Site Action Plan Guidelines

To guide ecological restoration planning and ongoing management of native vegetation and fauna habitat

Tweed-Byron

BUSH FUTURES

Project

Improving Urban and Peri-Urban Bushland Sustainability in Tweed and Byron Shires

Introduction

A Site Action Plan (SAP) is a site-specific document that provides guidance on the ecological restoration and ongoing management of habitat utilised by native flora and fauna.

A good quality SAP will: (1) provide sufficient background information and site assessment to justify the proposed works; (2) clearly describe specific ecological restoration and management outcomes including the timeframe required to meet each particular outcome; (3) provide details of ongoing monitoring requirements including measurable outcomes; as well as (4) contingency planning options in the case of system failure or natural events which hinder progression.

All SAPs should aim for improved environmental outcomes and must be consistent with existing natural resource management legislation and policy, including the principles of Ecologically Sustainable Development.

Scope and Content

The SAP should contain a **cover page** displaying: **title, site name, author and date** and include a short description of the circumstances leading to its preparation.

Site Attributes

The SAP should include a brief description of the site attributes including:

- Site descriptor (Lot/DP(s)), area, and location;
- Land tenure and zoning;
- Geology and soils;
- Topography and hydrology;
- Vegetation community type and extent of cover;
- Site layout, connectivity and landscape context;
- Site features – e.g. waterways and drainage features, buildings, roads, access and other infrastructure;
- Current land use(s).

Aims and Objectives

Aims and objectives are an essential component of the SAP as they form the basis for monitoring and evaluating the effectiveness of its implementation. Aims are overall statements of what is to be achieved with the SAP. Objectives are specific statements indicating how individual actions achieve the aims of the SAP.

Aims and objectives should reflect the project brief and, as noted, above provide for improved environmental outcomes consistent with existing natural resource management legislation, policy and relevant guidelines.

Map of Site location

The site should also be placed in the context of the local landscape, often best achieved through the use of a site and locality map.

One or more thematic maps of the site should be presented in the SAP. At least one map should be overlaid on an aerial photograph with the following standard features and supporting text:

- Title and date;
- Scale and orientation;
- Legend;
- Cadastral boundaries; and

- Key features – e.g. roads and waterways.

Essential thematic layers include:

- Vegetation communities;
- Relevant site constraints (see below);
- Significant plant locations and fauna habitat features;
- Management zones; and
- Photo monitoring point locations.

Council can assist with the provision of existing data layers and aerial photography. In general, site plans should be presented at a scale of 1:5000 or smaller (i.e. 1:2000).

The presentation of information regarding the location of threatened flora and/or fauna species susceptible to illegal collection should be negotiated with Council.

Site constraints

The SAP should specify any relevant planning, legal, physical or other constraints that may affect management of the site. This includes but is not limited to:

- Easements and restrictions on title;
- Zoning provisions;
- State Environmental Planning Policies - e.g. mapped areas of SEPP 14 Coastal Wetlands and/or SEPP 26 Littoral Rainforest;
- Bushfire asset protection zones;
- Development controls and policies;
- Provisions of relevant statutes - e.g. *Native Vegetation Act 2003*, *Threatened Species Conservation Act 1995*;
- Sites of Aboriginal or European cultural heritage; and
- Physical constraints such as slope, acid sulphate soils, stream bank stability and flooding.

Contractors/consultants are encouraged to consult with Council to ensure they are aware of all relevant known constraints which exist at the site. Council will provide a check list of site constraints relevant to the area.

Site Assessment

Vegetation description

The SAP should include detailed descriptions and maps of existing vegetation communities at the site. Vegetation should be described according to the structure and floristics of each stratum. Vegetation type mapping information recorded in either the Tweed Vegetation Management Strategy 2004 (Kingston et. al 2004) or the Byron Flora and Fauna Study 1999 (Byron Shire Council 1999) for the site should also be included. A clear explanation of survey effort and method should also be included.

Where possible, an indicative list of native and exotic plant species recorded on site should be included as an Appendix to the SAP. This species list should include for each species present at the site:

- Scientific name;
- Common name;
- Relative abundance of exotic (or pest) species in each strata; and

- Conservation or weed status (if applicable).

Weed infestations

Detail should be provided in the SAP on the extent and relative abundance of noxious and other environmental weeds. This information may take the form of individual maps, or be described in relation to individual management zones (see below for details on management zones). A table of weed species recorded and their control class should be included.

Native and Pest Fauna

Detail should be provided on the presence or potential presence of fauna species on site. This may include a list of observed fauna, evidence of fauna (tracks, scats and other traces) or potential fauna based on habitat assessment.

Detail should also be provided here on the presence and relative abundance of feral fauna species present on site or within the surrounding area that may impact on the site. Any legislative requirements relating to the presence of these species should be included.

Overview of Ecological Values

The SAP should include a brief assessment of:

- The condition of the habitats on the site;
- The context of the site within the broader landscape - e.g. habitat diversity, habitat fragmentation, corridors and linkages, land uses, etc; and
- The conservation status of individual vegetation communities - e.g. Threatened ecological communities listed under the *Threatened Species Conservation Act 1995* (TSC Act) and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Tweed Vegetation Management Strategy 2004 and Byron Biodiversity Conservation Strategy 2004 provide background data on the values of individual vegetation communities and a methodology for determining the ecological status of specific areas. Where possible, maps should be used to depict spatial variations in ecological status.

Threatened and/or significant flora

The SAP should locate and make management provisions (where necessary) for any threatened and/or significant plants occurring at the site. Threatened and significant plants include species listed under the TSC Act and/or EPBC Act. Significant plants include:

1. Rare or Threatened Australian Plant (ROTAP) as defined by Briggs and Leigh (1996);
2. Significant vascular plant of the Upper North East New South Wales as defined by Sherringham and Westaway (1995);
3. A species confined to the Tweed or Byron LGA; or
4. A species at the northern or southern limit of its range.

Threatened and/or significant fauna and their habitats

The SAP should also identify and make management provisions (where necessary) for any threatened or significant fauna (and their habitats) likely to occur at the site. Threatened and significant plants include species listed under the TSC Act and/or EPBC Act.

A desktop survey (e.g. NSW Wildlife Atlas) and habitat assessment should be used to identify any potential threatened species occurring on the site.

Management issues & site threats

The SAP should identify and describe any issues and threats to biodiversity on or adjacent to the site that are likely to influence ongoing management. Examples include:

- Fire protection and maintenance of bushfire asset protection zones;
- Potential impacts from adjacent development – e.g. sedimentation;
- Environmental and noxious weeds;
- Pest animals and domestic pets;
- Livestock grazing;
- Climatic hazards – e.g. frost and flood;
- Unauthorised human access – e.g. motorbike use and tracks;
- Rubbish dumping – e.g. garden waste, household and building waste;
- Site fragmentation and isolation;
- Altered hydrology; and
- Erosion.

Planned Restoration Activities

Management zones

The use of management zones will be necessary where there are spatial or temporal variations in restoration strategies (Appendix A) and required management actions across the site. Management zones should be displayed on a map and their area calculated. A description of their location, boundaries and condition should be provided as well as an explanation of reasons for zone allocation in the SAP.

Management zones and recommendations

Specific implementation strategies should be listed for each management zone, detailing the step by step approach, methods and techniques to be used for each restoration strategy.

An Implementation Schedule should be included detailing actions to be undertaken across the whole of site and within each management zone to achieve the aims and objectives of the SAP. The Implementation Schedule should prioritise management actions and specify timing for the implementation of each management action for the duration of the SAP. The Schedule should also include resource requirements (including labour) for each management action and specific monitoring requirements. This information may be presented in a table.

For example:

A) Where assisted natural regeneration (e.g. fencing to exclude livestock plus weed control to encourage natural regeneration) is proposed in a management zone, detailed methods and techniques for assisted regeneration need to be specified, including:

- Location and type of fencing;
- Primary weed control methods for woody, vine, forb, grass and aquatic weeds;
- Timing of weed control; and
- Follow up weed control requirements including methods, timing & frequency.

