

## SCORING THE WEEDINESS OF NEW ZEALAND'S ECOLOGICAL WEEDS

S-J. Owen, S.M. Timmins and C.J. West

Department of Conservation, PO Box 10-420, Wellington, New Zealand

**Summary** A system for scoring the weediness of species of conservation concern has been developed to facilitate effective weed management on conservation lands. The scoring puts a numerical value on the rate at which weed species establish, grow and spread; and their impact on the structure, function and natural processes of native community types.

### INTRODUCTION

The Department of Conservation has identified 217 ecological weeds of concern on conservation lands. Some are widespread, well known and troublesome in many native communities. Others are more recently naturalized and have yet to express their full weed potential. This large number of weeds, coupled with the Department's responsibility for managing 30% of New Zealand's land area, demands efficient, effective weed management. The Department's strategies for ecological weed control are discussed elsewhere in this volume (Owen and Sheldon 1996). To make the right decision and take the best action on weed management requires information on the ecology and control of the weed species of concern.

The Department has a database which tabulates a range of information for each weed species including: the date of naturalization in New Zealand, country of origin, other countries in which it is an ecological weed, the native communities in New Zealand in which it is of conservation concern, its national distribution, and an estimate of its weediness (Owen and Scobie 1995). To date, information for three quarters of the 217 ecological weed species has been collated, and stored electronically.

Additional descriptive information on the biology, ecology, impact on native communities and current control methods used or trialled is available for 67 of the ecological weeds in the publication by Timmins and Mackenzie 1995.

### SCORING WEEDINESS

The system used to score weediness is based on Esler (1988) as modified by Champion (1995) and further refined to suit the needs of the Department of Conservation. Two ratings are derived by assessing two sets of criteria for each weed species. The Biological Success rating describes the biological capacity of the weed

**Table 1.** Criteria used to derive the Biological Success rating.

Criterion	Categories and assigned scores for each Biological Success criterion			
	0	1	2	3
Maturation rate		Sets seed only after 3 or more years; or very slow vegetative growth	Sets seed within 2-3 years; or moderate vegetative growth.	Sets seed within first year or has very rapid vegetative growth
Seeding ability	No seed	Low seed set	100-1000 seeds per plant	More than 1000 seeds per plant
Persistence of seedbank	No seed	Seed is viable for less than one year	Seed has an estimated viability of 1-5 years	Seed viability estimated at over 5 years
Effectiveness of dispersal		Propagules spread by gravity or human activity (e.g. dumping garden waste)	Propagules spread by wind or water. by birds or feral animals	Very light, wind dispersed seeds or propagules spread
Establishment/growth rate		Poor establishment and slow growth	Poor establishment and fast growth; or good establishment, slow growth	Good establishment and fast growth
Vegetative reproduction	No asexual spread	Minor importance	Moderate importance, e.g. stem layering, suckering	Plant spread freely by stolons, rhizomes, bulbils or other asexual means

**Table 2.** Criteria used to derive the Effect on System rating.

Criterion	Categories and assigned scores for each Effect on System criterion			
	0	1	2	3
Capability of changing the composition or structure of a native terrestrial community	Does not affect structurally dominant species	Minor change in composition of dominant species. Little change to basic structure	Modest effect on composition of dominant vegetation. Some impact on structure	Major change to composition of dominant species; or major change to structure of community
Capability of changing aquatic communities (aquatic species only)	No significant effect on native species or water quality or water movement			One or more of: water courses covered; free flow of water restricted; major increase in sedimentation; native vegetation completely suppressed
Suppresses regeneration	No significant effect	Some effect on limited component of system	Major effect on limited component of system; or some effect on dominant species composition	Major effect on many native species; or major effect on the composition or density of dominant species
Persistence over time		A plant's lifespan is less than 5 years	A plant's lifespan is 5–50 years	Individual plant's lifespan of over 50 years; or species forms self-sustaining monoculture
Change to the impact of fire or the risk of fire in the invaded community	No increase in fire risk; or plant fire retardant /resistant	Plant ignites only during extreme fire danger <sup>A</sup>	Plant readily ignites at high–very high fire dangers, but not at low–moderate <sup>A</sup>	Plant readily ignites during low–moderate fire dangers <sup>A</sup> ; plant burns intensely

