

# Anthropogenic impacts on the occurrence patterns of predators & prey in eastern Washington

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WA Fish & Wildlife Commission Meeting

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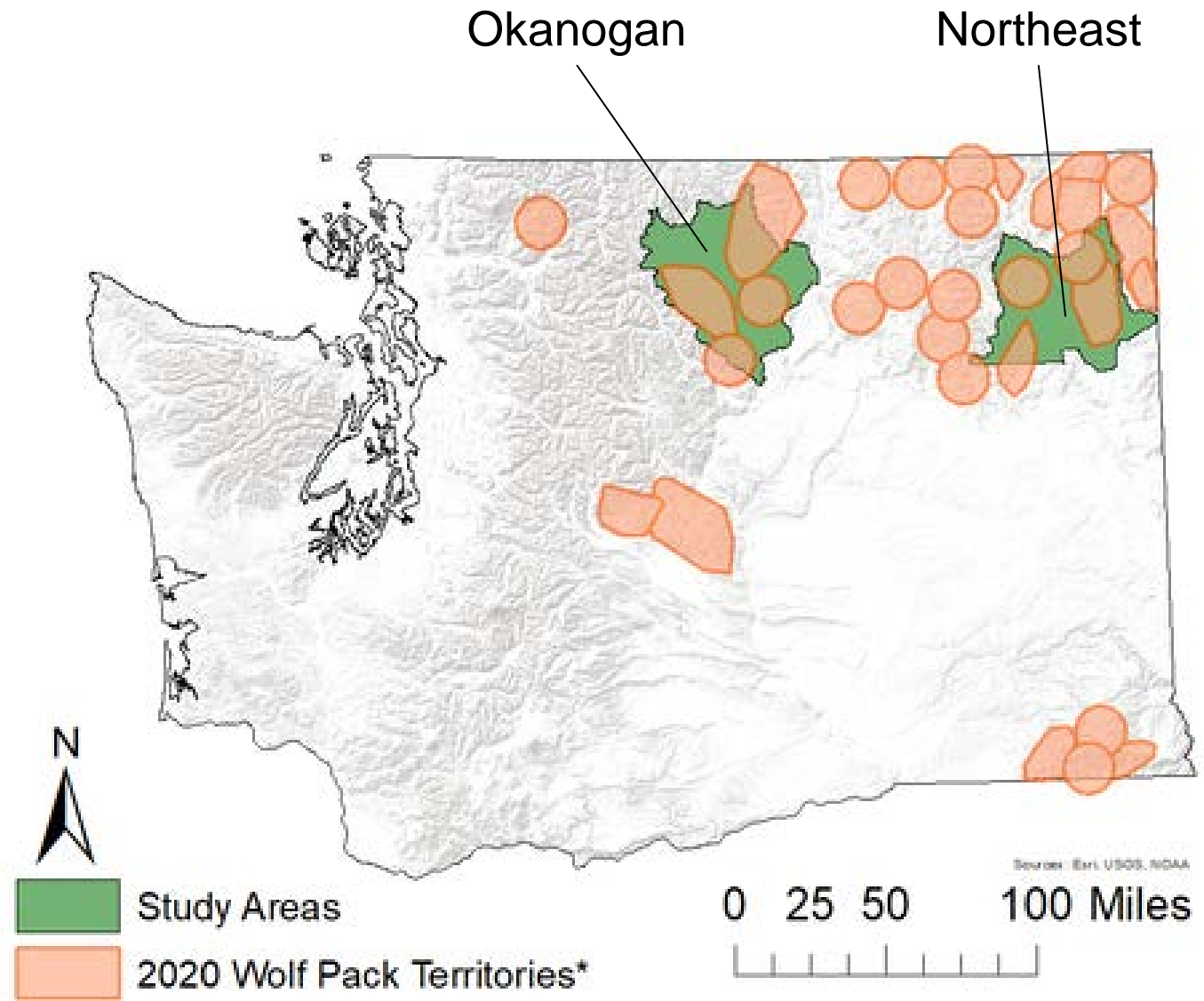


# Washington Predator-Prey Project



- Wolves recolonizing WA State
  - Wolf effects on deer & elk
- Legislatively mandated study
  - WA Dept. Fish & Wildlife
  - University of Washington
- Started 2016

