Pimelea spinescens Recovery Team

Coordinating the recovery of Spiny Rice-flower (subsp. spinescens) & Wimmera Rice-flower (subsp. pubiflora)

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Translocation Protocol

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This document was produced by Stephen Mueck, Senior Consultant Botanist, Biosis Pty Ltd and has been revised by Debbie Reynolds (Victoria University/Trust for Nature). It is endorsed by the *Pimelea spinescens* Recovery Team as being current best practice. The Recovery Team does not endorse translocation as a mitigation option when populations are faced with destruction; however, if plants are to be destroyed after all avoidance options are considered, and then translocation partnered with a long-term monitoring program should be implemented. This protocol should be treated as an evolving document and the Recovery Team must be consulted on all translocation plans so that the most successful methods are employed.

Citation:

PsRT (2013), Translocation Protocol (March 2013) [Online]. Melbourne: *Pimelea spinescens* Recovery Team. Available: http://bird.net.au/bird/images/4/4b/Pimelea_spinescens_Translocation_Protocol_March_2013.pdf [Date accessed].

Background

Spiny Rice-flower is a sub-shrub which grows to a height of up to 50 cm. It is a subdioecious subshrub endemic to grasslands and occasionally grassy woodlands in western, central and northern Victoria. While most populations are known from the Victorian Volcanic Plains Bioregion the subspecies is also known from the Victorian Riverina, Wimmera and Goldfields Bioregions (Department of Sustainability and Environment: www.dse.vic.gov.au).

Spiny Rice-flower is a slow growing perennial and mature plants support a large taproot which extends to a depth of over half a metre. Plants produce flowers from mid-winter to early spring (Entwisle, 1996). Seed production appears limited and seed longevity is unknown (Mueck 2000). Tumino (2003) indicates that known populations of Spiny Rice-flower consist predominantly of mature plants, with little evidence of seedling recruitment. However, more recently observations of germination (and possibly recruitment) have occurred under suitable habitat and climatic conditions. Debbie Reynolds (Victoria University, pers. comm. October 2010) has also observed a level of recruitment with 14 % of germinants across 16 site populations surviving their first summer. Cropper (2007) also has reported recruitment within a single population. The survival appears to be linked to regular management, which involves frequent biomass reduction events and the associated impacts of lower weed cover and biomass levels and a greater percentage of bare ground.

Spiny Rice-flower regenerates well from its robust rootstock after burning. However, the species is intolerant of soil disturbances such as ploughing or rock removal.

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Mueck (2000) described a method for translocation of this species using a tree spade and since then the methodology has been refined through the implementation of techniques applied in commercial translocations. This protocol describes these refinements but also identifies measures required to better quantify the size and extent of the target population and protocols for ongoing monitoring and management of translocated plants to maximise the probability of longer term survival and the potential for translocated populations to recruit and expand.

Importantly, translocation remains an option of last resort as *in situ* conservation and securing site protection should always remain the highest priority and is the best outcome. However, Spiny Rice-flower does occur on the expanding margin of Melbourne and regulators have continued to approve impacts on both small and large populations of this species. The significance of any population is determined by regulatory authorities (State and federal) and no translocation may occur without the appropriate permit/approvals and an approved translocation plan. Wherever possible translocation of plants should be minimised and at least 80 % of any significant population should be subject to protection and conservation management. Areas as small as 1000 square metres have been retained within developed areas and managed to protect a population of this species. However, as part of the recently approved expansion of Melbourne's urban growth boundary (UGB), land supporting a number of Spiny Rice-flower populations will be approved for development (DSE, 2009). No areas of habitat will be retained within this expanded UGB unless a population of greater than 200 individuals is present or less than 50 % of any population less than 200 plants are to be cleared (Victorian Government, 2010).

Translocation remains a tool to salvage plants which would otherwise be destroyed and in situations where the ecological value of an individual remains unknown, translocation offers some conservation opportunities.

All plants (mature and germinants) which would otherwise be lost in association with an approval for development must be salvaged. Salvage will include the physical translocation of plants using a tree spade and, where possible, seed collection prior to loss of plants within the development footprint. Plants will either be translocated into areas to be retained and managed in perpetuity as conservation reserves within the relevant development area or other recipient site(s) [i.e. the Western Grassland Reserve defined by the Strategic Impact Assessment process for Melbourne (DSE 2009)] defined in consultation with the *Pimelea spinescens* Recovery Team and the Department of Sustainability and Environment (DSE).

