

Andrew J. Bohonak
San Diego State University

Anna Mittelberg
San Diego Zoo Institute for Conservation Research

Connectivity Project Summary:
Southern mule deer

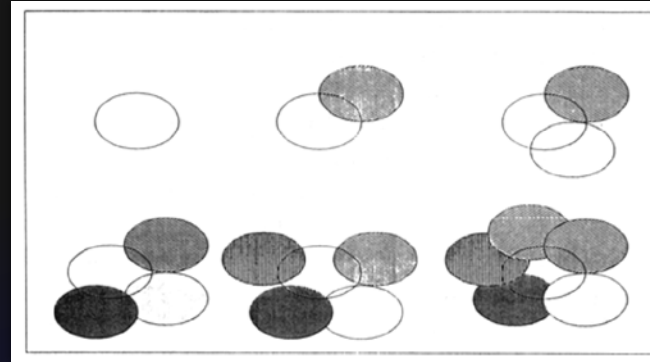


www.dfg.ca.gov

Southern Mule Deer

Mule deer

- Polygamous
- Male-biased dispersal
- Female site fidelity
- Rose-petal hypothesis:
Porter et al. 1991



MSCP monitoring

- Mule deer thought to be resilient to intense urbanization ...
... but no regional mark-recapture studies*
... and tracking data that indicate habitat use may not
translate to dispersal through an area.

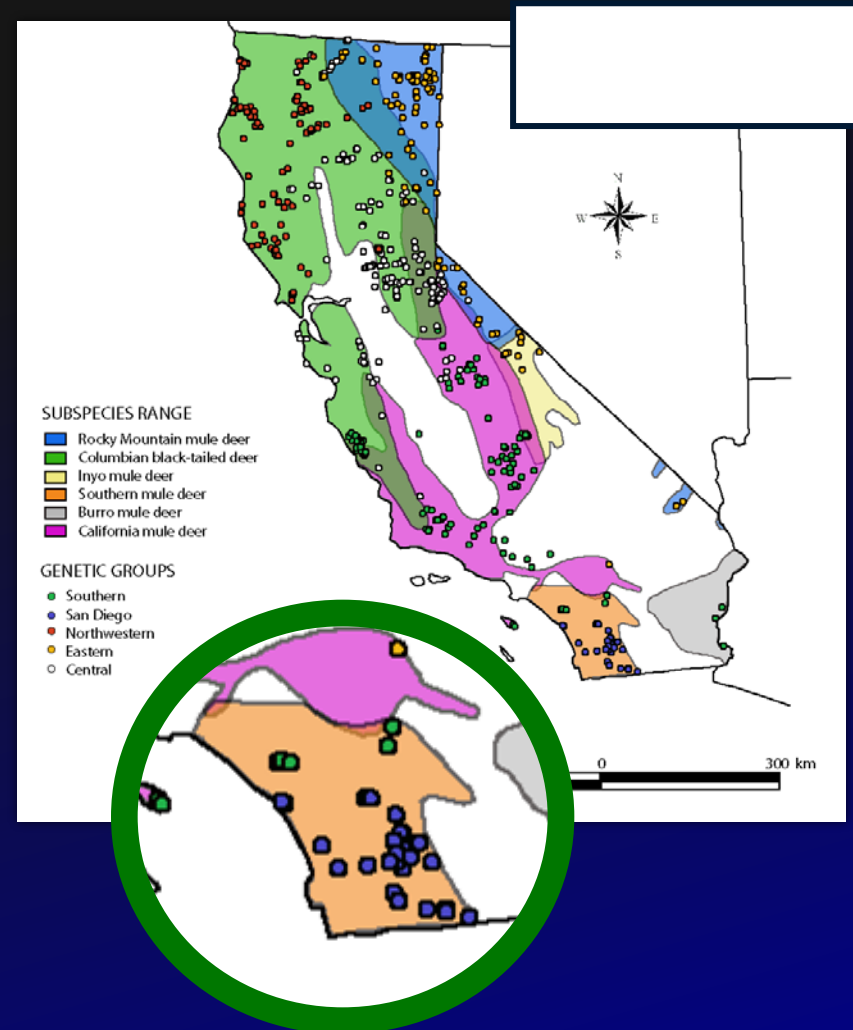
Southern Mule Deer

Six California mule deer subspecies

- 5 genetically distinct units
- San Diego County is genetically unique, even from “Southern Mule Deer” in Orange County