# Study areas

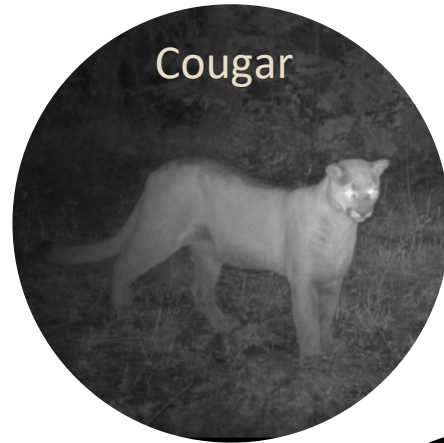
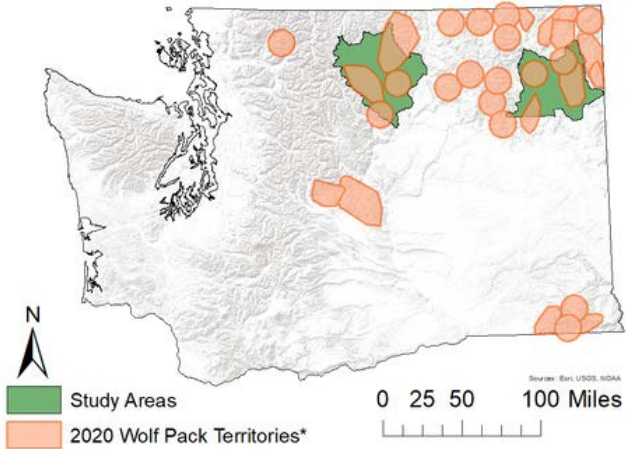


# Research questions

- How are wolves impacting ungulate populations?
- How are wolves affect other carnivores?
- How are multiple predators and multiple prey species interacting together?
- How are other factors influencing these relationships?
  - Human activity
  - Habitat quality



# Washington Predator-Prey Project



# Data collection



Lauren Satterfield

- Telemetry
  - 660 animals GPS-collared
- Camera traps
  - 350 sites monitored
- Carcass and kill site investigations
  - >600 sites investigated
  - 150 cameras to monitor scavenging
- Scat samples
  - 2,500 scats collected for diet and genetics
- Vegetation surveys
  - >260 sites surveyed

# Spatial & temporal patterns of predator-prey interactions



- Habitat use
- Movement
- Daily activity patterns
  
- Today's focus- human influences on where & when predators and prey overlap across the landscape

# Humans influence predator-prey interactions



- Human activity & predator-prey interactions
  - Create refuge for prey (e.g., human shield)
  - Push predators & prey closer together (e.g., increase nocturnal activity)
  - Potential to alter predation risk

