TRANSLOCATION PROPOSAL
Silky Eremophila
Eremophila nivea R.J. Chinnock (MYOPORACEAE)

1. SUMMARY

E. nivea was first collected by Charles Gardner near Three Springs in 1960. It is an erect shrub to 1.6m. The branches, leaves, pedicels and outer surface of the sepals are covered in white, grey hairs. Leaves are linear and 8-18mm in length by 1.5-3.5mm in width. Flowers occur singularly or in pairs between August and October (Brown *et al.* 1998). The corolla is lilac in colour with white on the lower, inside of the tube. The species is thought to be a partially fire tolerant (Richmond and Coates 1995), and soil stored seed responds to the application of smoke water (Obbens 2000). Viability of the seed varies and has been shown to be up to 100% (A. Cochrane pers. comm.). *E. nivea* is endemic to an area north west of Three Springs, occuring in red-brown sandy loam and lateritic gravel, or clayey loam (Brown *et al*. 1998). It occurs in low lying areas, usually near the edge of seasonal creeks, under York gum (*Eucalyptus loxophleba*) woodland (Beard 1976).

Extensive surveys for this species have failed to locate any additional populations than the nine populations currently known. The species is currently known from just six extant populations (and three extinct populations) of 344 individuals on a shire road reserves and private property. *E. nivea* was declared as Rare Flora in 1987 and ranked as Critically Endangered in September 1995. Its ranking was due to threats from weed invasion, increasing salinity, road and firebreak maintenance activities, inappropriate fire regimes, grazing, chemical drift and poor regeneration.

An Interim Recovery Plan has been published for this species. Under this plan translocation to a secure site is recommended (Phillimore *et al.* 2001). Due to the small number of individuals of this species and the presence of several threatening processes the need for translocation is considered to be high.

The aim of this translocation proposal is to conserve the wild genetic stock of the species over a 5 year period by establishing an additional population and enhancing one known population of *E. nivea* at sites where threats have been ameliorated. This translocation proposal outlines the need for translocation of the critically endangered *E. nivea*, the site selection process, the design of the translocation site and the provisions for monitoring. In addition it outlines the criteria for success or failure of this proposed translocation.

2. PROPONENTS

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3. BACKGROUND

3.1 History, Taxonomy and Status

E. nivea was first collected by Charles Gardner near Three Springs in 1960. In 1964 another population was discovered 80km to the east, however, neither of these populations have been seen again. In 1996 a new population was found north-west of Morawa, and since then only six more populations have been found.

E. nivea is an erect shrub to 1.6m in height. The branches, leaves, pedicels and outer surface of the sepals are covered in white, grey hairs. Leaves are sessile, usually alternate, linear and 8-18mm in length by 1.5-3.5mm in width. Flowers occur singularly or in pairs in the axil on a 2-5.5mm pedicel. The corolla is 15-23 mm in length and is lilac in colour with white on the lower, inside of the tube. Flowering occurs between August and October (Brown *et al.*1998). The species is thought to be a partially fire tolerant (Richmond and Coates 1995) and seedling regeneration from the soil stored seed bank has been recorded after application of smoke water (Obbens 2000). Viability of the seed varies and has been shown to be up to 100% (A. Cochrane pers. comm.).

Extensive surveys for this species have been undertaken during the writing of the Interim Recovery Plan and the Moora and Geraldton District Recovery Plans. The species is currently known from nine populations, however three of these no longer exist as live plants. The species is currently known from just 344 individuals on a shire road reserves and private property. *E. nivea* was declared as Rare Flora in 1987 and ranked as Critically Endangered in September 1995. Its ranking was due to threats from weed invasion, increasing salinity, road and firebreak maintenance activities, inappropriate fire regimes, grazing, chemical drift and poor regeneration.

3.2 Distribution and Habitat

Eremophila nivea is endemic to a small area north west of Three Springs. It occurs in red-brown sandy loam and lateritic gravel, or clayey loam (Brown *et al*. 1998). It occurs in low lying areas, usually near the edge of seasonal creeks, under York gum (*Eucalyptus loxophleba*) woodland (Beard 1976).

