



ADVANCES IN FOREST FIRE RESEARCH 2018

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17 years of wildfire detection and management supported by an optical sensor system: Field report from Germany's Brandenburg national forest, one of Europe's top wildfire regions at risk

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Abstract

When it comes to wildfires in Europe, people usually think about southern countries, such as Spain, Portugal or Italy. However, parts of northern and northeastern Germany have been classified by the European Union as top regions at risk of wildfires. The state of Brandenburg has more than one million hectares of forest, which is equal to 37% of the state area. Dry and sandy soil means poor growth conditions, and only undemanding plants may be cultivated with reasonable effort. That's why monoculture pine forests make up 78% of all woods in this area. Precipitation easily permeates the sandy soil while fires burn the extremely dry ground, fueled by liquid resin, needles and forest litter that does not decompose. This is particularly problematic since Brandenburg was a battleground of the final phase of World War II and a military training ground for more than 100 years. The region was contaminated by hundreds of thousands of tons of unexploded artillery grenades and bombs. About 36% of the entire state and 50% of the woodland is still heavily polluted with old weapons posing major risks to the civilian population and particularly to fire fighters. Early wildfire detection is crucial under these circumstances, and generations of human fire spotters worked for decades using a dense network of watchtowers. Due to extremely high maintenance costs of these watchtowers and due to difficult labor legislation, the automatic remote surveillance system FireWatch was introduced in 2001. Today human fire spotting is history; 108 sensors are operating successfully and have proven to be technologically efficient. Plenty of detailed statistics have been collected for decades giving evidence that the burnt area per hectare of a fire has been reduced tremendously since the installation of FireWatch and that the system has clearly outperformed the human spotter from a long-term perspective.

Keywords: early wildfire detection; forest fire management; climate; wildfire suppression; forest fire risk; monoculture forests; optical sensors; weapons and ammunition pollution; preservation of environment, safety and order

1. The Threat of Wildfires

1.1. Climate and Geography

Brandenburg is the most eastern state of the federal republic of Germany sharing a border of 252 km with the republic of Poland. Brandenburg is one of the most forested states of Germany encompassing 1.1 million hectares of forest of which pine trees dominate more than three quarters.

The sandy soil is characterized by the glacial period. The moraine landscape is slightly hilly, yet the flat outwash plains dominate the area, intermittent by numerous aquiferous drainage and by glacial valleys. Because of its eastern border location, the majority of the state is continentally influenced by climate. Only the northern and northwestern part of Brandenburg is characterized an oceanic climate (sub-Atlantic). Low precipitation and extreme temperature differences affect the continental climate. In the long-term average, precipitation in Brandenburg is below 500 mm per year. Influenced by location and climate, vast pine tree forests dominate the landscape. Based on these prerequisites, the wildfire risk in Germany is the highest in Brandenburg.

In the beginning of the 1990's, the European Commission categorized the forests of Brandenburg to be of high and highest wildfire risk, which is comparable to many Mediterranean regions.