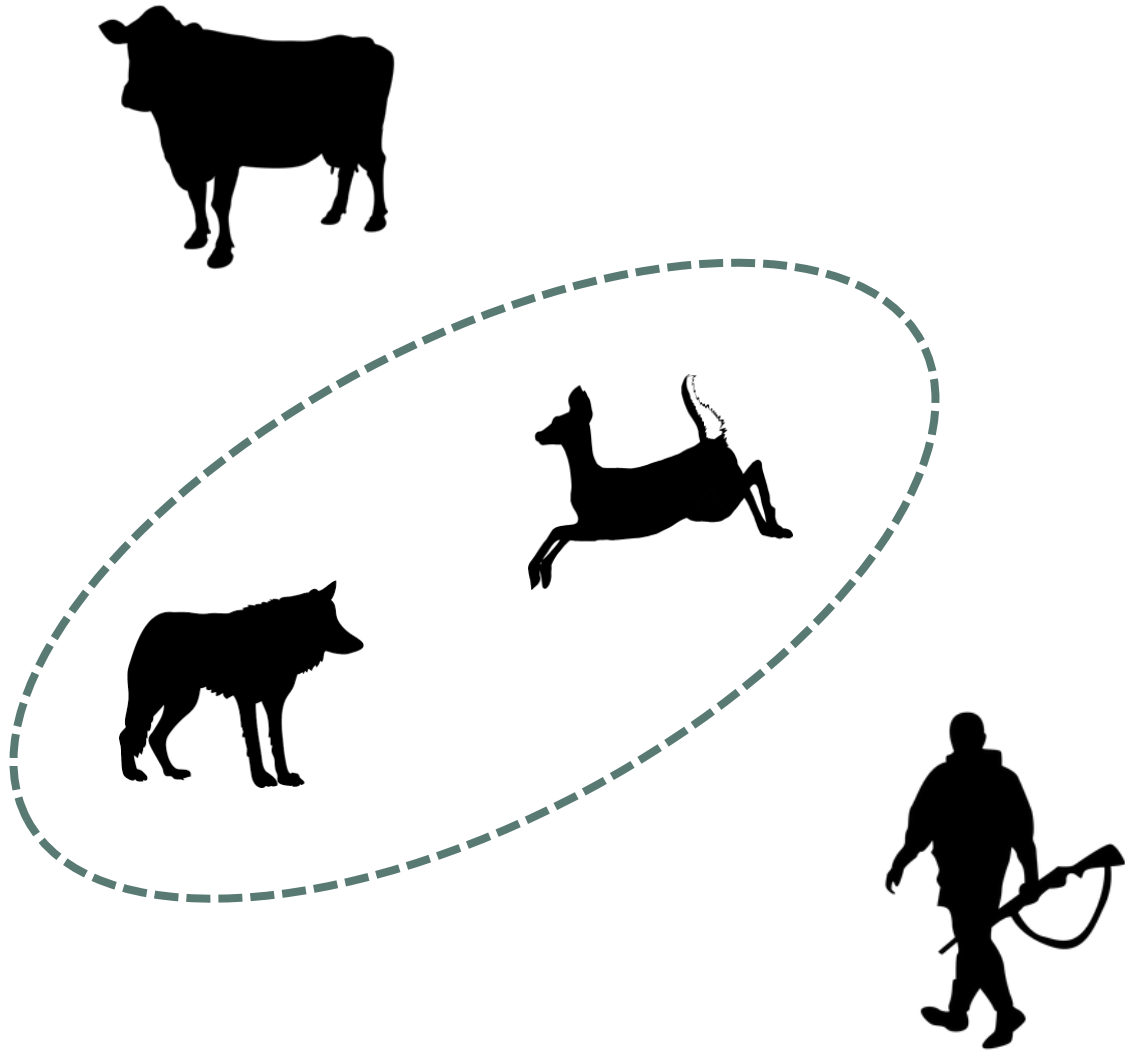


# Human activity in the American west



- **Grazing season (summer)**
  - Competition with herbivores
  - Food subsidies & increased conflict for predators
- **Hunting season (fall)**
  - Mortality risk for all harvested species
  - Food subsidies for predators

# Spatial and temporal overlap

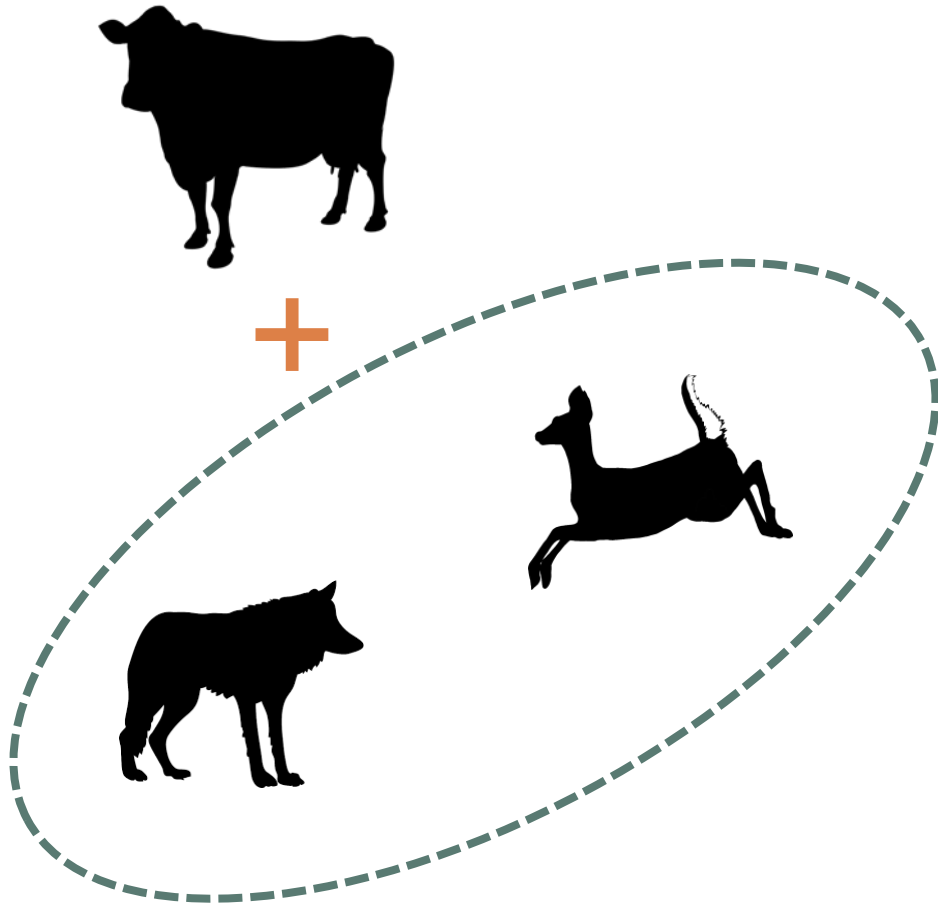


What are the effects of human activity on spatial & temporal overlap of predators and prey?

Spatial overlap  $\rightarrow$  Co-occurrence = Probability both predator & prey will use same location

