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Establishing Native Forests
TĀNE'S TREE TRUST FACTSHEET SERIES

Ecosourcing of native species for planting

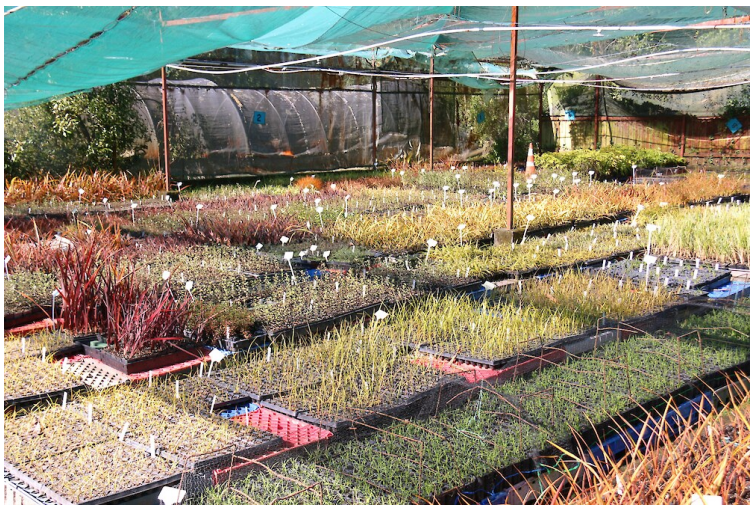
FACTSHEET 2, 2022 – by Jacqui Aimers & David Bergin

Refer to the other factsheets in this series for more about successfully establishing native forests.

Online version of this document with clickable links: https://docs.tanestrees.org.nz/1084/

Introduction

Ecosourcing is defined as the sourcing of seed (or vegetative material) from nearby natural populations to propagate native planting stock for planting in the same locality, i.e., collection of seed from wild populations that are as close as possible to the area being planted. Ecosourcing should be included in the planning stages of all native plantings.



The fundamental unit for ecosourcing is the local population, or provenance; i.e., a group of individuals of the same species that live in a particular geographic area. Ecosourcing is particularly important for ecological restoration projects but may be less relevant for other types of plantings, as discussed below.

The ecosourcing concept also includes collecting seed across a large range of individuals within the source population. This results in a broader and more representative genetic base, which increases adaptive fitness and decreases the risk of inbreeding depression in forest plantings.

The concept of genetic pollution

- Natural wild populations will occasionally have new genetic material introduced via pollen or seed dispersal. This adds to the within-population genetic diversity.
- However, if a large amount of new genetic material is artificially introduced into an area, then this could change the genetic character of the local population over time, i.e., genetic pollution could undermine the unique inherited characteristics of the local populations.
- Care needs to be taken to avoid planting either different provenances or commercially-bred strains near natural forest of high conservation value that contains the same species - due to the risk of genetic introgression or 'genetic pollution' undermining the unique inherited characteristics of the natural population.

Why is ecosourcing important?

- The concept of ecosourcing recognises the unique genetic variation that occurs within species at the local level, which has evolved over long periods of time and confers an adaptive advantage to local conditions.
- Provenances often show distinct differences in growth and form, foliage or flowering characteristics.
- Provenance studies undertaken for some native species show that these differences are persistent when grown in a different environment. They are distinct ecotypes, i.e., genetically distinct populations that have evolved to be adapted to local environmental conditions.
- Sometimes the genetic differences are not visibly evident but there are critical physiological differences that confer an adaptive advantage in the environment in which the plants evolved, e.g., frost hardiness or drought tolerance.
- Therefore, ecosourcing maximises survival through adaptive advantage, i.e., ensuring the best fit for the local environment.
- This is particularly important in an era of climate change where there are greater environmental pressures. There is some argument over whether we need to intervene and manipulate species distribution in order to take the effects of climate change into account. Regardless, applying ecosourcing principles will increase adaptive advantage.



Totara seed

- Adhering to ecosourcing principles is particularly important for ecological restoration projects, especially if they are close to areas of high conservation value, or where taonga species are being planted on or near iwi land. This prevents genetic pollution.
- Ecosourcing can help maintain distinctive local and regional landscape characteristics and identity. This, in turn, supports the perception of tūrangawaewae (sense of place), and connection to a local landscape area with its own unique, natural identity.

