

# Long-term changes in population and habitat selection of Red Kite in the region with the highest population density

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## Introduction

The Red Kite *Milvus milvus* is the most remarkable of all breeding birds in the Federal Republic of Germany. It is unique among the some 260 native species of breeding birds, in that half of its worldwide population live in Germany. The area with the highest population density is located in the federal state of Saxony-Anhalt. Currently about 2,000 pairs (8% of the global population) breed here (MAMMEN et al. 2014). In particular, the region north of the Harz Mountains has a high population density.

The changes in the Red Kite population in this region have been well known for more than 50 years. Almost all breeding pairs nest in isolated forests (Hakel, Huy, Hohes Holz), and none in the open countryside. The open countryside with its highly productive soil was intensively farmed, providing a good food supply for the Red Kite. In 1990/91 the highest population density of more than 40 bp/100 km<sup>2</sup> was recorded. Thereafter, in the course of only five years and as a result of extreme changes in agricultural practice, the population declined by nearly 50 % (NICOLAI 2006, 2011, NICOLAI et al. 2009). To date, in addition to population changes, there have been marked changes in habitat selection within the study area.

## Study area and Methods

### The study area:

- is located in the north of the Harz Mountains
- is the region with the highest density of breeding Red Kites (Fig. 1)
- covers an area of 445 km<sup>2</sup>
- is predominantly arable land with field sizes up to 90 hectare
- consists of open landscape with no forests
- is crossed by small riverine meadows
- has larger pastures in the north only

### Methodology:

- the recording of all raptor species every five years since 1986
- is based on nest searches
- recording of additional data per nest: exact position, nest site, nest height, nest tree species
- data digitisation using QGIS (Version 2.14.1)
- uses the official land use data for Saxony-Anhalt and is categorised into seven main types
- defines a radius of 500 m around the nesting site as nest environment
- statistics were evaluated using R (Version 3.0.1)

## Results

### Population development :

- a strong increase until 1991
- a dramatic decrease 1996
- stable since 2001 with about 100 bp (Fig. 2)

### Habitat selection:

- Red Kites began to settle in the study area in the early 1980s
- number of BP in surrounding forests decreased while the number in the open countryside increased (Fig. 3)
- increasing proportion of urban area within the nest environment ( $p < 0,005$ ) (Fig. 4)
- increasing number of breeding pairs within urban areas ( $p < 0,01$ ) and a 500 m periphery ( $p < 0,005$ )
- decreasing number of breeding pairs at a distance from 500 to 1000 m to urban areas ( $p < 0,01$ ) (Fig. 5)
- increase in nest height during the study period (Fig. 6)

## Discussion

### Colonisation of the study area by the Red Kite:

- the study area is crossed by rows of Poplar (*Populus spec.*)
- planted in the 1950s and 1960s (BLEY et al. 2015)
- the majority of Red Kite bred originally in the surrounding forests (STUBBE 1982)
- since the mid-1970s Poplar are useable for raptors as nest sites
- colonisation has been encouraged by a gain of useable nest sites

### Population development:

- reduced food availability due to changes in agriculture practice post-1991
- reproduction dropped in a short time and caused a regional population decrease (NICOLAI & BÖHM 1999)

