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Conservation Management Plan for Grassland and Wetland Reserves at Laverton

Lincoln Kern

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Phone: 9484 1555 Fax: 9484 913
Email: enquiries@practicalecology.com.a
Address: PO Box 228 Preston 3072 Office: 2B Stott Street Presto

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1. INTRODUCTION

The Former RAAF Williams Base at Laverton is refugia for lowland temperate grassland of national significance. The site is also a well documented wetland of regional significance (Schulz *et al* 1991). Numerous species of flora and fauna of national and state significance occur or have been recorded within the reserves (Schulz *et al*. 1991, Mueck *et al*. 1998).

Three conservation reserves were established by the Department of Defence prior to the sale of the land for development. These reserves were established to protect high quality grassland remnants, the wetland, and numerous rare or threatened species of flora and fauna. The sale of the site was conditional on the management of the reserves through the implementation of *A Conservation Management Plan for Three Rare Species Reserves RAAF Williams Laverton* (Mueck *et al*. 1998) prepared by Biosis Research P/L.

This Conservation Management Plan provides both a review of the previous CMP prepared by Mueck *et al.* (1998) and management directions for the next five years. The CMP (Mueck *et al.* 1998) established management guidelines for a five year period that was due for review in 2003. This CMP is intended to provide simplified management procedures for the reserves and the threatened species that occur within them.

This review provides documentation and some limited assessment of management actions completed to date. In addition this review also provides further management procedures and actions based on those provided by Mueck *et al.* (1998).

Firstly, the actions detailed in the initial CMP will be reviewed. The actions completed will be detailed and the actions yet to be completed will be identified.

The future management of the conservation reserves will then be defined with several issues discussed and action programs proposed, including:

- Principles for management;
- Monitoring processes; and
- Program of monitoring and works to assure adaptive management over time.

Actions for salvaging (seed collection) significant indigenous species across the larger site before development will also be detailed.

1.1 Scope of Management Directions

The management recommendations included in this CMP are aimed at providing continuity with past management and the simplification of monitoring programs for threatened species. In summary the management recommendations contained in this CMP address the following issues:

- Fencing;
- Pest plant and animal monitoring;
- Salvage of significant species;
- Biomass reduction;
- Literature search into advances in temperate grassland management; and
- Monitoring and reporting.

2. REVIEW OF MANAGEMENT ACTIONS COMPLETED

2.1 Fencing

All fencing and rabbit-proofing was completed on the reserves long prior to 2006 and repairs were implemented in July 2006, in response to the holes found in the fences in March 2006. In addition to this considerable rabbit eradication work has been done and until recently populations had been eradicated.

Reserve C was identified by Mueck *et al.* (1998) as a location of rabbit populations. While some management action had been undertaken in the reserve, hares and rabbits have not yet been eliminated. Mueck *et al.* (1998) states that poisoning may be required if densities of rabbits are high.

2.2 Monitoring and Reporting

Monitoring is a requirement of the CMP and is a fundamental tool for ecologically sustainable management (Mueck *et al*1998). Monitoring for all 3 reserves has not been undertaken at the regularity foreshadowed by the original CMP. A monitoring report for Reserve A was undertaken in 2000 (Smith and Mueck 2000) and another for Reserve B in 2003 (Mueck 2003). Monitoring of all three reserves was undertaken in spring 2005 and reported on by Cameron (2006); this report was provided to the Victorian state Department of Sustainability and Environment (DSE) and Commonwealth Department of Environment and Heritage (DEH).

Monitoring grids have been established for all 3 reserves and an initial stage of monitoring has been completed and documented for Reserves A and B (Smith and Mueck 2000 and Mueck 2003). Monitoring grids of 50m x 50m were established in reserves A and B and baseline data was collected (Mueck 2003). A progress report update was also completed for the 2000/01 reporting period. A third monitoring review took place from February 2001 to February 2003 (Mueck 2004, pers. comm.).

A grid for Reserve C was established and supplied to DSE and DEH in July 2004. In 2006, Practical Ecology felt the grid system could be improved and these works were undertaken in 2006. Reserve C was then monitored in spring 2006 and reported on in the March 2006 monitoring report (Cameron 2006).

Annual reports have been submitted for 1999, 200/2001, 2003, 2004 and 2006.

Monitoring must occur for all three reserves annually for the first three years then by agreement with DEH and DSE. Reports are to be forwarded to DEH and DSE.

2.3 Weed Control

According to Mueck (2004, pers. comm.) extensive control of Chilean Needle-grass (**Nassella neesiana*) has taken place successfully in Reserves A and B. The majority of adult plants have been eradicated and seedling recruitment has in most cases been thwarted by ongoing management. Works must continue to focus on controlling new plants emerging from soil stored seed throughout these areas. The management objective of Chilean Needle-grass and Serrated Tussock (**Nassella trichotoma*) control to date has been the elimination of adult plants and the exhaustion of soil stored seed.

2.4 Salvage of Threatened Species

Cedar Woods P/L has undertaken the required salvage operation of the Striped Legless Lizard in accordance with the CMP (Mueck *et al*. 1998) and in consultation with DSE. Prior to the sale of the site the Department of Defence undertook a salvage operation of some of the Plains Rice-flower outside of the 3 reserves.

