Forest Fire Prevention and Management: Prescribed Burning

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Abstract

The paper examines how prescribed burning for the prevention of wildfires is being carried out in Mediterranean-type forest ecosystems, so that it may be introduced at the policy level in Greece. Three case studies are used. The first two are from California (US) and Spain where prescribed burning is already being used successfully for forest management. The third examines the 2021 prescribed burning pilot programme held on the island of Chios (Greece), which shows good potential for the use of prescribed burning in Greece as well. The paper concludes that community knowledge and engagement, research and academic institutions, and cooperation among stakeholders are key parameters for the successful implementation of prescribed burning in Greece.

Introduction

Climate change exacerbates the negative impacts of long-term fire suppression and alters natural fire regimes in Mediterranean forest biomes. New management methods are needed to prevent extreme wildfires and their associated negative effects on forests and society. Prescribed burning (PB) is a promising tool which can help achieve that. This paper uses three case studies to examine how PB for the prevention of wildfires may be introduced at the policy level in Greece. California and Spain have successfully implemented PB in Mediterranean-type climates similar to that of Greece. The 2021 PB pilot programme held in Greece by WWF aimed to shed light on how PB might work and how policy can proceed to integrate it as a management tool.

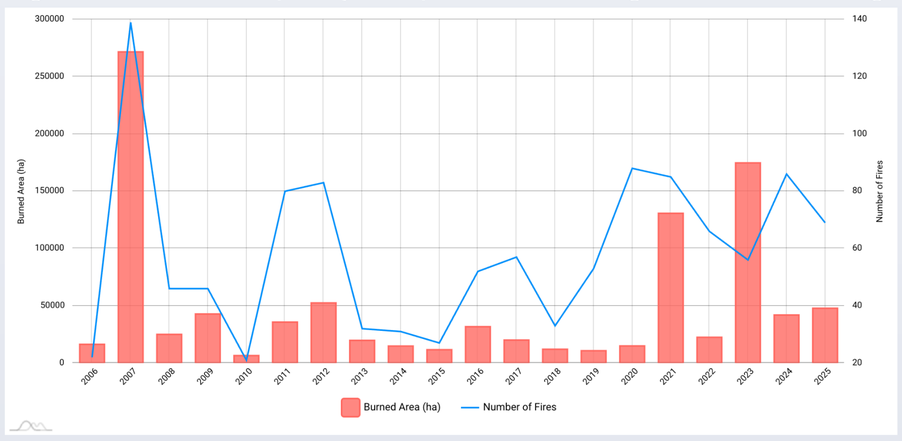


Figure 1: EFFIS Annual Statistics for Greece up to 20 Nov 2025

What is Prescribed Burning?

Small and controlled fires conducted outside of the wildfire season have positive impacts on forest ecosystems and help prevent the outbreak of larger fires and their devastating effects. The implementation of PB across spatial and temporal scales will depend on particular management objectives (e.g., fuel reduction vs biodiversity enhancement), forest type and location, fire regime and possible restrictions. Across Europe there is little progress in adopting PB, however Mediterranean countries like Portugal, Spain and (southern) France employ PB for fuel reduction.

Case Study A: California, USA

California has a Mediterranean-type climate and a long history of fire and cultural burning. PB was legalised on federal lands in 1943. Forest fire management occurs on the state level and community levels. Historical fire exclusion and losses to extreme wildfire events led to the formation of Prescribed Burn Associations (PBAs) across the US. PBAs are “cooperative volunteer networks of landowners, community members and others working together to plan and implement burns on their own land in local landscapes”. This community-led form of PB on private lands requires permits from the California Department of Forestry and was inspired by Indigenous practices. California has the largest number of and eldest PBAs in the country. Their primary objective of is wildfire risk reduction and restoration of fire-adapted ecosystems. PBAs highlight the importance of the central role that local people of all ages and perspectives can and should play in the management and restoration of fire. Fire use does not have to be overly expensive, bureaucratic, or out of reach.

