An update on the UC Davis Mountain Lion Research Project

Fernando Nájera DVM MS PhD

California Carnivores Program

UCDAVIS
VETERINARY MEDICINE
Karen C. Drayer Wildlife Health Center

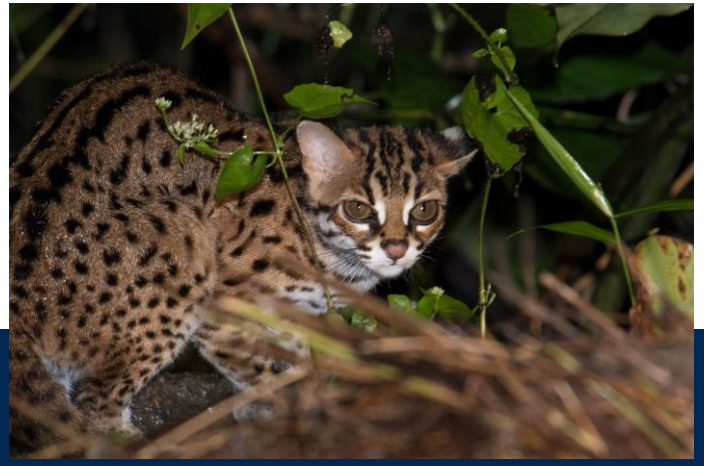
Outline

- Why mountain lions?
- Role of the UC Davis Wildlife Health Center in mountain lion research
- Importance of connectivity for mountain lion demographics
- Southern California mountain lion study
- Mountain lions and depredation prevention research
- Success stories

- Wildlife Research Veterinarian
- Interest in medicine, ecology and conservation of wild carnivores, especially felids.






Why conserve mountain lions

1. Umbrella species

Conservation Biology

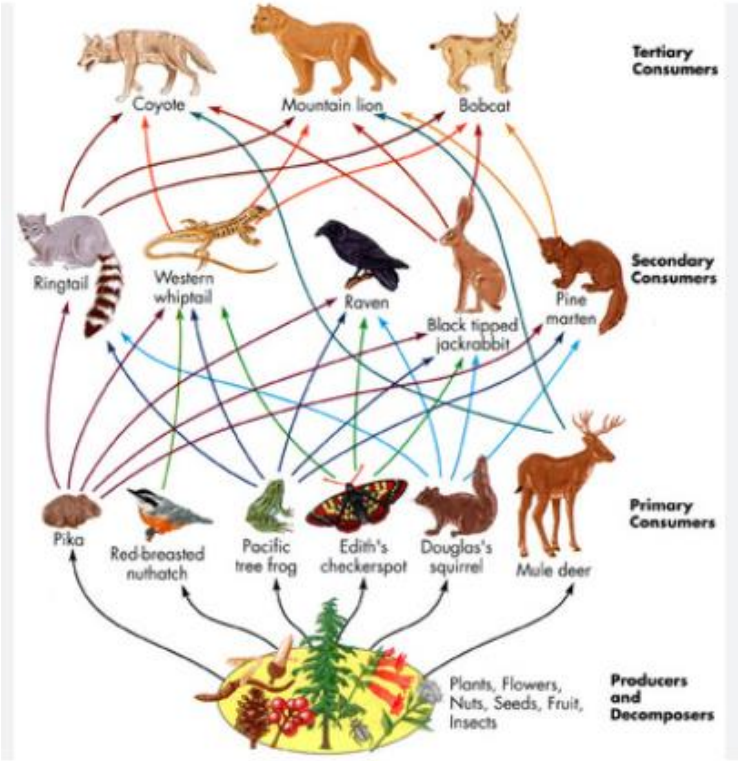
Contributed Paper

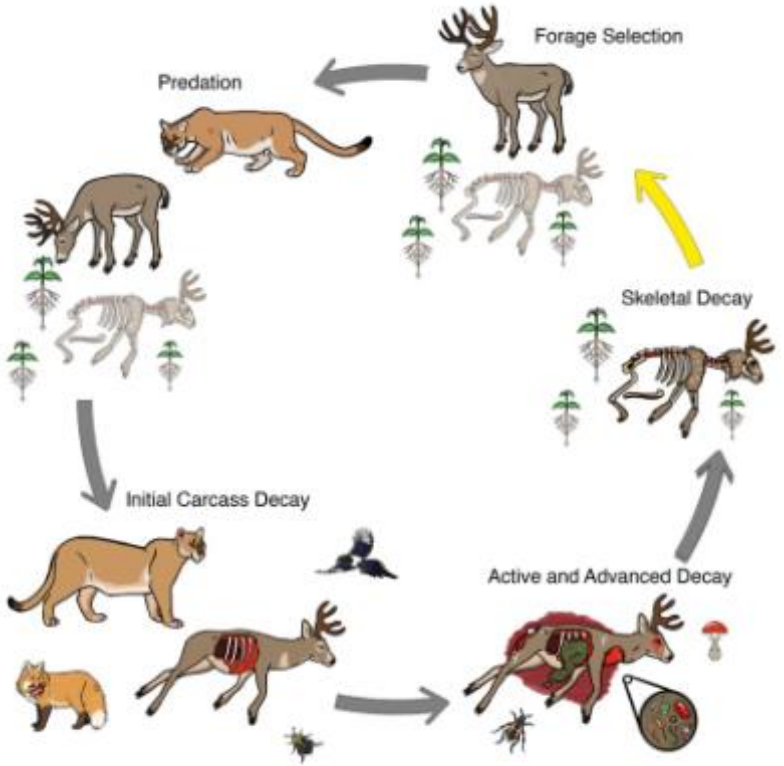
Priorities for global felid conservation

Amy J. Dickman,* Amy E. Hinks,*¶ Ewan A. Macdonald,† Dawn Burnham,*
and David W. Macdonald*

Why conserve mountain lions

2. **Keystone species**: influence in food webs, changes in community composition and prey dynamics





Why conserve mountain lions

2. **Keystone species**: influence in food webs, changes in community composition and prey dynamics

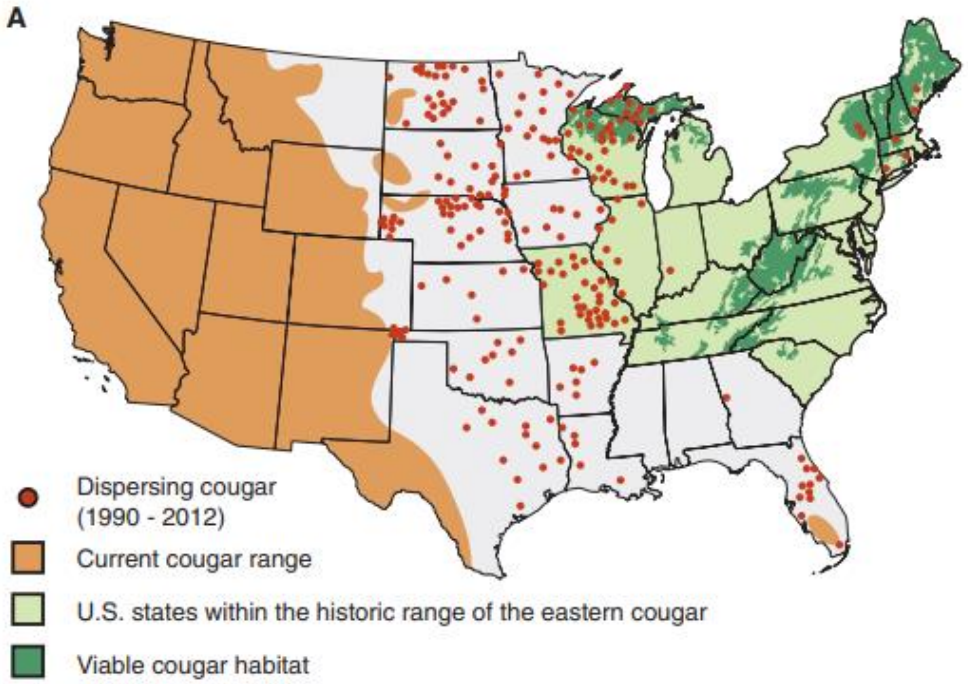
Conservation Letters
A journal of the Society for Conservation Biology
Open

LETTER

Socioeconomic Benefits of Large Carnivore Recolonization Through Reduced Wildlife-Vehicle Collisions

Sophie L. Gilbert[1,2,3], Kelly J. Sivy[3], Casey B. Pozzanghera[3], Adam DuBour[3], Kelly Overduijn[3], Matthew M. Smith[3], Jiake Zhou[3], Joseph M. Little[4], & Laura R. Prugh[3,5]

An ecosystem service of cougars



Why conserve mountain lions

2. Keystone species – ecosystem services

biology letters
Community ecology

Biol. Lett. (2010) **6**, 209–211
doi:10.1098/rsbl.2009.0742
Published online 28 October 2009

Mountain lions prey selectively on prion-infected mule deer

Caroline E. Krumm[1,2], Mary M. Conner[3], N. Thompson Hobbs[4], Don O. Hunter[5] and Michael W. Miller[1,*]

[1]*Colorado Division of Wildlife, Wildlife Research Center, Fort Collins, CO 80526-2097, USA*
[2]*Graduate Degree Program in Ecology, and* [4]*Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO 80523, USA*
[3]*Department of Wildland Resources, Utah State University, Logan, UT 84322-5230, USA*
[5]*United States Fish and Wildlife Service, Fort Collins, CO 80526, USA*
**Author for correspondence (mike.miller@state.co.us).*

Los Angeles Times

CALIFORNIA

Feral pigs are biological time bombs. Can California stem their 'exponential' damage?

UCDAVIS VETERINARY MEDICINE
Karen C. Drayer Wildlife Health Center


25.51 inHg
42°F
03/26/2024
11:41PM
CAMERA1

Why conserve mountain lions

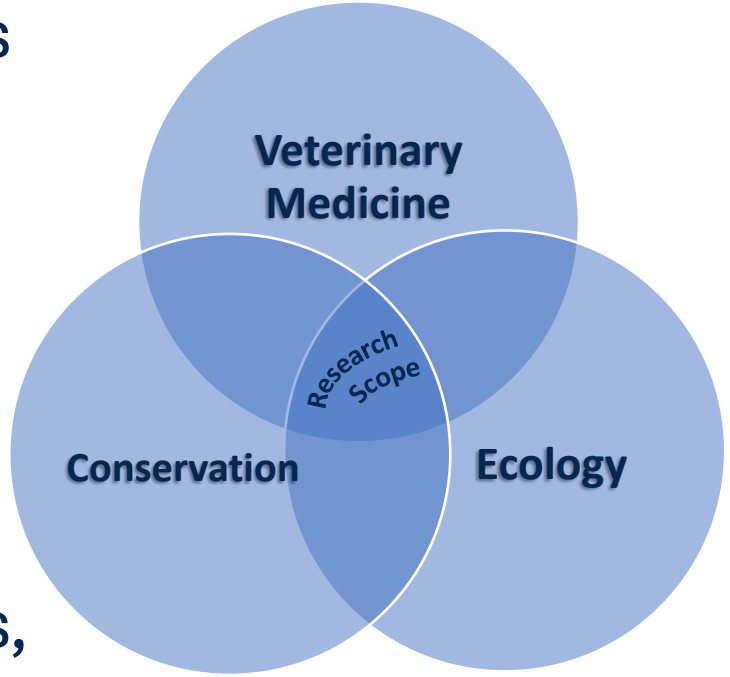
3. Flagship species: charismatic species. Attractive to public

UC Davis Wildlife Health Center and Mountain Lions

- Ongoing research with the species since + 20 years
- Initially focused on the southernmost part of the mountain lion range in CA
- Expanding efforts
    - Northern (along with the Institute for Wildlife Studies)
    - Central California
        - Central coast (Monterey, San Benito, Santa Clara, Merced Counties)
        - Tehachapi Mountains (Los Angeles and Kern Counties)

Research Scope

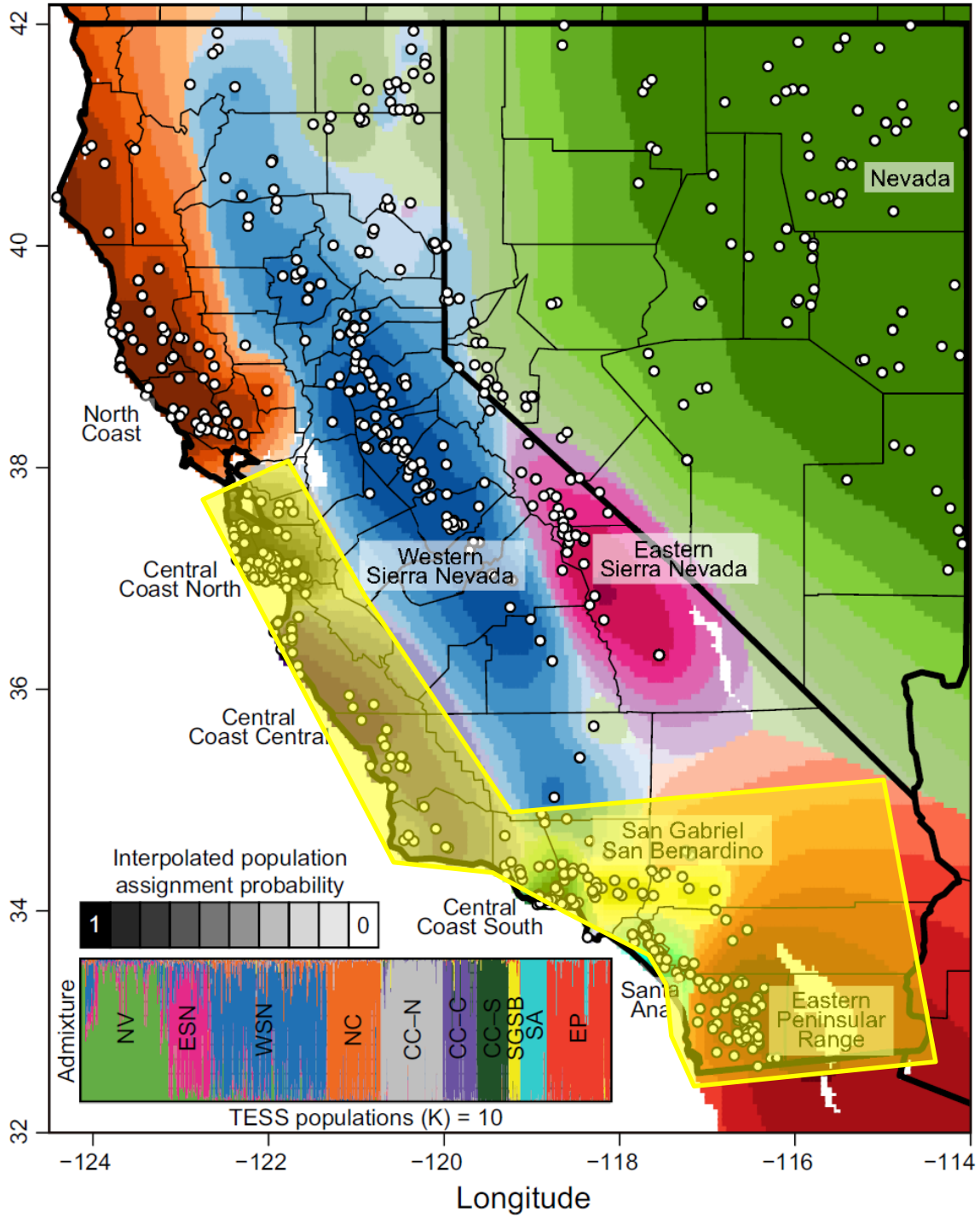
1) Health, infectious disease and toxin exposure patterns
2) Diet
3) Landscape connectivity
4) Habitat use and movement patterns
5) Population genetics
6) Development population estimation methods
6) Methods of reducing conflicts between mountain lions, domestic animals, and people
8) Interactions with other wildlife species



Loss of Genetic Diversity

- 10 genetically distinct populations
    - Geography
    - Habitat fragmentation
- 6 populations up for listing under California Endangered Species Act
    - Risk of ***inbreeding depression within 5 generations***
    - Risk of ***extinction within 50 years***

