

Developing control techniques for bridal veil (*Asparagus declinatus* L.) on Kangaroo Island – a study in progress

Marion A. Winkler^A and David A. Taylor^B

^AKangaroo Island Natural Resource Management Board, Shop 3 The Mall, Dauncey Street, Kingscote, South Australia 5223, Australia. Email: marion.winkler@internode.on.net

^BThreatened Plant Project, PO Box 39, Kingscote, South Australia 5223, Australia. Email: taylor.david@saugov.sa.gov.au

Summary

Prior to implementation of the 'Bridal Veil (*Asparagus declinatus*) Management Strategy: 2004–2006 Kangaroo Island South Australia', it was believed that eradication of bridal veil from Kangaroo Island was a feasible option and fundamental herbicide trials and grazing trials were established to ascertain their effectiveness. However, progressive mapping suggested that eradication was not a foreseeable outcome. Currently, trials manipulating fire, manual removal and a glyphosate-based herbicide mix are under investigation and initial results will be available within the next 12 months. This case study highlights the importance of a strategic approach to weed control, and describes the research currently underway into bridal veil control on Kangaroo Island.

Introduction

Bridal veil (*Asparagus declinatus* L.) is a South African creeper currently occurring in naturalized populations in south-west Western Australia and southern South Australia (Dixon 1996, Pheloung and Scott 1996, Sheridan and Pearce 2002). It was thought to have been introduced to Kangaroo Island in the early 1900s and initial recordings of bridal veil as a weed on the island were made in 1982 and again in 1986 in herbarium collections (Ball 1993). The known distribution of bridal veil now extends to an area of more than 234 km², in sections of the Hundreds of MacGillivray and Haines in eastern Kangaroo Island (Taylor *et al.* 2002). Populations of bridal veil are found amongst roadside scrub and within fenced and unfenced sections of native vegetation (Winkler 2006).

Based on its impact on native plants, ability to disperse, likely future distribution and potential impact on vegetation communities (including threatened species), bridal veil is considered a significant weed species of serious impact (Ball 1993, Bass and Lawrie 2003, Davies 1996, Dixon 1996, Sheridan and Pearce 2002, Taylor 2003a, Taylor 2003b, Taylor *et al.* 2002). Bridal veil tends to smother shoot growth

of native groundcovers and climbs into the understorey, competing for light. The dense tuber growth also competes with native plants as soil root space is taken up and seedling germination is hindered (Leah 2001). In September 2005 it was ranked as number two on the Kangaroo Island Comparative Weed Risk assessment list, second to bridal creeper (*Asparagus asparagoides*) (Pisanu 2005), and due to its resilience to commonly practiced weed control techniques this plant species presents a significant challenge for management and control.

History

Bridal veil has held ground on Kangaroo Island for more than eighty years and its impact on biodiversity is becoming increasingly apparent. Despite its known presence on the island for the past eight decades, opportunistic control did not begin until 1995. Descriptive records of location and severity of infestations were maintained by the community-based Kangaroo Island Asparagus Weeds Committee (then known as the Bridal Creeper Control Committee) from 1995 onwards and early mapping was carried out. By 1997 bridal veil was of increasing concern and preliminary trials of herbicides were carried out in an attempt to increase the potential effectiveness of management tools. Prior to this, treatment consisted of opportunistic target spraying amongst bridal creeper.

In response to heightening awareness of the weed's presence, an effort to proactively manage bridal veil was instigated in 2002. A GIS-based mapping program was used to establish an active database in 2002 and a grazing trial initiative using livestock began in 2003. The creation of the 'Bridal Veil (*Asparagus declinatus*) Management Strategy: 2004–2006 Kangaroo Island South Australia' (Turner 2004) followed. These focused efforts and prompted development of an effective control technique for the legally-declared weed. The GIS data served as an essential mapping tool that could accurately represent the

distribution and change in distribution of bridal veil over time.

As is commonly the case with weed infestations, weed incursions such as that of bridal veil on Kangaroo Island may originally be found at an early stage of invasion but control is then tardy or sporadic. Often this means the possibility of eradication has been forgone (Simberloff 2003). Noteworthy examples include the discovery of mile-a-minute (*Dipogon lignosus* (L.) Verdc.) on Rangitoto Island, New Zealand, in 1990 which was left uncontrolled and now persists in several patches across the Island (Timmins and Braithwaite 2002). Evergreen buckthorn (*Rhamnus alaternus* L.) is another example discovered on Rangitoto Island that when found as a single infestation in the 1920s was left unchecked, therefore resulting in a dense coastal fringe that displaced native coastal shrubs and herbs (J. Wotherspoon personal communication in Timmins and Braithwaite 2002).

