Science for Saving Species

Research findings factsheet

Project 4.3

Threatened Species Recovery Hub

National Environmental Science Programme

New guidelines for the translocation of threatened plants in Australia

In brief

The number of plant translocations in Australia has been increasing due to the rising numbers of plant species threatened by habitat loss and degradation, disease and climate change. Plant translocations aim to create self-sustaining populations capable of surviving long term in the wild and, if successful, can reduce the risk of extinction for a threatened plant.

Translocations are often costly and time-consuming, and it can be challenging to achieve high success rates. To help improve the success of plant translocation projects we have revised and substantially expanded a set of best-practice guidelines. The third edition of these guidelines embodies the authors' many combined years of experience and recognises new threats, presents new technologies to solve problems and features expanded sections on areas of new research. It also draws on learnings from long-term monitoring of translocations.

We emphasise that protecting and managing any remaining habitat where a species occurs is the best way to conserve the species and, whenever possible, should be the priority action. Our guidelines go through all the steps of the translocation process, from determining whether translocation is appropriate, to necessary approvals, site selection and preparation, right through to implementation, ongoing management, monitoring and evaluation. It also includes a chapter on community participation.

Background

Plant translocation is the deliberate transfer of plants or plant material from a natural population or an *ex situ* collection (such as a living collection housed at a nursery) to a new location. The objective of translocation programs is to support the conservation of a target species, with the ultimate aim to create self-sustaining population(s) capable of surviving over the long term in the wild. The necessity for plant translocations is increasing in response to the rising numbers of species threatened by habitat loss and degradation, disease and climate change. In Australia, 37 plant species have become extinct and more than 1300 are listed as Endangered or Vulnerable.

The first documented conservation translocations were carried out in Victoria in the late 1970s. Since then, more than 1000 translocations involving almost 380 taxa have taken place, 85% of these since 2000 and more than half since 2010. However, only a few documented cases of translocation programs have created self-sustaining populations.

Translocations are complex and involve many steps and, as such, need to be thoroughly planned.

For a plant population to persist in the short term there first needs to be:

- sufficient propagation material to establish a viable population;
- good survival and establishment of the translocated individuals;
- management and control of threats; and
- flowering, fruiting and natural recruitment at rates similar to natural populations.

Translocations can involve a diverse range of activities, including: seed collection and propagation; propagation via cuttings or tissue culture; planting of potted plants; direct seeding; and transplantation of whole plants from one site to another. For some plant species, topsoil containing the soil seed bank can be translocated, or pollen may be transferred between populations through hand pollination. It may also involve co-translocating symbiotic fungi or specific pollinators associated with the target plant.

ACT Government

Australian Network for Plant Conservation Inc

Department of Biodiversity, Conservation and Attractions, Government of Western Australia

Royal Botanic Gardens Victoria

Aims

Our overarching aim was to create a document that would provide best-practice guidance to increase the success rate of plant translocations. We also wanted to demonstrate that plant translocation is not a simple solution to the dilemma facing many threatened plants, and requires appropriate consideration of the key outcomes required and feasibility of achieving these.

Planting Acanthocladium dockeri. *Image: C Tourenq*

Translocation guidelines

Numerous translocations have taken place since the publication of the first edition of the guidelines in 1997, and the updated second edition in 2004. Our new, third edition of the guidelines builds on previous work and provides the most up-to-date resource for groups translocating threatened plant species. The guide provides a step-by-step guide for plant translocations. Here, we summarise each of the key steps.

1. Deciding whether to translocate

The type of translocation strategy needed for each threatened species will depend on the extinction risk, the threats impacting on the species and other legislative requirements. Management options requiring the least intervention should be considered first, and it is important that sufficient resources be directed towards conserving existing populations in situ through habitat protection and/or habitat restoration measures and the control of threatening processes.

Two broad factors drive translocations. First, these are conservation actions that are needed to reduce extinction risk and, hence, to maintain species or populations of species (conservation translocations). Second, amelioration measures may help to mitigate habitat loss. Translocation is often proposed as a compensatory measure for the loss of a species because of development activity. Given the low success of translocations, the potential use of translocation as an ameliorative measure should be carefully considered when assessing the potential to mitigate the residual impact of a development. The guidelines list a set of factors that should be considered in assessing a mitigation translocation.

