

Should the Chicken Cross the Road?

by Michael A. Patten

Population biologists in Europe have been at the cutting edge of research on how collisions with manmade structures affect avian survivorship. Much of their research has focused on the effects of fences, roads, and power lines. Studies by David Baines and colleagues--such as those published in the *Journal of Applied Ecology* (vol. 34, pp. 941-948, 1997) and *Biological Conservation* (vol. 110, pp. 169-176, 2003)--identified an interesting and disturbing pattern along fence rows: three species of grouse, the Red Grouse (*Lagopus lagopus scoticus*), Black Grouse (*Tetrao tetrix*), and Capercaillie (*T. urogallus*), accounted for over 90% of all avian mortalities. These startling data imply that grouse are far more susceptible than other birds to collisions with fences.

The Sutton Avian Research Center's long-term research on the ecology and demography of the Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) underscores the reality of this threat. Collisions with fences, vehicles, or power lines caused nearly 30% of the 198 Lesser Prairie-Chicken deaths the Center has documented. Fences are an especially pervasive threat. By itself, this information suggests an important conservation and management strategy for maintaining healthy populations of this species: remove or make more visible the many fences now crisscrossing what remains of the



Tyler Hinkle

Barbed wire fences are a significant source of mortality in Oklahoma prairie-chickens as evidenced by the carcass above.

prairie-chicken's habitat. But there is much more to the story. Mortality from collisions is not distributed evenly between the Center's study sites in New Mexico and Oklahoma. A prairie-chicken is three times more likely to collide with a fence, vehicle, or power line in the latter state (14.3% vs. 42.4% of mortalities). Moreover, the difference is driven chiefly by the females, as males succumb far more often to predation.

This large difference in collision frequency suggests that we should see strong selection pressure acting on females of the Oklahoma population, but just how would this pressure manifest itself? A well established element of the theory of life-history evolution, the branch of biology focusing on an organism's demography, is the tradeoff between fecundity and life span--as one goes up, the other goes down. If female life span has been reduced because the birds are much more likely to collide with a fence or other object, then we expect to see a compensatory increase in reproductive output. In other words, although natural selection is a blind process, it will "attempt" to balance the high mortality by favoring the production of more young.

Remarkably, this predicted increase in reproductive output is exactly what the Center has documented. Oklahoma females lay two eggs more per clutch (10.81 ± 0.42 vs. 8.73 ± 0.26) and fledge four more young per successful nest (11.08 ± 0.98 vs. 7.07 ± 0.63). Oklahoma females also attempt more nests within a given year: 79% of them re-nest in a year, as opposed to only 15% in New Mexico. Again, there are tradeoffs due to mortality: many females in Oklahoma now nest in only one year, whereas those in New Mexico virtually always nest in two or more. Nesting more often per year seems like a good strategy to counterbalance the increased rate of mortality, but this shift in reproductive strategy comes at a cost. Focusing more effort within a year places Oklahoma females at greater risk of annual vagaries of weather. A bad year can devastate the population because most females will attempt to nest only in that year. New Mexico females, by contrast, can withstand a bad year, because they can always try again next year. The results predict a crash in the Oklahoma pop-



Luke Bell

A female Lesser Prairie-Chicken seeks cover in northwestern Oklahoma shinnery oak habitat.



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Recently hatched chicks are vulnerable to severe weather and predators.