Gnangara Rural Community

Local Structure Plan

PART 3 – TECHNICAL SUPPORTING DOCUMENTS

City of Wanneroo

June 2014

Part 3 – Technical Supporting Documents

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Government of **Western Australia**
Department of **Parks and Wildlife**
Science and Conservation Division

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Steve Robertson
Linc Property Pty Ltd
P.O. Box 782
SUBIACO WA 6904

Dear Mr Robertson,

RE: NATURE CONSERVATION COVENANT – Bush Forever Site 463

Thank you for the copies of the Bush Forever Rehabilitation and Management Plan (BFRMP) dated May 2014.

As you are aware, a conservation covenant with the Department of Parks and Wildlife has been placed over portions of Bush Forever Site 463, within Lots 6, 10 and 9000 of Sydney Road, Gnangara. As a condition of the subdivision, a rehabilitation plan was required to be prepared and executed by the proprietor.

A review of the BFRMP (May 2014) has considered the current and proposed management actions to alleviate any threats imposed on the rehabilitation of the Bush Forever site, as suitable over the 2 year monitoring period.

I look forward to the annual report that will be submitted to the Department's Covenant Program over the two years.

Yours sincerely,

Lei Zhang
COVENANT OFFICER
10th June 2014

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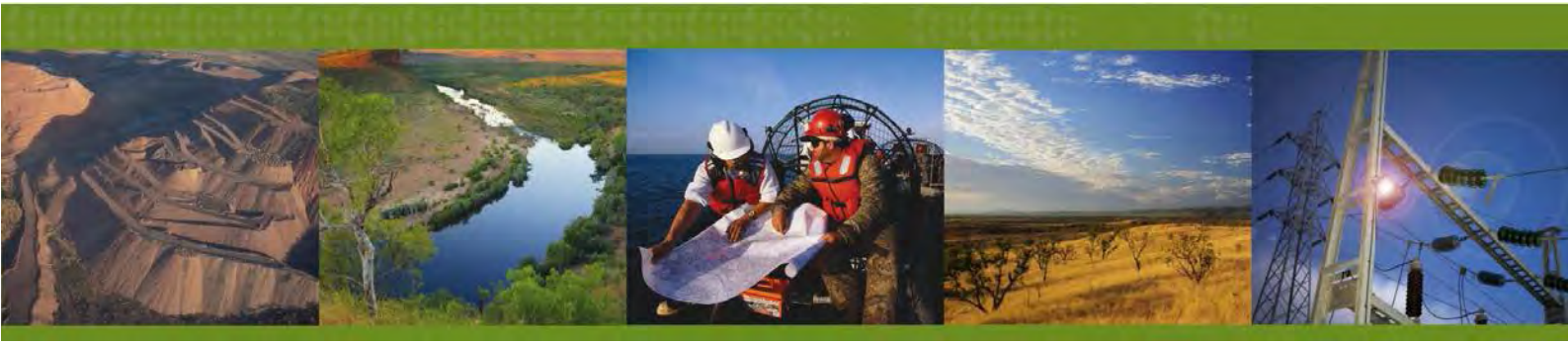

Bush Forever Rehabilitation and Management Plan

Starlight Grove Bush Forever site (No.463),
Gnangara

Prepared for
Gnangara Holdings Pty Ltd
by Strategen

May 2014

STRATEGEN
environmental consultants

Bush Forever Rehabilitation and Management Plan

Starlight Grove Bush Forever site (No.463), Gnangara

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May 2014

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Client: Gnangara Holdings Pty Ltd

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Preliminary Draft Report	A	Client review	R Chesney / J Morgan	Electronic	27 Mar 2012
Draft Report	B	Client review	R Chesney, J Morgan	Electronic	31 May 2012
Draft Report	C	DEC review	R Chesney, J Morgan	Electronic	6 June 2012
Final Draft Report	D		R Chesney, J Morgan	Electronic	30 July 2012
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1. Introduction

1.1 Purpose

Portions of Lots 6, 10 and 9000 (formerly Lot 50) Sydney Road, Gnangara contain the Starlight Grove Bush Forever site (No. 463). The Bush Forever site is to remain as freehold land and will be retained and managed in the long term by the landowner in accordance with an existing Conservation Covenant and associated Management Guidelines.

The land adjacent to the Bush Forever site has been rezoned to Industrial under the Metropolitan Region Scheme (MRS) in line with the State Government's Economic and Employment Land Strategy (WAPC 2012), which will support economic growth within the City of Wanneroo and provide a key source of local employment. The Bush Forever negotiated planning solution (NPS) associated with the MRS amendment for the adjacent industrial area, identified portions of Lots 6, 10 and 9000 Sydney Road, Gnangara for protection in perpetuity as Starlight Grove Bush Forever site, (reference number 463, hereafter referred to as the Bush Forever site). The Bush Forever site has also been identified as containing potential Carnaby's black-cockatoo habitat and its preservation, rehabilitation and management will ensure that this habitat function is retained in perpetuity.

The Bush Forever NPS outcome included the placement of a Department of Parks and Wildlife (DPaW) (previously Department of Environment and Conservation) Nature Conservation Covenant on the land title over the new boundaries of the Bush Forever site. The associated Nature Conservation Covenant Program Management Guidelines (NCCPM Guidelines) identify appropriate ongoing management activities for the Starlight Grove Bush Forever Conservation Covenant area. They do not, however, set out in detail the initial management activities which would be required to be implemented in order to facilitate the ongoing management of the Bush Forever site in line with the Conservation Covenant and associated NCCPM Guidelines by the landowner.

The purpose of this Bush Forever Rehabilitation Management Plan (BFRMP) is to identify the initial rehabilitation and associated management works which are required to be completed to ensure the Bush Forever site can be managed by the landowner after the implementation of the BFRMP in accordance with the Conservation Covenant and NCCPM Guidelines. The implementation of this BFRMP will be staged to ensure its delivery is appropriately coordinated with the construction works on the adjoining industrial estate. Rehabilitation, monitoring and ongoing maintenance activities will also take into account other factors, such as seasonal and inter annual climatic variations, to ensure that the identified rehabilitation and management activities have the highest likelihood of success.

This BFRMP outlines a process for the rehabilitation of areas which were identified in the Conservation Covenant and proposes a number of mitigation and management measures to ensure the Bush Forever site is retained and its habitat functions are enhanced in a manner which will facilitate ongoing management by the landowner. This BFRMP is not intended to duplicate or supersede the NCCPM Guidelines, but rather to set out the rehabilitation and management activities which will be implemented on the site and as such, it is intended to be consistent with and be read in conjunction with the Conservation Covenant and associated NCCPM Guidelines.

The boundaries of the Bush Forever site included in this BFRMP reflect the final boundaries depicted in the Conservation Covenant (Figure 1and Figure 2).

1.2 Plan format

The BFRMP details the initial management and maintenance measures which will be implemented for the Bush Forever site prior to and during construction of the adjacent industrial area. Ongoing management post-construction will then be undertaken in accordance with the requirements of the NCCPM Guidelines (Appendix 1).

Specifically, this BFRMP comprises:

- Bush Forever site description
- identification of the general management actions required to delineate and facilitate ongoing management of the Bush Forever site by the landowner (e.g. fencing, signage and fire management)
- identification of rehabilitation sites and objectives for rehabilitation, including any site specific characteristics and requirements
- description of the relationship of the rehabilitation and general management actions with the subdivision construction works associated with the adjacent industrial area (i.e. seed collection and topsoil salvage)
- monitoring and reporting requirements post implementation.

1.3 Document approval

The BFRMP is designed to accompany and be read in conjunction with the Guidelines (Appendix 1) which provides for the retention and ongoing management of the Bush Forever site in private ownership.

The Department of Parks and Wildlife (DPaW) (previously Department of Environmental Conservation) is the approval authority for this document as this will ensure consistency between the objectives of the BFRMP and the existing Nature Conservation Covenant and related auditing processes.

1.4 Related documents

The BFRMP should be read in conjunction with:

- DEC 2011, *Nature Conservation Covenant Program Management Guidelines* (Appendix 1).

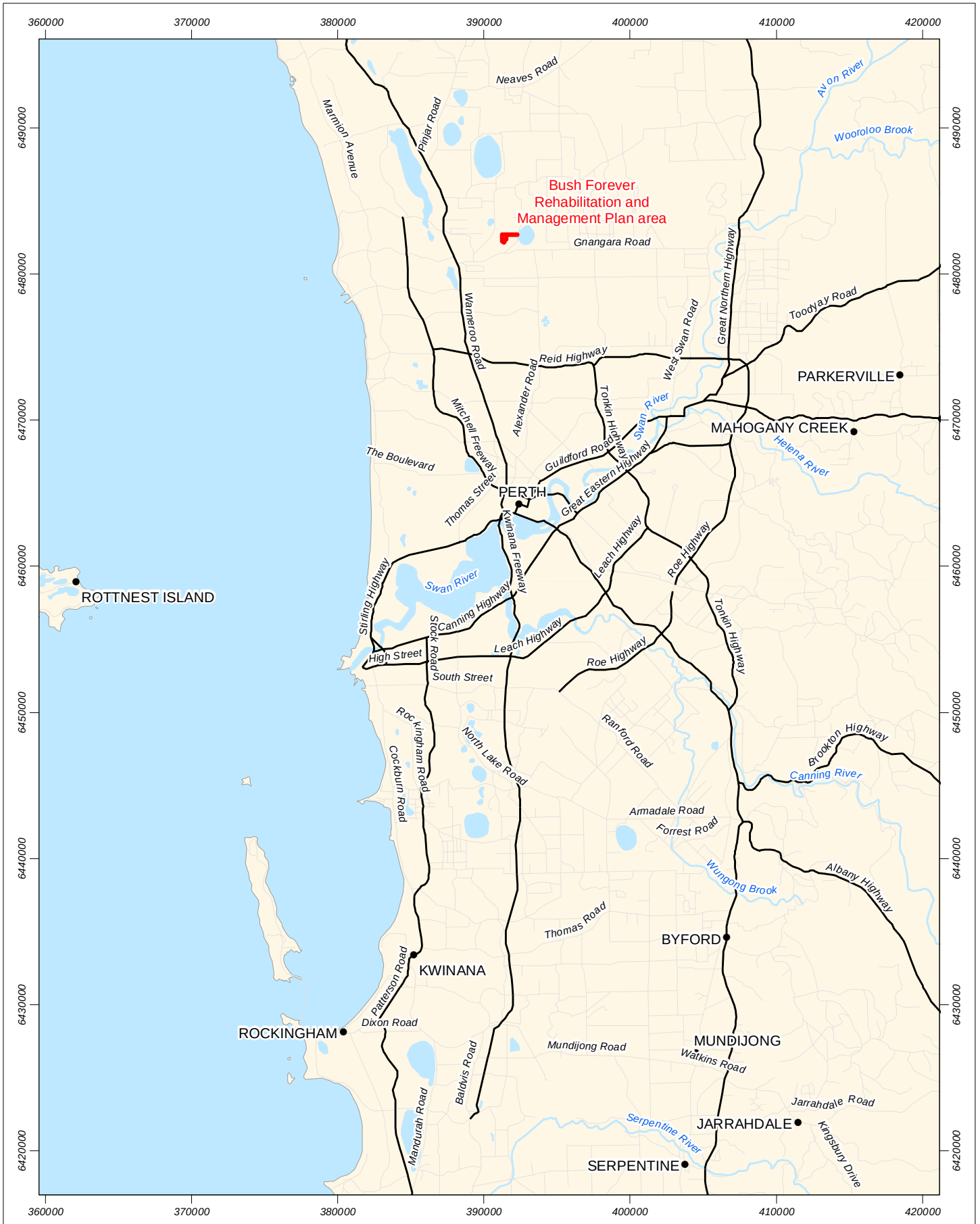

Figure 1 Regional location

Scale 1:350,000 at A4

0 2 4 6 8 10 km

N

Legend

- Town
- Major road
- Minor road
- Major river
- Lakes
- Bush Forever Rehabilitation and Management Plan area

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 14/05/2014
Author: JCrute
Source: Topography: Geoscience Australia 2011.

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Figure 2 Bush Forever Rehabilitation and Management Plan area

Scale 1:6,000 at A4

0 50 100 150 m

N

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 14/05/2014

Author: JCrute

Source: Client 2011.

Legend

Bush Forever Rehabilitation and Management Plan area

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1.5 Location and description of Starlight Grove Bush Forever site

1.5.1 Soils and landforms

The Swan Coastal Plain consists of five major geomorphological elements as defined by McArthur and Bettenay (1960). From west to east these are the: Quindalup Dunes; Spearwood Dunes; Bassendean Dunes; Pinjarra Plain; and Ridge Hill Shelf. These systems lie roughly parallel to the coast and are distinguished by their geology, topography, vegetation and soils. The survey area lies predominantly within the Pleistocene aged Spearwood Dune System described as having "a core of sandy aeolianite with a capping of secondary limestone overlaid by yellow brown siliceous sands" (DoA 1986). The Spearwood Dune System was further delineated by Churchward and McArthur (1980) into three more detailed units: Cottesloe; Karrakatta; and Herdsman. The survey area lies within the Karrakatta Unit of deep yellow sands (Churchward and McArthur 1980). A small portion in the northeast corner of Lot 10 belongs to the Bassendean Dune System (McArthur and Bettenay 1960), and more specifically to the Bassendean Unit (Churchward and McArthur 1980).

The Bush Forever Site generally slopes in a south-easterly direction with topography ranging from approximately 72 Australian Height Datum (AHD) to approximately 55 AHD adjacent to Ocean Reef Road and approximately 45 AHD adjacent to Sydney Road.

1.5.2 Seasonal conditions

The climate of the Swan Coastal Plain is generally described as warm Mediterranean with winter precipitation of 600–1000 mm, and with 5 – 6 dry months per year (Beard 1990). The 17-year average rainfall for the Perth metropolitan region, for the months of April to September, is 615.6 mm. However, winter rainfall can be variable, with 2008 - 2010 characterised as particularly dry. Rainfall for the Perth region for the months April to September 2010 was 413.6 mm, which represents a rainfall anomaly of 32% of the long-term average. The 2011 winter rainfall for the same period was above average, being 661.2 mm (BoM 2012).

1.5.3 Vegetation

The Bush Forever site is situated in the City of Wanneroo and covers approximately 19.7 ha.

Descriptions for vegetation complexes (broad-scale vegetation/soil mapping units) in the Bush Forever site and adjacent industrial area are described in Table 1 (EPA 2006, Heddle *et al*. 1980).

Table 1 Vegetation complexes of the Bush Forever site and adjacent industrial area

Complex*	Description*
Karrakatta Complex – Central and South	Predominantly open forest of *Eucalyptus gomphocephala* (tuart) – *Eucalyptus marginata* (jarrah) – *Corymbia calophylla* (marri) and woodlands of jarrah – *Banksia* spp.
Bassendean Complex – Central and South	Woodlands of jarrah-sheoak-banksia on the sand dunes to low woodlands of *Melaleuca* spp. and sedgelands on the low lying depressions and swamps.

Source: *Heddle *et al.* 1980; RPS 2011b **PBP 2011

Environmental investigations undertaken by RPS (2011a) identified one vegetation type within the Bush Forever site, described in Table 2.

Table 2 Vegetation types mapped in Bush Forever site

Vegetation community code	Short description	Location	Description
Em.Af	Jarrah-banksia-sheoak woodland	Upland	*Eucalyptus marginata* subsp. *marginata* scattered trees with *Allocasuarina fraseriana*, *Banksia attenuata* and *B. menziesii* low woodland over *Jacksonia floribunda* scattered shrubs to open shrubland over *Hibbertia hypericoides* and *Xanthorrhoea preissii* low open heath over *Mesomelaena pseudostygia* and *Alexgeorgea nitens* open sedgeland over mixed herbland/grassland.

Source: RPS 2011a.

