CDFW's Mountain Lion Program

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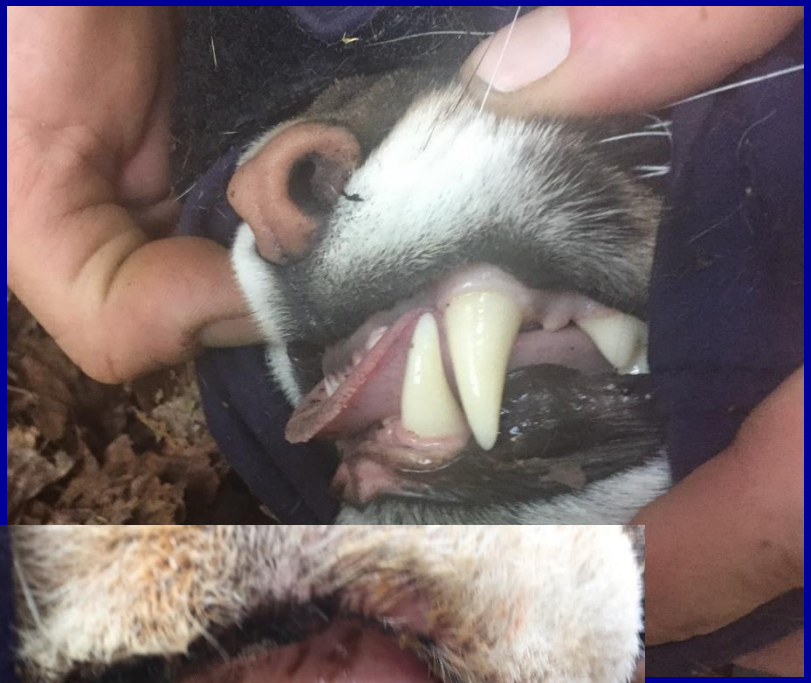
Natural History

Size: Males 120-160; Females 70-100

Natural History

Age: Gumline recession



Natural History

Sex: Look for black dot

Natural History

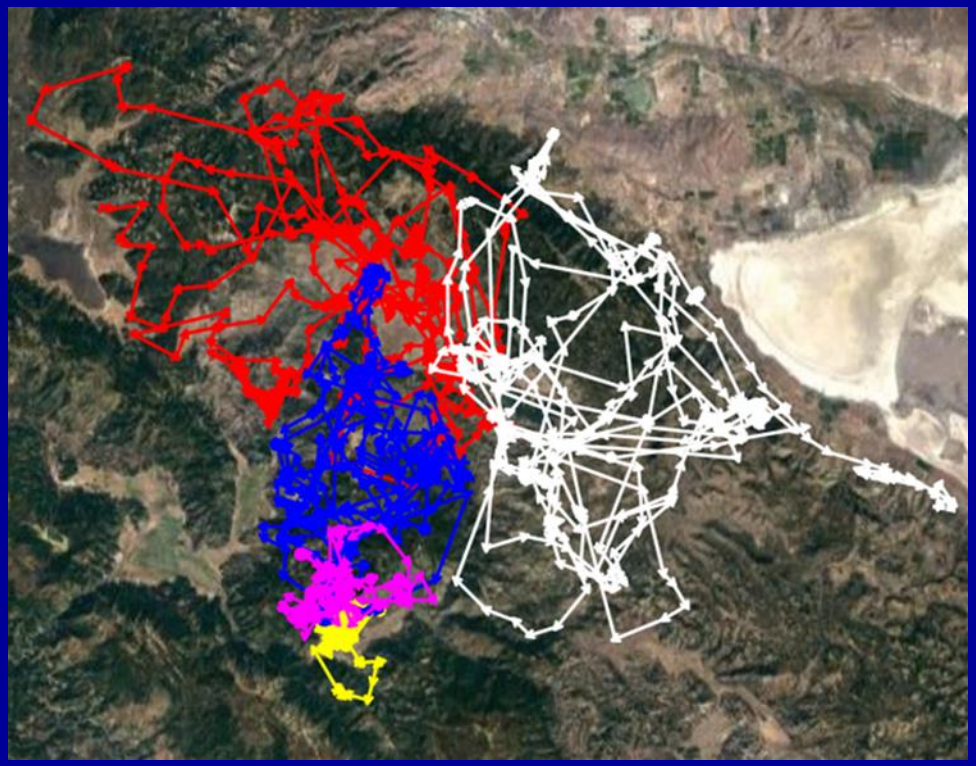
Diet: Deer and just about anything else

Natural History

Sign

Natural History

Space use: Males ~300 sq km; females ~60 sq km
Dispersal: Mainly males; females more philopatric
Habitat use: more like what will they not use



Natural History

Lions & People

-95% of reported sightings aren't lions

-Lethal attack occurs ~15 years in CA

-40 million people & lots of lion habitat = lots of opportunity but little occurrence

Legal Status of California Mountain Lions

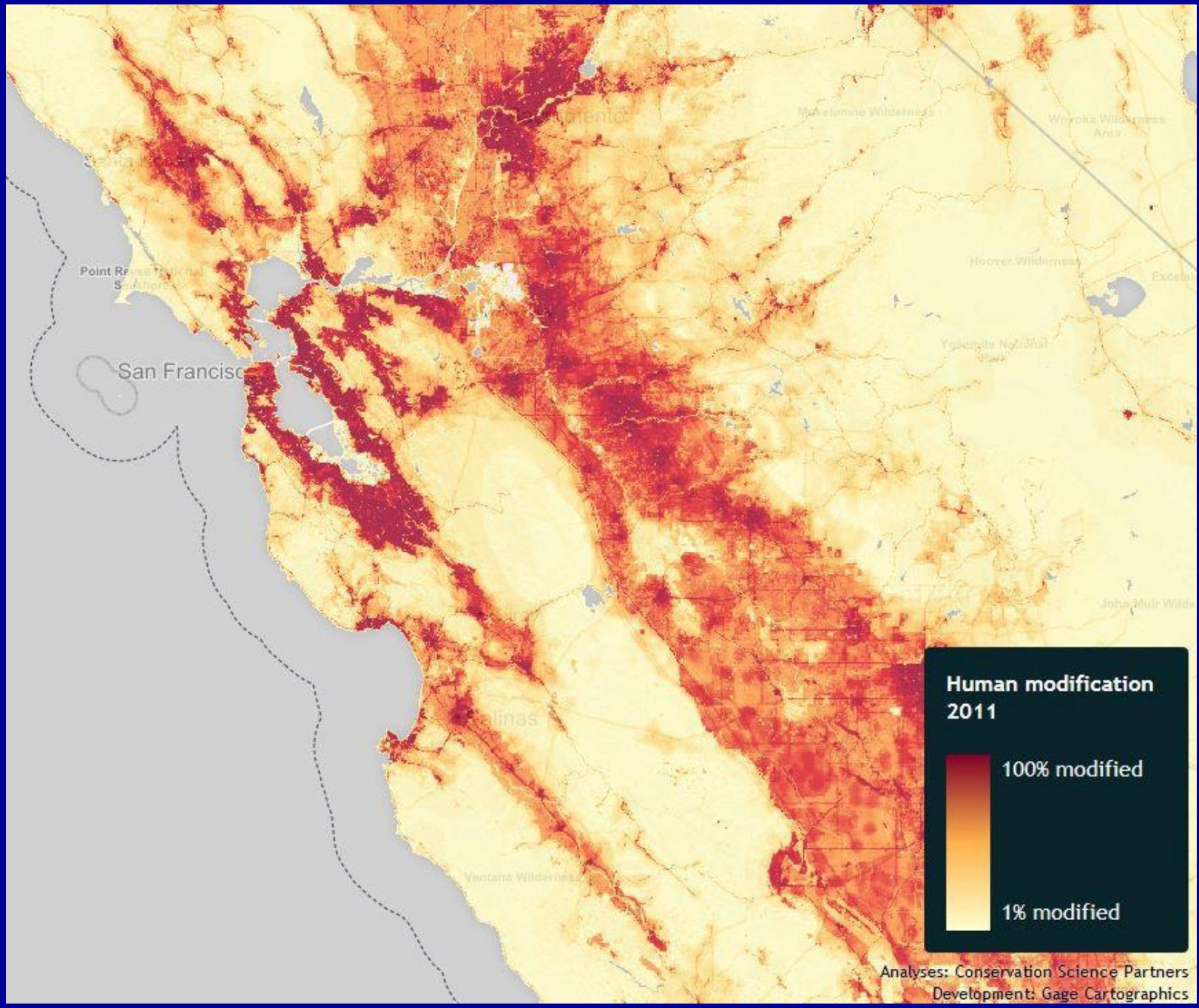
- 1907-1963 Bountied Predator
- 1963-1969 Nongame Mammal
- 1969-1972 Game Mammal
- 1972-1986 Protected Mammal
- 1986-1990 Game Mammal (no hunting)
- 1990-Now Specially Protected Mammal

