

Highways Block Gene Flow and Cause Rapid Decline in Genetic Diversity of Desert Bighorn Sheep

CLINTON W. EPPS,¹ Department of Environmental Science, Policy and Management,
University of California Berkeley, 137 Mulford Hall, Berkeley, CA 94720, USA

PER J. PALSBOELL, Department of Environmental Science, Policy and Management,
University of California Berkeley, 137 Mulford Hall, Berkeley, CA 94720, USA

JOHN D. WEHAUSEN, White Mountain Research Station, University of California,
3000 E. Line Street, Bishop, CA 93514, USA

GEORGE K. RODERICK, Department of Environmental Science, Policy and
Management, University of California Berkeley, 137 Mulford Hall, Berkeley, CA
94720, USA

ROB R. RAMEY II, Denver Zoological Society, Denver, CO, USA

DALE R. MCCULLOUGH, Department of Environmental Science, Policy and
Management, University of California Berkeley, 137 Mulford Hall, Berkeley, CA
94720, USA

Abstract: Rapid expansion of road networks reduced connectivity among populations of flora and fauna. The resulting isolation is assumed to increase population extinction rates, in part due to loss of genetic diversity. However, there are few cases where loss of genetic diversity has been linked directly to roads or other barriers. We analyzed the effects of such barriers on connectivity and genetic diversity of 27 populations of *Ovis canadensis nelsoni* (desert bighorn sheep). We used partial Mantel tests, multiple linear regression, and coalescent simulations to infer changes in gene flow and diversity of nuclear and mitochondrial DNA markers. Our findings link a rapid reduction in genetic diversity (up to 15%) to as few as 40 yr of anthropogenic isolation. The presence of interstate highways, canals, and developed areas apparently eliminate gene flow and presumably prevent recolonization of empty habitats. Our results suggest that anthropogenic barriers constitute a severe threat to the persistence of naturally fragmented populations.

BIENN. SYMP. NORTH. WILD SHEEP AND GOAT COUNC. 15: 2006

Key words: Desert bighorn sheep, genetics, microsatellite, mitochondria DNA, *Ovis canadensis nelsoni*, population structure.

¹ E-mail: buzzard@nature.berkeley.edu