Warrandyte to Kinglake Habitat Corridor Network

Environmental Works Toolkit

Parks VICTORIA

Melbourne Water®

State Government Victoria
Department of Environment and Primary Industries

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THE GREEN WEDGE SHIRE

Acknowledgements

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Further information

For further information on the Warrandyte to Kinglake Habitat Corridor Project or the Environmental Works Toolkit, visit the Nillumbik Shire Council Website at www.nillumbik.vic.gov.au or contact the project coordinator, Stacey Warmuth at Nillumbik Shire Council on 9433 3184 or stacey.warmuth@nillumbik.vic.gov.au.

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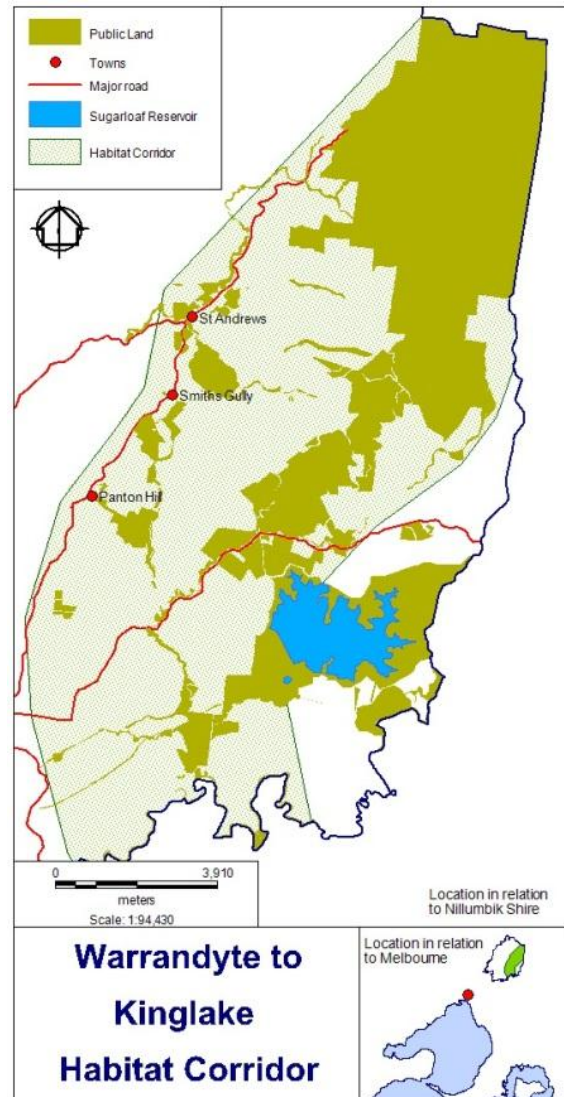Contains Vicmap information © The State of Victoria, Department of Environment and Primary Industries, 2014.

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1 The Toolkit

The *Environmental Works Toolkit* is a set of resources for land managers organising on-ground biodiversity conservation works. The *Warrandyte to Kinglake Habitat Corridor Network* developed this toolkit for projects on public land within the corridor. However, as interest in the toolkit has grown we are adapting the toolkit and sharing it with the broader environmental community.

The toolkit includes tools for prioritising and planning works, mapping weeds and rabbits, engaging contractors and reporting outcomes (Section 2). It provides methods (Section 3) for the practical application of the principles of collaboration, landscape-scale management, adaptive management, asset prioritisation, the biosecurity approach and strategic goal setting (Section 4).

We developed the toolkit using known best practice and trying to ensure consistency with existing systems (e.g. Parks Victoria Pest Plant Mapping and Monitoring Protocols, Victorian Biodiversity Atlas, National Core Attributes for Weed Mapping). We have used and refined the toolkit for public land works for more than three years ensuring the tools are practical and suitable for on-ground action. We have also started the process of developing tools for community groups and private landholders.

The aim of this toolkit is to have a system for managing environmental works that is easy and practical for users of all skill levels. We believe that having a shared system provides a framework for government and the community to collectively plan and share results for true landscape-scale management.

Figure 1: Data requirements of each user group

	Planning	Recording works	Reporting	Compiling and quality assuring data
Agency	✓	supporting*	✓	✓
Contractor	supporting	✓	✓	
Community group	✓	✓	✓	
Landholder	✓	✓		

* Assuming agencies employ contractors to carry out on-ground works.

