

What to do after fire? The contribution of the Phoenix Project Centre to post-fire management

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Abstract: The European Forest Institute (EFI) is the leading forest research network in Europe, with over 130 member organisations. EFI Project Centres consist of institutional networks of EFI members and other partners. They carry out research within the scope of EFI's research strategy and under the EFI name and scientific umbrella. The Project Centres are financed independently of EFI and have a limited duration. In May 2005, the EFI approved the creation of the Regional Project Centre PHOENIX (2005-2009), carrying out specific research on fire ecology and post-fire management. The consortium currently includes 18 members from Mediterranean countries and is coordinated by Centro de Ecologia Aplicada "Prof. Baeta Neves" of the Instituto Superior de Agronomia, Lisbon, Portugal (CEABN/ISA). The main objective of the Project Centre is to develop decision criteria for preventive post-fire forest management. PHOENIX has the following specific objectives: (a) to develop a database gathering state-of-the-art existing scientific knowledge concerning the fire characteristics of the different forest types and respective species; (b) to develop a set of criteria which can be used to classify forest types in terms of the associated fire hazard and resilience; (c) to define the potential and limitation of the various post-fire management options; (d) to help developing the transfer mechanisms needed between research and its application by end-users in this specific issue. The expected main benefits of PHOENIX include the provision of a scientific basis for post-fire management options that allow adequate decisions by land managers, an effective use of the acquired knowledge, the definition of priorities for research on post-fire management, the harmonization of research efforts envisaging the development of common criteria for post-fire management decisions. The activities carried out so far within PHOENIX are presented, as well as the main achievements. PHOENIX can be a very effective way of knowledge transfer from science to stakeholders and managers.

Keywords: post-fire management, techniques, research, knowledge transfer

1. The need for post-fire management

The frequency and intensity of fires in the Mediterranean region have attained unprecedented levels. Flammable vegetation recovers quickly after a fire event but fire also promotes more flammable vegetation, creating a positive feedback which also accounts for the increasing frequency of wildfires. In many other situations, natural vegetation has been replaced by single species forest stands, used for timber or pulp production. These stands often promote high-intensity fire behaviour given their structure and the intrinsic fuel properties of the respective species. When composed of conifers, their resistance to frequent fires is also very low, which originates considerable losses both from the economical and the ecological point of view. The result of this scenario is that fire has become the most important forest problem in several European countries, with an enormous environmental impact.

One of the first post-fire questions needing answers is: what to do, in the short-term, after a fire? Measures to avoid soil erosion, flooding, biodiversity impacts are needed. On the other hand, wildfires can be regarded as an opportunity (a window) to influence the direction of secondary succession towards more mature stages that could be less prone to fires. In order to capture this narrow window of opportunity and break the fire cycle, it is important to use scientifically based knowledge to support the different management solutions for burned areas. There are good indications that, in order to reduce combustibility of landscapes, deciduous broadleaved species might be a solution, as they are less “preferred” by fire (e.g. Moreira et al., 2001). Besides the problem of combustibility it is also important to consider the resilience of the different forest types to fire. There is evidence that some species are remarkably more resistant than others. In terms of fire resistance, the insulating properties of the bark are determinant as well demonstrated by cork oak in Southwest Europe. Other species are remarkable in their capacity to establish new seedlings after fire, as for example the Aleppo pine in the Mediterranean Region (e.g. Arianoutsou & Ne’eman, 2000).

A considerable effort has been put on forest fire research in recent years. For example, an ever-growing body of literature (e.g. the review by Fernandes & Botelho, 2003) testifies the advantages and limitations of fuel management. But there is still much more to know before we are able to have a comprehensive understanding of these post-fire issues, allowing a direct and current use of this knowledge in post-fire management actions. In particular there are important asymmetries between the knowledge levels corresponding to different forest types, characteristic of different fire-prone regions of Europe. Some species and forest systems are reasonably known whereas others have been completely forgotten.