2.4.1 Striped Legless Lizard

In accordance with the requirements set out in the CMP (Mueck *et al.* 1998:9) Cedar Woods P/L has undertaken a salvage operation of the Striped Legless Lizard *Delmar impar*. Ecology Australia P/L were commissioned by Cedar Woods to provide ecological advice during archaeological survey works and undertake rescue and salvage of Striped Legless Lizards during this process. The archaeological survey works occurred outside the reserves and involved ripping, hand raking, turning of sods and searching for the presence of the Striped Legless Lizard before further scraping. Geoff Heard was subcontracted by Ecology Australia to provide herpetological expertise during the operation which took place on March 9 2004 (Conole 2004).

The ripping, raking and searching was undertaken for three out of 11 scraped transects required for the archaeological survey. The remaining transects were ripped followed by scraping. Geoff Heard monitored the ripping and scraping of the remaining 8 transects.

No records were made of the Striped Legless Lizard during this process. The owner has agreed to undertake further works just prior to development in areas of prime habitat.

The necessary report detailing the salvage operation was provided to DEH and DSE in 2004.

2.4.2 Plains Rice-flower

The reserves support one of the largest known populations of the Victorian endemic Plains Rice-flower (*Pimelea spinescens ssp. spinescens*). Prior to sale the Department of Defence initiated salvage and translocation of Plains Rice-flower from unreserved areas into cultivation and directly into Reserve B in 1998 (Mueck *et al.* 1998, Mueck 2000).

The option of salvage and translocation was chosen over establishing a larger reserve to include all or most of the Plains Rice-flower populations due to the otherwise poor quality weed infested areas where the plants occurred (Mueck *et al*.1998, Mueck 2000). Approximately 300 cuttings were taken for propagation and approximately 222 individual plants were translocated in January and May 1998. Approximately 100 of the cuttings produced a root system and were subsequently planted in the reserves but have since died as a result of drought (Mueck 2000). According to Mueck (2000) 144 translocated individuals had survived when monitored in February 2000.

2.4.3 Basalt Sun-orchid (*Thelymitra sp. aff. pauciflora*)

According to Mueck *et al.* (1998) there were an approximate total of 400 plants scattered throughout the site. These occurred within both the then reserved and unreserved land. Changes were made to the boundary of Reserve A to accommodate this species. Ten plants west of Taxiway F were moved to Reserve B. Subsequent monitoring of Reserve B (Mueck 2003b and Cameron2006) has not resulted in any records.

It was understood that the salvage operation undertaken in 1998 would satisfy all requirements of the original CMP. However further salvage may be required.

2.5 Biomass Reduction

Biomass reduction is vital for the sustainable management of native grassland biodiversity in southeast Australia. The closing of dead standing vegetation across the inter-tussock spaces leads to a depletion of species diversity. This can lead to the decline and elimination of rare or threatened species.

Fire is the most effective management with the potential to provide high returns on threatened species populations requiring the type of disturbance fire produces. Slashing on the other hand can result in simplified grassland structure and diversity. Slashing within the site is likely to have resulted in a simplified structure in some areas over the past 50 years (Mueck *et al* 1998) but also played a role in maintaining existing values.

Burning is the preferred method of biomass reduction and this is the method currently being used on the site. After development commences on the site, alternative methods of biomass control should be investigated that deal with potential liability and conflict issues. Other methods of biomass control exist and decisions on the best method are to be made in consultation with DSE.

2.5.1 Burning

According to Mueck (2003) large areas of the site including sections of the reserves were burnt by the DNRE during February 2000. A wildfire occurred in Reserve C during the summer of

2000-2001. Burning has proved to be an effective practice for biomass reduction but is difficult to implement due to the lack of properly insured contractors & logistical difficulties.

2.5.2 Slashing

Slashing occurred around the perimeter of the three reserves and the perimeter of the entire site in November 2001 (Mueck 2003). Slashing may have occurred in these areas since but Practical Ecology has not been provided with any documentation. Cedar Woods slashes around the perimeter of the entire site each year in late spring as part of fire risk management plan agreed with Wyndham City Council.

2.6 Ongoing Weed Management

According to Mueck (2003) significant gains have been made in the control and elimination of a number of environmental and noxious weeds. Target species include Serrated Tussock (**Nassella trichotoma*) and Chilean Needle-grass which have the potential to adversely alter the ecology of the grassland ecosystem. Despite this weed management has generally been consistent with the Mueck *et al* (1998) Conservation Management Plan and well funded (Mueck 2003). Mueck *et al* (1998) states that major weed control works are to occur every six months with small scale follow up works to occur every three months. This regime must be maintained to ensure past management areas are not re-invaded.

Weed control has been intensive, ongoing and effective in the priority areas of Reserves A and B. Given the nature of Reserve C and it size of 33 ha a decision was made to focus available resources on Reserves A and B. The weeds in Reserves A and B were substantially under control by 2004 and only maintenance level works have been required since that time.

Primary weed management must be undertaken in Reserve C as a matter of urgency. Substantial efforts have been implemented to control Serrated Tussock and Chilean Needle Grass in the dry grassland areas but the wetland also has significant weed infestations. Toowoomba Canary-grass (**Phalaris aquatica*) and Water Couch (**Paspalum distichum*) are high threat weeds in grassy wetland environments.

The program for the eradication of environmental and noxious weeds in ongoing with regular works occurring each year that include small levels of maintenance works in areas where primary treatment has been achieved with new areas of primary weed control undertaken each year. Significant works have been undertaken in Reserve C as well as maintenance works in Reserves A and B in the last 12 months and summaries have been forwarded to DSE when reports were completed.