Please note: There is a potential for the toolkit to grow in scope and resources as more tools are developed.
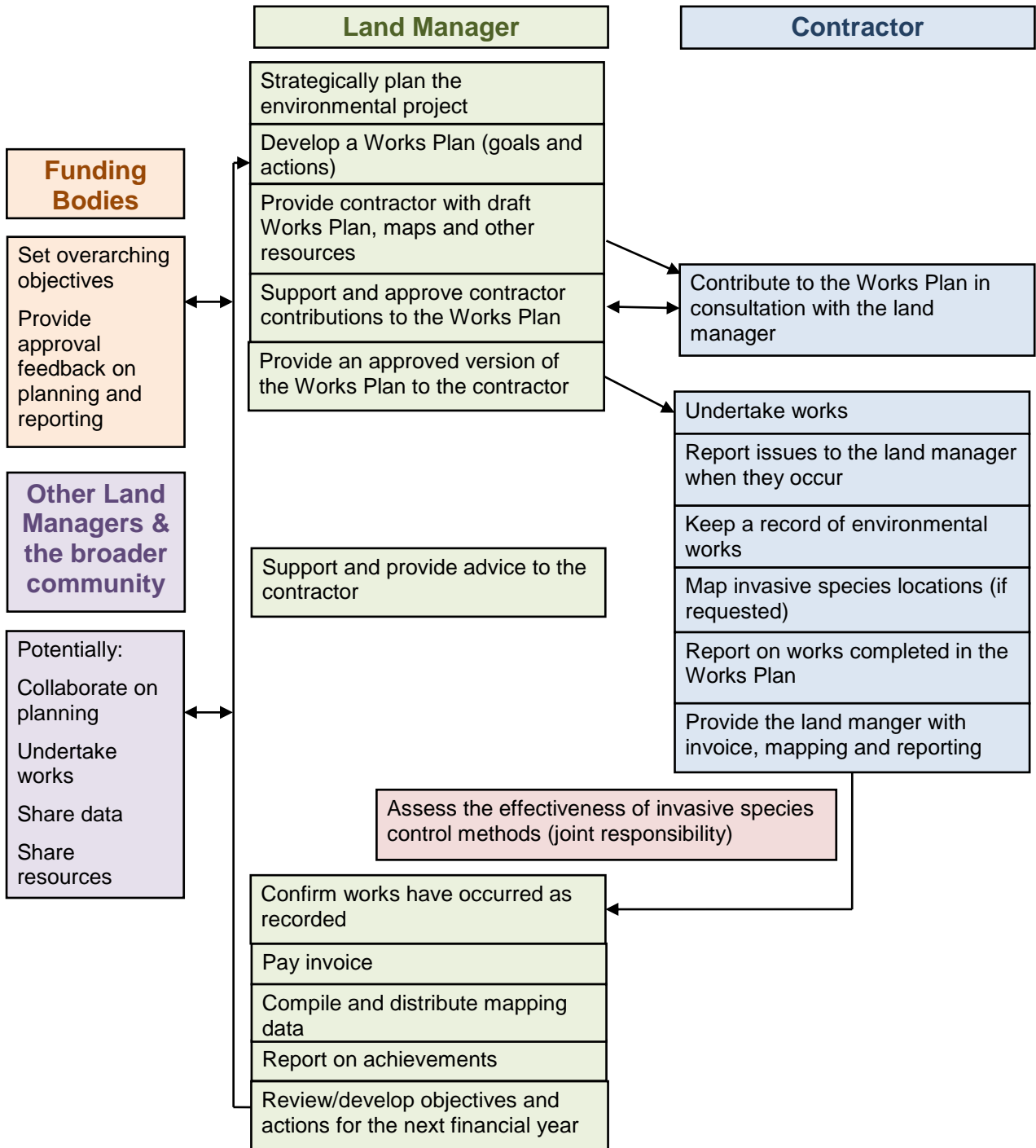
2 Toolkit contents

Table 1: Environmental Works Toolkit Contents

Type of tool	Tools
Manuals and fact sheets	- Environmental Works Toolkit (overview – this document) - Agency guide to running on-ground biodiversity projects (under development) - Environmental Works mapping data fields - Environmental Works contractor reporting procedure - Environmental Works planning, mapping and monitoring – a guide for community groups and private landholders (under development) - Weed mapping and monitoring for landholders - fact sheet (under development) - Weed Record for Apple Numbers (iPhone, iPad or iPod touch)
Templates	- Biodiversity project template (under development) - Works plan template – government - Works plan template – community (under development)
Data collection tools	- Weed mapping and control works recording sheet - Rabbit mapping and control works recording sheet - Weed data collection – quick reference - Rabbit data collection – quick reference - Weed Record for Apple Numbers (iPhone, iPad or iPod touch)
Training tools	- Environmental Works Toolkit Training (manual) - Environmental Works Toolkit PowerPoint presentation - Nillumbik Shire Council Environmental Works Contractor Induction Session PowerPoint presentation - Example Works Plan - List of workshop attendees spreadsheet
Additional resources	- Nillumbik Shire Council bushland and wetland reserves prioritisation and planning guidelines - Nillumbik Shire Council conservation management plan user manual - Nillumbik Shire Council conservation management plan template

3 Toolkit procedure

Figure 2: Environmental Works Procedure

Land Manager	**Contractor**

Funding Bodies

Set overarching objectives

Provide approval feedback on planning and reporting

Other Land Managers & the broader community

Potentially:

Collaborate on planning

Undertake works

Share data

Share resources

Land Manager:

Strategically plan the environmental project

Develop a Works Plan (goals and actions)

Provide contractor with draft Works Plan, maps and other resources

Support and approve contractor contributions to the Works Plan

Provide an approved version of the Works Plan to the contractor

Support and provide advice to the contractor

Contractor:

Contribute to the Works Plan in consultation with the land manager

Undertake works

Report issues to the land manager when they occur

Keep a record of environmental works

Map invasive species locations (if requested)

Report on works completed in the Works Plan

Provide the land manger with invoice, mapping and reporting

Assess the effectiveness of invasive species control methods (joint responsibility)

Land Manager:

Confirm works have occurred as recorded

Pay invoice

Compile and distribute mapping data

Report on achievements

Review/develop objectives and actions for the next financial year

3.1 Project management

The Warrandyte to Kinglake Habitat Corridor Network developed the toolkit within the broader scope of managing a collaborative landscape scale environmental project. The Network is currently developing a manual, which will bring together the different aspects of the toolkit with consideration for budgeting, risk management, stakeholder engagement and reporting within a MERI (Monitoring, Evaluation, Reporting and Improvement) framework.

3.2 Works Planning

Works plans (Figure 3 and Figure 4) define specific goals and actions. Works plans bring together asset prioritisation, the biosecurity approach and strategic goal setting (see Section 4).