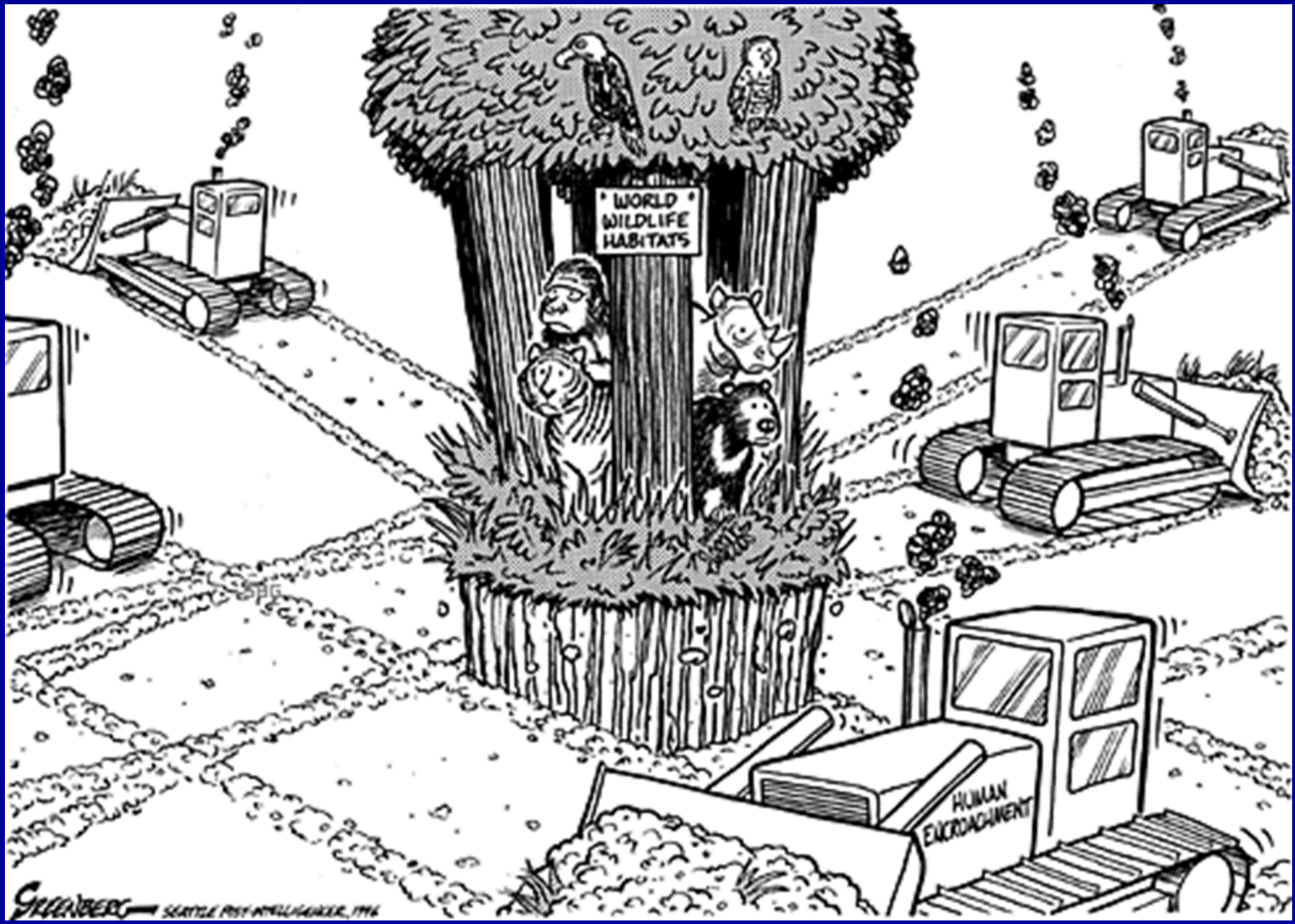
No funding since 1972

Human population growth

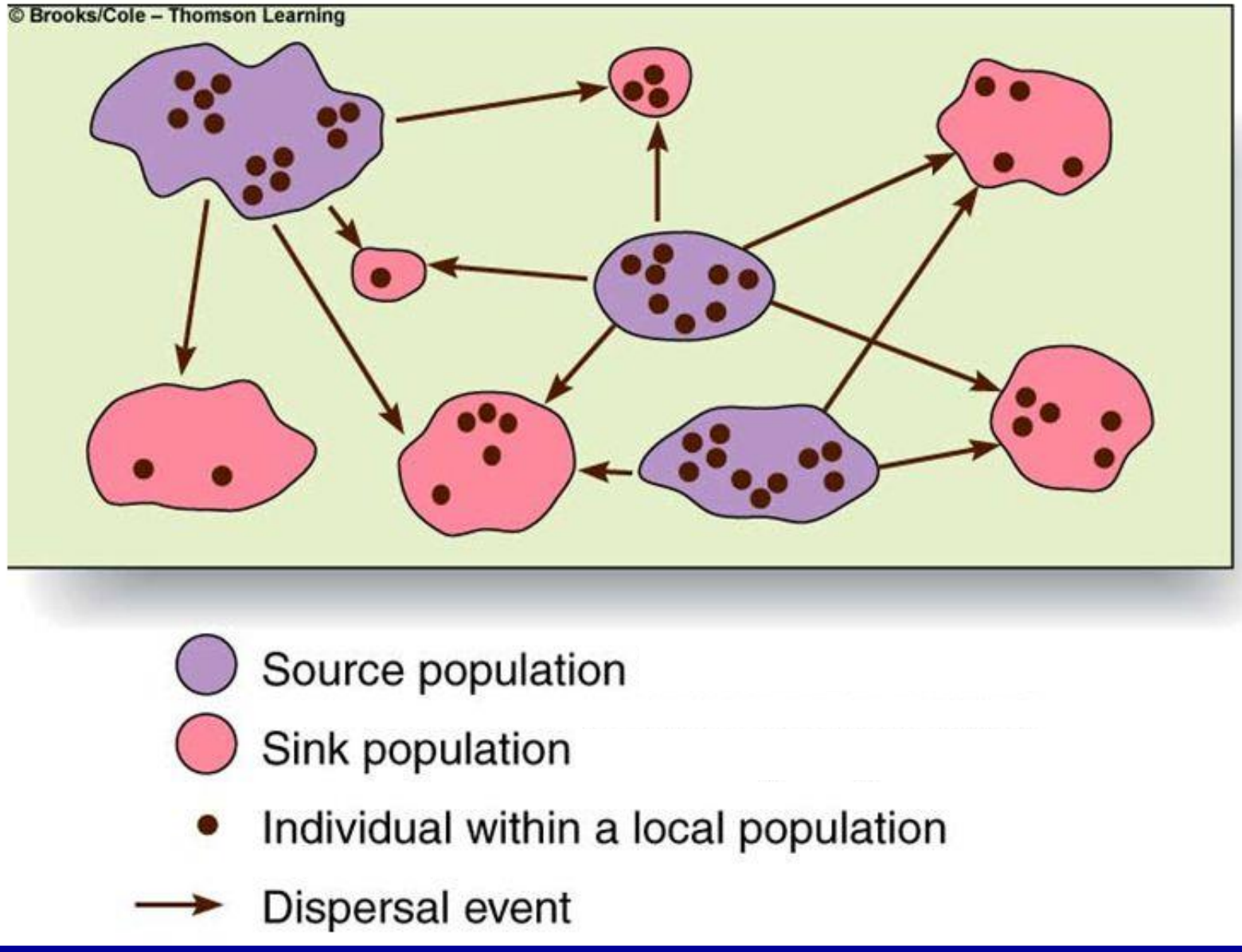
Year	Population	% Growth
1900	1,485,053	22.4%
1910	2,377,549	60.1%
1920	3,426,861	44.1%
1930	5,677,251	65.7%
1940	6,907,387	21.7%
1950	10,586,223	53.3%
1960	15,717,204	48.5%
