



## Fire Management on Federal Real Estate Property in Brandenburg

### Introducing the landscape

This paper describes a project where fire is used to maintain open landscapes on Federal Real Estate Property in the southeast of Brandenburg State, Germany.

The Federal Real Estate Property Zschornoer Wald is located in the south-eastern part of Brandenburg and belongs to the County Spree-Neiße with direct borders to its neighbours, the Free State Sachsen (Saxony) and the Republic of Poland, and comprises an area of around 1.880 hectares.

Since the 1950s the area was used as an exercise bombing range for the air force of the National People's Army. This form of land use was the major agent in forming today's landscape over the years. The open landscape, used as target area, was extended from initially 50 hectares to an area of 200 hectares due to technological development in the military sector. The surrounding forested areas were classified as restricted zone according to safety regulations. The bombing range was intensively used until the end of 1989 and was then inherited by the Federal German Army. However, it was decided that the bombing range was „permanently dispensable“ in the frame of a new positioning concept.

Since the beginning of the military activities the whole area was managed by the Military Forest Administration of the German Democratic Republic. In 1990 the forest management was incorporated into the jurisdiction of the Federal Forest Service.



**Figure 1.** Open landscape at Zschornoer Wald. Photo: F. Meyer.

The substantial clearings of the area for the establishment of target areas for the bombing range as well as forest fires during the training activities caused a severe degradation of the soils which in turn was favouring the establishment of vast heather stands (*Calluna vulgaris* L.). Forest succession from the surrounding forest patches was periodically removed and annual forest fires created a diverse

patch mosaic and age structure in the heathland. Archived material gives evidence of the regular occurrence of small fires as well as larger forest fires:

- 1972 - 245.5 ha and 32.5 ha
- 1978 - 196 ha
- 1989 - 4.5 and 8.8 ha
- 1994 - the last large fire covering an area of 25 ha

### **Importance of the area for Biodiversity, Landscape and Habitat Management**

A study published in 1991 (NABU) emphasized the high conservation value of former military training sites in the eastern part of Germany. With reference to this study 626 ha of the area were declared a nature reserve "Zschornoer Wald" in 1992 with the open landscape and surrounding forest patches as core area.

Of further importance was the evidence of an increasing black grouse (*Tetrao tetrix* L.) population (Brunn, 2004, 2008). As a consequence the responsible Nature Conservation Board of the County initiated a study on restoration measures for black grouse habitats with the following key objectives as a result (Lehmann, 1999):

- Preservation of the last remaining black grouse habitat in Brandenburg state
- Preservation of a dry continental heathland with its specific species composition of highly endangered taxa
- Development of a cost-neutral management alternative that allows the commercial use of products from the area

These key aspects emphasize the importance of the open landscape with *Calluna* heathlands and early succession stages for the area and accordingly all management activities focus on that vegetation type.

The initial study indexed the open habitats according to age structure, coverage of *Calluna* and young trees, and possible treatment for maintenance, which provided excellent baseline data for a management concept. A big advantage for the implementation of management activities was the removal of ammunition already by the late 1990s.

### **Introduction of prescribed burning and first results**

Motivated by a series of forest fire experiments conducted by the Fire Ecology Research Group / Global Fire Monitoring Center (GFMC) in August 2001 on areas belonging to Vattenfall Europe Mining in southern Brandenburg state a first exchange of ideas between the Federal Forest Service and the Research Group were initiated (Goldammer, 2002). The main objective of this contact was to find an experienced partner for prescribed burning in *Calluna* heathlands which resulted in a lasting cooperation for more than eight years by 2009.

Given the fact that Brandenburg state is belonging to the category with the highest fire risk in Central Europe, it becomes clear that prescribed burning was a delicate issue from the beginning. The more important it was to involve the general public especially in the preparatory phase. A regional workshop was conducted in June 2002 to specify the further procedure of the implementation phase of prescribed burning in heathlands with the following target groups and participants:

- Ministry for Agriculture, Environment and Rural Planning, Departments of Forestry, Nature Conservation and Environmental Protection
- Environmental Protection Office and Forestry Office of the County Spree-Neisse
- State Office of the accredited Nature Conservation Organisations
- Association for the Protection of Black Grouse
- Technical University of Brandenburg, Institute of General Ecology
- State Museum of Natural History Görlitz

This panel worked out the theoretical framework that was necessary to obtain the required permits. The discussion on the use of prescribed burning to maintain open *Calluna* heathlands included the following key points:

| <b>Arguments Con</b>                                      | <b>Arguments Pro</b>   |
|---|--|
| Fire Risk Class A1 – Highest risk for start of a wildfire | Professional experimental design, focussed operation with fire, controlled burning   |
| Considerable disturbance of habitats                      | Encouragement of natural regeneration of <i>Calluna</i> , removal of forest succession   |
| Negative effects on flora and fauna                       | Reduction of detrimental fire effects by the limitation to 1 hectare as a maximum area burnt to ensure swift recruitment from outside the area |

After a small test fire in February 2002 the first series of burning trials started in August 2002. Different burn plots partially with manual pre-treatments were selected to test if burning during the summer months would eliminate succession of birch trees (*Betula pendula* L.) (Casper 2003).



