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Are Umbrella and Target Species useful Instruments in Nature Conservation? Experiences from a Black Grouse Habitat in the Rhön Biosphere Reserve (*)

by
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KEY WORDS : *Tetrao tetrix*, Black Grouse, Röhn Biosphere Reserve, Germany, Conservation, Umbrella species, target species, species instrumentation

SUMMARY

The chances to use umbrella and target species in nature conservation management to indicate changes in habitat and landscape structure were outlined in respect to different levels of space. It is described in general how these umbrella species could be used as target species for nature conservation, which influences the type of management actions. Using the example of the nature reserve «Lange Rhön», the effects of habitat changes through natural landscape development and/or through specific habitat management on population development, habitat choice, and habitat use of Black Grouse and of characteristic avifaunistic umbrella species of open (Snipe, Lapwing, Corncrake) and half-open landscapes (Red-backed Shrike, Great Grey Shrike, Grasshopper Warbler) of the Rhön are explained.

The results and success of landscape conservation activities, which were carried out to improve the habitats of these species, are presented and discussed. Perspectives for the future use of umbrella and target species monitoring in future in the Rhön biosphere reserve are given.

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Introduction

The Black Grouse population of the Rhön lives in an ancient and open cultural landscape. The actual core-area of Black Grouse in this low mountain area is the nature reserve «Lange Rhön», where a small isolated population has survived until now.

Despite a variety of efforts the situation of Black Grouse populations in low land and low mountain areas of Central and Eastern Europe becomes more and more critical. In the «Lange Rhön», a continuous downhill trend takes place as well: In the beginning of the 1990`s, the absolute population-minimum with 12 cocks and 5 hens in 1996 was reached. In the following years, varied steps for their protection were undertaken by the Black Grouse-Monitoring-Project and could stabilize and slowly increase the population size -in the year 2000 16 cocks, 8 hens; in 2001 27 cocks, 16 hens (see **Fig. 1**).

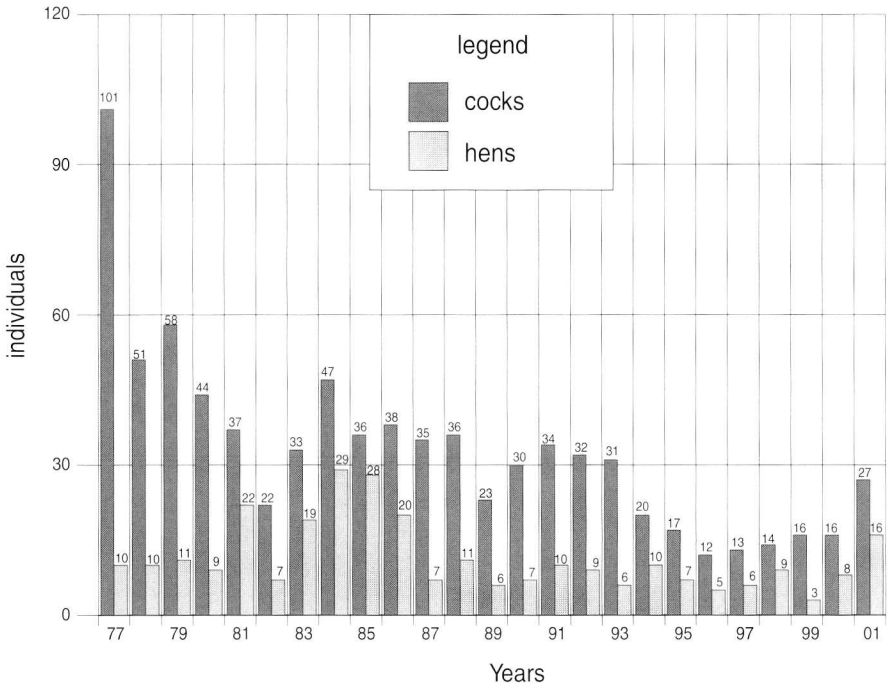


Fig. 1. Development of Black Grouse population in the nature reserve «Lange Rhön» (1977 – 2001)
Bestandsentwicklung des Birkhuhns im Naturschutzgebiet «Lange Rhön» (1977-2001).
Evolution de la population de tétras lyres dans la réserve naturelle «Lange Rhön (1977-2001)

One of the most important actions in the protection of Black Grouse has been and actually is the maintenance, development and enlargement of suitable habitats. Similar to other low mountain areas of Germany, farming is more and more in retreat in the Rhön, especially in its highlands. For this reason, more and more typical mountain meadows get out of use, which have developed their unique character and species equipment during centuries of extensive land use by grazing and/or mowing,. In consequence, natural succession takes place and simultaneously with the spread of shrubs, bushes and, later on, trees, important habitats of Black Grouse and other bird species of open landscapes get lost.

Biotope-management in order to stop this process and to maintain and enlarge Black grouse habitat, takes place already since 1981 with the beginning of the nature conservation project «Hohe Rhön/Lange Rhön» of the Federal Republic of Germany and continues till today in a great variety of different actions.

From the nature conservation point of view it is important to achieve the greatest possible effect in landscape management with a minimum action of staff, machines and money. Therefore such actions had to be planed appropriate in detail and had to be orientated towards the needs of the animal and plant species in order to conserve and to support them.

For practical reasons, it is understandably not possible to consider all relevant species in detail. Nevertheless, since a few years so called umbrella and target species concepts are used to achieve the maximum management success (ALTMOOS, 1997; FLADE, 1994; MÜLLER & KOLB, 1997). In the following will be shown, using the example of the Lange Rhön, how such concepts are implemented in the Rhön to optimize habitat and landscape management as well as conservation and support of important umbrella species.

Location and characteristics of the study area

The low mountain range Rhön is situated at the corner of the states Bavaria, Hesse and Thuringia in the centre of Germany. The area was designated as Biosphere Reserve in 1991 by the UNESCO. Its actual size are 185.000 hectares, which share out between the states Bavaria (73.000 hectares), Hesse (63.5000 hectares) and Thuringia (48.500 hectares)(see picture 2).

The «Lange Rhön», part of the Rhön highlands, represents one of the core areas of the Rhön Biosphere Reserve due to its geographic location as well as its particular valuable biosphere.

It runs as a stretched and closed high-plateau in North-South direction with a mean altitude of 800 metre above sea level (see **Fig. 2**). Characteristically for this area, which was designated as nature reserve with a size of 2.657 hectares in 1982, is the extensive farming of spacious mountain

meadows, which are used in an intensive meshed mosaic of small plots.

In this old cultural landscape, nardus graslands, yellow oat-grass meadows of various shapes as well as multi-shaped moist meadows with single bushes, individual copses and small groups of trees dominate beside from low moors and bogs.