3. ONGOING MANAGEMENT OF RESERVES

This section will discuss relevant issues for management of the reserves and proposed approaches to management and specific requirements if appropriate.

3.1 Maintaining Fencing

A routine of fence inspection and maintenance must be undertaken for (i) rabbit/hare proofing, and to (ii) secure area from access by unauthorised persons.

To prevent damage to flora, the owner must carry out fence repairs and follow up eradication works in the reserves within two weeks of any fence damage being discovered.

Recommendation:

The entire length of each fence will be formally inspected on an annual basis to ensure that it remains rabbit-proof. Repair works to be undertaken as required.

3.2 Signage

Two forms of signage are required at the site; pre development notices and post development interpretation. There are numerous cases (although poorly documented) of sites of botanical significance that have inadvertently been degraded or partially destroyed due to inadequate protection during development construction projects. Cases observed by the authors include service trenches constructed through 'reserved' crown land and housing envelope spoil dumped and spread over grassland remnants on rail reserves.

The existing fences around each reserve do not explicitly imply that the vegetation contained within the fenced off area is off limits. Any number of conclusions could be made by contractors working on the site. While the site was owned by the Department of Defence horses were grazed in some areas. It would not be an unreasonable assumption for an uninformed contractor to assume that existing fences where for horse containment and are now superfluous and utilise the reserve areas for a purpose causing damage to the vegetation. With increasing numbers of consultants and tradespersons entering the site it is important to prevent any inadvertent damage of the reserves due to a lack of onsite information.

Pre-development notices of weather resistant materials must be installed within the reserve at strategic locations. One main sign could be erected along the main access route from Forsyth Road. Such a sign must contain the following information:

- ATTENTION: This site contains three areas of national biodiversity significance. These areas are fenced. No unauthorised entry is permitted. Authorised entry is permitted for conservation management only. Do not interfere with any wooden or steel stakes or pegs within or near these reserves unless authorised to do so.

Such a sign must also contain contact details of relevant authorities that contractors can call prior to undertaking works if they have any doubts about the impact their specified works may have. Numerous local governments apply this approach to managing significant vegetation on roadside reserves.

Signage is considered to be necessary to inform the general public and users of the area that the reserves are significant conservation sites then the signs would be designed and installed according to the following principles:

- Each sign should be brief and to the point;
- The importance of the sites and requests for respect and care should be presented; and
- Installed at appropriate and effective locations where pedestrian access is high.

Once development has been completed in the vicinity of each reserve, post-development interpretive signage must be installed. This signage must focus on rare species that inhabit the reserves.

Recommendation:

Pre-development signage will be installed consistent with the above guidelines.

3.3 Vermin Control

3.3.1 Rabbits and Hares

Population densities of hares and rabbits inside areas currently bound by rabbit-proof-fencing must be monitored. Hares and a potential rabbit warren have been observed within Reserve C. Gates must be locked to prevent or limit hare/rabbit access and unauthorised use. Rabbit and hare monitoring will need to be ongoing, this was also stressed by Mueck *et al*. (1998:19)

Both informal observations and formal annual assessments of rabbit and hare levels must be undertaken. Formal assessments of rabbit and hare numbers would be undertaken each spring with the intention of targeting works over summer primarily but also into the following autumn. A suitably qualified pest control contractor will be used to help assess the level of infestation and to determine the best course of action in any one year, which includes, but is not limited to, baiting, dogs, ferrets and shooting.

Recommendation:

Take appropriate action to eliminate rabbits and hares within the reserves pending recommendations from the monitoring program each year.

3.4 Weed Control

As a priority weed management should provide follow up maintenance of areas where control has already occurred. This is essential in order to prevent re-establishment of priority weeds in sites that have already had a considerable investment of resources resulting in the virtual elimination of mature, seed producing weed species. A key consideration in many weed management strategies is the elimination of adult seed producing plants and the continual follow up elimination of seedling recruitment. This process, if maintained consistently for a number of years will eventually result in the exhaustion of the soil stored seed from the weed species and result in the complete elimination of the species from the site. This approach has been applied to the site and must continue.

In addition to the above strategy, ongoing weed management needs to be adaptive and based on:

- Weed threat status;
- Weed invasion fronts and their conservation significance;
- Weed dispersal mechanisms the potential to contain further spread;
- Potential for habitat modification (including weed allellopathy) and or elimination;
- Reflective of annual or biannual reviews of monitoring data; and
- Consideration of adjacent future uses.

It is important to engage qualified contractors for these works that possess a high level of expertise in grassland plant identification and the selective and sensitive use of herbicide.

Monitoring of the progress of the pest plant control measures is integral to the evaluation of the success of the control program. Regular observations by managers, researchers or technicians should allow the early identification of any new species requiring control. Any existing populations of introduced species observed to be noticeably increasing in numbers or distribution should also be evaluated for its inclusion on the list of priority pest plants requiring control.

Determining the success of management actions on pest plants is considered to be a relatively simple process. Observation of initial control works over a period (up to a year) should note a significant decline in the population or eradication of extant individuals. If the species is no longer obvious, efforts should be made to stimulate any soil stored seed (eg. using fire) and the resulting regeneration controlled. Regular observation should then indicate the need for any further follow-up works. A re-assessment of the 20 x 20m grid after two years of control works is recommended for providing very useful data to guide on-going management of the site.