The condition of the vegetation across the Bush Forever site ranges from Degraded - Excellent based on the scale of Keighery (Government of Western Australia 2000), with the majority of vegetation mapped as Very Good – Excellent condition. The majority of the site is characterised by low weed frequency and is relatively undisturbed by feral animals, however, there is some evidence that rabbits may occur on the site in low densities. Site investigations identified some plant species under stress particularly at the elevated areas in the north-west of the site. This is considered to be a combination of concurrent dryer than average winters and the depth to the water table in this location.

The vegetation community is identified as potential Carnaby's black-cockatoo habitat. The Carnaby's black-cockatoo (*Calyptorhynchus latirostris*) is listed as endangered under the EPBC Act. The protection and ongoing management, including rehabilitation, of the site as a conservation covenant area will ensure that this habitat function is retained in perpetuity.

1.5.4 Hydrology

Groundwater monitoring to establish predevelopment conditions of the adjoining future industrial area confirms that groundwater flow is in a south westerly direction and that the Bush Forever site is located hydraulically and topographically up-gradient from the adjacent industrial area (RPS 2011b). Groundwater is at approximately 40 - 41m AHD in the vicinity of the Bush Forever site (RPS 2011b) and this equates to a depth of between 4 – 29 m across the Bush Forever site depending on local topography.

2. General management actions

2.1 Management of native fauna

The Bush Forever site contains habitat which may be suitable for a number of threatened species, including the graceful sun-moth (*Synemon gratiosa*), Carnaby's black-cockatoo (*Calyptorhynchus latirostris*), and southern brown bandicoot (*Isoodon obesulus* subsp. *fusciventer*).

Prior to and during construction works being undertaken on the adjoining industrial land, the Bush Forever site is adequately delineated and fenced to prevent inappropriate access. It is noted that the existing external boundaries of the Bush Forever site are already fenced, including the recent fencing implemented by the City of Wanneroo associated with the Ocean Reef Road extension.

Where appropriate, prior to the commencement of clearing outside of the Bush Forever site and where fauna assessment identifies the presence of southern brown bandicoot, trapping will be undertaken to enable relocation. Any individuals captured will be relocated from the adjacent industrial area to the Bush Forever site or other designated DPaW managed reserves.

2.2 Management of domestic and feral animals

There is some evidence to indicate that rabbits occur within the Bush Forever site, and no evidence to suggest that foxes and feral cats are a problem within the Bush Forever site.

Prior to and during rehabilitation works being undertaken, rabbit control will be undertaken to reduce grazing competition. Any control programs for feral fauna should ensure that contractors are trained appropriately and hold the appropriate licences. The initial control measures will assist in determining the incidence of domestic and feral animals on site and will inform any further targeted work that is required to be implemented during the 2 year maintenance period.

2.3 Dieback management

Phytophthora cinnamomi is a pathogen that damages the roots of susceptible native species and spreads through the movement of infected soil or water. A dieback assessment was undertaken in March 2012 by Glevan Consulting of the Bush Forever site and adjoining areas identified for topsoil and vegetation relocation.

Although several sites exhibiting signs of recent vegetation decline were observed throughout the study area, the assessment concluded that the deaths are not thought to be related to *P. cinnamomi* as the pattern typically associated with *P. cinnamomi* infestation was not present. The deaths were largely random (not associated with an obvious vector), scattered, and many appeared staged. In addition, there was limited chronology amongst the deceased plants and generally no significant biomass reduction. Drought was thought to be the most likely cause of the recent vegetation decline observed, and most of the biomass reduction observed can be attributed to disturbance factors (Glevan 2012). Results from the dieback assessment are provided in Appendix 2.

As no dieback was detected during the survey, no specific management measures are required to be applied to the site; however, there is a general requirement to ensure that appropriate access control and hygiene measures are in place to avoid the introduction of dieback to the site.

2.4 Fire management

Fire management is to be undertaken in accordance with DPaW, the City of Wanneroo and Fire and Emergency Services Authority (FESA) requirements, in accordance with the NCCPM Guidelines.

There is no physical evidence that a bush fire has occurred at the Bush Forever site for approximately 20 years and the City of Wanneroo has required some reduction of bush fire loads to help manage the potential fire risk to adjoining rural-residential properties. This will involve a series of mosaic burns within the Bush Forever site, staged over subsequent years, to reduce accumulated fuel loads. This will be undertaken by the local Bush Fire Brigade in a manner which encourages natural regeneration and to maintain the conservation values of the Bush Forever area.

2.5 Site access management

As described in Section 2.1, prior to and during construction works, the Bush Forever site will be adequately delineated and fenced to prevent inappropriate access. Provision will be made for adequate access for fire services or other necessary services and controlled access by the landowners.

The external boundaries of the Bush Forever site are currently adequately fenced. New fencing will be erected for internal boundaries within Lots 6, 10 and 9000, which will be consistent with the existing fencing along Ocean Reef Road. Gates will be integrated at key strategic points, generally to align with identified firebreaks to facilitate emergency vehicle movement along appropriate routes.

Contractors undertaking rehabilitation and/or management works will be required to access the site at identified access points and keep to designated routes within the Bush Forever site unless the management activity specifically requires deviation from these routes. Contractors will be responsible for ensuring appropriate hygiene measures are undertaken to avoid the introduction of dieback to the site.

A minimum of six signs will be introduced along the new internal and the existing external boundaries identifying the Bush Forever site, that the site is being protected for conservation purposes under a Conservation Covenant, and that unauthorised access is prohibited. This will include signage as provided under the DPaW Conservation Covenant program. Additional temporary signage will also be introduced at the larger rehabilitation area to identify the presence and purpose of the rehabilitation areas.

In addition to the proposed fencing, there will be a hard edge delineation adjacent to the Bush Forever site, such as a public road or a combination of other measures such as fire breaks/accessways and retaining walls.

2.6 Weed management

Weed frequency throughout the site is generally low, and site observation suggests that weeds appear to be of higher prevalence in areas that have been subject to disturbance, particularly along existing boundaries (fire-breaks), internal tracks and in areas which are identified as requiring rehabilitation.

A number of invasive weeds have been recorded within these areas in the Bush Forever site and are identified in the NCCPM Guidelines as follows:

- *Leptospermum laevigatum* (Victorian tea tree)
- *Ursinia anthemoides*
- *Ehrharta calycina* (veldt grass)
- *Gladiolus* sp.

Prior to and during construction works being undertaken on the adjoining industrial land, the following management measures will be undertaken as described in the NCCPM Guidelines (Appendix 1):

- undertake control of existing weeds, particularly in areas subject to previous or current disturbance (e.g. edges of Bush Forever site, tracks, revegetation areas)
- selectively (as required) within the designated revegetation areas and tracks to coincide with preparation, revegetation installation, and two years of revegetation maintenance.

2.7 Rubbish management

Dumping of rubbish within bushland can result in the introduction of weeds and pathogens and encourage scavenging feral animals. During implementation of the actions identified in this BFRMP, any existing rubbish in the Bush Forever site will be removed where this can be undertaken in a manner which will not cause unreasonable damage to vegetation.

The implementation of this BFRMP, including the completion of fencing of the Bush Forever site, will prevent inappropriate access and reduce likelihood of rubbish dumping. Similarly, the reduction in ground levels on the adjoining industrial area and associated retaining will make access/unauthorised dumping more difficult, and the difference in ground levels will reduce the likelihood of introduction of any airborne rubbish into the Bush Forever site.

3. Rehabilitation program

3.1 Rehabilitation sites

3.1.1 Location and characteristics of rehabilitation sites

The BFRMP identifies four rehabilitation sites within the Bush Forever area, which are defined in Table 3 and illustrated in Figure 3.

Table 3 Rehabilitation sites

Rehabilitation site number	Vegetation community	Vegetation condition	Location	Lot number	Approx area (ha)
1	Jarrah-banksia-sheoak woodland/upland	Degraded	Southern boundary of Bush Forever site alongside Ocean Reef Rd.	9000	0.3
2	Jarrah-banksia-sheoak woodland/upland	Degraded – Completely Degraded	South-eastern boundary of Bush Forever site.	9000	0.1
3	Jarrah-banksia-sheoak woodland/upland	Not surveyed	Eastern boundary of Bush Forever site.	6	0.2
4	Jarrah-banksia-sheoak woodland/upland	Degraded – Completely Degraded	Far eastern boundary of Bush Forever site, creating linkage to Gnangara Lake.	10	2.0

3.2 Rationale to rehabilitation approach

The overall approach to the rehabilitation process will be as follows:

- appropriate site preparation including weed control
- the use of topsoil as site fill material to re-contour areas and to provide more appropriate physical soil properties
- exclusion of rabbits and kangaroos for larger rehabilitation areas while vegetation is re-establishing using temporary fencing specifically designed to restrict access (through measures such as buried skirts)
- a combined approach of direct seeding and advanced tubestock planting (forestry pot size)
- provision for infill tubestock planting for two years following initial works, if required.

The approach proposed is more intensive than some rehabilitation strategies but it is considered it will deliver better outcomes in terms ultimate plant densities and diversity.

The BFRMP has been developed closely with a specialist revegetation contractor who has extensive experience and has undertaken a number of similar projects involving the re-establishment and restoration of banksia woodland in Gnangara and surrounding areas. In particular, the approach has been based on that adopted for a major offset project being undertaken on behalf of DPaW within former Gnangara pine plantation areas adjacent to Melaleuca Park, involving the restoration of significant areas of banksia woodland.

3.3 Rehabilitation site 1

Site 1 is located at the southern boundary of the Bush Forever site, alongside and parallel to Ocean Reef Road (Figure 3). It covers an area of approximately 0.1 ha and is adjacent to vegetation mapped as jarrah-banksia-sheoak woodland (RPS 2011a). Site 1 is depicted in Plate 1.

Plate 1 Site 1

3.3.1 Site works considerations

Rehabilitation contractor access to 1 will be from the east via Lot 9000 with specific access via the existing fire break adjacent to the southern boundary and Ocean Reef Road. A site inspection identified the presence of woody weeds (*Leptospermum laevigatum*) within the revegetation area which will require specific control prior to and during rehabilitation establishment.

3.3.2 Rehabilitation approach

Rehabilitation of Site 1 will mostly be aimed at establishing jarrah-banksia-sheoak woodland utilising a combination of the methods described in Section 3.7.

3.4 Rehabilitation site 2

Site 2 is located in the southeast corner of the Bush Forever site (Figure 3). The area has been subject to historical sand mining and there are some deep, steep excavated areas which are devoid of vegetation and subject to local erosion. It covers an area of approximately 0.1 ha and is adjacent to vegetation mapped as jarrah banksia sheoak woodland (RPS 2011b). Site 2 is depicted in Plate 2.

Plate 2 Site 2

3.4.1 Site works considerations

Rehabilitation contractor access to rehabilitation area 2 will be from the northeast via Lot 6. Relocation of topsoil from adjacent areas of 'Good' or better vegetation which is to be cleared will be required to recontour areas which have been subject to historical sand extraction.

3.4.2 Rehabilitation approach

Rehabilitation of Site 2 will mostly be aimed at establishing jarrah-banksia-sheoak woodland utilising a combination of the methods described in Section 3.7.

3.5 Rehabilitation site 3

Site 3 is located at the eastern boundary of the Bush Forever site (Figure 3). It covers an area of approximately 0.2 ha and is adjacent to vegetation mapped as jarrah-banksia-sheoak woodland (RPS 2011b). Site 3 is depicted in Plate 3.

Plate 3 Site 3

3.5.1 Site works considerations

Rehabilitation contractor access to rehabilitation area 3 will be from the east via Lot 6, with specific access possible from existing internal roads. Some minor re-contouring of the site may be required to account for previous quarrying activity.

3.5.2 Rehabilitation approach

Rehabilitation of Site 3 will mostly be aimed at establishing jarrah-banksia-sheoak woodland utilising a combination of the methods described in 3.7.

3.6 Rehabilitation site 4

Site 4 extends extends from the north-eastern corner of the Bush Forever site to the eastern boundary of Lot 10 (Figure 3) and covers approximately 2 ha. Large portions of the rehabilitation area are completely cleared and accordingly a vegetation community was unable to be mapped by RPS (2011a). The area is adjacent to vegetation mapped as jarrah banksia sheoak woodland (RPS 2011b) and, as such, it will be revegetated to reflect this.

Plate 4 Site 4

Plate 5 Site 4

Plate 6 Site 4 looking eastward

Plate 7 Eastern section of Site 4 looking south into Proposal area

3.6.1 Site works considerations

Rehabilitation contractor access to area 4 will be from the east via Sydney Road and from the south via internal roads. The site has limited remnant vegetation, is completely cleared in places and is largely impacted by weeds. As such, site preparation, including weed control and topsoil relocation, will be required.

3.6.2 Rehabilitation approach

Rehabilitation of Site 4 is intended to establish jarrah-banksia-sheoak woodland utilising a combination of the methods described in Section 3.7.

3.7 Rehabilitation process

The rehabilitation of identified areas within the Bush Forever site will broadly follow the following schedule of works:

- initial site and other preparation works during the latter months of 2013/early 2014
- revegetation works during in 2014
- two years of monitoring and maintenance over 2015 and 2016.

Indicative timings for a range of rehabilitation works, as required by the Guidelines (Appendix 1), are as follows:

- preliminary earthworks and re-contouring of rehabilitation sites 2 and 3 utilising salvaged topsoil where possible to improve soil conditions (placed as bulk fill, not spread thinly)
- initial weed control involving herbicide applications in rehabilitation sites 1, 2 and 3 in spring 2013, and summer 2013/2014
- slashing of weeds within rehabilitation area 4 in summer 2013/2014
- seed collection from the Bush Forever site, areas to be cleared and other suitable local provenance bushland within 15 km of the site (as defined in the Guidelines [Appendix 1]) in summer 2013/2014
- topsoil placement in site 4 in summer 2014
- deep ripping to 400-500 mm in site 4
- weed control (prior to revegetation works) involving herbicide applications in autumn 2014
- habitat log placement in autumn 2014
- installation of rabbit-proof fencing around site 4 in autumn 2014
- planting seedlings with fertiliser and tree guards (planting density of 10,000 plants/ha or 1 plant/m^2) in autumn/winter 2014
- undertake monitoring for first year of maintenance in spring 2014 and autumn 2015
- undertake weed control (only as necessary) in spring 2014
- prepare rehabilitation progress report in December 2014
- undertake weed control (only as necessary) in autumn 2015
- undertake infill planting as and where required in autumn/winter 2015
- undertake weed control (only as necessary) in spring 2015
- prepare rehabilitation progress report in December 2015
- undertake weed control (only as necessary) in autumn 2016
- undertake infill planting as and where required in autumn/winter 2016
- prepare rehabilitation close-out report in December 2016.

Further details of key processes for the integrated construction and rehabilitation works are outlined below.

3.7.1 Clearing

The clearing program on the adjoining industrial area will include:

- seed collection for direct seeding and propagation within the rehabilitation sites
- trapping and relocation in areas identified as containing southern brown bandicoot (*Isoodon obesulus* subsp. *fusciventer*) into the Bush Forever area or other designated DPaW conservation reserve
- delineation/fencing to protect the Bush Forever site
- retention of suitable large trees for use as habitat logs in rehabilitation areas
- clearing and mulching of remaining vegetative material.

3.7.2 Seed collection

All seed for use within the rehabilitation areas will be sourced from within the Bush Forever Site, the adjacent areas which are to be cleared and from other suitable local provenance bushland within 15 km of the site as described in the NCCPM Guidelines (Appendix 1).