**Figure 2.** Summer burn 2002. Photo: E. Brunn.

The experimental design was the following:

- Burn plots with standing, non-treated birches
- Burn plots with partially cut and bent birches
- Burn plots with rootstocks of cut birches

Ground vegetation consisted of a complete cover of *Calluna* with a growth height between 50 and 60 cm. All plots were burnt the same day using the same burning technique.

These were the results the following year:

- Birch succession was killed superficially in all burn plots
- With beginning of the vegetation period strong resprouting of birches could be observed on all burn plots, even from the rootstocks of the cut birches

- There was no natural regeneration of *Calluna*
- Development of other ground vegetation was scarce



**Figure 3.** Summer burn plot #1 - summer 2004. Photo: E. Brunn.

This trial just confirmed what had been observed after accidental forest fires on the military training sites before and it became clear that pre-treatment of the birches did not have an influence on resprouting after the fire.

Surprisingly, a burn plot that was burnt a day later under similar weather conditions and using the same burning technique, but located 1 km away, was showing a complete different result:

- The burning was able to kill off all birches and no resprouting took place
- There was also no regeneration of *Calluna*, but a cover of white hair-grass established area-wide

An accompanying study was not able to work out the differences in the summer burn.



**Figure 4.** Summer burn plot #2 - summer 2004. Photo: E. Brunn.

In March 2003 a winter burn was conducted following the series of summer burn trials. For this purpose it was necessary to wait for weather conditions with extremely low relative humidity to achieve optimal effects. In the continental climate of the region this is reached under typical dry and cold weather conditions from the east where relative humidity can drop below 40% around 1400 hrs.



**Figure 5.** Winter burn 2003. Photo: E. Brunn.

The selection of plots for the winter burns was determined not only by the question if *Calluna* is regenerating after the fire but also if birch succession can be removed successfully. Again young birches were partially cut and bent also for the winter burns in 2003.

One year after the burn the following results could be observed during the vegetation period:

- Natural regeneration of *Calluna* was all over the area, other ground vegetation was scarce
- All young birches were killed by the fire and did not resprout
- One year after the burn *Calluna* reached a mean growth height of 27.5 cm



**Figure 6.** Winter burn 2003 – summer 2004. Photo: E. Brunn.

On the winter burn areas the late summer 2004 saw *Calluna* already in full flowering (Figure 7).



**Figure 7.** Winter burn 2003 – late summer 2004. Photo: E. Brunn.

Another burning trial, however, was not possible until March 2005 due to adverse weather conditions. Similar to conditions in 2003 winds were predominantly from the east. Two burn plots were selected in close proximity to plots that were burnt in summer 2002 and winter 2003 respectively to have the direct comparison. In the vegetation period after the winter burns the following results were observed:

- Both plots saw extensive regeneration of *Calluna*, complemented by cowberry (*Vaccinium vitis-idaea*) in one of the plots. *Calluna* was reaching a mean growth height of 22.5 cm already in the first year after the burns
- All birches were killed by the burning in one plot, and only stronger individual survived in the other burn plot.
- Resprouting was not completely inhibited by the burning, however, the young shoots died during the following year because of drought stress.

Of all birches that were not killed by the winter burns in March 2005 the diameter at breast height (DBH) was measured. These measurements revealed that birches with a mean DBH exceeding 9.6 cm are non-sensitive to primary damages through fire.

### **Burning techniques**

According to the agreements from the preparatory workshop in 2002 the individual burn plots were kept at 1 hectare at maximum. During the first burning trials the plots were secured by either mowing or burning control lines of around 2.5 m in width. These preparatory actions were time consuming and since the burning window is relatively short this went on the expense of valuable time for burning.

Only with well-trained teams it is possible to burn from the wet line with 2 pick-up trucks and slip-on-units on each flank of the fire. In principle all burns are started as backing fires while the rest of the area is burnt in segments with a combination of flanking and ring fires.



**Figure 8.** Setting a prescribed burn by the author in Zschorno heathland. Photo: GFMC

## Summary

The evaluation of all burns so far is suggesting that the actual and historical weather conditions of the previous months are of utmost importance to achieve optimal effects on the heathland maintenance.

Also the small scale burns with the combined burning techniques of backing, flanking and ring fires in segments has proved of value although these techniques shift the maximum temperatures closer to the ground.

Since all burns (2002, 2003, 2005 and 2008) have seen a gradual change in the burning techniques with a strong influence on the resources on scene and the time frame it is difficult to give a valid cost estimate for the burning operations.

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