By having standard methods and templates for developing works plans, land managers can compare works in different reserves, properties and projects and share information with the various people conducting on-ground work in the same area.

Wording of goals and actions in the works plans is very important to make sure the plan is implemented effectively and that land managers can monitor the success of their plans (see Appendix 5.1).

The toolkit's Works Plan Template also provides sections for reporting on works completed (Figure 4). This helps land managers monitor contractors, track invoices and plan works.

Figure 3: Works Plan Template

Works Plan			Year 1						Year 2
			Annual Works Plan*					Actual Works	…
Works ID	Weed/ Threat /Issue	Five year goal	Action	Control Method/s	Timing	Estimated Time (hrs)	Estimated Cost ($ exGST)	…	…

* The Work Plan template for agencies also provides a section to allow environmental contractors to provide input into the planning and costing of works.

Figure 4: Example of a Works Plan Reporting Template

Year 1						
Annual Works Plan	Actual Works					
….	Progress	Comments	Suggested follow-up works	Actual hours	Actual Cost ($ exGST)	Invoice number/s

3.3 Mapping

The toolkit sets a standard format for collecting location-based information about threats and assets and resources for collecting weed and rabbit mapping. By keeping all data in the same format we can compare information from a variety of sources and make better landscape-scale decisions. As an example, Appendix 5.2 provides the weed mapping data fields.

3.4 Monitoring

Monitoring is an important part of running an environmental works project. By understanding what is happening on the ground, land managers can make better decisions. Monitoring could include: flora and fauna surveys, vegetation-monitoring plots and transects, fauna cameras, photopoints, works monitoring and weed mapping. Currently the toolkit provides instructions and resources for photopoint monitoring, works monitoring and weed mapping.

3.5 Evaluation, Review and Reporting

Information collected when planning, recording works and mapping using the toolkit can help land managers determine if works are having a positive impact and how they can adapt actions to improve their results.

For most people, the ultimate outcome desired of environmental works is an improvement in the health of the natural ecosystems – not just a reduction in invasive species. However, in these complex environments other factors, such as climate, other works occurring, and the actions of other land managers, can have a major impact on environmental health. Particularly in the short term, it is very difficult to measure environmental health and link it to works completed.

However, the inputs (time, cost, actions) and the direct outcomes (changes in invasive species cover and abundance, area revegetated) provide important indicators of success. Longer term monitoring of assets, threats and works will reveal a more accurate picture of progress. Table 2 lists some of the important indicators of success and where the toolkit is used to collect the information.

On large and long-term projects and projects focusing on the protection of threatened species evaluation would be well complemented by using scientifically rigorous monitoring methods.

Based on the results of the evaluation there are several actions users can take to improve the outcomes of their projects:

- Review works plan – change goals, actions, estimations of costs and time
- Change resource allocations (money and time) – Increasing resources in the early years of a works plan may allow them to get on top of a weed infestation. Alternatively they may find that resources are better allocated to other weeds/areas/activities.
- Change invasive species control methods

Table 2: Indicators of success

Indicators of success	Source
Accurate estimations of costs and hours (time spent on on-ground works)	▪ Works plan
Works plan is accurate and easy to follow	▪ Works plan
Actions are completed as planned	▪ Works plan
A reduction in costs over time (without an increase in cover/abundance of invasive species)	▪ Works plan
A reduction in time spent on invasive species control over time (without an increase in cover/abundance)	▪ Works plan ▪ Weed mapping and control works record
A reduction in the use of herbicides and other chemicals (without an increase in weed cover/abundance)	▪ Weed/rabbit mapping and control works record
Area of weed treated reduced over time (without an increase in weed cover/abundance)	▪ Weed mapping and control works record
Cover and extent of invasive species infestations reduced	▪ Weed/rabbit mapping ▪ Photopoints
Number of new weed infestations reduced	▪ Weed mapping ▪ Works plan
Midterm (4-5 year) goals achieved or exceeded	▪ Works plan ▪ Mapping
Little or no off-target impact on native species	▪ Photopoints ▪ Observations of weed control works
Condition of native vegetation improved	▪ Photopoints ▪ General observations ▪ Other environmental monitoring (not in toolkit)

The toolkit also provides data that land managers can use to provide the following information in reports:

- details of expenditure.
- before and after photos from photopoints
- maps showing the location of works
- maps showing areas treated overlayed over weed distribution
- maps showing changes in weed cover and distribution
- maps showing planned treatment areas over actual treatment areas
- graphs/tables showing progress towards achieving annual actions
- graphs/tables showing progress towards achieving midterm (4-5 year) goals

3.1 Education

There are significant advantages when land managers (public and private) work together using shared tools. However, to do so requires education for agency staff, contractors and the community. The toolkit provides manuals, factsheets and training tools to help promote this consistent approach.