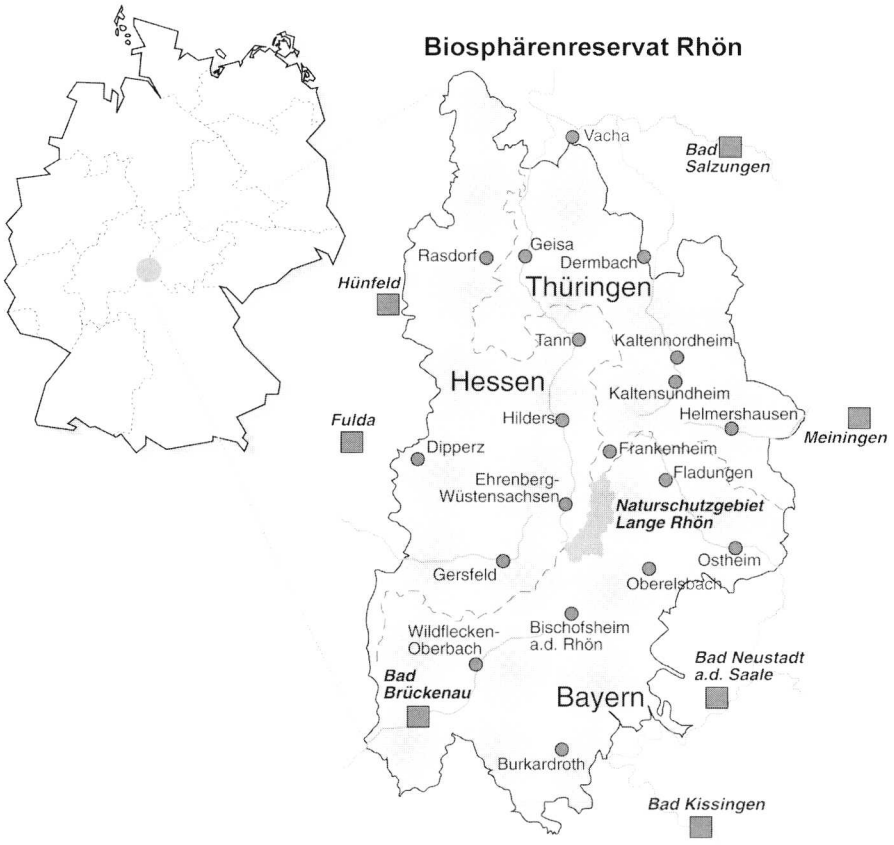
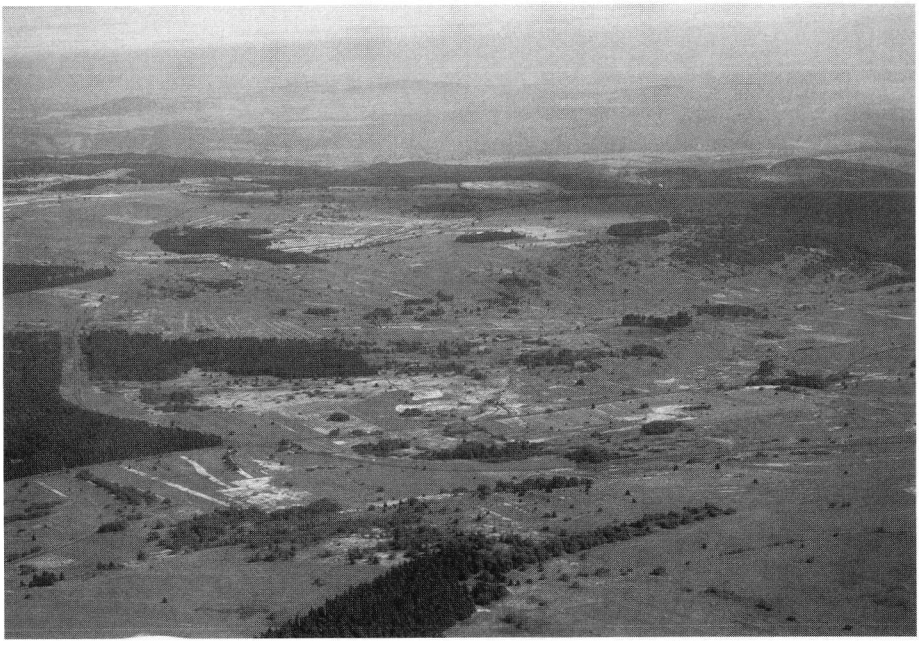


Fig. 2 Location of the test area : Left location of the Rhön biosphere reserve within the Federal Rebublic of Germany; right: boundaries of the Rhön biosphere reserve encompassing to the three states Bavaria, Hesse and Thuringia. Light green: area of the Rhön biosphere reserve; dark green: Nature reserve «Lange Rhön»; red: villages and towns

Lage des Untersuchungsgebietes. Links: Lage des Biosphärenreservats Rhön innerhalb der Bundesrepublik Deutschland, rechts: Abgrenzung des sich über die drei Bundesländer Bayern, Hessen und Thüringen erstreckenden Biosphärenreservats. Hellgrün: Fläche des Biosphärenrerservats Rhön; dunkelgrün: Naturschutzgebiet «Lange Rhön»; rot: Ortschaften und Städte

Localisation de la zone d'étude à gauche : localisation de la réserve de biosphère de la Rhön au sein de la Rébublique fédérale d'Allemagne. à droite : frontières de la réserve de biosphère de la Rhön englobant des parties des 3 états Bavière, Hesse et Thuringue. gris clair : étendue de la réserve de biosphère ; gris fonçé : réserve naturelle «Lange Rhön» ; rouge : villages et villes.

The percentage of wood is as low as 21%,which is why this historical cultural landscape is called «Land of open expanses» (see **picture 3**).



Picture 3. View from the «Heidelstein» mountain of the cultural landscape of the «Lange Rhön» «Land of open expanses» in northeast direction. Center of the picture: source hollow of the Els river with the so called «Elsgellen», an important habitat for meadow breeding birds. Aerial photo Karl-Heinz KOLB, 07.09.1992.
Blick vom Heidelstein über die reichstrukturierte Kulturlandschaft der Langen Rhön, das «Land der offene Fernen» nach Nordosten. Im Bildzentrum die Quellmulde der Els mit den Elsgellen einem wichtigen Wiesenbrütergebiet. Luftaufnahme Karl-Heinz KOLB, 07.09.1992.
Vue à partir de la montagne «Heidelstein» du paysage culturel de «Lange Rhön, «pays des étendues ouvertes» en direction du Nord Est. Centre de l'image : sources de la rivière Els, avec les «Elsgellen», un habitat important pour les oiseaux nicheurs de prairies. Vue aérienne K.H. KOLB, 07-09-1992.

The climate of the Rhön highlands is considered as rough and harsh with an annual mean-temperature of 4,7 C° (long-term mean temperature of the weather station Wasserkuppe).

Monitoring of umbrella species as an instrument for detecting changes in landscape structure

According to the definition of FLADE (1994), umbrella species are species, which reach a significant higher presence in one or a few types of landscapes and which in general appear also in considerably higher abundances than in all the other types of landscapes.

In the preferred types of landscapes, they find the required habitat structures and requisites more frequently and, above all, more regularly .than in all other types of landscapes.

Criteria, which identify animals as good umbrella species are summarized by KOLB & MÜLLER (1997).

Due to their complex demands on the habitat (e.g. spatial and temporal configuration of habitats), their close relationship to habitat types and types of areas, umbrella species indicate specific requisites of a habitat by their appearance.

For this reason and the fact that they appear in high presence and abundance in their optimal habitat, umbrella species are very useful instruments to monitor their occurrences, situation and development of population and habitat as well by means of special monitoring programs.

Monitoring of umbrella-species supplies important information on the protection of nature and species by making statements about the population and population development of the species in focus. Through this information on the condition of the regarded habitat can be gained indirectly.

Integrated over time the monitoring shows changes of species abundance and indirect changes of habitat as well as landscape structure.

