Government of **Western Australia**
Department of **Environment and Conservation**

INTERIM RECOVERY PLAN NO. 321

Grevillea acropogon

INTERIM RECOVERY PLAN

2012–2017

March 2012
Department of Environment and Conservation
Pemberton

FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos. 44 and 50. Note: the Department of CALM formally became the Department of Environment and Conservation (DEC) in July 2006. DEC will continue to adhere to these Policy Statements until they are revised and reissued.

Plans outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

DEC is committed to ensuring that threatened taxa are conserved through the preparation and implementation of Recovery Plans (RPs) or IRPs, and by ensuring that conservation action commences as soon as possible and, in the case of Critically Endangered (CR) taxa, always within one year of endorsement of that rank by the Minister.

This plan will operate from March 2012 to February 2017 but will remain in force until withdrawn or replaced. It is intended that, if the species is still ranked CR this plan will be reviewed after five years and the need for further recovery actions assessed.

This plan was given regional approval on 30th March 2012 and approved by the Director of Nature Conservation 19th April 2012. The allocation of staff time and provision of funds identified in this plan is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

Information in this plan was accurate at March 2012.

PLAN PREPARATION

This plan was prepared by Jo Smith[1], Ian Wilson[2], Cassidy Newland[3], Andrew Brown[4]

[1] District Flora Conservation Officer, Donnelly District, DEC, PO Box 20, Pemberton WA 6260
[2] District Nature Conservation Co-ordinator, Donnelly District, DEC, PO Box 20, Pemberton, WA 6260
[3] Conservation Officer, Warren Region, DEC, Locked Bag 2, Manjimup, WA 6258
[4] Coordinator (Threatened Flora), Species and Communities Branch, DEC, Locked Bag 104, Bentley Delivery Centre, 6983

ACKNOWLEDGMENTS

The following people have provided assistance and advice in the preparation of this plan:

Anne Cochrane	Senior Research Scientist, Albany Research, DEC, 120 Albany Hwy, Albany, WA 6330
Roger Hearn	Regional Ecologist, Warren Region, DEC, Locked Bag 2, Manjimup, WA 6258
Robyn Luu	Project Officer, Species and Communities Branch, DEC, Locked Bag 104, Bentley Delivery Centre, 6983
Rebecca Dillon	Research Scientist, Albany Research, DEC, 120 Albany Hwy, Albany, WA 6330

We would like to thank the staff of the WA Herbarium for providing access to Herbarium databases and specimen information.

Cover photograph by Jo Smith.

CITATION

This plan should be cited as:

Department of Environment and Conservation (2010) *Grevillea acropogon* Interim Recovery Plan 2010–2015. Interim Recovery Plan No. 321. Department of Environment and Conservation, Western Australia.

SUMMARY

Scientific name:	***Grevillea acropogon***	**Common name:**	None
Family:	Proteaceae	**Flowering period:**	June–September
DEC Region:	Warren	**DEC district:**	Donnelly
Shire:	Manjimup	**Recovery team:**	Warren Region Threatened Flora Recovery Team

Illustrations and/or further information: Department of Environment and Conservation (1998-) *Western Australian Herbarium FloraBase 2 – Information on the Western Australian Flora.* Department of Environment and Conservation, Perth, Western Australia. http://www.calm.wa.gov.au/science/; Hearn, RW, Meissner, R, Brown, AP, Macfarlane, TD and Annels, TR (2006) *Declared Rare and Poorly Known Flora in the Warren Region.* Australian Government Department of Environment and Heritage and Department of Conservation and Land Management; Australian Biological Resources Study (2000) *Flora of Australia*; *Vol. 17A, Proteaceae 2, Grevillea*. Canberra, ACT.

Current status: *Grevillea acropogon* is declared as Rare Flora and ranked Critically Endangered (CR) under International Union for Conservation of Nature (IUCN 2001) Red List criteria B1ab(iv,v)+2ab(iv,v); C2a(ii) as it has an extent of occurrence of less than 100km², an area of occupancy of less than 10 km², is only known from one location and until recently there has been a continuing decline in the number of mature individuals.

The species is highly threatened occurring on a single location, excluding the recently planted translocation site, with a very small number of mature individuals making the species susceptible to a single threat event. The main threats are its narrow distribution, death of plants from animal trampling and changes in hydrology.

Description: *Grevillea acropogon* is a prostrate to erect shrub to 1.8m high. The leaves are rigid with the ultimate lobes linear and pungent. The flowers are red; the perianth glabrous outside except for a few inconspicuous appressed hairs near the tip of limb segments and densely bearded inside (Makinson, 2000).

Habitat requirements: *Grevillea acropogon* is currently known from just one population east of Manjimup. It grows in shallow soils over ironstone on the margins of a seasonally inundated area.