4 Toolkit principles

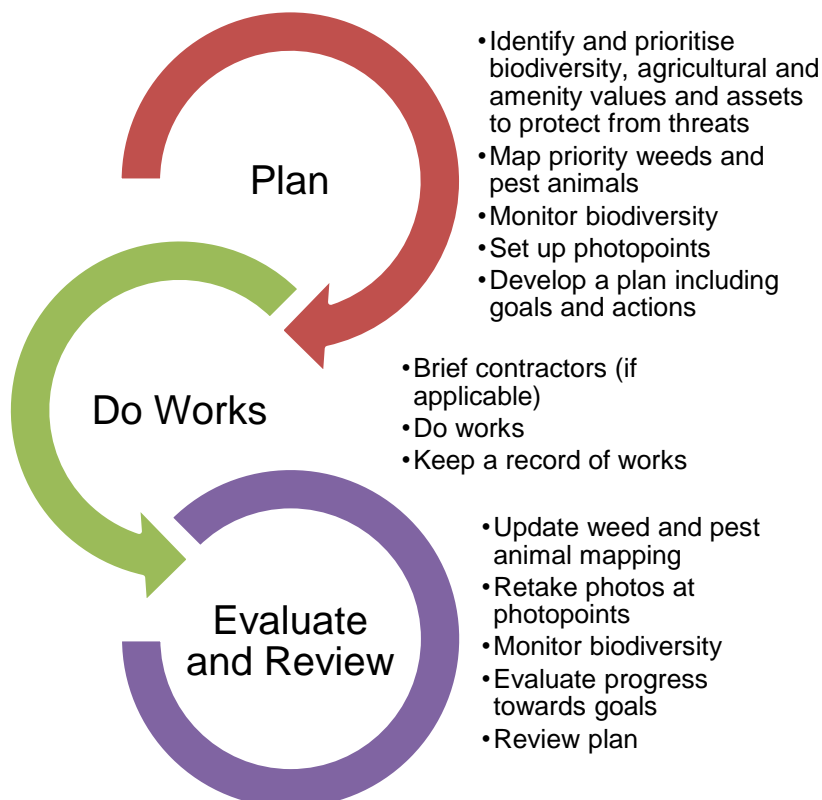## 4.1 Collaboration and Landscape-scale management

The toolkit allows different land managers to collaborate at a landscape scale. It does this by providing tools for land managers to develop collective goals and share works plans and mapping that are in the same format.

The toolkit acknowledges that environmental contractors can have an intimate understanding of the areas they are working in and certainly should have a better understanding on the effectiveness of different control methods. The toolkit allows better decisions by harnessing the contractor's knowledge and combining it with the land manager's broader understanding of the priorities at a landscape-scale. Maintaining the same contractor on a site over time and including them in the decision-making should help enhance the connection and ownership a contractor has for a site.

4.2 Adaptive management

Planning is essential for on-ground environmental works. Good plans enable land managers to manage works over several years and/or over large areas. The best plans constantly evolve based on the outcome of control works and changes in environmental condition through a cycle of **plan**, **do** and **review** (see Figure 5). The toolkit provides methods and tools for all stages in this process.

Figure 5: Environmental works cycle

Plan
- Identify and prioritise biodiversity, agricultural and amenity values and assets to protect from threats
- Map priority weeds and pest animals
- Monitor biodiversity
- Set up photopoints
- Develop a plan including goals and actions

Do Works
- Brief contractors (if applicable)
- Do works
- Keep a record of works

Evaluate and Review
- Update weed and pest animal mapping
- Retake photos at photopoints
- Monitor biodiversity
- Evaluate progress towards goals
- Review plan

4.3 Asset prioritisation

The toolkit operates on the principle of protecting and enhancing the highest value assets at the greatest risk first and then progressively concentrating on lesser value assets at lower risks. In this context, assets could be an indigenous species, a vegetation community, a landscape, a reserve or a patch of vegetation. Asset prioritisation allows land managers to decide how to best direct finite resources.

Asset prioritisation at a small scale may be obvious, however as the scale increases so does the complexity of the decision-making. For private landholders asset prioritisation may involve simply mapping their areas of bushland and learning about the plant and animal species present. For large landscape scale projects like the Warrandyte Kinglake Habitat Corridor Project more comprehensive knowledge and asset prioritisation tools are needed.

There are many asset prioritisation tools, resources, and decision frameworks. The ones a land manager chooses depends on the values and assets they are trying to protect. The toolkit provides some simple asset prioritisation tools based on those used for the Warrandyte to Kinglake Habitat Corridor Project and for the prioritisation of Nillumbik Shire Council's conservation reserves. Other parts of the toolkit are still usable with different asset prioritisation methods.

The Warrandyte to Kinglake Habitat Corridor Project selected key ecological assets (vegetation communities, species and attributes) representing the biodiversity values the project needs to protect from weeds to achieve the project's vision. By protecting these ecological assets, the project aims to contribute to the protection and enhancement of the whole range of communities, species and attributes supported within the project area.

Key Ecological Assets for the Warrandyte to Kinglake Habitat Corridor

Communities

- Dry forest (including Box Ironbark Forest)
- Riparian areas (including creek-lines and gullies)

Species

- Brush-tailed Phascogale
- Common Dunnart
- Galaxias species
- Orchids

Attributes

- Old growth, hollow bearing trees
- Structural diversity with a broad age class distribution
- Landscape Context (connectedness, width, area) connectedness of quality habitat
- Aquatic habitat health (Dwarf Galaxias and platypus present)
- Understory diversity
- Recruitment of native plants

Nillumbik Shire Council developed a reserves priority setting tool (see Appendix 5.3) to prioritise reserves for management according to their biodiversity, social and cultural values, the threats that may impact upon them to ensure Council's finite resources are used to achieve best long-term outcomes. Council used the scoring from the tool to divide reserves into groups that receive different levels of service.

For both the Warrandyte to Kinglake Habitat Corridor Project and Nillumbik Shire Council's bushland reserves the final step in asset prioritisation is the same. The toolkit provides guidelines for ranking different areas within reserves or a landscape in order of priority (see Table 3). This allows setting of consistent goals across large project areas.

Table 3: Asset area prioritisation

Core Habitat (& Biodiversity Hotspots)

Areas of **Core Habitat** provide refuge for indigenous plants and animals to live, reproduce and flourish. Protecting, improving and connecting core habitat areas is the highest priority for nature conservation to maintain ecological function at a landscape scale.