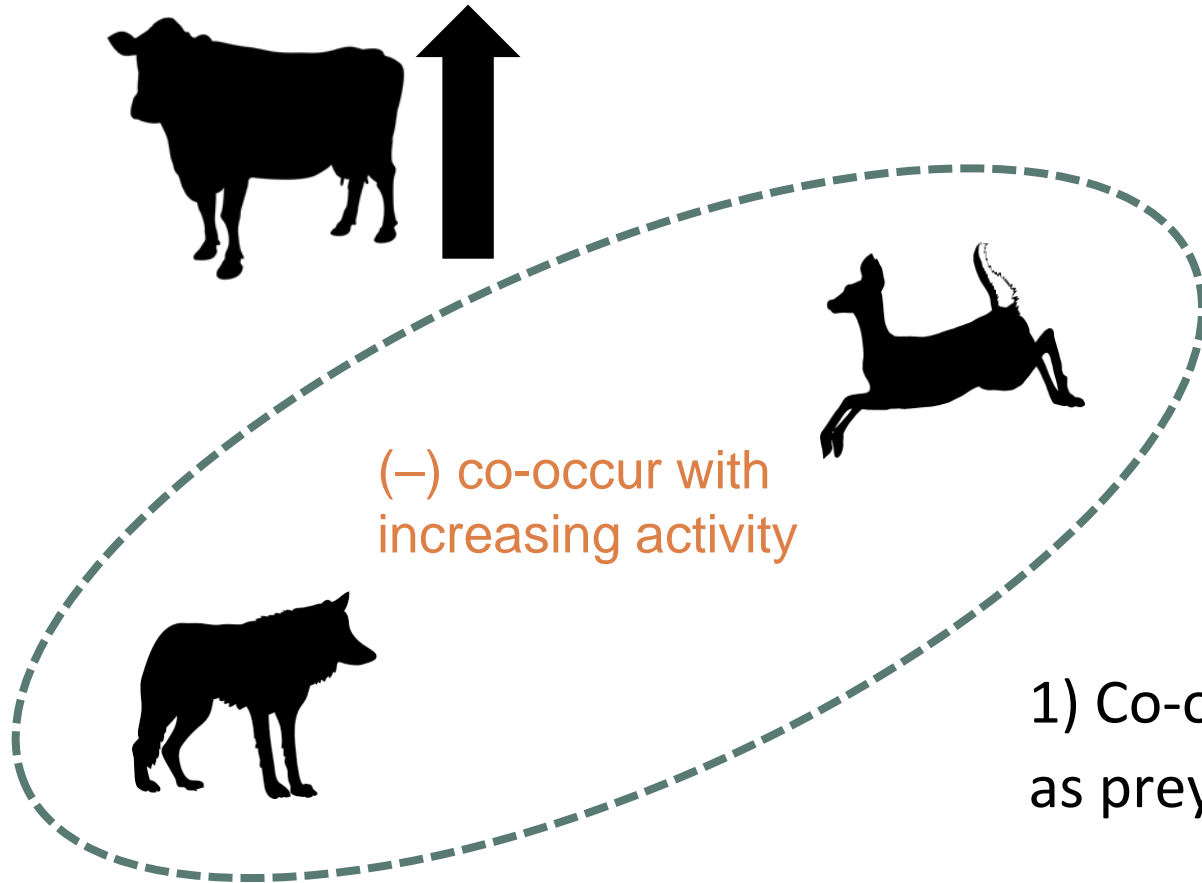
Temporal overlap  $\rightarrow$  similar daily activity patterns

# Spatial hypotheses



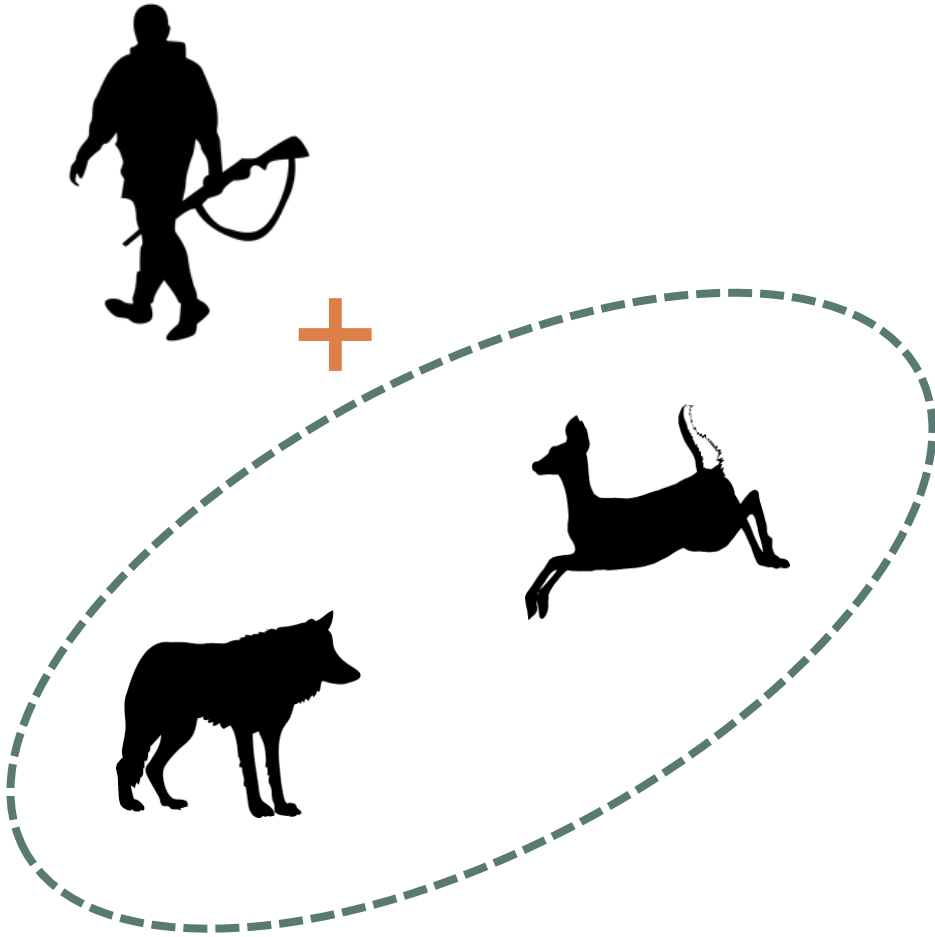
1) Co-occurrence declines with increasing activity as prey avoid cattle/hunters