Population Importance

The response of regulators to the presence of a threatened species within an area proposed for development is influenced by the size and distribution of the population. As the native grasslands that Spiny Rice-flower inhabits also tend to occur as relatively small, isolated patches, the extent of available habitat also influences the viability of a population.

A State-wide database recently compiled from a wide variety of sources records Spiny Rice-flower from 208 sites. However, this database is incomplete with many significant gaps including a lack of population data and a failure to record sites which have been degraded or destroyed. The State-wide database provides minimum population estimates for 178 sites (i.e. 30 are without minimum counts). Many sites (44) support <10 plants with the majority of sites (114) with small to very small populations of 100 plants or less. Medium to large numbers (>100 to 2,500) occur at

59 sites and five are large (>2,500 to >10,000). While less than 100 plants may still represent a viable population, a population of this size is considered to be a very important population given the relatively small number of such populations known to exist.

In the assessment of the importance of any particular population or area of habitat, concentrations of individuals tend to be the focus of conservation efforts, while the protection of isolated individuals or small numbers of plants tend to be included in developable areas as part of a trade-off to permit development. It is therefore important to have a good understanding of the size and distribution of the population being assessed in association with any development application.

Currently the loss of five or more plants is considered a significant under the EPBC Act. However, even in instances where less than five plants are proposed to be impacted by a development it is considered worthwhile to salvage the plants which would otherwise be destroyed.

Population Census

Once the presence of Spiny Rice-flower is suspected or the species has been detected on a site, an accurate census of the population provides important information on the conservation value of that population and for any regulatory response to proposals which impact on this species. This information can be difficult to collect as Spiny Rice-flower is cryptic, especially in dense grasslands and when plants are not in flower (Garrard, 2009). It is important therefore, that surveys for this species are conducted according to accepted protocols to ensure the information collected is reliable (e.g. DSE 2010 – Biodiversity Precinct Structure Planning Kit (Victorian Government, 2010), DEWHA 2009 Significant Impact Guidelines for the Critically Endangered Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*)(Commonwealth of Australia, 2009).

To date the main method used to locate all individuals within a site has been a systematic survey using two or more observers. The observers systematically walk over a site separated by about five metres, each scanning a band of grassland about five metres wide. As each individual of Spiny Rice-flower is encountered it is recorded as a GPS waypoint and marked with a steel pin with coloured flagging tape. Care needs to be taken by observers to ensure uniform coverage of the site.

Unfortunately in sites open to the public for extended periods the flags tend to encourage vandalism. Plants are targeted and often they are not located in future surveys. Sites that are likely to be affected by this activity should have flagging tape pinned to the ground which is less obvious and with GPS co-ordinates enables future location.

Grasslands on the northern and western edge of Melbourne tend to consist of dense and often rank swards of a mixture of indigenous and exotic grasses. In this environment detecting a diffuse subshrub such as Spiny Rice-flower can be difficult, particularly when the plant is not flowering (September to May) or during dry periods when plants are well camouflaged and often have little foliage. This is true even for a systematic survey conducted by experienced observers familiar with the species (Garrard, 2009). The efficacy of a systematic survey in detecting the full extent of a population therefore depends on the;

- Experience of the observers;

- Density of the grassland being searched;
- Plants condition (if flowering or drought stressed); and
- Size of the plants present.

As part of the salvage protocol for Spiny Rice-flower associated with construction of the Deer Park Bypass in western Melbourne, sections of the right of way for the freeway known to support Spiny Rice-flower were burnt prior to the translocation exercise. While plants typically resprout quickly after fire, a prolonged drought meant that in this instance they only did so after summer rains. Actively growing individuals were bright green and more easily observed in the open grassland with low grass biomass. The subsequent search identified more plants than previously detected by a systematic survey conducted before the fire. This type and timing of a survey is seen as a more efficient way of detecting a greater proportion of any population present within an environment where plants are otherwise difficult to detect.

The size and extent of a population must be determined using an intensive systematic survey. Plants are more observable in an open grassland environment or when resprouting soon after fire. If the habitat being assessed consists of a relatively dense sward of grass, then biomass reduction should be conducted between 12 to 6 months prior to the census. This is the preferred survey method to document the size of a population of Spiny Rice-flower. If this method is not used clear justification and evidence of observability must be provided. Where overgrown sites can't be burnt the survey must be conducted when plants are flowering and surveys will be conducted twice during the flowering season with each survey separated by at least a month.

As plants are generally either male or female it is important to document the sex of each plant to be translocated. If small numbers are moved then it is important to know that both sexes are present to help in the selection of a translocation recipient site as there is little benefit in establishing a translocated population consisting of a single sex or with a poorly balance sex ratio.