Within these **Core Habitat** areas may be hotspots of biodiversity (**Biodiversity Hotspots**). Biodiversity Hotspots provide important habitat for the most sensitive species and/or contain a particularly high diversity of indigenous plants and animals.

Rehabilitation Areas

Rehabilitation areas are areas of lower quality bushland compared to core habitat.

Cleared/degraded areas

Cleared or degraded areas are areas that support mostly exotic and few native plants

Agricultural areas

Agricultural areas are areas that support agricultural production, such as vineyards, orchards, cropping and pasture.

4.4 Biosecurity approach

The biosecurity approach supports the management of invasive species at all stages of invasion – from preventing the entry of new species to managing widespread infestations. It acknowledges that economic returns for managing pest plants and animals are much higher when infestations are new or small, thus the old adage: prevention is better than cure.

When managing established pest plants and animals, the biosecurity approach prioritises the protection of areas with the greatest biodiversity or agricultural values that are at the highest risk of damage. This also involves managing pest animals and high threat weeds growing outside these areas, if they are likely to spread into these high priority areas.

In practical terms, the biosecurity approach can include the following actions for weed management:

1. **Prevention:** Prevent the spread of invasive species from areas where they are present into areas where they are not.
   - Identify and manage sources of invasive species
   - Prioritise management of new and emerging invasive species
   - Manage threatening processes that encourage the growth and spread of invasive species

2. **Eradication:** Eradicate small infestations of invasive species.
   - Target invasive species when numbers are low

3. **Asset protection:** Manage existing infestations to minimise impact on biodiversity and agricultural values.
   - Prioritise the protection of areas with the greatest biodiversity and agricultural values at the highest risk of damage from invasive species
   - Target pest animal populations that are directly impacting biodiversity or agricultural values
   - Remove weeds that are smothering or otherwise directly impacting indigenous plants
   - Use structures to protect significant biodiversity values (e.g. rabbit proof fencing, orchid cages), particularly when grazing pressure is high
   - Stagger weed removal, allowing natural regeneration to maintain habitat value and prevent new weeds emerging
   - Manage vegetation to increase the protective habitat for native animals from predators like foxes and cats

4. **Containment:** Contain established species to limit spread.
   - Eradicate/remove isolated infestations
   - Target mature reproducing individuals
   - Prevent seed set (weeds)
   - Reduce the size of infestations at a rate that allows natural regeneration (weeds)

Some notes on the biosecurity approach for weeds

Figure 6: A biosecurity approach to weed management (adapted from Department of Environment and Primary Industries publications)
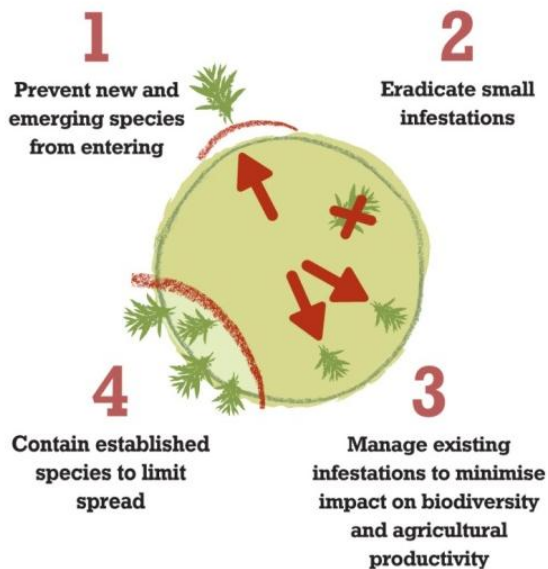
Weed lists

The toolkit advocates developing two weed lists:

- Weeds present that pose a high threat to biodiversity and agricultural values
- Weeds that have the potential to invade and if present would pose a high threat to biodiversity or agricultural values

These lists will vary with location.

New and emerging weeds

The Victorian Government (2010) defines a new and emerging weed as:

> *A recognised weed that has recently been detected, or a plant species that has been known in the area for some time, but has only recently been recognised as having invasive properties.*

> Invasive Plants and Animals Policy Framework

Consider which weeds are new and emerging at all scales. Thus a weed could be considered new and emerging if it is new to a Shire, a Landcare area, a reserve or a property.

The biosecurity approach gives priority to preventing new and emerging weeds establishing and, if possible, eradicating small infestations for the most cost-effective and long-term result. As a first defence against weeds, it is a priority to monitor for new and emerging weeds and budget for their management.

Established weeds

Weeds that are already established in an area are less cost effective to manage, but may pose a significant threat to biodiversity or agriculture values.

Some weeds pose a higher threat to native vegetation than others. The level of threat that a weed poses depends on the risk of a weed invading bushland or agriculture and the impact it has on the values present (biodiversity or agricultural).

Following the biosecurity approach, it is a priority to contain the extent of established weeds and minimise their impact on biodiversity and agricultural values.

Weed pathways of threat

Weeds disperse from many sources and by many processes. Without managing these pathways of threat, weed control works may be ineffective in the long-term. Weed mapping and monitoring should aim to identify where weeds are dispersing from to help land managers determine which weed sources are practical to manage. Appendix 5.2 identifies key threatening processes that encourage the growth and dispersal of weeds. The biosecurity approach prioritises the prevention of weeds.

4.5 Strategic goal setting

The toolkit promotes the setting of goals based on asset prioritisation, threat identification and available resources. Medium term goals (4-5 years) make choosing actions easier and allow land managers to assess if their projects are successful (see Figure 7).