1970	19,953,134	27.0%
1980	23,667,902	18.6%
1990	29,760,021	25.7%
2000	33,871,648	13.8%
2010	37,253,956	10.0%

*U.S. Census Bureau

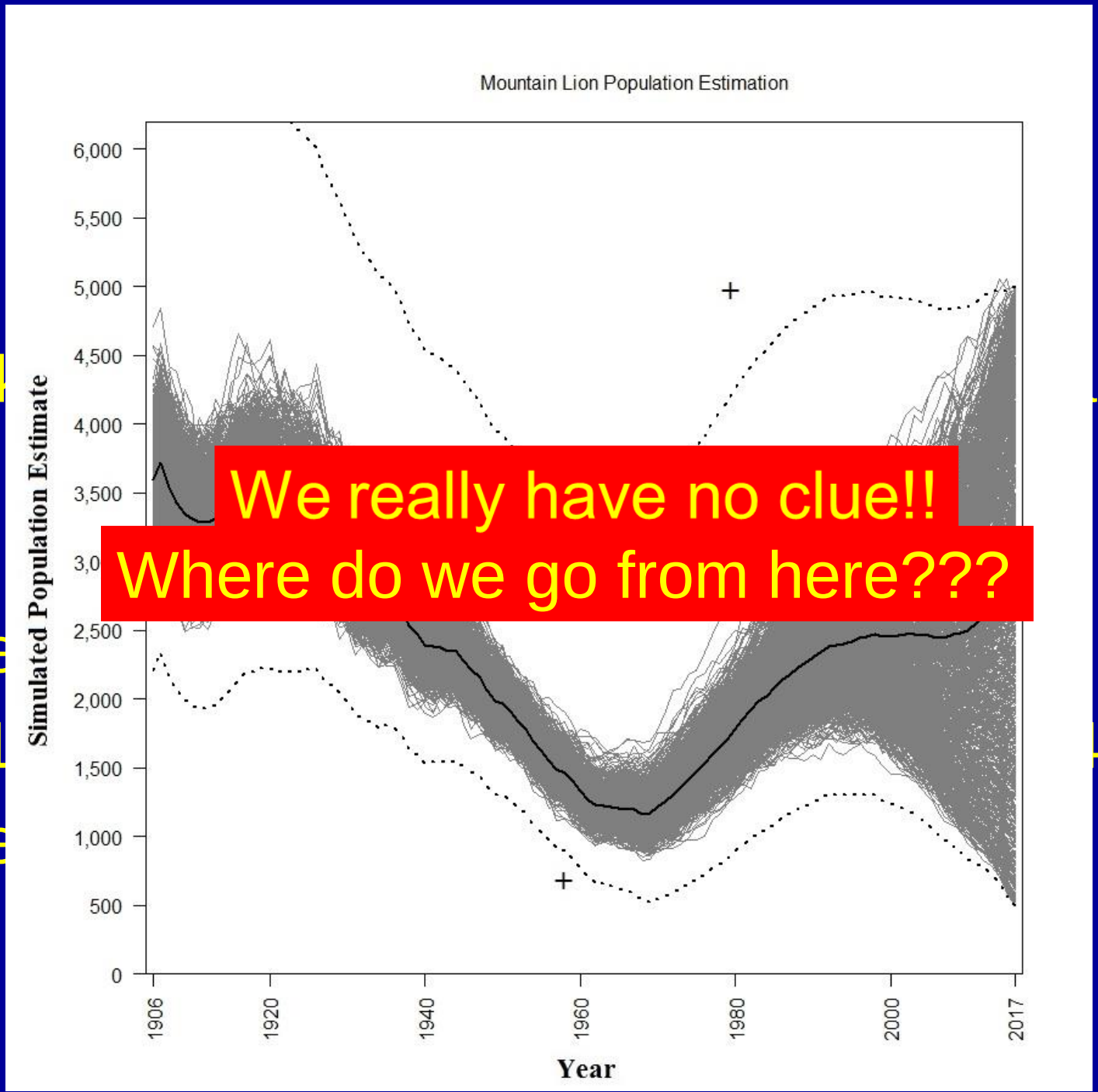

Human modification
2011
100% modified
1% modified
Analyses: Conservation Science Partners
Development: Gage Cartographics


