Banksia Woodland Restoration Project

Annual Report 1

July 2012

Department of Environment and Conservation
Our environment, our future

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Department of Environment and Conservation
Swan Region

Report for the Department of Environment and Conservation

Government of Western Australia

Department of Environment and Conservation

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Abbreviations

- DEC – The West Australian Department of Environment and Conservation
- SEWPAC - the Australian Department of Sustainability, Environment, Water, Population and Communities.
- JAH – Jandakot Airport Holdings Pty Ltd
- JA – Jandakot Airport
- BWC Banksia Woodland Restoration Project (this project)
- CBC - Carnaby's black cockatoos *(Calyptorhyncus latirostris)*
- TEC – Threatened Ecological Community
- Rehabilitation –repairing existing native vegetation
- Restoration – establishing new native vegetation where absent

Executive summary

The Jandakot Airport Offset Plan (2010) was developed by Jandakot Airport Holdings Pty Ltd (JAH) as an offset for land clearing of up to 167 ha native vegetation at Jandakot Airport in Western Australia. The conditions of the approval need to be fulfilled to the satisfaction of the Department of Sustainability, Environment, Water, Population and Communities and require JAH to provide the West Australian Department of Environment and Conservation (DEC) with $ 9,200,000. The role of DEC is to use the funds for rehabilitation and conservation activities for banksia woodland within 45 km of the airport. This project has the objective of increasing the area and condition of banksia woodlands, with similar biodiversity values to the Jandakot Airport bushlands, especially feeding habitat for Carnaby's Black Cockatoos (CBCs) and habitat for the rare Grand Spider Orchid (*Caladenia huegelii*). The main objectives of DEC's Banksia Woodland Restoration (BRW) project are:

1. Restore and rehabilitate banksia woodland within the conservation estate.
2. Select areas for management using a ranking process based on environmental values, especially concerning habitats for CBC and *Caladenia huegelii*.
3. Use scientific approaches to maximise cost effectiveness of ecosystem management.
4. Evaluate relative cost effectiveness of different methods for rehabilitation by monitoring of outcomes.
5. Maximise the area of banksia woodland substantially improved by efficient resource allocation.
6. Develop completion and success criteria for restoration and monitoring protocols for banksia woodland condition and biodiversity.
7. Support community groups who manage banksia woodlands.
8. Collate and share information on banksia woodland diversity and condition.

The Banksia Woodland Restoration project has initiated large-scale natural habitat restoration work on the Swan Coastal Plain in the Perth Metropolitan Region conservation estate to meet these objectives. These actions focus on banksia woodland habitats, giving highest priority to plant community types most similar to those at Jandakot Airport. Works undertaken or underway for the BWR project in 2011/12 include site ranking and selection and the following management actions:

1. Establishment of new banksia woodland in open areas by using topsoil from Jandakot Airport (18 ha), direct seeding (3 ha) and planting of seedlings (4 ha).
2. Banksia woodland rehabilitation to protect and substantially increase areas in good condition by:
    a. Weed management to control the most serious environmental weeds.
    b. Fencing to reduce illegal access causing disturbance, rubbish dumping and weed and dieback spread.
    c. Seed collecting to allow restoration with local provenance native plants.
3. Initiation of a banksia woodland condition monitoring program.
4. Providing support for community groups or local government to do any of the above.

1. Introduction

The Jandakot Airport Offset Plan (2010) was developed by Jandakot Airport Holdings Pty Ltd (JAH) as an offset for land clearing of up to 167 ha native vegetation at Jandakot Airport in Western Australia. The approval for the expansion of Jandakot Airport is subject to a number of conditions, specified in the EPBC 2009/4796 approval document (Government of Australia 2010). The conditions of the approval need to be fulfilled to the satisfaction of the Department of Sustainability, Environment, Water, Population and Communities (SEWPAC). Only Condition 4b is relevant to this project, but the Offset Plan also provides funding for acquisition and protection of at least 1600 ha of Carnaby's Black Cockatoo feeding habitat (Condition 4c), funding for Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) recovery actions of at least $150,000 per year over 5 years (Condition 4e) and $700,000 over 5 years for *Caladenia huegelii* research by the Botanic Gardens and Parks Authority (Condition 6e). Condition 4b refers specifically to the payment of $9,200,000 to DEC for the rehabilitation and conservation of banksia woodland within 45 km of Jandakot Airport. A memorandum of understanding between JAH and the DEC, signed in 2011, sets out the manner in which JAH and DEC will work together to satisfy condition 4b. In 2011 DEC initiated the Banksia Woodland Restoration (BWR) project to undertake these tasks.

