

New Zealand – a Weedy Paradise

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New Zealand the paradise?

Tourist brochures talk of New Zealand as a land of captivating scenery, snow-capped mountains, beautiful lakes and dinosaur rainforests: a mecca for nature-lovers. New Zealand has high endemism, for example 80% of the 2,057 native vascular plants are found nowhere else. Unfortunately, New Zealand is also a country teeming with weeds. Over 25,000 plant species have been introduced in the last 200 years. Of these, 2,100 species have already naturalised and many of the remaining massive pool of cultivated species will naturalise in the future.

But oh so weedy

About 10% of naturalised plant species subsequently become invasive weeds of conservation concern. The number of invasive weeds in New Zealand has been steadily growing since the 1860s and this trend shows no sign of slowing down. The New Zealand Department of Conservation (DOC) manages 30% of New Zealand's land area for conservation and lists about 250 invasive weeds on this and other land (Owen 1997). Based on past trends, we expect two new species to be added to this list each year (Buddenhagen et al. 1998). Most of these weeds were deliberately introduced to New Zealand – 75% as garden plants and 14% for agriculture,



horticulture or forestry. This trend also seems set to continue. Similarly, about half of the aquatic species listed by DOC as invasive weeds were introduced as ornamental plants (Buddenhagen et al. 1998).

These 250 weed species have invaded nearly all types of indigenous plant communities in New Zealand and almost the full range of altitude, soil type, rainfall and temperature. An inventory of conservation sites throughout New Zealand showed that weeds would degrade at least 575,000 hectares within 10–15 years and cause the extinction of native communities or species at over 150 sites if no con-

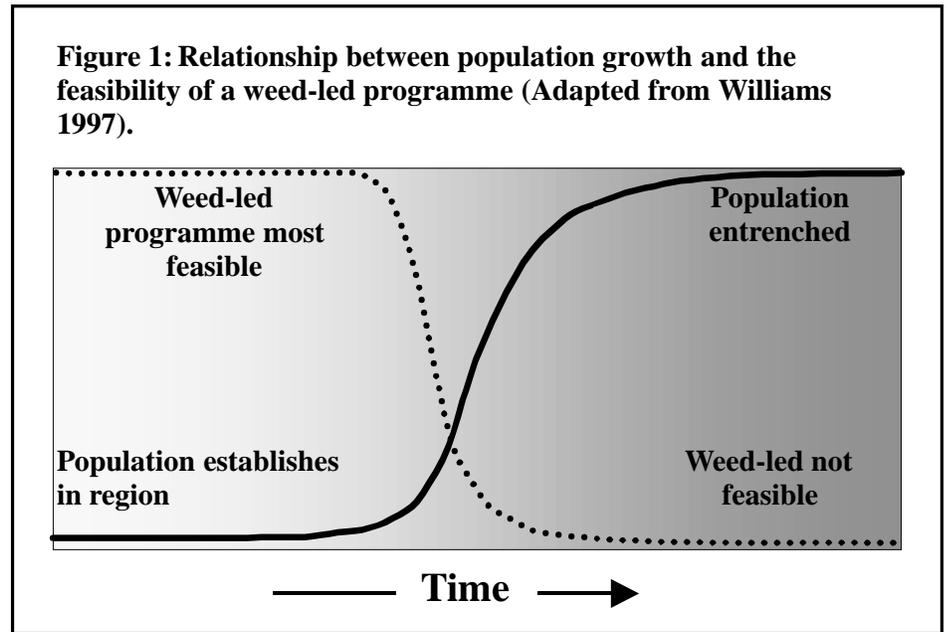
trol was done (Buddenhagen et al. 1998). Weeds threaten more than 111 high-priority native forest or shrubland reserves, large tracts of native tussock grassland and more than 30 remnant coastal vegetation communities. Invasive weeds have modified all remaining freshwater wetlands and spread throughout most of New Zealand's rivers and lakes (Howard-Williams et al. 1987). Another study showed that weeds are the main risk to survival of a third of New Zealand's threatened plant species (Reid 1998). Many of these threatened native plants are small, less than 10 cm tall, and are thus easily smothered or shaded out by competing weeds. They often occur in alpine seepages, wetlands, rivers and lakes, foreshore habitats, dune lakes and sand-dune communities. These same community types are among those most vulnerable to weed invasions – low-stature communities and small, narrow, disturbed remnants with fertile soils that are close to towns (Timmins & Williams 1991).