WORLD
WILDLIFE
HABITATS
HUMAN
ENCROACHMENT
GREENBERG — SEATTLE POST-INTELLIGENCER, 1996

Ernest et al. 2014


© Brooks/Cole – Thomson Learning
Source population
Sink population
Individual within a local population
Dispersal event

- Ens
- Lack … across CA
- Our …
  - -Me… 1… 45
  - -Me…



Overarching goals

- Define lion populations
- Assess populations
  - Habitat
  - Genetic Integrity
  - Population viability
  - Health
- Develop more cost-effective monitoring techniques

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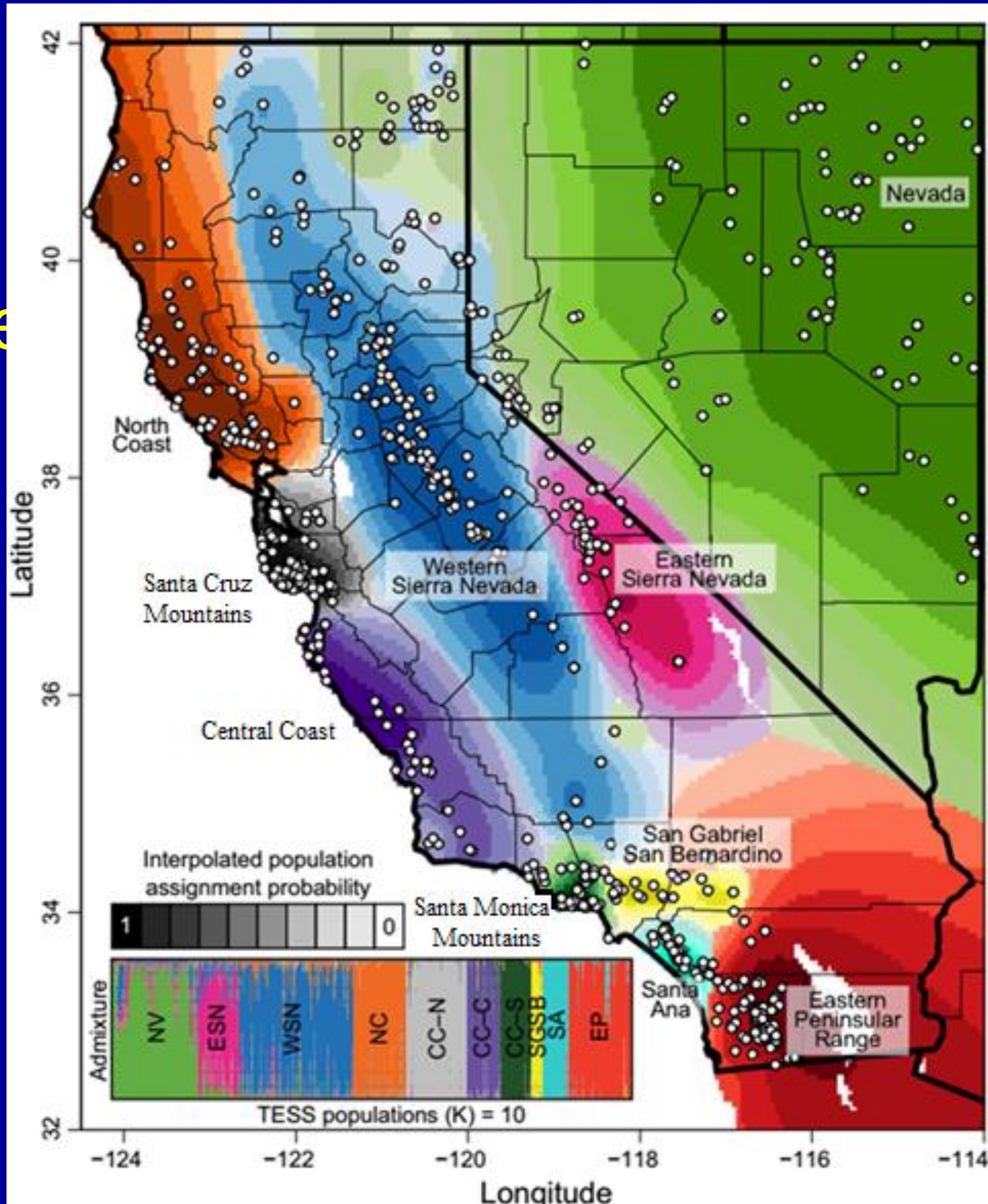
- Ge
  -