Foreman (2005) suggests that the female plant numbers are correlated to the overall density of mature plants within Spiny Rice-flower populations. Intuitively a higher proportion of female plants also have the potential to provide greater opportunities for recruitment. This is also supported by recent *P. spinescens* research, with a greater density of germinants found in populations with a greater density of female plants (D. Reynolds, unpublished PhD 2013). A soil stored seed-bank is also likely to be concentrated in close proximity to female plants given seed dispersal appears to be relatively limited. Therefore female plants are considered a higher priority for salvage. Should situations arise where some plants may be damaged during the salvage process because plants are often tightly clustered, the female plants should be given priority.

The value of female plants was highlighted in the salvage exercise conducted for the Deer Park Bypass. While about 50 % of plants translocated from the Deer Park Bypass did not survive the procedure, there have been two post translocation germination events, one each winter, presumably stimulated by the pre-translocation fire and subsequent watering. Translocated female plants that died therefore have the potential to be replaced by new seedlings.

Where sites are burnt, the sex of all observable plants may be documented before or after burning.

Where small isolated populations are subject to translocation, these plants should be relocated to areas that support existing populations. This would ensure that both sexes are present and the translocation has the potential to augment the viability of other local small populations. For the translocation of larger numbers there appears to be value in ensuring translocated plants are established with a regular array of both sexes but to date this has not been done.

Plants potentially subject to translocation are defined once a decision has been made that a particular area will be developed and plants within that area would otherwise be destroyed. At that time, any area to be protected needs to be clearly identified and protective measures put in place as soon as possible. All plants to be lost, capable of being translocated must be salvaged.

The Recipient Site

An area which plants are relocated to is known as a recipient site. Any recipient site must be a site which is permanently protected with conservation of biodiversity as the primary management objective. The site also needs to be inspected to determine that no other high conservation values would be impacted by the translocation exercise as this process can cause significant soil disturbance. Recipient sites need to be actively managed to control threatening processes such as weed invasion and biomass accumulation and it is the responsibility of the development initiating the translocation to provide the resources for such management. Recipient sites must be subject to intensive management over and above any existing management requirements. This additional management should last for at least ten years.

Most translocations of whole plants conducted to date have moved plants less than 300 metres. The furthest whole plants have been moved is four kilometres (about six kilometres by road). Logistically, the recipient site should be as close as possible to the salvage site as the further plants are moved the more likely they are to be damaged and the less likely they are to survive this process.

In the past, whole plants have been translocated into relatively disturbed areas within a reserve, typically within a few metres of the outer margins or along the margins of an access track. The rationale for this has been that translocation is unlikely to be successful and as such other conservation values should not be compromised by this activity. Such disturbed areas generally support a relatively high cover of weeds and support few native species. As such these areas require significant ongoing management to restore the dominance of indigenous species and to create an environment suitable for recruitment of Spiny Rice-flower. Ideally such recipient sites should be managed to control weed species well before the translocation exercise to reduce the risk to translocated plants associated with the use of herbicides and other management actions. A minimum pre-management period of one year is suggested and recommended, although two would be ideal. However, such delays are rarely palatable to developers and in the past recipient sites have received no management at all before translocation occurs.

Pimelea spinescens is found predominantly in the ecological vegetation class (EVC) of ‘lowland grasslands’ but is also found in ‘grassy woodlands’ and ‘open shrublands’. The EVCs in which *P. spinescens* occurs are associated with the basalt derived black or grey clay soils to the west of Melbourne and alluvial soils across the north west of Victoria (Carter *et.al.* 2006). The translocation site should be classified as one of the above ecological vegetation classes and not for example be a stony rise or knoll.

Translocation

Rationale for Translocation

As a critically endangered species it is considered that every population has the potential to contribute to the local conservation of this species and the endangered community it inhabits. While development and habitat loss continue to impact on this species the protection and management of unprotected populations as a compensatory measure is considered important in the conservation effort for the recovery of this species. Protection of such populations is also likely to benefit from translocations augmenting the genetic diversity and population size within compensatory habitat. Our understanding of the ecology of this species is also likely to improve in association with the detailed monitoring associated with the assessment of translocation exercises.

Seed Collection

Pimelea spinescens flowers from May to August; seed collection bags (breathable bags) can be placed on ~10% the plants stems from August and removed in October. If the rainfall is plentiful during this time check the bags as they can become mouldy (see seed collection protocol http://bird.net.au/bird/.../Pimelea_spinescens_Seed_Collection_Protocol.pdf).