When setting goals land managers may need to consider the biodiversity value of the asset, the cost versus the benefit of doing works, the time scale over which a threat is acting, community input and resources available now and in the future.

There is always a balance between allocating resources to achieve a small benefit for a very high value asset versus allocating resources to achieve a large benefit for a medium value asset. One way to solve this quandary, if resources are sufficient, is to start with the principle of no loss across all assets and then build improvement into the goals starting with the highest value assets.

Flexibility is required on-ground. Site-specific goals and actions may vary from the overarching goals of a project depending on the:

- biodiversity assets to be protected
- level of threat
- extent of an invasive species infestation
- the ecology of an invasive species
- feasibility of control
- ownership of the land
- accessibility
- resources available

Figure 7: Example of goal setting

■ Highest priority ■ Medium priority □ Lowest priority

	Core Habitat (& Biodiversity Hotspots) Improve the condition	Rehabilitation areas Maintain the condition	Cleared/Degraded areas Stop the threat
New and emerging weeds	▪ Prevent establishment ▪ Monitor for new infestations ▪ Eliminate		
High threat weeds	▪ Contain & reduce infestations ▪ Eliminate if practical/possible	▪ Contain infestations ▪ Prevent spread to other bushland areas	▪ Prevent spread into bushland
Other weeds	▪ Monitor for increasing abundance and contain where practical		▪ No objective
Weed pathways of threat	▪ Control threatening processes when possible ▪ Identify weed sources outside the project area and work with other land managers to contain the threat		
Pest animals	▪ Manage pest animal threats according to regional priorities ▪ Seek collaboration within the local area to achieve integrated pest animal management ▪ Consider rabbit proof fencing or orchid cages to protect specific biodiversity values		

5 Appendices

5.1 Setting Work Plan goals and actions

Setting Goals

Outcome based goals

Goals specify the outcome you expect at the end of a particular timeframe (such as the five-year timeframe of a Conservation Management Plan).

When setting goals, consider the overall goals for your area (Section 4.5) and the biosecurity approach (Section 4.4). Set goals that are S.M.A.R.T (**S**pecific, **M**easurable, **A**chievable, **R**elevant and **T**ime-bound). Goals should reflect the outcomes you want to achieve. You may vary your goals from the level of service depending on the:

- natural values to be protected
- vegetation type
- slope
- level of threat
- current availability of resources ($, time)

- weed or pest animals ecology
- ease of control
- accessibility
- your ability to control external weed sources, pest animals and threatening processes

Make sure you have a good understanding of the ecology of a weed or pest animal before setting control goals.

Wording goals

The language used when setting goals is very important because they provide a benchmark to monitor the success of your project. Goals need to make it very clear what you intend to achieve and where. For weed control, use words such as Maintain, Eliminate, Reduce, Remove or Engage.

Maintain: For example: "maintain an area free of a weed species". A maintain goal may apply to an area in which a weed has been removed (or is not yet present but likely to invade) and would involve actions such as surveillance for and treatment of all new infestations.

Eliminate: A nice way of saying kill. For example: "eliminate all isolated infestations", "eliminate a particular infestation" or "eliminate all plants within a particular area". Even if a weed is eliminated it is likely there will be a soil seed bank, a small number of remaining undetected plants and/or ongoing dispersal from outside the site. Thus, ongoing maintenance works will probably be required.

Reduce: A reduction in the cover of a weed, extent of a weed infestation or level of soil seed bank.

Remove: Use a remove goal to relate to the protection of a particular biodiversity asset. For example: "remove all plants from around a significant species" or for a climbing weed – "remove all aerial parts from native plants".

Engage: For example: "Engage adjacent land holders to treat their infestations of a particular weed".

Eradicate: Don't use the word 'eradicate' unless dealing with a small infestation of a high threat new and emerging weed (such as a state controlled weed), as it is defined as complete and permanent removal of a weed. For most weeds even once all plants are eliminated, seeds or propagules will remain in the soil or will be able to enter the site from nearby populations.

Containment

How you contain a weed infestation will depend on the ecology of the weed and its current extent. If the level of service is to contain and/or prevent spread, the specific goals may include:

- Eliminate all plants within a defined distance of a biodiversity asset
- Eliminate isolated infestations
- Eliminate recruiting individuals
- Reduce the extent of a core infestation
- Prevent a core infestation from seeding (e.g. by quick spraying, slashing or deadheading)

Setting Actions

Input based actions

Unlike a goal which is outcome based, actions should be input based, relating to what you want done on or for the site. Outcomes are difficult to measure over a single year due to environmental variability and variable responses of weeds to control. Input-based actions make it clear what you want done, make it easier for contractors to cost works and can be measured in the short term.

Wording actions

Writing clear, unambiguous actions is important to provide a clear line of communication with contractors and allow you to assess if the action is completed. Use words like treat, systematically search, map and engage:

- **Treat:** Use the word 'treat' to represent any control activities – the specific method can be included in the control method column. Specify the lifeform and location – for example: "Treat all mature sweet pittosporum in the rehabilitation area".
- **Systematically search:** For example: "systematically search an area of a reserve and treat all infestations found". This builds surveillance into your action and gives you some certainty that areas are weed free.
- **Map:** Sometimes mapping is required to plan and prioritise future actions (see Section **Error! Reference source not found.** and the Contractor Reporting Procedure).
- **Engage:** You may wish to specify how you want to engage a landholder, although as a different department or organisation than the land manger (you) often delivers programs available to assist landholders, you may wish to leave the action vague and provide details in the comments section at the end of the year.