A large proportion of the banksia woodland has been cleared on the Swan Coastal Ibra region and all of this is recognised as potential Carnaby's Black Cockatoo (CBC) feeding habitat. The BWR project has the overall objective of increasing the area and condition of banksia woodlands, with similar biodiversity values to the Jandakot Airport bushlands, to help mitigate the most significant impacts from clearing of native vegetation at Jandakot Airport. These impacts included the loss of CBC feeding habitat and some habitat for the endangered orchid (*Caladenia huegelii*). In the case of CBC feeding habitat, it is possible to estimate food reserves in an area by measuring the abundance of plants with canopy stored seed eaten by these birds, as explained below. The BWR project has the following principal objectives.

1. Restore and rehabilitate banksia woodland within the conservation estate.
2. Select areas for management using a ranking process based on environmental values, especially concerning habitats for CBC and *Caladenia huegelii*.
3. Use scientific approaches to maximise cost effectiveness of selected restoration techniques.
4. Evaluate relative cost effectiveness of different methods for rehabilitation and monitoring of outcomes.
5. Maximise the area of banksia woodland substantially improved by efficient resource allocation.
6. Develop completion and success criteria for restoration and monitoring protocols for banksia woodland condition and biodiversity.
7. Support community groups who manage banksia woodlands.
8. Collate and share information on banksia woodland diversity and condition.

DEC was notified by JAH in September 2011 that they planned to clear Precinct 5 (Figure 1) in early 2012, an area of 42 ha that included about 30 ha of excellent condition banksia woodland, This was a year ahead of the original schedule in the offset plan. This provided the only opportunity to use topsoil transfer to restore banksia woodland to previously cleared sites elsewhere, since topsoil in the remaining two areas on Jandakot Airport scheduled to be cleared, is of inferior quality. Consequently, DEC was required to rapidly develop a soil transfer tender and select recipient sites that totalled approximately 18 ha.

The Banksia Woodland Restoration project has also initiated large scale natural habitat restoration work in conservation estate to meet the objectives listed above. These other actions will primarily occur in banksia

woodland habitats in the Perth Metropolitan Area (PMR), giving highest priority to plant communities similar to those at Jandakot Airport. The process of site selection, topsoil transfer and restoration of these new habitat areas is summarised briefly below. Potential management actions include:

1. Establishment of new banksia woodland in open areas using topsoil from Jandakot Airport, seed and seedlings.
2. Banksia woodland rehabilitation to protect and substantially increase areas in good condition through:
    a. Weed management to control the most serious environmental weeds,
    b. Fencing to reduce illegal access causing disturbance, rubbish dumping and weed and dieback spread and/or,
    c. Infill planting of local provenance native plants where existing cover or diversity is low,
3. Banksia woodland condition monitoring as explained in Section 7 below, or
4. Providing support for community groups or local government to do any of the above.

