European Grouse and Wind Energy Development

Photo by Dennis Schroeder, NREL 50696

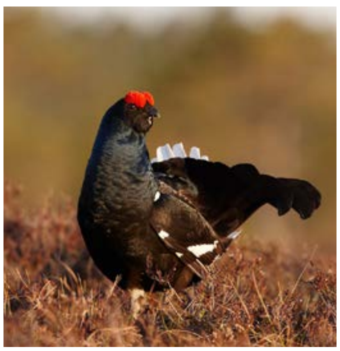
EUROPEAN GROUSE

Grouse (Tetraoninae) inhabit a wide range of habitats across the northern hemisphere. All grouse species are ground nesting, with chicks mainly feeding on insects and adults on a wide range of plants. Male grouse congregate at lekking sites and perform conspicuous displays to entice females to mate. Six species occur in Europe: Black grouse (Lyrurus tetrix), Capercaillie (Tetrao urogallus), Caucasian grouse (Lyrurus mlokosiewiczi), Willow ptarmigan (Lagopus lagopus), Rock ptarmigan (Lagopus muta) and Hazel grouse (Tetrastes bonasia). According to the International Union for Conservation of Nature (IUCN) Red List of Threatened Species, the populations of all European grouse species are declining, with the Caucasian grouse designated as "near threatened". The other species are listed as "least concern" due to their large distributionrange and population sizes. However, many species are included in national red lists of threatened species. The main causes for grouse population declines in Europe are related to habitat deterioration, human disturbance, increased predation pressure overhunting and climate change. Grouse can be sensitive to human disturbance, which leads to increasing conflicts between species conservation and human activities in grouse habitats, particularly in remnant populations. In addition to influences by recreation, hunting and forest management, wind turbines can affect grouse during the construction phase because of habitat loss or displacement (i.e., functional habitat loss due to disturbance by vehicular traffic or construction noise), and during the operational phase through collision fatalities, disturbance due to noise, shadow flickering and human activity.

INTERACTIONS BETWEEN GROUSE AND WIND ENERGY

Effects of wind farms on European grouse species range from collision mortality to behavioral responses leading to spatial displacement, which may impact population size. Due to their wing loading (ratio of body weight to wing area) and aspect ratio (ratio of wingspan squared to wing

Western capercaillie. *Photo by Istock, 465055817* area) grouse are considered "poor flyers" and are prone to collisions with a wide range of structures such as power lines and fences. Although grouse generally fly below the rotor swept area, at least three European species have been reported to collide with the towers of wind turbines: Black grouse, Capercaillie and Willow ptarmigan. In one study, Willow ptarmigan collision mortality was assumed to have negative effects on the local population. Local spatial avoidance of turbines has been observed in terms of reduced numbers of lekking males and reduced year-round use of habitats surrounding wind farms compared to habitats farther away. Depending on landscape features, displacement of lekking grouse may occur within a radius of 500 to 850 m around wind turbines. Noise produced by wind turbines, has been suggested to mask the singing of cocks, reducing the distance upon which displaying calls can be heard and inducing males to adjust their vocalizations. Although there are observations of males lekking within wind farms, reduced numbers of lekking males have been documented within the surroundings of wind farms after the construction in several cases.



Black grouse. *Photo by iStock, 92283386*

RISK MONITORING

Our understanding of the potential effects of wind energy infrastructure on grouse are based on several studies, comprising different study designs and research questions. The studies include six different countries (Austria, Germany, Norway, Scotland, Spain, Sweden) and four grouse species (Black grouse, Capercaillie, Willow ptarmigan, Rock ptarmigan). Most studies were performed in a single study area, however, data from up to 18 study areas have also been acquired. Differences in study periods range from 1 to 15 years. Studies on collision mortality consisted of both systematic surveys as well as anecdotal observations. Methods used to assess disturbance included counting of males at lekking sites, searches for indirect signs of occurrence (i.e., feathers and droppings), line transects with wildlife detection dogs, other census techniques or telemetry.

RISK MANAGEMENT

Mitigation measures, counterbalancing or preventing negative effects of wind turbines on grouse have rarely been implemented post-construction, and there is little evidence of their effectiveness. The primary mitigation measure is to avoid constructing wind farms in grouse habitats. One study indicates that constructing wind farms more than 850 m away from known Capercaillie habitats may reduce detrimental effects. In an experimental study, painting the lower 10 m of the wind turbine towers black reduced collisions of Willow ptarmigan by 48%. Whether improving local habitat suitability reduces the negative effects of wind turbines on grouse habitat use and population densities remains unclear. To reduce detrimental disturbance effects, construction should be prohibited during the reproductive period. Furthermore, measures to reduce use of access roads during the operational phase may also help to reduce disturbance pressure on grouse.

RESEARCH PRIORITIES

The type and number of turbines widely vary between studies, possibly explaining differences in results. Moreover, the impact of wind energy infrastructure is likely species- and site-specific, impeding general predictions of the impact of wind turbines on grouse in each area. To provide widely applicable results, future studies should include several study areas, using comparable data collection methods. Furthermore, it is important to collect data over multiple years to account for any potential time lag in the response of grouse to wind energy infrastructure and associated disturbances. Future studies should apply robust experimental designs, such as before-after-control-impact designs to address: 1) the species- and habitat-specific factors enhancing risk to grouse species, 2) the contributions of wind turbines effects to population dynamics, 3) whether negative effects of wind turbines can be mitigated (e.g., by improving local habitat suitability) and 4) the mechanisms behind collision impacts for all grouse species.

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