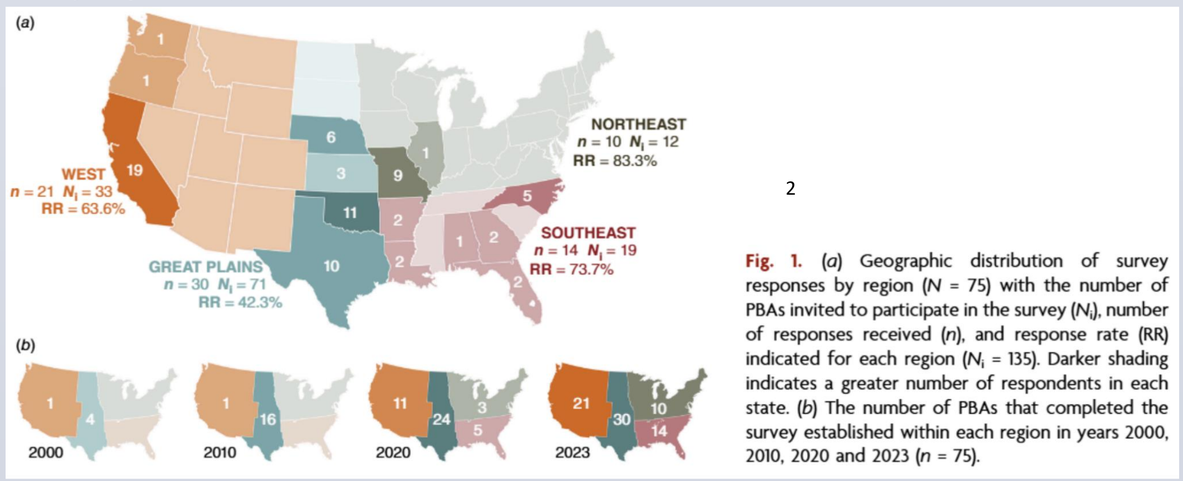


Fig. 1. (*a*) Geographic distribution of survey responses by region (N = 75) with the number of PBAs invited to participate in the survey (N_i), number of responses received (n), and response rate (RR) indicated for each region (N_i = 135). Darker shading indicates a greater number of respondents in each state. (*b*) The number of PBAs that completed the survey established within each region in years 2000, 2010, 2020 and 2023 (n = 75).

Case Study B: Spain

PB was adopted in Spain in the 21st century. Pilot schemes began in the 1990s and 2000s. Implementation and growth expanded in the 2010s. Like Greece, Spain has historically relied on fire suppression, leading the country to experience biodiversity and fire-adaptation losses, while also experiencing annual wildfires. PB in Spain is only carried out by government personnel, with each autonomous region having a regulatory agency for forestry issues. The progressive implementation of PB techniques was spearheaded by PB training courses offered by Lleida University and the Gran Canaria Council, as well as the research of scientists. The training courses allowed managers to apply PB activities at a local scale while simultaneously training local crews. Research centres in the forest sciences play a fundamental role in growing PB implementation.

Case Study C: Prescribed Burning Pilot in Greece

For a two-year period starting in June 2021 and ending in November 2023, a PB pilot project was carried out on the island of Chios in Greece for the purpose of exploring the use of PB as a form of wildfire prevention. The goal was to gather and provide data to form the basis of policy proposals for the prevention of forest fires using PB for fuel management, which would result in the institutionalisation of PB in Greece and the assimilation of PB by competent services and local communities. Researchers examined the relationship between fireline intensity and plant water potential, effects on soil, and plant biodiversity. They conducted field experiments in representative ecosystems, measuring flame length to determine fireline intensity, and gathering soil samples before and after PB treatments for analysis. They evaluated plant diversity (species number, Shannon and Simpson Indices) before and after PB as well, and measured leaf water potential to better understand the physiological plant response to different seasonal and site conditions. They found that PB has a significant effect on plant diversity in the burned forests of Chios. Plant diversity values were higher after PB, attributed to higher differentiation in burned areas and the promotion of regeneration of post-fire specialist species. Soil responses differed among sites; critical minerals organic carbon and nitrogen declined in some sites, while other soils were temporarily enriched with calcium and magnesium cations. Site-specific results are very important. Plant water potential analysis showed seasonal fluctuations in stress, with higher water stress conditions in the winter vs spring. Seasonality thus needs to be accounted for in PB planning. There was an overall enhancement of biodiversity and ecosystem recovery, combined with fuel load reduction.



Figure 3 - Training Omikron volunteers in destructive sampling of surface fuels

Lessons Learned, Recommendations & Policy Pathway for Greece

From the first case study (California) we learn the crucial role of PBAs in democratizing fire, as well as of collaboration among the state and the community. Local and Indigenous knowledge and practices are very important in ensuring the successful management of forests for the prevention of wildfires. The second case study (Spain) teaches us that scientific research and academic institutions are vital in the progression and implementation of PB at the national level. The third case study (WWF) reinforces the importance of cooperation between state, agencies, volunteers, and local communities in the successful application of PB. It also shows the need for long-term monitoring, accounting for seasonality in PB planning, and site-specific data. All three case studies reveal benefits of PB for wildfire prevention and biodiversity enhancement, proving PB to be an effective management tool for Mediterranean ecosystems. In Greece, moving forward, more PB projects should be promoted to progress the adoption of a legal framework for its implementation. They should be accompanied by training services, procedures to be followed, and guidelines on how to identify areas in need of treatment. Implementing PB will create more opportunities to improve cooperation and training between the Forest Service and the Fire Brigade.

Conclusion

Although controversial, PB has been shown to be an effective tool for wildfire prevention. With its over-reliance on fire suppression, Greece could benefit from implementing PB to reduce the effects of wildfires that have been ravaging the country every summer for the past decades. California teaches us the key role of PBAs in democratizing fire and promoting community knowledge. Spain teaches us the fundamental role of researchers and academic institutions in progressing the implementation of PB techniques at the national level. Both cases also teach us the instrumentality of collaboration between state and non-state actors. From the WWF pilot program in Chios we learn the importance of cooperation among all stakeholders (state, agencies, volunteers), as well as the active participation of the local community. We also get a first taste of how PB can be implemented in Greece. The Greek government should combine these three takeaways to successfully introduce PB at the policy level in Greece.

Indicative References

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