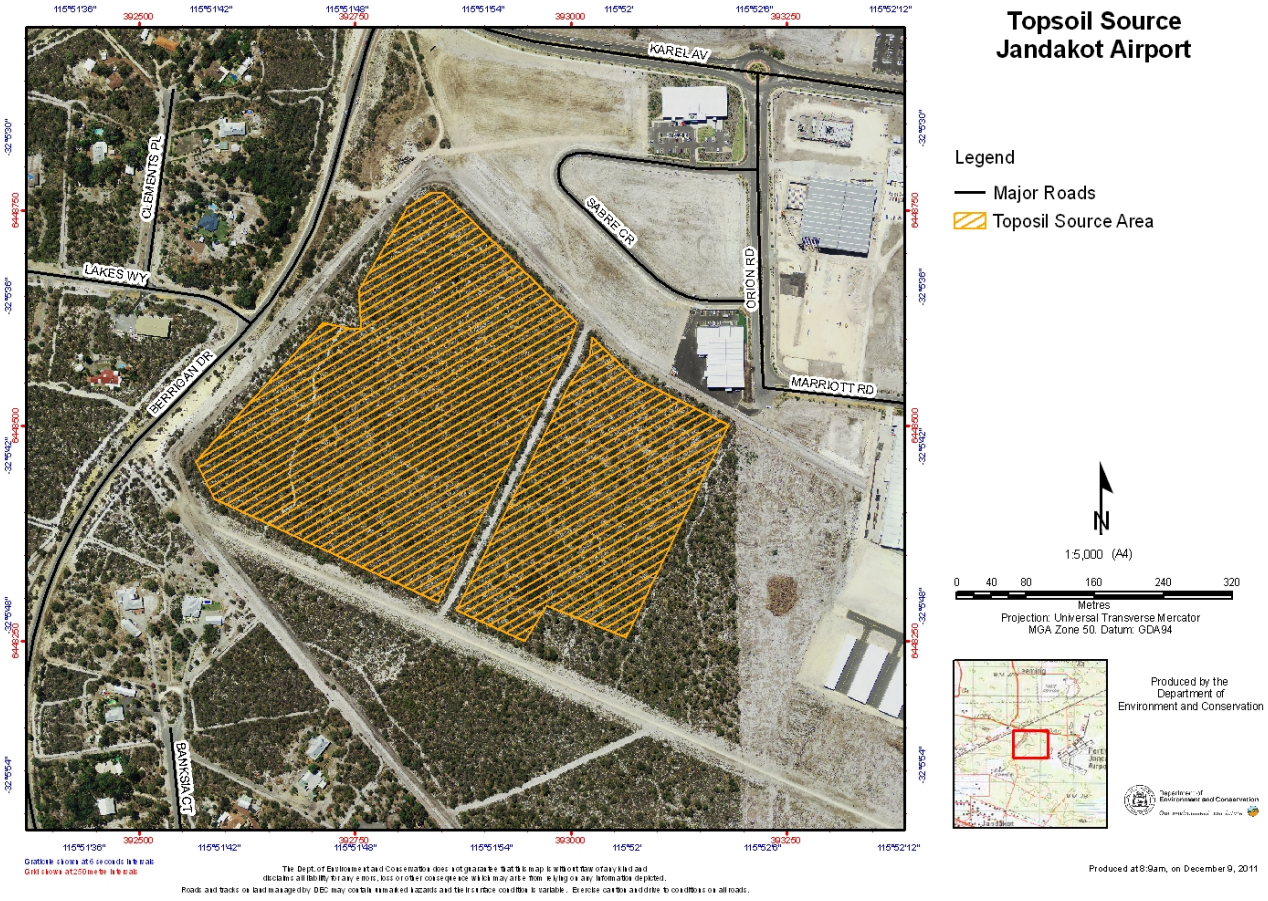

Figure 1. Map of Jandakot Airport Precinct 5 showing topsoil harvest area (18 ha). Adjacent areas of banksia woodland were cleared before the start of this project.

2. Site Prioritisation

Condition 4b stated all activities should occur within 45 km of Jandakot Airport. DEC has interpreted this geographic constraint as referring primarily to transport of topsoil and seeds to keep plants within their local provenance area. Table 1 lists the main criteria used to rank sites for BWR restoration actions. There were two separate site ranking processes, the first for topsoil transfer only, that included distance from Jandakot Airport as a primary consideration due to transportation costs. The second prioritisation process was for other habitat management actions, such as weed control, where distance was of lesser importance, but sites were still ranked based on their similarity to habitats lost at JA and their environmental significance. Following site ranking, highly ranked sites were assessed for the urgency, suitability and scale of required restoration actions, as explained in Section 7. Other constraints impacting on the site selection process were:

- Site management required partnerships with community groups, DEC staff and local governments.
- Partnerships were required to gain access to suitable areas for topsoil transfer due to existing offset projects in the same areas, for example, the Forrestdale Lake offset funded by Western Power.

Table 1. Brief summary of criteria used to rank sites for management.

Criteria	Importance
1. Carnaby's Black Cockatoos (CBC) feeding habitat (DEC GIS dataset)	high
2. Bush Forever Site	high
3. Within 45 km of Jandakot Airport (JA) on Swan Coastal Plain	high
4. Site with secure tenure	high
5. CBC breeding site proximity	high
6. CBC night roost proximity	high
7. Site containing *Caladenia huegelii*	high
8. Banksia woodland floristically similar to JA (i.e. Bassendean Dunes)	high
9. Proximity to JA	medium
10. Total area of remnant vegetation (DEC GIS dataset 2009)	high
11. DRF or Priority flora: WA State listings	medium
12. TEC or PEC: WA State listings	medium
13. Rare or priority fauna: WA State listings	medium

3. Reference Site Data and Completion Criteria

Floristic data was gathered from Precinct 5 at Jandakot Airport prior to clearing of native vegetation, providing representative, baseline plant diversity data for monitoring restoration success. Data on the relative abundance, frequency and cover of plant species were used as completion criteria for restoration areas where topsoil was used (Figure 2). This reference site data was used to develop quantitative target lists for seed collecting and nursery orders. Plants were also assigned to ecological categories, especially concerning their potential for propagation from seed or topsoil. The loss of CBC feeding habitat was estimated by measuring the abundance of plants that provide seeds for these birds and seed yields for canopy stored seed for these plant species. The floristic data from the reference was used to develop completion criteria by assigning minimum and maximum density and cover targets for all common species and a diversity target of a minimum of 60 per cent of species returned, with the majority of common species present.