Ecosourcing and cultural values

- Cultural values need to be considered in regard to ecosourcing but they are often overlooked.
- For many iwi groups, their particular provenances of native species with their unique local characteristics are a precious taonga (treasure).
- A Waitangi Tribunal report (Wai 262) has relevance here. Wai 262 documents the fundamental importance of treasured native flora and fauna to modern Māori in terms of their identity and kaitiakitanga (environmental guardianship). It recognises the importance of the whakapapa (lineage) of native species.
- It is important for tangata whenua that the unique characteristics of their local species are recognised and not compromised by genetic pollution from plants of the same species brought into their rohe that are different provenances or commercially-bred strains. Wai 262 needs to be considered when moving plant material from and between rohe (iwi territories).
- If any significant plantings are being planned, liaison with representatives of the local rohe is recommended, so as to resolve any potential Wai 262 issues.

Ecosourcing principles

The Department of Conservation suggest the following ecosourcing principles for a restoration project:

1. Plant species which are known to be native to the local area and refer to local planting guides.
2. The closer the seed source to the restoration project the better. Even in instances where species have become sparse and localised in their occurrence or have become locally extinct, the seed source for plants should be as close as possible to the restoration site.
3. Seed should be collected from a similar ecosystem to the one being restored. Some species grow in a variety of ecosystems and are capable of surviving a wide range of environmental conditions (e.g. manuka will grow in both wet and dry ground). It is good practice to choose plants grown from seed collected from a habitat and set of environmental conditions which simliar to the restoration site.
4. Planning for restoration projects must allow for the timeframes involved in collection and propagation of ecosourced plant material. This may mean a wait of two years or more between the inception of the programme and the plants being put in the ground.
5. Collection of seeds or propagules should take place from areas of native vegetation which are clearly of natural origin. Collection from roadsides or small stands of native trees which are in a park setting or are surrounded by developed land is unsatisfactory as there is a good chance that the stock has been planted from non-local sources.

Issues with ecosourcing

- A major issue with ecosourcing is defining what the boundaries are for local provenances, i.e., the physical area that defines the population.
- In practice, there is a range of interpretations of boundaries used for ecosourcing, including:
  - distinct geographic features (particularly topography and climate) or soil types;
  - regional council boundaries that may be split into broad zones (e.g., coastal versus inland, or lowland versus upland);
  - ecological regions or ecological districts, as described by McEwan (1987); or
  - restricted areas based on limited species distributions or documented genetic differences within species, such as for rare ecosystems and species (example).
- Many practitioners select ecological regions or districts as a practical scale at which ecosourcing can be carried out because this represents natural subdivisions that invoke an objective approach. However, these boundaries have not been mapped based on plant genetics.
- Each native species has a different pattern of genetic variability across its natural range depending on its natural history. Some show little genetic variation over large areas, even over the whole country. In contrast, other native species have genetically distinct populations that are specifically adapted to habitat areas much smaller than those of the ecological district.
- There are many parts of New Zealand where remnants of natural forest are now scarce. For example, it may be difficult to ecosource seed in some lowland areas yet re-establishing native forest in these areas is highly desirable.
- Where seed is not readily available locally, and seed needs to be obtained from outside the local area, seed collection should preferentially come from within the ‘seed distribution catchment’, i.e., the area over which seed dispersal is likely to occur. This will depend on the seed dispersal mechanisms of the species, e.g., the flight distance of a kereru.

A new look at ecosourcing - larger regions proposed

A recent paper by Heenan et al. (2023) recommends it is time to relax the strict guidelines around ecosourcing seed for local genetic stock if we want to build resilience into our changing environment. This call comes from researchers at Manaaki Whenua—Landcare Research and University of Otago who have published research in the New Zealand Journal of Botany that suggests creating nine broad ecosourcing regions. They believe this will lead to improved restoration outcomes by increasing species and genetic diversity, mitigating the negative effects of inbreeding, and facilitating the genetic rescue of threatened species populations. For more information refer to Factsheet 15.