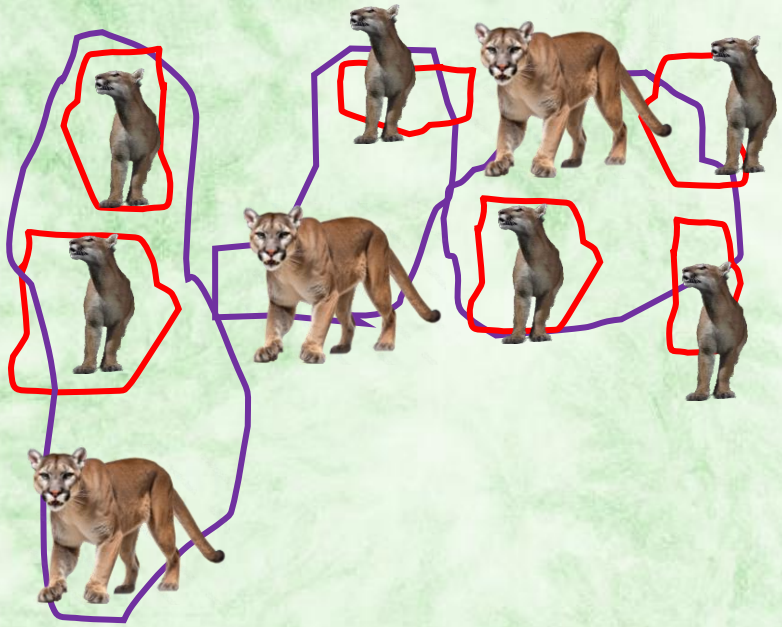
Connectivity between subpopulation is key to long-term persistence

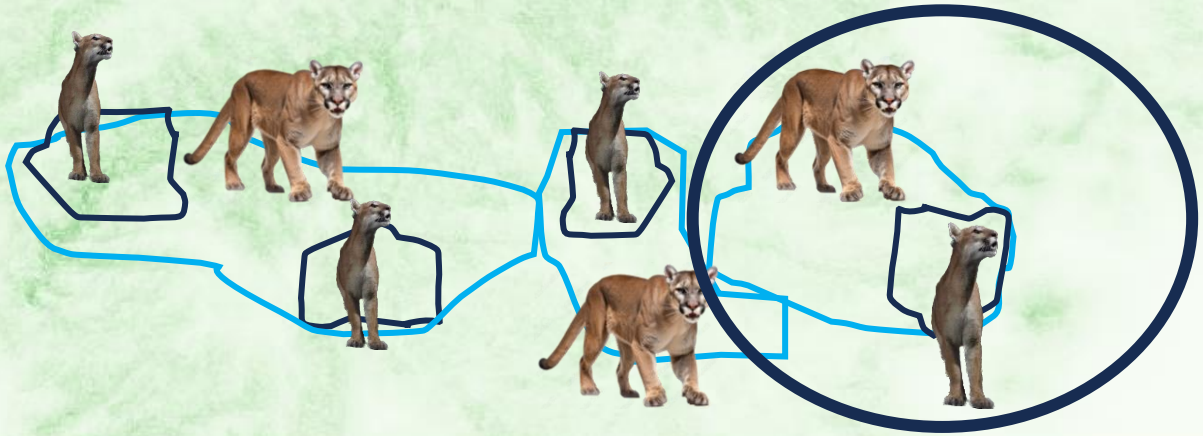


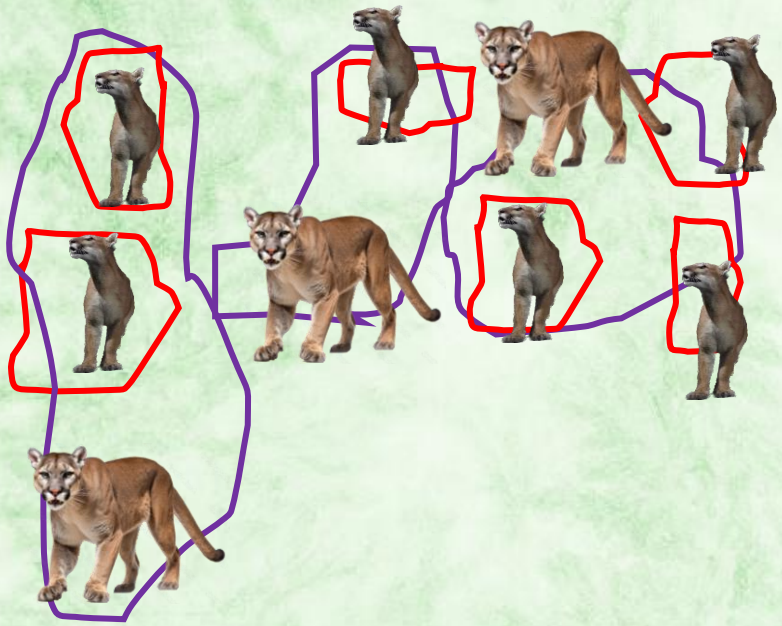
Gustafson et al. 2018. Genetic source–sink dynamics among naturally structured and anthropogenically fragmented puma populations