Many possible risks are associated with the technique, all of which need to be considered when deciding whether to translocate. These include: plants dying; the inability to eliminate major threats; displacement of non-target species; and the introduction of diseases. The guidelines provide a comprehensive checklist of the numerous factors to consider before starting a translocation program. A summary of these factors is presented Figure 1.

Translocation guidelines (continued)

2. Assessing biology and ecology pre-translocation

Once a decision to translocate has been made, comprehensive information on a range of topics is required to increase the chances of success. This includes details of the plant's ecology, reproductive biology, population genetics and environmental preferences. A translocation program should not commence or be approved until all the following questions can be answered:

- Has an established recovery team for the species helped with the pre-translocation assessment, or has a suitable translocation working group been established?
- Is the species' reproductive biology and ecology adequately understood?
- Have experts on the genus been consulted?
- Has an assessment of the need for genetic research been conducted in consultation with a population geneticist, and has any necessary genetic research been conducted?
- Have propagation methods been determined?

Translocations mainly use potted plants (tubestock) derived from germinated seeds, as these are cost-effective and likely to encompass a large proportion of the population's diversity. Alternatives to seed include cuttings, division, grafting or tissue culture. These techniques can produce large numbers of propagated plants in a short time, but generally have less genetic diversity and are more expensive. Translocation can also involve direct seeding, transfer of soil-stored seed and transplanting of seedlings or mature plants.

