Elk Population Dynamics and the Primary Factors That Drive Them

By: Ken Robins     BSCI 462
Goals For Presentation

• Briefly discuss biology/ecology of elk
• Highlight factors that effect population dynamics
• Review studies that offer explanations or support of these factors
• Form conclusions for management implications
Elk (*Cervus elaphus*) North American Range
Biology

• Elk are ungulates belonging to the deer family
• Antler size indicates dominance, nutritional state and genetic fitness of males
• Breeding period occurs from early September to mid-October
• Adult males weigh about 700 pounds, adult females weigh about 500 pounds
• Gestation period is 8-1/2 months
• Usually one calf is born; twins are very rare
• Average life span is 13 to 18 years
• K-selected species
Limiting Factors

- Predation
- Climate
- Habitat
- Population Density
- Inbreeding
- Disease
Predation

Predated by:

- wolves
- grizzly bears
- black bears
- cougars
- coyotes
- people

- Recent re-introduction of gray wolves believed by some to be the cause of declining populations because they target calves

- Wolves generally cull the most vulnerable (e.g., young, old, weak, or diseased)
Human Predation

- Without the presence of additional predators, which in many states is the case, regulated harvest takes the place of predation by animals.
- Shown to strongly affect the population characteristics of hunted populations.
- The combination of human hunting and wolf predation, or predation from multiple large predators may offset or exceed recruitment, leading to a decline in the prey population.
Northern Yellowstone study 1995-2001

- Wolves tend to select female elk under the age of 1, or 10 years and older.

- Humans tend to harvest primarily females between the ages of 2-9, the most productive age range.
Effects of Wolf and Human Predation

- Humans remove the most productive elk, while wolves remove the least productive and those most likely to die off in the winter
Population Density

2005 study in northeastern Oregon and southeastern Washington

- Study shows that both female fecundity and body condition were significantly higher in low population density
- Density-dependent factors overrode the effects of density-independent factors
- Disease more abundant in high-density populations
- High-density populations bad!
Climate

a) Negative autocorrelation between survival of harvest and winter survival. Elk not harvested more likely to survive winter

b) Higher early-winter precipitation correlates with lower juvenile survival

c) Higher summer precipitation correlated with higher juvenile survival
Historically, precipitation levels and winter severity have had the greatest impact on northern herd abundance through large reductions from winter-kill.

If climate change produces increasingly mild winters, populations have the potential to increase at rates as high as 28% until resources are stripped (particularly aspen) and the population crashes.
Disease

- Brucellosis - contagious bacterial disease that originated in livestock and often causes infected cows to abort their first calves. Average of 30% elk on feedgrounds have tested positive for exposure.

- Chronic Wasting Disease - No vaccination or treatment. Spreads easily in high density populations.

- Disease generally only accounts for about 3% of mortality.
Future Management Implications

- Re-introduced predators will need to be closely monitored to determine the most beneficial density
- Chronic Wasting Disease needs to be closely monitored and infected culled from herd
- Climate change may lead to severe changes in habitat and thus changes in population density. Harvest should be quickly adjusted accordingly
- Human harvest needs to be directed toward less productive life stages of the elk to continue culling weakest from the herd but allowing high productivity while populations are low
- Once populations are at a higher level, harvest can be redirected to the proper life stages to continue healthy population levels


