

CHAPTER 6

Monitoring

No one would claim to understand all the ecological processes taking place in an area of bush. Therefore, when we restore native bushland we do not always know exactly what the outcome will be. Because of this it is important to monitor a site to measure how it is responding after restoration work has begun (Nature Conservation Council of NSW 1994).

Monitoring involves observing the changes that take place on your site during and after your work and keeping records to measure the success of your activities.

In the same way it is good to keep records of how the land itself is responding to the way that it is being managed. Monitoring is the process of undertaking regular assessments or surveys, recording results, and periodically comparing and evaluating them to see how effective you have been or how far the project has progressed.

Why is it important?

Monitoring is important for two main reasons:

- ❖ it provides feedback on the effectiveness of management actions, and hence whether these actions need to be modified
- ❖ it allows us to work out whether natural resources are stable, improving or declining.

So that this can be done, the records need to be consistent, comparable, and easily interpreted by any interested person.

How your data is collected and accessed is important, as there is a very real need to have comprehensive data managed and coordinated by an organisation. Good management of your data will provide useful information for other groups about successful restoration activities and guide future restoration work on the Cumberland Plain.

Document your work

If you clearly specify your desired ecological outcomes and document what you *plan* to do and what you *actually* do, then you are in a better position to monitor your progress, correct any mistakes and evaluate your success. According to Department of Infrastructure, Planning and Natural Resources (2003b), types of documentation should include:

- ❖ Repeatable **'before' and 'after' photographs** – When you take a photograph mark your location and return to this exact location for the after shot. Take the photo from the same point in the same direction using the same equipment.
- ❖ **Aerial photos to record broad-scale changes** – Photos of every part of the state have been taken every four years since the 1950s. Comparing recent photos with older ones shows the major changes on your property and provides valuable historic evidence of how native vegetation cover has changed over the years. Planning future management of your property is easier using aerial photos which are available from the NSW Department of Lands www.lpi.nsw.gov.au (NSW National Parks and Wildlife Service 2003b)

- ❖ **Vegetation maps** showing boundaries of weed infestations and assessed condition of areas based on weed densities – This method gives a good indication about changes in vegetation dynamics, composition and structure over time.
- ❖ **Collect and prepare plant lists**, for both native and exotic species, taking note of any rare or endangered plant.
- ❖ Collect **lists of animal species**.
- ❖ Establish **permanent quadrats and/or transects** to enable quantitative recording of factors such as species densities and diversity and extent of cover.
- ❖ Record any new **techniques or approaches** being trialled.
- ❖ Record **hours and categories of work**.
- ❖ Prepare **reports**.

Sampling methods: rigorous or quick and simple?

Sampling methods using long-term quadrats or transects provide accurate and high-resolution results. They are a useful method for recording changes in native vegetation and weeds, and provide a quantitative account of what is happening on-site. Their use, however, requires skill and time generally lacking in most restoration projects. Long-term management of the data may also be problematic.

The *Community Rapid Assessment and Monitoring (CRAM) Project* promotes community environmental monitoring within the Hawkesbury–Nepean Catchment. CRAM is a project that helps community groups or individuals to assess and monitor their restoration projects.

The CRAM Project brings together a collection of methods that measure indicators of catchment health. These methods, designed as quick and simple checklists, have been devised and tested through community and professional cooperation. You can visit the CRAM website at www.zip.com.au/~aabr/cram/introduction for more information and view the various CRAM manuals (Hawkesbury–Nepean Catchment Management Trust 2000).

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Leaf litter. (DEC)



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Dodonea falcata, fast growing flower, two years after fire. (P. Watson)



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Appendix 1: Reference sites

Sites that contain remnants of Cumberland Plain endangered ecological communities can be found in the following national parks (NP), nature reserves (NR), state conservation areas (SCA), regional parks (RP) and other conservation reserves and council reserves scattered throughout western Sydney. Most of the reference sites are open to the public and can give land managers an idea of the type of vegetation that may have existed prior to European settlement.

Reserve	Agnes Banks Woodland	Blue Gum High Forest	Cooks River/Castlereagh Ironbark Forest	Castlereagh Swamp Woodland	Cumberland Plain Woodland	Moist Shale Woodland	Shale Gravel Transition Forest	Shale Sandstone Transition Forest	Sydney Coastal River-flat Forest	Sydney Turpentine-Ironbark Forest	Western Sydney Dry Rainforest	Non-endangered communities and unclassified vegetation
Agnes Banks NR	•		•	•			•					•
Bents Basin NR					•			•	•			•
Berowra Valley RP		•								•		•
Blue Mountains NP								•	•			•
Burratorang SCA					•			•	•	•		•
Cabramatta Creek Park									•			
Castlereagh NR			•	•			•					•
Cattai NP					•			•	•		•	•
Chain-o-Ponds NR									•			
Cumberland State Forest		•										
Dalrymple-Hay NR		•										
Darvall Park										•		
Dharawal SCA												•
Duck River Reserve			•									
Dural NR										•		•
Fagan Park										•		
Fairfield City Farm					•	•					•	
Garigal NP										•		•
Georges River NP			•					•	•	•		•
Georges River SCA												•
Gulguer NR								•				•
Kemps Creek NR				•	•		•		•			
Ku-ring-gai Chase NP												•
Lane Cove NP		•								•		•
Lansdowne Reserve									•			
Leacock RP					•				•			
Menai Park										•		
Mulgoa NR					•	•		•	•			
Mount Annan Botanic Garden					•							
Nattai NP								•				•
Newington NR										•		•
Noorumba NR					•			•				
Norfolk Reserve			•									
Nurragingy Reserve					•				•			
Parramatta River RP												•
Pitt Town NR												•
Plumpton Park					•							
Rouse Hill RP					•			•	•			
Scheyville NP					•		•	•	•			•
The Crest Reserve					•							
Thirlmere Lakes NP								•				•
Wallumatta NR										•		
Wedderburn Road Reserve								•				
Werombi Cemetery								•				
Western Sydney RP					•	•			•		•	
William Howe RP					•							
Windsor Downs NR			•	•	•		•					•
Yellomundee RP								•	•			•

Appendix 2: Demonstration sites

Elizabeth Macarthur Agricultural Institute

The Elizabeth Macarthur Agricultural Institute (EMAI) is located on the south-western outskirts of Sydney, about 70 kilometres from the CBD on the western banks of the Nepean River.

EMAI is a 1600-hectare (4000-acre) property that lies within the old Camden Park Estate settled by John and Elizabeth Macarthur in 1805. The property was part of the first land grant to the Macarthurs and as such is the birthplace of Australia's wool, fruit and wine industries. The Department of Primary Industries (formerly NSW Agriculture) became the formal owner of the property in 1990 and is currently developing the property as a demonstration farm in sustainable agriculture.

Three endangered ecological communities (Cumberland Plain Woodland, Sydney Coastal River-flat Forest and Moist Shale Woodland) can be found on the site. These ecological communities are classed as endangered under the NSW *Threatened Species Conservation Act 1995*. The site also contains several individual species listed as endangered under the Act, including *Grevillea juniperina* and *Eucalyptus benthamii*.

The land management practices and intensity of agricultural activities on EMAI have largely conserved the biodiversity values of the property, with natural regeneration occurring in most endangered ecological communities. A high level of compatibility has been achieved between agricultural activity and conservation of bushland remnants across the property.

EMAI lies between the Nepean River and the Razor Back Range and has the potential to provide important vegetation corridor links between these two natural landscapes. Past restoration activities have formed conservation corridors throughout much of EMAI. The revegetation works undertaken in 2004–05 for this project (funded by the Australian Government's Natural Heritage Trust) have ensured that these corridor connections were completed.

The project's restoration works have included fencing a minimum 20-metre buffer zone along parts of the western and southern boundary (Remembrance Drive and Woodbridge Road). Fencing has enabled control of stock access into these revegetated areas. The buffer areas have been revegetated using appropriate mixes of endemic seed and seedlings propagated from bushland remnants found on or adjacent to the property.

EMAI has been used to demonstrate the revegetation techniques of mechanical direct seeding operations and mechanical planting of tubestock. Hand broadcasting of seed and hand planting of seedlings have been undertaken in areas where a native shrub layer was present or where steep site conditions have made access by machine unsuitable. The use of both mechanical seeding and mechanical planting of tubestock in combination has also been trialled on this property.



The revegetated buffer zones provide other benefits including assistance in localised salinity management, improved hydrology, habitat and protection for native fauna and stock, while also enhancing the long-term sustainability of the property. The restoration activities demonstrate the important interactions necessary between environmental conservation and healthy sustainable agricultural practices.

