the rocky ridges were sourced from Hong Kong's climatic neighbors, such as northeastern Australia, New Caledonia, and New Guinea.[4] One such tree was the broad-leaf paperbark species *Melaleuca quinquenervia*, which still lines Hong Kong's streets in urban zones and is part of its wetland ecosystems.[5]

A similar tale of afforestation drives other histories of the paperbark and is implicated in its transformation from a treasured specimen tree to pernicious weed. Early twentieth-century developers and agriculturalists in South Florida employed the rhetoric of a wasteland ripe with latent potential, one that could be unlocked with the aid of trees' shade and fast-growing roots.[6] For decades, agriculturalists lauded *M. quinquenervia* as the tree that would dry up the Everglades, converting the putrid swamp into productive farmland. Local and federal horticultural agencies subsidized its planting and cultivation, even broadcasting its seed from low-flying planes across acres of swamp.[7] So highly prized was the paperbark for both its utility and ornamental value that early seed importers jostled to be recognized as its first American planters.[8] A memorial plaque in Lange Park, less than ten miles east of the Everglades, boasts that a *Melaleuca* planted there in 1900 is the oldest in the region. Growing to over 25 meters (before being struck by lightning in 1990), it was also the tallest, for which it was awarded status as a "champion tree" by the American Forestry Association in 1981.[9]



Map of the global spread of M. quinquenervia



Melaleuca tree growing in Lange Park, struck by lightnin...

Memorial plaque at Lange Park

Lange Park's broad-leaf paperbark is emblematic of the species' swift and steep fall from grace: from champion tree to incorrigible pest. "This is a living monument that needs to die," insisted Broward County environmental executive, Patti Webster, only a decade after receiving its national honor.[10] "It's a tribute to what not to plant. […] We'd be better off with a picture of it instead of the tree."[11] Webster's comments followed a series of laws passed in the 1990s to eliminate the species from southern Florida. Today, botanists enlist terms of war to describe its reproduction. As Jonathan Silvertown, professor of evolutionary ecology at the University of Edinburgh, writes in his book *Demons in Eden* (2005), the *M. quinquenervia* is part of an "army" that "arrived with a vengeance and is advancing mercilessly across Florida's natural ecosystems."[12] It is a villainous identity difficult to square with the paperbark's long history as a treasure of Aboriginal culture and bushcraft. How did the tree come to trace such a capricious path in its human alliances?

Colonial Discovery

The *Melaleuca quinquenervia* belongs to a genus of the Myrtle family. *Quinquenervia* is from the Latin words for five (*quinque*) and veins (*nervia*), describing the five veins typically found in the plant's leaves. It is closely related to eucalyptus and is endemic to mainland Australia, New Caledonia, and Indonesia - its southern geographical limit reaching Botany Bay. As its common name suggests, *Melaleucas* are distinctive for their bark, which easily peels from the trunk in smooth, flat sheets. *M. quinquenervia*, one of a group of nearly 100 species described as "broadleaf," can grow to heights of 20 meters. It favors riverbanks, swamps, floodplains, and estuaries. Its flowers, which appear in the fall, range from white to cream, and, characteristically, comprise spiked clusters of petals from which it derives an additional common name: "bottle-brush tree." Its leaves are dark, gray-green. As a fire-adapted species, burning can be beneficial to *Melaleucas*. Stress from the fire causes seed release and creates an ideal environment for germination and seedling growth owing to a more open canopy and carbon-rich soil.

Paperbark in flower

Bark structure

Paperbark fruit

In 1750, Swedish botanist Carl Linnaeus (1707-1778) identified the genus and named it *Melaleuca*, taken from the Greek “mélas” (black) and “leukós” (white). He used botanical descriptions written by German-born botanist (and famed as the Pliny of the Indies) Georg Eberhard Rumphius (1627-1702), who lived on the Maluku Islands of Indonesia as an employee of the Dutch East India Company in the last half of the seventeenth century. Rumphius’ botanical work, *Herbarium Amboinense* (1741), was published in 1741 - posthumously and against all odds, given his blindness late in life (as shown in the frontispiece portrait), the loss of his library and earliest manuscript draft to a fire, and a subsequent loss of a completed manuscript in a shipwreck.[13]

Portrait of Georg Eberhard Rumpf, alias Rumphius, (1627...