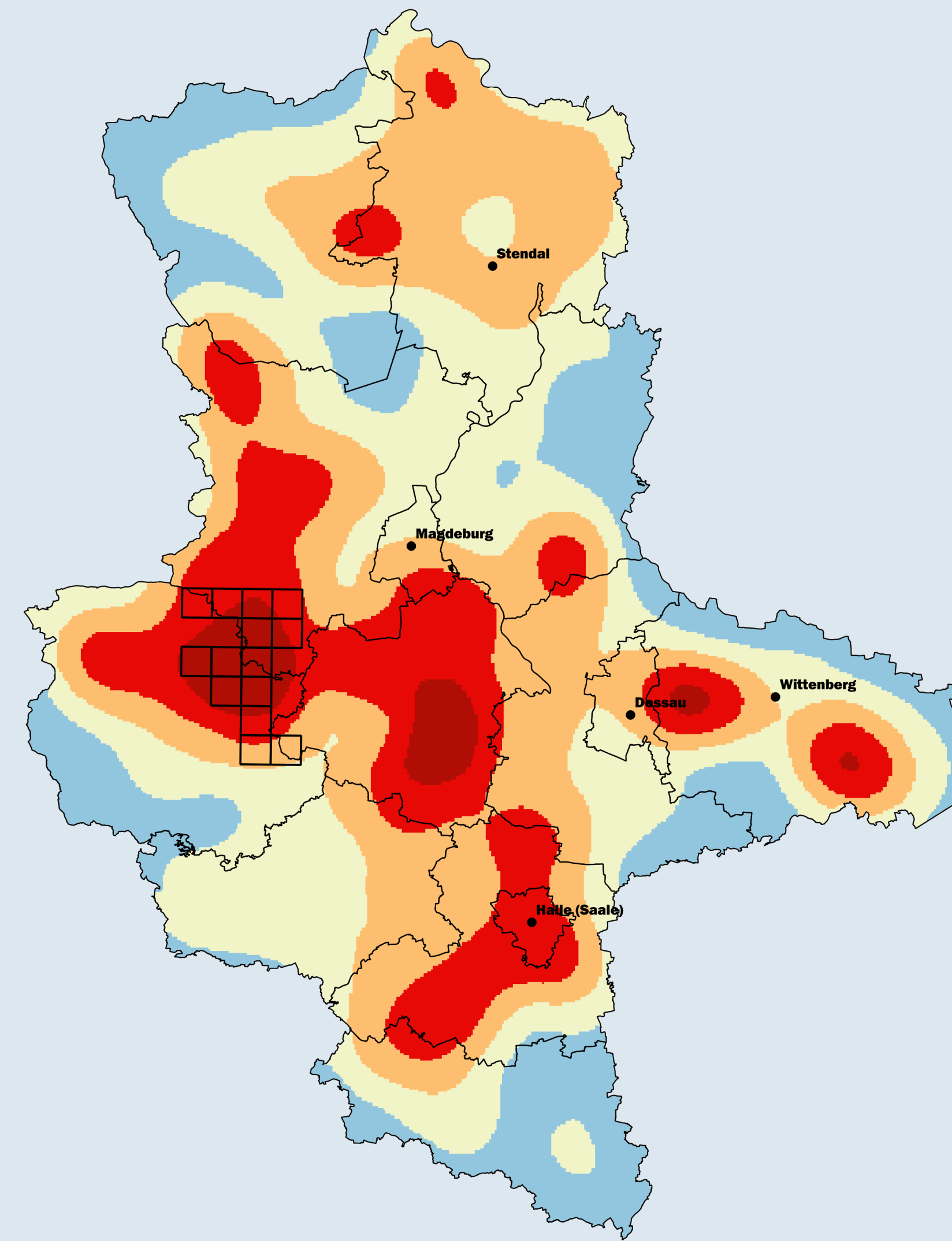


Fig. 1: Location of the study area and distribution of the Red Kite breeding pair density in Saxony-Anhalt.

- population in the open countryside achieved stability
- forest populations decreased further (WEBER et al. 2009)
- Today almost 90% of the regional Red Kite population breeds in the open countryside.

### Nest height:

- nest height increased during the study period
- Poplar (*Populus spec.*) is the predominant nest tree species
- trees reached the age suitable for nesting at the start of the study
- no new trees were planted
- the mean age and the height of trees increased
- increase can be explained by the growth of poplar trees
- lack of young trees and maximum lifetime of existing trees will lead to the loss of most trees in the next 20 years
- the consequences for the Red Kite population are still unclear

### Habitat selection:

- breeding birds in urban areas observed since the 1990s (HELLMANN 1999)
- increase of Red Kites breeding in or near urban areas
- marked increasing trend is detected in these areas at first
- food availability is probably better in the urban areas than in the open countryside
- feeding grounds during the breeding season are becoming increasingly rare due to intensive agriculture practices
- Red Kites are fed selectively in many places in the study area
- typical species of farmland countryside, experiences poor food availability in its natural habitat and becomes synanthropic
- increased disturbances at nest sites near urban areas could lead to greater nest failure and lower reproductive success
- development might result in an ecological trap
- in farming areas food availability should be developed positively to prevent a further decline in the Red Kite population

