



Grouse moor management: effects on other upland birds in the UK

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Management of privately owned heather moorland for sport shooting of Red Grouse *Lagopus lagopus* occurs widely in the British uplands. Maximizing grouse abundance for shooting occurs through employing gamekeepers to rotationally strip-burn heather habitat, to manage parasites that can cause cyclical fluctuations in grouse abundance and to control predators. The intensity of grouse management varies regionally. Driven shooting yields the biggest shooting bags and is arguably the only economically sustainable form of grouse management, yet the intensity of underlying management, both through the degree of burning and the severity of predator removal, makes it more controversial than either walked-up shooting or no management for grouse at all.

The intensity of grouse management has considerable effects on the composition of upland bird communities. Analysis of breeding bird data from surveys of 90 moors in northern England and Scotland between 2007 and 2012 showed distinct differences in bird responses to the type of grouse management. Driven shooting supported up to 10-fold more Golden Plover *Pluvialis apricaria*, five-fold more Northern Lapwing *Vanellus vanellus* and twice as many Eurasian Curlew *Numenius arquata* than moors managed for walked-up shooting, which in turn supported more waders than moors with no grouse interest. Conversely, driven moors supported fewer raptors and corvids than either walked-up moors or non-grouse moors. Passerines were more plentiful on moors that were less intensely managed, but had more grass, bracken and scrub. These data suggest that a reduction in the intensity of moorland management, i.e. a move from driven to walked-up shooting, could result in fewer grouse and waders, but more raptors, corvids and passerines.

The mechanism whereby driven grouse moors support more waders was explored in a 9-year experiment on four moorland blocks in northern England. Here, heather burning and parasite management were kept constant over time, but predator control was switched between two blocks, whilst being kept constant on the remaining two blocks, where, on one block, predators were controlled throughout the duration, but not on the other block. Breeding success of Red Grouse, Golden Plover, Curlew and Lapwing were two- to five-fold higher on blocks where predators were controlled, which in turn increased breeding densities two- to three-fold.

Results from these two studies suggest that grouse moor management helps conserve several species of declining upland birds, particularly waders, but may do so at the expense of protected predatory and scavenging species, especially raptors. Our data suggest that a reduction in the intensity of grouse management may benefit raptors, but would risk accelerating the on-going decline of upland breeding waders.