

BUSH REGENERATION HANDBOOK

A GUIDE FOR LOCAL VOLUNTEER GROUPS



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COUNTRY



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INTRODUCTION AND GENERAL INFORMATION

The 'Illawarra Bush Regeneration Handbook – A Guide for Local Volunteer Groups' is an introduction to the basic principles, concepts and techniques of bush regeneration. It aims to educate Landcare and Bushcare volunteers undertaking bush regeneration about these principles and techniques. Adoption of these guiding principles can assist with the long-term sustainability of restoration projects in our natural areas.

This handbook provides information relevant to volunteer groups undertaking bushland regeneration at sites across the three local government areas of Wollongong, Shellharbour and Kiama, but information may also be relevant to a number of other regions.

Some excellent Bushcare support programs exist in our region as part of local council programs including Wollongong City Council Bushcare and Shellharbour City Bushcare. These programs support volunteers working on public land in a range of ways including providing tools and resources, and advice and access to safety procedures specific to the local government area.

Volunteers who would like to work on public land in the Wollongong and Shellharbour local government areas are encouraged to contact their local Bushcare support officer (see 'Regional Contacts' section) to join a group or develop a project for their site of interest.

This handbook provides information for volunteer groups who work on private, as well as on public land where such local government support programs aren't available. These volunteers are often associated with other networks such as the local Landcare network, or a catchment management authority, and may benefit from access to this information.

Familiarity with this handbook will assist volunteers to gain a basic understanding of bush regeneration and associated management techniques. Information on the specific environmental issues of different sites, issues to be considered prior to carrying out projects, reasons for using certain management techniques, effective techniques for achieving project objectives and guidelines for monitoring progress over time will be provided.

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Written and prepared by Megan Rowlatt in consultation with Wollongong City Council, Shellharbour City Council, Kiama Municipal Council, Landcare Illawarra, Conservation Volunteers Australia, and Southern Rivers Catchment Management Authority.



WHAT IS BUSH REGENERATION?

Bush regeneration is the restoration and maintenance of natural ecosystems which have suffered some level of degradation, by removing or reducing threatening processes, and weed species which are having a detrimental impact on these areas. A specific set of principles and techniques are used to enhance ecological processes and encourage the natural regeneration of local native plant species.

Bush regeneration is typically associated with urban or peri-urban bushland, small-scale rural projects, maintenance of public reserves, walking tracks and vegetation corridors with the aim of improving habitat value for native flora and fauna, enhancing biodiversity and improving public amenity.

Threats to our natural areas

There are many processes and influences which threaten our natural areas and lead to the degradation of the condition of different ecosystems.

This can include things like weed invasion, flooding and high velocity run-off, erosion, fire from arsonists or bush fires, habitat fragmentation due to clearing or disturbance leading to the isolation of species, overuse and over grazing.

These processes can lead to a number of changes in the ecosystem which alter its ability to sustain itself and provide adequate habitat for native fauna. This can include:

- Weed invasion, which often results in numerous problems for an ecosystem. Weeds can displace native vegetation and outcompete native species by taking up limited light and nutrients, alter the soil conditions including the nutrient composition hindering natives ability to thrive or establish, displace local fauna due to natural habitat loss, increase the fuel load and therefore increase the risk of bushfire, and can also be highly toxic to animals and humans or cause contact irritations and allergic reactions.
- Habitat fragmentation threatens our ecosystems, particularly in more urbanised areas where native vegetation and ecosystems have been isolated due to land clearing and development, resulting in natural areas being reduced to small remnant patches of vegetation. Fragmentation, or the reduction of vegetation to isolated patches increases proximity of these areas to threatening processes. A range of impacts are associated with fragmentation, including increased edge effects such as weed invasion, alterations to microclimatic conditions, reduced pollination and recruitment, reductions in genetic diversity. The combined effect of these impacts lead to an overall lower resilience and ability to adapt to changes in the environment. Habitat fragmentation also leads to lack of connectivity and therefore habitat corridors for wildlife to take refuge and travel between habitats is reduced or lost.
- Overusing and overgrazing natural areas can lead to a number of problems in plant communities e.g. loss of understory plants due to trampling effects. This can lead to erosion in areas where there has been a loss of vegetation, resulting in disturbances in the vegetation community which increases opportunities for weeds to invade the site. In riparian areas (adjacent to waterways), erosion and nutrient runoff from farm or urban fertiliser and herbicide use can contribute to poor water quality. This increased sedimentation, and susceptibility to excess growth of water weeds then reduces oxygen available for aquatic fauna.
- Flooding and high velocity run-off can also lead to erosion problems and contribute to the spread of weeds on a site or transport weeds from neighbouring sites by spreading weed seed.

- Fire can alter the species composition of a site, and although change due to fire is a natural process, altered frequency and intensity of fires can contribute to unnatural change in the landscape and can also open areas up to weed invasion. Weed invasion after fire is common, particularly where the site is already heavily degraded and infested with exotic species, due to presence of weed seed in the soil.

Why do we want to protect our natural areas?

There are many reasons why we would want to protect our natural areas. Some of these include:

- We want to restore the bush to a state where it can sustain itself naturally
- Improving amenity and aesthetic value of an area for the community to enjoy
- Protecting a remnant natural area which represents the vegetation which once covered a wider proportion of the landscape, for educational and heritage purposes
- Providing habitat for native fauna
- Improving and re-establishing wildlife corridors between vegetation communities which have been isolated due to fragmentation of the landscape
- Improving water quality
- Maintaining and enhancing the genetic diversity of vegetation communities by protecting and restoring existing vegetation, and supplementing this with native species that have an appropriate genetic diversity
- Preserving the cultural heritage and historical significance



Image: Aboriginal sharpening groove, Gerringong NSW.

WHERE DO I BEGIN?

Before you start on your Landcare or Bushcare site...

It can often be overwhelming starting a new project on a site which has a range of environmental and Aboriginal cultural issues that need addressing. This section will assist you in developing a plan for your site, to guide your activities and achieve the outcomes you are aiming for.

There are a number of important things to consider before carrying out any on ground environmental restoration or bush regeneration activities. Firstly, you need to think about a number of questions, including:

What do you want to achieve?

You may have a range of issues on your site which have contributed to the degradation of natural areas. You might be dealing with issues such as erosion, weed infestations, low levels of biodiversity and lack of native recruitment into the vegetation community (natural/unassisted regeneration), loss of native fauna species in the area, over-clearing and fragmentation of vegetation, reduction of vegetation/wildlife corridors, vandalism and issues due to natural events such as flooding or bush fire.