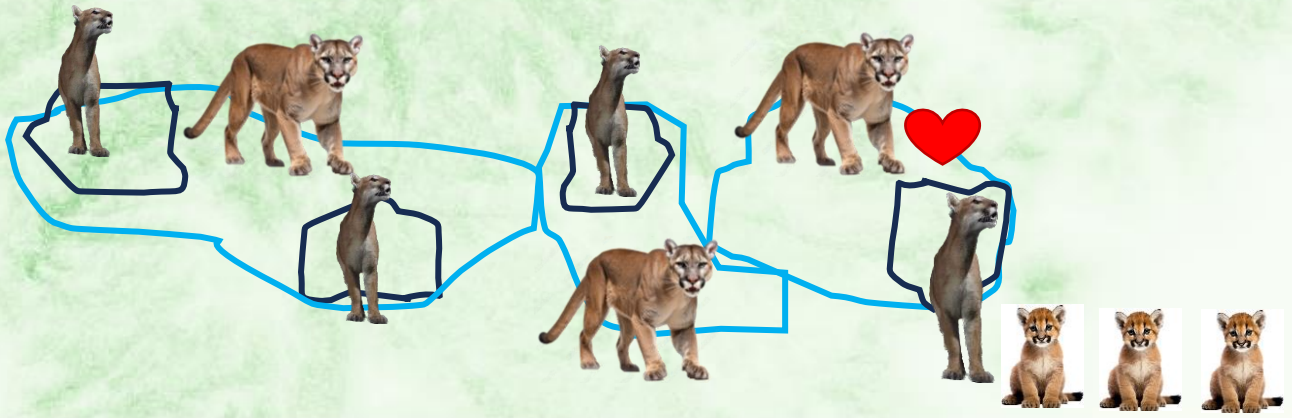
Felid ecology and connectivity

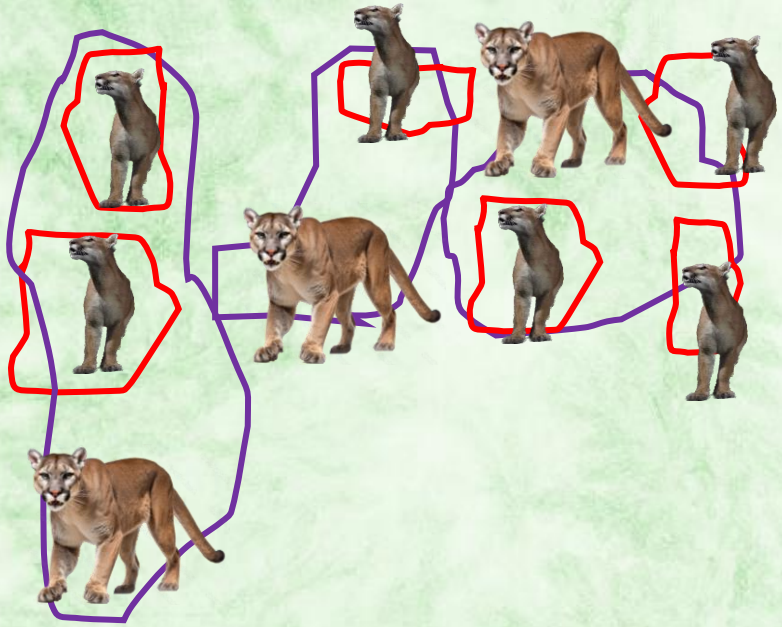
- Dispersal
- Philopatry

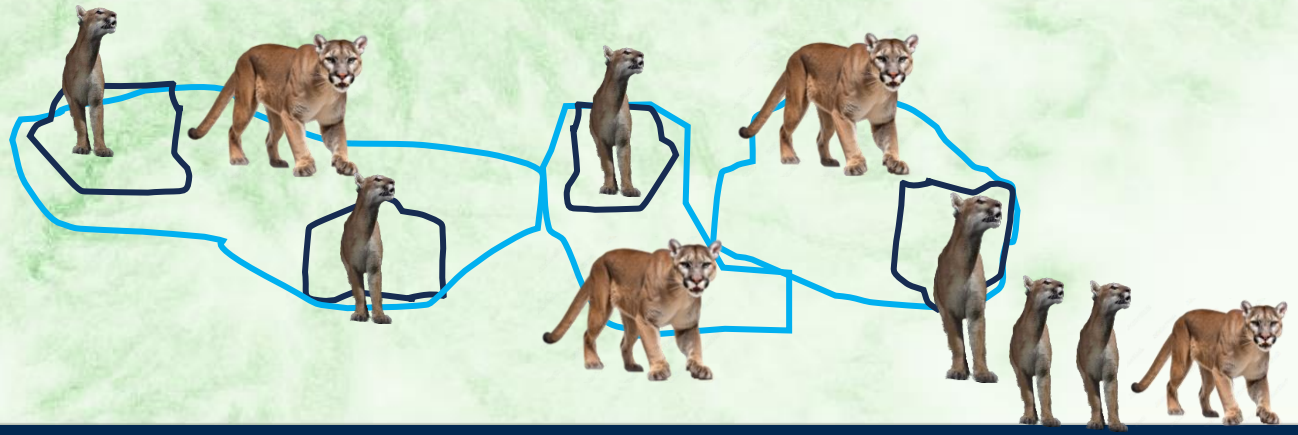




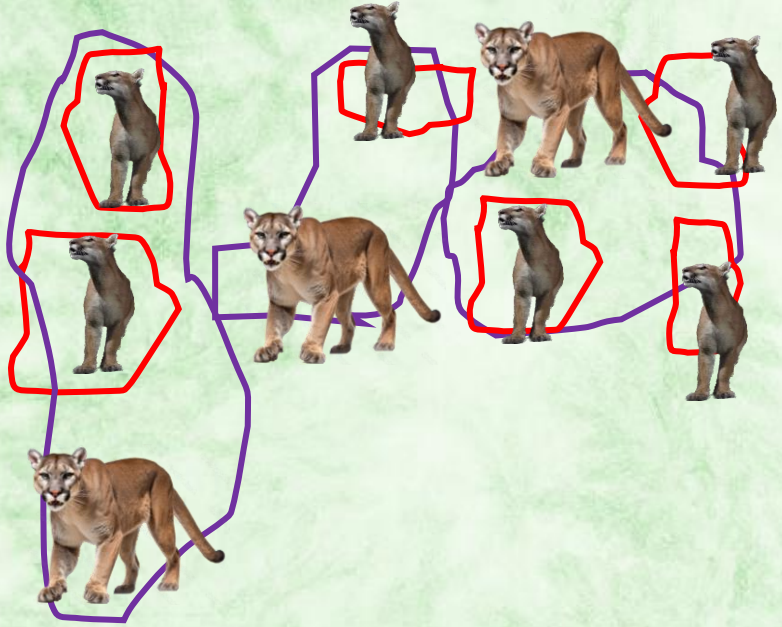


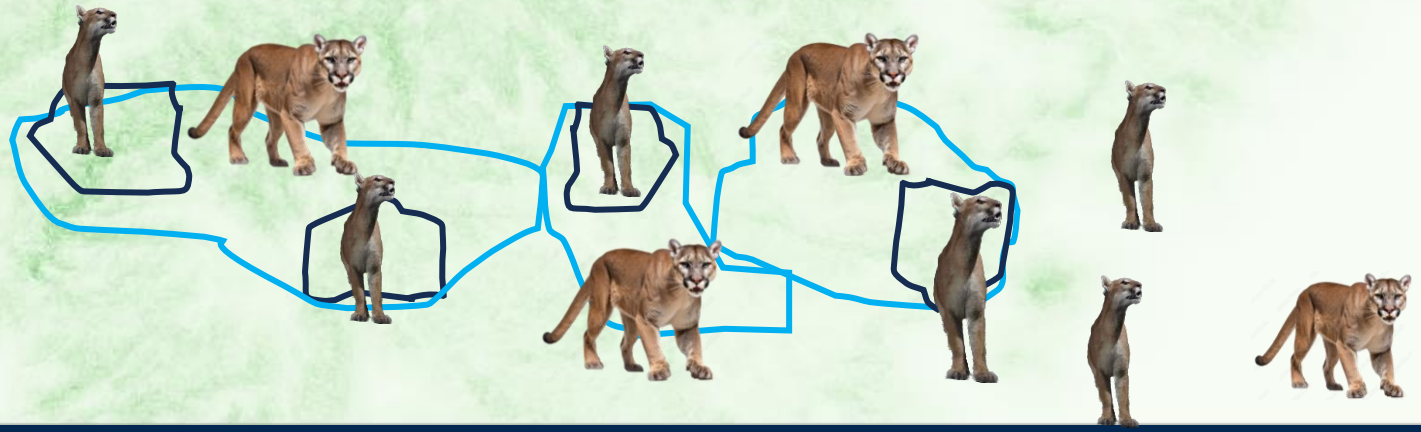


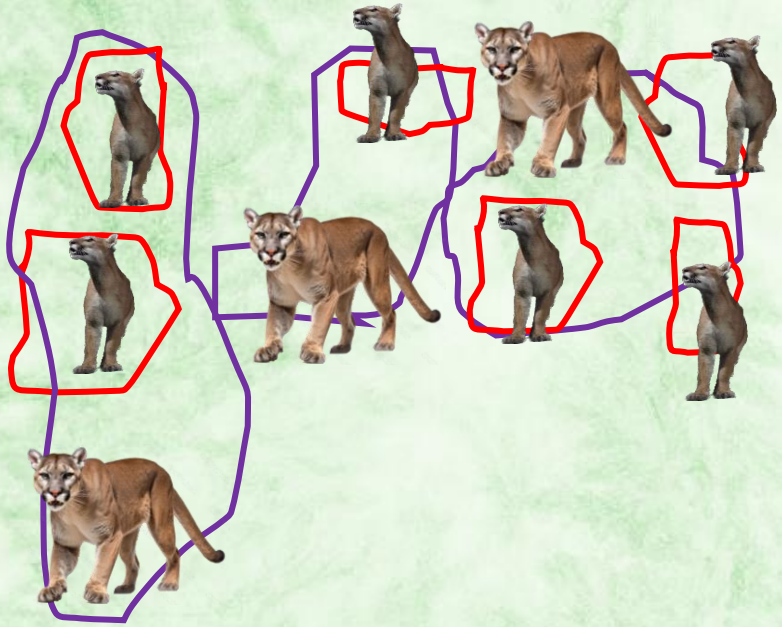


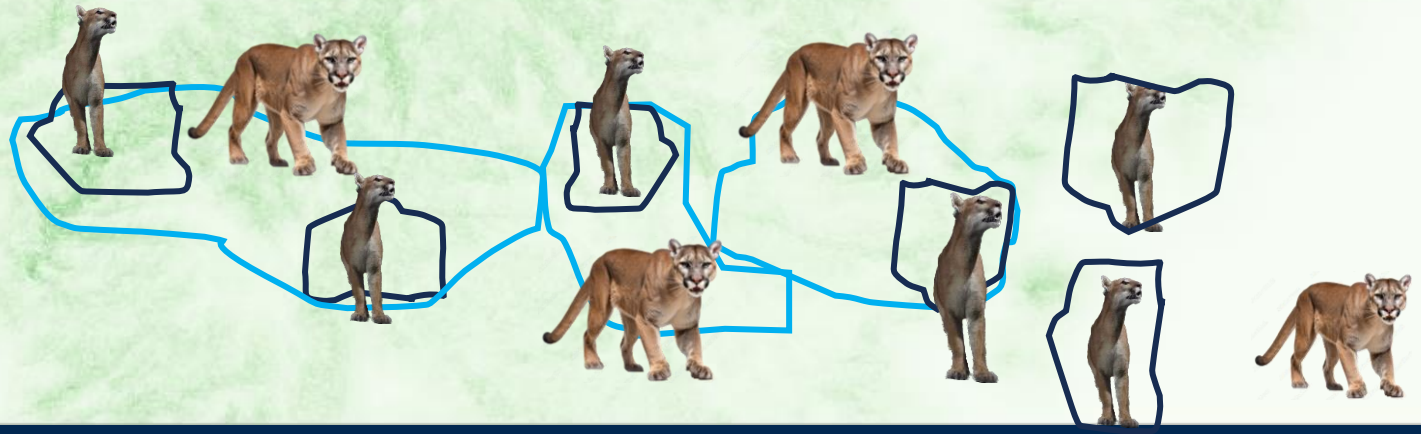


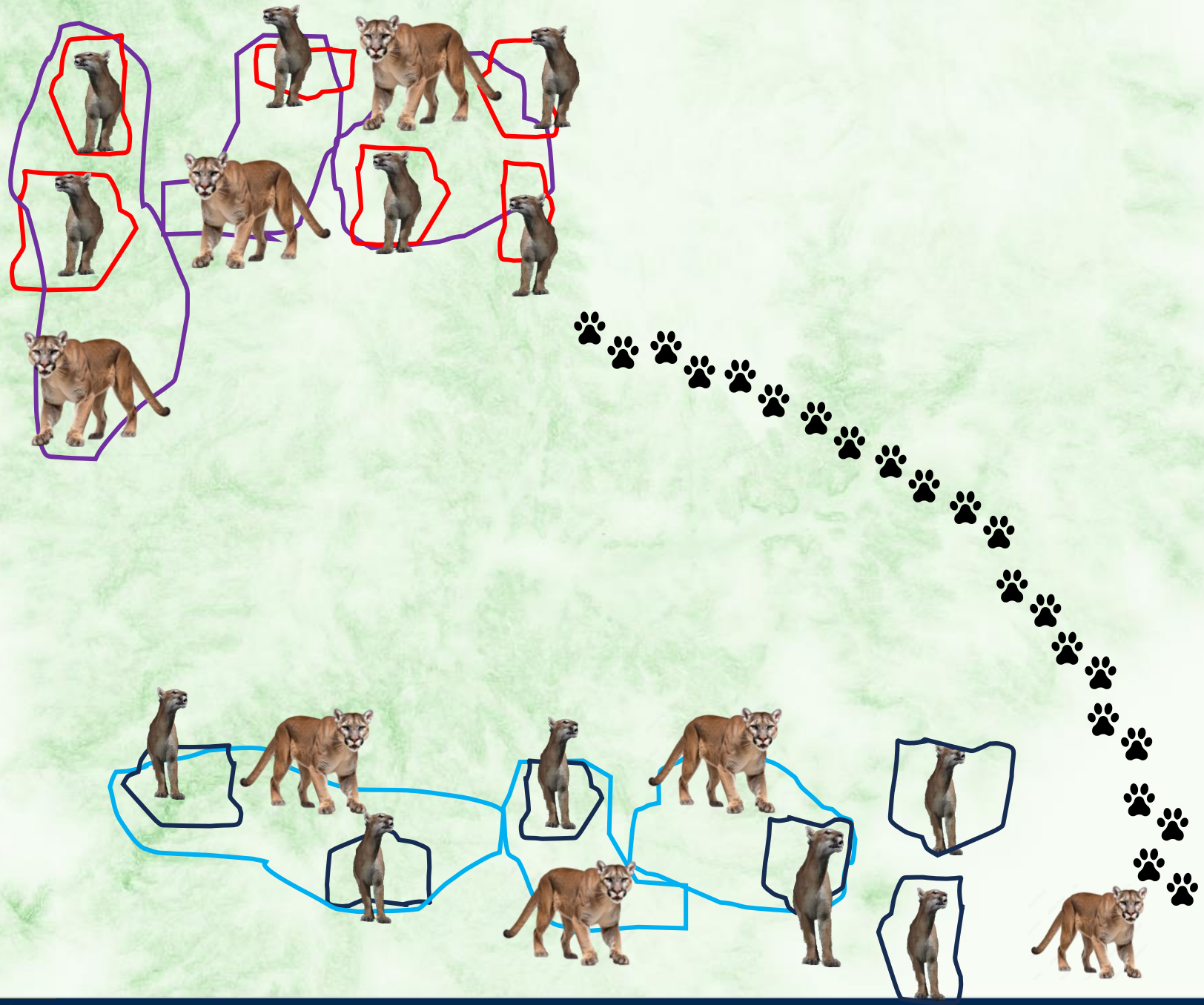

25.55 inHg - 50°F 02/19/2023 06:52PM 42WOLF1