In the *Herbarium Amboinense*, which Linnaeus also used to classify dozens of new genera, Rumphius described a type of Myrtle tree, known in native Malay as “Caju-puti,” to which he added the Latin “Arbor alba” (white tree) and Dutch “Witte boom.” He also provided an additional name, “Brant-boomen” (fire tree), noting the apparent mystery that, though no witness had ever seen the tree on fire, “the bottom of this trunk is always most black, as if it had been burnt.”[14] This suggested to Rumphius that the heat of the summer sun would scorch the dry and delicate bark without actually bursting it into flame.

Rumphius' description of the paperbark's appearance following a bushfire, its white, flakey bark patchy under a scorched outer layer, remains a strong association for many. In a recent work, Australian novelist Peter Carey depicts a character, disfigured by burns, whose "pale blue eyes peered out from his own tattered skin as if they were prisoners inside the trunk of a blackened antipodean paperbark."[15]

Paperbark after a bushfire

M. quinquenervia received formal botanical description in 1797 by the Spanish naturalist Antonio José Cavanilles.[16] But it also numbered among the plants that had been earlier observed and collected by Joseph Banks and Daniel Solander, the latter a student of Linnaeus. They traveled to Botany Bay on Captain Cook's *HMS Endeavour* between 1768 and 1771, returning to England with over 3,600 botanical specimens. A specimen of *M. quinquenervia* collected in Bustard Bay and formerly identified as *M. leucadendra* before its reclassification in 1968, is preserved in the Queensland herbarium.[17] The species is also included among the engravings of Banks' *Florilegium*, a work that, despite 13 years of labor and enormous personal expense (costing £7,000, or roughly $1,490,000 today), remained unpublished until 1990.[18]

Banks and Solander...

Banks' Florilegium

Description of...

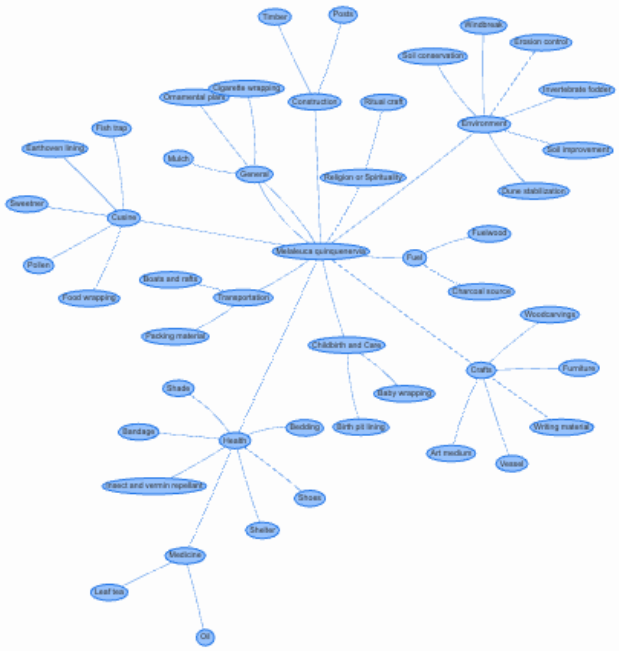
*Metrosideros...

Indigenous Treasure

The paperbark's centrality to Indigenous communities predates its eighteenth-century "discovery" by thousands of years. The tree goes by countless names across the Australian continent: in Bibbulmun, spoken by the south-western Noongar peoples, it is known as the "Mudrooroo"; in the northern languages of Ngalakgan and Kunwinjku, it is the "Gu-got" and "Kun-kod," respectively.[19] To a vast number of Indigenous peoples, including those of New Caledonia and New Guinea, the paperbark is no villain. In sharp contrast to its status in the United States, it holds a pivotal role among Aboriginal cultures.

