

Bridal creeper (*Asparagus asparagoides*)
Management Strategy for Kangaroo Island

2006 - 2010



Prepared by Colin G. Wilson, April 2006, for the
Kangaroo Island Asparagus Weeds Committee

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Executive Summary

Bridal creeper is currently the worst environmental weed on Kangaroo Island, posing a serious threat to our biodiversity.

Bridal creeper has the relatively unusual ability to invade undisturbed native bushland. Dispersal of seeds by native birds enables it to reach remote and inaccessible places. Once established, the stems and foliage smother native seedlings and understorey plants, and the aggressive tuberous root system forms dense, impenetrable mats, inhibiting the establishment of native trees and shrubs. Underground tuber reserves enable the plant to survive unfavourable conditions for many years, while fragments of underground rhizomes can be spread inadvertently in soil or mulch to begin new infestations.

It also has weaknesses that provide an opportunity for successful control. Seeds are very short lived and are only produced on the first stems to emerge each season. Seedlings take at least 3 years before they begin to produce their own seeds, and old infestations produce few seeds. Poor soils in undisturbed vegetation are rarely capable of giving rise to fruiting plants, seedling mortality is extremely high in a normal summer, and recruitment tends to occur episodically in occasional wet summers.

However, the biggest weakness of bridal creeper growing on Kangaroo Island is that most of the population is already growing under sufficient environmental duress to severely limit its reproductive capability.

Implementation of this strategy will achieve the following aims:

- 1. prevent any further extension of the area of Kangaroo Island infested with bridal creeper;**
- 2. selectively control bridal creeper where it impacts on threatened species; and**
- 3. educate and involve the wider community in bridal creeper management.**

For this strategy to be effective, a program needs to be funded for at least 3 years to employ a project officer and allow substantial control works. The officer would work under KIAWC direction to coordinate on-ground activities and enhance monitoring, strategic planning and landholder involvement. Ideally this position would also deal with bridal veil and other priority environmental weeds at a cost of approximately \$100,000/year.



Introduction

This strategy has been developed under the direction of the community-based Kangaroo Island Asparagus Weeds Committee (KIAWC), with funding coming from the NHT and NAP via the Kangaroo Island Natural Resources Board (KINRB).

In the preparation of this strategy, advice has been sought and received from many experts and participants in bridal creeper management both locally and nationally. The framework of weed ecologist Richard Hobbs (1995) – that management actions required for effective weed control should be, in priority order: quarantine; prevention; detection and early control; eradication; integrated ecosystem management – has been followed.

The objectives and actions here are designed to be consistent with and further the aims of the *National Bridal Creeper Strategic Plan*. The recommendations from the *Review of the Kangaroo Island Asparagus Weeds Management Project* (Virtue 2005) have been incorporated, and the requirements of the *Draft recovery plan for 15 nationally threatened plant species on Kangaroo Island* (Taylor 2003) have been taken into account.

Finally, the National Asparagus Weeds Management Committee has identified the following priorities, which this strategy reflects:

- establishment of nursery sites and redistribution of biocontrol agents for bridal creeper;
- containment of current infestations for all Asparagus weeds;
- creation of buffer zones between infestations and areas of high ecological value;
- eradication of new infestations, particularly emerging Asparagus weeds; and
- mapping for strategic management for Asparagus weed infestations.



Bridal creeper is one of the worst environmental weeds in southern Australia, posing a serious threat to our biodiversity.

Background

- **Identity, biology and ecology**

Bridal creeper or *Asparagus asparagoides* (sometimes known by the alternative scientific names *Myrsiphyllum asparagoides* or *Asparagus medeoloides*) is a climbing plant native to South Africa. There are approximately 120 species of *Asparagus* worldwide but only one, *Asparagus racemosus*, is native to Australia where it can be found in rainforests in the tropical north. Several exotic *Asparagus* species which are grown in Australian gardens, including the edible asparagus used as a vegetable, have escaped from cultivation and become environmental weeds. But bridal creeper is far and away the worst of these at present and has been recognised as one of 20 Weeds of National Significance (or WONS). Bridal veil (*Asparagus declinatus*) may one day soon take over pole position in this regard, at least on Kangaroo Island.

Bridal creeper produces annual stems from a perennial root system. This root system consists of a central rhizome, which is an underground stem with shoot buds, along which are grouped many swollen tubers or food storage organs. The rhizome elongates throughout its life and also divides to produce multiple growing tips. The root system eventually grows into an extensive mat of branching rhizomes and numerous fleshy tubers just under the soil surface. This mat, which can be up to 10cm thick, makes up nearly 90% of the biomass of bridal creeper plants when they are actively growing, and 100% when the shoots die back over summer. The tubers provide water, energy and nutrient reserves to enable the plant to survive over summer and allow rapid shoot growth in autumn. The tubers also provide a physical barrier that out-competes other vegetation for space.



Twisting, branching, wiry, green stems up to 3m in length grow from the rhizomes and shiny green 'leaves' (which technically are not leaves at all, but rather cladodes) are borne in groups along short side branches. One patch of roots will give rise to numerous stems which scramble across the ground, entwine with each other and climb shrubs and trees. In the absence of mechanical support, self-supporting clumps up to 70cm high are formed.

Shoots typically emerge from the soil after the first rains in autumn when nights of high humidity are common, and elongate and branch through the winter. Small, white, self-fertile flowers appear along the length of the stems in early spring. Bridal creeper seedlings must be at least 3 years old before they begin to flower, and usually older

where environmental conditions are less favourable. The shoots cease growth at flowering and normally die in late spring, but may survive later if there are

good summer rains. Only shoots which emerge in the first few weeks of the growing season produce flowers.

The fruits are green, pea-sized berries that ripen to pink, and then deep red in late spring or early summer. The berries each contain 1-9 seeds (more usually 3-6) that are black when mature. The amount of fruit set is significantly greater



where shoots are able to climb vertically by twining up shrubs or trees, and less where the plants are heavily shaded, suffer water stress, are sprawling along the ground or where there is a high level of competition between shoots in older, dense, bridal creeper infestations.

