

Chilean mayten (*Maytenus boaria*) – a ticking time-bomb?

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Experts reckon that about 20 new plants 'jump the garden fence' each year to become naturalised in New Zealand (Ewen Cameron, Auckland Museum, pers. comm.).

One such plant that I, and others, have become increasingly concerned about – particularly around my home area of Canterbury – is *Maytenus boaria* (also called Chilean mayten, mayten or maiten). Unfortunately, this species now appears to be a ticking time-bomb and has real potential for explosive spread to become a major environmental weed throughout New Zealand.

This article describes what Chilean mayten is, its history of introduction, why it's become a problem, and what we can do about it.

What is Chilean mayten?

There are more than 50 species of *Maytenus* and most are tropical. Several are said to have been cultivated in New Zealand², but *M. boaria* is by far the most widely grown due to its cold-tolerance and horticultural qualities. Chilean mayten belongs to the Celastraceae family and is native to South America, naturally occurring from about 30 to 50°S in Chile and Argentina.

This evergreen tree is fairly hardy and drought resistant. It's cultivated as a small to medium sized tree, typically reaching 6–8 m after several decades (Fig. 1). However, under optimum conditions and given enough time it can eventually grow up to 20–30 m tall. It has fissured grey bark (Fig. 2).

When mature, this graceful tree develops a straight trunk and pendulous branchlets that sway in the wind, similar in effect to a weeping willow (*Salix babylonica*) or the Western Australian peppermint tree (*Agonis flexuosa*).



Fig. 1 Habit of 30-year old tree growing in the CASC grounds, Lincoln. This female tree is the seed source that has caused its spread on that campus. It has now been cut down and the stump poisoned. Photo: Murray Dawson.



Fig. 2 Trunk showing fissured grey bark (same tree as Fig. 1). Photo: Murray Dawson.



Fig. 3 Characteristic serrated foliage and small flowers. Female shrub. Photo: Murray Dawson.

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² *Maytenus magellanica* (Lam.) Hook.f. and *M. vitis-idaea* Griseb. (endemic to South America), *M. canariensis* (Loes.) G.Kunkel & Sunding (endemic to Spain), *M. silvestris* Lander & L.A.S.Johnson (endemic to Australia), and *M. vitiensis* (A.Gray) Ding Hou (of the South Pacific).

Chilean mayten leaves are alternately arranged, glabrous (hairless), glossy and dark green on the upper surfaces, lighter green on the lower surfaces, and shortly petiolate (with leaf-stalks 1.3–6 mm long). The leaves are relatively small ((15–)20–60(–75) mm long), narrowly lanceolate to elliptic, and with finely serrated margins (Fig. 3).

In New Zealand it flowers from late August to early October. Its flowers are solitary or arranged in axillary clusters (arising from the stems), small (about 5 mm in diameter), 5-merous, greenish-yellow and relatively inconspicuous. There are separate male (Fig. 4A–B) and female (Fig. 5A–B) plants – they are either all-male or all-female (i.e., the species is dioecious and you don't get male and female flowers together on the same plant).

