State NRM Program
FINAL REPORT
2011

Emergency Recovery Actions for Highest Priority Threatened Flora

Project 09029

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Department of
Environment and Conservation

State NRM Program

FINAL REPORT

1. Project Administration

a. Project contact details

State ID	Large Project 3		
Project Title (Use the same title as in original Funding Agreement / Schedule)	09029 – Emergency Recovery Actions for Highest Priority Threatened Flora		
Organisation	Department of Environment and Conservation		
Project Contact	David Coates	**Ph:** (08) 9219 9048 **Fax:** (08) **Mobile:** 0439 969 404 **Email:** dave.coates@dec.wa.gov.au	
Contact Address	17 Dick Perry Ave, Technology Park, KENSINGTON 6151		

b. Project Duration

	Month Year		Month Year
Originally Planned Start Date	1/11/2009	Originally Planned Completion Date	1/11/2010
Actual Start Date	1/11/2009	Actual Completion Date	31/01/2011

c. Total Project Funding Details. Please provide information over the life of the project on the actual financial contributions of the various stakeholders in the project, as set out below.

	State NRM Program Funds	Interest	Other Cash Contributions (please identify the source)	In-kind Contributions (please identify the source)	**Total Funds**
Approved	**$870,000**				
Received	**$870,000**		**$2,795.45 (Friends of Brixton St Wetlands**		
Expended	**$870,000**		**$2,795.45 (Friends of Brixton St Wetlands**	**$252,000 (DEC) staff**	**$1,124,795.45**
Unspent					

d. Asset purchases. Please list the assets (>$5,000) purchased by the project including item, purchase date, cost and the disposal details.

Asset	**Date of Purchase**	**Cost**	**Disposal Date**	**Disposal Details (who to and where did the funds go)**	**Comments**

Fencing materials	May 2010	$6027.64		Midalia Steel (Albany)	
Fencing materials	6/1/2011	$17,159		Pendrey Agencies, Busselton	
Fencing materials	21/9/2010	$9,260		Landmark, Merredin	

e. Intellectual property. Has any intellectual property been created that has the potential for exploitation and/or commercialisation, and for which the Intellectual Property Rights should be legally protected under Statutory and/or Common Law? **No**

If **YES,** please describe

f. Audited Financial Statement. (Have you attached a copy of the audited financial statement?) This financial statement must be for the life of the project and must be signed by an auditor and a member of your organisation.

Yes

2. NRM Asset

a. Please list the NRM asset(s) addressed by this project (as per the project proposal).

Threatened Flora of south west Western Australia. See Table 1 for species list.

b. Please identify where the asset is located, including the nearest town and direction from it, and GPS location if available

South West Western Australia – Carnarvon to Esperance and inland to Kalgoorlie. See Table 1 for individual species locations.

c. Please identify all **investment priority areas you addressed.** (Please refer to your project proposal)

Priority 1. Biodiversity
1 Threatened species

3. Key Achievements

a. Provide a brief summary (in dot point form) of the key achievements of your project. Refer to the key activities described in the Project Proposal and investment objectives/outcomes in your project schedule

Key actions were carried out on a total of 97 threatened plant species currently ranked as Critically Endangered and Endangered that have a significant possibility of extinction in the next 10 years. The project aimed to stabilise and prevent any further loss of individuals and where possible to enhance recruitment in populations of these species.

Key achievements of the project were:-

1. Fire response database and developing fire management plans

- literature on plant fire response databases reviewed.
- fire response and life attribute criteria and monitoring protocols developed.
- fire response data collated from all sources into a spreadsheet - 815 fire response records compiled for 273 threatened species from seven DEC regions .
- district offices and threatened flora populations visited to gather fire response data.
- fire history data assessed.
- computer and hard copy fire response files established for each species.
- fire response data classified and a gap analysis conducted to identify species with little or no fire response data.
- fire management guidelines developed for 13 threatened flora.
- fire monitoring quadrats established and monitoring undertaken in populations of 26 threatened species.
- planning for disturbance (burn) trials in populations of two species completed in 2010; trials to be undertaken in 2011.

2. Weed control and habitat restoration

- conservation status of *Apium prostratum* ssp *phillipii* and *Ornduffia calthifolia* enhanced through a collaborative

project in the Porongurup National Park involving DEC, the Oyster Harbour Catchment Group and Friends of the Porongurup Range to control infestations of dolichos creeper and blackberry.
- weed control and habitat restoration undertaken at one of only two known populations of *Shoenia filifolia* subsp. *subulifolia* northeast of Mingenew.
- control of veldt grass, sparaxis and cape tulip in Bullsbrook Nature Reserve, critical habitat for *Grevillea althoferorum* and *Verticordia plumosa var. pleiobotrya.*
- management to control severe infestations of **Watsonia* spp. at the Watkins Rd Nature Reserve, home of the largest known population of *Tetraria austaliensis.*
- habitat of critically endangered *Caladenia huegelii* in Wandi Nature Reserve managed to control perennial veldt grass and other weeds. Wandi Landcare Group assisted with hand weeding and spot-spraying of pigface and pre and post spray monitoring of *Caladenia huegelii.*
- weed management and restoration plan prepared to guide on ground management of *Diplolaena andrewsii* .
- weed control undertaken at three populations of *Eremophila scaberula*, the only known population of *Philotheca basistyla* and at the site of a disturbance trial at the last known population of *Gyrostemon reticulatus* .
- access road running through the only known population of *Andersonia annelsii* closed and rehabilitated.
- weed management notes completed and published on *Florabase* for 44 herb and sedge species.

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3. Fencing and grazing protection

- kangaroo exclusion fencing installed at two sites in the Busselton district, protecting the last remaining wild populations of *Gastrolobium papilio, Lambertia echinata ssp. occidentalis, Petrophile latericola* and *Darwinia whicherensis* and populations of 3 other threatened taxa, 11 priority listed taxa, two occurrences of the critically endangered Busselton Ironstone TEC [*Shrublands on southern ironstones*] and one occurrence of the Priority 1 listed Ecological Community (PEC) [*Swan Coastal Plain Paluslope wetlands*]. Monitoring quadrats and transects established at one of the sites to assess the impact of exclusion fencing.
- fencing upgraded at translocation sites for critically endangered species *Grevillea maccutcheonii, Gastrolobium papilio, Lambertia echinata* ssp*. occidentalis, Petrophile latericola, Darwinia whicherensis*. One of the sites includes the only naturally occurring population of *Grevillea maccutcheonii*.
- specialised fencing and gates installed at the Brixton Street Wetlands in the City of Gosnells, protecting one threatened flora (*Eleocharis keigheryi*), three Threatened Ecological Communities (TEC's) and 17 priority listed flora.
- fencing to exclude feral pigs extended around two populations of *Reedia spathacea*, providing added protection to the TEC (Reedia Swamps – Warren Region) located at the sites.
- last known wild population of the critically endangered *Philotheca basistyla* fenced to exclude rabbits.
- rabbit-proof fencing constructed around a population of *Verticordia spicata* subsp. *squamosa* occurring in remnant vegetation adjoining farmland. Cooperative baiting program implemented with the assistance of the adjoining landowner.
- one of only two known populations of *Stylidium amabile* enclosed by rabbit-proof fencing, including recently recruited seedlings from a disturbance trial.
- rabbit-proofing of existing fencing around the only known wild population of *Grevillea acropogon* and erection of a rabbit-proof fence around a translocated population .
- fencing erected around populations of *Caladenia winfieldii, Shoenia filifolia* subsp*. subulifolia, Verticordia plumosa* var. *vassensis* and *Lechenaultia laricina.*

4. Research on aerial canker control

Research conducted on plant canker disease impact and climatic variables in Proteaceae on the south coast of Western Australia. The use of selected fungicides as a management tool for canker control was also investigated.