In asking yourself what you want to achieve in your project, you may consider one or more of the following points which community groups generally aim to achieve:

- Restoring degraded areas to stabilise native vegetation which is capable of sustaining itself
- Regenerating boundaries of the site so that the core of the site is protected from outside disturbance and further weed invasion
- Restoring and protecting habitat for native fauna
- Increasing vegetation corridors for native fauna
- Improving water quality and control of erosion
- Improving the aesthetic and visual value and amenity for the wider community

Once you have established your goals, you need to gather as much information about your site as possible. In gathering this information, your group will be able to develop a site plan which will guide you through your activities and help you reach your short and long term goals. Information that will help you develop a site plan includes:

- Who owns the land?
- Who do you need to involve in your project?

This could include local residents and neighbours, local council, other Landcare or Bushcare groups, noxious weeds authorities, pest management bodies, Aboriginal Land Councils, Catchment Management Authorities or state agencies such as the Office of Environment and Heritage, or National Parks and Wildlife Service.

- What other projects exist on your site or surrounding areas and how might they impact on your project?

For example, are there any existing local council or weeds authority weed/pest control programs in operation you will need to consider and coordinate your efforts with?

- What are the vegetation communities you will be working in and what species are present?

There are a number of people in the community who can help you develop a species list, and help identify the vegetation community of your site. This includes council staff, Landcare or Bushcare representatives, botanists and other experienced volunteers. There is also an extensive list of written material in the form of field guides and text books and websites relating to plant identification. See back of this manual for regional contacts and a list of resources which may be useful to you.

- Are any of these communities Endangered Ecological Communities (EECs)?

Endangered Ecological Communities - You can find out more information about the vegetation communities which are listed as EECs and their identifying features on the Threatened Species website at www.threatenedspecies.environment.nsw.gov.au

- Are there any threatened species on your site?

Threatened species - You can find out more information about the different species which are listed as threatened in our region on the Threatened Species website at www.threatenedspecies.environment.nsw.gov.au

- What is the habitat value for native fauna at the site?

Habitat refers to the place or home for a plant or animal, and provides necessary shelter, food and breeding potential. Habitat value refers to the capacity of the natural environment to provide resources for native fauna to survive and reproduce. If you have a large percentage of weeds vs natives on your site, before deciding on weed control activities, you will need to consider the value these weeds have to fauna on your site. Amphibians, reptiles, birds and mammals may be using rubbish and weeds as habitat, food sources or breeding areas due to a lack of native alternatives. It is important to consider the rate at which you remove and control weeds on your site and opt for a gradual approach to replacement of these resources to native fauna (see case study on Oak Flats Landcare pg 13).

- What is the resilience of your site, and is it likely to be self-sustaining once activities commence and are complete?

I.e. will natural regeneration occur once weeds are removed, or will plantings need to be carried out due to the loss of a native seed bank in the soil?

- What weeds are present and why do we want to remove them?

Is weed removal for aesthetic or ecological reasons? It is important to not only look at which weeds are dominating a site but also which weeds are the biggest threat and what the effect will be if this weed is or is not removed. It is common for community groups and private landholders to remove one particular weed on their site because it is the dominating weed and displeasing aesthetically, but once removed, other more invasive weeds take over which are more difficult to eradicate and manage.

- What native and pest fauna is present on your site?

It is important to know what species of fauna are using your site as habitat. This can affect the activities you carry out and also help prioritise works e.g. you may have threatened species of animals residing on your site. You may also have pest animals using your site as habitat and there may be existing control programs being carried out in your area. For further advice talk to relevant regional contacts about the best way to manage pest and native fauna on your site (see regional contacts section).

- Is there any cultural (Aboriginal or European) significance on your site?

This could be in the form of artefacts found on site, or community knowledge that the site is significant to the Aboriginal community. There are a number of people you can engage to seek advice in this area. If you suspect that you may have artefacts on your site, leave the area undisturbed and notify relevant local contacts for further advice (see the Aboriginal and Cultural Heritage and regional contacts section of this handbook).

- What legislation is relevant to the site given the vegetation community? i.e. is it an EEC, or are there threatened species or cultural heritage which may be associated with your site?
- Will you need a licence to carry out activities in the vegetation community of interest?

Legislation associated with a particular vegetation community may dictate the need for a permit or license for you to actually carry out activities within these vegetation communities.

- What site or management plans already exist for your site?

It is often beneficial to contact your local council to see if there has been a management plan already produced for your site. This may outline some of the permitted activities and may help guide your restoration efforts.

- What tools are you permitted/not permitted to use?

Depending on who owns the land and what insurance you have, you may or may not be permitted to use certain tools, for example chainsaws or power tools. Check with the landholder, your local council, Bushcare officer or Landcare representative for further advice.

- Are you allowed to use herbicide?

Some local councils (if you are working under their program), require that you undertake some herbicide training before you integrate this technique into your activities. Contact your local council Bushcare officer for more information. In other areas where there are no Bushcare support programs, it is important to check with your Landcare representative and landholder if there are any restricted activities associated with the site of interest.

- Are there signs of, or is your site at risk of being infected by plant pathogens such as Phytophthora or Myrtle rust?

See the 'hygiene protocols' section of this manual for further information.

- Do you have the required insurance cover?

If you are a Bushcare volunteer and working on public land, you are usually covered as a volunteer under that local council's Bushcare program. If you are a Landcare volunteer there are a number of different options, so contact your local Land Services officer for further advice.

- What techniques are you going to use and for how long will you carry out your restoration activities?

Many bush regeneration projects can take up to and go beyond ten years, so consider how long you can commit to a project to ensure its success.

- What resources will you need to carry out your project and where will you get these resources?

This includes; tools, funding, community support, advice or guidance, and plants. Local council Bushcare programs often have a range of resources available for Bushcare volunteers to assist with carrying out their projects.

- How will you monitor your progress and results achieved from carrying out your bush regeneration activities?

See the 'Monitoring and evaluating your work' section of this manual for more information.



Image: Volunteers removing Lantana at Tullimbah Landcare site, Albion Park NSW

BASIC PRINCIPLES OF BUSH REGENERATION

There may be a number of threatening processes occurring on your site. Once you have identified these threats, answered the questions in the previous section of this handbook and prioritised your activities, you can start to develop a plan for managing your site, and minimising or eliminating threats to the natural area you wish to restore.

