White-tailed deer and elk population dynamics (2017–2021) in NE WA

Taylor Renee Ganz

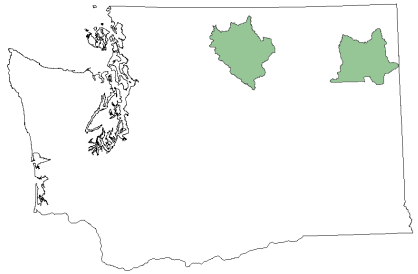
December 9, 2022 | Washington Fish and Wildlife Commission Meeting

Photo: Sarah Bassing

Research Goals

WASHINGTON PREDATOR-PREY PROJECT

How do wolves, other predators, humans, forage and landscape change influence ungulate survival, population dynamics and movement?



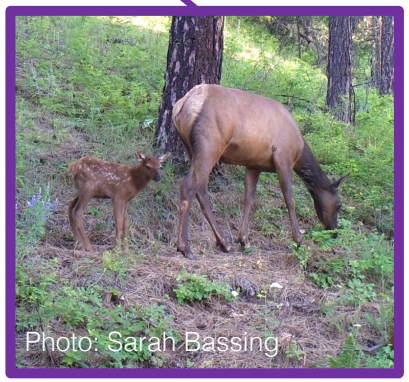
Research Goals

WASHINGTON PREDATOR-PREY PROJECT

How do wolves, other predators, humans, forage and landscape change influence ungulate survival, population dynamics and movement?

150 mule deer

280 white-tailed deer



93 elk

Dissertation Chapters

1. Forensic identification of predators
2. Wildfire and mule deer
3. White-tailed deer population dynamics
4. Elk response to human and non-human predators

DOI: 10.1002/wsb.1386

RESEARCH ARTICLE

WILDLIFE SOCIETY BULLETIN | THE WILDLIFE SOCIETY

Wildlife whodunnit: forensic identification of predators to inform wildlife management and conservation

Taylor R. Ganz[1] | Melia T. DeVivo[2] | Ellen M. Reese[1] | Laura R. Prugh[1]

Dissertation Chapters

1. Forensic identification of predators
2. Wildfire and mule deer
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Journal of Animal Ecology
BRITISH ECOLOGICAL SOCIETY

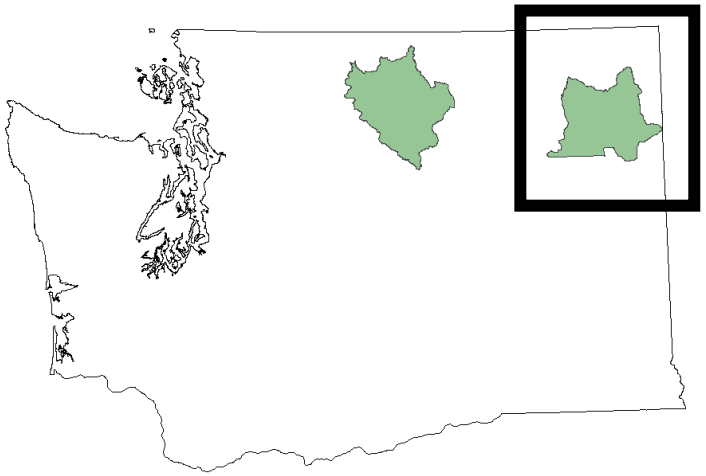
RESEARCH ARTICLE | Full Access

Interactive effects of wildfires, season and predator activity shape mule deer movements

Taylor R. Ganz, Melia T. DeVivo, Brian N. Kertson, Trent Roussin, Lauren Satterfield, Aaron J. Wirsing, Laura R. Prugh

First published: 07 September 2022 | https://doi.org/10.1111/1365-2656.13810

Dissertation Chapters



1. Forensic identification of predators
2. Wildfire and mule deer
3. White-tailed deer population dynamics
4. Elk response to human and non-human predators

Outline

Research methods & data streams

White-tailed deer population dynamics

- Background
- Causes of mortality
- Population dynamics
- Implications

Elk

- Population dynamics
- Causes of mortality

Wildlife tracking

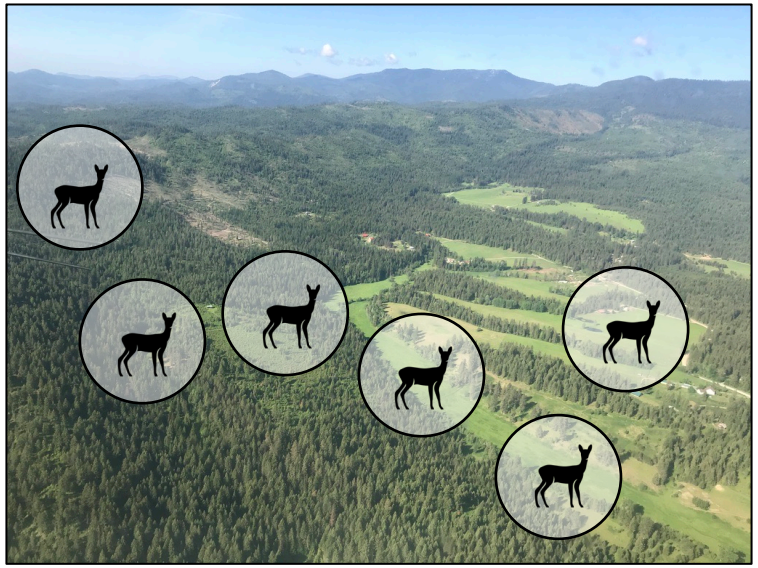
Wildlife tracking

Reproduction

Wildlife tracking

Reproduction

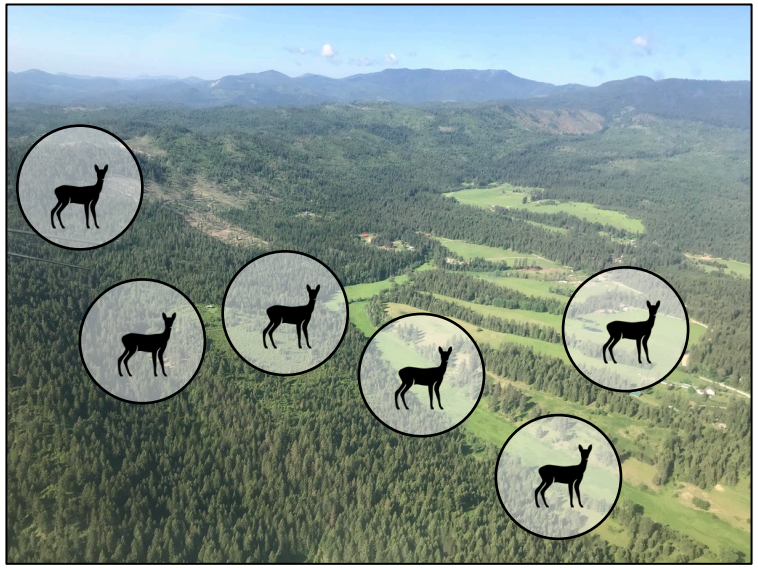
Movement



Wildlife tracking

Reproduction

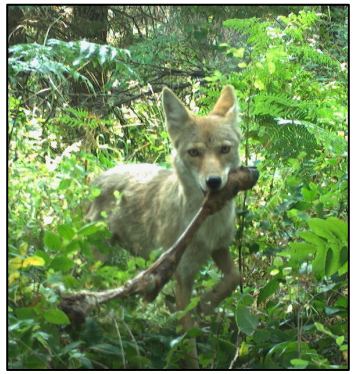
Movement



Survival & cause of death

Mortality Investigations

?



Mortality Investigations

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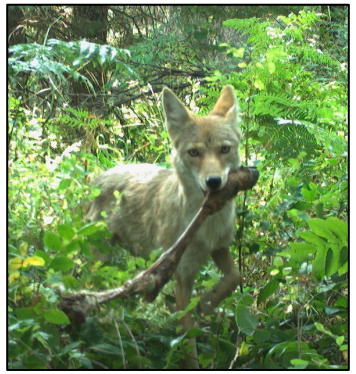

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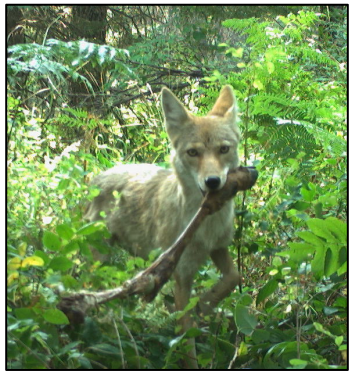

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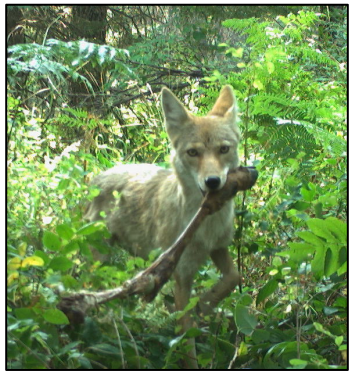

Mortality Investigations

CSI:
CRIME SCENE INVESTIGATION


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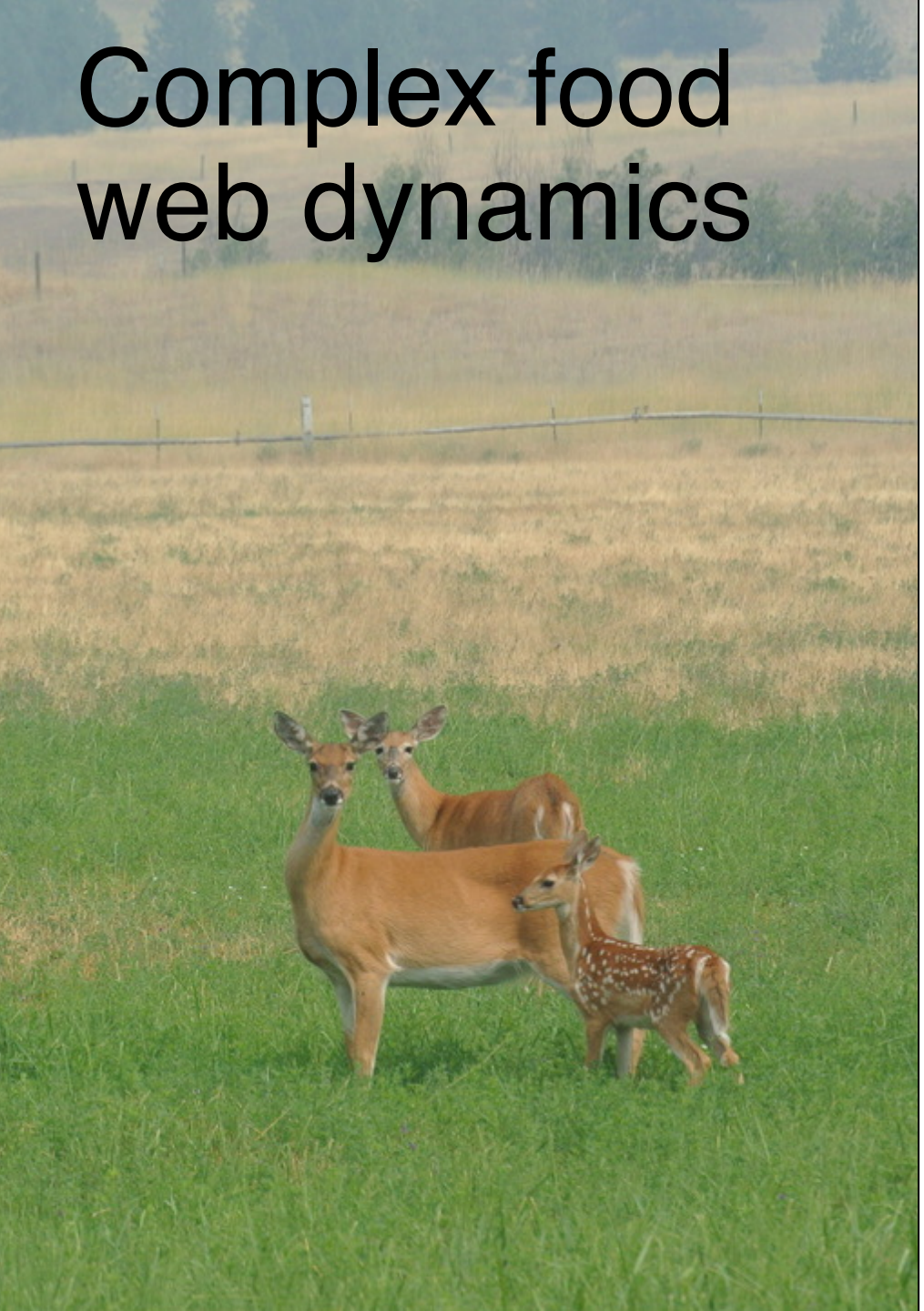
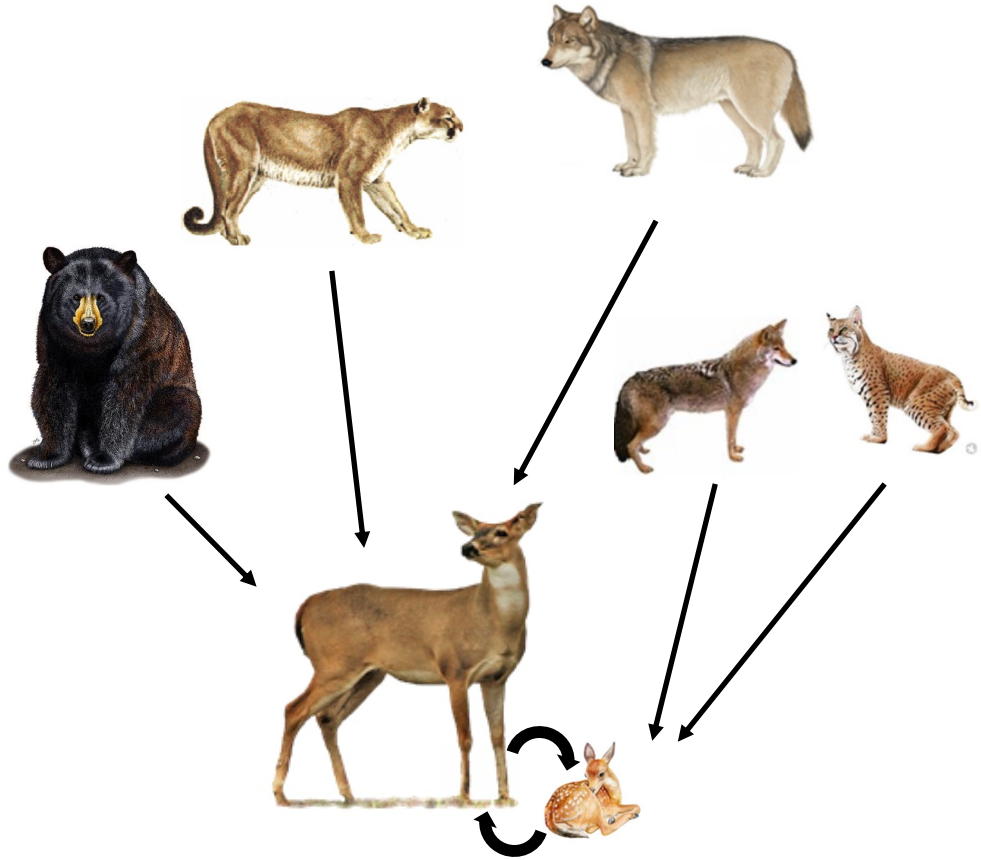
White-tailed deer population dynamics
UWP005
RECONYX