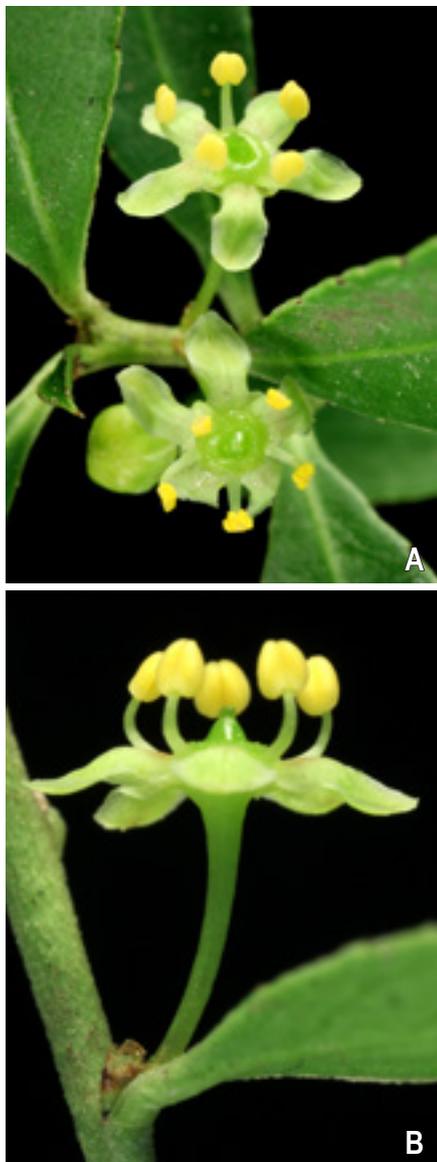


Fig. 4 Male flowers. **A**, flowers showing yellow anthers. **B**, close-up side view of flower. Photos: Murray Dawson.



Fig. 5 Female flowers. **A**, flowers showing stigmas and superior ovaries. **B**, close-up side view of flower. Photos: Murray Dawson.



Fig. 6 Mature fruit. **A**, fruit showing orange-red arils. **B**, close-up view. Photos: Peter Heenan, © Landcare Research 2015.

Seed formed on female plants mature from March to June, and are surrounded by orange to dark red coloured fleshy arils (Fig. 6A–B). The persistent fruit capsules are yellowish-brown in colour (Fig. 7A–B).

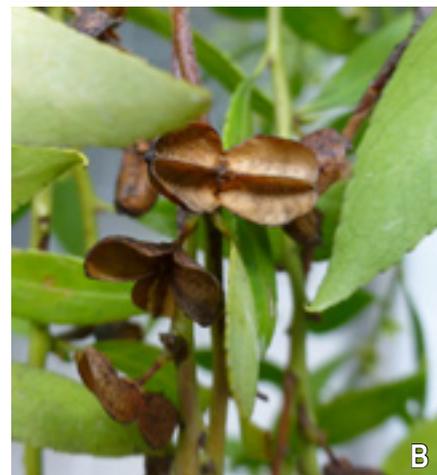


Fig. 7 Old fruit capsules persisting on tree after the fruit has been dispersed. **A**, general view. **B**, close-up view. Photos: Murray Dawson.

Early garden records

Searching the outstanding Papers Past resource (<https://paperspast.natlib.govt.nz>), the earliest record that I found of *Maytenus* being introduced into New Zealand is 1881, where “*Maytenus pendulinus*, the South American spindle tree” is noted as a new arrival, as part of the Christchurch Domain Board’s plant exchange programme (Some New Arrivals, *The Star*, Issue 4161, August 22, 1881, p. 3). *Maytenus pendulina* Steud. is probably a synonym for the currently accepted name *Maytenus boaria* Molina.

It is apparent that mayten successfully established from early imports such as this, as a large specimen of “*Maytenus chilensis*” was highlighted as growing in the Christchurch Botanic Gardens in a 1945 guide (Visitors’ Guide to Christchurch, *The Press*, Vol. LXXXI, Issue 24594, June 16, 1945, p. 6). *Maytenus chilensis* DC. is a valid synonym for *Maytenus boaria*. In 1962, Bill Sykes collected a herbarium specimen (Allan Herbarium, CHR 130131) from a tree he estimated to be a remarkable 100 ft (30 m) tall, cultivated in the gardens. In the same year, 1962, Diane Smith also lodged

a specimen collected in the gardens (Christchurch Botanic Gardens Herbarium, CHBG 1738).

In 1929, "*Maytenus escallonicus*" became commercially available in New Zealand, and was listed as a new shrub in a Duncan & Davies nursery catalogue of that year. This species name does not appear to be valid. However, in a later Duncan & Davies catalogue (c. 1947) the name "*Maytenus chilensis*" is instead used, and that catalogue description is a good match for Chilean mayten: "E [evergreen]. In maturity the slender branches develop a weeping habit, which in combination with the small bright green leaves makes this a very attractive tree. 12 ft."

