Exploring Cougar Restoration in the Northeast

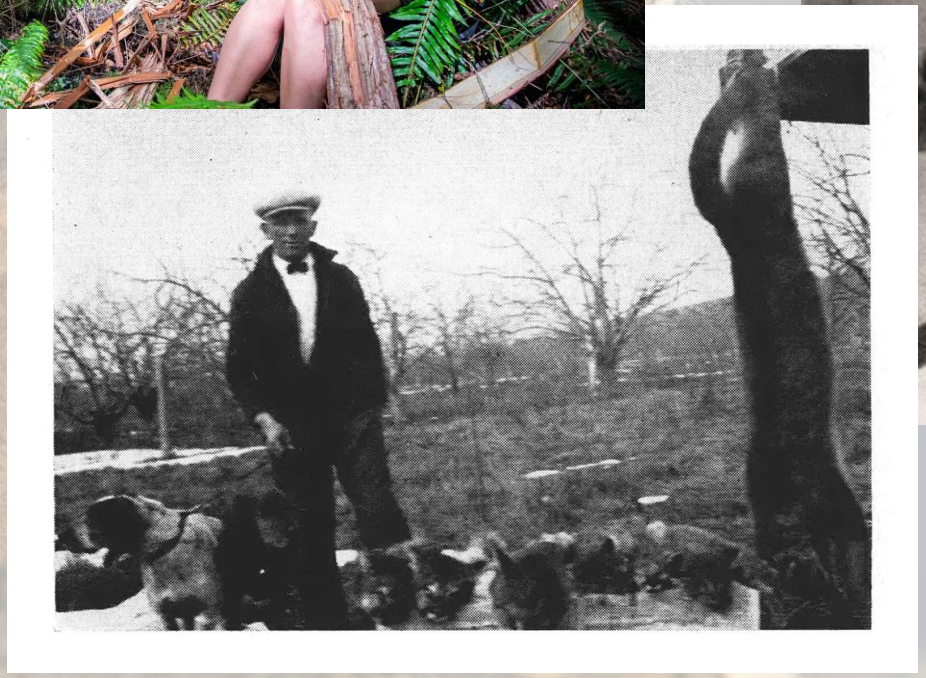
Cougar Research Collaborative

Who makes up the CRC?

- Three conservation non-profits
  - Panthera
    - Mark Elbroch, Axel Moehrenschlager, Rana Bayrakcismith, Emily Carrollo
  - Tompkins Conservation
    - Sawyer Downey, Tom Butler
  - Northeast Wilderness Trust
    - Tom Butler, Shelby Perry
- Three university researchers:
  - The Ohio State University
    - Jeremy Bruskotter and Ben Ghasemi
  - Michigan Technological University
    - John Vucetich

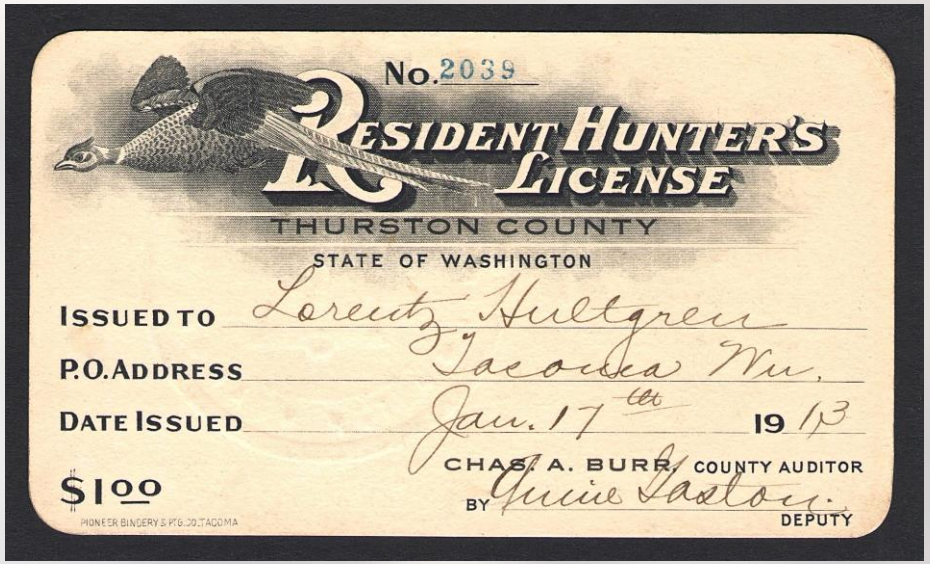
Who am I?

History of Northeast Wildlife Management

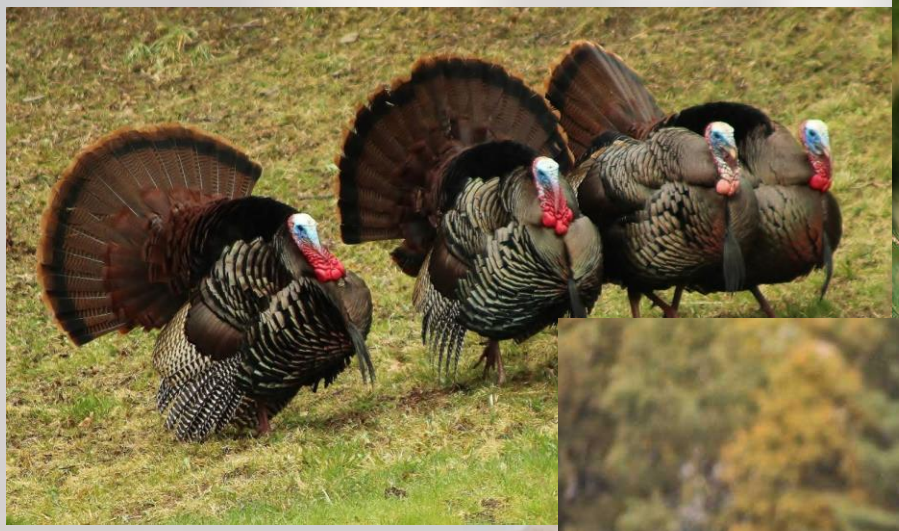


History of Northeast Wildlife Management

- First state wildlife agency established in Massachusetts in 1878; by 1900 17 states had established state wildlife agencies.
- First public federal lands established as early as 1832.
- Establishment of the North American Model of Wildlife Conservation practices and ideologies late 19th century into the 20th century.