# Spatial hypotheses



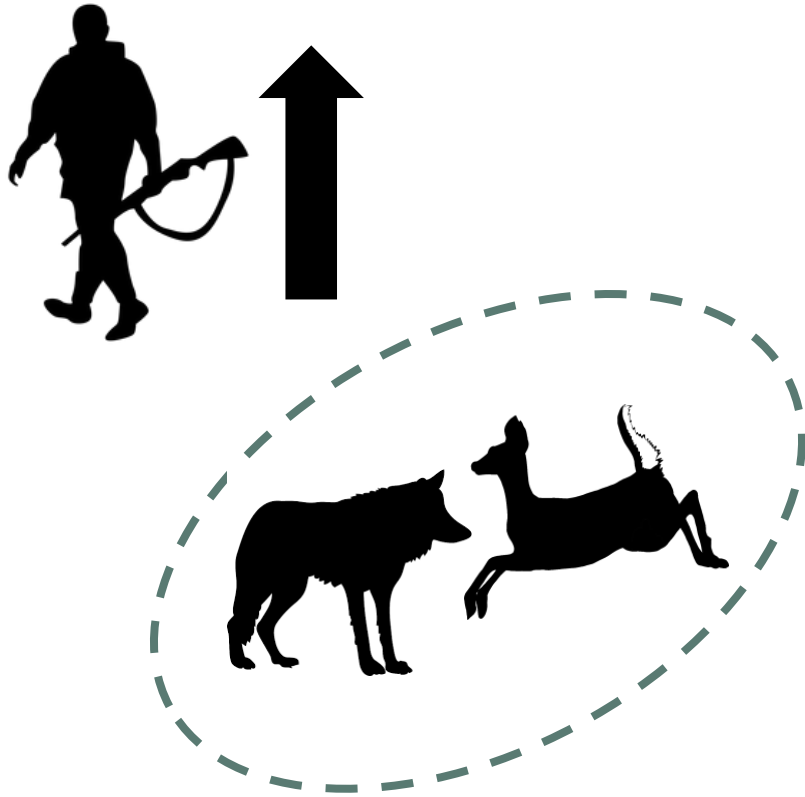
1) Co-occurrence declines with increasing activity as prey avoid cattle/hunters

