

Transplantation of a *Molinietum caeruleae* meadow in Lower Saxony (Germany)

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Introduction

The *Molinietum caeruleae* meadow recently is considered as a rare and valuable habitat according to the Europeans Habitats Directive. It contains a high number of endangered and target species (e.g. *Betonica officinalis* (Fig. 4), *Galium boreale*, *Inula salicina*, *Selinum carvifolia*, *Silaum silaus*, *Serratula tinctoria* (Fig. 5)) and it is classified as a phytocoenosis that is likely to become extinct in Germany².

The construction of the highway A 39 in the year of 2006 in the county of Wolfenbüttel (Lower Saxony, Germany) separated a *Molinietum* meadow of approx. 3 ha in two parts (Fig. 1).

To protect the meadow a compensation measure was created. About 1 ha of valuable grassland situated directly within the planned highway lane was transplanted in 2006 (sods of approx. 1,5 m² together with 30 cm layer of the underlying soil) to a nearby former farmland adjacent to one of the meadow remnants next to the new roadway. The substrate of the meadow consists of a seasonally wet Pelsosol which consists of an alkaline Jurassic clay soil. Additionally, on a second target area of former farmland semi-natural grassland was restored by transferring of diaspore-containing hay from the *Molinietum* meadow.

A monitoring program has been carried out annually since 2005 by the University of Applied Science in Bremen in order to document and evaluate the success and the effectiveness of the compensation measure, focussing on the following questions:

1. Does the *Molinietum* meadow remain as a habitat with its target species after transplantation?
2. Is the population size of target species constant?
3. Does hay disposal help to introduce a new *Molinietum* meadow?

Material and Methods

Transplanted meadow

The effected meadow was separated in different parts for a monitoring program. In 2005 an investigation of the current state was made. The investigation was repeated annually since 2007. The program included for each part:

- list of all vascular plant species
- population size of endangered species
- vegetation of permanent plots
- habitat mapping

Hay disposal site

- list of all vascular plant species
- population size of endangered species
- in 2010 creation of new permanent plots (Fig. 6)

Population size of *Saxifraga granulata* could not be recorded every year.

Results

Transplanted meadow

1. Habitat type remains *Molinietum* meadow, all in all flora of donation site has been established, even though disturbance indicators were found (Tab.).
2. In 2010, Red List and target species still existed. Population size decreased after transplantation, but recovered in 2010 to initial state (Fig. 2).

Hay disposal site

3. *Serratula tinctoria* and *Silaum silaus* were found in great numbers on hay disposal site (Fig. 3), *Selinum carvifolia* and *Galium boreale* were found on only one permanent plot. So far the habitat type is rather a mesophilic grassland than a *Molinietum* meadow.