Paper Bark

Its many uses intersect with daily life, including as a source of food, medicine, fuel, and protection from the elements. Its bark is easily peeled and used for shelter, construction, fuel, lumber, wrapping food, lining earth ovens, bundling babies, and as an antiseptic-laden bandage. The hardy tree also has environmental benefits, including soil conservation, windbreaking, erosion control, and providing habitats and sustenance for a multitude of organisms. Birds, bats, and invertebrates are among the creatures that live in or feast upon the paperback.



Uses of Paperbark

Part of what attracted European botanists and explorers to the paperbark was its many medicinal applications. Tea brewed from young bruised leaves is drunk for headaches and general sickness. The leaf oil is used to treat respiratory ailments, colds, and rheumatism and has antiseptic properties used to treat cuts and sores.[20] Ironically, in the United States, the *Malaleuca* has been labeled an allergen and respiratory irritant. While Florida authorities used human health concerns to justify a 1990 ban on its sale, transportation, collection, cultivation, or possession of *Melaleuca*, recent studies have found it is not a significant source of aeroallergen or a respiratory irritant.[21] The essential oil produced by *M. quinquenervia* is used as an antibacterial, fungicide, and insect repellant, often intended to treat superficial skin conditions. However, modern producers derive commercially available tea tree oil from *M. alternifolia*, not *M. quinquenervia*. Commonly known as Niaouli, some sellers market the oil from the *M. quinquenervia* as having more robust properties than the more common tea tree oil.

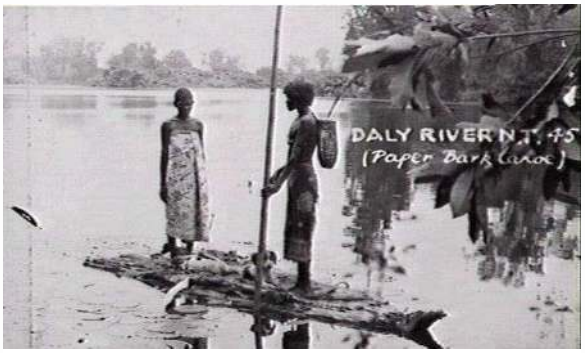
Tea tree oil

For generations, the Indigenous populations of Oceania have used *Melaleuca* bark to build structures and dwellings. Among some groups, dwellings were built entirely by women who cut the bark and erected the structure. When moving, the women would dismantle the dwelling and carry its component parts on their backs.[22] Indigenous communities stored paperbark sheeting when they were not in use and sometimes transported them over considerable distances, especially to areas where the trees were unavailable.[23] Bark structures could range from rafts for fishing, an important Indigenous tradition across much of Oceania, and open-air huts to more substantive shelters against the wet season's rains. Australian oral history from the Wik-Mungkan people, an Aboriginal group from northern Queensland, includes a tale regarding the origins of paperbark dwellings: a man and woman are out foraging and, when caught by surprise by the fast-approaching rainy season, construct a *Melaleuca* bark shelter.[24] In addition to its bark, *Melaleuca* lumber-hard and fine textured, and naturally resistant to termite attacks-is considered good building material, though liable to warp and difficult to cut and season.

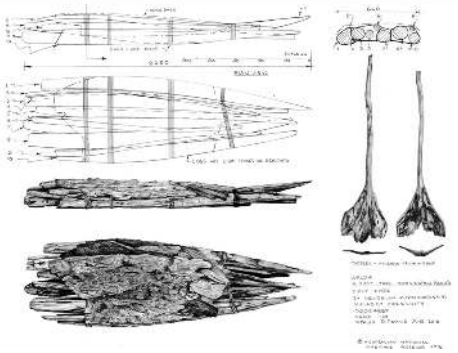
Two people sitting in fron...

Aboriginal men and a child outsid...

Bush shower of paperbark strips and timbe...



Two People and a Dog on a Paperbark Cano...