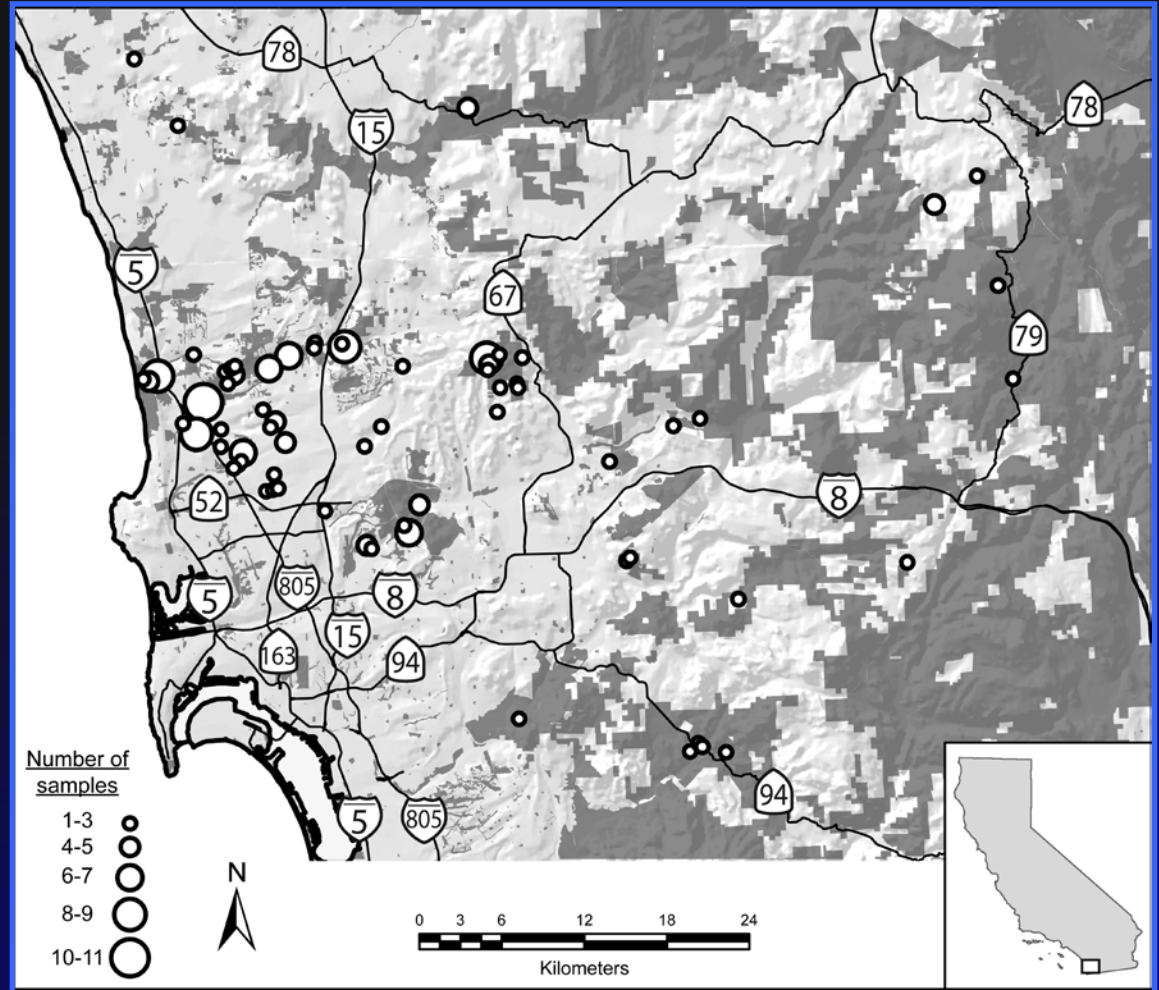
San Diego herd

- Non-migratory
- Rut/breeding: peak in late Nov-late Dec
- Fawning: late Jun-early Jul
- “Stable to slightly declining”
CDFG, 2009



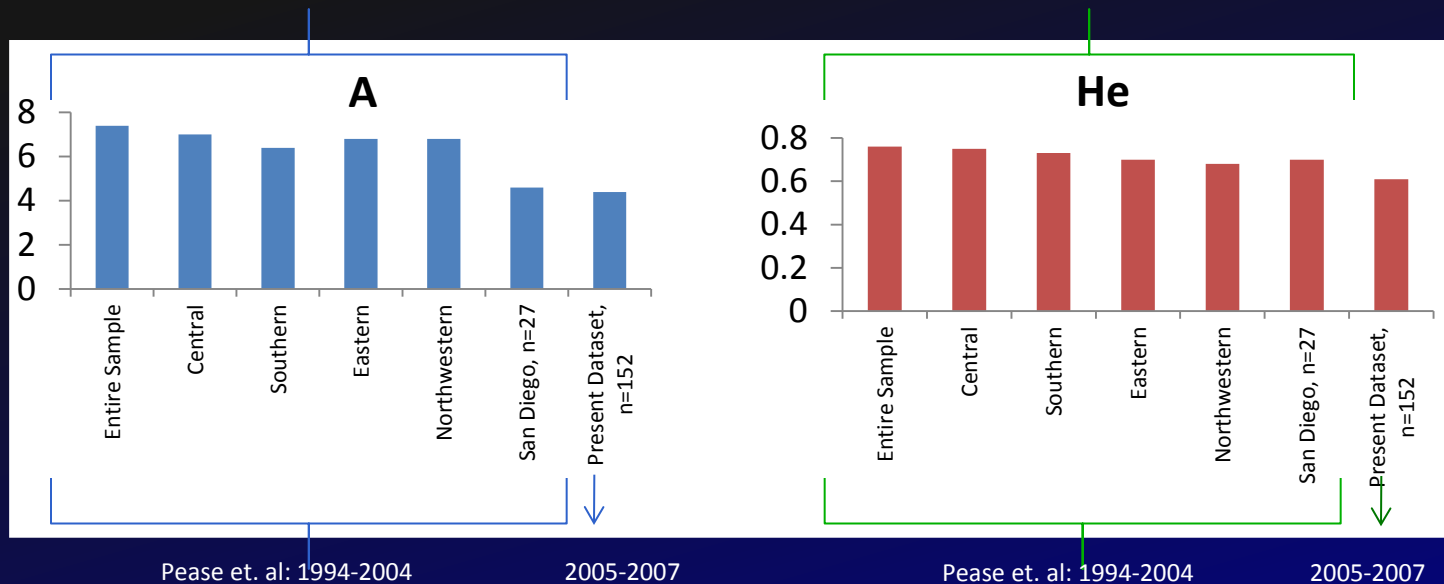
Genetic study of scat samples

- 364 samples from 2006-2007, and 2012-2013
- 240 samples with 99.49% reliability
- 173 individuals
- 17 “recaptures” from different days