Current best practice for specific weed control methods is presented in Appendix B.

Specific actions for management zones may also include measures to minimise impacts to flora and fauna during restoration works, including:

- Changing weed control methods or herbicide use when controlling exotic grasses amongst native grasses and forbs, when controlling weeds adjacent a threatened plant species and when controlling weeds in aquatic habitat or habitat of frog species;
- Timing on ground work in the vicinity of significant fauna habitat (raptor nests, flying fox camps) to avoid disturbance to breeding;
- Minimise ground disturbance (i.e. trampling) in sensitive habitats; and
- Specifying hygiene protocols were there is a risk of transmission of disease. For example spread of Chytrid fungus to threatened frog populations or spread of *Phytophthora cinnamomi* to susceptible plant communities.

B) Where planting (i.e. reconstruction) is proposed in a management zone, detailed methods and techniques for planting should be specified, including:

- Sourcing of planting stock;
- Preparation of planting site;
- Timing of planting;
- A list of suitable local native species to be used in the planting (may be included as an Appendix to the SAP);
- Number of each species;
- Planting density;
- Use of mulch and fertiliser; and
- Ongoing maintenance requirements.

Where planting is proposed, species selection and abundance should be consistent with the vegetation community being restored. Seed collection and propagation should be consistent with the principles of genetic integrity. Guidelines for the collection of seed and vegetative material are provided in Appendix C.

Information should be provided on the **qualifications of personnel** involved in the implementation of the SAP (i.e. on-ground weed control works, monitoring and reporting).

Any **permits or licences required** to implement the SAP (i.e. section 132C licence under the National Parks and Wildlife Act 1974 when undertaking weed control in threatened species habitat). A NPWS Checklist for bush regeneration activities is included as Appendix D

Record keeping requirements should comply with Pesticide Act 1999 and Regulation and Occupational Health & Safety Act 2000 and Regulation. A sample Daily Record Sheet including chemical use is included as Appendix E. A sample Job Risk Assessment Form and Matrix is included as Appendix F.

Highlight any **cultural heritage issues** relating to the site and the process to follow if any cultural heritage items are discovered during the cause of work.

Monitoring

The monitoring strategy should set out the intended monitoring methodology and performance indicators and must specifically address the management aims and objectives of the SAP. The monitoring strategy should set out timing of monitoring (baseline and ongoing), monitoring frequency and specify the qualifications of the personnel undertaking the monitoring. Monitoring methodology and performance indicators are discussed below.

Monitoring methodology

Monitoring for the *Bush Futures Project* will be based on the bushland health rating system developed as part of the initial auditing process. A rapid assessment of site attributes (e.g. structural composition, habitat features, weed density, weed severity and threats) is to be conducted using a scoring system. Scores for each attribute are combined to give an overall rating on bushland health. Monitoring over time will indicate if management activities are having a positive impact on bushland health resulting in a higher score for a site.

Monitoring and Evaluation Proforma

Monitoring for each site will require completion of a Monitoring and Evaluation Proforma (see Appendix G) for **each management zone** within a site. For sites with multiple zones a data sheet will need to be completed for each management zone. A guide to completing the data sheet is provided as Appendix H.

Photo points

In addition to completion of a monitoring and evaluation proforma, photo points must be established in **each management zone** of a site. A minimum of 1 photo point should be established in each zone where works will be undertaken. For larger, more complex zones additional photo points may be required.

For each photo point contractors must record relevant photo point number(s) and unique site identification, photo direction- facing information and GPS co-ordinates (easting and northing) on the monitoring and evaluation proforma.

- Photo point locations must be marked using a star-picket with flagging tape tied to the top.
- The star-picket must be located in a similar location for each photo to provide a reference point.
- Photos should be taken at the same time of the day each time.
- The camera lens, angle and height should be the same for each photo.

Performance indicators

Performance indicators are tools to measure the effectiveness of prescribed management and restoration actions. Examples of performance indicators include:

- Composition and relative abundance of each plant species in a revegetation program is as per the reference vegetation community;
- > 90% survival rate of planted stock;
- Growth of >1m by year three and 1.5m by year five for plantings and cumulative cover of 60% by year three;
- Increased recruitment of native species;
- Increased percentage cover of native species; and
- Nil fruiting of weed species after primary treatment.

Example performance indicators to measure restoration in a coastal dune and a coastal riparian habitat are provided in Appendix I.

Reporting

Reporting on the progress of the SAP is required to demonstrate that the restoration project is achieving its aims and objectives. The SAP should specify the reporting requirements including:

- Frequency of reporting;
- Duration of reporting; and
- Who the report will be submitted to.

Progress reports should include:

- Progress of the Implementation Schedule;
- Monitoring results and compliance with performance indicators;

- Any changes in the Implementation Schedule as a result of adaptive management;
- Progress of ongoing site management issues;
- Any records of threatened flora and fauna species; and
- Recommendations regarding the ongoing management of the site.

Reporting requirements are discussed further below.

Adaptive management & contingency planning

Provision should be made in the SAP for adjusting the proposed management strategies in response to unanticipated circumstances (e.g. fire, drought, floods, planting failure and insect pests), technical advances and/or regular monitoring. Procedures for variation to an approved SAP are discussed in below.

References

List all reference material used in the preparation of the SAP.

Appendices

Typical appendices to a SAP include:

- Species lists – native and weed species by vegetation community;
- Weed control methods;
- Planting list (if required);
- Photo points locations, photos and captions;
- Initial monitoring points and baseline data;
- NPWS Checklist for bush regeneration activities;
- Daily Record Sheets including Chemical Use; and
- Job Safety Analysis/Risk Assessment.

SAP Preparation, Implementation, Reporting & Compliance

SAP preparation

The SAP should be prepared by a suitably qualified restoration ecologist with a minimum of 2 years experience in ecological restoration in the vegetation communities addressed in the SAP.

Minimum qualifications and experience of a specialist ecological restoration consultant practising in the Tweed and Byron LGA's should comprise a tertiary degree in the natural sciences and/or Certificate 4 in Conservation Land Management (Natural Area Restoration) (or equivalent) and two years documented field experience in ecological restoration in north eastern New South Wales and/or south eastern Queensland regions.

SAP implementation

On-ground restoration works are to be undertaken by persons with qualifications in the field of bush regeneration. Minimum qualifications and experience to undertake on-ground restoration works should comprise Certificate 2 in Conservation Land Management (Natural Area Restoration) or equivalent and 2 years experience working in the vegetation type(s) at the site. Bush regenerators are to hold a current Chemical Users Certificate and other relevant legislative requirements e.g. Section 132C licence to work in the habitat of threatened species.

Plan duration

Management actions outlined in the SAP shall be maintained for a minimum period of **five** years to maximise the success of the restoration project. If performance criteria have not been achieved at the end of the five year period, Council may instruct that the duration of the SAP be extended.

Council may specify longer plan duration for offset projects or for restoration projects with complex management issues.

Council may approve works for a shorter timeframe than that covered by the SAP in accordance with site priority and funding availability.

Monitoring & progress reporting

Monitoring and reporting is to be undertaken by a suitably qualified person. The required frequency of monitoring:

- Initial baseline monitoring before work commences
- For progress report as specified by Council (usually every 6 months)
- At the completion of work contract as part of final report.

Circumstances for variation of a monitoring interval

Council may stipulate increased frequency for monitoring if considered necessary. Less frequent monitoring may be requested by the proponent however such requests must be accompanied by clear justification.

Content of progress reports

Progress reports should include:

- A summary of works completed by management zone (including all information recorded on Daily Record sheets);
- Rapid Assessment data sheets;
- Photo–point photos;
- Photo documentation of work activities;
- Evaluation of performance indicators;
- Any other management issues;
- Resources used including labour; and
- Any adaptive management approaches used or proposed.

Acknowledgement of progress reports

Progress reports will be acknowledged by Council and a response issued after the report is reviewed. A responsible officer will notify the proponent if the report is satisfactory or if changes and/or additions are required.

