

Abstract

Within the Northern Hemisphere, wildfires are considered to be an integral part of natural dynamics mainly in boreal forests and Mediterranean ecosystems, and most recently also in temperate forests of Northern America. By contrast, in temperate forests of Central Europe, the importance of wildfire for forest ecosystems has been traditionally marginalised despite documented frequent wildfire occurrence and existence of fire-prone forests. Apparently, the reason of this rooted attitude does not lie in the specific environmental conditions of Central Europe, but more likely in the traditional forest ecology approach, which generally does not consider the effect of disturbances on the shape of vegetation communities and strictly excludes human activity from natural processes since its beginnings. This attitude resulted in the lack of knowledge about local vegetation-wildfire relationship and patterns of wildfire occurrence in the landscape. The general aim of this thesis was to clarify the ecological role of wildfires for Central European forest ecosystems with a focus on *Pinus sylvestris* forests and using the Czech Republic as a model area for a broader region.

Chapter 1 deals with the spatial analysis of the occurrence of forest fires in the Czech Republic. We found that the presence of wildfire in this cultural landscape is controlled mainly by the environmental factors, while wildfire frequency is driven mainly by human factors, the most common ignition trigger. However, wildfire frequency was driven also by the density of cloud-ground lightning strikes. We traced naturally fire-prone areas in the landscape, which are determined mainly by a high proportion of coniferous forests in lower altitudes, ruggedness of the relief and occurrence of drainable soils. Striking example of such areas are the sandstone “rock towns” of the North Western part of the Czech Republic.

Chapter 2 is focused on one of such “rock town” areas in the Bohemian Switzerland National Park. We used a combination of recent forestry data and soil charcoal concentration values to compare the factors influencing wildfire occurrence patterns on decadal and millennial scales. The results of both analyses corresponded with the main driving factors of the wildfire incidence being topographic features, namely the heat load index and presence of rocks. An additional important factor was especially the *Pinus sylvestris* abundance, while human factors were of marginal importance. Since the topographic factors were stable over the time, we concluded that wildfires, regardless whether of human or natural origin, have been occurring in similar fire-prone habitats at least since the Subatlantic period which could result on such sites in the development of fire-adapted vegetation. The results of the analyses were also used for the creation of the wildfire risk prediction for the National Park territory.

Chapter 3 deals with the study of 192 years lasting spontaneous post-fire vegetation development of semi-natural *Pinus sylvestris* forests of four sandstone regions. The survey was focused on the forest resistance and resilience to wildfire and the role of fire severity and environmental factors on the post-fire vegetation dynamics. We found that the resistance of the tree layer turned out to be dependent on species composition and fire severity, while even low-severity fires induced great changes in the understorey species composition. The forests displayed structural and compositional resilience, resulting in fast recovery of the vegetation cover and return to a similar species composition to pre-fire stands after about 140 years. We noticed a continuous shift from initial prevalence of the regeneration of *Pinus sylvestris* and broad-leaved pioneer species towards higher proportional abundance of shade-tolerant and fire-sensitive tree species. Thus, periodic wildfires occurring at least once in 200 years seem to be a factor maintaining *Pinus sylvestris* forests in temperate sandstone landscapes.

These results indicate that wildfire occurrence in Central European landscape is subjected to similar rules like in the other regions, where wildfire is considered an integral part of forest dynamics. Moreover, wildfire turned out to be an important factor shaping Central European forest vegetation in the long-term, at least within certain regions and forest types.