Rafał Krawczyk, Piotr Osyczka, Grzegorz Siebielec, Marcin Nobis, **Fires in the face of climate change: Indicators of fire disturbance in heath areas – Inference from military training lands**, Journal of Environmental Management, Volume 363, 2024, 121373, https://doi.org/10.1016/j.jenvman.2024.121373.

Abstract:

Global warming significantly affects the frequency and intensity of wildfires in many fire-prone areas of the world and fire disturbance regimes are changing rapidly. Alongside this, controlled burning is often considered or implemented as an alternative method for nature protection. Here, we studied the post-fire secondary succession in dry heath habitat located in military training grounds to recognise the impact of fire on the effectiveness and rate of ecosystem recovery. We focus particularly on identifying indicator species for a given successional phase of Central European dry heath habitats and assessing their value for dating the last fire disturbance. The research involved 60 vegetation patches (plots of 25 m2), which were assigned to four post-fire age classes, namely: 1–5 years (Class A), 6–10 years (Class B), 11–15 years (Class C), and >15 years (Class D). In each study plot, species diversity and coverage of lichens, bryophytes and vascular plants were examined in addition to the physicochemical properties of the soil substrate. Cryptogams and vascular plants clearly differ in terms of the secondary succession pattern; specific sets of cryptogams correspond well to particular post-fire classes and are therefore good determinants of the post-fire succession stage. Spontaneous succession of plant vegetation eventually leads to complete recovery of the heath in a relatively short time. Nevertheless, great vegetation dynamics in the first years after a fire disturbance may result in seemingly different directions of succession. Post-fire classes did not differ noticeably in terms of soil properties, it follows that the effects of fire on soil conditions are negligible; though, a significant upward trend was observed for exchangeable form of K throughout the succession process. Our results indicate that sporadic fires reduce the undesirable overgrowth of heathlands or psamophilous grasslands and generally have a little negative side-effect on the ecosystem. The revealed succession patterns and defined sets of species characteristic for subsequent post-fire age classes are applicable to dating fire disturbances, regardless of whether the fire was planned or spontaneous.

Keywords: **Post-fire indicators; Heathlands; Cryptogams; Vascular plants; Soil properties; Habitat conservation**