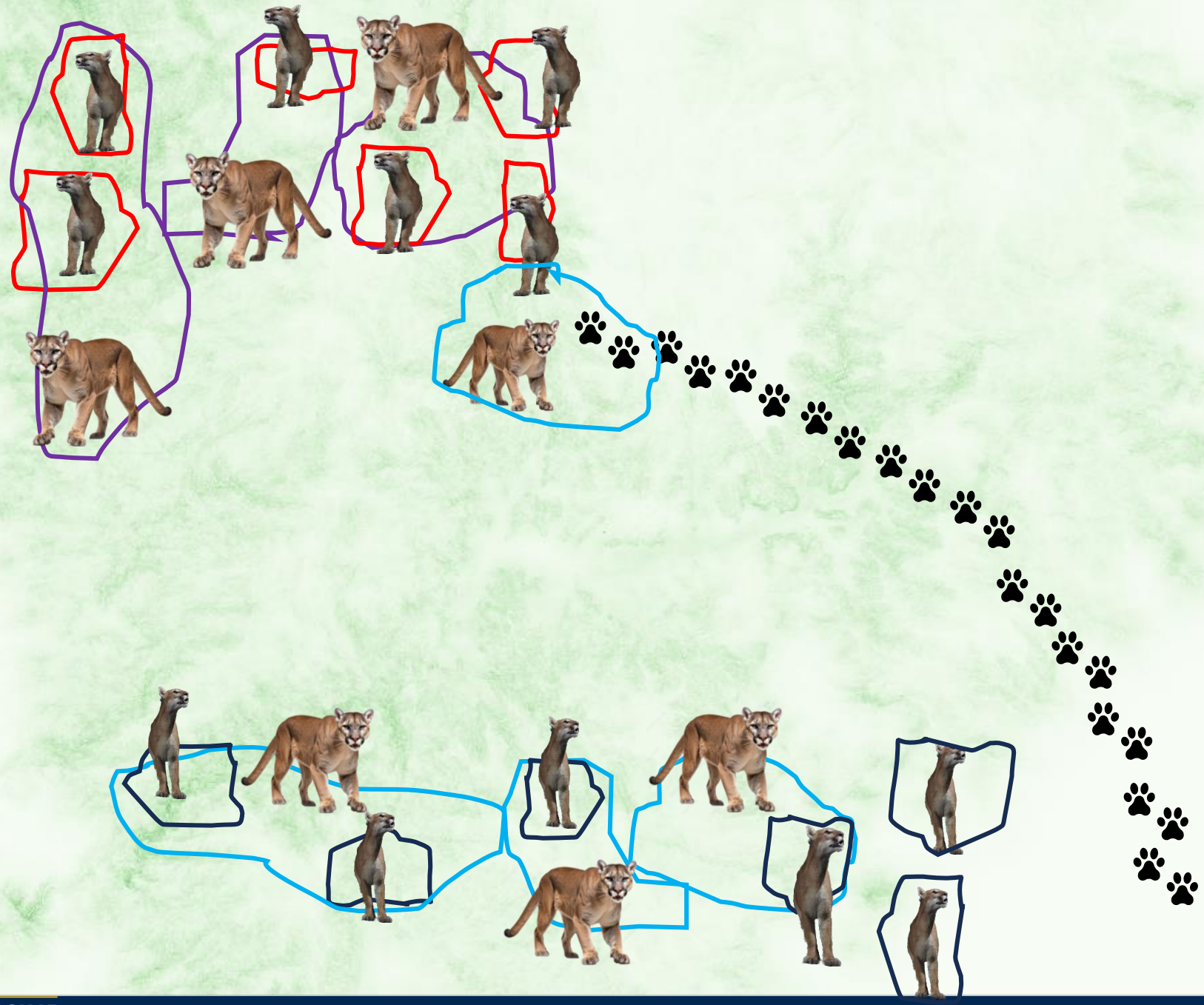


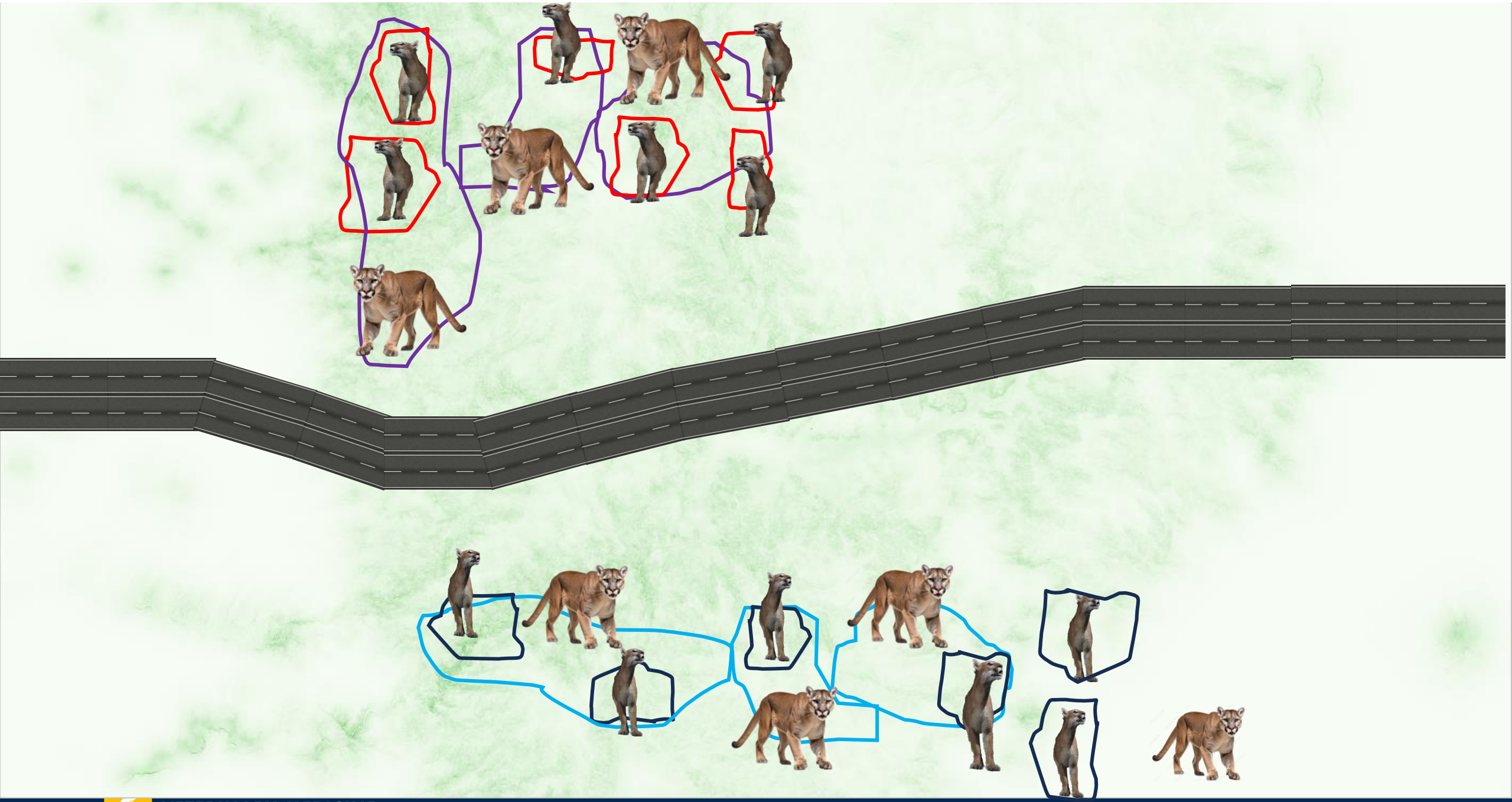


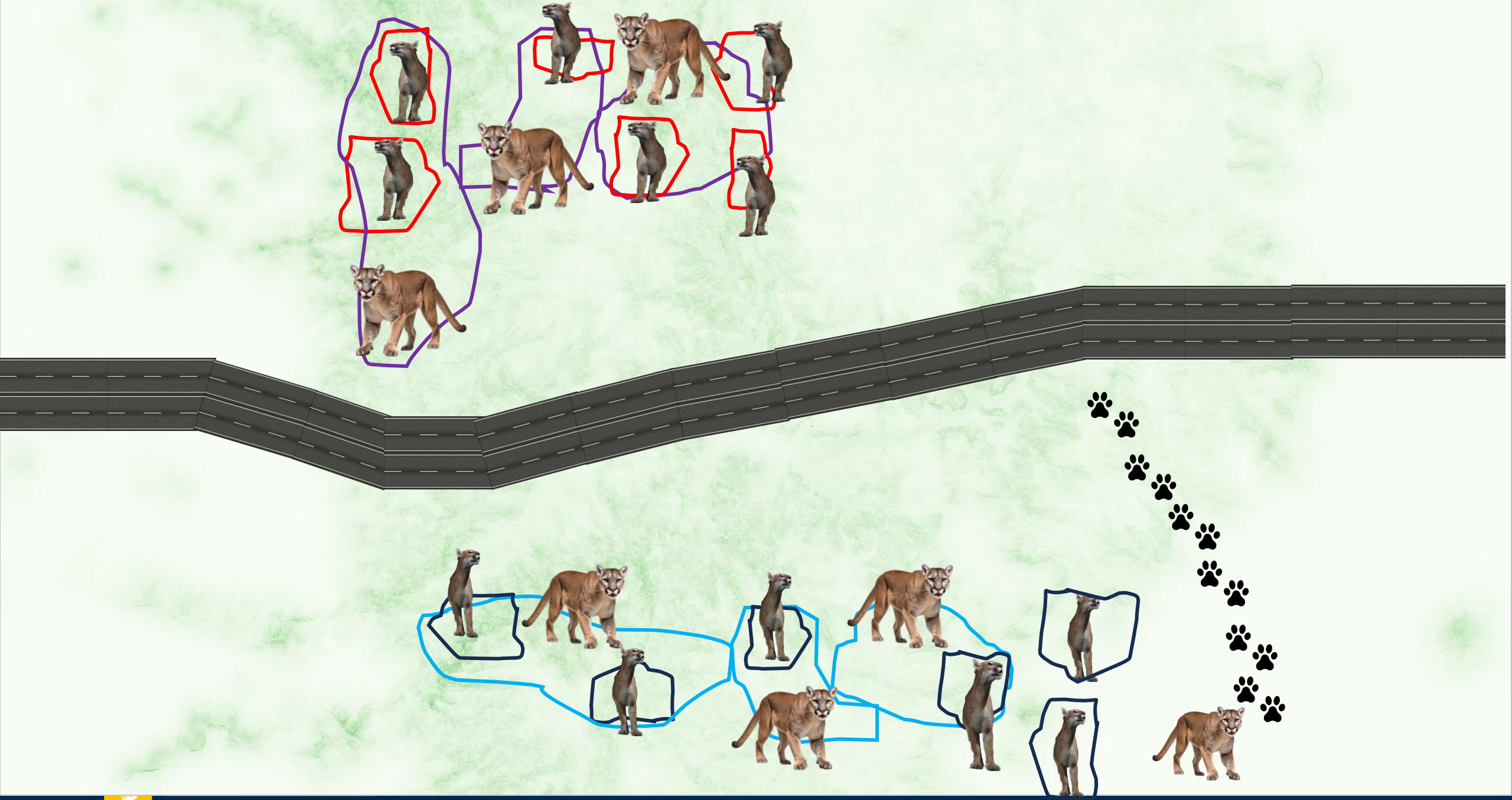


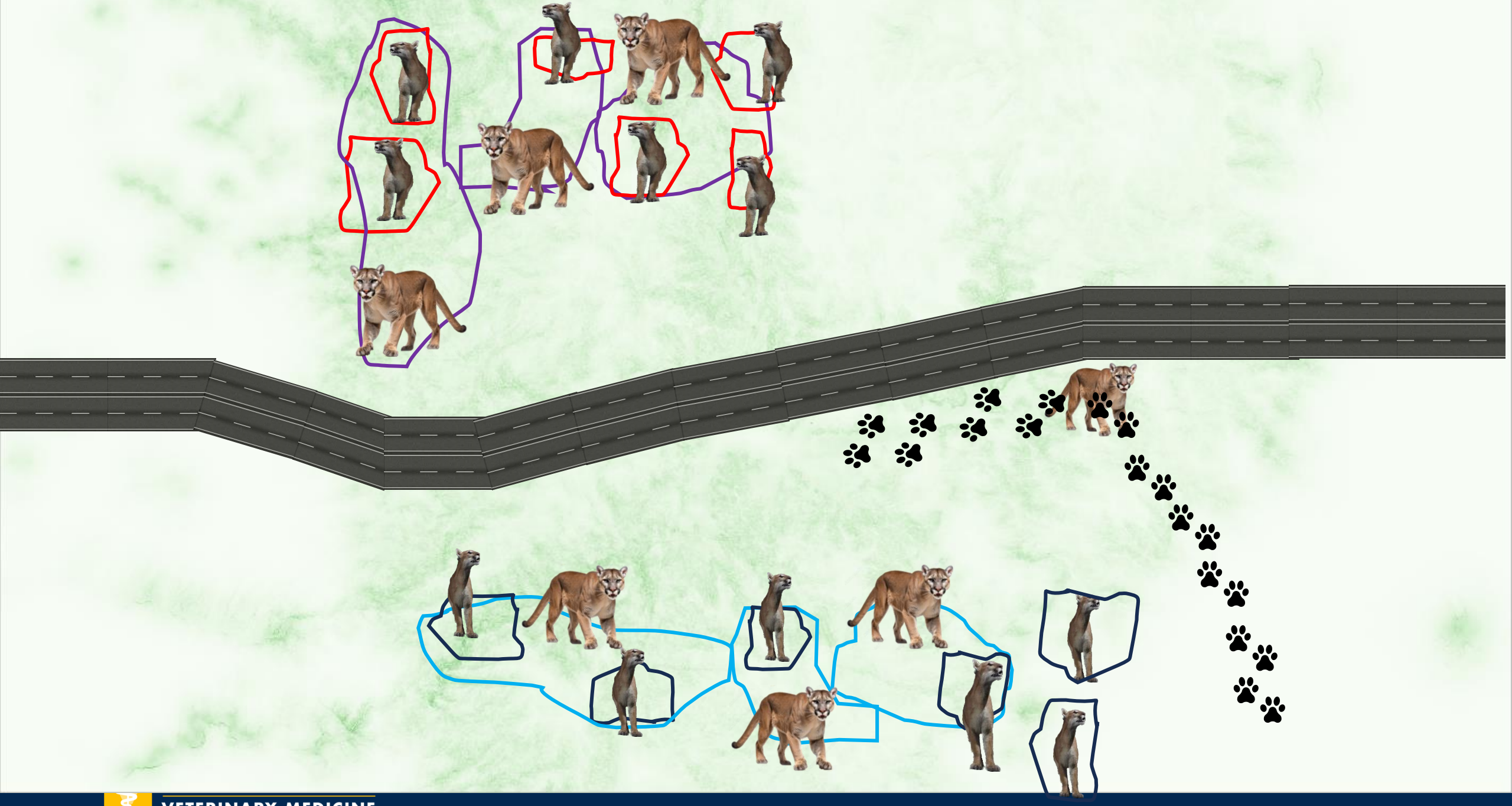


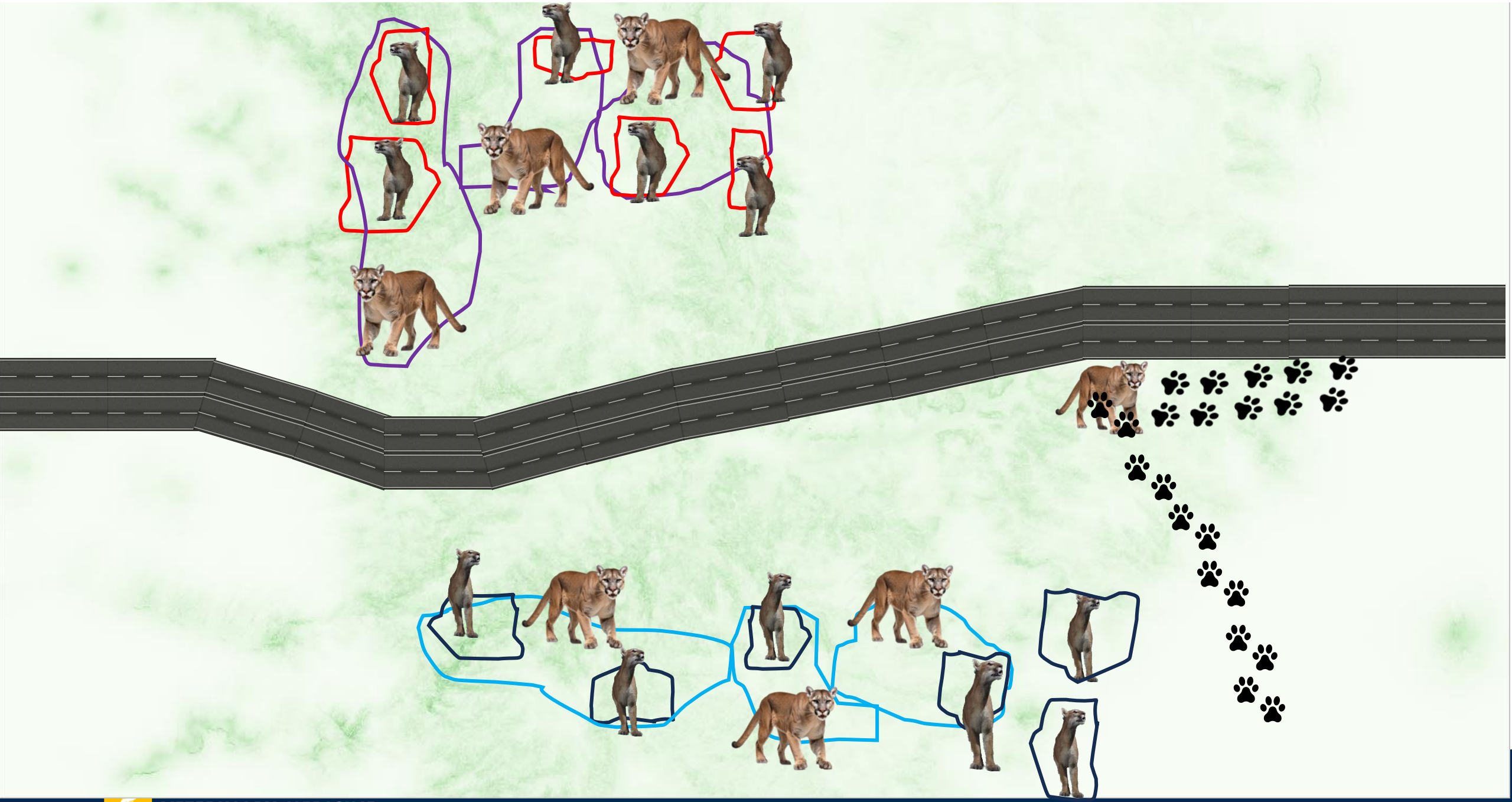


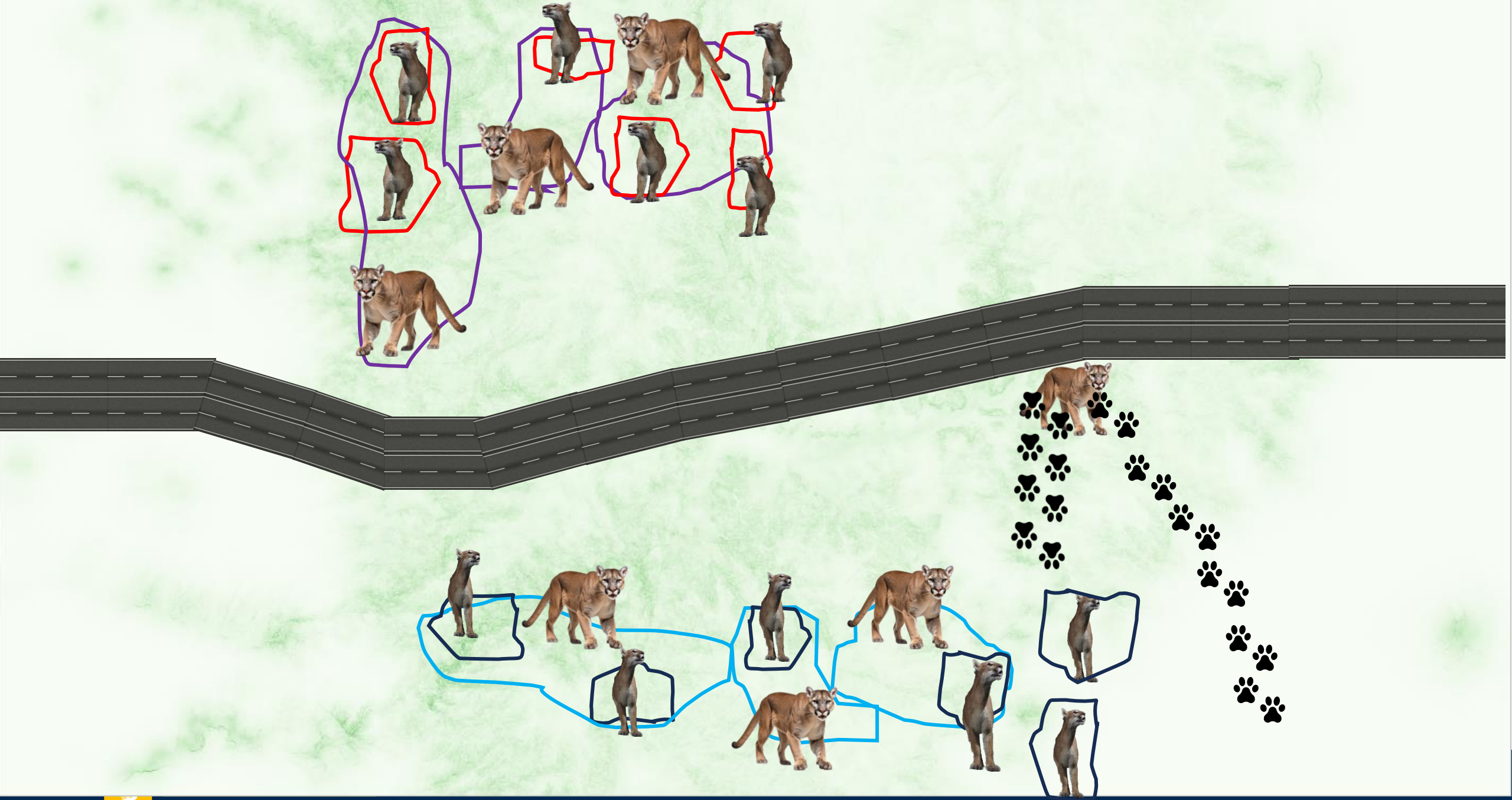


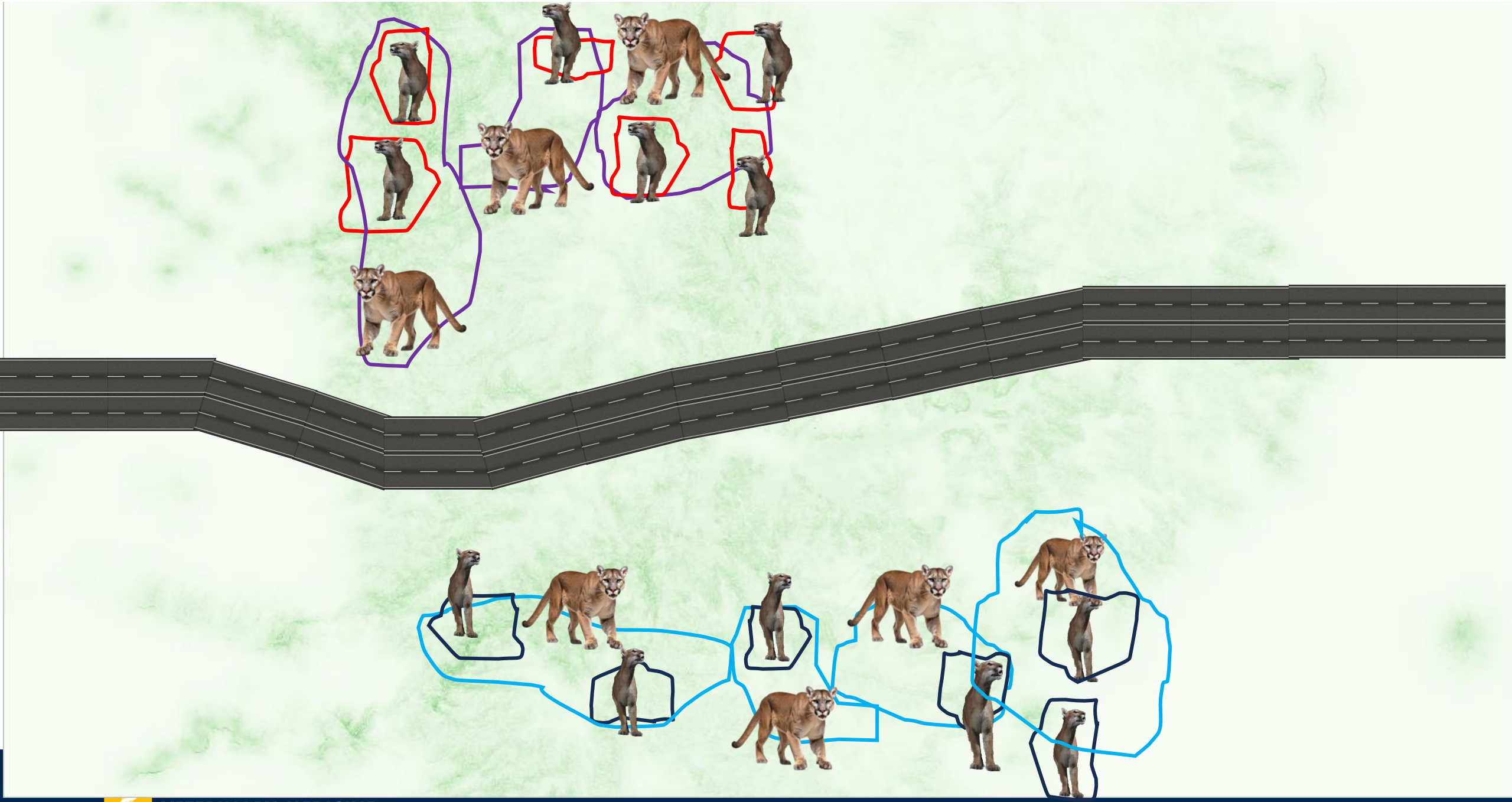












Barone et al. 1994

Inbreeding depression = lower survival and reproduction

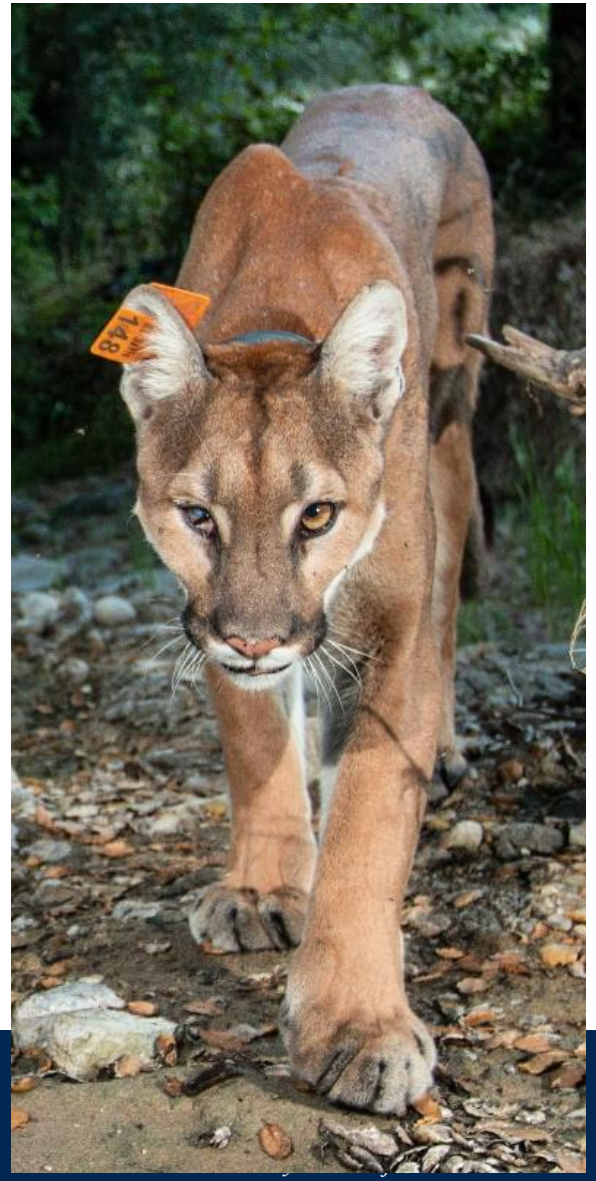
Observed in Florida panthers and **CA mountain lions**:

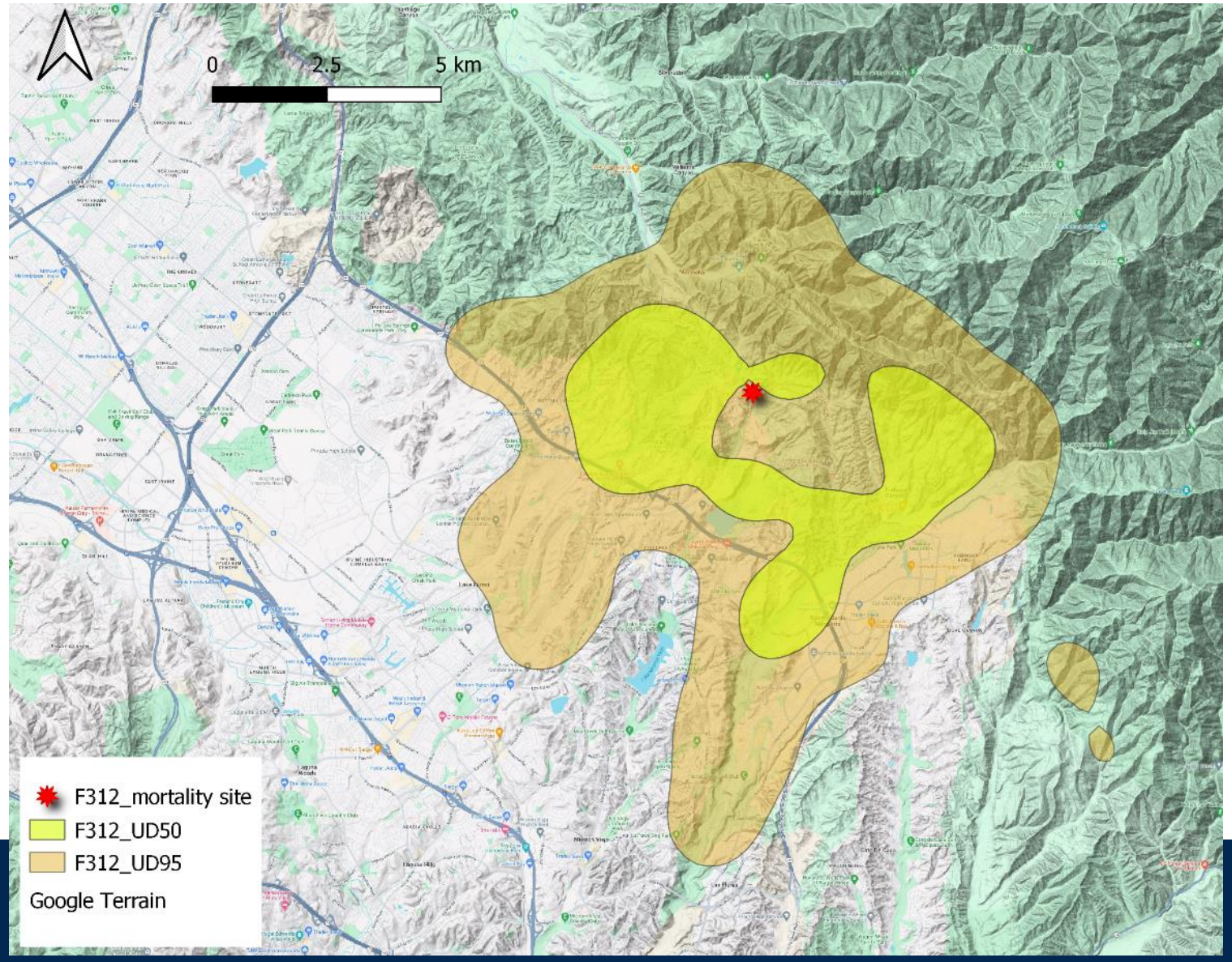
- **Poor sperm quality**
- **Undescended testes**
- Low testosterone
- **Kinked tails**
- Heart defects
- Increased susceptibility to parasites/disease
- Poor fecundity and recruitment

Photo: National Park Service

Huffmeyer et al. 2022. First reproductive signs of inbreeding depression in Southern California male mountain lions (Puma concolor)

SoCal Pumas: Living on a Road Matrix





Southern California Project Goals

- Contribute to the knowledge of mountain lion connectivity in Southern California
- Monitor kitten productivity as a metric of inbreeding depression in Southern California
- Provide high-quality DNA samples to investigate the genetic status of the Santa Ana Mountains subpopulation
- Investigate mountain lion-human interactions in peri-urban wilderness parks that are heavily used by both humans and mountain lions
- Investigate methods of mountain lion depredation prevention
- Increase understanding of the impacts of habitat and development on disease and toxin exposure and health
- Investigate home range sizes, maternal behavior, and dispersal patterns in different landscape types.

Project Tasks

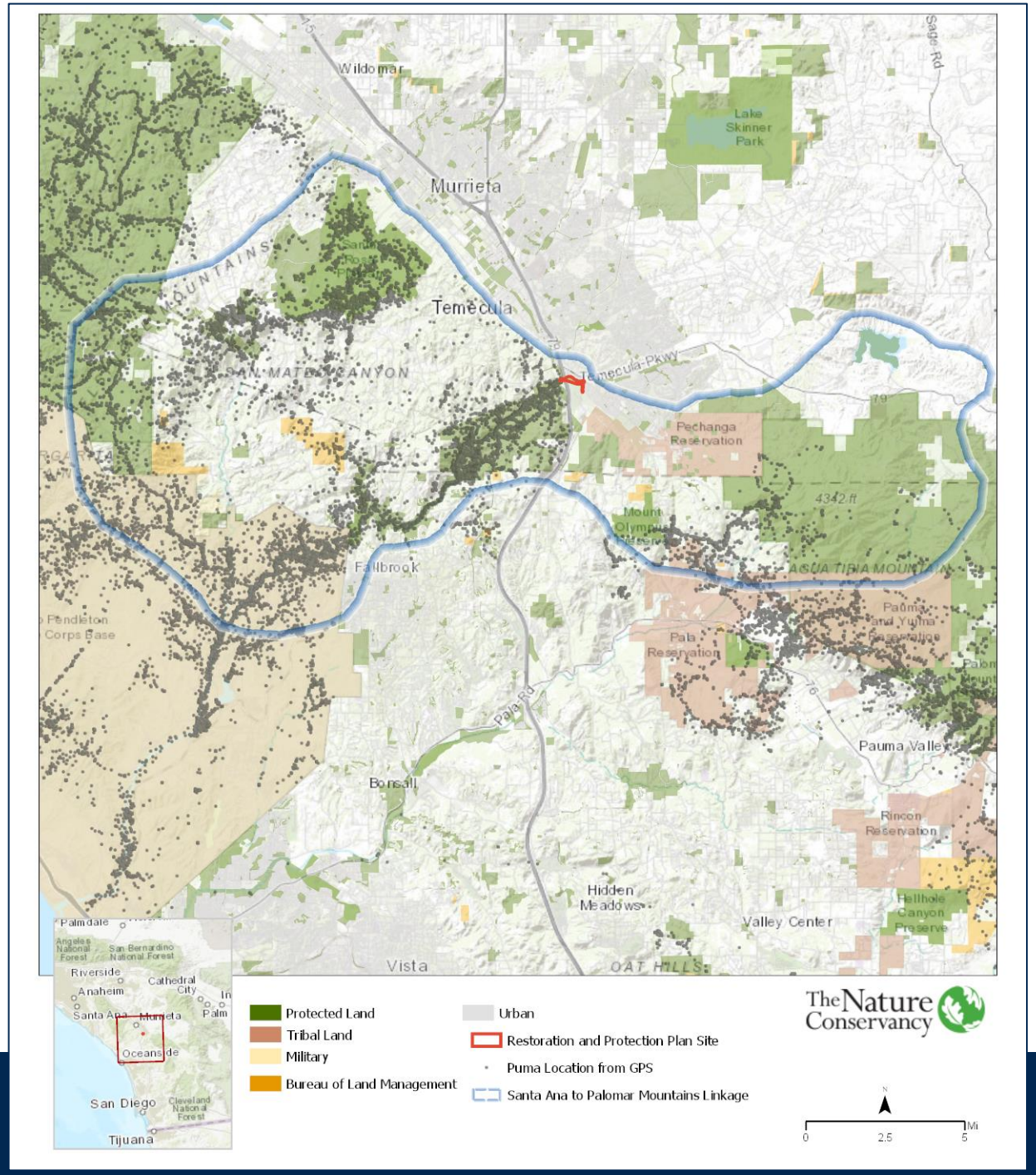
Camera trap mountain lions

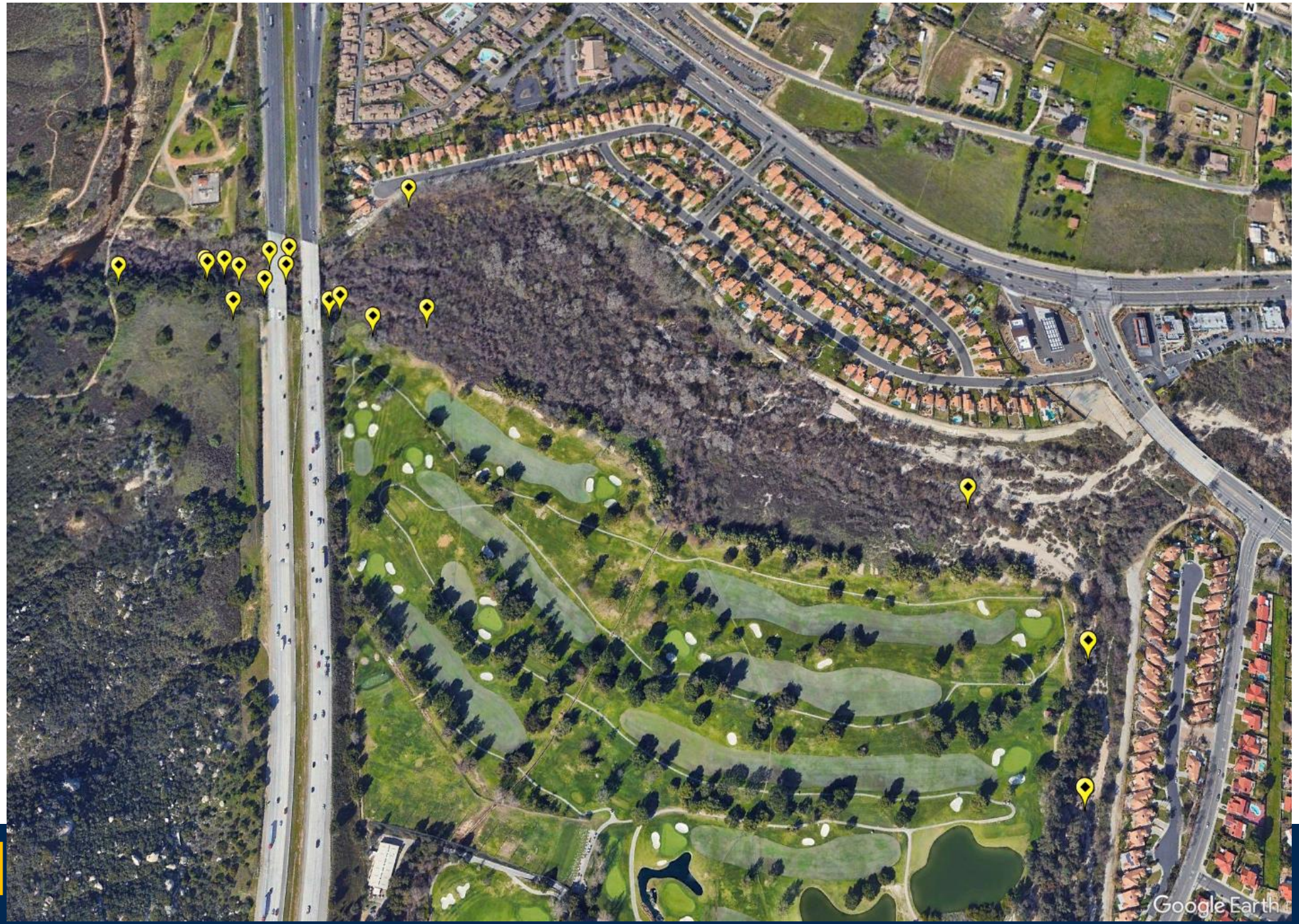
Capture and collar mountain lions

Gathering genetic samples

Analyze results

Camera-trapping




N
Google Earth

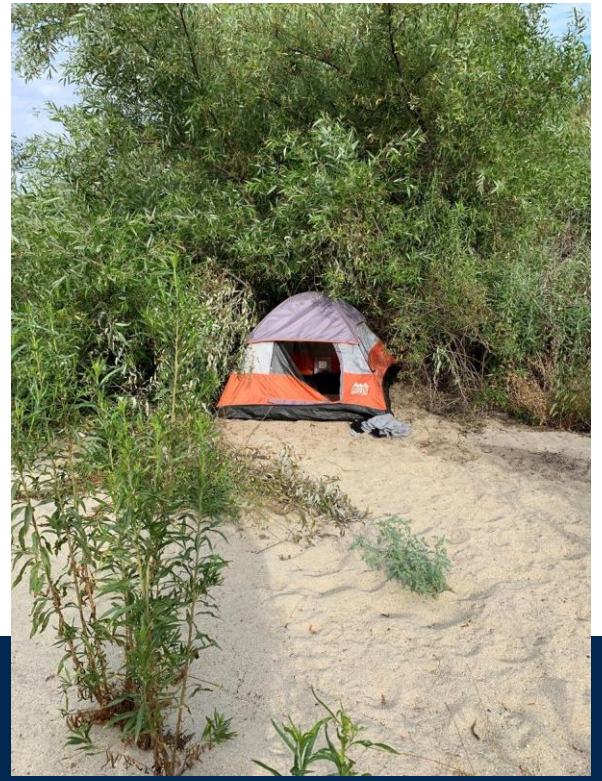
Results

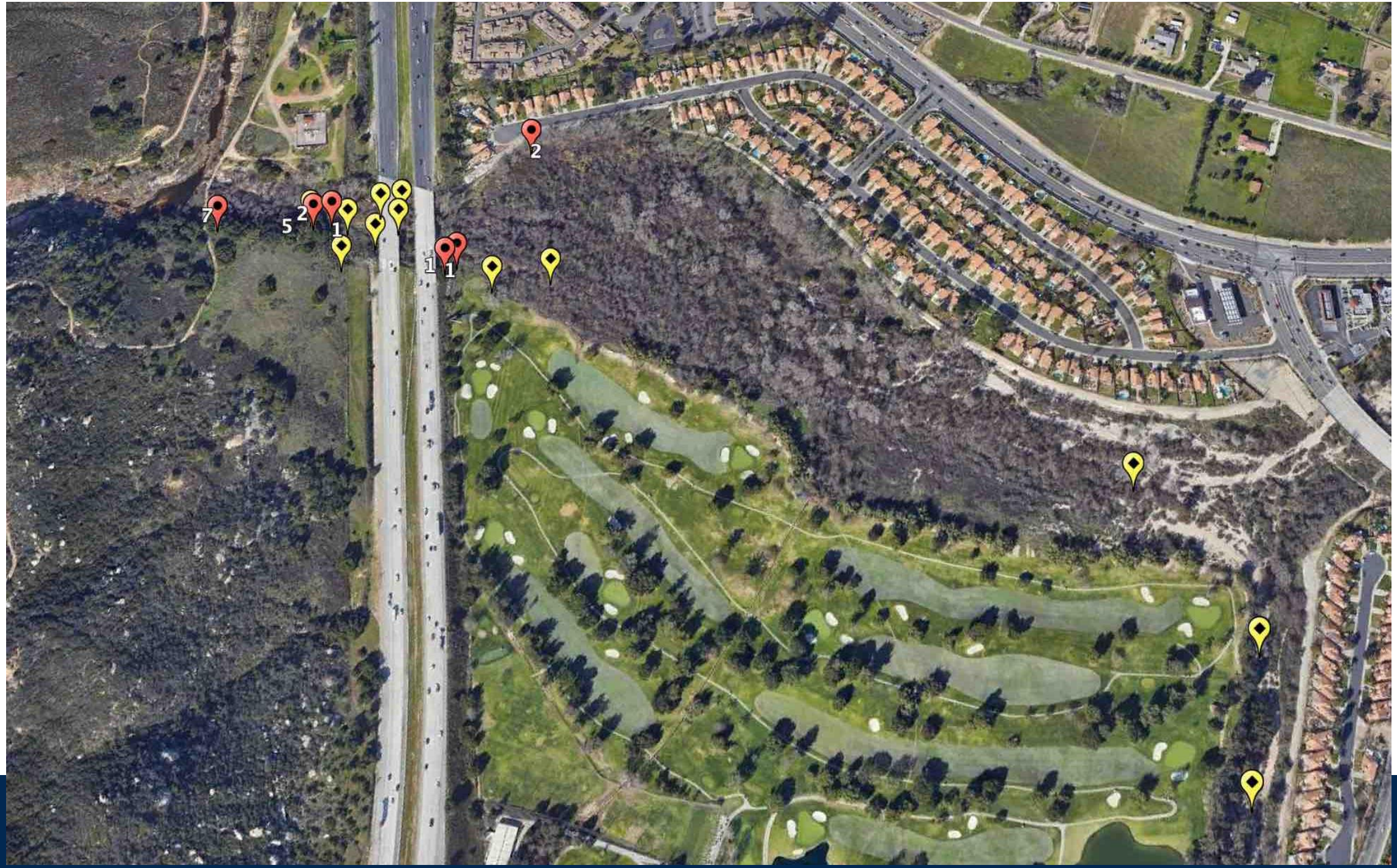
>10,000 camera trap days → > 13,000 wildlife detections

2. Wildlife presence

- Raccoons (n=3,586) and coyotes (n=3,153) were the most frequently detected wildlife species, followed by rabbits (n=1,563), opossums (n=970), and bobcats (n=940).