Dividing up actions over the length of a project

- Consider the sequence of actions required to achieve your goals.
- Consider budget and resource availability.

- For revegetation consider:
  - Ordering plants
  - Preparing the site
  - Planting
  - Watering
  - Follow up weed control
  - Removing guards
- For weeds consider:
  - the ecology of the weed. For example: Boneseed's seed can remain viable in the soil for up to 10 years. It reaches maturity at 18-24 months, flowers in autumn, fruits in winter-spring and seeds are mostly dispersed locally. Therefore, a systematic search and treatment of all plants every 2 years in autumn, when the plant is flowering, should reduce the seed bank to negligible levels within 10 years.
  - how the weeds will respond to other actions such as rabbit control, weed control or ecological and fuel reduction burns.
  - what plants may grow in the spaces created by treated weeds. Think about how you can stagger works or change control methods to prevent re-infestations of the treated weed or infestations by new weeds.
  - how weeds may spread if you don't do a particular action. Plan the actions first that protect a biodiversity asset or prevent a situation worsening.
  - that sometimes a big push in the early years, particularly if there are lots of mature seeding plants, can allow you to get ahead of a weed.
  - that in more degraded areas staggered removal of weeds is often desirable to allow natural regeneration of native species. Staggered removal may also be appropriate in more intact areas to make sure you don't impact too heavily on fauna populations that might be using weeds for habitat.
  - that it may take treatment of the same area over several years to exhaust a seed bank – consider the length of time seed remains viable in the soil.
  - Even once you reach your goal you will probably still need to systematically search for and treat new infestations and emerging seedlings.
- Build flexibility into your actions considering unexpected weather conditions, weed growth or wildfire.

5.2 Weed mapping data fields

Table 4: Weed mapping data fields

Field	Field Type	Field Options	Field Description
Asset ID	Character (100)		Unique identifier for each parcel of land.
Inspection ID	Integer		Unique identification code (ID) that provides a reference to a particular weed infestation record. In most cases this field will be added by the data manager or auto-generated by the PDA. Each ID is used only once. This ID will enable data to be collected from a number of different sources and prevent duplication.
Inspector	Character (100)		Name/s of person/people mapping the weed infestation and doing the works (including operator and supervisor). Initials are okay, as long as it is possible to identify the people present.
Inspect Date	Date/Time		Date the infestation is mapped and treatment starts.
Organisation	Character (100)		Name of the organisation collecting the data and doing the works.
Common name	Drop-down Character (254)	List of common names	Common name of weed. Entering common name will automatically fill in scientific name.
Scientific name	Automatic Character (254)	Automatically fill scientific name based on common name	Scientific/botanical name of weed. Filled in automatically by the common name drop down.
Extent diameter	Drop-down Character (20)	Polygon <1m 1-5m 6-10m 11-25m 26-50m >50m	The average diameter of the infestation. For polygon data (mapping the area of the weed infestation) select/enter "Polygon". For point data (a GPS point taken to represent a weed infestation), take the GPS point from the central point of the infestation and enter the extent.
Cover percent	Drop-down Character (60)	Present (not assessed) Trace (<1%) Light (1-10%) Medium (11-50%) Dense (>50%) Absent	Estimate of the projective foliage cover of the weed infestation. Projective foliage cover is an estimation of the percentage of the ground that would be covered by the shadow of the weed's leaves if the sun was directly overhead. For dormant deciduous trees, the estimate should consider what the cover would likely be in summer. Inspectors are advised to take care when estimating the cover of grasses as their cover can be misleading when viewed from the side; a better estimate is achieved by looking down at the infestation.
Age class	Drop-down Character (20)	N/A Seedling Juvenile Mature Resprout	Age class of the weed infestation. If treating or mapping multiple age classes and it is not practical to take multiple records, use the older age class. A resprout is a plant that has been previously treated that is showing regrowth. N/A may be selected where the distinction between age classes isn't apparent (e.g. herbaceous plants) or if the age class isn't assessed.
Adjacent Property	Drop-down Character (6)	N/A Yes	Does the weed exist on the adjacent property? Generally only used for roadsides, but may be used on reserves to

Field	Field Type	Field Options	Field Description
		No	indicate an infestation that occurs on an adjacent property. Select N/A if this field is not applicable or not assessed.
Comments	Character (254)		Details of the location, distribution of the weed, significance of the infestation, source of the infestation, habitat value of the weed, suggested treatment or follow-up treatment, issues or risks encountered and how they were managed, quantity of weeds treated (e.g. number of buckets of weeds, number of plants).
Control method	Character (200)		Control method used (e.g. spot spray, cut and paint, hand weed)
Chemicals used	Character (120)		Herbicide/chemicals used and rate (rate per 10L/total Volume) (if applicable).
Hours taken	Character (60)		An optional field to record the time taken to do the control work.
Invoice number	Character (40)		The contractor's invoice number for the works.
Works IDS	Character (60)		Unique ID that links to the corresponding goal/s and action/s in the Works plan
Extent integer	Integer		Used by data manager to enter the as the midpoint of the extent to allow the weed point to be represented as a polygon. <1m = 1, 1-5m = 3, 6-10m = 8, 11-25m = 18, 26-50m = 38, >50m = 75, N/A = 3
Data source	Character (150)		Used by data manager to specify the source of the weed mapping data (used by data manager only)
Data manager	Character (100)		Organisation responsible for managing the data.
Record status	Drop-down Character (20)	Current Archive	Used by the data manger to specify which data records are the most current. Current is used for all new mapping. Records are changed to archive when new mapping updates older mapping. The archived data is still relevant to understand the history of a site or the distribution of a weed, but can be filtered out for more user friendly maps.
Old ID	Character (60)		Old ID from previous mapping (useful when merging weed data from multiple formats)
Easting	Float		Easting collected in GDA94 MGA zone 55 in decimal format. Used for relocating points. Will represent the central point of polygons.
Northing	Float		Northing collected in GDA94 MGA zone 55 in decimal format. Used for relocating points. Will represent the central point of polygons.