Quadrats and species lists were established before restoration activities began. Monitoring will reveal the changes in both native and exotic species in composition and distribution over time. Assessing the monitoring results will also allow more responsive restoration.

If you are considering undertaking a restoration program on your property and would like information and advice on current successful techniques in use on the Cumberland Plain, a visit to Elizabeth Macarthur Agricultural Institute will allow you to see the on-ground results of the various restoration techniques discussed in this publication.

To visit this demonstration site contact:

Institute Manager
Elizabeth Macarthur Agricultural Institute
NSW Department of Primary Industries
Phone: (02) 4640 6333
Fax: (02) 4640 6300

Camden Town Farm

Camden Town Farm is a 54-hectare property in the heart of Camden and currently owned by Camden Council. During the twentieth century the farm was used principally as a dairy and dairy stud. Llewella Davies (1901–2000) came to live in Camden as an infant when her father Evan Davies bought the dairy farm. Miss Davies bequeathed the property to Camden Council with the condition that it be used to help the community. The council is currently developing the property as a demonstration farm, with the aim of educating the community in sustainable agricultural practices.

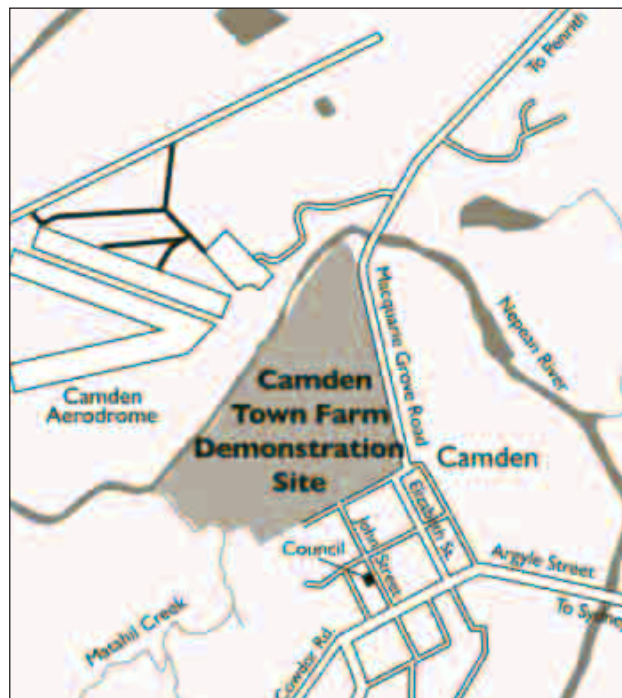
The remnant vegetation on the property is a linear strip adjacent to the Nepean River. This riparian vegetation is classed as Sydney Coastal River-flat Forest, an endangered ecological community under the NSW *Threatened Species Conservation Act 1995*.

The revegetation and restoration works undertaken in 2004–05 for this project (funded by the Australian Government's Natural Heritage Trust) have demonstrated that restoration of riparian vegetation can be integrated into a productive farm. A commercial agroforestry plot has been established adjacent to the remnant riparian vegetation in order to provide a buffer between farming and ecological zones, while ensuring that the buffer area also benefits the farm's productivity.

Seedlings grown from provenance seed collected on and adjacent to the site have been hand-planted along part of the northern boundary. These plantings have been undertaken in an area that was heavily infested with woody and environmental weeds and where natural regeneration was considered unlikely. The plantings will act as a buffer between the adjoining carpark and road, while also protecting the remnant native vegetation regenerating along the Nepean River.

The riparian remnant was heavily infested with woody and environmental weeds, but had an established canopy and the potential to regenerate from soil and canopy-stored seed. Best practice techniques in bush regeneration were used in this zone.

Both the riparian remnant and agroforestry plot have been fenced to control stock access. The species used in the agroforestry plot were selected for their ability to provide useful wood upon maturity (*Eucalyptus tereticornis*, *E. amplifolia*, *E. crebra*, *E. elata*, *E. eugenioides*). The plants propagated for the agroforestry plot were grown from seed collected locally (within a two-kilometre radius) – a factor that increases the ecological value of the plot. An area of approximately 20 metres has been left between the mechanically planted agroforestry plot and the regeneration zone. This was to allow for natural recruitment, regeneration and expansion of the riparian remnant.



The commercial agroforestry plot acts as a buffer, protecting the regenerating and established riparian vegetation from the activities of the farm. Other benefits of this planting include a lower watertable, reduced water contamination, provision of a windbreak and shelter and emergency fodder for stock and acting as a barrier to weed encroachment into the riparian areas.

Quadrats and species lists were established before restoration activities began. Monitoring will reveal the changes in both native and exotic species in composition and distribution over time. Assessing the monitoring results will also allow more responsive restoration.

If you are considering undertaking a restoration program on your property and would like information and advice on current successful techniques in use on the Cumberland Plain, a visit to Camden Town Farm will allow you to see the on-ground results of the various restoration techniques discussed in this publication.

To visit this demonstration site contact:

Camden Council
 Phone: (02) 4654 7777
 Fax: (02) 4654 7829

Western Sydney Parklands site, Eastern Creek, Doonside

The Eastern Creek demonstration site at Doonside forms part of the Department of Infrastructure, Planning and Natural Resources (DIPNR) Western Sydney Parklands.

Restoration works have been undertaken at the site since 1992 as part of a program called Greening Western Sydney (GWS).

Restoration works in conjunction with both the GWS project and the Australian Government's Natural Heritage Trust in 2004–05 have ensured that the rural landscape character of the broad floodplain has been retained and enhanced. A relatively dense corridor of riparian woodland along Eastern Creek and Bungarribee Creek has been restored and expanded. The restoration work aims to conserve and link endangered ecological communities across the Cumberland Plain.

This precinct contains 137 hectares of land set aside purely for conservation purposes. There are two endangered ecological communities (Cumberland Plain Woodland and Sydney Coastal River-flat Forest) on the site. The site also contains several individual specimens of the endangered *Grevillea juniperina*.

The management strategies to restore and expand the bushland on this site have included:

- ❖ works that focus on restoring the remnant riparian vegetation using bush regeneration and weed control techniques
- ❖ an extensive planting and direct seeding program in pastoral land adjacent to these riparian areas.

Current and successful best practice techniques in bush regeneration have been used in the riparian remnants along Eastern and Bungarribee Creeks. These techniques concentrate on controlling and removing environmental and noxious weeds, thereby reducing competition with native vegetation and allowing natural regeneration to occur.

A fence has been erected along the creeklines to control stock access into the regeneration and revegetation areas. The fence provides a 100-metre buffer area between the pasture and riparian vegetation along the creekline. This is a significant buffer zone and a good example of best practice riparian management.

Extensive planting and direct seeding has been undertaken along the eastern side of Eastern Creek and the southern side of Bungarribee Creek. Seed used in these operations has been collected from remnants on or adjacent to the site. An area 20–40 metres wide has been left between the remnant riparian vegetation and the revegetation zone to allow for natural recruitment, regeneration and expansion of the remnant riparian vegetation. The restoration works will assist in the long-term management and recovery of the endangered species and communities on the site by increasing areas suitable for their establishment.



Quadrats and species lists were established before restoration activities began. Monitoring at the site has revealed changes in both native and exotic species in composition and distribution over time. Assessing the monitoring results also allows more responsive restoration.

If you are considering undertaking a restoration program on your property and would like information and advice on current successful techniques in use on the Cumberland Plain, a visit to Western Sydney Parklands site, Eastern Creek, Doonside will allow you to see the on-ground results of the various restoration techniques discussed in this publication.

To visit this demonstration site contact:

Land Management Branch
Department of Infrastructure, Planning and Natural Resources
Phone: (02) 9895 7626

Western Sydney riparian corridors site, South Creek, Erskine Park

This site is part of the Department of Infrastructure, Planning and Natural Resources (DIPNR) western Sydney riparian corridors site at South Creek, Erskine Park. The site is presently undergoing long-term restoration works as part of DIPNR's Greening Western Sydney project, a land and vegetation management project operating since 1992 in the DIPNR-owned open space corridors in western Sydney. The works under the program aim to transform old farming paddocks into recreation and conservation areas.

The site has also been used as a demonstration site for the project funded by the Australian Government's Natural Heritage Trust in 2004–05. The site demonstrates best practice techniques in restoration of endangered ecological communities on the Cumberland Plain. Regeneration works have been undertaken at this site since 1998 and revegetation works since 2000. The site provides land managers with the opportunity to see an established restoration program.