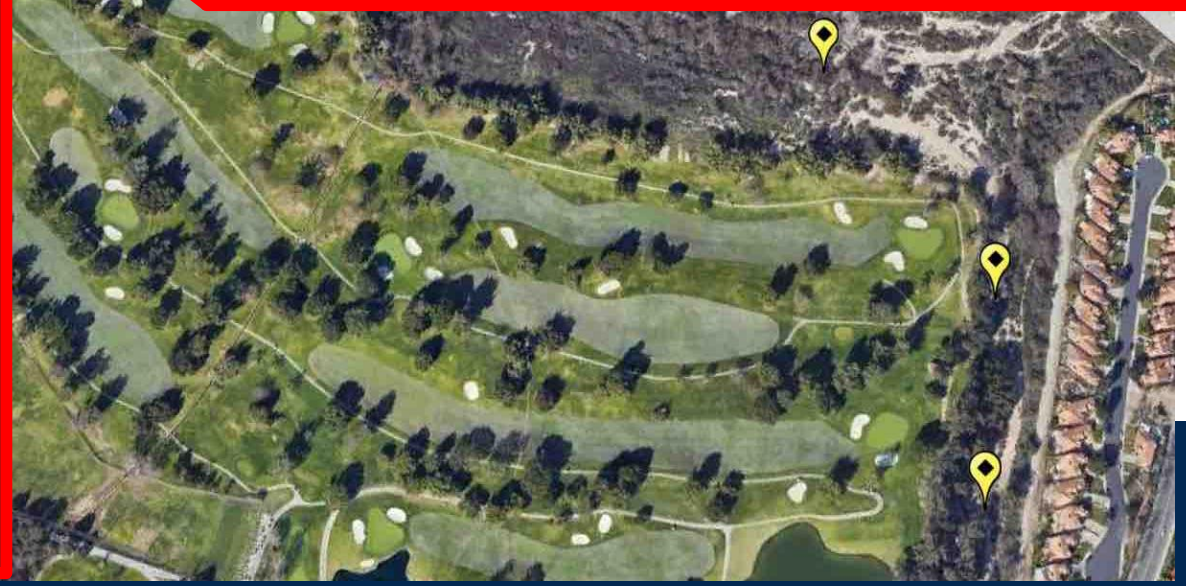
- Raccoons dominated east of the bridge (n=3,118) vs coyotes (n=1,395), but coyotes dominated west of the bridge (n=1,300) vs raccoon (n=282).

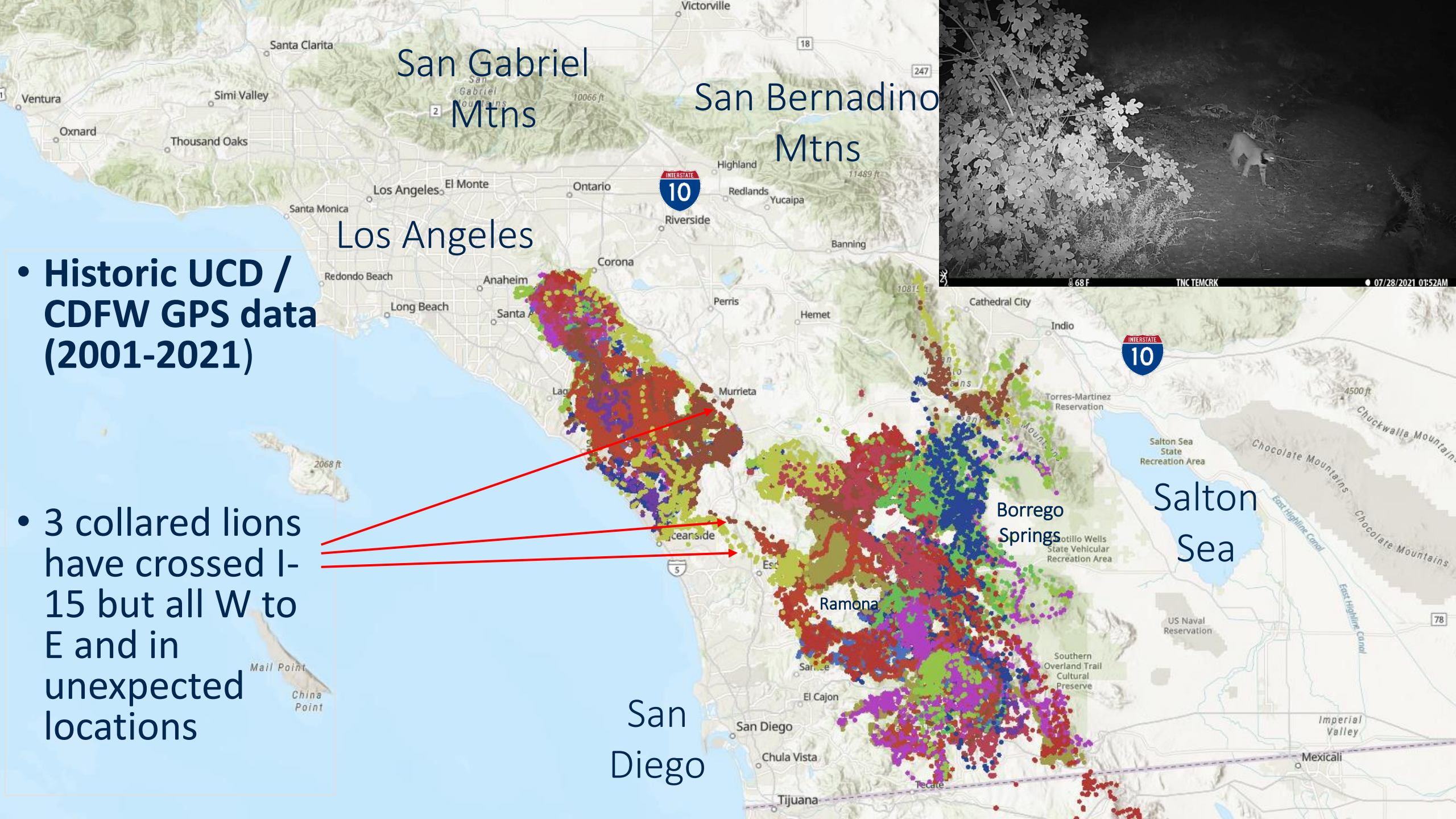



7
5
2
1
2
1
1

Results

Potential crossings = **2 ; WEST to EAST**





- **Historic UCD / CDFW GPS data (2001-2021)**

- 3 collared lions have crossed I-15 but all W to E and in unexpected locations

Mountain Lion Detections Via Camera-Trap: useful data prior to captures

BAITING

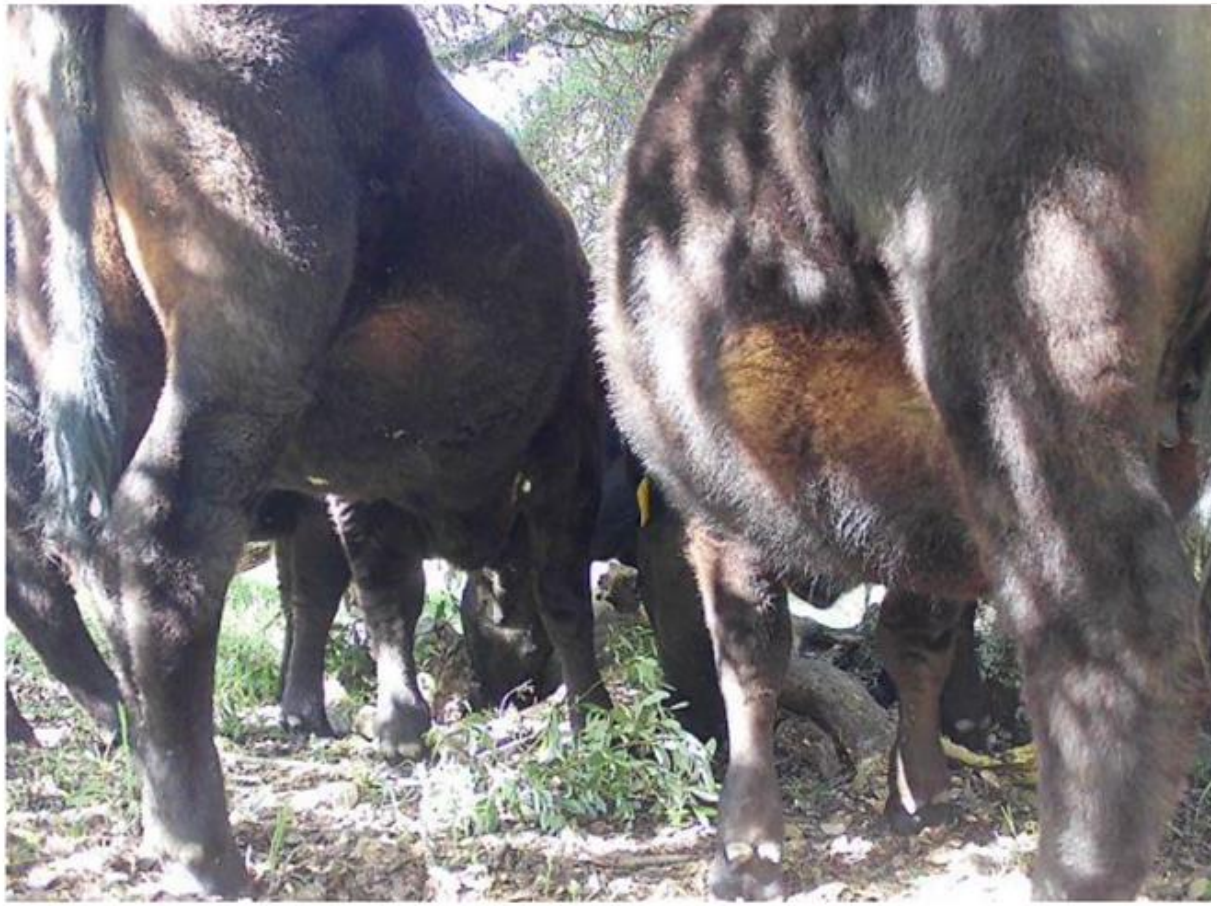

2024-01-08 17:47:23

Capture attempts


62 F 27.8 inHg
TRAILCAM01
11/16/2023 06:18:05PM

Challenges

- Weather




UC Davis
324

Improving GPS collars weight/size

Collar failures – solar prototypes

MARGO SUPPLIES
WILDLIFE TECHNOLOGY

Vectronic Lite: 699 grams
Vectronic Plus: 747 grams
Margo: 282 grams

Collar failures – solar prototypes

MARGO SUPPLIES
WILDLIFE TECHNOLOGY

Collar failures – solar prototypes

Collar failures – solar prototypes

SOLEX
VERTEX GPS TRACKING COLLAR

- Dual solar panels
- Light-dependent power supply
- Up to 100 GPS positions/day
- 250K stored GPS locations
- Iridium communication
- Temperature, activity, mortality, VHF
- Data access via INVENTA

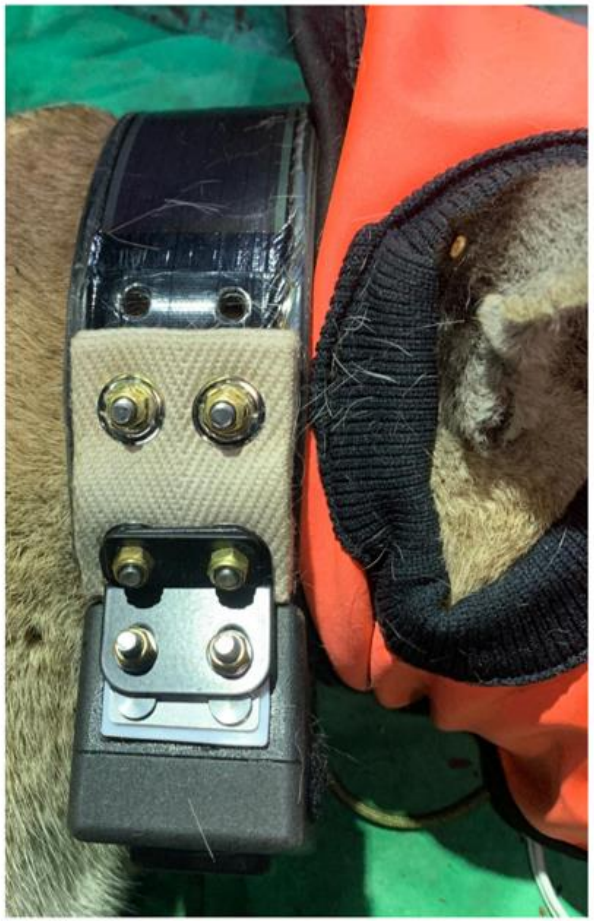
AVAILABLE OPTIONS

- Cotton layer
- Drop Off: integrated radio and timer
- Collar circumference: 40-120 cm
- Round and oval collar shape

SPECIFICATIONS

- Bottom housing: L 7.9 x W 4.9 x H 5.2 cm
- 56 cm collar = 450 grams
- Access data anywhere with INVENTA mobile app