<sup>A</sup> 'Low', 'moderate,' 'high,' and 'very high' categories are as determined by the NZ Fire Danger Rating System.

species. Those characteristics often associated with successful weed syndromes (e.g. Timmins and Williams 1987) are given a high score, for example fast establishment and growth rate, high number of seeds produced per plant, very effective asexual spread. Thus, a high total rating suggests that a species is likely to be very weedy. The criteria used to derive the Biological Success Rating are given in Table 1.

The Effect on System rating is an assessment of the behaviour of a weed species in the community type and geographical location in New Zealand where it has its greatest conservation impact. Those features which are most detrimental to native communities (e.g. Williams and Timmins 1990) are given the highest scores, for example major disturbance to the structure, composition and natural processes of a native community. The criteria for the Effect on System scores are given in Table 2.

#### DISCUSSION

As explained in Owen and Sheldon (1996), the Department's final decisions on weed management take into

account the conservation values of a site and the practicality of control, as well as the weediness of the species. Thus, these weediness scores are not, and indeed should not be used in isolation to determine control priorities. Nevertheless, the information in this database is critical to decision making for effective weed management. The Biological Success Ratings can highlight which new species should be closely monitored and they can be used to assess the potential for spread of an invading weed if it is left uncontrolled. Both the Biological Success Rating and the Effect on System ratings help in determining priorities for control, both where species are well established and where they have just invaded a new site or region. Although the scores themselves are qualitative, the scoring system and the criteria provide some objectivity and rationale for establishing priorities, both for control and for research.

#### ACKNOWLEDGMENTS

The development of these criteria and the scoring assigned to the species in the database was commenced by

Sue Scobie (Department of Conservation), and input from Peter Williams (Manaaki Whenua – Landcare Research), and Kerry Hilliard and the Department of Conservation's fire team. Chris Edkins (Department of Conservation) helped in the production of the poster paper.

#### REFERENCES

- Champion, P.D. (1995). Assessment of plant pests proposed for inclusion in Auckland Regional Council's pest management strategies. NIWA Consultancy report No ARC 315. (National Institute of Water and Atmospheric Research, Hamilton, New Zealand).
- Esler, A.E. (1988). Naturalization of plants in urban Auckland, New Zealand. 5. Success of alien species. *New Zealand Journal of Botany* 26, 565-618.
- Owen, S-J. and Scobie, S. (1995). Conservancy guidelines for preparing a strategic plan for the management of ecological plant pests. (Unpublished manuscript, Department of Conservation, Wellington, New Zealand).
- Owen, S-J. and Sheldon, J.K. (1996). Strategies for ecological weed control on conservation lands in New Zealand. Proceedings of the Eleventh Australian Weeds Conference, 2-5 October 1996, Melbourne, Australia, pp. 516-19.
- Timmins, S.M. and Mackenzie, I.W. (1995). Weeds in New Zealand protected natural areas database. Department of Conservation Technical Series 8. (Department of Conservation, Wellington, New Zealand).
- Timmins, S.M. and Williams, P.A. (1987). Characteristics of problem weeds in New Zealand's protected natural areas. In 'Nature conservation: The role of remnants of native vegetation', eds. D.A. Saunders, G.W. Arnold, A.A. Burbidge and A.J.M. Hopkins, pp. 241-7. (Surrey Beatty, Chipping Norton, NSW, Australia).
- Williams, P.A. and Timmins, S.M. (1990). Weeds in New Zealand protected natural areas: a review for the Department of Conservation. Science and Research Series 14. (Department of Conservation, Wellington, New Zealand).