Habitat critical to the survival of *Grevillea acropogon* and important populations: Given that *Grevillea acropogon* is ranked as CR, it is considered that all known habitat for wild populations is critical to the survival of the species, and that all wild populations are important populations. Habitat critical to the survival of *G. acropogon* includes the area of occupancy of important population; areas of similar habitat surrounding and linking the population (these providing potential habitat for population expansion and for pollinators); additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations; and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

Benefits to other species or ecological communities: Recovery actions implemented to improve the quality or security of the habitat of *Grevillea acropogon* will also improve the status of associated native vegetation dominated by *Hakea* and *Dryandra*. The species is not known to occur in association with any threatened taxa or ecological communities.

International obligations: This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that convention. *Grevillea acropogon* is not specifically listed under any international treaty, however, and this plan does not affect Australia's obligations under any other international agreements.

Indigenous consultation: A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register revealed that *Grevillea acropogon* falls within the bounds of Site 21909, a site covering a large area registered as a traditional hunting and camping area. Input and involvement will be sought through the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs to determine if there are any issues or interests. Indigenous opportunity for future involvement in the implementation of the Recovery plan is included as an action in the plan.

Social and economic impacts: The implementation of this plan is unlikely to cause significant adverse social and economic impacts as the populations occurs on a Department of Water Reserve and a DEC managed Nature Reserve. However many of the actions outlined under this recovery plan fall outside of the routine works of the Warren Region and the successful implementation of these actions without additional or external funding will have a significant impact on the current Regional budget. If Nature Conservation funds are unavailable recovery works will be deferred.

Affected interests: Stakeholders potentially affected by the implementation of this plan include the Department of Water and potentially the owners of private property in close proximity to the population.

Evaluation of the plans performance: DEC, with assistance from the Warren Region Threatened Flora Recovery Team (WRTFRT) will evaluate the performance of this plan. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed following four years of implementation.

Existing recovery actions: The following recovery actions have been or are currently being implemented.

1. The Department of Water has been made aware of the location and the conservation status of the taxon.
2. Field surveys have been undertaken in similar habitat in the Lake Unicup area and to the north of the Type population by staff from DEC's Donnelly District.
3. In December 2004 seed was collected and lodged with the Threatened Flora Seed Centre for storage and germination trials.
4. Germination trials have been conducted and seed viability was found to be 88%.
5. In 2006 DEC staff re-surveyed the extent of the known population and found a few additional individuals of the taxon.
6. A bushfire outbreak in January 2007 came in close proximity to the population of Grevillea acropogon. An exclusion track has been established to the west of the population, realigning the existing fire access track.
7. Staff from DEC's Donnelly District monitor the population of the taxon annually.
8. An animal exclusion fence was installed in 2008 to prevent further trampling, with additional rabbit proofing installed later in 2010.
9. Vehicle access to the population has been excluded through the installation of fencing.
10. Routine monitoring in 2009 found 32 new plants including 29 juveniles with 5 previously recorded mature plants having been lost.
11. A translocation was undertaken in 2009 in nearby similar habitat raising the number of known populations to 2 and preliminary planning for a second translocation has been undertaken.
12. The translocation site was fenced in 2011.
13. Boot clean down stations have been constructed at both the population and translocation site to prevent the spread of disease.
14. The WRTFRT are assisting DEC in overseeing the implementation of this plan and will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

Plan Objective: The objective of this plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the species in the wild.

Criteria for success: The number of populations have increased or the genetic diversity of populations has increased or the number of mature individuals within original population have increased by 20 per cent or more over the term of the plan.
Criteria for failure: The number of populations have decreased or genetic diversity of the populations have decreased or the number of individuals within populations have decreased by 10 per cent or more over the term of the plan.

Recovery actions

1. Coordinate recovery actions
2. Secure the tenure of Population 1
3. Monitor population and translocation
4. Develop and implement a fire management strategy
5. Determine *Phytophthora cinnamomi* susceptibility
6. Monitor hydrology and salinity
7. Prepare and implement a Dieback Management Plan
8. Undertake a study of the genetic diversity of the species
9. Map habitat critical to the survival of *Grevillea acropogon*
10. Liaise with Department of Water and Indigenous groups
11. Obtain biological and ecological information
12. Liaise with FPC regarding nearby plantation management
13. Develop and implement fire disturbance trials
14. Promote awareness
15. Conduct further surveys
16. Conserve genetic diversity of the species
17. Undertake a second translocation
18. Nominate *Grevillea acropogon* for listing under the Commonwealth EPBC Act
19. Review this plan and assess the need for further recovery actions

1. BACKGROUND

History

Grevillea acropogon was first collected by Ted Middleton on private property owned by the then Water Authority of WA to the north of Lake Unicup Nature Reserve in 1993 and later in 1996. Following collection of additional material by Ray Cranfield in 1999, the species was formally described as a distinct taxon in 2000 by Makinson.

In 2001 a collection was made on private property 53 km north of the known population near Kulikup Nature Reserve, later searches of the area failed to relocate any plants. Despite intensive survey at similar sites between 2000 and 2006 throughout the Lake Unicup/Muir and Perup areas, no additional populations of *Grevillea acropogon* were located and presently the species remains known from only one natural existing population.

Whilst little is known about the possible former distribution of this species, it is likely that high degree of land clearing for agriculture in this area is a significant contributor to the geographic restriction of the species.