3.7.3 Site preparation including weed control

Prior to topsoil relocation at relevant sites, and revegetation commencing, the rehabilitation sites will be prepared. Site preparation is likely to include some or all of the following, depending on the site:

- removal of rubbish and obstacles to access, if required
- improvement of access tracks, if required
- weed slashing in rehabilitation site 4 to ensure a basis for effective weed control
- transfer of topsoil from areas within the industrial estate that supports remnant vegetation in "Good" or better condition for infill and re-contour rehabilitation sites 2 and 4
- weed control using herbicides for key target species, ensuring selective herbicides (i.e. grass or broadleaf-specific) will be favoured over general knockdown herbicides to keep off-target damage to a minimum amongst remnant native vegetation
- ripping in rehabilitation site 4 will take place in autumn to allow for faster root growth, rainfall infiltration and greater seedling survival rates
- conducting harrowing immediately prior to direct seeding to remove excessive mounds and hollows, reduce compaction and improve water infiltration and create niches for the seed to settle in
- raking to remove excessive mounds and hollows, reduce compaction and improve water infiltration
- scarification of soil immediately prior to direct seeding to provide small niches for seed and organic matter to settle in and allow rainfall to concentrate on germinating seed
- conducting initial weed control including chemical spot spraying, hand weeding for herbaceous and woody weeds, large woody weed removal (cutting and disposing off-site), and hand wiping herbicide on bulbaceous weeds, allowing sufficient lead-in time to enable reduction of weed seed in the soil seed bank.

Figure 3 Rehabilitation areas and topsoil source and transfer sites

Scale 1:6,000 at A4

0 50 100 150 m

N

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 14/05/2014

Author: JCrute

Source: Client 2011.

Legend

- Bush Forever Rehabilitation and Management Plan area
- Revegetation areas
- Indicative topsoil transfer area
- Indicative topsoil source area

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3.7.4 Revegetation species

The flora species used for the rehabilitation should be local provenance species and include only native species recorded during the flora and vegetation survey of the Bush Forever site and adjacent industrial area. Key species listed below represent an ideal complement for the re-establishment of basic vegetation community structure and importantly is intended to facilitate an increase in the potential Carnaby's black-cockatoo habitat through the revegetation process.

Table 4 outlines the key species of the jarrah-banksia-sheoak woodland intended to be rehabilitated as part of this rehabilitation plan. The species listed comprise the key structural components (overstorey, mid-storey and understorey) of the jarrah-banksia-sheoak woodland vegetation community within the Bush Forever site based on vegetation descriptions provided by RPS (2011a), or species recorded commonly in survey sites within this vegetation community that are known to readily grow from seed.

Table 4 Key species for revegetation sites

Structural component	Species
Overstorey	*Eucalyptus marginata*
Mid-storey	*Banksia menziesii*
	Banksia attenuata
	Allocasuarina fraseriana
Understorey	*Acacia pulchella*
	Gompholobium tomentosum
	Jacksonia floribunda
	Xanthorrhoea preissii

Further species will be introduced to promote species richness and diversity and should be selected on the species list collated from environmental investigations undertaken within the Bush Forever area. Given the presence of species in adjacent areas natural re-colonisation over time will also occur through natural dispersal mechanisms as is generally observed on such sites.

3.7.5 Seedling planting

Selected species will be propagated from collected seed in selected nurseries. The majority of the required seedlings will be propagated to forestry tubes size and planted at a rate of 1 seedling per m^2.

It is common for seedling availability to fluctuate, or seedlings could be of unacceptable condition or size at the time of planting. These situations can require some alterations to the final species list, or possibly later planting of one or more species. Seedling procurement will need to be addressed well in advance of planting times to ensure adequate supply.

3.7.6 Direct seeding

Direct seeding will be undertaken at all revegetation areas at a rate of 3 kg/ha. All seed utilised will be pre-treated prior to seeding to break seed dormancy. This is likely to include aerosol smoke treatment, mechanical scarification, and hot water treatment as appropriate for each species. Prior to broadcasting, seed will be combined with a bulking agent to ensure even distribution across the site. Seed will be hand broadcasted to ensure even dispersal of all seed sizes, which is sometimes not possible with machinery.

Scarification of the soil surface will ensure that seeds will collect in the niches provided by the roughened surface. This method acts to minimise seed loss through water and wind movement and means the seed does not need to be covered after broadcasting, as soil settlement by rainfall will facilitate this. This allows soil to settle and lightly cover seed to promote higher germination rates, and minimises the potential for seed to wash away in storm events.

3.7.7 Rabbit control

Due to rabbit populations existing on site, a temporary rabbit proof fence will be installed around the perimeter of revegetation site 4, comprising a 1.2 m fence with rabbit netting dug into the ground to a depth of 300 mm.

4. Implementation of management plan

4.1 Summary of management plan activities

Table 5 below summarises the general management actions and specific rehabilitation works identified in this BFRMP and provides an approximate commencement for commencement for each activity.

Table 5 Summary of management activity and actions

Management activity	Action	Timing
Bush Forever management		
Threatened fauna	Ensure the Bush Forever site is adequately delineated and contractors do not enter the site unless undertaking specific Bush Forever Management Plan actions.	Prior to any works occurring adjacent to the Bush Forever site.
Domestic and feral animals	Undertake control to reduce grazing competition.	Prior to and during establishment of rehabilitation areas.
Seed collection for rehabilitation areas	Seed collection from areas to be cleared (and existing Bush Forever area).	Between October and April prior to works, and ongoing as required to facilitate rehabilitation program.
Fire	Construct firebreaks to specifications of, and in locations as required by the Fire Management Plan.	During development works and prior to occupation of any new houses on Lot 6.
	Undertake mosaic burn regimes (as required) in accordance with the Guidelines and Bushfire Brigade requirements.	Generally between July and September.
Uncontrolled access	Permanent fencing to be installed around internal/new boundaries of Bush Forever site.	Lot 6 – prior to occupation of houses. Lot 9000 – as early as possible during Stage 2 works. Lot 10 – following initial rehabilitation works.
	Appropriate signage will be displayed indicating the site is Bush Forever and restrictions on access.	Following rehabilitation and fencing works.
Weed control	Undertake initial control of grassy weeds (including *Ehrharta* spp., *Avena barbata*, *Eragrostis curvula*) in areas adjacent to cleared areas, along tracks or in/alongside other areas of disturbance.	Between late July to August or prior to rehabilitation works.
	Undertake initial control of bulbaceous weeds (including *Gladiolus caryophyllaceus*) in areas adjacent to cleared areas, along tracks or in/alongside other areas of disturbance.	Late August or prior to rehabilitation works.
	Undertake initial control of flat weeds (including *Hypochaeris glabra*).	Between May and September or prior to rehabilitation works.
Rubbish	Remove existing rubbish where it is practicable to do so (i.e., where removal does not present a risk to flora and vegetation).	During implementation of management works.
Spread of pathogens (dieback)	Ensure any movement of soil, vegetative material, rubbish, vehicles or personnel within, into or out of the Bush Forever site is free of dieback.	As required.
	Ensure any maintenance activities including fencing or modifying firebreaks is undertaken during dry soil conditions.	As required.
	Spot checks of contractor vehicles entering the Bush Forever site will be undertaken inspecting wheel arches and tyres for soil or plant material.	Particularly during winter months.

Management activity	Action	Timing
	Limit vehicles to designated tracks, remaining within the site works area.	As required.
Monitoring & reporting	Prepare annual report which summaries general Bush Forever management activities undertaken and success.	Annually in December, including the 2 year maintenance period.
Contingency actions	Implement contingency actions to address site environmental issues.	As required.
Site rehabilitation		
Weed control & site preparation	Initial weed control and site preparation of rehab areas.	Prior to any rehabilitation works.
Threatened Fauna	Relocation of southern brown bandicoot.	To coincide with any clearing works on the adjoining land in areas where presence is identified (timing will vary depending on DPaW advice to relocate offsite or to Bush Forever area).
Seedling planting	Planting of seedlings within rehabilitation sites.	Following weed control, prior to winter rains.
Direct seeding	Direct application of seed to rehab areas to achieve identified seed densities.	Following topsoil and mulching, prior to winter rains.
	Implementation of rabbit proof fencing.	If grazing by rabbits is impacting on rehabilitation areas.
Maintenance	Remove tree guards.	12 months after supplementary planting.
	Supplementary weed control of revegetation areas.	For each rehab. area for the subsequent 2 years.
Monitoring & Reporting	Prepare annual report which summaries rehabilitation activities undertaken and success.	Annually in December, including the 2 year maintenance period.
Contingency actions	Implement contingency actions if rehabilitation targets are not achieved.	As required.

4.2 Completion criteria

The success of the rehabilitation program will be measured against a set of completion criteria which specifies the required rehabilitation outcomes for the rehabilitation areas. In line with the EPA Guidance Statement No. 6 rehabilitation of Terrestrial Ecosystems (EPA 2006), completion criteria are considered as being the most appropriate mechanisms to monitor and audit rehabilitation programs.

The long-term goal of rehabilitating the currently 'Degraded' and 'Completely Degraded' rehabilitation areas is to enhance the vegetation condition of these areas to being at least "Good "condition. Whilst this outcome will take longer than the monitoring and maintenance period, short-term assessment in the form of short-term intermediate targets will provide an indication of the likelihood of long term success in achieving this goal. As part of this rehabilitation management plan, completion criteria have been developed through a review of available literature. The completion criteria have included the following factors:

- native species stem density
- native species cover
- native species diversity
- seedling survival rate
- weed competition.

For this rehabilitation project, the completion targets over 2 years after completing rehabilitation works are outlined in Table 6 below.

Table 6 Proposed completion criteria

Parameter	Year after planting	
	1	2
Direct seeding or seedling planting		
Native species stem density (stems/m2)	N/A	1.6
Area cover of native species (percent per 10 x 10 m quadrat)*	30	50
Representation across all quadrats of the initial species list	70%	70%
Percentage of planted seedling survival	70	70
Weeds		
Maximum percentage (%) weed cover (per 10 x 10m quadrat)	10	5

*Based on an assumed average of 5 seedlings planted per 10 x 10 m area (as well as directed seeded germinants

Where areas of the rehabilitation works do not meet the completion criteria specified in Table 6, additional seedlings will be planted or weed control conducted so completion criteria can be met. Inherent risks are associated with any rehabilitation programs which may lead to the required completion criteria being unmet. To manage this level of risk, a framework of contingency measures (as outlined in Section 4.4) has been developed to improve the likelihood that the completion criteria for all components of the offset package can be achieved within the 2 year maintenance period.

4.3 Monitoring and reporting

Each rehabilitation site will be specifically managed and monitored for 2 years following the initial revegetation works to assess the achievement of the completion criteria listed above and to identify any maintenance and/or contingency measures required.

During the implementation period, an annual report will be submitted to the DEC which provides a summary of the actions and success of the management actions identified in this BFRMP. The monitoring report will also identify the need for any additional maintenance or follow-up works to be undertaken during the next reporting period. Long term monitoring will be undertaken by the landowner as described in the NCCPM Guidelines (Appendix 1).

4.4 Contingency actions

Contingency actions will be enacted if monitoring and reporting indicates that rehabilitation sites are not performing sufficiently well. These actions will be undertaken as soon as practical and the outcome assessed and documented in the following annual report.

Table 7 identifies possible contingency actions which may be required to be implemented on site.

Table 7 Contingency actions for the Bush Forever site

Trigger	Action
Inappropriate species growing in rehabilitation areas	1. Identify cause. 2. Remove inappropriate species and replace (if required) with appropriate species. 3. Ensure inappropriate species are not used in future.
Low rate of seedling/germinant survival	1. Identify cause. 2. Implement approach to remedy cause, which could include: • watering of site • application of fertilisers or wetting agents etc • check for presence of dieback and follow contingencies for 'Introduction of diseases' below. 3. Monitor success of remedy.
Seedlings/new germinants show evidence of grazing	1. Identify whether caused by rabbits by undertaking monitoring. 2. If presence of rabbits is confirmed, undertake rabbit control as described in Appendix 1. 3. If grazing appears to be caused by native species (e.g., kangaroos), further protection measures may be required e.g., additional tree guards. 4. Monitor success of remedy.
Increase in weed infestations	1. Identify cause. 2. Identify the weeds, their location and coverage and obtain quotations from contractors to control them. 3. Employ a contractor to control the weeds. 4. Monitor success of control.
Excessive dust emissions from imported topsoil	1. Identify cause. 2. Implement approach to remedy cause, which could include: • Applying a biodegradable surface binding agent (e.g. hydromulch) • Fixing screening to surrounding fence (e.g. hessian or shade cloth). 3. Monitor success of remedy.
Erosion occurring	1. Identify cause. 2. Implement remedy (may involve consulting an expert to determine the appropriate remedy). 3. Monitor success of remedy.
Introduction of diseases, specifically dieback	1. Confirm presence. 2. Identify cause. 3. Undertake sampling to determine extent. 4. Erect signage warning of infested area. 5. Consult expert to determine requirement for treatment (i.e. phosphate spraying or stem injection). 6. Undertake treatment, if required. 7. Monitor movements of infestation annually.

4.5 Review and revision

This BFRMP may be revised with the approval of the DPaW, if required, to address environmental incident resolutions, audit findings, monitoring results or to achieve continuous improvement.

Any minor change, which does not alter the BFRMP outcomes, but is operational in nature in response to factors such as seasonal variability (e.g. seed availability, changes to site conditions, seasonal climatic factors, etc) will not require consultation.

5. Summary and conclusion

This BFRMP outlines key management actions for the Starlight Grove Bush Forever site in Gnangara. It is to be read in conjunction with the NCCPM Guidelines (Appendix 1).

In particular, the BFRMP identifies the works which will be implemented in order that the Bush Forever site can be managed in the future by the landowner in accordance with the DPaW Conservation Covenant and NCCPM Guidelines which apply to the Bush Forever site. The implementation of this BFRMP will be staged to ensure its delivery is appropriately coordinated with the construction works on the adjoining industrial site, particularly as many of the activities, such as fencing and topsoil relocation, are interrelated. Management activities will also take into account other factors, such as seasonal variations, to ensure that the identified management and rehabilitation activities have the best chance of success.

The BFRMP also identifies the process for rehabilitation of the areas which are identified for such in the DPaW Conservation Covenant and proposes a number of mitigation and management measures to ensure the Bush Forever site is enhanced as a result of its implementation in a manner which will facilitate ongoing management by the landowner. The BFRMP is not intended to duplicate or supersede the NCCPM Guidelines, but rather is intended to be consistent with and read in conjunction with the Conservation Covenant and associated NCCPM Guidelines.

Following implementation of the Bush Forever management actions identified in this plan (including maintenance, monitoring and reporting), ongoing management measures are to be undertaken by the landowners as described in the NCCPM Guidelines.

6. References

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RPS Environment and Planning Pty Ltd (RPS) 2011b, *Wangara Industrial Extension Area – Local Water Management Strategy*, report prepared for Gnangara Holdings Pty Ltd, Subiaco.

Western Australian Planning Commission (WAPC) 2012, Economic and Employment Lands Strategy: non-heavy industrial, Perth metropolitan and Peel regions, [Online], Government of Western Australia, Available from: http://www.planning.wa.gov.au/dop_pub_pdf/EELS_Executive_summary.pdf [May 2012].

