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Restoration of Endemic Dwarf Pine (*Pinus culminicola*) Populations in North Mexico

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Abstract

Pinus culminicola (dwarf pine) was described by Andresen and Beaman (1961) as a new endemic species at the top of the protected area Cerro El Potosí, in Nuevo Leon, Mexico. Later, the distribution of the species as a total of 106 ha was described. In 1978 wildfires burned 34 % of dwarf pine population. During the past four decades, a reduction of the area formerly covered by dwarf pine has been observed, due to human impact involving timber extraction, and land use change for aerial navigation infrastructure. Currently, only 30 ha of fragmented dwarf pine area exist, and these include many old trees with low seed production that are subject to cattle grazing. The species is now considered endemic and is subject to special protection.

A study was established to test the effect of cattle, small mammals and elevation on the success of reforestation of an endemic dwarf pine species in North Mexico was implemented. Dwarf pine is under pressure from grazing, wildfires and human activities. We planted and monitored 2-year-old seedlings at three elevations within the natural distribution range of this species. At each elevation three treatments were established: **(1)** seedlings protected from cattle plus small mammals, **(2)** seedlings protected from cattle, and **(3)** seedlings with free access to cattle and small mammals. Seedling survival was ca. 50 % in **(1)** after four years, but there were no surviving seedlings with free access to cattle.

In conclusion, seedling survival was poor after four years for seedlings protected from cattle and small mammals, and no seedlings survived after being exposed to grazing and trampling for three to four years. Mortality was similar at all sites in spite of differences in environments and plant communities present at different elevations. After four years, surviving seedlings were still very small and thus susceptible to trampling and grazing both by cattle and small mammals. The implications for a large scale restoration programme are discussed.

Keywords: Cattle exclosure, grazing, *Pinus culminicola*, rehabilitation, restoration, seedling

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