Walba, David Payne

Ethnographic accounts describe Aboriginal Australians using *Melaleuca* bark for bedding, lining earth ovens, wrapping food for cooking and storage, as fuelwood or kindling, and for making liquid-holding vessels and baskets.[25] More recently, Euro-Australians have championed the culinary applications of paperbark in combination with other Indigenous ingredients. Paperbark sheets for cooking are commercially available and chefs note that cooking food wrapped in paperbark provides a smoky flavor and recommend it for roasting fish, chicken, and vegetables. The plant's culinary uses extend beyond the *Melaleuca* bark. For example, steeping *Melaleuca* tree blossoms creates a natural sweetener that is used for making candy.[26] It is also a fine source of nectar and pollen for bees and is a significant source of honey in Australia and Florida.

Paperbark for food wrapping

Paperbark Basket, England...

Yikawana ga...

Paperbark provided women with versatile utilitarian material. Not only was it ideal for building and cooking, but women incorporated the bark into traditional birthing practices and the early care of infants.[27] In fact, for some Aboriginal Australians, childbirth occurred over a bark-lined pit, and the newly born baby was wrapped in paperbark or placed in a paperbark-lined coolamon (a basin-like vessel).

Aboriginal *coolamons* or carrying vessels

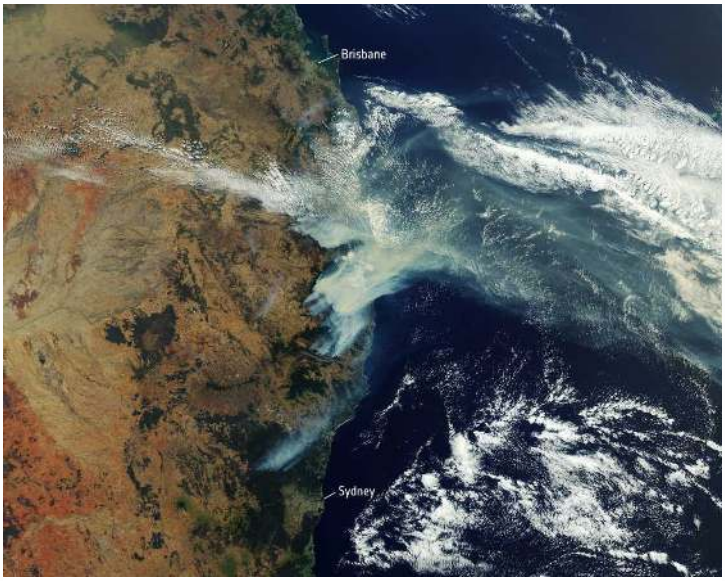
As a result, Aboriginal Australians were born into paperbark, lived in paperbark, ate from paperbark, and used paperbark for everything from ritual crafts to repelling insects. They incorporated paperbark into every phase of life, including funerary rituals, as a writing medium, and for smoking, shelter, and transportation. It is no wonder that the paperbark tree lives on in the minds of contemporary Australians and serves as a symbol of Aboriginal resilience.

Two Pieces of Tree Paperbark...

Aboriginal Australians value paperbark so highly that some have incorporated it into their names. The most famous is Oodgeroo Noonuccal (1920-1993), an Aboriginal Australian activist, educator, and artist. Formerly known as Kath Walker, the name she adopted in 1988 translates as “paperbark tree of the Noonuccal,” her ancestral tribe. Noonuccal devoted her life to combating social inequality for the Indigenous and advocating for the environment. Her writing explores themes of cultural identity, spirituality, place, and time, interwoven with rich descriptions of Australia’s natural environment. Her poem “Oodgeroo” tells the story of a woman, severed from her culture and people who, with the help of the Good Spirit Biami, spent many years recording lost tribal stories on paperbark. It concludes with the female protagonist finding peace in a tribe of paperbark trees, free from her old foe, Time.[28] “Oodgeroo” is exemplary in its exploration of ecological symbiosis, capturing both the *Melaleuca*’s utility and kinship with Aboriginal communities.

