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SESSION

05

Enhancement of multi-use landscapes

# **Biodiversity offsets and ecological compensation: finding the** missing link between green infrastructure and river restoration

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#### Introduction

In intensive agricultural landscapes, remnant habitats as the last beholders

The aim of this diploma thesis was to measure the restoration success and to spot the strengths and weaknesses by comparing ECM and TEC with reference areas (REF) within 300 m of the impact area.

## **Methods**

Vegetation inventories (98 plots) and habitat mapping (500 polygons around



of biodiversity are often bound to water bodies. Large-scale infrastructure projects provide the financial frame to restore these ecosystems. From 1990 to 2011 a completely new railway line of the Trans European Network was build in Lower Austria. The nature conservation restrictions of the environmental impact assessment enabled a complex of biodiversity offsets: pure ecological compensation measures (ECM) technical and constructions (TEC) with secondary compensation functions.



Retention pond between railway line and accompanying street.

the plots) were done in 2011. Plant communities were determined with the summarized percentage cover (SPC) of character species. The values were used to compare community structure. Landscape connectivity was ordered in 4 categories. Shannon's diversity index was calculated for habitat types and plant communities. The number of Red List species, as well as current and potential threats were counted. Significant differences between ECM, TEC and REF were calculated via the Kruskal-Wallis test. The enhanced biotope value was defined as follows:

ST ... structural features VA ... value defining attributes  $CM_{(c = t)}$  ... care & management that is both current and target TI<sub>(c)</sub> ... current threats & impairments



Large drainage ditch "Egelseergraben" after a flood event.

#### Results

44 different Red List species were found. The most (23) in TEC, thereof the most in water bodies, in dried pond beds and at banks of water bodies. Only 16 occurred in REF and 13 in ECM (Fig. 1) In contrast, the landscape planning efforts had an significant positive effect on the connectivity of ECM compared to TCM (Fig. 2), providing the most habitats in the best category. REF and ECM had both a significantly higher share of

character species than TEC (Fig. 3).



The current threats and impairments have been reduced to significant degree both for ECM and TEC, but potential threats were equally expected (Fig. 4). 63 different habitat types were mapped. REF had a significant higher habitat diversity than TEC (Fig. 5). 50 different plant communities were found in the study area. REF had significantly the highest diversity of plant communities, TEC significantly higher than ECM (Fig. 5).

The mean biotope values converged, but didn't reach the references (Fig. 6). Biodiversity offsets in context of river restoration contributed the highest biotope values, next to reference areas of a large drainage ditches.

Sparganium erectum subsp. microcarpum, a character species.



Submerged aquatic plants in a retention pond fed by a rivulet.





Fig. 1-6: ▲... technical constructions, ●... ecological compensation measures,  $\blacklozenge$ ... reference areas. ★... significant difference (Kruskal-Wallis), Cl... confidence intervals.

Fig. 2: Mean connectivity of landscape Fig. 3: Mean summarized percentage cover elements; n=92, p=0.016.

# **Discussion and Conclusions**

- The weak performances of ECM in species and communities is probably due to not using regional, wild plant seed mixtures nor green hay from near-by donor sites, although this was demanded in the nature conservation restrictions.
- Ecological compensation should include the protection and/or the enhancement of remnant biotopes of relatively high natural value with a biotope network system.
- Technical constructions with the likelihood of successfully mimicking nearnatural processes should be considered as a chance for creating a variety of secondary habitats.
- Methods for assessing restoration success should operate at different scales to account for effects at the landscape, habitat and community level.



Losses and gains: a drainage ditch within intensive agriculture the railroad crosses, giving large revegetation areas in return.

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