Eco-sourcing

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Eco-sourcing is one of those topics that generates heat but not (so far) a clear light to guide community groups. Wellington Botanical Society set up a debate for its meeting on 21 July 2014, with myself, Chris Horne, Stephen Hartley and Leon Perrie providing material to start the discussion. This paper reflects my views at the end of the debate.

The debate highlighted that there are in fact two closely related issues—when to intervene in natural processes, and what is the role of eco-sourcing in any interventions?

SHOULD WE INTERVENE OR LEAVE IT TO NATURE?

At one end of the spectrum would be the view that the best approach is to let nature do whatever nature chooses to do—humans cannot make better decisions, and nature does not need help. The other end of the spectrum would be to always plant, as that will always deliver faster and better outcomes. None of the participants in the debate seemed to be at either extreme, but there was clearly no consensus on what is the best place to land along the spectrum.

As a policy analyst I always try to start with the question "what are you trying to do?"

I've recently set up a charitable trust to use vegetation management to improve transport corridors in order to generate a wide range of desirable outcomes – cut the costs of management for the transport agency, reduce illegal rail crossings, reduce dumping and litter, stop tagging, reduce crime, create new populations of rare plants, provide amenity values, make public transport and walking more attractive, provide habitat for lizards and invertebrates, reduce bird kill, improve stream health, reduce weed propagules, and restore existing natural remnants or rare plant populations.

Nature isn't going to deliver most of those objectives. Nature is not going to conveniently put a native vine next to a bridge pier that has tagging, and even if it does, the vine will need help to climb the structure to hide the tags.

But even where we really are doing ecological restoration, I would argue that natural isn't always the best, and often won't produce a natural outcome.

Firstly, even if the "right" seeds turn up, they won't always establish. Stephen Hartley presented an Australian study that showed that even after

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45 years, an area in exotic grass was still in exotic grass, and none of the locally present eucalypts had colonized.

Chris Horne argued in the debate for patience. But in many cases we can't afford to wait. If the price of waiting is loss of animal species or inability to establish locally extinct species, stream banks slumping and downstream estuaries filling in, high fire risk, or any of the other possible outcomes of slow regeneration, I believe intervention is essential.

Waiting may also be just too expensive. Robyn Smith pointed out in the debate that weed control contractors cost $600 per day. Does it make sense to do weed control for 80 years at that price, rather than get in and plant?

And will the result of waiting be a more natural system anyway? Are there significant propagule flows from undesirable sources (e.g. gardens)? Would reliance on local propagule sources result in genetic bottlenecks? Are there species that will be missing, because there is no propagule source or because the changes to the site mean they won't establish on their own?

Do we really trust birds more than people, just because they are "nature"? Starlings in Wellington deliver plenty of weed seeds to the areas in which they roost. So natural regeneration may not result in "eco-sourcing".

DOES ECO-SOURCING MATTER?

Eco-sourcing relies on the hypothesis that there is a "natural" assemblage of species and science can work out what is "native" to a particular location. The meeting discussed the fine details of that concept (do we welcome some eucalypts because they were present in New Zealand a few million years ago?), but there seemed to be a broad consensus that there is a "natural" species composition that we should be aiming to retain or restore.

A few key principles seemed to get full agreement, one being that if you can, you should. If there is no cost to eco-sourcing, eco-sourcing should be the automatic choice, for two key reasons: the risk of altering natural genetic patterns is avoided, and there is a greater chance that the material will be suited to the conditions of the site. Stephen presented some research evidence for improved fitness with eco-sourced material.

Where there is a cost or barrier to ecosourcing (e.g., higher cost of plants, difficulty getting material, delays in planting programmes while the right stock is grown, risk of poor genetic fitness, the species is locally extinct), I would argue that the decision on whether eco-sourcing matters comes down to three questions. Is eco-sourcing directly relevant to your objectives (e.g., to create a scientifically accurate outcome)? Could you be creating a future weed or genetic contamination problem by doing something else? Could you repair the damage if your plantings turned out to be a mistake?

WHAT CONSTITUTES ECO-SOURCING?

