



## **Land-use change in mountainous headwaters: Different forest cover and its impact on eco-hydrological traits and biodiversity of spring habitats**

Martin Reiss (1) and Peter Chiffard (2)

(1) University of Marburg, Geography, Marburg, Germany (reissm@geo.uni-marburg.de), (2) University of Marburg, Geography, Marburg, Germany (peter.chiffard@geo.uni-marburg.de)

Headwater springs in the German Low Mountain Ranges are local ecotone habitats and biogeographical islands embedded in and interlinked with their adjacent landscape. The structure of forests reflects the eco-hydrological conditions in substrate type occurrence, microhabitat richness and biodiversity in forest springs. This study considers effects from different forest land-use by comparing spring habitats in deciduous beech forests and coniferous spruce forests on eco-hydrological structures and biodiversity. The objective of this study is to determine effects from different forest land-use by comparing to spring habitats in deciduous and coniferous forests on eco-hydrological structures and biodiversity. This research focusing on impacts from forest types as a determinant of the occurrence of corresponding microhabitat types, its substrate type composition and diversity as well as its specific colonization by invertebrates.

Study sites are located in 6 different forested parts of the Low Mountain Ranges in Central Germany. They were originally chosen to guarantee a wide range of hydro morphological structures within diverse substrate types as microhabitats for invertebrates. In total, 86 springheads were analyzed, split between 61 springs in deciduous forest land-use dominated by *Fagus sylvatica* (Beech) and 25 springs in coniferous forest land-use dominated by *Picea abies* (Spruce). Adjacent biotope field mapping was done by observing a length of 100 meters from the springhead considering four separated quarters oriented by compass directions. In-situ-measurements of physical-chemical parameters like water temperature, pH, electrical conductivity, oxygen concentration and saturation were taken with hand held sensors. Hydro-morphological structure mapping and invertebrate sampling was conducted using a novel integrated technique for multi-habitat sampling (Reiss, Chiffard 2015).

Different forest land-use patterns cause considerable contrasts in microhabitat structures; obvious organic substrate type composition and cover ratios; as well as differences in species richness and invertebrate abundance of spring habitats in deciduous and coniferous forest. This means, land-use as an ecological mesoscale property determined by different forest types has an impact on eco-hydrological structures and biodiversity on the micro scale. It implies an essential consideration of adjacent biotope type mapping is an important integrative parameter for spring habitat assessment approaches. Furthermore, the recognition of substrate preferences of invertebrates within an ecotone based assessment approach characterizes microhabitats explicitly for all parts of a springhead, regarding aquatic and terrestrial spring habitat zones. Here, the importance of the land-use and substrate type diversity relationship is taken into account within an ecological spring habitat assessment methodology and characterizes its consequences on invertebrate biodiversity. Therefore, negative effects from forest management practices (e.g. forest conversion) within a nature conservation perspective can be included in decision-making and action plans to realize national or regional strategies on biodiversity.

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