

Section Two

Managing boneseed



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SECTION 2: Managing boneseed

Why planning is important

A management plan will help to identify the most appropriate boneseed control methods for your site, and the best time to use each control method. Planning in this way can save you time and money by directing limited resources to where they will be most effective. Following a plan helps you monitor the effectiveness of your control efforts, measure progress against objectives, and adapt to changing conditions. Management plans can also help to achieve consistency, which is important when the control program involves multiple stakeholders and spans several years. A good plan increases your chances of success.

Boneseed management occurs at a number of levels. For example, management plans at individual sites can feed into local government pest management plans, which feed into regional pest strategies at the natural resource management (NRM) board and catchment management authority (CMA) scale. These in turn feed into the National Bitou Bush and Boneseed Strategy. You should consider these other strategies when developing your plan, as your actions benefit not just your site, but ultimately the national boneseed effort. Working in conjunction with other strategies will ensure your efforts are valuable, and may also help you to attract funding.

This section of the manual discusses some of the main issues you should consider when developing a weed management plan. Firstly, you should decide whether you are trying to eradicate or contain the boneseed infestation. Then you must consider the many issues related to your particular land-use situation (e.g. natural areas, pastures, vacant land). Using this information, you can then develop a management plan, considering your goals and the resources required. Finally, you need to monitor the success of your management



Kym Smith

Boneseed in native open woodland, SA.

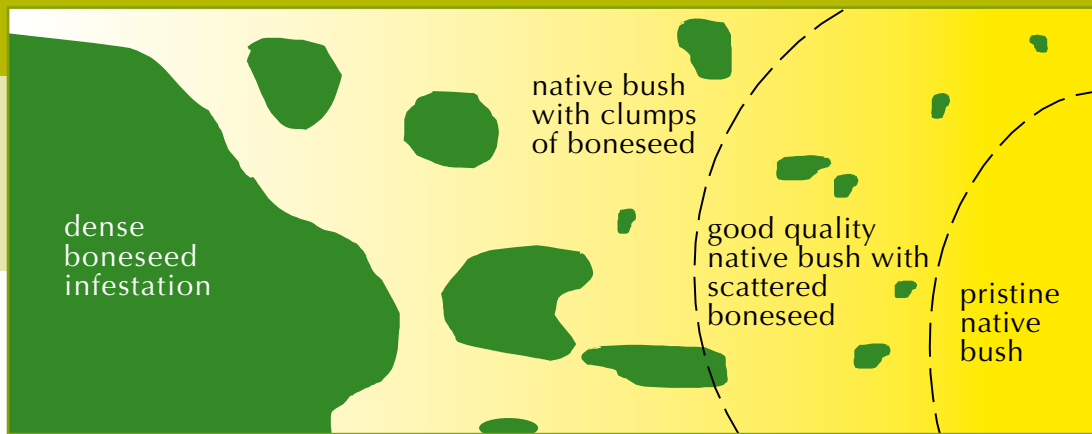
program (some simple monitoring methods are presented in Section 4).

Eradication or containment?

Ideally, the goal of all weed management programs would be the total eradication of all weeds from an area. Eradication over a small, local scale is achievable in many situations. With a long-term commitment to follow-up control and the resources to carry it out, you can eradicate boneseed from your site. However, for widespread weeds such as boneseed, eradication over a large (e.g. regional) scale is not always achievable due to a lack of resources, and containment of weed populations may be a more appropriate goal.

Containment means restricting a boneseed infestation to its current boundaries. This is a more realistic goal than eradication if the infestation is widespread and well established. Containment protects areas of native vegetation, reduces the number of new weed infestations and reduces the need for future control. The main objective is to reduce infestations to a level that does not negatively impact the natural ecology of the site.

Containing a boneseed infestation in the short-term will increase the chance of successfully eradicating the infestation in the future if more resources (funding and people) become available. Containment should also involve restoration of treated areas through native regeneration or revegetation (see Section 4).



Grades of boneseed invasion: dense infestation, patches of boneseed in native bush, good quality native bush with only scattered boneseed plants, and pristine native bush with no boneseed.

Eradication programs

Eradication of boneseed is possible when:

- the boneseed infestation only covers a small area
 - the extent of the infested area is known and accessible
 - the chance of reinvasion from adjoining areas is low
 - the infestation is detected before seeds are released
- or
- resources are available for regular surveying and control for the lifespan of the seedbank
 - new seedlings are controlled before more seeds are produced.

Eradication is most often attempted in areas of relatively good native bushland, as these areas have a greater potential for natural regeneration of native species, and may provide more resistance to further weed invasion.