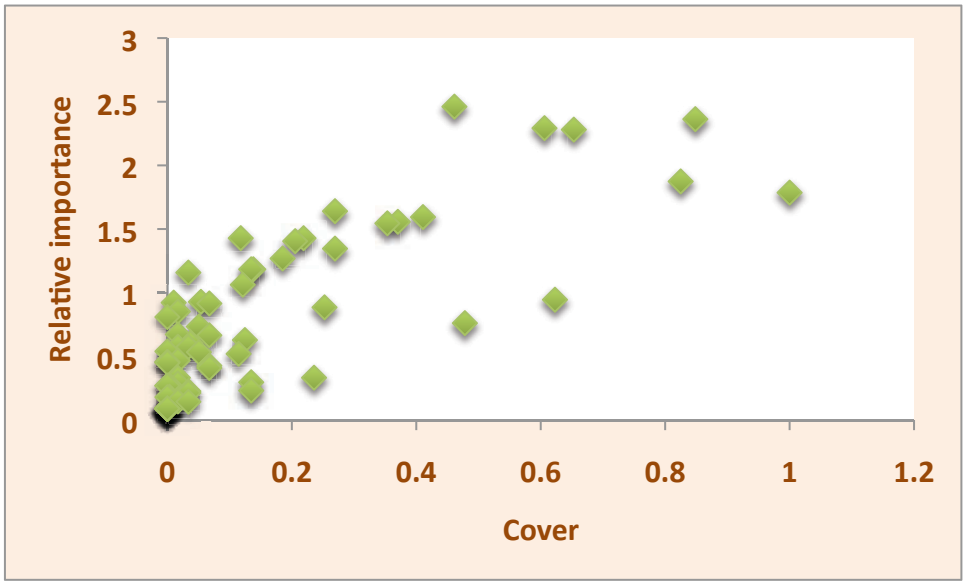

Figure 2. The relative cover and importance of species in Jandakot Airport Precinct 5 (the topsoil harvesting area). This graph shows that species diversity is dominated by many small or uncommon species while cover is dominated by a few species of trees and large shrubs.

4. Topsoil Transfer to Restore Banksia Woodlands

For this project, two major sites were chosen after ranking all available locations according to the selection criteria listed in Table 2. Both sites were open paddocks with only a few scattered native plants (Figure 3AB). Consequently, a thin layer of existing topsoil was scraped off before application of the banksia woodland topsoil to reduce weed seed levels (Table 2). Some exotic trees were also removed from Forrestdale Lake to free up additional space for restoration. The two topsoil recipient sites were purchased by the WA Department of Planning and Infrastructure for inclusion within nature reserves.

Methods for managing the restoration of banksia woodlands at the topsoil recipient sites are illustrated in Figure 3 below. Topsoil was also used to help restore small areas in Ken Hurst Park, a banksia woodland site with a large *Caladenia huegelii* population adjacent to Jandakot Airport. Direct seeding and planting of nursery-grown seedlings was started at the topsoil recipient sites in 2012 and will continue for at least two more years (Figures 3EF and 5). These areas will also be subject to weed management and monitoring to assess plant diversity relative to the completion criteria targets for plant density and diversity for the duration of this project.

Table 2. Locations selected for restoration of banksia woodland using topsoil from Jandakot Airport.

Topsoil Transfer Site	ha	Tenure	km to JA	Preparation
Forrestdale Lake	6	Acquired land for DEC Nature Reserve	25	Weed spraying, some exotic trees felled, weedy surface topsoil layer removed
Anketell Rd, Jandakot Regional Park	12	Acquired land for DEC Regional Park	25	Weed spraying and weedy surface topsoil layer removed
Ken Hurst Park	< 1	City of Melville Nature Reserve	1	Small areas of topsoil spread in disturbed areas after ripping

Figure 3A. The topsoil recipient site at Jandakot Regional Park had 12 ha of weeds with some scattered natives.

B. Forrestdale Lake topsoil recipient sites totalled six ha in area and were dominated by grassy weeds and exotic trees.

C. Topsoil harvesting at Jandakot Airport in April 2012. A thin 5 cm layer was harvested to maximise seed quantities, as most seed is near the surface.

D. Topsoil spreading at Jandakot Regional Park in April 2012. Soil was spread to a uniform depth of either 5 cm or 10 cm.

E. Volunteers from BirdLife Australia and DEC staff planting banksia trees and shrubs at Forrestdale Lake in July 2012.

F. BirdLife Australia volunteers planting banksia woodland species in Jandakot Regional Park in July 2012.

5. Seed Management and Storage

Banksia woodland restoration is complex due to the difficulty in predicting species recruitment from topsoil before filling major gaps by supplemental plantings using direct seeding or nursery grown tubestock. The most difficult problem is obtaining and growing plants from seed, as about 1/3 of banksia woodland species set seed poorly or are difficult to germinate from seed. Seed availability is also a major limitation and seed collecting is a major expense. The DEC Swan Coastal Plain seed collections currently contain large amounts of seed from Jandakot Airport and smaller quantities of seed from other areas. BWR seed collections now include over 250 seed batches, with 50 large batches of tree seed (some over 1 kg). Most collections of seed in 2011/2012 were obtained from Jandakot Airport Precinct 5 prior to clearing of vegetation. Additional seed collection from a wider range of habitats is being planned to replace stocks used in 2012 and provide seed needed for rehabilitation projects in the future.

