The Spanish Forest decline monitoring database: decaimiento.es

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Introduction

Climate change is accelerating forest decline, primarily due to increasing drought and heat stress, leading to widespread tree die-off and rapid ecosystem disruption. In Spain, this phenomenon is particularly alarming, as future climate scenarios predict an increase of severity and frequency of drought events. **The Spanish Network for Monitoring Climate-Induced Forest Decline** (Red Española de Seguimiento del Decaimiento Forestal inducido por el Clima), is developing a national database to systematically investigate, monitor and document die-off events across the country. The **aim of this initial phase** is to document the sites where forest decline is being studied, as well as to gather all possible details about methodologies, techniques, and other relevant aspects.

Material & Methods

The **decaimiento.es** database compiles detailed information on forest die-off sites, including location, affected species, environmental and biotic factors, defoliation rates, monitoring protocols, and the date of observed events. The database integrates metadata from field observations where climate-induced die-off is being recorded and monitored. For its design, we considered the structure and methodology of leading international die-off databases and relevant bibliographic compilations on tree mortality (e.g., International Tree Mortality Network, ITMN) to make it directly compatible with other harmonizable international initiatives.

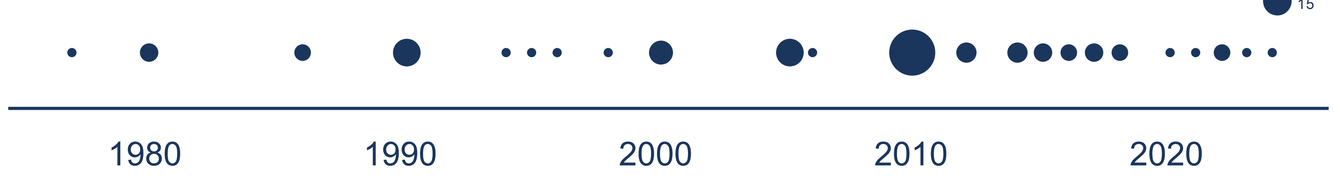
Results

Up to now, the database includes **92 locations** where research on forest mortality is being conducted. Research has been reported on **21 species** (11 broadleaved and 10 coniferous), of which 4 are shrub species

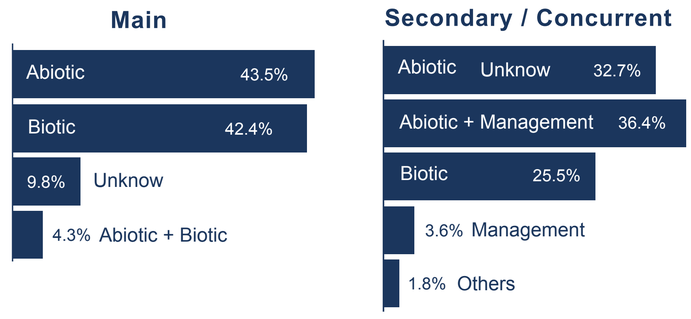
Where is forest mortality research being conducted?

When did the forest die-off start?

This plot shows the date when the forest die-off were detected. Point size is proportional to the number of sites with the same startig year



What types of drivers of forest mortality have been reported?