A priority for eradication programs is to reduce the size of the boneseed seedbank, and to prevent fresh seed fall. This generally requires eradication programs to be more intensive (i.e. they require more resources) in the short- to medium-term, so *all* boneseed seedlings can be controlled before they mature and set seed.

Follow-up control of seedlings is critical in the first few years, but it is just as important that you maintain your commitment over the longer-term. It only takes a few plants to establish and set seed for all your hard work to be undone. Seedlings will continue to emerge

from the seedbank (perhaps for up to 10 years), or seeds may be dispersed into the area, so you need to ensure for many years that all seedlings are controlled before they set seed (i.e. annually). Only through sustained effort will you be able to achieve eradication.

A long-established boneseed infestation will be difficult to eradicate due to the large, persistent seedbank. The seedbank needs to be depleted, and this can be accomplished quickly by stimulating the seeds to germinate. Mass seedling germination can occur after fire (see case study on page 60), or after soil disturbance.

Containment programs

The key to successful containment is to focus efforts on isolated or scattered plants, and prevent boneseed spreading beyond the edges of the main, dense infestation. Once control of isolated plants is achieved, you can begin to reduce the size and impact of the main infestation. Where dense patches of boneseed border native bush, work from the edges of the boneseed infestation towards the middle of the infestation. This allows natives to regenerate from propagules in the adjacent bush. Let native plant establishment determine the rate of weed removal. That is, completely remove weeds from small areas at a time, and don't move on to the next area until enough native species have established to inhibit weed invasion.

Remember to monitor the area outside the main infestation for new boneseed seedlings. These must be controlled before they set seed for your containment strategy to be successful.

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Managing boneseed in different situations

Natural ecosystems

Many types of native vegetation are invaded by boneseed, but there are general management principles that apply to them all. Boneseed invades coastal dunes, grasslands, heath, riparian and estuarine vegetation, woodland, dry and wet sclerophyll forest, and mallee. In all these natural ecosystems control measures must be adopted that minimise damage to desirable vegetation, minimise soil disturbance, and encourage native regeneration (see Section 3 for details of control methods discussed below).

Hand removal and chemical control methods are the best choice in natural areas. Hand pulling, cutting (without herbicide), cutting-and-swabbing, and stem injection are preferred over foliar spraying, which may cause off-target herbicide damage to native vegetation.

Native ground cover species can be killed by off-target spraying, and this opens up areas to further invasion by boneseed and other weeds. Although foliar spraying may be a more efficient initial herbicide treatment than cutting-and-swabbing or stem injection, follow-up control can take far longer if many more weeds have colonised the bare ground.

Clearing a dense boneseed infestation can allow other weeds to spread rapidly by reducing competition for light, water, nutrients and space. Before removing boneseed, take note of what other weed species are growing under and around the boneseed. Other weeds may need to be treated at the same time to prevent scattered weed populations expanding after boneseed is removed. To resist further weed invasion, remove the boneseed at the same rate that native species establish and (re)colonise the area.



Kerry Brougham

Boneseed invading native eucalypt woodland.



Kym Smith

Cut-and-swab can be done close to native plants (herbicide with blue dye applied to boneseed stump on right).



Kym Smith

Overclearing of mature boneseed. Note lack of native regeneration, and numerous boneseed seedlings.

Native animals using boneseed

Boneseed may provide shelter and food for native animals in the absence of native vegetation. Keep this in mind when removing boneseed from large areas, and clear the infestation in stages to allow native plants to re-establish and to give animals time to find new habitat. Large boneseed plants can be killed by stem injection, so that the dead plants are left standing and can continue to provide some shelter.

Herbivores inhibiting native regeneration

Dense boneseed infestations may restrict herbivores such as feral deer, rabbits and kangaroos from grazing on native grasses, ground covers and seedlings. Removing large areas of mature boneseed can allow herbivores access to an area, and their grazing can prevent the establishment of native seedlings. It may be preferable to thin the cover of boneseed using hand pulling or the cut-and-swab technique, to allow native shrubs to recover before clearing the remaining boneseed. This will help restrict grazing of native ground covers, and allow native shrubs and trees to regenerate.

Disposing of boneseed plants

Removing whole boneseed plants by pulling or cutting results in a large amount of dead plant material. Dragging large boneseed plants through the bush can damage native vegetation and spread seed (if plants are fruiting), so it is recommended that dead plants be left on site to decay. To prevent re-establishment, ensure that roots are not in contact with the soil. Seeds can be destroyed on site by fire (if permitted), or can be bagged and disposed of carefully off-site by fire or in suitable land-fill.