Credit Kyle Gustafson
And Holly Ernest

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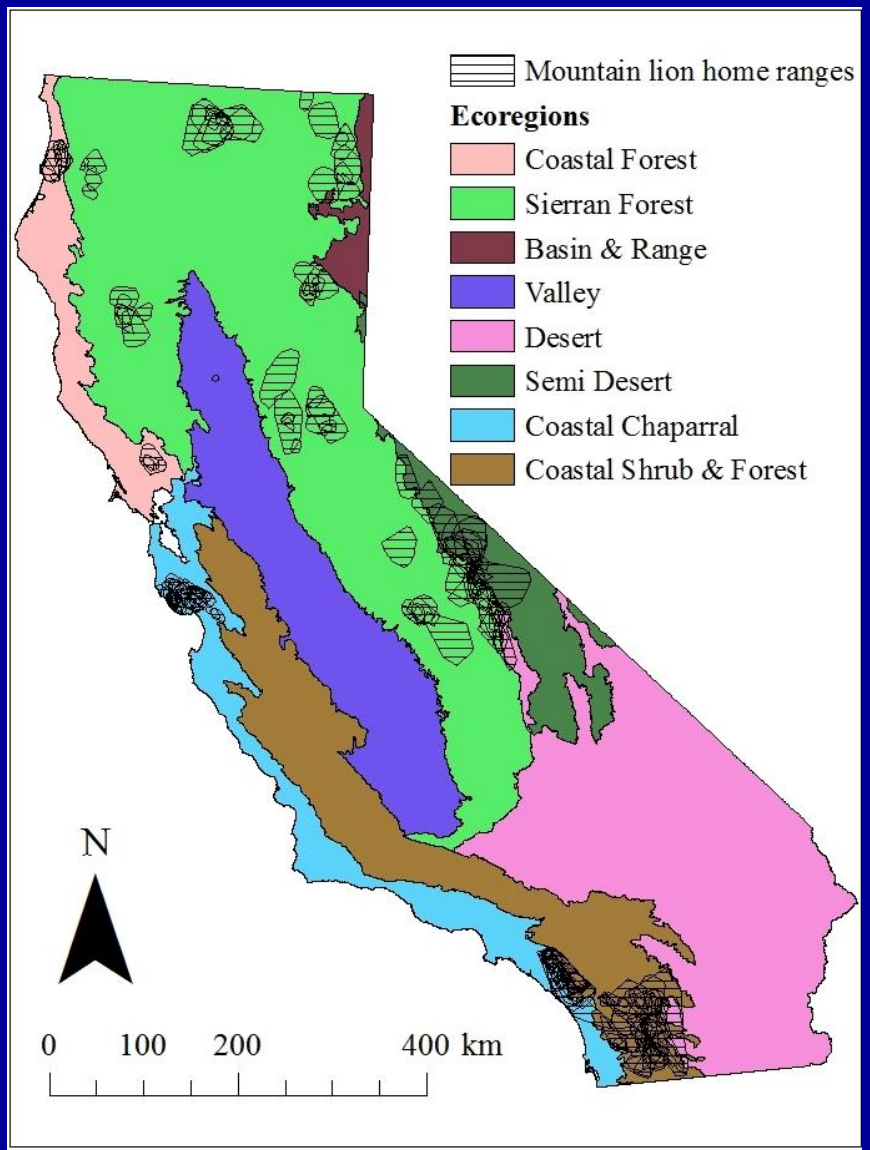
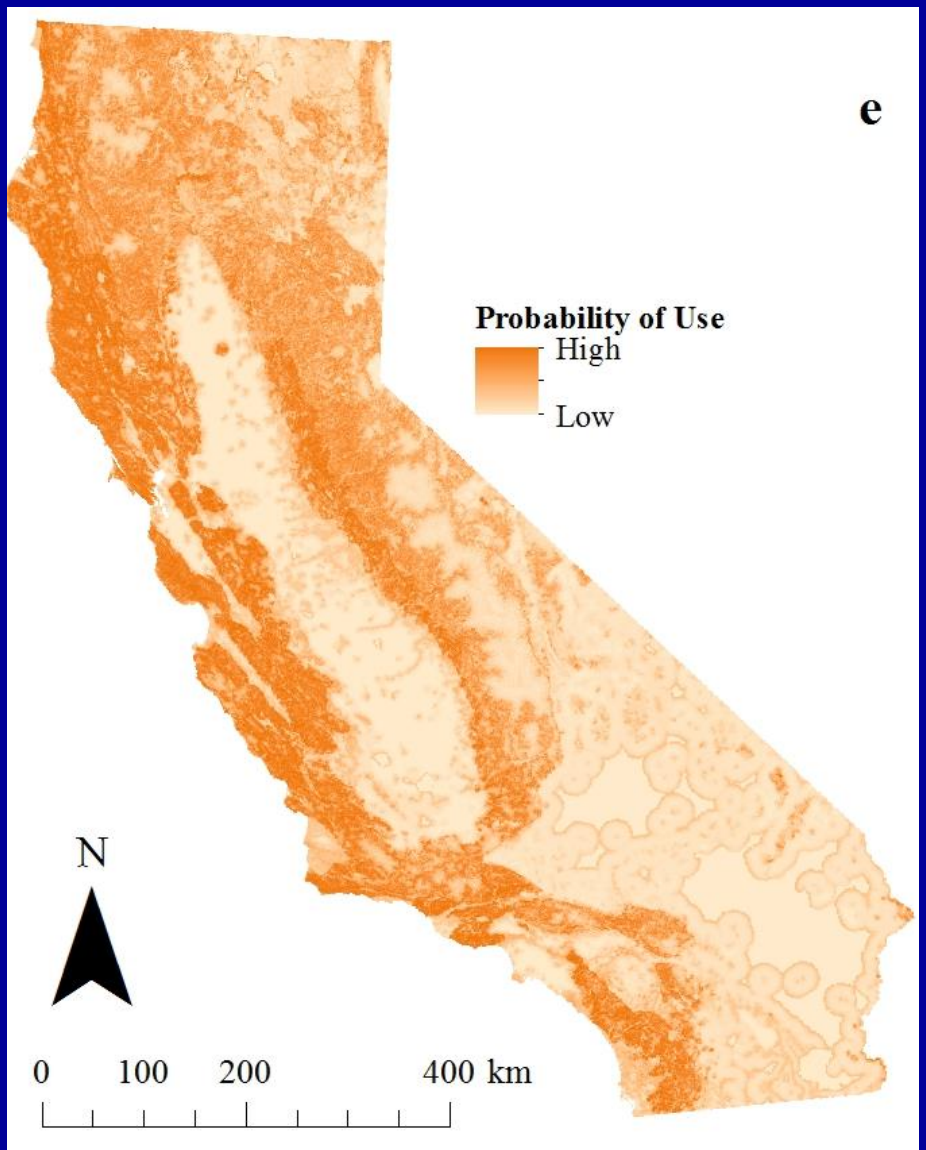
Amount of suitable habitat





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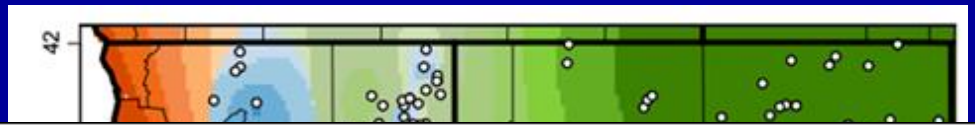
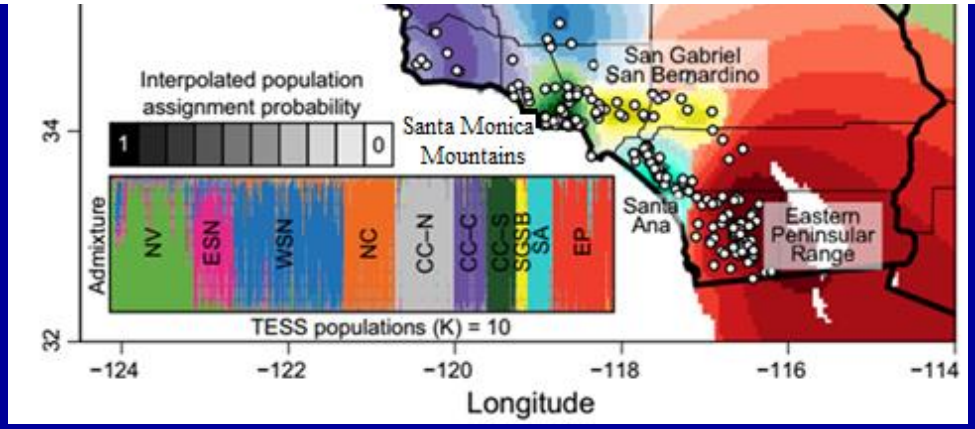
Genetic Integrity



Area	Expected Heterozygosity	Internal Relatedness	Effective Population Size
Western Sierra-Nevada Mtns	0.52	0.09	156
Eastern Sierra Nevada Mtns	0.53	0.11	23
North Coast	0.41	0.28	83
Santa Cruz Mtns	0.42	0.27	17
Central Coast	0.46	0.19	57
Santa Monica Mtns	0.41	0.27	3
Santa Ana Mtns	0.33	0.39	16
Eastern Peninsular Range	0.44	0.21	32
San Gabriel and San Bernardino Mtns	0.42	0.29	5