Description

Grevillea acropogon is a prostrate to erect shrub to 1.8m high with branchlets softly angular to sub terate, loosely to sparsely sub-tomentose with straight hairs, becoming nearly glabrous. Leaves are linear, rigid, 1.5 to 2.5 cm long, divaricately pinnatisect with five to seven primary lobes 10 to 15 mm long by 0.8 to 1.1 mm wide, the upper surface loosely subtomentose or subsericeous, soon glabrous, not pitted. Margins are angularly revolute and the lower surface mostly or wholly enclosed except for mid-veins. The conflorescence is decurved, shortly and broadly secund, 18 to 24 flowered, acropetal. The rachis is 12- 17 mm long (only c. eight to nine mm active), openly pubescent becoming almost glabrous. The perianth and style are both red, the perianth glabrous outside except for a few inconspicuous appressed hairs near the tip of the limb segments, densely bearded inside. The pistil is 20 to 22 mm long. (Makinson, 2000)

Distribution and habitat

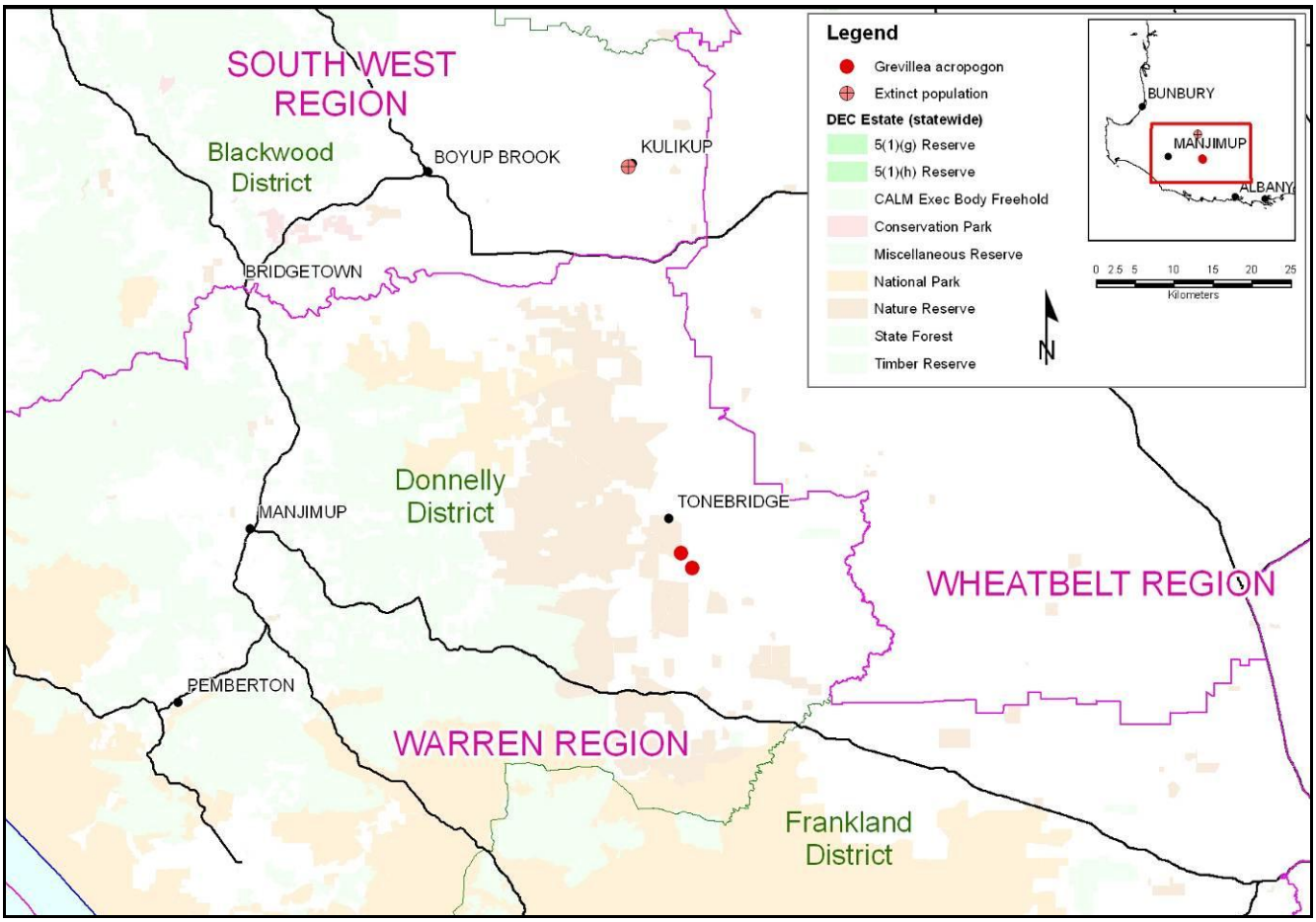
Grevillea acropogon is currently known only from a single population north of Lake Unicup and east of Manjimup and the nearby translocation site, however a historic record exists of at least one plant further north near Kulikup, see Map 1, but attempts to relocate the plant have been unsuccessful. The species grows in shallow soils on the slopes of a low ironstone expression at the edge of a seasonally inundated area. It occurs in open Proteaceae heath of *Hakea* and *Dryandra*. The natural population encompasses two separate sites within approximately 50 m of each other.

