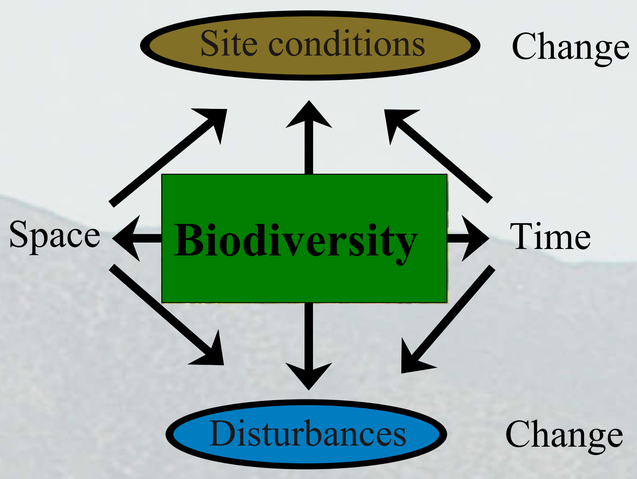
Spatial Patterns of Biodiversity and Disturbance Regimes in Semiarid Ecosystems of North Eastern Morocco

Problem



Disturbances have positive and negative effects on biodiversity:
- can lead to biodiversity loss
- contribute to the preservation of biodiversity

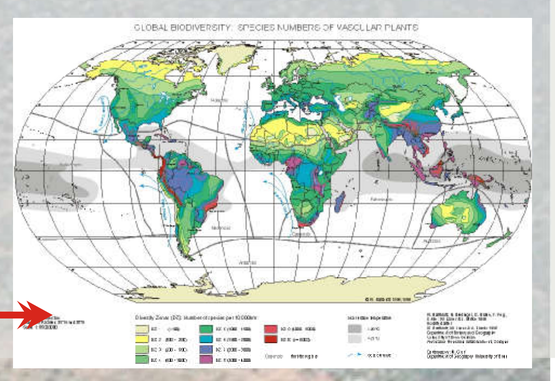
Close interrelation between biodiversity and ecological functions:
- interrelations are evident but not yet quantifiable
- hypotheses (dynamic equilibrium, insurance, intermediate disturbance, resilience, time-stability) define a causal interconnection between disturbances and biodiversity

Biodiversity loss is not necessarily apparent. Modificated land/use techniques cause a gradual loss of the variety of land-use techniques and therewith a gradual species loss. On the other hand new species are introduced (good&evil pattern).

Deficits: quantitative comprehensible methods to determine the effective biodiversity loss of a certain area or region as well as methods to identify the mechanisms which drive biodiversity loss.

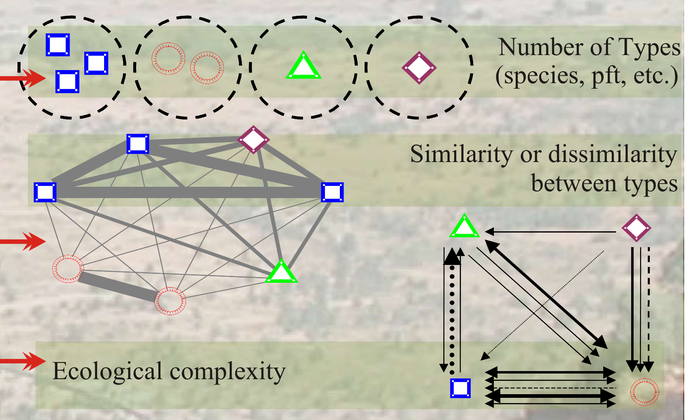
Aims

- determine the impact of disturbances on spatial patterns of diversity
- development of unbiased methods to show the impact of human land/use on to spatial patterns of floristic diversity
- test these methods in field sites in different climatic regions (tropics and subtropics: high biodiversity and at the same time great potential of conflict)



Theses

- disturbances in terms of human land-use are shaping the spatial organisation of **quantitative diversity** in ecosystems
- spatial patterns of **qualitative diversity** can - with consideration to the effect of site conditions - be explained by disturbance effects
- **functional diversity** reflects site conditions and human impact in a similar way as patterns do which are derived from species data



