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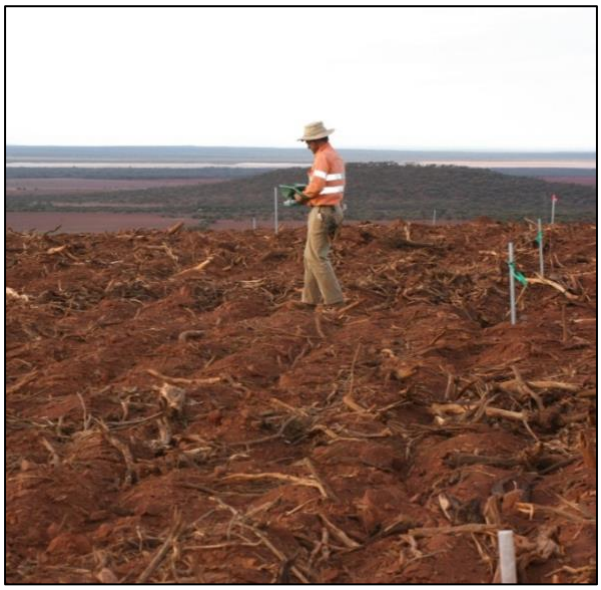
Restoring a threatened ecological community: defining and achieving restoration targets

by Carole Elliott, Peter Golos, Jason Stevens, Ben Miller (Department of Biodiversity, Conservation and Attractions), Lucy Commander (The University of Western Australia), Luis Merino-Martín (Universidad Rey Juan Carlos). Industry partners: Sinosteel Midwest Corporation and The University of Western Australia. carole.elliott@dbca.wa.gov.au

Background

Connecting scientific research and government policy is essential for conserving biodiversity and sustaining the economy. While conserving intact ecosystems remains a primary strategy for protecting biodiversity, ecological restoration can help mitigate environmental impacts. Ecological restoration requires the application of ecological theory and practice to biodiverse ecosystems, and tests current scientific understandings of natural systems. This intersection between ecological restoration and complex regulatory and policy frameworks is becoming more sophisticated. Ecological restoration is a joint venture between three areas:

- Theoretical ecology (defines important restoration terms and identifies ecological processes central to restoration outcomes);
- Applied ecology (puts theory into practice); and
- Policy (guides the decision-making process that reflects community expectations).



Beginning restoration research trials of a Threatened Ecological Community (TEC) on a mine waste rock dump in 2015.

Using these three areas of restoration ecology, our research goal was to inform the restoration of a Threatened Ecological Community on a mine waste rock dump with the following aims:

Aim 1: Define ecologically realistic and scale-appropriate restoration targets.

Aim 2: Identify an optimal approach to return the required species.

Aim 3: Optimise and facilitate the pathway for restoration.

Aim 4: Develop a protocol to assess restoration achievements.

Findings

- Scale-appropriate points of reference (spatial scale), combined with previous (or historic) information, effectively characterised the restoration target and defined the evaluation criteria for regulatory compliance assessment for this threatened vegetation community (see Fig. 1, Aim 1).
- Experiments showed that 62 species, from the identified species pool, could be returned with four methods and the topsoil seedbank was the most successful, returning 33 species (see Fig. 1, Aim 2).
- Knowledge gaps between project goals and restoration pathways included approaches to investigate plant performance and survival responses to different landform factors (topography, soil moisture dynamics) and techniques (topsoil use, soil ripping, irrigation, seed enhancement) (see Fig. 1, Aim 3).
- The restoration trial, as a working example, represented a scale-appropriate return of 60% of the target species richness in 20 months (see Fig. 1, Aim 4).
- Bottlenecks to restoration included: sourcing material for all species; needing a longer time frame to resolve species identification; and dealing with cryptic species (at target setting and post-restoration).

Management implications

Our approach (Fig. 1) is a new industry benchmark in setting scale-appropriate restoration targets from for an entire vegetation community and has global applications for systematically addressing complex theoretical, practical and regulatory challenges for achieving biodiverse restoration.

