



## The Use of Prescribed Fire on Embankments along Railway Tracks for Reducing Wildfire Ignition in Germany

### Introduction

During the extremely dry year 2003 more than 800 wildfires occurred along the railway network throughout the Federal Republic of Germany, resulting in considerable operational disturbances and delays of trains. In order to ensure safety of railway traffic and fire fighters the tracks have to be closed immediately after reporting of a fire. The response to the fire alert by the fire services is quite rapid. However, the duration of track closure is determined jointly by the fire services and German Railways (Deutsche Bahn AG). Opening of the railway traffic is permitted after fires are extinguished. Thus, the duration of halting the traffic does not depend on the coordinated organization of the response. Most critical is the composition of vegetation and fuel loads in the immediate vicinity of tracks on which trains have to reduce speed by breaking. Sparks that are generated by the breaks provide the ignition source of flash fuels within a belt of a couple of meters width on both sides of the railroad track. Thus, German Railways is investigating options for fuel management, especially in extreme droughts such as in the summer of 2003. Prescribed burning for fuel reduction is one of the fuel management options.



**Figure 1.** Railroad track embankments also constitute a risk of fires spreading into residential areas such as this situation in Unterfranken, Bavaria.



**Figure 2.** This family home was damaged by wildfire spreading from the slope in summer 2003.

### The Fuel Complex

The embankments of those railroad tracks that are typically affected by wildfires is dominated by grass cover. During dry summers, at the peak of the fire season, the desiccated grass layer constitutes a flash fuel bed which is easily ignited by sparks – even if these have a short lifetime of glowing.



**Figure 4.** Typical grass fuel bed on embankments along a railroad track in Unterfranken, Bavaria, Germany. The main species grass species in this region include *Glyceria declinata*, *Brachypodium pinnatum* and *Arrhenatherum elatius* (Poaceae), which become highly flammable during dry spells.

## The Use of Prescribed Fire in Wildfire Hazard Reduction

The application of controlled fire to reduce the risk of uncontrolled wildfires along railroad tracks had a long tradition in Germany until the early 1970s. However, the methods of burning were not based on scientific research. There was also a lack of safety standards. With the new Federal and State Nature Conservation Laws as well as the waste disposal regulations of the 1970s, the use of fire as a tool for disposing agricultural waste or maintenance of open grasslands was prohibited. As a consequence mechanical treatments replaced burning, making embankment maintenance labour-intensive and costly.

The existing laws and by-laws, however, provide exemptions from the general fire ban which are granted under certain exemptions. In order to obtain such an exemption accompanying research must prove that there are no negative effects of prescribed fire application on the environment and that precautions and safety rules are observed to exclude the risk of uncontrolled fire spread and undesired side effects of burning.

The target fuels for fire treatment are primarily flash fuels, notably the grass layer, that must be burned under prescribed conditions immediately before the onset of extreme wildfire danger, i.e. during the summer months. Slopes with high fuel loads, e.g. residues of mechanical shrub and tree clearings, may be burned during the winter months.

Other aspects of prescribed burning on railroad embankments include the necessity of halting succession from grass-stage vegetation towards bush and tree encroachment. This is not only a consideration affecting traffic safety. Open slopes along railroads are providing valuable home for valuable floristic and faunistic biodiversity, including endangered species. For instance, the habitat requirements for lizards (e.g., *Lacerta viridis*, Lacertidae) include open grass stages and a warm soil surface during daytime. Some plant species are endangered due to bush and tree succession, e.g., heather (*Calluna vulgaris*, *Erica tetralix*) – a development which can be controlled by the application of prescribed fire.



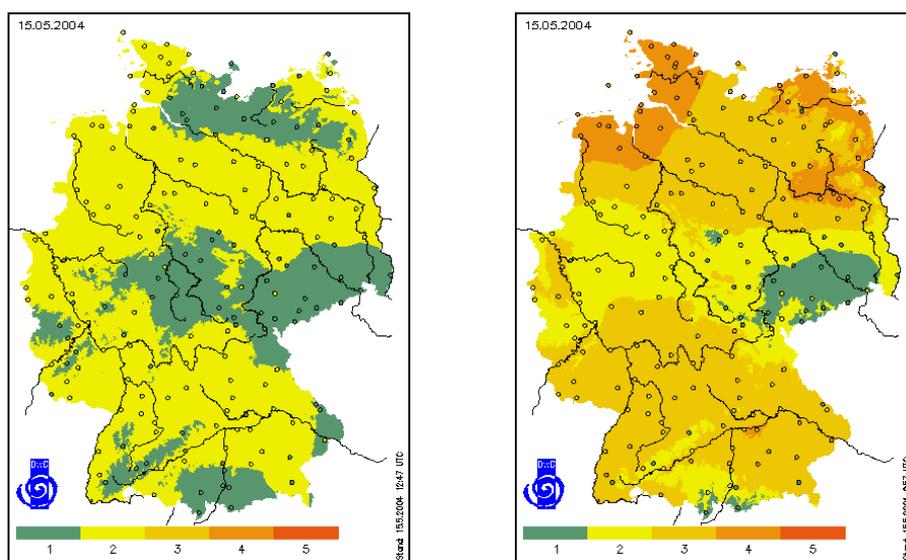
**Figure 5.** Timing and coordination of prescribed burning operations with railway traffic control is required to ensure safe traffic. This photograph shows a prescribed burning trial along a single-rail track in Bavaria.

## First Experiences in 2004

After the devastating fire season of 2003 German Railways requested the support of the Fire Ecology Research Group / Global Fire Monitoring Center (GFMC), Freiburg, Germany, to conduct initial trials in order to prove environmental-friendly and safe burning procedures. First experiments were conducted in Bavaria in August and September 2004.



**Figure 6.** Passing of a passenger train during a prescribed burning operation. The photograph reveals the importance of prescribed wind conditions. Smoke management considerations in average situations require burning at the downwind (lee) side of embankments in order to drive the smoke away from the rails.



**Figure 7 a,b.** Comparison between the DWD Forest Fire Index vs. Experimental Grassland Fire Index (Example of 15 May 2004).

Source: <http://www.agrowetter.de/Agrarwetter/fbidx.htm>

## **Prospects for 2005-2006**

Based on the experiences gained in 2004 German Railways and the GFMC intend to continue a series of test burns and the consolidated development of prescribed burning guidelines for the specific use on railway embankment conditions. One of the core activity will be the training of personnel. It is aimed at handing over the torch to German Railways by end of 2005.

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