Complex food web dynamics

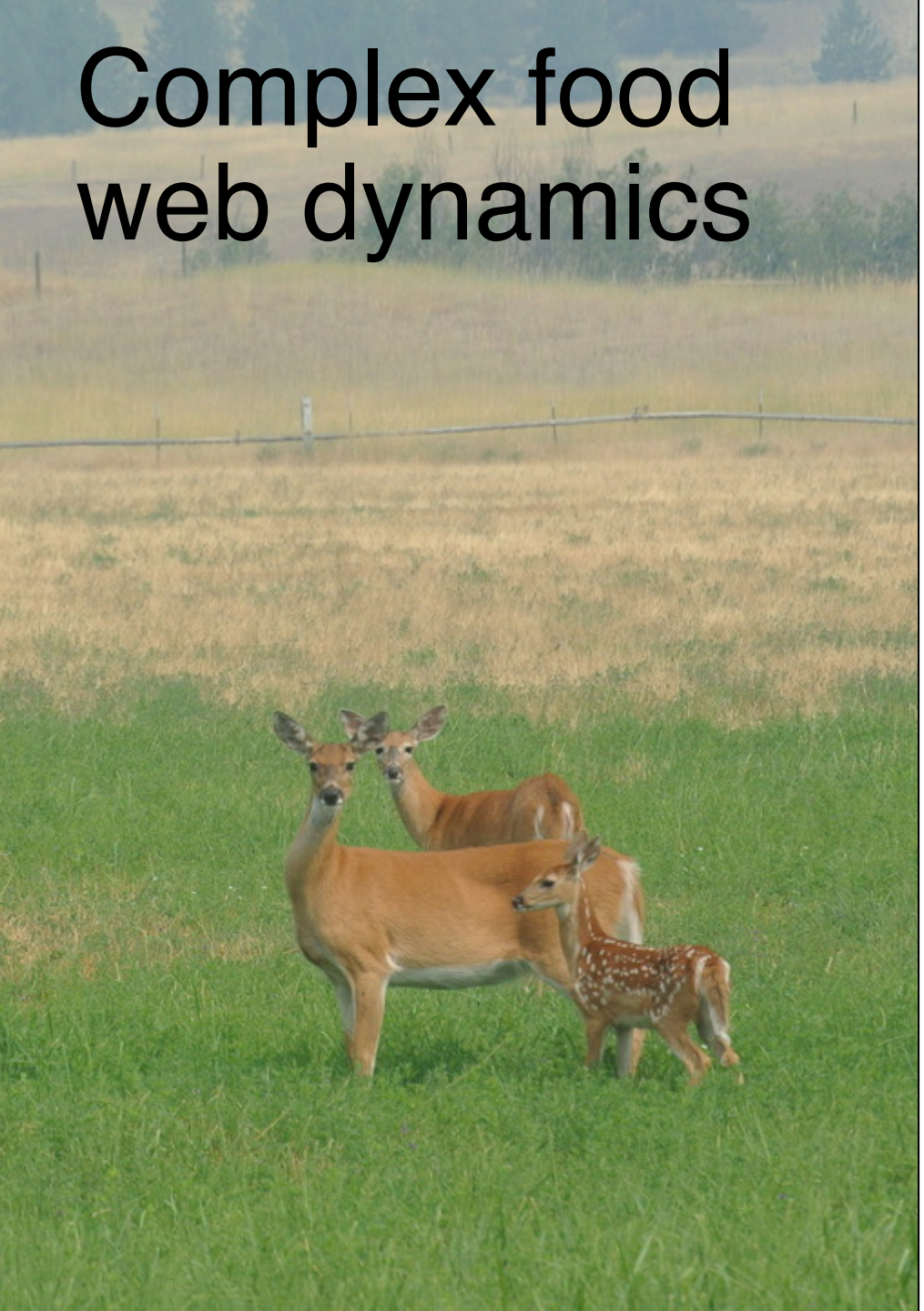


Top-down effects



Images: Roger Hall and Melinda Josie

Complex food web dynamics



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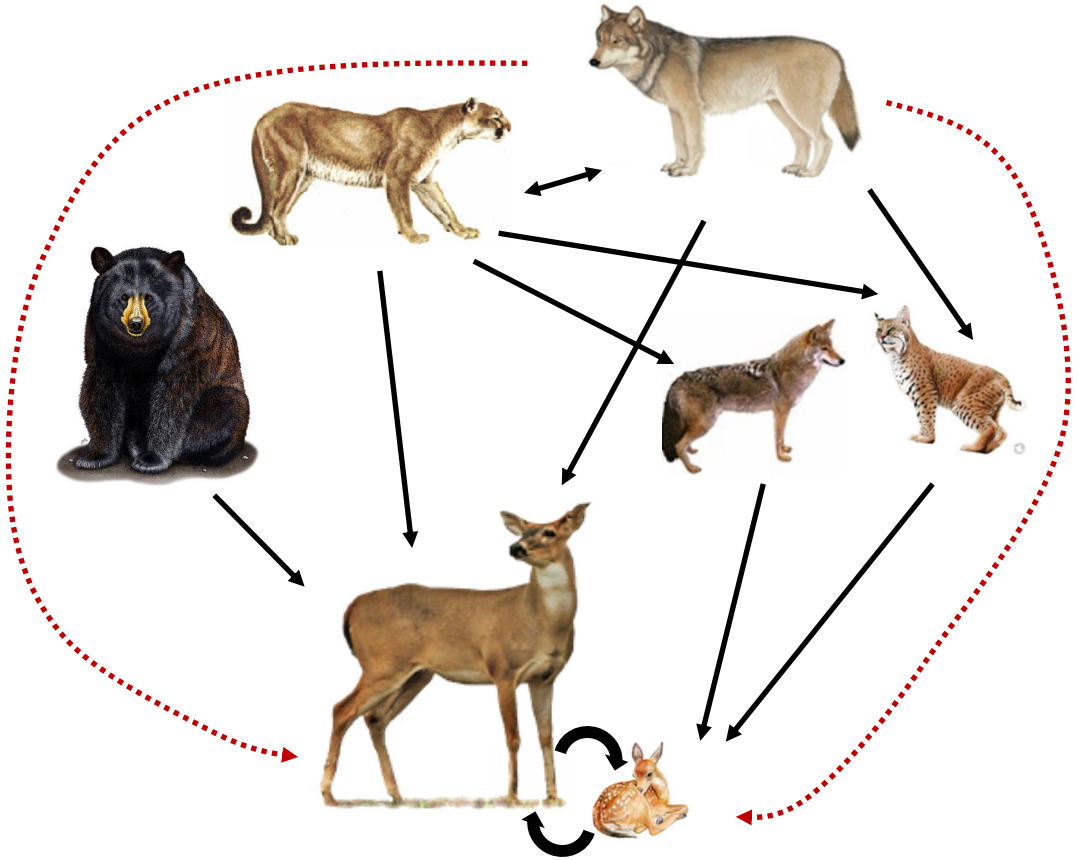

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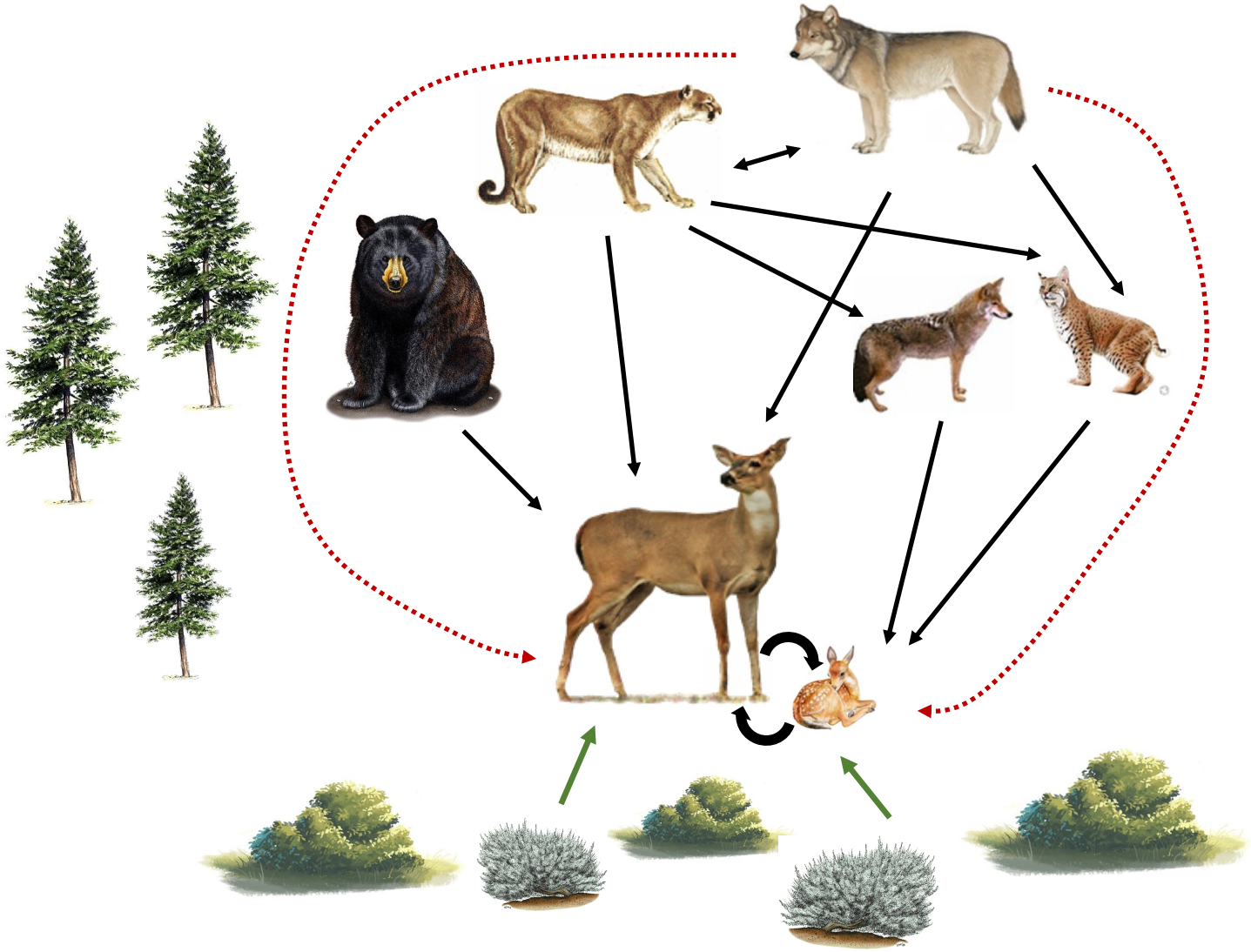
Complex food web dynamics