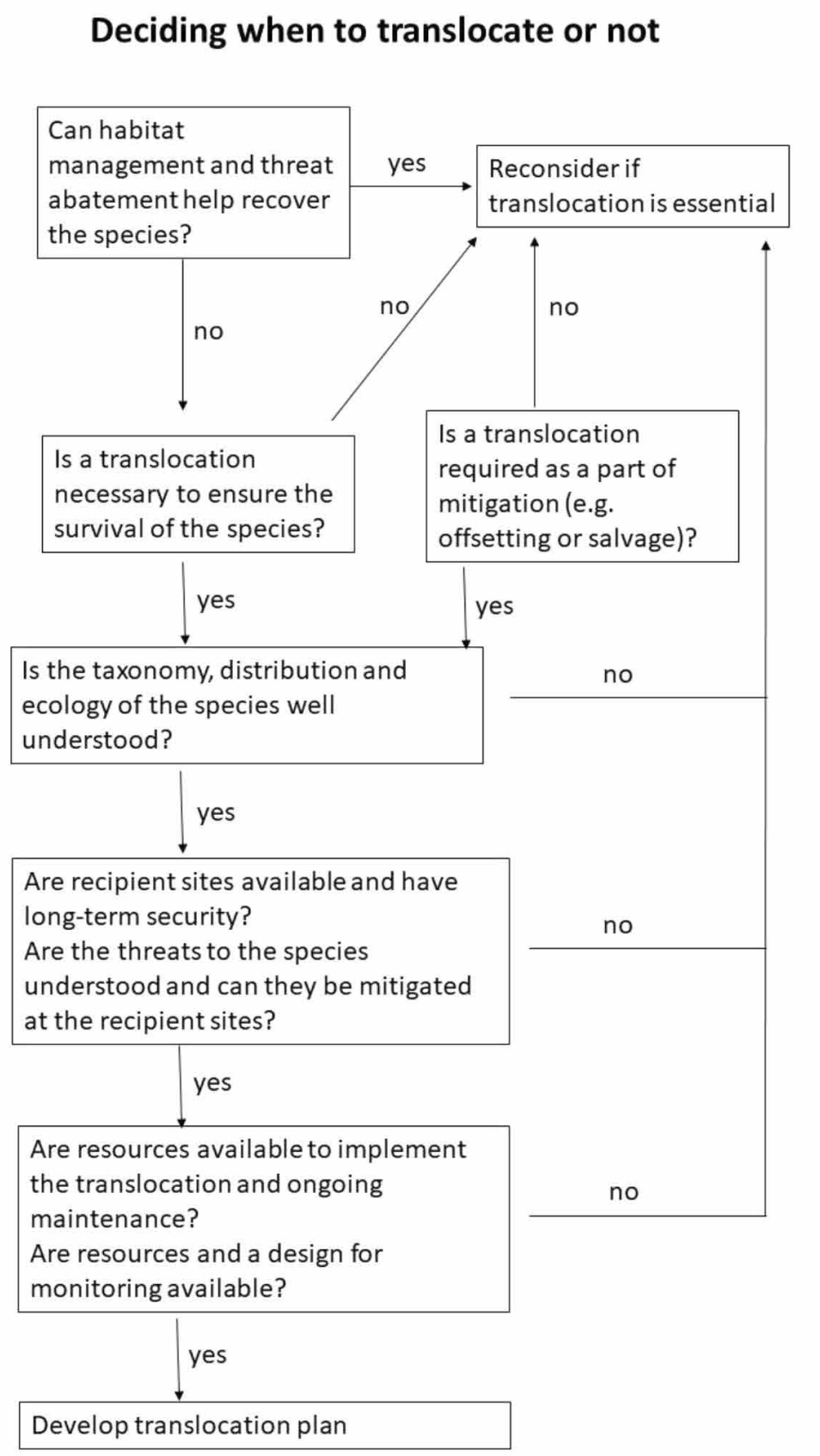

Figure 1. A decision tool to help decide whether to translocate or not.

RIGHT: A transplanted Wollemi pine. Image: H Zimmer

Translocation guidelines (continued)

3. Selecting source and recipient sites

The selection of source populations will depend on the purpose of the translocation, the location of recipient sites and the amount of genetic diversity within the source populations. It is important to maximise genetic diversity for long-term persistence of populations, and this can be achieved by harvesting seeds or cuttings from multiple individuals. The persistence of populations in the face of changing climate conditions may also need to be considered when selecting propagation material. It is best to propagate as many plants as resources will allow, as the survival rate of plants after translocation can be low.
The guidelines outline a method to estimate the minimum number of plants required to establish a viable self-sustaining population.

The site(s) selected for translocation should attempt to decrease the risk of extinction for the translocated species. There are a variety of options for site selection: reinforcement (individuals are added to an existing population); reintroduction (a population is established where it no longer occurs); introduction (a population is established in a site where it has not previously occurred but is within the known range) and assisted migration (an attempt to establish outside the indigenous range based on climate change or habitat change predictions). Sites where the target species occurs or is known to have occurred in the past are most likely to support a population over the long term. If threats affecting the species cannot be removed or controlled (e.g., *Phytophthora*), areas that have similar habitat within the known range of the species can be considered. The guidelines provide a detailed assessment list to work through when selecting potential recipient sites.

The risk of negative impacts to the recipient site also needs to be considered.

Negative impacts may be caused by the translocation process or through ecological interactions between the translocated population and resident species. These impacts may affect cultural as well as biodiversity values and may have ecological,