- 50 semi-permanent monitoring transects established in populations of *Banksia baxteri*, *B. coccinea, B. verticillata* and a translocated population of *L. orbifolia ssp orbifolia***.** 12 site and 9 host parameters recorded at each transect.
- data loggers recording temperature, dew point and humidity installed at 20 sites covering the northern and southern rainfall extremities.
- an increase in canker disease incidence was identified and significant correlation of canker impact with basic climatic variables was demonstrated.
- three main canker causing pathogens isolated, identified and deposited in the Department of Agriculture Plant Pathogen collection.
- a prescription for fungicide treatment developed to reduce the rate of canker lesion growth by testing in-vitro for linear growth rate reduction by the four systemic fungicides considered to exhibit control.
- fungicides evaluated for efficacy in-vivo (shade house) on 1 year old seedlings of *Banksia attenuata*, *B. baxteri*, *B. coccinea* and *B. verticillata* wound inoculated with the three canker pathogens. Visible lesion rate of the canker pathogens was reduced significantly with no phytotoxicity evident in any of the treatments.
- fungicide efficacy tested in a natural stand of *B. coccinea* near Wellstead (results pending).
- monitoring framework established that can utilise changes in plant canker pathogen impact on Proteaceae as indicators of climate change.

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5. Seed collections and seed banking

- 50 seed collections (accessions), totalling more than 140,000 seeds, made from populations of 40 threatened flora
- collections made from nine species not previously stored in DEC's Threatened Flora Seed Centre (TFSC).
- 75 % of collections sampled from (multiple) individual mother plants in populations.
- all collections processed, quantified and stored under long-term storage conditions at the TFSC.
- germination trials completed for 13 collections.
- duplicate seed samples from 44 collections sent to the Millennium Seed Bank at the Royal Botanic Gardens Kew (UK).

b. Please identify any significant unforseen issues that arose, whether they were resolved or not.

Nil

c. Did your project proceed as you anticipated? If not, why not, and identify any lessons learnt as a result.

Project proceeded as anticipated.

d. Identify all milestones achieved in your project under the following headings. Use the milestones described in the project schedule.

Milestone	Describe how/when it was achieved

1. Fire response database expanded to include Threatened Flora. Fire management plans developed for 13 threatened species

The entire threatened flora in Western Australia was included, other than five species found in the Pilbara and Kimberley regions.

Literature was reviewed on general plant responses to fire and life attributes which allow species to survive and persist after fire. Literature on the fire responses of a wide range of species was also reviewed. A number of fire response databases from other state conservation agencies were examined and compared to that currently used in Western Australia. The literature review identified issues with the selection of fire response and life attribute criteria, and with other species information collected in the databases. Many of these issues were addressed in the development of the spreadsheet and monitoring protocols.

Fire response and life attribute criteria were selected and in some cases adapted or simplified from other databases. They enable the collection of a wide range of relevant information to describe the full response of a threatened species to fire across the range of habitats in which it exists. Other fields were also included to ensure that all relevant information about the species, population, specimen number, fire history, habitat and threats were recorded along with full referencing. A comments field captures other relevant information and observations.

Data collection sheets were developed to collate existing information from a variety of sources. Fire response monitoring field sheets were also developed to record fire response and life attribute data during ongoing monitoring of populations. These were designed at two levels, one for monitoring at the population or quadrat level and the other for monitoring the response of individual plants. The spreadsheet and monitoring field sheets were designed for data which could reasonably be collected during routine monitoring by district staff. Other research data would need to be summarised and added to fields when completed. Monitoring protocols were developed for using these data collection sheets and these were tested out in the field by staff and modified as needed. A fire response monitoring guide was prepared with field sheets, protocols and definitions to help staff collect the relevant data.

Fire response data for WA threatened flora were collated from various sources so that variations in fire responses between populations, habitats and fire history could be captured. Most records were for one fire event at one population, but other more general sources of information were also included which were at the species level.

Sources of information included:
- the original vegetation response database for 18 species;
- DEFL population monitoring records and report forms;
- Recovery Plans and Interim Recovery Plans for most species;
- FloraBase (WA Herbarium database);
- DEC Science and WA Herbarium observations;
- DEC Fire Management Branch for fire history;
- DEC internal reports;
- DEC district files and reports, recruitment burn proposals and reports;
- Unpublished consultant reports to DEC;
- Published scientific articles;
- Published reference books.

The type and source of data used for each record was included so the user of the data can make judgements about its reliability and check the original source.

During the project most DEC district offices in WA were visited with the aim of meeting staff involved in threatened flora monitoring to encourage participation in the collection of fire response data. Fire response monitoring protocols and data collection sheets were demonstrated in the field. District files, reports, trial and population monitoring data were examined to extract relevant information for the fire response database. New fire response information was collected in the field in recently burnt populations and habitat information and photographs were taken for species for which fire management guidelines were being prepared.

Fire history data was taken from population monitoring records in DEFL where available. Fire history records were also examined in some district offices to verify the year, month and type of fire for each burnt population. Fire history data was accessed from the Fire Management Services (FMS) corporate GIS layers Fuel Age, Fire Scars and Fire History which covers the main forest regions. FMS also provided fire history data for individual populations in several other regions, by intersecting population point data with fire mapping.

Hard copy and computer files were established for all threatened species for which fire response information was available. Population monitoring forms, maps of populations, digital photographs, recruitment burn proposals and reports, Interim Recovery Plans, FloraBase print-outs with relevant specimen information, scientific papers, theses, district file notes, monitoring data and personal observations were downloaded, copied and filed.

The fire response spreadsheet was linked to the herbarium database so that plant names can remain current. Some of the fields in this spreadsheet have been copied directly from the DEC threatened flora database (DEFL) and it is anticipated that the fire response monitoring data will be incorporated into the DEFL database in the future. It is expected that data would continue to be collected until the response to a range of fire regimes could be predicted with some confidence. The range of fire responses can then be summarised for a species and made publicly available on NatureMap.

Fire response data was collated for 273 threatened species from seven DEC regions in WA. The quality and reliability of this data varies according to the type of data, whether it was from observations, population monitoring or trial data. Of these there are about 200 species with relatively good data from several different burns or populations, 45 species with only one record, 23 species which regenerated after other disturbances or where the population was burnt and regenerated but the type of response was not known, and five species where plants did not respond after fire. There are few species for which there is a complete record with all life attributes known. At the completion of this project, 815 fire response records have been complied for threatened species in Western Australia.

The overall fire response for each species was determined after considering the responses of all the population records for each species collated during this project. Of the 245 threatened taxa with fire response records, 51.4% are obligate seeders (S), 20.8% are resprouters (R), 14.7% are seeder/resprouters (SR), 7.3% are mainly seeders with some resprouting (Sr) and 5.7% are mainly resprouters with some seeding (Rs). There are 96 taxa which responded as seeders to soil disturbance (Sd), and can be classed as disturbance opportunists. This information was gained from comments on monitoring sheets about seedlings being found after significant soil disturbance due to road grading, mining, track and firebreak maintenance, or the construction of fences, pipelines and drains. Nearly half of the resprouter species are geophytes (Rg) which includes 24 orchid species. These were categorised as resprouters (R) although most also regenerate from seed after fire and possibly should be included in the Rs category.

Minimum fire intervals were calculated for about 162 threatened species which had some fire response data. Of these there are 30 species with short minimum fire intervals (<3 years), including 12 geophytes, 75 species with medium minimum fire intervals (3–8 years) and 57 species with long minimum fire intervals (>8 years) including 35 obligate seeders. Obligate seeder species with long juvenile periods are considered to be some of the most fire regime sensitive species and are used as key indicators for fire management planning. Maximum fire intervals were only calculated for a few species as there was inadequate data on age to senescence and seed longevity for most species.

Fire management guidelines were prepared for 13 threatened species (see CD) which had adequate fire response information available and which represented a range of habitats, fire responses, life forms and regions. These include nine Critically Endangered, three Endangered and one vulnerable taxon.

