



# ADVANCES IN FOREST FIRE RESEARCH 2018

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# Calibration of the Canadian FWI System for the Territory of Europe

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## Abstract

The role played by the meteorology in the development of a forest fire is widely recognized. There are several models to assess the risk of forest fires used by the authorities to define the state of readiness of the fire-fighting resources to suppress them in their early stages. The Fire Weather Index (FWI) of the Canadian Fire Danger System, widely used in several parts of the world, is a composite index that represents fire weather conditions quite well.

An important aspect in the application of the FWI is the definition of the threshold values to determine the fire danger classes for a given region and day. One of the simplest methods to define the classes is to use percentiles based on historical data, but this method lacks information regarding wildfire history and its relation to FWI. To obtain a credible assessment of the fire danger using the FWI it is important to perform a calibration to determine the limiting values of FWI for each class. Probabilities of fire duration exceeding specified thresholds are then used to calibrate FWI leading to the definition of fire danger classes. Although the Canadian Fire Danger System proposes an indicative table of limiting values for the five original fire danger classes that are usually adopted, these limiting values are not universal and have to be determined for a given region and season.

This study that was requested by the Joint Research Centre of Europe (JRC), aims to produce a calibration for the FWI based on historical wildfire data, for the territory of Europe, providing an updated table of threshold values to have a better definition of the risk classes of each region. The spatial division of the various countries and regions covered by the daily analysis of fire risk was defined to be the level 3 of the Nomenclature of territorial units for statistics (NUTS3). The methodology to calibrate the fire danger classes based on the statistical data of daily FWI, number of fires and burned area for each NUTS3, was performed between 2006 and 2015.

**Keywords:** fire danger, fire meteorology, Canadian Fire Danger System, Fire Weather Index

## 1. Introduction

Forest fire danger is greatly dependent on meteorological conditions, although the fire risk depends on other factors like vegetation cover and socio-economic parameters, namely those related to fire ignition, fire prevention and fire suppression activities.

In forest fire management, the need for understanding and predicting fire ignition probability and difficulty of control is the main reason for collecting fire statistics and for the development and use of fire danger rating systems (Xanthopoulos, *et al.*, 2014). These systems are usually translated into a general risk scale with 3 to 6 fire danger classes. There are multiple methods for estimating the fire danger classes, based on meteorological parameters, which are used around the world. Several methods were developed with the aim of being applied to a given region or country, considering the specific fire regime; others were developed considering a more general application. In some countries, several systems are used to estimate the index, leaving the decision to adopt the most appropriate level of risk in each situation to the users (Viegas, *et al.*, 2011).