Over time there have been a number of techniques developed to tackle different threats to natural areas. One of the pioneer methods for restoring natural areas is the 'Bradley method' developed by Joan and Eileen Bradley. Basic principles of their methods are still very relevant today and should be considered when developing a strategy for managing native vegetation on any type of site.

A number of guidelines have been produced to guide efforts in restoring natural areas. Below is a summary which is outlined by the Australian Association of Bush Regenerators and the National Trust (2005).

Retain first	Conserving existing natural areas is the first priority. Efforts should be directed to protecting these areas from threatening processes such as weeds, grazing, stormwater, mowing etc.
Regenerate second	Where bushland is degraded by threats such as weed invasion, grazing, or other disturbances, regeneration is the primary goal. This involves mitigating threats such as weed invasion to encourage natural regeneration.
Replant last	Planting should only be considered after a site's natural ability to regenerate has been assessed as very poor.

The Bradley Method

During the 1960s the Bradley sisters, Joan and Eileen, pioneered a system known as the 'Bradley method', for regenerating and restoring natural areas in a way that helped ecosystems to recover from disturbances sustainably. The result of this method is that over time the ecosystem is able to sustain itself, regenerating naturally with very little or no human assistance.

Basic principles of the Bradley method include:

- Always begin working in areas with the best native vegetation, and later move into more weed-infested areas

In areas where there is only a small amount of weed infestation, it is likely that there will also only be a small amount of weed seed in the soil. While high densities of native plants compared to weeds indicate the majority of seed stock is likely to be native. When weeds are removed from these areas, the plants replacing the weeds will more often be native species. It is therefore most beneficial work in the best areas first, in order to assist natural regeneration. This increases the probability that the site will become self-sustaining, and will require less effort to maintain in the long run.

This method also keeps volunteers motivated when they can see their efforts are fruitful.

- Create minimal disturbance

Native areas of bushland can be sensitive and any disturbance to the environment can encourage the migration and establishment of weeds. Weeds thrive on disturbed areas and easily establish where there is bare soil and plenty of sunlight. Instead of using machinery (which can create a lot of disturbance), weeds are best removed by hand, and any ground that is uncovered should be covered up with soil and leaf litter or mulch if necessary, to suppress weed growth. Be careful of the native plants already on site and try not to disturb soil layers.

- Let the rate of regeneration of native plants determine the rate of weed removal

Once an area has been cleared of weeds, it is important to undertake follow up work, as weeds will grow from seed stock in the soil. If large areas are cleared at once, this can potentially create a large amount of work in terms of follow up, which may be beyond the capabilities of your volunteer group. Concentrate on smaller natural areas, and once you have removed the weeds and natives have begun to re-establish, then move onto a new area within your site.

These three basic principles were developed with the aim of:

- Preventing the deterioration of good areas
- Improving the next best areas
- Holding the advantage gained
- Cautiously moving into the worst areas

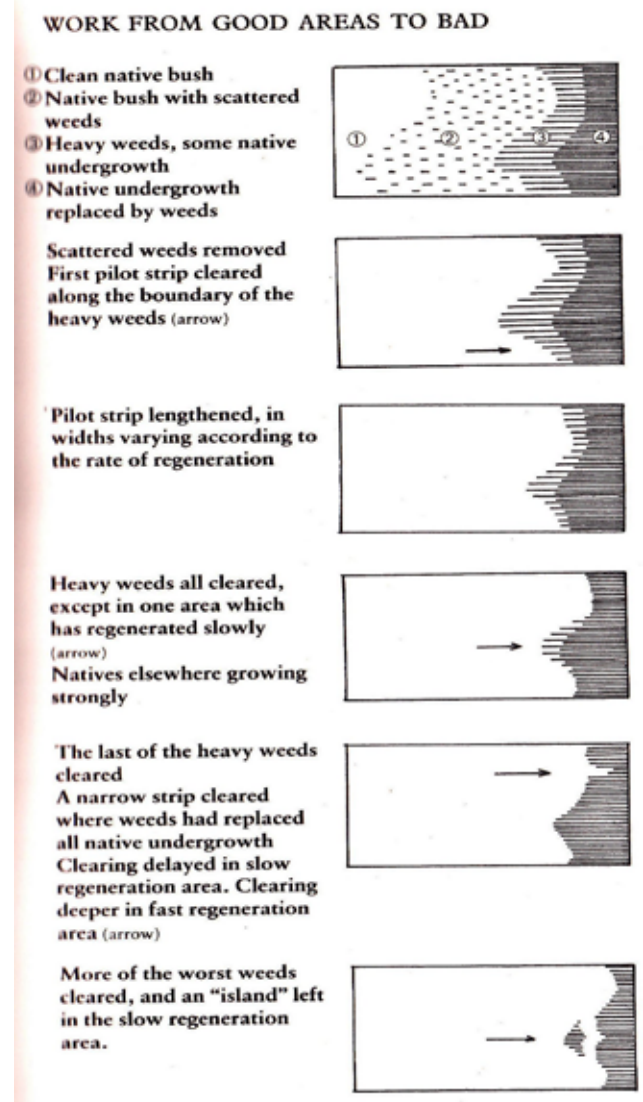


Image: source: Bradley, 1971. Demonstrating areas to work into from good to bad in weed removal.

In addition to the Bradley method of bush regeneration, a number of other techniques have evolved over time, and are used often in combination with the Bradley method to manage threatening processes (including weed invasion) on sites in the region.

Many groups and individuals choose to combine basic bush regeneration principles such as the Bradley method, with techniques such as herbicide use, biological control for specific weed species, tree planting, and other methods such as stock and pest exclusion fencing.

Herbicide Use

Many groups and individuals working in bush regeneration use herbicides to assist with the control of certain species of weeds. It is important to consider all possible control techniques before using herbicides and also to develop a plan which involves a combination of control techniques so a more holistic and sustainable approach is taken to controlling weeds on your site. It is often wise to work under the supervision of a person who is certified in the use of chemicals and herbicides and seek permission from the landholder (if it is not you) before commencing any herbicide treatment.

If you choose to spray on site consider all potential impacts of this herbicide use including long-term effects, and proximity to waterways. Limitations in application of herbicide use apply when working near waterways.