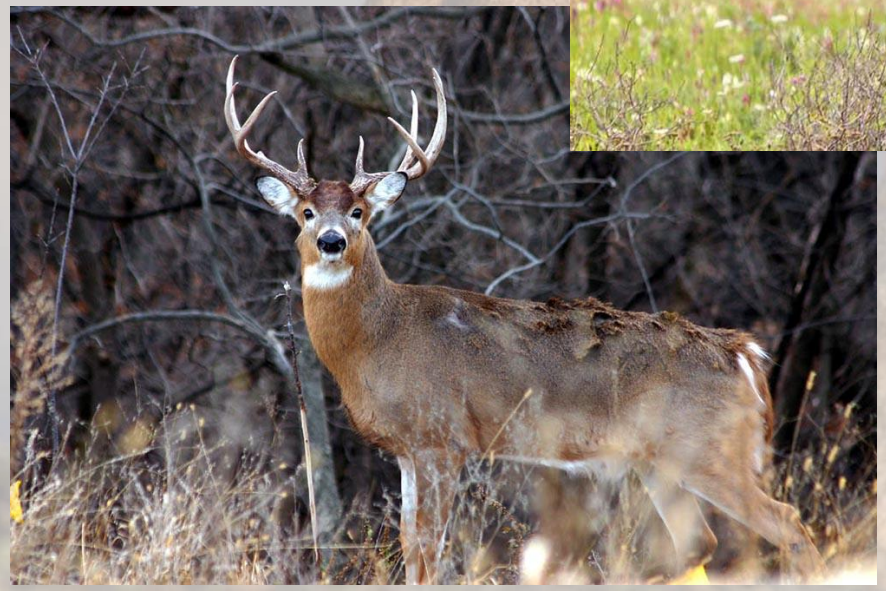


Northeast Reintroduction History



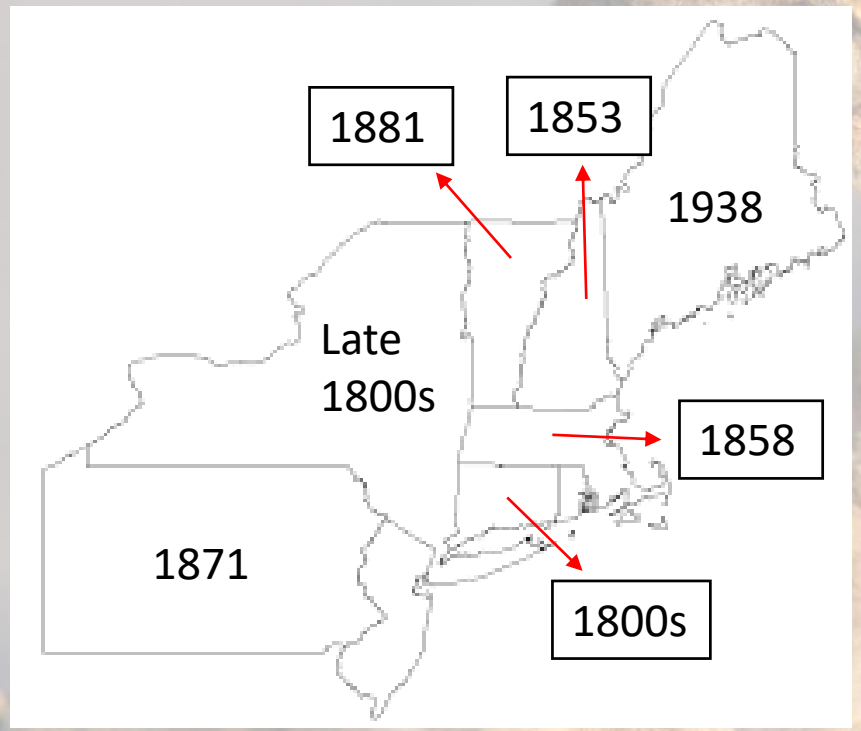






Cougar History in the East

- Why are they gone? Habitat loss, overharvest, and persecution.

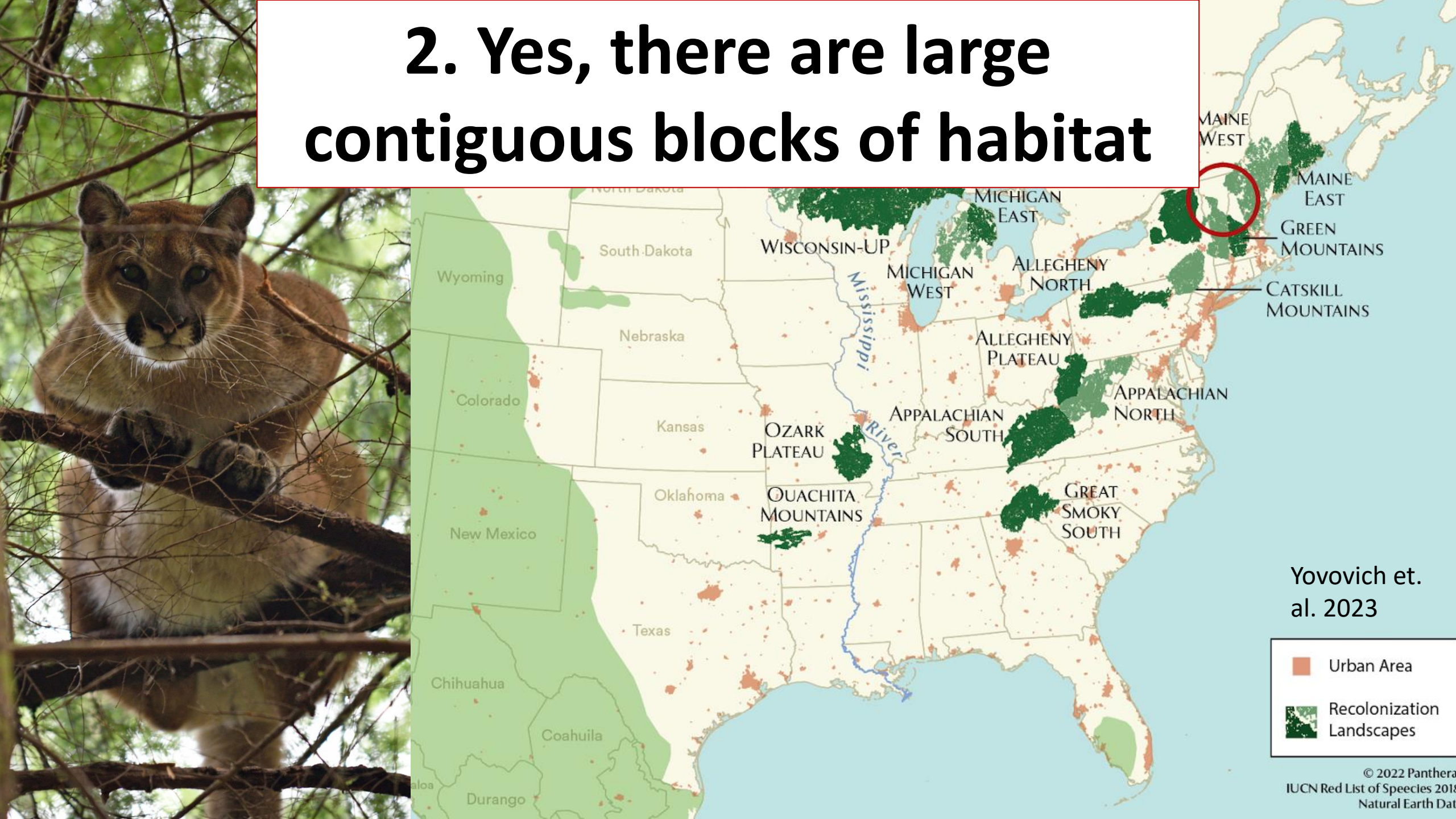


Aren’t Cougars Already Here?