Ecosourcing and nurseries

- At the nursery, providing planters with an assurance that stock supplied is ecosourced relies on the integrity of the nursery and scope for providing any tangible evidence such as seed collection records linked to labelled beds of seedlings. It is up to those paying for the seedlings to demand proof and to undertake checks they are getting ecosourced stock.
- With the proliferation of 'growing-on-lines' (GOLs), it is getting increasingly difficult to track provenances as nurseries are at the mercy of their seedling supplier's ability to correctly identify provenances.
- Another ecosourcing issue is the potential risk of nurseries collecting or accepting seed from natives with an unknown history; i.e., sourcing seed from plants that may have been planted in the past, particularly if they were not ecosourced.
- Ideally, seed should be collected from nearby natural populations. There are many cultivars of native species widely planted in gardens and parks where seed can be easily collected but should not be used for providing an easy source of seedlings for restoration programmes. The colour and shape of foliage and colour of early flowers can be indicators of cultivars.
- It is imperative that all nurseries, irrespective of size and ownership, whether large commercial nurseries or smaller community or iwi-based nurseries, that they know the origin of the seed, including avoiding cultivars.

Situations where ecosourcing may be less relevant

- Ecosourcing may have less relevance where native trees are planted primarily for reasons other than ecological restoration, such as amenity values or educational purposes (e.g., in arboretums), or timber utilisation.
- Also, where species are part of an ex-situ threatened species programme, they will often need to be planted outside their natural range, particularly if they have a limited natural distribution. Regardless, it is important to conserve the different genetic provenances of threatened species.
- There is a great deal of conjecture about the sourcing of native tree seedlings for plantations established for timber supply; e.g., selecting faster-growing provenances for planting beyond their natural geographical region.



Miro fruiting

- The use of seed from the best-performing provenances may give improved growth, tree form, and wood quality – and may be a prudent option for landowners and investors in establishing native tree plantations.
- Further research is required to determine patterns of variation among provenances of the major native timber species, the benefits of using selected seed sources in plantations for wood production, and the implications for maintaining local (natural) gene pools.
- Avoiding the planting of non-ecosourced native plantings near natural forest will reduce the potential for genetic pollution of local natural populations.



Left: Manuka flowers and seed capsules. Right: Totara seedlings in propagation trays.

A pragmatic perspective on ecosourcing

Paul Pope, ecologist based in Otago, gives his perspective on ecosourcing:

- The word ‘ecosourcing’ is readily included in planning documents and as part of consent conditions and nursery orders, but it is not well defined and not often scrutinised. It seems at times more of a buzzword denoting ecological purity, but once the plants are in the ground everyone forgets about it.
- The lack of plant and ecological knowledge is a serious issue in our industry. An increased understanding of what ecosourcing means and especially how it is applied across regions is at best mixed.
- A further driver of poor ecosourcing is price, and this is again part of the supply chain tension between funders/planters and nurseries. Planters and community groups (especially local government) are driven by the best price possible and are prepared to shop around outside of their region to satisfy their supply requirements. Ecosourcing becomes less of an issue when you have a finite budget.
- A better understanding of regional demand that drives supply over 3-5 years will allow growers and nurseries opportunities to plan and invest in ecosourcing. Too many projects demand “off the shelf” supply lines based on instant funding that doesn’t allow suppliers time to propagate sufficient.
- We are likely to get better ecosourced plants at a better price for planters if we can signal and plan better with our suppliers. Nurseries are nervous to commit to increased production because they’re looking for surety in supply from planters, and raising multiple lines to provide a range of ecosourced seedlings only exacerbates these concerns. Ecosourcing is as much about economies of scale as it is about ecology in our current market.





Recommendations

- Tāne's Tree Trust advocates for best practice ecosourcing as outlined above, but it should not be so rigidly enforced that it becomes a deterrent to planting native forest.
- Strict adherence to the use of local seed raises difficulties where the definition of boundaries for seed-collecting zones is not clear, or the supply of local seed is inadequate.
- We believe a pragmatic approach is required to incentivise the adoption of ecosourcing principles in raising and planting natives for multiple purposes.
- Planters should ask their nurseries about their ecosourcing policies. Nurseries that practice ecosourcing will likely be able to provide tangible evidence that the stock they are raising is ecosourced from naturally occurring stands, such as clear labelling on different lines of stock in the nursery, or a record of their seed collection areas.



Native forest factsheets series

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