Translocation Methods

A number of methods have been attempted to translocate this species from areas proposed for development into conservation reserves. This includes moving entire mature plants with a tree spade, collecting cuttings and planting these into a reserve, collecting seed and germinating it via nursery conditions and treating then direct sowing seed into a reserve.

To date the translocation of whole plants and nursery seedlings has had some level of success. While cuttings can be readily struck, transferring this material back into natural grasslands has had little success. Of 300 cuttings propagated from material within Williams Landing, Laverton and planted into one of the reserves within this site, only one was known to survive for more than a year. This is due the fibrous roots that cuttings grow which are unlike the taproot that they would naturally grow (D. Reynolds 2009, pers. comm. July).

Seedlings produced from seed have been successfully reintroduced at four sites:

- Tang Tang Swamp Wildlife Reserve, Dingee. 120 seedlings were planted with approximately 50 % survival after 3 years;

- Terrick Terrick National Park (Finns Paddock), 240 seedlings were planted with approximately 40 % survival after 3 years;

- Tonkins Road Timber Reserve, Prairie, 240 seedlings were planted, with 84 % survival after one year and four years later 72 % were located alive (B. Thomas, 2012, pers. comm. November); and

- 100 seedlings were planted into a reserve at Williams Landing, Laverton. With seventy-three persisting at William landing after one

year but only 30 % surviving 2 years later (S. Bretherton 2012, pers. comm. October).

Propagation via this method has been successful and has become an effective translocation tool for augmentation of plants at a site.

With translocation of *P. spinescens* mature plants having some success, identifying and transplanting germinants found in areas destined for development should also be incorporated into translocation planning.

Equipment, physical conditions, timing and placement for germinant translocation

During the winter growth period within six to twelve months of a burn event, *P. spinescens* germinants are likely to emerge (Foreman, 2005, D. Reynolds 2010, pers. comm. August). These individuals should be located and marked for translocation along with the mature individual plants. The best time for their transplantation is during winter when the soil is soft and they will be easily excavated using a spade. Transplantation of germinants in winter will allow them time (winter and spring) to settle in during benign conditions before the summer period. The excavation and translocation of germinants should occur on the same day or within 24 hours. One spade thrust excavated to a depth of approximately 30 cm would be optimal then place the germinant in a large plastic bag or bucket for transport. No heavy machinery is required and the bags/buckets can be transported via a wheel burrow to the recipient site. A similar spade hole made and the spade plug with the germinant relocated in, ensuring that the plug is flush with the ground surface. The germinants should be placed in clusters (next to each other 10 to 30cm apart) of at least four to six individuals and positioned no more than ~2metres from another cluster. Clearly identify the recipient site clusters with a flag or pin flagging tape to the clusters perimeter, for future monitoring and to ensure that they are not impacted upon when the mature plant translocation occurs.

Equipment for mature plant translocation

Once the individuals to be salvaged have been identified and marked the translocation process is ready to begin. The main piece of equipment used in the translocation process is a tree spade. This hand-made tool consists of three hydraulic blades held on a metal frame mounted on the rear of a tractor. This machine drives the blades into the ground, which come together at a depth of about half to three quarters of a metre (depending on the size of spade used) and extract a cone of soil (Mueck, 2000). Other equipment includes a water tanker and, depending on how far plants are to be moved, steel baskets (cone shaped), hessian, a small crane and a trailer. A supply of washed sand is also needed to act as fill between the extracted cones and the holes dug at the recipient site.

Other forms of tree spade used include a trailer mounted version towed by a four wheel drive. Documentation of the success of this machine is not available. Limited observations of the end result of a translocation exercise using this equipment suggests it is more difficult to provide a consistent physical outcome in that many plants are obviously elevated above the surrounding natural soil surface. This is considered undesirable.

Physical Conditions for Translocation

Translocations have mostly been conducted during times when soils are dry as the machinery involved has the potential to cause significant soil disturbance. Dry basalt soils are relatively robust and a small number (less than 5) of passes by a tractor or other small vehicles does not appear to cause any obvious permanent damage. Moist soil is heavily disturbed by even a small number of passes by a tractor and would result in unacceptable levels of soil disturbance at the recipient site.

Translocations have occurred during the winter period (Christies Rd – Westlink) with the site destined for destruction and recipient sites impacts minimal, due to the area having a large weed load. Many translocated plants have survived with a 46 % survival rate after three years.

Translocation of Spiny Rice-flower has also only been conducted where soils are relatively free of surface rock as the tree spade cannot be used in rocky environments.