Table 1: Summary of population land vesting, purpose and management

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Management
1. SE of Tonebridge	Donnelly	Manjimup	Department of Water	Freehold	Department of Water
2. SE of Tonebridge	Donnelly	Manjimup	Conservation Commission	Nature Reserve	DEC

Population 2 is the translocated population established in 2009.

Map 1. Distribution of *Grevillea acropogon*



Biology and ecology

Grevillea acropogon flowers from June to September and is restricted to shallow soils over wet ironstone in heath of *Banksia armata, Hakea* sp., *Daviesia* sp., *Melaleuca scabra and Xanthorrhoea preissii* surrounded by *Eucalyptus marginata, Eucalyptus decipiens* and *Melaleuca cuticularis* woodland.

Viability of seed has been recorded at 88% from germination trials carried out at the Threatened Species Seed Centre (A. Crawford, unpublished data) and multiple germination events have been recorded in population 1 in the absence of fire. Until the exclusion of kangaroos from population 1, germination of seedlings had only been observed under the protection of mature plants however since the exclusion, seedlings have been observed in the open outside of the protection of parent plants. Observations made by Jo Smith in 2010 of recruitment suggest the survival rate of these seedlings in the first year is around 33% but more rigorous study is required to confirm this.

As mentioned above it is known that germination of *Grevillea acropogon* seed is not reliant on fire as a number of germination events have been observed however the fire response of the species has yet to be determined but it is believed to the species is killed outright by fire and relies on seed for regeneration of a population.

Observations made since the exclusion fence suggest that whilst mature plants deter grazing, seedlings are being grazed by kangaroos which is supported by the observation of seedlings in unprotected areas since the erection of a kangaroo exclusion fence.

Seed predation may be an additional issue to recruitment in the wild as the large size of the seed may make it more vulnerable to predation (pers. Comm.. Ray Cranfield).

Threats

Grevillea acropogon was declared as Rare Flora and ranked Critically Endangered in September 2007. It currently meets World Conservation Union (IUCN 2001) Red List Category 'CR' under criteria A2(a,e); B1(a)(b-iv); B2(a)(b-iv); C1; C2(ii); D;E as it is known to exist from only one location; the number of mature individuals has continued to decline over a period of 10 years and the area of occupancy less than 10 km^2. The main threats are narrow distribution, vehicle access, drought, trampling, disease, inappropriate fire regimes, altered hydrology and the potential threat of salinity.

Vehicle access – access was previously a threat with a vehicle track running through the middle of the population constituting a disease risk and hampering regeneration and resulting in some plant deaths, however this track has now been closed following fencing of the population. Vehicle access around the population should continue to be monitored to prevent the spread of *Phytophthora* disease.

Drought –it is presumed that, because *G. acropogon* grows on shallow soils over ironstone on the edge of a seasonally inundated area, the survival of the species may be affected by drought. More research is required to determine this species susceptibility to a decrease in rainfall.

Trampling – animal tracks are present through the population of *Grevillea acropogon* with trails being created where they are moving through. This has caused considerable damage to the foliage, particularly that which is more prostrate. It is most likely that these tracks are used by kangaroos. The population has recently been fenced off and since then there has been recruitment within the population.

Grazing – prior to the exclusion of kangaroos seedlings were only observed under the protection of mature plants however since exclusion of seedlings have been observed in the open suggesting seedlings were being grazed by kangaroos. Fencing should be considered for all translocation sites.

Disease – a sample of a dead *Banksia littoralis* from the site where *Grevillea acropogon* occurs was tested for the presence of *Phytophthora cinnamomi* with a negative result. It is not known whether or not *Grevillea acropogon* is susceptible to *Phytophthora cinnamomi,* therefore testing of the species' susceptibility to this pathogen is required. Even if the *Grevillea* is not directly susceptible, a decline and degradation of the vegetation and habitat in which it occurs may impact on this rare species in the long term if the dieback disease is introduced into the area, to prevent this boot cleaning stations have been installed at the access points to the population and translocation.

Altered hydrology –a number of *Eucalyptus decipiens* occurring approximately 200m to the ESE of the population of *Grevillea acropogon* have died, with additional eucalypts senescing towards the *G. acropogon* population which may be the result of elevated groundwater levels. The establishment of plantations in the areas has helped prevent further rises in ground water and whilst it is unlikely that the current groundwater level will have an impact on the population, ground water is likely to rise following the harvest of nearby plantations, which may impact on the population and could lead to some secondary salinisation at the site.

Salinity – is a potential threat to the species with soils in the area are known to have a salt store which could be mobilised if there are rises in groundwater as mentioned above through the harvesting of the nearby plantations. Secondary salinisation of the site is likely to result in decline of the *Grevillea acropogon* population.