Bottom-up effects



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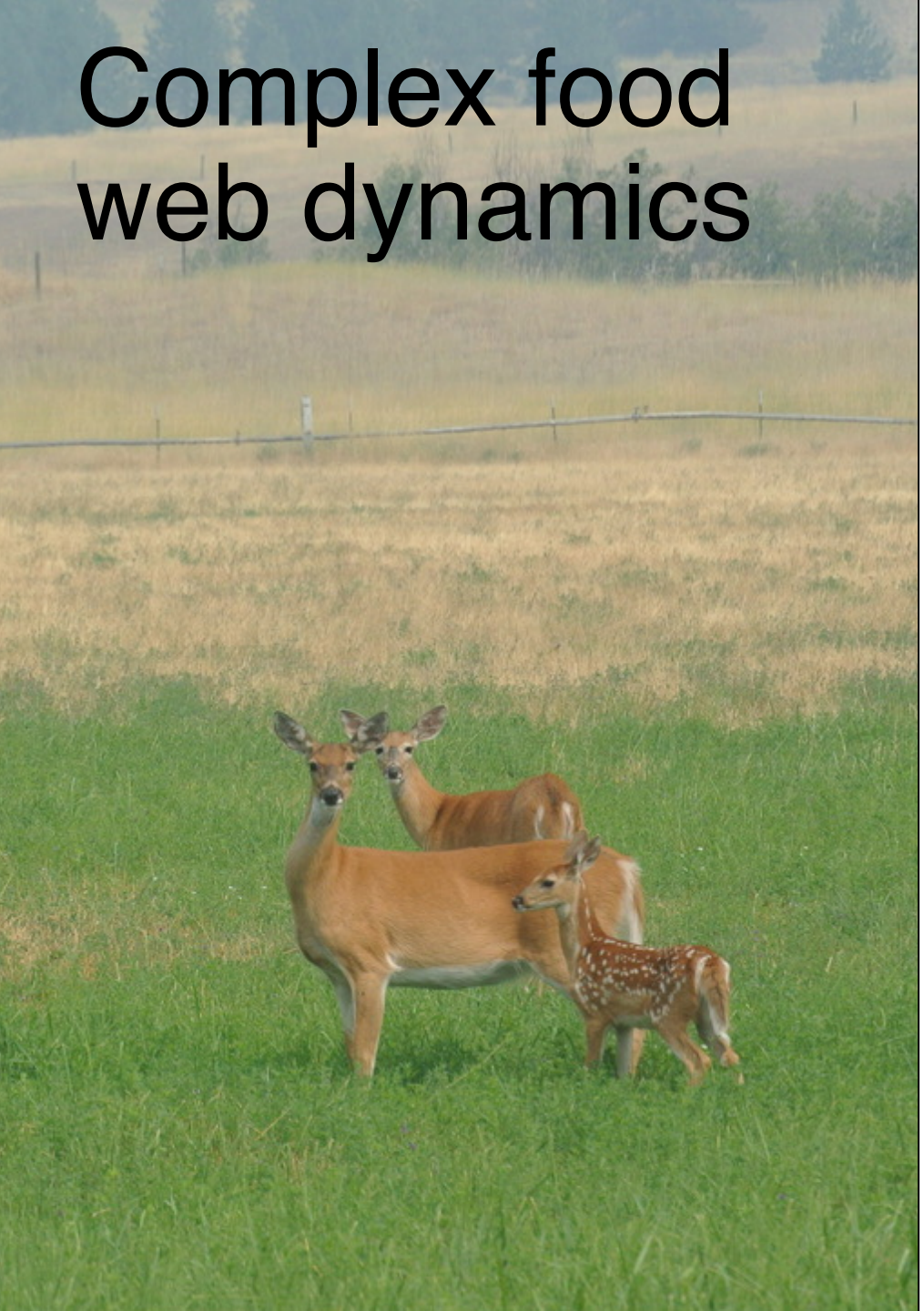
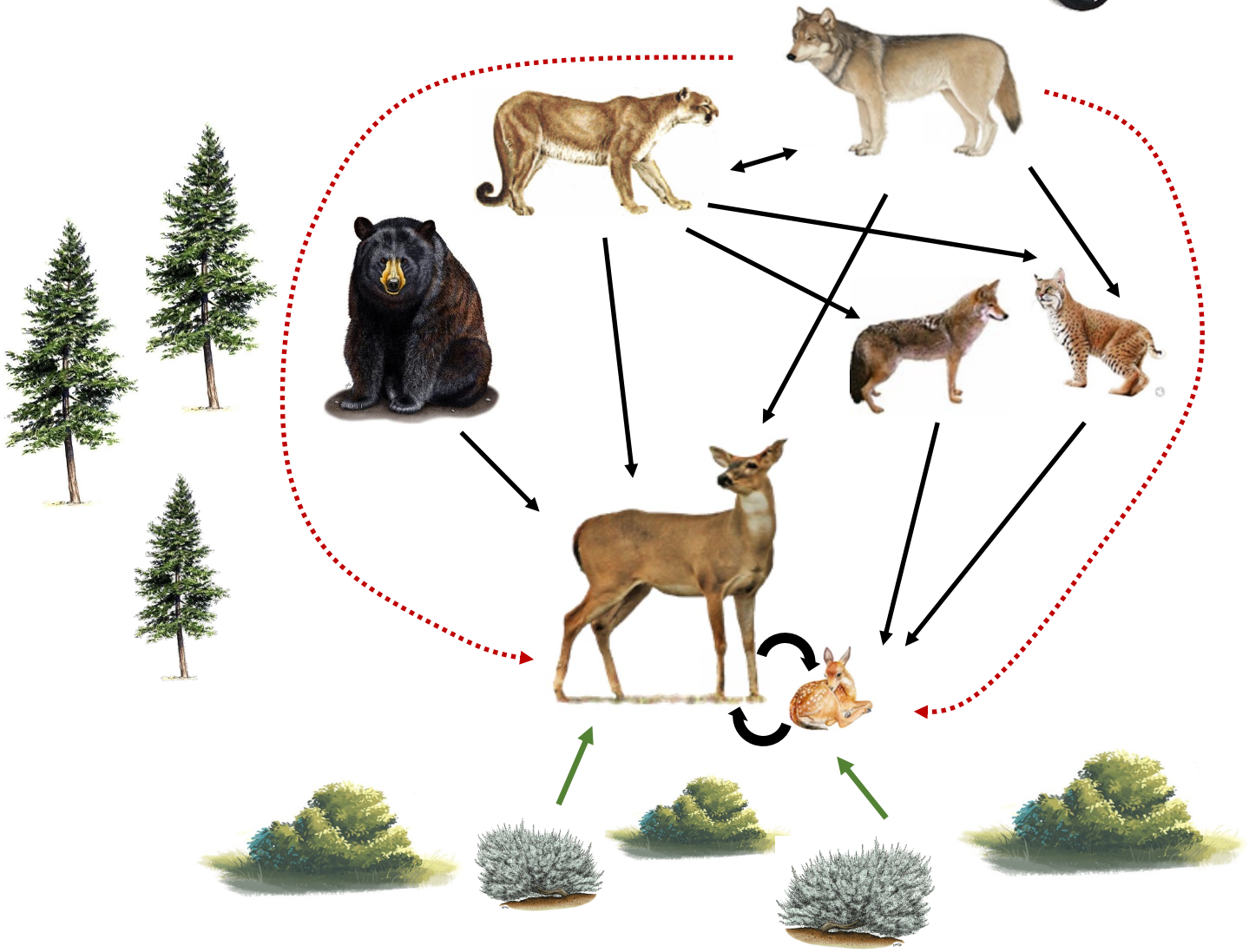


Human influence

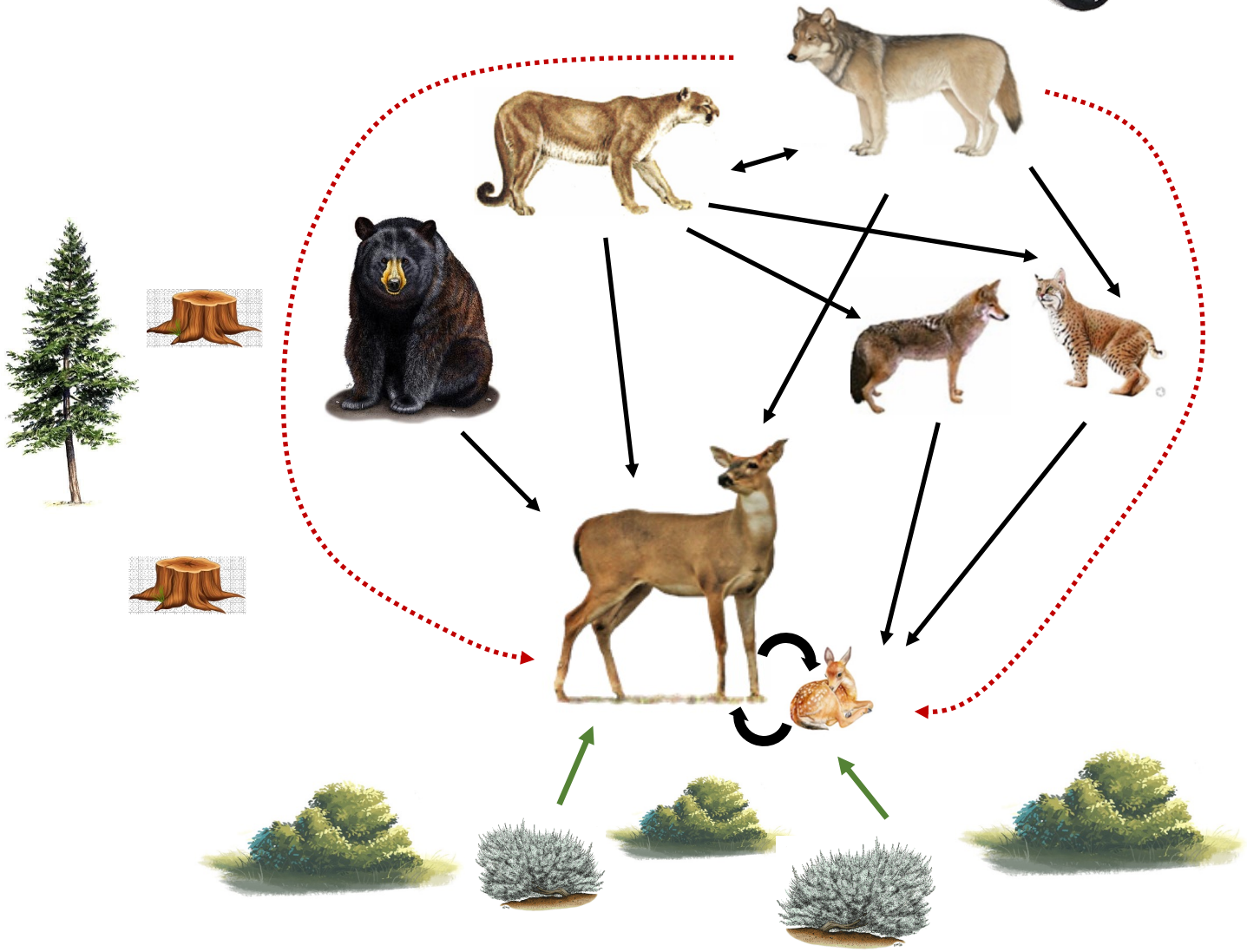


Images: Roger Hall and Melinda Josie

Complex food web dynamics

25% of forested area lost since 2000 (Hansen et al. 2013)