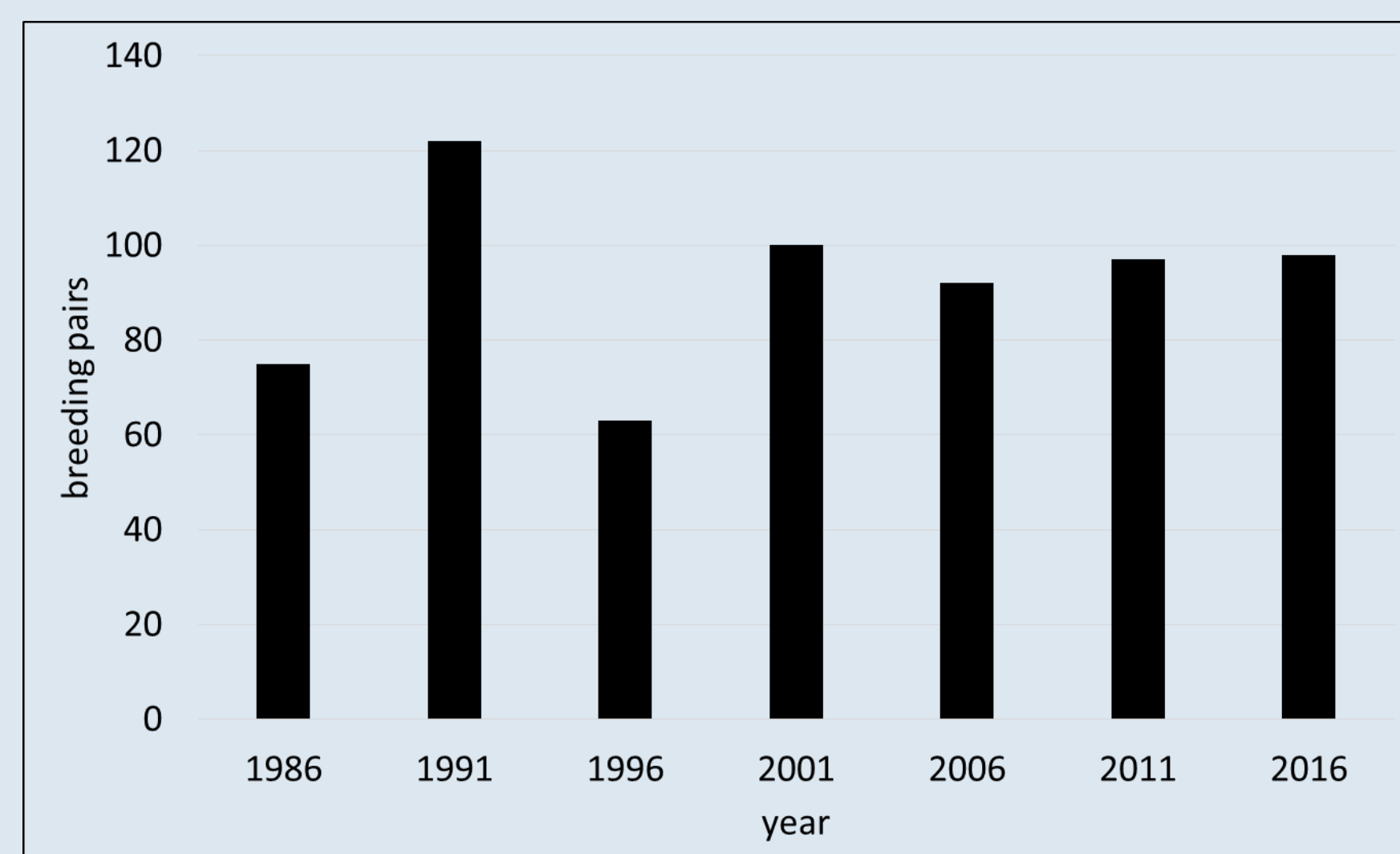


Fig. 2: Development of Red Kite breeding pairs in a 445 km<sup>2</sup> study area in the north of the Harz Mountains.