If you choose to use herbicide (including non spraying methods – see the following section) make sure that you are following the correct protocol for the use of the chemical you are using on the label and Material Safety Data Sheet (MSDS) included with the herbicide, and note that the type of herbicide required will vary with the type of weed you are controlling. When considering herbicide use with any weed you should also refer to the latest edition of the Noxious and Environmental Weed Control Handbook (I&I NSW). This lists all herbicides currently registered for noxious weeds as well as the permits required for many environmental weeds. Herbicide must also be used in accordance with the Work Health and Safety Act 2011. Use of herbicide in a public area may also require notification via appropriate signage.

Always follow the directions outlined on the labels and the MSDS of the products you are using, and always wear appropriate safety attire when in contact with poisons. This includes gloves, long sleeves and long pants, safety glasses, sturdy closed in shoes and a face mask as well as any additional recommendations included with the product information. If you are ever in doubt on whether to use herbicide on your site, consult your local council or weeds authority for further advice (see 'regional contacts' section).

Weed removal techniques

First and foremost it is important that you correctly identify the species you are removing or controlling on your site. If in doubt of what species a particular plant is, do not remove it and have it identified by an expert.

Once you know what you are working with, it is good to be aware of the fruiting and seeding times of the weed and plan to remove the plant before it sets seed and is able to spread further on your site. If you choose to use herbicide, learn the best times to carry out treatment e.g. for bulb and corm species the best time to apply herbicide can be after flowering but before seed is set.

Try to remove as little green waste as possible from your site, leaving parts of the plant which are not capable of reproducing/re-shooting on site to mulch down. You can do this by cutting the plant into small pieces and spreading where the weed once invaded to return nutrients to the soil. Bag and remove any seed heads, flowering or reproductive parts from the site to reduce the chance of further distribution. Try to avoid stockpiling weeds in large piles, as these can become attractive to arsonists and will also take longer to break down. Where there is potential for weeds to re-shoot or re-establish in the soil, these can be left perched on a nearby rock or low-lying branches to eliminate contact with the soil. Monitor over the coming months to make sure the plant does not take root, re-shoot or cause rot within the tree branch.

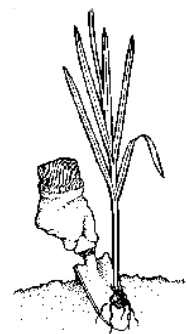
Hand pulling

Many young plants can be hand removed with caution so as to not leave any reproductive parts in the soil. This can be carried out with a knife or a trowel, digging beneath the surface to remove runners, the tap root and any bulbs etc. It is helpful for removal if the soil is moist. Take care to shake any excess soil from the roots into the area the plant has been removed from, and leave the area as undisturbed as possible.



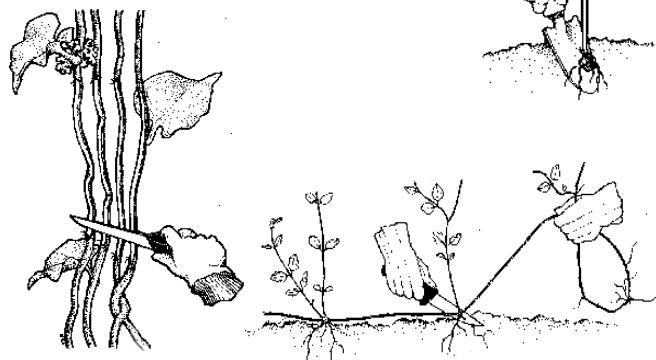
Digging and removing corms, bulbs and tubers

This is achieved by digging reproductive plant parts out of the soil. Move aside any leaf litter and expose the base of the plant. Dig down next to the stem until the bulb or tuber is exposed. Dig up the bulb or tuber and remove the plant, bagging the bulb or tuber. Some plants for example Turkey rhubarb, may have multiple tubers and will require further digging and follow up.



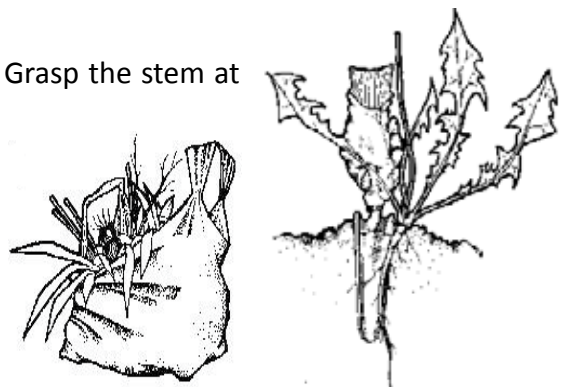
Vines and scramblers

Using a knife or trowel for ground scramblers, follow the vine along the ground and dig carefully below the surface to remove any tubers or reproductive plant parts. Bag and remove them from the site. The vines, if stems or other parts cannot re-shoot, can be rolled and left on site to compost down.



Soft herbaceous weeds

Carefully remove any seed or fruit, bag and remove from site. Grasp the stem at ground level to eliminate risk of snapping the stem and leaving the roots in the ground. Gently rock the stem loosening the soil around the base and slowly remove from the soil, shaking any loose soil and cover disturbance with soil by patting back down into the ground. This process can also be assisted with the use of a trowel. Leave plants to break down on site where roots are not making contact with the soil once removed. This can be done by placing on a rock or on top of some low-lying branches on site.



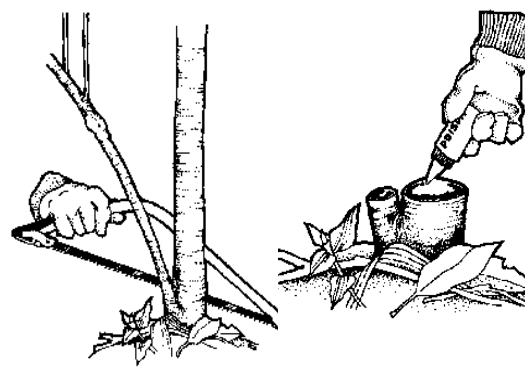
Crowning

This is where the crown of the plant (which is the growth point of the plant), is cut and removed from the ground. An example of this is Asparagus fern (*Asparagus atheopicus*). Gently remove and bag any seed or fruit from the stems of the plant. Grab the stems around the base of the plant to expose the base. Insert a knife or lever on an angle into the ground close to the crown. Working around the base, cut through all of the roots around the crown. Remove and bag the crown.



Cut and paint

This method is most effective on woody weeds up to 10 cm in basal diameter, but can be used on some vines and scramblers. Make a horizontal cut as close to the ground as possible (to eliminate run off of herbicide and reduce trip hazards on your site), with loppers, secateurs, or a saw. Immediately apply herbicide to the exposed area, ideally within 10 seconds before the plant cells begin to close and translocation of the herbicide ceases to occur. If the plant does re-shoot, you can cut and paint the shoot after sufficient growth has occurred.