The guidelines include a description of the species, its habitat and associated vegetation, conservation status and distribution, ecological and biological notes on life attributes and critical life stages and fire history. A fire response summary box outlines the type of response to fire, age to first flowering, seed bank longevity, and minimum and maximum fire intervals. Examples are provided of the fire responses to individual recruitment burns, bushfires or prescribed burns where there has been detailed monitoring. The guidelines also cover the fire responses of other related threatened species where relevant, responses to other disturbances and threatening processes associated with fire.

The fire management guidelines include appropriate fire regimes that should be used if fire is to be introduced as a prescribed burn. Recommended fire season, fire intensity and fire interval are provided with consideration of other conservation values in the surrounding landscape and priorities for monitoring. Each fire management guideline is fully referenced and has been edited by staff conducting the original research and recruitment burns and by staff from the DEC Species and Communities Branch.

This project has increased awareness of the need for fire response monitoring and encouraged greater participation in the collection of fire response data, including the installation of new monitoring quadrats and the implementation of fire disturbance trials.

In the South Coast Region a total of 31 permanent 10 x 10m fire succession monitoring quadrats were installed in a range of recently burnt and longer unburnt habitat types for eight endemic threatened flora species (*Adenanthos dobagii , Adenanthos ellipticus, Eucalyptus nutans, Kunzea similis* ssp. *similis, Myoporum cordifolium, Ricinocarpus trichophorus, Verticordia crebra, Verticordia pityhrops)* In the Fitzgerald River National Park (FRNP) and four (*Drummondita longifolia, Eremophila ciliata, Eucalyptus insularis, Marianthus aquilonaris*) in the Esperance area (Cape Le Grand National Park, Peak Charles National Park and Mt Newmont). Details are provided on the CD

In the DEC Frankland District fire response data for *Reedia spathacea* was collated into a comprehensive report, bringing together information collected from 13 populations over a 10 year period. Until now, the data existed in multiple locations and varied formats and was not readily available to be used to inform fire management strategies for this species. Information was obtained from corporate records, monitoring reports, burn prescriptions, personal observations, weather data and rare flora report forms. The final report titled "*Preliminary Report on the Fire Response and Recovery of Reedia spathacea F. Muell."* has been forwarded to relevant personnel in the South West Region DEC office and the DEC Species and Communities Branch. The fire response data has been recently utilised in a pre and post burn monitoring project for a *R. spathacea* population occurring within a planned prescribed burn area in the district.

In the DEC Great Southern District *Conostylis setigera* ssp. *dasys*, *C. drummondii*, *Boronia capitata* ssp. *capitata* and A*cacia insolita* ssp. *recurva* have been incorporated into prescribed burn planning. Monitoring designs have been developed and permanent monitoring quadrats have been installed for each species. Pre-burn data has been collected and databased and metadata and maps have been produced. The information collected will be used to develop fire management strategies for these species and contribute to reserve management within the district. The need for permanent monitoring in all large DRF populations in the district was recognised to both collect quantifiable data on population structure and allow the capture of data from unplanned fire events. As a consequence the district has developed a three year works plan to install permanent monitoring quadrats in 119 DRF populations.

A recent disturbance trial (fire/smoke application) at one of only two known populations of *Stylidium amabile* was monitored quarterly over the term of the project. The trial was successful in stimulating recruitment, with over 400 new recruits recorded in December 2009. Recruits were counted and individually tagged and data on health, crown diameter and presence/absence of flowering recorded. The results showed that the largest number of recruits occurred in burnt plots and in those areas in closest proximity to where adult plants were known to have been present. Some recruitment also occurred in un-burnt areas affected by smoke. The initial mortality rate for the first summer was around 50-60% with mortality higher for recruits in areas that were affected by smoke and not fire. Monitoring in June and September 2010 recorded an increase in number of recruits during the second winter. The information obtained to date suggests that the use of fire as a management tool may be necessary to maintain this species.

Preparation for an in situ recruitment burn trial at Gnarlbine Rock (south west of Coolgardie), the site of a now extinct population of *Gastrolobium graniticum*, has been completed. A translocation proposal to conduct the trial was submitted and received approval in September 2010. Seed collected from a nearby population was placed *in situ* in December 2010, replicating the time of seed dispersal in natural populations. Burning is scheduled for autumn and spring 2011 and fencing will be installed after each burn.

Approval to undertake a disturbance trial to monitor the effect of fire on a senescing population of *Grevillea batrachioides* was received in December 2010. The trial, prepared in an adaptive management framework, aims to stimulate recruitment from seed into the population. A population census conducted in February 2010 confirmed a continuing decline in plant numbers. These observations were reported in "*Grevillea batrachioides Population Census and Monitoring of Change 2010*", completed in April 2010.

In the Central Wheatbelt District monitoring plots installed within recruitment burn sites for *Philotheca basistyla* and *Acacia sciophanes* were visited in December 2010. All seedlings were marked in the field with a unique number and will continue to be monitored through to their first flowering event. The information from this monitoring will eventually be collated into fire management plans for each species.

Monitoring of a burn trial at the last known population of presumed extinct *Gyrostemon reticulatus* failed to record any recruitment. Monitoring of the site will continue. Valuable information about the preferred habitat of this species, gathered with the assistance of the Geraldton Herbarium Volunteer Group, will aid in the survey for new populations.

Fire response monitoring quadrats were installed in three populations of *Conospermum toddii*, a species occurring in the western area of the Great Victoria Desert, more than 200 km ENE of Kalgoorlie. Monitoring has shown that *Conospermum toddii* is both a seeder and resprouter following fire and that at least five years is required to reach reproductive maturity. Energy and Minerals Australia, who are currently undertaking uranium exploration in the western areas of the Great Victoria Desert, have offered assistance to monitor the sites.

Data-loggers have been used to record soil variables (temperature and moisture) during and after prescribed fire events in populations of three threatened species (*Caladenia excelsa* , *Caladenia harringtoniae, Reedia spathacea*) occurring in the DEC South West Region. In addition to the soil attributes, population data (number of plants, location) and community composition and condition were recorded and will be monitored over several years. The data collected from the loggers will

enable a more accurate assessment of the impact of soil conditions in promoting or restricting recruitment after fire.

2. Completed weed control and habitat restoration for 12 species

Apium prostratum* ssp *phillipii* and *Ornduffia calthifolia
In the Porongurup National Park (PNP) management to control infestations of dolichos creeper (*Dipogon lignosus) and blackberry (*Rubus sp) enhanced the conservation status of threatened species *Apium prostratum* ssp *phillipii* and *Ornduffia calthifolia*. A collaborative weed control project in and around the park involved DEC, the Oyster Harbour Catchment Group and Friends of the Porongurup Range. Historical and recent data on PNP weed management and its effectiveness was compiled. Funding contributed to the development of a mobile mapping project by a local consultant working in close consultation with DEC's weed coordinator. The mapping was based on handheld PDA/GPS units with mobile GIS software (ArcPad 7.1). It built on a Geographic Information System (GIS) for the Porongurup weed control project developed and maintained by the coordinators for the Oyster Harbour Catchment Group. The GIS includes data on weed distribution, treatments (location/spray/application density/rate etc) and threatened flora locations. This system will be an invaluable resource for strategic planning and evaluation of weed management in the park.

Weed control was achieved through the application of herbicide (Grazon) by casual labour crews coordinated and supervised by the DEC PNP weed coordinator. In addition, the Friends of the Porongurup Range weeding group spent approximately 150 hours hand weeding dolichos in and adjacent to communities of *A. prostratum* ssp *phillipii*.