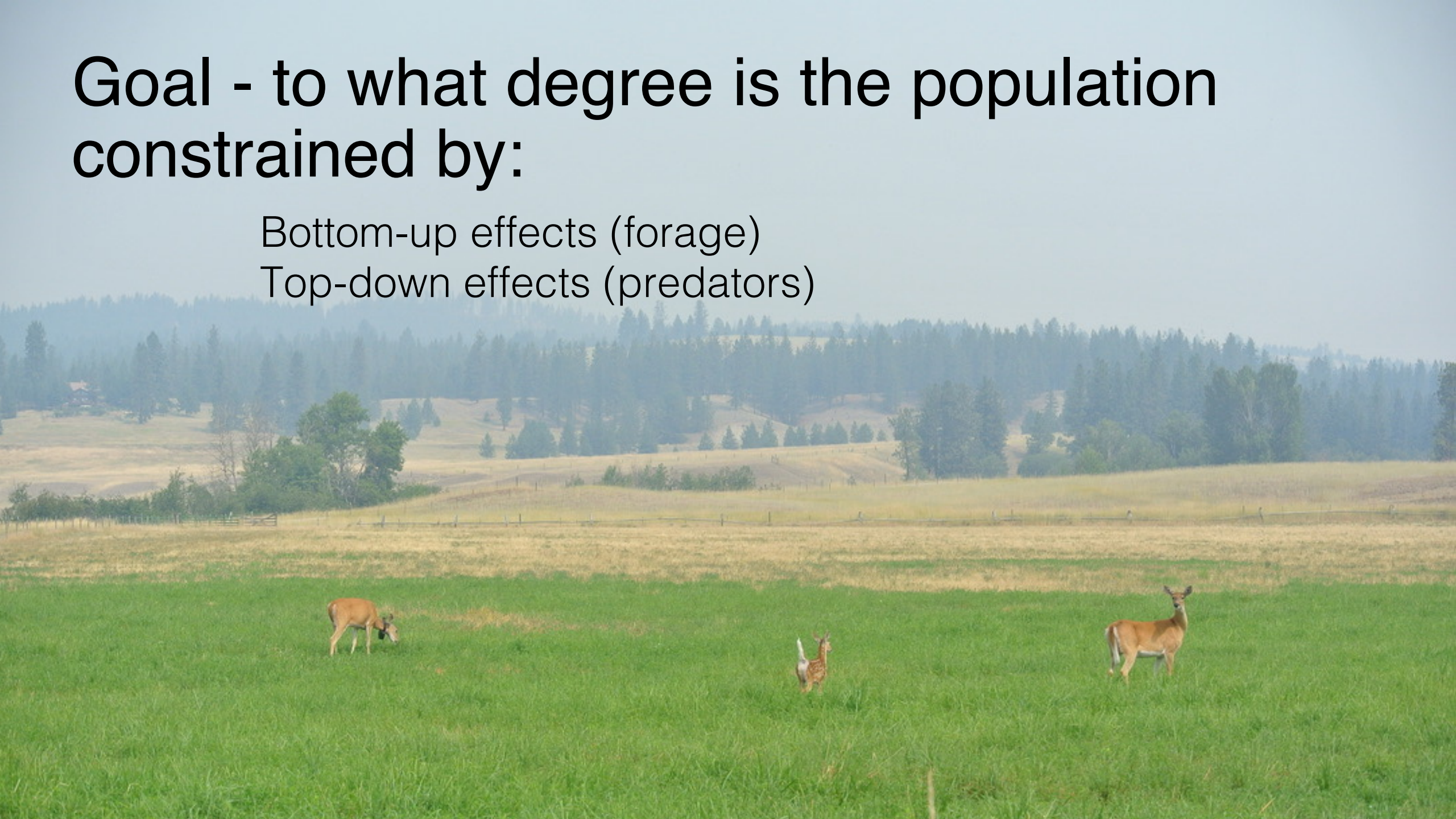
Human influence



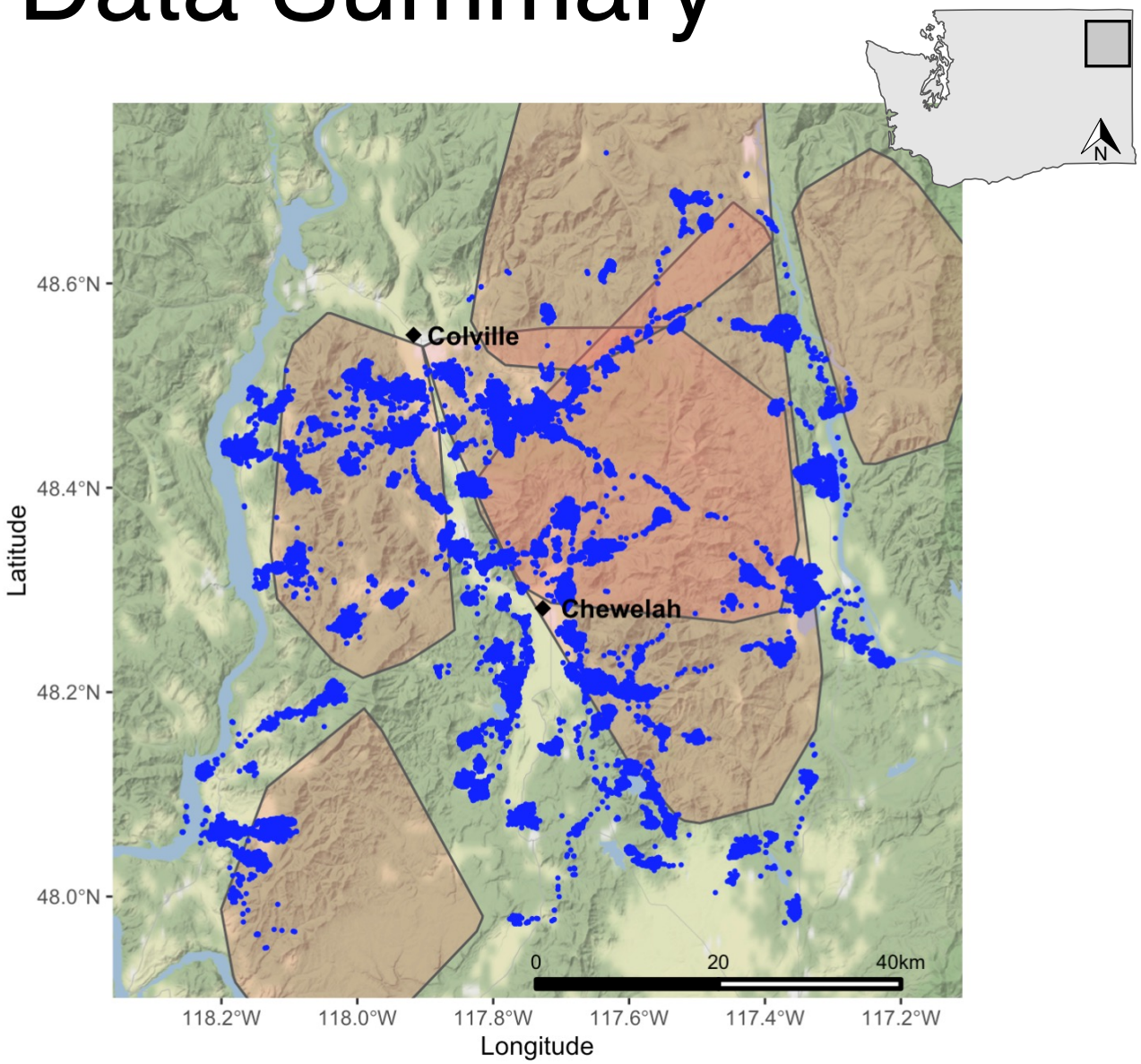
Images: Roger Hall and Melinda Josie

Goal - to what degree is the population constrained by:

Bottom-up effects (forage)
Top-down effects (predators)



Data Summary



- Deer locations
- Wolf packs (2019)

Data collected Jan 2017 – June 2021, no hemorrhagic disease outbreak

131 adult females
266 'deer-years'
Annual Survival: 73%
(CIs: 67% – 80%)
Pregnancy: 96% (94%- 98%)
Fetal rate: 1.6 fawns per litter

150 fawns
Annual Survival: 36%
(CIs:28% – 46%)

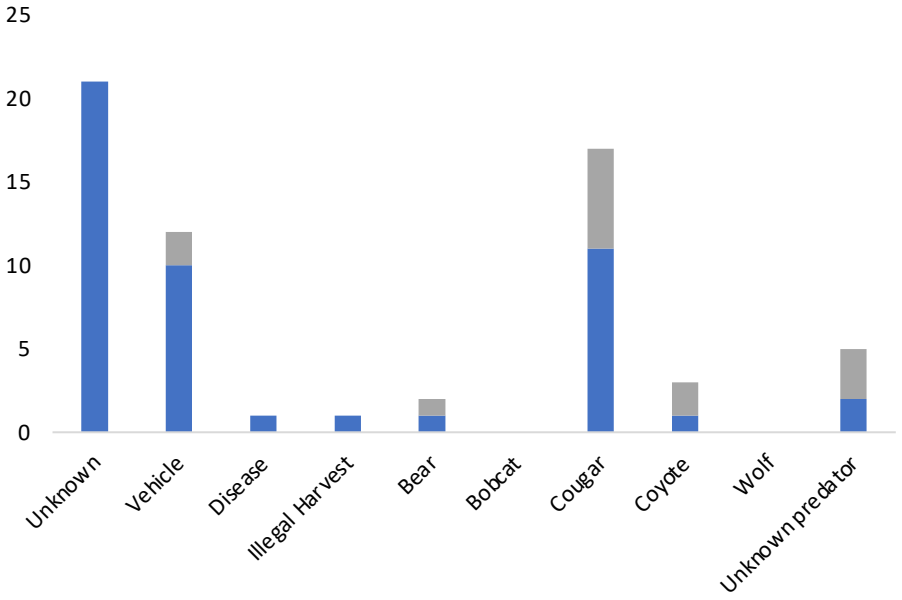
<u>Mortalities</u>
46 adult females
72 fawns