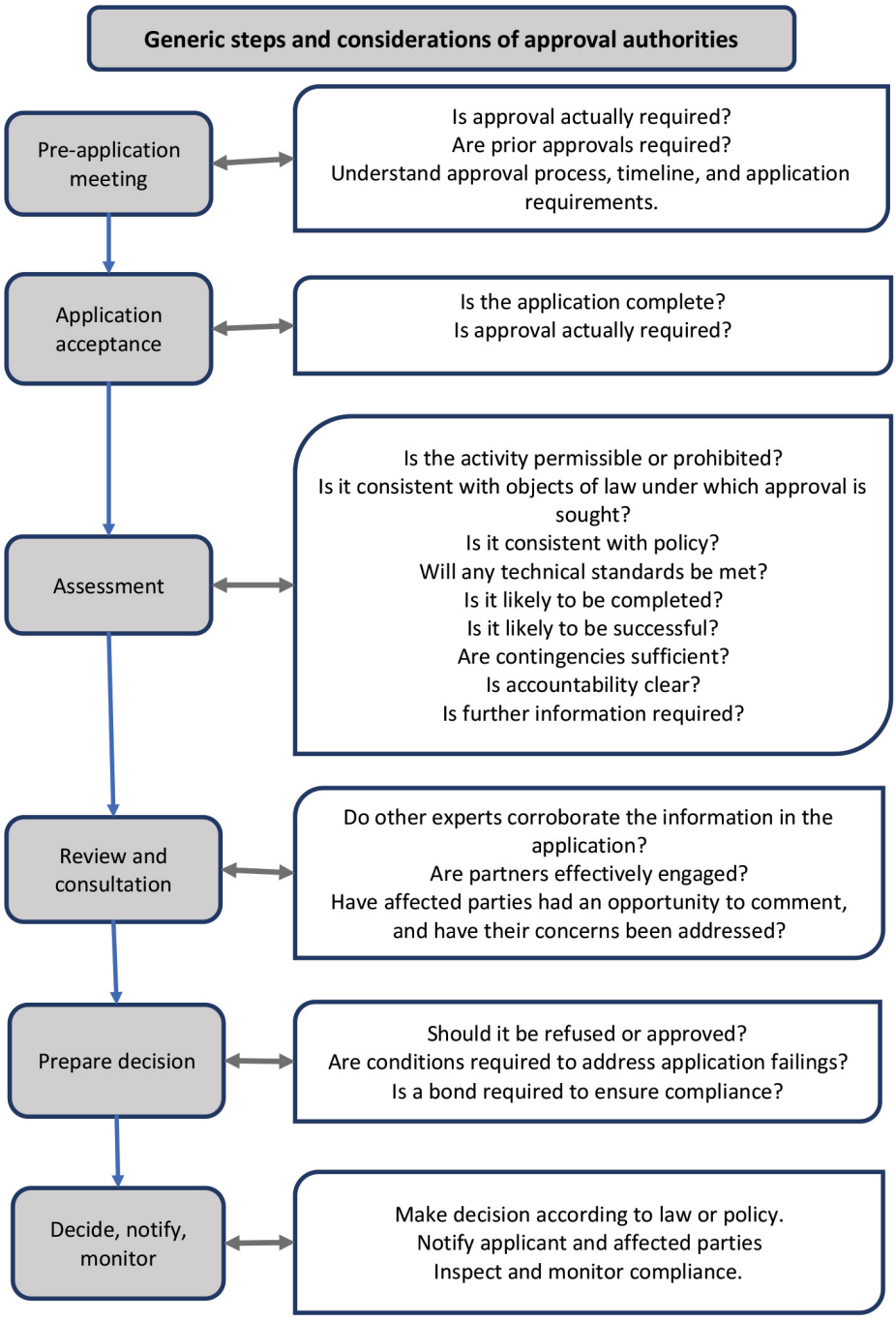

Figure 2. *Steps involved in the approval processes, and examples of considerations made at each step.*

LEFT: Monitoring translocated Leionema equestre.
Image: M Jusaitis

Translocation guidelines (continued)

socioeconomic or financial consequences. Conducting a formal evaluation of the risks, costs and benefits of a translocation can help clarify such issues.

4. Doing the paperwork: Policy, approvals and translocation proposals

There are few government policies in Australia that specifically address plant translocation. The New South Wales and Western Australia governments identify our guidelines as the primary reference and indicative of their expectations. We have developed a translocation proposal template which can be used as a key planning document and may be used to make a case for approval in some states and territories.

A range of state- and Commonwealth-level policies need to be identified and used as key reference material during the planning process. These include recovery plans, action statements, regional biodiversity strategies, species management programs and Threatened Species Strategies. The pre-translocation assessment will identify what approvals, authorisations, licences or permits (approvals) are required to conduct the translocation (Figure 2).

It is critical that the translocation process is recorded and reported upon to maximise the conservation benefits of the project, manage the new population, and distinguish between a species' original distribution and where it has been introduced.

5. Preparing pre-translocation

After the translocation proposal has been approved, pre-planting preparation can begin.

These activities can take months to years and involve the collection, storage, propagation and growing of appropriate plant material *ex situ*, and site preparation. It is critical to ensure appropriate phytosanitary techniques are applied through all stages of preparation to minimise the risk of disease, pest or pathogen transfer.

The translocation process will require a team leader and a diverse range of specialists to ensure that it is conducted correctly. Specialists could include administrators, bush regenerators, horticulturists, taxonomists, landholders, community groups, seed scientists, ecologists and geneticists. It is best if funding is secured for the duration of the project before commencing on-ground works and that the resources required be carefully considered. During the planning phase, a monitoring and evaluation schedule can be designed to assess the success of the translocation. Criteria for determining success will need to be identified and included in the translocation proposal.