Additional requirements

A site visit by Council after submission of a progress report may be required to assess the progress of works.

Larger projects may require periodic meetings with the proponent and consultant in conjunction with the quarterly or annual reports.

Non-compliance with an approved plan/failure to achieve performance criteria

Council reserves the right to ensure compliance with an approved SAP and ensure agreed performance criteria are met. If at the end of the SAP duration, performance criteria are not achieved or the proponent does not comply with any component of the SAP, Council may require:

- An independent consultant to undertake an audit of the project against the management actions and performance criteria; or

- An extension of the duration of the SAP until management actions are implemented and the performance criteria are met.

Variation of an approved SAP

The proponent may apply to vary the existing SAP by submitting an amended SAP to Council for a new approval. Once approved, the new SAP replaces the old one.

Approval of an amended SAP will be subject to the same assessment process as the original SAP. Justification for the amendments, including an analysis of the implementation, maintenance and success of the existing SAP will be taken into account in assessment of the amended SAP.

Format and presentation

The SAP shall be submitted to Council in A4 hardcopy and digital copy (.pdf) formats. Two copies of each are required, with one hard copy being returned to the proponent on approval of the SAP.

All accompanying plans, aerial photos and maps shall be printed at A4 or A3 size and shall be in colour. All plans shall also be provided in digital format (.pdf)

Council is able to assist with the provision of aerial photos and associated data layers.

References

Briggs, J.D. & Leigh, J.H. (1996) *Rare or Threatened Australian Plants*. CSIRO Australia

Byron Shire Council, 1999, *Byron Flora and Fauna Study*. A report prepared for Byron Shire Council by Landmark Ecological Services, Pty. Ltd., Ecograph, and Terrafocus Pty Ltd.

Joseph, R. (2001) Course Notes from Certificate II in Bushland Regeneration. TAFE, Wollongbar.

Kingston, M. B., Turnbull, J. W. and Hall, P. W. (2004), *Tweed Vegetation Management Strategy (2004)*, report prepared by Ecograph for Tweed Shire Council, August 2004

Sheringham, P. & Westaway, J. (1995) *Significant Vascular Plants of Upper North East New South Wales*. New South Wales National Parks and Wildlife Service.

Society for Ecological Restoration International Science & Policy Working Group (2004). *The SER International Primer on Ecological Restoration*. www.ser.org & Tucson: Society for Ecological Restoration International.

APPENDICES

APPENDIX A: Approaches for the rehabilitation / restoration of natural areas

APPENDIX B: Weed Control Methods

APPENDIX C: Guidelines for collecting seed and vegetative material

APPENDIX D: NPWS checklist for bush regeneration in threatened species habitat or an endangered ecological community

APPENDIX E: Sample Daily Record Sheet

APPENDIX F: Sample Project Risk Assessment Form and Matrix

APPENDIX G: Monitoring and Evaluation Proforma

APPENDIX H: Guide to completing Monitoring and Evaluation Proforma

APPENDIX I: Example Performance Indicators

APPENDIX A: Approaches for the rehabilitation / restoration of natural areas

Definitions for ecological restoration and rehabilitation according to the Society for Ecological Restoration International Science & Policy Working Group (2004) are given below.

Restoration
Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed. A restored ecosystem:

- Contains a characteristic assemblage of the species that occur in a reference community;
- Consists of indigenous species to the greatest practicable extent;
- Contains all functional groups necessary for the continued development and/or stability of the restored ecosystem;
- Is capable of sustaining reproducing populations;
- Functions normally for its ecological stage of development;
- Is suitably integrated into a larger ecological landscape;
- Potential threats to the health and integrity of the restored ecosystem have been eliminated or reduced as much as possible;
- Is sufficiently resilient to endure normal periodic stress events in the local environment; and
- Is self sustaining to the same degree as a reference community.

Rehabilitation
Rehabilitation emphasises the reparation of ecosystem processes, productivity and services, whereas the goals of restoration also include the re-establishment of the pre-existing biotic integrity in terms of species composition and community structure (Society for Ecological Restoration 2004).

Accepted approaches to site restoration are provided in the table below. The restoration approach chosen will be dependent on the degree of habitat disturbance and degradation, the anticipated potential of habitats to recover and the aims and objectives of the SAP.

Natural Regeneration	
Applies:	• To relatively large, intact and weed-free areas of native vegetation. • Where native plants are healthy and capable of regenerating without human intervention. • When native plant seed is stored in the soil or will be able to reach the site from nearby natural areas, by birds or other animals, wind or water. • Where the plant community has a high potential for recovery after any short-lived disturbance, such as a fire or cyclonic winds. • When preventative action is all that is required to avert on-going disturbance e.g. erection of fencing to prevent intrusion by cattle.
Affect of planting:	Planting in such areas can work against the aims of restoration by interfering with natural regeneration.
Goal vegetation community:	The re-establishing plant community will be similar in structure, composition and diversity to the original vegetation.
Assisted Natural Regeneration	
Applies:	• To natural areas where the native plant community is largely healthy and functioning. • When native plant seed is still stored in the soil or will be able to reach the site from nearby natural areas, by birds or other animals, wind or water. • Where the natural regeneration processes (seedling germination, root suckering, etc.) are being inhibited by external factors, such as

	weed invasion, soil compaction, cattle grazing, mechanical slashing, etc. • When limited human intervention, such as weed removal, minor amelioration of soil conditions, erection of fencing, cessation of slashing, etc. will be enough to trigger the recovery processes through natural regeneration. • When the main management issue is weed infestation.
Affect of planting:	Planting in such areas can work against the aims of restoration by interfering with natural regeneration.
Goal vegetation community:	The re-establishing plant community will be similar in structure, composition and diversity to the original vegetation.
Reconstruction	
Applies:	• Where the site is highly degraded or altered. • When the degree of disturbance has been so great and long-standing that the pre-existing native plant community cannot recover by natural means. • To sites such as areas of fill, sites affected by stormwater flow, areas that have been drastically cleared, either mechanically or by stock even though there may be a few remaining native trees or shrubs. • When a greater degree of human intervention is required, such as weed removal, cessation of grazing and/or slashing, amelioration of soil conditions such as importation of soils, drainage works or re-shaping of the landscape.
Affect of planting:	Importation of native species to the area is required, either through planting or direct seeding (in some situations). Natural regeneration and recruitment is insufficient to re-establish the original vegetation.
Goal vegetation community:	The re-establishing planted community should be similar to the original vegetation in structure, composition and diversity.
Fabrication (Type Conversion)	
Applies:	• Where site conditions have been irreversibly changed. • When it is not possible to restore the original native plant community. • Where a better-adapted local plant community can be planted that will function within the changed conditions. • In situations such as the construction of a wetland plant community to mitigate increased urban storm-water run-off.
Affect of planting:	Revegetation (planting) is the major component in a fabrication program.
Goal vegetation community:	The re-establishing planted community should be similar to a naturally occurring plant community of the same type e.g. freshwater wetlands in structure, composition and diversity. Sometimes a combination of approaches is required. For example, when remnant native vegetation is surrounded by cleared and degraded lands, an assisted natural regeneration approach is appropriate for the remnant and a re-construction approach for the surrounding lands. If increased storm water run-off is a threat to the recovery of these areas, it may be necessary to establish a wetland plant community (fabrication) that will slow run-off and increase nutrient uptake, thus improving the quality of water entering a natural area.

Adapted from Ford, J. & Joseph, R. (?)

APPENDIX B: Weed Control Methods

Current best practice methods for weed control are described below.

Please note: (1) It is the responsibility of the herbicide user to hold an off-label permit (obtained from the National Registration Authority for Agricultural and Veterinary Chemicals) for herbicide use that is not consistent with conditions specified on the label; and (2) The methods and herbicide use rates provided below are current best practice methods. It is the responsibility of the operator to ensure methods used are current best practice and are suitable for the site and any environmental constraints experienced at the site.

