Olivia Guswiler

Final Project Outline

2024-10-03

*Introduction*

* Influence of human activity on wildlife
  + Landscape of fear and direct mortality via hunting/car strikes
  + Strong avoidance of large carnivores to areas with greater human activity
* Prugh et al. (2023) found that mesocarnivores will utilize what they referred to as a “human shield”
  + Wolves and cougars strongly avoided areas with high human footprint
  + In presence of large carnivores, coyote and bobcat space use positively associated with human footprint index
  + There is an obvious risk/reward to this activity
    - Humans were 3x more lethal than large predators in this study
* Discuss mesocarnivore response to humans in absence of large predators

*Objective*

* Determine how distance to hiking trails influences temporal and spatial use of bobcats and coyotes across a gradient of human influence

*Study Area*

* Okanogan study site in northern Washington, USA
  + ~5000-km2, mix of public and private lands
  + Predominately montane conifer forests at mid-to-higher elevations, agriculture at lower elevations
* Harvest regulations in Washington
  + Coyotes: year-round hunting, no bag limit
  + Bobcats: Sept 1 – March 15 (7.5 months), no bag limit

*Data*

* Locations of collared coyotes and bobcats
  + GPS points
    - Locations recorded every 4 hours
  + Exclude individuals with <100 locations
* Human footprint index
  + 1-km resolution
  + Scale of human influence across the landscape (0% [wilderness] to 100% [urban])
* Landcover
  + 30-m resolution
  + 16-class land cover type based on a modified Anderson Level II classification system
* Elevation
  + ~10-m resolution
  + Bare earth digital elevation model
* Hiking Trails
  + GPS points

*Analyses*

* Response variable: mesocarnivore space use
* Covariates:
  + distance to trails
  + human footprint index
  + landcover type
  + elevation
  + season – winter vs non-winter
  + time-of-day
* These analyses are adapted from the original publication from which this data was procured (Prugh et al. 2023).
  + Scale-optimize continuous variables (distance to trails, human-footprint index, elevation, and time-of-day)
  + Fit integrated step selection functions (SSFs) of habitat selection by coyotes and bobcats in response to covariates
    - Fit fully random-effect SSFs to allow individual heterogeneity in responses to all covariates
    - Resample coyote and bobcat GPS tracks for temporal consistency using four-hour intervals
  + Construct seasonal utilization distributions
    - Individuals with >50 locations in a given season, construct winter (Dec-Mar) and non-winter (Apr-Nov) kernel density utilization distributions
    - Known habitat preferences controlled for by including a variable for proportion of forest cover within a 250-m radius around each used and unused location
  + Using a hierarchical generalized mixed-effects model with a binomial distribution, model used-available data for bobcats and coyotes in response to distance from trail at human footprint index -0.5 (wilderness) to 0 and 0 to 0.5 (urban)