Seed processing and seed testing was required for species with poor quality seed to identify seed batches that can be sent to the nursery and recalcitrant seed that must be treated and pre-germinated in the laboratory before growth in the nursery (Figures 4 & 5). Banksia seed was the most expensive to collect, due to the brief window of opportunity (in early summer) and unusually low seed set due to the 2009/2010 and 2010/2011 summer droughts. Banksia seed availability data was also collected for use in CBC ecological studies being carried out by DEC.

Figure 4. Examples of seed germination on agar plates to test viability, or overcome dormancy problems. These are seeds of *Eremaea pauciflora* (left) - a species with very few viable seeds in most batches; *Conostylis aculeata* (middle) – a species with seed dormancy problems and *Banksia attenuata* (right) - seed tested to confirm survival after long-term storage.

6. Nursery Production of Seedlings and Direct Seeding

Seedlings raised in the nursery are required to supplement plant recruitment from direct seeding and topsoil transfer. In the first year (2011), nursery orders primarily consisted of trees and shrubs with canopy stored seed that were unlikely to regenerate from topsoil alone. These include banksia seedlings required to restore the canopy to rehabilitated areas (Figure 5A). In addition to seedlings, for species where seedlings could not be grown, some plants were propagated from cuttings (Figure 5B). Nursery orders in subsequent years will be based on monitoring data from the rehabilitation sites and will target species that require infill plantings to reach completion criteria targets.

Seed lists were also made for direct seeding, with separate seed mixes for upland and lowland areas. The majority of direct seeding in 2012 occurred on the transferred topsoil in upland areas suitable for banksia woodland re-establishment (Figure 5C).

Figure 5A. Banksia seedlings raised from seed collected primarily at Jandakot Airport. Several seed batches performed badly in the nursery, but most germinated very well. These seedlings were sown in November 2011 and planted in July 2012.

B. Some plants are propagated from vegetative divisions when seed is not available, or cannot be germinated. The illustrated plants were propagated at the Nuts About Natives nursery from material harvested from Jandakot Airport Precinct 5 for this project.

C. Direct seeding trial at Forrestdale Lake by Greening Australia (WA) for the Banksia Woodland Restoration Project. Seed of species unlikely to be present in the topsoil was applied including seed of banksias and other Carnaby's Black Cockatoo food plants.

7. Protection of Areas by Weed Management and Fencing

The highest priority banksia woodland areas on the Swan Coastal Plain for weed control and other management actions are listed in Table 3. These areas were prioritised by site visits and weed mapping. The areas selected for weed management include over 500 ha (Table 3) and the budget for this work is over $ 1,000,000. It will be necessary to revisit and respray areas in subsequent years to ensure weeds do not regain dominance from surviving individuals and the soil seed bank. Large areas have also been identified where fencing and gates are required to control illegal access and rubbish dumping. This will substantially reduce the spread of weeds and dieback disease by off-road vehicles in nature reserves. Reference plots, weed maps and photo reference points will be used to measure benefits of weed management to banksia woodland flora and fauna.

Figure 6. Large areas in the DEC estate require weed management. In this case, at Leda Nature Reserve, the understorey is dominated by veldt grass (*Ehrharta calycina*).

Permanent reference plots will also be used to monitor banksia woodland health and to help calibrate satellite data on vegetation condition. Areas to be monitored will include major habitat areas for the endangered Grand Spider Orchid and large CBC feeding areas. Areas where many drought-related tree deaths have occurred may be selected for tree seedling planting if natural replacement has not occurred (Figure 7).

Figure 7.
Banksia canopy loss at Ken Hurst Park, possibly due to groundwater problems during highway construction in 2005-6. Carnaby's Black Cockatoos are flying in the background.

Table 3. List of potential banksia woodland sites for weed control, fencing and other management actions.