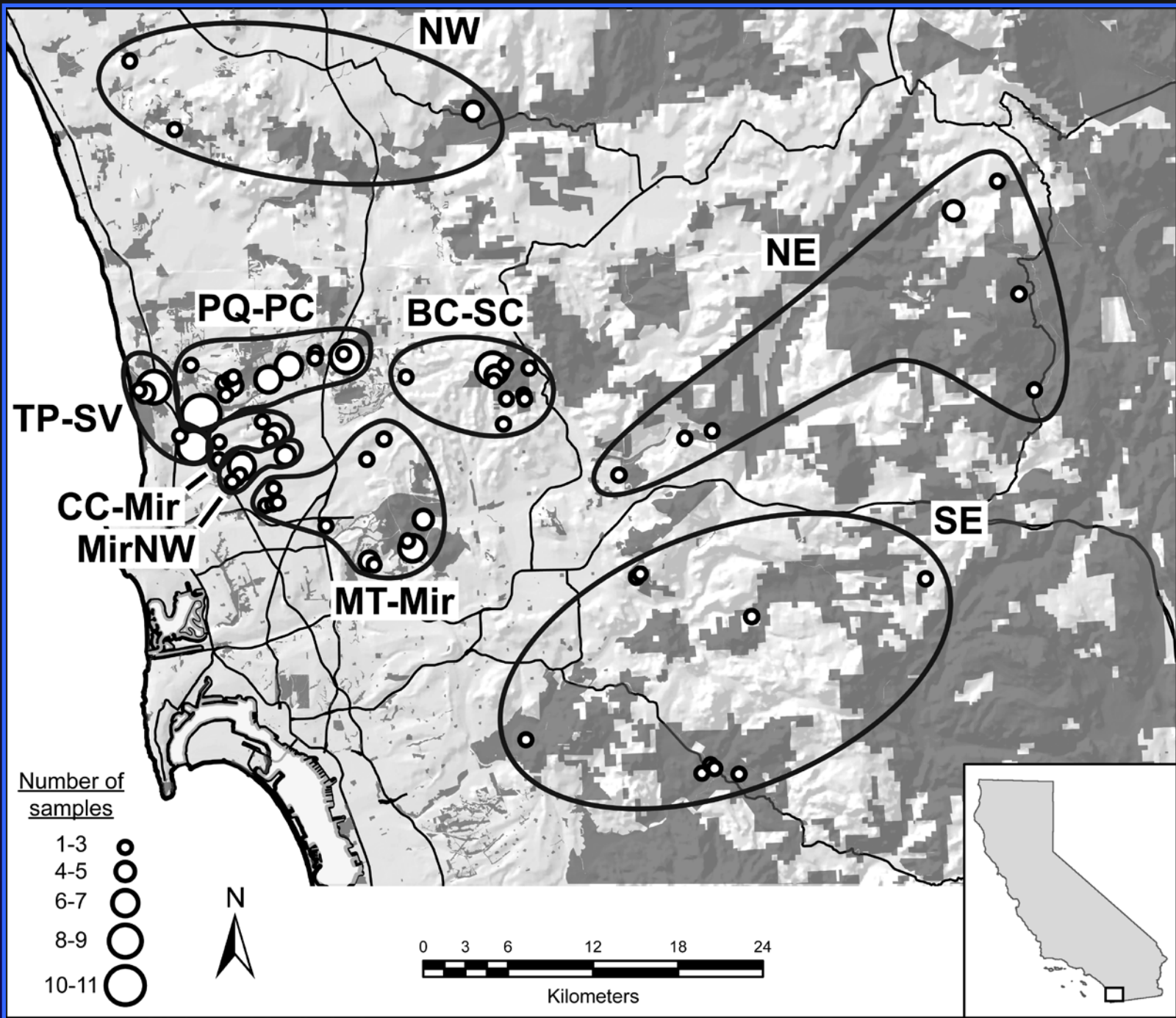
Connectivity and resource

- Southern mule deer have less overall genetic diversity than subspecies elsewhere in the state.



