

SILVICULTURE

APPLYING THE TARGET PLANT CONCEPT TO REGENERATION AND RESTORATION OF KOA

Douglass Jacobs, Ph.D. (Purdue University), Anthony Davis, Ph.D. (Oregon State University), Kas Dumroese, Ph.D. (USDA Forest Service Rocky Mountain Research Station), Diane Haase (USDA Forest Service State and Private Forestry), and Jeremy Pinto, Ph.D. (USDA Forest Service Rocky Mountain Research Station)

Abstract

Applying the Target Plant Concept (TPC) is an important step in determining the best quality seedlings for regeneration and restoration programs. The TPC emphasizes the importance of selecting plant morphological, physiological, and genetic characteristics as defined by the project objectives and conditions of the outplanting site. As such, there is not a “one size fits all” when describing an ideal seedling.

There are five key components of the TPC for determining the desired quality characteristics for a given project on a specific site. First, the project’s objectives and constraints must be considered. For example, optimum plant characteristics can differ greatly for projects designed to achieve conservation, timber production, or wildlife habitat. Second, the source of the plant material is an important factor. It is recommended to use material of an appropriate species and genetic source for the site to maximize environmental adaptation and minimize stresses. Depending on the project objectives, using an improved source with pest resistance or superior growth form may also be desirable. Third, limiting factors on the outplanting site will influence the target morphological and physiological characteristics. Accounting for factors such as seasonal drought, temperature extremes, nutrient deficiencies, grazing animals, and vegetative competition is important for selecting seedling characteristics suited to those conditions (along with site preparation to mitigate limiting factors whenever possible). For instance, seedlings destined for a site where water is limiting may be cultured at the nursery to have a relatively large root:shoot to be able to access a greater volume of soil water. Fourth, stocktype and plant quality choices have a significant influence on subsequent growth and survival. A multitude of container types are available for producing nursery stock, the varying sizes and dimensions will affect seedling morphology. Plant quality can also be tailored using fertilization, irrigation, pruning, and other culturing methods to

achieve targets. Fifth, the outplanting methods and follow-up practices must also be used to help set plant targets. The optimum planting window for the site, the planting tools to be used, treatments to be applied at the time of outplanting, and subsequent project maintenance activities should be accounted for when choosing plant characteristics for each site.

Successfully applying the TPC requires a collaborative effort between nursery managers and their customers. At the onset of a project, the two parties must agree on plant specifications based on the five components of the TPC. Once the target seedling is grown in the nursery, its fitness for purpose needs to be verified by outplanting trials to monitor its performance for up to five years. This information can then be used to fine-tune target specifications for future projects.



Figure 1: Good quality koa seedlings staged for planning into a well-prepared site on Mauna Kea.