

## Assessing wildfire occurrence probability in *Pinus pinaster* Ait. stands in Portugal

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### Abstract

Maritime pine (*Pinus pinaster* Ait.) is an important conifer from the western Mediterranean Basin extending over 22% of the forest area in Portugal. In the last three decades nearly 4% of Maritime pine area has been burned by wildfires. Yet no wildfire occurrence probability models are available and forest and fire management planning activities are thus carried out mostly independently of each other. This paper presents research to address this gap. Specifically, it presents a model to assess wildfire occurrence probability in regular and pure Maritime pine stands in Portugal. Emphasis was in developing a model based on easily available inventory data so that it might be useful to forest managers. For that purpose, data from the last two Portuguese National Forest Inventories (NFI) and data from wildfire perimeters in the years from 1998 to 2004 and from 2006 to 2007 were used. A binary logistic regression model was build using biometric data from the NFI. Biometric data included indicators that might be changed by operations prescribed in forest planning. Results showed that the probability of wildfire occurrence in a stand increases in stand located at steeper slopes and with high shrubs load while it decreases with precipitation and with stand basal area. These results are instrumental for assessing the impact of forest management options on wildfire probability thus helping forest managers to reduce the risk of wildfires.

**Key words:** forest management; risk; fire occurrence model; *Pinus pinaster* Ait.

### Resumen

#### Evaluación de la probabilidad de ocurrencia de fuegos en rodales de *Pinus pinaster* en Portugal

El artículo presenta un modelo para evaluar la probabilidad de ocurrencia de incendios en masas regulares y puras de *Pinus pinaster* en Portugal. Se desarrolla un modelo basado en datos de inventario fácilmente disponibles de tal forma que pueda ser una herramienta útil para los gestores forestales. Los datos proceden de los dos Inventarios Nacionales de Portugal (NFI) y de los datos de los parámetros de incendios forestales durante los años 1998-2004 y de 2006 a 2007. Se ha utilizado un modelo de regresión logística binarias utilizando datos biométricos del NFI. Los datos biométricos incluyen indicadores que puedan ser cambios en las operaciones prescritas en los planes forestales. Los resultados muestran que la probabilidad de ocurrencia de incendios en un rodal aumenta en rodales localizados en grandes pendientes y con una carga alta de matorrales, mientras que decrece con la precipitación y con el área basimétrica. Estos resultados son instrumentos para evaluar el impacto de las opciones de gestión forestal en la probabilidad de incendios ayudando por tanto a los gestores a reducir el riesgo de incendio.

**Palabras clave:** gestion forestal, riesgo, modelo de ocurrencia de incendios, *Pinus pinaster* Ait.

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### Introduction

In Portugal, nearly 40% of the country's territory was burned in the last three decades (Marques *et al.*, 2011). These wildfires had a substantial impact in the

forested landscape configuration and composition. For example, the relative importance of the maritime pine area decreased from 30% to 22% of the total forest area in the period from 1995 to 2006 (DGRF, 2006). In the last ten years wildfires burned about 26,000 hectares,

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Received: 12-01-11. Accepted: 27-06-11.