Appendix 1
Nature Conservation Covenant
Program Management Guidelines

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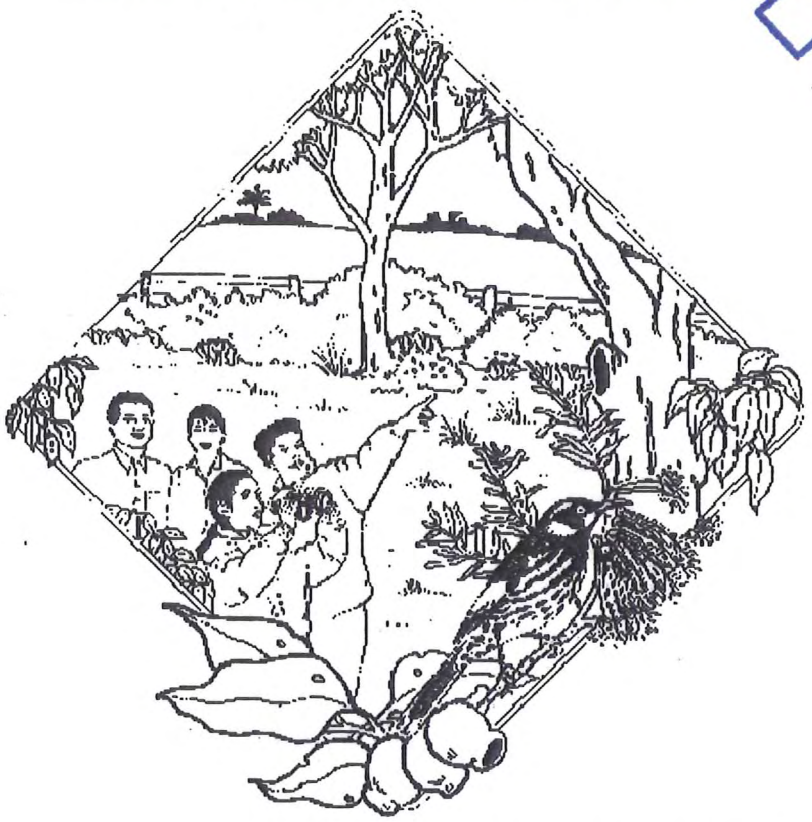
Nature Conservation Covenant Program

Management Guidelines



[DEPARTMENT'S COPY] / [LANDOWNER'S COPY]

Owner's Details	
Landowner's name:	Aboriginal Lands Trust
Company name:	Aboriginal Lands Trust
Postal address:	Level 1, 197 St Georges Terrace, Perth
Contact:	Robert Baker
Phone number:	Senior Strategic Land Officer – Department of Indigenous Affairs +61 (8) 9235 8053
Fax number:	+61 (8) 9235 8088
Email address:	Rob.Baker@dia.wa.gov.au
Date of initial enquiry:	8th April 2011

Nature Conservation Covenant Program
Department of Environment and Conservation
Species and Communities Branch
Locked Bag 104
BENTLEY DELIVERY CENTRE WA 6983

Phone: (08) 9334 0477
Fax: (08) 9334 0199
Email: covenant@dec.wa.gov.au

Nature Conservation Covenant – Management Guidelines

Preamble

These Management Guidelines are developed through a process of mutual consideration and represent the responsibilities of both parties for management of the covenanted land ("the Land").

They are intended to provide suggestions for a three-year period for the most appropriate management of the natural values of the Land, and the landowner ("the Owner") is not required nor necessarily expected to undertake all of the activities listed within. The activities are suggested so that, should the Owner wish to undertake management, they represent best-practice management for nature conservation and are prioritised in order of importance. However, where these Management Guidelines contain activities referred to in the Nature Conservation Covenant, they describe the manner in which such activities must be undertaken should the Owner wish to do so. After the three-year period, or if the property changes ownership, these Management Guidelines can be re-negotiated with the Owner and amended to reflect changing management practices.

While the Owner is responsible for any management activities undertaken on their Land, the Department of Environment and Conservation ("the Department") can provide management advice and any financial assistance specified.

One of the benefits of belonging to the Department of Environment and Conservation's Nature Conservation Covenant Program is that the Department can provide technical support in the event that your land's biodiversity conservation values are threatened by management actions undertaken or proposed to be undertaken by a third party. The Department can ensure that other agencies are made aware of the location of these environmentally important areas so that they can be taken into consideration when investigating new development proposals or when undertaking activities.

Once a covenant is registered on your land's title, information about the location, shape and size of the covenant site will be provided to other agencies for the purpose outlined above. This Program respects your confidentiality and will not provide other specific details about you or your property without your permission; however you should be aware that such information is available through the public land titles register.

If you have any concerns regarding the provision of the location of your registered covenant site to other Government agencies for biodiversity conservation purposes, or if further assistance on management advice is required, please advise your Covenant Officer, or contact the Nature Conservation Covenant Coordinator on (08) 9334 0477.

Property Details

Property name:	Bush Forever 463		
Property:	**Address**	**Lot Number:**	**Lot Area:**
	137L Sydney Rd, Gnangara	Lot 50/57145	21.271 ha
	139L Sydney Rd, Gnangara	Lot 6/40305	18.98 ha
	139 Sydney Rd, Gnangara	Lot 10/83662	20.62 ha
Local gov't authority:	City of Wanneroo		
Co-ordinates of Central Point:	115° 51' 16.562" E, 31° 47' 14.754"S		
Area of covenant site/s:	Conservation Zone: 16.41 ha (Lot 6 and Lot 50)		
	Rehabilitation Zone: 1.95 ha (Lot 10)		
	Total area: 18.36 hectares		

Synopsis of Conservation Values

The current conservation values of this property are:

- Presence of Bush Forever area 463;
- Presence of Banksia woodland vegetation in good to excellent condition with linkages to other bushland in the area providing connectivity between Lake Gnangara and Lake Badgerup;
- Populations of the Threatened Fauna Graceful Sun Moth (*Synemon gratiosa*) listed on Schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2010(2*);
- Suitable habitat for the Threatened Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) listed on Schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2010(2*); and
- Suitable habitat for the Southern Brown Bandicoot (*Isoodon obesulus* subsp. *fusciventer)* listed as Priority 5 on the Department's *Threatened and Priority Fauna List 2010(2).*

Potential conservation values and habitat values include:

- Potential habitat for the Threatened Australasian Bittern *(Botaurus poiciloptilus)* listed on Schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2010(2*);
- Potential habitat for the following species listed on the Department's *Threatened and Priority Fauna List (2010(2)*: Masked Owl (South West subsp.) (*Tyto novaehollandiae* subsp. *novaehollandiae*) listed as Priority 3; Little Bittern (*Ixobrychus minutus*) listed as Priority 4; and the Black-striped Snake (*Neelaps calanotus*) listed as Priority 3;
- Potential habitat for the Threatened Flora Grand Spider Orchid *(Caladenia huegelii)* listed on the *Wildlife Conservation (Specially Protected Flora) Notice 2010(2);* and
- Potential habitat for the following species listed on the Department's *Priority Flora List* (2010(2): *Dampiera triloba* listed as Priority 1; *Hibbertia helianthemoides* listed as Priority 3; and Waldjumi (*Jacksonia sericea*) listed as Priority 4.

Definitions

"Department" and "DEC" refers to the Department of Environment and Conservation.

"Chief Executive Officer" refers to the Chief Executive Officer of the Conservation and Land Management Executive Body.

"the Land" That portion of Lot 6 on Diagram 40305 being part of the land comprised in Certificate of Title volume 2775 folio 79 marked as A on Deposited Plan 70539, and that portion of Lot 50 on Deposited Plan 57145 being part of the land comprised in Certificate of Title volume 2773 folio 281 marked as C on Deposited Plan 70539, and that portion of Lot 10 on Diagram 83662 being part of the land comprised in Certificate of Title volume 1968 folio 62 and shown marked as B on Deposited Plan 70539 ("the Land")

"Conservation Zone" and "Rehabilitation Zone" refer to different management zones within the covenant area.

"Bush Forever area 463" refers to the covenant area and the neighbouring road reserves as depicted in the Negotiated Planning Solution agreed to by the Western Australian Planning Commission. The Bush Forever area is 19.5 hectares.

Other items

Please note that the draft Covenant and draft Management Guidelines have been prepared in accordance with discussions between the landowner and a Covenant Program representative at the time of the site assessment, and address specific requests made by the landowner that are not necessarily supported by the Department. Certain allowances and activities made in these draft documents will require approval from other sources prior to being confirmed in the final version of these documents.

Maps, plans and other items attached

Map showing covenant site

Appendix 1 – Seed Collection from Native Plants, Wildlife Notes No. 4, Land for Wildlife

Appendix 2 – Fire Management Plan prepared by Fireplan WA, 2011

Appendix 3 – Bush Forever area 463 Management Plan (to be appended once completed)

Summary of Management Issues, Objectives and Activities in Priority Order		
Issue 1	*Inappropriate habitat management for threatened species*	
Objective	*Protect and manage habitat for threatened species*	
Activity 1	*Management of habitat for threatened species*	*Timeline: ongoing*
Issue 2	*Inappropriate management and use of Bush Forever area*	
Objective	*Protect, maintain and enhance the Bush Forever area*	
Activity 2	*Actively manage and monitor the Bush Forever bushland*	*Timeline: ongoing*
Issue 3	*Soil erosion and loss of seed bank in bare, cleared or degraded areas*	
Objective	*Manage and improve bare areas to improve habitat, long-term viability of the bushland, and to create buffers between the bushland and agricultural areas*	
Activity 3	*Manage and improve bare, cleared or degraded areas*	*Timeline: autumn - winter*
Issue 4	*Competition with weed species*	
Objective	*Prevent the spread of weedy plant species in the bushland*	
Activity 4	*Manage existing weeds*	*Timeline: as necessary*
Issue 5	*Predation of, and competition with, native fauna by introduced fauna*	
Objective	*Assist the survival of native fauna by managing introduced animals*	
Activity 5	*Restrict access to the bushland by domestic dogs*	*Timeline: all year*
Activity 6	*Manage foxes and feral cats*	*Timeline: as necessary*
Activity 7	*Manage rabbits*	*Timeline: as necessary*
Issue 6	*Degradation due to plant disease*	
Objective	*Prevent the introduction and/or spread of plant diseases in the bushland*	
Activity 8	*Manage the impact of Phytophthora cinnamomi dieback*	*Timeline: all year*
Issue 7	*Risk of bushfires, and senescence of vegetation due to a lack of natural processes*	
Objective	*Fire management for bushfire prevention and to assist regeneration*	
Activity 9	*Implement bushfire prevention strategies*	*Timeline: annually, summer*
Activity 10	*Use of fire to encourage natural generation*	*Timeline: autumn*
Issue 8	*Landuse activities inconsistent with nature conservation*	
Objective	*Implement an environmentally sensitive management program*	
Activity 11	*Manage rubbish dumping to prevent weeds, rubbish and disease incursion into the bushland*	*Timeline: as appropriate*

Summary of Management Issues, Objectives and Activities in Priority Order (cont')		
Issue 9	*Disturbance caused through maintenance activities*	
Objective	*Perform maintenance activities in an environmentally sensitive manner*	
Activity 12	*Maintenance of tracks, walk trails, fences, transmission lines, fire breaks and fire access tracks*	*Timeline: as necessary*
Issue 10	*Use of natural resources*	
Objective	*Establish an ecologically balanced removal program*	
Activity 13	*Collection of plant propagation and identification material*	*Timeline: as appropriate*

Covenant Restrictions

Under the terms of the covenant the Owner shall not:

a) subdivide or permit subdivision of the Land;

b) place or permit to be placed any structure or dwelling on the Land;

c) destroy or remove or permit the destruction or removal of any local indigenous flora or any indigenous fauna or their related habitats on or from the Land, save for:

   i) plant propagation and identification material, in accordance with the Management Guidelines;

   ii) the purpose of establishment and carrying out maintenance of tracks, fences, firebreaks and fire access tracks, in accordance with the Management Guidelines; and

   iii) the rehabilitation of the Rehabilitation Zone and other sites, in accordance with the Management Guidelines;

d) introduce, or cause or permit the introduction of, any flora onto the Land that is not indigenous to the Land;

e) destroy or do or permit (unless required by law) any act that would result in the deterioration in the natural state or in the flow, supply, quantity or quality of any body of water on the Land;

f) introduce, or cause or permit the introduction of, any fauna onto the Land that is not indigenous to the Land, save in accordance with the relevant local government's regulations, for up to two domestic dogs which must be under control (as defined in the Management Guidelines) at all times;

g) conduct, permit or consent to any investigation or exploration for, or the mining, extraction, removal or production of gas, petroleum, minerals, soil, stones, sand, rock, gravel, clay or other substances on the Land;

h) permit or consent to (unless required by law) the construction, erection or establishment of any transmission lines or other services or works on the Land, save for;

   i) fire protection measures in accordance with Management Guidelines; and

   ii) the provision of essential services to the balance of Lot 6 along the Proposed Driveway Access identified in the drawing annexed hereto including but not limited to underground electricity, telecommunications and water provided in such a manner as to minimise damage to native vegetation;

i) carry out or permit on the Land the operation of any trade, industry or business;

j) permit on the Land the use of vehicles including but not limited to trail bikes or four wheel drive vehicles or land management machinery, save for when required for the proper management and protection of the Land;

k) carry out or permit on the Land the storage of rubbish or garden refuse or materials,

l) carry out or permit on the Land any activities inconsistent or incompatible with the conservation of the vegetation and fauna on the Land;

m) erect or permit to be erected any fence on the Land, save for a perimeter fence around the Land;

n) introduce or permit the introduction upon the Land of any rocks, soil, gravel, sand or other basic raw materials, except from external sources first approved in writing by the Executive Body as being free of weeds and known plant pathogens including *Phytophthora* Dieback disease, nor use or permit the use of earth moving machinery on the Land unless it has been first cleaned offsite and/or where appropriate precautions have been taken to reduce the risk of introduction or further spread of weeds and plant pathogens; and

o) use or permit the use on the Land of guns, hunting weapons, animal traps or poisons, save for the purposes specified in the Management Guidelines.

Management Activities and Monitoring

Issue 1 *Inappropriate habitat management for threatened species*

Objective *Protect and manage threatened / priority species and/or communities*

Activity 1 *Management of habitat for threatened species* *Timeline: ongoing*

Fauna present

- Known occurrence of the Threatened Graceful Sun Moth (*Synemon gratiosa*) listed on Schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2010(2)* (location as shown on the map attached to these Management Guidelines)
- Suitable habitat (evidence of feeding) for the Threatened Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) listed on Schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2010(2);*
- Suitable habitat (evidence of feeding) for the Southern Brown Bandicoot (*Isoodon obesulus* subsp. *fusciventer*) listed as Priority 5 on the Department's *Priority Fauna List 2010(2)*;

Management actions

- Keep the bushland area adequately fenced so that grazing by stock does not occur.
- Avoid disturbance of the vegetation and soil in the area.
- Control rabbits to reduce grazing pressure.
- Protect the habitat from accidental fires. Maintain firebreaks around the perimeter of the site in accordance with local regulations, and maintain an adequate water supply for fire fighting purposes.

Monitoring

Photo-monitoring points can be set up in the area generally, and near known habitat areas, and photographs taken each year to determine if there is any change in the habitat over time.

Report any uncontrolled events or threats (such as wildfire, locust plagues, encroaching salinity) affecting these species and/or their habitats to the Department's Covenant Program.

References

Department of Conservation and Land Management (1992) Policy Statement No. 9 *Conservation of Threatened Flora in the Wild.*

Department of Conservation and Land Management (1991) Policy Statement No. 33 *Conservation of Threatened and Specially Protected Fauna in the Wild.*

Department of Conservation and Land Management (1998) Policy Directorate Administrative Instruction No. 34 *Protection of Rare (Threatened) Flora on Private Land and on Crown Land not vested in the Department.*

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Valentine, L.E. and Stock, W. (2008) *Food Resources of Carnaby's Black-Cockatoo (Calyptorhynchus latirostris) in the Gnangara Sustainability Strategy study area.* Report to Forest Products Commission. Centre for Ecosystem Management, Edith Cowan University and the Department of Environment and Conservation

For more information on Carnaby's Black-cockatoo, see

http://www.dec.wa.gov.au/content/view/6333/2361/

Management Activities and Monitoring (cont')

Issue 2 *Inappropriate management and use of Bush Forever area*

Objective *Protect, maintain and enhance the Bush Forever area*

Activity 2 *Actively manage and monitor the Bush Forever bushland* *Timeline: ongoing*

Management actions

Manage the Bushland in accordance with Appendix 2: Bushland/ Bush Forever Management Plan (still to be drafted as at February 2012)

The Bush Forever Management Plan should include, but not be limited to:

- Description of the site through off and onsite assessments;
- Protection of flora and fauna;
- Emergency vehicle access and people access;
- Hard edge bushland interface controls;
- Fencing and signage;
- Rubbish removal;
- Conservation and enhancement of natural attributes;
- Aboriginal heritage protection;
- Re-vegetation and rehabilitation areas;
- Pest and feral animal control;
- Dieback and other diseases control;
- Protection of hydrology;
- Control of undesirable activities such as 4 wheel driving and rubbish dumping;
- Appropriate remediation of any contaminated sites;
- Responsibilities, implementation and timing;
- Ongoing monitoring and maintenance; and
- Contingency actions.