Inappropriate fire regimes - it is thought that *Grevillea acropogon* is probably killed outright by fire and regenerates from seed after fire. However, until such information is confirmed through trials, a no burn policy should be used. Inappropriate fire regimes may interfere with the reproduction phase (flowering, pollination, seed development, seed dispersal) of the species resulting in low or nil recruitment.

Narrow distribution – *Grevillea acropogon* has a current known distribution of less than 1km² making it vulnerable to a single event impacting on the population. The species is currently only known from 1 natural population and the recently planted translocation site.

Senescence – plant health from 2006 to 2009 has shown a marked decline and it is expected that senescence of mature individuals was the likely cause of some of the decline. Before the erection of the animal exclusion fence senescence of the population was a major issue but the 2009 survey shows there has been some recruitment following the erection of the fence with 29 juveniles having been observed. However until the continued survival of these juveniles is confirmed senescence remains and issue within population 1.

The intent of this plan is to provide actions that will deal with immediate threats to *Grevillea acropogon*. Although climate change may have a long-term effect on the species, actions taken directly to prevent the impact of climate change are beyond the scope of this plan.

Table 2: Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1. SE of Tonebridge	Department of Water	2006 56 mature 2009 54 mature, 29 juvenile 2010 46 mature, 61 juvenile 2011 75 mature, 110 Juvenile	Very Good Good Good Very Good	Narrow distribution, vehicle access, drought, trampling, disease, salinity, inappropriate fire regimes, senescence, grazing
2. SE of Tonebridge	DEC	2009 154 seedlings planted 2010 213 seedlings planted	Very Good Very Good	Kangaroo trampling, grazing, inappropriate fire regimes

Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments and/or land clearing in the immediate vicinity of *Grevillea acropogon* populations require assessment. Developments or clearing should not be approved unless the proponents can demonstrate that their actions will have no significant impact on the species, its habitat or potential habitat, or the local surface and ground water hydrology, such that drainage in the habitat of the species would be altered.

Actions that could result in any of the following may potentially result in a significant impact on the species:

- Damage or destruction of occupied or potential habitat.
- Alteration of the local surface hydrology or drainage.
- Reduction in population size.
- A major increase in disturbance in the vicinity of a population.
- Spread or amplification of dieback disease.

Habitat critical to the survival of *Grevillea acropogon* and important populations

Given that *Grevillea acropogon* is ranked as CR, it is considered that all known habitat for wild populations is critical to the survival of the species, and that all wild populations are important populations. Habitat critical to the survival of *G. acropogon* includes the area of occupancy of important population; areas of similar habitat surrounding and linking the population (these providing potential habitat for population expansion and for pollinators); additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations; and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of the habitat of *Grevillea acropogon* will also improve the status of associated native vegetation dominated by *Hakea* and *Dryandra*. The species is not known to occur in association with any threatened taxa or ecological communities.

International obligations

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that convention. *Grevillea acropogon* is not specifically listed under any international treaty, however, and this plan does not affect Australia's obligations under any other international agreements.

Indigenous consultation

A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register revealed that *Grevillea acropogon* falls within the bounds of Site 21909, a site covering a large area registered as a traditional hunting and camping area. Input and involvement will be sought through the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs to determine if there are any issues or interests. Indigenous opportunity for future involvement in the implementation of the Recovery plan is included as an action in the plan.

Social and economic impacts

The implementation of this plan is unlikely to cause significant adverse social and economic impacts as the populations occurs on a Department of Water and a DEC managed Nature Reserve. However many of the actions outlined under this recovery plan fall outside of the routine works of the Warren Region and the successful implementation of these actions without additional or external funding will have a significant impact on the current Regional budget. If Nature Conservation funds are unavailable recovery works will be deferred.

Affected interests

Stakeholders potentially affected by the implementation of this plan include the Department of Water and potentially the owners of private property in close proximity to the population.

Evaluation of the plans performance

DEC, in conjunction with the Warren Region Threatened Flora Recovery Team (WRTFRT) will evaluate the performance of this plan. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed following four years of implementation.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

The objective of this plan is to abate identified threats and maintain or enhance viable *in situ* populations to ensure the long-term preservation of the species in the wild.

Criteria for success: The number of populations have increased or the genetic diversity of populations has increased or the number of mature individuals within original population have increased by 20 per cent or more over the term of the plan.

Criteria for failure: The number of populations have decreased or genetic diversity of the populations have decreased or the number of individuals within populations have decreased by 10 per cent or more over the term of the plan.

3. RECOVERY ACTIONS

Existing recovery actions

The Department of Water has been made aware of the location and the conservation status of the species.

Field surveys have been undertaken in similar habitat in the Lake Unicup area and to the north of the Type population by staff from DEC's Donnelly District.

In December 2004 seed was collected and lodged with the Threatened Flora Seed Centre for storage and germination trials.

Germination trials have been conducted and seed viability was found to be 88%.

In 2006 DEC staff re-surveyed the extent of the known population and found a few additional individuals of the taxon.

A bushfire outbreak in January 2007 came in close proximity to the population of Grevillea acropogon. An exclusion track has been established to the west of the population, realigning the existing fire access track.