4. THE TRANSLOCATION

4.1 The Need to Translocate

E. nivea is restricted a small area of just 35km in radius north west of Three Springs, where there are only nine populations (including three extinct populations) with approximately 344 individuals (Table 1). Despite the discovery of three new populations in 1997 and 1998, there was an overall decline in the number of individuals of approximately 10 plants over the last ten years. Three populations have become extinct.

Translocation to a safe site is recommended in the Interim Recovery Plan and is an essential part of the recovery process of this species. Translocation to a new site and augmentation of a small population are considered important components of the recovery process as this spreads the risk of a threatening process, such as salinity, causing a significant population decline over a greater number of populations and individuals

The species occurs in low lying areas, such as broad valleys and seasonal creeks which are highly prone to the twin problems of rising water tables and increasing salinity (Malcolm 1983). Some 1.8 million hectares in the south west of Western Australia are already affected by increasing salinity and predictions suggest that a further 1.2 million hectares will become saline by 2010 – 2015 (State Salinity Council 2000). Salinity and waterlogging are, therefore, serious threats to the survival of *E. nivea*. There is an urgent need to increase the numbers of individuals, as well as establish new populations, to reduce the risk of salinity and waterlogging causing the extinction of some or all of the known populations. In addition many of the populations occur on narrow degraded road verges where they are extremely vulnerable to accidental destruction during road maintenance.

Translocation of *E. nivea* to secure sites is vital, as it is a highly restricted species that is threatened by increasing salinity and waterlogging and highly vulnerable to accidental destruction in its road verge habitats.

Table 1. Number of plants of *Eremophila nivea* in each population and the land tenure where they occur.

Population number	Number of individuals	Land tenure
1A	21	Shire road reserve
1B.	14	Private property
2.	22	Shire road reserve
3A.	93	Shire road reserve
3B.	1	Private property
4.	0	Shire road reserve
5.	0	Shire road reserve
6.	100+	Private property
7A.	38	Shire road reserve
7B.	11	Private property
8.	0	Shire road reserve
9.	1	Private property

4.2 Translocation Site Selection

A search was made of Nature Reserves around the known populations on 30th January 2001 to locate possible translocation sites. An area at the south eastern corner of Reserve # was chosen as suitable for an initial translocation attempt. In addition the private property where population 7 occurs (Milloy's property) is also considered suitable for a restocking translocation. A map of the proposed translocation sites is shown in Appendix one. Endorsement for the use of these sites was received from the Milloy Family and the CALM Midwest Region (Appendix two).

The first translocation site is located in the south eastern corner of Reserve #. This site contains the same vegetation type of sclerophyll woodland dominated by *Eucalyptus loxophleba* (York Gum) as the known *E. nivea* localities (Beard 1976) and has several associated species in common (Table 2). In addition the site has a soil type of orange clay loam which is also found at the original *E. nivea* localities. This site is only 47 km away from population 1, 2, 3 and 6 and only 17 km away from population 7. Fire records show that the reserve was last burnt in 1999. As this species has not previously been recorded from this reserve this translocation can be considered an introduction under the definitions provided by Policy Statement 29 and the Guidelines for Translocation of Threatened Plants in Australia.

Table 2. Associated plant species at the *Eremophila nivea* populations and the proposed translocation site at Reserve #.

Associated species at *E. nivea* site	Associated species at translocation site
	Acacia bidentata
	Acacia ligustrina
	Atiplex ?amicola
Acacia sp.	
Chenopod sp.	
Eucalyptus loxophleba	*Eucalyptus loxophleba*
	Eucalyptus salomophloia
Maireana brevifolia	*Maireana brevifolia*
Melaleuca sp.	
	Ptilotus divaricatus var. *divaricatus*
	Rhagodia sp. (2 species)
	Sclerolaena uniflora
Stylobasium australe	

There is already a small population (population 7) of *E. nivea* at the second translocation site (Milloy's property). This population was the focus of a rehabilitation project jointly undertaken by World Wide Fund for Nature, Conservation Volunteers Australia, Conservation and Land Management and the landowners, Scott and Judy Milloy. An area of land, approximately 21 hectares, was fenced in 1997 and local Eucalypt species were planted within this fenced area. There appears to be good survival for the Eucalypts, however, despite the exclusion of the stock no recruitment of *E. nivea* seedlings has occurred to date. The lack of recruitment is likely to be due to the lack of events such as fire, which is believed to promote seed germination (Phillimore *et*

al. 2001). As *E. nivea* already occurs at this site, conditions are considered suitable for this species. This translocation can be considered a restocking under the definitions provided by Policy Statement 29 and the Guidelines for Translocation of Threatened Plants in Australia.