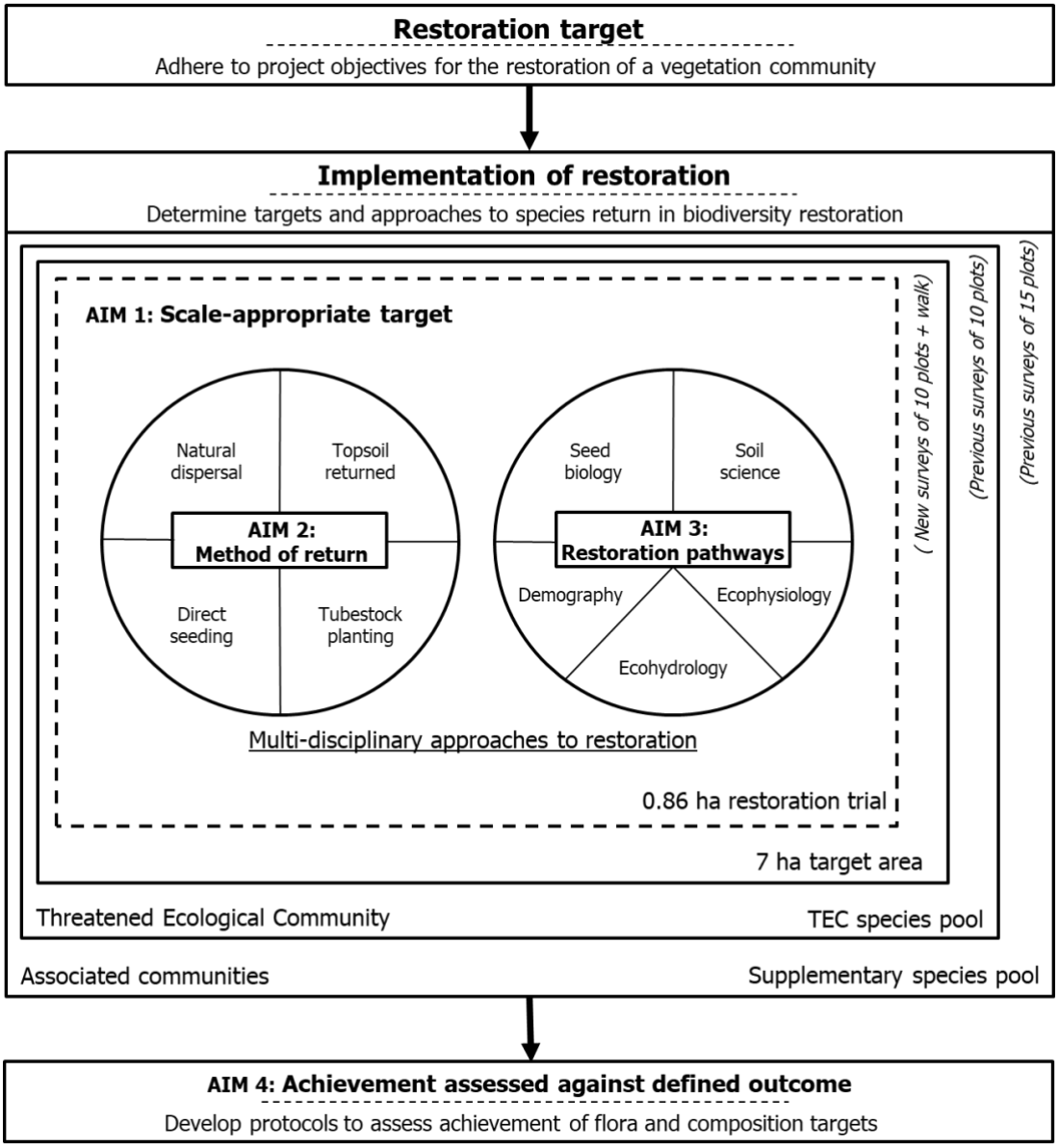


Figure 1: After setting a target for restoration (e.g. a Threatened Ecological Community), the following approach can assist managers with the implementation of restoration by: (1) defining a scale-appropriate restoration target; (2) identifying optimal methods of return; (3) optimising and facilitating restoration pathways, and (4) developing a protocol for assessing restoration against the target.

To define and achieve a scale-appropriate restoration target, several spatial scales must be taken into account (in this case: the species pools for the 0.86 ha research trial area, the 7 ha target restoration area, the entire habitat of the TEC, and associated communities). Spatial scales are represented by the nested boxes. Survey sources used for each nested box for this study are vertical text in italics.

Below: Post-restoration on a mine waste rock dump.

Further information

Elliott CP, Commander LE, Merino-Martín L, Golos PJ, Stevens JC, Miller B (2022) An approach to defining and achieving restoration targets for a threatened plant community. Ecological Applications: DOI https://doi.org/10.1002/eap.2613

Commander LE, Golos PJ, Elliott CP, Merino-Martín L, Stevens J, Miller B (2017) Sinosteel Midwest Corporation: Practitioner Restoration Manual. Botanic Gardens and Parks Authority for Sinosteel Midwest Corporation. http://smcl.com.au/wp-content/uploads/2018/09/Sinosteel_Restoration_Manual_March_2017.pdf