Monitoring

Establish a number of photo-monitoring points across the site in order to monitor any changes. Photograph during spring each year to determine if there is any change in the number or quality of plants over time. Record photos and observations.

Report any uncontrolled events or potential threats (such as disease, wildfire, encroaching salinity) affecting the bushland to the Department's Covenant Program.

References

Government of Western Australia (2000) *Bush Forever Volume 1: Policies, principles and Processes*. Western Australian Planning Commission

Management Activities and Monitoring

Issue 3 *Soil erosion and loss of seed bank in bare, cleared or degraded areas*

Objective *Manage and improve bare areas to improve habitat, long-term viability of the bushland, and to create buffers between the bushland and agricultural areas*

Activity 3 *Manage and improve bare, cleared or degraded areas* *Timeline: autumn - winter*

Where bare, cleared, grazed or otherwise degraded areas (ie, where the natural vegetation has been disturbed or removed) occur within bushland, they can provide a harbour for weeds and source of erosion. The potential for these problems can be reduced through revegetation and by encouraging natural regeneration, while at the same time improving the quality, connectivity and habitat values of bushland.

Often an ecosystem is modified to such an extent that one or more factors necessary for natural regeneration to occur are missing. In these circumstances it may be necessary for land managers to assist the rehabilitation of an area by mimicking certain processes to stimulate germination and natural regeneration, or through planting by hand.

At your site

- Your site contains the following areas requiring revegetation and rehabilitation:
  1. an area designated for rehabilitation (the Rehabilitation Zone) as part of the development of the Wangara Industrial Precinct. Located along the north eastern arm of the covenant site, it consists of a degraded paddock area of approximately 1.95 ha as indicated on the map included with these Management Guidelines.
  2. a portion of a disused sand quarry in the south east (see attached map).
  3. the southern boundary with Ocean Reef Road that has been partially impacted by road works.

1. Rehabilitation Zone

2. Disused Sand Quarry (view from west)

3. Ocean Reef Road impacts

Continued overleaf...

Management Activities and Monitoring (*cont'*)

Issue 3 *Soil erosion and loss of seed bank in bare, cleared or degraded areas (cont')*

Objective *Manage and improve bare areas to improve habitat, long-term viability of the bushland, and to create buffers between the bushland and agricultural areas (cont')*

Activity 3 *Manage and improve bare, cleared or degraded areas (cont')* *Timeline: autumn - winter*

Suggestions for rehabilitation and revegetation

A mixture of revegetation through direct seeding and planting with locally-native species, and using techniques to encourage natural regeneration, would assist in rehabilitating these areas to provide habitat for wildlife.

Some methods of achieving this are provided over the next few pages.

Method 1 - Direct seeding

The main advantages of direct seeding compared to planting seedlings are that it is cheaper, a wide range of species can be planted at the one time, and the end result will mimic natural regeneration more so than rows of shrubs and trees.

Weed control can be difficult, and insects and birds can be an issue after seeding as they will eat seeds, and dry conditions immediately after germination can kill the young plants. Make sure any weeds and pests are controlled both before and after seeding.

Prepare the site before planting, including any earthworks or soil preparation that may be necessary, pest (insect / rabbit) and weed control, and temporary fencing to deter kangaroos. Prepare the seed bed by ripping or raking as it helps to improve early growth.

Choose seed obtained from a local provenance source (such as your site). For the purpose of these Management Guidelines, 'local provenance' can be defined as similar vegetation on a similar landform within 15 kilometres of the site to be revegetated, or the nearest source. To collect seed from Crown land a *'Scientific or Other Prescribed Purposes licence'* is required from the Department. On private property, the landowner's permission is required.

Choose the right species and a suitable seeding rate and mix for the site, and choose the correct time of year for sowing. Also make sure the seeds are viable, and treat hard-coated seeds before seeding.

The seed can be scattered by hand or using specialised direct seeding machinery. In both methods the seed needs to be 'bulked up' with a substance such as sand, sawdust, vermiculite or even kitty litter to ensure an even spread of seed over the area.

Continued overleaf...

Management Activities and Monitoring (*cont'*)

Issue 3 *Soil erosion and loss of seed bank in bare, cleared or degraded areas (cont')*

Objective *Manage and improve bare areas to improve habitat, long-term viability of the bushland, and to create buffers between the bushland and agricultural areas (cont')*

Activity 3 *Manage and improve bare, cleared or degraded areas (cont')* *Timeline: autumn - winter*

Method 2 - Planting seedlings

Where possible, obtain seedlings that have been grown from seed obtained from a local provenance source (local provenance defined above under "direct seeding"). Many nurseries are willing to grow seedlings from seed collected and supplied by the landowner.

Prepare the site before planting, including any earthworks or soil preparation that may be necessary, pest (insect / rabbit) and weed control, and temporary fencing to deter kangaroos. Make sure any weeds and pests and controlled both before and after planting.

Before transporting seedlings to the site, make sure they are acclimatised to the sort of conditions they are expected to survive in. On arrival at the site, keep the seedlings in a shaded area until they are required for planting out. Planting should be done into moist soil, preferably following the first winter rains.

A planting tube, such as a Potti Putki®, is the fastest and easiest method of planting by hand, especially where there are a large number of seedlings involved. Alternatively, machinery such as a tractor-mounted tree planter can be used for planting rows, however a person should follow behind and check that plants are in the ground correctly.

Make sure that seedlings are planted vertical and at least as deep as they were in the seedling trays or pots. Compress the soil around seedlings to prevent them drying out.

Method 3 - Encourage natural regeneration

There are a few methods of achieving this. In some instances, disturbing the soil with a rake or through 'ripping' (see description below) may be all that is necessary for natural regeneration of some species to occur. Other methods include:

Weed control

Gradual weed control over several years, working from the edge of an infestation slowly to the centre, will allow native vegetation to slowly replace weeds without exposing the area to further invasion. Methods for weed control are discussed in more detail in Issue 2.

Brushing

Cut seed-laden branches from seed-holding plants such as sheoaks, paperbarks and eucalypts, and lay these on the bare ground. Seed should germinate under the branches.

Mosaic burns

The heat and chemicals produced by fire can stimulate germination in a wide range of plant species, and some of these species may otherwise become locally extinct if fire is excluded over the long term. If deliberate burning is not appropriate for your bushland, heap burns or use of smoke water can be effective regeneration tools. The use of mosaic burns to assist regeneration is a complex issue because it can be difficult to achieve, particularly in small remnants. The theory behind mosaic burns is that about 10% of the bushland is burnt periodically (in such a way that each pocket has several years, possibly decades, between burns) to create a mosaic of different-aged vegetation pockets to provide a variety of habitats.

Continued overleaf...

Management Activities and Monitoring (*cont'*)

Issue 3 *Soil erosion and loss of seed bank in bare, cleared or degraded areas (cont')*

Objective *Manage and improve bare areas to improve habitat, long-term viability of the bushland, and to create buffers between the bushland and agricultural areas (cont')*

Activity 3 *Manage and improve bare, cleared or degraded areas (cont')* *Timeline: autumn - winter*

Method 3 - Encourage natural regeneration cont'

Smoke water and heat treatment

An alternative to a mosaic burn. Smoke water and/or heat treatment can be applied directly to hard-coated seeds, such as those from wattles, to assist germination by providing some of the chemicals and/or high temperatures necessary for breaking down the hard seed coat. Alternatively, apply smoke water directly onto bare soil in an area free from overhanging trees and shrubs, and with the leaf litter raked aside. Smoke water can be made at home by bubbling the smoke from a small fire through a beaker of water using a hose, or purchased from Botanic Gardens and Parks Authority (Kings Park).

Heap burn

An alternative to a mosaic burn. In an area free from overhanging branches, pile fallen timber and other debris into a heap, and burn to assist the germination of seed stored in the soil, and to create an ashbed into which seed can be sown.

Ripping

The aim of mechanically 'ripping' the soil in previously cleared areas (such as unused gravel pits) is to disturb and loosen compacted soils to a depth of 45-100 centimetres, in order to allow germinating plants access to nutrients, water and other resources more easily, and so that roots have space to grow. Depending on the accessibility of the site, ripping can often be carried out with standard agricultural machinery. Specialised ripping machinery may be single tine (ie, a single blade deep-ripping a single line), or multiple tined (deep-ripping 2 or 3 lines simultaneously). Ripping is ideal preparation for brushing, as it creates niches for seed to lodge and germinate. Follow-up weed control may be necessary.

References

Kings Park and Botanic Gardens (1999). *Smoke to Sow and Grow*. Kings Park and Botanic Gardens, Western Australia.

Hussey, B.M.J. (2001). *Photographic Monitoring of Vegetation*. Wildlife Notes No. 9, Land for Wildlife Scheme. Department of Conservation and Land Management, Western Australia.

Hussey, B.M.J. (1999). *How to Manage Your Wandoo Woodlands*. Land for Wildlife Scheme. Department of Conservation and Land Management, Western Australia.

Hussey, B.M.J. (1998). *How to Manage Your Granite Outcrops*. Land for Wildlife Scheme. Department of Conservation and Land Management, Western Australia.

Hussey, B.M.J. and Wallace, K.J. (1993). *Managing Your Bushland*. Department of Conservation and Land Management, Western Australia.

Management Activities and Monitoring (*cont'*)

Issue 4 *Competition with weed species*

Objective *Prevent the spread of weedy plant species in the bushland*

Activity 4 *Manage existing weeds* *Timeline: as necessary*

Weeds are plants that occur outside of their natural environment (this includes garden plants), and compete with native species. In some cases they can also cause a fire hazard, be toxic to stock or native animals, choke waterways and be hazardous to human health. Weeds are generally fast growing and can reproduce quickly, and often dominate areas that have been subject to disturbance.

The following species are present:

- *Leptospermum laevigatum* (Victorian tea tree)
- *Ursinia anthemoides*
- *Ehrharta calycina* (Veldt grass)
- *Gladiolus* sp.
- Flat weed species (*Arctotheca calendula* and *Hypochaeris radicata*)

Example of weedy track through bush

Seek advice from the Department where unfamiliar plants are found. Some methods for managing weeds in bushland are provided below.

Management methods

Weeds are best managed just before they flower (or as soon as possible during flowering), as the plant will be actively growing rather than dormant, and won't have set seed yet.

In most instances follow-up management will need to be done a couple of months later, then on an annual basis for the following three or so years. Revegetation and natural regeneration should out-compete weeds over time.

Manage any Declared Plants and Environmental Weeds that you find in your bushland. The Department, or your local Department of Agriculture and Food Biosecurity Officer, can provide advice on the identification and management of these species.

Ensure that you wear gloves to protect against any chemicals or spines, and avoid getting the milky sap that some weeds produce on your skin as it may cause an allergic reaction.

Manual methods

For new, small or isolated populations of weeds or individual weedy plants, plants can be dug up or hand-pulled (if practical) and disposed of. Weeds with corms or bulbs will need to be dug up and all the corms and bulbs extracted intact.

For larger plants and trees with trunks, cut through the stem or trunk of the plant just above ground level. In lignotuberous plants (such as some species of wattles and eucalypts), cut just under the swelling on the stem or trunk.

Continued overleaf...

Management Activities and Monitoring (cont')

Issue 4 *Competition with weed species(cont')*

Objective *Prevent the spread of weedy plant species in the bushland (cont')*

Activity 4 *Manage existing weeds (cont')* *Timeline: as necessary*

Chemical methods

Alternatively, chemical herbicides can be used. When using herbicides in bushland areas, bear in mind that most are detrimental to native vegetation as well as to weeds. Take care around wet areas as many herbicides contain a surfactant to help plant absorption, which also causes lethal damage to the mucous membranes of aquatic animals such as frogs.

Before using chemicals, familiarise yourself with the contents of the relevant "material safety data sheet", poisons information and poisons emergency contact number.

For most weeds, a general herbicide such as glyphosate applied at the recommended dilution plus a wetting agent is effective. General herbicides include (not necessarily endorsed by the Department) Glyphosate 360®, Roundup®, Ally®, Brushoff®, Sprayseed®, Tryquat®.

Grassy weeds can be effectively controlled with a grass-selective herbicide (such as Fusilade® which is registered for use in bushland, although not necessarily endorsed by the Department) applied at the recommended dilution plus a wetting agent.

Some methods of applying herbicide that could be used at your site include:

- *Spot spraying.* Spray individual plants with a mist of herbicide from a knapsack or standard spray bottle. Take care not to allow the spray to drift onto native plants.
- *Stem wiping.* Use a domestic spray bottle (dedicated to this purpose) with a piece of sponge secured over the nozzle to brush herbicide against the leaves of plants. Squeeze the trigger of the spray bottle to moisten the sponge.
- *Blanket spraying.* Large or widespread populations can be over-sprayed with herbicide, however be aware that herbicides will affect native species as well.
- *Cut stump method.* If large woody weeds are found, cut through the stem / trunk of the plant and paint the stump with a general herbicide.
- *Stem injection method.* For large woody weeds, use a cordless drill, chisel or axe to cut a notch at 45° through the bark into the sapwood at regular intervals around the stem / trunk at breast height, and use a plastic disposable syringe or an eye-dropper to apply a general herbicide directly to the exposed sapwood.

Monitoring

Perform twice-yearly checks of the edges, tracks, and any clear or revegetated areas at the sites for new populations of weeds. This is particularly important during the spring months.

You may find it useful to establish photo-monitoring points at areas within the sites where weeds occur and are being managed, as this will help you to evaluate the effectiveness of your methods, and the success of a particular herbicide and its effect on native plants. The areas are best photographed just before treatment and about six weeks later, after any follow-up treatment, and then on an annual basis.

References

Brown, K. and Brooks, K. (2003). *Bushland Weeds – a Practical Guide to their Management*. Environmental Weeds Action Network (Inc), Western Australia.

Management Activities and Monitoring (*cont'*)

Issue 5 *Predation of, and competition with, native fauna by introduced fauna*

Objective *Assist the survival of native fauna by managing introduced animals*

Activity 5 *Restrict access to the bushland by domestic dogs* *Timeline: all year*

Dogs can harass and disturb wildlife, and may also disturb soil through digging and scratching or enrichment by their droppings.

Dogs must be prevented from killing or injuring wildlife in the covenanted area, and therefore access by dogs to this area should be restricted, and dogs must be on a leash, as described in the conditions below.

Domestic cats retain their natural instincts to hunt small animals, and should be prevented from doing so in bushland. Cats are therefore not permitted in the covenant site at any time. Cats are also the principle vector for the disease *Toxoplasmosis* that can seriously affect native fauna.

<u>The following conditions must be adhered to if undertaking this activity:</u>

- Dogs must be placed on a leash at all times.
- The use of a muzzle on dogs permitted to enter bushland areas is recommended especially when 1080 poison baits are being used in the area for feral animal management.

Management Activities and Monitoring (*cont'*)

Issue 5 *Predation of, and competition with, native fauna by introduced fauna (cont')*

Objective *Assist the survival of native fauna by managing introduced animals (cont')*

Activity 6 *Manage foxes and feral cats* *Timeline: three-monthly*

Foxes and feral cats prey on a wide range of native fauna including mammals, birds, frogs and invertebrates.