# Spatial hypotheses



2) Co-occurrence increases where predator respond to food subsidies

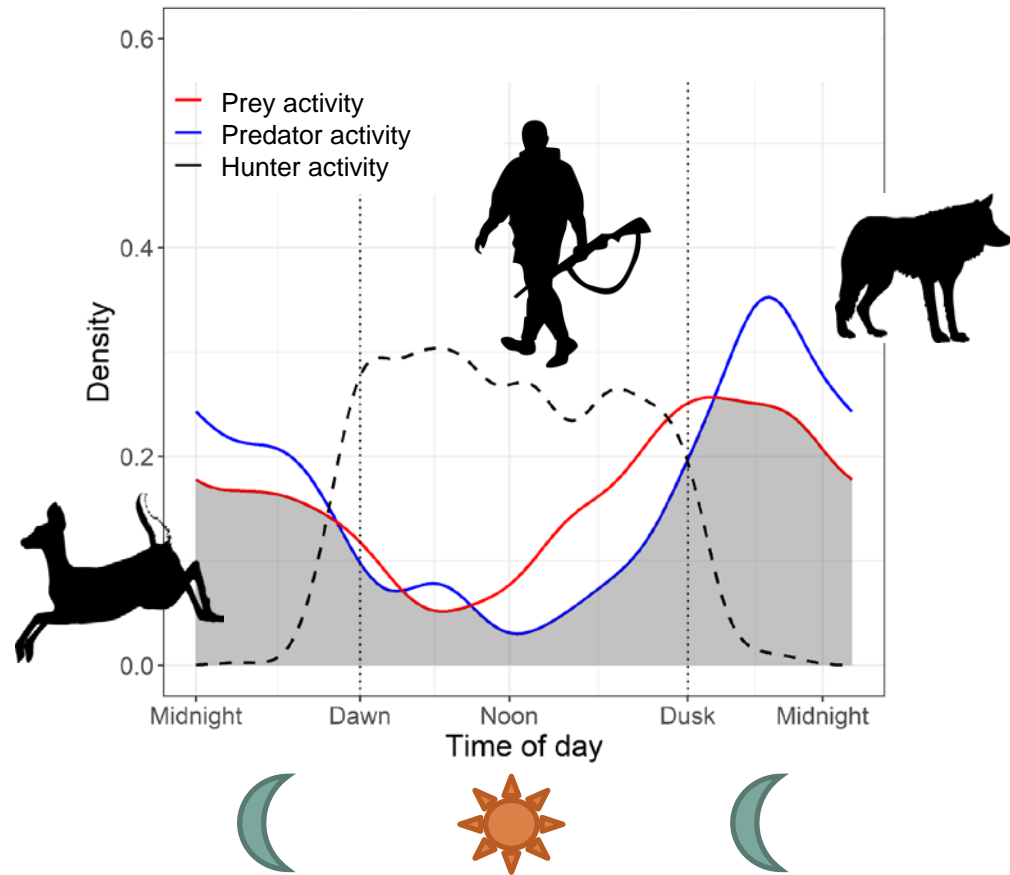
# Spatial hypotheses



(+) co-occur with increasing activity

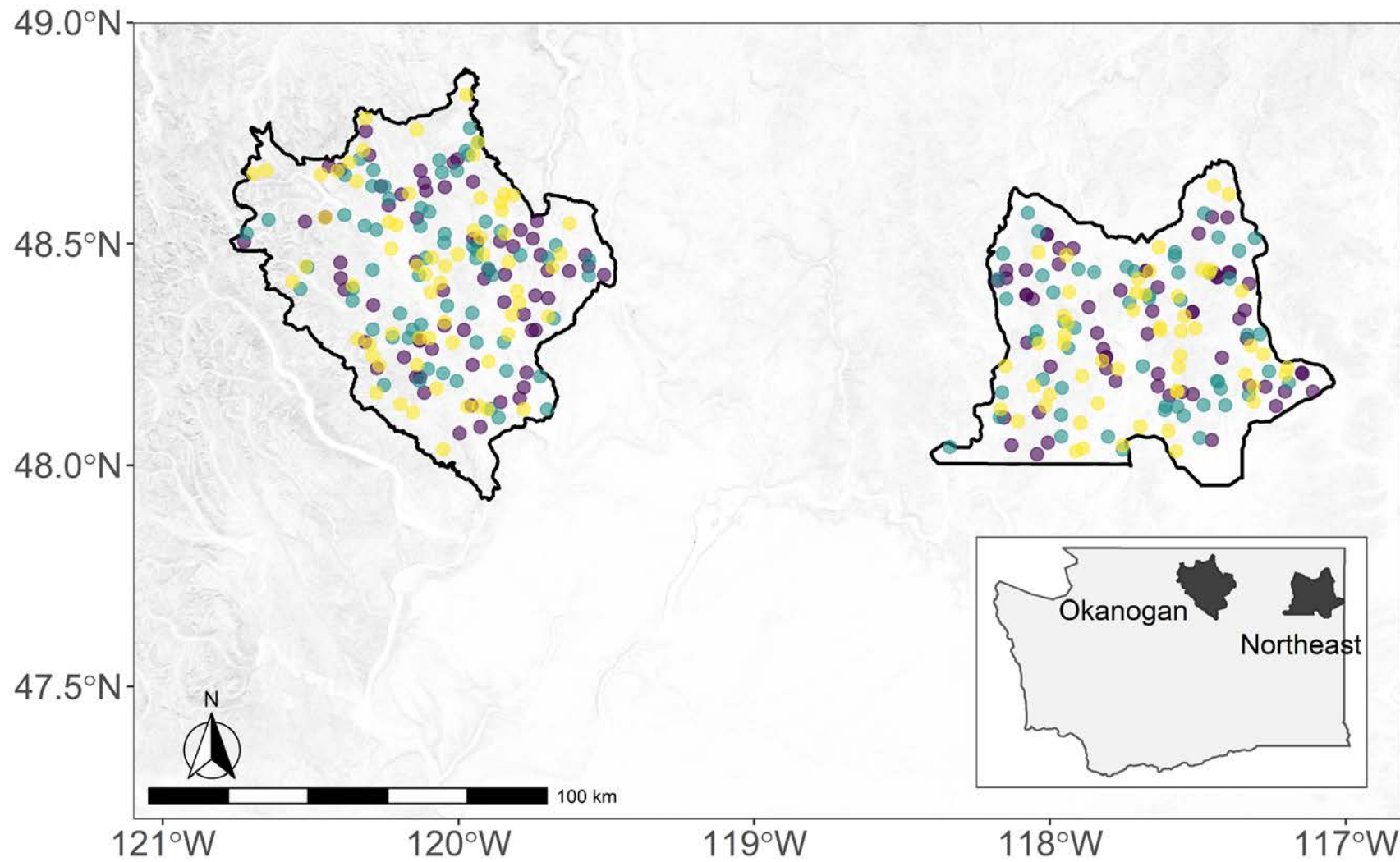
2) Co-occurrence increases where predator respond to food subsidies