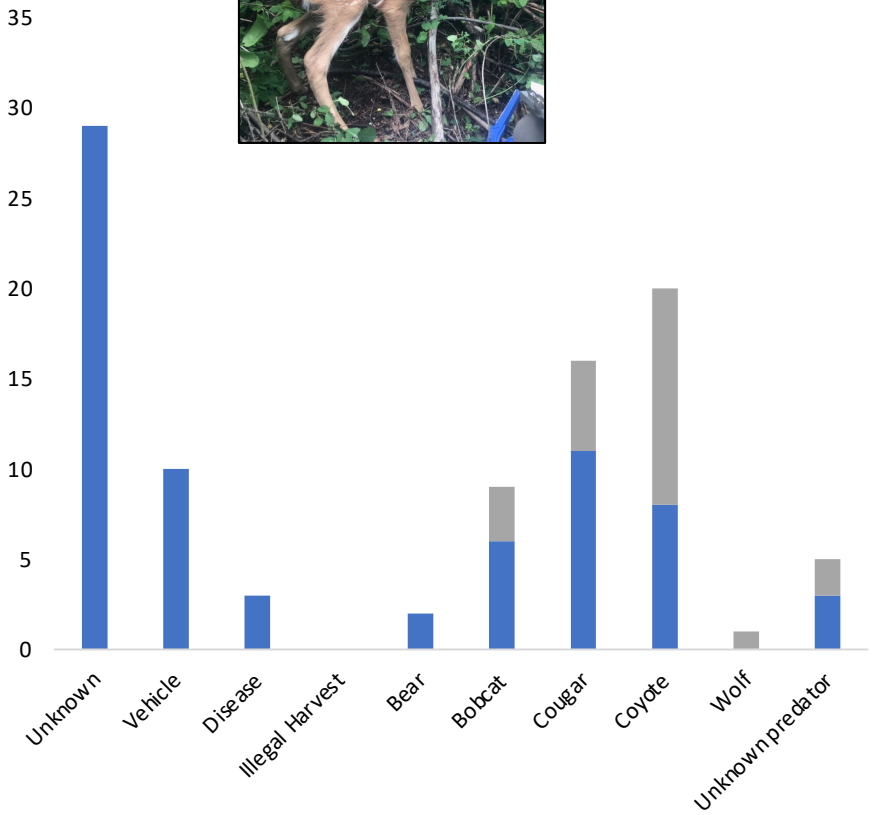
Causes of mortality

Data collected Jan 2017 – June 2021,
no hemorrhagic disease outbreak

46 adult female mortalities

72 fawn mortalities





Confirmed

Unconfirmed but possible

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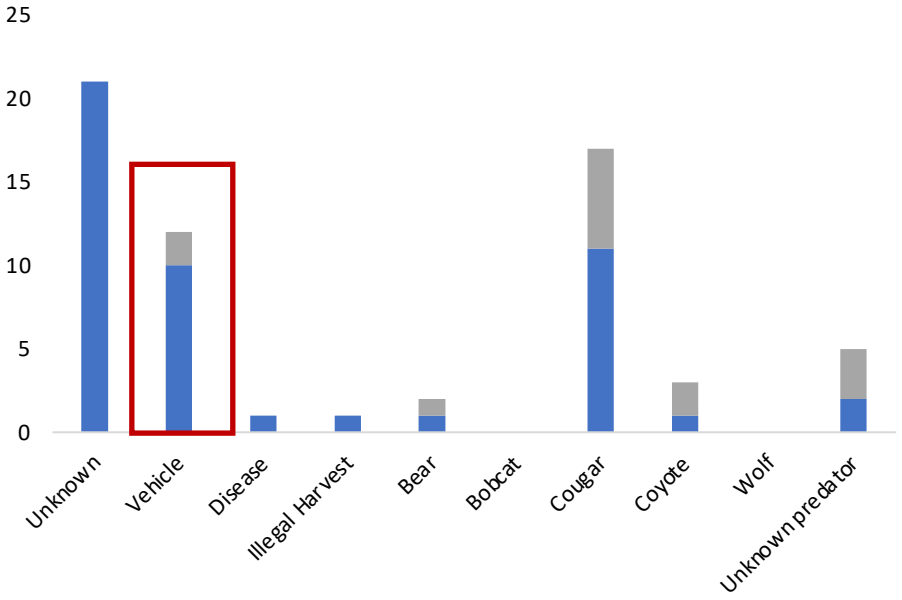

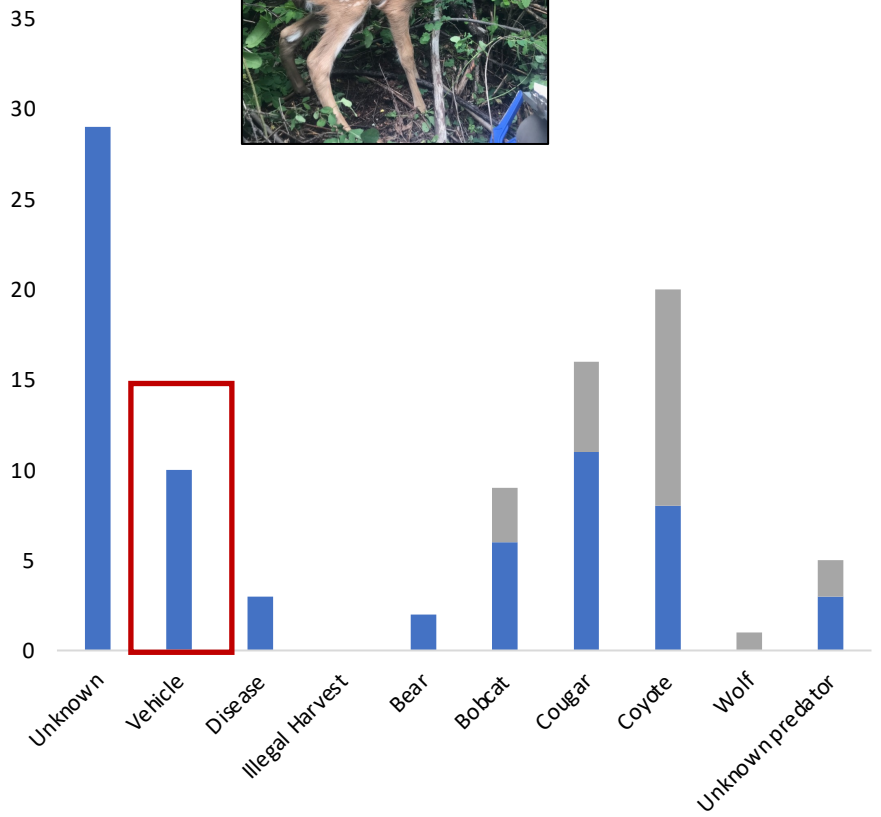

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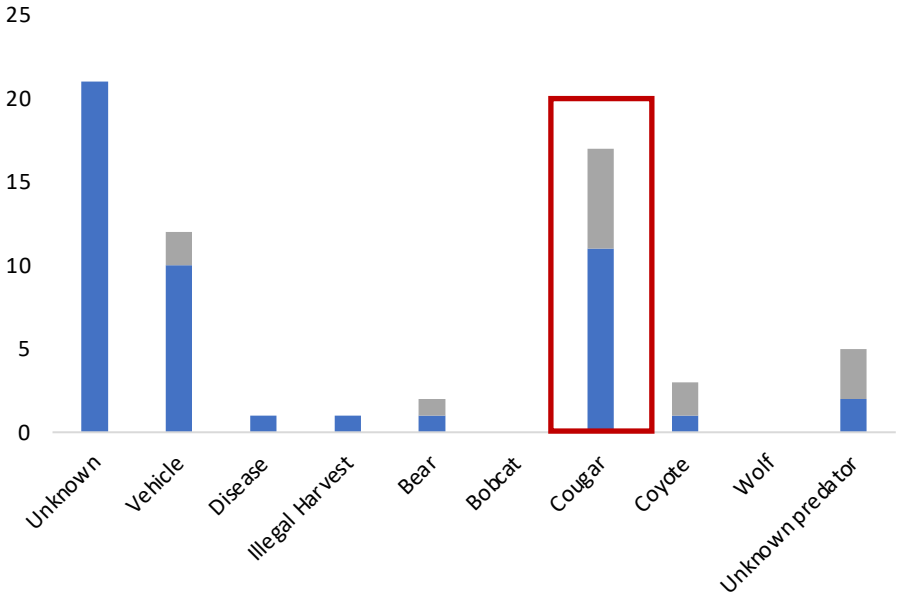

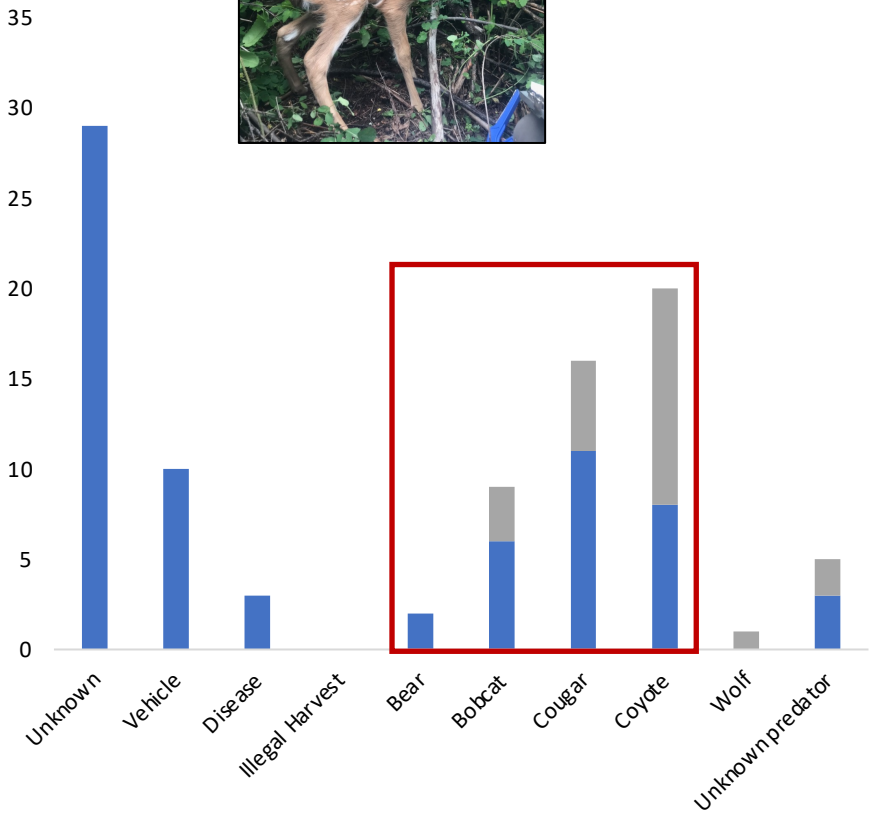

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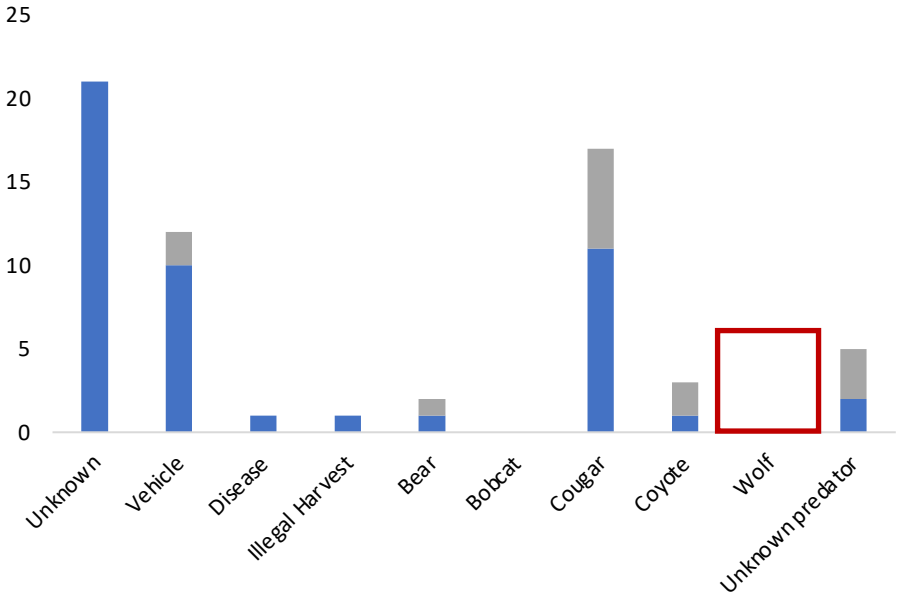

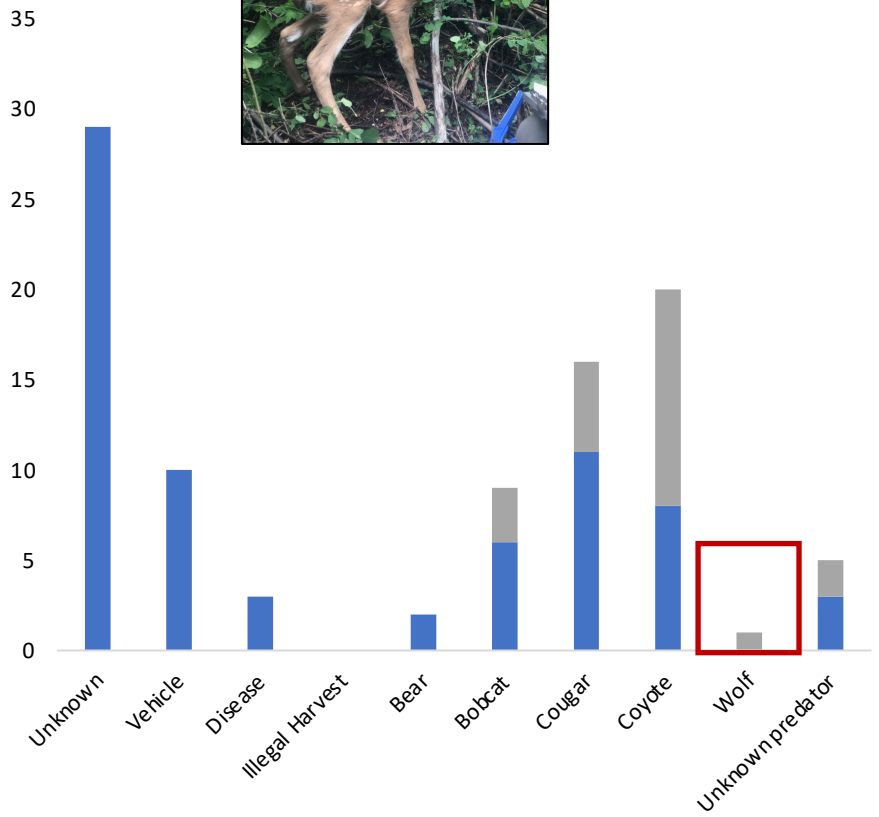

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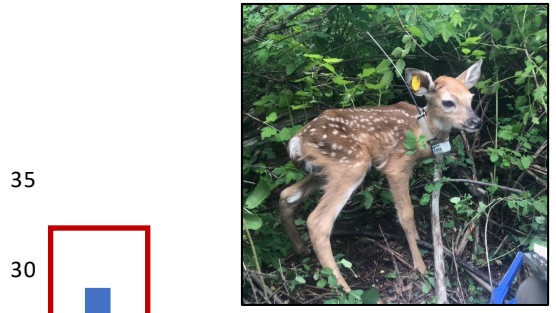