Management methods

- A baited wire cage trap can be used to capture foxes and feral cats. Caught animals must be disposed of humanely (a .22 calibre rifle shot to the brain at point blank range is appropriate). Ensure that you have an appropriate licence and have complied with all of the safety and licensing requirements before using a firearm in a metropolitan location. Traps may be available through your local government authority.
- Contact your local District Department of Agriculture and Food Biosecurity Officer for advice on the use of 1080 poison baits in your area. Manage foxes with a controlled baiting program. A coordinated community approach involving the local shire will be the most effective method (if this is an option in a metropolitan area). 1080 poison baits must be used with caution.

Monitoring

Monitor fox and feral cat numbers by undertaking spotlight surveys during optimal conditions (i.e. when it's not cold, with low wind, no rain and a new moon).

References

Lund, D. and Staff of the Vertebrate Pest Research Services (2001). *Options for Fox Control*. Farmnote 91/2001. Department of Agriculture and Food, Western Australia.

Thompson, P. (2000). *Red Fox*. Farmnote 115/2000. Department of Agriculture and Food, Western Australia.

Adamson, H. (2001). *Make your own cat trap*. Western Wildlife Vol. 5 No. 2, Land for Wildlife Scheme. Department of Conservation and Land Management, Western Australia.

Baxter, A. (2002). *An Innovative Cat Trap*. Western Wildlife Vol. 6 No. 2, Land for Wildlife Scheme. Department of Conservation and Land Management, Western Australia.

Horner, A. and Platt, S. (1993). *Foxes – Options for Control in Wildlife Habitat*. Land for Wildlife Note No. 24, Land for Wildlife Scheme. Department of Conservation and Natural Resources, Victoria.

Platt, S. (1993). *Cats and Wildlife – How You Can Protect Both*. Land for Wildlife Note 25, Land for Wildlife Scheme. Department of Conservation and Natural Resources, Victoria.

Management Activities and Monitoring (*cont'*)

Issue 5 *Predation of, and competition with, native fauna by introduced fauna(cont')*

Objective *Assist the survival of native fauna by managing introduced animals (cont')*

Activity 7 *Manage rabbits* *Timeline: autumn / spring*

Rabbits graze young plants and compete for resources with native fauna and help support fox and cat populations.

Management methods

- The following options may not be appropriate in a metropolitan locality, and the City of Wanneroo should be able to advise on alternative strategies for removing rabbits.
- Contact your local District Department of Agriculture and Food Biosecurity Officer for advice and authorization on the use of 1080 poison 'One-Shot' oats or pindone on your property. Please note that pindone should only be used in baiting stations that exclude macropods (kangaroos and wallabies) – the advising Officer will be able to provide advice on how to achieve this.
- Using impaction explosives to destroy warrens should only be done by qualified persons and only if warrens are confirmed to be housing only rabbits and not other fauna. This technique can be useful in sandy areas or rocky or stony areas where access is limited.
- If warrens are confirmed to be housing only rabbits and not other fauna, fumigation of warrens can be done using Phosphine tablets or similar.
- 'Ripping' warrens is not recommended as accessing the warrens with machinery is likely to cause excessive disturbance to the soil and vegetation.

Monitoring

Monitor rabbit numbers by undertaking spotlight surveys as conditions permit.

References

Staff of the Vertebrate Pest Research Services (2003). *European Wild Rabbit - Oryctolagus cuniculus*. Farmnote 39/2003. Department of Agriculture and Food, Western Australia

Twigg, L. and Lowe, T. (2003). *Bait Stations and Rabbit Control*. Farmnote 38/2003. Department of Agriculture and Food, Western Australia.

Farrelly, G., Merks, P. and Staff of the Vertebrate Pest Research Services (2001). *Options for Rabbit Control*. Farmnote 89/2001. Department of Agriculture and Food, Western Australia.

Kruger, E. (2005). *Landholder Use of 1080 One Shot Oat Rabbit Bait*. Farmnote 63/2005. Department of Agriculture and Food, Western Australia.

Twigg, L. and Lowe, T. (2007). *Fumigation for Rabbit Control*. Farmnote 279. Department of Agriculture and Food, Western Australia.

Twigg, L. and Lowe, T (2008). *Rabbit Warren and Harborage Destruction*. Farmnote 286. Department of Agriculture, Western Australia.

Lowe,T. and Twigg L. (2007). *Rabbit control in urban and semi urban areas.* Farmnote 241. Department of Agriculture and Food, Western Australia.

Management Activities and Monitoring (*cont'*)

Issue 6 *Degradation due to plant disease*

Objective *Prevent the introduction or spread of plant diseases in the bushland*

Activity 8 *Manage the impact of Phytophthora cinnamomi dieback* *Timeline: all year*

Phytophthora cinnamomi is a water mould that spends its life in the soil and in plant tissue. It causes the plant roots to rot which limits the uptake of water and nutrients to the rest of the plant. In warm, moist conditions, *P. cinnamomi* produces spores that move through the soil, attracted to plant roots. The most susceptible plants are jarrah, banksias (and other proteaceous species), grass trees and zamia palms.

The root-rot dieback fungus *P. cinnamomi* is believed to be present in parts of the site, predominantly along the tracks. The extent of the dieback on the property is not known so to avoid accidental spread, dieback mapping may be necessary.

Management

Phosphite (phosphonic acid) is a chemical that can be applied to vegetation to assist it to withstand *Phytophthora cinnamomi*. Phosphite not only helps to protect a plant from the effects of this disease, but it can also help a plant to recover if it is already infected.

Phosphite is available from most large nurseries and rural supply stores. The Nurserymen's Industry Association should have stock available. It is generally sold in a 20% or 40% solution, under the label of Fos-ject® or Agri-Fos®. When applied at the recommended very low rate, phosphite binds to the soil and does not reach the water table.

Phosphite has toxicity similar to table salt. It will sting eyes and cuts, but causes no permanent damage. Follow the safety instructions on the side of the pack, and wear long pants and shirt, PVC gloves and safety glasses. Spray in a downwind direction, so the spray does not blow back on to you.

The most appropriate method of applying phosphite for a landholder is by stem injection. Treatment needs to be ongoing.

Stem injection

Inject canopy vegetation in the trunk with phosphite to assist survival. The best time to inject a tree is in the morning during spring or summer. Injection can be done with large syringes or specialised stem injection equipment. Injecting a tree will provide about three to five years of protection from *Phytophthora cinnamomi*.

For further information on the use of phosphite to treat *Phytophthora cinnamomi* contact Department's Swan Region Office on (08) 9423 2900.

Continued overleaf...

Management Activities and Monitoring (*cont'*)

Issue 6 *Degradation due to plant disease (cont')*

Objective *Prevent the introduction or spread of plant diseases in the bushland (cont')*

Activity 8 *Manage the impact of Phytophthora cinnamomi dieback (cont')* *Timeline: all year*

The following guidelines should be followed to reduce the risk of spreading dieback on your property:

- Survey and map the location of dieback on your property;
- When undertaking maintenance on firebreaks, slash or spray rather than grade them;
- All vehicles, equipment, machinery and footwear must be free of soil before entering the property and when moving between infected and non-infected areas;
- Avoid bringing diseased soil, gravel or sand into the bushland;
- Do not move soil between infected and uninfected bushland; and
- Avoid walking through the bushland when it is wet. Keep to the tracks when possible.

Monitoring

A photo-monitoring point adjacent to the bushland can be a useful tool for observing any changes in vegetation quality. Monitor Proteaceous plants (such as Banksias, Dryandras, Hakeas etc), as well as Jarrah and Grasstrees, and undertake photo-monitoring before, during and after treatments. Note any changes, and keep photographs and notes in a journal.

Map the boundary of the current extent of vegetation deaths, and monitor each year to note any increase in the area and decline in plant health.

References

Dieback Working Group. (2008). *Managing Phytophthora Dieback in Bushland: A Guide for Landholders and Community Conservation Groups.* http://www.dwg.org.au/files/DWG%20Handbook.pdf

Management Activities and Monitoring (*cont'*)

Issue 7 *Risk of bushfires, and senescence of vegetation due to a lack of natural processes*

Objective *Fire management for bushfire prevention and to assist regeneration*

Activity 9 *Implement bushfire prevention strategies* *Timeline: annually, summer*

Bushfire suppression

Where possible and practical, maintain good vehicular access and firebreaks around the perimeter of the bushland, in accordance with your relevant local government authority's regulations for fire management. If possible, maintain a supply of water at all times of the year for fire fighting purposes. Some local governments require a readily-mobile operational fire fighting unit containing a minimum of 400 litres of water to be on stand-by between the 1st of November and the 30th of April each year.

A Fire Management Plan has been prepared for Lot 6 and portions of Lot 10 and Lot 50 Sydney Rd. The Fire Management Plan was prepared by FirePlan WA (2011) and is attached as Appendix 2. A separate Bush Forever Management Plan will be prepared for the Bush Forever area and will include details on appropriate hazard reduction programs.

Recommendations for fire hazard management from the Fire Management Plan relevant to the Covenant site include;

- Construction of fire breaks around and through the Covenant site as shown in the attached Fire Management Plan.
- Implement the Hazard Reduction program within this Bush Forever area in accordance with the Bush Forever Management Plan (once drafted);
- Construction of limestone fire breaks around the perimeter of the housing site just outside of the covenant area (see map); and
- A building protection zone of 20 meters and a hazard separation zone of zero (0) meters applied to the buildings outside the covenant area (buildings should thus be a minimum of 20m from the covenant land boundary).

Department's offered assistance

Information on fire, and assistance with bushland management following an unplanned fire.

Monitoring

Record the date, location (on an aerial photo and lot plan), extent, season, and intensity of any unplanned fires. Establish a photo-monitoring point adjacent to these areas in order to record the response of the vegetation to fire, and its ability to recover over time.

References

Fire and Emergency Services Authority of Western Australia, and Department of Planning (2010). *Planning for Bush Fire Protection Guidelines (Edition 2).* Western Australian Planning Commission.

Davies, S. (2000). *Fire Management Planning for Urban Bushland.* Fire and Emergency Services Authority of Western Australia, and Urban Bushland Council WA Inc, Western Australia.

Fire and Emergency Services Authority of Western Australia (Jun 2000). *The Homeowner's Bush Fire Survival Manual.*

Management Activities and Monitoring (*cont'*)

Issue 7 *Risk of bushfires, and senescence of vegetation due to a lack of natural processes(cont')*

Objective *Fire management for bushfire prevention and to assist regeneration (cont')*

Activity 10 *Use of fire to encourage natural generation* *Timeline: autumn*

The heat and chemicals produced by fire can stimulate germination in a wide range of plant species, and some of these species may otherwise become locally extinct if fire is excluded over the long term. If deliberate burning is not appropriate for your bushland, heap burns or use of smoke water can be effective regeneration tools.

Since European settlement, the frequency, seasonality and intensity of fires have changed. In some areas, fires occur more often and at different times of the year. More frequent fires mean that bushland has less time to recover and regenerate, so that some species disappear. Also, weeds can respond faster after a fire than native plants, which means that weeds can out-compete native species so that they don't get a chance to grow. The patchy nature of remnant bushland also means that the entire remnant is likely to be affected by the fire, whereas in the past the fire may have affected only part of the landscape, leaving areas of habitat still intact for animals to flee to.

Mosaic burn

The use of mosaic burns to assist regeneration is a complex issue because it can be difficult to achieve, particularly in small remnants. The theory behind mosaic burns is that about 10% of the bushland is burnt periodically (in such a way that each pocket has several years, possibly decades, between burns) to create a mosaic of different-aged vegetation pockets to provide a variety of habitats. There are a number of situations where the use of mosaic burns can be inappropriate. Particular care should be taken with areas of rock outcrops, riparian (river) zones and swamps, and habitats of rare or threatened species. Small areas of bushland also require care, as there will be difficulties in limiting the size of the area burnt and the risk of weed invasion. The frequency (time period between fires) of burning is also complex. The appropriate frequency for your bushland will depend on the vegetation type, climate and other factors, and advice should be sought from your local office of the Department. Guidelines prepared for the cut-flower industry suggest that the frequency should be at least twice as long as the length of time to maturity (to set seed) of the slowest growing reseeder species. The time of year to burn is another complex issue, and depends on the vegetation type and climate of your area. Autumn is often favoured since the follow up rains of winter assist the survival of regenerating plants, and also avoids the breeding season of many animal species.

Smoke water and heat treatment

An alternative to a mosaic burn. Smoke water and/or heat treatment can be applied directly to hard-coated seeds, such as those from wattles, to assist germination by providing some of the chemicals and/or high temperatures necessary for breaking down the hard seed coat. Alternatively, apply smoke water directly onto bare soil in an area free from overhanging trees and shrubs, and with the leaf litter raked aside. Smoke water can be made at home by bubbling the smoke from a small fire through a beaker of water using a hose, or purchased from Botanic Gardens and Parks Authority (Kings Park).

Heap burn

An alternative to a mosaic burn. In an area free from overhanging branches, pile fallen timber and other debris into a heap, and burn to assist the germination of seed stored in the soil, and to create an ashbed into which seed can be sown.

Monitoring

Establish a photo monitoring point near areas where fire or smoke water has been used to encourage natural regeneration, in order to evaluate the success of the technique. Record the response of the vegetation to fire and its ability to recover over time.

Management Activities and Monitoring (*cont'*)

Issue 8 *Landuse activities inconsistent with nature conservation*

Objective *Implement an environmentally sensitive management program*

Activity 11 *Manage rubbish dumping to prevent weeds, rubbish and disease incursion into the bushland* *Timeline: as appropriate*

Some rubbish is scattered throughout the south eastern portion of the covenant site such as a car body, old washing machine and other odd pieces of furniture (see images below).

Rubbish in areas of bushland can have a negative impact on the quality of the surrounding vegetation, as weeds and disease can be introduced, scavenging animals (such as feral cats, foxes, rats and gulls) can increase in number in the area, and rubbish can spread.

Management

There are some simple measures that can be taken to ensure that rubbish dumping has minimal impact on the surrounding bushland.

- Avoid dumping any further rubbish in the bushland
- Gradually collect and remove the rubbish from the bushland area
- Prevent the spread of rubbish into the surrounding bushland by regularly inspecting the surrounding bushland and collecting of any rubbish that has blown into it. Fencing of the covenant area will also assist in reducing any unauthorised dumping.
- Many landowners burn their dumps periodically to reduce volume, however burning of dumps is not recommended in bushland areas because of the risk of the fire escaping. If you are planning to burn your dump, burning should only be undertaken in accordance with local fire by-laws and regulations.

Rehabilitation

Gradually rehabilitate the area to help in preventing erosion and suppressing weed growth, and to provide habitat for local wildlife.

Management Activities and Monitoring (cont')

Issue 9 *Disturbance caused through maintenance activities*

Objective *Perform maintenance activities in an environmentally sensitive manner*

Activity 12 *Maintenance of tracks, walk trails, fences, transmission lines, fire breaks and fire access tracks* *Timeline: as necessary*

Maintenance or servicing activities on tracks, fences, firebreaks and fire access tracks should be carried out carefully so that disturbance to the surrounding bushland is kept to a minimum.

Any pruned vegetation resulting from maintenance activities should not be dumped in the bushland. Prunings of native vegetation can be spread out over degraded or previously cleared areas that may require revegetation, or removed from the site altogether. Any weeds that are removed should be disposed of properly.

Fences

Check fences at least once annually and following any storm events for fallen debris, and maintain as necessary to prevent uncontrolled access to the site.

Tracks

Ideally for hygiene reasons, obtain any required gravel for track maintenance from disease-free sites in the local area (if possible from elsewhere on your property) to avoid the possible introduction of new weeds or diseases.