It depends on the demand of space of the species in focus, whether a considered umbrella species makes extensive statements about the suitability of habitat- and landscape-structures possible, or whether statements are only possible for a restricted area.

Species, such as Black Stork and Black Grouse, both with high demand of space, allow statements for whole landscape sections as large deciduous forests or the Rhön highlands. Species with a medium demand of space for instance Adder, Great Grey shrike, Snipe and the bat *Myotis natteri*, allow state-

ments for so called habitat complexes. Umbrella species as the dragonfly *Aeshna subarctica*, the butterfly *Colias palaeno* and the grasshopper *Mecostethus grossus* supply the necessary. information to characterize the so called habitat-areas like a bog or a moist meadow. Even for single structures such as a source, umbrella species could be defined. In case of the Rhön, it is the endemic snail *Bythinella compressa*.

In case of the nature reserve «Lange Rhön», the Black Grouse is the flagship species, which represents the whole landscape section. The habitat requirements of Black Grouse summarize the needs of many other rare and endangered plant and animal species, some of which are also good umbrella species. Based on this fact, the abundance of these species is much higher inside than outside the Black Grouse habitats (see MÜLLER, F.& K.-H. KOLB, 1997).

In addition to the Black Grouse, ecological guilds out of the avifauna are used as umbrella species to monitor landscape condition in the nature reserve «Lange Rhön».

In open grassland, there are so called «species of open landscapes» (Snipe, Lapwing, Corncrake, Meadow Pipit), which tolerate only single bushes in their habitat. Characteristic umbrella species in half-open landscapes - grassland which is more or less overgrown by shrubs and trees - are the so called «species of half-open landscapes» (Red-backed Shrike, Grasshopper Warbler, Whitethroat, Great Grey Shrike) (see **Fig. 4.** and MÜLLER, F. & K.-H. KOLB, 1997; KOLB, K.-H. in BORNHOLD, G. *et. al.*, 2000; KOLB, K.-H.& J. JENRICH, 2001). These umbrella species react to both natural or man-made changes in their specific habitat by population increase or decrease, depending on whether the changes of habitat are positive or negative for the species in focus. In general they react more specifically and often earlier than Black Grouse, which owns a higher demand of space. Changes in abundance of this umbrella species are therefore important indicators for changes in the Rhön landscape.

Fig. 4. Habitat use of Black Grouse and characteristic umbrella species of Black Grouse habitat sections (habitat complexes) within the landscape section «open grasslands of Rhön highlands» Graph MÜLLER & KOLB (1997), some changes.

Habitatnutzung des Birkhuhns und charakteristischer Leitarten der Birkhuhn-Teillebensräume (Lebensraumkomplexe) im Landschaftsausschnitt «offene Wiesenlandschaften der Hochrhön». Grafik aus MÜLLER & KOLB (1997), leicht verändert.

Utilisation de l'habitat par le tétras lyre et des espèces indicatrices, caractéristiques de sections au sein de la section paysagère «prairies ouvertes» de la haute Rhön. Dessin de MÜLLER et KOLB (1997), légèrement modifié.

Umbrella-species as target-species for actions in nature conservation.

At the same time with monitoring changes in their habitat and consequently in landscape structure umbrella species are important target species for actions in nature conservation. This is true for planing future actions as well as for the implementation of current actions and the performance evaluation of already finished actions.

What is the meaning of the term target species?

According to ALTMOOS (1997), «target species are all species appropriately chosen due to reasons in nature conservation strategy (normative assessment on a scientific basis, special criteria!), in order to conserve and support them with priority.

This terminology concept includes an autecological approach, following the method, which, first, identifies animal species as target species and, second, orientates possible species conservation activities towards the needs of the species (e. g. habitat needs or processes, creating suitable habitats). It is possible to take into account the complex dynamic landscape with the help of target species from the zoological species conservation point of view. Using this approach landscape will not be first devided into different areas.

A concept of target species as deduced from ALTMOOS for the local conservation of species in the Rhön Biosphere Reserve represents an important help especially in case of habitat management within the framework of landscape management but also for actions to canalise visitors. For that reason this concept was implemented into practice in the Bavarian part of the Rhön.

Effects of habitat changes through natural landscape development and/or specific habitat management on population development, habitat choice and use of characteristic avifaunistic umbrella species of open and half-open landscapes in the nature reserve «Lange Rhön».

In cultural landscapes such as the Rhön constant opposing processes are running.

On the one hand, man uses and develops the landscape according to his ideas, on the other hand natural succession takes immediately place in areas,

which are not longer used by man.

At the end, in the Rhön and other low mountain ranges of Europe, this process leads to the climax woodland following different stages depending on site factors.

The open cultural landscape of the Rhön highlands, of which the «Lange Rhön» is part and where a lot of rare and highly endangered plant and animal species are native, represents a product of man using the land for his needs. In future its typical character as «Land of open expanses» will be conserved only by permanent intervention of man (cultivation, management) into the naturally running processes.

Reduction of bushes and trees as management action against the increase of wood in open grassland through progressive succession

On the occasion of basic zoological investigations for the creation of the management plan «Lange Rhön» in the years 1984/85, the avifauna was investigated in eight sample areas in the nature reserve «Lange Rhön» by BANDORF & PFRIEM (1987). In the years 1993/94 and 1999, respectively 10 and 15 years later, this mapping was repeated by KOLB (KOLB in BORNHOLD *et al.*, 2000) for selected areas of the eight sample areas with increased sampling size. For some characteristic umbrella species such as Snipe, Lapwing, Corncrake, Whinchat, Great Grey Shrike, Red-backed Shrike and Grasshopper Warbler the territories/breeding pairs were recorded for the three different samples in the whole nature reserve «Lange Rhön». The monitoring of umbrella species during the Black Grouse Monitoring Project, running since 1995, supplied important data for the year 1999.

Fig. 5 describes the results of the three samples for the whole nature reserve «Lange Rhön» compared to the total number of territories of the four umbrella species Snipe, Lapwing, Red- backed Shrike and Grasshopper Warbler (FLADE, 1994).

It is obvious that the territories of the two species of open landscapes, Snipe and Lapwing have significantly decreased by 38% and 82%. from 1985 to 1999. In contrast, during these 14 years, the territories of Red-backed Shrike and Grasshopper Warbler, species of half-open landscapes, have dramatically increased by more than ten times the original number in 1985. With the help of the umbrella species it can be postulated that a significant increase of wood tillering has taken place in the area. Especially Snipe and Red-backed Shrike are specific indicators for this development in open grassland. In the case of Lapwing, a common nationalwide downhill trend of the population as well as a high dependence on spring weather in high elevations are responsible for the collapse of population. In contrast, clear-cuts of spruce forests, where logging

took place between 1987 and 1995 (see also chapter 5.3), have now developed to favourable habitats for the Red-backed Shrike and Grasshopper Warbler through softwood succession. In addition, the Grasshopper Warbler prefers