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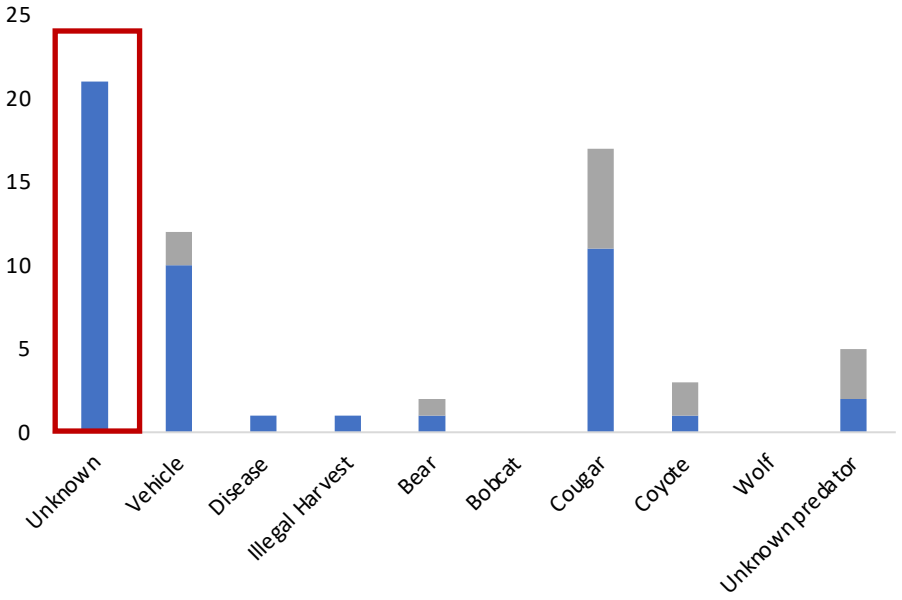

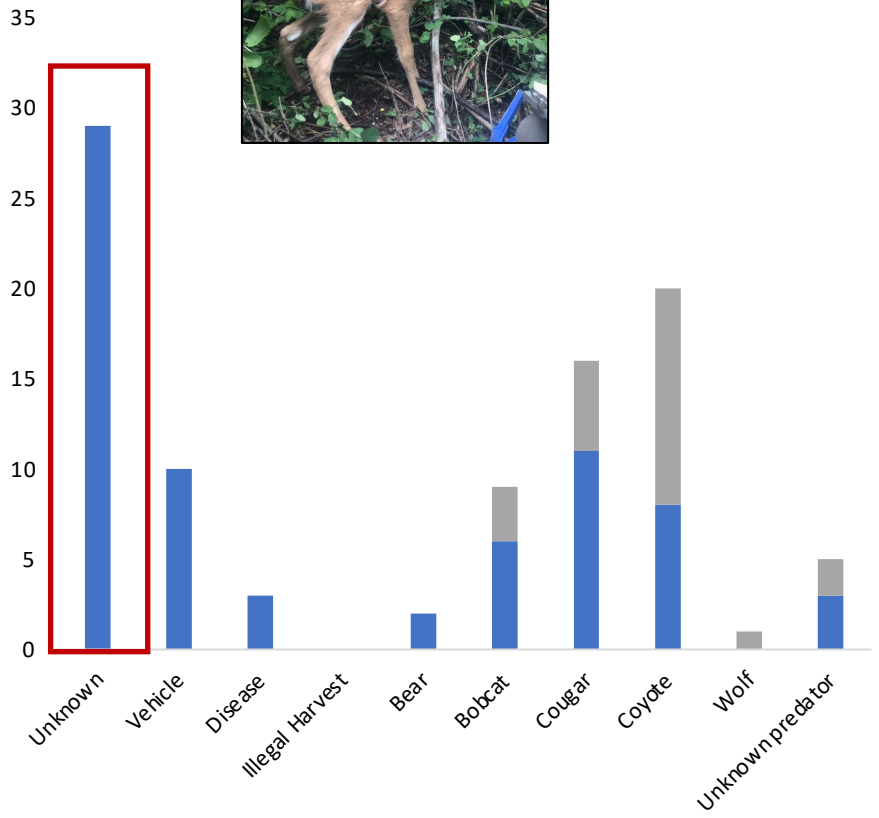

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Population Model Framework

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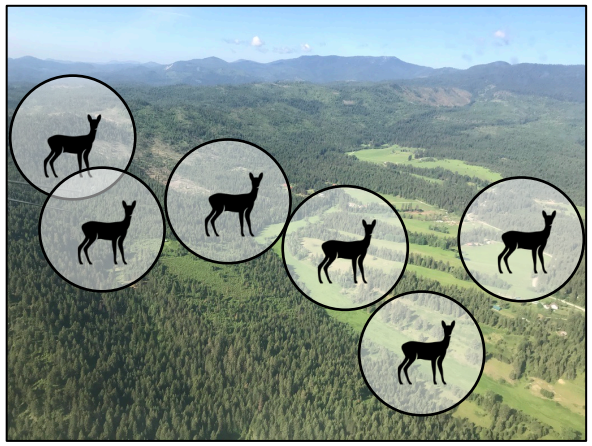
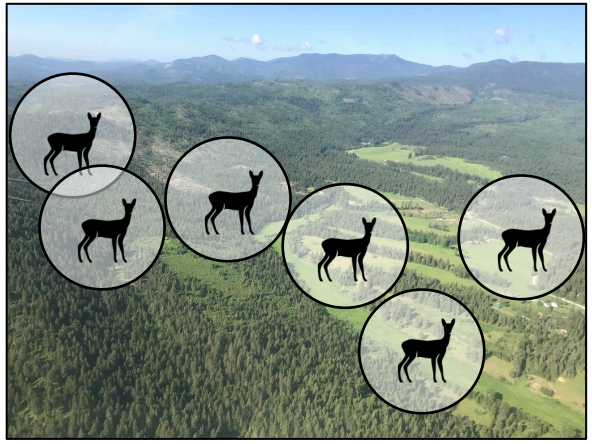


Cox Proportional Hazard

- Survival ~ wolf + cougar + bobcat + coyote + forage proxy + distance to roads + winter severity
- Seasonal models for fawns and adult females

Population Model Framework

+



Reproduction

Photo: Jeff McElhinney

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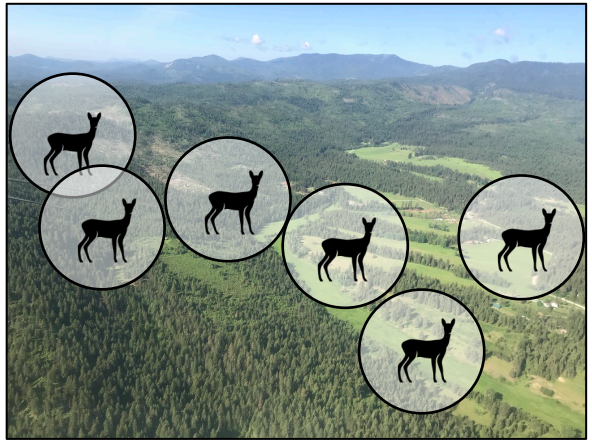

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Population growth (λ)

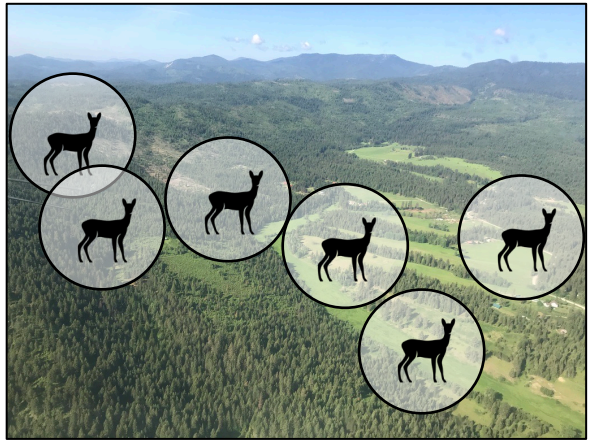
$$\begin{bmatrix} 0 & P_y * F_y * S_y & P_a * F_a * S_a \\ S_f & 0 & 0 \\ 0 & S_y & S_a \end{bmatrix}$$

S =survival
P = pregnancy rate
F = female fawns per pregnancy

f = fawns
y = yearling
a = adult female

Population Model Framework

+



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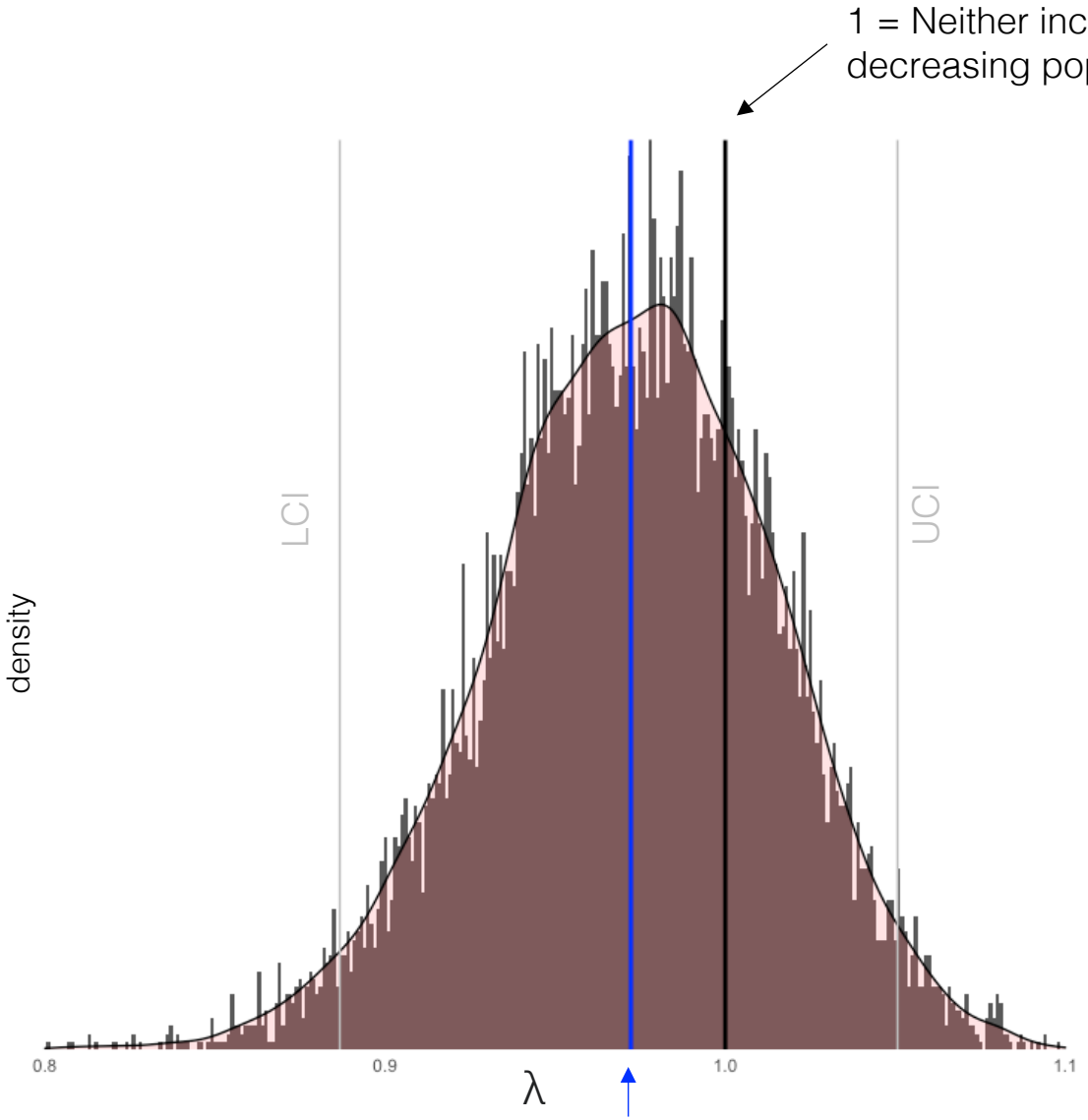
simulate changes