Chilean Needle Grass and Serrated Tussock are among the highest priorities for control on the site. It is essential that works continue to focus on controlling new plants emerging from soil

stored seed throughout these areas. The management objective of Chilean Needle-grass control to date has been the elimination of adult plants and the exhaustion of soil stored seed.

Use of conservative weed control measures such as spot spraying and hand removal are the priority. Other less sensitive methods are to be utilised only by prior agreement with DSE.

The following lists high priority weeds identified in the three reserves and the appropriate control measures required.

Table 1. Weed species of high priority for control and appropriate control methods.

Scientific Name	Common Name	Notes for control
All	Annual Grasses	Spot spraying with grass specific herbicide or spot burning with hand held weed burning before seeding
**Calicotome spinosa*	Spiny Broom	Spot spray with broad-leaf specific herbicide
**Cirsium vulgare*	Spear Thistle	Spot spray with broad-leaf specific herbicide
**Cynara cardunculus*	Spanish Artichoke	Spot spray with broad-leaf specific herbicide
**Helminthotheca echioides*	Ox-tongue	Spot spray with broad-leaf specific herbicide
**Homeria flaccida*	One-leaf Cape-tulip	Spot spray with glyphosate herbicide or hand removal
**Lycium ferocissimum*	African Box-thorn	Spot spray with broad-leaf specific herbicide or cut and paint
**Nassella neesiana*	Chilean Needle-grass	Spot spray with glyphosate herbicide
**Nassella trichotoma*	Serrated Tussock	Spot spray with glyphosate herbicide
**Paspalum dilatatum*	Paspalum	Spot spray with glyphosate herbicide
**Pennisetum clandestinum*	Kikuyu	Spot spray with glyphosate herbicide or hand removal
**Plantago coronopus*	Buck's-horn Plantain	Spot spray with broad-leaf specific herbicide
**Romulea rosea*	Onion Grass	Spot spray with glyphosate herbicide
**Rosa rubiginosa*	Sweet Briar	Spot spray with broad-leaf specific herbicide
**Sporobolus indicus*	Indian Rat-tail Grass	Spot spray with glyphosate herbicide or hand removal
**Paspalum distichum*	Water Couch	Spot spray with glyphosate herbicide

Scientific Name	Common Name	Notes for control
		or hand removal
**Phalaris aquatica*	Toowoomba Canary	Spot spray with glyphosate herbicide

Recommendation:

Effective weed control and follow-up management will be undertaken by qualified contractors in all reserves and any adjacent open space in two periods each year, primarily in mid to late spring before warm season weeds set seed and late autumn and early winter after the autumn break stimulates cool season weeds.

3.5 Biomass Reduction

Fire is a valuable tool for the sustainable management of grassland reserves within the site. The use of fire within the site to date has aided the control and partial elimination of environmental weeds. Further, the use of fire reduces plant biomass often removing all standing material above ground. The accumulation of dead matter is removed and the inter-tussock spaces are opened up to indigenous shrubs, herbs and smaller grasses.

A key consideration prior to the planning of any burns is the ability to adequately resource follow-up weed management. Fire stimulates the soil stored seed of many grassy weeds and fire can result in a boom in germination. Appropriate resources must be allocated to post-burn weed management.

Grassland and much of its constituent flora have historically relied on fire for survival and regeneration (DCE 1992). Fire continues to play a role in the maintenance of grasslands and numerous species are dependent on fire during their lifecycle (Lunt 1991). Burning needs to be carried out at appropriate times of year that don't harm some species of orchids. The best time of year is in summer when few life forms are actively growing (Mueck *et al* 1998). However this may favour the proliferation of the indigenous Kangaroo Grass (*Themeda triandra*) but be reduced during cool season burns. Concern has been expressed that an increase in Kangaroo Grass within the reserves will eliminate some rare or threatened species.

Based on the proposed future uses of the site it is possible that alternative methods of biomass control will be required. Discussions with DSE may occur about alternatives to burning for biomass reduction once development plans are implemented.

Despite this, little information exists on the effects of differing biomass reduction techniques on grassland life forms (Lunt 2003). Burning at any time of year is preferable to an extended period (>3 years) of no burning.

Recommendation:

Undertake burning with appropriate contractors every 2 to 3 years in the native grassland areas of the site and ensure post-burn weed control in adequately resourced and undertaken.

Once the inter-tussock space reaches less than 30% across grassland areas then controlled burning should be implemented as soon as possible even if it hasn't been 2-3 years since the previous burn.

3.6 Rare Flora and Fauna Management

The reserves are known to support six species of national significance and two species of state significance according to Mueck *et al* (1998). A review by Smith and Mueck (2000) demonstrated the occurrence of further species of state conservation significance.

Of particular importance is the wetland and what species of birds, amphibians and other fauna use this habitat. Pest plant and animal control may have inadvertent negative impacts on significant species not yet accounted for in current biological inventories.

Recommendation:

Maintain up-to-date records of listed flora and fauna species in each reserve.

3.6.1 Salvage of Significant Species

A salvage operation for rare and threatened flora and fauna outside of the reserves is required prior to development by method of seed collection and translocation of selected species. The salvage operation must be undertaken in the latter months of the calendar year. After the proposed salvage operation there are to be no further salvage requirements and the land outside the reserves is to be available for clearing. A seed collection operation and the translocation of selected species are to be undertaken in spring prior to the development of the first stage.