The existing tracks are indicated on the aerial photograph included with these Management Guidelines. Vehicle tracks should not be greater than 3 metres wide at any point. Walk trails should not be greater than 1 metre wide at any point.

Firebreaks

The establishment and maintenance of firebreaks and fire access tracks should be done in accordance with your relevant local government authority's and Bush Fire Brigade's regulations and guidelines for fire management.

Special consideration may be needed where the fire break comes in contact with the nearby contaminated site area. See the attached map for the location. Details of the contaminated site are on the certificate of title for lot 6.

<u>Monitoring</u>

Monitor tracks and firebreaks for any signs of erosion, particularly on slopes with frequent use. If areas of erosion are encountered, contact the Department for advice.

Management Activities and Monitoring (*cont'*)

Issue 10 *Use of natural resources*

Objective *Establish an ecologically balanced removal program*

Activity 13 *Collection of plant propagation and identification material* *Timeline: as appropriate*

Under the covenant you may opportunistically collect seed from your bushland for the non-commercial purpose of revegetation in the local area, and in particular, for revegetation within the Rehabilitation Zone of the covenant area as shown on the map attached with these Management Guidelines. Plant material may also be collected as voucher specimens for identification. Plant propagation material other than seed can also be collected for the purpose of revegetation in the local area, but not for any commercial purpose. However, you cannot burn, irrigate, prune, fertilise or undertake any other activity specifically for the purpose of manipulating the production of seed or plant material.

Methods

Timing of seed collection is important. The aim is to collect mature seed with the highest viability possible. Collect seed from many different plants of the same species in order to obtain a diverse gene pool. Seed is best collected into paper bags to prevent it from sweating. Make sure that seed from different species is kept in separate bags. Seed can be collected by handpicking, using loppers or secateurs to remove branches, or spreading a tarp under a plant.

Collect / photograph a specimen of each species of plant that seed is collected from, including fruits, buds and flowers (where possible). Tag and number the specimens, providing details of the date of collection, a brief description of the plant, its preferred soil type and position in the landscape, and the surrounding vegetation type. Write the same details on the relevant paper bag containing that species' seed. This will enable identification of the species and its seed at a later stage.

The following conditions must be adhered to if undertaking this activity:

- No more than 20% of the seed or 10% of the foliage may be taken from any individual plant during any one reproductive season, or in the case of annual flora harvesting is to be limited to 30% of the plants in a population. This ensures that there will be some resources available for natural regeneration, and for foraging animals and birds. No whole plants or roots of plants are to be taken.
- Do not harvest those species on the Department's *Threatened and Priority Flora List 2010(2)* without prior permission from the Department. Threatened Flora cannot be harvested without prior written permission from the Minister for the Environment.
- Take precautions to avoid the spread of plant pathogens (in particular *Phytophthora* spp. dieback) whilst undertaking picking activities. Ensure that blades of secateurs, saws and pruners are kept sharp and cleaned regularly with methylated spirits.
- No protected flora shall be taken in such a manner which destroys or jeopardises the survival of the plant, population or associated vegetation, or in the case of annual flora, in such a manner that jeopardises the survival of the population and associated vegetation.

For further information regarding seed collection, please see Appendix 3, a *Land for Wildlife* publication entitled "Seed Collection from Native Plants", or contact DEC's Covenant Program on (08) 9337 0477.

Continued overleaf...

Management Activities and Monitoring (*cont'*)

Issue 10 *Use of natural resources(cont')*

Objective *Establish an ecologically balanced removal program (cont')*

Activity 13 *Collection of plant propagation and identification material(cont')* *Timeline: as appropriate*

Monitoring

It is worth keeping notes on the abundance of particular species harvested, the time of year that they were harvested, their response to harvesting, and any other information that may be useful for future harvesting. If harvesting is done following a particularly dry or wet season, keep notes on the amount of resource that is available. These notes will assist with harvesting activities in future, particularly if targeting a certain species or habitat type. Keep a record of any rare or unusual plants, and of all notes and photographs taken.

References

Bradby, K. and Morris, V. (1997). *Seed Collection from Native Plants*. Wildlife Notes No. 4, Land for Wildlife Scheme. Department of Conservation and Land Management, Western Australia.

Rohl, L. and Smith, R. (1999). *Management Guidelines for Remnant Vegetation being Harvested for Cutflowers*. Wildlife Notes No. 7, Land for Wildlife Scheme. Department of Conservation and Land Management, Western Australia

Hussey, B.M.J. and Wallace, K.J. (1993). *Managing Your Bushland*. Department of Conservation and Land Management, Western Australia.

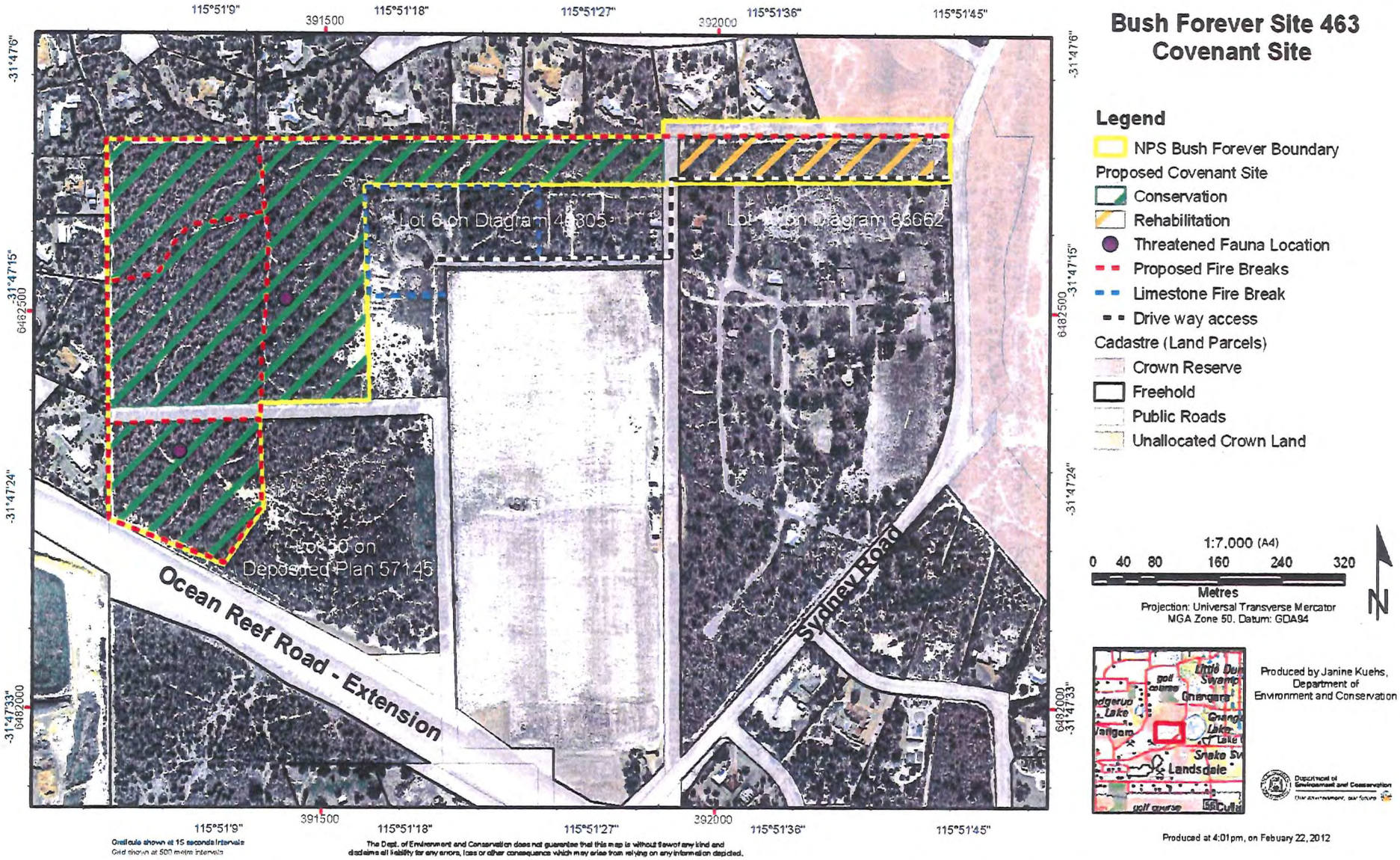
Review

(Guidelines are designed to be reviewed every three years, or earlier if circumstances change)

An evaluation of the monitoring results will provide information on the effectiveness of the management activities, and allow for the modification of those activities where appropriate to improve management. This process should include reviewing the:

- state of rehabilitation efforts within the Rehabilitation Zone;
- state of weed incursion into the bushland, including assessment of the response of weeds to current weed management techniques (alter management as necessary);
- state of feral animal (fox, feral cat, and rabbit) populations, determined by the decline in feral animal populations, the number of baits taken (if applicable), and the state of local wildlife by any changes in population noticed;
- disease status of the bushland and assessing whether any plant pathogens are present or have spread within the area, and review of any control methods as necessary;
- fire management strategy, and the effectiveness of smoke water and fire as a regeneration tool (if used);
- impact of human activities, (i.e. the management of the rubbish dump with respects to weed, rubbish and disease prevention), assessed as effects on surrounding vegetation;
- impacts of seed and propagation material collection; and
- impact of maintenance activities (use of vehicles on existing tracks for management purposes), assessed as effects on surrounding vegetation.

Covenant Site Location – Site Close up (scale 1:7,000)



Aerial photography courtesy of Landgate. Contact phone 9273 7373, website: http://www.landgate.wa.gov.au/corporate.nsf/web/contact+us#map

Agreement

These Management Guidelines are developed through a process of mutual consideration for achieving the goals in relation to the Land over the next three years or until the property changes ownership, and the Owner will undertake as far as is practicable the management activities identified within them.

The Department will provide the financial assistance and will arrange for the provision of such technical advice as deemed necessary for implementing these Management Guidelines, and can also assist the Owner should the land be subject to external threats. Please contact the Nature Conservation Covenant Program Coordinator on (08) 9334 0477 if assistance or advice is required.

Signed: ..... **Date:** 17.4.2012

Aboriginal Lands Trust Chairman

ABORIGINAL LANDS TRUST COMMON SEAL

Signed: ..... **Date:** 17.4.2012

Aboriginal Lands Trust Secretary

CONSERVATION AND LAND MANAGEMENT EXECUTIVE BODY COMMON SEAL

Signed: ..... **Date:** 30/4/12

Chief Executive Officer

Conservation and Land Management Executive Body

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APPENDIX 1

LAND FOR WILDLIFE

Wildlife Notes

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT Information Notes for the Land for Wildlife Scheme in Western Australia

No. 4 September 1997

Seed collection from native plants

Keywords:	seed, selection, picking, seed types, storage, wildflowers.
Location:	South-west WA
Authors:	Keith Bradby & Vicky Morris

Each picking situation presents its own challenges. Once you have learnt the basic principles, you then have to start using your own ingenuity. Be observant and adaptable, as virtually every plant will require some modification to the general technique of collection. A good guiding principle to seed collection is firstly to obtain the correct license for picking, and secondly to ensure that your actions will not harm the plant from which you are taking the seed, and that the seed you harvest will be usable for your purposes.

SEED SELECTION

You first need to identify the species of flora that you require seed from. This may be through literature or matching up soil types. You then must locate a suitable population of the plant species you are after. This will need to have sufficient seed for your purposes, and be in an area that you can legally pick from. Ideally, collection should be from a decent-sized area of bush if possible with no roadside collection.

The seed needs to be checked for ripeness and for the level of insect attack. For ripeness, cut a fruit capsule or pod open and check the seed for 'firmness', much as you would a grain crop. The level of insect attack will vary, but in many areas where there are few small birds, it is not unusual for most seed to be full of small grubs. This can make it impossible to collect large quantities of viable seed. It maybe worthwhile to note that the most accessible seed is not necessarily the best.

To preserve a broad genetic base in your future plantings, it is important that you get your seed from more than one plant, and pick from as many as possible. It is also important to bear in mind the end purpose of the seed. If it is to rehabilitate a salty area, pick your seed from those plants that are closest to the salt, as they may carry increased salt tolerance. If it is for a garden, some of the plants you are picking from may have a special feature such as a more attractive "weeping" habit than others, or unusual flower colours. Keep in mind that approximately

Hakea cristata
Snail hakea

80% of the resulting plants will take after the seed-bearing plant rather than the pollen-producing plant, especially if collecting from gardens.

If your purpose is to rehabilitate an area of local bushland, remember that in Western Australia the regional variation within plant species can be considerable, so it is important to pick your seed from similar habitat as close as possible to the area you are intending to replant.

EQUIPMENT

Depending on the nature of the plant you are collecting seed from and the type of collection method you intend to use, there are a few basic tools which will be necessary. A first-aid kit is a must with any activity in case of emergency (for example, some people are allergic to certain types of plants; some plants are very prickly and could cause injury). A container to transport the collected seed will be required, as well as some form of labeling the species collected and the date and area of collection (many species produce similar looking seed). Eye protection, a sieve, a pair of secateurs or pruning saw and perhaps a ladder may be useful when collecting seed-bearing stems. The best results are obtained when the equipment for collection is kept scrupulously clean and serviced, which also helps prevent spreading any infections from one seed source to another. Blunt and dirty secateurs will be more likely to cut you than the plant!

PICKING

Fruit types

The seed `container' in the bush has a variety of forms, ranging from large woody fruits (eg. *Hakeas, Banksias),* smaller 'nuts'(eg. *Eucalyptus,* sheoak), pods (eg. wattles), or tiny swollen ovaries (eg. *Calytrix)* at the base of shrivelled flower parts.

Successful seed picking generally tries to mimic the natural mechanisms used by the plant to release the seeds from their containers, with the seed ending up where we want it, not where the plant would otherwise spread it.

Based on how they release their seed, most plants fit into one of three main groups:

1. Fire openers - these store the seed for various periods (often several years), only releasing it after the plant is burnt in a bush fire, eg. *most Banksias, Xylomelum spp,* and some *Hakeas.*
2. Drying openers - these can hold the ripe seed for extended periods, but eventually the fruit dries out and the seed falls, eg. *Eucalyptus spp, Melaleuca* spp.
3. Once-a-season producers - these drop their seed (or sometimes throw it!) once the seed has ripened after flowering, eg. *Anigozanthus* (Kangaroo Paws), *Acacias, Kennedias.*

1. FIRE OPENERS

Winged Seed

Banksia attenuata
Slender Banksia

The most obvious of these is the *Banksias,* which have a woody cone with numerous follicles (the woody seed-containing `eyes') which, when cracked by heat, open to release two winged seeds and a central woody separator. The seeds are ripe about twelve months after flowering - look for fruits where the follicles are hard and brown.

The easiest way of collecting the seed from fire openers is to follow a fire, picking the fruits (cones) as soon as possible after the fire has passed. This method is not generally recommended for the average casual picker as hazards in the form of ash beds do occur! It is generally best to get the seed within 24 to 48 hours, depending on weather conditions. (It will drop faster in higher temperatures). Care should be taken, however, to ensure sufficient fruit are retained on the plants for regeneration after the fire. It is recommended that only 1 in 10 fruit are harvested after fire.

Banksia fruit can also be piled into a heap (1-2 bags per heap) and soaked with approximately 3-5 litres of mixed kerosene and sump oil and set alight to create the heat required to open the follicles. When alight the heap should be turned with a rake. It must be noted, however, that temperatures over 60 degrees Celsius are destructive to seed, so as soon as you notice the follicles start to open remove the cones from the heat.

The aim is to evenly subject each nut to intense flash heat. Have a hose handy to thoroughly wet the nuts after the follicles have cracked. And be careful, singed eyebrows regrow reasonably fast, but singed skin is painful and the scars can be permanent!

Whether collected burnt, or burnt after collection, only a certain amount of seed falls out straight away. The fruits generally require a period of successive wetting and drying before they drop all their seed.