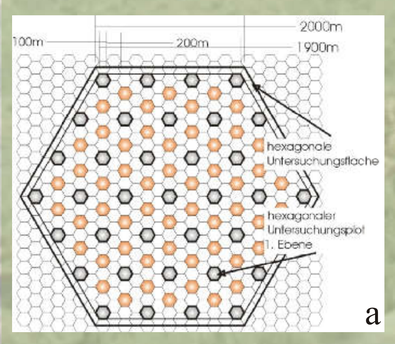
Design

Data

- recording species (plants, mosses, ferns) inside hexagonal plots (nested sampling), recording of quantitative data depends on scale
- arrangement of plots alongside disturbance gradients (recording extremes)
- plots as uniform as possible regarding site conditions (comprehensive recording of site conditions)
- challenge: characterising disturbances (circular arguments!)
- disturbance features: kind of, temporal characteristics, spatial characteristics, specifity, significance

Sampling Design

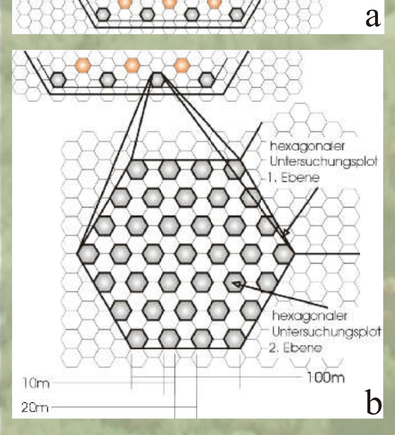
a.) Hexagonal plots in systematic regular grid (grey plots: first field period / orange: if required). **b.)** Nested sampling inside the plots of a certain scale are placed others of the inferior scale (3 scales).



c.) It is possible to analyse the first left out plots iteratively if necessary: neighbored plots have equal centre point distances which grants a reproducible analysis

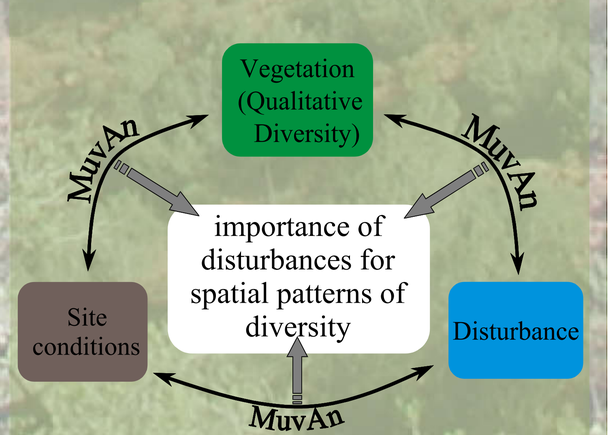
d.) overlapping similarity measures (as possible with square plots) are avoided

e.) Equal spatial distances between the plots grant for a consistent geographical comparability. In the right part: visiualising the results of the similarity measures as heights > creating a surface of heterogeneity.



Analysis

- calculating (dis)similarity measures (diversity indices) between the individual plots
- comparing several similarity measures to regard different aspects of spatial heterogeneity
- data management inside a GIS, multivariate analysis with the data



Field Site

At the Gaada of Debdou (at the border of the east moroccan high plateaus, about 100km from the Algerian border, at approximately 34°N and 3°W . The geographically favored location causes a very humid and therewith convenient climate (compared to the surrounding). This allows an old stone oak forest to grow as the last isolated outpost of mediterranean hard wood vegetation between the steppe ecosystems of the high plateau and those of the Moulouya valley

- historic stone oak forest at the Gaada of Debdou (Morocco)
- significant human pressure onto the landscape (nomadic and seminomadic shepherds)
- possibility to analyse temporal changes (alpha/diversity) also because of earlier works at the University of Bayreuth (among others Beierkuhnlein 1985)

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