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## ESTIMATION OF SUSTAINABLE MORTALITY THRESHOLDS FOR GRIZZLY BEARS IN THE NORTHERN CONTINENTAL DIVIDE ECOSYSTEM

Cecily M. Costello\*, Montana Fish, Wildlife, and Parks, Kalispell  
Richard D. Mace, Montana Fish, Wildlife, and Parks, Kalispell  
Lori Roberts, Montana Fish, Wildlife, and Parks, Kalispell  
Daniel Carney, Blackfeet Fish and Wildlife Department, Browning, MT  
Stacy Courville, Confederated Salish and Kootenai Tribe, East Polson, MT  
James Jonkel, Montana Fish, Wildlife and Parks, Missoula  
Michael Madel, Montana Fish, Wildlife and Parks, Choteau  
Tim Manley, Montana Fish, Wildlife and Parks, Kalispell  
John Waller, National Park Service, Glacier National Park, West Glacier  
Erik Wenum, Montana Fish, Wildlife and Parks, Kalispell

Habitat management and limits on mortality have led to population growth and sizable range expansion for the federally-listed grizzly bear population in the Northern Continental Divide Ecosystem (NCDE), Montana. Human-caused mortality has coincidentally increased, but it is not clear what level of human-caused mortality would cause the population to decline. A record of annual documented mortalities of independent ( $\geq 2$  years old) bears is maintained for the NCDE, from which an estimate of the total number of mortalities is generated. Our goal was to estimate sustainable survival rates for independent bears and to develop realistic thresholds for sustainable mortality, which could be applied to these annual estimates. We estimated survival and recruitment rates using 662 bear-years of telemetry data, performed stochastic modeling, and estimated the annual growth rate as 1.023 and annual population size as 765–960 during 2004–2014. We then evaluated minimum independent survival rates consistent with a stable to increasing trend, and integrated these sustainable rates with model-estimated population size and mean estimates of total annual independent bear mortality to establish mortality thresholds. During 2004–2014, estimates of total annual mortality were highly variable, but averaged 13.8 for females and 16.4 for males. For females and males, respectively, these estimates accounted for only 69% (range 28–168%) and 62% (28–121%) of sustainable mortality thresholds, indicating that approximately 6 and 10 additional annual mortalities could have been sustained without the population declining. Application and periodic reevaluation of mortality thresholds will help managers reach or maintain a target population size for grizzly bears in the NCDE.