1. Is their habitat in the East?
2. Are their large contiguous blocks?
3. When will they recolonize on their own?

1. Yes, there is habitat

2. Yes, there are large contiguous blocks of habitat



0 20 40 60 80 km
0 20 40 60 mi

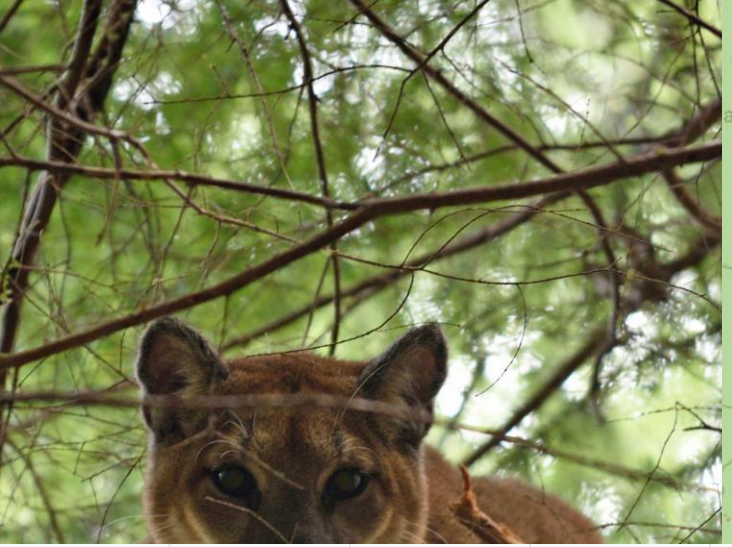
QC
NB
ME
VT
NH
NY
MA
CT
RI

8
14
13
5
2
7

Area Enlarged

PANTHERA

Interstate
Federal Highway
Urban Area



	LIVESTOCK	PUBLIC LANDS	PEOPLE	TOLERANCE	TOTAL SIZE
1	ME	MI, WI, MN	MN	NY, VT, MA	MI, WI, MN
2	MN	MN	MI, WI, MN	ME	MN
3	ME, NH, VT, MA	NY	NY	NY, PA	VA, WV, KY, TN
4	MI, WI, MN	NY, PA	NY, PA	ME, NH, VT, MA	ME, NH, VT, MA
5	VA, WV, KY, TN	NC, SC, GA, TN	MO	MN	NY
6	NY	MD, WV, VA	ME	NY	NY, PA
7	NC, SC, GA, TN	MO	MD, WV, VA	NC, SC, GA, TN	MD, WV, VA
8	NY, PA	ME, NH, VT, MA	OH, WV, PA	MI, WI, MN	NC, SC, GA, TN
9	NY, PA	VA, WV, KY, TN	NY, VT, MA	NY, PA	MO
10	NY, VT, MA	NY, VT, MA	ME, NH, VT, MA	MD, WV, VA	ME
11	MD, WV, VA	NY, PA	VA, WV, KY, TN	VA, WV, KY, TN	NY, PA
12	OH, WV, PA	ME	NY, PA	OH, WV, PA	OH, WV, PA
13	MO	OH, WV, PA	NC, SC, GA, TN	MO	NY, VT, MA

They are coming, right?

Agent-based modeling

- Where will they come from?
- When will they arrive in the East?
- What are the current impediments to recolonization?