Collar failures – solar prototypes



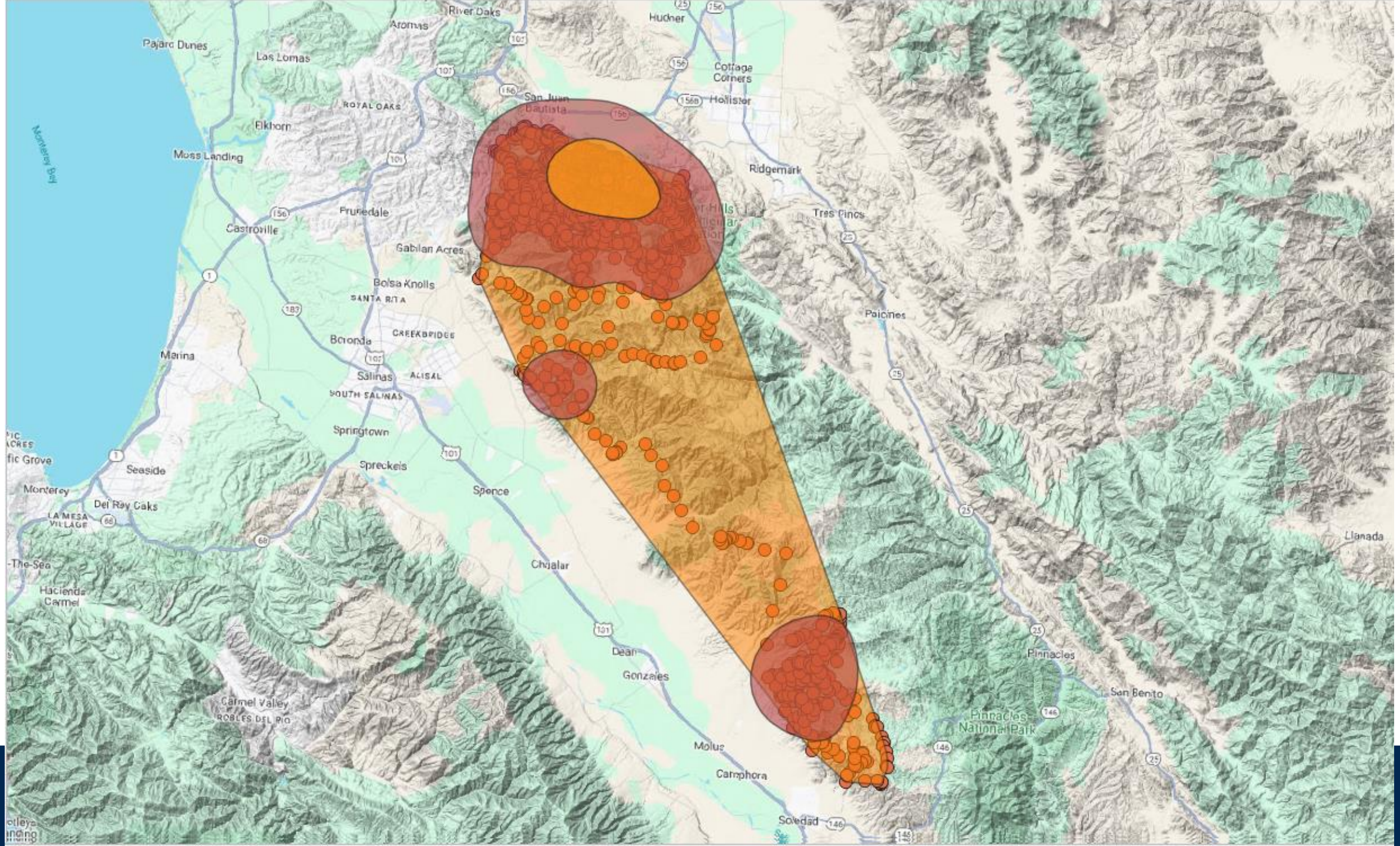
Collar failures – solar prototypes

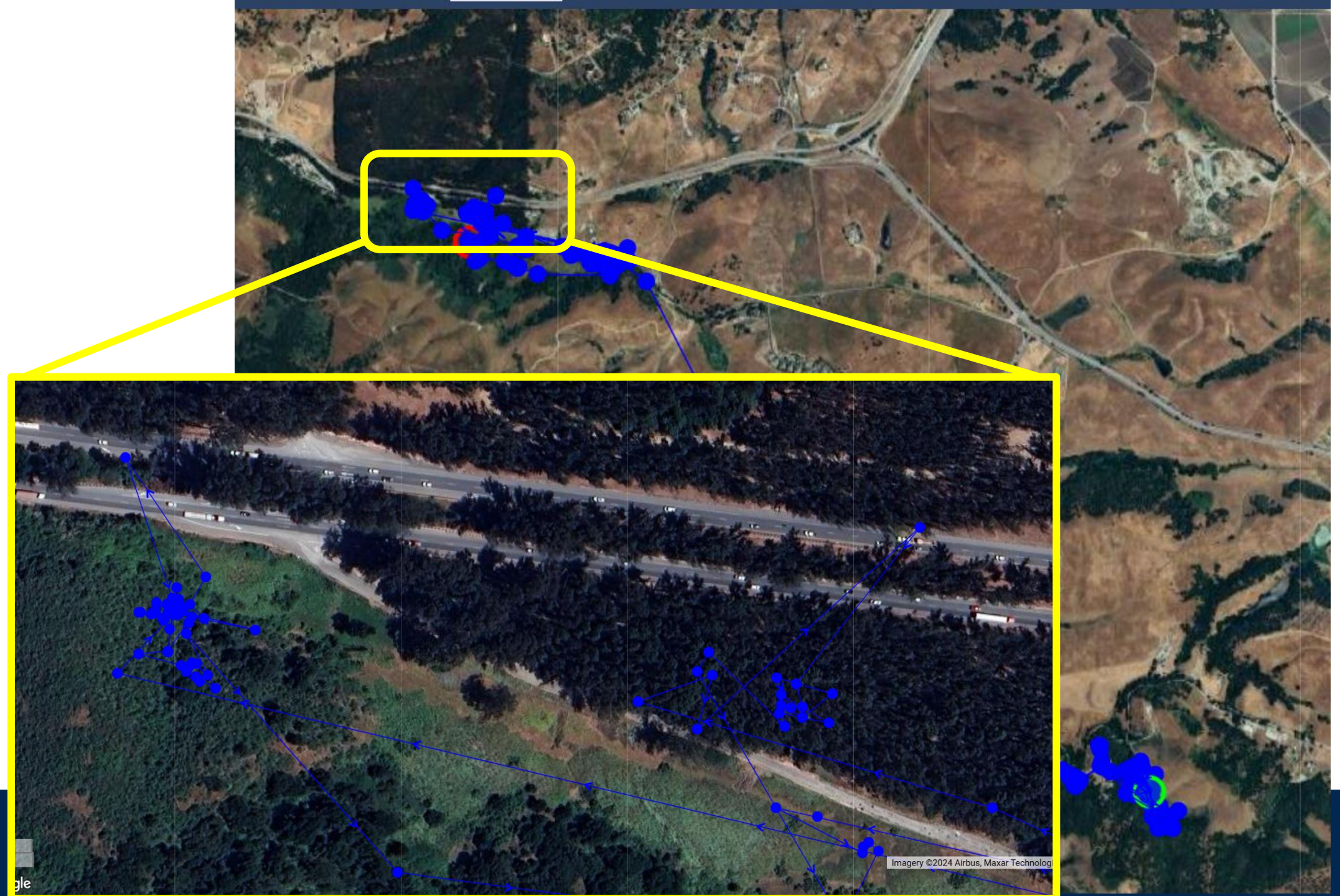
Video courtesy of Marc Girardeau

Lotek 40

Photos courtesy of Dr. Mathias Tobbler

Information collected via GPS collars


Pajaro Dunes
Las Lomas
Aromas
River Oaks
Hudner
Cottage Corners
Hollister
San Juan Bautista
ROYAL OAKS
Elkhorn
Moss Landing
Monterey Bay
Ridgemark
Tres Pinos
Fruitedale
Castroville
Gabilan Acres
Bolsa Knolls
SANTA RITA
Paicines
Boronda
CREEKBRIDGE
Marina
Salinas
ALISAL
SOUTH SALINAS
Springtown
Spreckels
Seaside
Monterey
Del Rey Oaks
LA MESA VILLAGE
Spence
Chualar
Hacienda Carmel
Dean
Gonzales
Pinnacles
San Benito
Pinnacles National Park
Carmel Valley
ROBLES DEL RIO
Llanada
Molus
Camphora
Soledad


Imagery ©2024 Airbus, Maxar Technologi

Depredation Prevention Research

Depredation prevention → paramount for pacific coexistence and mountain lion survival

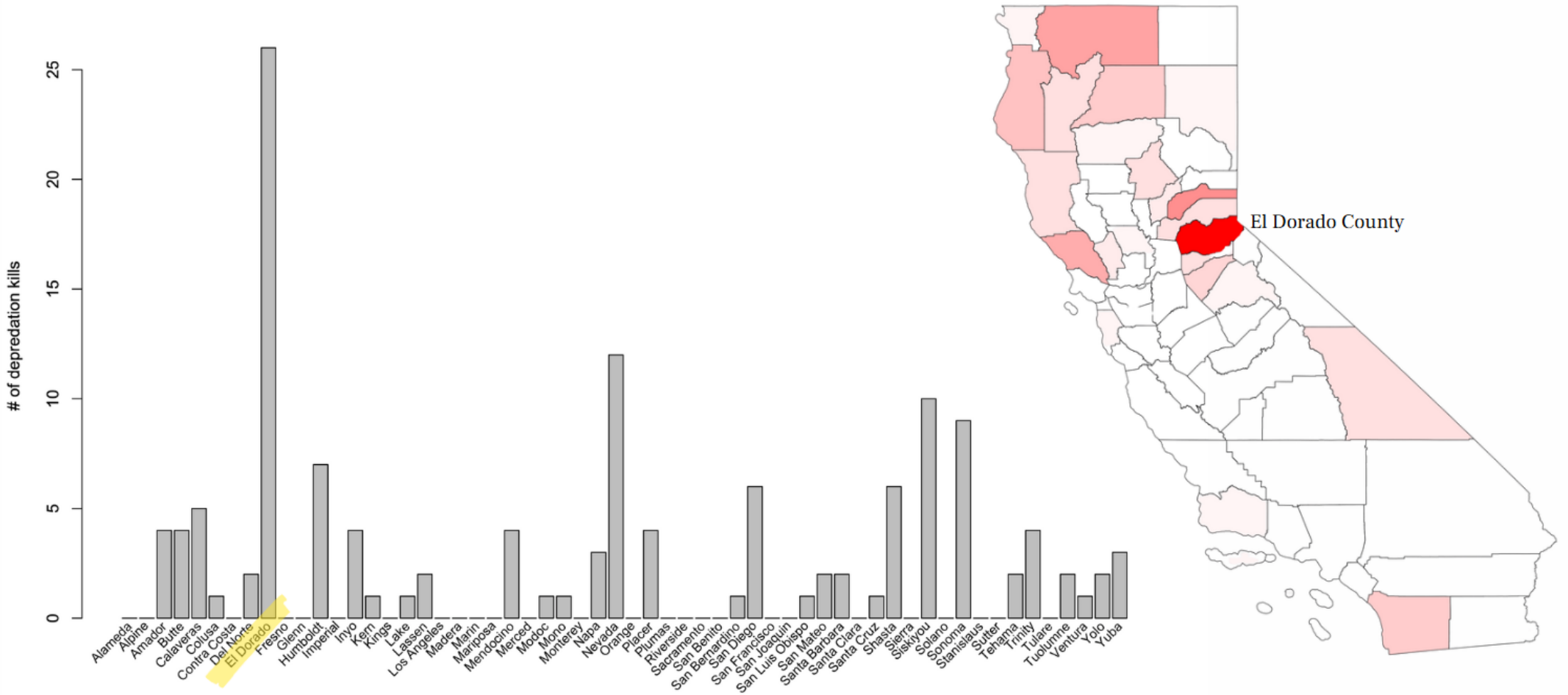
- Primary threats:
  - Loss of connectivity → genetic inbreeding
  - Depredation permits (and poaching)
  - Low annual survival
    - Statewide: males 67%, females 80%
    - Eastern Peninsular: 56% both sexes

- Some threats, such as rodenticides and fire, may be increasing

Cause of death	Percentage of mortalities
Vehicle strike	40%
Depredation permit	**24%**
Killed illegally	**16%**
Disease suspected	16%
Disease confirmed	8%
Fire	8%
Public Safety	4%
Killed by another puma	4%
Unknown	20%

Causes of death for radio-collared pumas in Santa Anas and eastern Peninsular ranges from 2001–2013.
(Vickers, et al. 2015)

Mountain Lion Depredation Kills by California County, 2020-2022



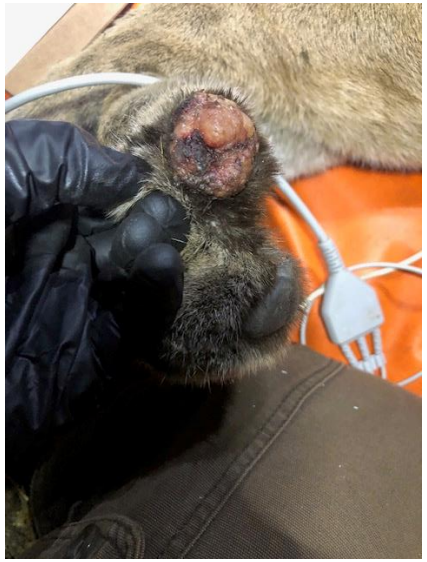
Source: California Department of Fish and Wildlife

Profiling the Offender

1. Dispersal individuals - young adult pumas that recently left their natal range (and mom)

2. Females with dependent kittens

3. Injured individuals



Research since 2021.

Several conflict mitigation techniques used:

- Deterrents
- Preventive husbandry

Hulpre motion sensor alarm

Solar sound and light alarm

Foxlight

Wasatch call

Mr. Beams solar Wedge

Predator Guard

Deterrence Device Testing at Artificial Bait Sites


NIGHT 1
59 F 28.78 inHg
03/26/2022 03:07:07AM

Campark TC27 4G LTE Cellular Trail Camera 2.5K Wireless Solar Powered Cam with Instant Alert and Color Night Vision


2023-12-26 20:53:11


61F 24.58 inHg
TRAILCAM01
11/03/2023 04:05:46PM

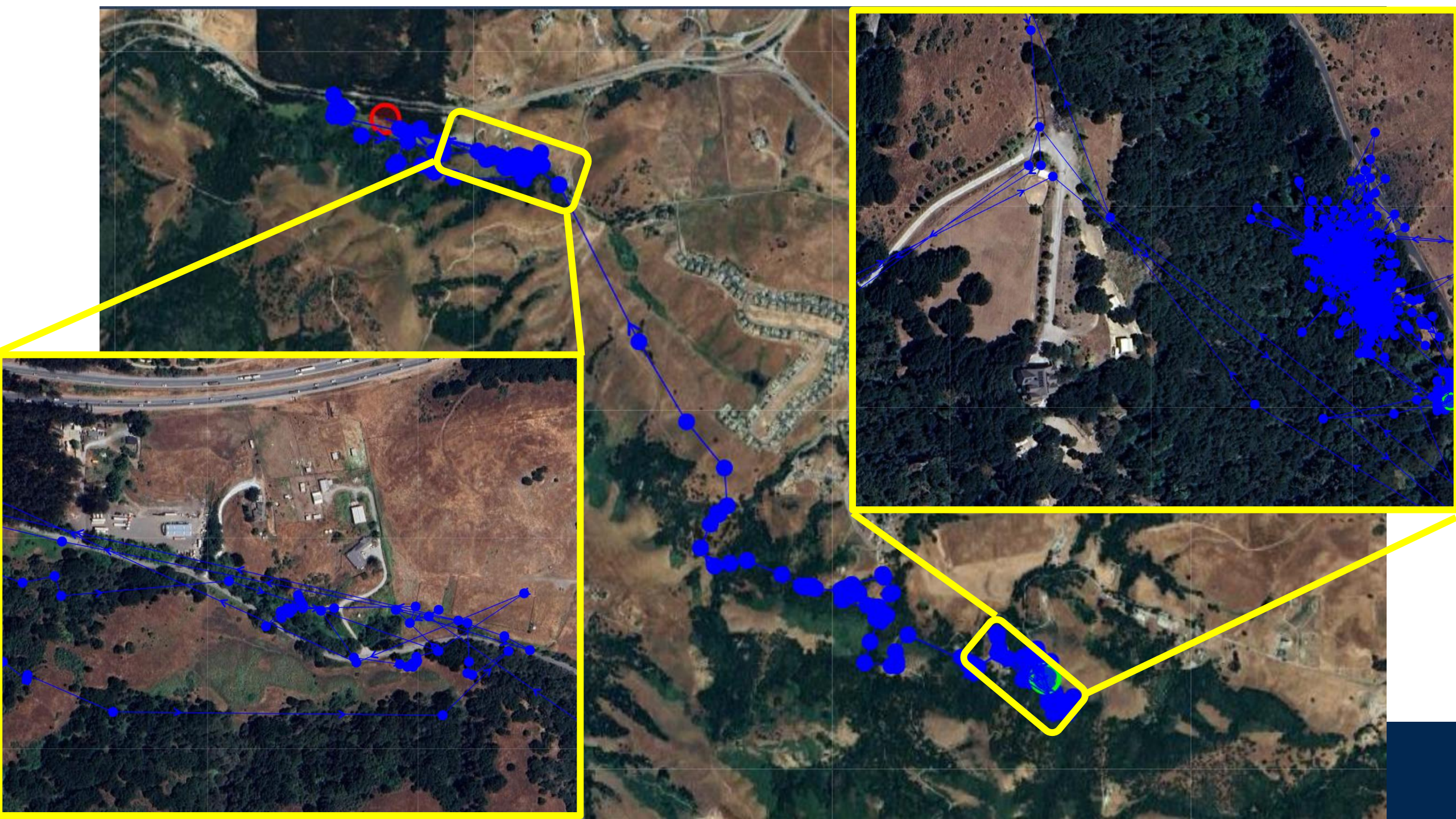
Deterrence Device Testing at Artificial Bait Sites