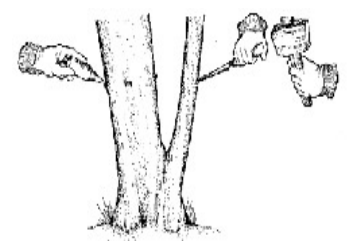
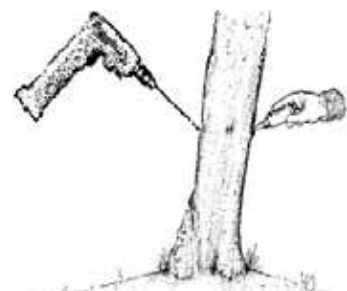
Stem injection or Frilling/Chipping

This method is ideal for woody weeds (trees and shrubs) over 10 cm in basal diameter and often where the site restricts access to the weeds or removal is a problem.

Stem Injection: At the base of the tree or shrub drill holes at a 45 degree angle into the sapwood at 5 cm intervals deep enough to penetrate into the sapwood or vascular tissue (which is the living tissue that transports water and nutrients around the plant). Immediately fill with herbicide.

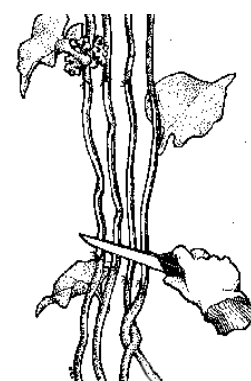
OR

Frill/Chip: Instead of a drill use a chisel and hammer to make incisions into the trunk and fill each hole or incision with herbicide immediately. Incisions should be made at 5 cm intervals around the base of the tree/shrub.



Scrape and paint

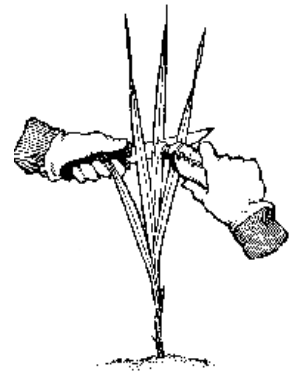
This treatment is ideal for the control of vines and scramblers. With a sharp knife or with smaller vines a potato peeler can be useful, scrape 15-30 cm along the length of the vine to expose the fleshy layer beneath the epidermis of the vine. Within 10 seconds, apply the herbicide along the length of the scraping. Do not ring bark, ring barking is a process which cuts into the vascular tissue which transports water and nutrients throughout the plant. If ringbarking occurs, this will cut off the flow of nutrients to the roots and leaves of the plant and the herbicide therefore will not be transported through the plant. For thicker vines you may need to complete two scrapings opposite each other along the vine. Vines left in the canopy should die but follow up treatments may be required.



Stem swipe

This technique is most useful for species with underground tubers, bulbs and corms which can be hard to remove from the soil. Using a knife for backing support, swipe along the length of the stems or leaves with the herbicide applicator bottle.

Be mindful of your body when carrying out any of the above tasks, be sure to vary your position as to not injure or fatigue your back and joints. Take regular breaks and always wear appropriate safety attire.



How much is too much weed removal?

Often groups and individuals working at removing weeds from natural areas make the mistake of removing too many weeds. This can have a number of detrimental effects on the site and can result in the work being hindered, and in some cases the site can end up worse than what it originally was prior to works commencing.

When planning weed control it is important to consider the rate at which you remove weeds in relation to your capabilities to control any weeds which might replace the weeds you intend to remove. Remember that many weeds (such as Lantana and Wild tobacco) can provide valuable habitat for native fauna when there is very little or no other native alternatives. Removing this vegetation can displace these animals. Consider removing weeds at a rate which allows new native habitat to re-establish to ensure habitat is available for native fauna.

Make sure you are allowing time for native species to replace the weeds which you have removed, or your native plantings to establish. If you open up an area too much, you are creating prime conditions for new weeds, and often more invasive weed species to establish. Choosing an area of a manageable size to work with, consider whether the seed bank in the soil is likely to contain predominately native or weed seed. This will indicate whether you will need to replace weeds by planting local indigenous species or if there is already a seed bank of natives ready to take the place of the weeds.

Case Study: Bringing back the beautiful Blue Wren – Oak Flats Landcare Project

As with many bush regeneration sites, one of the main focuses is to remove noxious and environmental weeds such as lantana from the site to allow for the native vegetation to return. But for this small Landcare group there were more complexities to the removal process than they originally thought when they began their landcare project 12 years ago.

*As the group worked away they were treated to the delights of the sounds of the small blue Superb Fairywren, *Malurus cyaneus*. But as they continued to remove larger stands of lantana over the years, they noticed that the presence of the wren was starting to diminish and then realised that this may have something to do with the removal of the lantana.*

*Although lantana is a Weed of National Significance (WONS), the group realised that the lantana had been providing important habitat for this native bird to nest and breed, so they decided to focus their efforts on encouraging the bird's return to the site. Oak Flats Landcare approached Shellharbour City Council Bushcare staff to see what they could do. Native species such as *Melaleuca styphelioides* (Prickly Paperbark), *Pittosporum multiflorum* (Orange Thorn), and *Maclura cochinchinensis**

(Cockspur) were sourced and planted to replicate the prickly habitat that provided a secure and protected sanctuary away from predators as the lantana had previously done.

To encourage insects as a food source the group planted a variety of native grasses which the birds were observed to enjoy, which is left un-mown on the site.

The group has seen a dramatic return of the blue wren and can hear them flying overhead as they continue to carry out their regular Landcare activities.

It is important to consider the habitat weeds provide for native species such as the blue wren and other fauna when carrying out environmental restoration activities. This group has learned of the importance of allowing for replacement habitat to establish so that these sites are providing the resources needed for all native species to survive.

For more information about creating habitat for native birds visit www.birdsinbackyards.net

Planning removal on your site

In addition to working from areas of low weed infestation to high infestation you may like to work into the more infested areas choosing small sections at a time, to keep the work carried out by volunteers manageable. This may involve working in a mosaic on your site, where you are controlling small patches instead of one large area.

Where working on a sloped site, it is valuable to work from the top of the site down to the bottom (where safe) over time. This is important as you need to consider how seed from weeds is being transported around your site. By removing weeds from the top of the slope, you are helping to reduce further seed being blown or washed down into the lower areas of your site, and not transporting weed seed upslope.