Site	Rank[1]	Site Area	Weed Control Area[2]	Fence km	Threats and management targets
Anketell Rd (Jandakot Regional Park)	1	520	12	6	Weeds in restoration areas
Wandi Nature Reserve	1	31	20		Veldt, freesia, pigface to protect DRF
Wandi/Anketell (Jandakot Regional Park)	1	520	50		Arum lily, cotton bush, dieback
Melaleuca Park	3	4,055	10	15	*Euphorbia terracina* control, stop illegal access along Neaves Rd
Lowlands Private Property	5	1030	50		Arum lily, etc.
Brixton St Damplands (greater)	7	130	10	TBA	Ongoing eradication of bulbs, etc. in TEC, fences and gates
Dennis de Young Nature Reserve (Jandakot Regional Park)	9	306	20		Various weeds (City of Cockburn)
Forrestdale Lake	4	620	10	4	Weeds in restoration areas
Forrestdale Lake Nature Reserve	4	620	20		Arum lily, bridal creeper, veldt grass, etc. (friends group)
Modong Nature Reserve (Jandakot Regional Park)	12	290	TBA		Sydney golden wattle
Anstey/Keane Dampland (Jandakot Regional Park)	15	310	50		Veldt grass, etc.
Acourt Rd (Jandakot Regional Park)	19	285	TBA		Veldt grass, pampas grass, unauthorised access
Banjup Bushland (Jandakot Regional Park)	22	131	30		Grassy weeds, Sydney golden wattle, restore habitat
Cardup Nature Reserve	23	86	10		Woody weeds in TEC, restoration
Watkins Rd Nature Reserve	25	76	TBA		Various weeds, revegetation
Lake Cooloongup Nature Reserve	29	1,716	20		Pampas grass, fig, giant reed
Paganoni Nature Reserve	33	700	20		Various weeds, dieback (Urban Nature site)
Neerabup National Park	36	1,094	0	TBA	Fencing and gates
Fraser Rd Bushland	37	123	30	TBA	Tree canopy loss & veldt grass primarily in DRF habitat
Leda Nature Reserve	42	932	100		Veldt grass and African love grass in best areas
Harrisdale Swamp (Jandakot Regional Park)	43	100	12		Veldt grass, pampas grass, Sydney golden wattle
Mt Brown & Brownman Swamp (Beeliar Regional Park)	45	530	TBA		Weeds, restoration?
Hawkevale Reserve	47	10	10	TBA	Grassy weeds post fire in 2010
The Spectacles Regional Park	79	386	50		Veldt grass, arum lily
Lambkin Rd (Byford)	95	15	2		African love grass, watsonia, etc.
Johnson Rd, Kwinana Reserve	NA	10	2	>1	Weed control and fencing to protect rare flora (*Diuris micrantha*)
Piara Nature Reserve (Jandakot Regional Park)	63	36	15		Arum lily, pampas grass, woody weeds
Total		13,000	~500	TBA	

Notes: 1. Rank from desktop assessment. See Table 2 for ranking criteria, 2. Preliminary estimates only.

8. Managing Rare Flora

The main focus is on habitats for the Grand Spider Orchid (*Caladenia huegelii*) and other rare orchids that occur in banksia woodlands. Several sites have been identified where weed management and tree canopy replacement is needed to maintain suitable habitats for *C. huegelii* (Figure 8). The project works closely with community groups to monitor rare orchids and fund restoration works (e.g. Friends of Ken Hurst Park, Friends of Forrestdale Lake, Wandi Landcare Group, The City of Melville and The City of Cockburn). Despite the focus on banksia woodlands, there has been some contribution to management of other habitats where threatened flora and plant communities occur.

With regards to *Caladenia huegelii*, weed spraying is planned from 2012 onwards to protect important habitat areas for this endangered orchid at Wandi Nature Reserve and the Fraser Avenue Bush Forever site adjacent to Jandakot Airport. Rare flora surveys, with the assistance of volunteers from the West Australian Native Orchid Study and Conservation Group, are planned in these areas for this spring.

Figure 8. Grand Spider Orchid

- *Caladenia huegelii*
- Rare flora (nationally and state listed)
- According to the Interim Recovery Plan, ~25 populations are extinct
- Of 33 remaining populations, only ½ are healthy and only 7 are substantial (>20 plants)
- Recent surveys recorded 1,614 plants, but some are from severely impacted habitats
- Sites with *C. huegelii* selected for restoration works in this project:
    a. Fraser Avenue
    b. Ken Hurst Park
    c. Dennis De Young
    d. Wandi Nature Reserve
- Reference: DEC Recovery Plan (http://www.environment.gov.au/biodiversity/threatened/publications/recovery/caladenia-huegelii.html)

9. Monitoring protocols for banksia woodland diversity and condition

Several projects to monitor tree canopy condition, weed management benefits and fauna recovery in restoration sites are currently being planned. A number of features will be selected as indicators of ecological condition (e.g. the relative cover of weeds and native plants, DEC Rapid Bushland Assessment techniques, the BirdLife Australia Atlas 20-minutes bird surveys method, DEC fauna monitoring protocols, etc). The intention is that these sites (including topsoil recipient sites) will be monitored at regular intervals to document benefits from restoration works. Several reference sites were also chosen to provide baseline diversity data for restoration areas as explained in Section 3.

Table 4. Jandakot Offsets Project Outcomes to July 2012.