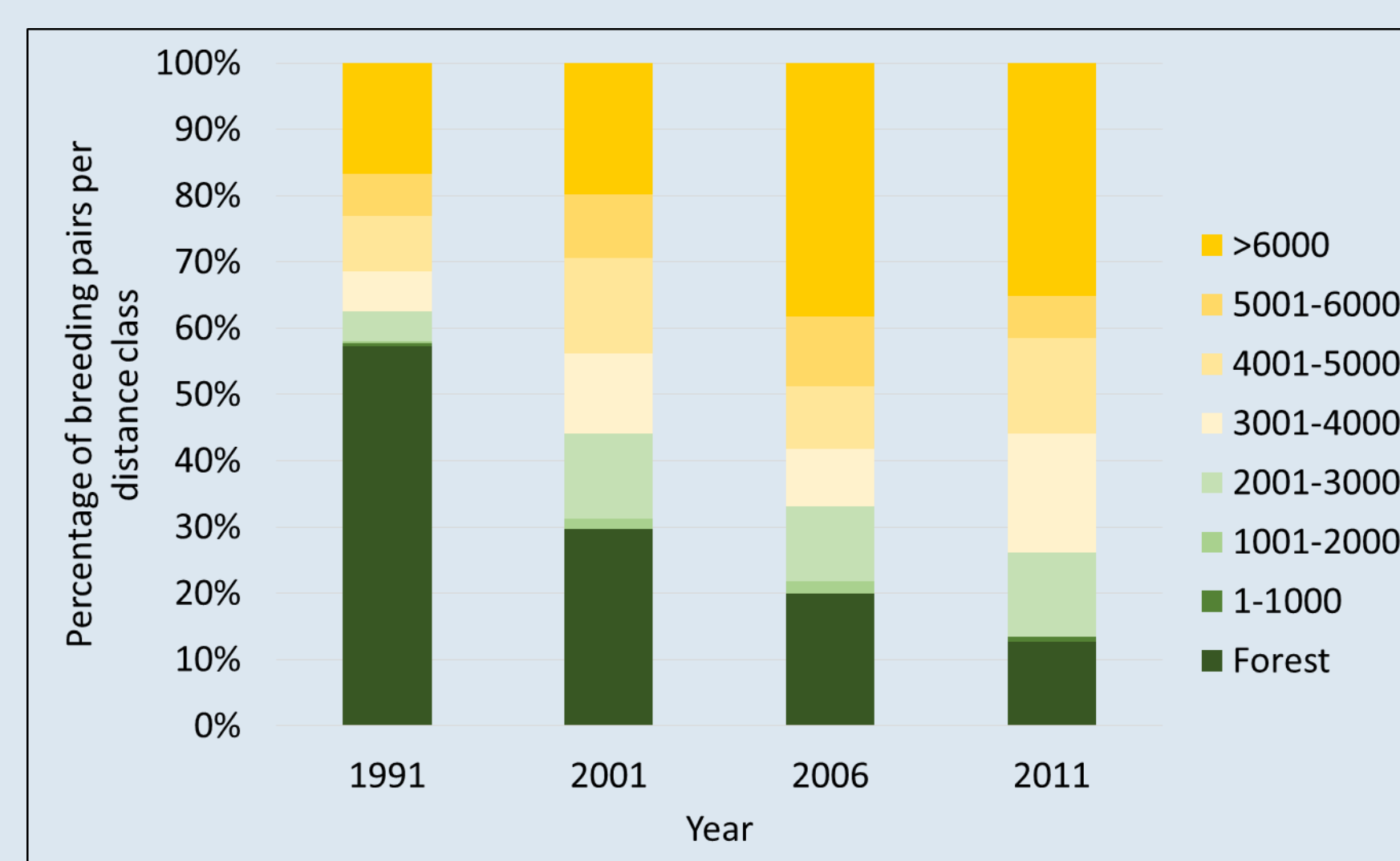


Fig. 3: Development of the percentage of Red Kite breeding pairs in distance classes to the forest during the investigation showing the settlement of Red Kite in the open countryside.