- Gadfly
- Wasach Calls
- Human recordings

} Alone or in combination → Success in 64% of cases (16/25)

Deterrence Device Testing at Depredation Sites

- Building up numbers
- Collaring conflict pumas → analysis of behavior/success-failure of the devices (e.g., M409)



Deterrence Device Testing at Depredation Sites

- Collar data → proactive measures → determine effectiveness of tools → increase chances for success


REVEAL
TACTACAM
08/12/2024 21:22:05

Deterrence Device Testing at Depredation Sites →

PLAN B

Deterrence Device Testing at Depredation Sites →

PLAN B

Depredation Prevention

1. Proactive measures
2. Husbandry Practices
3. Deterrence Devices

Partnerships and the Carnivores Program

Success is better with partners

CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

+

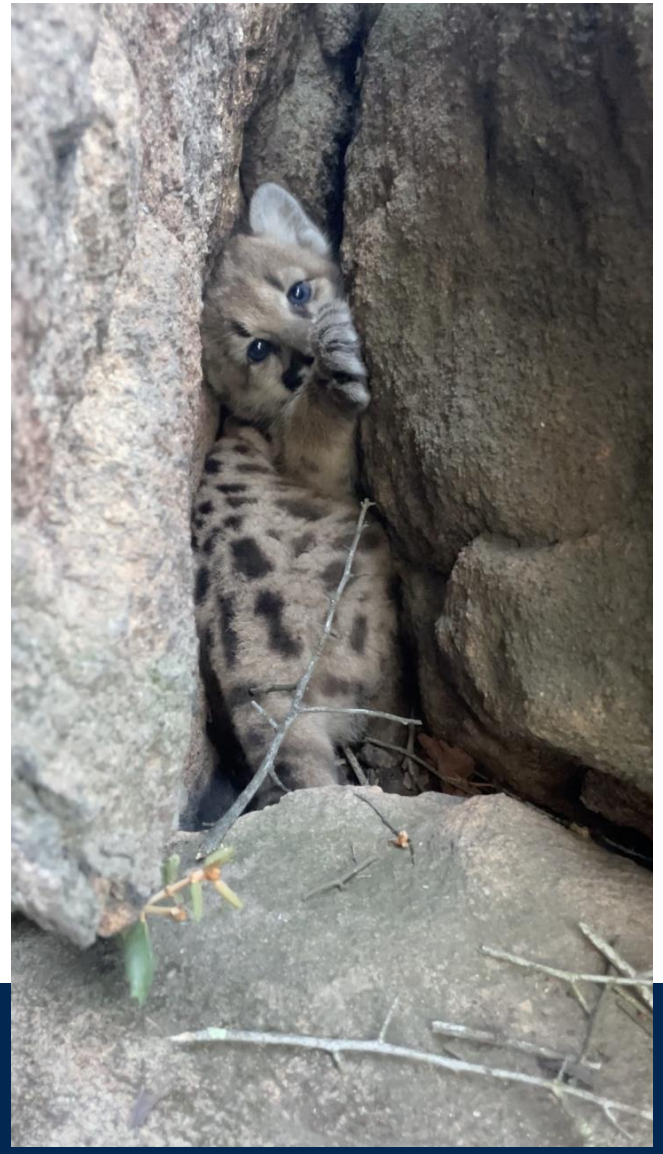
San Diego Zoo Wildlife Alliance

SANDAG

+

=

Success is better with partners



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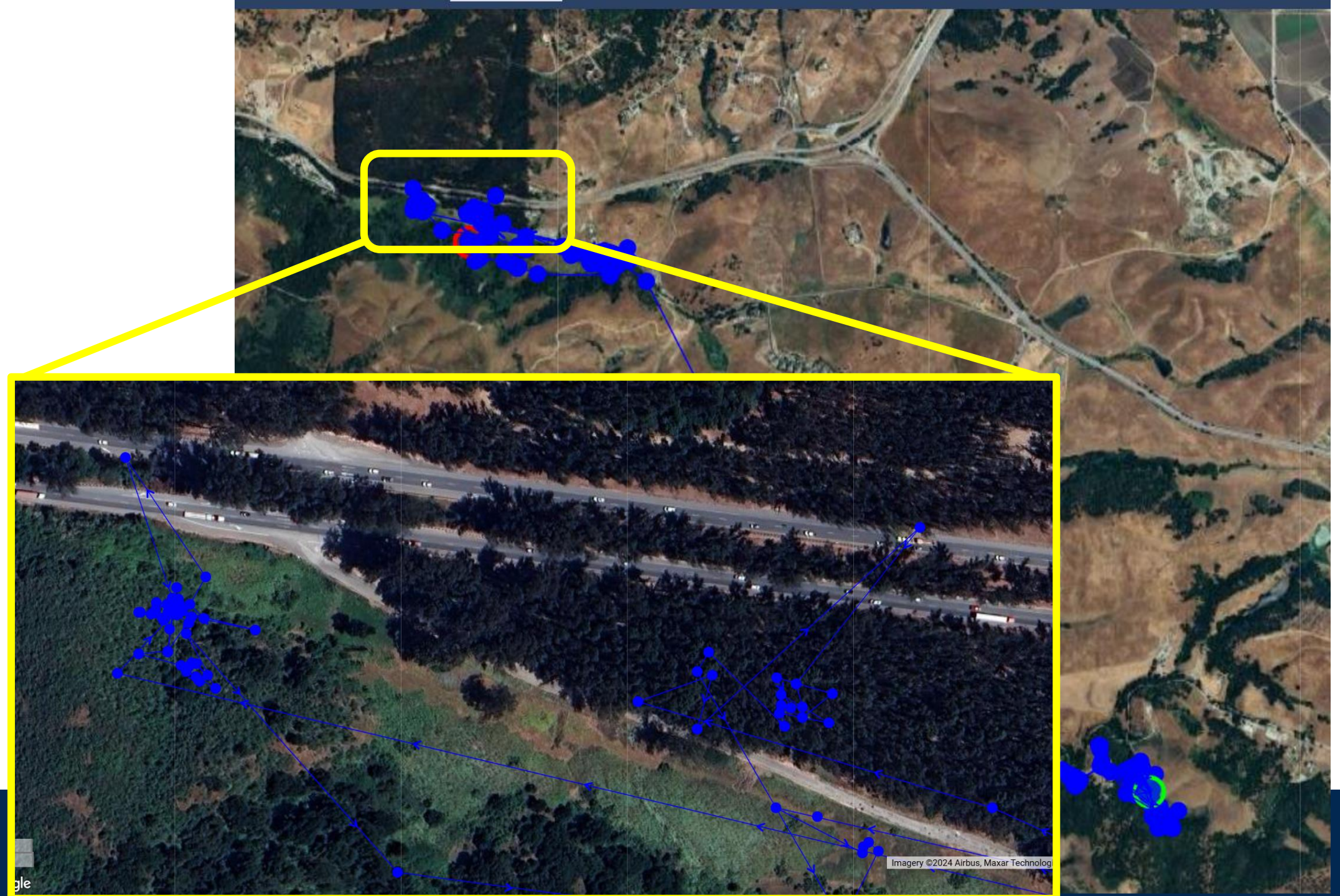
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WCN Wildlife Conservation Network

The Nature Conservancy

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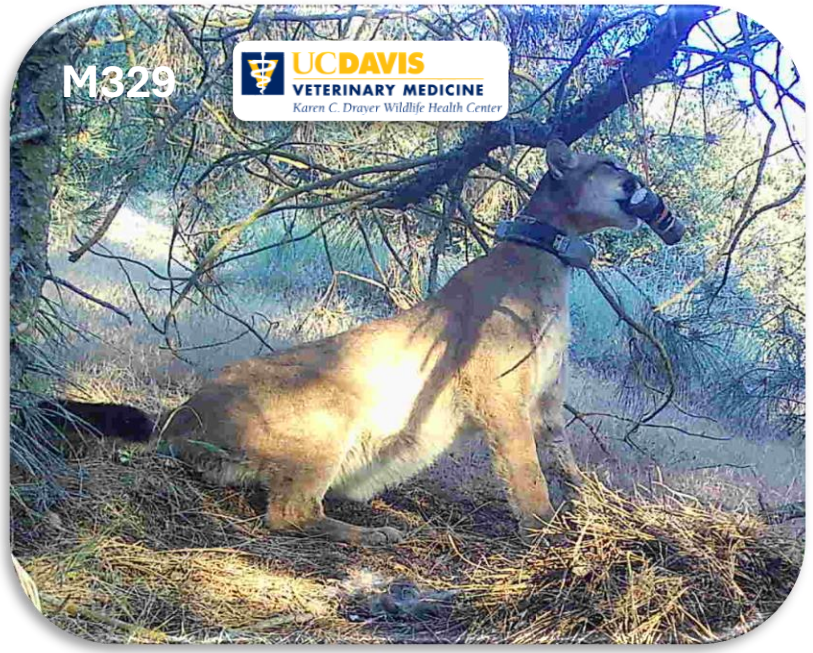

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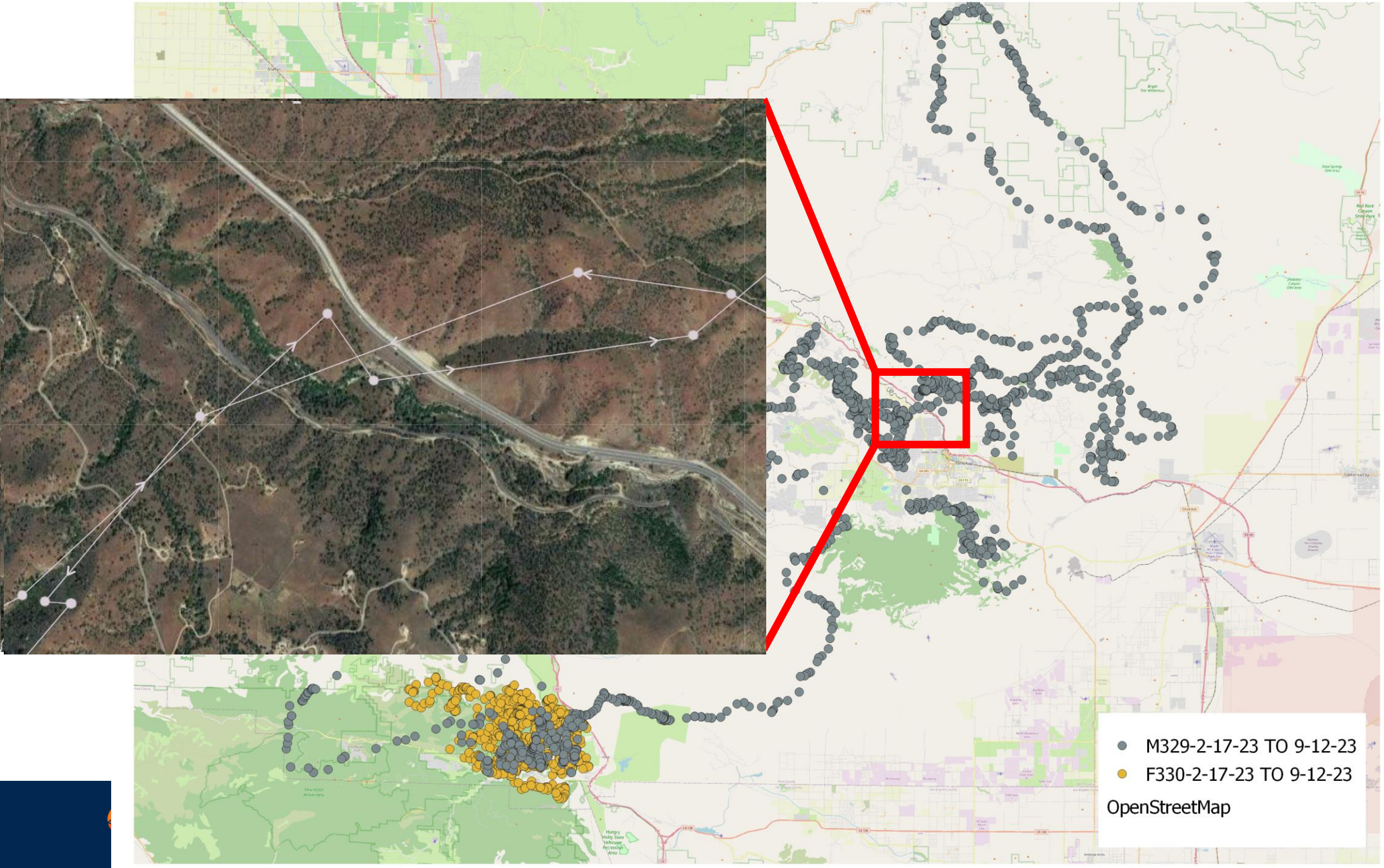
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F330-2-17-23 TO 9-12-23
OpenStreetMap

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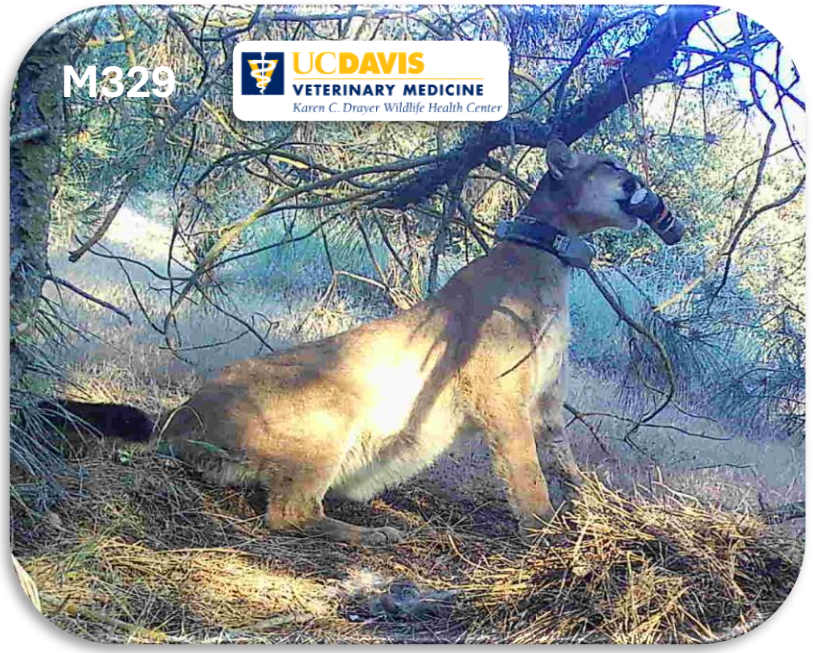

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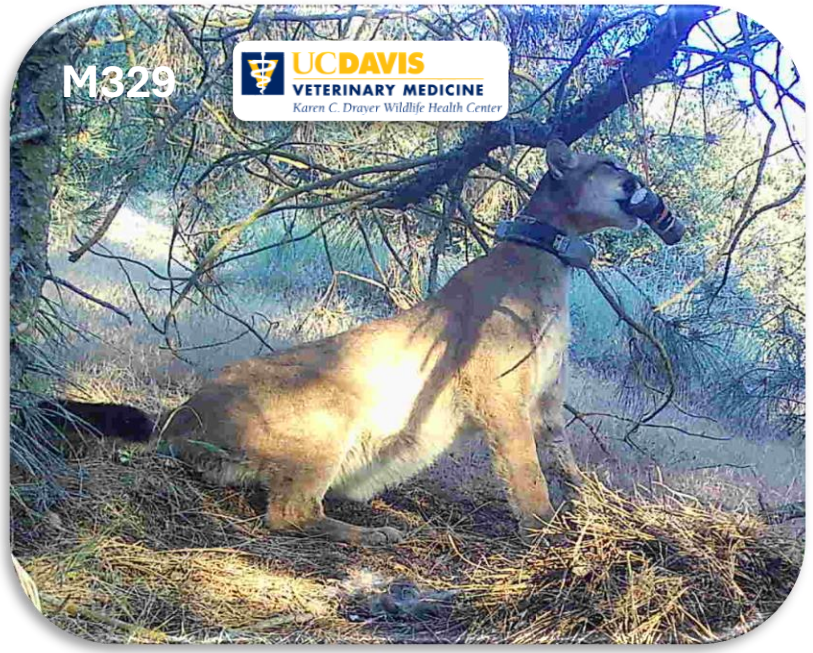

COLLABORATORS AND FUNDERS

THANK YOU ALL VERY MUCH

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