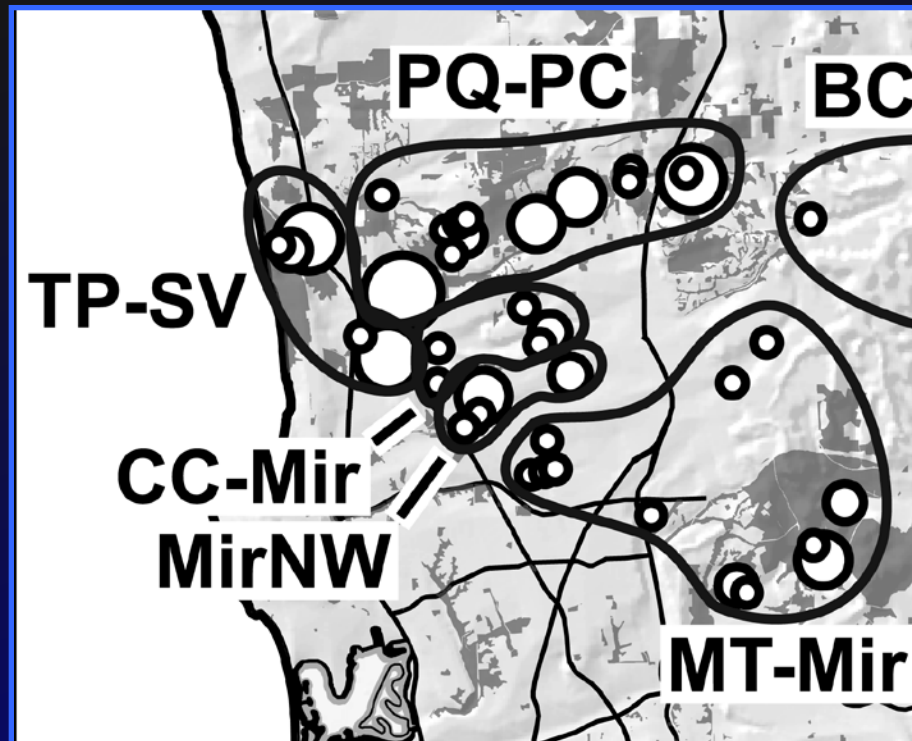
Connectivity and resource

- There is statistical justification for dividing coastal San Diego County into numerous management units. In the part of our study area where sampling was the most dense, populations generally correspond to existing reserves and canyons.



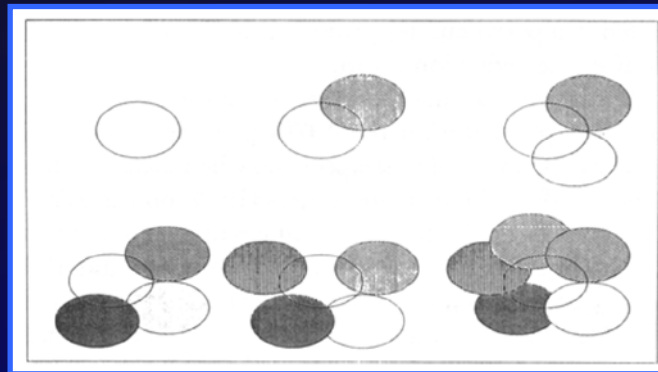
Connectivity and resource

- As in prior studies, the isolating effects of I-5 north of the I-5/805 merge are apparent, as well as the isolating effects of I-805 south of the merge.