Climate Change and Indigenous Management

In a time of unprecedented wildfires and biodiversity loss, governments, institutions, and individuals are reevaluating how human behavior shapes natural environments. In Australia, climate change is creating hotter average temperatures and a more extended fire season while increasing the likelihood of bushfires, droughts, floods, rising sea levels, and extreme temperatures.[29] Like many other countries, Australia is facing environmental challenges that stem not only from global climatic change but also from a legacy of colonial land management and the displacement of Indigenous peoples.

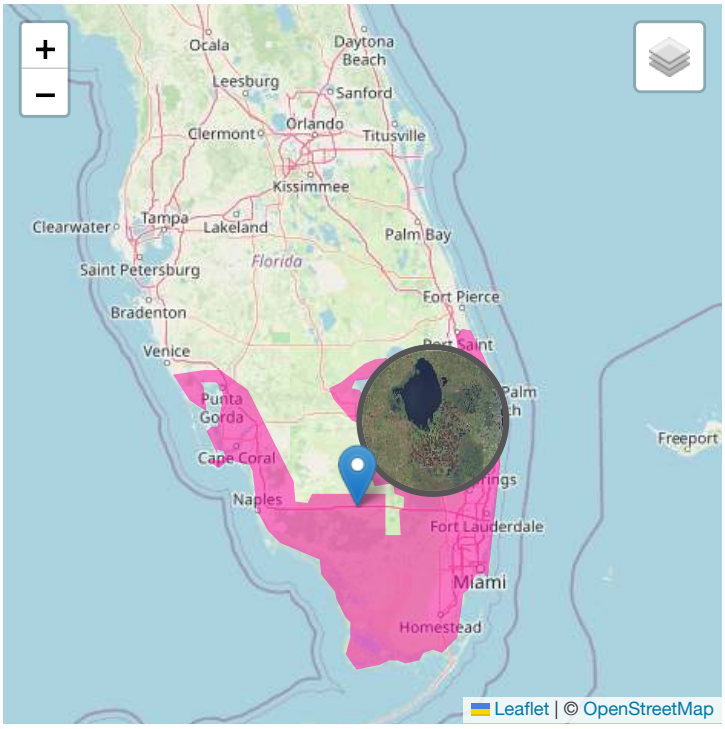


Satellite image of bushfire smoke over Easter Australia,...

Controlled burn

Before the arrival of Europeans in Oceania, Indigenous peoples shaped their landscapes by facilitating the growth of specific flora, including *Melaleuca*. Pollen, charcoal, and dendrochronological records indicate that Aboriginal Australians actively managed the environment before the eighteenth century.[30] This included anthropogenic burning; wind- and water-induced soil erosion following the removal or alteration of vegetation; irrigation; drained wetlands; redirected waterways; fertilizer use; and the introduction and exploitation of specific flora and fauna.[31] One of the most powerful tools for land management is anthropogenic or prescribed burning. The fires typically cover small areas of land, herding animals while burning grasses and underbrush. The heat and lack of competition encourage the growth of a heterogeneous range of annual vegetation, creating ecologically diverse patches. Small and frequently prescribed burning reduces the chances of subsequent high-severity wildfires.[32] To promote more sustainable practices, Australians have worked to reincorporate elements of Indigenous land management. For instance, the Ngarrindjeri Nation in South Australia has negotiated with the state government to be recognized as a sovereign partner in environmental management and implemented a program that facilitates collaboration, training, and the protection of the sites' cultural value.[33] Federal funding has supported the replacement of nonnative flora with *M. quinquenervia* and other endemic species native to eastern Australia, including tuckeroo and lomandra.[34]