Staff from DEC's Donnelly District monitor the population of the taxon annually.

An animal exclusion fence was installed in 2008 to prevent further trampling, with additional rabbit proofing installed later in 2010.

Vehicle access to the population has been excluded through the installation of fencing.

Routine monitoring in 2009 found 32 new plants including 29 juveniles with 5 previously recorded mature plants having been lost.

A translocation was undertaken in 2009 in nearby similar habitat raising the number of known populations to 2 and preliminary planning for a second translocation has been undertaken.

The translocation site was fenced in 2011.

Boot clean down stations have been constructed at both the population and translocation site to prevent the spread of disease.

The WRTFRT are overseeing the implementation of this plan and will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

Future recovery actions

Where recovery actions occur on lands other than those managed by DEC, permission has been or will be sought from appropriate owners/land managers prior to recovery actions being undertaken. The following recovery actions are generally in order of descending priority, influenced by their timing over the life of the plan. However this should not constrain addressing any of the actions if funding is available and other opportunities arise.

1. Coordinate recovery actions

DEC with assistance from the WRTFRT will continue to oversee the implementation of recovery actions for *Grevillea acropogon* and will include information on progress in its annual report to DEC Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: DEC (Warren Region) with assistance from the WRTFRT
Cost: $1,500 per year

2. Secure the tenure of the natural population

The only naturally occurring population is located on freehold land held by the Department of Water. Negotiations to have the area transferred to DEC for inclusion within the conservation estate are continuing.

Action: Secure the tenure of the natural population
Responsibility: DEC (Warren Region, Donnelly District)
Cost: $,3,000 for years 1 and 2

3. Monitor population and translocation

Monitor the natural population and the translocated population of *Grevillea acropogon* annually for factors such as *Phytophthora* disease, salinity, habitat degradation, illegal vehicle access, population stability (expanding or declining), flower and seed production, recruitment and longevity. In addition monitor and maintain fencing and irrigation system as required.

Action: Monitor populations
Responsibility: DEC (Donnelly District)
Cost: $7,000 per year

4. Develop and implement a fire management strategy

To protect the natural population and translocation sites from the possible detrimental effects of inappropriate fire, the critical habitat of *Grevillea acropogon* will be excluded from prescribed burns, until further scientific information on the species is available regarding its reproductive cycle and response to fire. A fire management strategy will be developed by DEC's Donnelly District in consultation with relevant authorities and land managers.

Action: Develop and implement a fire management strategy
Responsibility: DEC (Donnelly District) in consultation with relevant authorities and land managers
Cost: $3,000 in first year, and $1,700 in years 2-5

5. Determine *Phytophthora cinnamomi* susceptibility

The susceptibility of *Grevillea acropogon* to *Phytophthora cinnamomi (Pc)* has not been determined. Plants will be propagated from seed from held at DEC's Threatened Flora Seed Centre and inoculated with *Pc* in glass house trials to determine the *Pc* susceptibility of *Grevillea acropogon*.

Action: Determine *Phytophthora cinnamomi* susceptibility
Responsibility: DEC (Donnelly District; Science Division)
Cost: $10,000 in year 2

6. Monitor hydrology and salinity

Population 1 and the translocation site are surrounded by an existing network of deep monitoring bores, routinely monitored by DEC's Warren Region, but no shallow bores are located near the two sites. Donnelly District in consultation with the Warren Region will establish shallow bores at both sites to monitor near surface water levels and salinity in the populations every 2 months and will liaise with the Warren Region in regards to hydrological data from their nearby deep bores. If it is not possible to use hand augers to establish shallow bores, costs and timeframes will need to be revisited. Monitoring should be combined with other monitoring requirements to reduce costs.

Action: Monitor hydrology and salinity
Responsibility: DEC (Donnelly District)
Cost: $7,000 in year 1 $2,500 per year in years 2-5

7. Prepare and implement a dieback management plan

With only a small number of mature individuals and a small distribution *Pc* poses a serious threat to *Grevillea acropogon* if it is susceptible to the pathogen. Given the potential risk a dieback management plan should be prepared including the identification of likely sources of infection, monitoring dieback fronts, measures to prevent spread and strategies to minimise the impact of any infection within the population including the potential application of Phosphonate.

Action: Monitor *Phytophthora* impact and spray if required
Responsibility: DEC (Donnelly District)
Cost: $2000 in year 1 & up to $5,000 in years 2-5 depending on management requirements

8. Undertake a study of the genetic diversity of the species

To enable conservation of the genetic diversity of the species a study should be undertaken of the genetic diversity of plants from the original population, translocation sites and soil seed store. Of particular importance is the soils seed store which may contain additional genetic diversity to that expressed within the present live population.

Action: Undertake a study of the genetic diversity of the species
Responsibility: DEC (Donnelly District, TFSC, Science Division)
Cost: $15,000 per year in years 2

9. Map habitat critical to the survival of *Grevillea acropogon*

It is a requirement of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) (Section 207A) that spatial data relating to critical habitat be determined. Critical habitat to the survival of the species is alluded to in Section 1. Although habitat critical to the survival of the species is alluded to in Section 1, all the areas described have not yet been accurately mapped and will be addressed under this action. If additional populations are located, habitat critical to their survival will also be determined and mapped.

