

Limiting new invasive weeds in New Zealand — some emerging issues

William Lee

Landcare Research,
Private Bag 1930,
Dunedin
leew@landcare.cri.nz

Peter Heenan

Landcare Research,
PO Box 64,
Lincoln.

Jon Sullivan

Landcare Research,
Private Bag 92170,
Mt Albert,
Auckland.

Peter Williams

Landcare Research,
PO Box 6,
Nelson.

In New Zealand weeds have been considered largely in relation to agro-ecosystems, particularly cropping and pastoral uses. However, over the last decade the rationale for the control of weeds has broadened considerably to include environmental weeds. These are introduced plant species that threaten the conservation of native plants and animals. The current emphasis on weeds that overwhelm and radically alter native plant communities is motivated by several factors. Maintaining and restoring native biodiversity is now an important national goal, driven by recognition of the intrinsic value of native biota, international conservation agreements, and their by-catch value as evidence of “green” agri-business practices. In this article we discuss a few of the questions commonly asked by weed managers and mention some of the new issues emerging from recent research.

Invisible native plant communities — what do they look like?

We all recognise that some communities appear to be more susceptible to weed invasion than others but defining the critical features driving these differences is a challenge. Low stature, open communities with diverse floras, comprising short-lived species, on fertile soils, and those with frequent disturbance and/or large areas of bare soil will be more readily invaded by weeds than communities lacking these characteristics. However, recognising threatening weeds will more often depend on understanding the key processes controlling the structure and composition of the native vegetation. Regeneration, successional trends, resource availability, and natural disturbance regimes are the major processes we need to understand to be able to predict the incursion and impact of weeds. Often these processes are evident from a basic familiarity with the vegetation.

Why is predicting new weeds so difficult?

We get a reliable indication of a species’ weed potential from information on its (or close relatives’) behaviour in other countries where it is naturalised. For example, pines and willows are weeds in many countries, while orchids, in contrast, rarely cause problems. The difficulty is that the process of weed invasion involves multiple stages (e.g. immigration, cultivation, naturalisation, spread etc), and that quite different selective factors operate at each stage. For example, nowadays a plant generally has to have colourful flowers or distinctive foliage (e.g., *Xanthorrhoea*) to be considered for importation into New Zealand. However, to establish and spread in the wild a species would need to have strong vegetative growth or fruits attractive to local birds. The environment into which the species is going is new, and it is often hard to know precisely how the plant will respond. From experience in other countries, heather was predicted to spread on volcanic soils only if it was burnt, but this was not true in New Zealand.

Perhaps the most important factor making it challenging to know in advance whether a plant will spread and become a weed or not is the key role of random events, such as the presence of roads, changes in garden fashions, alterations in landuse etc. In the case of kiwifruit, the triggering factor was the large scale dumping of fruit as cattle fodder near bush remnants. This would never have been predicted even by the most comprehensive weed risk assessment system. Such critical unpredicted events make it complicated to determine which species will eventually become a major environmental weed.

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What weed species will have the most impact?

Environmental impact, for native ecosystems, is the ability of a species to modify the composition, structure or ecosystem character of habitats and communities. Weeds that appear to have the capacity to physically transform native communities are the ones to eradicate first. These species often have characteristics that are not evident in the local native flora — they may quickly monopolise resources, usually via rapid growth and biomass accumulation, and smother existing vegetation or choke out regeneration. Long-lived, slow-growing, shade-tolerant plants are insidious invaders in forests and are potentially serious vegetation transformers in the New Zealand context. A second high-impact group include those weed species that perform better than natives in select environments, such as willows in flood plain areas, and pines above native treeline. However, they are often the most practical to control due to their typically slow rates of individual growth and population expansion.

Where should we focus to have greatest effect on reducing environmental weeds?

Biosecurity at the national border is important to restrict the incursion of unwanted organisms. However, although the volume of material is high, the impact of national border security on future environmental weeds in New Zealand is relatively low, because all of the new weeds of the immediate future are already growing in the country. Requirements for the horticulture industry to remove all potential weed species from sale will meet strong industry and public resistance, and are likely to have minimal impact in the short-term.

With relatively few weed species at their full environmental potential, New Zealand's main weed reservoir is the more than 20,000 species currently growing in and around urban centers. It is here that we should focus our control efforts. Naturalisation — the process whereby plants escape from the garden and establish in the wild — is a critical phase of limited spatial occurrence. At this stage eradication or at least containment is possible, and the cost/benefit ratio is very high. Ideally, any new naturalized species should not be propagated, otherwise control agencies will have to respond to an ever increasing number of new weeds.