5.3 Reserves Priority Setting Tool

Table 5: Reserves Priority Setting Tool

Criteria	Rationale	Weighting	Level	Score
Ecological Criteria				
Level of Significance				
Site of Biological Significance	A BioSite is a physical area of land or water containing biological assets with particular attributes, such as the presence of rare or threatened flora, fauna or habitat required for their survival and/or rare or threatened vegetation communities.	X 2	National	4
			State	3
			Regional	2
			Local	1
			None	0
Native Vegetation Condition				
Vegetation Condition (based on Keighery 1994)	A rapid assessment of vegetation condition at a reserve level was undertaken to determine what the quality of vegetation was. Scores ranked from Pristine-no obvious signs on disturbance to Completely Degraded.	X 5	Pristine	6
			Excellent	5
			Very Good	4
			Good	3
			Modified / Revegetation	2
			Degraded	1
			Completely degraded	0
Ecological Vegetation Class Bioregional Conservation Value	A bioregional conservation status is provided for each EVC within a bioregion. It is a measure of the current extent and quality for each EVC, when compared to its pre-1750 extent and condition.	X 1	Endangered	5
			Rare	4
			Vulnerable	3
			Depleted	2
			Least Concern	1
NEROC Assessment Data				
Sites of Faunal Significance		X 1	National	3
			State	2
			Regional	1
			None	0
Habitat Link		X 1	Regional	2
			District	1
			None	0
Habitat Significance		X 1	Very High	3
			High	2
			Medium	1
			None	0
Threatened Flora & Fauna				
Flora	Contains Nationally Endangered Species	X2	Present	1
			Absent	0
Flora	Contains Victorian Rare or Threatened	X2	Present	1

Criteria	Rationale	Weighting	Level	Score
	Flora Species		Absent	0
Fauna	Contains Nationally Endangered Species	X2	Present	1
			Absent	0
Fauna	Contains Victorian Rare or Threatened Fauna Species	X2	Present	1
			Absent	0
Natural Features				
Wetland or Waterway	The presence of wetlands or waterways provides variety and dimensions to the habitat arrangement	X1	Present	1
			Absent	0
Shape & Size				
Reserve Size	Larger reserves are more likely to support viable and resilient communities	X 1	Greater than 10ha	5
			5-10ha	4
			2-5ha	3
			1-2ha	2
			0-1ha	1
Reserve Shape	Larger more rounded/square shaped reserves are more likely to have less edge effects and provide better habitat quality as compared to long and thin shaped reserves	X 1	Circular, square	6
			Oval, rectangular	5
			Irregular with few indentations	4
			Irregular with many indentations	3
			Long and thin with large proportion greater than 50m wide	2
			Long and thing with large proportion less than 50m wide	1
Community Values Criteria				
Community Use				
Active Community Group	Presence of an active Friends Group at a site would increase the community value and priority	X 3	Present	1
			Absent	0
Recreational Use		X 1	High	3
			Medium	2
			Low	1
			None	0
Heritage Significance				
Known European Historical / Cultural Values		X 1	Present	1
			Absent	0
Known Indigenous Historical / Cultural Values		X 1	Present	1
			Absent	0

5.4 Threatening processes encouraging the growth and spread of weeds

Commerce
- Sale of new and existing weed species
- Promotion of high threat weed species

Roads
- Introduction of weeds from vehicles and maintenance machinery (including lack of vehicle hygiene)
- Spread of existing weeds from road maintenance activities (e.g. slashing, grading)
- Spread of weeds along roads from vehicle movement, wind, pest animals and stock movement

Transport and machinery
- Disturbance of soil and spread of seed and plant material

Waterways
- Introduction of weeds from higher in the catchment
- Spread of weeds along waterways from water movement
- Stock grazing of waterways causing soil disturbance, spread of weeds and increased nutrient levels promoting weed growth

Construction of fuel breaks
- Disturbance of soil
- Spread of weeds from machinery and movement along breaks

Fire
- Encouraging weed growth through disturbance and disadvantaging native species
- Germinating weed seeds that require post fire weed control

Pest animals (foxes, goats, deer, rabbits)
- Disturbance of soil and spread of seeds (including deer wallows)
- Rabbit, deer and goat grazing preventing regeneration and reducing the resilience of sites to weeds

Dieback (caused by a range of factors including fragmentation, bell minors, Phytophthora cinnamomi infection, etc)
- Reducing resilience of native vegetation to weeds

Recreation (Horse riding, trail bike riding, mountain bike riding and bush walking)
- Disturbance of soil and spread of seed and plant material

Waste disposal
- Dumping of garden and other waste on public land
- Accumulation of weed species at rubbish disposal sites
- Prohibitive land fill fees can encourage inappropriate disposal of weeds

Private Properties
- Weeds escaping into public land
- Planting of high threat weed species
- Residents not identifying or managing weed species

- Stock escaping causing disturbance of soil, spread of seeds and reducing resilience of vegetation to weed invasion
- Runoff from private property increasing nutrient levels promoting weed growth.

Changed hydrology, drainage patterns
- Disturbance of soil and vegetation
- Changing environmental conditions that may encourage weed growth
- Creating new hydrological pathways along which weeds can spread