A major salvage operation was undertaken of Plains Rice-flower and the Basalt Sun-orchid with plants relocated into Reserve B. The survival of the translocated Plains Rice flower specimens was comprehensively surveyed in 2000, two years after the translocation event. The survival rate was greater than 60% and the operation considered successful. Due to the inability to distinguish remnant from translocated specimens such a long time after the translocation event, this survey has not been repeated.

Recommendations:

The salvage plan will be prepared and implemented prior to construction works commencing.

It is preferable that relocation occurs on site given that there is opportunity in all of the reserves to do this without conflict with existing flora and given the measures that are in place to protect and manage these species. Further, The survival rate of translocated specimens is likely to be greater if it occurs onsite given the site conditions would be the same.

Any future translocation would have GPS recorded positions to enable monitoring and be implemented according to the Conservation Guidelines for the Translocation of Threatened Plants in Australia (Valle *et a*l 2004)

3.7 Native Grassland Research

As part of the monitoring procedure and the development of subsequent general recommendations for management for the following year a literature search into temperate grassland management, i.e. scientific journals, new books and other less formal sources, would be reviewed to determine if any new science or insights are available to inform management of the reserves. Each monitoring report would detail the sources reviewed and any relevant information that may improve management procedures.

4. MANAGEMENT RESTRICTIONS

Management restrictions were discussed by Mueck *et al.* (1998) and are reiterated here.

Access to the reserves and a number of activities must be strictly controlled. To elaborate on the management restrictions discussed by Mueck *et al.* (1998) it is recommended that:

- Vehicle access is prohibited from all three reserves. If ride-on mowers can be effectively used to control weeds in degraded areas this is the only exception. However, such an activity should be closely supervised by suitably experienced ecological consultants. Any mowing should be undertaken by suitably experienced vegetation restoration specialists.

- Access by pedestrians should be kept to a absolute minimum, restricted only to those undertaking activities consistent with this CMP, or scientific research on grassland ecology (including surveys) and management; and

- Fire crews should not enter the reserves unless absolutely necessary. Specific areas need to be defined as critical no-go-zones for fire crews; these would need to be clearly negotiated and agreed with each fire crew during the planning process but in general they would be asked to keep their vehicles out of the fenced areas. Mueck *et al* (1998) have specified four Kangaroo Grass areas are off limits.

5. MONITORING AND REPORTING

Temperate lowland grasslands are one of Australia's most threatened ecological communities. Remnants are small (relative to their original extent), fragmented and in various states of degradation. The management, conservation and restoration of grassy ecosystems are subjects of national importance. Unfortunately there remain numerous gaps in knowledge and few tested methods of adequate monitoring procedures to clearly identify deficiencies in management regimes particularly with regard to biomass reduction (Lunt 2003). Biomass reduction remains a critical issue for grassy ecosystems due to the high diversity and rare and threatened status of many species dependent on the inter-tussock spaces that are lost with biomass build up.

Rare and threatened species and pest plant and animal populations require ongoing monitoring. This is required to assess the success or other impact of management actions on populations of these species (Mueck *et al* 1998). In their Conservation Management Plan Mueck *et al* (1998) outlined the importance of scientifically robust monitoring methods capable of withstanding statistical analysis. The importance of this approach is reiterated here. The site is of national significance and its sustainable management is a considerable responsibility.

Intermittent monitoring occurred across the reserves until spring 2005. The original CMP (Mueck *et al* 1998) had quite minimal detail on monitoring objectives and procedures. The process implemented by Cameron (2006) was designed to provide a framework of straightforward objectives and procedures to be implemented in the future. All three reserves were monitored in spring 2005 and reported on by Cameron (2006). The monitoring procedures presented are based on the procedures used in that report.

The reserves can potentially play a major role in the accumulation of information on grassland ecological functions. The reserves are secure, they support a high level of diversity including species of national significance and species that may have become locally extinct in other grassland reserves and are close to Melbourne. The type of monitoring required is long-term and needs to be scientifically robust.

Monitoring should rotate around three important issues:

- Biomass;
- Introduced species and habitat quality; and
- Status of significant indigenous species.

The pattern of monitoring established by Cameron (2005) should continue. Within that report several core repeatable procedures were implemented both through data collection and qualitative assessment. Subsequent monitoring reports should follow the same procedures.

5.1 Biomass

Lunt (2003) describes a system of monitoring biomass through the use of indicators in degraded grasslands in the western basalt plains of Melbourne. Quadrat data from across the Basalt Plains was included in Lunt's (2003) data set for the selection of indicator species for monitoring of biomass accumulation and impact. From the quadrat data a number of species were selected as possible indicator species. Of these the majority were eliminated through a seven step process of elimination outlined in Lunt's (2003) report with three species remaining. Lunt (2003) proposes to replant these species into grassland reserves as indicators. All three species (Table 1) already occur within Reserve A and possibly B and would not require replanting to utilise Lunt's proposed monitoring process.

Table 2. Indicator Species

Scientific Name	Common Name
Calocephalus citreus	Lemon Beauty –heads
Chrysocephalum apiculatum	Common Everlasting
Leptorhynchos squamatus	Scaly Buttons

Importantly, Lunt's (2003) process was designed to be applied in degraded and depauperate grassland remnants dominated by Kangaroo Grass (*Themeda triandra*). The grassland reserves are predominantly of good quality and are not consistently dominated by one type of grass. Kangaroo Grass is present as a dominant in a mosaic pattern.