Who finds new naturalised plant species?

An updated list of new plant naturalisations is published every few years based on plant specimens sent to the biosystematic staff at Landcare Research, the Department of Conservation, and several museums. Recent collections

(1988-2001) of new naturalised plants in New Zealand have largely been the result of the collecting efforts of five people, mostly professional botanists, and is largely restricted to the major centres. Detecting new naturalisations is the key to containing the spread of new weeds, and we (biosecurity officers, ecologists, botanists etc.) need to be regularly collecting any "new" species we come across. If in doubt, collect it anyway and send the specimen to Landcare Research, Plant Identification, (PO Box 69, Lincoln) for identification.

Eradication — is it possible?

Worldwide there is growing evidence that eradication of early incursions of weeds is possible, provided the total extent is less than a hectare. Success of eradication is enhanced if there is a clear strategy, co-ordination between different groups over large areas, an understanding of the weed's biology, tenacious weed managers who persist to get the last plant, and broad community support. Two recent, ongoing eradication attempts in Auckland involve Devil's tear-thumb (*Polygonum perfoliatum*), a newly discovered herbaceous garden plant which is an aggressive climber, and scrambling lily (*Gneitoplesium cymosum*), a woody climber that reaches into the forest canopy. Each species is fast growing and reproduces both vegetatively and with bird-dispersed fruit, giving urgency to the eradication efforts.

The main culprits for introducing new potential weeds into New Zealand are gardeners, horticulturalists, and to a lesser extent, the forestry industry. These groups all engage in large-scale plantings, which push local seed production levels over critical thresholds for successful naturalisation. They also often have strong fashions, and old (or aggressive) species are tossed out over the back fence or into the nearest gully. A horrendous example is climbing spindleberry (*Celestrus orbiculatus*), which went out of fashion with dried flower arrangements, and now threatens the commercial forestry industry in parts of the North Island. However, these industry groups are not malevolent and could become key allies in the control of weeds. Already some elements of the forestry and horticultural industry are accepting responsibility for control of off-site impacts. Ideally, all plants sold need to include an environmental levy to cover weed control, the amount broadly depending on their weed potential.

How do we prioritise control of newly invasive environmental weeds?

Recently Peter Williams and Melanie Newfield developed a Weed Risk Assessment system for the Department of Conservation for priority ranking of

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newly invasive environmental weeds. They used information on the weed history elsewhere, invisibility, likely impact on New Zealand vegetation, and rate of spread and persistence. As part of the evaluation they also included criteria related to the public perception of the species, and its economic value. The WRA model has been tested in the Nelson/Marlborough area on woody species.

Are there key surveillance sites for limiting environmental weed invasions?

As we mentioned above, urban areas, especially abandoned land and older housing suburbs, are important localities for detecting new naturalisations and for detecting weeds at a very early stage. Other target sites include natural conduits such as gullies and rivers, and along the road system. Perhaps the best place to look for potential weeds is on the land adjoining major amenity or commercial plantings of introduced species.

How fast are invasions taking place?

Nationwide, 12-20 new plant species become naturalised each year and the number of new species in any one region is approximately proportional to the local human population. Subsequent spread following naturalisation depends on a number of factors but most species move around at a remarkably slow pace. For example in a recent survey of 172 introduced plants in 62 river segments (four complete river systems), distribution was strongly related to time that the species had been naturalised in New Zealand: those that had

been here less than 50 years occupied 6% of the river segments; 50 -100 years, 16% of segments; and >100 years, 20% of segments. In this system, all the introduced plants should be in all river segments by 2600, assuming the habitat was universally suitable.

Conclusion.

To effectively reduce the long-term impacts of weeds in New Zealand, we will need improved early detection and subsequent control of newly naturalized and spreading, potentially serious, agricultural and environmental weeds. Irrespective of the success of new border control approaches, rates of establishment of new weed species will continue at existing levels for the next century.

Within New Zealand, priority should be given to containing exotic plants within urban areas and removing marginal pioneer populations. Eradication is often possible for the smallest populations but will require co-ordinated and persistent action by government and private agencies, with public support. Critical biological information should be used to make weed control programmes more effective. Improved collecting and identification of new naturalisations, more even surveillance regionally, attention to spread from larger plantings and in targeted habitats, and a focus on plant species that form dense monocultures in scrub and forest are also required. An environmental levy on commercial plant species should be introduced to pay for controlling their outbreaks.
