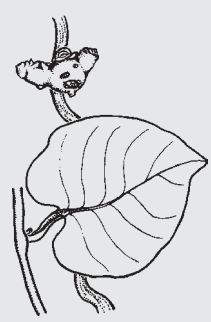


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Climbing spindleberry

Climbing spindleberry, a weed on the rise

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Climbing spindleberry, *Celastrus orbiculatus* (Celastraceae), is a dioecious or gynodioecious deciduous woody vine, originally from temperate east Asia, which climbs by wrapping its stems around other vegetation. The plant is a garden ornamental climber grown for its attractive yellow autumn leaves and bright red fruits in the winter. *Celastrus orbiculatus* has simple, alternate leaves, typically hairless and with serrated margins and elongated tips. The stems are green, usually with noticeable lenticels (wart-like markings). The bright red flesh of each fruit (an aril) is enclosed within a yellow papery capsule, 6-8 mm in diameter. Each fruit contains 1-6 small black seeds. Also, the outer surface of the roots is characteristically bright orange. Excellent photos of the species can be viewed at the Salisbury University (USA) Arboretum website (see <http://www.salisbury.edu/arboretum/Celastr/CeOr/CeOrHM.html>).

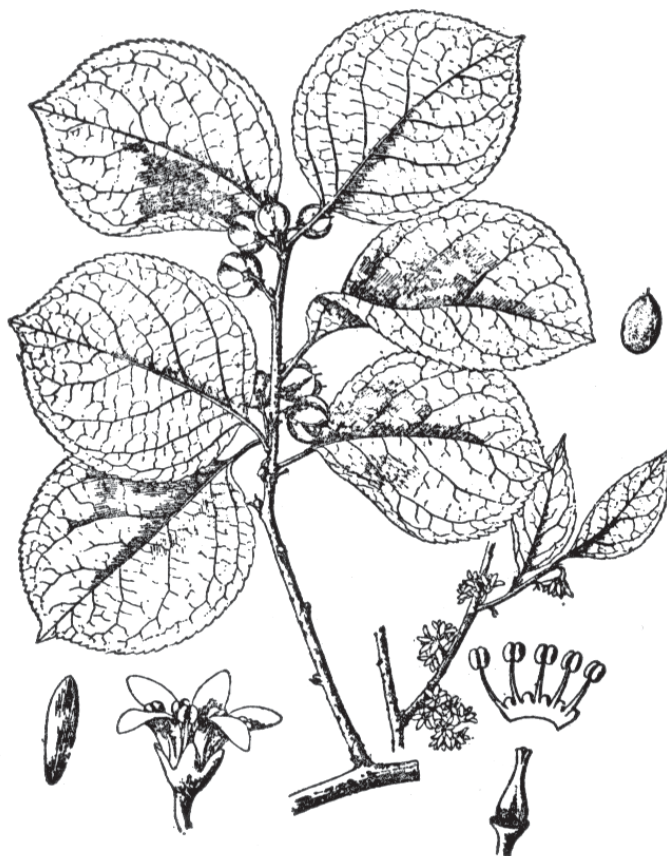


Flora of New Zealand Volume IV Webb et al. (1988) records the species as naturalised at only one site in New Zealand, collected at Tairua, Coromandel, in 1981. It further mentions that the species "may persist in abandoned gardens". Things have changed greatly since then. *Celastrus orbiculatus* has recently been added to the 2001 National Plant Pest Accord list, and is highlighted as one of DOC's weeds of concern. It is one of 12 climbing weeds targeted by Environment Bay of Plenty. The Marlborough and Tasman district councils, Nelson City Council, and DOC have a control programme in place for the upper South Island. A recent DOC/Environment Waikato survey has verified wild *C. orbiculatus* as established and spreading at 37 different localities throughout the Waikato region, with unverified reports from a further four localities (Fig. 1). These sites span the region, but current densities are greatest in the southern, cooler areas.

Celastrus orbiculatus has already proved itself as a troublesome weed in the eastern United States (Dreyer 1985), where it is known as Asian bittersweet,

Asiatic bittersweet, and Oriental bittersweet. It reaches weedy proportions from New York State and Connecticut to Louisiana and the southeastern Great Plains, and is still spreading, demonstrating a wide climatic tolerance. Vines have been found reaching heights up to 18 m, and they strangle and smother other vegetation. Nearly pure stands of the vine are not uncommon in affected areas. Upland meadows, young forests, and beaches are most vulnerable to *C. orbiculatus* invasion and dominance. The species is noted for its rapid growth and high reproductive rate, and along eastern US roadsides it is said to be reminiscent of the infamous kudzu-vine-infested areas of the southeastern US. In a study in Connecticut, the fruit were fed upon by a wide variety of birds during the winter months, including the European starling. A persistent seed bank of >6 years has been observed.

DOC Waikato staff have been concerned about whether or not *C. orbiculatus* can germinate and establish beneath native forest. We performed a small greenhouse trial in 2001–2002 to test the ability of *C. orbiculatus* to withstand understorey shade. Thirty pots were set up in a greenhouse at Landcare Research, Mt Albert, in late July 2001, and planted with seeds sourced from Waikato. Ten seeds were planted per pot, under 0.5 cm of soil. The pots were randomly divided between full sun and 90% shade cloth. Pots



were further separated by seed number per fruit to see whether seed viability was affected by the number of seed in a fruit— six pots each had seeds sourced from fruits containing 1, 2, 3, or 4 seeds. The trial was run for five months.