Without some form of biomass reduction Kangaroo Grass can out-compete smaller herbs and grasses. The build-up of Kangaroo Grass biomass closes the inter-tussock gaps occupied by light demanding herbs. There exists little information on the best ecological methods of biomass reduction (Lunt 2003). Grassland reserves established to the exclusion of grazing have resulted in diversity and abundance declines as a result of biomass build-up.

Lunt's (2003) proposed system of monitoring using the above three indicator species is intended to provide rapid assessment capability to determine if biomass levels are causing declines in species abundance. The logic behind the use of the above three indicator species is that they provided an accurate indication of condition of the broader community. If existing management practices are not capable of maintaining these indicator species it is unlikely that numerous other inter-tussock species will survive. If such a result is provided by this monitoring system then management regimes will need revision.

This process could possibly be established in experimental plots trialling differing forms of biomass reduction techniques.

Methods:

Use existing quadrats and grid in Reserve A established by Mueck *et al* (1998). New quadrats were established in suitable locations in reserves B and C to be used to monitor intertussock space. Follow standard cover abundance techniques using the Braun and Blanquet scale. All reserves must be monitored.

5.2 Significant Indigenous Species

Each reserve contains significant species of flora and Reserve C contains significant species of both flora and fauna. Management actions including biomass reduction, weed control or eradication and vermin control may potentially change conditions either favourably or unfavourably for significant species. Monitoring is essential. Conservation categories are explained in Appendix 1.

5.2.1 Flora

The reserves support nine flora species of state or national significance. The effect of biomass reduction, weed control or of being translocated or planted as nursery grown plants in the reserves should be monitored on the species listed in Table 2 below. Listing refers to the Flora and Fauna Guarantee Act 1988 and the Environment Biodiversity and Biodiversity Conservation Act 1999 and is sourced from DSE (2005).

Table 3. Species of State or National Significance

Listing	Status	Scientific Name	Common Name	Reserve
	e	*Craspedia* sp. 2	Derinallum Billy Buttons	A
	v	*Dianella* sp. aff. *longifolia*		A
	k	*Diuris* aff. *pardina*	Short-tailed Leopard Orchid	
EPBC FFG	VU e	*Diuris ochroma*	Pale Golden Moth Orchid	
EPBC FFG	CR v	*Pimelea spinescens* ssp. *spinescens*	Spiny Rice-flower	A, B
	e	*Podolepis* sp. 1	Basalt Podolepis	A, B
EPBC FFG	VU e	*Senecio macrocarpus*	Large-fruit Fireweed	A
	e	*Thelymitra* sp aff. *pauciflora* (Basalt Plains)		
	k	*Thelymitra* sp. aff. *pauciflora* (Laverton)	Short Sun-orchid	

Methods:

Use existing quadrats and grid in Reserve A established by Mueck *et al* (1998). New quadrats in were established in suitable locations in December 2005 (Cameron 2006); these will be used for monitoring some significant flora species and vegetation change in general. Follow standard cover abundance techniques using the Braun and Blanquet scale. Monitoring of significant flora species would occur in spring and reports would be compiled and provided to DSE and the Minister for the Environment and Heritage by March each year after the spring data collection.

5.2.2 Fauna

The reserves support eleven species of state or national significance. The effects of biomass reduction, water quality, weed control and vermin control should be monitored on the species listed in Table 3 below. Monitoring will be particularly important if there are going to be changes in the current use and function the wetland in Reserve C such as increased storm water run-off.

Table 4. Species of State or National Significance

Listing	Status	**Scientific Name**	**Common Name**	**Reserve**
	VU	*Anus rhynchotis*	Australian Shoveller	C
FFG	VU	*Ardea alba*	Great Egret	C
FFG	CR	*Ardea intermedia*	Intermediate Egret	C
FFG	EN	*Botaurus poiciloptilus*	Australasian Bittern	C
	NT	*Coturnix ypsilophora australis*	Brown Quail	C
FFG EPBC	EN	*Delmar impar*	Striped Legless Lizard	C
	NT	*Gallinago hardwickii*	Latham's Snipe	C
FFG EPBC	EN	*Litoria reniformis*	Growling Grass Frog	C
	VU	*Platalea regia*	Royal Spoonbill	C
FFG	VU	*Porzana pusilla palustris*	Ballion's Crake	C
FFG	VU	*Rallus pectoralis pectoralis*	Lewin's Rail	C

Methods:

Bird monitoring will be consistent with the current Birds Australia Atlas approach using the Usual Record Report Form outlined in Barrett *et. al*. (2003). Reserves A and B would each comprise a census area while two census areas would be established in Reserve C, one in the wetland in Reserve C and one in the dry grassland area to the north of the reserve.

For frogs, identification of calls would be used. Frog monitoring would be done in reserve each year by listening to calls using methods detailed by Frogwatch. In dry years it would be

expected that few frogs would call in grassland areas where there are no intermittent pools but the wetland would be expected to consistently have frogs in the spring.

Mammals and reptiles will be assessed through incidental observations.

Annual reports and monitoring reports must satisfy DSE and the Commonwealth Minister for the Environment and Heritage.

5.3 Priority Introduced Species

Reserves A, B and C contain introduced pest plants and animals of national significance. Their control with the aim of elimination is essential for the long-term maintenance of the reserves' state and nationally significant conservation values.

5.3.1 Vermin

The occurrence of rabbits or hares within any of the reserves has the potential to thwart salvage and reintroduction efforts for the 11 significant plant species. Further, significant fauna utilising the wetland reserve may be vulnerable to fox predation.