Cut-scrape-paint
This weed control method applies to all woody shrubs, trees and some vines.

- Cut plant low to the ground at an angle.
- Apply Glyphosate immediately at the rate of 1 part Glyphosate to 1.5 parts water, with a paintbrush approximately 1.5 centimetres wide.
- Scrape sides lightly to reveal green tissue and apply the herbicide to the scraped area.
- Take care that the brush is not contaminated with soil.
- Note - all seed that has high viability and longevity, e.g. *Senna spp*. and other members of the Fabaceae family, or plants with a high invasive potential, such as Umbrella Tree *Schefflera actinophylla*, must be removed from the parent and either composted on site or removed from the site.

Gouge-paint
This weed control method applies to those plant species that have a fleshy root system, such as rhizomes or large bulbs. It is particularly appropriate for the treatment of *Asparagus spp*.

- Gouge out sections of the fleshy base with a knife (if using on Asparagus, first cut the stems at shoulder height and also at the base).
- Apply 1 part Glyphosate to 1.5 parts water immediately, with a paint brush approximately 1.5 centimetres wide.

Stem Injection
This weed control method applies to all woody trees and shrubs with a diameter of about six to ten centimetres or greater.

- With a tomahawk, make a cut the width of the blade, at a slight angle, into the trunk. Note - it is important not to make cuts too deep.
- Apply herbicide immediately into the cut using a tree-injecting device (if using Glyphosate, apply at the rate of 1 part Glyphosate to 1.5 parts water).
- Repeat this procedure in a brickwork pattern around the circumference of the tree, as close to the ground as possible. Where the presence of a crotch angle makes this difficult, make a cut above it. Note - two rows of cuts will be sufficient for trees with trunks of six to ten centimetres; larger trunk diameters will need correspondingly more.
- Treat all visible lateral roots as per dot point 1.

Scrape-ditch-paint
This weed control method is applicable to many species of vines where it is desirable to treat the vines intact, particularly those with aerial tubers such as Madeira Vine *Anredera cordifolia* or those which will propagate from segments, e.g. Cape Ivy *Delairia odorata*.

- Scrape the stem tissue on one side of the stem only for at least 20-30 centimetres if possible. Note - on Madeira Vine, it is necessary to scrape heavily. Scrape as many sections of the stem as possible.
- Apply undiluted Glyphosate with a paintbrush.
- On stems that are thicker or horizontal, make a ditch into the stem with a knife and apply herbicide. Tubers and side roots should be treated the same way. Note - care must be taken not to sever the stem.

Spraying
This weed control method is carried out using a 15 litre backpack spray unit with a modified spray nozzle that gives a solid spray pattern. Glyphosate is the main herbicide used with the addition of a marker dye. For plants that show some resistance (e.g. Madeira Vine) or where growing conditions are not optimal, an acidifying agent, LI700®, is added. Metsulfuron methyl can also be used for resistant species and grasses. It should be used with a surfactant, such as Agral®.

Where both Glyphosate and Metsulfuron methyl are recommended for a species, it may be possible to use a commercially available compound of these two herbicides. This approach is currently under trial and is not suitable for operators unskilled in precision spraying.

Dilution rates for Glyphosate and Metsulfuron methyl are in accordance with the manufacturer's recommendations and any variation requires a permit from the National Registration Authority.

Dilution rates for Glyphosate to water for treatment of some weed species are provided below:

- Plants with more or less succulent leaves, e.g. Wandering Jew *Tradescantia fluminensis*, Madeira Vine *Anredera cordifolia* (autumn to winter is the suggested time for spraying these plants), Spider/Ribbon Plants *Chlorophytum spp*. etc - 1 part Glyphosate to 50 parts water + LI700® 0.5%
- Lantana *Lantana camara* - 1 part Glyphosate to 100 parts water
- Other soft-leaved plants, annuals and grasses - 1 part Glyphosate to 100 parts water
- Bitou Bush *Chrysanthemoides monilifera subsp. rotundata* - 1 part Glyphosate to 150 parts water to 1 part Glyphosate to 400 parts water

Typical dilution rates for Metsulfuron methyl to water are - 1.5g Metsulfuron methyl to 10 litres water + 20 millilitres Agral® to 10 litres water.

Overspray
This weed control method is applicable to large, dense infestations of such plants as *Lantana camara*, where it is desirable to leave the dead plants intact to prevent erosion and over-exposure of large areas, protect native seedlings from predators such as wallabies, and avoid trampling by humans.

- Spray over the top of the infestation, using a weak solution of Glyphosate.
- Any native plants that may be under the weed will be protected by the foliage cover of the weed.
- Leave the sprayed plants intact so that native seedlings can establish under the shelter provided.
- The rate for overspraying of Lantana is 1 part Glyphosate to 100 parts water.

Alternatively, weeds can be cut and flattened with bush-hooks or loppers and the subsequent regrowth sprayed with Glyphosate. In many cases it is preferable to overspray wherever practicable as this will cause less erosion and trampling of suppressed native plants, such as ferns and seedlings. However, handwork will be necessary to cut-scrape-paint any unsprayed Bitou Bush or Lantana that surrounds native plants.

Crowning
This weed control method is applicable to weeds which have their growing points below the surface of the ground (corms, bulbs, rhizomes, clumped or fibrous root systems, etc. e.g. *Asparagus spp., Chlorophytum comosum* and grasses).

- Grasp the leaves or stems and hold them tightly so that the base of the plant is visible. Plants with sharp leaves or stems should be cut back first.
- Insert the knife close to the base of the plant at a slight angle, with the tip well under the root system.
- Cut through the roots close to the base. Depending on the size of the plant, two or more cuts may be needed to sever all the roots.
- Remove the plant. Make sure that the base of the plant where the roots begin is completely removed.

Adapted from Joseph (2001)

APPENDIX C: Guidelines for collecting seed and vegetative material

Guidelines for collecting seed and vegetative material for planting in rehabilitation/ restoration projects in or near natural areas are detailed below.

Seed Collection
It is important to consider the issue of genetics in the selection of seeds and seedlings. The following guidelines have been developed to provide practical assistance when collecting seeds for use in rehabilitation/restoration projects:

- Collect in an area within the local catchment, preferably with the same aspect, and no further than a 10-kilometre radius (the extent of the area will vary depending on the method of seed dispersal which affects the ease of gene flow).
- Collect from as many "wild" growing plants as possible to ensure variation. Seeds should not always be gathered from a favourite or easy-to-access site, nor should they be picked only from well-laden or easy-to-reach specimens (all of which ensure lack of variation).
- Collect seed from several (at least 10) well-spaced plants to reduce the possibility of them being related. Mix together equal amounts of seed from each plant before planting. This is particularly important if planting uncommon or rare species. Make sure that a section 132C licence under the National Parks and Wildlife Act has been obtained if collecting seed from any protected native plant, or any plant that is a threatened species or is part of an endangered population or an endangered ecological community.
- If the planting program is to be ongoing, identify each seed collection plant so that different plants can be used in the following years.
- Do not collect only from "good looking" specimens. Such plants may be in this condition because they are responding to certain favourable environmental conditions present at the time. If these conditions change in any way so may their ability to survive.
- Try not to collect from isolated plants, as self-pollination and/or inbreeding may have occurred and this can often yield low quality seed.
- Seed collection from plantations and other planted specimens requires caution. A plantation will be a poor source of seed if it was derived from the seeds of a single plant, or from seeds of unsuitable provenance.
- Seed collected from woodlands or forests where only a few trees have flowered well will also tend to be more inbred than seed collected after a heavy flowering year when it is likely that greater rates of out-crossing have occurred.
- Be careful not to strip plants of their seeds as they may be important food for wildlife. Over-harvesting may also negatively impact on the local seed bank available for natural regeneration in the area of collection.