An endangered ecological community, Sydney Coastal River-flat Forest, is found on the site.

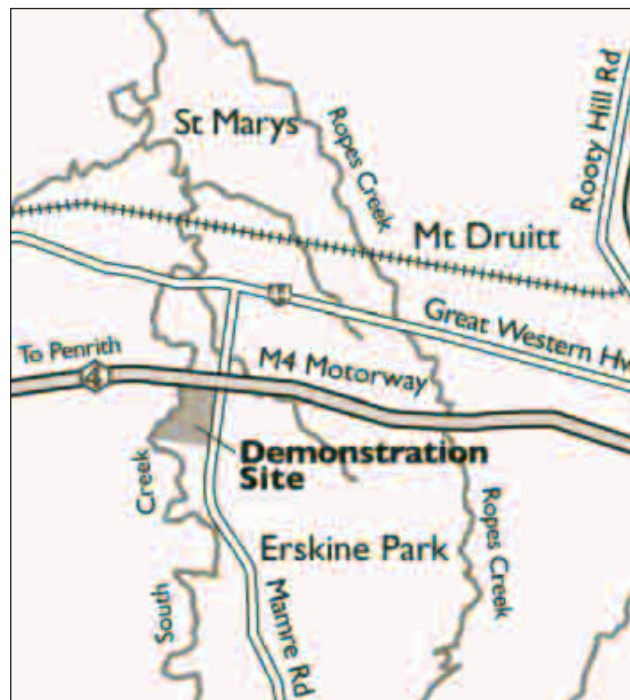
Restoration works have been ongoing at this site since 1998. The management strategies to restore and expand the bushland on this site have included:

- ❖ works that focus on restoring the remnant riparian vegetation using bush regeneration and weed control techniques
- ❖ an extensive planting and direct seeding program in pastoral land adjacent to these riparian areas.

Current and successful best practice techniques in bush regeneration have been used in the riparian remnants along South Creek. These techniques concentrate on controlling and removing environmental and noxious weeds, thereby reducing competition with native vegetation and allowing natural regeneration to occur. The artificial use of disturbance events, such as pile burns, have also been trialled with the aim of 'triggering' a regeneration response from native vegetation.

A fence was erected in 1999 along the creekline to control stock access into the regeneration and revegetation areas. The fence has provided a 50 to 100-metre buffer area between the pasture and the riparian vegetation along the creekline.

In 2000 extensive planting was undertaken along the eastern side of South Creek, with seed collected on or adjacent to the site. An area of approximately 20 metres has been left between the remnant riparian vegetation and the revegetation zone to allow for the natural recruitment, regeneration and expansion of the remnant vegetation. The restoration works will assist in the long-term management and recovery of the endangered species and communities on the site by increasing the areas suitable for their establishment.



An old oxbow section of the river was recognised as a significant frog habitat area. The area had an excellent mix of native grass species but was devoid of trees and heavily infested with Blackberry. Revegetation programs in 2001–02 established Sydney Coastal River-flat Forest vegetation around the site and linked this area with the remnant vegetation along South Creek.

Monitoring at the site has revealed changes in both native and exotic species in composition and distribution over time. Assessing the monitoring results also allows more responsive restoration.

If you are considering undertaking a restoration program on your property and would like information and advice on current successful techniques in use on the Cumberland Plain, a visit to the South Creek riparian corridor site at Erskine Park will allow you to see the on-ground results of the various restoration techniques discussed in this publication.

To visit this demonstration site contact:

Land Management Branch
Department of Infrastructure, Planning and Natural Resources
Phone: (02) 9895 7626

Appendix 3: Cumberland Plain weeds and their treatment

Herbaceous weed and grass control

Common name	Scientific name	Hand remove	Cut and paint	Spraying Roundup Biactive® rate	Possible selective herbicide and other techniques
African Love Grass	<i>Eragrostis curvula</i>	•		1:100	Slash or mow, spray regrow with Roundup®. Spot-spray also possible.
Alligator Weed	<i>Alternanthera philoxeroides</i>			1:100	
Amaranth	<i>Amaranthus</i> sp.	•	•	1:100	
Asparagus Fern	<i>Asparagus aethiopicus</i>	•		1:75	Brush-off
Asthma Weed	<i>Parietaria judaica</i>	•		1:100	
Black Thistle	<i>Cirsium vulgare</i>	•	•	1:100	
Blackberry Nightshade	<i>Solanum nigrum</i>	•	•	1:100	
Cobbler's Peg	<i>Bidens pilosa</i>	•	•	1:100	
Common Couch	<i>Cynodon dactylon</i>	•		1:75	
Creeping Buttercup	<i>Ranunculus repens</i>	•		1:100	
Crofton Weed	<i>Ageratina adenophora</i>	•		1:100	
Drain Sedge	<i>Cyperus eragrostis</i>	•		1:100	
Ehrharta	<i>Ehrharta erecta</i>	•		1:100- 1:500	
Fat Hen	<i>Chenopodium album</i>	•	•	1:100	
Fennel	<i>Foeniculum vulgare</i>	•			
Fireweed	<i>Senecio madagascariensis</i>	•		1:100	
Flatweed	<i>Hypochaeris radicata</i>	•		1:100	
Fleabane	<i>Conyza</i> spp.	•	•	1:100	
Giant Bamboo	<i>Bambusa</i> sp.		•		
Giant Reed	<i>Arundo donax</i>		•		
Guinea Grass	<i>Panicum maximum</i>	•		1:75	
Ink Weed	<i>Phytolacca octandra</i>	•	•	1:100	
Johnson's Grass	<i>Sorghum halpense</i>	•			
Kikuyu	<i>Pennisetum clandestinum</i>	•		1:100	
Ludwigia	<i>Ludwigia peruviana</i>	•	•	1:100	
Mist Flower	<i>Ageratina riparia</i>	•		1:100	
Needle Grass	<i>Nassella</i> sp.	•			
Paddy's Lucerne	<i>Sida rhombifolia</i>	•	•	1:100	Grazon, Garlon®
Pampas Grass	<i>Cortaderia selloana</i>	•	•	1:75	
Paspalum	<i>Paspalum dilatatum</i>	•		1:100	
Patterson's Curse	<i>Echium</i> sp.	•		1:100	
Plantain	<i>Plantago lanceolata</i>	•		1:100	
Prairie Grass	<i>Bromus catharticus</i>	•		1:100	
Prickly Lettuce	<i>Lactuca serriola</i>	•		1:100	
Quaking Grass	<i>Briza</i> sp.	•		1:100	
Rhodes Grass	<i>Chloris gayana</i>	•		1:100	
Ryegrass	<i>Lolium perenne</i>	•		1:100	
Salvinia	<i>Salvinia molesta</i>			1:100	
Sowthistle	<i>Sonchus oleraceus</i>	•		1:100	
Spider Plant	<i>Chlorophytum comosum</i>	•		1:75	
Spiny Rush	<i>Juncus acutus</i>	•		1:75	
St John's Wort	<i>Hypericum perforatum</i>	•			Garlon®, Grazon
Summer Grass	<i>Digitaria sanguinalis</i>	•		1:100	
Wandering Jew	<i>Tradescantia fluminensis</i>	•		1:75	Starane; other techniques include raking where no native groundcovers are present
Veldt Grass	<i>Ehrharta longiflora</i>	•		1:100	
Wild Oats	<i>Avena</i> sp.	•		1:100	
Water Hyacinth	<i>Eichhornia crassipes</i>	•			

The information above has been prepared and provided by Greening Australia (NSW).

The list of selective herbicides included in this chart is by no means extensive.

For detailed information consult NSW Agriculture 2004 (available at www.agric.nsw.gov.au/reader/weeds-general/nox-weeds-splash.htm).

For further options you can search the Australian Veterinary Medicine and Pesticide Authority website at www.apvma.gov.au

Vine control

Common name	Scientific name	Hand remove	Cut and paint	Scrape and paint	Spraying Roundup Biactive rate	Possible selective herbicide and other techniques
Turkey Rhubarb	<i>Acetosa sagittata</i>	•			1:100	Starane
Madiera Vine	<i>Anredera cordifolia</i>	•		•	1:75	Starane
Moth Vine	<i>Araujia sericifera</i>	•		•	1:50	
Balloon Vine	<i>Cardiospermum grandiflorum</i>	•	•	•	1:100	
Cape Ivy	<i>Delairea odorata</i>	•			1:75	
English Ivy	<i>Hedera helix</i>	•		•	1:100	
Coastal Morning Glory	<i>Ipomoea cairica</i>	•		•	1:100	
Morning Glory	<i>Ipomoea indica</i>	•		•	1:100	Garlon®
Honeysuckle	<i>Lonicera japonica</i>	•		•	1:75	
Bridal Creeper	<i>Asparagus asparagoides</i>	•			1:75	Brush-off used under permit is effective. Must apply herbicide at flowering. Note some natives, e.g. <i>Bursaria</i> , are sensitive to Brush-off. Spray in combination with hand removal.

