Tree physiology

Ivan Marbà Vologjanin

2026-02-04

Introduction

In recent decades, drought-driven tree mortality has become widespread, particularly in Mediterranean ecosystems (Lemus-Canovas et al., 2024), where prolonged drought accelerates forest-to-shrubland transitions (Coughlan de Perez et al., 2022). Detecting **early-warning signals** of tree decline is therefore essential for anticipating ecosystem changes and guiding conservation.

We investigated massive 2023 mortality event in Aleppo pine (*Pinus halepensis*) at the Garraf Massif (NE Iberian Peninsula).


Figure 1: Mortality zone, Garraf 2024

This episode of drought-driven tree mortality from 2023 was reported in the Catalan news. Despite the rains of recent months, the effects of the drought remain visible.
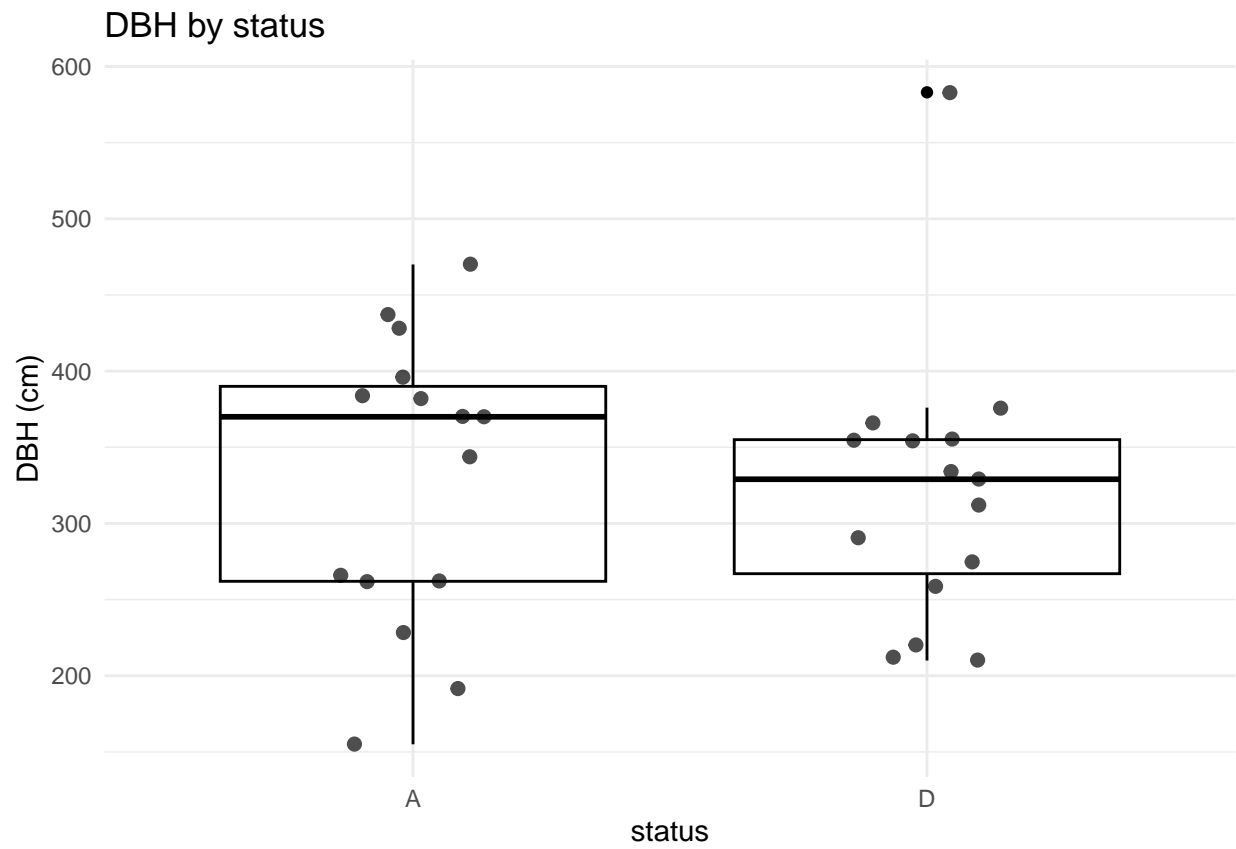
Climatic data

Climatic data were obtained from the meteorological station at El Prat Airport, which has recorded weather variables since 1950 (Prohom et al., 2023). These are the trends of temperature and precipitation for the period 1950-2022.