Additional threatened flora data was collected during reconnaissance searches for weed infestations, weed control work and volunteer surveys. Monitoring of selected threatened flora populations has provided an insight into the demography and population dynamics of *A. prostratum ssp phillipii* and *O. calthifolia.*

Shoenia filifolia* subsp. *subulifolia
Weed control and habitat restoration was carried out at one of only two known populations of *Shoenia filifolia* subsp. *subulifolia* northeast of Mingenew. This site had become increasingly degraded and weed infested over recent years. Herbicide application occurred in July and August, Fusilade being used to treat grass-leaved weeds and non-selective Glyphosate to spot spray broad-leaved weeds. Weeds in close proximity to *S. filifolia* subsp. *subulifolia* were removed manually. A buffer of brushing from the surrounding vegetation was placed around the perimeter of the fenced area to assist in trapping weed seed carried in rainfall run-off. A buffer of endemic habitat species was planted around the perimeter of the population. Weed matting was purchased to place in areas where weeds have become the only plants present.

Two 2mx2m quadrats were installed to monitor the effectiveness of the weed control. Weed control measures and below average rainfall are likely to have resulted in a significant reduction in weed seed set in 2010. A district staff member involved in this project attended DEC's weed management course and provided assistance with producing Weed Management Guidelines to direct long term management at this site. The Weed Management Guidelines will be implemented and further survey will be carried out in nearby remnant vegetation in spring 2011. A direct seeding translocation *S. filifolia* subsp. *subulifolia* is being considered.

Eremophila scaberula
Three of the six known populations of the *Eremophila scaberula* were sprayed for weeds in October 2010 to reduce the annual grass burden and allow for the recruitment of seedlings. Approximately 7.4ha were treated with Fusillade. DEC staff undertaking the work completed training in weed identification and chemical handling in July 2010.

***Grevillea althoferorum* and *Verticordia plumosa var. pleiobotrya* (Bullsbrook Nature Reserve)**
Weed control was undertaken in Bullsbrook Nature Reserve, critical habitat for *Grevillea althoferorum* and *Verticordia plumosa var. pleiobotrya*. Several weeds, namely veldt grass (**Ehrharta calycina*), sparaxis (**Sparaxis bulbifera*) and cape tulip (**Moraea flaccida*), pose significant threats to these species in the reserve. They currently occur in low numbers but have the potential to invade bushland, out-compete native species and alter fire frequency and intensity. DGPS mapping of veldt grass, sparaxis and cape tulip infestations in the reserve was completed in mid 2010. These maps form part of the Bullsbrook Nature Reserve bushland restoration plan, a document that guides DEC district officers undertaking on ground works in the reserve.

In July 2010 veldt grass populations were sprayed with Fusillade Forte. All populations of sparaxis and cape tulip were sprayed with Brushoff in early September 2010. In addition, isolated populations of pink gladiolus (**Gladiolus caryophyllaceous), *Tamarix sp., *Euphorbia terracina, *Juncus acutus*, figs and arum lilies were mapped and control undertaken. The results of this weed control work will not be evident until winter 2011.

***Tetraria australiensis* (Watkins Rd Nature Reserve)**
At the Watkins Rd Nature Reserve management to control severe infestations of **Watsonia* spp. was implemented. The reserve is the home of the largest known population of *Tetraria austaliensis*. Without active management **W. barbonica* had the potential to increase its distribution and density to severely threatening levels. Prior to treatment some 15ha of this site was mapped with >75% cover of **Watsonia*.

In August/September 2010 a total of 31ha of mapped *Watsonia* was treated with the selective herbicide Dalapon. A previous

weed control trial in the reserve demonstrated that Dalapon significantly decreased the cover and numbers of *W. borbonica* without impacting on *T. australiensis* health or mortality. Priority for treatment was determined by the presence of *T. australiensis*, burnt area, bushland condition and *Watsonia* density. All *Watsonia* occurring within the *T. australiensis* population boundary were treated, with only those areas in completely degraded condition omitted from the treatment program.

Initial inspections post-application show promising results for *Watsonia* mortality however a full assessment cannot be undertaken until 2011 when it begins actively growing after its annual summer dormancy. *Watsonia spp* density recorded across the site in winter 2009 will provide reference baseline data to monitor the effectiveness of this management program.

***Caladenia huegelii* (Wandi Nature Reserve)**
Banksia woodland habitat of critically endangered *Caladenia huegelii* in Wandi Nature Reserve has been managed to control perennial veldt grass *(Ehrharta calycina*) and other weeds. A grass selective herbicide was applied to approximately 9 ha of veldt grass *(E. calycina*) in the reserve. Mapping and targeted management of freesia (*Freesia alba x leichtlinii*) was also conducted using spot-spray selective herbicide. Freesia is an emerging threat invading from adjoining properties to within 50m of the largest grand spider orchid sub-population. Wandi Landcare Group held three events to hand weed and spot-spray internal populations of pigface (*Carprobrotus edulis*) in 2010, completing a primary weed of all mapped locations begun by the group in 2009.

Pre and post spray monitoring of grand spider orchid was undertaken by Wandi Landcare Group and DEC staff. The population showed no off-target damage from the application of grass selective herbicides. Individual plant numbers were observed to increase from 28 in 2009 to 42 in 2010. Initial post-spraying inspections showed variable weed mortality however a full assessment cannot be made until the active growing season in 2011. Weed density mapping for veldt grass (April 2009) and freesia (August 2010) and spot location records for pigface (April 2009) will provide reference data to monitor the effectiveness of weed management.

Diplolaena andrewsii
A weed management and restoration plan was prepared to guide on ground management, including research trials, of *Diplolaena andrewsii.* This species is known from only 2 populations (11 sub-populations) in John Forest National Park and north Gidgegannup (shire reserve, road reserve, private). Survey and precise mapping of individual plants in both populations was completed using DGPS. Weed species within a 50m radius of all sub-populations were surveyed. The priority weed species were identified based on invasiveness, impact and potential/current distribution and mapped using a DGPS. A fire history map of the area was also compiled.

Philotheca basistyla
Weed control was conducted during winter 2010 at the only known population of *Philotheca basistyla* . Wild oats(*Avena *fatua*) and ice plant (**Carpobrotus* sp.) occurring throughout the remnant were treated with Round-up using a knap-sack sprayer.

Gyrostemon reticulatus
Hand removal of weeds in June and September at the site of the disturbance trial for the presumed extinct *Gyrostemon reticulatus* has been successful in limiting the spread of weeds.

Brixton St Wetlands
Weed control following fence construction at Brixton Street Nature Reserve (see milestone 3) was undertaken. Perennial grass **Tribolium uniolae* invading critical habitat was also treated.

Andersonia annelsii
Rehabilitation of an access road running through the only known population of *Andersonia annelsii* was undertaken. Seed was collected locally from species occurring in the associated vegetation and was broadcast directly on the road and in surrounding habitat. Realignment of the track was investigated, but was not possible within the time constraints of this project. The track has been closed to traffic, significantly reducing the potential of introducing dieback into the population.

Weed management notes
Weed management notes have been completed and published on *Florabase* for 44 herb and sedge species. These are high priority invasive species in the Swan NRM Region and beyond. These notes will assist in the management of threatened flora species impacted by these weed species.

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3. Fencing and grazing control completed for 19 species

Busselton TEC's
Exclusion fencing was undertaken at five sites to manage the impact of excessive kangaroo grazing and rabbit burrowing on endemic threatened flora in the Busselton district. The sites are within 5km of each other and include occurrences of a critically endangered Busselton Ironstone Threatened Ecological Community (TEC).

Site A is the habitat of the last remaining wild populations of *Gastrolobium papilio, Lambertia echinata ssp. occidentalis, Petrophile latericola* and *Darwinia whicherensis* plus several other threatened species (*Chamelaucium* sp. C Coastal Plain R.D Royce 4872, *Banksia nivea spp. uliginosa, Banksiaa squarrosa ssp. argillacea*). This site is adjacent to cleared pasture and has been subject to heavy kangaroo impact through daytime refuge and summer grazing. The grazing impact of the

kangaroos was particularly heavy on *G. papilio* and *P. latericola* with both species producing little if any seed. A general aging and lack of recruitment had been noted at the site with one area of a wetland community close to collapse through excessive grazing and resting activity.