The information above has been prepared and provided by Greening Australia (NSW).

The list of selective herbicides included in this chart is by no means extensive.

For detailed information consult NSW Agriculture 2004 (available at www.agric.nsw.gov.au/reader/weeds-general/nox-weeds-splash.htm).

For further options you can search the Australian Veterinary Medicine and Pesticide Authority website at www.apvma.gov.au

Lissanthe strigosa flowers. (P. Watson)



Woody weed control

Woody weed seedlings can often be treated by spot spraying with a Roundup Biactive® solution (check herbicide label for dilution rates). The addition of a surfactant can improve results. Additionally, several selective herbicides can also be used in this way.

Medium-sized woody weeds can be treated using a technique known as basal spraying. A prescribed solution of diesel and selective herbicide (often Garlon®) is applied to the leaves and stems. This can be an effective treatment but consideration must be given to the risk of off-target damage and the impacts on future regeneration. This method should not be used in areas where native regeneration is expected.

Common name	Scientific name	Hand remove	Cut and paint	Scrape and paint	Stem Injection	Garlon® or Access-preferred herbicide	Possible selective herbicide and other techniques
African Box Thorn	<i>Lycium ferocissimum</i>	•	•		•	•	The use of Garlon® and diesel is a very effective herbicide for this species.
African Olive	<i>Olea europaea</i> subsp. <i>Africana</i>	•	•		•	•	The use of Garlon® and diesel is a very effective herbicide for this species. Best techniques are cut and paint.
Boneseed	<i>Chrysanthemoides monilifera</i> subsp. <i>Monilifera</i>	•	•		•		
Blackberry	<i>Rubus fruticosus</i>	•	•	•		•	Hand prune or slash to encourage new growth, spray new growth with herbicide. Follow-up may be needed.
Briar Rose	<i>Rosa rubiginosa</i>		•				
Box Elder	<i>Acer negundo</i>	•	•		•		
Camphor Laurel	<i>Cinnamomum camphora</i>	•	•	•			For small plants apply herbicide by vertically scraping the stem with a knife blade and applying herbicide.
Cassia	<i>Senna pendula</i>	•	•		•		
Castor Oil Plant	<i>Ricinus communis</i>	•	•				
Coral Tree	<i>Erythrina xyskiesii</i>	•	•		•		
Cotoneaster	<i>Cotoneaster glaucophyllus</i>	•	•		•		
Cox's Coral Tree	<i>Erythrina crista-galli</i>	•	•		•		
English Broom	<i>Cytisus scoparius</i>	•	•		•		
Gleditsia	<i>Gleditsia tricanthos</i>		•		•		Stem injection best from early spring to autumn.
Gorse	<i>Ulex europaeus</i>		•				
Green Cestrum	<i>Cestrum parqui</i>	•		•	•	•	Garlon® and diesel is a very effective herbicide for adults of this species. Some degree of reshooting may occur with all treatments requiring follow-up.
Hackberry	<i>Celtis occidentalis</i>	•	•		•	•	
Indian Hawthorn	<i>Raphiolepis indica</i>	•	•		•		
Broad-leaved Privet	<i>Ligustrum lucidum</i>	•	•		•		
Montpellier Broom	<i>Genista monspessulana</i>	•	•		•		
Mulberry	<i>Morus alba</i>	•	•		•		
Ochna	<i>Ochna serrulata</i>			•	•		
Pittosporum	<i>Pittosporum undulatum</i>	•	•		•		
Radiata Pine	<i>Pinus radiata</i>	•	•		•		
Rhus Tree	<i>Toxicodendron succedaneum</i>	•	•		•		
Narrow-leaved Privet	<i>Ligustrum sinense</i>	•	•		•		
Wild Tobacco	<i>Solanum mauritianum</i>	•	•				
Tree-of-Heaven	<i>Ailanthus altissima</i>			•	•	•	Tordon is effective in treating this species using the cut and paint technique. Basal bark application of Garlon® and diesel also effective.
Willow	<i>Salix</i> spp.	•	•	•	•		
Willow Leaf Wattle	<i>Acacia saligna</i>	•	•		•		

The information above has been prepared and provided by Greening Australia (NSW).

The list of selective herbicides included in this chart is by no means extensive.

For detailed information consult NSW Agriculture 2004 (available at www.agric.nsw.gov.au/reader/weeds-general/nox-weeds-splash.htm).

For further options you can search the Australian Veterinary Medicine and Pesticide Authority website at www.apvma.gov.au

Major Cumberland Plain noxious weed species

The following species are known to have an impact on the endangered ecological communities of the Cumberland Plain and have been listed as noxious under the *Noxious Weeds Act 1993* for some local government areas of the Cumberland Plain.

Actions for control categories are shown below.

Common name	Botanical name	Control category
Turkey Rhubarb	<i>Acetosa sagittatus</i>	W4b
Crofton Weed	<i>Ageratina adenophora</i>	W2
Alligator Weed	<i>Alternanthera philoxeroides</i>	W1
Madeira Vine	<i>Anredera cordifolia</i>	W4c
Giant Reed	<i>Arundo donax</i>	W4a
Bridal Creeper/Baby Smilax	<i>Asparagus asparagoides</i>	W4c
Mother of Millions	<i>Bryophyllum delagoense</i>	W2 or W3
Balloon Vine	<i>Cardiospermum grandiflorum</i>	W4c
Green Cestrum	<i>Cestrum parqui</i>	W2 or W3
Bitou Bush/Boneseed	<i>Chrysanthemoides monilifera</i>	W2 or W3
Camphor Laurel	<i>Cinnamomum camphora</i>	W4d
Pampas Grass	<i>Cortaderia selloana</i>	W2
Cotoneaster	<i>Cotoneaster glaucophyllus</i>	W4b
Cotoneaster	<i>Cotoneaster pannosus</i>	W4b
English Broom	<i>Cytisus scoparius</i>	W2
Cape Ivy	<i>Delairea odorata</i>	W4d
Paterson's Curse	<i>Echium plantagineum</i>	W3
Water Hyacinth	<i>Eichhornia crassipes</i>	W1 or W2
Montpellier Broom	<i>Genista monspessulana</i>	W4b
St John's Wort	<i>Hypericum perforatum</i>	W2
Morning Glory	<i>Ipomea indica</i>	W4c
Lantana (pink-flowered) Lantana (red-flowered)	<i>Lantana camara</i>	W2
Broad-leaved Privet	<i>Ligustrum lucidum</i>	W4b
Narrow-leaved Privet	<i>Ligustrum sinense</i>	W4b
Water Primrose	<i>Ludwigia peruviana</i>	W2
African Boxthorn	<i>Lycium ferocissimum</i>	W2
Cat's Claw Creeper	<i>Macfadyena unguis-cati</i>	W4c
Chilean Needle Grass	<i>Nassella neesiana</i>	W2
Serrated Tussock	<i>Nassella trichotoma</i>	W2 or W3
Ochna/Mickey Mouse Plant	<i>Ochna serrulata</i>	W4b
African Olive/Wild Olive	<i>Olea europaea</i> subsp. <i>africana</i>	W4b
Prickly Pear	<i>Opuntia stricta</i>	W4f
Sticky Weed/Asthma Weed	<i>Parietaria judaica</i>	W3
Bamboo	<i>Phyllostachys</i> spp.	W4a
Castor Oil Plant	<i>Ricinus communis</i>	W2
Sweet Briar	<i>Rosa rubiginosa</i>	W2
Blackberry	<i>Rubus fruticosus</i> (agg. spp.)	W2 or W3
Willow	<i>Salix</i> spp.	W4g
Salvinia	<i>Salvinia molesta</i>	W1 or W2
Cassia	<i>Senna pendula</i>	W4b
Johnson Grass	<i>Sorghum halepense</i>	W2 or W3
Rhus Tree	<i>Toxicodendron succedaneum</i>	W2
Wandering Jew	<i>Tradescantia fluminensis</i>	W4c
Gorse	<i>Ulex europaeus</i>	W2
Noogoora Burr	<i>Xanthium</i> spp.	W3