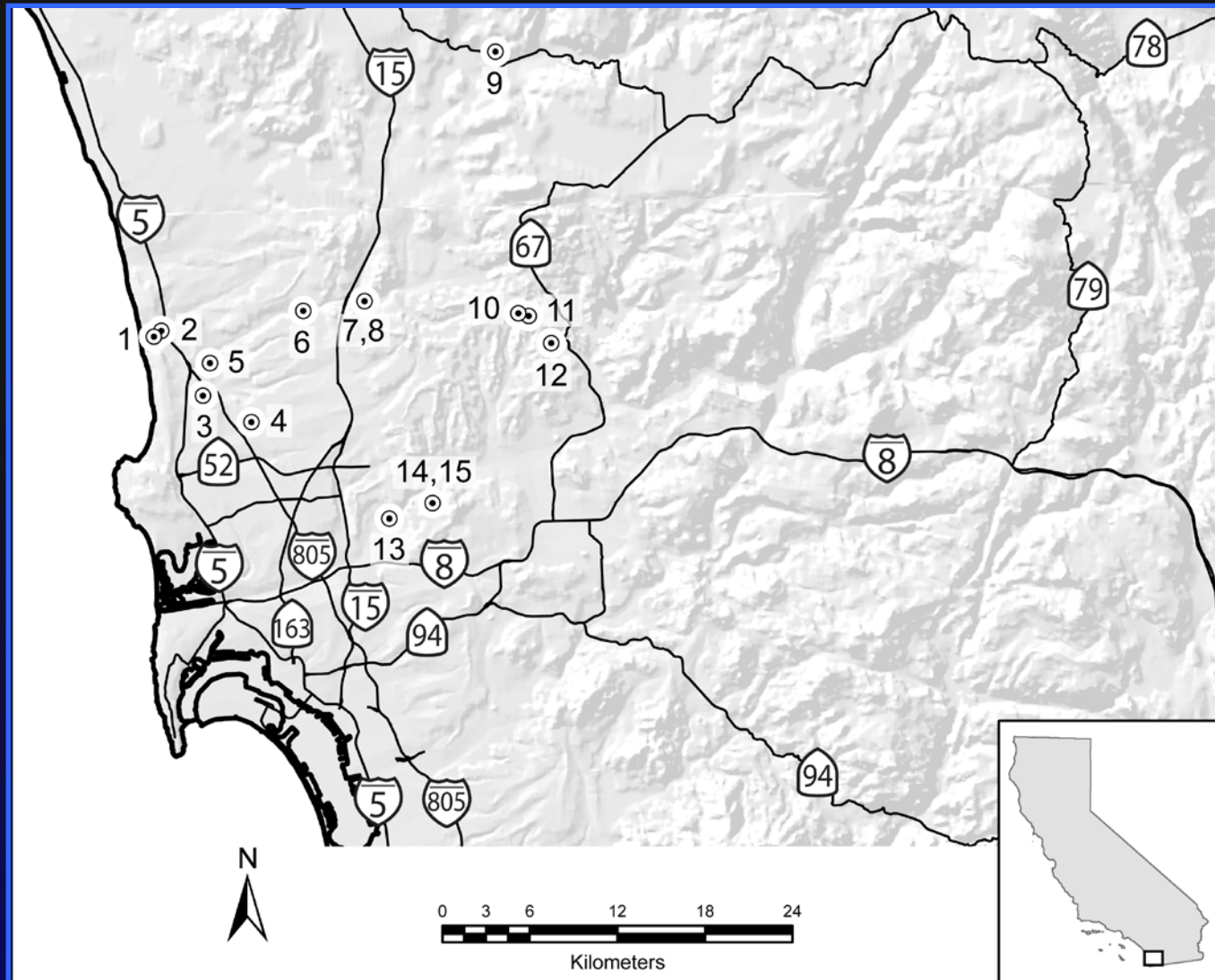


Hypothesized mechanism for impacts

- Southern mule deer are relatively sedentary/territorial over many years. Offspring are often found very close to one or both parents. Females in close proximity tend to be more closely related than males in close proximity.

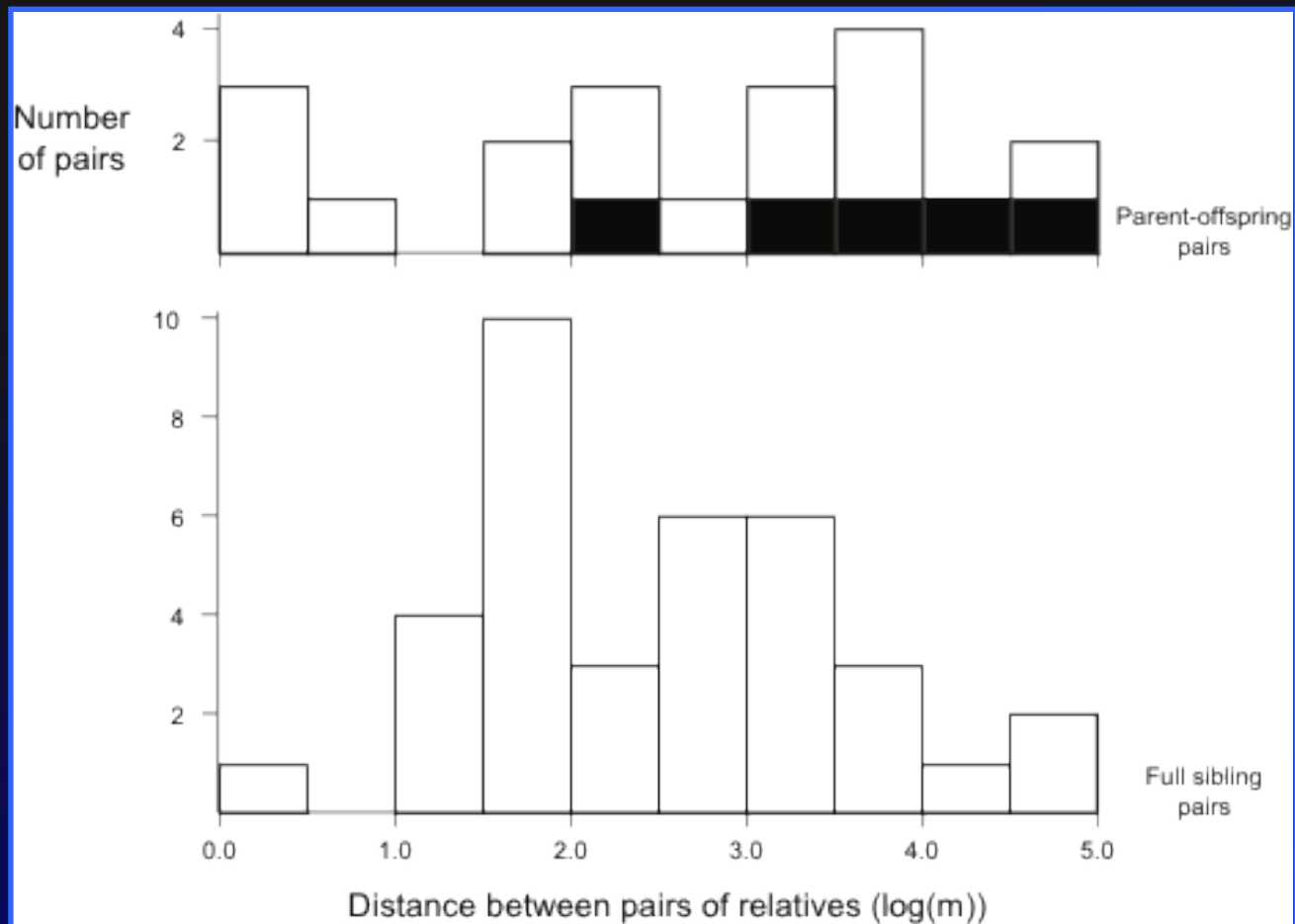


Locations of 15 individuals "recaptured" 1-2 times. The maximum capture-recapture distance is 1.1 km; all captures and recaptures fall within the the map symbols.