Salvage

The tree spade works poorly in dry basalt soils and therefore plants need to be watered before being salvaged. Fortunately the deep cracking clay soils which support Spiny Rice-flower readily and rapidly absorb water to a depth beyond that penetrated by the tree spade. Once the soil has been saturated the blades easily penetrate the ground but should also be lubricated with water as they are driven into the ground. The closed tree spade is then elevated to remove the salvaged plant within a cone of soil.

The translocation of 137 Spiny Rice-flower conducted for the Deer Park Bypass added a rooting hormone to the water used. However no rigorous evaluation of this additive was conducted. The hormone did not appear to have any obvious effects, positive or negative, and no recommendation to include or exclude hormone additives can be made.

The extracted cone of soil is then either driven to the recipient site while held within the spade or placed into a hessian lined steel basket for bulk transport with other salvaged plants.

Distance between Salvage and Recipient Sites

Where plants are to be translocated a short distance (within five to ten minutes driving distance for the tractor) the tractor should be able to drive back and forth from the salvage site to the recipient site. Where a relatively large number of plants are to be translocated over longer distances it is logistically simpler, and just as successful, to place the salvaged soil cones into steel baskets and to transport many plants to the recipient site at the same time.

At the Recipient Site

The logistics for the movement of the tree spade are as follows. The spade cuts a hole in the recipient site and disposes of the unwanted soil in an appropriate location. It then proceeds to the salvage site, extracts a plant, transports it to the hole in the recipient site and places it in the hole. This process is then repeated until all plants are relocated. This process can be used for small numbers of plants to be moved greater distances but becomes time consuming (and expensive) for large numbers.

Preparation for the digging of recipient holes is the same as that for plant salvage (i.e. water and then dig). If plants are brought to the recipient site in the tree spade, the tractor lowers the spade into the hole with the three blades aligned as they were when the recipient hole was dug. Once inserted a person stands within the cone as the blades are withdrawn, while also watering the blades for lubrication. Firm pressure should be applied to ensure a tight fit while also trying to avoid breaking the soil cone. Any gaps between the salvaged cone and the recipient hole should then be filled with washed sand which should also be watered in. This maintains contact between the salvaged soil and the recipient hole and helps maintain soil moisture at depth.

Where plants arrive within steel baskets these are lifted from the transport vehicle by crane and placed within the recipient site holes. The hessian supporting the soil cone within the basket is then lifted out of the basket, which can then be re-used. The soil cone and hessian are then placed back into the recipient hole and the gaps filled with washed sand.

While requiring accuracy and a good level of coordination, it was found that two people holding the soil plug about a metre or so above the recipient hole and dropping it into the hole provided a suitable force to ensure good contact between the soil plug and the hole.

Once translocated plants are well watered to ensure the soil cone settles into its new location and the surrounding soil is saturated for at least a metre around the translocated plant.

Monitoring

Marking translocated plants is important in being able to determine the survivorship of any individual over time. As the environment in which these plants are placed will be subject to prescribed fire any markers need to be fire resistant. The labels used to date have therefore typically been metal. The most successful labels used to date have been small brass tags stamped with a number. However these have been held in place with a thin steel pin many of which have corroded resulting in the tag being lost. Weed managers have also used whipper snipers to remove dense infestations of green annual grasses and these have effectively removed any elevated tags. The plants must be tagged with individually numbered tags made from galvanized steel and then anchored by stainless steel orchid pins, which are rust, fire and weather resistant. This will ensure that the plants can be identified and relocated for future monitoring, and a metal detector could be used to relocate them if required during periods of high biomass.

A diagram and GPS point map of how the translocated plants are arranged at the site can be useful. However, over time the translocated soil often melds into the soil of the recipient site and determining the location of any individual soil cone can be very difficult.

Translocated germinants will require watering over the following autumn to summer period post their transplantation to aid their survival and reduce the shock of translocation.

The physical translocation of whole plants (or most of the plant) is typically done during summer as soils need to be dry to cope with the physical impacts associated with machine activity. As such the plants to be translocated are often under drought stress before this process begins. The watering used in the translocation process relieves this stress and plants begin active growth. If dry conditions persist, soil moisture levels can decrease quickly and any new growth can place even more stress on the translocated plants. Translocated plants have therefore always been watered until rainfall produces persistent moist soil conditions. Soil moisture conditions need to be monitored at least weekly or more frequently if conditions are hot and dry. Soils need to be kept moist to minimise stress on these plants and encourage active growth. Plants typically need to be watered on a weekly basis unless adequate rainfall elevates soil moisture levels.