University of Montana postdoc position

0 200 400 600 800 km

0 200 400 600 mi

Contributed Data
Study Area

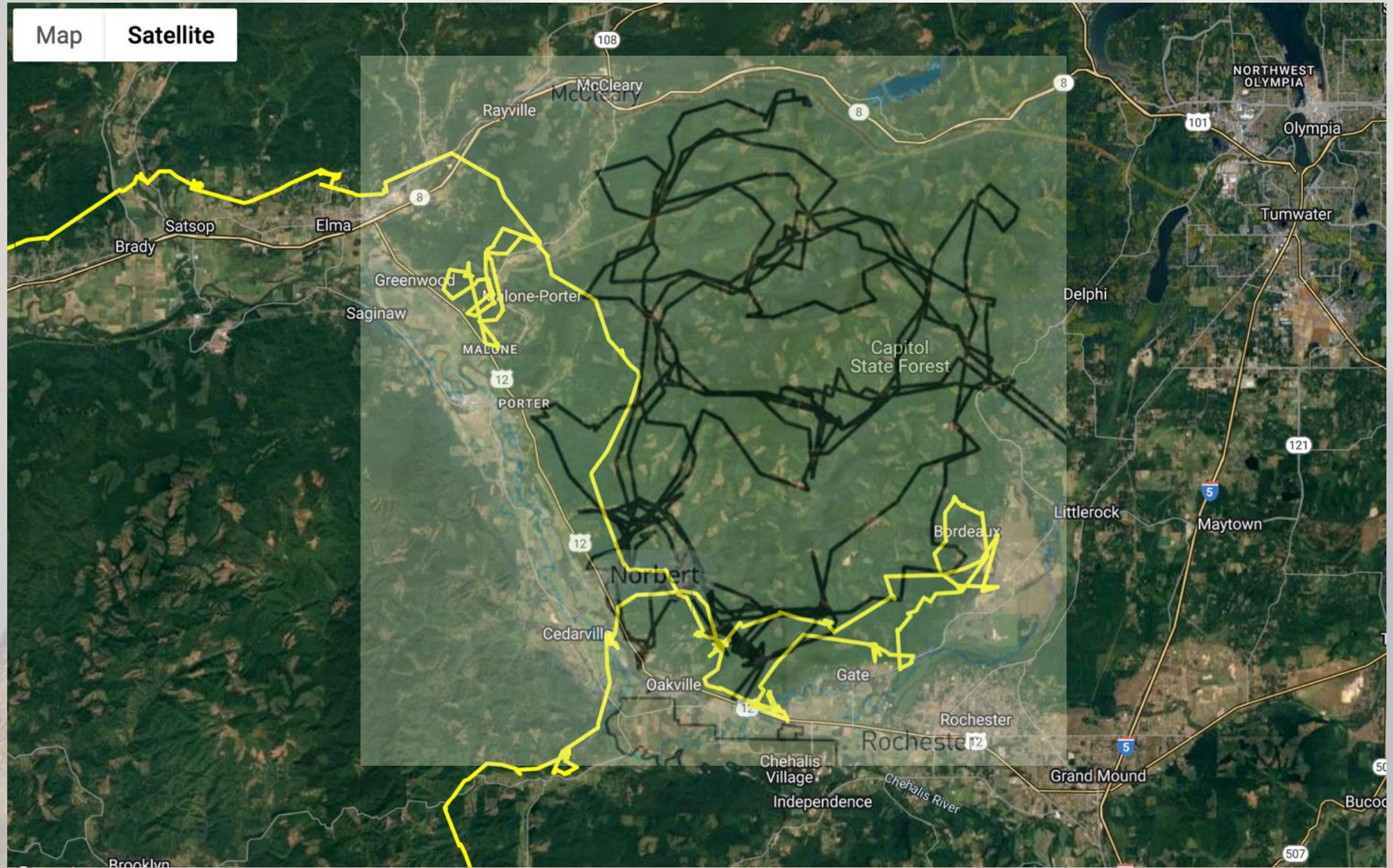
Historic Cougar Range

Current Cougar Range

Recolonization Landscapes

Potential Corridors

Residents vs Dispersers // Time steps for mapping dispersal



Models within models…
Probability of surviving a road crossing

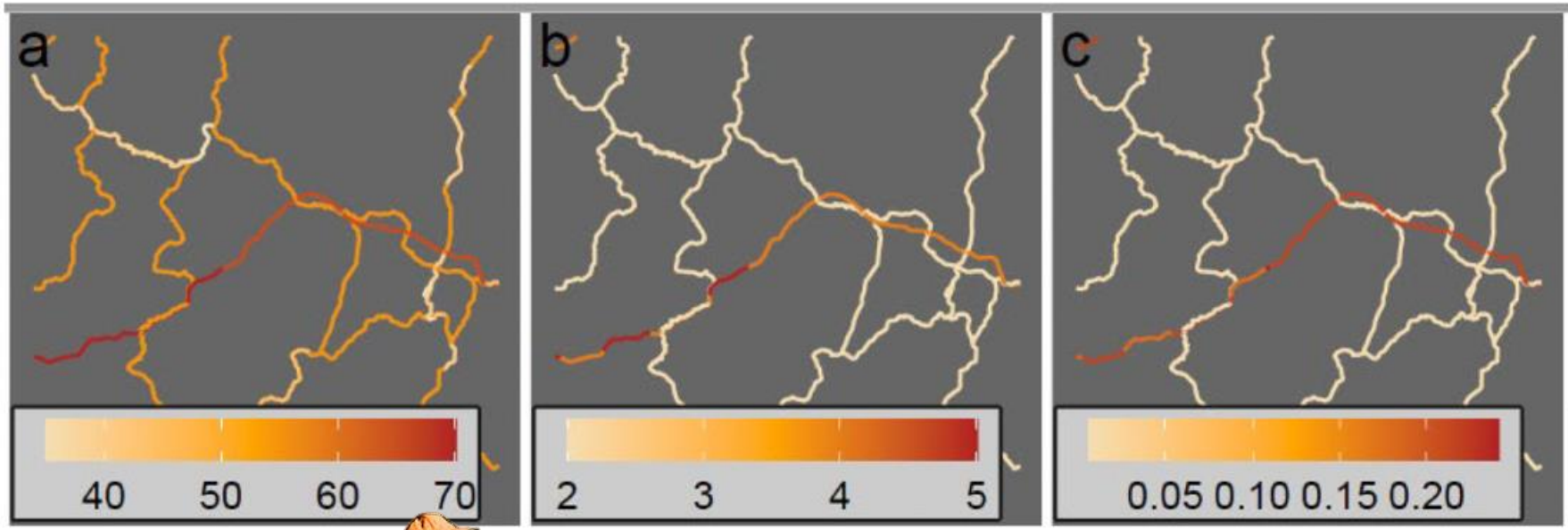
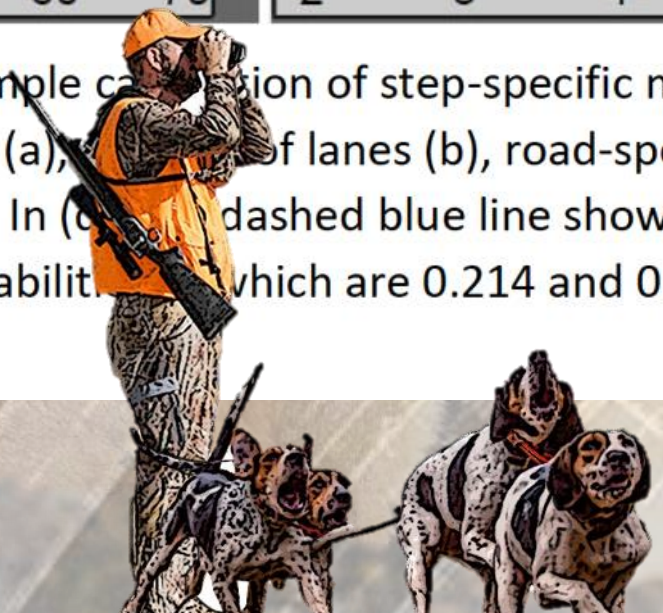


Figure S3. Example ca[illegible]ion of step-specific mortality probabilities from crossing roads, showing speed limit in miles per hour (a), [illegible]f lanes (b), road-specific mortality probability (c), and cell-specific mortality probability (d). In (d) the dashed blue line shows a hypothetical next step crossing two roads, the individual mortality probabilit[illegible]which are 0.214 and 0.007, yielding a cumulative probability of 1-((1-0.214)*(1-0.007)) = 0.22.