Population Growth



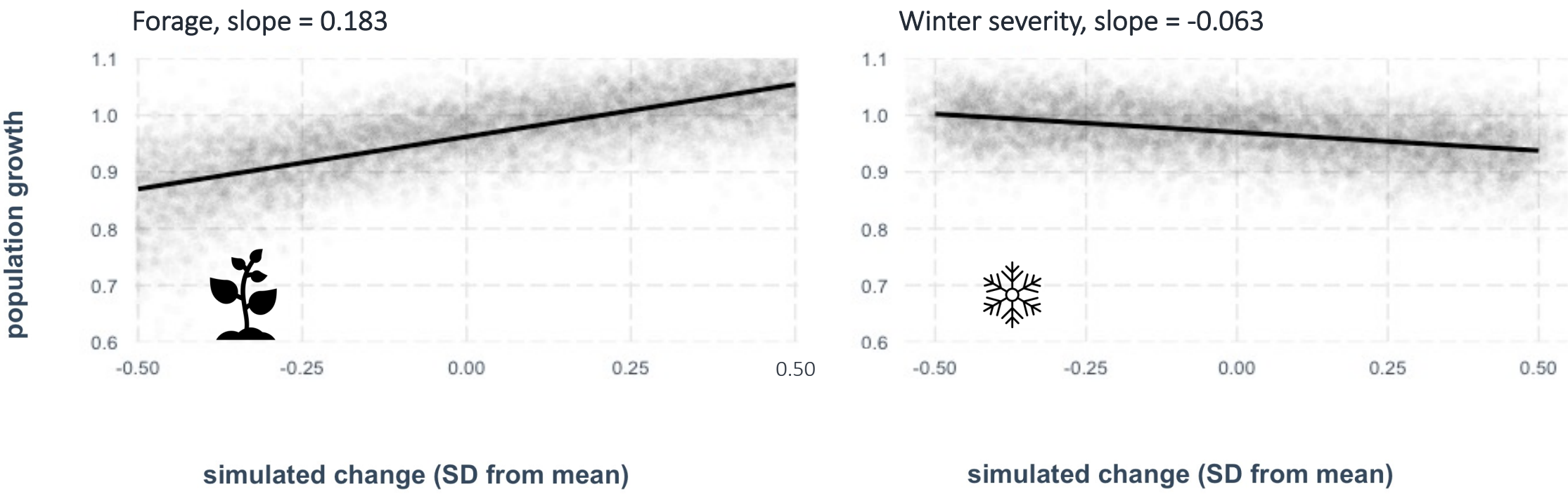
Mean population growth = 0.97

(95% CIs: 0.88, 1.05)

Stochastic model with 10,000 repetitions

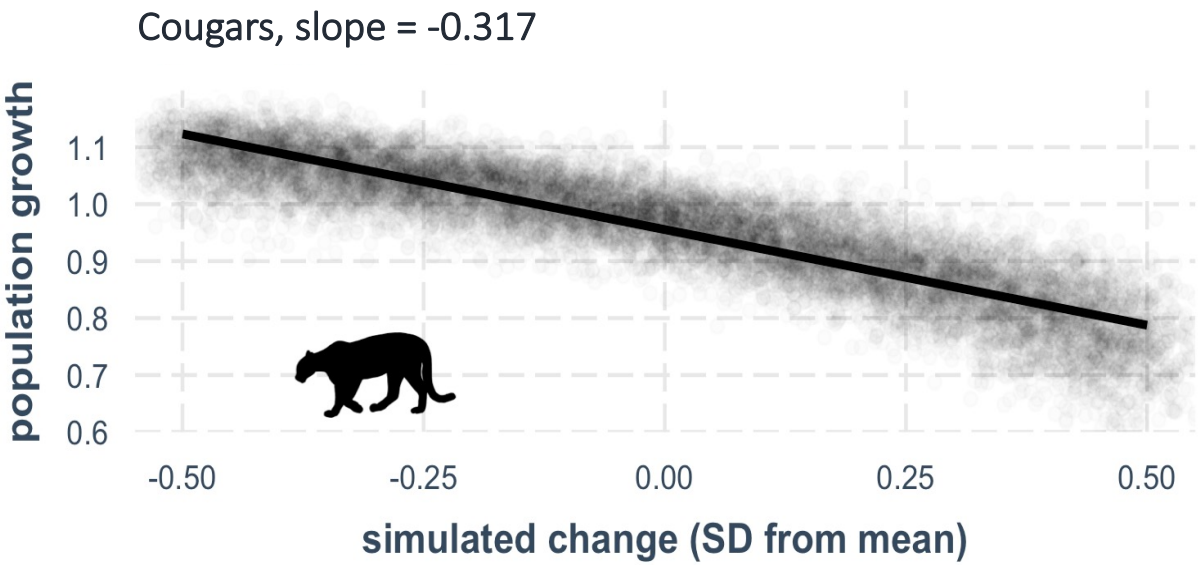
Population Simulations

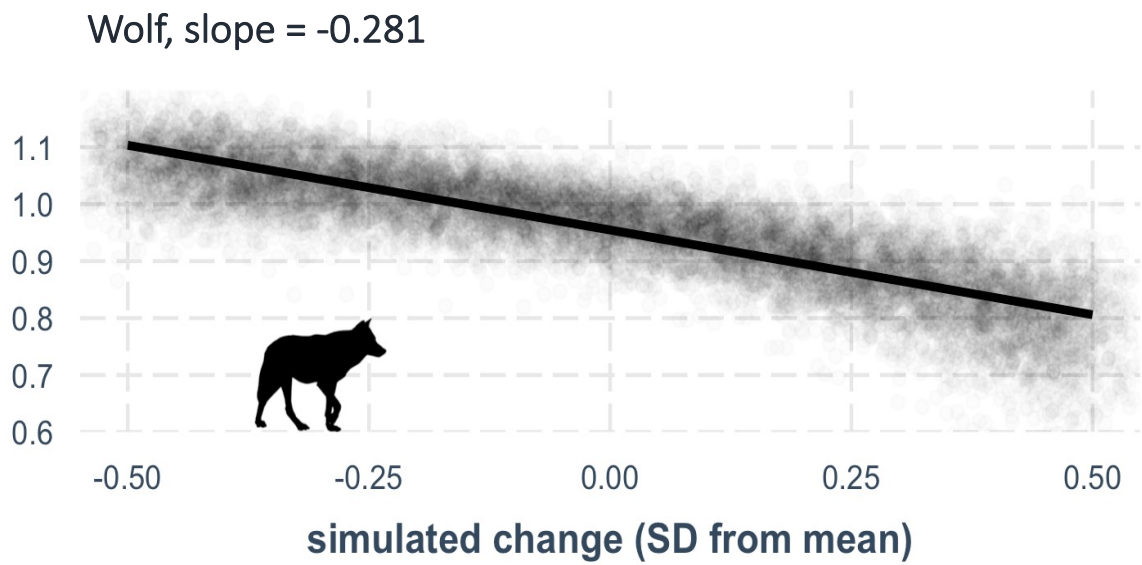
✓ Bottom-up: Strength of effect likely underestimated



Population Simulations

✓ Top-Down: Apex predators limit population



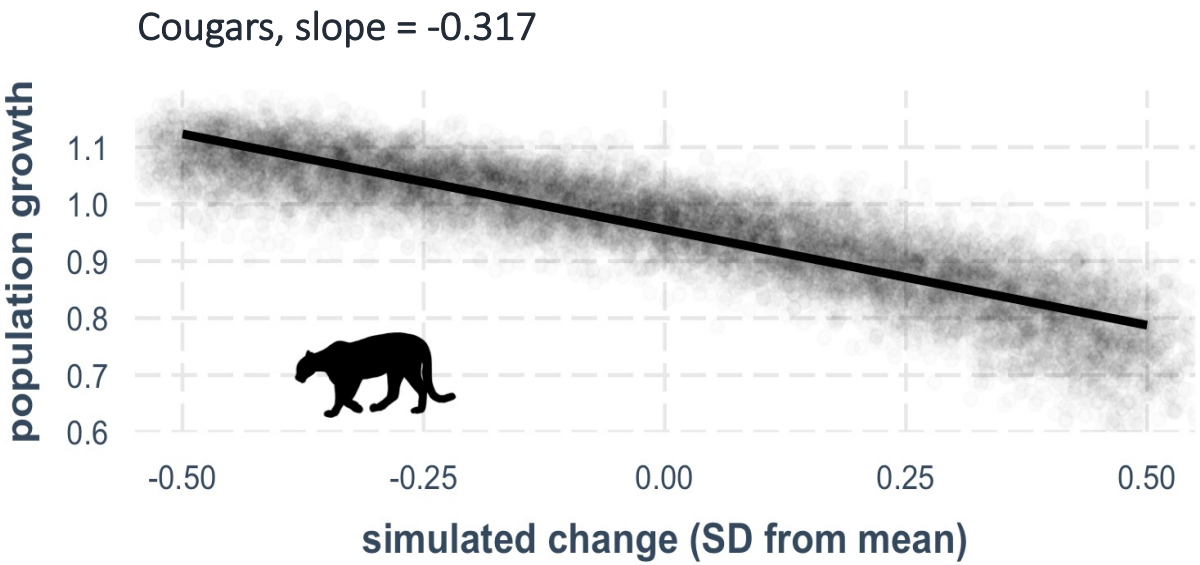


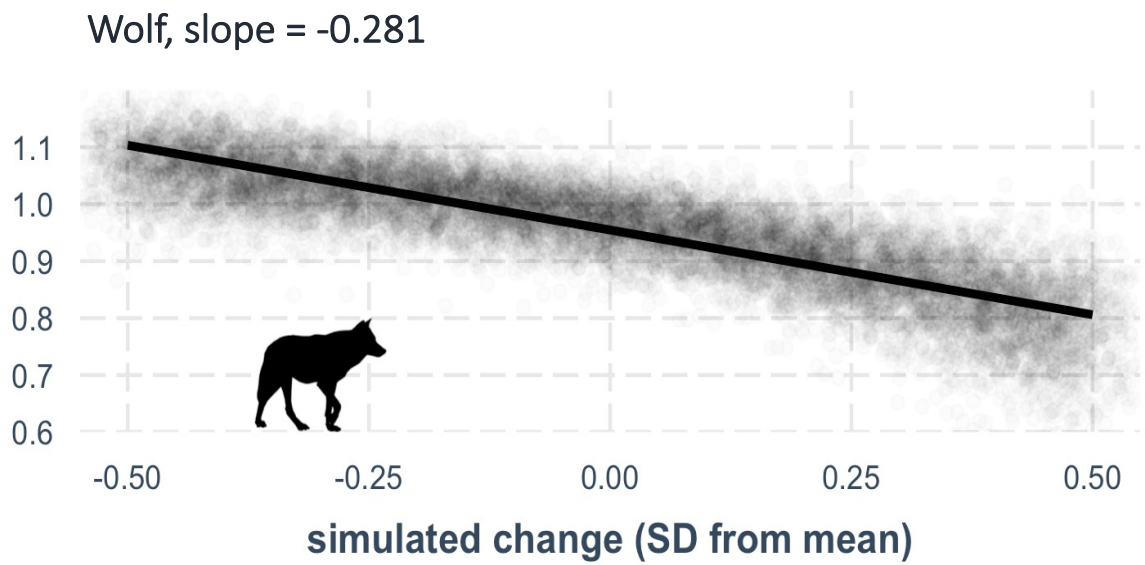
Silhouettes: Gabriela Palomo-Munoz (cougar), Margot Michaud (wolf)

