



# A Guide to Natural Regeneration and Seeding



Knowing your objective  
and encouraging success

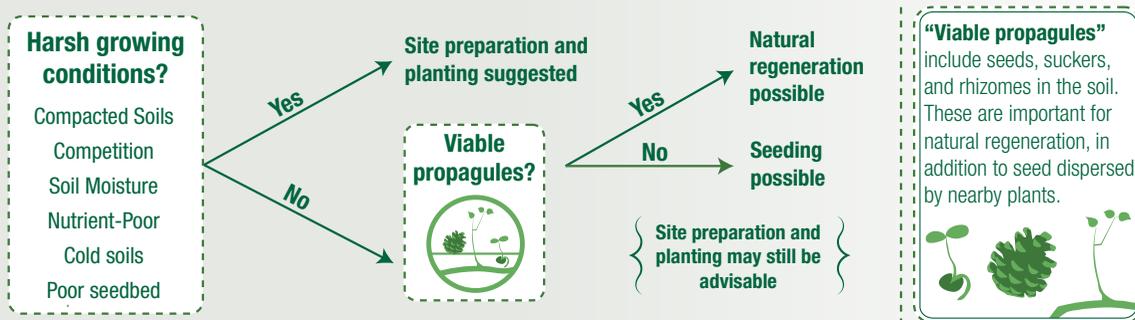
Seeding is less reliable than planting, and natural regeneration even less so, but these regeneration methods may be suitable, low-cost alternatives on some reclaimed sites. Both seeding and natural regeneration avoid the costs of nursery stock, seedling transportation, labour-intensive planting and narrow operational windows. However, these techniques also have high risks as target species may fail to become established at target densities, particularly if there is high competition or other limiting factors on a reclaimed site.

Microsites exposed by contouring and site preparation on reclaimed sites tend to be rapidly colonized by competing vegetation; careful planning and vegetation management are therefore necessary to ensure that competition does not lead to regeneration failure.

## When is seeding or natural regeneration appropriate?

Seeding and natural regeneration both rely on favourable growing conditions for seeds to germinate and seedlings to grow successfully. When environmental conditions are suitable or may be sufficiently improved through site preparation, seeding or natural regeneration may be good options. Natural regeneration is typically only suitable on smaller, minimally disturbed sites with a viable seedbed and requires a large volume of seeds and propagules in the seedbank or from surrounding vegetation (Fig. 1).

**Figure 1. Generalized decision-making framework for regeneration methods.**



## Broadcast Seeding

Seeding is most likely to succeed on sites with low competition, evenly distributed microsites, a good seedbed and favourable conditions for germination (Fig. 1). Favourable conditions include microsites that are well aerated with suitable water, sunlight and nutrient availability, moderate temperatures and low competition.

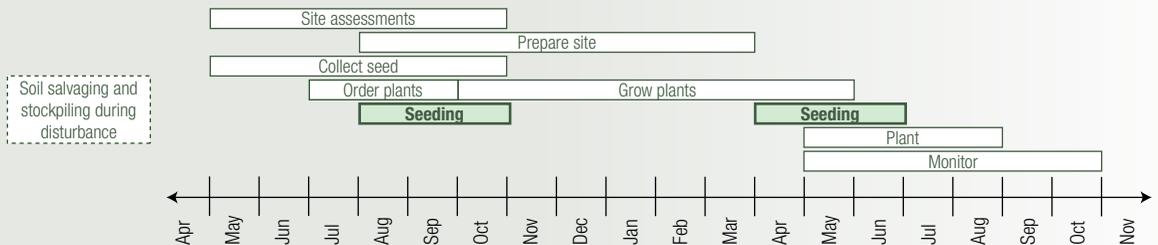
## Applying seed

Many species may require stratification to increase germination. Seed dormancy can be broken using cold stratification and/or digestive seed destruction, with the most appropriate method depending on the plant species. In some cases, fall seeding will promote natural stratification (Fig. 2).

Planners must also weigh the importance of efficiency versus control of seed application. Aerial application can seed a large area very quickly but requires a larger volume of seed. As there is little control over where seeds land, only a fraction will land on microsites suitable for germination, leading to variable success and stocking. Ground-based broadcast application of seed is slower, but it improves control and can also be done at the same time as site preparation.

Germination and survival rates are often variable after seeding, and monitoring is critical to identify and address sites with low success or uneven stocking. Germination and germinant survival both require favourable weather, low predation (e.g., rodents), appropriate microsites and low vegetative competition. If one or more of these conditions is not met, seedling success may be variable or low. Monitoring will help identify sites that require reseeding, in-fill planting, spacing and/or vegetation management.

**Figure 2. Seed may be applied in the fall or in the spring.**



## Natural regeneration

Natural regeneration is the least costly regeneration technique but the riskiest in terms of achieving a return to forest cover on reclaimed sites in a short time frame. It should only be considered for sites that meet the following three conditions:

1. A natural propagule supply must be available. Propagules (seeds, rhizomes and suckers) may be stored in salvaged topsoil but may not be viable if the topsoil was stockpiled incorrectly (see *A Guide to Soil Salvage*). Target tree species surrounding the site may be a seed source but are only effective on small sites across which seed can disperse and are dependent on good seed years.
2. Different species have different soil requirements for germination, and suitable microsites must either be present or be established through site preparation and the use of salvaged topsoil.
3. The site must exhibit favourable environmental conditions (see Fig. 1) or have limiting factors that can be sufficiently addressed by site preparation.

## Conclusions

Minimally disturbed sites with low competition and sufficient exposed microsites may be suitable for direct seeding or natural regeneration. Recognizing these sites is an essential skill to ensure that seeding and natural regeneration are only attempted where these techniques are likely to succeed. While broadcast seeding and natural regeneration cost far less than planting, they are only reliable under favourable site conditions. Ultimately, planting represents the best option to expedite the recovery of a reclaimed site to a closed-canopy forest, bypassing the most vulnerable growth stages and providing direct control over the species and densities of the regenerating vegetation.

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