Gillian Baker

Dead boneseed left to decay on site.

Dead boneseed plants appear to rot quickly in damp areas, but may decay more slowly in dry areas. Mulching the plants will improve the aesthetics of the site and help control erosion. Cut the plants into small pieces (about 30 cm long) and spread evenly over the ground. Be careful, however, not to lay the cuttings so thickly that you create a deep mulch that prevents native regeneration.

Mulching the boneseed cuttings on site will increase nutrient levels in the soil. This can have adverse impacts on native vegetation adapted to low nutrient soils (such as heath), by favouring weeds that thrive on high nutrient loads. Be careful where you use boneseed as mulch, so you don't provide a competitive advantage to the weeds!

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Hillary Cherry

Boneseed (in foreground) invading riparian vegetation, Tamar River, Tas.

Cultural heritage sites

Weed control around Indigenous and historic heritage sites needs to be managed carefully. Before starting any activities at your site, find out if the site holds any historical or cultural significance. Asking locals is a good place to start, and be sure to contact the local council. All stakeholders who have an association with, or interest in the site need to be involved in planning the weed management program.

Many states require that assessments be done before beginning restoration work in areas that hold cultural significance. Initially, contact your local government or NRM authority; they will be able to inform you of any issues and advise you on how to proceed.

Riparian areas

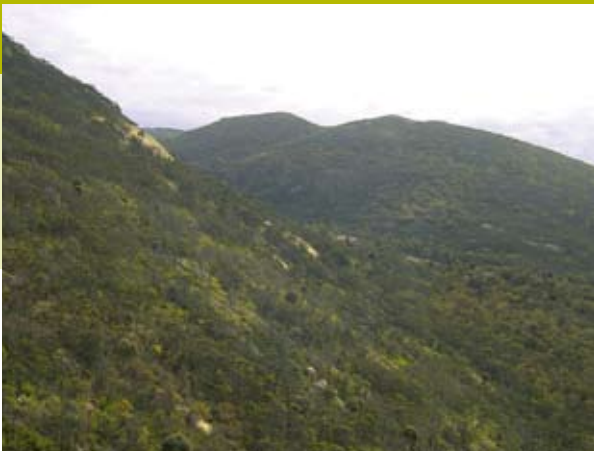
When controlling weeds along watercourses you need to use control methods that minimise bank erosion. Treat small areas one at a time to allow native plants to regenerate and stabilise the bank. In addition, try to prevent large amounts of plant material falling into pooled water, as the breakdown of organic matter can kill aquatic organisms by depleting oxygen levels. For these reasons, mechanical control methods should be avoided in riparian areas.

Cut-and-swab is the most appropriate method to use, and the cut plants should be removed from the water's edge. Cutting-and-swabbing leaves the roots in the ground, which decreases the chance of bank erosion, and removes the foliage, which prevents dead leaves from falling into the water.

Some herbicides contain surfactants that are toxic to aquatic organisms such as frogs. Use only herbicides registered for use in aquatic situations, and follow all label directions. See Section 3 for information on herbicides.

Steep and inaccessible areas

Terrain can greatly influence the choice of control methods, and in some circumstances even prevent control. Boneseed on cliff faces, steep slopes, remote areas, and at the water's edge may be inaccessible. It is important to identify inaccessible and difficult-to-access areas in your management plan, as you may need to engage trained contractors or government agency staff to control boneseed in such areas. People with the appropriate training and experience can control boneseed on cliff faces and steep slopes using safety equipment such as harnesses and ropes. You should always consider occupational health and safety guidelines when planning to control boneseed in difficult to access areas.



CSIRO

Flowering boneseed in steep country, You Yangs, Vic.

Erosion

Boneseed control on steep slopes can result in erosion, so use control methods that limit soil disturbance, and do not leave areas of bare ground. Chemical control methods are the most suitable as the roots are left in the ground and soil is not disturbed. Manual control may be used on small infestations, although hand pulling should only be performed when the soil is moist or loose to prevent erosion.

Take into account drainage patterns, and always work from the top of a slope to the bottom to prevent boneseed spreading by seed movement down slopes and watercourses. If possible, remove boneseed from the edge of watercourses to prevent seeds being carried downstream.

Pastures and grazing lands

Boneseed is not considered an agricultural weed as it is palatable to stock, and does not persist when grazed or cultivated. For this reason, many landholders do not consider boneseed to be a problem on their properties. However, good land management is important to prevent the spread of boneseed around your property and onto neighbouring properties and native bushland.