Gustafson et al. 2018

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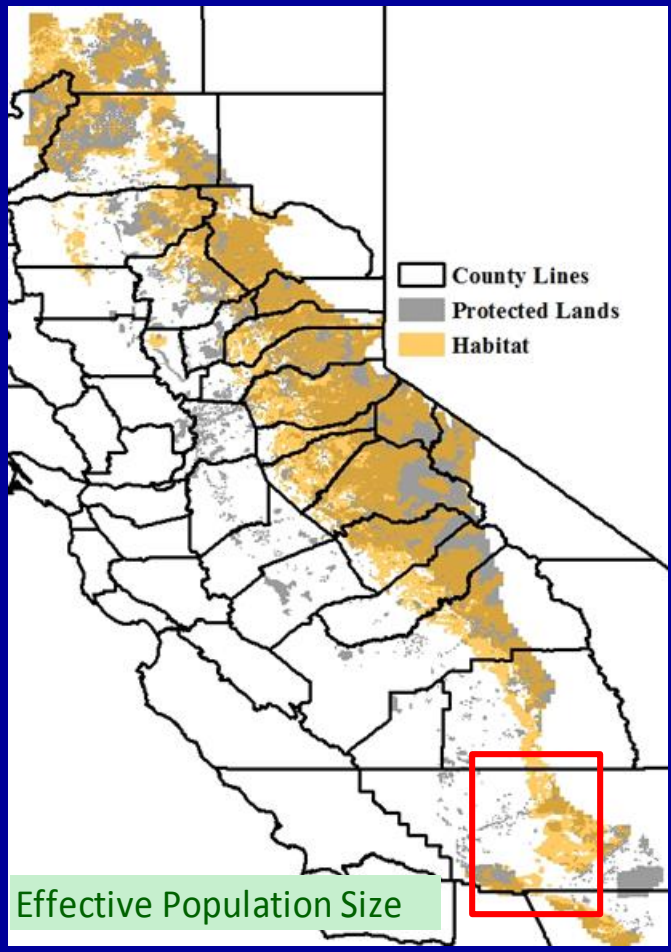
Population Viability

- Analyses
  - Effect. Pop. Size ~ Overall suitable habitat
  - Effect. Pop. Size ~ Protected suitable habitat
  - Minimum Threshold – Effect. Pop. Size n = 50

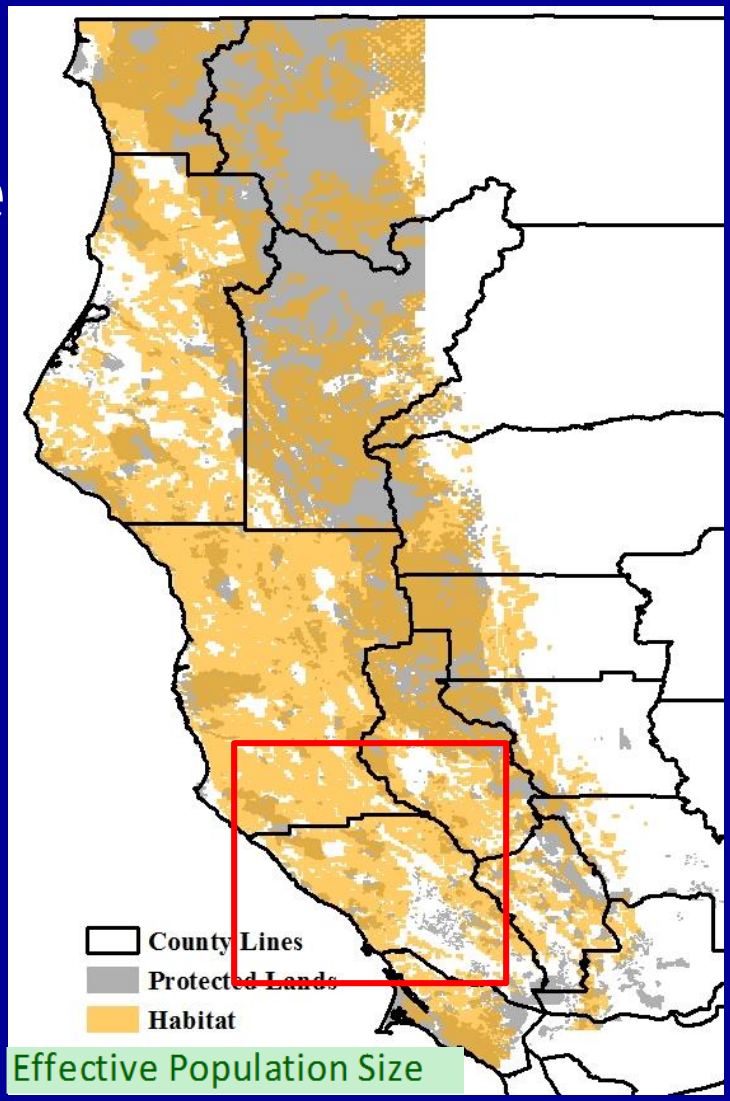
Western Sierra

- No current concerns
- Important source for entire state & beyond
- Important to maintain habitat in southern extent



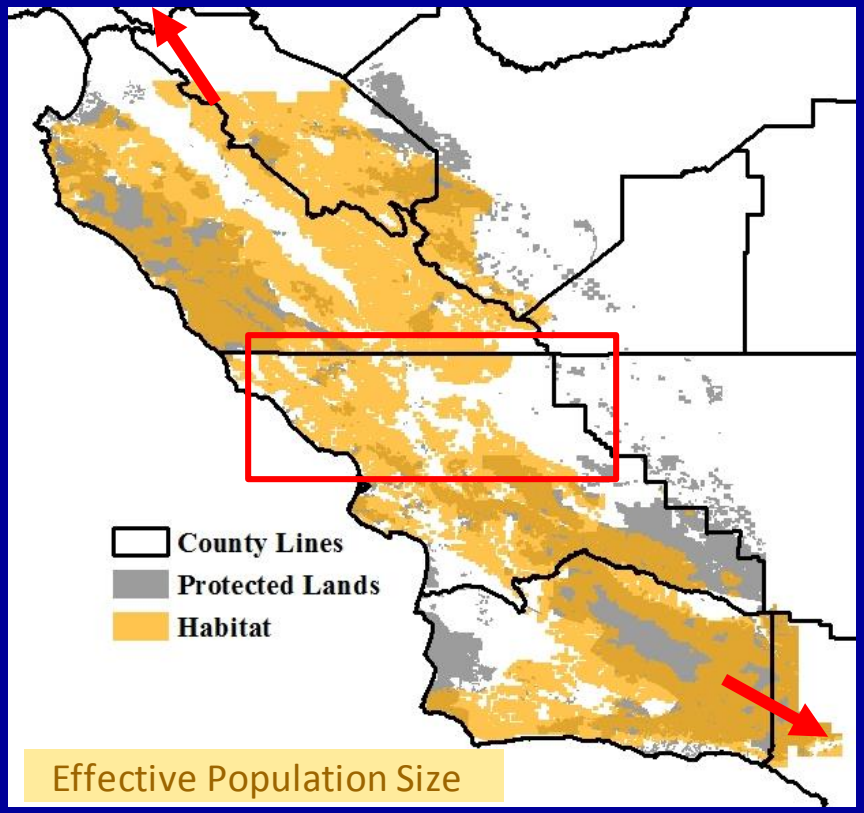
North Coast

- No current concerns
- Southern extent a possible concern due to ‘habitat peninsula’ and little protected habitat



