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# GOOD ANIMALS IN BAD PLACES: EVALUATING LANDSCAPE ATTRIBUTES ASSOCIATED WITH ELK VULNERABILITY TO WOLF PREDATION

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Vulnerability of prey to predators is heavily influenced by their respective physical and behavioral characteristics; however their interactions with landscape, and climate, collectively termed “environmental vulnerability,” may also assume considerable importance. Little is known about the impact of environmental vulnerability in large mammal systems, where post-encounter vulnerability may assume more importance than encounter probability. This study utilized 18 years of survival and mortality data for radio-collared elk (*Cervus elaphus*), in concert with abundance, distribution, and habitat use data prior to and following restoration of wolves (*Canis lupus*) to Yellowstone National Park to evaluate the relationship between environmental attributes and elk mortality. We modeled the odds of mortality for 108 elk in 1257 animal sample intervals from 1991-2009 across a range of environmental conditions and gradients of wolf predation risk to evaluate: 1) The relationship between landscape, habitat, and environmental attributes and elk vulnerability to wolf predation and 2) Changes in the attributes related to elk mortality before and after wolf colonization. In the absence of wolf predation, mortality risk for elk was primarily associated with physical attributes of elk known to influence starvation mortality. Following wolf reintroduction mortality risk was more strongly associated with characteristics of the landscape and climate within an animal’s home range. These environmental influences resulted in substantial changes in distribution and abundance of elk in the study system and suggests environmental heterogeneity may have an important influence on wolf and elk distributions and dynamics.