

# Can Genetic Diversity be Influenced by Nursery Practices?

Why We Care About Genetics Vol.10

When seeds (or other plant propagation materials) are collected, the 'genetic diversity ceiling' has been defined. From that point on, the amount of diversity in the collection can only decline. This has two implications for revegetation projects: it emphasizes the importance of having adequate genetic diversity in the original collection and it points to a need to be mindful of maintaining that diversity to the fullest extent possible until the completion of the planting project, or for as long as the collection is used as the basis of planting projects.

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Genetic diversity is lost when a substantial portion of the original seed collection dies or is culled, or if there is a smaller — but specific — loss of seeds or plants through selection. This happens in nature, too — through natural selection and random events. But because our effects on genetic diversity are in addition to those that occur in the field (and the cumulative effect may be unacceptably large), and because they may not be in the same direction as natural selection, it is beneficial to be aware and minimize or control them.

Practically every nursery activity — seed extraction and cleaning, storage, stratification, seed sowing, seedling

management, packaging, and transportation — can influence genetic diversity. In some cases, this potential shift or loss in genetic diversity is a result of inadvertent selection, such as losing the smaller or lighter seeds during the seed cleaning process, or mortality of some seeds in storage conditions that favor those seeds with thicker seed coats, for example. In other cases, the loss of diversity is intentional — for example, if the larger, more uniform, or faster germinating plants are selected and others are excluded. In both cases, if the plant characteristics that are favored or selected have a genetic basis, then there is loss of genetic diversity to some extent. If, on the other hand, the losses are small and random, there may be no (or negligible) genetic effects.

In many cases, the largest potential genetic impact from nursery practices would result from the inadvertent selection that results from the growing conditions and the intentional culling of plants with (or without) certain features. Nursery culture often involves providing moisture, temperature, and nutrient conditions that are most effective in producing numerous, healthy, fast-growing plants. These cultural practices favor the maintenance of genetic diversity in that many seedlings will survive and grow under such benign conditions. However, if seeds with slower or later germination and seedlings with slower growth rates are culled with the objective of attaining uniformity and other characteristics, some of



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## More Information

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the genetic diversity may be lost. In particular, plants that are adapted to grow in harsh conditions may differ in germination or growth characteristics and be less competitive in a nursery environment. This loss of diversity due to cultural practices is particularly undesirable if the intended planting sites are environmentally heterogeneous (and thus might be better served by introducing plants that span considerable genetic diversity) or if the sites are considerably harsher or much different from the nursery conditions. In the latter cases, there could be a significant loss of adaptive genetic diversity between the nursery and planting stages.

Genetic diversity is further influenced if seedlings are used as donors for cuttings rather than being outplanted directly. Depending upon the number of plants used as parents and their genetic diversity, and how the species reproduces in nature (i.e., if it reproduces asexually and so naturally has several or many plants per clone), this nursery propagation procedure could have negligible to significant genetic impacts. Diversity is also impacted by mixing together seed collections from various areas. While increasing diversity, this practice undermines the ability to track and match locally adapted material.

To help prevent significant losses or shifts in genetic diversity at the nursery stage, natural resource managers can express interest in these impacts



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to nursery managers; encourage nursery conditions that favor retention of much of the original seed collection or that are similar to outplanting sites, where possible; and develop contract specifications that include these requirements and allow diversity in size or other traits in the plants provided. ■

