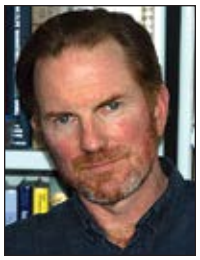
# UNDERSTANDING THE DECLINE IN ELK RECRUITMENT IN THE WEST



JOHN F. ORGAN
B&C PROFESSIONAL MEMBER
Director of the Cooperative Fish and Wildlife Research Units

**In the Spring 2015 issue of *Fair Chase* ("A Little Help From Our Friends"), I wrote about the Western Elk Research Collaborative and the promise it held for a greater understanding of elk population dynamics across the northwestern United States. To recap, this study involved seven state fish and wildlife agencies (Colorado, Idaho, Montana, Oregon, Utah, Washington, Wyoming), two U.S. Geological Survey (USGS) cooperative research units (Montana and Wyoming), the USGS National Wildlife Health Center, four universities (University of Montana, University of Wyoming, Yale University, University of British Columbia), and Yellowstone National Park. The beauty of this study is that it assembled data from seven states and 101 elk management units collected over a period of 22 years (1989–2010), allowing for more robust analyses over time, space, and weather conditions, that could provide greater understanding than if the data were analyzed at the individual state or management unit level.**

Recently, initial results were published in the *Journal of Wildlife Management* ("Factors Influencing Elk Recruitment Across Ecotypes in the Western United States"; DOI 10.1002/jwmg.21438). This paper was coauthored by 18 wildlife scientists and managers representing a multijurisdictional, multiagency collaboration at a scale seldom seen in big game studies. The authors used the accumulated data to test seven predictions proceeding from four hypotheses related to elk recruitment. The hypotheses and predictions tested were:

### MATERNAL BODY CONDITION CARRYOVER HYPOTHESIS

- As precipitation the previous summer increases, age ratios (number of juvenile elk per 100 adult female elk) will increase.
- As winter severity the previous year increases, age ratios will decrease.

### CALF SURVIVAL HYPOTHESIS

- As winter severity increases, age ratios will decrease.
- As precipitation the current summer increases, age ratios will increase.

### PRIMARY PRODUCTIVITY HYPOTHESIS

- As average cumulative forage productivity of a unit increases, age ratios will increase.
- As anomalies in cumulative forage productivity increase, age ratios will increase.

### PREDATION HYPOTHESIS

- As the number of predator species increase, age ratios will decrease.

The results showed support for the primary productivity hypothesis on winter range only and support for the predation hypothesis. There was weak support for a negative effect of previous winter precipitation (age ratios decrease as winter severity the previous year increases), and for early summer precipitation having a positive effect at low values of summer precipitation (age ratios will increase as current summer precipitation increases). There was no support for the predictions that increases in previous summer precipitation increases age ratios, and increases in winter severity decreases age ratios.

The results demonstrated a decline in recruitment of juvenile elk across a large area of western North America during the period for which data were collected. This has been noted at smaller scales across the region, but this study is the first synthesis demonstrating that the pattern exists over a broad area with 74 of 101 elk management units showing declines. Average declines amounted to nearly one calf per 100 females every two years over a 22-year study period. The results suggest that these declines may be related to long-term changes in precipitation patterns, forage conditions, the recovery of wolves and grizzly bears, and the interactions among these factors. It could also include factors such as density dependence (more animals on the range resulting in less forage per individual) that were not evaluated.

Let's tease out these results. The relationship between the amount of forage and the nutritional value is complicated. As the amount of forage increases, the digestibility decreases, which is why many elk, mule deer, and pronghorn herds migrate from lower elevation winter ranges to higher elevation summer ranges. Dr. Matt Kauffman, leader of the USGS Wyoming Cooperative Fish and Wildlife Research Unit and one of the coauthors of this study, has termed this "surfing the green wave" where the animals will follow the emergence of plants,

**The authors suggest that wildlife managers interested in improving elk recruitment consider the combined effects of habitat and predators on processes influencing population dynamics.**


A LITTLE HELP FROM OUR FRIENDS

**Western Elk Research Collaborative (WERC) was the original idea of Pete Zager, a wildlife biologist now retired with Idaho Department of Fish and Game. His thought was that states have lots of data on elk that are nonetheless limited individually in terms of the timeframes studied and their geographic extent (spatial and temporal scope)—what could we do if the states pooled those data? This magically coincided with the Cooperative Fish and Wildlife Research Unit Program's (Coop Units) strategic push to develop transboundary, multi-unit/multi-state projects. Research wildlife biologists Mike Mitchell and Matt Kauffman at the Montana and Wyoming Coop Units began working with elk biologists in seven western states. WERC has since been tremendously fruitful. From a management perspective, the northwestern states have likely never communicated or collaborated more with each other. All the state participants in WERC cite this as one of the best outcomes of this effort.**

**Log into the Associates Community to read the entire article along with past Science Blast columns.**

feeding on them when they are young and most nutritious (they emerge later in higher elevations). So, just because an area may exhibit higher forage productivity in the summer does not mean it is beneficial to elk from a nutritional standpoint—at least from the scale the authors were able to measure forage. Winter ranges tend to lose most of the highly digestible forbs and grasses due to senescence. The nutritional quality of the plants that remain tend to equalize, therefore, more is better. The more forage there is on winter range is beneficial.

Total winter precipitation the previous year had a strong negative relationship with recruitment. Adult female elk coming out of a hard winter are in poorer body condition, which can affect embryo development and calf fitness the following year.

The authors found that in addition to the populations of black bears, mountain lions, and coyotes ubiquitous across the study area, the presence of an established wolf population was associated with an average reduction of five calves per 100 females. Adding grizzly bears produced an additional reduction of seven calves per 100 females. The authors stress that these are average effects estimated over a long time period at a broad geographic scale and may not be representative at an individual herd level.

Comparing the effects of environmental factors and large carnivore communities provides insights to the relative importance of habitat, climate, and large carnivores. The effects of wolves alone that was observed was relatively small (5 calves/100 females) compared to forage productivity (15 calves/100 females), but if wolves and grizzlies were both present, the decline in productivity was equal to the change across the entire range of variability in forage productivity observed by the authors. Wolves and grizzlies were only present in the northern mountain ecotype of the study area, and these results should not be assumed to occur in the southern mountain and shrub-steppe ecotypes should wolves and grizzlies expand there. These more southern systems characterized by high productivity will likely be more impacted by changes in weather and forage productivity.

The authors suggest that wildlife managers interested in improving elk recruitment consider the combined effects of habitat and predators on processes influencing population dynamics. Specifically, proactively managing harvest or vegetation productivity to compensate for reduction in elk recruitment caused by large carnivores in the northern mountain areas; on southern winter ranges managing for forage resources.

As with any good study, the authors identified a number of other research questions that emerged that should be pursued to increase our understanding of the population dynamics of this magnificent big game species, such as changes in forest condition that could affect understory forage. I anticipate more results from this study will be forthcoming, which will help wildlife managers across the west ensure a sustainable elk resource for future generations. Thanks to Dr. Mike Mitchell, leader of the Montana Cooperative Wildlife Research Unit for keeping me informed on the progress of this benchmark study. ■