Bridal creeper plants can produce more than 1000 berries per square metre. Birds, mainly

currawongs and silvereyes, feed on the berries and later excrete or regurgitate the seeds at perch sites. Seeds germinate in autumn and winter in leaf litter and at soil depths up to 10cm. Buried seed that does not germinate generally rots within 2 years, while dry seeds on the soil surface may be viable for up to 3 years. Seedlings produce at least one tuber in their first year.

Bridal creeper can grow in most soil types and tolerates a wide range of soil pH and salinity, but it does best in neutral sandy soils derived from river deposits. It also thrives in nutrient enriched soils such as along drainage lines and roadsides adjacent to farms where there can be increased nutrients from fertilizer use, increased moisture with runoff from the road, and no grazing. It is invasive in many natural habitats, including coastal vegetation, wet and dry sclerophyll forests, heath, mallee and stream banks.

Bridal creeper is typically found within patches of trees and native vegetation, and along roadsides. This is partly because of the pattern of bird dispersal of seeds, greater seedling establishment in leaf litter, better growth in partly shaded situations, and intolerance of cultivation and grazing by stock. Poor soils in undisturbed vegetation are rarely capable of giving rise to fruiting plants and so the major areas of reproducing bridal creeper populations are located in naturally fertile river valleys, or adjacent to areas where agricultural fertilizers have been applied.

Bridal creeper is one of the worst environmental weeds in southern Australia, posing a serious threat to our biodiversity. It is relatively unusual amongst weeds in its ability to invade undisturbed natural habitats. Dispersal of its seeds by native birds enables it to reach remote and inaccessible terrain. Once established, the stems and foliage smother native seedlings and understorey plants, and the aggressive tuberous root system forms dense, impenetrable mats, inhibiting the establishment of native trees and shrubs.

Recently a different form of bridal creeper has been discovered, known as the Western Cape form. It has not yet been found on Kangaroo Island, although it is known to have been in Australia for at least 7 years. It is a bigger, more robust plant, the leaves are a bluer green and less shiny, the tubers are bigger and broader, radiating outwards from the centre like spokes on a wheel, and the fruit is more deeply ridged. It is quite possibly a separate species, but this is yet to be confirmed.

- **History of introduction and naturalisation**

Bridal creeper is native to South Africa, where it occurs naturally around the Cape and up the east coast into the Transvaal. It is found in areas which get mainly winter rainfall as in southern Australia, but also in areas where summer rainfall predominates. It was first recorded in Australia in 1857 in a nursery catalogue, and was present in the Adelaide Botanic Gardens in 1871. By the 1870s it was a common garden plant in Australia and its flowers were popular in floral arrangements, particularly wedding bouquets, hence the common name.

It is thought to have been present on Kangaroo Island for over 100 years as it was well established around Penneshaw in the 1940s and at Antechamber Bay in the 1950s. Many bridal creeper infestations on Kangaroo Island occur in native scrub along public roads next to improved pastures where nutrient levels are higher following past fertiliser applications and there is protection from stock grazing. This is particularly so where the land was opened up before the removal of the super bounty in 1974.

As well as being a serious environmental weed across southern Australia, with infestations in WA, SA, Victoria, NSW (including Lord Howe Island), Queensland and Tasmania, bridal creeper also creates problems in New Zealand, South America and the southern USA.

- **Threat posed to KI environment and industries**

Although not generally ranked highly as a weed by landholders, local scientists and officials consider bridal creeper to be one of the most important weed threats to biodiversity. It not only forms a thick mat of underground tubers which impedes the root growth of other plants and makes it difficult for seedlings to establish, but its shoots form a dense aerial canopy which smothers shrubs, herbs and seedlings.

It does not persist in most pasture or cropping situations as it does not tolerate grazing, cultivation or herbicides, but in indigenous vegetation its cost in loss of biodiversity is significant. Bridal creeper poses one the greatest hazards to growth, recruitment and survival of nationally listed threatened plant species on Kangaroo Island (Taylor 2003). Plant species known to be threatened by bridal creeper are *Olearia microdisca*, *Leionema equestre*, *Pultenaea insularis*, *Beyeria subsecta*, *Pomaderris halmaturina* ssp. *halmaturina* and *Spyridium eriocephalum* var. *glabrisepalum*.

Kangaroo Island in recent years has seen well-meaning developments which unexpectedly played into the hands of this opportunistic weed. In an attempt to protect vulnerable native vegetation from uncontrolled stock grazing, widespread fencing of remnant vegetation has been carried out, particularly along creek lines. This has created safe havens from grazing pressure for bridal creeper across the island. Widening of roads has made them more susceptible to bridal creeper infestation by opening the tree canopy, and the switch of many farmers from grazing to cropping has opened up paddock boundaries to bridal creeper infestation.

While bridal creeper is considered largely an environmental weed, it also causes losses to primary industries by shading citrus and avocado trees and interfering with picking, especially in the Murray River Irrigation Area where it is estimated to cost growers an additional \$2,000/ha/year. Kangaroo Island's emerging plantation forestry, vineyard and olive industries may also suffer losses if bridal creeper invades seedling plots.

- **Dispersal**

Birds, especially currawongs and silvereyes, play a critical role in spreading bridal creeper when they feed on the fleshy berries and excrete or regurgitate seeds at perch sites. When there is a major concentration of fruiting bridal creeper plants, birds will come from some distance to feed and then return to their normal areas of habitation. Silvereyes are likely to be responsible for only short-distance dispersal, while currawongs may transport the seeds up to 2.5km. Even so, most spread by birds is likely to be within 100m of source plants. Dispersal distances may be further where native vegetation is fragmented. New infestations are often associated with the tallest trees, reflecting preferred bird perching sites.

In spite of the major role played by birds in dispersing seeds, most fruit is not actually taken but falls beneath the plant, leading to increasingly dense infestations over time.