Clearly in attempting to closely match the habitat of *E. nivea* for the translocation sites salinity will also be an issue, as it is in the natural populations. It is believed, however, that the translocation sites are at less risk of increasing salinity than some of the natural populations. The site at Reserve # is a sizeable area (347 hectares) dominated by several deep rooted perennial species. It is believed that in the long term this site is less likely to be affected by increasing salinity than many of the natural localities of *E. nivea*. (A. Desmond pers. comm.). The site at the Milloy's property was planted with many deep rooted perennial species in 1997 to assist in preventing salinity increasing. The landowners manage the land surrounding the translocation site with the aim of reducing the threat of salinity. This site is therefore, also less likely to be affected by salinity than the other natural localities of *E. nivea*. Weeds are another threatening process present at the translocation sites. The site at Reserve # has a weed problem, which is currently being treated with applications of herbicide (A. Desmond pers. comm.). It is proposed to treat the site at the Milloy's property with herbicide prior to translocation, and thereafter hand weed around the translocated plants.

4.3 Translocation Design

Two sites are being proposed for the translocation and it is proposed to split the experimental treatments between these. As there are protocols in place for controlled burns on CALM managed reserves it was decided to undertake the burning treatments at Reserve # and implement watering treatments at the Milloy's property. As we will not be making statistical comparisons between treatments that are on different sites this not considered to be detrimental to the experimental design. All activities that are proposed as part of this translocation will be undertaken by, or under the direction of the proponents.

Due to the close proximity of population 1, 2, 3 and 6 (all occur in an area with a radius of 4 km) it is considered unlikely that there are significant genetic differences between them (D. Coates pers. comm.). Seed collected from these populations was therefore bulked together for translocation into Reserve # site. A total of 200 seedlings from this seed have been raised for this year's translocation. Four areas of 10m x 10m each will be measured. In each of these plots seeds will be buried in half the plot (an area of 5m x 10m). Seeds will be pressed into the soil to a depth of no more than 1 cm (which is twice the depth of the seed, a standard horticultural practice (A. Shade pers. comm.), which was a depth shown to produce the best germination percentages in several other Eremophila species (Harrington 1977 – Cited in Richmond 1993). Seeds will be buried in 10 rows of five where each seed is one metre away from the next seed. The plot will then be divided in half perpendicular to the previous division to form four subplots within each plot. Within each plot one subplot with buried seed and one subplot without buried seed will be covered in a light layer of leaf litter (collected in the area) and burnt. After the fire has been allowed to cool, the subplots which did not have buried seed will be planted with seedlings. Seedlings will be planted in 10 rows of five where each seedling is 1m away from the next seedling. Table 3 describes the treatments applied. See Appendix 3 for plot layout. Issues associated with the procedures to be followed during the controlled burn will be addressed in a separate Burn Prescription (see Appendix 4).

Approximately 100 seedlings have been germinated from seed collected from Milloy's property. These will be planted back into this site. Five plots of 5m x 4m will be measured. 20 seedlings will be planted into each plot in four rows of five and spaced one metre apart. In each plot 10 seedlings will be assigned to the watering treatment and 10 will be assigned to the control treatment. Table 3 describes the treatments applied.

Each plant will be permanently tagged so that each individual will always be identifiable. Small cages of rabbit netting with a lid will be placed around each plant to prevent herbivory by mammalian and avarian predators.

Plots will not be cleared of vegetation at the translocation sites; instead seedlings will be planted in gaps in the vegetation, adhering as close as possible to the grid pattern presented in this proposal. Issues associated with the procedures to be followed during the controlled burn will be addressed in a separate Burn Prescription (see Appendix 4). There appears to be no reason that the controlled burn or the translocation will result in adverse effects on the conservation values of this area.

Table 3. Description of experimental treatments.