Bushcare Squared

This technique of bush regeneration has been adapted from basic Bushcare principles and can increase habitat to attract wildlife to your site, as well as urban backyards. The below information has been modified from the original 'Bushcare Squared' training provided by Wollongong City Council (WCC) Bushcare. This method was pioneered by experienced Illawarra bush regenerators Sue McGregor and Lynne Kavanagh from WCC Bushcare, and is suited to sites where there have been high levels of degradation, where no native seed bank exists in the soil, and planting of native vegetation is required.

Step one: Preparing your site

Prepare the site where you want to plant by clearing the weeds or mowing or slashing any exotic vegetation or grass. Overlap newspaper several sheets thick over the ground and wet the paper. Weigh the paper down with a thick layer of mulch. This will kill the grass and suppress any weeds over a few weeks, and leave the soil loose and ready to plant into.

Step two: Ready to plant

You will need: a bucket, water, digging tools – mini-mattock is good or a trowel, a camera for before and after photos, and four local native plants suitable for the ecosystem you are restoring – one tree, one shrub, one grass and one ground cover.

Peg out one square metre in your mulch. Immerse your plants in a bucket of water to soak them until the bubbles stop. Scrape all the mulch from the square to reveal soft soil. The newspaper will have mostly disappeared over a few months.

Place your plants on your site – one tree, one shrub, one grass and one clump of ground cover in the one meter square plot. The ground cover can be planted with the tree in the same hole, and the shrub and grass can be planted separately in their own holes.

Move your plants to one side and dig your holes deep. This is one of the secrets to successful planting – make sure the hole is deep enough that the plant is a few centimetres below the soil surface. Backfill with the soil, remembering to leave a basin in which water can collect when it rains.

Pull the mulch back around the plants but not touching the plant stems. Remember that if you plant and water well at the start then the native plants should be able to cope without being watered again. If we have prolonged dry periods of course they will need some support.

Step three: Adding the ‘furniture’ that animals like

Introduce some debris to the site in the form of rocks, logs and sticks. This will provide habitat for reptiles and amphibians as well as help micro-organisms survive. The plants will eventually attract birds and larger mammals to the site as well as insects for the animals to feed on.

Step four: Maintaining your habitat

Keep an eye on your habitat and pull out any weeds that may grow through the mulch. After a while the ground cover will spread and keep out weeds and the tree, shrub and grassy plant will provide shade to keep your weeds away. Watch to see which birds and creatures use your habitat as it quickly grows and changes.

An excellent example of the success of this technique being used, is at Greenhouse Park, Coniston NSW (image below), where volunteers from Friends of Tom Thumb Lagoon Landcare, Wollongong City Council Bushcare and Conservation Volunteers Australia have worked at restoring an old builder’s tip to the thriving urban bushland it is today.



Biological control

This involves the introduction of natural enemies to exotic plants, and has been adopted by weeds authorities, local councils, catchment management authorities and other NRM agencies under different programs to manage large infestations of specific species of weeds over large areas.

This often involves releasing biological control agents such as fungus or insects into vegetation communities to target specific invasive weed species and allowing the agent to attack these infestations over time.

Case Study: Beating Bridal Creeper using its own worst enemies

Source: Weeds in Australia website www.weeds.gov.au

*Bridal Creeper (*Asparagus asparagoides*) is one of southern Australia's worst weeds and a Weed of National Significance (WONS). It invades and smothers native vegetation and threatens rare species. Conventional control methods using herbicides and physical removal are difficult and expensive to implement.*

*Efforts to find biological control agents started in 1998, when researchers from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) travelled to South Africa to investigate Bridal Creeper in its native range. Three potential agents were identified and carefully tested to confirm that they were host-specific and safe for release: the Leafhopper *Zygina* spp., the Rust Fungus, *Puccinia myrsiphylli* and the Leaf Beetle *Crioceris* spp.*

Since 2002, the CSIRO, in collaboration with state agencies, has taken a leading role in the national distribution of Leafhoppers and Rust Fungus, with financial assistance from the Natural Heritage Trust. The community has enthusiastically embraced the biological control methods and established over 2000 release sites.

Schools across the country have been involved in rearing and releasing Leafhoppers on local infestations, while community groups have created their own innovative methods to redistribute the rust spores from nursery sites. These community efforts are significantly aiding the natural spread of the agents. The biological control of Bridal Creeper has been so successful that emphasis has started to shift to managing regeneration of native vegetation on previously infested sites.



Image: Rust fungus damage on Bridal Creeper



Image: Leafhopper on Bridal Creeper



Image: Leafhopper damage to Bridal Creeper

Images sourced from CSIRO, 2009

You can find out more information about local programs by contacting your local weeds authority (see regional contacts).

MONITORING AND EVALUATING YOUR WORK

It is best practice to record what you aim to achieve in the work you will be carrying out before commencing your project. It is also best if you can capture the work you do, and how your site progresses over time. This will help to record the value your project is contributing to the overall health of the environment.

As a minimum, it is of great benefit to undertake the following basic monitoring practices:

Photopoints – These are a series of points on your site that you establish at the beginning of your project, and from these points you take the same photograph at regular intervals. This is usually done every six months and is an important technique to gauge how your site is changing over time, particularly the vegetation.

Refer to the Southern Rivers Catchment Management Authority (SRCMA) ‘Project Journal’ for more information about photopoints on your site. This can be downloaded from the Landcare Illawarra and SRCMA websites (see the resources section for more information).

Recording of fauna – It can also be beneficial to monitor the different fauna which is present on your site. This may be done informally through observation as you are working by writing down what you see after or during your work session and you can look back over time to see if any new species are occurring in your area.

You may like to record what birds are using the vegetation on your site as habitat, or if there is a water body on your site you may like to take note of fish present or the types of frogs heard calling etc. Over time you may notice species of fauna never seen prior, and this can be a great indicator of the increasing health of the habitat on your site.

There are a number of websites and printed material that can assist you with fauna monitoring on your site. See the resources section for more information.

Recording of hours worked by volunteers – it is valuable to record how long you and your volunteers are spending carrying out bush regeneration activities on your site. Every hour spent restoring degraded bushland is of great benefit to the native vegetation and wildlife, the wider community and the region. It is important to record these efforts so that you realise just how much you are contributing to the betterment of the environment and community.