Too often information about the location and severity of weed infestations is passed around by word of mouth. Invasive species management has been criticized for a heavy reliance on information generated from descriptive observations and slow adoption of formal experimental and investigative support (Reddiex *et al.* 2004). Under these conditions the relevant stakeholders may remain misinformed about the true extent and severity of infestations, and too relaxed about weed issues pending in the future. Only when a directed search is employed to reveal the actual extent of weed infestations, is an accurate understanding of severity ascertained.

Strategic approach

Preliminary mapping in 2002 indicated the presence of core, intermediate and outlier populations across an area of 234 km² (see Figure 1). These classifications were used as management zones from which the following key outcomes were sought:

- a reduction in the extent of occurrence of bridal veil on Kangaroo Island from 234 km² to less than 150 km²;
- a halt to the expansion of bridal veil populations; and
- complete removal of bridal veil from the critical habitat of nationally threatened plant species.

The 'Bridal Veil (*Asparagus declinatus*) Management Strategy: 2004–2006 Kangaroo Island South Australia' (Taylor 2004) was written in 2004 and follows the principles of the National Bridal Creeper Strategic Plan (ARMCANZ *et al.* 2001), in which bridal veil is described as 'an increasingly serious weed in South Australia that should be the target of control programs where encountered'.

Key objectives of the Kangaroo Island strategy included restricting the reproductive capacity and expansion of bridal veil populations, significantly reducing the