# Temporal hypothesis



3) Predators and prey shift activity to lulls in cattle/hunter activity

# Camera locations



## Camera locations

- 2018-2019
- 2019-2020
- 2020-2021



# Grazing & hunting season



- Separate analyses for **grazing** & **hunting** season
  - Grazing season: July – Sept
  - Hunting season: Oct – Nov
- Tested influence of:
  - Cattle activity
  - Camera on/off grazing allotment
  - **Hunter activity**
  - **Camera on public/private land**

“Activity” = number of detections per day;  
No unique identification, composition or count of individuals



# Analyses

- Multi-species occupancy models
  - Species occurrence when other absent
  - Predator-prey co-occurrence
- Overlap of daily activity patterns
  - Predator and prey activity where cattle/hunters were detected vs not detected

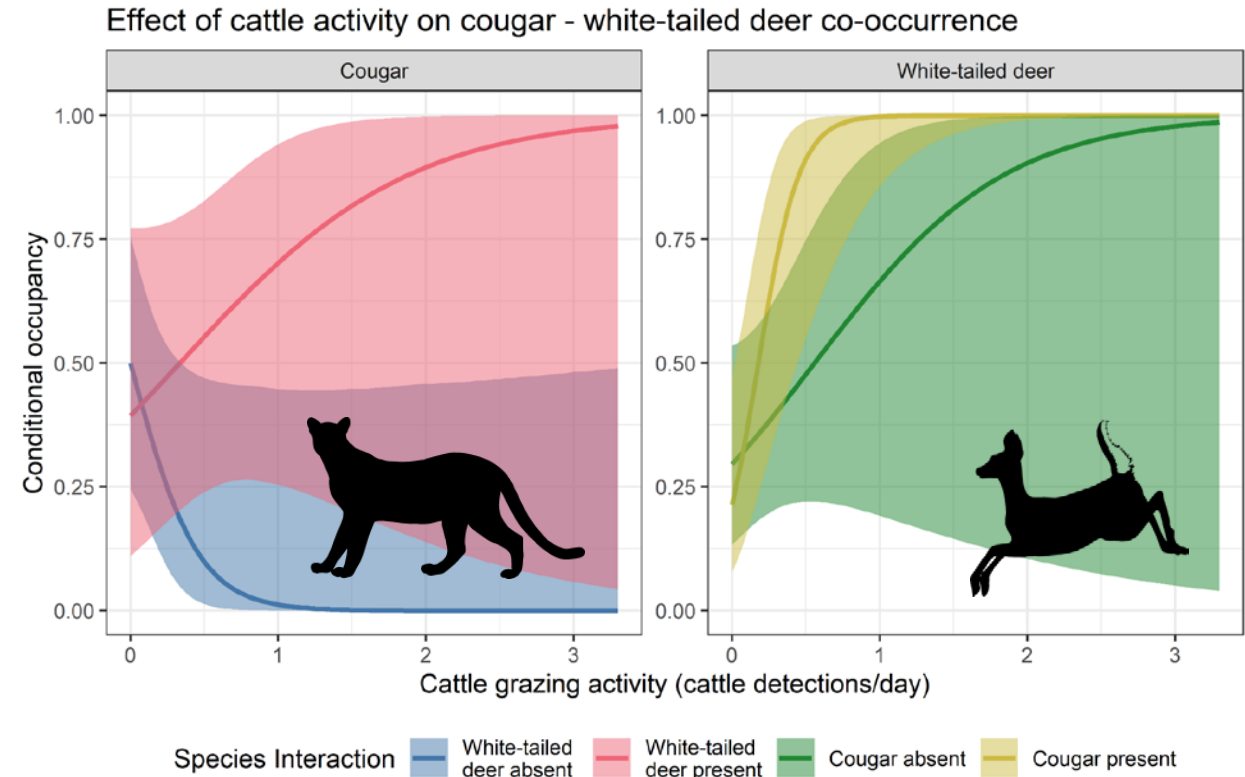
# Grazing effects on co-occurrence

- Few instances of grazing effects, but...
- Grazing allotments
  - (+) on moose
- Cattle activity
  - (+) on mesopredators & deer occurrence
  - (-) on cougar occurrence



# Grazing effects on co-occurrence

- Few instances of grazing effects, but...
- Grazing allotments
  - (+) on moose
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  - (+) on mesopredators & deer occurrence
  - (-) on cougar occurrence
  - (+) on cougar-white-tailed deer co-occurrence
    - Cougars avoided cattle when deer not present