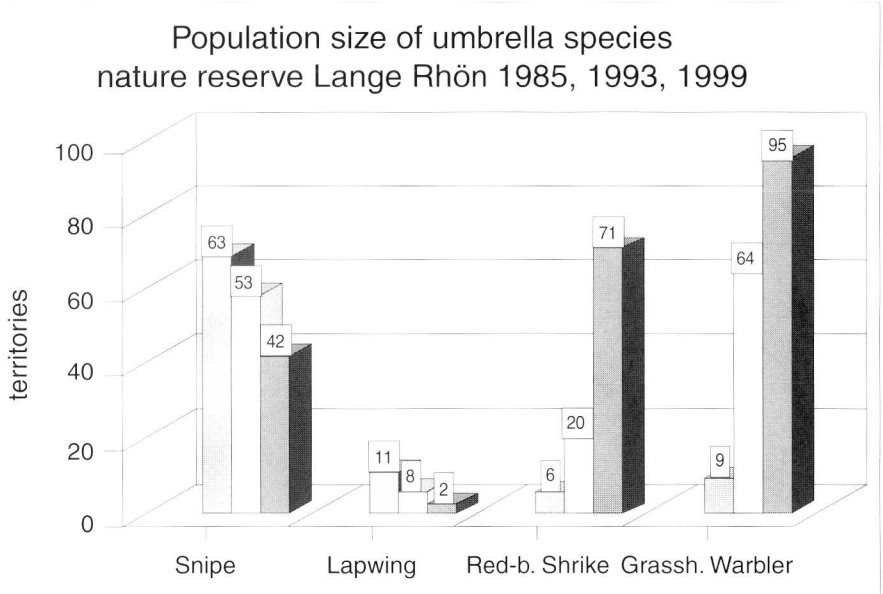


Fig. 5. Comparison of population size of the open landscapes species (Snipe and Lapwing) with species of half-open landscapes (Red-backed Shrike and Grashopper Warbler) in the entire nature reserve «Lange Rhön» in 1985, 1993 and 1999
Bestandsvergleich der Offenlandarten Bekassine und Kiebitz mit den Halboffenlandarten Neuntöter und Feldschwirl für das gesamte NSG «Lange Rhön» für die Jahre 1985, 1993 und 1999.
Comparaison de la taille de la population des espèces de paysages ouverts (Bécassine des marais et Vanneau huppé) avec les espèces de paysages semi-ouverts (Pie-grièche écorcheur et Locustelle tachetée) dans l'entièreté de la réserve naturelle «Lange Rhön» en 1985, 1993 et 1999.

apart from areas with shrubs and bushes sites with tall herbaceous vegetation.

The observed decrease of species of open landscapes (Snipe and Lapwing) and the simultaneous increase of species of half-open landscapes (Red-backed Shrike and Grasshopper Warbler) clearly point out that wood and therefore the wood cover have increased in the nature reserve «Lange Rhön». A comparison of digital aerial photos of the years 1984, 1993 and 1998 was carried out in 1998 for areas with very dense wood cover in order to verify the increase of wood indicated by examined umbrella species.

In two areas with dense wood cover, called «Leitgraben» and «Eselsroth», extensive actions of wood reduction took place in autumn 1997. For theses management actions heavy machines (Timber Jack with rope winch) were used to extract the Eared Willow bushes together with roots and to remove cut Downy Birch trees *(Betula pubescens ssp. carpatica)* from the grassland.

Fig. 6 shows the spread of wood from 1984 to 1993 for the sample area «Leitgraben».

Fig. 6. Development of wood and resulting increase of wood cover in the sample area «Leitgraben» (area in the center of the graph) in the nature reserve «Lange Rhön» from 1984 to 1993
Entwicklung des Gehölzbestandes und damit verbundene Zunahme der Gehölzdeckung auf der Probefläche Leitgraben (Gebiet im Zentrum der Abbildung) im Naturschutzgebiet «Lange Rhön» von 1984 bis 1993.
Développement des boisements et peuplements de bois. Augmentation concomittante de la couverture boisée dans la zone échantillon «Leitgraben» (zone au centre de la Fig.) dans la réserve naturelle Lange Rhön de 1984 à 1993.

The comparison of aerial photos verified the increase of wood cover which was already clearly indicated by the specific umbrella species. **Fig. 7** shows the results of the two sample areas «Leitgraben» (8,5 hectares) and «Eselsroth» (23,8 hectares) in a graph. In 1984 the percentage of wood cover results in 7,4 % (ca.1,37 ha) and respectively 4,0% (ca. 0,95 ha) of the whole surface of the two sample areas. Until 1993 the area increases to 14,2% = ca. 2,63 hectares (Leitgraben) and respectively 7,7% = ca. 1,83 hectares (Eselsroth). This corresponds to an increased wood cover of 92% on both sample areas over a period of nine years. The calculation of the yearly increase of wood cover results in an increase of 10% per year. In autumn 1997, the actions of wood reduction reduced the wood cover in the sample areas at about 130% (Leitgraben) and respectively 126% (Eselsroth) (see **Fig. 7** graph for 1998).

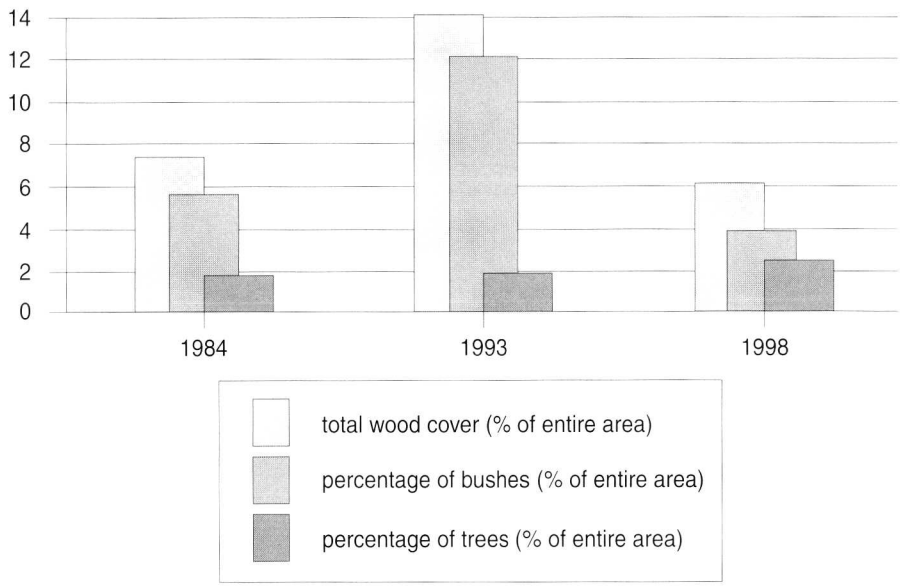


Fig. 7. Development of wood cover in the sample areas «Leitgraben» (18,5 ha) and «Eselsroth» (23,8 ha) in the nature reserve «Lange Rhön» from 1984 to 1998.
Entwicklung der Gehölzdeckung in den Probeflächen Leitgraben (18,5 ha) und Eselsroth (23,8 ha) im NSG Lange Rhön von 1984 –1998.
Développement de la couverture boisée dans les zones échantillons «Leitgraben» (18,5ha) et «Eselsroth» (23,8ha) dans la réserve naturelle Lange Rhön de 1984 à 1999.