At the same time, there is undoubtedly a lack of knowledge transfer between the results obtained by previous research and their application in terms of post-fire management procedures. There is scientific knowledge not being applied, but there are also technical procedures which are not scientifically based or even contradicting the current state-of-the-art. Best practices for post-fire management should be a by-product of the fire behaviour and fire ecology sciences, but such combination and application of knowledge have not been approached previously in a structured, consistent, comprehensive way.

2. The contribution of PHOENIX

“PHOENIX – Fire ecology and post-fire management” is a Project Centre of the European Forest Institute (EFI). EFI Project Centres are consortiums of EFI members and other relevant partners. They carry out research within the scope of EFI's research strategy and under the EFI name and scientific umbrella. The Project Centres are financed independently of EFI and have a limited duration.

PHOENIX consortium consists of a group of researchers from various countries in southern Europe much affected by forest fires (Portugal, Spain, France, Italy, Greece).

PHOENIX focuses on research and related policies in fire ecology and post-fire management in Europe. Its objectives are: (1) to gather the state-of-the-art of existing scientific knowledge concerning the fire characteristics of the different forest types and respective species; (2) to develop a set of criteria which can be used to classify forest types in terms of the associated fire hazard and resilience; (3) to define the potential and limitation of the various post-fire management options; (4) to help developing the transfer mechanisms needed between research and its application by end-users in this specific issue. The activities of PHOENIX address both institutional actors (e.g. forest administration, forest research and education organizations, extension services) and practitioners.

3. The PHOENIX network

The PHOENIX network currently consists of 18 research organizations from 5 European countries (Portugal, Spain, France, Italy and Greece) (Figure 1). Partners benefit from joint research and co-operation activities as well as regular information and knowledge exchange. The Technical University of Lisbon, Institute of Agronomy, Centre of Applied Ecology “Prof. Baeta Neves”, Lisboa, Portugal hosts its office. PHOENIX activities will take place from 2005 to 2009.



Figure 1 – Geographic location of current PHOENIX partners. **Portugal** (Institute of Agronomy, University of Trás-os-Montes e Alto Douro, University of Aveiro); **Spain** (Centro de Estudios Ambientales del Mediterraneo, University of Santiago de Compostela,

Centre Tecnològic Forestal de Catalunya, University of Castilla-La Mancha, IPROCOR); **France** (CEMAGREF, IAMF, INRA); **Italy** (University of Napoli, University of Tuscia, Italian Academy of Forest Sciences, University of Basilicata); **Greece** (University of Tessaloniki, University of Athens).

4. PHOENIX scientific activities

The activity of the Centre is being developed according to four tasks:

Task 1. A scientific basis on post-fire management

This task consists on gathering the state-of-the-art of existing scientific knowledge on post-fire management, including the fire characteristics of the different forest types and respective species. This will allow to detect the existence of knowledge gaps and to define essential guidelines for future research. Five different subtasks are considered, aiming to answer five different questions about the fire characteristics of the different species and forest types and about the range of options to be taken:

- 1.1 What forest types are less likely to burn? This will be done by identifying in available databases and publications, the major land cover types (particularly forest types) avoided (and preferred) by wildfires;
- 1.2 What are the characteristics of the dominant species that can explain the different preference to fire of the various forest types? This will be performed by analysing, from the available literature, the characteristics of dominant species that make them more or less prone to burn, not only as individual plants but as parts of important forest ecosystems.
- 1.3 What forest types are more resilient to fire? This will be based on the review of studies that assess resilience of the various plant formations.
- 1.4 What are the species characteristics that control the different passive (a) and active (b) resistance to fire? This implies finding from existing studies the plant characteristics (traits) that are associated with the persistence of the species after fire and under different fire regimes.
- 1.5 What are the general findings of the fire history of some major forest types and species in southern Europe? This is based on previous works dealing with fire history based on different techniques such as pedomorphology, palinology and phytosociology. The first technique is relatively recent and is based on the identification of woody species from traces of charcoal remaining from past fires.

