

Understanding and managing the risk of garden escapes to Australia's native flora: which future weed candidates are already here?

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Summary Escaped garden plants form 66% of Australia's weed flora. They also comprise approximately 66% of the weeds posing a threat to biodiversity within NSW. This problem is perpetuated by the availability for sale of many of these weed species. Also many others are present in gardens either acting as foci for new invasions or awaiting an opportunity to escape. Whilst information on which weeds are available for purchase and banning their sale is an important advancement, this will only address half the problem, as such actions do not account for those species presently growing in gardens. Therefore, those invasive plants currently grown in gardens will continue to pose a potential threat even if the species is banned from sale. Thus, future weed management initiatives need to focus on what's grown in gardens. At present there is a lack of knowledge to enable weed managers to respond pro-actively to this risk, in terms of which known and future weed species are present in gardens. An urgent starting point is a pseudo-audit to establish what potentially invasive plants are most likely to be in gardens in addition to those that are available for sale. This can be achieved through assessments of nursery catalogues to find out how long candidate species have been available for sale and from how many major garden outlets. This can then be combined with their weediness attributes and their known weediness elsewhere in the world. From this process a robust priority alert list can be developed to focus early warning and surveillance programs and target high-risk invasive garden plants that the public should be encouraged to replace with low-risk species.

This initiative would fill an important gap in the national response to weeds. At present we are: i) closing the front door on new introductions; ii) focusing efforts on new incursions; and iii) combating Weeds of National Significance. But we are not as yet looking at the large pool of several thousand invasive garden plants that are already here but yet to jump the garden fence.

Keywords Garden escapes, risk assessment, future weeds.

INTRODUCTION

Impact of garden escapes Garden escapes have been identified as a major source of weed introductions worldwide. The scale of the problem is reflected by 56% of the world's worst invasive plants (ISSG 2000) being garden escapes. In New Zealand, 75% of terrestrial weeds and 50% of aquatic weeds are garden escapes (DOC 2003; this figure that can be as high as 97% at a regional scale (see Williams and Cameron 2006)), while in the United States the number is estimated to be over 50% (Randall and Marinelli 1996). In Australia, garden escapes comprise 66% of all naturalised plants (Groves *et al.* 2005).

The specific impacts of escaped invasive garden plants on biodiversity in NSW were recently documented. A review of the weed threats to biodiversity listed on the schedules of the NSW *Threatened Species Conservation Act 1995* (TSC Act) revealed that 66% of the weed species identified were garden escapes (Coutts-Smith and Downey 2006). These 84 garden escapes threatened 190 species or just over 20% of all threatened biodiversity. This figure was increased to 45% when only the biodiversity threatened by weeds was considered and 93% when the biodiversity threatened by specific weed species was considered. Approximately 35% of these garden escapes threatened more than one threatened species. For example, *Lantana camara* L. threatened 96 biological entities listed in NSW. In addition, some threatened species were threatened by more than one garden escape. For example, *Acacia pubescens* (Vent.) R.Br. is threatened by eight garden escapes, namely *Andropogon virginicus* L., *Bryophyllum delagoense* (Eckl. & Zeyh.) Schinz, *Lonicera japonica* Thunb., *Olea europaea* L., *Pennisetum clandestinum* Hochst. ex Chiov, *Rubus fruticosus* agg., *Sida rhombifolia* L., *Opuntia* spp. and two cultivated weeds *Eragrostis curvula* (Schrud.) Nees and *Paspalum dilatatum* Poir.

While the Coutts-Smith and Downey (2006) review only examined threatened species, an indication of the broader impacts to biodiversity can be assessed by using another example to examine such impacts. The Bitou Bush Threat Abatement Plan identifies 158

native plant species at risk from bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata* (DC.) T.Norl.) invasion, 65% of which were not listed as threatened under the TSC Act (DEC 2006).

Garden escapes still available for sale While Groves *et al.* (2005) outlined the most serious invasive garden escapes that were still available in each Australian State and Territory, such acknowledgement has not translated into the banning of these weed species from sale. One reason may be associated with the fact that for many of these species the impacts have not been clearly demonstrated other than by broad sweeping statements. Unfortunately such statements are not sufficient to persuade many policy makers or industry stakeholders to make any changes.

A recent examination of weed impacts showed that 55 species or 43% of the weeds posing a threat to threatened species in NSW are still available for sale (Coutts-Smith and Downey 2006). For example, *L. japonica* threatens one threatened species and four endangered ecological communities in NSW and is available for sale in NSW and more generally across Australia (Coutts-Smith and Downey 2006). Thus, it is perplexing that on one hand we are trying to protect these threatened species from extinction, yet on the other hand we continue to allow the main threat to continue (i.e. through on-going trade). It is anticipated that the report by Coutts-Smith and Downey (2006) will provide the final catalyst to enable this problem to be addressed appropriately.