Precipitation trend at Aeroport del Prat (1950–2023)

$y = -1.85x + 4254.14 \quad | \quad R^2 = 0.043 \quad ns$

DBH by status
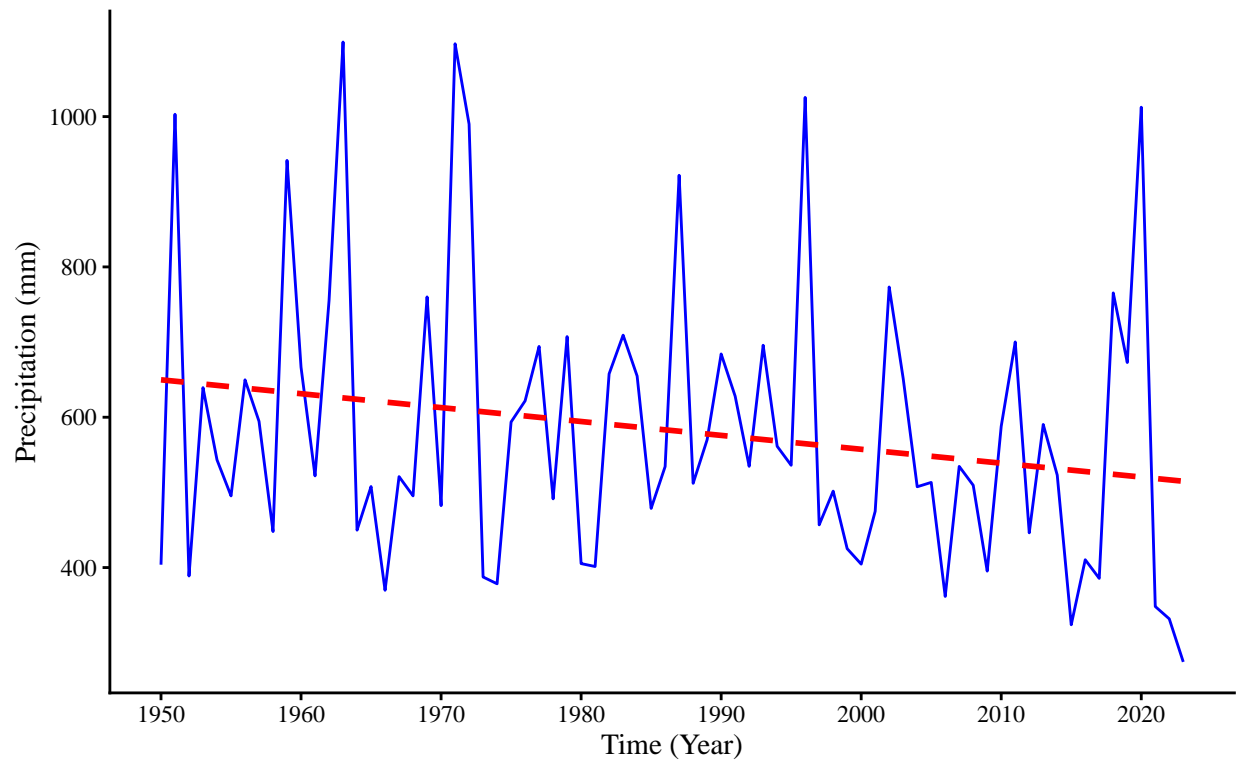
Bibliography

Coughlan de Perez, E., Harrison, L., Berse, K., Easton-Calabria, E., Marunye, J., Marake, M., Murshed, S. B., Shampa, & Zauisomue, E.-H. (2022). Adapting to climate change through anticipatory action: The potential use of weather-based early warnings. *Weather and Climate Extremes*, *38*, 100508. https://doi.org/10.1016/j.wace.2022.100508

Lemus-Canovas, M., Insua-Costa, D., Trigo, R. M., & Miralles, D. G. (2024). Record-shattering 2023 Spring heatwave in western Mediterranean amplified by long-term drought. *Npj Climate and Atmospheric Science*, *7*(1), 25. https://doi.org/10.1038/s41612-024-00569-6

Prohom, M., Domonkos, P., Cunillera, J., Barrera-Escoda, A., Busto, M., Herrero-Anaya, M., Aparicio, A., & Reynés, J. (2023). CADTEP : A new daily quality-controlled and homogenized climate database for Catalonia (1950–2021). *International Journal of Climatology*, *43*(11), 4771–4789. https://doi.org/10.1002/joc.8116