Task 2. Technical recommendations

This task aims to contribute to the production of scientifically-based decision criteria on post-fire management. It has two stages targeted to answer two sequential questions:

- 2.1 What are the adequate forest types /species to use in forest conversion after fire and;
- 2.2 What is the potential and the limitation of the various post-fire management options.

In order to answer task 2.1 the creation of classification criteria concerning the fire characteristics of the different forest types at the European level is needed. This has to do with the establishment of standards for the main characteristics involved such as flammability, heat content, combustibility and fire resistance. The achievement of a common understanding at this level will allow the development of a set of criteria, which can be used to classify forest types in Europe in terms of the associated fire hazard. The answering of the second question will consist on the analysis of short-term post-fire management options, as well as the review of the regeneration-capacity levels for the major forest types.

Task 3. Knowledge transfer

This task aims to identify the reasons for the lack of effective transfer mechanisms between research achievements and its final application by end users. Since the situations will certainly vary for each country considered, the different teams integrating the working group corresponding to this task will be particularly concerned with the specific situation of the respective countries. This task will imply for example an assessment at the legislative, social, economic and institutional levels.

Task 4. Technical guidelines on post-fire management

The overall aim of the PHOENIX Project Centre is the improvement of Fire Ecology and Post-Fire Management knowledge for a better management of fire-prone areas, both for the benefit of professionals and technical operators and as a communication tool to promote towards general public the interest and the appreciation of these issues. For these reasons the network achievements will be integrated into book on “Technical guidelines on post-fire management”. Apart from offering a valuable product to train the stakeholders, the Guidelines (printed and available on the web) will focus the network on a tangible target exploitable towards a wider user audience.

5. PHOENIX outputs

The main outputs expected from PHOENIX activities are:

PHOENIX Web-Server: A PHOENIX web site was created, containing both missions and achievements of the network (Figure 2).



Figure 2 – The PHOENIX website (<http://www.phoenix-efi.org>).

The project website aims at creating a reference point for information about the progress of the Project Centre and its events and scientific aspects. It is a channel for diffusion of the projects objectives and results open to the potentially interested audience. It will host the main PHOENIX results, including the "PHOENIX Guidelines on post-fire management"

PHOENIX leaflet: A leaflet was produced to promote the Project Centre and its objectives towards the communities of foresters and to diffuse the PHOENIX mission towards a wider audience.

PHOENIX newsletter: A newsletter will be published every year with the objective of informing the partners of the Project Centre and the target audience.

PHOENIX Conferences: For a major diffusion of the state of the art in the field and of project, aims and results, as well as to offer something valuable for addressing a wider audience, two "PHOENIX Conferences" are planned, that will be promoted and organised in order to become a meeting point for the technical operators in this field.

PHOENIX Workshops: These are workshops at the national level, in order to discuss with the decision makers, public and private organisations, planners and citizens the needs on post-fire management. These workshops have already been carried out in Portugal, Italy and Spain.

Advanced Courses on post-fire management: these courses will be organized in order to train new researchers, including BCs, MSc, PhD and post-doctoral researchers and for mid-career training of forestry professionals. The first edition took place in Portugal (November 2005) and a new edition is planned for November 2006.

Technical guidelines on post-fire management and electronic handbook: an electronic handbook will be developed on the Action's website, addressing (a) an analysis of (short-term) post-fire management actions, and (b) an analysis of fire hazard and management options per forest type in Europe. The handbook will be planned in order to be updated as new knowledge is added by further research initiatives.

6. PHOENIX future

We have an ambitious plan, and we aim to increase this network with other institutions having relevant knowledge in fire ecology and post-fire management. However, the success of this network depends on funding, currently not existing. This is a short-term priority for the consortium. We have made an application for a COST action that could be an important step for our achievements.

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