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Planting mahogany in canopy gaps created by commercial harvesting

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This paper is dedicated to the memory of Tim Whitmore.

Abstract

Attempts at natural forest management of mahogany (*Swietenia macrophylla* King) have so far met with limited success, whilst many plantations are beset by the shoot borer *Hypsipyla* spp. In this paper we present preliminary results of an approach to enrichment planting that aims to balance economic returns (rapid growth and good silvicultural form) with intervention costs and changes to forest structure. Mahogany seedlings were planted in gaps created by selective timber harvesting and that ranged in vertical projected area from 91 to 542 m^2 (mean = 257 m^2). Seedlings grew within the matrix of gap regrowth, with limited control of competing vegetation. Sixty-one percent of seedlings had survived by 4.4 years (equivalent to an annual mortality rate of 10.5% $year^{-1}$), and had reached a mean height of 4.5 m. Stocking levels of mahogany were similar to that of naturally regenerated commercial species in unplanted gaps of the same age, but mahogany seedlings were significantly taller. The incidence of shoot borer attack on mahogany stems was relatively low (54.7%), but, more importantly, most damaged stems (58%) responded by producing a single replacement leader. The cost of the proposed methodology (US$ 94 per gap over 4.4 years) was low compared to the high value of mahogany timber relative to other species in the forest. The implications of planting mahogany in gaps for forest management and the potential benefits to conservation of the species are considered.

Keywords: Brazilian Amazon; Canopy gaps; Height growth; *Hypsipyla*; Silviculture; *Swietenia macrophylla*

1. Introduction

Mahogany (*Swietenia macrophylla* King) is one of the world's most valuable timbers. Yet most mahogany logging in Brazil and elsewhere has been at best poorly regulated and at worst illegal (Rodan et al., 1992; Greenpeace, 2002). Such logging removes most of the commercial-sized trees (Gullison et al., 1996; Snook, 1996), may deplete the genetic variability of the species (Newton et al., 1996), and has acted as a catalyst for deforestation (Veríssimo et al., 1995). The unsustainable nature of this trade resulted in the neotropical populations of mahogany being included in Appendix II of the Convention on International Trade in Endangered Species (CITES) in November 2002. More recently, legislation has been adopted in Brazil that seeks to ensure long-term management of the species. The effects of these measures remain to be seen.

Sustainable management of mahogany in natural forest is seen as an important means of ameliorating these impacts (Jennings et al., 2000). However, several studies have argued that there is little or no regeneration after logging in Bolivia (Quevedo, 1986; Gullison et al., 1996), Mexico (Snook, 1993; Dickinson and Whigham, 1999), and Brazil (Veríssimo et al., 1995; Grogan et al., 2003, 2005). It has been suggested that this is because mahogany regenerates as single-aged stands following catastrophic disturbance, and that selective logging causes insufficient disturbance to provide the conditions necessary for regeneration (Snook, 1996). This view was challenged in a recent review of the available evidence, which concluded that not only there was no evidence that mahogany requires catastrophic disturbance in order to regenerate, but that regeneration is often dense after logging in areas transitional between savannah and high forest (Brown et al., 2003). Unfortunately, attempts to increase the density of natural regeneration of mahogany through silvicultural interventions have been attempted only rarely, and have met with mixed success (reviewed in Mayhew and Newton, 1998).

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