Site B, a small area of TEC bushland surrounded by cleared pasture, was purchased as a Nature Reserve in the 1990's. Existing stock fencing had not prevented kangaroo access and the community showed no improvement in condition or recruitment since purchase. A population of threatened *Grevillea elongata* in the reserve is one of only two populations of this species occurring within secure conservation vesting.

Kangaroo exclusion fencing installed at both sites has improved the status of the threatened species by protecting individuals from grazing, enhancing recruitment potential and improving general overall health of the plant community. In addition, fencing in site A and B has provided protection for populations of 11 priority listed taxa (Table 1), two occurrences of the critically endangered Busselton Ironstone TEC [*Shrublands on southern ironstones*] and one occurrence of the Priority 1 listed Ecological Community (PEC) [*Swan Coastal Plain Paluslope wetlands*]. Monitoring quadrats and transects recording species presence and density have been established within three plant communities in Site A to assess the impact of exclusion fencing. Control quadrats and transects are also located outside the fenced area.

Sites C and D are the only translocation sites for endemic critically endangered species (*Grevillea maccutcheonii, Gastrolobium papilio, Lambertia echinata* ssp*. occidentalis, Petrophile latericola, Darwinia whicherensis)* of the Busselton Ironstone TEC. These sites are used as nurseries (seed orchards) to grow plants for the harvesting of seed. Both sites are surrounded by cleared pasture and impacts such as kangaroo and rabbit grazing and digging reduces the survival of translocated plants.

Site C was fenced to exclude rabbits in the 1990's and included the road reserve which supports the only natural population of *Grevillea maccutcheonii.* The rabbit netting on the original fence had deteriorated and funding was used to replace the rabbit netting on three of the four sides. Repair of the fence within the road reserve could not be achieved without adversely impacting the population of *G. maccutcheonii*. Work has commenced on the construction of a newly aligned fence (kangaroo exclusion standard) to enclose the entire translocation site. Site D was also fenced to exclude rabbits in the 1990's, however the fence was in poor condition and could not be repaired. A new kangaroo exclusion fence was erected around a larger area, allowing for the expansion of translocation work. A small roadside population (site E) of *Verticordia plumosa var. vassensis* was fenced to exclude cattle. The site is surrounded by cleared pasture and was being impacted by cattle movement between paddocks.

Brixton Street Wetlands

The Brixton Street Wetlands in the City of Gosnells are located in a DEC managed nature reserve and support one Declared Rare Flora (*Eleocharis keigheryi*), three Threatened Ecological Communities (TEC's) and 17 priority flora (see Table 1). Illegal trail bike activities in the reserve have resulted in severe disturbance, degradation and destruction of the clay pan communities and the rare and restricted flora located there. The existing ringlock fence was in poor condition and the gates offered little resistance to entry. With funding from this project specialised fencing and gates were built by contractors under the supervision of Swan Coastal District staff, and completed in July 2010. Since the completion of the fence there has been almost no evidence of off-road vehicles accessing the reserve and no damage to the fence requiring repair.

Reedia spathacea

Partial fencing around two populations of *Reedia spathacea* heavily impacted by feral pigs was extended in June 2010 to include disturbed areas. *R spathacea* plants within the fenced area were recorded and cohort structure, health and level of pig damage noted. An inspection in December 2010 showed that the fencing had been successful in excluding feral pigs with signs of pigs traversing the area outside the fence but not within. The fenced populations have been included in the district feral pig control program. Ongoing monitoring will be carried out to ensure proper maintenance of the fences and to determine if regeneration of *Reedia spathacea* is occurring. *R. spathacea* is part of the Threatened Ecological Community Reedia Swamps – Warren Region and the fence plays a role in protecting this community.

Philotheca basistyla

The last known wild population of the critically endangered *Philotheca basistyla* was fenced to exclude rabbits in November 2010. The site was subject to heavy rabbit activity which also contributed to weed invasion through rabbit generated soil disturbances. The fenced area comprises a narrow road verge and a small section of remnant vegetation on the adjoining private property. It includes the 25 live plants remaining in the population and the area encompassing dead plants and, potentially, soil stored seed. Post fencing the area has been intensively fumigated and will be baited early in 2011.

Verticordia spicata* subsp. *squamosa

A population of *Verticordia spicata* subsp. *squamosa* occurring in remnant vegetation adjoining farmland has suffered serious habitat degradation due to heavy rabbit infestation. Rabbit-proof fencing was constructed around the remnant vegetation and a cooperative baiting program was implemented with the assistance of the adjoining landowner. The road reserve boundary was not fenced due to very dense vegetation which was considered to provide an effective buffer to weeds entering the site. Monitoring of rabbit activity at the site in August 2010 found that although rabbits had been prevented from moving freely between the remnant vegetation and adjoining crops they had not been excluded from the area entirely. Successful negotiations with the local shire have lead to approval to fence the road reserve boundary at the edge of the maintenance zone, incorporating the road verge vegetation into the remnant. Fencing of the road reserve and a baiting program will be carried out in 2011. A re-stocking translocation project for *V. spicata* subsp. *squamosa* may be considered in the future.

Stylidium amabile

Following a recent disturbance trial at one of only two known populations of *Stylidium amabile* weld mesh cages were positioned over recruits to protect against rabbit grazing. Negotiations with Main Roads were successful in gaining approval to fence on the road reserve and the site was entirely fenced with rabbit-proof fencing in May 2010. The fencing has been successful in preventing rabbits entering the area with no evidence of grazing of flower buds observed during monitoring in September 2010. A baiting program inside the enclosure will be carried out if necessary.

Grevillea acropogon
Rabbit proofing of existing fencing around the only known wild population of *Grevillea acropogon* was undertaken. This population was senescent with little or no recruitment observed until the construction of a ring-lock fence in 2008 to exclude kangaroos. It is anticipated that with added protection from rabbits, seedlings will survive to enable an increase in plant numbers. A rabbit-proof fence was also erected around a translocated population of *G. acropogon* established in 2009
During fencing, boot cleaning stations and access ladders were installed to prevent/minimise the spread of disease into the sites.

Caladenia winfieldii
Fencing around a population of *Caladenia winfieldii* has been extended to include plants discovered outside the original fenced area. In addition a boot cleaning station and access ladder were installed.

Lechenaultia laricina
A stock-proof fence was erected around a heavily grazed sub-population of *Lechenaultia laricina* occurring on private property, providing opportunity for regeneration of this species and associated habitat. The fenced sub-population adjoining this site is in good condition growing in an intact understorey. This work demonstrated the capacity for developing a positive working relationship with a new property owner.

Shoenia filifolia* subsp*. subulifolia
One of only two known populations of *Shoenia filifolia* subsp*. subulifolia* was fenced to exclude stock in July 2010. This work was carried out in conjunction with weed control and habitat restoration activities (see milestone 2). During the fence construction an earlier flowering Declared Rare Flora species, *Wurmbea tubulosa*, was found at the site.

4. Control measures for aerial canker developed and implemented on 4 species

Research was undertaken to advance the understanding of canker disease biology and epidemiology in Proteaceae of the south coast region of Western Australia and to develop direct therapy methods for treating canker in threatened flora populations. Currently two declared rare flora, *Banksia verticillata and Lambertia orbifolia ssp. orbifolia* are being severely impacted by canker disease.

To quantify and monitor canker impact and climatic variables baseline transects were established across climatic gradients in the south west of Western Australia. 50 semi-permanent monitoring transects were established in populations of *B. baxteri*, *B. coccinea, B. verticillata* and a translocated population of *L. orbifolia ssp orbifolia* (- integrated with Minor project 7, Threatened flora translocations *Lambertia orbifolia*). *B. baxteri* and *B. coccinea* are keystone structural species that occupy a wide geographic and climatic gradient across the south coast region. Each transect consisted of 30 individuals providing canker incidence and severity scores for 1500 plants across the south west and was completed in July 2010. For each of the 50 transects 12 site and 9 host parameters were recorded. To gather climate information data loggers recording temperature, dew point and humidity were installed at 20 sites covering the northern and southern rainfall extremities. Interpolated rainfall, temperature and humidity data for each site have been collected for comparison against canker impact scores in an attempt to develop predictive ability in climate change scenarios.