Observations from previous physical translocations of Spiny Rice-flower suggest that most mortality occurs relatively quickly with an ongoing slower decline in survivorship, presumably as a response to the stress associated with the move. Initial monitoring of a translocated population concentrates on maintaining a low stress environment through maintaining soil moisture and identifying priorities for weed control.

Soil moisture should be monitored weekly for a least the first three months after translocation and each soil cone examined for evidence of seedling germination. Close monitoring of plants is important as the disturbance associated with translocation, particularly if the salvage site was burnt before the translocation, as it been observed to stimulate seed germination. Where seed germination occurs additional watering may be warranted depending on the prevailing weather. If large numbers of seedlings germinate within any individual soil cone then consideration should be given to transplanting some of these plants while they are still very small. Plants could be relocated to other soil cones where plants have died or to other suitable environments within a few metres of other members of the translocated population.

Information on plant survivorship should be collected monthly for the first six months, bimonthly for another 12 months. Monitoring should then continue at quarterly intervals for the next two and a half years (up to the 4th year), then if environmental conditions are similar or have been previously experienced by the site. The monitoring can be scaled back to six monthly or remain at quarterly assessments for the remaining six years of the ten year management programme post translocation. The documentation collected during monitoring visits is survivorship, flowering, and recruitment. Also assessment of biomass conditions and adapts management practices to promote *P. spinescens* recruitment and ensure prescribed and recommended ongoing management actions are completed. It is suspected that seedling recruitment is only successful during relatively wet years. Therefore if drought conditions prevail additional watering will be necessary after any seedling germination. It is important to note that the translocation remains unsuccessful until a self-sustaining population establishes in response to the active ecological management of the reserve.

Monitoring report summaries (Appendix 1) of site and plant survival (1) and management and plant health (2), should be sent to the relevant responsible authority to ensure compliance with any approval conditions (potentially including local, state and federal authorities) and also to the Administration Officer of the *Pimelea spinescens* Recovery team (debbier@tfn.org.au) annually for a period of 10 years following the translocation.

Management of a Translocated Population

Grassland environments supporting a translocated population must be subject to active ecological management and it is important that where translocation is a conservation measure associated with a development that the funding for such management be dedicated as a condition of the development permit.

The recipient site must be or become a secure conservation reserve. In the past plants have been translocated into existing reserves or new reserves have been created in association with the development proposal which initiated the translocation exercise.

Management plans of the translocated *P. spinescens* plants within the native grassland must include regular biomass reduction. Biomass reduction (in order of best practise):

- Should take the form of:
  - Burning or
  - Mowing (ensuring thatch removal).
- Must occur at least every three years and should be adjusted according to local conditions. Years of high rainfall = rapid accumulation of biomass = ↑ fire frequency (annually to biannually), years of low rainfall = slow biomass accumulation = ↓ fire frequency (biannual to triennially).

Burning large plants reduces their above ground biomass and therefore lowers transpiration stress and stimulates growth. It also assists in weed control and provides space and is a likely stimulus for seed germination. Careful consideration should be given to timing (spring or autumn burn) for the application of fire as a management tool to maximise the benefits for the translocated population and the reserve into which this population is planned to expand. Autumn burning is considered optimal for native grassland species but spring burning can be an effective tool to target specific weed species. *In situ Pimelea spinescens* populations have been found to tolerate either timing. The sites which support the highest numbers and largest areas of *P. spinescens* remaining in Victoria (Mt Mercer-Shelford Rd, Geggies Rd), have traditionally (50 + years) been burnt annually in early summer.

The unfortunate side effect of frequent watering that a translocated plant receives and the generally weedy environment in which it has been placed, is the rapid growth and increased vigour of the weeds present. Intensive weed management is therefore important to reduce competition from these pest plants. Biomass control is also essential as native grasses also respond well to the optimal growth conditions (McDougall, 1989). This can be more difficult in the presence of Spiny Rice-flower seedlings, which are likely to need special attention over at least the first two years. Seedlings need to be protected from fire and from being smothered by the increased growth of other plants responding to any additional watering. If the surrounding area is to be burnt when seedlings less than 2 years old are present, they must be covered by ceramic pots or have other forms of protection during the fire.

While permanent ecological management of any grassland reserve is essential, a high level of management, particularly weed control, is likely to be required for a period of at least ten years, depending on the type and extent of weeds present.