The sample area «Leitgraben» was also chosen for investigation of bush, shrub and tree development because the increase of wood until 1993 in this area, where in 1985 three Snipe territories were still found, resulted in a complete abandoning by the Snipe. Due to the wood reduction in autumn 1997, the sample area becomes again attractive and useable for species of open landscapes. This fact can be illustrated by the establishment of three Snipe territories in the year 1999 (see **Fig. 8**). This picture shows the change of distribution of Snipe and Red- backed Shrike territories for a time period of 15 years for the area of the source hollow of the Els-river comparing the years 1985, 1993 and 1999. Areas, which the Snipe has left because the wood cover became too dense over the years are edged with violet. The yellow area represents the sample area «Leitgraben». Within the area of nature reserve «Lange Rhön» in focus, the Snipe has declined from 28 territories in 1985 to 18 territories in 1999, corresponding to a more than one third decrease.(36%) of territories. During the same period, the number of territories of Red-backed Shrike increased from four territories in 1985 to 20 territories in 1999, which means a five time increase of the original amount. The decline of Snipe in the area in focus corresponds to its reduction in the whole nature reserve. However the increase of Red-backed Shrike is much less than in the whole nature reserve. The reason for this can be found in the fact that the increase of Red-backed Shrike territo-

ries is not caused only by an increased Red-backed Shrike population in open landscapes but decisively also by its colonization of clear-cuts of spruce forests, which provide an optimal habitat for them (see under chapter 5.3).

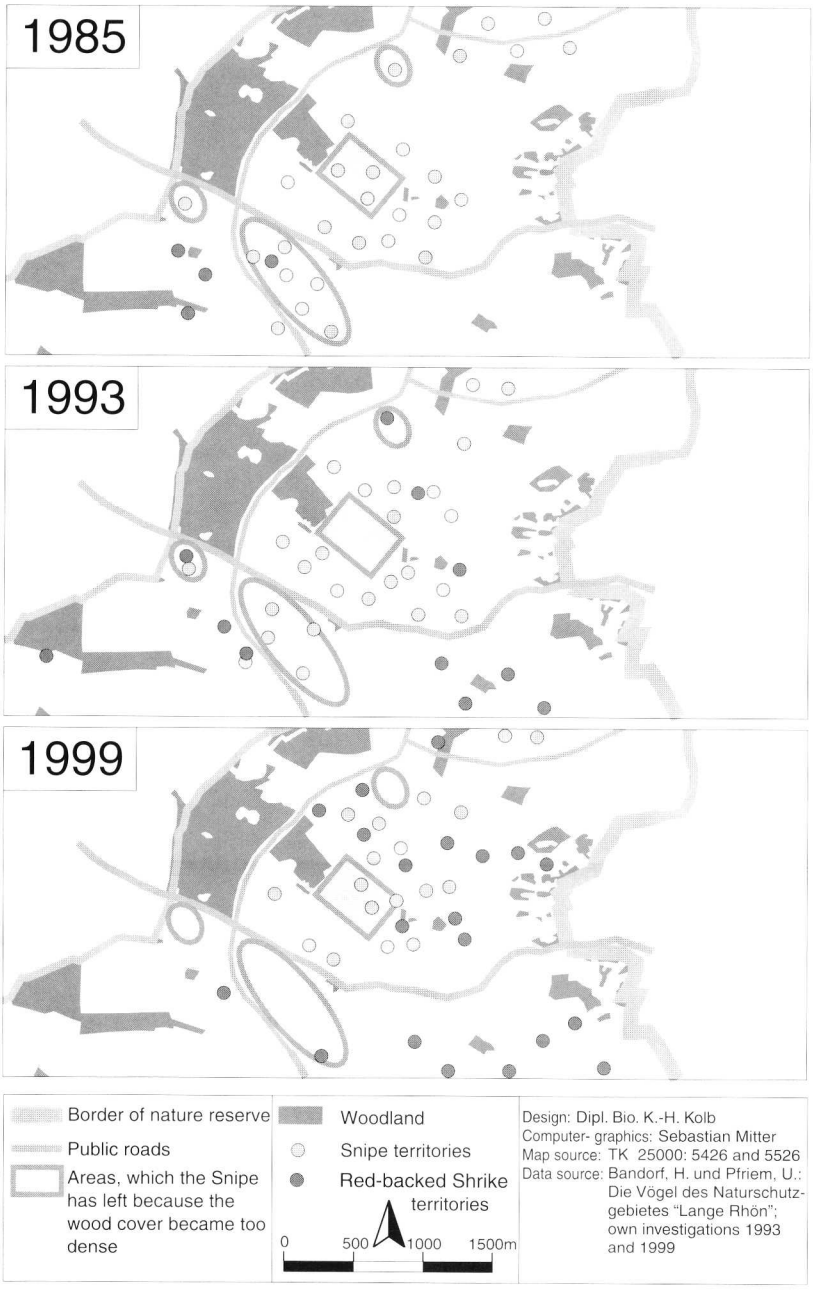


Fig. 8. Change of Snipe and Red-backed Shrike abundance in one section of the nature reserve «Lange Rhön» from 1985 to 1999.
Wandel der Siedlungsdichte der Bekassine und des Neuntöters in einem Teilgebiet des NSG Lange Rhön von 1985-1999.
Changements d'abondance de la bécassine des marais et de la pie-grièche écorcheur dans une section de la réserve naturelle Lange Rhön de 1985 à 1999.

Fallow land management for an increased structure diversity and the creation of a small scale mosaic of different land uses

In most parts of the nature reserve «Lange Rhön», especially in the source hollows, where land use is difficult, an increasing retreat of grassland farming has taken place since the middle 1980`s. For this reason, fallow land has established in many areas, which becomes more and more monotonous over time. Due to the failed establishment of grassland farming on this plots grass increases to the disadvantage of herbs. Grass is matted more and more, the flowering aspect is reduced and, as a consequence, the number of insects also decreases. Therefore and due to the gradual appearance and development of wood succession such permanent fallow land becomes more and more unattractive for Black Grouse and other bird species, such as Great Grey Shrike. On behalf of the nature conservation project «Hohe Rhön/Lange Rhön» of the Federal Republic of Germany, between 1981 and 1995 extensive management actions have started for this reason and are implemented today in the Bavarian landscape management guidelines («Bayerische Landschaftspflegerichtlinie»). These actions encompass the treatment of fallow areas with a flail mower in order to prepare grasslands for a yearly mowing. This method allows to structure spacious and monotonous fallow land by irregular mowing patterns. An improvement of structures in areas, where the individual plots size is very small, takes place by changing plots which were treated with a flail mower, in yearly mowed plots with staggered mowing times according to the «Bayerisches Vertragsnaturschutz Programm».

The treatment of fallow grassland with the flail mower had a positive effect especially on the breeding population of Great Grey Shrike.

According to the definition of FLADE (1994), the Great Grey Shrike is a good umbrella species for open landscapes with half-open structures (means half-open landscape) with a changing bush (1 – 5 meters tall) and tree (15 – 30 m tall) cover as well as with low vegetation cover with eventual holes.

The Great Grey Shrike is a character species of half-open landscapes with single bushes and trees as well as small copses in the nature reserve «Lange Rhön», which can be found for instance in the source hollow of «Oberelsbacher Graben», on the «Querberg» and on the extensive sheep grazing at the «Maihügel».

Its breeding territories in these areas are characterized by a good overall view and a loose wood cover of bushes and trees of different heights, which offer a variety of perches for this perch and pounce hunter. In contrast to the Red-backed Shrike, which still uses areas with dense wood cover, Great Grey Shrike avoids these areas.

The territories of Great Grey Shrike in the «Lange Rhön» are characterized by large woodless areas with low vegetation, which play, besides areas with single bushes and shrubs, an very important role as feeding ground for this bird species.