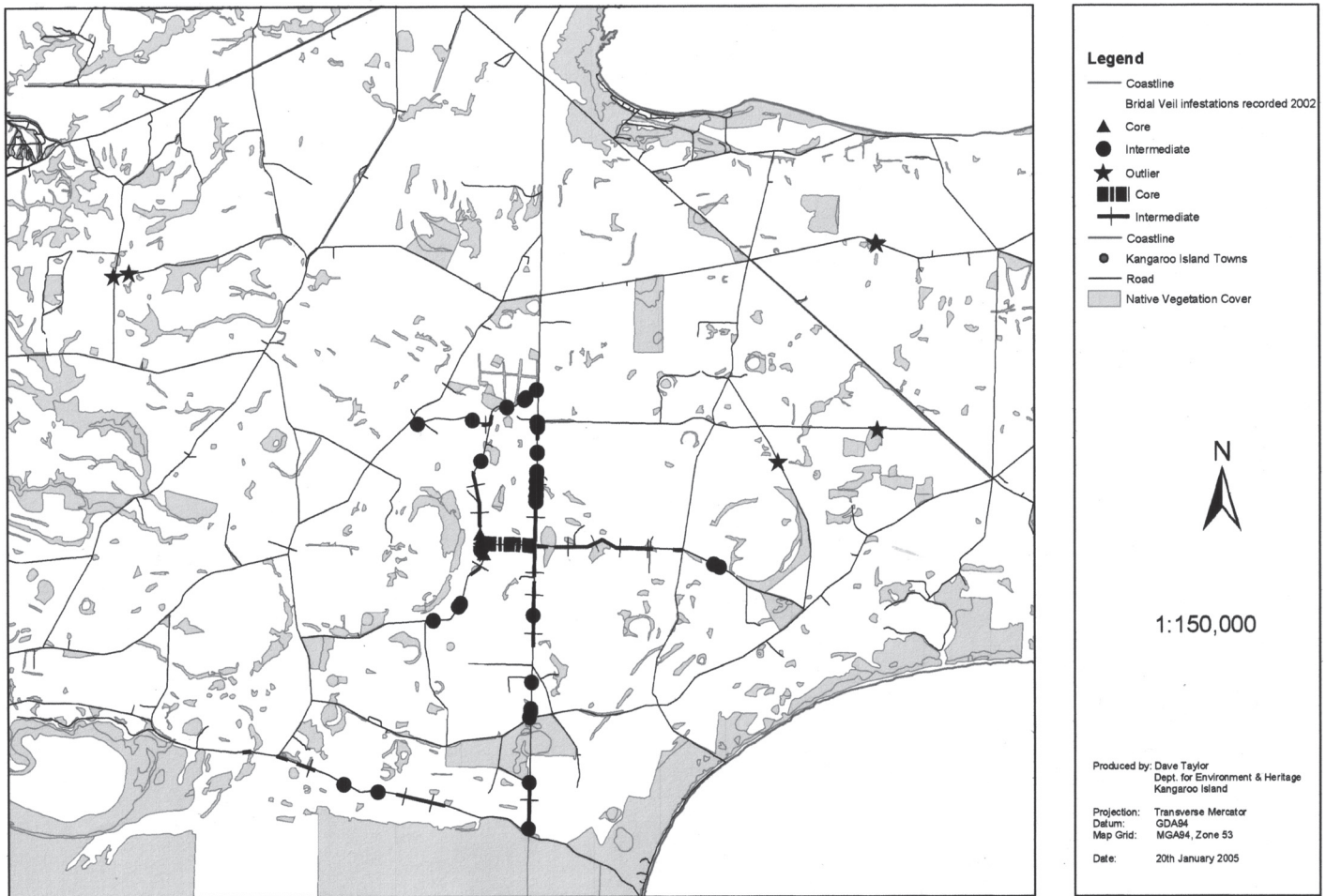


Figure 1. The distribution of bridal veil on Kangaroo Island in 2002, which is mainly within the MacGillivray area, approximately 25 km south of Kingscote.

impact of bridal veil on threatened plant species and restricting the distribution and abundance of bridal veil to an area in which an eradication program may be feasibly undertaken in the future. A reliance on information generated from the descriptive studies was to be replaced by experimental support and a comprehensive monitoring program.

In a review of vertebrate pest management for the Commonwealth Department of Environment and Heritage, Reddiex *et al.* (2004) discussed the need to collect accurate information on control measures. Without collation of accurate information, effective management is lacking its measure of success (Johnson 2002). Hence, each of the developing control techniques discussed below is being subject to an independent, long-term, scientific experiment.

Progress made

Whilst the implementation of the Kangaroo Island Bridal Veil Management Strategy (KIBVMS) during 2004 successfully led to the mobilization of significant human and financial resources, expectations of the progress of control and survey actions were not fully met. The primary reason for this was a substantial increase in

the known distribution and abundance of bridal veil following the completion of the first phase of survey work. This significantly increased the number and distribution of outlying and intermediate infestations to be treated. It also substantially increased the area requiring survey. As a result, the planned actions and budget of the KIBVMS for 2004 significantly underestimated the work and resources required to meet the target objectives and outcomes.

Despite these negative impacts, implementation of the KIBVMS during 2004 did lead to advancement in three aspects of the management of bridal veil on Kangaroo Island:

- A much improved understanding of the distribution and abundance of bridal veil on Kangaroo Island. This information will be critical to the setting of realistic control and impact mitigation programs in the future.
- A focusing of control works in priority critical habitat for nationally threatened plant species. This is likely to have decreased the current and potential short-term impact of bridal veil on five nationally threatened plant species (Taylor 2005).

- An increase in the level of training of staff and volunteers in methods for the survey and control of bridal veil on Kangaroo Island. This collective knowledge is likely to greatly improve the effectiveness and efficiency of future management actions.

Had the strategic approach not been adopted, a categorical understanding of the extent of the problem would not have been ascertained.

Research

One of the most significant issues at present with bridal veil is that methods of highly effective control are yet to be developed. The leaves (cladodes) of bridal veil plants are fine and 'feathery' which makes herbicide application difficult (K. Hodder 2005 personal communication) and the suggested compartmentalization of the rhizomatous and tuberous root system means that regrowth from root system sections of treated plants occurs year after year (R. Taylor 2005 personal communication).

Emulsifiable vegetable oil is now being experimentally trialled by the Kangaroo Island Asparagus Weeds Committee in combination with herbicide (glyphosate) and surfactant (Nufarm Pulse Penetrant®)

to help chemicals stick amongst the feathery leaves. This will add to herbicide research by the Asparagus Weeds Working Group of the southern Mt. Lofty Ranges of South Australia, on various glyphosate and metsulfuron methyl herbicide combinations.

During August 2005 three trial sites of the above mix and another glyphosate mix based on Nufarm Credit® Broadacre Herbicide-plus-Nufarm Bonus Adjuvant/Surfactant® were set up to measure their long-term effectiveness. No herbicide is specifically registered for use on bridal veil. Initial knockdown using the Credit plus Bonus-based mix looks promising and tuber desiccation is apparent in the early stages after treatment. First year's results from these trials will be available in late 2006, with the study continuing in following years.

A trial in 2003 investigated livestock grazing (sheep) as an alternative method for control, producing results of significant shoot biomass reduction. However, the use of grazing as a control method is limited by the inability of one-off grazing events to reduce the long-term health and viability of bridal veil infestations, plus the potential impact of livestock grazing on non-target, native plant species (Taylor 2003b).

Manual removal is being tested for the impact of tuber-mat removal on native regeneration, but is not considered an appropriate management technique due to the substantial time and human resources required (Winkler 2006).

Future activities

Attempts to utilize fire as an integrated management tool will be experimentally tested in spring 2006. Control using previously trialled glyphosate-based mixes will continue with the aim of halting fruit development, if not actually hindering the growth of the plant in general (Winkler 2006).