The New Zealand Department of Conservation's Weed Strategy

Having painted you a picture of a triffid-like land, it will come as no surprise that we have neither the money nor the people-power to do all the weed control that we might want to – so we must prioritise. The Department of Conservation distinguishes between weed control to protect high-value places (site-led control) and weed control to minimise future threats (weed-led control). The two approaches have distinct characteristics (Table 1); full details can be found in Owen (1998) and a summary of the associated prioritising systems in Timmins & Owen (1999). DOC is organised into 13 administrative units called conservancies. Weed-led control is a conservancy-wide programme on land of any tenure, whereas site-led control focuses on a protected natural area or part thereof (Table 1).

Weed-led Control: Nipping it in the Bud

Early during an invasion there is a brief window of opportunity to eradicate or contain the species; this is the only time for weed-led control (Figure 1). Our aim is to get rid of a nasty weed *before* it gets away on us. Weed-led programmes are *only* pursued if we think it is feasible to permanently remove the target weed species with little likelihood of re-invasion or at the least, contain the spread of the weed within the conservancy. We evaluate the current distribution of the weed and the availability of a suitable control method. In practice, this limits weed-led programmes to species just beginning to invade, or with a very confined distribution, within a conservancy. Only for these species is the infestation likely to be controllable and re-invasion manageable. We also assess the likelihood of gaining co-operation from relevant landowners; to be successful, the weed species must be controlled wherever it occurs in a conservancy, irrespective of the quality of the sites or who owns them. The feasibility of a weed-led programme mirrors the weed population growth (Figure 1). Very few species infestations are feasible for weed-led control. Those



that pass the test are prioritised, taking into consideration the potential invasiveness of the species as well as the likely cost, difficulty and speed with which eradication can be achieved.

Site-led control: it's the putting right that counts

The impetus for site-led control comes from the otherwise high conservation values of a site invaded by

weeds. The aim is to protect the site values. Site-led programmes are prioritised on the basis of several factors. The higher the site's biodiversity value the higher its priority for weed control. Preventing weeds invading an otherwise pristine place is given a higher priority than controlling well-established infestations. Urgency for control is another factor. Programmes that integrate weed control with other threat management activity, such as species recovery and animal pest control, are also given preference. DOC's site-led programmes vary from places of less than 5 acres to programmes covering 10,000 acres and occur in all community types.

Shifting paradigms

The weed-led / site-led approach to weed management is a relatively new initiative for DOC. It has meant completely letting go of the paradigm: "It's a noxious weed – kill it" or "It's not on the list – ignore it". Because a new weed must pass the low-incidence test to qualify as a weed-led programme, it is axiomatic that sometimes we don't know much about the invasiveness of a species that is new to a conservancy. Some people don't see the point in controlling a weed species that has no demonstrable ecological impact (yet!). Therefore they are reluctant to conform when, for example, a weed-led programme calls for a ban on growing

Table 1: The characteristics which distinguish the weed-led and site-led management approaches.

	Weed-led	Site-led
<i>Purpose</i>	Prevent new weed species becoming entrenched in the wild in the conservancy.	Protect valuable places and threatened species.
<i>Scale</i>	A whole conservancy.	The invaded site.
<i>Species focus</i>	Newly invading and/or with a very confined distribution in a conservancy.	Those necessary to protect the place. Often widespread weeds.
<i>Sites</i>	All infestations within the conservancy, on sites of any quality and any tenure.	Infestations within the place; plus buffers and seed sources outside it.
<i>Success when...</i>	The species is eradicated or contained within the conservancy.	The condition of the native communities and species improves.

Note: a conservancy is a Department of Conservation administrative unit; there are 13 in New Zealand.

a species in gardens.

Under the site-led approach, weed control cannot be justified at low-value sites, including those where weeds have been traditionally controlled. Many staff have found it hard to give up on widespread weed species which they had previously attempted, in vain, to eradicate. In addition, each site-led programme control focuses on the species threatening the values of that particular site, whether or not they are commonly thought of as weeds. The weed-led / site-led approach leads us to focus conservancy-wide eradication attempts on weeds of very limited distribution and to confine control of ubiquitous weeds to important sites.

Monitoring the outcome, not just the weed

The weed-led / site-led approach to weed management, in concert with robust monitoring, should give us better conservation return for our weed control dollar. By monitoring we regularly evaluate the feasibility of weed-led programmes, e.g., control techniques may not be as successful as an-

ticipated, or new infestations may be discovered that make eradication or containment unlikely. Continuing with such programmes could then waste both resources and community support.

