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 **FIND CITATIONS**
* Is space use of mesocarnivores influenced by “hot spots” of activity within areas of high human footprint?
  + Roads (**ask Javan if should include**)
  + Hiking trails

*Objectives*

* Determine if space use of bobcats and coyotes is influenced by distance to hiking trails
* Determine if use with distance to hiking trail differs within versus outside of the “human shield”

*Study Area*

* Two large study sites in northern Washington, USA
  + Okanogan
    - ~5000 km2
    - Mix of public and private lands
  + Northeast
    - ~5000 km2
    - Mix of public, private, and tribal lands
  + At both site: 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* (describing both the wildlife and environmental data and the scales at which those data are measured)

* GPS locations from collared coyotes and bobcats
  + Exclude individuals with <100 locations
* Landcover
* and elevation maps will both be obtained from the U.S. Geological Survey database. <https://www.mrlc.gov/data?f%5B0%5D=category%3ALand%20Cover> & <https://data.usgs.gov/datacatalog/data/USGS:77ae0551-c61e-4979-aedd-d797abdcde0e>
* I will use AllTrails to download spatial coordinate for hiking trails in the area of interest in CSV format. At the time I am downloading the data, I will also take note of the total number of user interactions on the detail page for each trail to obtain an estimate of relative use or popularity across trails. <https://www.alltrails.com/explore/us/washington/grand-coulee?b_tl_lat=48.94417371318937&b_tl_lng=-121.2110978405697&b_br_lat=47.18612780542284&b_br_lng=-117.13467756922867&mobileMap=true>

*Analyses* (including, but not limited to, type of data, study design type, proposed selection function, scale optimization, statistical model, mode of statistical inference, etc.)

* Response variable: mesocarnivore space use – GPS points
* Covariates:
  + distance to trails – GPS points
  + human footprint index – obtained from where the original paper got it
  + elevation – raster map
  + landcover type – raster map
  + season – winter vs non-winter

Study Design

These analyses are adapted from the original publication from which this data was procured (Prugh et al. 2023).

* 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
  + Exclude individuals with fewer than 100 locations
* Construct seasonal utilization distributions for coyote and bobcat in each study area
  + For each coyote and bobcat with 50 locations in a given season, construct winter (Dec-Mar) and non-winter (Apr-Nov) kernel density utilization distributions
* Known habitat preferences will be controlled for by including a variable for proportion of forest cover within a 250m radius around each used and unused location