



Ecological Monitoring of Slope Vegetation Managed by Prescribed Burning in the Kaiserstuhl Region, Germany

Summary

The impacts of prescribed burning on the vegetation, flora and fauna of the characteristic slopes in vineyards were investigated in the Kaiserstuhl Region (Germany). It is concluded that the legally prescribed burning is not harmful for the majority of the threatened species and their habitats. However, it contributes only marginally to their sustainable protection. Therefore, burning itself cannot be considered to be an effective form of slope management. This applies only if combined with other measures like mowing, grazing, clearance of shrubs, or removal of top soil.

Question, subjects and approach of the study

The impacts of prescribed burning on the vegetation, flora and fauna of the characteristic slopes in vineyards were investigated in five study areas of the Kaiserstuhl Region (Baden-Wuerttemberg State, Germany) in the period from 2002 to 2005. The key question was to analyse if the process of burning inevitably leads to considerable and permanent negative effects for threatened species. On the other hand, also the positive effects of burning on the prior targets of nature conservation for this region were investigated (see Kobel-Lamparski et al., 2000). A focus was set on preventing the succession of shrubs and trees as well as the suppression of dominance stocks (e.g. *Solidago gigantea*) by controlled burning. Preventing the succession of shrubs and trees is the explicit overall concept for the development of the characteristic slopes within vineyards in the Kaiserstuhl-Region.

Apart from the vegetation types, the main subjects of the study were selected target species of several groups of species: flora, birds, reptiles (especially *Lacerta bilineata*), butterflies and burnet moths, mantids and grasshoppers, ground beetles, spiders, bees and terrestrial snails. The selection of target species comprised a broad range of indicator species for different strategies of hibernation, feeding, mobility and sensitivity.

Overview: Different investigation methods were applied depending on the species

- Counting of individuals of target species (e. g. *Lacerta bilineata*, *Minois dryas*, *Chorthippus vagans*)
- Analyses of habitats and sensitivity (*Nola subchlamydula*, *Satyrium acaciae*)
- Investigation into hibernation, distribution (e. g. terrestrial snails) and mortality (*Mantis religiosa*)
- Investigation into the ability of compensating the loss of individuals (e.g. *Plebeius argyrognomon*, *Mantis religiosa*)
- Investigation into the reaction of shrubs/dominating plants on burning (e.g. Giant Goldenrod, *Solidago gigantea*)
- Direct comparison of burned and untreated slopes (especially vegetation/shrubs, terrestrial snails, mantids and grasshoppers, ground beetles and spiders)
- Analyses of vegetation by Duration-Square-Method

Results

The assessment of inevitable and permanent negative effects of burning was based on the concept of "environmental sustainability".

Aims of nature conservation for the characteristic slopes of vineyards in the Kaiserstuhl region were derived from the "Target Species Concept Baden-Wuerttemberg" ("Zielartenkonzept Baden-

Württemberg”, cf. Reck et al., 1996; LFU, 2005). The “Target Species Concepts” defines regional conservation goals for Baden-Wuerttemberg based on the demands of target species.

In the investigated slopes of the Kaiserstuhl region 241 target species were found: 132 “Landesarten” (= highest level, state-wide importance) and 109 “Naturraum-Arten” (= second level, regional importance). The target species were classified according to the importance of the slopes as characteristic habitats (main habitat - occasional habitat). Finally it was assessed to which degree these target species are affected and show a sensitive reaction to burning.