Task	Objectives	Completed
I. Administration		
1. Filling Positions	Fill Senior Ecologist, Conservation Officer, Operations Officer, Survey Botanist roles	Four positions filled 2011, 2012 and existing staff allocated tasks
2. Project Management	Hold regular planning meetings to allocate budget and staff to tasks and roles	Meetings held ever 2-4 weeks 2011-2012
3. Meeting with advisory committee	Hold meetings to present outcomes and discuss objectives with scientific experts	Two meetings held in 2011 and 2012
II. Operations		
4. Selection of restoration sites	Choose best site(s) for topsoil based banksia woodland restoration	Two sites selected in 2011 following comprehensive ranking process
5. Topsoil transfer process	Undertake urgent transfer of 18 ha of topsoil from Jandakot Airport Precinct 5	Advertised Jan 2012, soil transfer concluded May 2012
6. Baseline data collection at JA	Collect data for restoration site diversity targets and Carnaby's Cockatoo food	Data obtained for completion criteria, nursery orders and seed collection
7. Baseline vegetation data collection and monitoring	Measure weed and native cover data at restoration sites before topsoil transfer	Completed, but monitoring plant diversity and cover will be ongoing
8. Restoration site preparation	Tree removal, weed spraying, fencing etc. (20 ha restoration area)	Weed control completed early 2012, grazing protection fencing underway
9. Experimental design and setup at restoration sites	Use targeted research to optimize restoration of banksia woodland from topsoil seed banks and direct seeding	Research underway (BRW funded PhD project with Neal Enright and Joe Fontaine at Murdoch University)
10. Seed collecting, seed management and germination trials	Obtain seeds required for nursery orders and direct seeding and optimise germination by seed quality investigation	Seeds for 2011 planting obtained and requirements for 2013 investigated. Seed quality data obtained.
11. Nursery seedlings and cuttings	Produce sufficient tubestock of banksia woodland plants to meet completion criteria for restoration sites	Approx. 5000 seedlings grown and planted in 2012, cuttings started for 2013 planting
12. Direct seeding and planting native plants	Undertake seeding initial trails in 2012 (Five ha). Restore larger areas in 2013 if feasible	Four ha of direct seeding in July 2012, areas suitable for 2013- identified
13. Site selection for weed control and other actions	Identify sites with highest priorities for weed control and allocate resources	Site visits completed in June 2012, ranking process and weed mapping for sites listed in Table 3underway
14. Actions to protect nature reserves from weeds	Control weeds in up to 500 ha (Table 3) with quality control assessment and follow-up spraying as required	Tender advertised June 2012, spraying commencing in July (small scale), larger scale projects Aug 2012 onwards
15. Controlling illegal site access	Fencing to protect banksia woodland from disturbance, weeds and dieback	Fencing planned and works initiated to protect nature reserves
III. Collaborations		
16. Community Group and Local Government	Manage high priority sites with community groups and local government (e.g. Friends of Ken Hurst Park)	Planting days with BirdLife Australia volunteers in July 2012. Support for community groups provided.
17. Banksia woodland monitoring program	Measure health of banksia woodlands in Perth using vegetation, groundwater and remote sensing data	Process to consolidate existing data and select sites for detailed work initiated. Scientific collaborations investigated.
18. Rare flora monitoring and management	Undertake surveys and manage habitats of rare orchids, especially *Caladenia huegelii* in banksia woodland	Surveys with community groups and works to improve habitats planned
19. Scientific research program	Research to measure and optimize plant and animal diversity in restoration sites	One scientific collaboration initiated (see 9 above), others planned
20. Communications	Provide information to community groups, the public and other stakeholders	Information session held (May 2012), also presentations and press releases

10. Project Management

Major BWR project objectives and tasks are listed in Table 5. The pie graph below (Figure 9) shows a preliminary allocation of resources for different management actions in the first financial year. These relative allocations will be revised after outcomes from restoration activities in 2012 are assessed. Topsoil transfer will be replaced by planting tubestock and direct seeding as the main cost of restoration in future years. A key objective of this project is to evaluate the relative cost effectiveness of different approaches for ecosystem management, especially weed management and restoration of banksia woodland. The BWR project is also currently developing partnerships with community groups and local governments to effectively manage banksia woodland areas, as listed in Section 8.