Seeds germinate readily, but the rate of dispersal by birds is slowed by the fact that bridal creeper does not produce significant amounts of fruit, if any, in the first 3 years of life. When the plant does reach reproductive age, fruiting is reduced when there is poor rainfall, low soil fertility, heavy shading, waterlogging, the absence of deep litter, or cold, wet and windy weather during July and August that suppresses bee activity.

Berries may be dispersed by water down creeks and rivers. Spread also occurs when people dump garden rubbish containing seeds or roots and machines such as graders move soil containing roots along road verges. Small pieces of actively growing root rhizome will produce new plants when moved to a suitable site.

The current distribution on Kangaroo Island suggests a clustering of age ranges coinciding with the peak wet years of 1983/84 and 1992/93 (David Ball, *pers. comm.*). The rate of spread in other years appears to have been much lower.

- **Current and potential distribution**

Bridal creeper is well entrenched across the eastern third of Kangaroo Island, especially on the Dudley Peninsula (see Winkler *et al.* 2006). Individual outlying infestations have been reported at various locations in the west, such as along Eleanor and Stunsail Boom Rivers, at Kelly Hill Caves and in Flinders Chase National Park. Bridal creeper could potentially infest nearly all of the remainder of Kangaroo Island, but would be most troublesome along the more fertile waterways across the central plateau.

- **Legislation**

In South Australia bridal creeper is a proclaimed noxious weed state-wide under the Animal and Plant Control (Agricultural Protection and Other Purposes) Act of 1986. It is a legal requirement for landholders to control it on their properties and adjacent roadsides, and it is not to be cultivated, sold or transported. As a WONS, all Australian States and Territories have now prohibited sale and movement of bridal creeper.

- **Control options**

Bridal creeper is difficult to control because:

- Underground tuber reserves enable the plant to survive unfavourable conditions for many years;
- It reproduces sexually by seeds, but also vegetatively through fragments of underground rhizomes;
- The fleshy berries enable birds to disperse seeds long distances into remote locations;
- The seeds will germinate under a wide range of environmental conditions; and
- It does not need any artificial disturbance to readily establish in native vegetation where soil and litter is suitable.

On the other hand, it has weaknesses that provide an opportunity for successful control:

- The seeds are very short lived, with few remaining viable after 2 years;
- Seeds are only produced on the first stems to emerge each season;
- Old infestations produce few seeds;
- Seedlings take at least 3 and up to 5 years before they begin to produce seeds;
- Poor soils in undisturbed vegetation are rarely capable of giving rise to fruiting plants;
- Seedling mortality is extremely high in a normal summer, and extensive recruitment tends to occur only during occasional wet summers;
- Small, localised infestations are unlikely to become magnets for habitual feeding by seed-dispersing birds.

The biggest weakness of bridal creeper growing on Kangaroo Island is that most of the population is already growing under sufficient environmental duress to severely limit its reproductive capability.

Prevention and quarantine

Prevention is always the most cost-effective means of weed control. It is too late to stop the spread of bridal creeper across the more heavily modified eastern portion of Kangaroo Island, but the west of the island, with its extensive tracts of undisturbed native vegetation, can still be maintained bridal creeper-free by diligent effort.

Buffer zones up to 3km wide around existing infestations, within and beyond which a high degree of control is maintained, can stop most spread of seeds by birds. Preventing the formation of berries within the buffer zones can be achieved by selectively targeting larger, climbing infestations, which produce most seed and are most attractive to birds. Surveys for new infestations need to concentrate on significant perch trees used by birds, tree corridors, fencelines and roadsides that may link areas of indigenous vegetation with and without bridal creeper.

Rhizomes can be readily transported in soil or mulch. Council and private contractors need to be aware of the risks of spreading rhizomes when doing earthworks such as roadside grading, and root material should not be composted or mulched.

Physical and cultural control

The most common and effective control method for bridal creeper is stock grazing. For this reason the plant on Kangaroo Island is almost entirely confined to roadside verges and uncleared scrub. But stock can significantly damage understorey plants in native vegetation and are not recommended as a control measure in conservation reserves. Unfortunately, kangaroos and wallabies do not generally favour bridal creeper and are unlikely to keep it under control in such places.

Simple physical removal is only effective if all rhizomes are dug up and destroyed. If they are left on a damp surface they will send down roots and are capable of re-shooting from mats of tubers and rhizomes left over summer on the soil surface. Slashing stems may temporarily prevent fruit production and slowly deplete root reserves, but is unlikely to eradicate an infestation.

The deliberate use of fire is not likely to lead to control of bridal creeper except perhaps at specific small sites where an artificially high fuel load can be created. In this case seeds and possibly even the dense tuber mat may be destroyed. Fire may be of some use in larger infestations, however, by removing understorey vegetation and hence improving access for later spraying, but should be used with care as it may also damage native flora.

For many weeds the re-establishment of dense native vegetation is enough to exclude them from an area. But bridal creeper is one of those rare weeds which can readily establish in undisturbed natural habitats, so a program of revegetation alone is not sufficient to control it.

Chemical control

Bridal creeper can be successfully controlled with herbicides, but in dense infestations the underground tuber mat may persist for many years, even after the weeds have been killed, maintaining a barrier to regeneration of native vegetation. Glyphosate (Roundup) and Metsulfuron methyl (Brush-off) are both registered for use, but the KIAWC has favoured Brush-off in recent years. Both should be used with a wetting agent to aid penetration into the glossy leaves, and always strictly in accordance with the directions on the herbicide label.

In places where the need is to completely eradicate bridal creeper, herbicide spraying followed 2 years later by digging the remaining live rhizomes should be the technique used. Where containment is the chief aim, infestations should be treated with herbicide in the year prior to establishing the biocontrol rust fungus to ensure long-term suppression of fruiting.

Investigations are underway into the recovery of native vegetation following chemical control of bridal creeper, and also into the use of fire to reduce the barrier to native seedling establishment caused by the persistent tuber mat.