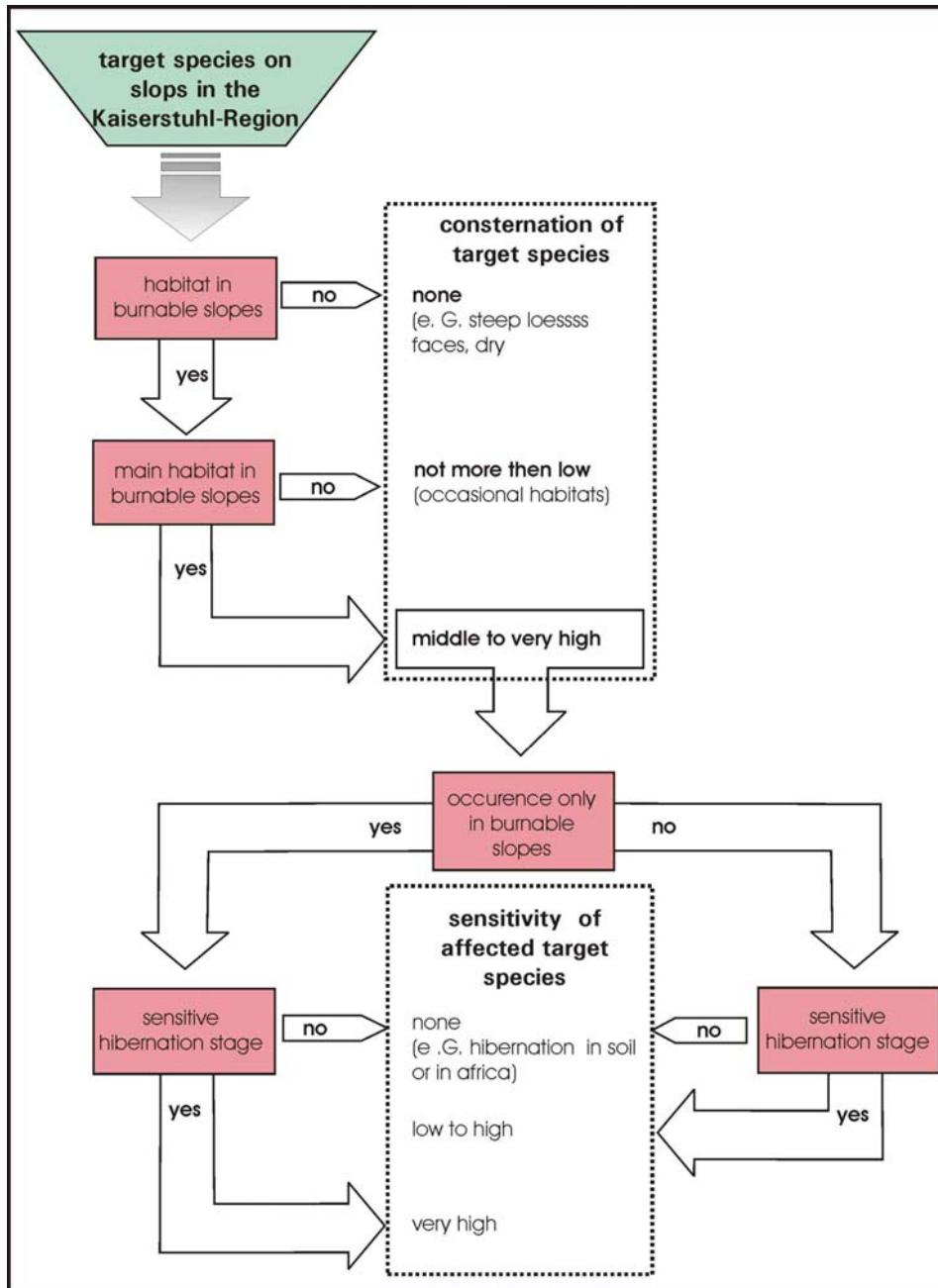


Figure 1. Classification of target species

Of the 241 detected target species, 182 (76%) are not or slightly affected by burning. So, 59 target species (24%) are affected as their main habitat consists of burnable slope-types. None of the affected target species have a very high sensitivity to burning. 7 target species are affected, but not sensitive to burning (e. g. *Lacerta bilineata*). 52 target species (21%) show low, medium or high sensitivity to burning.

All of those suffered losses of individuals. Separate factors are responsible for the extinction of populations / inevitable impairments (e. g. mobility, population-structure).

16 target species (7%) have low sensitivity. They hibernate only partially in the impact area of burning (e. g. *Mantis religiosa*, cf. Lunau and Rupp, 1988), or they can successfully compensate the disturbance by high mobility of individuals, multiple breeding per year, favourable population-structure or fast regrowth after cutting (plants). These species are not expected to be threatened or to become extinct because of prescribed burning within the study area.

For 36 target species (15%) it is proved or assumed that burning leads to a considerable reduction of populations within the habitat complex of the slopes – however without driving these species to extinction. These species were assessed with medium to high sensitivity. These are species, that hibernate in plant-litter, snail-shells, stems of plants (bees), directly on the ground or that are active in winter.

An example is the butterfly species *Minois dryas*. For this species, a negative correlation between the annual burned area and the population size of the following year could be found (Figure 2). For example in winter 2001/2002, only small portions of the study area Mondhalde (MH01_02) could be burned. In the following summer, a high number of individuals of *M. dryas* could be observed. In the same study area, a lot of burning took place in winter 2003-2004 and in the following summer only few individuals of the affected and sensitive butterfly appeared.