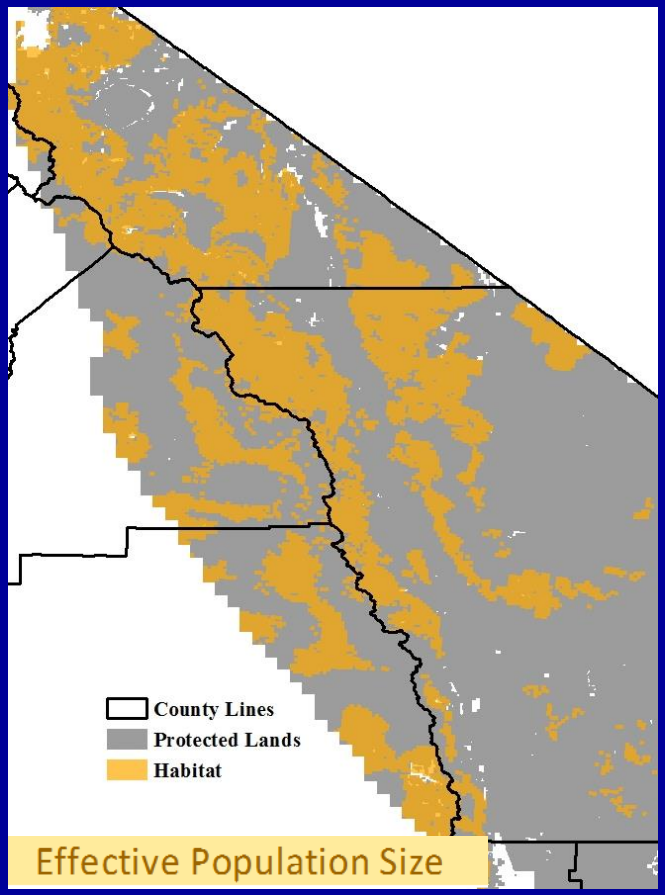
Central Coast

- No current concerns
- Increase protected habitat
- Central section is vulnerable
- Improve connectivity to smaller adjacent areas



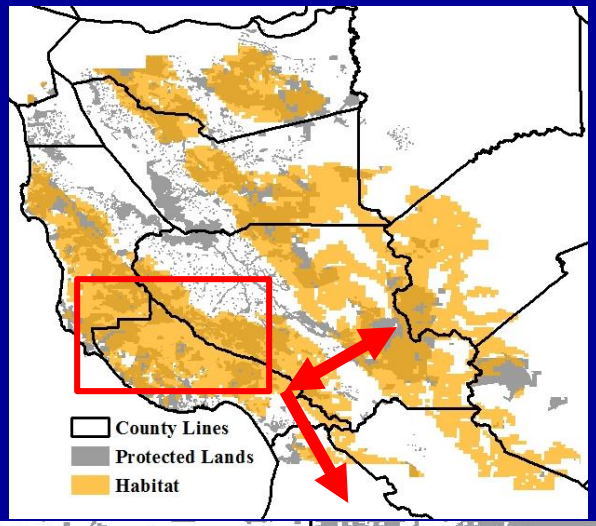
Eastern Sierra

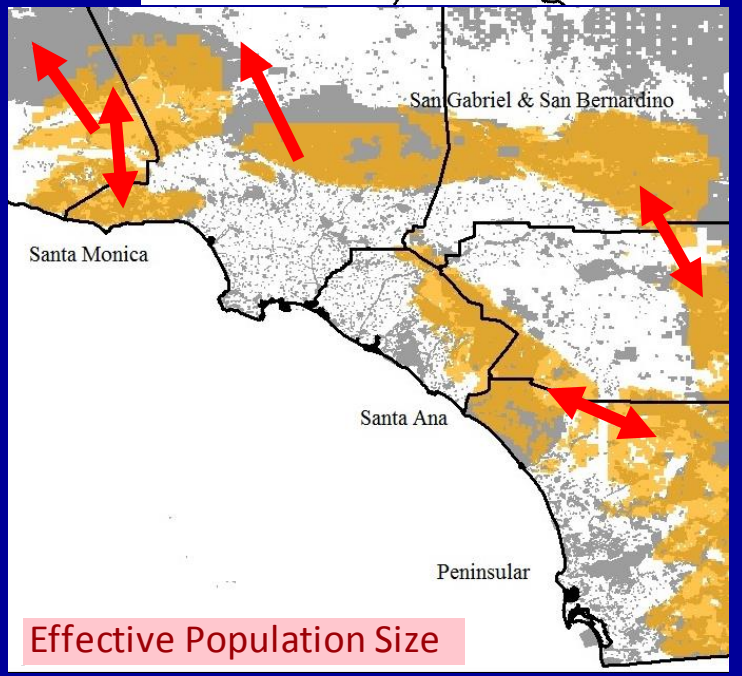
- Currently no concerns despite lower amount of habitat
- All habitat protected
- Maintenance of metapopulation dynamics likely promote persistence



SC & SoCal

- Current habitat/genetic concerns
- Internal habitat & connectivity at risk
- External connectivity limited
- Long-term viability of these areas a concern unless habitat protection & connectivity improved





Viability Summary

- Habitat predictor of genetic integrity
- Suitable habitat isn’t as good as protected suitable habitat
- Regional habitat/genetic concerns in CA
- Improved habitat connectivity/conservation = restored metapopulation dynamics = increased genetic integrity
- Abundance only part of population status
- Work to promote working landscapes, open spaces, and wildlife passage

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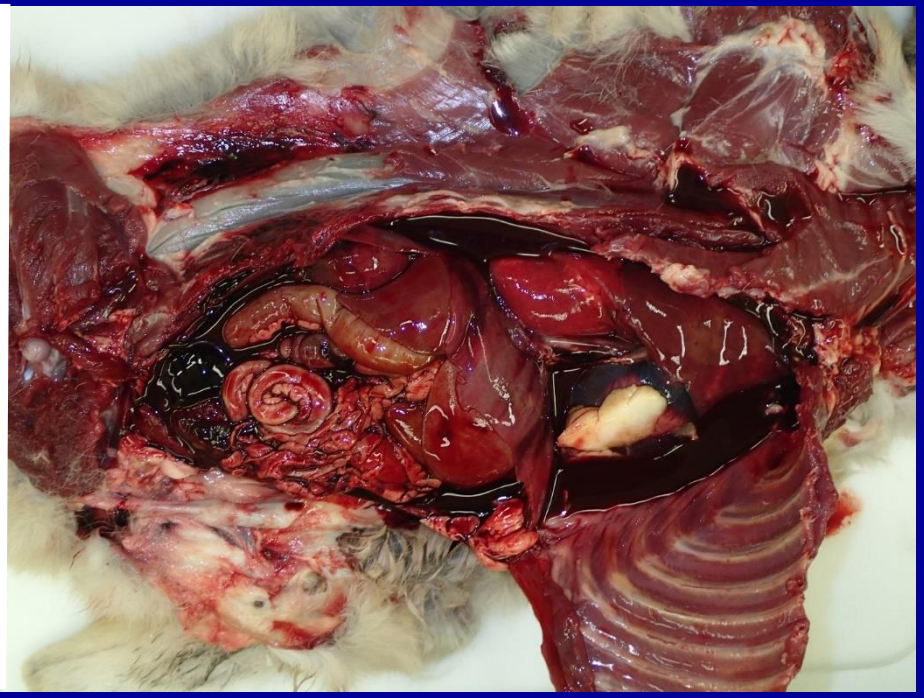
Health