Three main known canker causing pathogens were isolated, identified and deposited in the Department of Agriculture Plant Pathogen collection. 540 individual cankers were cultured, pathogens isolated and identified morphologically. *Neofussicoccum australe* and N. *macroclavatum* (previously reported as (*Botryosphaeria spp*.) were the most commonly isolated pathogens, followed by a putative *Microthia* sp and *Cryptodiaporthe melanocraespeda.*

Significant correlation of canker impact with basic climatic variables has been demonstrated. Multivariate analysis of canker incidence with interpolated climatic data has shown positive correlations with daily minimum temperature for *B. baxteri*. In actual logged data, positive correlations were found with humidity, maximum and mean daily temperatures. For *B. coccinea* there were positive correlations with interpolated minimum temperature and evaporation.

An increase in canker disease incidence was identified by comparison of the initial assessment in March and the subsequent assessment in November. There was an increase in canker incidence of 7.3% in *B. baxteri* and 7.5% in *B. coccinea.* For *B. verticillata and L. orbifolia ssp. orbifolia* there was no increase in incidence as they were both already at 100%. There was an increase in canker severity of 2.7% in *B. Baxteri*, 3.4% in *B. coccinea*, <1% in *B. verticillata* and 4.6% in *L. orbifolia ssp. orbifolia*. A mortality rate of 1.6% in *B. baxteri* and 2.8% in *B. coccinea* over a 6 month period was determined after the November 2010 ratings.

Control options for the four most common canker causing pathogens were investigated. A prescription was developed for fungicide treatment to reduce the rate of canker lesion development. This was achieved in December beginning with an initial identification of the pathogens, followed by testing in-vitro for linear growth rate reduction of the four systemic fungicides Sportak®, Rubigan, Tecto® and Tebuconazole considered to exhibit control. This experiment was repeated in September. Sportak® was most effective against *Neofussicoccum* sp. and Rubigan was most effective against the *Microthia* sp.

Both fungicides Sportak® and Rubigan were evaluated in December for efficacy in-vivo (shade house) on 1 year old seedlings of *Banksia attenuata*, *B. baxteri*, *B. coccinea* and *B. verticillata* wound inoculated with the three canker pathogens. The resulting visible stem lesions were then measured after 3 weeks growth. Both fungicides reduced the visible lesion rate of the canker pathogens significantly with no visible phytotoxicity evident in any of the treatments.

A further test of fungicide efficacy was established in January 2011 with Sportak® being applied to a natural stand of *B. coccinea* near Wellstead on the south coast of Western Australia. Monitoring results will be available in 2011.

Data from this research will be used to develop management strategies for canker affected communities in the south coast of Western Australia. An increase in canker incidence and severity is forecast for the Proteaceous spp. investigated in this study in future climate change scenarios of increased maximum and minimum temperatures predicted for south Western Australia. A monitoring framework has been established that can utilise changes in plant canker pathogen impact on Proteaceae as indicators of climate change.

5. Seed collections completed for 41 species and placed in storage in the DEC Threatened Flora Seed Centre.

Fifty seed collections were made by staff from the Threatened Flora Seed Centre (TFSC) from populations of forty threatened flora. 20 of these taxa are ranked as critically endangered, 14 endangered and six vulnerable under IUCN criteria (Table 1). Seed collections were spread across eight DEC districts encompassing six DEC regions. Collections from nine of these species have not previously been stored in the TFSC.

All collections have been processed, quantified and stored. In total, more than 140,000 seeds were collected. Germination trials for 13 collections are underway. As a risk management strategy, duplicate seed samples from 44 of the collections were sent to the Millennium Seed Bank at the Royal Botanic Gardens Kew (UK). For a number of species only a small quantity of seeds were collected due to a limited amount of fruiting material being available during the 2009-2010 collecting season.

Seed collections were also made in conjunction with other works being conducted by staff in the districts. In the Goldfields Region significant quantities of seed were collected from three populations of *Gastrolobium graniticum* for recruitment burn trials and ex-situ storage at the TFSC.

Seed collections were also made from *Grevillea involucrata* and *Philotheca basistyla* in the Great Southern and Central Wheatbelt districts respectively. For *G. involucrata* low and sporadic seed production hampered collection efforts with only four small individual collections made. Low seed set was also observed in the last known population of critically endangered *P. basistyla* with only 22 seeds collected from 4 individuals, despite the use of bagging techniques to trap mature seed. A dedicated seed collection program for these species is required.

e. Identify the milestones not achieved in your project under the following headings. **Use the milestones described in the project schedule. All milestones were achieved.**

Milestone	Describe why it was not achieved and what proportion was, if any

f. Identify all outputs achieved in your project under the following headings. Use the outputs described in the project schedule.

Output	Output measure used	Output measure proposed	Output measure achieved
Expansion of the DEC fire response database to include Threatened Flora and fire management response plans completed for 13 threatened species	Species/fire management response plans	13	13 (+26 monitoring projects established)
Weed control completed and habitat restoration commenced for 12 threatened species	Species/weed control completed	12	12
Fencing and grazing control completed for 12 threatened species	Species/fencing completed	12	19 (+ 28 priority flora, 6 TEC's and 1 PEC protected)
Control measures for aerial canker developed and implemented on 4 threatened species	Species/aerial canker control completed	4	4

Seed collections completed for 21 threatened species and seed placed in storage in the DEC Threatened Flora Seed Centre	Species/seed collections completed	21	41

g. Identify all outputs not achieved in your project under the following headings. Use the outputs described in the project schedule. **All out-puts achieved**.

Output	Output measure used	Output measure proposed	Output measure achieved

g. Use of Project Results

a. Where have your results been used now and where do you anticipate them being used in the future?

In 2010 seeds from one collection of *Acacia volubilis* were used in a threatened species translocation funded by the State NRM Translocation Project 7. The remaining seed collections are being stored securely until required for future recovery actions. Seed collections are representative of the genetic diversity found in each species and are an insurance policy against extinction in the wild. Considerable benefit will be derived from these collections in the future for groups wishing to conduct translocations or research under an approved Interim Recovery Plan.

The fire management plans prepared for 13 threatened species will be used to inform ecologically sustainable fire management. The fire response monitoring field sheets and monitoring protocols developed during the project will be used by staff to record fire response and life attribute data during ongoing monitoring of populations. The fire response database (spreadsheet) will be used by district flora conservation officers and staff from the Species and Communities Branch, and possibly the Fire Management Branch of DEC. Fire response monitoring data will be added to this spreadsheet as new records so that the knowledge for each threatened species can be improved and readily communicated and used in fire management planning. It is anticipated that the fire response data will becomes part of the corporate threatened flora population monitoring database (DEFL).

When adequate fire response data has been collated and summarised for each species then a statement about the fire response will be added to the species information pages on the publicly available DEC website NatureMap. This information will benefit NRM community groups, wildflower groups and environmental consultants who may be monitoring and managing threatened flora. Weed management notes published on *Florabase* for 44 high priority invasive herb and sedge species are available for use by DEC staff, local government officers, contractors, community volunteers and land managers.

Data collected on the fire responses of 12 threatened flora in the FRNP and Esperance area will be incorporated into DEC fire management strategies for these species and their habitat (e.g. FRNP fire management strategy). It will also be used to guide management of similar habitat types in the South Coast Region. Observations reported in "*Grevillea batrachioides* Population Census and Monitoring of Change 2010" will be used in the active management of both natural and translocated populations and may be incorporated into recovery and management plans. Results from the disturbance (fire) trial will be added to the fire response database. Data collected from monitoring plots installed within recruitment burn sites for *Philotheca basistyla* and *Acacia sciophanes* will be collated into fire management plans for use by the district in planning its operations in those locations. The document "*Preliminary Report on the Fire Response and Recovery of Reedia spathacea F. Muell."* will be used to guide management of populations burnt either under prescribed fire or wildfire conditions in the future. The fire response data has been recently utilised in a pre and post burn monitoring project for a *R. spathacea* population occurring within a planned prescribed burn area in the Frankland district.