The availability of seeds and the optimum time of year for collection of seeds and vegetative material needs to be considered when developing project milestones, as does the time taken to propagate enough material. When collecting material, it is important that the source population is not adversely affected as a result of the collection. If material is to be propagated ex situ, adequate time is required for the plants to grow to a sufficient size before planting out commences.

Transplanting entire plants from naturally occurring populations has a low rate of success. Specialised equipment and transport are often required when moving mature shrubs and trees, involving advanced planning. This method is a last-resort strategy, as the risk also exists of moving harmful organisms.

The time of year to plant depends on the climate at the recipient site and whether seeds are sowed, tubestock are planted or mature plants are transplanted. For many translocations, reproductive material is limited, and planting over multiple years or seasons can allow some resources to be kept in reserve for future plantings, if required.

The recipient site needs to be prepared so that it is in a suitable condition for planting. This could involve removing or control of threatening processes (e.g., weeds, feral animals), soil ripping, conducting a prescribed burn or erecting fencing. Hygiene procedures must be strictly adhered to, particularly when using large machinery.

6. Implementing the translocation and ongoing maintenance

Numerous steps must be considered when organising and conducting the translocation plantings, and the guidelines provide a checklist of these. The translocation should take place when conditions are optimal to support the survival and growth of the plants. General factors to consider include conditions at the translocation site (e.g., frost, rainfall, site access) and the condition of the plants to be planted (e.g., age, health, acclimatisation).

All plants should be labelled with a unique code, and then be tagged and mapped at the site once planted. We have outlined key steps and useful tools to help with the planting of tubestock in the guidelines. After-planting care and habitat management also needs be

Copies of the full translocation guidelines are available from the ANPC website
https://www.anpc.asn.au/translocation/

Translocation guidelines (continued)

considered. Plants may need short-term horticultural care after planting (e.g., irrigation, mulching), and are likely to need longer-term habitat management and threat abatement. Undertaking a translocation is therefore a long-term commitment.

7. Translocation monitoring and evaluation

The steps in designing and implementing a monitoring program are similar to those of an ecological experiment or field trial. An effective monitoring program will:

- generate quantified evidence of translocation success or failure against stated objectives;
- deliver information on population changes and the factors that may drive such changes;
- provide early warning of problems with the translocation;
- highlight ways to make future translocations more effective; and
- evaluate return on conservation investment.

Numerous parameters can be monitored, including growth, flowering, seed production and plant survival. Characteristics of the habitat can also be assessed, such as climate and potential disturbances (e.g., flooding, grazing). In general, monitoring is recommended three months after planting and yearly thereafter. The guidelines include detailed information on monitoring design and a worked example based on the Wollemi Pine. Data collected can be used to evaluate the project by comparing them to the objectives, and the outcome can trigger any necessary management actions.

Even when translocations have limited success in terms of plant survival and recruitment, an experimental approach and regular monitoring can inform future attempts. We have found that successful translocations are typically characterised by the following:

- planting sufficient plants (50 minimum);
- a detailed translocation proposal;
- the commitment and collaboration of numerous individuals and organisations with the required expertise;
- sound site selection;
- the removal and ongoing control of threatening processes;
- watering of plants during dry periods at least over the first year or two;
- protection from grazing and trampling where there are high numbers of herbivores; and
- financial commitment to ongoing maintenance, monitoring and evaluation.

8. Encouraging community participation and support

Community support can increase the long-term success of the project, especially beyond the short-term funding cycle of many projects. The community can make a valuable contribution to all stages of a translocation program. For example, community volunteers can help in the early stages of a project, such as with field surveys. Surveys can be time-consuming and expensive, but community involvement and engagement with local knowledge can increase the survey area and improve the chances of finding other occurrences of a threatened species. In the guidelines, we outline ideas on how to engage the community initially, and then continue to manage and maintain community involvement for positive outcomes.

Cited material

Commander, L.E., Coates, D., Broadhurst, L., Offord, C.A., Makinson, R.O. and Matthes, M. (2018). *Guidelines for the translocation of threatened plants in Australia*. Third Edition. Australian Network for Plant Conservation, Canberra.

Further Information

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