For more information about monitoring techniques you can implement into your project, see the Southern Rivers Catchment Management Authority ‘Keeping a Project Journal’. A version of this journal can be obtained from the Local Land Services Officer (see Regional Contact section) or downloaded from the Landcare Illawarra website www.landcareillawarra.org.au

If you are working under a council Bushcare program you should check what level of monitoring you are required to undertake as part of your project.



SAFETY ON YOUR SITE

Before you start work on your site, you need to identify all of the potential hazards and risks you are likely to face. A range of things need to be assessed to make sure you are minimising harm to yourself, the community, and your volunteers.

Consideration should be given to:

- What trip hazards are on your site?
- Is there potential for an eye stick injury while working?
- What are the weather conditions like? Is it hot? Is it windy? Are volunteers at risk of heat exhaustion or having branches blown from trees fall on them?
- Does your site suffer any soil contamination?
- Are there ticks, spiders, snakes or other hazardous insects and how will you manage this?
- Are your activities repetitive? How will you manage this?
- Is there potential for back injury?
- Are any of your volunteers allergic to some of the plants or insects likely to occur on your site and how will you manage this?
- Will you be using herbicides?
- Do any of the volunteers have pre-existing injuries and how will they/you manage this?
- Where can volunteers go to the bathroom?
- What tools are you permitted to use?

What to wear

When working on site it is always important to protect yourself by wearing appropriate clothing. This includes:

- Long pants and long sleeves
- Sturdy closed in shoes or boots
- A hat, sunglasses or safety glasses and sunscreen
- Gardening/safety gloves

First aid

It is also ideal for at least one member of the group to be first aid trained, and a fully stocked first aid kit should always be available to volunteers working on site. A central location should be established for the first aid kit so that all volunteers can readily access it in the event of an emergency.

Evacuation points

An emergency meeting point should be established so that in the case of an emergency such as a bush fire, volunteers can re-group to ensure that all volunteers are safe, and assess evacuation or management of the emergency.

While working

Once volunteers start carrying out manual labour it is important to keep in mind to:

- Drink plenty of water and take regular breaks
- Work in the shade where possible
- Re-apply sunscreen and insect repellent (as needed)
- Follow standard safe lifting procedures when lifting heavy objects i.e. lift with the knees to protect your back and ask for help when needed
- If you feel unsafe at any stage do not carry out, or discontinue the activity
- Use tools for what they are intended, and follow correct procedures
- Change or rotate tasks regularly to minimise muscle fatigue and take breaks to stretch and rest
- Do not handle hazardous materials or syringes found on site. Contact the relevant local health department or council for advice on what to do about such materials and to report anything suspicious
- When dealing with discarded syringes, broken glass, and sharps in general, you should follow the safest procedure possible in clearing these objects from your site.
- If using herbicides follow all directions on the label and on the Material Safety Data Sheet
- You should always have clean water and soap on site for hand washing after herbicide use or in the event of a spill
- Always wash your hands thoroughly before eating and after working in the field

LEGISLATION AND PERMISSIONS

The following State and National legislation is relevant to managing natural areas.

- Protection of the Environment Operations Act 1997
- Coastal Protection Act 1979
- Coastal Protection and Other Legislation Amendment Act 2010
- Environmental Planning and Assessment Act 1979
- Heritage Act 1977
- Local Government Act 1993
- Ozone Protection Act 1989
- Environmentally Hazardous Chemicals Act 1985
- National Parks and Wildlife Act 1974
- Threatened Species Conservation Act 1995
- Fisheries Management Act 1994
- Work Health and Safety Act 2011
- Native Vegetation Act 2003

It is crucial that prior to commencing natural area restoration/bush regeneration activities, advice is sought from the relevant local, state or other responsible authority or landholder regarding relevant legislative requirements.

There is a large number of state acts, regulations, planning instruments and other government policies and guidelines that can affect the land and any activities on it.

It is advisable to talk to your regional officers to obtain information such as this and make sure you are following the correct protocol and have obtained any permissions or licenses required to carry out activities on your site. If you are working within an Endangered Ecological Community or threatened species on your site, your group will require a Section 132 Scientific Licence under the National Parks and Wildlife Act 1974. See regional contacts for more information on who to contact.

ABORIGINAL AND CULTURAL HERITAGE

All natural areas are remnants of Aboriginal land which have remained intact or relatively undisturbed by colonisation. With this in mind, it is likely that many of our Bushcare and Landcare sites will contain some Aboriginal heritage or will have some level of cultural or historical significance (Aboriginal or European). If you are working in an area that is likely to have, or you are unsure of any Aboriginal significance attached to the site, then you should consider following these procedures:

Prior to commencing works (if possible), contact your local support officer, council officer or Aboriginal catchment officer with the local catchment management authority, to have an Aboriginal Heritage Information Management System (AHIMS) search carried out.

What is an AHIMS search?

AHIMS contains information and records about Aboriginal objects that have been reported to the Director General of the Office of Environment and Heritage. It also contains information about Aboriginal places which have been declared by the Minister to have special significance with respect to Aboriginal culture. AHIMS refers to these recorded Aboriginal objects and declared Aboriginal places as “Aboriginal sites”.

Why would I need to search AHIMS?

Before carrying out an activity you should think about how it might affect Aboriginal sites. For some activities the National Parks and Wildlife Act 1974 requires that you exercise due diligence to check if Aboriginal sites will be harmed by your activities. Checking AHIMS is a part of due diligence.

What will the results of an AHIMS Basic Search tell me?

Your AHIMS Basic Search will tell you whether there are any Aboriginal objects recorded in the search area. An Aboriginal object that is recorded on AHIMS could be but not limited to (as defined under the NPW Act)

- Human skeletal remains
- Aboriginal culturally modified trees
- Middens
- Stone artefacts
- Raised earth rings
- Grinding grooves
- Rock shelters
- Earth mounds
- Stone arrangements.
- A group (i.e. a collection, scattering, deposit etc) of Aboriginal objects
- An area of land containing Aboriginal objects
- A “potential” archaeological deposit which is an area where, based on previous investigation, Aboriginal objects are likely to be present
- A declared Aboriginal place (as defined under the NPW Act), which may or may not contain Aboriginal objects
- An Aboriginal site that has been partially or completely destroyed under the conditions of a past consent.

What do I do with the results of an AHIMS Basic Search?

If the results of your AHIMS Basic Search indicate that there is an Aboriginal site in the area of your proposed activity, you will need to seek further information in order to determine the precise nature of the Aboriginal site. This would involve conducting an Extensive Search.