Methods:

The method for rabbit, hare and or fox monitoring described by Mueck *et al* (1998) should be continued. This involves spotlighting at night in and adjacent to the reserves. Annual inspections will occur and a level of rabbits or hares above 5 individual in any of the reserves will result in control efforts being implemented as recommended by a qualified pest animal contractor.

5.3.2 Weeds

Mueck (1998) identified 14 weed species and the entire 'Annual Grasses' group as major Environmental Weeds. These are presented in Table 4 below together with a further two weeds of significance observed within the wetland in Reserve C.

Table 5. Weed species of high priority for control.

Scientific Name	Common Name	Habitat
All	Annual Grasses	Grassland
**Calicotome spinosa*	Spiny Broom	Grassland

**Cirsium vulgare*	Spear Thistle	Grassland
**Cynara cardunculus*	Spanish Artichoke	Grassland
**Helminthotheca echioides*	Ox-tongue	Grassland
**Homeria flaccida*	One-leaf Cape-tulip	Grassland
**Lycium ferocissimum*	African Box-thorn	Grassland
**Nassella neesiana*	Chilean Needle-grass	Grassland
**Nassella trichotoma*	Serrated Tussock	Grassland
**Paspalum dilatatum*	Paspalum	Grassland
**Pennisetum clandestinum*	Kikuyu	Grassland
**Plantago coronopus*	Buck's-horn Plantain	Grassland
**Romulea rosea*	Onion Grass	Grassland
**Rosa rubiginosa*	Sweet Briar	Grassland
**Sporobolus indicus*	Indian Rat-tail Grass	Grassland
**Paspalum distichum*	Water Couch	Wetland
**Phalaris aquatica*	Toowoomba Canary	Wetland

Methods:

Use existing quadrats and grid in Reserve A established by Mueck *et al* (1998). Establish new quadrats in suitable locations pending the number of suitable existing quadrats. Follow standard cover abundance techniques using the Braun and Blanquet scale.

5.4 Weed Cover and Vegetation Quality

In order to establish and identify management priorities, the quality of vegetation throughout each reserve, and any open space adjacent to the reserves must be surveyed and mapped using a four-tiered colour-coded system based on one developed for the NSW National Trust (Buchanan 1989). The indicative quality of the vegetation across either of the reserves is represented by one of four colours:

Green: *75-100% indigenous cover. Areas of ground-flora largely or completely intact and carrying little or no exotic flora.*

Blue: *50-75% indigenous cover. Areas of ground-flora substantially intact but with a moderate cover of exotic flora.*

Orange: *25-50% indigenous cover. Areas of ground-flora substantially degraded and predominantly carrying exotic flora but where some indigenous ground-flora remains.*

> ***Red:*** *< 25% indigenous cover. Areas where the ground-flora is severely degraded and largely or totally dominated by exotic flora.*
>
> (Source: Muyt and Kern 2004)

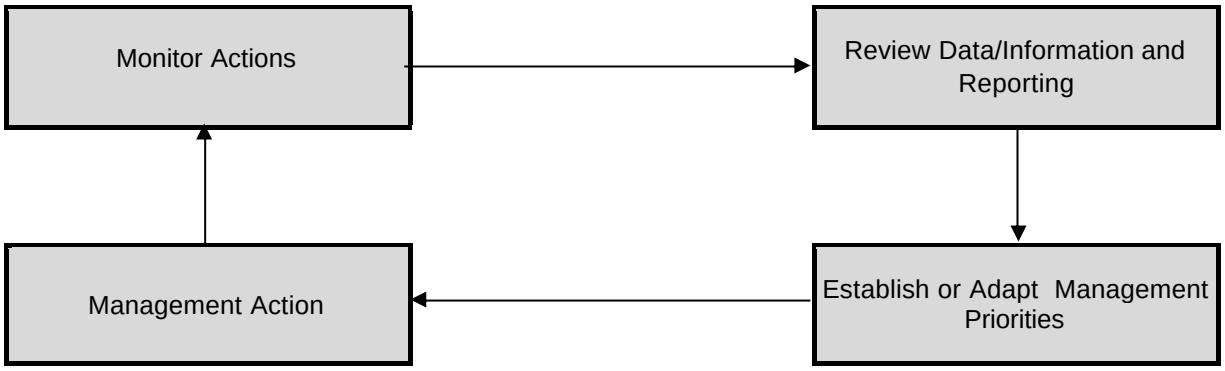
Establishing zones based on the above measurements provides a detailed guiding system in the implementation and interpretation of works plans. This approach provides the opportunity to ensure the highest quality areas are maintained and provides a measure of the overall quality of the each reserve. With constraints on management funding limiting the amount of potential works priorities will need setting. Threatened species management is an obvious priority but where this coincides with the most achievable outcomes for overall management should be another priority. Broad assessment of vegetation quality will enable targeted works to continue.

The highest priorities should be the invasion fronts of weeds and where they specifically threaten rare indigenous or high quality sites. The monitoring and mapping of weeds and rare plants is necessary to determine the best targets for the budgets available.

Weed data and general inspections will be used to design the weed control program. Weed invasions on the site are substantial and it will be difficult to eradicate all weeds at any time in the future because of substantial soil seed banks and the inevitable reinvasion processes. Each annual weed program will be designed to maintain low levels of weeds in high quality areas and initiate primary weed control efforts in new areas. The annual data collection for monitoring will allow evaluation of past efforts and the prioritisation of subsequent efforts.