This trial revealed *C. orbiculatus* to be relatively robust in shaded conditions. Germination rates were low, but were not significantly affected by shading (averaging 11.4% in full sun versus 13.8% in shade). Higher germination rates (30–95%) have been found in the United States (Dreyer 1985), where germination has similarly been observed in partial to dense shade



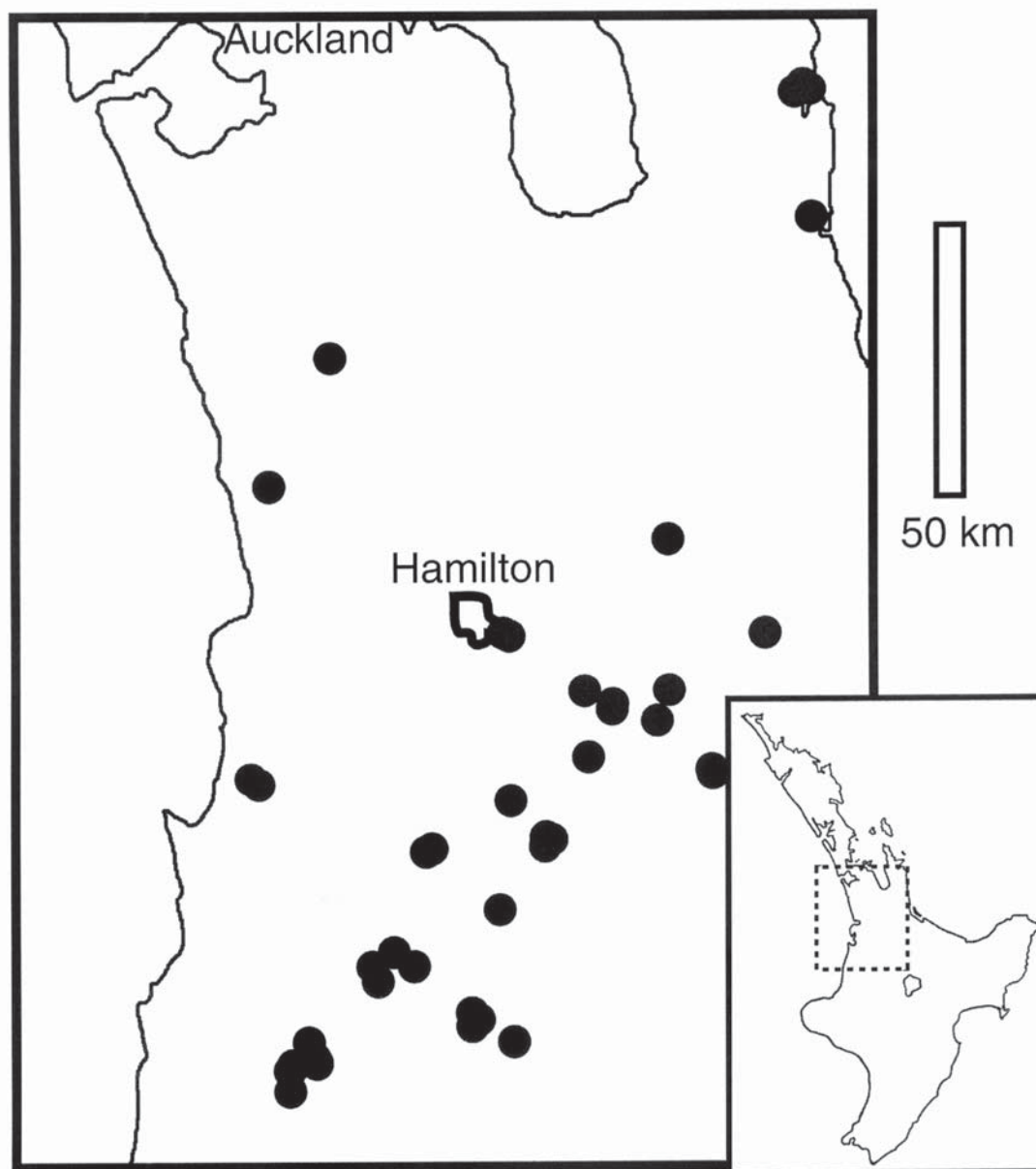


Figure 1. The current known locations of *Celastrus orbiculatus* in the Waikato. The site of first recorded naturalisation, in 1981, is Tairua, at the upper right. Data courtesy of DOC/Environment Waikato.



(Bergmann & Swearingen 1997).

These plants were smaller and with larger, thinner leaves than the full-sun plants, but still appeared healthy.

An additional, curious result of our trial was that seed germination differed significantly depending on the number of seeds per fruit. The highest germination rates were found for the seeds taken from fruits containing four seeds (28.3%), which was significantly higher than the germination rates of seeds taken from fruits with 1–3 seeds each (8.3%). Only 7.6% of fruit contained four seeds. The majority of fruit contained one or two seeds (32% and 37.8% of fruit respectively).

Our results and several aspects of *C. orbiculatus* biology suggest that it poses a substantial threat to forests. It can smother forest edges, and can penetrate into forests through root suckering. While seed viability appears to be low in New Zealand (and this needs to be confirmed), reproductive output of *C. orbiculatus* is very high, and the fruit are likely to be sought after by starlings, blackbirds, and perhaps kererū. The ability of seeds to germinate in the shade and some seedlings to survive shading should enable the species to establish in forest tree-fall gaps, and potentially smother native tree seedlings and saplings there. The species definitely deserves the attention it is beginning to attract in New Zealand.

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