Action: Map habitat critical to the survival of *Grevillea acropogon*
Responsibility: DEC (Donnelly District)
Cost: $2,000 in year 2

10. Liaise with Department of Water and Indigenous communities

Staff from DEC's Donnelly District will liaise with Department of Water to ensure that the population is not accidentally damaged or destroyed. Indigenous consultation will take place to determine if there are any issues or interests in areas that are habitat for *Grevillea acropogon.*

Action: Liaise with Department of Water and Indigenous communities
Responsibility: DEC (Donnelly District)
Cost: $2000 per year

11. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Grevillea acropogon* will provide a better scientific basis for its management in the wild. An understanding of the following is particularly necessary for effective management:

1. Investigate the species 'response to disturbance, including fire, following Adaptive Management principles, see recovery action 13.
2. Investigate time to first flowering.
3. Investigate the species pollination biology.
4. Investigate the levels of flower and fruit production.
5. Investigate seed longevity.
6. Investigate conditions necessary for germination.
7. Determine longevity of plants and time taken to reach maturity.

Action: Obtain biological and ecological information
Responsibility: DEC (Science Division, Donnelly District)
Cost: $8,000 per year

12. Liaise with FPC regarding nearby plantation management

Nearby FPC share farm plantations are helping maintain current hydrology, but the harvest of these plantations may raise the water table in the vicinity of population 1 which could lead to decline through water logging or secondary salinisation. DEC Donnelly District will liaise with FPC regarding harvest timelines for these plantations and possible options such as staggered harvesting to minimise the threat to the population.

Action: Liaise with FPC regarding the nearby plantation management
Responsibility: DEC (Donnelly District)
Cost: $1000 per year

13. Develop and implement fire disturbance trials

DEC Donnelly District will, in consultation with Science Division, Warren Region and Department of Water, will develop and implement deliberate disturbance trials within a subsection of the population in 2012/2013 and will make provision for the monitoring of populations which are subjected to unplanned fire. If unplanned fire occurs in a population and suitable observations can be gathered, deliberate disturbance trials will not be implemented. Deliberate disturbance trials should only be implemented if population 1 is in good condition and the initial translocation site is successful as per the success criteria listed in the translocation proposal, if growth rates at the translocation site are slow this action should be deferred as determined suitable.

Action: Develop and implement fire disturbance trials
Responsibility: DEC (Donnelly District, Science Division, Warren Region) in consultation with Department of Water
Cost: $3,000 to prepare proposal in first year, $7,000 to implement in year 3 and $1,500 in years 4 and 5 to monitor

14. Promote awareness

With previous a previous record of the species on private property over 50km away from the current population it is possible that there may be other unrecorded populations. Raising the awareness of DEC staff and members of the public of this species may lead to further discoveries or interest in hosting further translocations. This will be achieved through an information campaign using the local print and electronic media.

Action: Promote awareness
Responsibility: DEC (Donnelly District, Species and Communities Branch (SCB)) with assistance from the WRTFRT
Cost: $1,500 in the first year, $1,000 in years three and five

15. Conduct further surveys

Surveying areas of suitable habitat for translocation and possible further populations of *Grevillea acropogon* should be undertaken on a systematic basis during the flowering period of June to September of the species. Surveys will be conducted with the assistance of volunteers where possible, and supervised by DEC staff.

Action: Conduct further surveys
Responsibility: DEC (Donnelly District)
Cost: $2,000 per year in years 2-5

16. Conserve the genetic diversity of the species

To conserve the population in the wild and to propagate for possible future translocations, germplasm collection should be continued and should investigate the collection of soil stored seed in order to collect and conserve a greater genetic diversity of germplasm.

Action: Conserve genetic diversity of the species
Responsibility: DEC (Donnelly District, TFSC)
Cost: $3,300 per year

17. Undertake a second translocation

The single natural population of *Grevillea acropogon* is relatively small and highly threatened. Therefore translocation is essential for the long-term conservation of the species. A single translocation has been undertaken in close proximity to the existing population but the establishment of a second translocation further away will provide greater security for the species. A second translocation will be established further from the existing sites and will include the fencing of the site, to exclude kangaroos and rabbits.

Action: Undertake a second translocation
Responsibility: DEC (Science Division, Donnelly District)
Cost: $20,000 in the third year

18. Nominate *Grevillea acropogon* for listing under the Commonwealth EPBC Act

Staff from DEC Species and Communities Branch (SCB) will develop a Species Profile and Threats (SPRAT) and/or nomination form for this species, and forward it to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities for referral to the Threatened Species Scientific Committee (TSSC) and Minister for the Environment for listing under the EPBC Act.

Action: Nominate *Grevillea acropogon* for listing under the Commonwealth EPBC Act
Responsibility: DEC (SCB)
Cost: $3,000 in year 1

19. Review this plan and assess the need for further recovery actions

If *Grevillea acropogon* is still ranked CR at the end of the five-year term of this plan, the need for further recovery actions, or a review of this plan will be assessed and a revised plan prepared if necessary.