With results pending from all of these trials on Kangaroo Island, as well as studies elsewhere in South Australia, information as to the most effective integration of techniques may then be incorporated into future management strategies both on the island and nationwide.

Acknowledgments

Much credit is offered to the community members and founders of the Kangaroo Island Asparagus Weeds Committee who built information resources, generated momentum and established an on-ground

investigative framework on Kangaroo Island.

References

- Agriculture and Resource Management Council of Australia and New Zealand, Australian and New Zealand Environment and Conservation Council and Forestry Ministers (2001). 'Weeds of National Significance. Bridal Creeper (*Asparagus asparagoides*) Strategic Plan'. (National Weeds Strategy Executive Committee, Launceston).
- Ball, D. (1993). A report on the status of bridal creeper (*M. asparagoides*) and the related species *M. declinatum* on Kangaroo Island in 1993. Unpublished report to the Kangaroo Island Bridal Creeper Control Committee.
- Bass, D.A. and Lawrie, S.L. (2003). Impacts, dispersal, predictive modelling and control of bridal veil. Environmental Weeds Group, Flinders University, South Australia.
- Davies, R.J.P. (1996). Threatened plant species on roadsides: Kangaroo Island, South Australia. Unpublished report to the Department of Environment and Natural Resources, South Australia.
- Dixon, I.R. (1996). Control of bridal creeper (*Asparagus asparagoides*) and the distribution of *Asparagus declinatus* in Kings Park bushland, 1991–1995. *Plant Protection Quarterly* 11(2), 61-3.
- Johnson, D.H. (2002). The importance of replication in wildlife research. *Journal of Wildlife Management* 66, 919-32.
- Leah, A.G. (2001). The impacts of the environmental weed bridal veil (*Asparagus declinatus*) on native vegetation in South Australia. Honours Thesis, School of Geography, Population and Environmental Management, Flinders University of South Australia.
- Pheloung, P.C. and Scott, J.K. (1996). Climate-based prediction of *Asparagus asparagoides* and *A. declinatus* distribution in Western Australia. *Plant Protection Quarterly* 11(2), 51-3.
- Pisanu, P. (2005). Environmental weeds on Kangaroo Island: results of weed risk assessment and the development of strategies for mapping and collecting new weed data. Unpublished report. Department for Environment and Heritage, Kingscote, SA.
- Reddiex, B., Forsyth, D.M., McDonald-Madden, E., Einoder, L.D., Griffioen, P.A., Chick, R.R., and Robley, A.J. (2004). Review of existing red fox, wild dog, feral cat, feral rabbit, feral pig, and feral goat control in Australia. I. Audit. Report for Department of Environment and Heritage, Canberra. Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, Melbourne.
- Simberloff, D. (2003). Eradication – preventing invasions at the outset. *Weed Science* 51, 247-53.
- Sheridan, P. and Pearce, R. (2002). Have you seen this plant: bridal veil *Asparagus declinatus*. Brochure produced by Southern Eyre Animal and Plant Control Board, Port Lincoln South Australia.
- Taylor, D. (2003a). Draft recovery plan for 15 nationally threatened plant species on Kangaroo Island, South Australia. Report to the Threatened Species and Communities Section, Environment Australia.
- Taylor, D. (2003b). Manipulation of livestock grazing regimes as an alternative method managing bridal veil (*Asparagus declinatus*) infestations on Kangaroo Island, South Australia. Unpublished report to the Department for Environment and Heritage, Kangaroo Island Region, South Australia.
- Taylor, D. (2004). Bridal veil (*Asparagus declinatus*) Management Strategy: 2004–2006, Kangaroo Island, South Australia. Document submitted to the Kangaroo Island Asparagus Weeds Committee, May 2004.
- Taylor, D. (2005). Implementation of the Kangaroo Island bridal veil (*Asparagus declinatus*) management strategy: Stage 1, 2004. Document submitted to the Kangaroo Island Asparagus Weeds Committee, January 2005.
- Taylor, D., Mussared, R. and Flanagan, G. (2002). A road survey to determine the distribution of bridal veil (*Myrsiphyllum declinatum*) on Kangaroo Island, South Australia. Unpublished report submitted to National Parks and Wildlife South Australia, Kangaroo Island.
- Timmins, S.M. and Braithwaite, H. (2002). Early detection of invasive weeds on islands. In 'Turning the tide: the eradication of invasive species', eds C.R. Veitch and M.N. Clout, p. 311-18. (IUCN SSC Invasive Species Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK).
- Winkler, M. A. (2006). On-ground management and monitoring of bridal creeper and bridal veil on asparagus weeds management, Kangaroo Island, South Australia. Report to the Kangaroo Island Asparagus Weeds Committee, March 2006.