Collection of vegetative material
The use of vegetatively propagated plants in restoration/rehabilitation projects may be necessary if insufficient local viable seed is available or if germination of seeds is prolonged, erratic or difficult. Vegetative propagation can be a useful tool, especially when propagating ground layer plants that spread by bulbs, corms, rhizomes or stolons, such as native grasses, Matrush *Lomandra spp*., Flax Lillies *Dianella spp*. and Native Ginger *Alpinea spp*.

Vegetative propagation includes the use of stem or root cuttings, aerial layering or division, and plants produced through these methods are genetically identical to parent plants. There is a lack of genetic variability within a planting and thus the possibility of increased susceptibility to disease and insect attack.

The following guidelines for collection of vegetative material are recommended:

- Collect in an area within the local catchment, preferably with the same aspect, and no further than a 10-kilometre radius.
- Collect material from as many "wild" growing plants as possible to ensure variation within the parent plants.
- Collect material from several (at least 10) well-spaced plants to reduce the possibility of parent plants being related. Make sure that a section 132C licence under the National Parks and Wildlife Act has been obtained if collecting material from any protected native plant, or any plant that is a threatened species or is part of an endangered population or an endangered ecological community.

- If the planting program is to be ongoing, identify each collection plant so that different plants can be used in the following years.
- Do not collect only from "good looking" specimens. Such plants may be in this condition because they are responding to certain favourable environmental conditions present at the time. If these conditions change in any way so may their ability to survive.
- Propagative material collected from isolated plants, plantations and other planted specimens requires extra caution. These will be a poor source of vegetative material if derived from inbred plants or plants of unsuitable provenance.

References & further information

Harwood, C. (1990). Aspects of Species and Provenance Selection. In '*Sowing the Seeds' Direct Seeding & Natural Regeneration*. Proceedings of a conference 22-25 May 1990, Greening Australia, Adelaide.

Indigenous Flora & Fauna Association Inc. Conservation Genetics (1992). What does it mean? How can we use it? In *Indigenotes Volume 5, Number 11, November 1992.*

Playford, J. (1997). Seed Sources – Conservation versus Preservation. In Big Scrub Rainforest Landcare Group 2005 *Subtropical Rainforest Restoration*. A practical manual & data source for landcare groups, land managers & rainforest regenerators. BSRLG Bangalow NSW.

Playford, J. (1998). Genetic issues in Bush Regeneration. In S. Horton (ed.) 1999, *Rainforest Remnants - a decade of growth*. *Proceedings of a conference.* NSW National Parks & Wildlife Service, Hurstville NSW.

APPENDIX D: NPWS checklist for bush regeneration in threatened species habitat or an endangered ecological community

The following guidelines are derived from the relevant sections of NPWS Draft Checklist for Bush Regeneration Activities in the Habitat of Threatened Species, Endangered Populations and Endangered Ecological Communities.

Management Planning:	**yes**	**no**	**more info attached**
The proposed activities will be in accordance with a management plan or site plan (map). Please attach the plan or relevant sections of the plan or strategy to the licence application.			
The project has been discussed with the relevant Landcare coordinator. If not, provide details of any other professional advice you have sought, e.g. from a qualified bush regenerator.			
A NPWS Wildlife Atlas database search of a 5km radius of the site has been undertaken to identify threatened flora/fauna species known or likely to occur on the site.			
Prior to commencing any works on site, a permit or permission will be obtained from the relevant landowner(s) or land manager(s).			
Training and supervision:	**yes**	**no**	**more info attached**
All activities by workers will be regularly checked and approved by the co-ordinator.			
All workers will be informed of any threatened species or endangered ecological communities known from the area or which may occur in the area and the potential impacts of activities on these species/communities e.g. vines on the edge of a littoral rainforest remnant may protect the remnant from salt-bearing winds.			
All workers have adequate weed and native plant identification skills i.e. all workers can identify and differentiate between weeds and native plants that occur on the site.			
Workers will be familiar with the identifying features of threatened flora that are known or likely to occur in the project area. Where threatened species known from the area are similar to weed species, the distinguishing features between these will be understood prior to commencing the work.			
Access to site:	**yes**	**no**	**more info attached**
All vehicular access to the site will be restricted to formed roads.			
Unnecessary damage to sites will be avoided e.g. avoid working in wet weather to lessen soil compaction.			
To reduce the possibility of introducing plant diseases and weeds the following measures will be applied: (1) Secateurs will be sharp and cleaned with methylated spirits; and (2) Footwear will be cleaned of loose soil and preferably treated with bleach between sites.			
Impacts on flora:	**yes**	**no**	**more info attached**
Prior to any works being undertaken, the presence or absence of threatened flora will be determined by a thorough walking search of the area.			
All threatened flora will be tagged with highly visible flagging tape before work commences. If a number of individuals occur in a clump, the area should be marked out with flagging tape.			
Cutting or damaging of threatened flora will be avoided.			
All plants will be positively identified before they are removed (pulled, cut, poisoned etc).			
Weed removal within two metres of a threatened species will be			

undertaken by hand.			
Impacts on fauna:	**yes**	**no**	**more info attached**
All workers will be aware of any threatened fauna that are known or likely to occur on site, and the potential impacts of the proposed activities on those species.			
The habitat and refuge potential of weeds and rubbish will be considered prior to removal e.g. Lantana can provide cover for threatened fauna such as the Bush-hen. Dead Lantana and poisoned Camphor Laurels should, where possible, be left in situ.			
Weeds will be removed gradually in areas where an infestation is extensive. Ideally, 50% of weeds that may provide habitat should be left until native plant species have re-established and provide alternative refuge.			
Disturbance to, and removal of rocks, logs and other potential refuge sites will be avoided.			
A herbicide registered for use near waterways will be used within five metres of waterways.			
Herbicide spraying will be restricted to a distance greater than five metres from watercourses where threatened frogs are known or likely to occur and within a ten metre radius of records of threatened frogs.			
A buffer of one metre along other watercourses will be maintained in which no herbicide will be sprayed.			
Care will be taken to minimise disturbance to shy or cryptic species e.g. the Marbled Frogmouth roosts in vine 'curtains'.			
Care will be taken to minimise disturbance to the leaf litter layer.			
Reconstruction through revegetation: (Note - this section does not address propagation or planting of threatened species. This activity would need to be separately addressed).	**yes**	**no**	**more info attached**
Seed collection or cuttings will be from species, populations or ecological communities other than those listed as threatened (unless licensed)			
Prior to collecting any seed or cuttings permission will be obtained from the relevant landholder or manager of the site e.g. a licence is required to collect native plants on National Parks estate.			
Seed collection from any one species will be limited to less than 10% of the available crop at that site.			
Seed collection from any individual plant will be limited to less than 10% of the available crop.			
If your seed source is used by other seed collectors, has consideration been given to minimising any cumulative impacts to the source plants? Some individual plants are known as a reliable seed source and their seed is collected extensively. This may result in – (1) a reduction in genetic diversity); and (2) an impediment to the individual's natural ability to regenerate.			
When collecting propagation material from a wild population, collection will be random from as many individuals as possible across the population to ensure a representative range of genetic material is collected. Collectors will avoid selection of propagation material on the basis of physical attributes e.g. tallest, most attractive, greatest amount of seed or flowers.			
Plantings will be sourced from stock of local provenance.*			
Will propagated material collected only be used at the subject site? i.e. excess material will only be used at other sites if it meets the provenance criteria.			
(Plants are likely to be purchased from reputable commercial nurseries – appropriate seed collecting techniques assumed)			
A buffer of five metres will be maintained around all threatened plant			