Biological control

Biological control agents take longer to bring about control of bridal creeper infestations than herbicides, but they deplete the tubers and in the long run will be more effective in enabling native plant regeneration. This is already considered among the more successful biological control programmes undertaken in Australia.

➤ ***Zygina* sp. (leafhopper)**

The leafhopper was approved for release in July 1999. The adult is a tiny, white, winged insect about 2mm long which pierces the photosynthetic cells of the leaf with its proboscis and sucks them dry. Feeding damage shows up as white spots, often in a zig-zag pattern, on the upper surface of leaves. Eggs are laid inside bridal creeper leaves, hatching into wingless nymphs that also feed by sucking photosynthetic leaf cells. A heavy infestation leads to early defoliation and reduced tuber production. Leafhoppers prefer shaded areas and are most often found on the lower leaves.

Leafhoppers have been released at many sites across southern Australia, including on Kangaroo Island. Their performance tends to be highly variable between different places and at different times. They usually take a few years to build up damaging populations, but then experience sudden crashes, possibly due to egg parasites.

They are established at several locations on KI but have spread slowly and are not contributing significantly to control.

➤ ***Puccinia myrsiphylli* (rust fungus)**

Puccinia myrsiphylli was approved for release in Australia in June 2000 and has proven to be a very effective biocontrol agent, especially in coastal regions. It infects stems and leaves of bridal creeper, obtaining nutrients and water for its own development directly from the host plant. It also



destroys leaf tissue thereby reducing photosynthetic capacity. Severely diseased plants lose all of their leaves, produce few or no fruits and produce fewer tubers.

An attack by the rust fungus is easily recognisable as yellow circular areas on the upper sides of leaves and corresponding orange sporulating pustules on the under side. The first symptoms usually appear a couple of months after the onset of autumn rains, around about May. The incidence and severity of the disease then rapidly increases during winter and reaches a peak during spring when the plants are flowering and fruiting.

As the rust only attacks the above-ground, growing parts of bridal creeper, it must reinfest plants each growing season. The rust has one stage in its complex life cycle called a teliospore which enables it to survive adverse conditions over summer when there is no living host plant above ground. This ensures that inoculum is available for a new disease cycle to be initiated early in the following season. New infective spores that are produced in autumn in response to rain and cooler temperatures will infect fresh leaves that remain moist for at least 8 hours when the temperature is between 10-20°C.



Once an area is infected with rust, it usually takes about 3-4 years to achieve effective control. It is widely established on Kangaroo Island and is working well in reducing the size and vigour of bridal creeper infestations in many places.

A cheap, easy and effective means of spreading the rust was pioneered by the KIAWC. It involves washing spores from infected leaves into clean rainwater and spraying the solution onto uninfected infestations. The best time to spray this spore-water is on warm days just before it rains or during misty rain when there are light breezes.

➤ ***Crioceris* sp. (leaf beetle)**

Crioceris sp. was approved for release in May 2002. Adults and larvae both feed on young growing shoots of bridal creeper, preventing plants from climbing and reducing fruit production. It has been released at several sites on Kangaroo Island but is not thought to have established here. It has persisted at several sites in WA.

● **Formation and achievements of the KI Bridal Creeper Control Committee**

The Kangaroo Island Bridal Creeper Control Committee (KIBCCC) was formed in June 1997 by a group of residents concerned about the rapidly escalating impact of bridal creeper on native vegetation, in particular threatened species. The committee was formed to coordinate the management of bridal creeper amongst landholders, community groups and authorities involved in weed control, and to significantly increase the profile of the weed as a threat to biodiversity, sustainable agriculture and nature-based tourism.

The main aims of the committee have been to:

- prevent any further extension of the area of KI infested with bridal creeper;
- selectively target areas where bridal creeper is impacting on threatened species;
- educate and involve the wider community.

More recently the committee has expanded its terms of reference to include management of bridal veil (*Asparagus declinatus*) and has changed its name to the Kangaroo Island Asparagus Weeds Committee (KIAWC).

The committee has implemented a management strategy which has included:

- detailed and regular mapping of the distribution of bridal creeper;
- subdivision of the existing population into more manageable local zones;
- targeted control in areas which support threatened plant species;
- localised eradication of populations capable of producing flowers and fruit, particularly in identified buffer zones;
- research into chemical and biological control methods;
- coordination and implementation of chemical and biological control programs;
- provision of a framework for community and school involvement through weed recording and monitoring; and
- development of a community awareness program.

Community understanding of the threat posed by bridal creeper is high, and many landholders and community groups have become involved in the program, particularly assisting in the eradication of small, outlying infestations and in the widespread distribution of biocontrol agents.

By the year 2000 over 1,400km of roadsides had been sprayed with herbicides, approximately 80 properties had been sprayed with herbicides by contractors, and more than 100 landholders had completed control work on their own properties using herbicides, all coordinated and assisted by the KIBCCC. By 2005 spore-water had been applied to more than 200km of roadsides and the rust had spread at least 10km from some original release sites on its own. As a result of these efforts, there has been little significant expansion of the area infested by bridal creeper in recent years.

- **Relevant actions from National Bridal Creeper Strategic Plan**

The Objectives and Actions of the Bridal Creeper Strategy for Kangaroo Island should be, and are, consistent with those of the 2001 National Bridal Creeper Strategic Plan. The vision of the national strategic plan is:

Bridal creeper is managed effectively to stop further spread and to reduce its impacts on Australia's natural assets.

The national strategy aims to deliver 3 key outcomes, each of which is supported by a number of prioritised actions. Some of these actions are national or state responsibilities, but some need to be carried out by regional groups. The key outcomes are listed below, along with the actions that are relevant to the KIAWC.

