

# Restoration of “Guaitecas Cypress” forests in North Patagonia, Chile

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## Introduction

*Pilgerodendron uviferum* (Cupressaceae) is an endemic species of Patagonia. It is considered a long-lived and very slow growing species that can live more than 800 years. Its geographic distribution covers more than 1.600 km (40°Lat. South to 55°Lat. South), converting this species in the conifer of most southern distribution in the World. On Chiloé Island (North Patagonia), the historical utilization of the *P. uviferum* forests for timber extraction has caused the destruction of extensive areas of *Pilgerodendron* forests.

Anthropogenic fires have produced radical changes to the structure and composition of the *P. uviferum* forests, which may have exceeded the ecological threshold of the ecosystems. On Chiloé these disturbed forests are not able to revert to their original state, resulting in the establishment and dominance of young second-growth mixed stands belonging to a different successional sequence (Fig. 1). In this context, *P. uviferum* was classified by IUCN as vulnerable and included in Appendix I of CITES.



Figure 1: Undisturbed and disturbed forests of *P. uviferum* in Chiloé Island

## Methods

### a) Plot sampling

The *P. uviferum* forests on the study area (Fig. 4) have been classified into undisturbed and disturbed swamp forests and upland forests. For each forest condition, 4 replicate stands have been located (Total: 16 plots of 500 m<sup>2</sup>). In each of the plots an inventory of trees and regeneration has been made. Light conditions within stands and for seedlings (% Photosynthetic photon flux density, %PPFD) were measured based on the one-point overcast sky conditions method. Trees were cored and root collar discs from *P. uviferum* seedlings were collected (Fig. 3).

### b) Restoration strategies and field assays

In disturbed swamp and upland forests, seed trees of *P. uviferum* were selected to study the regeneration near seed trees. For the quantification of the seed dissemination potential, seed traps were established at 2 m and then every 5 m from 2 seed trees in each cardinal direction. Three disturbed swamp forests and upland forests have been selected to investigate the effect of substrate and light condition on active restoration through planting. For this reason, 216 saplings have been planted (36 per unit) and will be monitored every year for 3 years (Fig. 2). Finally 2 experiments to evaluate the effect of the substrate and heat in the germination of *P. uviferum* seeds will be done.

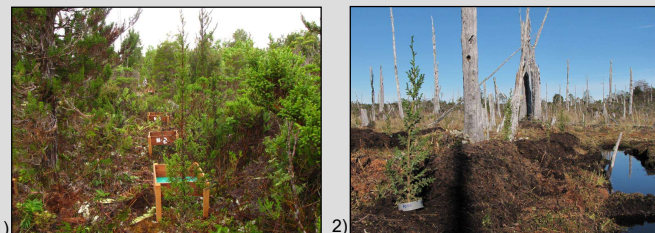


Fig. 2: 1) Seed traps near seed trees of *P. uviferum*, and 2) Restoration planting

## Research questions

This study aims to answer the following questions:

- What is the regeneration niche of *P. uviferum* in long-term undisturbed ecosystems?
- Does *P. uviferum* require catastrophic disturbances to regenerate?
- Which are the key ecological factors (seed dispersal, light, germination substrate etc.) impeding the natural recovery of disturbed *P. uviferum* forests?
- To what extent can natural regeneration from dispersal of seeds of remnant *P. uviferum* trees assist the recolonization of disturbed forests?

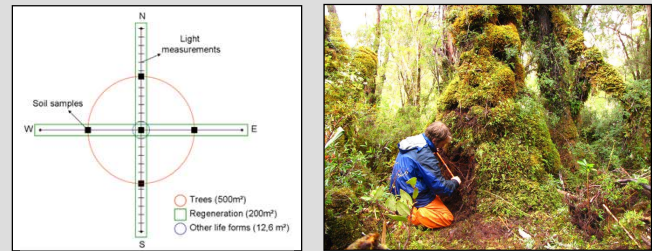


Fig. 3: Plot design and tree rings cores collection

## Outcomes and significance

- Clarity about the often discussed requirement of disturbance for the dynamics and regeneration in *P. uviferum* forests.
- Identification of the ecological factors that are inhibiting the natural recovery of *P. uviferum* after anthropogenic fires.
- Quantification of the seed dissemination potential and its effect on the regeneration near seed trees of *P. uviferum* after fires.
- Information about the best substrate and light condition for the establishment of *P. uviferum* seedlings

In the context of “Restoration Ecology” this is one of the first studies carried out in the temperate forests of Patagonia. The methodologies applied in this study, could be replicated in other disturbed temperate forests of Patagonia.

## Study area

Tantauco Park on south part of Chiloé Island

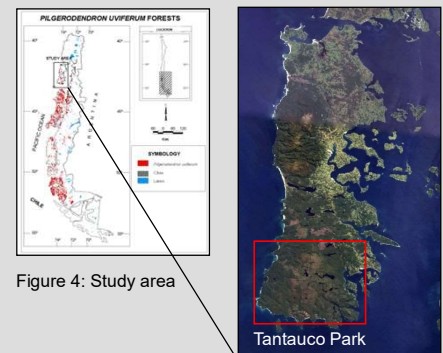


Figure 4: Study area

## Acknowledgments

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