specimens. Planting will only be undertaken outside this buffer. This requirement is intended to protect the roots of the threatened plant from damage or introduction of disease.			
Care will be taken to ensure that mulch does not introduce weeds or impede natural regeneration at the site.			
Care will be taken to ensure that weeds and/or *Phytophthora cinnamomi* are not introduced to a site from pots of cultivated plants.			
Consideration will be given to the possible impacts of plantings on the ecological requirements of threatened species at the site e.g. reduced light, competition, etc.			
Species will be planted within their natural habitat and range. Plantings will be guided by the plants' local habitat preferences e.g. the species used for plantings along watercourses should be those that naturally occur in that habitat in your local area.			
Herbicide use: (Note - A permit from the National Registration Authority for Agricultural and Veterinary Chemicals PO Box E240, Kingston ACT 2604 may be required for herbicide use that is not consistent with conditions specified on the label).	**yes**	**no**	**more info attached**
A buffer of two metres will be maintained around all threatened plant specimens. Herbicide use will only be undertaken outside this buffer.			
Herbicide use will cease where there are any signs of threatened species being affected by herbicide e.g. browning off, wilting or deformed growth.			
All herbicide spray operators will be capable of undertaking precise and effective weed control.			
Spray will be directed away from threatened flora.			
Herbicide will only be sprayed in suitable weather conditions when the impact of spray drift (windy) or run-off (wet) on threatened flora is minimised.			
Marker dyes e.g. white field marker' will be mixed with herbicide before use. Marker dye enables the worker to see where the spray is landing.			
Reporting and data records:	**yes**	**no**	**more info attached**
Any new records of threatened species will be provided within three months to NPWS. These records will be in a format appropriate for entry into the Wildlife Atlas, once identification of a threatened species is confirmed by a recognised authority.			

*Local provenance species should be regarded as those species propagated from material that has been collected from a natural wild population as close as possible to a site. For example, within the local catchment which may be based on a local creek.

APPENDIX E: Sample Daily Record Sheet

Site Name / Location: _____

Date: _____ **Time:** _____ **to** _____

Team / Staff: _____
_____

Growing conditions	Temperature / Humidity	Weather conditions	Wind direction / Speed

Zone(s) / Work locations	Hours	Weeds treated	Method	New T.S. encountered / location

Chemicals used / Rates / Totals						Notes and comments		
Equipment used	Glyphosate	Met-methyl	Herbidye	Additive	Other	Water	Number mixed	*include batch number and brand
Daily Chemical Totals								

APPENDIX F: Sample Project Risk Assessment Form and Matrix

Sample Risk Assessment Form

HAZARD IDENTIFIED	RISK RATING	CONTROL MEASURE RISK ASSESSMENT
Traffic Hazard Working in close proximity to roads		□ Use traffic controller □ Use of safety signs □ Use of witches hats or temporary barrier □ High visibility clothing
Sun Exposure Hot conditions		□ Reduce exposure time – rest breaks □ Provide ample water □ Protective clothing and sunscreen
Working With Chemicals		□ Current MSDS held □ Adequate washing facilities □ Hazardous substances stored and labelled correctly □ Use of personal protective clothing □ Rotate tasks to avoid prolonged exposure
Biological Hazard Needle stick injury		□ Inspect site before work commences □ Provide appropriate waste disposal container □ Personal protective equipment
Manual Handling Handling heavy objects		□ Use correct lifting and carrying techniques □ Use lifting aids □ Use wheelbarrow etc wherever possible □ Ensure clear area before lifting □ Share the load □ Rotate activities or rest breaks □ Appropriate personal protective clothing
Crush Impact Cut, crush and impact		□ Knowledge and correct use of tools □ Appropriate personal protective clothing □ Correct tool for job
Slips, Trips and Falls		□ Avoid carrying awkward or heavy objects on uneven ground □ Remove all potential hazards if possible or mark with coloured tape □ Do not leave tools lying in pathways □ Do not run □ Ensure boots are firmly laced
Hazardous Plants Plants that may cause allergic reaction		□ Identify plants which may cause allergic reactions □ Mark area with coloured tape
Bites and Stings		□ Create disturbance on site before beginning work □ Apply insect repellent □ Wear appropriate personal protective equipment

Sample Risk Assessment Matrix

How severely could it hurt someone **Or** **How ill could it make someone**	**Very likely - could happen anytime**	**Likely - could happen sometime**	**Unlikely - could happen, but very rarely**	**Very unlikely - could happen, but probably never will**
☠ **kill or cause permanent disability or ill health**	1	1	2	3
Long term illness or serious injury	1	2	3	4
Medical attention and several days off work	2	3	4	5
! First aid needed	3	4	5	6

Appendix G

BUSH FUTURES

Monitoring and Evaluation proforma

A guide to completing this form is included in the appendices of the SAP guidelines.
This form should be completed for each management **zone** within a work site. Assessment should be made of the zone as a whole.

Date		Observer	
Site name		Site location	
Zone		Area	

Dominant Vegetation Community

Dominant Species Canopy			
Dominant Species Mid			
Dominant Species Ground			

Notes and Comments (including Threatened Species observations, presence of EEC, variations in veg types and location)

Structural and Compositional Integrity

Stratum	Height Range(m)	%Cover			Disturbance Type / Stratum		Score (1-4)
		Natives	Exotics	Total		Native Vegetation Cover	
Emergent						Age Class Diversity	
Canopy						Native Species Composition	
Mid						Overstorey Regeneration	
Ground						Growth Stage	
						Overall Score (average)	

Notes and Comments:

Habitat Features (Score 0-3)

Hollows(>5cm)		Glossy Black Cockatoo FT	
Fallen Logs		Koala FT	
Native Grass/Reed/Sedge		Blossom bat FT	
Riparian/Wetland		Flying Fox Camp	
Gullies		Other Feature	
Rock/Boulders			
Cave/Overhangs		**Raw Score**	
Low Cover/Thickets		**Habitat Assessment Score**	

Dominant Weed Assessment % cover

Species	Upper	Mid	Lower

Weed Density Score (D)=

1_Few or no weeds observed (No or Light Infestation).
2_Weeds mainly edges /very scattered (Light to Mod)
3_Weeds common, but patchy or scattered (including canopy)
4_Weeds throughout excluding canopy (Heavy infestation)
5_Weeds throughout including the canopy (Heavy infestation)

Weed Severity Score (S)=

1_No problem weeds present
2_Infestation is mostly cat 3 weeds
3_Infestation a mix of cat 2 & 3 weeds
4_Infestation mostly cat 2 or a cat 1 weed present
5_2 or more cat 1 weeds present

Weed Total Score (DXS) = (1-25)

Other weeds

Threats:

Other Threats	Score
Erosion	
Grazing	
Dumping	
IFR	
Vehicles	
Clearing	
Underscrubbing	
Other	
Raw Score	
Scaled Score	

Management notes:

Erosion Control	
Structural Works	
Rubbish removal	
Contamination	
Pest Control	
Fire Management	
Other	

Fencing

Fence Type	Length	Cost
Fencing Notes:		

Photo points

Photo point No.	Description	Direction (N,S,E,W)	GPS co-ordinates	
			Easting	Northing

APPENDIX H

Guide to completing Bush Futures Site Attribute and Habitat Assessment Data Sheet.

- A data sheet should be completed for **each management zone** as defined by the Site Action Plan. Therefore more than one data sheet should be completed for each work site.
- The scoring methodology was developed to create a score of overall health of the area which can be assessed over time to determine if management actions are having a positive impact on the site resulting in a increase score of the site over time.
- Data sheets should be complete prior to on-ground works and then by each progress report period as defined by council.
- Data sheet information will be entered into council database to monitor and report on project outcomes.

1. Note date, site name, location, observers, and approximate area of management unit and tenure.

Dominant Vegetation Community

2. Record a brief Vegetation Description for the management Unit noting dominant floristics and structure

3. Record the three dominant species in each strata (canopy, mid and ground).

4. Note variation in vegetation communities recording presence of minor vegetation communities and relevant notes of significance regarding threatened occurring on the site.

Structural and Compositional Integrity Assessment

5. Record which strata are present in the area surveyed and the height range of each strata.

6. Record the percentage canopy cover (natives, exotic and total vegetation) for the canopy and emergent strata (% of sample site within the vertical projection of the periphery of the crowns)

7.. Record the percentage cover of the other strata (natives, exotics and total vegetation) (% of sample site occupied by the vertical projection of the foliage and woody branches.)