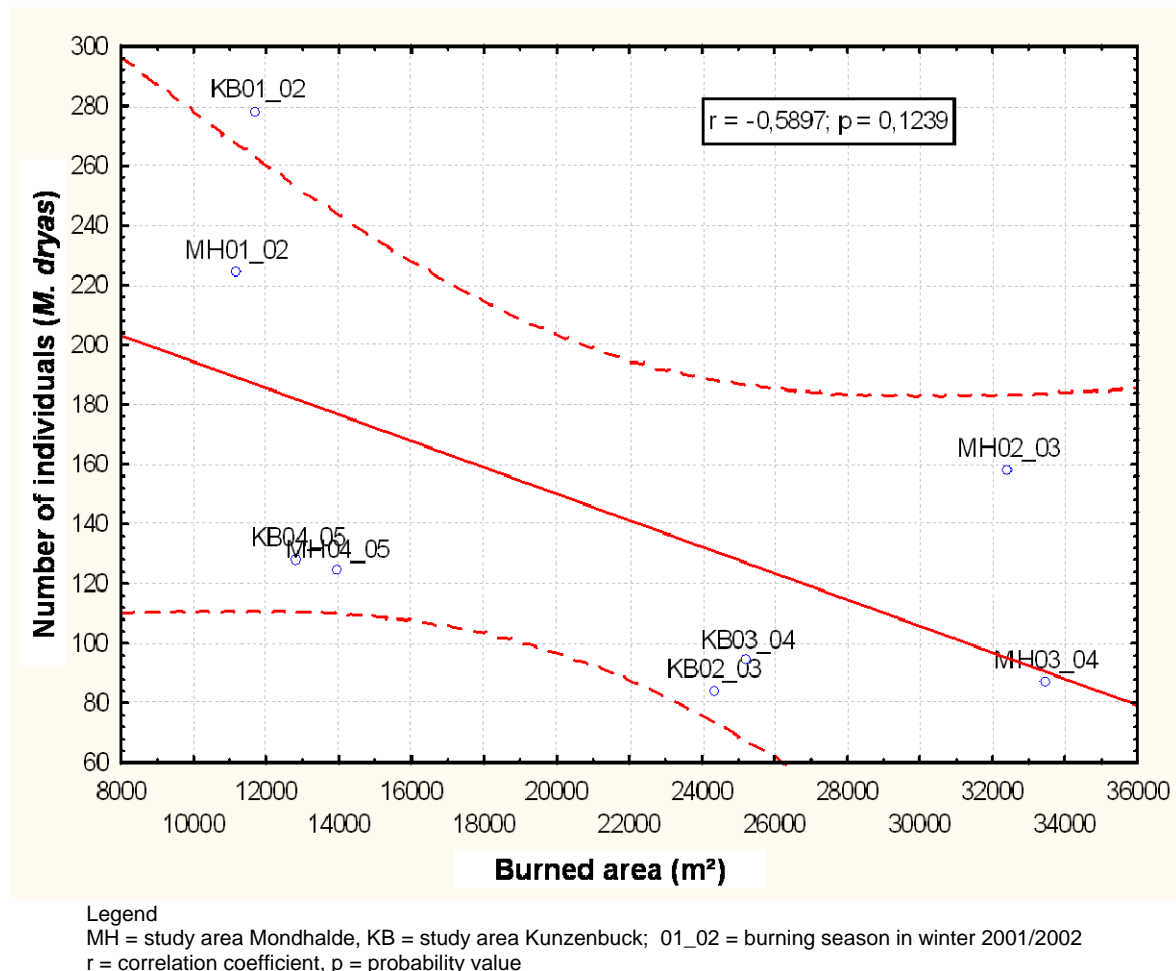


Figure 2. Correlation between burned area and registered individuals of *Minois dryas*.

Conclusions

Does the process of burning inevitably lead to considerable and permanent negative effects for threatened species?

In general, for the majority of the considered target species, a threat for the populations caused by the burning in the analysed extent (cf. Page et al., 2006) could not be observed. However, for a small number of extremely sensitive species, a decline of the population size has to be expected, although they will not disappear completely from the slope-complexes. Direct positive effects on populations of threatened species or on their habitats could not be found.

The overall effectiveness of burning to prevent the succession of shrubs and trees has to be considered as low. Suppressing the dominance stocks of *Solidago gigantea* cannot be achieved exclusively by burning (see also Page et al., 2000; Starfinger and Kowarik, 2005; Görger and Staub, 2001, 2002). An initial growth of trees and shrubs from seeds might possibly be prevented on certain locations or under favourable conditions. However, the spread of already existing trees and shrubs can in general only be delayed by burning, not completely prevented. Eliminating existing trees and shrubs might be achieved locally as an exception, but not as a regular and wide-spread consequence of burning. The height of trees and shrubs can only be limited by burning for isolated bushes or stands of root suckers growing in well burnable surroundings.

Burning can only be effective in preventing succession if combined with other measures like mowing, grazing, clearance of shrubs, or removal of top soil.