- Necropsies mandated for depredation lions
  - Underutilized source for health assessment and disease testing
- Feb 2016 – Feb 2018
- Determine disease and rodenticide exposure statewide

Health Assessment

- Carcasses submitted:
  - Depredation
  - Vehicle strike or other trauma
  - Illness
  - Other reasons
- Performed systematic necropsies
- Histology performed by pathologist
- Liver submitted to toxicologist for rodenticide exposure testing

Evidence of AR Toxicity



Health Summary

- ARs detected in lions from 37 California counties
- Exposure to more than one rodenticide is common
  - Related to application practices?
  - What does this mean for individual fitness?
- Despite the 2014 restrictions of SGAR use in the state, SGAR still most commonly detected rodenticide in our sample

Health Summary

- Further reduce knowledge gap about AR in wildlife
  - Determine route(s) of exposure
  - Identify any spatiotemporal or demographic trends in rodenticide application
- Investigate potential synergism with other pathogens
- Create an improved surveillance system and protocol for legislatively-mandated lion mortality investigations

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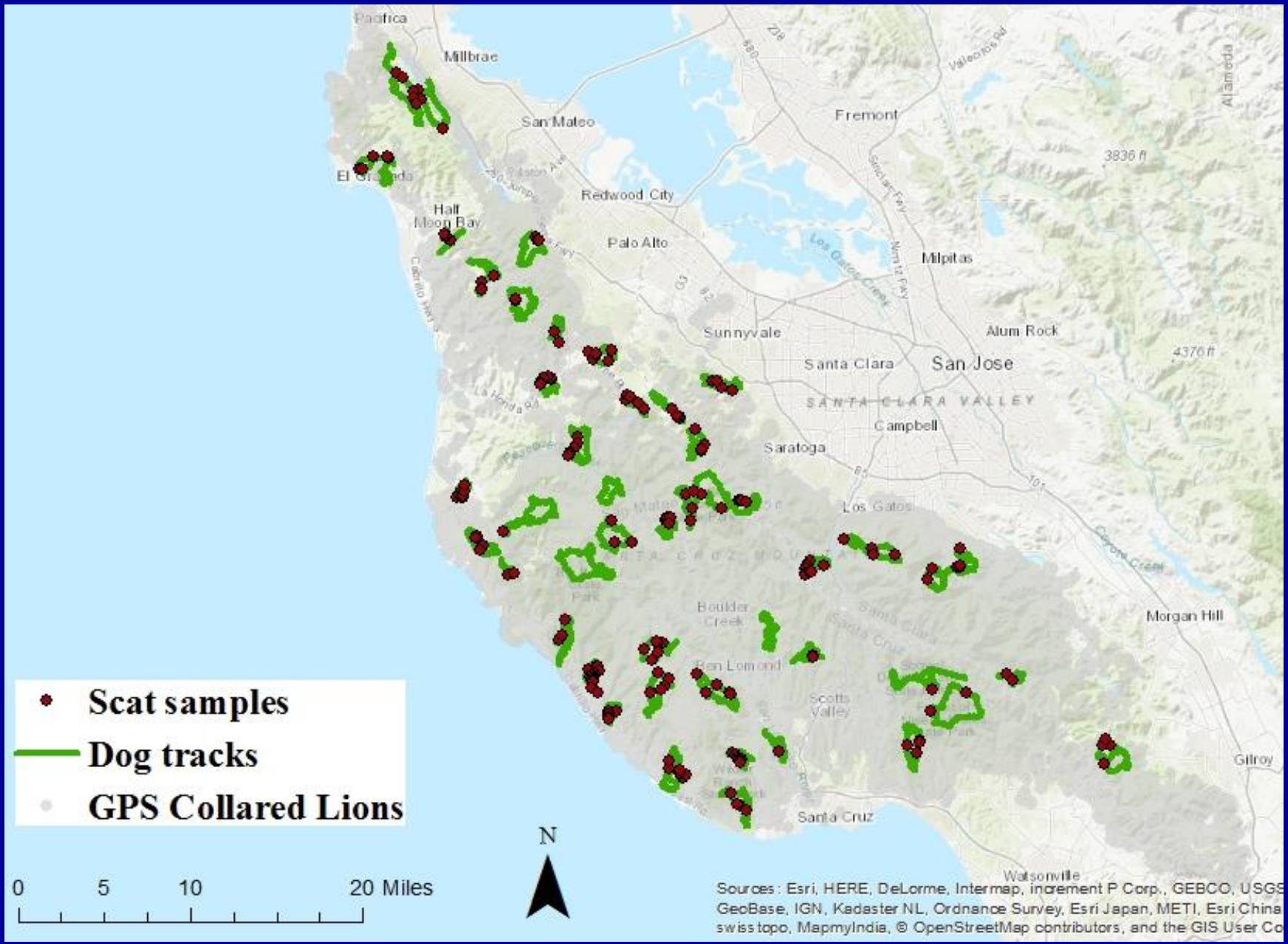
Population Monitoring

- Single data points of little use
- Need multiple sequential data points
  - Understand if policy/management activities are working
- Maximize inference

Population Monitoring

- Invasive Methods (Gold Standard…expensive)
- Less/Non-invasive Methods (newer & cheaper)


Scat samples
Dog tracks
GPS Collared Lions
0 5 10 20 Miles
N
Pacifica
Millbrae
San Mateo
Fremont
Redwood City
Half Moon Bay
Palo Alto
Milpitas
Sunnyvale
Santa Clara
San Jose
Alum Rock
SANTA CLARA VALLEY
Campbell
Saratoga
Los Gatos
Boulder Creek
Morgan Hill
Scotts Valley
Gilroy
Santa Cruz
Watsonville
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS
GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China
swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Co

Population Monitoring

- Scat collection work completed:
  - Western Sierra
  - Santa Cruz Mtns
  - Modoc Plateau
  - Eastern Sierra
- Ongoing work:
  - Central Coast
  - North Coast
  - Peninsular Range

Population Monitoring Summary

- Regular monitoring of regional lion populations
  - Sampling every ~5 years per region
  - Multiple surveys for large regions
- Aim is to have multiple lines of inquiry for single monitoring effort
- Adaptive management/conservation
  - Policy informed by monitoring/data

Closing

- Regional habitat/genetic concerns
  - Persistence of lions in many parts of CA can benefit from actions across the state
- Questions concerning health statewide
- Population monitoring across regions
  - Completion ~2023
- Investigating many more lines of research with all the data being collected for this statewide effort
  - E.g., Conflict, survival rates, local adaptations
- Ensuring lions persist ensures persistence of many other species & ecological processes
- Need permanent funding

Thanks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