8. Native Vegetation Cover Score: Consult Vegetation Benchmark thresholds or use professional judgement and **score (1-4)** for native vegetation cover %:

4- All strata OK – within benchmarks for all strata (woody or non –woody communities),

3 - Only overstorey OK – within over-storey benchmarks for woody communities,

2 – Only lower strata OK – within lower strata benchmarks only

1 - Other – other observation.

9. **Age Class Diversity Score:** score (1-4) for forests and woodlands only (not shrublands or non woody communities)

4 – All Strata OK – range of age classes within all strata (or within normal limits),

3 – Only overstorey OK – range of age classes (or within normal limits) within overstorey only;

2 – Only lower strata OK- range of age classes (or within normal limits) within lower strata only.

1 – Other. Other (woody or non-woody vegetation communities)

10. Native Species Composition: Score (1-4) for native species composition. Assess both woody and non woody communities. Native species composition (NSC) includes both species richness and relative abundances (use professional judgement for normal limits). Do not assess weeds.

4- All Strata OK –NSC within normal limits and weed cover < 10 % in all relevant strata (woody /non woody),

3 – Only overstorey OK - NSC within normal limits and weed cover < 10 % within the overstorey (woody communities only),

2 – Only lower strata OK – NSC within normal limits and weed cover < 10% in lower strata only (woody communities only),

1 – Other – Other (woody or non woody vegetation communities)

11. **Overstorey Regeneration:** Score (1-4) overstorey regeneration. Assess regeneration (young canopy species - overstorey species up to 5 cm diameter at breast height (dbh).

4 – Common – native regeneration common throughout,

3 – Patchy – native regeneration common but patchy,

2 – Minimal – native regeneration observed but minimal,

1 – None, No native regeneration observed.

12. Growth Stage: Score (1-4) for growth stage of vegetation. Assess successional stage of vegetation unit as an indication of disturbance history .

4 Old growth – Mature forest or other vegetation with common age related features (fallen logs, senescent trees, stags, tree hollows, epiphytes, buttresses, large trees, emergents etc).

3- Mature vegetation – well developed vegetation; e.g. > 5 yrs old for non woody vegetation; >8yrs for shrublands; >40 yrs for forests.

2 - Advanced regrowth – intermediate successional development e.g. 1 – 5 yrs old for non woody vegetation; 3 – 8 yrs for shrublands; 10 – 40 yrs for forests.

1 – Early successional development e.g. < 1 yr old for non-woody vegetation; < 3 yrs for shrublands; < 10 yrs for forests.

13. Note the overall (average) site score for steps 9 – 16.

14. Note any relevant disturbances observed and the relevant stratum

15. Can note any relevant comments / observations

Habitat Feature Assessment

16. Abundance of habitat features within the management unit where for each habitat feature

0= Absent,

1 = Few observed,

2 = common,

3 = abundant.

Raw score = sum of all scores

Scaled score: will convert this into an index or %.

Weeds and other Threat Assessment

17. Rank the 5 dominant weed species (in order of abundance) across the site noting species and the % cover for relevant strata.

Dominant weed: weed which is recorded = or > 5% cover of any stratum.

Record all other weeds present on the site in *Other Weeds* box.

18. **Weed Density Score** within the management unit:

5 – Weeds throughout including canopy (Heavy infestation),

4- Weeds throughout excluding canopy (Heavy infestation),

3 - Weeds common, but patchy or scattered (including canopy),

2 – Weeds mainly around edges or very scattered (Light to Mod),

1 – Few or no weeds observed (No or Light infestation)

19. **Weed Severity Score**. Assess dominant weeds only. See table below for weed categories. If no dominant weeds present but some are problem weeds the use category 4.

5 –Two or more category 1 are present,

4- Infestation mostly category 1 &/or 2 weeds present,

3 –Infestation a mix of category 2 & 3 weeds,

2 – Infestation is mostly category 3 weeds,

1 –No problem weeds present

20. Total Weed Score is the sum of the Weed Density multiplied by the Weed Severity scores (1 – 25)

21. Other Threats: Score the presence of other threats .Where threat is present a score of -1 is given.

22. Scaled score will be converted

23. Site score will be calculated on all field assessed values

24. Site ranking will be calculated in relation to all other sites entered in database.

Fencing and Management notes

25. For **fencing** note type (Standard, Electric), length, cost and any relevant notes/ issues.

26. Brief comments on any other potential or recommended management actions can be noted next to the relevant action.

Photo Points

A minimum of 1 photo point must be established in each management zone. For larger more complex zones then additional photo points should be established.

Photo points should be established at the start of the project before on-ground work begins and included in the site action plan if possible.

Record relevant photo point number, site identifier or description of shots, direction facing and GPS co-ordinates (easting and northing).

- Photo point location must be marked using a star-picket with flagging tape tied to the top.
- Photos should be taken at the same time of the day each time.
- The camera lense and angle of the photo should be the same for each photo.
- The star-picket must be located in the centre of the photo to provide a reference point.

Weeds Severity Categories

ID	Common Name	Scientific Name	Category	Form
1	Asparagus Fern(s)	*Asparagus spp.*	1	Groundcover/Vine
2	Balloon Vine	*Cardiospermum grandifolium*	1	Vine
3	Camphor Laurel	*Cinnamomum camphora*	1	Tree
4	Cats Claw Climber	*Macfadyena unguis-cati*	1	Vine
5	Glory Lily	*Gloriosa superba*	1	Groundcover
6	Madeira Vine	*Anredera cordifolia*	1	Vine
7	Morning Glory	*Ipomoea spp.*	1	Vine
8	Moth Vine	*Araujia sericifolia*	1	Vine

ID	Common Name	Scientific Name	Category	Form
9	Privet(s)	*Ligustrum spp.*	1	Tree
89	Salvinia	*Salvinia molesta*	1	water weed
10	Bitou Bush	*Chrysanthemoides monilifera*	2	Shrub
11	Broad Leaf Pepper Tree	*Schinus terebinthifolia*	2	Tree
12	Cape Ivy	*Delairea odorata*	2	Vine
13	Chinese Celtis	*Celtis sinensis*	2	Tree
14	Dutchman's Pipe	*Aristolochia elegans*	2	Vine
15	Firethorn	*Pyracantha spp*	2	Shrub / Tree
16	Fishbone Fern	*Nephrolepis spp.*	2	Groundcover
17	Green-leaved desmodium	*Desmodium intortum*	2	Vine
18	Hairy Commelina	*Commelina benghalensis*	2	Groundcover
19	Hawthorn	*Crataegus monogyna*	2	Shrub
20	Honeysuckle	*Lonicera japonica*	2	Vine
21	Monbretia	*Crocosmia X crocosmiiflora?*	2	Groundcover
22	Mother of Millions	*Bryophyllum spp.*	2	Groundcover
23	Ochna	*Ochna serrulata*	2	Shrub
24	Silver-leaf Desmodium	*Desmodium uncinatum*	2	Vine
25	Siratro	*Macroptilium atropurpureum*	2	Vine
26	Smooth Senna	*Senna X floribunda*	2	Shrub
27	Thorny Poinciana	*Caesalpinia decapetala*	2	Vine
28	Turkey Rhubarb	*Acetosa sagittata*	2	Vine
29	Umbrella Tree	*Schefflera actinophylla*	2	Tree
30	Watsonia	*Watsonia meriana cv. Bulbillifera*	2	Groundcover
31	Winter Senna	*Senna pendula var glabrata*	2	Shrub
77	Devil's Fig	*Ficus chrysotrichum*	2	Tree
82	White Trumpet Flower, Monkey's Comb	*Pithecoctenium crucigerum*	2	Vine
32	Aerial Yam	*Dioscorea bulbifera*	3	Vine
33	African Olive	*Olea europaea ssp. africana*	3	Tree
34	Ardisia	*Ardisia crenulata*	3	Shrub
35	Black-eyed Susan	*Thunbergia alata*	3	Vine
36	Blackberry	*Rubuis fruticosus agg. spp*	3	Vine
37	Blue Skyflower	*Thunbergia grandiflora*	3	Vine
38	Brazilian Cherry	*Eugenia uniflora*	3	Shrub / Tree
39	Bush Lemon	*Citrus lemonia*	3	Shrub / Tree
40	Busy Lizzie	*Impatiens walleriana*	3	Groundcover
41	Butterfly Bush	*Buddleja madagascariensis*	3	Vine
42	Cadagi	*Eucalyptus torelliana*	3	Tree
43	Callisia	*Callisia fragrans*	3	Groundcover
44	Canna Lily	*Canna indica*	3	Shrub
45	Cape Honeysuckle	*Tecoma capensis*	3	Vine
46	Caster Oil Tree	*Ricinus communis*	3	Shrub / Tree
47	Century plant	*Agave spp.*	3	Shrub
48	Coast TeaTree	*Leptospermum laevigatum*	3	Shrub / Tree
49	Cocos Palm	*Syagrus romanzoffianum*	3	Tree
50	Coffee	*Coffea arabica*	3	Shrub
51	Coral Berry	*Rivina humilus*	3	Shrub