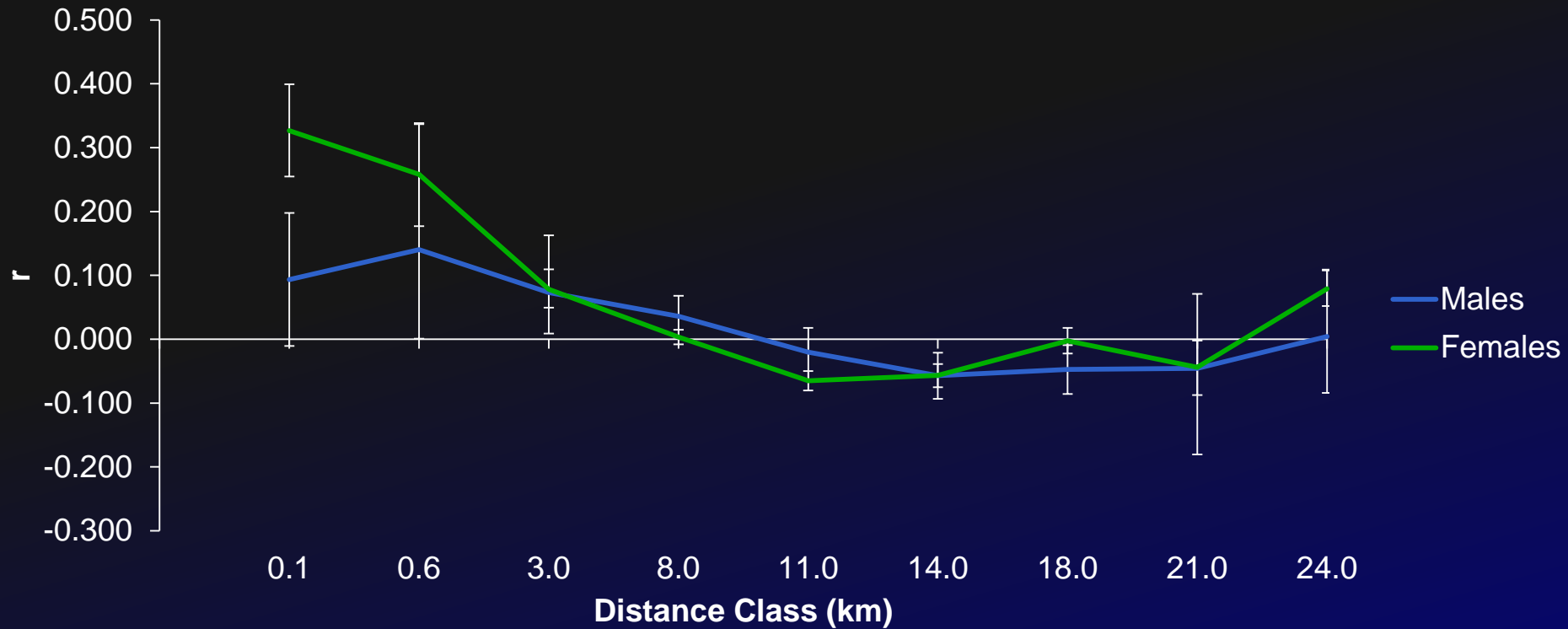


Individual (gender)	Population (site)	First Date	Second Date	Third Date	Days Apart	Distance (m)
1 (f)	TP-SV (TPSR)	4/19/06	7/22/06	3/25/07	93, 243	384, 1086
2 (f)	TP-SV (TPSR)	7/16/06	4/8/07		262	203
3 (f)	TP-SV (SV)	6/18/06	2/24/13		2406	78
4 (f)	MirNW (MirA)	5/29/12	6/20/12		21	935
5 (m)	PQ-PC (PQ)	7/10/06	3/25/07		255	269
6 (m)	PQ-PC (PQ)	6/11/06	7/9/06		28	68
7 (f)	PQ-PC (PC)	5/8/06	4/8/07		330	195
8 (f)	PQ-PC (PC)	5/8/06	4/8/07		330	101
9 (f)	NW (WAP)	12/20/12	6/3/13		163	n/a
10 (f)	BC-SC (SC)	7/17/06	9/26/06	12/6/06	69, 70	184, 20
11 (f)	BC-SC (SC)	6/6/06	12/6/06		180	1010
12 (f)	BC-SC (SC)	8/19/13	8/21/13		2	318
13 (f)	MT-Mir (TS)	10/9/12	10/15/12		6	453
14 (m)	MT-Mir (MT)	9/3/12	10/8/12		35	79
15 (f)	MT-Mir (MT)	9/3/12	10/8/12		35	95

Distribution of geographic distances between all pairs (dyads) of parent and offspring (top), and between full siblings (bottom). Note the logarithmic scale. For the parent-offspring histogram, dyads that contain a father are in black, while dyads with a mother are open.



