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Editorial

Virtual Issue in *Australian Journal of Botany*: rare and threatened plant conversation and recovery

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Abstract. Virtual Issues consist of previously published papers that are repackaged into an online themed collection. With appropriate marketing, and making them free for a limited time, these issues are a powerful tool that allow all readers to rediscover and access content already published. Release of this Virtual Issue of *Australian Journal of Botany* was timed to coincide with the 11th Australasian Plant Conservation Conference (APCC11), held on 14–18 November at the Royal Botanic Gardens, Melbourne. For more information, please visit: http://www.publish.csiro.au/bt/content/VirtualIssues.

Introduction

The conservation, management and recovery of rare and threatened species is complex, challenging and requires an understanding of many aspects of a species' biology. It is also important to understand key threats to population and species persistence, including those that may not be immediately obvious. The highlighted virtual issue brings together papers from previous issues of the *Australian Journal of Botany* to highlight three important research areas for plant conservation and recovery – genetics, ecology and *ex-situ* conservation – the virtual issue was developed by the Australian Network for Plant Conservation for its 11th Australasian Plant Conservation Conference held at the Royal Botanic Gardens, Melbourne on 14–18 November 2016.

Genetics

The role that genetics can play in improving species conservation and recovery is well known. Early genetic research was primarily applied to determine levels of genetic diversity and population structure with a view to guiding conservation actions such as prioritising populations for more immediate intervention. Later, genetics research expanded into the exploration of plant reproductive strategies and mating patterns, helping to improve species management through a better understanding of the impacts of inbreeding in small and isolated populations, as well as the scale of pollen and seed dispersal. Genetic analyses have also been used to clarify species boundaries and conservation status, identify cryptic species, and to help prioritise populations for germplasm collection and translocation. The papers (Moran and Hopper 1983; Peters *et al*. 1990; James and Brown 2000; Elliott *et al*. 2002) in this section highlight the application of genetics to improve the conservation and recovery of rare Australian plants.

Plant ecology

Demography forms the cornerstone of much of the research undertaken to understand the survival, management and recovery of rare species. Plant population processes – including flowering, seed set, germination, early seedling survival – are crucial life history stages that determine whether population growth rates (r) are stable ($r = 0$), growing ($r > 0$) or declining ($r < 0$). Assessing rare plant demography, often by comparing their performance against common congeners, has typically shown that seed production and viability and germination cues are not necessarily more restrictive in rare species. Instead, seed dispersal and early seedling survival, linked to microsite availability, are often more limited for rare species, with competition a key ecological process that underpins outcomes. The papers in this section (Gilfedder and Kirkpatrick 1994; Osunkoya and Swanborough 2001; Jusaitis *et al*. 2003; Nield *et al*. 2009) highlight aspects of early life history dynamics, focusing on the importance of making viable seeds, dispersing those seeds, and the fate of seeds (i.e. germination cues), with emphasis on how management might promote these processes. It is clear that to understand population dynamics, more emphasis on whole of life cycle dynamics is necessary, perhaps using population viability analyses (PVA), to determine where and why population bottlenecks occur. This has rarely been done but the last paper in this section (Nield *et al*. 2009) provides a good case in point of using PVA modelling to optimise disturbance regimes that advantage rare species.

Ex situ *conservation*

A fundamental component of conservation and restoration programs is the close link between effective *ex situ* (off-site) germplasm management and successful species reintroduction. Target 8 of the Global Strategy for Plant Conservation aims to

conserve 75% of the world's threatened plant species in *ex situ* collections with 20% of these being included in recovery or restoration programs. This is encouraging active participation in *ex situ* conservation targets and acknowledges the need to link these targets to on-ground restoration and species recovery. This selection of papers (Batty *et al*. 2001; Bunn *et al*. 2007; Crawford *et al*. 2007; Cochrane *et al*. 2007) explores the concepts and practical principles underpinning *ex situ* conservation relating to the protection of germplasm, particularly for rare and threatened species, and cover the traditional approaches (seed banking) and more biotechnologically challenging areas such as tissue culture and cryopreservation. While optimising seed storage technologies is a focus for *ex situ* conservation of rare and threatened plants, biotechnology is an important opportunity for species that cannot be stored by seed (i.e. low or nil seed production species; species with recalcitrant seed).

If you have an idea for a virtual issue, the editorial team at *Australian Journal of Botany* would love to hear from you. Please get in touch at publishing.ajb@csiro.au.

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