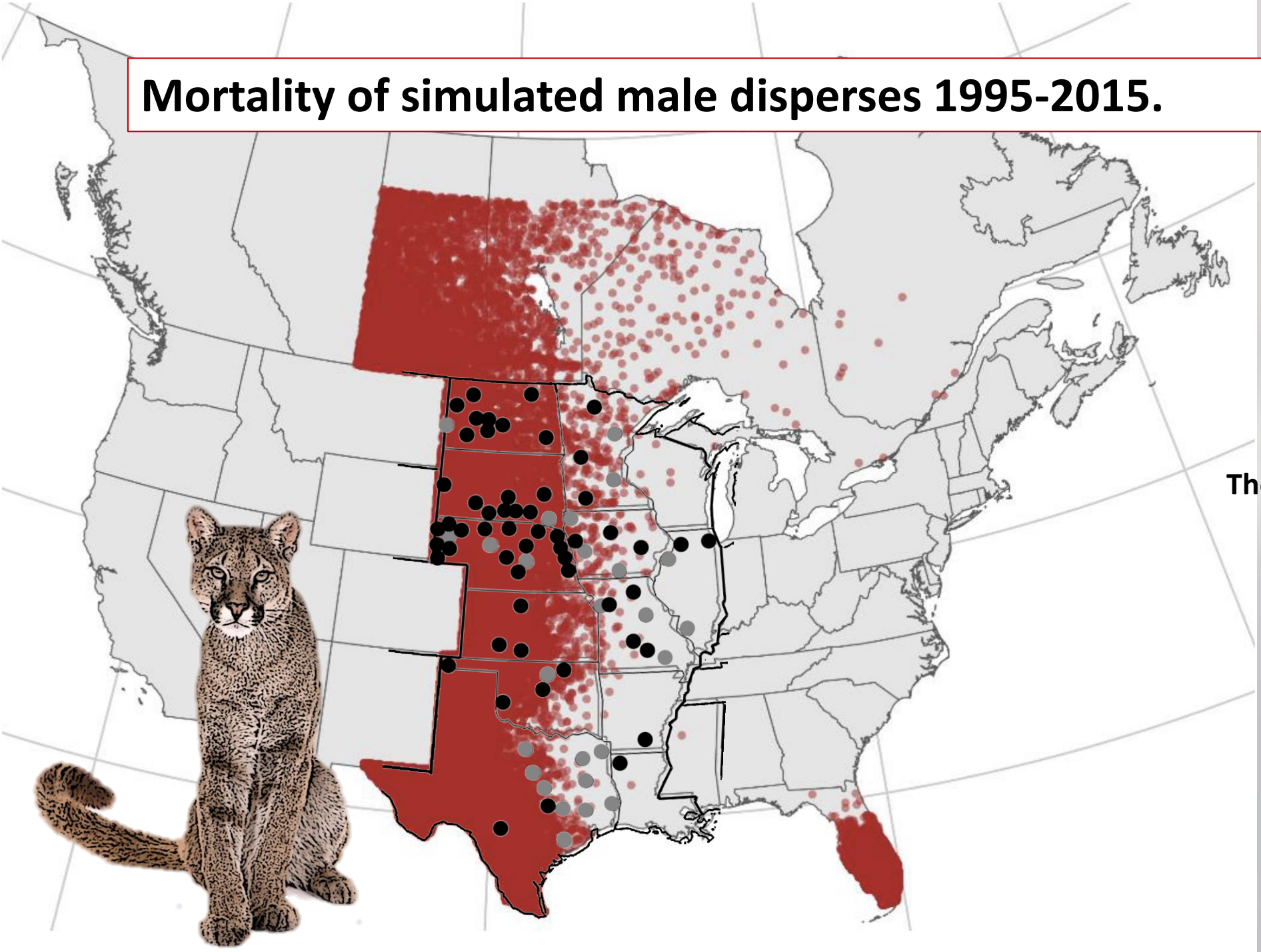
Causes of mortality

Anthropogenic

Natural



Mortality of simulated male disperses 1995-2015.



The “Connecticut Cat,” 2011

Mortality of simulated male disperses 1995-2015.

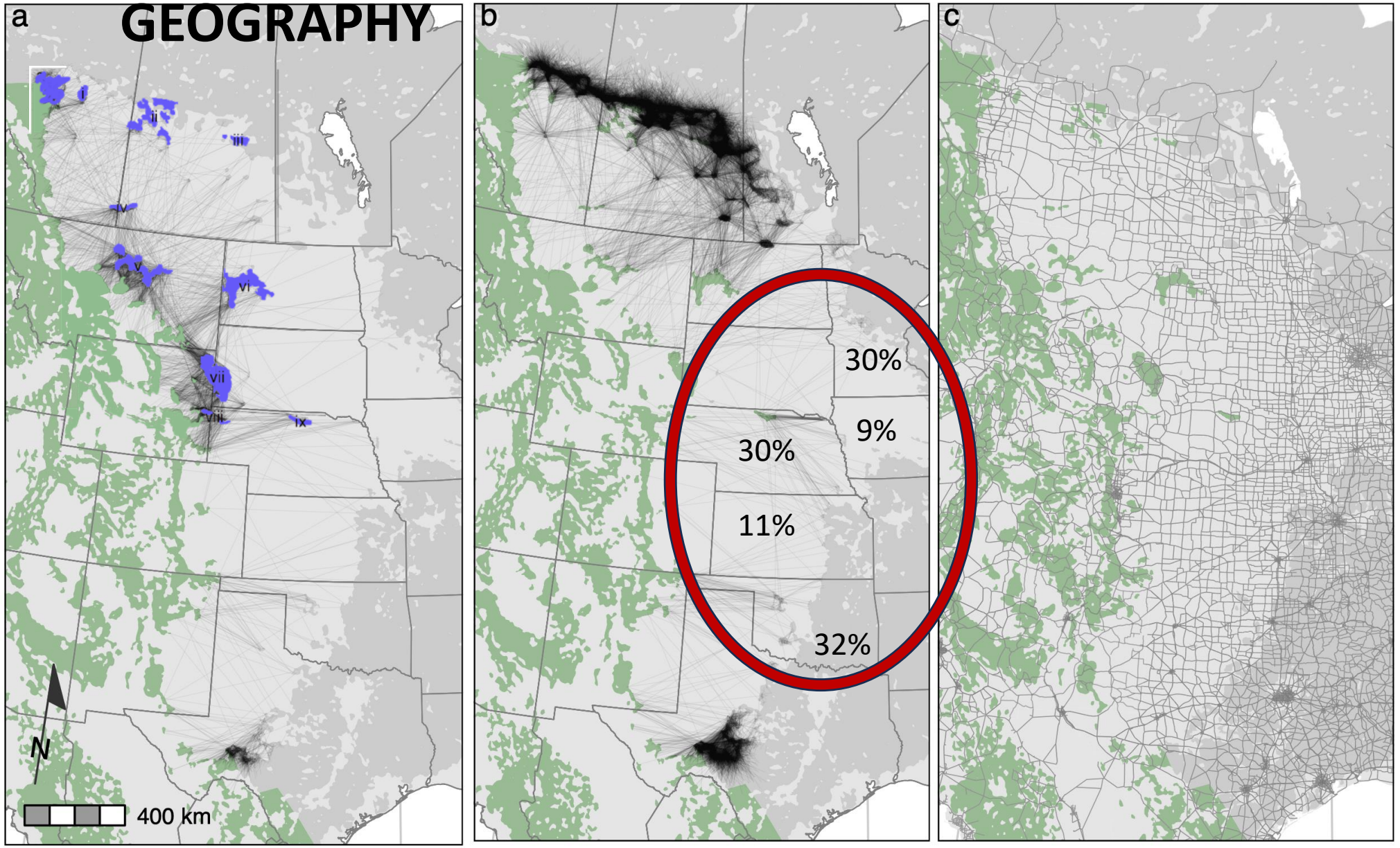
The “Connecticut Cat,” 2011

77 years forward

(1150 females*28,105 steps*150)