Western gene pool, pooled, 0.1 km.

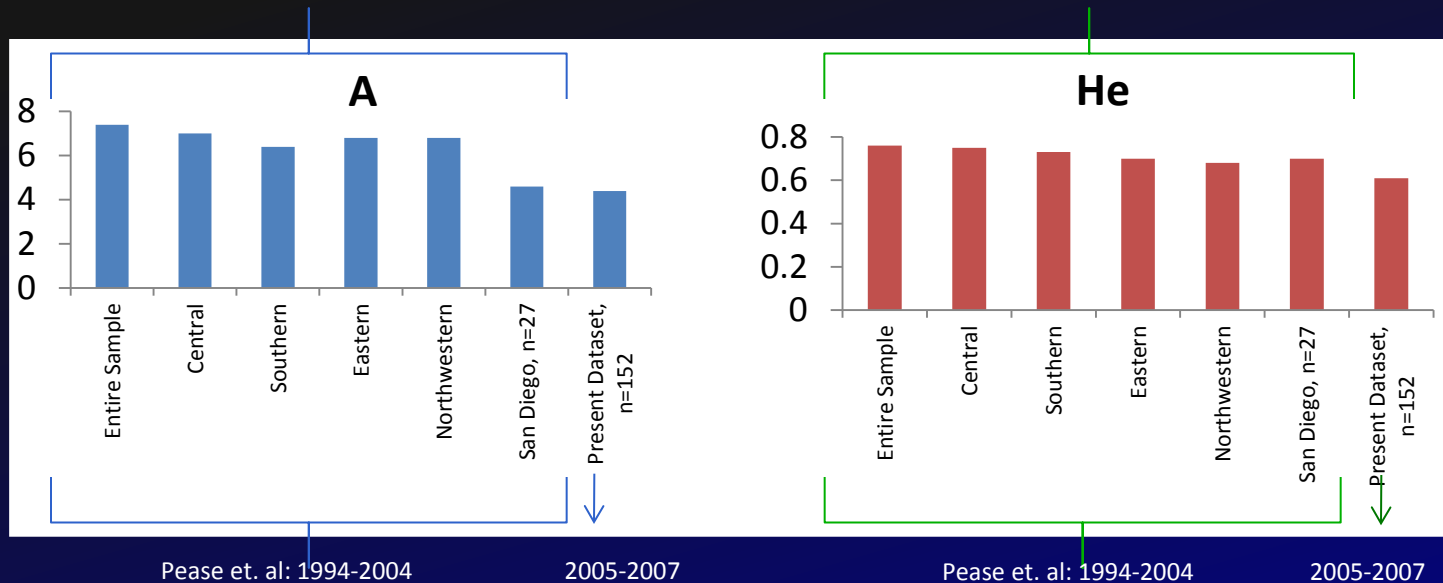


Hypothesized mechanism for impacts

- Low genetic diversity is consistent with an effective population size that is less than 200 individuals for the region we studied (up to 500 km²), and perhaps less than 100.
- Major freeways correlate with population boundaries, at least in some areas.

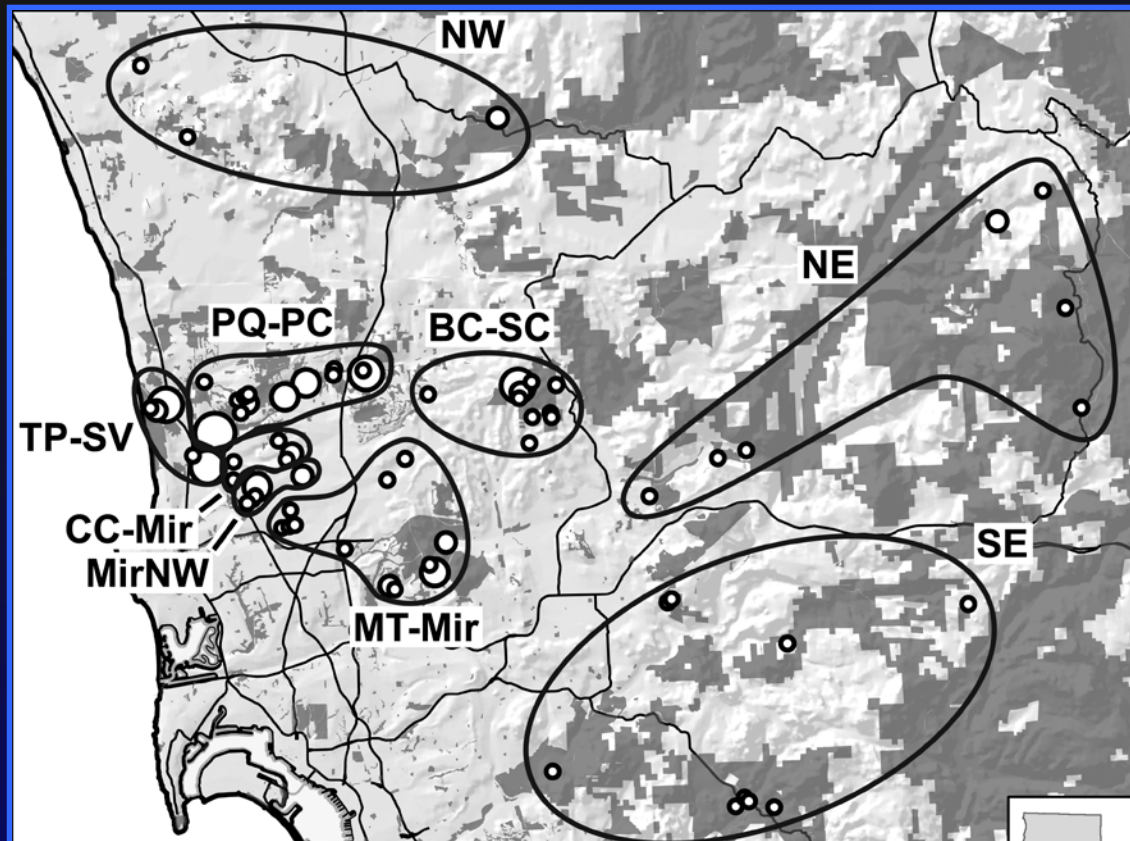
Information needs for future adaptive management