If the results of your AHIMS Basic Search indicate that there are no Aboriginal sites in the area of the proposed activity you would not be required to carry out an extensive search. However, you may need to consider whether Aboriginal objects are likely to be in the area by looking at the landscape features and taking care to look out for the following indicators:

- Surface shell material, middens
- Bones
- Rock paintings
- Axe grinding grooves in rocks
- Stone arrangements
- Tree scars which could relate to birthing trees and sacred sites

If you suspect or are unsure if there is something significant on your site:

- Contact your local Aboriginal Lands Council
- Move your activities away from the area
- Mark on a map the area where you suspect any significant articles are located
- Notify your Local Land Services Officer, Aboriginal Land Council, or local council officer immediately if you suspect you have found a heritage item or site (see regional contacts section for more information).

HYGIENE PROTOCOLS

Volunteers should practice good hygiene protocol before commencing activities on a bushcare or landcare site. There are a number of reasons for this:

Footwear and clothing can often have weed seed attached which could be present due to volunteers visiting other weed infested areas or from previous removal projects on your current site or other sites. This can often be a source of new seed being introduced and can result in more problematic weeds establishing on your site and sometimes reversing all of the hard work you have already contributed to your project. Tools, footwear and vehicles (where relevant) can also carry in pathogens which can be harmful to the vegetation. Two such pathogens which threaten our region are Myrtle Rust and Phytophthora.

Myrtle Rust

Myrtle Rust (*Uredo rangelii*) is a newly described fungus that is closely related to the Eucalyptus/Guava rusts. These rusts are serious pathogens which affect plants belonging to the family Myrtaceae including Australian natives like Bottle Brush (*Callistemon* spp.), Tea Tree (*Melaleuca* spp.) and Eucalypts (*Eucalyptus* spp.).

Myrtle Rust is distinctive in that it produces masses of powdery bright yellow or orange-yellow spores on infected plant parts. It infects leaves of susceptible plants producing spore-filled lesions on young actively growing leaves, shoots, flower buds and fruits. Leaves may become buckled or twisted and may die as a result of infection. Sometimes these infected spots are surrounded by a purple ring. Older lesions may contain dark brown spores. Infection on highly susceptible plants may result in plant death.

What you can do to prevent spread:

- Thoroughly wash and clean your clothing and footwear make sure all soil and seeds are removed
- Clean and disinfect your tools before each visit to your site. This can be done by spraying tools with 70/80% methylated spirits.
- Ensuring your planting material comes from a reputable nursery.

For more information about what you can do to prevent the spread of Myrtle rust visit:
www.dpi.nsw.gov.au/biosecurity/plant/myrtle-rust



Images sourced from Council of Heads of Australian Botanic Gardens (CHABG), 2011

Phytophthora

Phytophthora Dieback kills plants and infection is permanent. The pathogen attacks the roots of plants, travels in water and along root systems and is spread in contaminated soil. This can be via small amounts of soil attached to shoes of walkers up to large soil disturbances during major earth works. Highly susceptible plants die quickly but even those that are not highly susceptible will succumb during long periods of dry weather. The loss of root mass limits the amount of water and nutrients the plant can absorb, leaving it susceptible to insect attack, other diseases and drought stress. The pathogen poses a significant threat to ecosystem functions by altering and reducing species composition and structural form of the vegetation. Native birds and animals, invertebrates and microflora may all be threatened by these changes in vegetation. There are only three management objectives for Phytophthora Dieback: keeping areas free of infection, limiting the spread and managing infected sites using hygiene, quarantine, and treatment of infected plants.

What you can do to prevent spread:

There are already some known outbreaks of the disease in the Illawarra region, and it is impossible to eradicate Phytophthora from infested areas once present. So limiting further spread is critical to management efforts. You can reduce the chances of spreading the disease by:

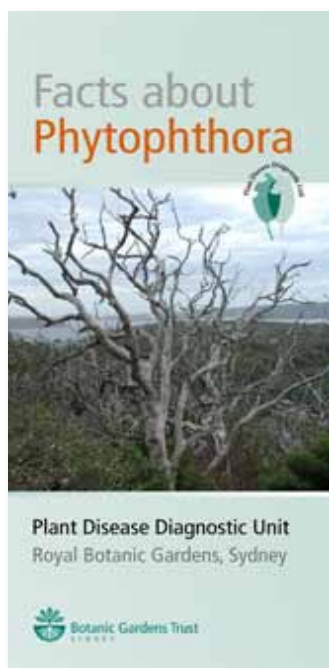
- Preventing the movement of infected soil or plant material
- Cleaning your shoes when moving in or out of bushland areas
- Making sure your tools are clean before you start working. This can be done by spraying tools with 70/80% methylated spirits.
- Ensuring your planting material comes from a reputable nursery.
- If you think you may have dieback on your site, you can have your soil tested for the presence of Phytophthora.

For more information about what you can do to prevent the spread of Phytophthora visit:

www.rbgsyd.nsw.gov.au/plant_info/pests_diseases/phytophthora_dieback

or download the 'Phytophthora Root Rot' fact sheet:

www.environment.gov.au/biodiversity/invasive/publications/p-root-rot/pubs/p-root-rot.pdf



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Weeding the Dunes Carol Nance

Can be downloaded from: www.members.westnet.com.au/robnance/WEEDING%20THE%20DUNES.pdf

Websites

Australian Government Weeds in Australia
www.weeds.gov.au

CSIRO
www.csiro.au/science/invasiveplants.html

Grass Identification
www.stipa.com.au/NativeGrasses/GrassIdentification.html

Illawarra Bushland Database
www.bushlands.southerncouncils.nsw.gov.au

Illawarra District Noxious Weeds Authority
www.idnwa.com.au

NSW Flora Online
www.plantnet.rbg Syd.nsw.gov.au

NSW Industry & Investment
www.dpi.nsw.gov.au/agriculture/pest-weeds/weeds

Office of Environment and Heritage
www.environment.nsw.gov.au

South Coast Weeds
www.esc.nsw.gov.au/weeds/

Weeds Australia
www.weeds.org.au

Threatened species

Scientific Licences

www.environment.nsw.gov.au/wildlifelicences/ScientificResearchLicences.htm

Threatened Species information

www.threatenedspecies.environment.nsw.gov.au/index.aspx

Wildlife Atlas

www.wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp

REGIONAL CONTACTS

Local Councils

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Office of Environment and Heritage

For general enquiries visit the website for contact details:

www.environment.nsw.gov.au/contact/