The low vegetation is naturally occurring at locations with vegetation of low height (low moors and nardus grassland) or can be created by human activities such as grazing or mowing.

Fallow land with high vegetation and often highly matted parts in the ground near strata of vegetation make feeding activities of the Great Grey Shrike more difficult. In 1995 the percentage of fallow land in the breading territories fluctuates between 30% («Steir») and 80% («Kuhhüttenweg») (JENRICH, 1995 – 2000). The last mentioned areas are spacious fallow land of nardus grassland type tightly meshed with low moor land.

The number of breeding pairs of the Great Grey Shrike in the nature reserve «Lange Rhön» has been monitored already since 1984. It distinctly increases 3 times from 3 to 4 breeding pairs between 1984 and 1988, when especially the edge of the «Black Bog», moist source hollows with fragile wood cover as well as rough sheep grazings were populated, to 9 to12 breeding pairs between 1992 and 2000. The increased number of breeding pairs is due to intensified biotop management activities in open landscapes such as flail mowing, instalment of yearly mowing, the reducing of bushes (since 1988) and the clear-cut of spruce forests (since 1987) (see **Fig. 9** and chapter 5.3).

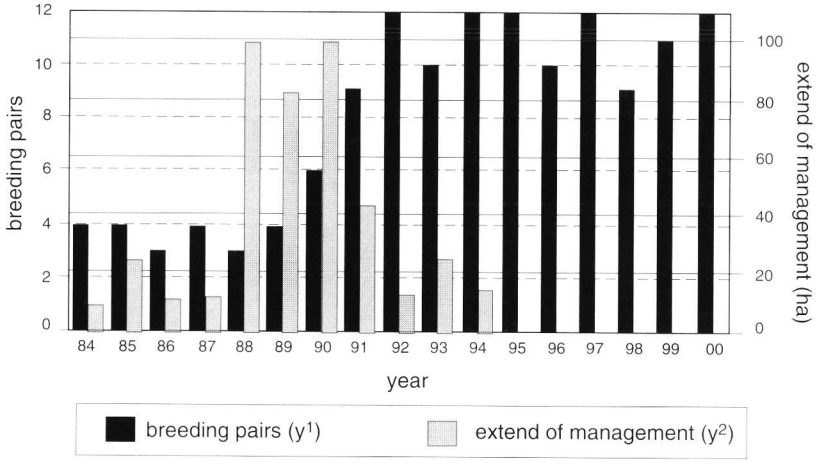


Fig. 9. Effects of flail mowing on the breeding population of Great Grey Shrike in the nature reserve «Lange Rhön» ; Black columns: Great Grey Shrike breeding pairs (ordinate, left side) ; Grey columns: Extent of management actions in hectares (ordinate, right side).
Auswirkungen der Erstpflegemahd auf den Brutbestand des Raubwürgers im Naturschutzgebiet «Lange Rhön» ; Blaue Säulen: Raubwürgerbrutpaare (Ordinate auf der linken Seite) ; Rote Säulen: Pflegeumfang in Hektar (Ordinate auf der rechten Seite).
Effets du fauchage sur la population nidificatrice de pie grièche grise dans la réserve naturelle «Lange Rhön» ; colonnes noires : couples de Pies grièches grises nidificatrices (en ordonnées côté gauche) ; colonnes grises : étendue de la gestion par fauchage en hectares (ordonnées côté droit).

The reasons for this enormous population increase can indeed be found in biotop management activities, which decisively improved the suitability of the habitat especially by improving the food availability and reachability by short cut vegetation.

The improvement of food availability and reachability seems to have a key function. Picture 9 shows a significant population increase of the Great Grey Shrike during the period of intensified flail mowing (1888 – 1991), when ca. 330 hectares of fallow grassland were prepared for yearly mowing. The breeding population with 3 to 4 breading pairs in the years 1984 to 1888 (mean 3.6 breeding pairs) increased to 9 breading pairs (mean 6.3 breeding pairs) until 1991. In the following years (1992 – 2000), the Great Grey Shrike population stabilized on a level of 9 to 12 breeding pairs (mean 11.1 breeding pairs), when flail mowed areas were transformed into yearly mowed areas and mowing was intensified on further areas.

Due to the mowing activities, insect groups such as ground beetles and hymenopteras, which form the most important insect prey of Great Grey Shrike, are promoted compared with fallow grassland. Concerning the ground beetles, the favourable density of vegetation, concerning the hymenoptera the improved supply with flowers on the mowed meadows is the decisive factor (PGNU, 1995 and BORNHOLDT oral communication). On the meadows, which are shortcut due to mowing, the most important group of prey animals, concerning the proportion of mass and weight are small rodents, which are easy to catch and which can be effectively used for food supply. The clear-cuts of spruce forests seem to be favourable feeding territories, too. Out of 12 breading pairs in the nature reserve in the year 1995, 6 pairs used clear-cuts of spruce forests in their breeding territories (JENRICH, 1995 – 2000).

Especially the areas in the «Lange Rhön», where land consolidation has taken place, are of poor structure due to mowing of large plots. An opposite strategy to improve the structure and to increase the structure variability in these areas is used by establishing fallow grassland structures. With the help of mowing rotation in a rhythm of 2, 3 and 5 years and mowing only half a plot in one year, it is possible to establish fallow grassland of different size and age. In addition to these actions, important small structures at the edges and borders of

the plots such as stone bars and stone piles, single bushes and copses as well as fallow stripes and fallow areas were conserved where it is useful, or were created new.

As result of the described actions a narrow spaced mosaic of structures is created, offering feeding ground and shelter for Black Grouse and many other animal species in direct neighbourhood. This shows, that the principle of short distances is implemented most effectively in this way.

Creation of a grassland network through clear-cut spruce forest according to a gradual silviculture plan

In some parts of the «Lange Rhön» an extensive cutting and fragmentation of grassland took place after spruce trees matured, which were planted partially in a grid structure during world war II according to the so called «Dr. Hellmuth-Plan» (see **picture 10**). For this reason, extensive clear-cutting of spruce forests on ca. 101 hectares took place between 1987 and 1995 on the occasion of a gradual silviculture plan within the nature conservation project «Hohe Rhön/Lange Rhön» of the Federal Republic of Germany (see **picture 11**). The aim of these clear-cutting actions was to establish Black Grouse population in parts of grasslands, which were unsuitable as habitat before by cutting spruce forests. Apart from this umbrella species for entire sections of the open landscape in the Rhön highlands, other bird species which breed in grassland, such as Snipe, which is an umbrella species of open moist grassland in the Rhön highlands, were supported through logging activities.

These species abandoned grasslands, which are in very close neighbourhood to spruce afforestations or which are situated inbetween spruce afforestations, because they cause predation pressure.

After the-clear cut of spruce trees, the former woodland was left to natural succession with the aim to conserve softwood succession at an early stage (similar to the «Kampfwaldzone» in the mountain ranges), because of its suitability for Black Grouse and other umbrella species and in order to ensure a continuous population in these areas.

In order to conserve this successional stage, tall grown trees will be removed in future.

Different methods were used to clear cut the spruce forest (KOLB and JENRICH 2001). The reaction of Black Grouse to different methods of cutting spruce forest in the nature reserve «Lange Rhön», during seven years, was examined with standardized mapping methods on behalf of a Black Grouse monitoring project (KOLB, 2001).The removal of the spruce clusters, especially those with grid structure, enabled Black Grouse and other birds, which breed in grassland, to use grassland close to an inbetween these clusters again.