1. **The community recognises bridal creeper as a major environmental threat and is committed to its management;**

- Ensure awareness of the plan
- Identify key target groups for awareness and education
- Develop and implement extension and communication plans utilising the media
- Develop and distribute information pamphlets
- Identify stakeholders
- Include stakeholder consultation in all project development
- Develop projects which access all appropriate components of funding programs
- Coordinate project funding applications
- Ensure that resources for on-ground projects are adequate and long-term

2. **High value natural assets are protected from invasion by bridal creeper;**

- Identify and collate existing data sources
- Map current bridal creeper infestations
- Map assets in relation to bridal creeper distribution
- Use maps to identify eradication, buffer and containment zones
- Fund and implement control programs within eradication and buffer zones
- Develop and implement an early detection mechanism and implement regular surveys in eradication zones

- Integrate on-ground actions with existing plans (eg: for property, pest management or conservation reserve)
- Establish a system for reporting and eradicating new infestations
- Develop and implement regional containment strategies

3. Bridal creeper is managed to reduce its density and occurrence;

- Develop, publicise and implement a training program on best practice
- Document changes in health of landscape and ecosystems to measure success of bridal creeper management
- Involve the community in rearing, release and redistribution of biocontrol agents

● Recommendations of the 2005 independent review

In 2005 the Kangaroo Island Asparagus Weeds Management Project, funded through KINRB, was independently reviewed (Virtue 2005). As a result of the review, a number of suggestions and recommendations were made which are summarised here.

- Asparagus weeds remain a major threat to biodiversity on KI and a program to manage these weeds should be ongoing. An effective program needs to be funded for at least 3 years, requiring at least \$100,000/year for a project officer and substantial control works. The officer would work under KIAWC direction to coordinate on-ground activities and enhance monitoring, strategic planning and landholder involvement.
- The KIAWC would benefit from formal recognition by the KINRMB of its role in environmental weed management on KI. Environmental weed management should be seen as an ongoing program by KINRMB.
- KIAWC needs to strengthen interactions with other similar groups in SA.
- Mapping of bridal creeper should be consolidated into a GIS database. It would be useful to overlay data on the presence and absence of bridal creeper with GIS environmental layers (eg: soil type, drainage, vegetation type) to determine with confidence any patterns in the weed's distribution.
- Future KIAWC activities should include:
 - A greater focus on monitoring to see if native vegetation recovers as the rust reduces bridal creeper density;
 - Formalising reporting for new asparagus weed outbreaks;
 - Production and circulation of a colour brochure for landholders on asparagus weed management on KI.
- Eradication sites need to be consolidated into an ongoing work plan so that individual progress can be monitored annually.
- Other emerging environmental weeds have not been receiving an equivalent amount of attention. The KIAWC has the expertise to become a reference group on environmental weeds on KI.

The Bridal Creeper Management Strategy

Aims of the strategy

1. Prevent any further extension of the area of Kangaroo Island infested with bridal creeper;
2. Selectively control bridal creeper where it is impacting on threatened species; and
3. Educate and involve the wider community in bridal creeper management.

Objectives

1. Develop and maintain a coordinated approach to the management of bridal creeper across Kangaroo Island.
2. Regularly survey and map the extent and density of bridal creeper infestations.
3. Maintain the Eradication Zone free of bridal creeper infestations.
4. Prevent bridal creeper from producing seeds within the Buffer Zone.
5. Reduce the impact of bridal creeper within the Management Zone.
6. Educate and involve the community in effective management and containment of bridal creeper
7. Obtain ongoing funding to support management and containment of bridal creeper



Table of specific actions to achieve objectives

Objective	Specific Action	Responsibility for progressing action	Timeframe	Priority
1. Develop and maintain a coordinated approach to the management of bridal creeper across Kangaroo Island	KIAWC will maintain its coordinating role in bridal creeper management on Kangaroo Island.	KIAWC	Ongoing	1
	KI NRM Board will be approached to formally recognise KIAWC role in coordinating bridal creeper management.	KIAWC to make representations to KINRMB	2006	3
	A formalised reporting and recording protocol will be developed for new outbreaks, especially in the Eradication and Buffer Zones. Efforts will be made to ensure that the protocol is widely publicised and diligently followed.	KIAWC	2006	2
	A formalised reporting and recording protocol will be developed for biocontrol agent releases and subsequent observations of establishment and spread, and all other control activities. Efforts will be made to ensure that the protocol is diligently followed by persons working under KIAWC direction.	KIAWC	2006	2
	KIAWC will build and maintain links with other similar groups in SA and nationally.	KIAWC	2006 and ongoing	3
	Efforts will be made to expand the scope of the KIAWC to include other environmental weeds.	KIAWC	2006	2
	An annual work plan of prioritised actions required under this Strategy will be prepared, taking account of available resources, to ensure that the most pressing tasks required to fulfil the overall aims are not subordinated to easier but less pressing tasks.	KIAWC	Annually	1
	Progress in carrying out actions of this strategy will be a permanent agenda item at meetings of KIAWC.	KIAWC	Quarterly or as required	2
	Progress towards meeting the objectives of this strategy will be reviewed annually.	KIAWC	Annually in summer	1

2. Regularly survey and map the extent and density of bridal creeper infestations	All high risk areas in the Buffer Zone within 3km of known infestations (i.e.: fertile river valleys, fenced remnant vegetation and roadsides adjacent to pastures) will be surveyed for presence of bridal creeper every 2 years.	KIAWC to coordinate	2007 2009	1
	All public roadsides in the Buffer Zone will be surveyed for presence of bridal creeper every 3 years.	KIAWC to coordinate	2008	1
	High risk areas within the Eradication Zone (i.e.: close to the Buffer Zone boundary, close to previous infestations, fertile river valleys and roadsides adjacent to pastures) will be surveyed every 3 years.	KIAWC to coordinate	2008	1
	Areas within 1km of threatened plant locations in the Buffer and Management Zones will be surveyed annually.	DEH/Threatened plants Project Officer	Annually	1
	A GIS database of bridal creeper infestations, biocontrol agent releases, establishment & spread, and other control activities will be developed and maintained.	DEH	2006 and ongoing	1
	A calendar of follow-up action required for each bridal creeper occurrence in the Buffer and Eradication Zones will be developed and maintained. KIAWC will nominate a person to be responsible for maintaining the calendar.	KIAWC to coordinate	2006 and ongoing	1
	Implementation of actions in the calendar will be a permanent agenda item at meetings of KIAWC.	KIAWC	Quarterly or as required	1
	Achievement of required actions in the calendar will be reported on and reviewed annually by KIAWC.	KIAWC	Annually	1
	The position of Zone boundaries will be reviewed following surveys of roadsides in the Buffer Zone and high risk areas in the Eradication Zone.	KIAWC	2008	2
	The detailed 2005 roadside survey of bridal creeper and rust fungus distribution and abundance in the Buffer Zone and on the Dudley Peninsula will be repeated after 5 years.	KIAWC to coordinate	2010	3