Action for control categories

- W1 The presence of the weed must be notified to the local control authority and the weed must be fully and continuously suppressed and destroyed.
- W2 The weed must be fully and continuously suppressed and destroyed.
- W3 The weed must be prevented from spreading and its numbers and distribution reduced.
- W4a The weed must not be sold, propagated or knowingly distributed and any part of the weed must be prevented from growing within 3 metres of the boundary of a property.
- W4b The weed must not be sold, propagated or knowingly distributed and any existing weed must be prevented from flowering and fruiting.
- W4c The weed must not be sold, propagated or knowingly distributed and the weed must be prevented from spreading to an adjoining property.
- W4d The weed (a) must not be sold, propagated or knowingly distributed and (b) must be fully and continuously suppressed and destroyed unless it is –
- ❖ listed on the state heritage register under the *Heritage Act 1977*
 - ❖ listed for preservation or protection as a heritage item under an environmental planning instrument under the *Environmental Planning and Assessment Act 1979*
 - ❖ listed for preservation or protection in a council tree preservation order for the local government area
 - ❖ included for preservation or protection in a plan of management for a local government area under section 40 of the *Local Government Act 1993*, or
 - ❖ included for preservation or protection in a noxious weed policy or a noxious weed control program approved by the local control authority for the area for which it is the local control authority.
- W4e The weed must be fully and continuously suppressed and destroyed. All reasonable precautions must be taken to ensure produce, soil, livestock, equipment and vehicles are free of the weed before sale or movement from an infested area of the property.
- W4f The weed must not be sold, propagated or knowingly distributed. Any biological control or other control program directed by the local control authority must be implemented.
- W4g The weed must not be sold, propagated or knowingly distributed.

Appendix 4: Weed removal techniques

[The information in this appendix has largely been sourced with permission from the Bush Regenerators' Handbook by the National Trust of Australia (NSW) (1991). The illustrations have been supplied by the Australian Association of Bush Regeneration (AABR) and the National Trust of Australia (NSW).]

Hand removal

Weeds with shallow roots

Weed examples: Crofton Weed, Cobbler's Peg, Fleabane, Purple Top, small grasses and most seedlings

Small soft weeds and seedlings, annuals and tufted grasses that root directly from the base usually have shallow roots. These plants can be pulled out by hand. Even tough perennials like Paddy's Lucerne can be removed this way. Be warned, however, that if some of the rootstock stays in the ground, a different method will be needed.

For seedlings and small plants, take hold of the plant at ground level and pull. If you pull at any higher point on the stem, it may break and the plant re-shoot.

For larger plants, take hold of the stem at ground level and gently rock the plant back and forth until it comes away cleanly. If the plant has a spreading root system, it may be necessary to pull individual lateral roots. Always pull roots horizontally through the soil towards the stem of the plant. This causes the least disturbance to the soil and reduces the chance that the root will break. Never pull large lateral roots upwards as they may break and will then need to be dug out.

Replace any disturbed soil and lightly sweep the mulch back over the spot. All weed debris should be removed. If this is not possible, seedlings and most soft, leafy weeds can be left lying on the ground. Larger plants with substantial roots should be placed upside down on a rock or propped up so that the roots do not make contact with the soil. Ensure that all weeds that are left on-site cannot set seed.

Note: Annual weeds can be sprayed with herbicide before flower and fruit set. If annuals are treated while in flower, there may be enough stored food in the plant to allow the plant to set seed before it dies. Seedling perennials can be sprayed with herbicide as long as the plant contains enough green tissue to absorb the poison. Grasses are best treated with herbicide when the plant is actively growing.



AABR/V. Bear

Weeds with brittle or readily fragmented stems

Weed example: Wandering Jew

Each of the weeds in this group needs careful weeding and regular follow-up. Any fragmented piece of stem that bears a node can regenerate, so all plants must be bagged and removed from the site.

Hand pulling

Use this method if you are working entirely by hand.

1. Take hold of one runner and pull it gently along the ground towards you.
2. When the runner disappears under vegetation or mulch, stop pulling and scrape back the mulch until you get another grip further along the stem. Continue to pull gently until the runner comes away from the soil, then bag it immediately. If the runner breaks, trace it out.

This method is suitable for isolated or moderate infestations, particularly those which are tangled with more desirable species. If the infestation is dense, however, several more efficient methods are available.

Rolling

When Wandering Jew is growing thickly on a hard surface, such as a rock-face or compacted soil, the weed can be rolled up like a carpet.

1. Locate a convenient starting point and two side boundaries. Use a sharp knife to cut along these three sides. This weed has very shallow roots which hold little soil so it is possible to roll the carpet up into convenient lengths.
2. Cut the roll off and bag the lot. Continue in this manner until the weed is completely removed.

If necessary, return to the site and hand-pull all the small pieces that were missed or broken off. A stiff broom will finish the job.

Raking

If no native groundcover plants are present, large infestations can be raked up and bagged. This method is probably the most efficient for large infestations on a base of soil. It is important to return to the site several times and remove the small portions that were passed over. Maintenance and perseverance are the key to eradicating this weed.

Note: Other weed species growing among Wandering Jew should be removed using the appropriate method.

Removal using a knife or trowel

Weeds with large root systems

Weed examples: Plantain, Dock, Cat's Ear, Flatweed

This technique is useful for small soft leafy plants with a larger root system or tap roots or hardy perennials which rely on a swollen root system.

1. With your right hand push a narrow trowel or knife into the soil next to the plant (the knife should be pushed in with the side of the blade towards the plant). Push the handle towards the plant and pull the blade out of the soil.
2. Repeat at right angles, then carefully remove the plant. If the plant does not move, repeat the action around the other side of the plant, remembering to push the knife towards the plant. Repair any disturbance to the soil or mulch.

Weeds with below-surface crowns

Weed examples: Paspalum, Pampas Grass, Ginger Plant, Asparagus Fern, Bamboo

This is useful for weeds which have their growing points below the surface (crowns, corms, rhizomes and clumped or tufted fibrous root systems).

1. Grasp the leaves or stems and hold them tightly so that the base of the plant is visible. Plants with sharp leaves or stems should be cut back first, before you attempt to get in close to the base.
2. Insert the appropriate tool (either knife or lever) close to the base of the plant at a slight angle, with the tip well under the root system.
3. Cut through the roots close to the crown or rhizome. Depending on the size of the plant, two or more cuts may be needed to sever all the roots.
4. Remove the plant. Make sure the hard crown, or base of the plant where the roots begin, is completely removed. If part of this is left in the ground, it will usually re-shoot.

Note: The water tubers of Asparagus Fern can be left in the ground once the crown has been removed, as they contain no food and cannot reproduce.



National Trust (NSW)/V. Bear

Weeds with bulbs or tubers

Weed examples: Oxalis, Onion Weed, Watsonia, Turkey Rhubarb

Plants with bulbs, corms or small tubers must be completely removed from the soil. These reproductive parts can form small off-shoot bulbs or growing points which can form a new plant if broken off.

1. Prepare the area by moving back mulch and other vegetation. Using a trowel or larger spade, dig a narrow channel next to the stem until the main bulb is reached.
2. Check the soil for adjoining bulblets. If present, they must be removed with a substantial quantity of soil, and the whole lot bagged.
3. Periodically check for regrowth.

Plants which form underground tubers are especially difficult to eradicate as they may have several tubers connected by thin roots. Although you might remove the plant body and some tubers from the soil, other tubers which remain in the soil can re-establish the plant. These secondary tubers can develop even when buried deep in the soil.



AABR/V. Bear

Weeds with surface or climbing runners

Weed examples: Honeysuckle, Morning Glory, Jasmine, Cape Ivy

The stems of many climbers or scramblers develop roots and new shoots from the nodes, so broken portions should not be left in or on the ground.

1. Take hold of one runner and gently pull it along the ground towards you. Follow the runners until the main root system is located. Either remove it manually or cut and paint it with herbicide.
2. Continue until all the runners have been removed. Small fibrous roots growing from the nodes along the runners can be cut with a sharp knife as long as there is no stem tissue attached.
3. Check for broken pieces of stem and large roots which may have been overlooked. Replace the mulch.
4. Follow up regularly. Regrowth from underground roots can be sprayed with herbicide or removed manually.

Note: Rampant vines such as Honeysuckle often have several major nodes with numerous runners branching in all directions. All of these runners must be removed. Major infestations of rampant vines can be sprayed with herbicide as long as no native species are present.