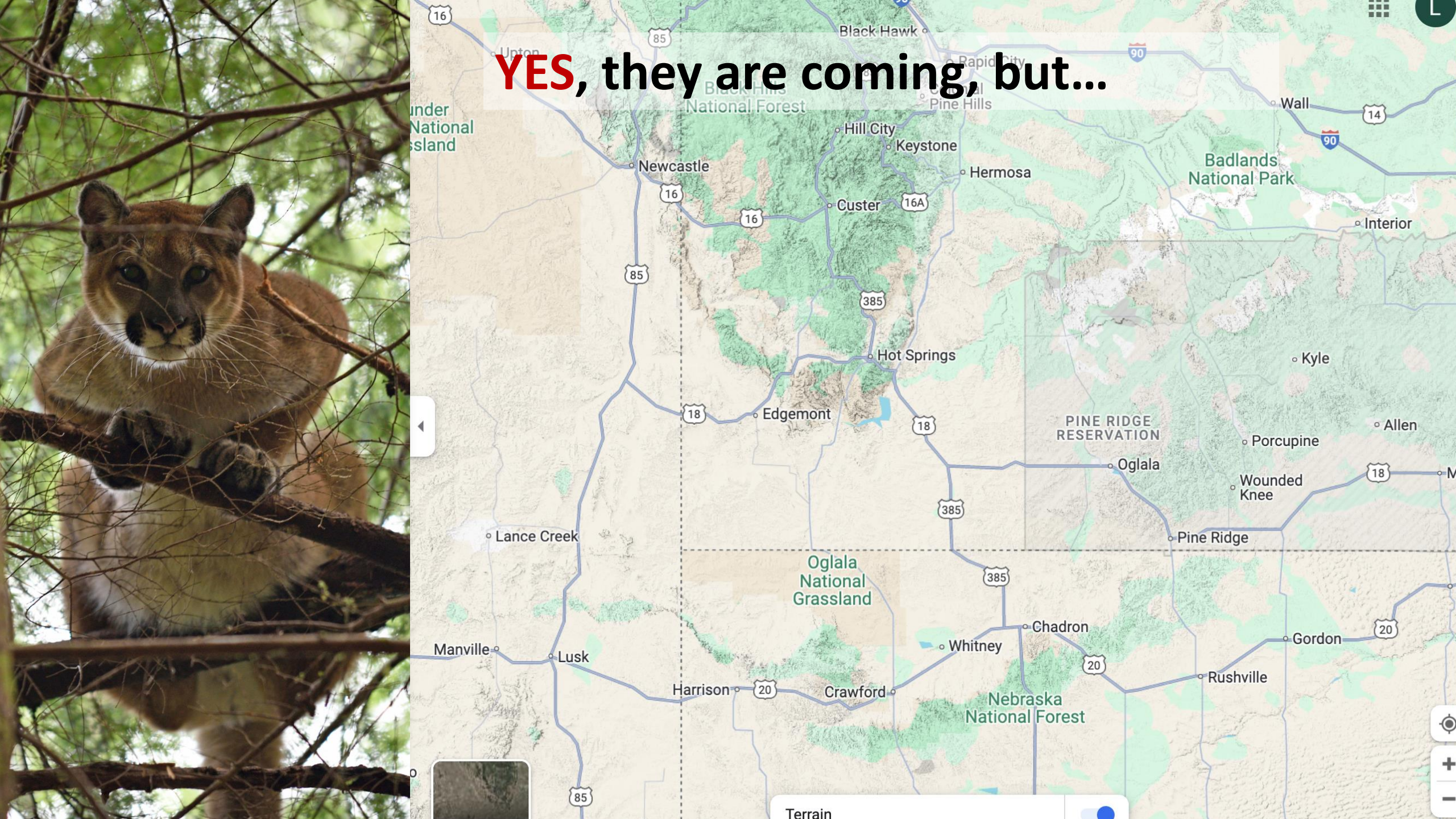
Hind casting: GEOGRAPHY

Eastern roads



86.3% of Eastward-moving females will likely die.

Outcome	
Harvest	35.4% (35.1 – 35.5%)
Roadkill	29.7% (29.5 - 29.9%)
Non-harvest mortality	11.9% (11.8 – 12.1%)
Natural mortality	11.1% (11.0 - 11.4%)
Established and reproduced	8.8% (8.7 – 8.9%)
Established without mate	2.9% (2.8 – 3.0%)


YES, they are coming, but…
Black Hawk
Rapid City
Black Hills National Forest
Pine Hills
Wall
Hill City
Keystone
Newcastle
Hermosa
Badlands National Park
Custer
Interior
Hot Springs
Kyle
Edgemont
PINE RIDGE RESERVATION
Allen
Porcupine
Oglala
Wounded Knee
Lance Creek
Pine Ridge
Oglala National Grassland
Chadron
Gordon
Manville
Lusk
Whitney
Rushville
Harrison
Crawford
Nebraska National Forest
Terrain

Investigating Social Tolerance through Survey Data

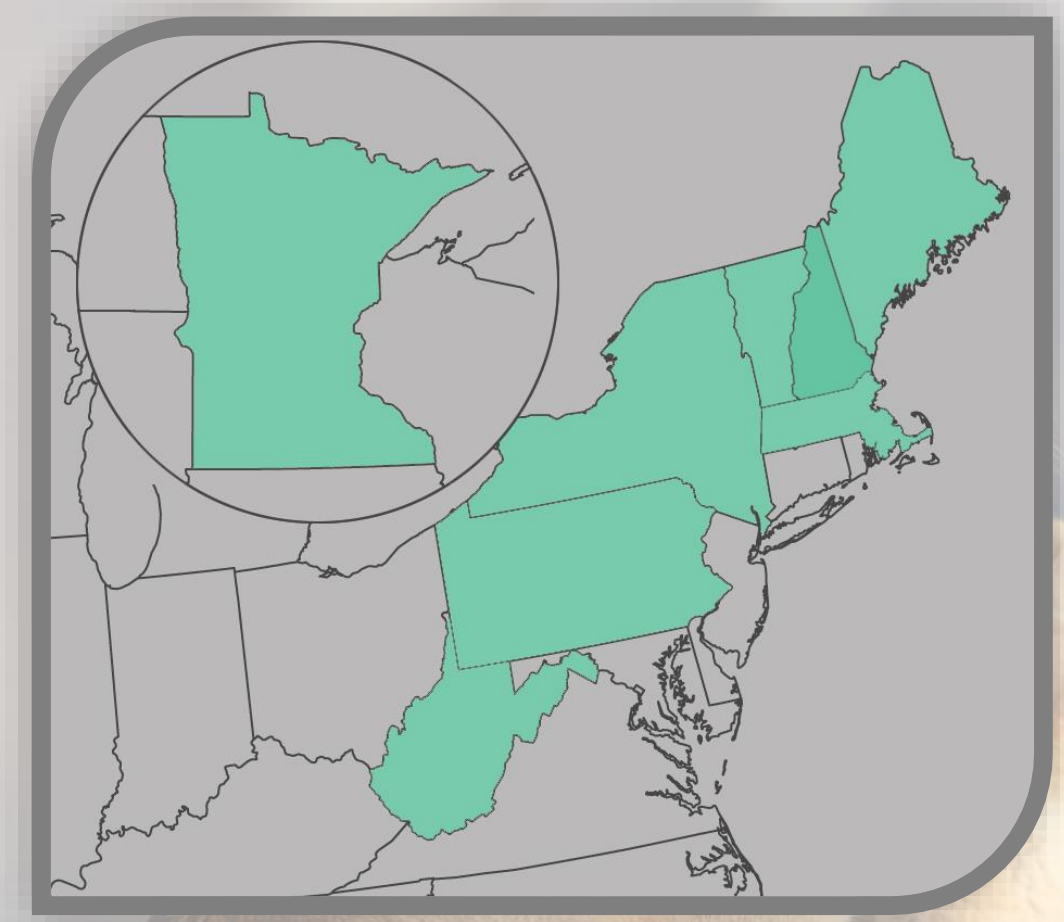
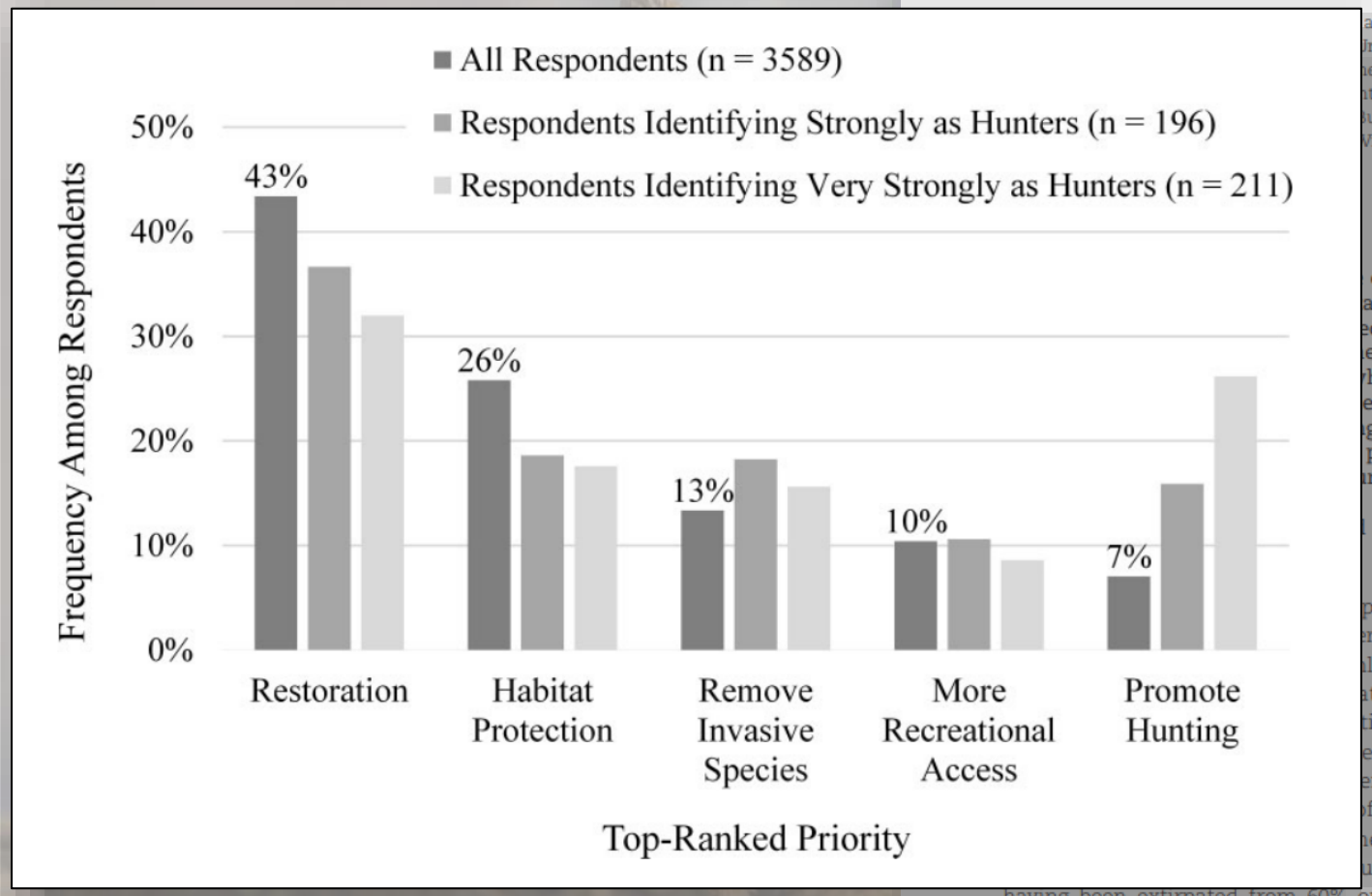