Action: Review this plan and assess the need for further recovery actions
Responsibility: DEC (Donnelly District, Warren Region) with assistance from the WRTFRT
Cost: $2,500 in year 5

Table 3: Summary of recovery actions

Recovery Actions	Priority	Responsibility	Completion date

Coordinate recovery actions	High	DEC (Warren Region) with assistance from the WRTFRT	Ongoing
Secure the tenure of the natural polpulation	High	DEC (Donnelly District)	2014
Monitor population and translocation	High	DEC (Donnelly District)	Ongoing
Develop and implement a fire management strategy	High	DEC (Donnelly District)	Ongoing
Determine *Phytophthora cinnamomi* susceptibility	High	DEC (Donnelly District, Science Division)	2014
Monitor hydrology and salinity	High	DEC (Donnelly District, Warren Region)	Ongoing
Prepare and implement a dieback management plan	Medium	DEC (Donnelly District)	Ongoing
Undertake a study of the genetic diversity of the species	High	DEC (Donnelly District, TFSC, Science Division)	2015
Map habitat critical to the survival of *Grevillea acropogon*	Medium	DEC (Donnelly District)	2014
Liaise with Department of Water and Indigenous communities	Medium	DEC (Donnelly District)	Ongoing
Obtain biological and ecological information	Medium	DEC (Donnelly District, Science Division) and relevant authorities	2017
Liaise with FPC regarding nearby plantation management	Medium	DEC (Donnelly District, SCB, Strategic Development and Corporate Affairs)	Ongoing
Develop and implement fire disturbance trials	Medium	DEC (Donnelly District, Science Division, Warren Region) in consultation with Department of Water	2017
Promote awareness	Medium	DEC (Donnelly District, SCB, Strategic Development and Corporate Affairs) with assistance from the WRTFRT	Ongoing
Conduct further surveys	Medium	DEC (Donnelly District)	2017
Conserve the genetic diversity of the species	Medium	DEC (Donnelly District, TFSC)	Ongoing
Undertake a second translocation	Medium	DEC (Science Division, Donnelly District)	2015
Nominate *Grevillea acropogon* for listing under the Commonwealth EPBC Act	Medium	DEC (SCB)	2013
Review this plan and assess the need for further recovery actions	Low	DEC (Donnelly District, Warren Region) with assistance from the WRTFRT	2017

4. TERM OF PLAN

This plan will operate from March 2012 to February 2017 but will remain in force until withdrawn or replaced. If the taxon is still ranked CR after five years, the need for further recovery actions will be determined.

5. REFERENCES

Department of Conservation and Land Management (1992) Policy Statement No. 44 *Wildlife Management Programs*. Department of Conservation and Land Management, Perth, Western Australia.

Department of Conservation and Land Management (1994) Policy Statement No. 50 *Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna*. Department of Conservation and Land Management, Perth, Western Australia.

Department of Conservation and Land Management (1995) Policy Statement No. 29 *Translocation of Threatened Flora and Fauna* Department of Conservation and Land Management, Perth.

Department of Environment and Conservation (2009) *Translocation Proposal Grevillea acropogon PROTEACEA January 2009* Department of Environment and Conservation, Albany.

Hearn, RW, Meissner, R, Brown, AP, Macfarlane, TD and Annels, TR (2006) *Declared Rare and Poorly Known Flora in the Warren Region.* Australian Government Department of Environment and Heritage and Department of Environment and Conservation.

International Union for Conservation of Nature (2001) *IUCN Red List Categories: Version 3.1. Prepared by the IUCN Species Survival Commission.* IUCN, Gland, Switzerland and Cambridge, UK.

Makinson (2000) *Flora of Australia*; *Vol. 17A, Proteaceae 2, Grevillea*. Australian Biological Resources Study, Canberra, ACT

6. TAXONOMIC DESCRIPTION

Makinson (2000). *Grevillea acropogon*

Prostrate to erect shrub to 1.8m high. Branchlets softly angular to subterete, loosely to sparsely sub-tomentose with straight hairs, becoming nearly glabrous. Leaves rigid, 1.5–2.5cm long, divaricately pinnatisect with 5-7 primary lobes, the basal 1 or 2 pairs again divricately 2- or 3-sect; ultimate lobes linear, 10–15mm long, 0.8–1.1mm wide, pungent; upper surface loosely subtomentose or -subsericeous, soon glabrous, not pitted; margins angularly revolute; lower surface mostly or wholly enclosed except for mid-veins, sometimes lamina narrowly exposed and then subsericeous. Conflorescence decurved, shortly and broadly secund, 18–24 flowered, acropetal; rachis 12–17mm long (only c. 8–9mm active), openly pubescent becoming almost glabrous. Perianth and style both red. Perianth glabrous outside except for a few inconspicuous appressed hairs near tip of limbs segments, densely bearded inside. Pistil 20–22mm long. Follicles and seed not seen.