An Advancing Enemy in Florida



The global dispersal of the paperbark tree was accompanied by patchy and incomplete knowledge transference. Western horticulturalists, like those in Florida, recognized few of the multitude of Aboriginal uses. At the turn of the twentieth century, nurserymen and regional planters in and around the Everglades saw potential in the paperbark as a timber species as well as a land management tool. As mentioned previously, they posited that its high water usage and its fast-growing speed would make it ideal for converting the swamp into a dry and "productive" agricultural landscape while eradicating mosquitos and other pests.[35] The tree's thick roots were utilized as a natural erosion-prevention infrastructure to stabilize disturbed areas, especially around Lake Okeechobee.[36] Finally, especially in its early years, the paperbark was appreciated as an ornamental and planted as such in gardens around South Florida.[37] Today, scientists recognize another utility for the tree: as a climate recorder. Its leaves can provide proxy data for quantifying past rainfall.[38] Although limited in its uses when compared to its endemic range, the paperbark entered Florida as an appreciated and valuable addition. This positive image lasted for much of the twentieth century.

M. quinquenervia stand lining I-75 in the Everglades

As the twentieth century came to a close, so did the paperbark's era of good grace. Many of the traits that made the tree attractive became those for which it is now most despised. *M. quinquenervia* grows quickly and is a prolific reproducer, with some mature plants holding up to 20 million seeds at a time. If contained within their capsules, these can remain viable for up to 10 years and germinate in various conditions.[39] South Florida and the tree's endemic zone both fall within subtropical latitudes and share a climate of high precipitation in the summer and mild temperatures, combined with low precipitation in the winter. Both habitats experience frequent wildfires and have histories of Indigenous anthropogenic burning. These traits made *M. quinquenervia* preadapted to thrive in Florida, which it certainly did immediately upon its introduction.[40] Its seeds established themselves within South Florida's many wetland environments with efficiency and ease. By 1994, estimates of the paperbark spread had surpassed 500,000 acres, most of which comprised monocultural stands.[41]

Melaleuca leaf weevil

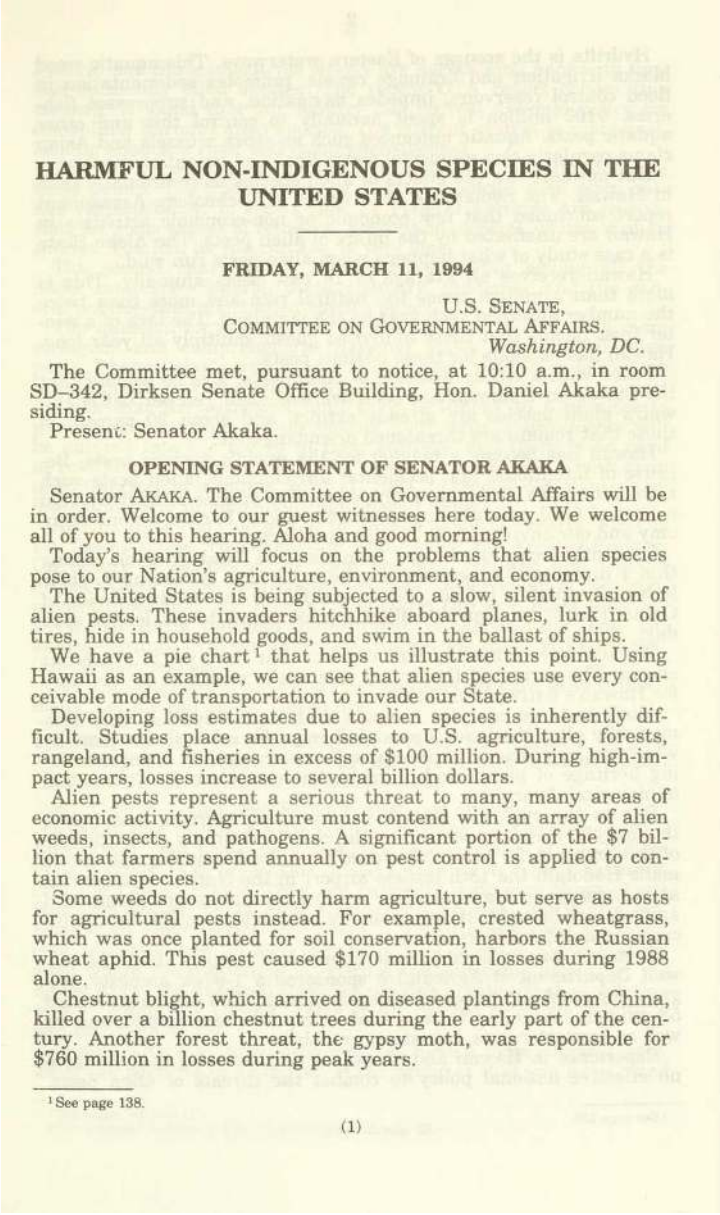
Militaristic analogies reenter the narrative of the paperbark tree in discussions of controlling its spread. Attempts to push back the edges of the tree's groves are described using the language of battles and outright war between humans, accompanied by their army of emissaries, and the ever-encroaching, anthropomorphized enemy, the tree. Battle tactics are aggressive and varied, including cutting, herbicides, burning, flooding, hand removal of individual saplings, and, increasingly, biological control.[42] A 1997 article in *The New York Times* speaks of a valiant "Army of Tree-Hungry Beetles" ready for employment in the battle against the insidious paperbark. It celebrates *Oxyops vitiosa*, a snout beetle, also native to Eastern Australia, which was released in the late 1990s to colonize stands of paperbark in South Florida in the hopes that the weevils, who feed primarily on the fresh leaves of saplings, would keep the further expansion at bay.[43] In the decades since their introduction, other insects like *Lophodiplosis trifida* and *Fergusonina turneri* have been studied and eventually released for their possible usefulness in this ongoing "war."[44]

