



Conservation Methods for *Calluna* Heathlands by Prescribed Fire in Schleswig-Holstein State, Germany

Project objectives

The project aims to investigate the effects and test operational procedures of prescribed burning in the maintenance of diverse heather species associations and succession stages in Atlantic heathlands of Northern Germany. The project was initiated in 2002 and will continue 2005-2006.

The use of prescribed fire in diverse heather species associations and succession stages in the nature conservation areas of Northern Frisia (Nordfriesland), Schleswig-Holstein State, Germany, aims to substitute cost-intensive mechanical treatments and to restore historic burning practices

Since 1984 a variety of tools for heathland management have been used large-scale in the management of old, matured and grass-dominated stands of *Calluna vulgaris*, e.g., by mowing, mulching, grazing and swiping). The aim of these methods is to preserve different succession stages. In some of the nature conservation areas these practices produced a mosaic of different development stages of the heather vegetation. For technical, financial and nature conservation reasons it is now aimed to combine the above-mentioned management tools with prescribed fire.

The use of heavy machinery is limited due to the vulnerable features of the terrain: The impact of heavy equipment would destroy microclimatic and micro-topographic structures which are vital for a number of species.

The first prescribed burns took place in late summer of 2002 in different types and degradation stages of heathlands. It was important to gain local experience as the fire characteristics are completely different – due to different climatic conditions – from heathland fires in other regions of Germany.

After successful tests a series of follow-up prescribed fire experiments were conducted between 2003 and 2004. Technical and scientific implementation of the project is under the responsibility of the Fire Ecology Research Group / Global Fire Monitoring Center (GFMC), Max Planck Institute for Chemistry, Freiburg, Germany.

First results reveal that in general, the post-fire regeneration and re-establishment of *Calluna* is satisfying. On most plots tree succession is suppressed. However, birch (*Betula pendula*) responds quite commonly by re-sprouting. Even where the raw humus layer is not consumed completely the regeneration of *Calluna* seedlings is abundant. This effect is also visible on plots that had been covered by dense Crowberry (*Empetrum nigrum*) stands before the fire.

In November 2004 the Nature Conservation Agency conducted a survey of all plots that were burned since the beginning of the project. The following is a summary of the results to date and a recommendation for the future use of prescribed fire in the nature conservation areas of Northern Germany:

- Prescribed fire for *Calluna* regeneration proved to be always effective. No differences between winter and summer burns were recorded, besides that after a winter fire the flowering starts already in the same vegetation period. A fair amount of *Calluna* seedlings is found on all plots.
- Crowberry stands burn with high intensities, the duff and raw humus layers burn only if allowed to smoulder for a longer period. On most *Empetrum* plots, *Calluna* seedlings were found between the resprouting Crowberries. *Calluna* regeneration is significant slower compared to *Calluna* stands, but it seems possible to bring *Calluna* back on *Empetrum* stands.
- Die-back of bush and tree succession is not uniform. Conifers are generally killed by fire, whereas older birch trees react with basal resprouting.

- There are observations that indicate late winter burns to be effective in killing birch trees. Comparable observations are made in Brandenburg State.
- If the area that has to be burned is already grass dominated (*Deschampsia* and/or *Molinia*) certain limitations in the use of fire for *Calluna* regeneration were observed.
- The fertilizing effect of the ash can be seen clearly in heavy resprouting, which must be grazed by sheep. A very positive effect is the reduction of soil covering litter and as a consequence a higher number of lizards and insects were recorded on these areas.
- There are assumptions from the United Kingdom and Denmark that burning with high frequencies (even annually burning) is damaging and reducing the grass sward in the long term. If the raw humus layer is not too thick *Ericaceae* will have a slight advantage. In general, grass dominated areas with a thick grass sward are limiting the use of prescribed fire for *Calluna* regeneration.
- Most difficult is the partial or complete reduction of the compact raw humus layer (Figure 4). Under sufficiently dry conditions the raw humus should be allowed to burn as long as possible. Experience gained in the last two years show that slow-burning or smouldering ground fires must be observed and secured over night and sometimes the following days – this makes the burning operations more cost and labour intensive. Ploughing a mineralized strip around the area to be burned will stop the ground fire from spreading.

In conclusion, maintenance burning of not grass dominated heathlands is an effective and low-cost management tool to suppress the bush and tree succession and regenerate *Calluna*. For grass-dominated areas further experiments are planned.

The promising results in *Calluna* and *Empetrum* heathlands are encouraging the future use of fire in nature conservation and heathland management.

To date all test areas were small and burning was done very carefully to demonstrate the possibility to use fire under prescription and to ensure acceptance of the project. It is envisaged to expand the burn sizes significantly to ensure that fire is used efficiently for the maintenance and management of the endangered heathlands in Northern Germany.

In 2004 a partnership with the University of Kiel was established. The University of Kiel is using the experimental sites for long-term research on fire effects on soil and water.

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Visual Impressions



Figure 1. *Calluna* heathland on Sylt Island, Braderup Nature Conservation Site, subjected to succession. Photo: GFMC.



Figure 2. Cost intensive mechanical removal of the raw humus layer for *Calluna vulgaris* regeneration, Sylt Island. These mechanical measures, including disposal of harvested biomass, cost ca. 25,000 Euro / ha. Photo: GFMC.



Figure 3. Prescribed burning operation in *Empetrum* / *Calluna* stands in the Lütjenhom Nature Conservation site, Schleswig-Holstein, 5 September 2002. Photo: GFMC.



Figure 4. Raw humus layer superficially reduced by prescribed burning in 2002. The photograph taken shows regeneration of *Empetrum* in 2003. Lütjenhom Nature Conservation site, Schleswig-Holstein, 5 September 2002. Photo: G. Hoffmann.