# HETEROGENEOUS DISTURBANCE AND BIODIVERSITY: CASE STUDIES FROM MILITARY TRAINING AREAS IN GERMANY

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The *heterogeneous disturbance hypothesis* suggests that biodiversity is maximized where multiple kinds, frequencies, severities, periodicities, sizes, shapes, and/or durations of disturbance occur concomitantly on a landscape in a spatially and temporally distributed fashion. There is a growing body of evidence that military training areas are among the most biodiverse landscapes in the regions where they occur. We suggest this is true, at least in part, due to the heterogeneous nature of the disturbances that occur there. On a typical military training area, some portions are heavily disturbed by a variety of forms of disturbance; other portions are generally untouched. Between the two extremes exists a broad spectrum of disturbance and succession. This creates a diverse mosaic of habitat patches, each favored by a unique suite of species.

Threatened and endangered (red list) species garner more public attention and research funding than more common species. In order for the *heterogeneous disturbance hypothesis* to be valid in the context of threatened and endangered species, at least some of those species must necessarily prefer severely disturbed habitat patches. While many endangered species show significant preference for undisturbed habitat, we provide conclusive evidence that others are disturbance dependent, with some requiring extremely disturbed sites during at least some part of their life-cycle.

We conclude that, contrary to common perception, anthropogenic disturbance is not necessarily negative. Indeed, it can be a positive, and sometimes necessary, factor in maintaining biodiversity and ecosystem health if applied in a heterogeneous fashion.

Data collected recently from Grafenwöhr Training Area in Germany, indicates that habitat heterogeneity, as a function of disturbance, is positively related to plant biodiversity. Initial results suggest that spectral diversity of the landscape, as detected in satellite imagery, is positively correlated to habitat diversity and to plant biodiversity. As such, it may become possible to identify areas of probable high biodiversity using satellite imagery, thus reducing the cost of and dependence on field labor.