FIREMAN

Fire management to maintain biodiversity and mitigate economic loss in forests and heathlands in Europe

OBJECTIVES

Fire is a natural part of many forest, shrubland and grassland ecosystems' natural functioning, having effects on species dynamics and diversity, physical structure of ecosystems, and on services they provide. Fire-ecosystem relationships are modified under changing climatic conditions, and fire regimes (i.e. the pattern, frequency and intensity of fires in a given area) have been heavily modified due to human activities, with both ecological and economical implications. Intense or inappropriate fires can cause enormous damage, and extreme fires experienced in Europe since the year 2000 have called for co-ordinated European policy on fire management. In this context, FIREMAN aimed at analysing fire-biodiversity relationships and generating policy guidance and management tools for the appropriate use of fire to foster biodiversity in three major European ecosystems (boreal forests, wet upland heathland/moorland and Mediterranean shrub-forest systems).

APPROACHES

Gathering researchers from four countries across Europe, the FIREMAN team's approach was to:

1. Establish fire-biodiversity "baselines" (i.e. reference relationship between fire and biodiversity) in the studied ecosystems;
2. Develop site-specific models of fire-biodiversity relationships and a regional model of climate-fire-vegetation relationships, and produce scenarios at local and regional scales;
3. Develop and disseminate practical decision tools and regional burning guidelines for policy-making, including an evaluation of societal preferences towards prescribed burning, fire prevention and biodiversity management.

MAIN ACADEMIC FINDINGS

- Looking back several thousand years at fire histories in Europe by analysing sedimentary charcoal data, FIREMAN found a progressive increase in fire activity during the last 3,500 years, even more drastic during the last 250 years and declining abruptly after the industrial era. The long-term control of fire is best explained by land-cover change linked to human activity, plant litter availability and climate-related parameters [66].
- FIREMAN mapped fire risks for Northern Europe based on forecasted climate change and found most significant increases in fire intensity/frequency for southern Scandinavia and the Baltic States.
- Most current Scandinavian fire regimes could be more appropriately managed to foster biodiversity [67].

Based on their work and results, the FIREMAN team developed local fire-biodiversity models in study sites for the UK and Scandinavia, including burning timing, frequency, location and intensity. The models were used as a basis for management tools. In addition, the project developed a regional model accounting for vegetation impact and emissions caused by fire.

Consortium partners:

School of Environmental Sciences, University of Liverpool, UK
Coordinator: Richard Bradshaw

Swedish Forest Society Foundation (Skogssällskapet), Sweden

Peak District National Park Authority, UK

Institute of Evolution Sciences of Montpellier, CNRS/IRD, France

Faculty of Economic Science, University of Santiago de Compostela, Spain

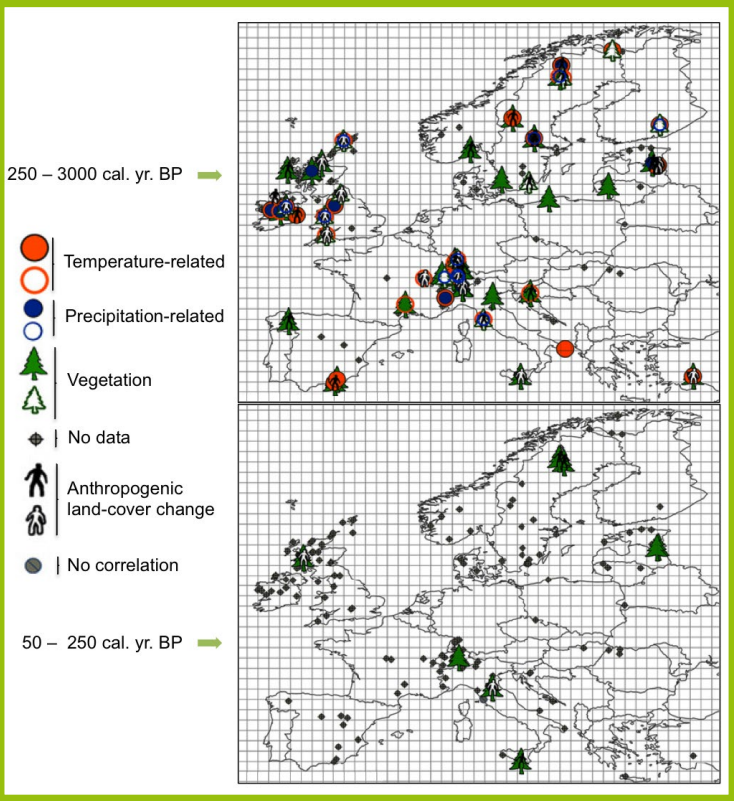
Dept. of Physical Geography and Ecosystems Science, Lund University, Sweden

