



Project No 226852



## Securing the Conservation of biodiversity across Administrative Levels and spatial, temporal, and Ecological Scales

SCALES (2009–2014) is a European research project financed by the seventh EU framework programme for research and development (FP7).

SCALES seeks ways to better integrate the issue of scale into policy and decision-making and biodiversity management in the EU.

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## SCALES briefs 2

### Systematic reserve site selection in dynamic landscapes

Authors: Klaus Henle, Birgit Felinks



Figure 1. Rainforests are very dynamic and species rich ecosystems that suffered strongly from human impacts. The picture shows a relatively pristine rainforest of the Mata Atlantic in Brazil. Photo: Klaus Henle.





### Key lessons

Setting aside protected areas is widely recognized as one of the most effective measure to prevent species from extinction. The efficiency of networks of protected sites can be enhanced considerably by a systematic selection that considers the principle of complementarity (e.g. Margules and Pressey 2000). While the theory and practice of systematic reserve site selection has considerably advanced, changes in species composition, which is an important process in many ecosystems, especially in dynamic landscapes, is rarely considered. Usually, the data from several years are compiled. Site selection based on species occurrence data of a single year may result in remarkably divergent network configurations. Hence, temporal variability in species occurrences and composition should

be routinely tested and considered in systematic reserve site selection in dynamic systems. For an implementation of conservation planning into praxis on a fine spatial scale in a fragmented landscape, this means, besides the collection of such temporal data (repeated surveys for more than 1 year), that species should be represented in a several sites so that recolonization from neighbouring sites is possible. Ideally, aggregated site networks that contain viable metapopulations should be considered as planning units. If the temporal variability is mainly due to low detection probability, sampling must be increased to obtain data suitable for systematic reserve site selection.



Figure 2. *Proceratophrys boiei*, a leaf-litter frog species present in most fragments. It showed a low turn-over in occurrences/absences between years. Photo: Klaus Henle.





Figure 3. *Marmosops incanus*, a marsupial mammal restricted to forest habitat that was found in both years in most fragments.  
Photo: Henning Steinicke.

### Model study in a tropical rainforest

To assess the influence of temporal variability in species composition on the establishment of a reserve network in dynamic landscapes, Felinks et al. (2010) compared network configurations based on species data of small mammals and frogs sampled during two consecutive years in a fragmented Atlantic Forest landscape in south-eastern Brazil. Site selection with simulated annealing was carried out with the datasets of each single year and after merging the datasets of both years. Remarkable differences are reflected in both the identity of the selected fragments and in the amount of flexibility and irreplaceability in network configuration. Networks selected when data for both years were merged did not include all sites that were irreplaceable in one of the 2 years.

Results of species number estimation revealed that significant changes in the composition of the species community occurred. Hence, temporal variability of community composition should be routinely tested and considered in systematic reserve site selection in dynamic landscapes.

### References

MARGULES CR, PRESSEY RL (2000). Systematic conservation planning. *Nature* 405:243–253.

FELINKS, B., R. PARDINI, M. DIXO, K. FOLLNER, J.-P. METZGER & K. HENLE (2011): Effects of species turnover on reserve site selection in a fragmented landscape. *Biodiversity and Conservation* 20: 1057–1072. Accessible via: <http://www.springerlink.com/openurl.asp?genre=article&id=doi:10.1007/s10531-011-0015-2>.



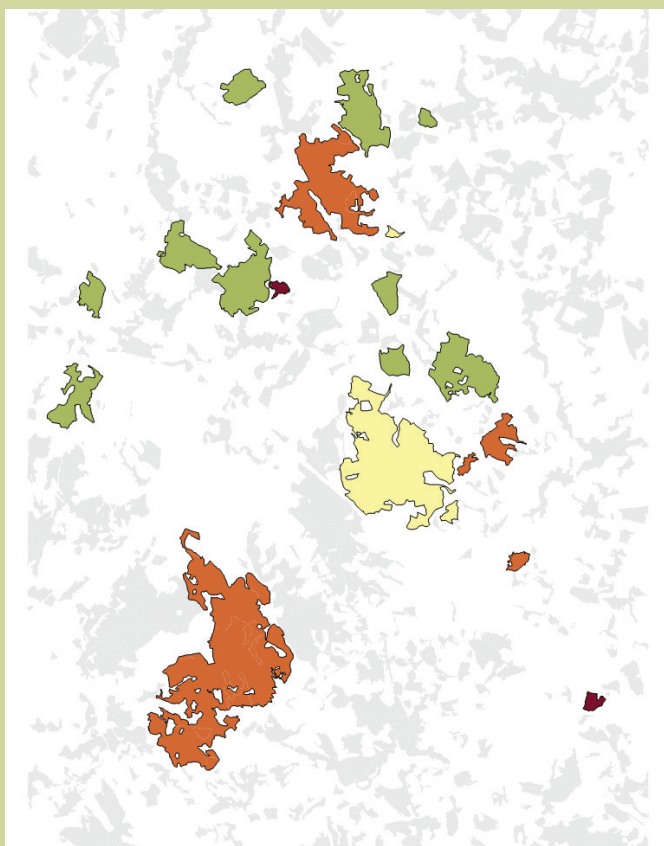
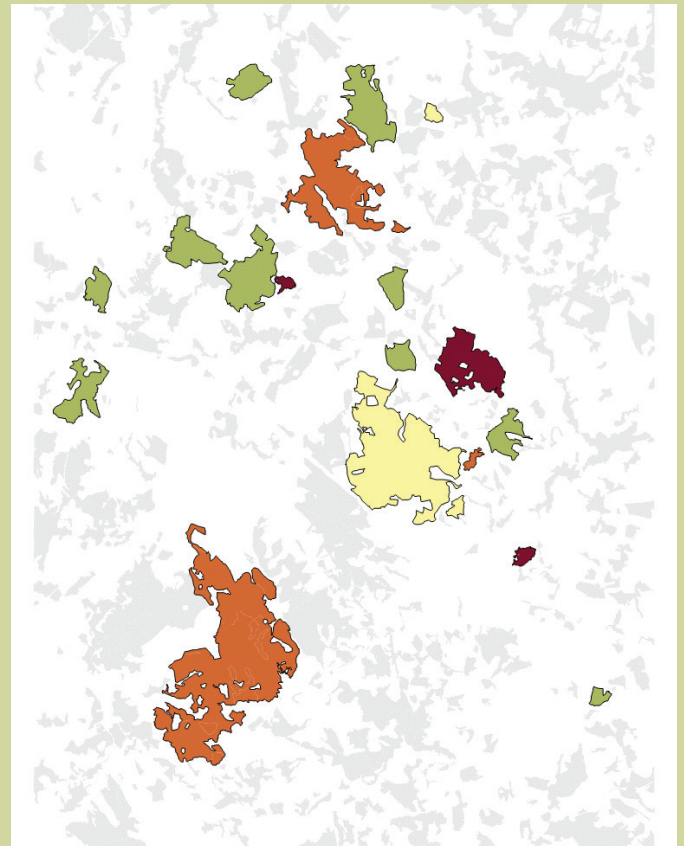


Figure 4. Results of site selection in a fragmented landscape of the atlantic Forest in South-Eastern Brazil for a single representation target based on presence data for small mammals in (a) 2002, (b) 2003, and (c) 2002/2003.