



# PHOTO GALLERY

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## ELK BALANCE THREATS FROM HUMANS, COUGARS, AND WOLVES BY SHIFTING HABITAT USE BETWEEN DAY AND NIGHT

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### Study Description

In unprotected areas, ungulates such as elk face risk from both humans and carnivores like cougars and wolves, creating a tradeoff where avoiding one threat may increase exposure to another. In northeastern Washington, USA, we GPS-collared elk, cougars, and wolves to examine elk survival and movement. By day, elk avoided humans, which were responsible for 80% of adult female mortality. At night, elk used areas near humans, reducing proximity to wolves, but not cougars. Elk consistently avoided wolves, but only avoided cougars at night. This research illustrates the impacts of humans on predator-prey interactions in managed landscapes.



Photo 1. We fit 63 elk (*Cervus canadensis*, A) with GPS-tracking collars that collected a location every 4 hours. Cougars (*Puma concolor*;  $n=42$ , B) and wolves (*Canis lupus*;  $n=16$ , C) were likewise GPS-collared to determine which areas they used most actively and where they would be the greatest threat to elk. Photo credit: (A, C) Sarah Bassing, (B) Taylor Ganz.



Photo 2. Humans caused 80% of the mortality of adult female elk, primarily via hunting and vehicle collisions. Photo credit: Taylor Ganz.



Photo 3. Elk generally preferred to use open areas at night, where cougars and wolves were less likely to hunt, and used forests during the day where they were less visible to humans. Photo credit: Taylor Ganz.



Photo 4. Elk avoided human-impacted landscapes in the day but preferred these areas at night, which reduced exposure to wolves. Photo credit: Taylor Ganz.

These photographs illustrate the article “Cougars, wolves, and humans drive a dynamic landscape of fear for elk” by Taylor R. Ganz, Melia T. DeVivo, Aaron J. Wirsing, Sarah B. Bassing, Brian N. Kertson, Savannah L. Walker, Laura R. Prugh published in *Ecology*. <https://doi.org/10.1002/ecy.4255>