<p>3. Maintain the Eradication Zone free of bridal creeper infestations</p> <p>Prevention is much easier and cheaper than cure.</p>	<p>Any small infestations found in the Eradication Zone will be physically dug up, making sure that all underground rhizomes are removed.</p> <p>Each site will be surveyed annually for at least 2 years after the last occurrence, then after a further 3 years.</p> <p>Details will be recorded on GIS and the required follow-up action entered into the calendar.</p>	KIAWC to coordinate	Ongoing	1
	<p>Larger infestations found in the Eradication Zone will be sprayed with an appropriate registered herbicide.</p> <p>Any rhizomes remaining alive after 2 years will be dug up and destroyed.</p> <p>Each site will be resurveyed annually for at least 2 years after last occurrence, then after a further 3 years.</p> <p>Details will be recorded on GIS and the required follow-up action entered into the calendar.</p>	KIAWC to coordinate	Ongoing	1
	<p>Council and private grading contractors will be strongly encouraged to grade roadsides in the Buffer Zone from west to east, and towards known roadside infestations rather than away from them.</p>	KIAWC	2006 and ongoing	2



<p>4. Prevent bridal creeper from producing seeds within the Buffer Zone</p> <p>The highest priority for action is to control the scattered outlying infestations while preventing the known core populations from spreading.</p>	<p>All known infestations in the Buffer Zone will be surveyed annually.</p> <p>Any fruiting plants will be sprayed with an appropriate registered herbicide. Regrowth will be sprayed with spore water in the following year to establish rust infection.</p> <p>Details will be recorded on GIS and the required follow-up action entered into the calendar.</p>	KIAWC to coordinate	2006 and ongoing	2
	<p>Spore water will be sprayed annually onto any non-fruiting plants amongst known infestations in the Buffer Zone that are not already infected with the rust.</p>	KIAWC to coordinate	Ongoing	3
	<p>Any small new infestations found in the Buffer Zone will be physically dug up, making sure that all underground rhizomes are removed:</p> <ul style="list-style-type: none"> ➤ more than 3km from known infestations ➤ less than 3km from known infestations <p>Each site will be resurveyed annually for at least 2 years after the last occurrence, and then after a further 3 years.</p> <p>Details will be recorded on GIS and the required follow-up action entered into the calendar.</p>	KIAWC to coordinate	Ongoing	2 3
	<p>Larger new infestations found in the Buffer Zone will be sprayed with an appropriate registered herbicide. Any rhizomes remaining alive after 2 years will be dug up and destroyed:</p> <ul style="list-style-type: none"> ➤ more than 3km from known infestations ➤ less than 3km from known infestations <p>Each site will be resurveyed annually for at least 2 years after the last occurrence, then after a further 3 years.</p> <p>Details will be recorded on GIS and the required follow-up action entered into the calendar.</p>	KIAWC to coordinate	Ongoing	2 3