Amount: € 1,628,709

ACADEMIC RESULT HIGHLIGHT

The FIREMAN team investigated Holocene fire activity based on 156 sedimentary charcoal records from across Europe and covering the last 9000 years. Combined with palaeoclimate, vegetation and fire indices simulated by a dynamic vegetation model, these data show that a progressive increase in fire frequency began around 3500 cal. yr bp and rose sharply from 250 cal. yr bp onwards, reaching a maximum during the early Industrial Era and then declining abruptly. When considering the whole Holocene, the long-term control of fire is best explained by anthropogenic land-cover change, litter availability and temperature-related parameters (see Figure). The 20th century decline in biomass burning is likely due to increased landscape fragmentation and active fire suppression policies.

* Molinari *et al.* (2013) Exploring potential drivers of European biomass burning over the Holocene: a data-model analysis. *Global Ecology and Biogeography* 22: 1248-1260

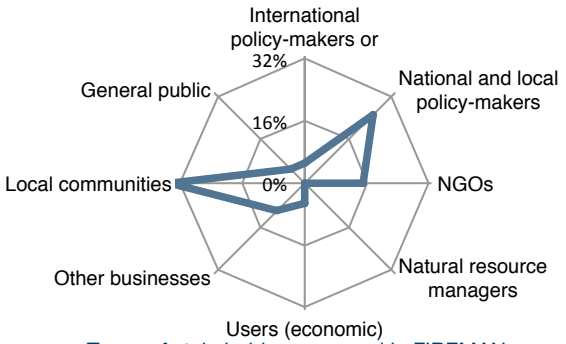


Best predictor of major changes in fire activty in Europe for the different selected timescales (here: 250-3500 cal. yr. BP and 50 to 250 cal. yr. BP). After Molinari *et al.* 2013 (*Global Ecology and Biogeography*)

STAKEHOLDER ENGAGEMENT AND PRODUCTS RELEVANT TO SOCIETY/POLICY

The FIREMAN team interacted with a range of stakeholders (see Figure) in different ways, thanks to:

- Annual National Consultative Fora involving project stakeholders from the government and local authorities, forest industry, landowners, fire fighters, etc;
- A European-wide survey of attitudes towards fire, evidencing a North-South gradient as to the apprehension of risks posed by uncontrolled or prescribed burning;
- The involvement of the Peak District authorities in the UK as a project partner. Beyond accessing sites, the provision of background data and a close collaboration led to the development of a specific management tool developed for the Peak District moorland burning system;



Types of stakeholders engaged in FIREMAN

- Active provision of advice to NGOs involved in nature protection and government authorities in charge of prescribed burning, providing evidence-based recommendations;
- Provision of information and recommendations at different policy-levels, for instance within the Forest Europe Ministerial Conference.

HIGHLIGHTS ON SOCIETY/POLICY-RELEVANT PRODUCTS

- **Proof of evidence**: FIREMAN actively provided advice on both prescribed burning practice, wildfire risk and moorland management part of a DEFRA Public Inquiry on a conflictual situation involving the owners of moors in the UK and an NGO. The contribution of FIREMAN allowed unlocking this particular situation with an evidenced-based defence of prescribed burning.

- **Technical review**: FIREMAN team members built on project results to contribute to an IUCN technical review on the impacts of burning management on peatlands (http://www.iucn-uk-peatlandprogramme.org/publications/commission-inquiry/work-commission/impacts-burning-management-peatlands).