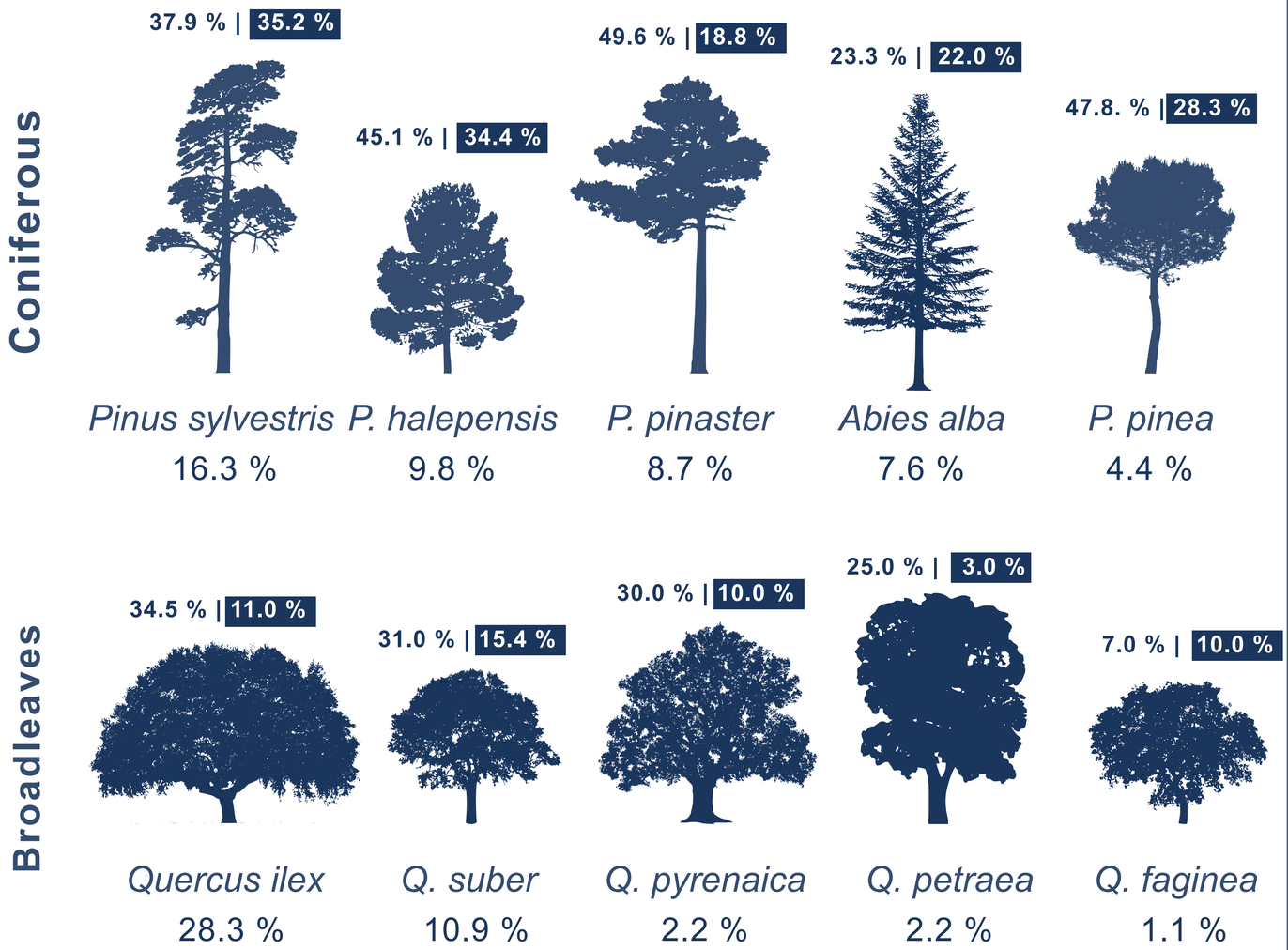


What are the most frequent species affected?

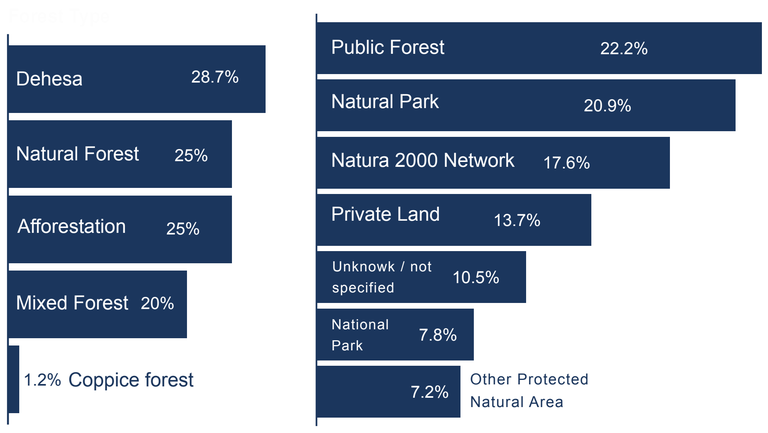
Site average

Defoliation **40.5 %** | Mortality **24.6 %**

In 94.5 % of the documented sites, the main species affected was the dominant one. The average defoliation and mortality were 40.5% and 24.6% respectively. In 21.7 % of the cases, decline was observed in more than one species.

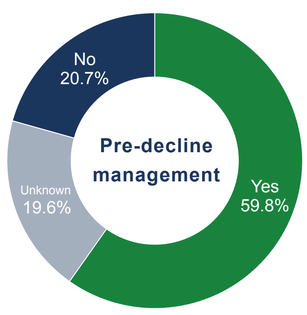


In what type of forest and land ownership has forest decline been reported?



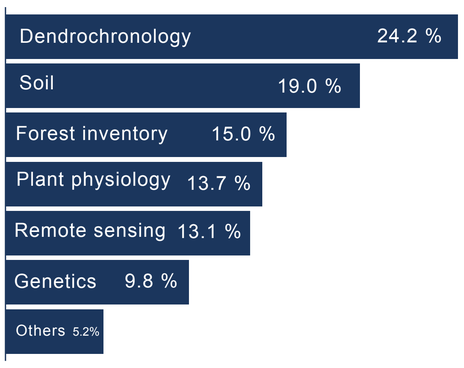
What is the most common forest management action once forest decline has occurred?

Most management actions after forest decline involve removing dead trees, while many remain unreported. Notably, in almost 60% of cases, pre-decline management practices were present



Post-decline management actions

How about the research conducted in the reported sites?



In this first version, our database has recorded 88 researchers conducting multidisciplinary studies at the reported sites. On average, there are three researchers per site, with a maximum of 14 researchers at some locations. These investigations have resulted in a total of 58 scientific papers. Dendrochronology and soil studies are the most frequently used methodologies.

Conclusions

In its initial version, the database including forest die-off sites distributed across Spain. The database (**decaimiento.es**) acts as a collaborative platform, connecting scientists working with different methodological approaches, and fostering joint efforts to address the shared challenge of forest die-off. Next version will include data from more sites and will allow to analyze spatial and temporal patterns of tree die-off in Spain.

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