- Prevent regional declines in genetic diversity.



Information needs for future adaptive management

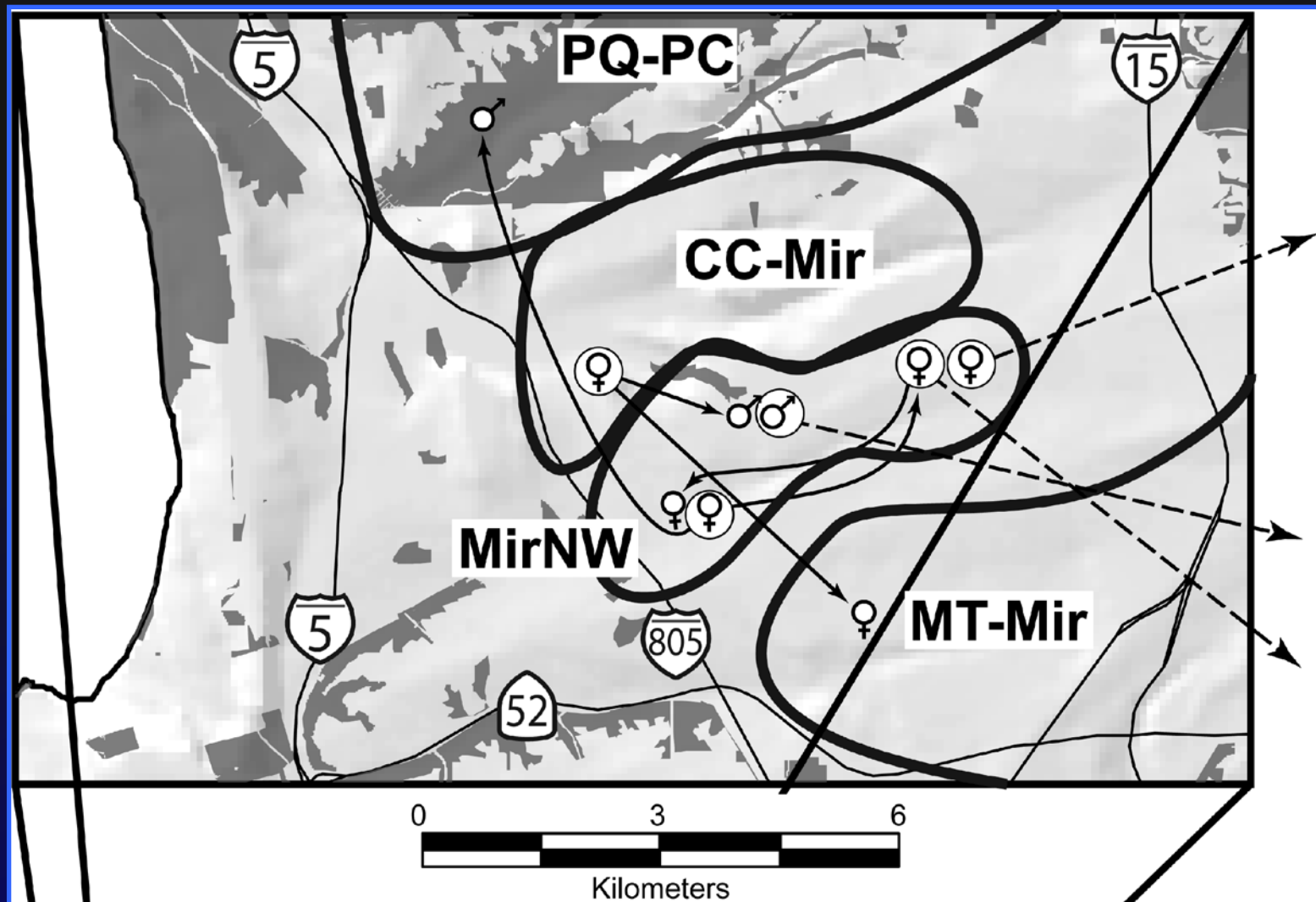
- Define multiple management units for southern mule deer.



Information needs for future adaptive management

- Maintain high levels of connectivity.

Locations of the eight offspring that were sampled from different sites than their parent. The parent is circled, and the offspring is at the destination of each arrow.



Information needs for future adaptive management

- Future studies

