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Restoring forests: advances in techniques and theory

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Introduction

Much of the past science of forest regeneration emphasized reforestation following timber harvest for industrial purposes. These research initiatives fostered groundbreaking advances in our field. The establishment of a target seedling concept was developed in North America during the 1980's and 1990's (Rose et al. 1990; Colombo and Noland 1997). Genetic improvements in wood quality and productivity of plantations have led to substantial gains in profitability (Ahtikoski et al. 2012). A vast amount of literature has shown the complex interactions between forest vegetation management and seedling responses, underlining the need to untangle the multiple factors involved (Ammer et al. 2011). Characterization of ecophysiological processes associated with resistance to planting stress and early establishment in temperate and boreal forests (Duryea and McClain 1984; Burdett 1990; Margolis and Brand 1990) has also shed light on the basis to improve reforestation success by managing cultural variables during nursery production and post-planting. Collectively, these contributions have greatly advanced the science and application of forest regeneration.

In recent decades, however, a pronounced evolution has occurred whereby the focal point of many of today's forest regeneration scientists has shifted prominently toward restoration of harsh, degraded environments. Intensive management practices, such as surface mining and road construction, yield extremely harsh sites requiring restoration, demanding new seedling production and planting techniques (Badía et al. 2007; Bell and Hobbs 2007; Salifu et al. 2008; Josa et al. 2012). Many areas, previously converted to agriculture, have since been afforested in developed countries by overcoming problems associated with years of cropping use, such as weed competition or soil compaction.

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