Fig. Sampling Region for Social Tolerance Survey

Population: 8 states in the eastern U.S. were habitat modeling showed substantial cougar habitat. (+1 western state for comparison)

- Data gathered in Feb – Mar 2022 by Qualtrics via online surveys
- Obtained >400 respondents in 8 of 9 states (Vermont = 251); total including Colorado= n~3500

Public Priorities for State Wildlife Agencies



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Forum

The role of governance in rewilding the United States to stem the biodiversity crisis

Shelby C. Carlson, John A. Vucetich, L. Mark Elbroch, Shelby Perry, Lydia A. Roe, Tom Butler and Jeremy T. Bruskotter

affiliated with the Terrestrial Wildlife Ecology Lab, in the School of Environment and Natural Resources at The Ohio nited States during the manuscript's presentation, and is presently affiliated with the Cornell Lab of Ornithology at e United States. John A. Vucetich is affiliated with the College of Forest Resources and Environmental Science at ton, Michigan, in the United States. L. Mark Elbroch is affiliated with Panthera, in New York, New York, in the United utler are affiliated with the Northeast Wilderness Trust, in Montpelier, Vermont, in the United States. Jeremy T. ildlife Ecology Lab, in the School of Environment and Natural Resources at The Ohio State University, in Columbus,

of the biodiversity crisis is the contraction of geographic range experienced by most studied ter-
ates, the primary policy tool for mitigating the biodiversity crisis is a federal law, the Endangered
ecades, the federal agencies that administer the ESA have interpreted the act in a manner that pre-
ent of the crisis. Therefore, the burden of mitigating the biodiversity crisis largely falls on wildlife
hich are obligated to operate on behalf of the interests of their constituents. We present survey re-
ents expect state agencies to prioritize species restoration over other activities, including hunting.
g self-identified hunters, which is significant because state agencies often take the provisioning
priority. By prioritizing rewilding efforts that restore native species throughout portions of their
nify hunting and nonhunting constituents while simultaneously stemming the biodiversity crisis.