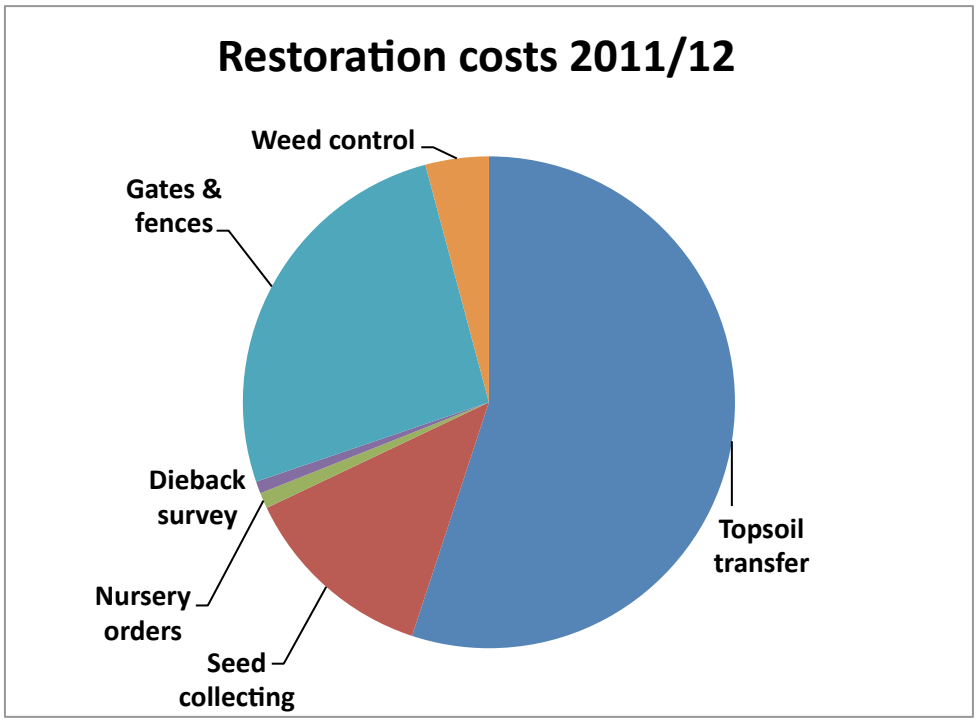

Figure 9. Financial allocations for restoration expenses in the 2011/2012 financial year.

10. Project Governance

The Project Management Group, which oversees this project, consists of the DEC Swan Region Manager (Stefan de Haan), Regional Ecologist (Geoff Barrett), Acting Regional Leader Nature Conservation (Barbara Wilson) and Senior Ecologist (Mark Brundrett). Meetings are held every 2-4 weeks to organise finances, staffing, collaborations with other organisations, etc. Record keeping and quality control for this project follows standard DEC protocols and requirements.

A Scientific Advisory Group was formed in 2011 to provide advice on scientific and management aspects of restoration programs such as the BWR project and the Malaga wetland offset project. Membership of this committee is listed in Table 5 and the first two meetings were held in November 2011 and May 2012. This advice primarily concerns:

a) Management of the restoration programs,
b) Habitat restoration research priorities for conservation of the biodiversity,

c) Development of completion and success criteria that include fauna as well as flora and can be used to assess restoration outcomes.
d) Establishing links with other projects and sharing relevant data
e) Collection of rigorous, scientific principles base line and reference site data for monitoring
f) Timeliness and progress of the programs and projects and
g) Feedback on reports and major documents produced by the programs and projects.

Table 5. Members of the Scientific Advisory Group for the BRW project.

Prof. Richard J Hobbs	Australian Laureate Fellow, School of Plant Biology, University of Western Australia
Prof. Neal J Enright	Professor of Plant Ecology, Murdoch University
Dr Ben Miller	Restoration Ecologist nominated by Dr Kingsley Dixon, Director, Science, Kings Park and Botanic Garden
Prof. Mark Tibbett	Restoration Science, Chair of Soil Ecology, Cranfield University, UK
Prof. Will Stock	Prof. Environmental Management, Edith Cowan University
Dr Mike Bamford,	Consulting Ecologist, fauna expert
Dr Katinka Ruthrof	Restoration ecologist, Centre of Excellence for Climate Change, Woodland and Forest Health, Murdoch University
Stefan de Haan	Regional Manager, DEC Swan Region
Dr Barbara Wilson	Acting Regional Leader Nature Conservation, DEC Swan Region
Dr Mark Brundrett	Senior Ecologist, Banksia Woodland Restoration
Dr Geoff Barrett	Regional Ecologist, DEC Swan Region

11. Communication

Presentations to the public and community groups are summarised in Table 6 below. A meeting held in May 2012 presented information on this project and CBC's. The other presentation was for the annual conference of Wildflower Society of Western Australia.

Table 6. Communication activities.

Activity	Dates
1. Press releases (published in local papers)	March 2012, July 2012,
2. Public information session	May 15, 2012
3. Other presentations to community groups	July 1 2012
4. Planting days (BirdLife Australia Volunteers)	July 11 & 15 2012

12 References

Jandakot Airport Holdings Pty. Ltd. *Jandakot Airport Offset Plan.* March 2010. (url: www.jandakotairport.com.au/images/cms/content/Airport%20Offset%20Plan%202010.pdf)

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