

# Communities of small mammals as indicators of biodiversity changes in reclaimed areas after coal mining.



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Photo: H. Brumová

### Brown coal mining and recultivation

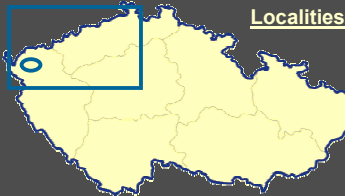
There are extensive areas destroyed by brown coal mining in north-western Bohemia. Huge amount of soil was removed to another place and so created soil-heaps had to be recultivated. The research of various aspects of sustainability and revitalization successfulness in these areas started already in 1985. Our team is occupied mainly with the energy and matter flows in the area, hydrology and hydrobiology of spoil-heap waters and plant and animal succession. Our aim is to suggest strategies of restoration coming out from a hypothesis, that a landscape is formed like a stabilized living system with optimized flow of water and energy.



Photo: M. Kočík



Photo: I. Šimová



### Localities

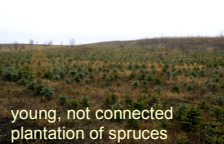
All the localities are located in the area of Velká Podkráňská spoil-heap, which could be found in the north-western part of the Czech Republic, in the vicinity of the towns Sokolov and Chodov. The spoil-heap is approximately 15 km long and 5 km wide.

### Agricultural recultivation

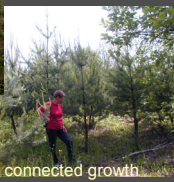


regularly mowed meadow

### Forest recultivation



young, not connected plantation of spruces



older, connected growth with prevalence of pines

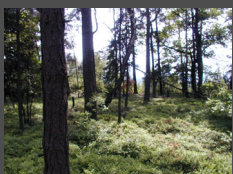
### Wetland recultivation



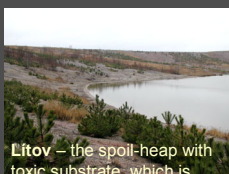
wetland at the foot of spoil-heap

coastal vegetation around small artificial pond surrounded by meadow

As a control, two more localities were used:



Original forest – mixed forest near the spoil-heap



Litov – the spoil-heap with toxic substrate, which is almost without vegetation and the revitalization is very difficult.

### Succession and biodiversity of small mammals

The spoil-heaps areas could be recultivated in various ways. The main types are:

- 1) agricultural recultivation (fields with various farming products or, in most cases, meadows of production)
- 2) forest recultivation (mostly forest monoculture of production)
- 3) wetland recultivation (without function of production, but important for water regime and with a crucial ecological function)

One way how to assess the successfulness of the selected type of revitalization is to specify the biodiversity in this "new created" area. We chose small mammals as biodiversity indicators, because of their good reproduction capacity and an ability of invasion. Previous studies show, that small mammals can be successfully used as a good indicator of current condition of the environment (Bejček, 1983; Pecharová & Hanák, 1997). The aim of the study was to compare different types of revitalization from the small mammals' biodiversity point of view.

	Agriculture revitalization	Forest revitalization	Wetland revitalization	Original forest	Toxic spoil heap Litov	Altogether
<i>Apodemus</i>		62	47	19		128
<i>Microtus</i>	72	27	47		1	147
<i>Clethrionomys</i>		2	15	21		38
<i>Arvicola</i>			1			1
<i>Micromys</i>			1			1
<i>Mus</i>	1					1
<i>Sorex</i>		2	18	3		23
Not determined						56
Altogether	73	93	129	43	1	395

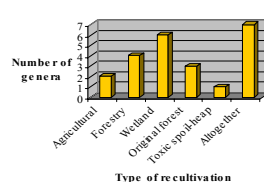
Table 1: The numbers of captured individuals from various genera for each individual revitalization type.

### Results

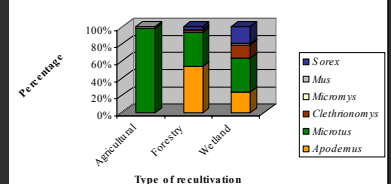
In total 395 individuals of 7 small mammals genera were captured (128 ind. of *Apodemus*, 38 ind. of *Clethrionomys*, 147 ind. of *Microtus*, 23 ind. of *Sorex*, 1 ind. of *Arvicola*, 1 of *Mus*, 1 ind. of *Micromys*, 56 ind. were yet not determined). The results are still in the process, but we can already see some facts:

- 1) the wetland localities were the richest in small mammals species (6 genera), the forestry revitalized areas were second (4 genera) and the agriculturally revitalized areas were the poorest ones (2 genera).
- 2) at the standard number of trap-nights the similar number of individuals at all localities were captured.

### Generic richness at various localities



### Proportional representation of genera



### Conclusions

Our preliminary study found the highest biodiversity at the wetland localities. It supports the idea, that wetlands are very important ecosystems in the reclaimed landscape, not only from the energy and matter flows' point of view. Wetlands also offer the living space not only to many small mammals species, but naturally also to many amphibians, reptiles and birds. So they present an important source of biodiversity in the recultivated areas.

### Literature

- Bejček V. (1983): Sukcese a produktivita drobných savců na výspěch v Motečské pánvi. Academia, 70 str.  
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 Wilson D. E., Cole F. R., Nichols J. D., Rudran R., Foster M. S. (1996): Measuring and monitoring biological diversity. Standard methods for mammals. Smithsonian Institution press, Washington and London, 409 pp.

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Thanks to all, who helped me with trapping in harsh conditions of spoil-heaps!