Site where treatment applied	Treatment	Description of treatment
Reserve #	Direct seeding with no other treatment	Seed will be buried in the soil.
Reserve #	Direct seeding with burning	Seed will be buried in the soil and then litter on the soil surface above the seeds burnt.
Reserve #	Seedlings with no other treatment	Three month old seedlings will be planted.
Reserve #	Seedlings with burning	Litter on the soil surface burnt, then three month old seedlings will be planted.
Milloy's Property	Watered	Plants will be watered with a set amount of water once a week for 24 weeks from the start of November to the end of April to see whether watering over the first summer enhances survival.
Milloy's Property	Not watered	Plants not given any water.

Seedlings have been raised at the accredited nursery at Kings Park and Botanic Gardens and therefore are considered disease free. All equipment used during planting will be maintained under strict disease hygiene.

Monitoring of the translocated population will be undertaken after planting and then at approximately six monthly intervals for a two year period. Monitoring will include counting the number of surviving plants, height of the surviving plants, width of the crown of the surviving plants in two directions, reproductive state, number of flowers and fruit, whether second generation plants are present and general health of the plants. Long term monitoring will also include assessing whether a soil stored seed bank is present. This will be assessed via the collection of soil samples from around the translocated plants and sieving the soil to find any *E. nivea* seeds.

Monitoring of the original populations will also occur every third month in conjunction with monitoring of the translocated populations. This will provide essential baseline data for assessing the performance of the translocated population. Monitoring will include counting the number of individuals, height and crown width of the individuals, reproductive state, number of inflorescences and follicles and general health of the plants. The presence and size of a soil stored seed bank will also be assessed in the same way as the translocated population.

The experimental setup of the translocation site allows this detailed monitoring data to be statistically analysed. In most cases data will be analysed using analysis of variance, and if necessary a post hoc test will be applied. Percentage data will be arcsin transformed prior to analysis. Consultation will be made with the CALM Biometrician for cases where analysis of variance is not considered appropriate. All data is to be stored on a database maintained at the WA Herbarium.

4.4 Source of Plants

Seed was collected from a bulk of 21 plants from population one, 7 plants from population two, 40 plants from population three, 20 plants from population 6 and 40 plants from population 7. The seed and seedlings from population one, two, three and six will be bulked together and used at the translocation site at Reserve #. Seed and seedlings from population 7 only will be used at the restocking site. Seedlings are being raised at Kings Park and Botanic Gardens nursery after being germinated at the Threatened Flora Seed Centre.

4.5 Criteria for Success or Failure

Criteria for Success

- Short Term: establishment of translocated seedlings and seed
  production of flowers and seed
  after one generation the number of individuals is sustained by natural recruitment
- Long Term: after two or more generations the number of individuals is sustained by natural recruitment, and a soil stored seed bank has been established.
- The production of guidelines for the establishment of future translocations of related species.

Criteria for Failure

- Short Term: failure of translocated seedlings and seed to establish
  failure of plants to produce flowers and seed
- Long Term: there is a significant decline in the size of the translocated population due to lack of natural recruitment

5. TIMETABLE

Time	Action
February 2001 – June 2001	Plants raised from cutting material
February 2001	Translocation site selected.
April 2001	Translocation proposal submitted for review.
August 2001	Translocation of seedlings and seed into Reserve # (includes controlled burn) and the Milloy's property.
August 2001 – August 2003	Three monthly monitoring of translocated plants.
November 2001	Setting up of irrigation system.
May - June 2002	Further translocation of seedlings or seed into the translocation site if deemed necessary.
August 2003 – August 2006	Once or twice yearly monitoring of translocated plants and soil seed bank and maintenance of translocation sites.
August 2006	Final Report

6. FUNDING

This project is funded under the Salinity Action Plan Translocation Project. A total of $10, 000 has been provided for the translocation in 2001, which covers all actions outlined in this proposal.

7. ACKNOWLEDGMENTS

Sue Patrick, Neil Gibson and Anthony Desmond are thanked for their input in selecting suitable translocation sites. The Milloy family is thanked for their enthusiastic response to having more *E. nivea* on their property.

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Appendices One, Two and Four may be available on contacting the authors.