National Trust (NSW)/V. Bear

Herbicide treatment

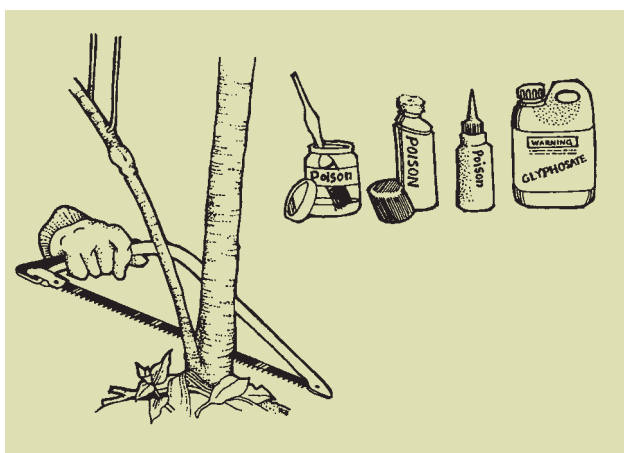
Method 1: Cut and paint

This is useful for all small- to medium-sized woody weeds, and some soft, leafy perennials such as Privet, Ochna, Lantana, Wild Olive, Cotoneaster, Camphor Laurel, Ginger, Bamboo and Arundo.

For larger specimens remove the top of the plant for easy access.

1. With an appropriate tool (secateurs, loppers or bush-saw), cut the base of the plant close to the ground with a straight, flat cut. The cut must be horizontal so that the herbicide rests on the cut area while being absorbed, rather than running away down the side of the stem. The cut should be as close as possible to the ground as stumps are unsightly and dangerous.
2. Immediately spray and paint herbicide solution onto the exposed surface (less than 10 seconds for water-based solutions and 1 minute for diesel solutions), as the sap ceases to flow once the tissues are severed. For convenience, use a paintbrush, eye dropper or small squeeze bottle. For larger specimens, wipe the poison around the outer rim of the cut only.

Note: If plants re-shoot, repeat the method. Ochna is especially difficult, but it has been successfully poisoned by scraping each side of the stem just below the cut. Plants growing in damp areas may require special attention as they are likely to re-shoot.



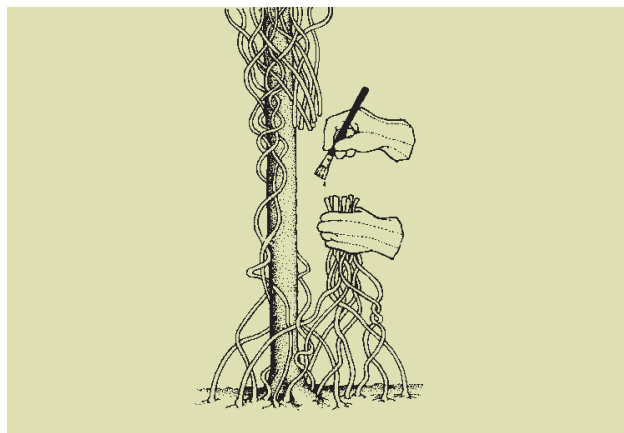
AABRV. Bear

Method 2: Cut and swab

This method is similar to Method 1, but is suited to vines and multi-stemmed shrubs.

Here the plant stems are cut through completely, close to the ground. Herbicide is then applied immediately to the cut surface emerging from the ground, via spray or brush.

Some vines, such as Morning Glory, Balloon Vine or Moth Vine, have many stems which climb into the canopy. Handfuls of stems can be cut and painted with herbicide. The vines which remain in the canopy will soon die and decompose, and do not need to be removed.



National Trust (NSW)/V. Bear

Method 3: Tree injection

Tree injection and frilling and chipping (see below) are used for trees and woody weeds with stems or trunk greater than five centimetres in circumference. They are also used on inaccessible sites where rubbish removal is a problem, or where the dead tree is going to be left for habitat.

1. Drill holes at an angle into the sapwood approximately five centimetres apart around the tree, using a cordless drill or brace and bit.
2. Place the correct dose of herbicide into each hole as it is cut. If necessary, wait until the liquid subsides then apply the remainder. It is important to follow the manufacturer's recommendations for the correct dose.

Note: Best results are achieved with plants which are actively growing. The success of any systemic herbicide relies on the plant's normal physiological activities to move the chemical through its tissue.



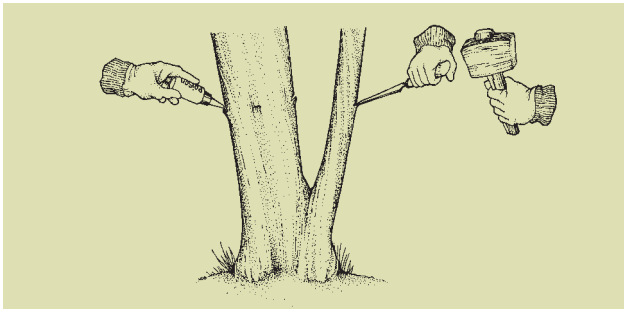
National Trust (NSW)/V. Bear

Method 4: Frilling or chipping

This technique is used when a cordless drill is not available for tree injection.

1. With a sharp chisel or axe, make a deep horizontal cut into the sapwood at regular intervals (no farther than three centimetres apart) around the base of the tree. Take care not to ringbark the plant.
2. Immediately apply herbicide as described in Method 3 above.

Note: For multi-stemmed plants, inject or chip below the lowest branch or treat each stem individually.

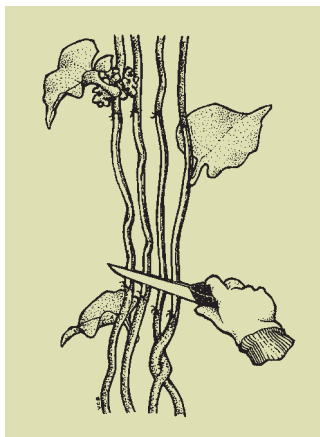


AABR/V. Bear

Method 5: Stem scrape and paint

This is a technique used on many vines, such as Madeira Vine, which has aerial, not underground, tubers. Instead of producing seeds, in the Sydney region the plant drops thousands of these tubers or small 'potatoes' which develop along the stems. These fall to the ground and establish new plants.

1. For seedlings and small plants without aerial tubers, use the hand removal technique (above).
2. For mature vines with aerial tubers, scrape a very thin layer of bark from a 15 to 30 centimetre section of the stem and apply herbicide. The aerial tubers will slowly rot, so do not disturb the vine until all the tubers have shrivelled and fallen. This may take weeks or even months. Do not remove the roots from the soil, as this will prevent the herbicide from circulating through the whole plant.



AABR/V. Bear

Method 6: Foliar spraying

Foliar spraying is the use of herbicide diluted with water or diesel at a specific rate, and sprayed over the foliage to the point where every leaf is wet, but not dripping. This method is most suited to shrubs, grasses and dense vines less than six metres tall. Foliar spraying can be done in a number of ways, depending on the size of the plant or infestation.

1. Blanket spraying using a boom spray mounted from a tractor or 4WD can be used to treat large areas completely infested with weeds.

2. For large infestations that need targeted applications of herbicide, a hose and handgun can be used to spray herbicide from a tractor or tank mounted on a 4WD.
3. Smaller infestations can be spot-sprayed using a backpack spray unit. Spot-spraying is used to treat individual weed plants or areas that have only small clumps of weeds.

Method 7: Spraying of bulbous plants

Bulbous plants should be treated between flower and fruit set. The herbicide will enter the plant's underground storage organ, reducing its ability to store food for the next growing season. Spraying is useful for treating dense infestations of Blackberry.

1. Spray the plant when it is actively growing. Spraying in general should be undertaken between late summer and early autumn, between the flowering and the setting of fruit.
2. When the plant appears dead, remove it from the site using a McLeod tool, rake or brush hook if required.
3. Check for regrowth and treat it using one of the following methods: cut and paint the main stem again; spray the regrowth with herbicide; paint a few leaves directly with herbicide; or remove it manually.

Note: Wandering Jew has been successfully controlled with herbicide. The results vary greatly according to light intensity, season, chemical dosage rate and coverage.

Method 8: Basal bark application

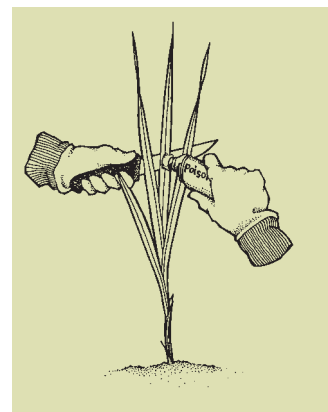
[The information on this method and Method 9 have been sourced from the Noxious and Environmental Weeds Control Handbook by NSW Agriculture (2004).]