These areas are used by Black Grouse not only for foraging, because at different places even new leks emerge.

Pict. 10 The so called «Dr. Hellmuth afforestations» in the northern part of the nature reserve «Lange Rhön» before the beginning of clear-cut of spruce forest. Notice: grid shaped organisation of the afforestations. Aerial photo Karl-Heinz Kolb, 07.09.1992

Die sog. «Dr. Hellmuth-Aufforstungen» im Nordteil des Naturschutzgebietes «Lange Rhön» vor der Fichtenräumung. Beachte die gitternetzartige Anlage der Aufforstungen. Luftaufnahme Karl-Heinz Kolb, 07.09.1992.

Les «plantations du Dr Hellmuth» dans la partie nord de la réserve naturelle Lange Rhön avant le début des coupes d'épicéas. Notez l'organisation des plantations en quadrillage. Photo aérienne K.-H Kolb , 07-09-1992.

If the above described method of cutting spruce forest is appropriate and successful is highly dependant of the existing and developing vegetation. Exposed old birch trees and rowans are used by Black Grouse in winter as feeding trees and also serve as night rusts. Clear-cuts, where spots with dense succession alternate with spots of open soil, form favourable breeding, hatching and rearing areas for Black Grouse. This can be proved by several successful broods in these areas.

On spots with open soil, a higher appearance of insects can be observed. Ants and grasshoppers can be easily reached by Black Grouse and therefore form an important food source for their chicks.

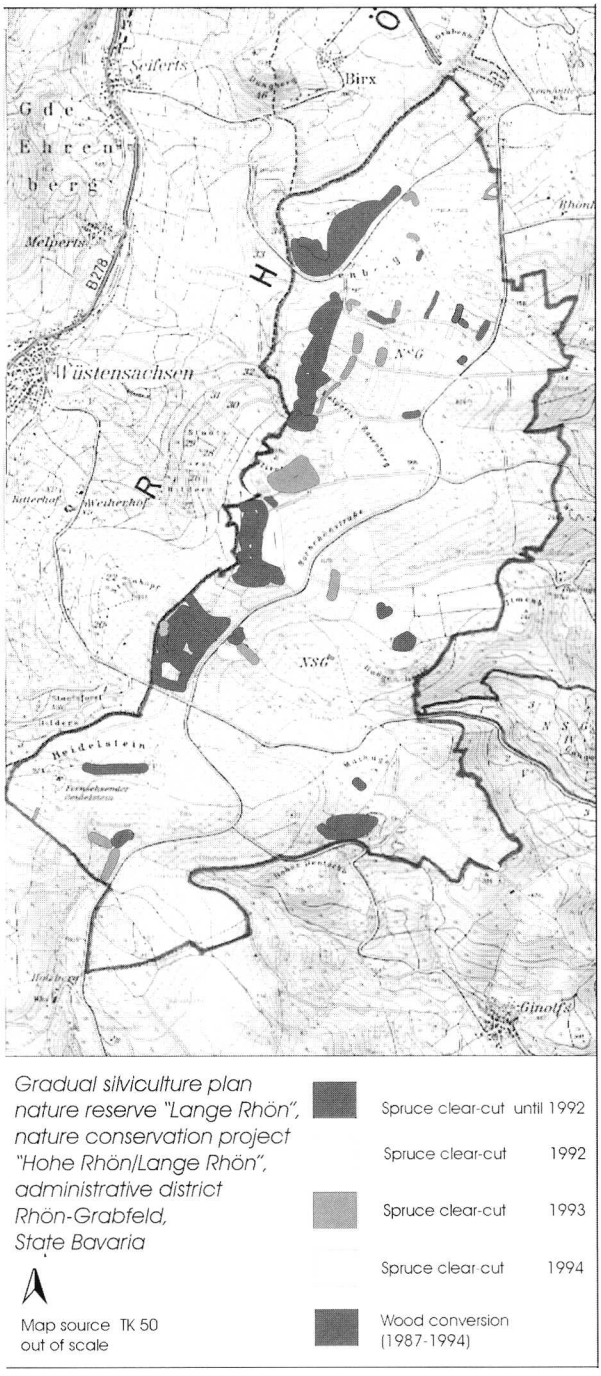
Apart from Black Grouse, clear-cut spruce forests had a significant positive effect on the two shrike species Red-backed Shrike and Great Grey Shrike. These two species of half-open landscapes use clear-cuts in a different way. The abundance of Red-back Shrike on clear-cuts is partly very high, because all required habitat requisites are present. For Great Grey Shrike, clear-cuts represent only one component of its total habitat, which is used primarily as foraging territory. Despite of low disturbancy and high abundance of rodents in these places, the share of Great Grey Shrike habitat in extensive used grassland is much higher than in clear-cuts.

The very high quality of clear-cuts as a habitat for Red-backed Shrike can be seen from its population development within. In the nature reserve «Lange Rhön», the number of territories of Red-backed Shrike increased from less than 10 territories until the end of the 1980`s to 88 territories in the year 2000 due to increased wood cover in open landscapes through succession, due to biotope management actions in open landscapes (e. g. mowing of fallow land) and due to clear–cut of spruce forests between 1987 and 1995 (see **picture 12**). Before of spruce clear-cuts happened Red-back Shrike was only abundant in open landscapes. It started to populate clear-cuts in 1993 with a single breeding pair. In the following years the number of territories in clear-cuts increased. In 1998, for the first time the number of territories (37) was significantly higher than the number of territories in open landscapes (21). This trend continued until 2000 (52 territories in clear-cuts and 36 territories in open landscapes). With a total number of 88 territories in 2000, the Red-backed Shrike population was ten times higher than in the middle (1984 = 8 territories) or the end (1987 = 9 territories) of the 1980`s. The yearly population increase in clear cut spruce forest made an important contribution to the strong overall population increase (see **Fig. 12**).

The clear-cuts seem to develop further to a habitat optimum because of the yearly Red-backed Shrike population increase in a higher degree than in open landscapes.

The low increase rate of Red-backed Shrike in open landscapes is caused, among other things, by the reduction of wood cover in the open grassland through yearly landscape conservation.

The ongoing population increase of species of half-open landscapes such as Red-backed Shrike and Grasshopper Warbler in the open grassland (see **picture 5** and **12**) clearly shows, that the described management actions need to continue to protect the habitat of typical species of open landscapes (Snipe, Lapwing and Corncrake) and to conserve the «Land of open expanses».



