MANAGING ECOSYSTEM SERVICES

UPLANDS

REDUCE BURNING FREQUENCY

Limit or eliminate planned burns of upland peat areas.

GOODS & SERVICES

- Biodiversity
- Recreation & Tourism
- Environmental Settings
- Health & Wellbeing
- Climate Regulation
- Erosion Control
- Fire Control
- Flood Control
- Water Quality

These pages represent a review of the available evidence linking management of habitats with the ecosystem services they provide. It is a review of the published peer-reviewed literature and does not include grey literature or expert opinion. There may be significant gaps in the data if no published work within the selection criteria or geographical range exists. These pages do not provide advice, only review the outcome of what has been studied.

Full data are available in electronic form from the Evidence Spreadsheet.

Data are correct to March 2015.

KEY

Quality of Evidence

Good

Medium

Poor

Quantity of Evidence

Number of sources showing direct evi-

Number of sources showing indirect evidence

Magnitude and Direction of Effect

Direction

Magnitude

Strong

Medium

Low

MANAGING ECOSYSTEM SERVICES

UPLANDS

REDUCE BURNING FREQUENCY

Provisioning Services—providing goods that people can use.

Cultural Services—contributing to health, wellbeing and happiness.

Regulating Services—maintaining a healthy, diverse and functioning environment.

CULTURAL

Biodiversity: There are a number of studies that show the responses of specific species or communities to burning and the results are often site specific and depend on the initial species composition, soil and previous management[1]**.** These studies refer mainly to changes in the abundance of specific species. The analysis here refers to the relevance of burning in maintaining upland peat vegetation types. ***Strong Evidence:-***— In areas where active grouse management (including burning) has ceased, woodland cover increases and heather cover decreases[2] . In general, burning favours species that recover quickly, such as graminoids[3] and can lead to a *Molinia* dominated flora[4]. Sphagnum species show a mixed response, sometimes increasing post-burn[1]. Control plots (90+ years unburnt) show higher species richness and less bare peat than experimental burn plots in the South Pennines[5]. Burning on *Calluna* stands in the Peak District resulted in a decline and the occasional loss of crowberry *Empetrum nigrum*, a initial increase then decline and loss in bilberry *Vaccinnium myrtilus* and cowberry *V. vitis-idaea* and an increase in wavy hair-grass *Deschampsia flexuosa*[6]. On Ilkley Moor, burning resulted in an increase in bare ground, a decline in *E. nigrum* and *V. myrtillus* resulting in an overall decline in ericoid diversity, but otherwise little change in the flora[7]. In Northern Ireland, burns were found to increase the abundance of *V. myrtillus* in the short term, and over the medium term (12 years post-burn) an increase in species of sedge[8]. A study from Northumberland found that three years post-burn, and in combination with grazing, *Callluna* declined and *Molinia* increased[9]. In the Peak District, the long term effect of cool burns were investigated, with the suggestion that *Calluna* could be rejuvenated but that grazing in combination with burning has a complicated interaction[10]. Lichen diversity is lower in areas with more frequent burns (more often than 15-20 years) as many species colonise the older wood stems of *Calluna*[11]. A review of previous studies of burning on upland blanket bog and wet heath found that overall there was a trend to dominance by a few species, or a switch from eriocoids to graminoids, and an increase in the amount of bare ground[7,12]. Spider diversity is lower on shorter swards following burning and grazing in Scotland[13]. In the North York moors, patches of burnt and unburnt moor provided a matrix that supported a range of spider and beetle species[14].

CULTURAL

Biodiversity: ***Moderate Evidence:-*** Short rotation burning can benefit species which need open habitats, such as some birds and invertebrates, but be detrimental to others[15]. For birds, there were more meadow pipits (*Anthus pratensis*) on sites with less burning in upland Britain[16]. On moors in eastern Scotland and northern England, abundances of red grouse and golden plover correlated with burning while meadow pipits were negatively correlated with burning[17]. In the Peak District, areas subject to burning had more curlew, lapwing and ring ouzel, while twite, skylark and wheatear declined with increased burning[18].

Recreation & Tourism: ***Weak Evidence:-*** Around 49,000 people work on activities directly related to shooting, with some 620,000 people involved in the sport, though there are no accurate estimates as to how the reduced burning of grouse moorland would affect tourism levels[19].

Environmental Settings: ***Moderate Evidence:-*** Burning activities on dry peat can cause the loss of historic information such as the pollen record and archaeological remains that are at or below the soil surface[19].

Heath & Wellbeing: ***Weak Evidence:-*** Wildfires in Australia often produced exposure levels to smoke higher than occupational limits[20]. It is not clear how this would translate into the UK.

REGULATING

Climate Regulation: ***Strong Evidence:-*** Upland peat soils are usually assumed to be carbon sinks, however, burning can increase overall dissolved organic carbon (DOC) levels and change the hydrological status of the peat resulting in increased aerobic decomposition[21]. While burning at the surface can reduce carbon stored by 56%, the bulk of carbon storage is at depth[22]. Direct carbon loss from burning may not be as significant as first thought as 14% of the original vegetation carbon remains on site as charcoal[23]. ***Moderate Evidence:-*** Peat accumulation is also affected by burning, with reduced rates, and hence reduced carbon sequestration on burned sites[24].

Erosion Control: ***Moderate Evidence:-*** Burning of vegetation cover exposes bare peat to wind-splash erosion though transport distances of material are small[25]. ***Weak Evidence:-*** Bare peat areas exposed by fire in combination with grazing may lead to erosion and gulley formation[26]. In Northern England, streams from burned sites had higher levels of organic matter and suspended sediment, implying erosion[27].

Fire Control:- ***Weak Evidence:-*** There are no direct studies which analyse the link between fire management and wildfire risk[1], but a number of studies demonstrate that fuel load affects fire behaviour and that controlled burning can reduce fuel load[28], and that this may be more necessary as a result of climate change[29].

Flood Control: ***Weak Evidence:-*** A study of the hydrology of sites following burning found that water tables were significantly closer to the surface[30] and run-off was increased[31] There was no proven link to an increase in flood risk however[1].

Water Quality: ***Strong Evidence:-*** For the Pennines, burning as a management for grouse resulted in an increase of humic coloured dissolved organic carbon[32] which would colour the water supply. A study from the Peak District however found no clear relationship between burning and water discolouration[33]. ***Moderate Evidence:-*** Burning of peat leads to an increase of metal and suspended sediment in UK streams[34]. ***Weak Evidence:-*** Burning changes the relative compositions of soil and run-off water with regard to a number of metal ions that may have consequences for water treatment downstream[35]. Soil water quality is also degraded following a burn in upland UK moors, with unburned plots having a deeper, near neutral pH, and higher conductivity [36].

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