Data from the Porongurup weeds project will be used to strategically plan and evaluate efficacy of current and future weed control to protect threatened flora in the national park. Weed maps for Bullsbrook Nature Reserve have been incorporated into the Bullsbrook Nature Reserve Bushland Restoration Plan, a document that will guide DEC staff undertaking on ground works in the reserve. Weed management guidelines for *Schoenia filifolia* subsp. *subulifolia* will be implemented in 2011-12.

The management plan prepared for *Diplolaena andrewsii* will guide on ground management, including research trials, across populations. This document will assist DEC staff, community groups in John Forest National Park and the owner of land supporting a population. Data gathered during the project will assist in completing the Interim Recovery Plan (currently in draft).

Monitoring at the Busselton TEC (Site A) will be combined with other ongoing small scale herbivorous mammal exclusion trials to document the impact of high number kangaroo populations on native plant communities.

The canker research will assist in the development of a management strategy for canker. It will help to determine environmental triggers for aerial canker epidemics and linkages to climate change through the long term monitoring framework. It will also aid in the development of a predictive capacity for canker impact in relation to climate change scenarios. Monitoring data will input into management and conservation of keystone Proteaceous species, in particular

Banksia species, canker affected communities and threatened flora. It is anticipated that the results of the fungicide research will be used in the management of *in-situ* and translocated DRF where canker is an issue.

b. Please list any benefits this project has provided to other groups.

Weed management notes published on *Florabase* for 44 herb and sedge species are available for use by contractors, local government officers, community volunteers and land managers.

A fire response summary to be made available on the species information pages on the DEC website NatureMap will benefit NRM community groups, wildflower groups and environmental consultants who may be monitoring and managing threatened flora.

Advice regarding management has been provided to the Natural Resource Management Officer, Shire of Denmark for a new canker outbreak.

DEC relationships with neighbouring private landholders have been strengthened during negotiations and operations (e.g. weed control in Watkins Rd Nature Reserve, *Lechenaultia laricina* fencing) undertaken during this project.

Four Goldfields MATES (mentored aboriginal trainee employment scheme) have assisted in site preparation for the disturbance trail to be conducted at the *Gastrolobium graniticum* population. It is hoped that the trainees can participate in the monitoring of the plants after the burn has taken place.

This project has fostered awareness of and community involvement in on ground conservation projects.

Participation by community groups/individuals included:-

- Geraldton Regional Herbarium assisted with survey and monitoring at *Gyrostemon reticulatus* and *Shoenia filifolia* subsp. *subulifolia* populations
- Newdegate Wildflower Group and a DEC volunteer assisted with seed collection from *Grevillea involucrata* and *Philotheca basistyla*
- Wandi Landcare Group assisted with hand weeding and spot-spraying of pigface (**Carprobrotus edulis*) populations and pre and post spray monitoring of the grand spider orchid *Caladenia huegelii*
- A local volunteer dedicated considerable time and expertise in sourcing and compiling data on *Reedia spathacea*
- Friends of the Porongurup Range provided spray equipment; mapping and volunteer weeding activities
- Albany Wildflower Society members assisted with fire ecology quadrats and plant identification in the Fitzgerald River National Park
- Oyster Harbour Catchment Group assisted with equipment, mapping, GIS and field support
- A Friend of Fitzgerald River National Park assisted with flora survey and monitoring

c. What media coverage or other publicity did you use during the project?

Wed 16th Feb 2011 – ABC radio interview with Goldfields Regional Manager on *Gastrolobium graniticum* disturbance trial (Milestone 1)

Article in the local Jurien newspaper "Craytales" 3rd July 2010 and in a DEC update (district poster on display at Jurien foreshore) – "The Mount Lesueur Grevillea" (Milestone 1)

Media release "New protective fencing a success" - January 2011 (Brixton Street – Milestone 3)

Article in "*Wandi Warbler"* December 2010. "Wandi Landcare Group - Wandi Nature Reserve Roundup for 2010." (Milestone 2)

Article in Bushland News 73: Autumn 2010. Erdtsieck, F. (2010). "Weed control in Wandi Nature Reserve" (Milestone 2)

Article in Bushland News 74: Winter 2010. Cullity, J. (2010). "Graceful sun-moth at Wandi" (Milestone 2)

Article in Narpulungup News: February 2010. "An opportunity for botanical volunteers" (Milestone 1)

d. Please name all publications/reports/data collection compiled with the funding from this project. ***Note: Two CD copies of all products completed as a result of this project must be provided with this Final Report***.

- Fire Management Plans for 13 species
- Fire responses of threatened flora in Western Australia. Final Report. State NRM Project (09029). Emergency Recovery Actions for Highest Priority Threatened Flora. Department of Conservation and Environment. E. Shedley 2011. Unpublished Report.
- Oral paper presented at the Australian Network for Plant Conservation 8th National Conference in Perth in September 2010. E. Shedley. "Fire response of threatened flora – what have we learned?" Paper to be published in a special issue of the Journal of the Australian Network for Plant Conservation in 2011.
- Poster presented at Australian Network Plant Conservation 8th National Conference in Perth September 2010. C.E. Crane, S. Barrett, B.L. Shearer and C.P. Dunne. "Comparison of the impacts of plant canker disease and climate on Proteaceae and evaluation of selected fungicides as a management tool for canker control in declared rare flora *Banksia verticillata* and *Lambertia orbifolia*."
- Poster presented at the Australian Network for Plant Conservation 8th National Conference in Perth and at the Midwest Science Summit in Geraldton. G. Phelan, C. Page and A. Chant. "New recruits for the loveable triggerplant (*Stylidium amabile*)."
- Abstract of initial results from canker research published in Threatened Species Research Forum. July 2010.
- Canker research results presented at 'Inspirational Exchanges' discussions. Meetings of the State Centre of Excellence for Climate Change, Woodland and Forest Health, Murdoch University.
- Weed management notes completed and published on *Florabase* for 44 high priority invasive herb and sedge species.
- Rare Flora Report Forms (RFRF) completed for populations of several species, recording size and health of population and identifying current and future threats (e.g. *Eremophila scaberula, Grevillea batrachioides*). Forms forwarded to DEC Species and Communities Branch for inclusion on DEFL database.

e. How will this information be maintained for future use by other interested partners?

Fire response monitoring data will be added to the fire response spreadsheet as it becomes available. It is anticipated that fire response monitoring data will be incorporated into the DEC corporate threatened flora database (DEFL) in the future. Management and maintenance of the database would then become the responsibility of the Species and Communities Branch with data input from district conservation officers and other field staff.

When sufficient data has been collated for each species a fire response summary will be added to the species information pages on the publicly available DEC website NatureMap. The summary will be updated regularly as new information becomes available.

Weed management notes on Florabase will be updated by Swan Region staff as new information on these species becomes available.

5. Participation

a. How many people have been directly employed in your project?

