

THE TRIVERS-WILLARD MODEL AND SOUTHWESTERN MONTANA ELK

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The Trivers-Willard (1973) model (TWM) suggests maternal control of offspring sex (*in utero* or by the end of parental investment) may be an adaptive advantage in some species. In sexually dimorphic, polygynous ungulates, the TWM suggests male offspring should be favored when the female is in superior condition. Population and harvest models for elk (*Cervus elaphus*) often assume sex ratios of 50:50 at parturition and recruitment. We tested this assumption using 11,094 known-sex fetal elk and 4404 known-sex calf elk (age 6-8 mos) from hunter harvest in three herds in southwestern Montana (1961-2007). We included maternal, individual, and environmental condition covariates to test the TWM *in utero* and near recruitment. After 30 logistic regression and chi-square tests on fetal sex ratios using data from three populations, five distinct time periods, and 11 variables, we found significance in three tests ($P \leq 0.05$); two supporting the TWM, and one opposing it, suggesting little evidence to support maternal control of fetal sex. However, all populations

tested demonstrated a significant female-biased ratio of calves at harvest (60:40; $P \leq 0.003$). We concluded that differential mortality of males must occur between the first trimester *in utero* and age 6-8 months. However, due to inconsistent evidence from six elk calf mortality studies across Montana, Wyoming and Idaho, further research is necessary to determine when and how sex ratios become biased. We suggest that elk population managers take into account potential differences in sex ratio at recruitment when building population and harvest models.