Boneseed is especially palatable to sheep and can be controlled by grazing. However, stock should not be used to graze fruiting boneseed plants as they can spread the seed in their faeces. If they have ingested fruits, quarantine stock in holding facilities before moving them into 'clean' areas.



Ros Gibson

Boneseed flowering along the Great Ocean Road, Vic.



Gillian Baker

Care needs to be taken when controlling boneseed on slopes.

Be aware of the effect of removing stock from paddocks containing boneseed. When stock graze emerging boneseed seedlings they prevent the young plants from establishing and fruiting. If stock are removed, the boneseed seedlings can mature and produce seed, and the boneseed population will expand rapidly. If you are fencing off areas of previously grazed land to promote native regeneration, you will need to control the boneseed (and other weed) seedlings as they emerge.

Mechanical control using heavy machinery may be appropriate on agricultural land. Small excavators can be used to pull mature boneseed plants from the ground. To minimise soil disturbance, mechanical pulling should only be done in sandy or loose soils so that the root mass comes out of the ground more cleanly. Slashing or grooming attachments on tractors or excavators can also be used to fell and shred boneseed plants. However, this will not kill all boneseed plants, and the regrowth will need to be treated.

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Nicole Zeoli

Boneseed plants clustered around dead paddock tree. Birds deposit seeds while roosting.

All machinery and vehicles will cause soil disturbance and compaction, and this needs to be carefully balanced against the time-saving benefits of using machinery. Revegetation with local native species will usually be needed after mechanical slashing and grooming to prevent further weed invasion.

Road, utility and railway corridors, and vacant land

Boneseed often occurs along road, utility and railway corridors, which are managed by local councils, state governments, utility providers and transport operators. Although these areas are often degraded, roadsides and utility corridors can contain the only remnants of native bush left in an area. If this is the case, these areas do have conservation value, and weed control methods should be chosen that minimise disturbance to desirable vegetation and soil (e.g. hand pulling or cut-and-swab).

Vacant land, such as land awaiting development, is often unmanaged. Weed infestations on such land can easily spread to neighbouring properties and native bushland. At a minimum, boneseed infestations should be managed to prevent seeding and spread to other areas. On heavily degraded land, this can be achieved by slashing (mechanical

slashing or with a brush-cutter) at least once a year before flowering. Alternatively, foliar spraying from a vehicle-based spray unit at least once a year will also prevent seeding, and should kill all boneseed plants. These control methods can be carried out cost-effectively by land managers or contractors.

Legislation exists in most states and territories that requires landholders to control boneseed on their land (see Section 6 for declaration details). Cooperation between all landholders in an area is essential for successful control, as boneseed will quickly spread from an unmanaged property to (re)invade neighbouring properties.

Developing a management plan

Presented below are the steps involved in developing a weed management plan. A good resource with more detailed information on planning and monitoring is the *Introductory weed management manual*, published by the Cooperative Research Centre (CRC) for Australian Weed Management (2004) and available free in hard copy or by download from the CRC's website <www.weeds.crc.org.au>.



Hillary Cherry

Boneseed invading degraded vacant land, Tas.



Richard Holloway

Boneseed in ungrazed pasture, Droughty Point, Tas.

Step 1: site assessment

To help you plan your weed control activities, carry out a site assessment. Preparing a site information sheet and a weed management map will help to:

- accurately target weed control activities
- allocate time and funds
- monitor the effectiveness of control treatments
- identify other important issues (safety, access etc.).

Site information sheets

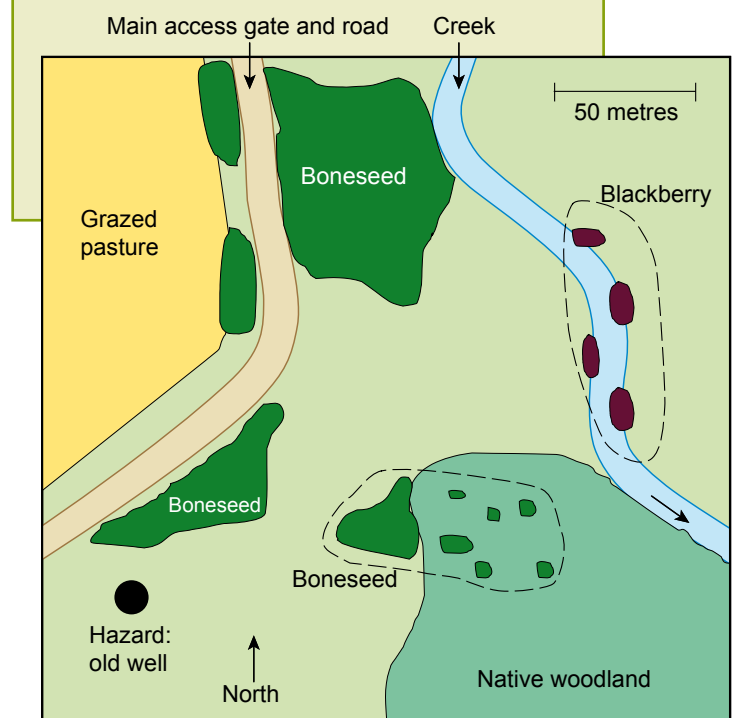
A site information sheet should include:

