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Vegetation and landscape dynamics in the extremely arid Tarim Basin, Xinjiang, China

Under the extremely arid conditions in the Tarim Basin, as well as in the Aral Sea Basin, the vegetation is concentrated along rivers (Tugai vegetation). Most of the Tugai vegetation has been destroyed by logging and indirectly by diverting water from the rivers. The middle reaches of the Tarim River, Xinjiang, China, harbour one of the last near-natural riparian Tugai vegetation complexes along an unregulated river stretch. Tugai forests continuously tap the groundwater, rather than save water. Currently, the Tarim River is regulated in order to provide water to the drought prone lower reaches of the Tarim River. Lateral river dykes have been constructed along most of the Tarim middle reaches and weirs are proposed to be constructed. This work aims at investigating the impact of the Tarim regulation on the Tugai forests and other riparian ecosystems and present ideas for their future conservation. Forest distribution and ecology and recruitment of the key-species *Populus euphratica* were investigated. The results reveal that river dynamics plays a crucial role for the generative recruitment of Tugai forests, e.g. conservation of genetic diversity. Stable groundwater fed by river courses only can sustain existing Tugai forests without the existence of any vegetation dynamics.

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Assessing the Conservation Status of Vegetation: Problems and Progress

Assessment of the conservation status of vegetation units is becoming a standard component of environmental impact assessment in Australia and elsewhere, and is closely aligned to legislation, policy and practice of identifying and

protecting threatened ecological communities. Such practices are more difficult than is widely appreciated (perhaps because vegetation scientists are rarely involved in the process) and force us to revisit many of the fundamental conceptual conundrums of vegetation science (such as continuum versus community, appropriate levels of abstraction, and suitability of classification methodology, to name a few). This paper will summarise these difficulties as well as providing some potential solutions based on the author's experience in vegetation assessment in arid Western Australia. In particular, the contribution of climatic gradients and stochastic variation in species distributions to 'within-habitat' species turnover will be highlighted, as an integral factor to be considered when deciding on appropriate levels of abstraction. Levels of such turnover in arid Australia appear high and will be demonstrated using a variety of measures, including plotting of species similarity measures with geographic distance, gradient analyses, and testing for differences between vegetation units based on geographic locality. An essential component of assessing conservation significance is determining how common the vegetation unit is in the surrounding landscape or region. Techniques for doing this, especially in the absence of detailed vegetation mapping, will also be discussed. Lastly the legal ramifications of these fundamental questions will be considered.

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Dispersion of plant species in a scattered landscape on a regional scale; a modeling approach

Due to human activities, natural landscapes have become isolated. As a result the dispersal of plant species is hampered. The goal of this research is to develop a model that is able to simulate the plant species dispersion in a scattered landscape on a regional to European scale and to apply this model for several species. We developed a spatially explicit dispersion model (DIMO) based on

dispersion capacity. Barriers, such as roads and rivers as well as unsuitable vegetation types, are affecting the dispersion speed. Spatially explicit data about current and past occurrence of species is based on inventories. From the inventories, the presence of a viable seed bank is derived. First model runs show that plant species, depending on their dispersal capacity and their presence in a seed bank, may become isolated and are not able to reach new suitable habitats due to the lack of connectivity of the landscape. Populations that are not large enough may become locally extinct. This process may be enhanced due to climate change.

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Estimation of association responses for soil pH

In vegetation assessment, vegetation modelling and the estimation of critical loads Ellenberg indicator values are still widely used, despite major drawbacks. Based on the response of the species to soil pH we estimated the response of the syntaxa, from class to sub-association level. To this end, we used a dataset of 160,000 syntaxonomically identified relevés. For each relevé, we calculated the expected pH value as the mean of the pH optima of the species present. Response curves per syntaxon were estimated based on the estimated pH values per relevé. Percentiles values were used to define amplitudes per syntaxon. We were able to estimate a response for almost all associations occurring in The Netherlands. Regression to the mean causes contraction of the response axis. We offer a solution by directly estimating the optima of a small number of associations with sufficient data, and using this to correct the indirectly estimated optima and percentiles. The lower pH percentiles can be used as a minimum value for the occurrence of the association, e.g. to determine the critical load for acid deposition.

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Species mobility and coexistence – are there any 'rules' we do not know yet?

Although the mechanisms underlying non-random coexistence patterns of plant communities have been examined for over a century, little is known about the role of clonal growth in generating these patterns. We studied the variation in annual rhizome increment and community-wide Clonal Mobility (sum of average annual mobility of species weighted with their relative cover) in a coniferous forest, represented by young and old stands. The observed pattern of CM indicates the differential response of plants with different growth forms to disturbance, in terms of annual rhizome increment and different representation of them in old and young stands. We propose a distinction between two kinds of species in perennial plant communities. Matrix forming species (hemirosette- and rosette-forming species), exhibiting limited clonal mobility, represent a stable component of the community. 'Running-around' species (erosulate forbs) represent the mobile component of plant communities, consisting either of species with high vegetative mobility or species regenerating from seeds. These species respond rapidly to disturbances and may decline or perish temporarily and afterwards re-colonize the space between matrix forming species. We propose that within a given species pool, coexistence of species within a limited space is determined by their spatial mobility and by the time since disturbance.