Gradual silviculture plan nature reserve "Lange Rhön", nature conservation project "Hohe Rhön/Lange Rhön", administrative district Rhön-Grabfeld, State Bavaria

Map source TK 50
out of scale

Spruce clear-cut until 1992

Spruce clear-cut 1992

Spruce clear-cut 1993

Spruce clear-cut 1994

Wood conversion (1987-1994)

Fig. 11. Clear-cut spruce forests according to the «gradual silviculture plan» and activities in wood convertion (spruce forest into mixed deciduous forest)
Im Rahmen des «Waldbauliche Stufenplans» durchgeführte Fichtenräumungen und Waldumbaumaßnahmen (Fichtenwald in Laubmischwald).
Coupes à blanc des boisements d'épicéas dans le cadre du «plan de sylviculture graduelle» et activités de conversion forestière (bois d'épicéas au sein d'un bois de feuillus mélangés)

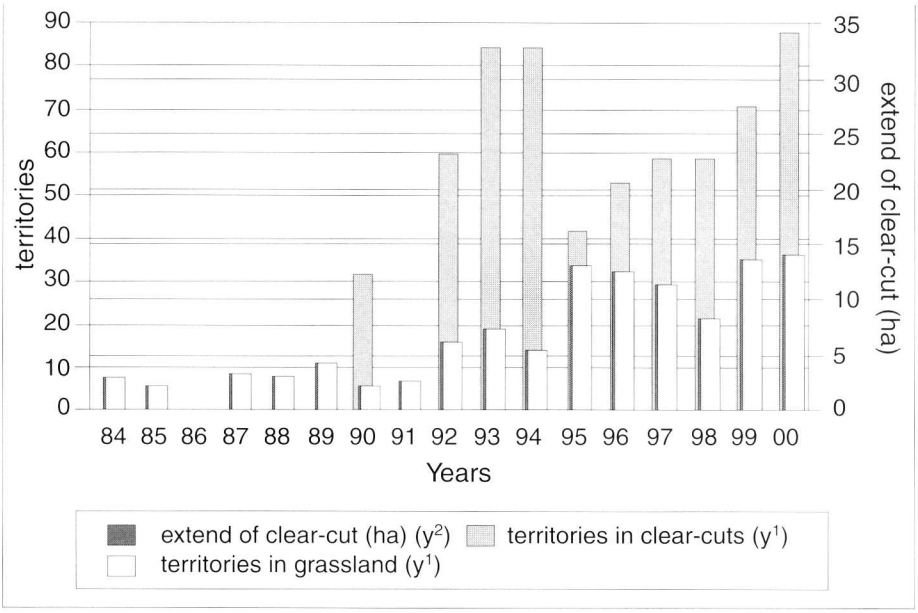


Fig. 12. Effects of clear-cut spruce forests and ongoing wood succesion in open grassland on Red-backed Shrike abundance in the nature reserve «Lange Rhön»
Auswirkungen der Fichtenräumungen und der fortschreitenden Gehölzsukzession auf der Freifläche auf die Siedlungsdichte des Neuntöters im Naturschutzgebiet «Lange Rhön».
Effets de la coupe des bois d'épicéas et de succession forestière en cours dans les prairies ouvertes, sur l'abondance de la pie-grièche écorcheur dans la réserve naturelle «Lange Rhön»

Perspectives

The described monitoring of umbrella and target species in the nature reserve «Lange Rhön» with its main emphasis on the «Black Grouse Monitoring Project» should continue in future in order to monitor the population development of the characteristic umbrella species, to further optimise habitat management in this area for species conservation and to early detect negative developments in habitat and landscape structure.

In future, a main goal is the expansion of the monitoring-project to other valuable and important areas within the Rhön biosphere reserve. Especially other nature reserves as well as reported FFH-areas should be mentioned.

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RESUME : Les espèces «sentinelles» ou espèces «cibles» sont-elles des instruments valables en matière de Conservation de la Nature ? Rélexions sur l'habitat du Tétras lyre dans la Réserve de la biosphère de la Rhön.

Les espèces sentinelles exigent des standards de qualité complexes dans leur domaine vital et ont des liens étroits avec certains types de milieux et composantes de leur habitat. Dès lors, elles fréquentent avec une plus grande constance les milieux qui leur sont les mieux ajustés, et évitent les autres. Elles réagissent d'une manière très sensible, par des variations de la densité de leurs populations, aux changements de leur habitat, que ceux-ci soient naturels ou le résultat de mesures de gestion.

Une espèce sentinelle des milieux ouverts, par exemple la Bécassine des marais, réagit par une baisse de densité de sa population, jusqu'à un abandon de son habitat,

lorsque les taillis l'envahissent et le ferment. à l'inverse, une espèce comme la Pie-grièche écorcheur, indicatrice des milieux semi-ouverts, réagit positivement à l'apparition de buissons pour autant que le niveau préféré de recouvrement ne soit pas dépassé.

Le Tétras lyre habite des milieux ouverts et des milieux semi-ouverts, qui s'entremêlent pour constituer son habitat préféré. Les sites envahis par les taillis sont désertés, comme le sont les grands espaces sans quelque boisement. Cela fait de lui l'espèce étendard de l'ensemble du paysage de la Haute Rhön. En raison de leurs exigences particulières, notamment quant à l'espace, certaines espèces sont donc représentatives de l'ensemble du site (Tétras lyre), de complexes paysagers particuliers (Bécassine des marais et Pie-grièche écorcheur), ou d'un habitat particulier (Râle des genêts) (ALTMOOS 1997). Il en résulte qu'un collectif d'espèces sentinelles représentatives fournissent de bons indicateurs de la qualité de l'ensemble du paysage et de ses habitats, tels que le paysage cultural ouvert de la Haute Rhön, le «Pays des lointains dégagés».

Le besoin d'espace du Tétras lyre combiné avec sa demande d'un mélange de milieux ouverts et semi-ouverts le désigne comme l'espèce cible sur qui centrer les étapes de la gestion du paysage et de ses habitats. Les variations de ses populations indiquent où se sont produits les changements de l'habitat à corriger. Les variations de densité qui s'ensuivent permettent de juger de la pertinence des interventions et, si besoin, d'y adapter les mesures de gestion.

Depuis le début des années 80, une gestion extensive du paysage (fauchages, enlèvement des broussailles et épicéas) est appliquée dans la Réserve Naturelle «Lange Rhön», une zone protégée de 2.666 ha au centre de la Réserve de la Biosphère de la Rhön et qui abrite une population de 35-40 Tétras lyres. Cette politique est combinée au suivi des variations des effectifs de plusieurs espèces indicatrices, et ses résultats permettent d'ajuster les prochaines étapes des interventions. Depuis les cinq dernières années, la gestion s'est intensifiée sur base de l'expérience acquise, sous forme d'un Projet de Surveillance du Tétras lyre, visant à la protection et au développement de ses populations et des espèces associées, meilleurs garants de la préservation du paysage typique de la Rhön

ZUSAMMENFASSUNG

Die Möglichkeiten im Naturschutzmanagement Leitarten als Indikatoren für Habitat- und Landschaftsveränderungen einzusetzen werden für verschiedene Raumebenen vorgestellt.

Wie diese Leitarten spezifisch als Zielarten des Naturschutzes eingesetzt werden können, an denen verschiedene Managementmaßnahmen ausgerichtet werden, wird allgemein beschrieben.

Am Beispiel des näher vorgestellten Naturschutzgebietes «Lange Rhön» werden die Auswirkungen von Lebensraumveränderungen durch natürliche Landschaftsentwicklung und/oder gezieltes Habitatmanagement auf die Populationsentwicklung, Habitatwahl- und nutzung des Birkhuhns und typischer avifaunistischer Leitarten des Offenlandes der Rhön (Bekassine, Kiebitz, Wachtelkönig) und Halboffenlandes (Neuntöter, Raubwürger, Feldschwirl) erläutert. Die Ergebnisse und Erfolge spezieller zur Habiatatverbesserung für diese Arten durchgeführter Landschaftspflegemaßnahmen werden vorgestellt und diskutiert. Ausblicke und Perspektiven für den zukünftiges Einsatz eines Leit- und Zielarten Monitorings im Biosphärenreservat Rhön werden gegeben.