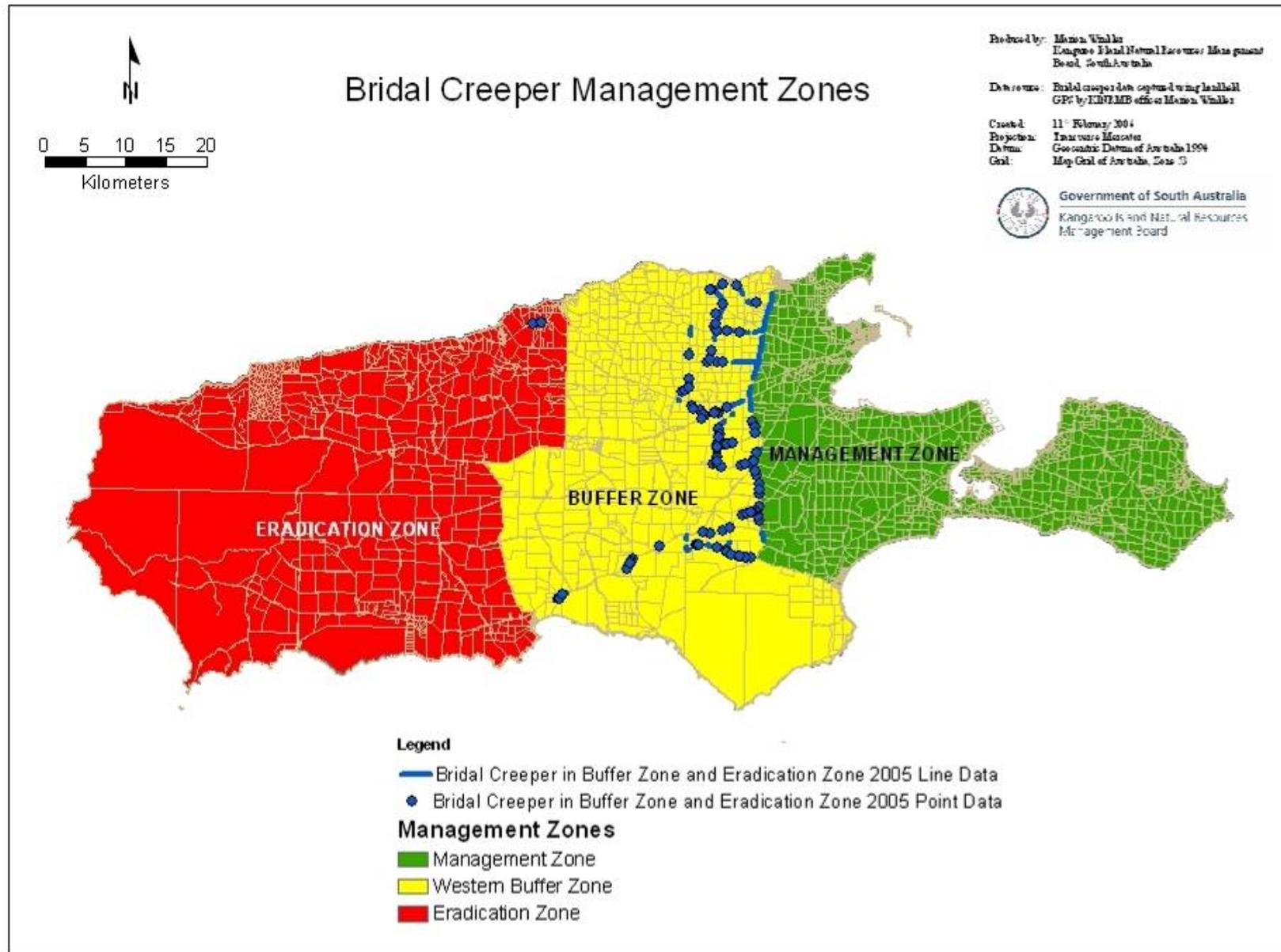
5. Reduce the impact of bridal creeper within the Management Zone	Spore water will be sprayed annually onto any infestations in the Management Zone that are not already infected with the rust.	KIAWC to coordinate community action	Ongoing	3
	Any small infestations found within 1km of a threatened plant location will be physically dug up, making sure that all underground rhizomes are removed and destroyed. Each site will be resurveyed annually. Details will be recorded on GIS and the required follow-up action entered into the calendar.	DEH/Threatened plants Project Officer	Ongoing	1
	Larger infestations found within 1km of a threatened plant location will be sprayed with an appropriate registered herbicide. Any rhizomes remaining alive after 2 years will be dug up and destroyed. Each site will be resurveyed annually. Details will be recorded on GIS and the required follow-up action entered into the calendar.	DEH/Threatened plants Project Officer	Ongoing	1
	Herbicide and ecological impact research sites (established by Marion Winkler) will be maintained for a further 5 years.	KIAWC to coordinate	Annually	2



6. Educate and involve the community in effective management and containment of bridal creeper	Biannual updates on progress towards the strategy will be written for The Islander and Landcare Newsletter, and specific articles explaining results of research or any new developments will be written when required.	KIAWC to coordinate	May and October annually	1
	A colour brochure aimed at landholders with information on management of bridal creeper will be produced, to be distributed as an insert in the Landcare Newsletter and placed in shops, tourist facilities and public buildings around KI.	KIAWC to coordinate	2006	2
	The cooperation of all companies involved in earth moving operations on the island will be sought to minimise the risk of moving living rhizomes through the Buffer Zone and into the Eradication Zone.	KIAWC	2006 and ongoing	1
	Information on bridal creeper will be provided to all companies involved in the nursery industry on Kangaroo Island, and to relevant community organisations such as the Garden Club, Flora and Fauna Club, Walking Club and Friends of Parks groups.	KIAWC	2006 and ongoing	2
	School activities will be organised in association with the annual Weed Buster Week.	KIAWC to coordinate	Annually	3
	Community or school involvement in production and spraying of spore water into uninfected infestations, and in rearing and releasing of other biocontrol agents when available will be encouraged and fostered.	KIAWC to coordinate	Ongoing	1
	Training courses or field days will be held as required.			
	An article will be written for the Landcare Newsletter on the identification and issues surrounding the Western Cape form of bridal creeper.	KIAWC to coordinate	2006	2
	KIAWC will liaise with the KINRMB Biosecurity Project Officer to prevent the introduction of the Western Cape form onto Kangaroo Island.	KIAWC to approach KINRMB	2006	2

7. Obtain ongoing funding to support management and containment of bridal creeper	KINRMB will be encouraged to take responsibility for environmental weed management as one of its funded programs.	KIAWC to make representations to KINRMB	2006	1
	Efforts will be made to ensure that the threat posed by environmental weeds is prominently covered in the next KI NRM Plan.	KIAWC to seek involvement in the plan development process.	2006/07	1
	All available avenues of funding for bridal creeper management will be explored.	KIAWC to liaise with DEH and KINRMB	Ongoing	1





Implementation and review of the strategy

This strategy is designed to run for 5 years from 2006-2010. The Kangaroo Island Asparagus Weeds Committee (KIAWC) will coordinate its implementation, drawing upon government, industry or community expertise, resources and involvement as necessary to progress the listed actions.

Progress in carrying out the actions of this strategy will be a permanent agenda item at monthly meetings of the KIAWC. Progress towards meeting objectives of this strategy, and prioritised actions for the coming year will be reviewed annually in summer by the Committee.

The position of Zone boundaries will be reviewed in 2008 following bridal creeper surveys in the Buffer and Eradication Zones.

References/bibliography

Agriculture & Resource Management Council of Australia & New Zealand, Australian & 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.

Asparagus Weeds Control Group (2004). Asparagus weeds – regional strategy for Eyre Peninsula 2004-2007. Eyre Peninsula Natural Resource Management Group.

Asparagus Weeds Steering Committee (Southern Hills Region) (2003). Asparagus weeds management plan, Southern Hills region, 2003-2006. Fleurieu Animal and Plant Control Board, Willunga.

Asparagus Weeds Working Group Southern Hills Region (2005). Asparagus weed update. 2005/2006 Newsletter.

Ball, D. (1993). A report on the status of bridal creeper (*M. asparagoides*) and the related species *M. declinatum* on Kangaroo Island in 1993. SA Department of Environment and Natural Resources. Unpublished report.

