GENERAL INFORMATION

author(s)	Baeten L, Hermy M, Van Daele S, Verheyen K
year	2010
English title	Unexpected understorey community development after 30 years in ancient and post-agricultural forests
original title	
reference	Journal of Ecology 98
pages	1447-1453
type	article (a1)
ecosystem service	supporting – forest dynamics, biodiversity
keywords	herb layer, shrub layer, tree layer
taxa	
project	Msc thesis VanDaele_2009, PhD Baeten_2010
supervisor	Verheyen K, Hermy M
institution	Laboratory of Forestry
location	pdf, hardcopy
data	Flora&Fauna.xls (VanDaele_2009)

MATERIALS & METHODS

study area	3a, 5n (scientific zone)
time period	July-August 2008
goal	Investigate whether partial vegetation recovery from past agriculture reduced the compositional differences between post-agricultural versus ancient forest sites over time, and whether gradual changes in vegetation composition led to overall impoverishment and homogenization within and between sites.
set-up	resurvey of the vegetation in 78 of the former vegetation plots (Hermy_1985_PhD) in ancient (39 plots) and post-agricultural forest (39 plots) the sample plots (10 m * 15 m) lay in West- and East-Flanders and had been surveyed between 1977-1983 by Martin Hermy. plot selection criteria: (1) alluvial forest, (2) ancient forest or forest established on former agricultural land after 1862 (first topographical map), (3) no recent cuttings
data collection	1980: April-first half of June – 2009: late spring herb layer (plants < 25 cm): cover per species (Londo)
remarks	4 plots in the Aelmoeseneie forest (see map below, nr 249-250, 252-253), plot positions in data_Aelmoeseneie/sample_locations_publications/ Hermy_1985_VanDaele_2009.pptx only the herb layer is discussed in this paper, VanDaele_2009_th also shows soil data and changes in tree and shrub layer

ABSTRACT

1. Land-use change is considered one of the most radical and extensive disturbances that have influenced plant distributions and diversity patterns in forest understorey communities in much of Europe and eastern North America. In forests growing on former agricultural land, local species diversity and community differentiation among sites are generally reduced compared with ancient forests (i.e. forests with no historical record of agriculture). Yet, no study has determined how the compositional differences created by former land-use change over time as the forest sites recover from former agricultural use.

2. Here, we resurveyed 78 vegetation plots (half of the plots in ancient and half in post-agricultural forest) to demonstrate how three decades of forest development have changed the compositional differences

between post-agricultural and ancient forest sites. The impact of land-use history and survey date was tested on two measures of species diversity and two measure of community divergence.
3. The data indicate that the imprint of former agricultural land use persisted over time, yet not through compositional stability. Parallel and strong vegetation shifts occurred in both ancient and post-agricultural forest: the species diversity decreased and local species cover strongly diverged, which indicates community drift. The observed understorey changes did thus not support the commonly accepted model of community development in post-agricultural forests, i.e. the diversity did not increase and the vegetation did not become more similar to the ancient forest vegetation over time. The changes in species composition were associated with an increase of common, competitive species at the expense of ancient forest indicator species. The source populations of ancient forest species have been gradually depleted, so the recovery of post-agricultural forests becomes even more precarious.
4. Synthesis. While land-use history is likely to persist as the primary predictor of local species diversity and community divergence, other environmental drivers may additionally structure forest understorey communities and lead to biotic impoverishment and pervasive species reordering on the time scale of only decades.

RESULTS

In the old survey, 105 different species were found across the 78 plots; 94 species in the new survey. Twenty-nine species were only found in the old survey and 18 new species appeared in the new survey. Land-use history was a stronger predictor for the variation in community composition among sites than survey date. The post-agricultural forest vegetation did not become more similar to the ancient forest vegetation over time.
Land-use history had a significant impact on the species diversity and community divergence. The Evenness and presence–absence based community divergence were reduced in post-agricultural versus ancient forest stands, while cover-based divergence was significantly higher in post-agricultural forest. Furthermore, the two measures of species diversity (evenness and species richness) decreased between 1980 and 2009. The cover-based community divergence increased over time, i.e. local species cover appears to have diverged. The species that showed the strongest shifts in plot-level cover were all generalists characterized by a competitive component in their strategy.
Nine forest herbs were significantly associated with ancient forests. Seven of the nine ancient forest species contributed to the decline in species richness of the ancient forest sites.