Researchers test powerful new tool to advance ecology, conservation

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A new University of Florida study shows ecologists may have been missing crucial information from animal bones for more than 150 years.

The study featured on the cover of the November issue of *Ecology* shows animal bone remains provide high-quality geographical data across an extensive time frame. The research may be used to identify regions of habitat for the conservation of threatened species.

Charles Darwin first noted the importance of studying where animal bones lie on the landscape in 1860, but the topic has since become largely lost to scientists trying to protect and conserve native wildlife. By documenting accumulations of elk bones and antlers on the landscape of Yellowstone National Park in Wyoming, study author Joshua Miller identified areas critical for the species' survival during spring and winter.

"This is fundamental stuff, because for a long time the common knowledge was that bones only lasted a few years on the landscape," said Miller, an assistant scientist at the Florida Museum of Natural History on the UF campus and Fenneman assistant research professor at the University of Cincinnati. "It turns out they last a lot longer and surveys of bones on landscapes offer a new tool for conservation and management – one that allows us to collect decades of biological data in a single field season."

Walking across Yellowstone Park, Miller documented elk skeletal remains and determined the bones record the same seasonal distributions

as aerial surveys of living elk.

Ecologists typically gather information for conservation by monitoring wild animals, a task requiring years of financial support and countless hours of observation by wildlife biologists. A long-term study in ecology consists of at least 10 to 20 years of census data. However, because some bones can survive on some landscapes for hundreds of years, they may include data from time periods beyond the reaches of a traditional ecological study, including historical insight often missing from scientists' knowledge of ecosystems, Miller said.

"A major challenge for wildlife conservation and management has been that biologists can only work in the present – researchers can only start from when they began collecting data," Miller said. "If someone wants to develop a piece of land, for example, there may only be time for a few years of data collection, and we know as ecologists that such limited observations aren't enough to capture the full complexities of an ecosystem. This research shows we can go into the past, essentially using bones to travel through time and learn about generations of wildlife that were previously lost to science."

A popular hunting species, male elk grow to 700 pounds, shedding their more than 30-pound antlers annually. Miller used standardized bone surveys on 40 five-eighth-mile-long plots in the northern range of Yellowstone Park to identify wintering grounds by antler accumulations and calving grounds by the appearance of newborn skeletons.

"Bones are not randomly scattered across a landscape," Miller said. "Where a bone is found is often as biologically informative as which species it's from. As we investigate the quality of these geographic data, we're discovering that this is a gold mine of information."

Although the study represents a narrow test case, the strong correlation

between how bones are distributed across Yellowstone Park and known patterns in how elk use the landscape shows this low-impact survey technique may be useful for understanding other areas, including poorly known or fragile ecosystems, Miller said.

Anna Behrensmeyer, vertebrate paleontology curator at the Smithsonian Institution's National Museum of Natural History, uses bone surveys in East Africa for understanding the area's mammal populations and how bones become part of the fossil record. She said the study of taphonomy, the processes affecting organic remains as they become fossilized, is not commonly recognized in the field of ecology.

"In my long-term studies of bones, it has struck me that many ecologists have been missing useful information that is available in bones lying about on modern landscapes," Behrensmeyer said. "Josh is showing the potential of using bones, antlers and other remains to monitor what animals have been doing for the past decades and even hundreds of years."

Behrensmeyer said she hopes taphonomy as a research tool spreads from its traditional place in paleontology and archaeology into the realm of ecology.

"Sometimes we taphonomists feel like a small voice in the universe – it's hard for the dead to capture the attention of scientists focused on understanding living organisms and ecosystems," Behrensmeyer said. "Once ecologists see this study, they could very well say, 'Why didn't I think of that?' "

Provided by University of Florida

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