Potential future microrefugia in changing landscapes

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Microrefugia are small areas that enable the long-term persistence of species outside of their main distributions. An increasing body of evidence suggests that these areas have played an important role in mitigating regional environmental changes over time throughout the globe. Karst landscapes are the foremost examples of ground-water erosion on the Earth that provide topographically complex environments. As such landscapes cover about 15–20% of the Earth's dry land surface, they play a crucial role in ecological speciation and maintaining global biodiversity. For instance, enclosed depressions (cenotes, dolines, sinkholes or tiankengs) of these landscapes may act as important safe havens or microrefugia for many endangered species (both plants and animals); thus, they are particularly important from a conservation point of view. Our aim is to provide an overview about the ecological factors, biodiversity and threatening factors of karst depressions and to highlight knowledge gaps that will advance our understanding regarding the function of these areas. We present case studies from Central Europe to show the effects of human activities on the vegetation patterns of dolines. Finally, we point out the necessity of greater research efforts aiming to improve our knowledge of the effects of human-mediated landscape changes (e.g., agriculture and forestry management) and climate change (e.g., temperature increase and drought) on the refugial capacity of these types of topographic depressions.