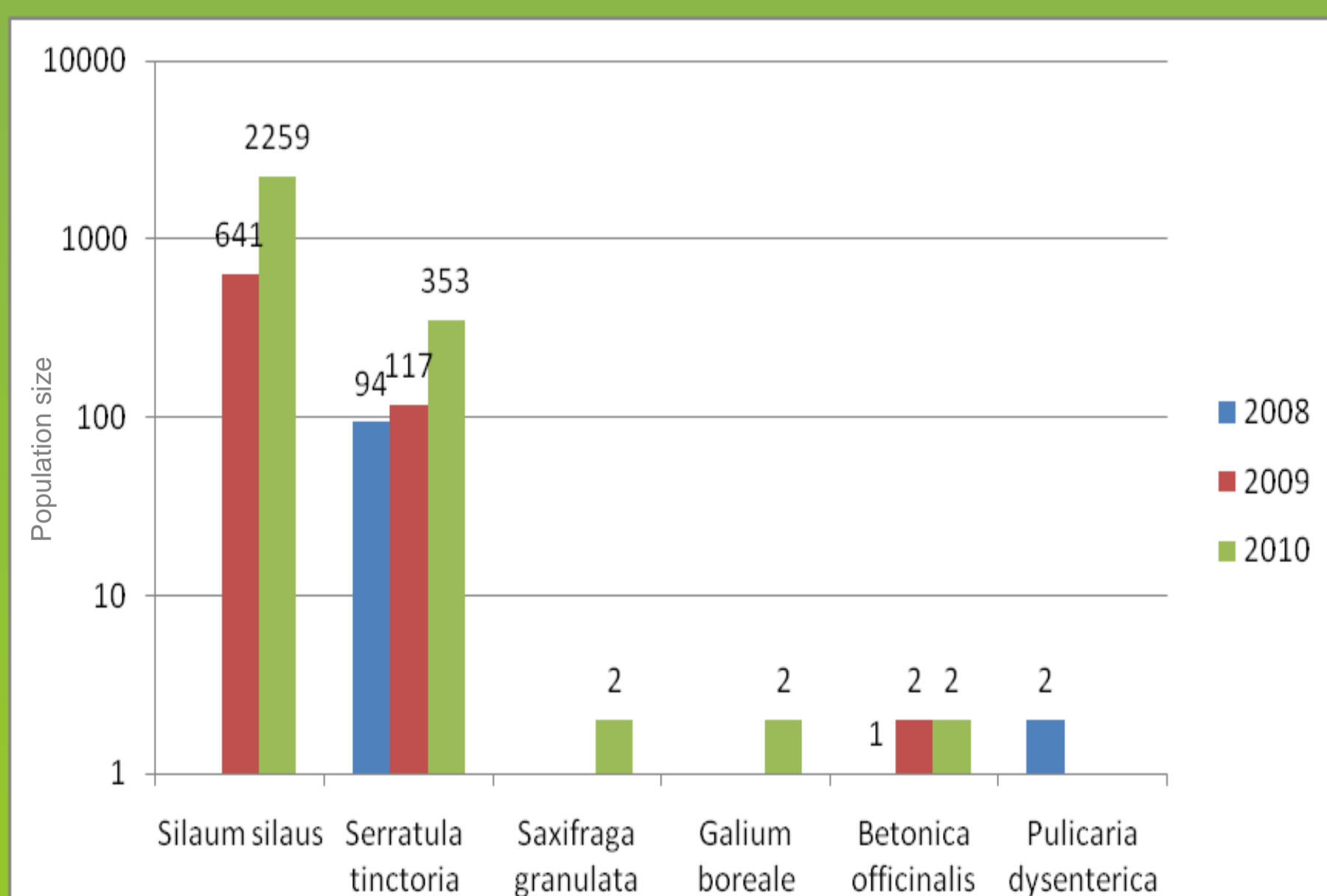


Fig. 3: Logarithmic diagram of number of target species individuals from 2008-2010 on meadow with seed dispersal. Dispersal in 2007.



Fig. 4: *Betonica officinalis*

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Fig. 5: Ground leaves
Serratula tinctoria



