Evaluating Bottom-Up and Top-Down Effects on Elk Survival and Recruitment: Year Two Update of a Case Study in the Bitterroot Valley

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Understanding the contribution of recruitment to population growth rate in ungulates is a fundamental challenge to wildlife managers attempting to integrate carnivore and ungulate management. Like much of western Montana, in the Bitterroot Valley, the decline of elk (*Cervus elaphus*) populations and calf recruitment occurred concurrently with wolf (*Canis lupus*) recovery. However, a multitude of abiotic, bottom-up and top-down factors likely affect recruitment rates. We studied cause-specific mortality of elk calves to understand the role of competing mortality risk on calf recruitment in the East Fork and West Fork of the Bitterroot Valley, Montana. A total of 66 and 76 neonatal elk calves were captured in spring 2011 and 2012, respectively, and an additional 31 and 29 6-month-olds in late November 2011 and 2012. We analyzed calf survival using a Weibull parametric survival model, and cause-specific mortality using cumulative incidence functions. Preliminary analyses for the first 20 months of the research indicate mountain lions as the leading cause of mortality for elk calves

during both summer and winter. We are also evaluating the role of summer forage resources on maternal condition, calf birth weights and survival. Preliminary results from nutritional work suggest potential bottom-up differences influencing resilience of elk populations to top-down predation. Our study fills a critical knowledge gap regarding the role of summer vs winter mortality in elk and the role of nutrition. The study will complement previous studies and help wildlife managers integrate carnivore and ungulate management across western Montana following carnivore recovery.