# Can a Low Carrying Capacity and a Highly Stochastic Environment Induce a Predator Pit in Elk Populations?

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Abstract: Due to concern over declining elk populations and the unknown effects of wolf predation, Idaho Department of Fish and Game initiated a survival study of elk in north-central Idaho. A total of 82 adult and 80 calves (~6 months old) were captured and fitted with GPS radio-collars from the winter of 2009 – winter 2014. Adult survival rates averaged 86% (range 76% - 97%). Calf survival rates averaged 44% but varied dramatically from year to year. We used a stochastic model of elk-wolf dynamics to investigate the implications of a highly stochastic growth rates indicative of the observed survival rates. In particular, we were interested in the interaction between elk density-dependent growth, carrying capacity and the amount of stochasticity in predation rates. We found that when predation rates were highly stochastic and carrying capacities were low, populations behave as if they were in a predator pit but if carrying capacity was high or stochasticy low, populations grew out of the predator pit. These results suggest that in a stochastic environment, populations may actually be influenced by both bottom-up and top-down forcing simultaneously as opposed to being governed by one or the other.

Jon Horne Background
Jon is a Senior Research Biologist with Idaho Department of Fish and Game (IDFG). Jon has worked for IDFG since 2013 on research projects related to understanding elk population dynamics, especially in relation to predation. Other projects include improved approaches for abundance estimation and modeling wildlife space use. Jon obtained his Ph.D. from the University of Idaho in 2005 where he developed new approaches for studying animal space use. After obtaining his Ph.D., Jon continued working for the University of Idaho as a Post-doc and later a Research Scientist on several projects related to modeling space use and population dynamics of wildlife.