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

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### Abstract

A study was established to test the effect of cattle, small mammals and elevation on the success of reforestation of an endemic dwarf pine in Northeastern Mexico. *Pinus culminicola* grows only in four high peaks in the Sierra Madre Oriental, and is under pressure from grazing, wildfires and human activities. We planted and monitored 5-year-old seedlings at three elevations within the natural distribution range of this species at Cerro El Potosí.

At each elevation 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. Elevation in general did not account for variation in survival.

We have found low levels of natural and planted seedling recruitment to be a further threat to this endemic species. Seedling growth was poor during five years, which implies that seedlings remained susceptible to grazing and trampling by cattle and small mammals. In this study we have shown that free-range cattle severely limit seedling recruitment as suggested by Jiménez et al. (1999), hence its special protection status should be followed by management plans that exclude free-range cattle, and perhaps seed consuming parrots (Guzmán 1998) and rodents (Beagan et al. 1996) from restoration areas. Seedling survival was poor after five 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.

There were no naturally occurring seedlings found in this study, hence it appears that replanting will be necessary to ensure the continued survival of this endemic species. In addition to protection of natural populations of dwarf pine from wildfires, reforestation programs that include protection for seedlings from cattle and small mammals should be implemented.

**Keywords:** Endemic Pine, Mexico, rehabilitation areas, restoration

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