Annona glabra or pond apple

It is a small jump from this metaphorical battle to one between nations. In what the botanist Tim Low termed one of the ironies of the broad-leaf paperbark's invasive speed, the native habitats of this tree are increasingly under threat. Writing in 1990, Low reported how he "trudged across the bulldozed fields" in south-east Queensland, shaking his head in dismay as he thought back to his "American friends, and how they would love to see a scene like this acted out in Florida." These areas of Australian wetland are fast being developed for human habitation. And even in still-preserved wilderness, the tree faces ecological challenges. In the greatest irony of all, among the threats to the paperbark in its Australian habitat is the Pond Apple, which is native to the Everglades (*Annona glabra*). It is difficult not to conceive of this development as an act of botanical revenge.[45]

Conclusion

Should this framing of conflict and warfare give us pause for thought? The label “invasive,” as a scientific term applied to an organism, has its mainstream origins in zoologist Charles Elton’s 1958 work, *The Ecology of Invasions by Animals and Plants*, and caught on broadly only in the 1990s, when publications on “invasives” skyrocketed.[46] In 1994, Hawai’i’s Senator Daniel Akaka spoke before Congress about the “slow, silent invasion of alien pests” creeping across the borders of the United States.[47] By 1999, this concern had gained such traction that an executive order mandated the formation of an interagency government coalition, the National Invasive Species Council, to eradicate botanical threats.[48] Around the same time, several landscape design scholars turned a critical eye to the tenor of this discourse and the countervailing enthusiasm for “native plants,” a term that constitutes a “mixture of sound biology, invalid ideas, false extensions, ethical implications and political usage both intended and unanticipated”.[49] In particular, Joachim Wolschke Bulmahn and Gert Gröning have sought to trace this discourse to ideologies of landscape under Nazi Germany and American “nativism” in the early twentieth century. How easily, they ask, can the scientific become political? Can these conceptions of landscape feed xenophobia?[50]



HARMFUL NON-INDIGENOUS SPECIES IN THE UNITED STATES

FRIDAY, MARCH 11, 1994

U.S. SENATE,
COMMITTEE ON GOVERNMENTAL AFFAIRS.
Washington, DC.

The Committee met, pursuant to notice, at 10:10 a.m., in room SD–342, Dirksen Senate Office Building, Hon. Daniel Akaka presiding.

Present: Senator Akaka.

