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The effect of discontinuous land use on floristic diversity

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The traditional cultural landscapes remain as islands in the modern landscape of agri- and silviculture. The biodiversity in these fragments has been the major driver for nature conservancy efforts and ecological research over the last decades. The focus has been to save the small areas that are left by continuous management of meadows and pastures by grazing or mowing and leaving semi-natural forests unmanaged. However, we suggest that this biodiversity is a result of past discontinuous management at different spatial and temporal scales providing optimal habitats for species groups favored by traditional management, succession and old growth forest, and thus allowing them to coexist. Discontinuity in land use can be found on small scales in the traditional agriculture, such as rotation of crop land, and on larger scales when people abandoned whole areas during times of crises e.g. during wars and the Black Death period (AD 1350). We use new palaeoecological methodology combined with archaeological and historical data to test the hypothesis in southern Sweden. Landscape Reconstruction Algorithm (LRA), makes it possible to quantitatively reconstruct past land-cover and composition on regional and local scale using fossil pollen records with high temporal resolution. Chronologies are based on radioisotope dating (210Pb, 137Cs and 14C) and lead pollution history. Land use changes in the lake catchments are also indicated by erosion proxies, such as magnetic and XRF measurements. The past land-use changes are compared to changes in past floristic diversity. Past floristic richness and evenness may be assessed using both palynological richness and quantitative estimates of plants. Until now past floristic diversity estimates have been restricted to the use of palynological richness (i.e. number of pollen types) to assess floristic richness. An important methodological result is that the LRA enables reconstruction of past floristic evenness which makes comparison with modern diversity indices more straight forward. Here we present preliminary results on quantitative estimates of land use and floristic diversity changes in 20 year intervals during the last 200 years and 50 year interval between 200 and 1000 years ago. The quantitative estimates of grassland and cultivated fields on regional (104-105 km2) and local (2-20 km2) scales are in agreement with historical records on maximum extent of agricultural land around 1880 and reforestation during the 2000 century. For example our results show that the cover of Picea increases from about 15 % around 1900 when the first silvicultural law appear to 60 % during the following 100 years. Moreover, the quantitative estimates of land use are validated in detail using historical maps from the 1700th, 1900th and 2000th century. The agricultural practices gradually changed toward a more large scale land use and meadows were replaced by cultivated fields or forest. The fossil record of past floristic diversity on regional scale show an increase of floristic richness and evenness until 1900th century and then a gradual decrease until today.