Full time	2
Part time	7
Casual	54

b. How many people have been actively involved in your project? (Please provide details below)

Regular	75
Less regular	100

c. Which groups/organisations/agencies have been involved in the project? List all who contributed to the planning, implementation, administration or financial (in-kind and/or cash) aspects of the project, eg community groups, schools, research organisations, government (Commonwealth, State, Local), business, Indigenous groups. (Please include your own organisation)

Name of Group/organisation/ agency	Type of Involvement (eg full-time employees, casual employees, volunteers, equipment, investigations, development of activities)	Number of Participants (please split into full, part time and casual employees and volunteers)	Financial contributions
Department of Environment and Conservation			
Flora Conservation officers	project planning, implementation, data collection, reporting, supervision	PT x12	
Conservation officers/employees	implementation, seed collection, survey, monitoring	PT x13	
Technical officers	research, seed collection and curation	FT x1,	
Ecologists	planning, implementation, data collection, reporting, supervision	PT x3,	
Research scientists	project management, technical advice, review, fire response database and fire management plans	PT x9,	
Ranger	supervision, implementation	PT x1	
Community education co-ordinator	planning, implementation, supervision	PT x1	
Reserves/operations officers	implementation	PT x3	
Nature conservation co-ordinators	supervision	PT x4	
Administration officers	admin support	PT x10	
Species and Communities Branch - manager, co-ordinator, senior botanist	advice, review	PT x3	
Project co-ordinator (Environmental Impact Assessment)	planning, implementation	PT x1	
Regional leader, parks and visitor services	field assistance	PT x1	
Goldfields MATES (mentored aboriginal trainee employment scheme)	field assistance	PT x4	
District protection officers	field assistance	PT x2	
Fencing the Capes fencing contractors	fencing	casual x1	
South West Tree Safe	vegetation removal	casual x1	
Geographe Underground Services	site preparation	casual x2	
Australind Contracting and Tractor Hire	site preparation + construction activities	casual x2	

Rob Johns Rock drilling	site preparation + construction activities	casual x1	
Skills labour hire	weed control	casual x12	
Klaus Braun ICS Group	co-ordinate and collate GIS mapping	casual x 1	
Fencing contractors (various)	fencing	casual x 14	
Bush regenerators	weed spraying	casual x2	
private consultant	flora surveys	casual x1	
Friends of the Porongurup Range	mapping, hand weeding, GPS and spraying equipment	volunteer x 5	
Oyster Harbour Catchment Group	mapping, GIS + field support, spraying equipment	volunteer x 5	
Wildflower Society of WA (Albany)	seed collection +plant ID	volunteer x 4	
Fitzgerald River National Park volunteer	flora survey + monitoring	volunteer x 1	
Geraldton Regional Herbarium	flora surveys, monitoring, plant ID	volunteer x 7	
Friends of Brixton St Wetlands	monitoring + fence maintenance	volunteer x 6	$2,795.45
Newdegate Wildflower Group	seed collection	volunteer x 1	
DEC volunteers	seed collection	volunteer x 2	
volunteer	data sourcing/compilation	volunteer x 1	
private landowners	liaison, rabbit control, fencing	volunteer x2	
WACE, Community Service Program, Perth Modern School student	monitoring	volunteer x1	
Main Roads	liaison	X1	
Department of Agriculture and Food, WA	plant pathogen collection, technical advice on weed control	X2	
West Net Rail	liaison	X1	
Mingenew Shire	liaison	X1	

Kojonup Shire	monitoring quadrat set-up	X1	
Murdoch University Program for Australian Tree Health	advice	X1	
Botanic Gardens and Parks Authority	advice	X1	
UWA research scientist	advice	X1	

d. Future Action

Describe any future actions that are planned or are likely to arise as a result of this project.

How is your organisation planning to maintain the project after funding has ceased? (eg who is responsible for ongoing maintenance and operations?)

The monitoring, collation and analysis of fire response data will continue. Further development of the monitoring protocols may be required to include more detailed fire behaviour data and to quantify other interacting threats. Fire response monitoring quadrats will be established more widely in threatened flora populations so that trends can be identified and quantified more accurately. Training on the collection of fire response monitoring data will be incorporated into appropriate training programs (e.g. DEC Flora Conservation Training Course).

Fire response monitoring quadrats installed within populations of 26 threatened flora species (see CD) will continue to be monitored by district and regional staff. Data obtained during monitoring will be submitted for inclusion on DECs Threatened and Priority Flora Database and the fire response database.

The disturbance (burn) trial for *Gastrolobium graniticum* will be implemented in 2011. Fencing of the site will be completed after the burn. Ongoing monitoring will be the responsibility of the regional conservation officer. Goldfields MATES (mentored aboriginal trainee employment scheme) employees may provide assistance with monitoring. Any weeding, fence repairs and possibly watering of the seedlings will be undertaken as required.

The disturbance (burn) trial for *Grevillea batrachioides* will also be implemented in 2011. Follow up monitoring will be carried out by DEC staff and in the longer term will be incorporated into the annual monitoring of the species.

Six monthly monitoring and manual weed control at the disturbance trial site for *Gyrostemon reticulatus* will continue and will be the responsibility of the district conservation officer. Survey of any recently burnt sites within the range of this species occurrence will be conducted by DEC staff, possibly with the assistance of the Geraldton Regional Herbarium.

In the Porongurup Range National Park follow-up weed surveys and management will be required to maintain effective control of dolichos and blackberry infestations. National Park staff will be responsible for implementing weed control programs with likely assistance from the Oyster Harbour Catchment Group and Friends of the Porongurup Range.

Weed management in the Bullsbrook, Wandi and Watkins Rd nature reserves will need to continue annually for a number of years, depending on resources, and will be the responsibility of the DEC district and regional staff. The weed management notes will be updated by Swan Region staff as new information on these species becomes available.

The impact of grazing exclusion following the fencing of *Grevillea acropogon, Caladenia winfieldii, Philotheca basistlya, Lechenaultia laricina* and *Reedia spathacea* populations will be monitored by the district flora conservation officers. Fences will be inspected regularly and any required maintenance, baiting or weed control will be carried out by DEC staff. If natural regeneration does not occur in the highly disturbed *Reedia spathacea* populations then the option of manual seeding and planting will be explored. The feral pig control program associated with this fencing program is the responsibility of the DEC Frankland District Feral Animals program co-ordinator.

In the Busselton district, quadrats and transects installed to assess the impact of exclusion fencing will be monitored annually in spring for the first three years and beyond that bi-annually. Fence maintenance at all sites and rabbit baiting within the kangaroo exclusion fences will be ongoing. Rehabilitation of cleared areas at one of the fenced sites (site B) will be undertaken and may include translocation of other Busselton Ironstone threatened species. These duties will be the responsibility of DEC regional and district conservation staff. Translocation programs at the two newly fenced translocation sites will be reviewed and may be upgraded.

Trail bike activity in the Brixton Street Nature Reserve will continue to be monitored by the “Friends of Brixton St Wetlands” group and DEC regional and district staff. Maintenance of the fence will be the responsibility of district staff.

Implementation of fungicide control options for canker infestations in natural stands of *Banksia verticillata* and translocated *Lambertia orbifolia ssp. orbifolia* populations will be undertaken where required. Annual recording of canker scores and downloading of data

loggers for approximately 10 years will be the responsibility of DEC research and district staff. Investigation of canker causing pathogens will continue.

Threatened flora seed collections made during the project will be maintained under long term storage conditions at the DEC Threatened Flora Seed Centre and will be made available for future use in threatened flora translocation projects as required. Ongoing maintenance of the collections is the responsibility of DEC and involves periodic testing of seeds for viability. Seedlings generated from the monitoring tests may be used for augmenting existing translocation projects, new translocation projects and research into disease susceptibility and other conservation outcomes. Seedlings may also be made available for inclusion in the living collections at the Botanic Gardens and Parks Authority, Kings Park.

f. Group Declaration

This report must be signed by the funding recipient's (the Proponent) Delegated Officer.

In order to maximise the benefits of this Funding, information relating to all projects funded by the State NRM Program is regarded as in the public domain and will be made available to the public on request except for information which needs to be kept confidential. Under privacy legislation, personal information cannot be divulged without the consent of those involved.

Do you consent to the inclusion of contact name and contact details in response to public information requests concerning this project? Yes [X] No [ ]

I declare that the information given on this form is complete and correct.

Signature of Proponent's Delegated Officer			
Name	Dr David Coates		
Position in Organisation	Senior Principal Research Scientist		
Date	14 July 2011	Contact Number(s)	08 9219 9048