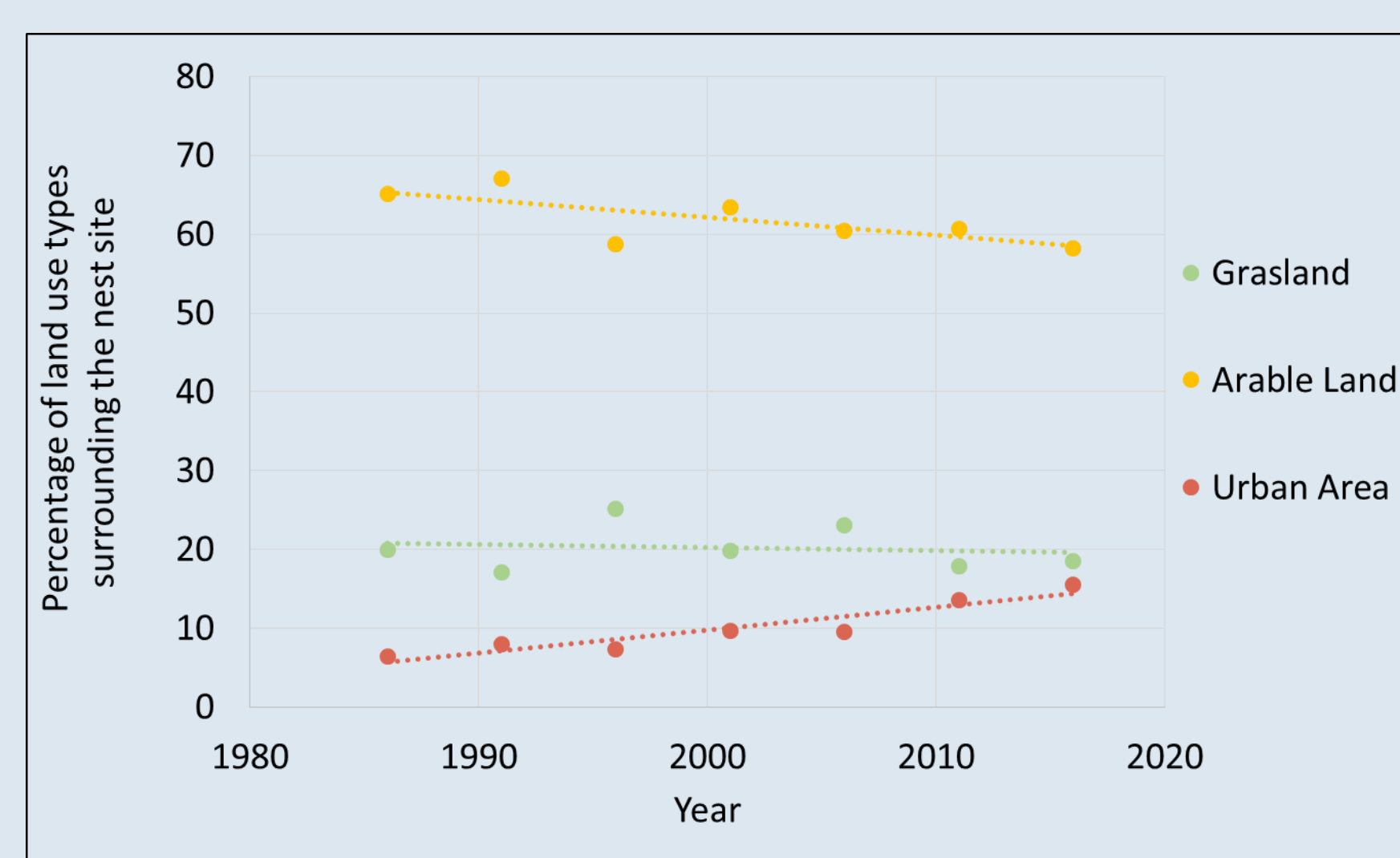


Fig. 4: Change of percentage grassland (n.s.), arable land (n.s.) and urban areas ( $p < 0,005$ ) within the nest environment.