Fig. 6: Permanent plot on hay disposal site



Fig. 7: Heterogenous relief on transplanted meadow

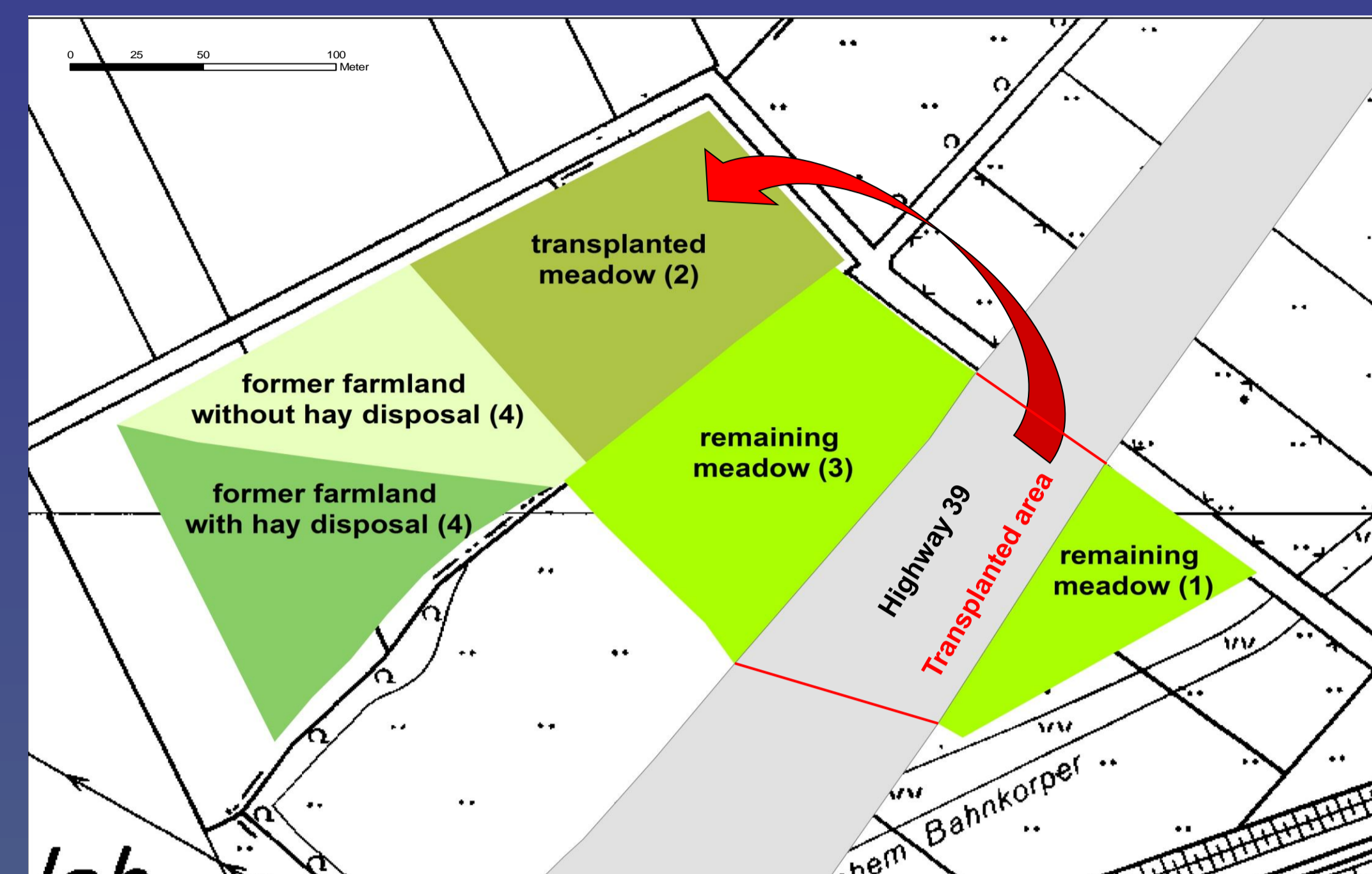


Fig. 1: Compensation measure area

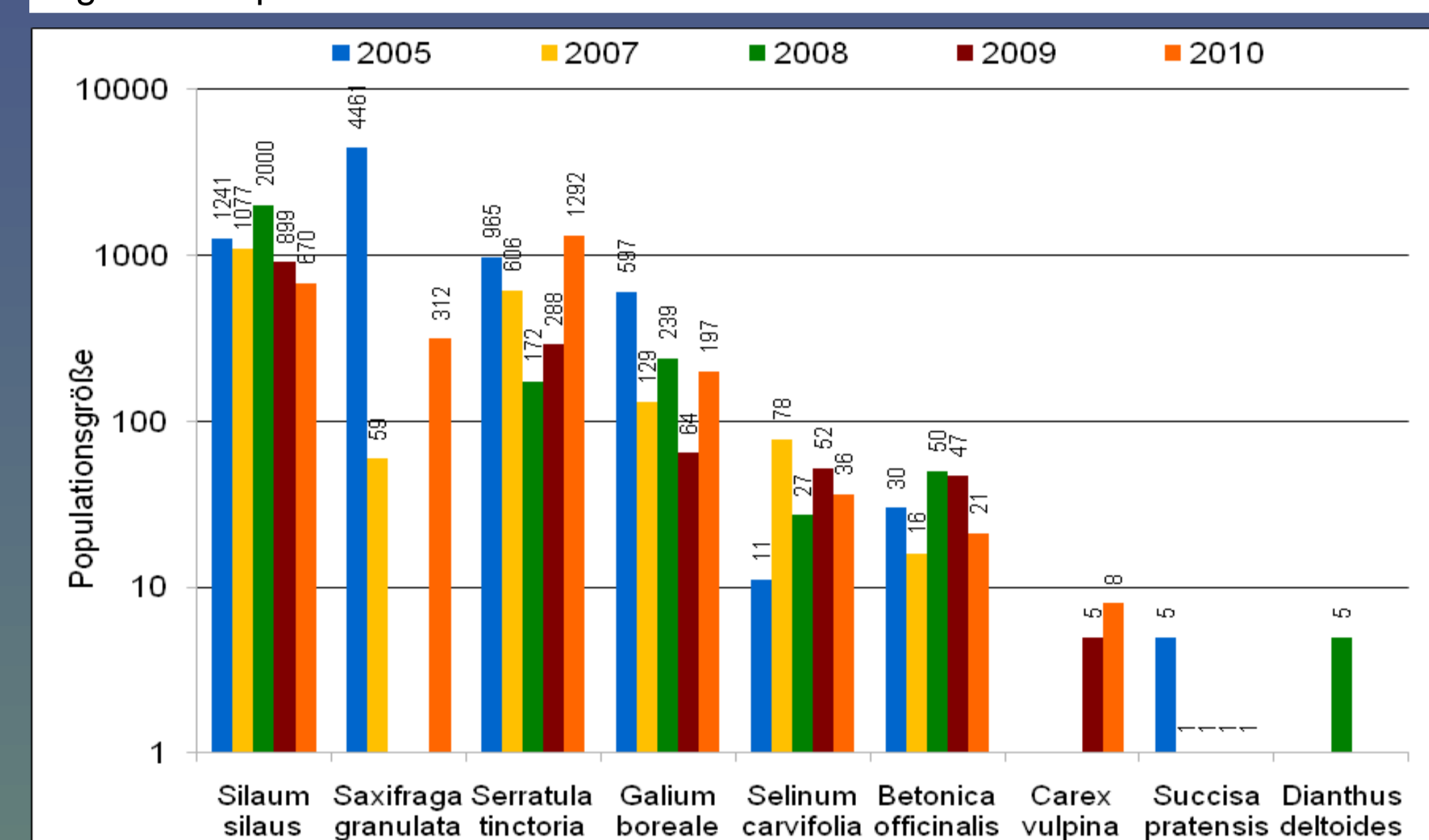


Fig. 2: Logarithmic diagram of number of target species individuals from 2005, 2007-2010 on relocated meadow. 2006 year of transplantation.

Conclusion

Transplanted meadow

- The new location is in parts identical to the old location, but includes larger areas with soil compaction, heterogenous relief (basin) (Fig. 7) and edge effects are clearly visible. Formation of temporarily flooded areas occurred.
- *Molinietum* as habitat type could be preserved.
- Target species remained and population size in 2010 is similar to initial state.
- Total number of species remained, additionally 50 new species appeared (e.g. disturbance indicators and species of new micro habitats within the target site) (Tab.).
- In total compensation measure was successful.

Hay disposal site

- Trend towards species rich mesophilic grassland with *Molinietum* species and some target species already occurred: *Silaum silaus*, *Serratula tinctoria* (Fig. 5).

Perspective: Transplantation is a viable compensation measure in order to preserve a habitat.³ New species and habitats can occur on some areas because they were altered.

Tab.: Total number of plant species on transplanted meadow in the years 2005, 2007-2010. 2006 Year of transplantation

Year of monitoring	2005	2007	2008	2009	2010
Total number of plant species	54	102	95	110	105

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Acknowledgments and Literature

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²RENNWALD, E. (editor) (2010): Verzeichnis und Rote Liste der Pflanzengesellschaften Deutschlands. Schr.R. f. Vegetationskunde 35, Bundesamt für Naturschutz, Bonn-Bad Godesberg, 800 S.

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