

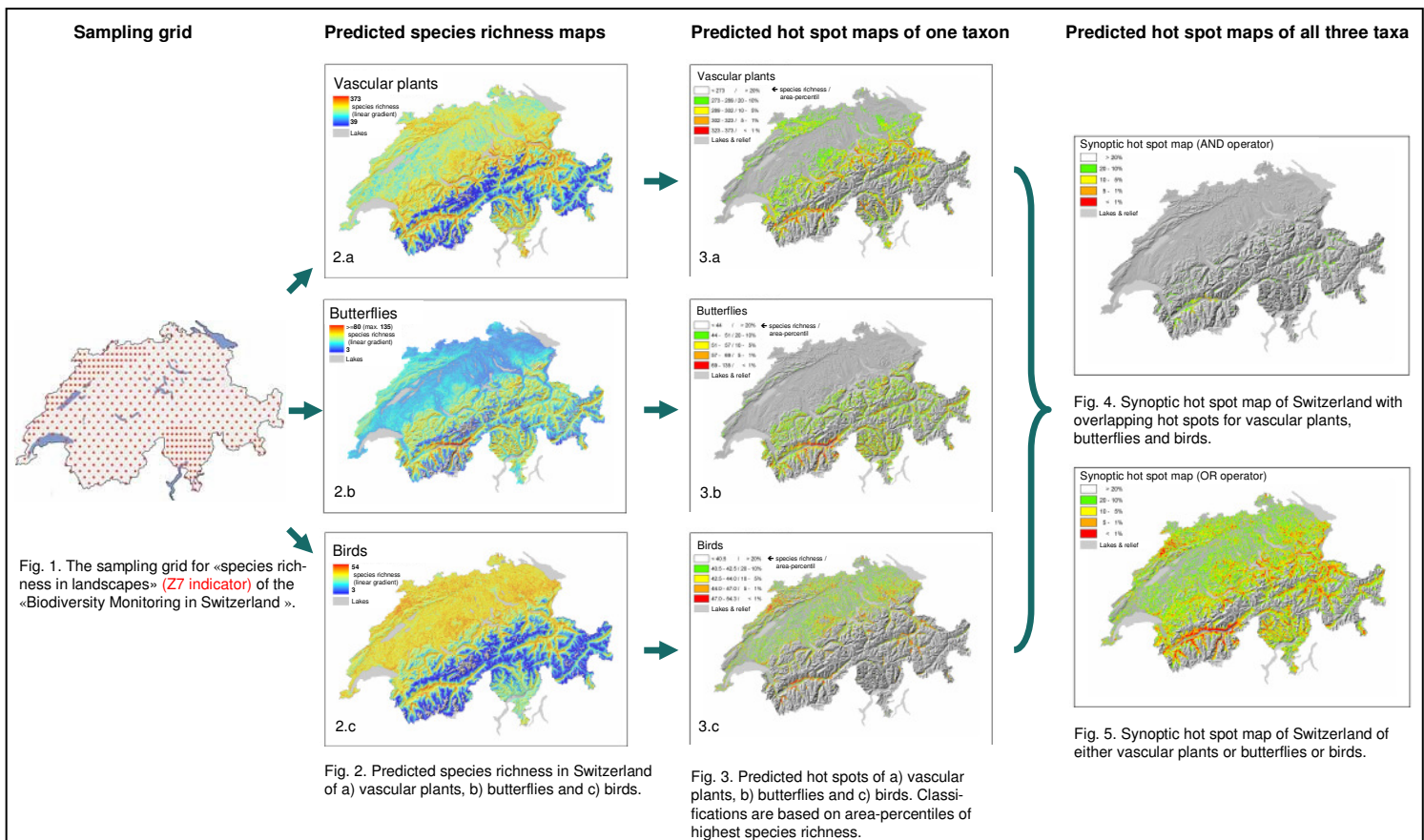
From Systematic Samples to Model-predicted Richness Maps and Swiss Biodiversity Hot Spots

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Introduction: The «Biodiversity Monitoring in Switzerland» (BDM), a programme of the Federal Office for the Environment (FOEN), has been launched in 2001 with the purpose to monitor Swiss biological diversity [1,2]. One of the central indicators of the BDM focuses on surveying the «species richness in landscapes» (Z7). In a systematic sampling grid 520 sampling areas of 1 km² are surveyed (Fig. 1), thus ensuring reliable data for the whole country and for its biogeographical regions. The survey focuses on the typical or common species of the landscape and records up to now vascular plants, birds (both since 2001), and butterflies (since 2003). However, the information is restricted to the 520 km², a small portion of the countryside. The aim of this study is to predict nation-wide richness maps for vascular plants, birds and butterflies based on the BDM-Z7-samples. In a further step we use the predicted richness maps to deduce single-taxon and multi-taxa hot spot maps on the landscape scale.

Methods: We predict the species richness for the complete landscape by modelling. Generalized Linear Models (GLMs) were applied to a set of 80 topographical, geological, climate, and land-use correlates of species richness [3]. Nationwide species richness maps were generated by applying the models with a moving window approach (1 km² window, 100 meter-steps; Fig. 2a-c). Hot spot maps of single taxa were colored with respect to area-percentiles of highest species richness (Fig. 3a-c). Based on single-taxon hot spot maps, multi-taxa hot spot maps were built by using the logical operators AND or OR (Fig. 4 & 5; i.e. for a certain hot spot class the lower species richness criterion has to be satisfied by all taxa or by a single taxon only).

Results and Discussion :



The models explain 71 % of the variability in vascular plant species richness (crossvalidated D²; 451 plots; 7 model variables), 78 % for birds (445 plots; 5 variables) and 69 % for butterflies (270 plots; 8 variables), respectively. For each taxon the species richness map shows a clear broad-scale pattern (Fig. 2a-c). However, the spatial patterns for vascular plants, birds and butterflies richness differ considerably and hot spots hardly ever coincide (Fig. 4). Nevertheless, all hot spots are located in mountainous regions and are mainly found along valley slopes with a certain accumulation in the inner alpine valley of the canton Valais (Fig. 5).

Conclusions: Modelling species richness based on systematic (monitoring) samples, GLM and a moving window approach is a suitable tool to predict and visualize broad-scale patterns of species richness and hot spot regions. Because «species richness in landscapes» (Z7) focuses rather on surveying common species than rare or endangered ones, the study provides additional information to the widely used criteria of species rarity or endangerment for nature conservation and landscape protection. Against the background of total species richness the results make clear, that a single taxon can not indicate the relevance of a region for its whole biodiversity. Regions with biodiversity hot spots of several taxa, e.g. the canton Valais, have a particular responsibility to conserve and improve corresponding habitats.

- References**
 [1] Koordinationsstelle Biodiversitätsmonitoring Schweiz (2006). *Zustand der Biodiversität in der Schweiz*. Umwelt-Zustand Nr. 0604. Bundesamt für Umwelt. Bern.
 [2] For further information have also a look at the poster «The contribution of a nation-wide baseline monitoring».
 [3] Wohlgenuth, T., Nobis, M., Kienast, F., Plattner, M. (accepted). *Model predictions of vascular plant diversity on a landscape scale based on a systematic sample*. J. Biogeogr.