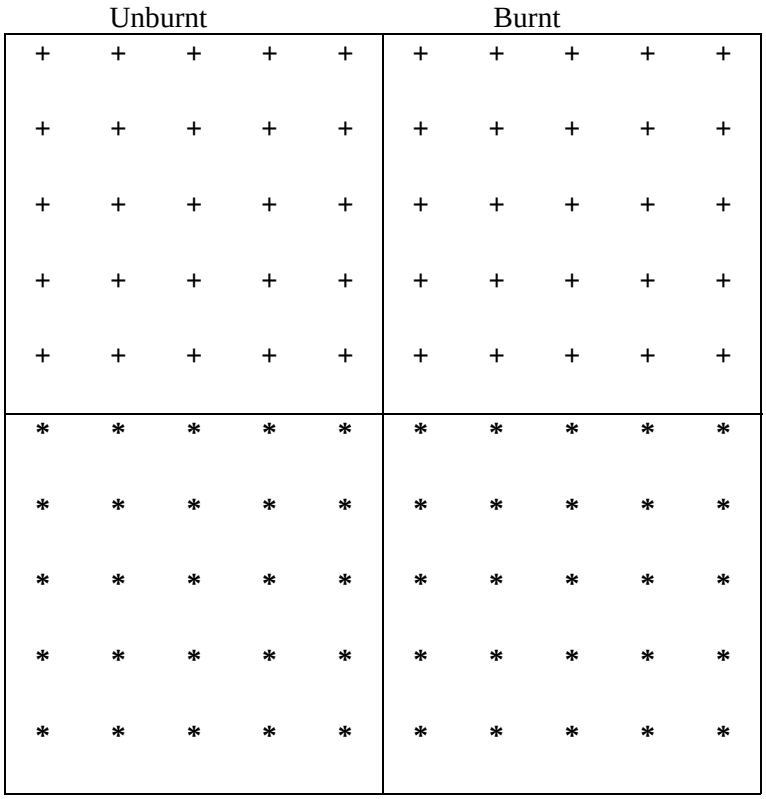
Appendix Three.
Diagram of the proposed layout of the treatments and plots.

Reserve #

Legend
+ = seedling
* = seed

Scale: **1 m**

Replicate 1



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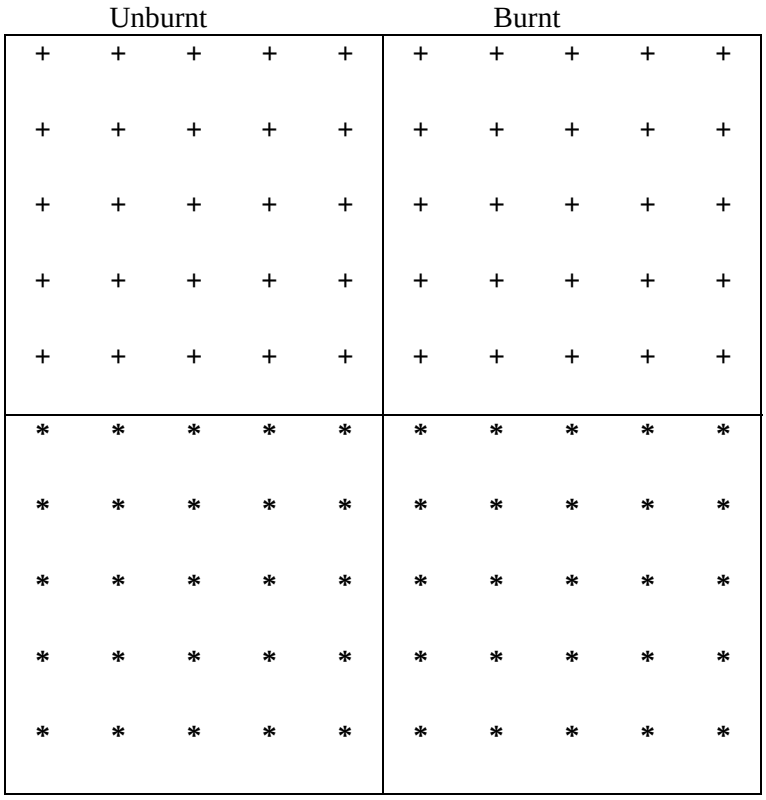