If the answer is that eco-sourcing is desirable, there is one further issue to be resolved - what constitutes eco-sourcing? Not a simple question to answer, and (as far as I can determine) it hasn't been answered in the literature. But we know some key things to consider in trying to achieve that misty goal.

Closer is better. Go for the remnant next door, not the one in the next catchment.

Similar habitat is better. Similar altitude, soil type, hydrology, exposure to wind, exposure to salt.

In terms of how far might be too far, the likely natural gene exchange distances are, in my view, highly relevant. Something dispersed by a kereru will have a larger population/metapopulation area than something pollinated and dispersed by lizards. Focusing on natural dispersal ranges is, in my view, likely to be more useful than trying to use simple concepts like ecological districts, although real genetic data would be even better.

At the same time, it is important to avoid creating genetic bottlenecks. In the debate the idea of taking propagules from the nearest 100 plants was floated. That might be a useful approach, but I believe the number needs more thought. 250 individuals is the number used to identify species that are critically endangered. While that also relates to risk of stochastic loss, it might be a better number to use to ensure a wide gene pool.

An alternative might be to use the nearest populations that collectively have at least 250 individuals, and then collect from as many individuals within those populations as possible.

SOME PROPOSED PRINCIPLES

At the end of the debate I had concluded that we need some simple guidance for community groups, covering both the "when to intervene" and the "what plants to use" arguments. I would offer the following.

1. Work out what you are trying to achieve, and be explicit about that when explaining your project to other people. If you aren't doing true ecological restoration, don't call it that—call it stream bank stabilization, or water quality improvement revegetation work, or lizard habitat creation, or whatever best describes the core goal.
2. Minimise your interventions. That will reduce costs and reduce risks of mistakes. In terms of revegetation, use the following hierarchy:
    a. Blocking new threats (e.g., legal protection, fencing and quarantine).
    b. Changing the nature of the site so natural regeneration is enhanced (e.g. turfing or spraying grass)

   c. Assisting natural regeneration (e.g., weeding, controlling herbivores)
   d. Adding missing dispersal agents (e.g., introducing kereru) or replacing them (e.g., lobbing seed bombs).
   e. Planting
3. Ensure your intervention is the best way to achieve the intended result and avoid creating new impacts.
4. If bringing in seed or plants, use site-appropriate, regional natives. Get your material from the closest possible source(s), but if possible ensure that you are collecting from a large number of individuals. A good rule of thumb would be:
   a. Use sites that are within the likely natural gene dispersal catchment of your planting site for that species, unless that will mean less than 100 individuals will be available. If there are less than 100 individuals, think about the relative merits of risking genetic bottlenecks or risking genetic contamination.
   b. Within those sites collect from as many individuals as you can.
5. If that isn't possible, or doesn't fit with your objectives, choose species that best meet your objectives, that aren't weedy, and that can be identified by other people as human interventions. That might mean using exotic species, or species that are from another part of New Zealand. In particular
   a. avoid using seed or plants of local natives that have come from unknown or distant sites;
   b. avoid using species that will hybridise with local natives; and
   c. avoid species that will invade natural ecosystems and out-compete local natives.
6. If the horse has already bolted (i.e., the locally native plants turning up as a result of natural dispersal are already a genetic mix), you can be a bit more relaxed about using those species. But try not to make the problem worse. Use the local mix rather than introducing new material from outside the local area to add to that mix. If you can, select those which are most likely to match what was the local population.

CONCLUSION

It is important to get out there and do work, even if you don't get it right. On Tiritiri Matangi Island in the Hauraki Gulf, some of the plantings proved to be far from optimal. But they still delivered better ecological outcomes than doing nothing, and thinning of dense pohutukawa greatly improved the outcomes from the affected areas.

But it is also important to ensure that mistakes can be recognised and fixed. Science isn't finished – our understanding will hopefully improve over time, and our capacity to do restoration will also grow.

In historic structure conservation, repairs are generally designed so that they are visibly repairs, not original structure, and can be easily removed later if the repair was considered to be an error. Materials that will cause further damage to the remaining original structure are avoided. The aim of repairs is to stablilise the structure and retain what is left of its intrinsic values. I think that approach is equally applicable to a lot of vegetation/ soil management, with the obvious difference that ecosystems can repair themselves, while historic structures have only a downward trajectory available.