This method involves mixing an oil-soluble herbicide in diesel and spraying the circumference of the trunk or stem of the plant. It is suitable for thin-barked woody weeds, undesirable trees, saplings, regrowth and multi-stemmed shrubs and trees.

The full circumference of the stem or trunk should be sprayed with herbicide solution from the ground to a height of 30 centimetres. It is important to saturate right around the trunk.

Method 9: Rope/wick applicators and stem swiping

This method consists of a wick or rope soaked in herbicide from a reservoir attached to a handle or pumped to the wick. The wetted wick is used to wipe or brush herbicide over the weed. It is sometimes necessary to provide some resistance to the wiper when the weed leaf or stem is soft. Stem swiping involves using a knife to provide resistance down the back of the stem or leaf, while wiping herbicide down the front.



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Appendix 5: Funding opportunities

Government organisations

Department of the Environment and Heritage

The Commonwealth Department of the Environment and Heritage (DEH) advises the Australian Government on policies and programs for the protection and conservation of the environment, including both natural and cultural heritage places. It manages a number of major programs. The most significant of those dealing with natural resource management come under the umbrella of the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality. DEH also manages a National Reserve System Program that offers protection for ecosystems on a priority basis. DEH also coordinates the Australian Greenhouse Office and has many environmental conservation incentive programs including:

- ❖ Bushcare
- ❖ Threatened Species Network
- ❖ National Landcare Program
- ❖ Endangered Species Program
- ❖ Fisheries Action Program
- ❖ National Rivercare Program
- ❖ National Wetlands Program
- ❖ Waterwatch.

Contact DEH on (02) 6274 1111 or visit its website at www.deh.gov.au

Department of Agriculture, Fisheries and Forestry

The Commonwealth Department of Agriculture, Fisheries and Forestry provides leadership and coordination and management of funding for the sustainable use, management and conservation of Australia's land and water resources, fisheries and forestry. The department has a large number of natural resource management funding programs including:

- ❖ AAA Farm Bis – Skilling Farmers for the Future
- ❖ Australian Government Envirofund
- ❖ National Action Plan for Salinity and Water Quality
- ❖ National Feral Animal Control Program.

Contact the department on (02) 6272 3933 or visit its website at www.daff.gov.au

Department of Environment and Conservation (NSW)

The Department of Environment and Conservation (DEC) incorporates the former NSW National Parks and Wildlife Service, Botanic Gardens Trust, Environment Protection Authority and Resource NSW. DEC manages the NSW Environmental Trust grant scheme. DEC also has a range of options available to landholders wanting to be involved with conservation on their property. The Conservation Partners Program includes:

- ❖ Voluntary Conservation Agreements
- ❖ Wildlife Refuges
- ❖ Land for Wildlife and other options that support conservation on private and public land.

For more information on DEC services, phone 131 555 or (02) 9995 5000 or go to www.environment.nsw.gov.au

Hawkesbury–Nepean Catchment Management Authority

The Hawkesbury–Nepean Catchment Management Authority plays a vital role in the management of one of the most important catchments in Australia. The authority oversees the development of strong partnerships in natural resource management and works closely with government agencies, community groups, industry and individuals within the Hawkesbury–Nepean catchment to achieve its goals. The authority has many projects and programs designed to help land managers with improvements in natural resource management.

Contact the Hawkesbury–Nepean Catchment Management Authority on (02) 4828 6747 or email at hn@cma.nsw.gov.au

Department of Infrastructure, Planning and Natural Resources (NSW)

The Department of Infrastructure, Planning and Natural Resources (DIPNR) drives, coordinates and streamlines land-use and transport planning, infrastructure development and natural resource management in NSW. DIPNR has many projects and programs aimed at helping land managers with improvements in natural resource management.

Contact DIPNR on 1300 305 695 or visit its website at www.dipnr.nsw.gov.au

NSW Department of Primary Industries

NSW Agriculture is part of the NSW Department of Primary Industries. NSW Agriculture is involved in agricultural research, advisory services, education and regulation and providing practical farm production solutions for profitable agriculture and a better environment.

Contact the department on (02) 6391 3100 or email at nsw.agriculture@agric.nsw.gov.au

NRM Options

NRM Options is a website (www.nrmoptions.nsw.gov.au) maintained by NSW Government specialists containing a synthesis of current research and understanding about natural resource management options in the State. The site helps in selecting and designing management responses for processes threatening natural resource assets.

Local government

A number of local councils on the Cumberland Plain are running or implementing incentive programs. These programs aim to encourage sustainable management of natural resources on private land. These councils are:

Camden Council – Phone (02) 4654 7777
or visit www.camden.nsw.gov.au

Fairfield City Council – Phone (02) 9725 0222
or visit www.fairfieldcity.nsw.gov.au

Hornsby Shire Council – Phone (02) 9847 6666
or visit www.hornsby.nsw.gov.au

Liverpool City Council – Phone 1300 36 2170
or visit www.liverpool.nsw.gov.au

Non-government organisations

Greening Australia

Greening Australia has a contract with the Commonwealth's Department of the Environment and Heritage to provide technical support for the Bushcare program in NSW. This involves oversight of the technical delivery of Bushcare projects, including on-ground advice to Bushcare recipients, and project support.

For further information, contact your local Greening Australia office or visit www.greeningaustralia.org.au

World Wide Fund for Nature (WWF)

WWF Australia is part of the WWF International Network – the world's largest independent conservation organisation. WWF Australia is committed to conserving the unique wildlife of Australia and the Asia-Pacific, ensuring sustainable resource use and promoting the reduction of pollution and wasteful consumption.

Contact WWF by phoning 1800 032 551 or visiting www.wwf.org.au

Birds Australia

Birds Australia is dedicated to the conservation, study and enjoyment of Australia's native birds and their habitats in addition to providing information about particular bird species.

Contact them by phone on 1300 730 075 or visiting www.birdsaustralia.com.au

Field naturalists

Field naturalists clubs operate all over Australia and are vigorous and practical advocates of conservation and the study of natural history. These community-based clubs undertake a range of activities ranging from botanical and fauna surveys to terrestrial and marine biodiversity research.

Enter 'Field naturalists' on a web search engine for details of the closest club.

Australian Plants Society

The Australian Plants Society caters for people interested in Australia's native flora whether simply appreciating its beauty and diversity or actively propagating, cultivating and conserving it.

Visit their website at farrer.riv.csu.edu.au/ASGAP/index.html

Conservation Volunteers Australia

Conservation Volunteers Australia involves the community in conservation projects in urban, regional and remote Australia. Typical projects include tree planting, seed collection, endangered species protection, weed control, flora and fauna surveys, walking trail construction, and fencing and environmental monitoring.

Contact them by phoning 1800 032 501 or visiting their website at www.conservationvolunteers.com.au

Australian Bush Heritage Fund

The Australian Bush Heritage Fund is a private fund which purchases land of high conservation value. To date, three properties in NSW have been acquired and are managed by the fund.

Contact details are: phone (03) 8610 9100 or website www.bushheritage.asn.au

Appendix 6: Contacts

Commonwealth and state government

Australian Museum: (02) 9320 6000

Department of Agriculture, Fisheries and Forestry:
(02) 6272 3933

Department of Infrastructure, Planning and Natural Resources: 1300 305 695

Department of the Environment and Heritage:
(02) 6274 1111

Forests NSW: (02) 9980 4100

Hawkesbury–Nepean Catchment Management Authority:
(02) 4828 6747

Mount Annan Botanic Garden: (02) 4648 2477

NSW Department of Environment and Conservation:
131 555 or (02) 9995 5000

NSW Department of Primary Industries: (02) 6391 3100

NSW Natural Resource Atlas: A website
(www.nratlas.nsw.gov.au/wmc/savedapps/nratlas) that
provides community access to natural resources information

Royal Botanic Gardens Sydney: (02) 9231 8111

Rural Fire Service: 1800 679 737 and www.rfs.nsw.gov.au

TAFE NSW has numerous courses in bush regeneration:
131 601 or www.tafensw.edu.au

