

ISSUES IN CONSERVATION

**SAGE-GROUSE AND INDIRECT INTERACTIONS: POTENTIAL IMPLICATIONS OF COYOTE CONTROL ON SAGE-GROUSE POPULATIONS**

EDUARDO T. MEZQUIDA, STEVEN J. SLATER, AND CRAIG W. BENKMAN<sup>1</sup>

*Department of Zoology and Physiology, University of Wyoming, Laramie, WY 82071*

Manuscript received 6 April 2006; accepted 14 July 2006.

<sup>1</sup> Corresponding author. E-mail: cbenkman@uwyo.edu

**Abstract.** Coyotes (*Canis latrans*) are lethally controlled throughout the range of Greater Sage-Grouse (*Centrocercus urophasianus*) and it has been suggested that such control may benefit sage-grouse. However, the perceived benefits of control are based on the direct effects of coyotes on sage-grouse and largely ignore potential indirect interactions. Here, we summarize some of the evidence for direct effects in a simplified food web including coyotes and sage-grouse. There is very little evidence to suggest that coyotes have much of a direct negative effect on sage-grouse, but there is considerable evidence supporting direct interactions that would lead to positive indirect effects between coyotes and sage-grouse. The three likely forms of positive indirect effects arise because coyotes reduce the potential negative effects resulting from mesopredator release and apparent and exploitative competition. Mesopredator release would adversely affect sage-grouse if a decrease in coyotes allowed an increase in foxes (especially *Vulpes vulpes*), badgers (*Taxidea taxus*), and Common Ravens (*Corvus corax*), mesopredators that prey on sage-grouse eggs and young. A decrease in coyotes is likely to allow jackrabbits (*Lepus* spp.) to increase, which would cause sage-grouse to suffer from apparent competition if Golden Eagles (*Aquila chrysaetos*), which are perhaps the most important predator on adult sage-grouse, then increase in response to the increase in jackrabbits. This increase in jackrabbits may also depress the availability of sagebrush (*Artemisia* spp.) and forbs, leading to an increase in exploitative competition with sage-grouse. For these reasons, we argue that intense and extended lethal coyote control is likely detrimental to sage-grouse conservation.

**Key words:** *apparent competition, Canis latrans, Centrocercus urophasianus, exploitative competition, indirect effects, mesopredator release, predator control.*