Eastwoodhill Arboretum's stock records (unpub. data) show that their first accessions of this tree date from 1935, from Stevens Brothers Nursery in Bulls, New Zealand. Eastwoodhill's 1948 imports came from Hillier Nurseries in Winchester, UK.

Chilean mayten as a weed

Webb (1988) recorded Chilean mayten as naturalised in the *Flora of New Zealand, Vol. 4*. He mentioned two collections from Canterbury – one from a footpath and gutter in Christchurch and the other from a single thicket growing amongst indigenous trees at Church Bay, Banks Peninsula.

I have examined these and other Allan Herbarium (CHR) specimens of Chilean mayten and the accompanying collectors' notes.

The late A.J. Healy (a weed expert from the then Botany Division, DSIR) noted in his 1975 collection from Clyde Road, Christchurch (CHR 326322; referred to by Webb 1988) that his specimens were taken outside of a residential section where planted trees were suckering out through the footpath and gutter channel.

In some growing conditions, these suckers can form dense thickets more than 10 m away from the parent tree. I'm not certain that suckering from a cultivated tree (even after it is cut down) represents a genuine naturalisation event in all cases, as material may not spread far beyond the confines

of the original root zone³. For Chilean mayten, seedling spread is a more robust determiner of naturalisation and I would not consider 1975 as the year of naturalisation here.

1986 specimens from Hunters Gully above Church Bay (CHR 437248, collected by Bill Sykes, and CHR 497744, collected by Hugh Wilson) may represent the earliest likely record of naturalisation from seedlings. However, unless you pull the emergent shoots out of the ground, it's difficult to confirm what material they are arising from. Central root leaders are characteristic of seedlings, and suckers arise from mature tree roots growing horizontally near the surface. The aforementioned herbarium specimens from Church Bay don't show any below ground parts.

In the Gisborne and Whanganui regions, there is additional evidence from herbarium collections of Chilean mayten escaping from cultivation.

In 1989, Bill Sykes collected specimens (CHR 463199A–C and CHR 463200A–C) from trees growing nearby but outside of the boundary of Eastwoodhill Arboretum. Bill returned in later years to collect female specimens cultivated within the arboretum (CHR 472607, collected 1991, and CHR 497192A–D, collected 1994). A management goal of Eastwoodhill is to remove Chilean mayten from the park which involves cutting down the tree, removing all suckers and poisoning the stumps. Full control is difficult to achieve given their current resources (Dan Haliday, pers. comm.). Suckers are more easily controlled if stock are on-site to eat them, or if the tree has been planted as a lawn specimen so any suckers are constantly mown down.

More recently, in 2012, Colin Ogle collected for the Allan Herbarium obvious Chilean mayten seedlings complete with roots – these came from Bason Botanic Gardens, Westmere, near Whanganui (CHR 621564; Fig. 8). Colin tells me that he has alerted the Friends of Bason Botanic Gardens about the emerging threat that Chilean mayten presents. Hopefully, they will set about to remove at least the female trees from their gardens.



Fig. 8 Herbarium specimen (CHR 621564) collected by C.C. Ogle from Bason Botanic Gardens showing obvious seedlings. Photo: © Landcare Research 2017.

So why is Chilean mayten now becoming invasive more than 130 years after its first introduction into New Zealand? Why is this previously benign tree going rogue?

Full credit goes to Joe Cartman, Christchurch City Council Nursery Supervisor and a renowned plantsman, for unlocking this puzzle. He realised that up until the mid-1980s only male plants were sold by nurseries. This was based on observations he made of dozens of trees around Christchurch and elsewhere, all males and probably a tendency applicable to the rest of New Zealand at that time. Cartman commented that these male plants appeared to be uniform and probably from the same clone. Material would be easy to propagate vegetatively by pulling up suckering shoots (Fig. 9) and growing them on through root cuttings.