Local councils

Auburn Council: (02) 9735 1222

Bankstown City Council: (02) 9707 9999

Baulkham Hills Shire Council: (02) 9843 0555

Blacktown City Council: (02) 9839 6000

Blue Mountains City Council: (02) 4780 5000

Camden Council: (02) 4654 7777

Campbelltown City Council: (02) 4645 4000

Canterbury City Council: (02) 9789 9300

Fairfield City Council: (02) 9725 0222

Hawkesbury City Council: (02) 4560 4444

Holroyd City Council: (02) 9840 9840

Hornsby Shire Council: (02) 9847 6666

Hurstville City Council: (02) 9330 6222

Ku-ring-gai Council: (02) 9424 0770

Liverpool City Council: 1300 362 170

Parramatta City Council: (02) 9806 5050

Penrith City Council: (02) 4732 7777

Ryde City Council: (02) 9952 8222

Strathfield Municipal Council: (02) 9748 9999

Sutherland Shire Council: (02) 9710 0333

Willoughby City Council: (02) 9777 1000

Wollondilly Shire Council: (02) 4677 1100

Non-government organisations

Australian Association of Bush Regenerators: 0407 002 921

Australian Bush Heritage Fund: (03) 8610 9100

Australian Conservation Foundation: (02) 9212 6600

Australian Network for Plant Conservation: (02) 6250 9509

Birds Australia: 1300 730 075

Cumberland Bird Observers Club: (02) 9484 3017

Cumberland Plain Carers: (02) 9895 5965 (western Sydney
environmental community groups' network)

FloraBank: (02) 6281 8585

Greening Australia (NSW): (02) 9560 9144

Landcare Australia: 1800 151 105

Local NSW Aboriginal Land Council: (02) 9689 4444

Nature Conservation Council of NSW: (02) 9247 4206

Planet Ark: (02) 9251 3444

World Wide Fund for Nature (WWF): 1800 032 551

Community groups

Many local community groups are associated with either their local council or Landcare. Contact these organisations to find out if there are any community groups active in your area, or alternatively get some like-minded friends together and start one with the support of your local council or Landcare.

Appendix 7: Recommended reading

Major background resource

Native Vegetation of the Cumberland Plain: Final Edition (2002)

This publication should be consulted for comprehensive information and species lists for each endangered ecological community. This report (maps and interpretation guidelines) can be viewed:

- ❖ online on the Department of Environment and Conservation (DEC) website
www.environment.nsw.gov.au – put ‘Cumberland Plain Vegetation Mapping Project’ in the search box
- ❖ as a CD available for purchase – phone 131 555 or (02) 9995 5000 for details.

General

Taken for Granted by D. Benson & J. Howell, Royal Botanic Gardens, Sydney (1990).

Sydney's Bushland: More than Meets the Eye by D. Benson & J. Howell, Royal Botanic Gardens, Sydney (2000).

Mountain Devil to Mangrove: A Guide to the Natural Vegetation in the Hawkesbury–Nepean Catchment by D. Benson, J. Howell & L. McDougall, Royal Botanic Gardens, Sydney (1996).

Wildlife in the Home Paddock by R. Breckwoldt, Angus & Robertson, Sydney (1983).

Plan for Trees by D. Brouwer, Paterson, Sydney (1998).

Trees on Farms by D. Brouwer & I. Dutton, Paterson, Sydney (1991).

Urban Bushland Biodiversity Survey, NSW National Parks and Wildlife Service, Hurstville (1997).

Rare and Threatened Plants of Western Sydney by T. James, L. McDougall & D. Benson, Royal Botanic Gardens, Sydney (1991).

Noxious and Environmental Weeds Control Handbook 2004–05 by NSW Agriculture, Orange (2005).

Losing Ground by S. Rosen, Hale & Iremonger, Sydney (1995).

Green web, WSROC, Blacktown (1997).

Native plant identification

‘Ecology of Sydney plant species’ in the journal *Cunninghamia*, National Herbarium, Botanic Gardens Trust, Sydney (1993 and ongoing).

Field Guide to the Native Plants of Sydney by L. Robinson, Kangaroo Press (1994).

Native Plants of the Sydney District by A. Fairley & P. Moore, Kangaroo Press (1989).

Flora of the Sydney Region (3rd edition) by N.C.W. Beadle, O.D. Evans & R.C. Carolin. Reed Publishing (1982).

Australian Native Plants, by J. Wrigley, Collins (1983).

Rare Bushland Plants of Western Sydney (2nd edition) by T. James, L. McDougall & D. Benson, Royal Botanic Gardens, Sydney (1991).

Trees for the Back Paddock by N. Oates & B. Clarke, Goddard & Dobson (1987).

Weed identification and control techniques

South-east Australia

Bush Invaders of South-East Australia by A. Muyat & R.G. & F.J. Richardson, Australia (2001).

The Glove Box Guide to Plants of the NSW Rangelands by G. Brooke & L. McGarva, NSW Agriculture (1998).

Identifying the Weeds Around You by E.M. Felfoldi, Inkata Press, Australia (1993).

Waterplants of New South Wales by G.R. Sainty & S.W.L. Jacobs, Water Resources Commission of New South Wales (1981).

Identifying Thistles, a video produced by NSW Agriculture (running time 14 minutes).

Noxious and Environmental Weeds Control Handbook by NSW Agriculture (2004) (www.agric.nsw.gov.au/reader/weeds-general/nox-weeds-splash.htm) – an excellent resource for identifying weeds

National

Weeds Australia (www.weeds.org.au) has been created by the Australian Weeds Committee to promote access to key weed regulations, current issues, research and training. Weeds Australia has also developed WEEDeck cards. These cards have been designed as a pocket guide for identifying Australian weeds and are easy to understand and user-friendly.

Weeds: An Illustrated Botanical Guide to the Weeds of Australia by B.A. Auld & R.W. Medd, Inkata Press, Australia (1992).

Noxious Weeds of Australia by W.T. Parsons & E.G. Cuthbertson, Inkata Press, Australia (1992).

Weeds: The Ute Guide by J. Cummins & M. Moerkerk, Primary Industries South Australia (1996).

Field Guide to Weeds in Australia (3rd edition) by C. Lamp & F. Collet, Inkata Press, Australia (1989).

Crop Weeds by J.L. Wilding, A.G. Barnett & R.L. Amor, Department of Natural Resources and Environment, Victoria (1993).

More Crop Weeds by M.R. Moerkerk & A.G. Barnett, Department of Natural Resources and Environment, Victoria (1998).

A Plain English Guide to Agricultural Plants by C. Pearson, G. Cunningham & D. King, Longman Cheshire Pty Limited (1993).

Plant propagation

Australian Native Plants by A. Blombery, Angus & Robertson, Australia (1977).

Propagating Australian Plants by A. Blombery & B. Maloney, Kangaroo Press (1994).

The Encyclopaedia of Australian Plants by W.R. Elliot & D. Jones, Vol.1, Lothian Publishing Company Pty Ltd, Melbourne (1994).

Australian Native Plants by J. Wrigley, Collins Publishers Australia (1979).

Appendix 8: Legislation

If you are managing the restoration of bushland on the Cumberland Plain it is your responsibility to be aware of the legislative requirements associated with any restoration works.

The Department of Environment and Conservation (NSW) (DEC) encourages restoration of bushland areas on the Cumberland Plain. However, given the disturbance to the landscape since European settlement, virtually all of the vegetation on the plain belongs to one or another endangered ecological community listed under the *Threatened Species Conservation Act 1995*.

Under this Act most restoration work will require a licence from DEC. Work requiring a licence would include:

- ❖ collection of seed
- ❖ revegetating or carrying out bush regeneration activities in areas where an endangered ecological community currently exists
- ❖ revegetating or carrying out bush regeneration activities close proximity to an endangered ecological community.

Planting native species propagated from seed collected under a licence into a cleared site that is not immediately adjacent to an existing remnant will not require a licence.

Licensing queries should be directed to DEC's Wildlife Licensing Unit on (02) 9585 6540.

Other legislation which relates to clearing of weeds or vegetation management is listed below.

Commonwealth and State Acts of Parliament can be found on the internet at www.austlii.edu.au

For NSW legislation, www.legislation.nsw.gov.au is also useful.

Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999

NSW legislation

Catchment Management Authorities Act 2003

Commons Management Act 1989

Environmental Planning and Assessment Act 1979

Environmental Trust Act 1998

Local Government Act 1993

National Parks and Wildlife Act 1974

Native Vegetation Act 2003

Nature Conservation Trust Act 2001

Noxious Weeds Act 1993

Occupational Health and Safety Act 2000

Pesticides Act 1999

Protection of the Environment Operations Act 1997



PROJECT PARTNERS



Department of
Environment and Conservation (NSW)



NSW DEPARTMENT OF
PRIMARY INDUSTRIES



Department of
Infrastructure, Planning and Natural Resources