Population Simulations

Top-Down: Apex predators limit population

Bobcats and coyotes did not limit population





Silhouettes: Gabriela Palomo-Munoz (cougar), Margot Michaud (wolf)

Findings

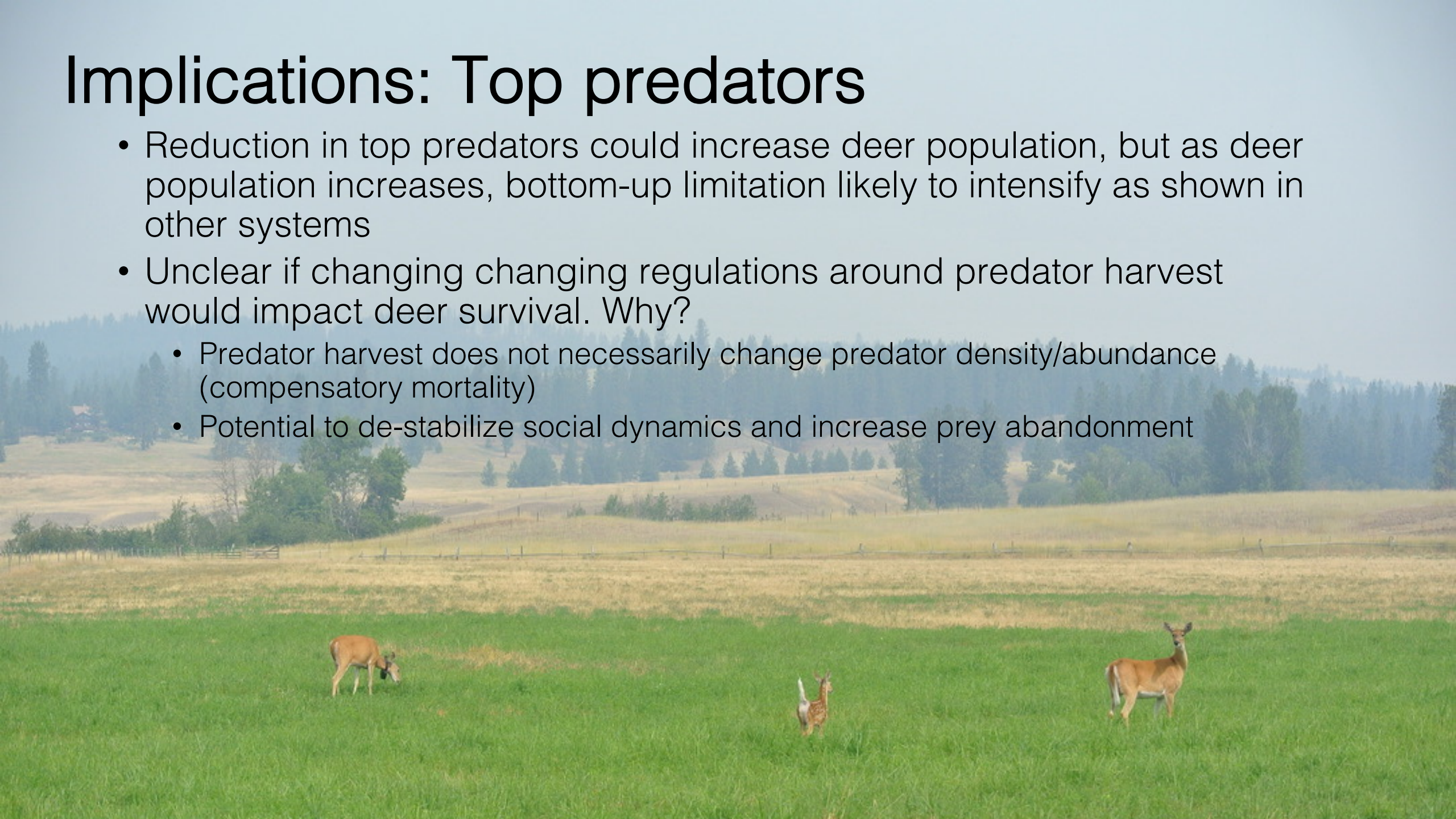
- Co-limitation by bottom-up factors and top predators (cougars and wolves)
- We did not detect an effect of meso-predators (bobcats and coyotes)
- Winters more severe than average over course of study
- Land management practices can influence population potential

Implications: Forage

- Improved forage could increase deer population, but nutrition is complex, and we could only consider a very coarse proxy
- Increase in early seral habitat has supported growing white-tailed deer populations elsewhere

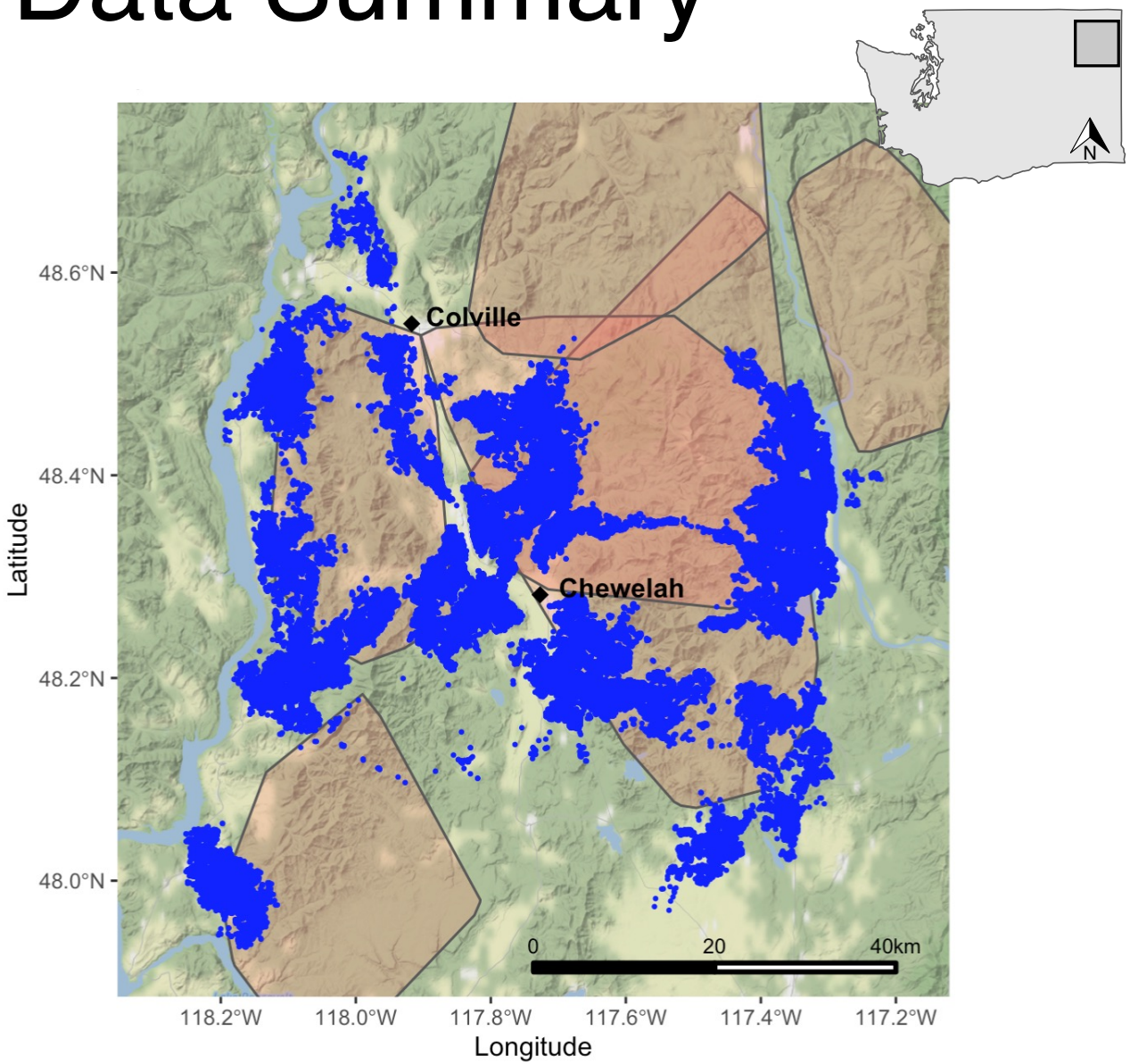
Implications: Top predators

- Reduction in top predators could increase deer population, but as deer population increases, bottom-up limitation likely to intensify as shown in other systems
- Unclear if changing changing regulations around predator harvest would impact deer survival. Why?
  - Predator harvest does not necessarily change predator density/abundance (compensatory mortality)
  - Potential to de-stabilize social dynamics and increase prey abandonment



Elk population dynamics

Data Summary



- Elk locations
- Wolf packs (2019)

63 adult females
226 ‘elk years’
Annual Survival: 93%
(CIs: 90%-95%)
Pregnancy: 91%
(CIs: 87% - 95%)

30 calves
Annual Survival: 63%
(CIs: 54% - 72%)

<u>Mortalities</u>
14 adult females
16 calves

Elk population dynamics

- Matrix model
- Population **growing** by 10% (4% – 15%) per year
- Population growth most sensitive to **adult female survival**

Elk population dynamics

- Matrix model
- Population **growing** by 10% (4% – 15%) per year
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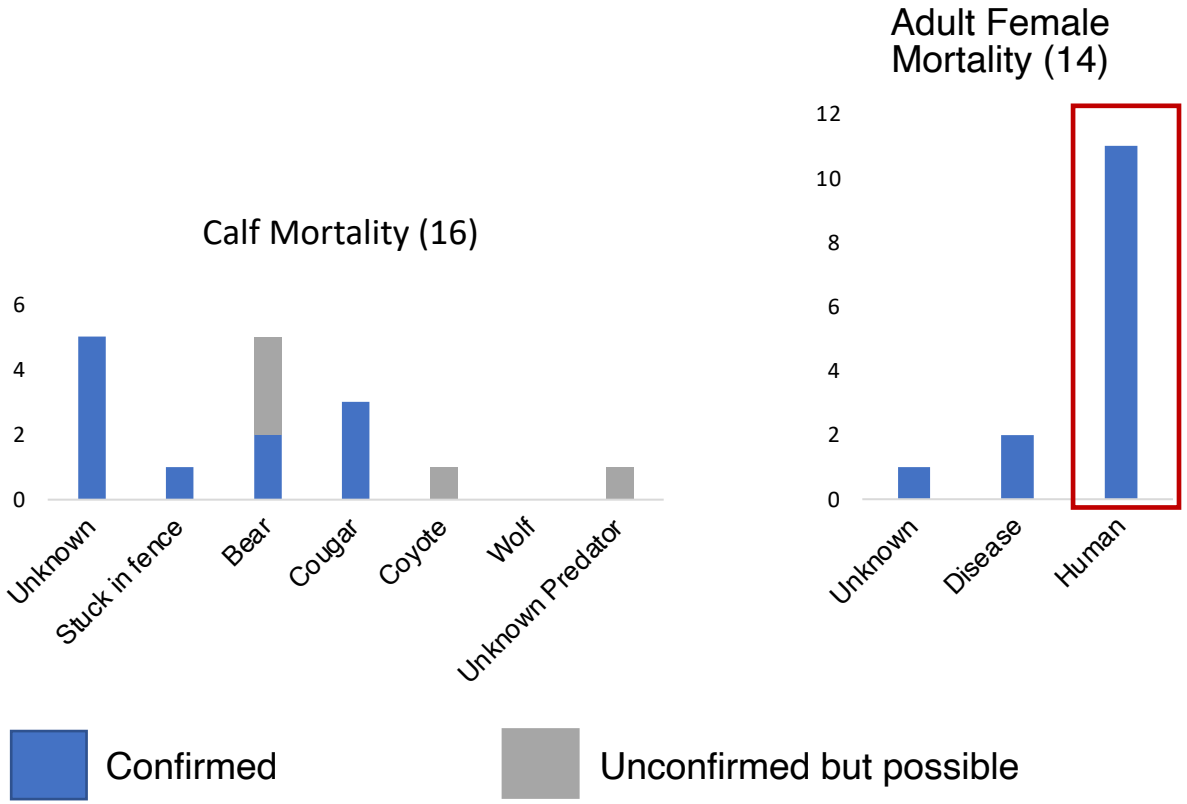

Thank you

Wildlife Restoration

RMEF

Spokane Tribe of Indians

Kalispel Tribe of Indians

School of Environmental and Forest Sciences
University of Washington
College of the Environment

Washington Department of Fish and Wildlife

Predator-Prey Project