As long as the weather is not too cold or wet (ie. for more than two days), the best method is to place the fruits outside on a well drained surface which will hold the seed. Most seed should be out within 3-4 weeks - the rest probably isn't worth bothering about. Possibly the best surface for drying on is shade cloth as it lets the moisture, dust, and ash, but not the seeds, through.

During wet periods the nuts could be spread in the warmest part of your shed, and shifted out into the rain for a day every few weeks.

It is also possible to remove seed in a microwave oven, but it is easy to `cook' and so kill them, therefore this method is not recommended.

Other bushes burnt to collect the seed include *Dryandras, Petrophiles and Isopogons.* Fruiting heads can be laid on the ground and given a thin spray of petrol. The leaves often provide much of the heat once they are started, and you need to wet them down before the fire affects the seed.

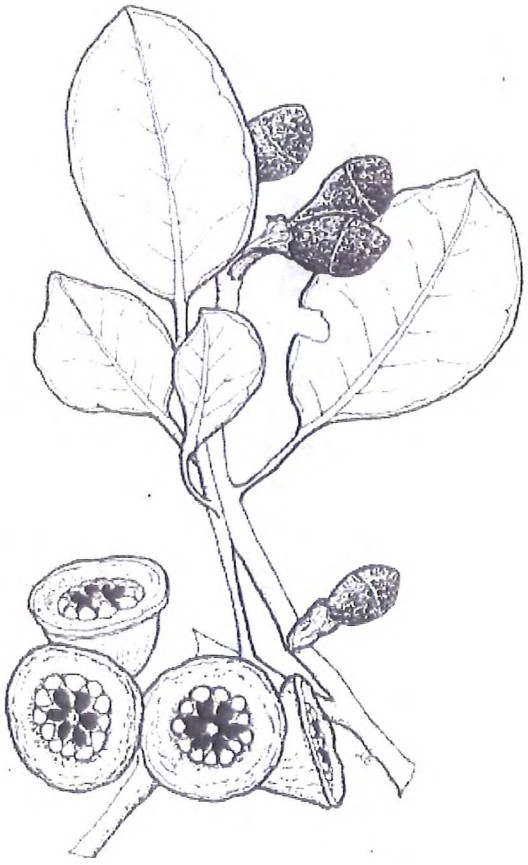
2. DRYING OPENERS

The main types of these are the smaller woody fruits that open from central valves to release a much finer seed, such as *Eucalyptus spp, Allocasuarina spp* and *Melaleuca* spp, and the woody fruits which split to release two seeds, such as *Hakeas*.

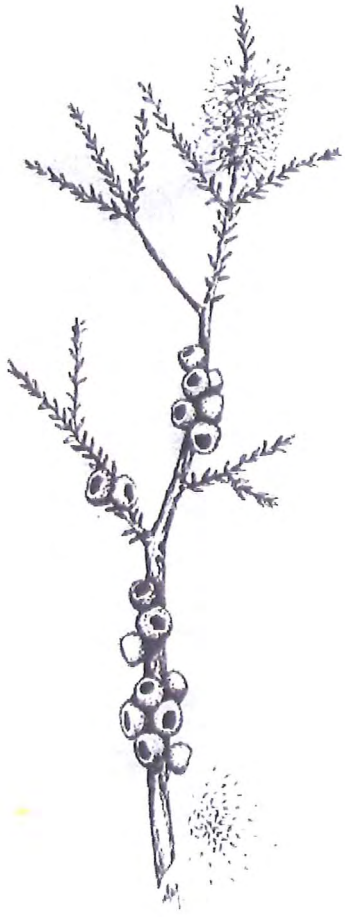
They generally ripen about 12 months after flowering, although some species can take 2 - 3 years to mature, such as *Callistemon phoeniceus,* which may contain several years' seeds along their stems. The fruit hardens, generally loses its green colour, and the valves, or join, becomes clearly defined. The seed can be checked for dryness and good colour by cutting through the "nut".

To release seed, place stems and branchlets holding ripe fruit on a tarpaulin in a warm dry place. If drying the fruit outside, the use of fine weed mesh is good insurance because if it rains, the moisture will drain away. The seed will drop within 3-4 days in summer, longer in cooler weather. Ensure that strong winds cannot blow away the released seed. Note that no heat treatment is required for this group, which also includes *Kunzeas, Grevilleas* and *Hardenbergias.*

Remember to leave at least two thirds of the fruits on each plant for natural regeneration.



Eucalyptus preissiana
Bell-fruited mallee



Melaleuca brevifolia
Dwarf salt honey-myrtle

3. ONCE-A-SEASON PRODUCERS

These are often the very hardest to collect seed from. Most of these plants makeup the spring profusion of flower and drop their seed between the middle of October and the middle or end of January. Although there are many, many different types of fruit and seed release mechanisms involved, which you can never completely work out, the basic principles are reasonably simple.

You generally have to try to assess when the seed will be ripe. This requires regular checks on the ripening progress. It's a skill you will only get better at with experience.

Generally cool weather means seed will ripen slowly, but beware of those few hot days toward the end of December and the New Year, particularly if it's also windy.

The seed can go from green, to pickable, to lying on the ground faster than you thought possible, and generally all the species you are trying to pick will choose the same hot spell to ripen.

Even under reasonable conditions, patches of a species will often ripen unevenly. On the same plant seed can be ripe, ripening and green. You have to make a judgment on the best time, but generally 'later' is better. Early ripened seed is often unviable. Green seed should be left on the bush for regeneration of the species inespective of the ripeness, some seed should be left on each plant that is harvested from.

Kennedia prostrata
Running postman

Gahnia trifida
Coast saw-edge or cutting grass

The main picking methods are:

Tarping

Many seeds and pods can be shaken off the bush when ripe. Spread tarps underneath, and either shake the bush or hit the pods with a stick or a piece of flexible pipe. A garden rake is often useful for combing the pods off. Depending on the species, tarping can generally only be done after the morning dew has dried off and, with the larger trees, before a breeze or a wind comes up. This is quite often difficult to do, as the wind often blows away the seed or the tarp! A few heavy rocks may help keep the tarp in place.

Binning

Smaller bushes can often be stripped by hand into large plastic rubbish bins.

Stem cutting

Often wattles and similar plants grow too close to the ground for tarping. In this case, stems holding ripe seed need to be cut and laid on a mesh, where the seed can be threshed off by walloping them with a pitchfork. Note that only seed bearing stem ends should be cut, and some leaves left on the plant below the cut to assist regrowth. No more than a total of 3 0% should be removed from any one plant. This ensures that sufficient stems with leaves remain on the plants to enable them to recover.

Some plants, such as *Kennedias,* ripen very unevenly. When some pods are ripe the stems can be cut and laid in a cool place (often under shade cloth) and many of the remainder will ripen by drawing on the moisture in the stems. Seeds that `pinch out' are unviable and can generally be winnowed out.

Stem cutting is often also the most effective way to collect small fruit. Occasionally, as with kangaroo paws, the seed pod is collected when it starts to open, but then `freezes' and won't open to release all the seed. The fruits need to be dried thoroughly, and then crushed to free the seed. This can be done by hand, by placing the pods on a concrete floor and walking over them, or by running them through a small thresher.

Desperate measures

If you got to your patch too late, then don't despair. With wattles and other plants with large hard seeds it is sometimes possible to sweep or shovel the seed off the ground, so that the dirt and leaf litter can be sieved out. Small battery-operated vacuum cleaners may prove useful for this task.

DRYING. CLEANING AND STORING

For much of the year drying can be done outside, and moisture from any rain or dew helps the fruit `work' the seed out. Any clean surface will do to dry your seed on. The most effective is the rolls of woven polythene weed mesh, which retains the finest seed, but lets any rain or moisture through (plastic bags are NOT appropriate).

The stems or pods should be spread reasonably thinly on the mesh or tarpaulins, and turned every few days. Extreme care should be taken to ensure that the mesh or tarp is secured down against strong winds, and that sand and dust will not be blown or walked onto tarps holding fine seeds. Some pods, such as *Kennedias,* need shade cloth or fly wire over them to stop the seed `pinging' everywhere as the pods explode open.

Even when it is on your tarp there can be a bit of competition for the seed. Ants are often very appreciative of your effort in bringing so much seed to a convenient point for them, and you may need to shift the seed, or spread an ant deterrent, or spray a surface insecticide around the tarp. Occasionally some birds will browse over your pods, but these are rarely a cause for concern, unless it is a mallee fowl on a tarp of its favourite wattle.

Once the stems or pods have been removed, the remaining material can be hand sieved, which generally requires a number of different sized sieves. Light material can generally be winnowed out *(a la* peasant grain cleaning techniques). With a number of species, such as *Banksias* and *Dryandras,* the seed will sink if placed in water, and much of the other material can be skimmed from the top of the water.

If the seed is for a local revegetation project using the direct seeding method it does not need to be very clean, unless you want to know the weight to use per hectare. However, be warned that seed mixed with other material soon becomes bug infested. Producing a perfectly clean seed sample can be quite laborious, and is only really necessary if you want to sell the seed, or store it for an extended period.

Before storing seed, even if only for a short period, make sure that it is perfectly dry. If possible, spread a thin layer over a tarp or metal tray and leave in a warm position for a day or two.

Clean seed will keep for varying lengths of time if stored properly and regularly checked. Many species will last quite a few seasons, however some species *of Grevillea* will not. Store seed in a rodent-proof, dry, almost airtight container in a cool, dark and dry place (even your fridge). A small piece of Shelltox pest strip, renewed every six months or so, will kill any bugs that may appear.

If you are selling seed (for which you will need a license) it needs to be perfectly clean. Some seeds clean relatively easily, others need machine cleaning or even picking through by hand. If selling to a seed firm, discuss this with them, as they can probably arrange the final cleaning for you.

Cleaning up

Using the simple approaches outlined in this leaflet, it is possible to collect quite large quantities of seed. In doing so, you will also collect a much greater amount of stems or pods. Even after you have taken most of the seed away, these will still contain seed, and can be quite useful for regeneration.

If tarping on site, the residue should always be spread thinly over the site, so that it does not become a fire hazard. Wherever possible, the residue (and your screenings) should be spread over the area you are regenerating, as it will provide useful ground cover, and organic matter, as well as adding some extra seed.

RULES AND REGULATIONS

by Sarah McEvoy

The laws governing flora conservation are contained in the Wildlife Conservation Act and its regulations, which are administered by the Department of Conservation and Land Management.

Flora native to Western Australia is protected under this Act, which means that regulations exist regarding the harvest of that flora. Certain flora that is considered to be threatened with extinction is declared as rare flora under the Act, and such flora is given special protection, and may not be harvested without the permission of the Minister for the Environment, on any lands.

Protected flora other than declared rare flora may be harvested for seed as specified below. On Crown land seed can only be taken where the person taking the seed holds a license issued by CALM. There are two types of Crown land licenses which may apply to people wishing to harvest seed. A Commercial Purposes license is required if the flora is to be taken for a commercial purpose (which would include minesite rehabilitation, or any circumstance where the seed picker obtains any gain, either direct or indirect, from disposing of the seed). The fee for this license is $100.00 per annum.

Where the harvesting of seed is for non-commercial propagation, such as local rehabilitation by a community group, a Scientific or Other Prescribed Purposes license can be obtained. The fee for this license is $10.00 per annum.

Allocasuarina fraseriana
Common sheoak

Even when a license is held, all pickers must obtain the permission of the land manager before picking in any vested Crown land (eg, State Forest, Water Reserves, etc). Both the Commercial Purposes license and the Scientific or Other Prescribed Purposes license generally preclude the taking of flora from the conservation estate - ie, National Parks and Nature Reserves.

On private land, protected flora can only be taken by the owner or occupier of the land, or by a person who has the owner or occupier's consent to take the flora. If the flora is to be sold, the owner or occupier must hold a Commercial Producer's or Nurseryman's license. The fee for this license is $25.00.

Further specific conditions are attached to each license and are designed to ensure that sustainable harvesting occurs. For further information about licensing contact CALM's Wildlife Branch on (08) 9334 0455.

About the Authors

Keith Bradby and Vicki Morris have collected seed commercially and for use in revegetation projects for many years.

Sarah McEvoy is a consultant ecologist, who formerly worked for CALM as Flora Industry Botanist.

Diagrams by
Anne Miles from What Seed is That, Greening Australia (South Australia)
Louise Burch from Banksias of the Wellstead District and Eucalypts of the Wellstead District, Wellstead Land Conservation District Committee. Margaret Pieroni and Sue Patrick from 'Leaf and Branch', Trees and Tall Shrubs of Perth, CALM. Used with permission.

Published by the Department of Conservation and Land Management, Perth.
All correspondence should be addressed to: The Editor 'Wildlife Notes', CALM Wildlife Branch, Locked Bag 104, Bentley Delivery Centre, WA 6983. Phone: (08) 9334 0530, Fax (08) 9334 0278

APPENDIX 2

Fire Management Plan (FirePlan WA)

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APPENDIX 3

Bush forever Management Plan

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Appendix 2

Dieback assessment results

Glevan Consulting
50 Chatsworth Drive, Erskine. 6210
(08) 9582-7772
Fax (08) 9582-9884

Your ref:
Our ref: 12010
Enquiries: SR
Phone 0427 113 336
Fax: 95 829884
Email: simon.robinson@glevan.com.au

Julia Morgan
Stratagen

Dear Julia

Phytophthora cinnamomi occurrence assessment of the Gnangara Conservation Covenant.

Qualified interpreter Simon Robinson from Glevan Consulting completed a *Phytophthora cinnamomi* occurrence assessment of the area known as the Gnangara Conservation Covenant on March 26th 2012. The study area is located at the junction of Ocean Reef Rd and Sydney Rd Gnangara, and comprises open *Banksia attenuata* and *B. menziesii* woodland. The information and recommendations provided in this assessment are valid for 12 months and will expire in March 2013.

The method employed to conduct the assessment was to traverse the study area on foot and record any suspicious sites for further assessment and sampling. The assessment focused on the sites identified by Stratagen as potential top soil donor sites, and the area suspected of containing dieback. While there are water-gaining sites immediately adjacent to both of the potential top soil donor sites, it was observed that neither of these water gaining areas actually extend into nominated areas, leaving the access tracks as the most likely source of any possible infestation.

Several sites exhibiting signs of recent vegetation decline were observed throughout the study area, particularly the area identified as potentially infested. The majority of deceased plants observed were *Banksia attenuata, B. menziesii, Lomandra sonderi* and *Patersonia occidentalis* specimens. The deaths are not thought to be related to *P. cinnamomi* however, as the pattern typically associated with *P.*

cinnamomi infestation was not present. The deaths were largely random (not associated with an obvious vector), scattered, and many appeared staged. In addition, there was limited chronology amongst the deceased plants and generally no significant biomass reduction. Drought is thought to be the most likely cause of the recent vegetation decline observed, and most of the biomass reduction observed can be attributed to disturbance factors.

As a result of these observations, both of the potential top soil donor sites are believed to be uninfested. The area identified as potentially containing dieback is also believed to be uninfested, and samples have been taken within all of the sites to further support this assertion.

A total of 6 sites were targeted for sampling during the assessment to confirm that the decline observed is not related to *P .cinnamomi*:

Sample No.	Species	Easting	Northing	Pattern	Other Possible causes of Death	Result
1	*Banksia menziesii*	391270	6481954	No	Drought	Negative
2	*Banksia grandis*	391277	6482397	Slight	Drought	Negative
3	*Xanthorrhoea gracilis*	391296	6482536	Slight	Drought	Negative
4	*Pattersonia occidentalis*	391325	6482625	Slight	Drought	Negative
5	*Banksia attenuata*	391477	6482334	Slight	Drought	Negative
6	*Banksia attenuata*	391960	6482717	Slight	Drought	Negative

Thank you for your interest in *Phytophthora* management.

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