Species Act, wildlife restoration

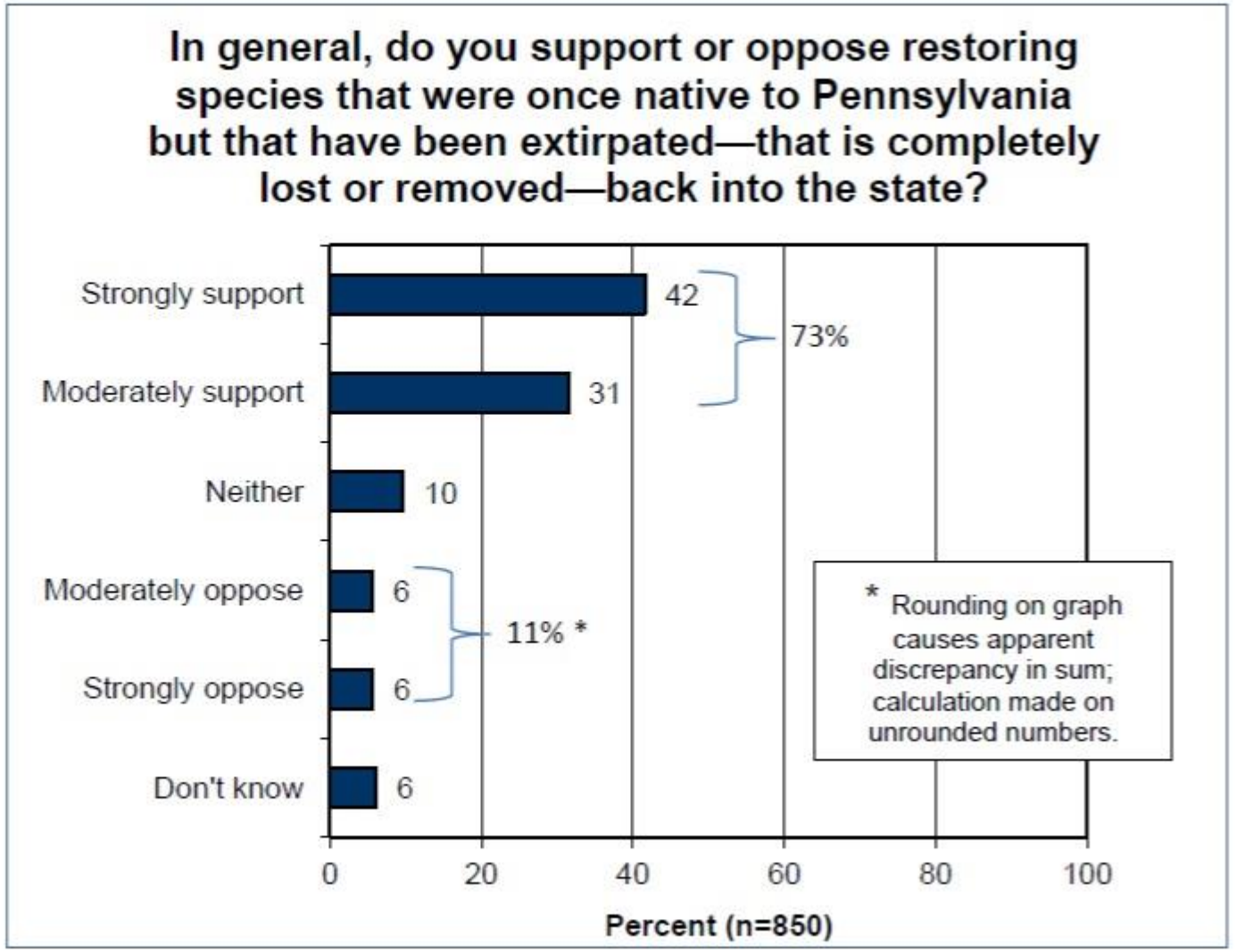
pecies extinction by approxi-
r the background rate (Pimm
ly 40,000 known species of
t elevated risk of extinction
tics are important and grim,
e understanding of the biodi-
n not only by worldwide ex-
f species' geographic ranges.
e biodiversity crisis requires
udied terrestrial vertebrates
having been extirpated from 60% or more of their geographic ranges (Ceballos and Ehrlich 2002, Ceballos et al. 2017). The cumulative effect of these contractions means that disturbingly large

ened, just slowly entering an episode of major biodiversity loss. This view overlooks the current trends of population declines and extinctions… We show the extremely high degree of population decay in vertebrates, even in common 'species of low concern.' Dwindling population sizes and range shrinkages amount to a massive anthropogenic erosion of biodiversity and of the ecosystem services essential to civilization. This 'biological annihilation' underlines the seriousness for humanity of Earth's ongoing sixth mass extinction event."

In summary, the biodiversity crisis has two facets, global extinction and range loss, and the latter facet has important and underappreciated consequences for the health and function of native ecosystems. But how can range loss be mitigated?

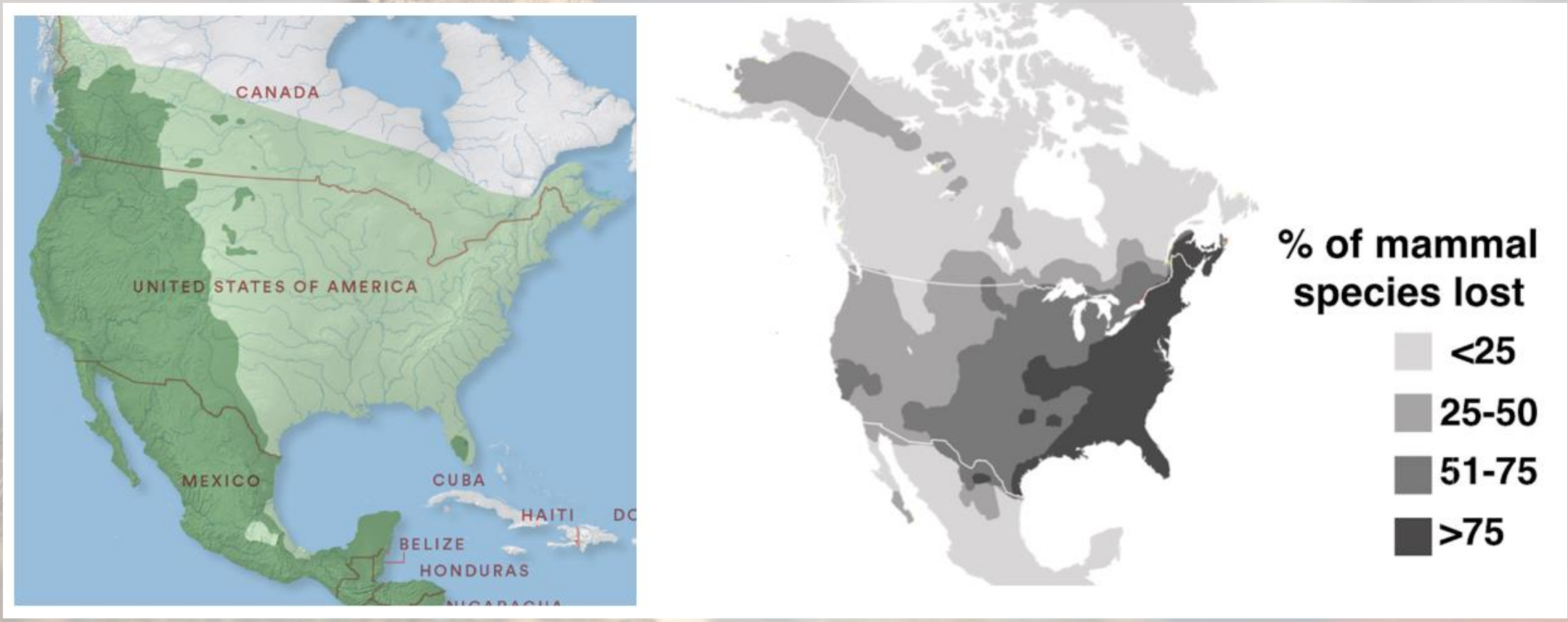
ATTITUDES TOWARD AMERICAN MARTEN AND ITS REINTRODUCTION

Before asking residents about American martens, the survey first asked them about their opinions on restoring extirpated species in general. The large majority of Pennsylvania residents support doing so (73%). On the other hand, 11% oppose.



Why Rewild the Northeast?

- The biodiversity crisis is real, and the East has faced tremendous species loss
- Diverse ecosystems are more resilient to environmental change
- We can see the effects in real time of species loss



Steps for Species Restoration

Feasibility Assessment

↓

Reintroduction Plan

↓

Physical Reintroduction Efforts

↓

Post-Release Monitoring and Research

Questions?

Florida panther release. Photo by Florida Fish and Wildlife Commission.

NORTHEAST WILDERNESS TRUST

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TOMPKINS CONSERVATION

THE OHIO STATE UNIVERSITY

PANTHERA