ID	Common Name	Scientific Name	Category	Form
52	Coral Tree	*Erythrina spp*	3	Shrub / Tree
53	Duranta	*Duranta repens*	3	Shrub
54	Evening Primrose	*Oenothera spp*	3	Groundcover
55	Freckle Plant	*Hypoestes phyllostachya*	3	Groundcover
56	Ginger Lily	*Hedychium gardnerianum*	3	Shrub
57	Golden Rain Tree	*Koelreuteria paniculata*	3	Tree
58	Guavas	*Psidium spp*	3	Shrub / Tree
59	Jacaranda	*Jacaranda mimosifolia*	3	Tree
60	Japanese Daisy	*Tithonia diversifolia*	3	Shrub
61	Lantana	*Lantana camara*	3	Shrub
62	Large-leaf Abutilon	*Abutilon grandiflorum*	3	Shrub
63	Loquat	*Eriobotrya japonica*	3	Tree
64	Mistflower	*Ageratina riparia*	3	Groundcover
65	Mother-in-law's Tongue	*Sansevieria trifasciata*	3	Groundcover
66	Mulberry	*Morus sp*	3	Tree
67	Nightshades	*Solanum spp*	3	Shrub
68	Orange Jessamine	*Murraya paniculata*	3	Shrub
69	Passionfruit	*Passiflora spp.*	3	Vine
70	Pellaea viridis	*Pellaea viridis*	3	Groundcover
71	Periwinkle	*Vinca major*	3	Groundcover
72	Prickly Pear	*Opuntia spp*	3	Shrub
73	Singapore Daisy	*Wedelia trilobata*	3	Groundcover
74	Tecoma	*Tecoma stans*	3	Shrub / Tree
75	Tradescantia (Wandering Dew)	*Tradescantia fluminensis*	3	Groundcover
76	Variegated Ribbon Grass	*Chlorophytum comosum cv. Variegatum*	3	Groundcover
78	Broad-leaved Paspalum	*Paspalum wettsteinii*	3	Grass
79	Pigeon Grass	*Setaria spp.*	3	Grass
80	White Butterfly	*Syngonium podophyllum*	3	Vine
81	Callisia	*Callisia repens*	3	Groundcover
83	Green Cestrum	*Cestrum parqui*	3	shrub
84	Creeping Inch Plant	*Callisia repens*	3	ground cover
86	Whisky Grass	*Andropogon virginicus*	3	grass
87	Orange Trumpet Vine	*Pyrostegia venusta*	3	vine
88	Trumpet Flower	*Campsis radicans*	3	shrub
90	introduced grasses	introduced grasses	3	ground cover
91	Yucca	*Yucca elephantides*	3	shrub
92	Slash Pine	*Pinus elliottii*		tree

This table displays the vegetation benchmarks for various community types in the Northern Rivers. This is used, combined with professional judgement, to score the **Native Vegetation Cover.**

Veg type benchmarks: NORTHERN RIVERS

	Native over-storey cover		Native mid-storey cover		Native ground cover (grasses)		Native ground cover (shrubs)		Native ground cover (other)	
Veg Type Name	**Lower**	**Upper**	**Lower**	**Upper**	**Lower**	**Upper**	**Lower**	**Upper**	**Lower**	**Upper**
Subtropical Rainforests	50	100	10	100	0	5	0	20	10	60
Littoral Rainforests	40	100	10	100	0	10	5	15	5	50
Dry Rainforests	20	100	10	60	0	25	5	25	5	40
Coastal Swamp Forests	10	70	0	80	0	50	0	60	5	60
Coastal Heath Swamps	0	80	0	80	0	20	20	75	1	60
Wallum Sand Heaths	0	10	0	60	0	40	20	80	5	60
Coastal Floodplain Wetlands	10	50	5	70	1	70	0	10	1	80
Coastal Headland Heaths	0	5	0	50	5	75	5	80	1	40
Mangrove Swamps	5	100	0	5	0	5	0	1	0	5
Coastal Dune Dry Sclerophyll Forests	10	50	0	60	5	60	5	60	5	60
North Coast Wet Sclerophyll Forests	15	100	25	100	0	90	0	25	10	50

This table was adapted from the Vegetation Benchmark database. Further detail can be found at: http://www.environment.nsw.gov.au/biobanking/vegbenchmarkdatabase.htm

Example Subtropical rainforest: Native overstorey cover must be 50%-100% to be within benchmark. Native mid-story cover must be between 10%-100% to be within benchmark etc.
Example Coastal Swamp Forest: Native Overstorey cover must be 10%-70% to be within benchmark (as 70% is maximum FPC for this veg type.) Native mid-story cover must be between 0%-80% to be within benchmark (i.e. no weeds present) etc.

APPENDIX I: Example Performance Indicators

Performance indicators will be site specific and will also be dependant on the type of habitat being restored. For example, performance indicators for plant growth rates and vegetative cover for reconstruction of a riparian rainforest community growing on rich alluvial soils will not be the same as for reconstruction of a coastal Banksia forest growing on sand, with differing environmental factors and abiotic conditions in these habitats affecting the rate of plant growth.

The below example performance indicators are from restoration projects undertaken on the Tweed Coast., in a dune and riparian habitat both on coastal sand.

Example Performance Indicators for a Coastal Dune Habitat

- Frontal and secondary dune vegetation maintained in good condition.
- Complete prevention of blowouts.
- Sustained reduction of weed species to a level that ensures natural recruitment by native species is not suppressed or excluded.
- Nil fruiting of weed species after primary treatment.
- No inappropriate genetic material used in plantings.
- High (>70%) survival rate of planted stock and naturally recruited native species.
- Growth of tree species to achieve an average height of >1metre by the end of the fifth year of the Plan.
- A density of trees to average 1 per 5m^2 over the whole dunal area at the end of the fifth year of the Plan.
- Colonisation and use of the site by native flora and fauna.
- Effective restriction of access by pedestrians, vehicles and domestic and feral animals to the revegetation sites.

Adapted from Aspect North (2000) *Dune Management Plan for Kings (Casuarina) Beach*

Example Performance Indicators for a Coastal Riparian Habitat

- Primary treatment of all weeds in the riparian zone by the end of year three.
- Nil fruiting of weed species after primary treatment.
- Increased number and abundance of native species.
- Increased recruitment of native species.
- Increased percentage canopy of native species.
- No inappropriate genetic material used in plantings.
- >70% survival rate of planted stock and naturally recruited native species.
- Growth of >1 metre by year three and 1.5 metres by year five for rainforest plantings and cover (cumulative cover from ground level to canopy) of 60% after 3 years and 80% after five years for sclerophyll plantings.
- Increased colonisation and use of the site by native fauna.
- Effective restriction of access by pedestrians, vehicles and domestic and feral animals to the revegetation sites.
- No net increase in streambank erosion.

Adapted from Aspect North (2002) *Cudgen Creek Riparian Plan, SALT*