Ball, D. (2000). Report on the KI Bridal Creeper Committee Control Programme. Unpublished report.

Coles, R.B., Willing, K.L., Conran, J. & Gannaway, D. (2005). The distribution of Western Cape form of Bridal Creeper (*Asparagus asparagoides*) in the South East of South Australia and Western Victoria. Proceedings of the National Asparagus Weeds Management Workshop, Adelaide, 10-11 November 2005.

- Cooper, J. & Warren, W. (2005).** Tasmania and asparagus weeds: hanging in the balance. Proceedings of the National Asparagus Weeds Management Workshop, Adelaide, 10-11 November 2005.
- CRC for Australian Weed management (2003).** Bridal creeper – *Asparagus asparagoides*. Weeds of National Significance Weed Management Guide.
- CRC for Australian Weed Management (2005).** Weed of the month – *Asparagus asparagoides*.
http://www.weeds.crc.org.au/text_ver/main/wom_bridal_creeper.html
- CSIRO Entomology (2005).** Bridal creeper leafhopper, *Zygina* sp.
<http://www.ento.csiro.au/weeds/bridalcreeper/leafhopper/index.html>
- CSIRO Entomology (2005).** Bridal creeper rust fungus, *Puccinia myrsiphylli*.
<http://www.ento.csiro.au/weeds/bridalcreeper/fungus/index.html>
- CSIRO Entomology (2005).** Bridal creeper leaf beetle, *Crioceris* sp.
<http://www.ento.csiro.au/weeds/bridalcreeper/leafbeetle/index.html>
- Downey, P.O. (2005).** Determining the biodiversity at risk from *Asparagus asparagoides* (L.) Druce (bridal creeper) and *Asparagus aethiopicus* L. (ground asparagus) in southern New South Wales. Proceedings of the National Asparagus Weeds Management Workshop, Adelaide, 10-11 November 2005.
- Hobbs, R.J. (1995).** What makes an area invasible? In: Hassol, S.J. & Katzenberger, J. *Elements of change*. Aspen Global Change Institute, Aspen, Colorado. Pp. 250-253.
<http://www.agci.org/publications/eoc94/EOC3/EOC3-11.html>
- Kleinjan, C. (2005).** *Asparagus* weeds in Australia – a South African perspective with emphasis on biological control prospects. Proceedings of the National Asparagus Weeds Management Workshop, Adelaide, 10-11 November 2005.
- Kularatne, D., Holland-Clift, S., Kwong, R. & Morfe, T.A. (2005).** Benefit-cost analysis: biological control of bridal creeper in citrus orchards of the Murray Valley region. Department of Primary Industries, unpublished report.
- Maguire, A., Ball, D., Twyford, K., Gill, F. & Overton, D. (2000).** Strategic control of bridal creeper (*Myrsiphyllum asparagoides*) and bridal veil (*Myrsiphyllum declinatum*) on Kangaroo Island. National Parks and Wildlife South Australia, Report to Native Vegetation Council.
- Morin, L. (2004).** The fight to overcome bridal creeper in Australia. *Biocontrol News & Information* 25(3).

- Morin, L., Neave, M., Batchelor, K. & Reid, A. (2005).** The pivotal role of biological control in the management of bridal creeper. Proceedings of the National Asparagus Weeds Management Workshop, Adelaide, 10-11 November 2005.
- National Asparagus Weeds Management Committee (2005).** The Bridal Creeper, August 2005, Vol. 1(2).
- Scott, J.K. & Batchelor, K.L. (2005).** Climate-based prediction of potential distribution of introduced *Asparagus* species in Australia. Proceedings of the National Asparagus Weeds Management Workshop, Adelaide, 10-11 November 2005.
- Siderov, K., Ainsworth, N., Lowell, K. & Bellman, C. (2005).** An investigation of the invasion dynamics of *Asparagus asparagoides* at the habitat level using spatial analytical techniques. Proceedings of the National Asparagus Weeds Management Workshop, Adelaide, 10-11 November 2005.
- Stansbury, C.D. & Scott, J.K. (1999).** The history, distribution and rate of spread of the invasive alien plant, bridal creeper, *Asparagus asparagoides* (L.) Wight, as determined from a questionnaire survey of landholders in south-western Australia. *Diversity and Distributions* 5(3): 105-116.
- Taylor, D. (2003).** 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. (2004).** Bridal veil (*Asparagus declinatus*) management strategy: 2004-2006. Unpublished report for Kangaroo Island Asparagus Weeds Committee.
- Turner, P.J. & Virtue, J.G. (2005).** An eight-year removal experiment measuring the impact of bridal creeper (*Asparagus asparagoides* (L.) Druce) and the potential benefit from its control. Proceedings of the National Asparagus Weeds Management Workshop, Adelaide, 10-11 November 2005.
- Virtue, J. (2005).** Review of the Kangaroo Island Asparagus Weeds Management Project. Unpublished report.
- Willis, A.J. (2000).** Best Practice Management Guide 6: Bridal creeper, *Asparagus asparagoides*. Cooperative Research Centre for Weed Management Systems, Australia.
- Winkler, M., Taylor, D., Overton, B. & Hodder, K. (2006).** Management and monitoring of bridal creeper and bridal veil – addressing issues of control, distribution and impacts on the natural environment, Kangaroo Island, South Australia. A report to the Kangaroo Island Natural Resources Management Board.



Bridal creeper defoliated by rust, Dudley Peninsula, Kangaroo Island

Glossary of Acronyms

CRC	Cooperative Research Centre
DEH	Department of Environment and Heritage
GIS	Geographic Information System
KI	Kangaroo Island
KIAWC	Kangaroo Island Asparagus Weeds Committee
KIBCCC	Kangaroo Island Bridal Creeper Control Committee
KINRMB	Kangaroo Island Natural Resources Management Board
NAP	National Action Plan on Salinity and Water Quality
NHT	Natural Heritage Trust
SA	South Australia
WONS	Weeds of National Significance