Unfortunately, this status quo changed. Cartman and McCombs (2002) noted that from the mid-1980s seed-grown plants started to appear on the market, and inevitably some of these were female. Birds love to eat the fleshy seed-containing arils and thus Chilean mayten has literally now gained wings in New Zealand. This has allowed the species to disperse well beyond the original (all-male) plantings and to colonise new areas.

³ Conversely, for some species such as bamboos naturalised in New Zealand, soil excavation and transport to new sites can indeed lead to new wild plants.



Fig. 9 Suckering from a tree that was cut down more than 15 years ago at the CASC grounds, Lincoln. Photo: Murray Dawson.

Cartman and McCombs (2002) recounted that around 1990, several of the seed grown plants were purchased and planted out in a shelterbelt at the Christchurch City Council nursery in Gardeners Road, Harewood (e.g., CHR 478917, collected from the nursery by Bill Sykes in 1988). Within a few years of planting, Joe Cartman observed numerous seedlings emerging in the vicinity of the original tree (e.g., CHR 567754A–B, collected by Peter Heenan in 2003). They cut down this tree but found the seedlings and suckers persistent and difficult to control. They repeatedly poisoned the stump and removed regrowth. Joe Cartman (pers. comm.) tells me that Roundup® kills the seedlings (using a $\times 1.5$ dose rate and with penetrant added).

It's a similar story at my workplace campus, the Canterbury Agriculture and Science Centre (CASC) at Lincoln, Canterbury. Landscaping planted in the early 1990s by the former Ministry of Works included a female Chilean mayten tree in the South American courtyard garden (Fig. 1–2). Fast forward to the present, and sure enough, saplings are rampant throughout our native and exotic plantings on campus, some male and others female.

At the nearby Lincoln University campus, suckers are persisting from trees that were originally planted there but have been cut down, and fully mature trees that are still cultivated and also suckering (Fig. 10). Roy Edwards

(pers. comm.) has seen plants appearing in parts of the amenity area where it was never planted, suggesting that it may also be spreading on that campus by seed dispersal.



Fig. 10 Suckers (shown in the foreground) from a large mature tree (background) cultivated at Lincoln University, Canterbury. Photo: Murray Dawson.

John Stevens told me of his personal horror story of Chilean mayten infesting his native plantings at Willowbridge, near Waimate, and his efforts to control it. From 2001, John planted more than 10,000 native plants on 4 ha of his land. This revegetated area gained a QEII covenant in May 2007. Unfortunately, around 2002–2003 his neighbour on the opposite side of the road planted a shelterbelt that included some 50 plants of Chilean mayten, recommended for that purpose by a local plant nursery. Obviously, some of those trees must have been females as 13–14 years after the shelterbelt was planted, thousands of Chilean mayten seedlings became apparent in John's native plantings across the road. These appeared as isolated plants and also thick patches of seedlings (particularly under native trees and shrubs favoured by the birds to roost on). John's neighbour readily agreed to kill the Chilean mayten from the shelterbelt, and together they trialled different treatments in 2016. These trials included spraying the foliage of the 4 m tall trees with Starane® herbicide, and drilling and filling holes in the trunks with neat Roundup®, Tordon® and a 50:50 mix of the two. They found of all

treatments, spraying with Starane® (60 ml per 10 litres) to be the most effective, killing off all adult trees along with their suckers that were growing up to 6 m away from the parent trees (some, but not all, of those suckers were sprayed along with the parent foliage). Drilling and filling trunks with Tordon® was the next most effective treatment, and Roundup® on its own was less effective⁴. Starane® spray also effectively killed off Chilean mayten seedlings.

