



## Application of Prescribed Burning in Pine Stands in Germany to Reduce Wildfire Hazard

The Fire Ecology Research Group initiated first experiments in 1977 on the use of prescribed burning to reducing fuel load in Scotch Pine forests (*Pinus sylvestris*) with the aim to reduce the energy potential on the forest floor and thus the intensity of uncontrolled forest fires (Goldammer, 1979). However, this concept had to be dismissed in the following three decades due to the lack of professional and emotional acceptance. As a follow-up of the burning experiments in 1977, a prescribed burning for demonstration purposes was conducted again in February 2008 near by the former experimental site. The objective of this experiment was to demonstrate the secure feasibility of controlled burns in Pine stands in Central Europe. Prescribed burning is generally applied to reduce fuel load and to facilitate the regeneration of pine.

The experimental site is located in the municipal forest of Breisach, approximately 30 km west of Freiburg (47°57'N, 007°37'E). It lies in an arid environment in the area of the former Rhine floodplain without contact to the groundwater. Altitude is 200 m above sea level, and mean annual temperature is 10°C. Due to the location in the rain shadow of the Vosges mountains (France), the mean annual rainfall ranges only from 550 to 650 mm. Soils in the flat area are derived from alluvial mud, sand and grit of the Rhine.

The stands are composed of *P. sylvestris* and *Pinus nigra* that were planted in separated areas 48 ago (Figure 1). During the fine road network constructions in 1998 and 1999 very moderate thinning was operated at the same time. Trees of *P. sylvestris* and *P. nigra* are pruned up to 4 m and 2 m, respectively. The forest floor cover consists primarily of a dense grass layer (*Calamagrostis* spp., *Carex alba*, *Milium* spp.) with a partially very dense scattering of understorey shrubs such as *Clematis vitalba*, *Ligustrum vulgare* and *Cornus sanguinea*. Shrubs were primarily present in the *P. nigra* stand.

The fuel load of different size classes was determined prior to the burn with the line intersect sampling after Brown (1974) as presented in Table 1.

**Table 1.** Fuel load (kg/m<sup>2</sup>) of the *Pinus sylvestris* stand determined with line intersect sampling.

Size class	I	II	III	IV	>7	>7	Total
Diameter (cm)	0-0.49	0.5-0.99	1-2.99	3-6.99	rotten	sound	
Fuel load (kg/m <sup>2</sup> )	0.034	0.079	0.401	0.434	0.308	0.402	1.658

Most of the fuel load was present in size classes III and IV. Also the larger stamps lying on the ground contributed significantly to the fuel load.

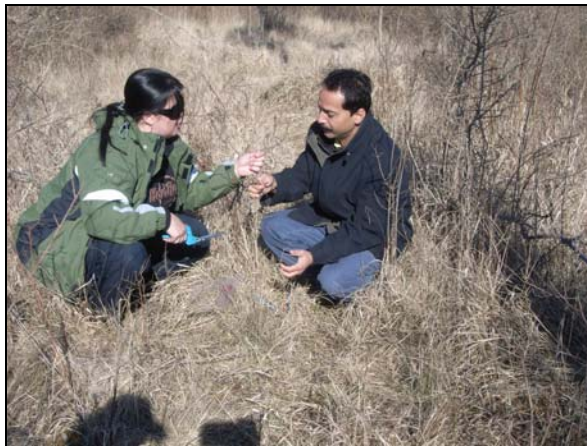
Before the burning took place, the fuel moisture content was determined one day before around noon by collecting samples of pine needles of the upper and below lying soil layers, which were then dried in the oven for 24 hours (Table 2).

A team of six persons conducted the prescribed burn. Amongst others the fire behavior was observed. A fire rate of spread of 7.6 m/min. in the mean was measured. Flame lengths reached generally 0.8 m,

**Table 2.** Fuel moisture content of the fuel load

No	Green weight (g)	Dry weight (g)	Moisture content (%)	Remarks
1	47.8	40.7	14.9	pine needles, site I
2	36.7	27	26.4	site II, upper
3	29	13.5	53.4	moss layer
4	16.5	12.2	26.1	site I, lower
6	64.7	54.3	16.1	pine twigs, site II
7	38.9	18.1	53.5	lower layer, site II
8	10.5	9.8	6.7	site I, upper grass

although flares up to 1.8 m were noted in areas where the fuel load was greatest.



**Figures 1-4.** Views of the prescribed burn in the pine stand (1) Prevailing grass and shrub fuels around and inside pose a high wildfire risk in the dray early spring months (February/March); (2) Low-intensity backing fire; (3+4) headfires with flame lengths up to 3 meters are not resulting in crown scorch if crowns are well separated from surface fuels

As conclusion is drawn that the winter conditions and a sufficient low fuel moisture content of the forest floor, dead wood and the understory vegetation allow a secure burning of middle old and old Pine stands. Whether this method will be accepted in Germany remains uncertain.

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### **References**

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- Goldammer, J.G. 1979. Der Einsatz von kontrolliertem Feuer im Forstschutz. Allg. Forst- u. J. Ztg. 150, 41-44.