Site-led programmes have demanded more than just a shift in our thinking. We have also changed the way we monitor the effectiveness of weed control. It is not enough to just check whether the infestation has been removed or reduced. Even more important is whether control has achieved the desired conservation outcome. Have the threats posed by the weed to native communities been alleviated and have native plants colonised the space previously occupied by the weed? We have developed monitoring guidelines that outline how the monitoring should be done to produce statistically robust results (Geritzlehner 2000).

Our new approach to weed management demands quality information. To partially address the information problem, DOC has developed the National Weeds Database. It stores eco-

logical, distribution and control information on weed species of concern to DOC.

Finding new weeds early enough

Too often in the past, by the time a weed was widely recognised as a threat, it was too widespread for eradication to be feasible. Finding new weeds early enough, while they are still in the lag phase, is the aim of DOC's weed surveillance plan (Braithwaite in press). The surveillance plan brings a system to what was a haphazard process and provides for planned, regular and systematic checks for new weeds. Conservancies survey high-value places for weeds new to that place to provide early information for preventative site-led control. They also do species-specific searches, and surveys of vulnerable places looking for any new weed species. Finds become potential weed-led control programmes. Vulnerable sites may have little or no conservation value but they are where new weed species are likely to first naturalise, for

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example, wastelands and natural areas close to towns.

Each conservancy prepares a list of likely species before surveys are conducted. The list may include species that are cultivated but not yet naturalised, or those invasive in a nearby conservancy, or those new to New Zealand and causing concern in areas with similar conditions. The list gives the searcher an idea of some of the species to look out for while still being alert for novel species.

The Plan also ensures that action is taken on the often-casual sightings made by DOC staff, as well as by weed folk in other land management agencies and members of the general public – such sightings are only valuable if they are heeded (Braithwaite & Timmins 1999). With more systematic searching, and follow-up of new sightings, we expect to be able to find more newly naturalised species, while they can still be eradicated.

Conclusion

Science provides us with information essential for managing weeds: their autecology, their impacts, and techniques for controlling them. Translating the science into practical and effective management systems requires us to be very clear about what we are trying to achieve. The Department of Conservation distinguishes between weed control to eradicate a weed species and minimise future problems (weed-led) and weed control to protect important places (site-led). This approach, in concert with the other weed initiatives – surveillance system, robust monitoring and a national database – allow us to prioritise our weed work to deliver more conservation return per weed dollar spent.

Acknowledgements

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References

Braithwaite, H. in press. Weed surveillance plan for the Department of Conservation. Department of Conservation, Wellington, New Zealand.

Braithwaite, H.; Timmins, S.M. 1999. Weed surveillance – catching 'em early. In: Proceedings of the twelfth Australian weeds conference, September 1999, Hobart, Australia.

Buddenhagen, C., Timmins, S.M., Owen S.J., Champion, P., Nelson, W. and Reid V.A. 1998. An overview of weed impacts and trends. In: Owen, S.J. Department of Conservation strategic plan for managing invasive weeds. chapter 3. Department of Conservation, Wellington, New Zealand.

Geritzlehner, J. 2000. The standard operating procedure for monitoring weed control. Unpublished report. Department of Conservation, Wellington, New Zealand.

Howard-Williams, C.; Clayton, J.S.; Coffey, B.T. and Johnstone, I.M. 1987. Macrophyte invasions. In: Viner, A.B. (ed), Inland waters of New Zealand. pp 307-331. Bulletin of the Department of Scientific and Industrial Research, Wellington, New Zealand.

Owen S.J. 1997. Ecological weeds on conservation land in New Zealand: A database. Department of Conservation, Wellington, New Zealand.

Owen, S.J. 1998. Department of Conservation strategic plan for managing invasive weeds. Department of Conservation, Wellington. 86p.

Reid, V.A. 1998: The impact of weeds on threatened plants. Science & Research internal report 164. Department of Conservation, Wellington, New Zealand. 67p.

Timmins, S.M. and Owen, S.J. 1999. Scary species, superlative sites: assessing weed risk in New Zealand's protected natural areas. Proceedings of First international workshop on weed risk assessment, February 1999, Adelaide, Australia.

Timmins, S.M. and Williams, P.A. 1991. Weed numbers in New Zealand forest and scrub reserves. New Zealand Journal of Ecology 15(2):53-162.

Williams P.A. 1997: Ecology and management of invasive weeds. Conservation Sciences Publication No. 7. Department of Conservation, Wellington.

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