Summary

The proposed protocols for the translocation of Spiny Rice-flower are summarised as follows:

- The size and extent of a population is determined using an intensive systematic survey. If the habitat being assessed consists of a relatively dense sward of grass, then biomass reduction (via burn is optimal) should be conducted and a census performed at an appropriate time thereafter. The sex of all observable plants may be documented before or after burning. This is the preferred survey method to document the size of a population of Spiny Rice-flower. If this method is not used, clear justification and evidence of observability must be provided. Where overgrown sites can't be burnt the survey must be conducted when plants are flowering and surveys will be conducted twice during the flowering season with each survey separated by at least a month.
- Mature plants targeted for translocation will be subject to one season of seed collection (October to November) and collected seed utilised to establish propagated seedlings within the approved recipient site.
- If a burn or biomass reduction event has occurred, in the following winter a germination event is likely to occur.
- As many plants (mature and germinants) as physically possible which would otherwise be destroyed by development must be salvaged (i.e. as plants are generally clustered, the salvage of some plants could result in damage or loss of others):
    - Germinants should be salvaged first during winter (end of July to August) and transplanted to recipient site within 24 hours (preferably the same day);
    - Mature plants should be salvaged after the germinants and during a time when the ground is not as moist.
- Surveys should be done when the plants are flowering to allow the sex of each plant to be determined. Where applicable, this would allow a recipient site to be defined within the development area and for the arrangement of male and female plants at the recipient site to be planned.
- Translocation of plants should be minimised and at least 80 % of any significant population should be subject to *in situ* protection and conservation management. Exceptions to this include permitted development within Melbourne's expanded UGB or otherwise if *in situ* conservation is only capable of producing highly isolated "pocket parks" (i.e. >1 ha).
- Any recipient site must be:
    - A site which is permanently protected with conservation of biodiversity as the primary management objective and the additional management requirements for the translocated population are adequately resourced; and
    - Considered a suitable ecological vegetation class and soil type.
- A separate survey for germinants must occur in the *P. spinescens* population area destined for destruction, during mid winter. All germinants found should be flagged and transplanted in the same winter period.

- Translocation of mature plants using a tractor mounted tree spade is currently considered the most reliable method to salvage and translocate this species.
- Translocation of mature plants using a tree spade is conducted during times when soils are dry as the machinery involved has the potential to cause significant soil disturbance.
- The translocation recipient site should be an area of relatively low conservation value within a broader area of high conservation value.
- Selected areas in the translocation recipient site and plants to be translocated must be watered in preparation for the use of the tree spade.
- All translocated plants (mature and germinants) need to be marked to allow for monitoring of survival and potential recruitment. A diagram of the configuration of translocated plants can also be useful in any monitoring program.
- All translocated plants (mature and germinants) need to be watered until rainfall produces persistent moist soil conditions.
- Soil moisture conditions need to be monitored weekly or more frequently if conditions are hot and dry.
- All translocated plants (mature and germinants) need to be watered during the first and potentially the second summer after the translocation occurs.
- Plant survivorship should be monitored monthly for the first six months, then every two months for 12 months. Monitoring should then occur at quarterly intervals for the next 2½ years post translocation. Following this if environmental conditions remain stable the monitoring can drop to 6 monthly or otherwise continue at quarterly intervals. Monitoring will document survivorship, flowering, general observations and tagging of any recruitment, assess biomass conditions and adapt management practises in light of the success or failure to promote *P. spinescens* recruitment and ensure prescribed and recommended ongoing management actions have been completed.

- Monitoring report summaries (Appendix 1) of site and plant survival (1) and management and plant health (2), should be sent to the relevant responsible authority to ensure compliance with any approval conditions (potentially including local, state and federal authorities) and also to the Administrative Officer of the *Pimelea spinescens* Recovery team (debbier@tfn.org.au) annually for a period of 10 years following the translocation.

- The recipient site should be subject to an approved ecological management plan which includes regular small scale (patch) burning to maintain an open grassland structure and adequate levels of control works to eliminate high threat environmental weeds and control the cover and abundance of other weeds to low levels. The plan should also include a high level of management works concentrating on the population of translocated plants.
- The supply of adequate funding for active conservation management and monitoring of the translocated population and the associated reserve should be provided for a minimum period of ten years as a precondition of any approval.
- The translocation remains unsuccessful until a self-sustaining population establishes in response to the active ecological management of the reserve.

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Appendix 1 - Monitoring report summary sheet for site and plant survival over 10 years (1).

