

CONSERVATION SCIENCE

A win-win for wildlife and ranching

Livestock production can pose challenges for populations of large wild mammals. Conservation failure isn't a foregone conclusion, however, if integrated management for ranching and for wildlife benefits both.

Jacob R. Goheen

National parks and other formally protected areas in which human activities are minimized to safeguard nature have long been viewed as a mainstay for conserving populations of large mammals. Although protected areas often function as intended¹, chronic underfunding, lack of enforcement, and civil conflict can undermine their positive impacts, especially in developing countries^{2,3}. Most insidiously, there is growing consensus that protected areas are too small to conserve viable populations of large carnivores, migratory ungulates, and other wide-ranging species^{4,5}. Such inconvenient truths have led to something of a paradigm shift in recent years, forcing us to consider human-occupied landscapes as venues for conservation that complement efforts in protected areas. In this issue of *Nature Sustainability*, Keesing and colleagues⁶ demonstrate a fascinating example through which both wildlife-based and ranching economies may reinforce each other.

On the one hand, the 9,000 km² Laikipia highlands in central Kenya are unusual. Outside of the famous Serengeti ecosystem, no place in East Africa houses such staggering diversity and numbers of large wild mammals (including several threatened species such as Grévy's zebra, black rhino, reticulated giraffe, and bush elephant)⁷. On the other hand, however, Laikipia is typical. Like most rangelands around the globe, it lacks formal protection, such that humans raise their livestock alongside wildlife on communal grazing lands and privately owned ranches. Landowners vary in their tolerance for wildlife; some ranches function almost exclusively as wildlife-tourism operations, and others focus solely on livestock production, discouraging wildlife through fencing and other deterrents. This variation in land-owner attitudes gives rise to a patchwork of three broad categories of privately owned land parcels: livestock-dominated, wildlife-dominated, and 'integrated', in which livestock and wildlife occur in roughly equal proportions.



Reticulated giraffes share the landscape with cattle at Ol Pejeta Conservancy, in Laikipia, Kenya. Felicia Keesing and colleagues report on the economic and ecological benefits of integrating livestock management with wildlife conservation outside national parks and reserves. Credit: Caroline C. Ng'weno

Keesing and colleagues asked a question at the heart of many conservation efforts in human-occupied landscapes: do trade-offs prevail, such that properties dedicated exclusively to either livestock production or to wildlife conservation fare better than properties on which livestock and wildlife co-occur? Alternatively, could land-owners or wildlife derive greater benefit from integrated strategies? To tackle this question, the authors focused on two processes frequently regarded as underlying livestock-wildlife conflict: competition for forage and parasite transmission.

Supporting the possibility of synergies, the authors discovered that integrated properties had ecological advantages with economic benefits. Integrated properties had both more-abundant and more-nutritious grass than properties dominated by livestock, with grass abundance comparable

to levels on wildlife-dominated land parcels. This is especially encouraging because these wildlife-dominated properties happened to be in areas receiving more annual rainfall, suggesting that integrating livestock production with wildlife conservation could enhance forage for both animal groups in dry places. Additionally, livestock reduced tick populations. Ticks were less common on both livestock-dominated and integrated properties than on wildlife-dominated ones. Finally, and perhaps most crucially, mixing livestock and wildlife did not reduce earnings from ranching or tourism: livestock production on integrated properties was just as profitable as on livestock-dominated properties, and tourism on integrated properties was just as profitable as on wildlife-dominated properties. In other words, wildlife did not competitively

suppress livestock, and the presence of livestock did not make wildlife tourism less appealing.

Results from ecological field studies are notoriously difficult to extrapolate from one place to another. Conducted across a remarkable spatial expanse (23 properties totalling over 3,500 km²), the work of Keesing and colleagues is especially compelling because it demonstrates that findings from previous, smaller-scale work do indeed ‘scale up’ to entire regions. Manipulations of wildlife and cattle on 4-hectare plots through the Kenya Long-term Exclosure Experiment pinpointed a likely mechanism for why livestock production was equally profitable on integrated and livestock-dominated properties: grazing by zebra, antelope, and other wildlife enhanced diet quality and thus weight gains of cattle in the rainy season, in part by removing dead grass stems⁸. In these manipulations, as in this study, exclusion of cattle greatly increased tick numbers relative to plots accessible to both cattle and wildlife, likely because cattle are treated with a tick-killing pesticide⁹.

The punchlines of this study are both conceptually interesting and of conservation

relevance. But do they extend to other human-occupied landscapes outside Laikipia? Livestock densities in Laikipia are low relative to those in much of sub-Saharan Africa. Furthermore, above a critical stocking threshold, cattle, sheep and goats will competitively suppress wildlife (especially in dry places and during dry periods⁸). Finally, most of the properties surveyed in this work receive in excess of 600 mm annual rainfall, meaning forage supply is less likely to be an issue. So, some combination of low stocking rates and relatively moist climates probably contributes to the ability of integrated strategies to perform as well as or better than those in which livestock or wildlife is the singular source of income.

In attempting to conserve wildlife alongside people and their livestock, win–win outcomes are unusual and often require a diverse set of lenses to recognize. Keesing and colleagues have identified pathways by which ranchers may be incentivized to conserve wildlife and, reciprocally, by which wildlife-friendly property managers may be incentivized to incorporate livestock production into their operations. In so doing, they add to

a growing literature showing that wildlife conservation and human livelihoods can not only be compatible but are sometimes mutually beneficial. The degree to which their results hold elsewhere will hinge largely on locals’ attitudes toward wildlife and on the tradeoffs associated with sharing the landscape¹⁰. □

Jacob R. Goheen

Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming, USA.

e-mail: jgoheen@uwyo.edu

Published online: 15 October 2018
<https://doi.org/10.1038/s41893-018-0156-3>

References

1. Barnes, M. D. et al. *Nat. Commun.* **7**, 12747 (2016).
2. Craigie, I. D. et al. *Biol. Cons.* **143**, 2221–2228 (2010).
3. Daskin, J. H. & Pringle, R. M. *Nature* **553**, 328–332 (2018).
4. Western, D., Russell, S. & Cuthill, I. *PLoS One* **4**, e6140 (2009).
5. Woodroffe, R. & Ginsberg, J. R. *Science* **208**, 2126–2128 (1998).
6. Keesing, F. et al. *Nat. Sustain.* <https://doi.org/10.1038/s41893-018-0149-2> (2018).
7. Goheen, J. R. et al. *Ann. New York Acad. Sci.* <https://doi.org/10.1111/nyas.13848> (2018).
8. Odadi, W. O., Karachi, M. K., Abdulrazak, S. A. & Young, T. P. *Science* **333**, 1753–1755 (2011).
9. Keesing, F., Allan, B. F., Young, T. P. & Ostfeld, R. S. *Ecol. Appl.* **23**, 1410–1418 (2013).
10. Reid, R. S. *Savannas of our Birth* (Univ. California Press, 2012).