OPENING STATEMENT OF SENATOR AKAKA

Senator AKAKA. The Committee on Governmental Affairs will be in order. Welcome to our guest witnesses here today. We welcome all of you to this hearing. Aloha and good morning!

Today’s hearing will focus on the problems that alien species pose to our Nation’s agriculture, environment, and economy.

The United States is being subjected to a slow, silent invasion of alien pests. These invaders hitchhike aboard planes, lurk in old tires, hide in household goods, and swim in the ballast of ships.

We have a pie chart [1] that helps us illustrate this point. Using Hawaii as an example, we can see that alien species use every conceivable mode of transportation to invade our State.

Developing loss estimates due to alien species is inherently difficult. Studies place annual losses to U.S. agriculture, forests, rangeland, and fisheries in excess of $100 million. During high-impact years, losses increase to several billion dollars.

Alien pests represent a serious threat to many, many areas of economic activity. Agriculture must contend with an array of alien weeds, insects, and pathogens. A significant portion of the $7 billion that farmers spend annually on pest control is applied to contain alien species.

Some weeds do not directly harm agriculture, but serve as hosts for agricultural pests instead. For example, crested wheatgrass, which was once planted for soil conservation, harbors the Russian wheat aphid. This pest caused $170 million in losses during 1988 alone.

Chestnut blight, which arrived on diseased plantings from China, killed over a billion chestnut trees during the early part of the century. Another forest threat, the gypsy moth, was responsible for $760 million in losses during peak years.

[1] See page 138.

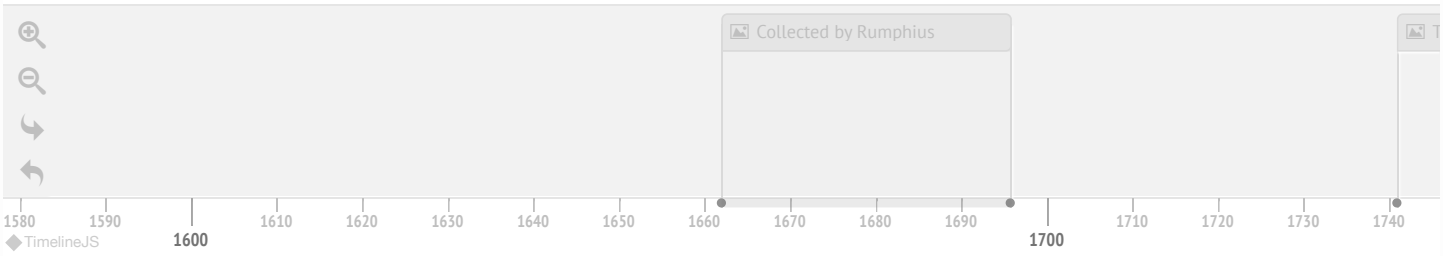
(1)

Opening remarks of the 1994 congressional hearing,...

These questions have faced pushback. In the case of the paperbark, the ecological reality of its dominance in Florida cannot be denied, regardless of the language used to describe its spread. This debate is nevertheless part of the paperbark tree's history. Its vilification arose at the same moment toward the end of the twentieth century. Just as "invasives" were entering mainstream consciousness as ecological villains, the USDA placed *Melaleuca quinquenervia* on the Federal Noxious Weed List, restricting its sale, circulation, and importation in the United States.[51] In the later part of the 1990s, this zeal for prevention morphed into one for eradication, and significant sums of money, from federal agencies and NGOs, were put toward removing stands in Florida. Legislation supported by its invasive status began to imply that nearly anything, including development, was preferable to the tree's presence.[52] In the space of a century, *M. quinquenervia* had fallen from a plant of immense possibility to an invasive "garbage" weed. Nothing in the plant had changed. What did change was our illusion of control. The tree escaped the settings and roles that Floridian planters had hoped to consign to it, serving as a reminder that human interests are but one force shaping our dynamic, global environment.

Geoff Whalan

Monsoon season paperbark swamp, Amy Johnson Drive, Darwin International Airport precinct, 2018



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