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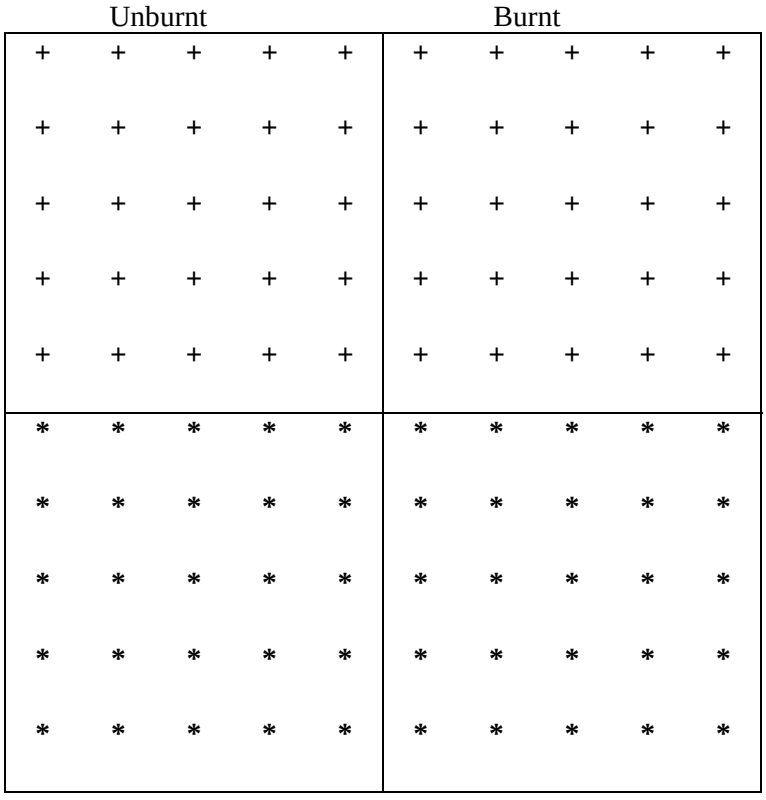

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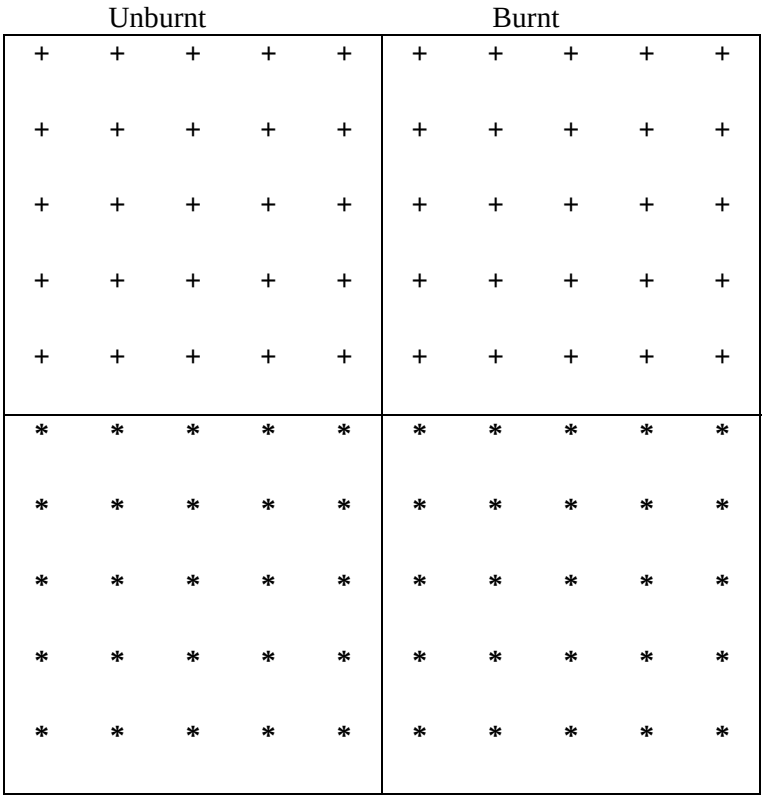

Milloy's Property

Legend
+ = watered
* = not watered

Scale: **1 m**