Based on NatureWatch NZ 'Citizen Science' observations, Central Canterbury appears to be a primary source of spread in New Zealand (Fig. 11). Several recent observations include:

- Suckers coming up in a garden more than ten years after the adult tree was killed by Jon Sullivan and the stump and all suckers being liberally treated with Vigilant® herbicide gel (<http://naturewatch.org.nz/observations/3659022>).
- An observation by Jon Sullivan of a wild sapling found in the middle of Bottle Lake Plantation growing under tall pines (<http://naturewatch.org.nz/observations/2537947>).
- A mature female tree with numerous seedlings or suckers in Kaiapoi (<http://naturewatch.org.nz/observations/1000227>), and observations by Sue McGaw in many other locations on earthquake abandoned wasteland in Kaiapoi.

Chilean mayten is a master of disguise and hides amongst native shrubs, so it may well have been overlooked in other regions. When it's still a shrub, it looks rather nondescript with its small evergreen leaves and (unless in fruit) few distinguishing features. Chilean mayten looks a lot like a native New Zealand plant, and resembles a small leaved māhoe (*Melicytus*) or perhaps a ribbonwood (*Hoheria*). Worse, it's very shade tolerant so can co-exist with and then potentially outcompete in native ecosystems, restoration areas, and amenity plantings.

As a result of its weedy characteristics, Chilean mayten was added to the

⁴ Cartman and McCombs (2002) also tried drilling and filling with Roundup®. They note that "Plants have been drilled and the holes filled with 60% Roundup solution. This kills about half the treated stems. In comparison, this method has a 100% kill of hawthorn, spindleberry, sycamore and eucalypts elsewhere within the shelterbelt. Poisoning is necessary as merely cutting the plants stimulates a mass of root suckers."



Fig. 11 Distribution of *Maytenus boaria* in Central Canterbury. Map generated from NatureWatch NZ (<http://naturewatch.org.nz>).

National Pest Plant Accord (NPPA) in 2012, banning its sale, distribution and propagation in New Zealand.

It was with some surprise then that I spotted mayten listed in a landscaping and tree planting appendix to the proposed 2014 Christchurch Replacement District Plan. Needless to say, because of its NPPA status, I tendered a written submission pointing out that it cannot now be considered for planting under any circumstances. This is somewhat ironic as Joe Cartman and Kate McCombs, who raised the alarm in the first place, are (and were respectively) Christchurch City Council employees. Also, their informative 2002 article no longer appears to be retrievable directly from the CCC website.

Maybe Environment Canterbury and other regional authorities can step up and include Chilean mayten in their next Regional Pest Management Strategy? I think that there is a strong case for doing so.

What can you or I do about this ticking time-bomb? I repeat Cartman and McCombs (2002) plea for early intervention, now made nearly 15 years ago. We need sharp eyes looking out for this new pest plant. Saplings and trees – of females in particular – should be hunted down and actively removed as soon as possible to prevent further spread of seedlings. The cost of inaction could well be a new environmental weed becoming established throughout New Zealand, and perhaps capable of invading native forest. Let's hope that it's not already too late.

I've 'walked-the-talk' and had the adult tree (Fig. 1) and a female sapling on my campus cut down. No doubt we will be spending several frustrating decades

removing the resulting suckers and a legacy of seedlings.

Summary

A timeline of known information for Chilean mayten establishment in New Zealand is:

- 1881: Introduced into the Christchurch Botanic Gardens from overseas.
- 1929: Sold commercially by Duncan & Davies nursery, New Plymouth.
- Mid-1980s: Seed-grown plants started to be sold, including females.
- 1986/1989: Recorded as naturalised from herbarium specimens.
- 2002: Joe Cartman and Kate McCombs published an article outlining the emerging weed threat.
- 2012: Chilean mayten was added to the NPPA list.
- Present day: Citizen Science observations indicate the expanding distribution of this species, particularly in Canterbury.

Weedy characteristics of Chilean mayten include:

- Long-lived.
- Drought resistant.
- Persistent suckering from roots.
- Resistant to poisoning.
- Very shade tolerant but also grows in full sun.
- Difficult to distinguish from New Zealand native plants.
- Flowers and fruits from an early age (3–5 years, 2 m tall).
- Seed readily dispersed by birds.

Acknowledgments

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My images used in this article have also been added to the NatureWatch NZ platform.

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