- site location (latitude and longitude, GPS or map coordinates) and a site map
- date surveyed
- stakeholders – who owns the land, who uses the area, or who has an interest in or association with it?
- site conditions (e.g. vegetation communities, soil type)
- weed species present, their origins and reinvasion pathways (if possible)
- animals or threatened plant species present
- land-use and/or management history of the site
- disturbance history of the site
- safety hazards such as water, steep or uneven terrain
- management issues such as accessibility, gates, cultural heritage assets.

Weed management maps

Topographic maps or aerial photographs (available from your local council or library) are a good base on which to create your weed management map. Use separate transparent overlays and coloured markers to record natural features, native vegetation and weed infestations. This will make the map easier to interpret. Make sure you include a map legend, north orientation, and a scale.

A mud-map (below) is a simple alternative. Use different colours for different weed species.



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Step 2: set goals

Set realistic goals that focus on what you are trying to protect or restore, rather than on weed control alone. For example, your goal may be to:

- restore a native open woodland community by eradicating a recent boneseed infestation
 - protect a threatened plant species by controlling the boneseed
- or
- contain an extensive boneseed infestation to its current area in the short term by controlling isolated plants, and in the long term restore the site by gradually controlling sections of the main infestation.

Step 3: prioritise

Prioritise areas for control beginning with areas of highest conservation value (e.g. areas containing threatened species). High priority should also be given to new boneseed infestations and isolated plants that have not set seed, to prevent a seedbank forming that will require extensive follow-up control.

Focus control efforts where success is most likely, such as areas that are easily accessible, have relatively intact native bushland (or good agricultural land), and are important to the community (so long-term management is maintained). Highly degraded areas that have a high chance of invasion by other weeds following boneseed control may be a lower priority.

Where possible you should consult local experts, council weed officers, NRM board officers or CMA officers to help you prioritise areas for control.

Always work from the best areas to the worst.



Above: Volunteers control boneseed to protect the rare Woolly New Holland Daisy (inset).



Wendy Andrew

H&A Wapstra

Step 4: develop a control plan

Determine the best boneseed control methods for your site for initial and follow-up treatments by assessing:

- the appropriateness of each method (based on land-use situation, terrain, and the size, density and age of the boneseed infestation)
- your goals (are you trying to eradicate or contain the infestation?)
- your resources (people, funding and equipment).

Establish a long-term plan (i.e. more than three years), and schedule control and follow-up activities at the time of year they will be most effective (see Section 3 for details on control methods). Include time for monitoring in your annual timetable.

People required

Assess how many 'people-hours' will be required to complete the planned control program. Also consider what skills, training and experience are needed to carry out each control method and monitoring technique. If labour is likely to be a limited resource, focus your control efforts on a manageable area – it is better to completely control boneseed over a small area than to expend resources on a large area that cannot be followed-up or maintained.



Trevor Wyniat

Boneseed is easily spread along road corridors (along roadside, Mt Burr, SA).

Financial plan

Compare the costs associated with each control method, and develop a financial plan. There are obvious costs associated with each technique such as herbicide, spray equipment, machinery, and labour; but do not forget the less obvious expenses such as protective gear, lockable storage for herbicides, and training. It is important to budget over the long term, and allow for follow-up work and monitoring.

To save costs, check if you can borrow equipment from councils, landcare organisations, and catchment authorities. If you are working on public land, councils or state agencies may also supply herbicides and even trained operators to assist you. See Section 6 for information on funding opportunities.

Step 5: monitor your progress

Monitoring allows you to:

- assess the effectiveness of your control measures
- assess the rate of establishment of desirable vegetation
- identify new weed infestations
- identify any new issues that will affect your control program
- demonstrate your progress to your group or funding body.

Monitoring is an extremely important part of a boneseed control plan. Information gathered through the monitoring process will allow you to adjust your weed management plan to adapt to changes at your site, and improve future outcomes. Collecting meaningful monitoring data ensures your results can be used to develop and improve best-practice guidelines for management. See Section 4 for further details on monitoring.