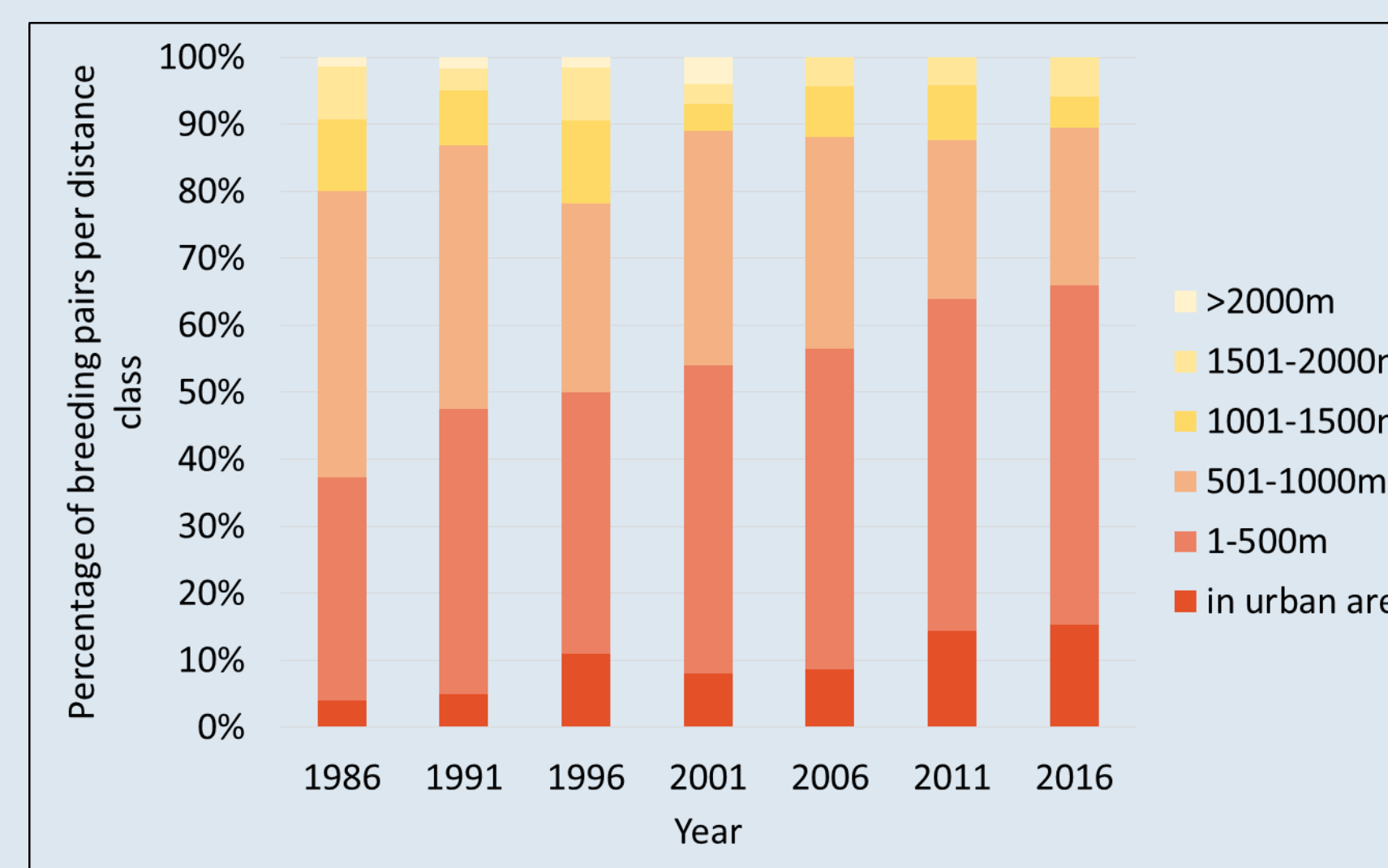


Fig. 5: Development of the percentage of Red Kite breeding pairs in distance classes to urban areas during the study period (in urban areas  $p < 0,01$ ; 1-500m  $p < 0,005$ ; 501-1000m  $p < 0,0005$ ; other n.s.).



Fig. 6: Change of nest height of Red Kites on the study area during the study period.

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