<u>*Pimelea spinescens* translocation field monitoring sheet – 1 – Site and plant survival</u>

Assessor/s: ____________________ Date: ______________ Site name: ________________ Locality (Mel map & ref): ______________________________

Managers (consulting company): _________________________ GPS co-ords (GDA94): ____

Total number of translocated plants: ___________ Date translocated: ___________ Soil moisture: wk1_________wk2___________wk3____________

wk4___________wk5__________ wk6___________wk7__________ wk8___________wk9__________ wk10___________wk11__________ wk12______________

Watered week: ____

Comments: ____

____

Date report written/submitted: 12mths __________________ ☐ 2nd year____________________ ☐ 3rd year_________ ☐ 4th year ___________

5th year __________ __ 6th year ___________ 7th year ___________ 8th year ___________ 9th year ___________ 10th year ___________

Site Map

Appendix 1 - Monitoring report summary sheet for site and plant survival over 10 years (1).

No	**Plant present or absence**																		**Comments**
	Plant ID No	**1st year =**									**2nd year =**					**3rd year =**			
		1st six months						**2nd six months**			**months**								
		1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**8th**	**10th**	**12th**	**14th**	**16th**	**18th**	**22nd**	**26th**	**30th**	**34th**	**36th**	
Date																			
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Appendix 1 - Monitoring report summary sheet for site and plant survival over 10 years (1).

No	Plant ID No	Plant present or absence																	Comments
		1st year =									2nd year =					3rd year =			
		1st six months						2nd six months			months								
		1st	2nd	3rd	4th	5th	6th	8th	10th	12th	14th	16th	18th	22th	26th	30th	34th	36th	
Date																			
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Appendix 1 - Monitoring report summary sheet for site and plant survival over 10 years (1).

No	Plant present or absence																Comments (If environmental conditions are stable 6mthly from 5th year or go to pages 20 to 23)
	Plant ID No	4th year =			5th yr =		6th yr =		7th yr =		8th yr =		9th yr =		10th yr =		
		40th	44th	48th	54th	60th	66th	72th	78th	84th	90th	96th	102th	108th	114th	120th	
Date																	
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Appendix 1 - Monitoring report summary sheet for site and plant survival over 10 years (1).

No	Plant ID No	Plant present or absence															Comments
		4th year =			5th yr =		6th yr =		7th yr =		8th yr =		9th yr =		10th yr =		
		40th	44th	48th	54th	60th	66th	72th	78th	84th	90th	96th	102th	108th	114th	120th	
Date																	
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Appendix 1 - Monitoring report summary sheet for site and plant survival over 10 years (1).

No	Plant present or absence										Comments
	Plant ID No	5th year =			6th year =			7th year =			
		52th	56th	60th	64th	68nd	72th	76th	80th	84th	
Date											
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Appendix 1 - Monitoring report summary sheet for site and plant survival over 10 years (1).

No	Plant present or absence										Comments
	Plant ID No	5th year =			6th year =			7th year =			
		52th	56th	60th	64th	68th	72nd	76th	80th	84th	
Date											
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Appendix 1 - Monitoring report summary sheet for site and plant survival over 10 years (1).

No	Plant present or absence										Comments
	Plant ID No	8th year =			9th year =			10th year =			
		88th	92th	96th	100th	104th	108th	112th	116th	120th	
Date											
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Appendix 1 - Monitoring report summary sheet for site and plant survival over 10 years (1).

No	Plant present or absence										Comments
	Plant ID No	8th year =			9th year =			10th year =			
		88th	92th	96th	100th	104th	108th	112th	116th	120th	
Date											
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Appendix 2 - Monitoring report summary sheet for site management and plant health over 10 years (2).

*Pimelea spinescens* translocation field monitoring sheet – 2 - Management and Plant Health

Date translocated: ______________ Current date: _____________ Loss of translocated plants: ____________ Timeframe: ___________________

Current management actions for the site: ____

____

Date of last biomass reduction event: _______________ Event: ___________ Date of next biomass reduction event: ______________________

Last weed control works: __________________ Next planned weed control works: _________________ Weed control used: ________________

Comments: ____

Actions planned from previous assessment: ____ Achieved; ______________________

Comments: ____

____

Management adjustments required: Yes/ No What: ____

No	Plant ID No	Flowering (%)	sex	Seeding	In a 1m radius around plant. Exotic cover (%)	Bare soil (%)	Evidence of seed germination	Soil moisture	Plant watered	Comments regarding state of plant health
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

Appendix 2 - Monitoring report summary sheet for site management and plant health over 10 years (2).

No	Plant ID No	Flowering (%)	sex	Seeding	In a 1m radius around plant. Exotic cover (%)	Bare soil (%)	Evidence of seed germination	Soil moisture	Plant watered	Comments regarding state of plant health
13										
14										
15										
16										
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19										
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21										
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