Active intervention is required for at least the 55 weed species threatening threatened biodiversity that are still for sale because voluntary approaches have not worked in the past (see Caton 2005) or are unlikely to work (Moss and Walmsley 2005). While some voluntary approaches have achieved success by providing a range of native alternatives (i.e. the Bushland Friendly Nursery Scheme or Grow Me Instead initiatives developed in NSW), these are long-term and thus do not account for the immediate nature of the threat, especially to threatened species.

Scale of the problem While considerable work has been recently directed at closing Australia's quarantine front door to new introductions of invasive plants (Pheloung 2001, Spafford Jacob *et al.* 2004, Glanznig 2005a), limited effort has been directed at understanding which of the introduced garden plant species that are currently present in Australia (i.e. being grown in backyards) pose a significant risk of invading and impacting on the environment and/or agricultural lands. A recent examination of the 27,000 deliberate plant introductions to Australia revealed that

approximately 94% (25,400) were introduced through the gardening sector (Virtue *et al.* 2004). Given that approximately 66% of Australia's 2900 naturalised plants were originally introduced as garden plants (Groves *et al.* 2005), a thorough examination of the remaining 22,500 species is needed to establish those species most likely to jump the garden fence.

This risk can be put into perspective when it is noted that several recent studies have suggested naturalisation patterns and rates increase when propagule pressure is high (see Pyšek *et al.* 2003, Sullivan *et al.* 2004). The probability of non-naturalised weedy garden plants becoming invasive is significantly increased if they are continually sold, planted and dispersed into the wild over a long enough period of time. Therefore, even using a very conservative estimate of 10% of these 22,500 species to take into account alien plants that have been in Australia for a long time and those that were not intensely propagated and widely distributed, this would double the current number of naturalised plants in Australia without any new introductions. Even a 1% escape rate, stretched over decades, would still pose a significant management challenge and add considerably to Australia's weed problem.

In addition, until the impact of garden escapes on biodiversity has been adequately assessed in terms of the species threatened, outside of NSW and including species not formally listed as threatened, can future risks to biodiversity be ascertained.

A PROPOSED RISK ASSESSMENT SYSTEM

What is required is a thorough examination of these 22,500 introductions that are not yet known to be weedy, in order to establish a list of those species that pose the highest risk of becoming invasive. Once such a list of plant species is established, a system is needed to prioritise species for targeted surveys to detect them before they establish. This must also be supported by other policy interventions, such as banning the species from sale, to limit the probability of any such establishments as well as reduce future impacts.

Knowing the problem Mulvaney (1991) examined historic nursery catalogues for several Australian capital cities (Sydney, Melbourne, Adelaide and Canberra) to identify when weeds were first imported and how long they were available for sale. While this dataset is extremely valuable, what is urgently needed is an extension of this work to the present day. Mulvaney (1991) also used field surveys to establish which species had 'jumped the garden fence'. Again this approach needs to be revisited and revised based on an updated list of weeds, along with a list of those species that have not yet escaped.

Recent analysis by the CRC for Australian Weed Management found that the garden industry has imported over 3700 non-native referenced weed species that have yet to be detected as naturalised in Australia (Glanznig 2005b). Referenced weeds refer to those plants documented as weedy either in Australia or overseas. Although not all these species will become weeds in Australia, they do pose a higher risk than those with no documented weed history. While this is a good first step, a robust system backed up with support at all levels of government, community and industry is needed. This process could enable a pseudo-audit of gardens to be undertaken without actually assessing every garden in Australia.

Developing a risk assessment process Once a list of species has been compiled, a risk assessment process is needed to determine priorities. This risk assessment process could be based on the current weed risk assessment (WRA) used to assess new plant importations (Pheloung 2001). Those species currently grown in gardens that fail the WRA should be given priority as likely candidates for escape. There is real benefit from using the current WRA system as: i) it has been developed, tested and accepted; ii) stakeholders have already had exposure to it; and iii) it would add consistency to the process. In essence this process would be re-testing all the species imported prior to the establishment of the current WRA. In addition, any plant that fails the WRA should be assessed for a possible ban from sale and the prevention of future import.

Managing those plants that have the potential for escape Targeted surveys can be undertaken for those species known to be likely to escape. This approach is far more efficient than the current system of detecting new incursions after the event: a system that is solely reliant on the expertise of the individual searchers or botanists to detect new and potentially weedy species. Once detected, the current procedures for dealing with new incursions would be employed.

SUMMARY

The acknowledgement that garden escapes are a significant contributor to Australia's weed flora illustrates that a main invasion pathway remains relatively open, especially when the number of potentially invasive plants that are currently in gardens are considered. Banning such species from sale is a good starting point. However, this is not an easy task, especially given that for many of these species the impacts have not been clearly demonstrated other than the typical broad statements like they invade natural ecosystems. Such statements do not necessarily encourage

policy makers and industry stakeholders to adopt change.

Garden escapes are a major contributor to Australia's current weed flora and will continue to be until we can: i) establish a list of potential weeds that are present in gardens, but have not yet jumped the garden fence; ii) develop a system from preventing their establishment; and iii) better understand their impacts. In this paper we have highlighted the problem and a solution in order to raise the awareness of current garden plants as the main source of Australia's future weed problem.

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