6. ONGOING INTERACTION OF MANAGEMENT, MONITORING AND WORKS PROGRAMS

The monitoring processes must help guide the development of annual management and works programmes. The flow chart below sets out a basic cycle of monitoring, management and assessment.



It is envisioned that the above management model will be implemented each year. Management works would primarily occur between June and December each year. Monitoring data would be collected in late spring. Monitoring data would then be used as a basis for developing a review of the previous year and works plan for the following year. A document including the following information would be submitted to DSE and DEH by May each year:

- Results of monitoring in the past year;
- Management actions undertaken and their success (or otherwise) in the past year; and
- Proposed actions/monitoring priorities for the coming year.

Presented in Table 6 below is the approach to annual works within the reserves. This approach establishes a systematic hierarchy of management actions that are applicable during differing times of the year.

Table 6. Proposed Works Programme

Timing of Activity	Activity	Reserve		
		A	B	C
Spring (Sept-Nov)	Monitoring of Rare Species (flora and/or fauna)	x	x	X
Early Summer or late Autumn (Dec or April)	Biomass Reduction Burns	x	x	X
Summer (late Dec – Jan).	Investigate / consider slashing as alternative to burn	x	x	X
Summer (throughout)	Compile annual monitoring reports. Inspect for rabbit and hares and implement control if required	x	x	X
Late Summer/Autumn	Review previous year's works and develop Action Plan for next financial year	x	x	X
May	Submit annual reports of monitoring and management actions and an indicative lists of upcoming management priorities	x	X	X
July-August	Implement Winter Weed control works	x	x	X
October - December	Implement Spring-summer weed control	x	X	X
As required	Other activities: fence maintenance, vermin control	x	x	X

7. PROPOSED DEVELOPMENT AND RESERVE USAGE

Development of the areas immediately adjacent to reserves needs to be sympathetic to the conservation values of the reserves (Mueck *et al* 1998). Further, the use of fire is not likely to be an indefinite management tool and will need addressing in the future. The use of any reserve will require approval from DSE.

7.1 Mitigating Development Impact

Mueck *et al.* (1998) stressed the importance of avoiding any adverse impact on reserves A, B and C. Their recommendations are reiterated here. One recommendation, fencing, has already been enacted. Other considerations included:

- Non indigenous grassy areas within 100 meters of the reserves must be slashed at low levels on a regular basis;
- Areas of high-threat weeds within close proximity to the reserves should be eliminated which could be facilitated by further mapping and use in the development design process;
- Sealed roads and footpaths should be utilised as reserve barriers where practical to limit the potential spread of weed propagules; and
- Development needs to have consideration of height and the potential to cast shade on the grassland reserves. This should be avoided.

7.2 Use of Reserves

Cedar Woods has proposed that recreational infrastructure be developed in the reserves. This is proposed on the grounds that interaction between the reserves and the community occupying the proposed development will foster community support and ownership of the reserves and that resistance may result if people are excluded.

Recreational infrastructure proposed by Cedar Woods includes:

- Educational signage; and

Under the Framework (DNRE 2002) any area of native vegetation proposed for any form of development including recreational path and or boardwalk construction must be subject to planning approval. Prior to lodging an application to construct either a boardwalk or path an assessment of the entire patch of vegetation must occur.

8. DRAINAGE

The wetland within Reserve C performs a drainage function for land north of the Princess Freeway as it is a naturally occurring depression or low lying area.

Particular catchments, mainly those in the west of the subject site and north of the subject site, will continue to utilise the area in Reserve C for drainage purposes. Melbourne Water and the land owner have agreed to a broad framework for the drainage infrastructure on the subject site utilising 3 existing culverts that run underneath the freeway towards Skeleton Creek. One of these channels water directly from the wetland in Reserve C.

The Land Owner is to work with Melbourne Water, DEH and DSE to ensure available options are investigated and any impacts on the hydrology of the reserve are mitigated. Regard to both water quality and volumes will be required.

9. CONCLUSION

The earlier report by Mueck *et al* (1998) provides a sound scientific approach to the general management of the reserves. Provision is also provided for a number of significant species including their salvage from outside the reserve system and monitoring within the reserve system.

Mueck *et al*. (1998) set species specific priorities for weed management. This is necessary for some species and this approach has also achieved significant reductions in the extent of Chilean Needle-grass (Mueck 2004, pers. comm.). This review has proposed a combined species specific and vegetation quality approach that:

- Identifies high threat weeds;
- Identifies the highest quality areas;
- Identifies significant species sites;
- Reviews monitoring data; and
- Establishes an adaptive management works programme.

Conservation infrastructure within the reserves includes rabbit-proof fencing, quadrat markers and monitoring grids and a secure entrance (padlocked gate) limiting public access and preventing unauthorised vehicle access.

Suitably qualified personnel will be contracted to undertake the works described in this CMP. In order for the management of the three reserves to be successful a high level of botanical and technical skill is required.

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APPENDIX 1. Categories of Conservation Status

Flora

Categories of Conservation Status	
E	Endangered in Australia
e	Endangered in Victoria
V	Vulnerable in Australia
v	Vulnerable in Victoria
R	Rare in Australia
r	Rare in Victoria
K	Poorly known in Australia
k	Poorly known in Victoria

Ross and Walsh 2003, DSE 2005

Fauna

Categories of Conservation Status	
VU	Vulnerable in Victoria
CR	Critically Endangered in Victoria
EN	Endangered in Victoria
NT	Near Threatened Victoria