Does burning in winter support the goals of nature conservation?

Direct positive effects of prescribed burning on populations of threatened species or their habitats could not be found (see also Handke, 1997). A major reason is that the most valuable slopes in vineyard terraces (12%) are mostly legally protected or cannot be burned because of the specific vegetation structure. Therefore, in these situations burning cannot contribute to prevent succession, although exactly these slopes strongly require a protection against the dispersion of trees and shrubs. It is debatable if burning can directly contribute to reach the regional prior targets of nature conservation (preventing succession) on the other slopes (67% of all slopes).

However, as a side effect, it can be expected that prescribed burning strengthens the identification of winegrowers with the management of vineyard-slopes. An increase in own initiative is likely to lead to more management and maybe to an application of measures which support target species of the Kaiserstuhl region.

Overall conclusion

The legally prescribed burning is not considered to be harmful for the majority of the threatened species and their habitats. However, it contributes only marginally to their sustainable protection. Therefore, burning itself cannot be considered to be an effective form of slope management. This applies only if combined with other measures like mowing, grazing, clearance of shrubs, or removal of top soil (see also Friedlaender et al., 2005).

A differentiated consideration is necessary before applying the presented results and recommendations on other habitat-types or in other landscape units. The most obvious transfer of the results might be the application in the neighbouring Tuniberg and foothills of the Black Forest.

IFFN contribution by

Jörg Rietze
Working Group for Animal Ecology and Planning
Filderstadt
Germany

References

Friedlaender, H., Page, H., and Wiessner, S. 2005. Pflegekonzept für die Kaiserstühler Rebböschungen. Project: „Kaiserstuhlweite Einführung eines Feuer-Managements in die Böschungspflege.“ Landschaftserhaltungsverband Emmendingen e.V., 39 p. + Annexes.

- Görger, A., Staub, F. 2001. Brandfläche NSG „Haselschacher Buck“ I. Vegetationsentwicklung. Gutachten des Büros für geobotanische und landschaftsökologische Untersuchungen (Datura, Freiburg), im Auftrag der BNL Freiburg, 7 p. + Annexes (unpubl.).
- Görger, A., Staub, F. 2002. Brandfläche NSG „Haselschacher Buck“ II. Dokumentation der Vegetationsentwicklung nach dem Brandereignis vom 21.02.2001. Gutachten des Büros für geobotanische und landschaftsökologische Untersuchungen (Datura, Freiburg) im Auftrag der BNL Freiburg, 5 p. + Annexes (unpubl.).
- Handke, K. 1997. Zur Wirbellosen-Fauna regelmäßig gebrannter Brachflächen in Baden-Württemberg 1983/84. NNA-Berichte, 10 (5), 72-81.
- LFU – Landesanstalt für Umweltschutz Baden-Württemberg (ed.) 2005. Informationssystem Zielartenkonzept Baden-Württemberg. Planungswerkzeug zur Erstellung eines kommunalen Zielarten- und Maßnahmenkonzepts Fauna.
- Lunau, K., Rupp, L. 1988. Auswirkungen des Abflämmens von Weinbergböschungen im Kaiserstuhl auf die Fauna. Veröff. Naturschutz Landschaftspflege Baden-Wuerttemberg 63, 69-116. Karlsruhe.
- Page, H., Friedlaender, H., and Wiessner, S. 2006. Kaiserstuhlweite Integration eines Feuermanagements in die Böschungspflege (2002 bis 2005). Abschlussbericht: 479 S. + Anhang; Landschaftserhaltungsverband Emmendingen e. V.
- Page, H., Rupp, L., Wiessner, S., and Goldammer, J.G. 2000. Forschungsvorhaben „Feuerökologie und Feuer-Management auf ausgewählten Rebböschungen im Kaiserstuhl“. (Kap.0802 Tit.685 47) Abschlussbericht. 49 p. + Annexes. Arbeitsgruppe Feuerökologie, Max-Planck-Institut für Chemie, Abt. Biogeochemie, Universität Freiburg.
- Reck, H., Walter, R., Osinski, E., Heidl, T., and Kaule, G. 1996. Räumlich differenzierte Schutzprioritäten für den Arten- und Biotopschutz in Baden-Württemberg (Zielartenkonzept). Gutachten im Auftrag des Landes Baden-Württemberg, gefördert durch die Stiftung Naturschutzfonds: 1730 S. u. ein Kartenband; Institut für Landschaftsplanung und Ökologie, Universität Stuttgart.
- Starfinger, U., and Kowarik, I., 2005. *Solidago gigantea* Aiton. (Asteraceae), Späte Goldrute. Artensteckbrief, 5 p. (www.neophyten.de).