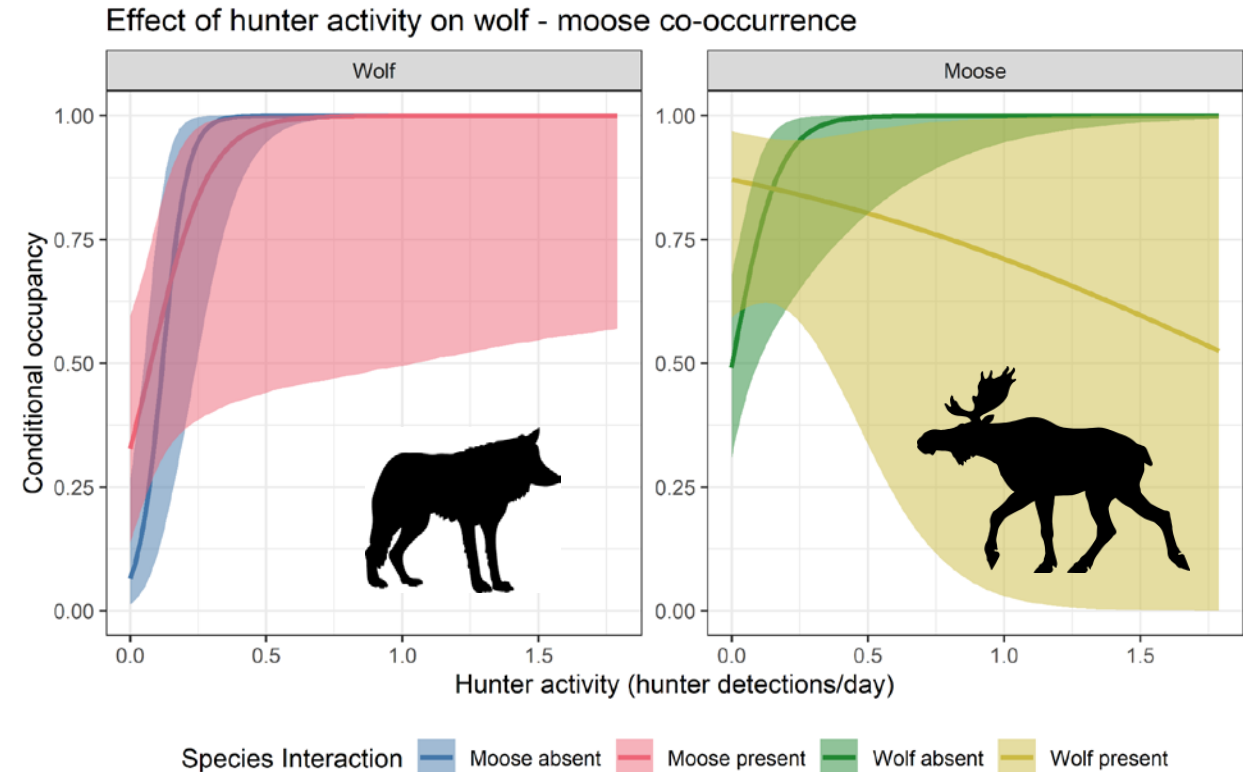
# Hunting effects on co-occurrence

- More instances of hunting effects
- Public land
  - (-) on deer occurrence
  - (+) on predator-deer co-occurrence
- Hunter activity
  - (+) on bobcat, coyote, wolf & moose occurrence



# Hunting effects on co-occurrence

- More instances of hunting effects
- Public land
  - (-) effect on deer occurrence
  - (+) on predator-deer co-occurrence
- Hunter activity
  - (+) on bobcat, coyote, wolf & moose occurrence
  - (-) on wolf-moose co-occurrence
    - Wolf presence influenced moose occurrence, not hunter activity



# Shifts in daily activity

- White-tailed deer increased daytime activity around cattle
- Deer did not change daily activity during hunting season
- Predators generally became more nocturnal, avoiding daytime cattle and hunter activity



# Human activity & predator-prey overlap



- **Cattle grazing**
  - Ungulate occurrence **↑** with cattle/allotments
    - Forage benefits?
    - Predator-specific responses to cattle activity
- **Hunting season**
  - Ungulate occurrence **↓** on public land
    - Spatial refuge from harvest mortality
  - Predator occurrence **↑** with hunter activity
    - Potential food subsidies worth the risk?



# Management implications



- Ungulates used private land during hunting season
  - Possibly reduced predation risk on private lands
  - Private lands have potential mediate predator-prey interactions
- Did not consider M vs F differences
- Underlying mechanisms and ultimate consequences unknown



- Morgan Delgado
- Melia Devivo
- Scott Fitkin
- Taylor Ganz
- Beth Gardner
- Sara Hansen
- Jeff Heinlen
- Brielle Jaglowski
- Brian Kertson
- Parker Levinson
- Ben Maletzke
- Donny Martorello
- Jerry Nelson
- Julian Olden
- Scott Pearson
- Annemarie Prince
- Laura Prugh
- Nate Rice
- Jon Rohrer
- Trent Roussin
- Lauren Satterfield
- Dan Thornton
- Ben Turnock
- Matt VanderHaegen
- Rebecca Windell
- Aaron Wirsing
- Jon Wyss
- WDFW, WDNR, USFWS, and USFS biologists
- UW undergraduate students
- Private property owners



Cougar and deer silhouettes  
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