Background: Prescribed burning in peatlands is controversial due to concerns over damage to their ecological functioning, particularly regarding their key genus *Sphagnum*. However, empirical evidence is scarce.

Aims: The aim of the article is to quantify *Sphagnum* recovery following prescribed burns.

Methods: We completed nine fires at a raised bog in Scotland, achieving a range of fire severities by simulating drought in some plots. We measured *Sphagnum* cover and chlorophyll fluorescence F_v/F_m ratio (an estimate of photosynthetic capacity) up to 36 months post-fire.

Results: Cover of dominant *Sphagnum capillifolium* was similar in unburnt and burnt plots, likely due to its high moisture content which prevented combustion. Burning decreased *S. capillifolium* F_v/F_m 5 months after fire from 0.67 in unburnt plots to 0.44 in low fire severity plots and 0.24 in higher fire severity (drought) plots. After 22 months, F_v/F_m in burnt plots showed a healthy photosynthetic capacity of 0.76 and no differences between severity treatments. Other *Sphagnum* species showed similar post-fire recovery though their low overall abundance precluded formal statistical analysis.

Conclusions*: S. capillifolium* is resilient to low–moderate fire severities and the same may be true for a number of other species. This suggests that carefully applied managed burning can be compatible with the conservation of peatland ecosystem function.