

LETTERS

Edited by Jennifer Sills

Carnivore coexistence: Value the wilderness

IN THEIR REPORT “Recovery of large carnivores in Europe’s modern human-dominated landscapes” (19 December 2014, p. 1517), G. Chapron *et al.* recount encouraging news that brown bear, wolf, European lynx, and wolverine populations are stable or increasing in Europe. Still more encouraging, these carnivores now persist in human-dominated landscapes, a change they attribute to “land-sharing” practices.

Europe is undoubtedly becoming more hospitable for large carnivores, owing to effective law enforcement, shifting social values, and favorable habitat change (1). However, it is unclear whether land-sharing will routinely support self-sustaining large carnivore populations in isolation. Chapron *et al.* show that carnivores are permanently present in areas of high human density, but this does not imply intrinsic population growth. Rather, their presence might hinge on immigration from remaining wilderness areas.

The benefits of land-sharing can be contingent on connectivity between landscapes shared with humans and intact wilderness (2), particularly for long-lived, slow-reproducing, and strongly dispersive species like large carnivores (3), whose populations can be interconnected over huge distances (4). The recovery of the

brown bear in Norway, for example, depends on females traveling from wilderness areas in Sweden, where human densities are extremely low (5). Similarly, the European lynx remains critically dependent on protected areas in Central Europe (6). Without detailed analyses linking land use and socioeconomic change to carnivore demography, it is premature to conclude that land-sharing offers an effective general model for carnivore conservation.

Protected areas are under increasing pressure worldwide (7); it is therefore essential that policy-makers continue to recognize the value of wilderness for biodiversity. Successful land-sharing should be applauded, but it does not represent a green light to roll back protected-area designation. Without the ongoing sparing of European wilderness zones, it is unlikely that favorable trends will continue for large carnivores.

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Carnivore coexistence: America’s recovery

IN THEIR REPORT “Recovery of large carnivores in Europe’s modern human-dominated landscapes” (19 December 2014, p. 1517), G. Chapron *et al.* attribute the return of predators in Europe to a “coexistence” model for conservation, in which carnivores and humans inhabit shared landscapes. They contrast this model with the “separation” model, in which carnivores and humans do not intermingle. Chapron *et al.* suggest that the separation model originated in North America and serves as the basis for management approaches in Asia, Africa, and Neotropical countries. We consider this dichotomization artificial and posit that there is no such North American model.

In North America, black and grizzly bear, cougar, and gray wolf populations are all expanding. Large protected areas in North America have long supported carnivores living separately from people (1), but many of the recent recoveries have occurred in landscapes shared with people. For example, New Jersey, the most densely populated state in the United States, supports densities of 12.4 black bears/100 km² (2). The broader North American recovery has benefited from cultural acceptance and favorable legislation (3), and thus is similar to coexistence-based recoveries reported for Europe.

Chapron *et al.* argue that coexistence is more effective than separation, but true separation of carnivores and people, such as fencing to isolate African lions from humans, has been shown to be a successful conservation model in some regions of the globe (4), particularly where large carnivores regularly kill people. For example, in Tanzania alone, lions attacked more than 1000 people between 1990 and 2007 (5).

The approaches that Chapron *et al.* identified to distinguish coexistence from separation do not derive from North American management policies. Rather, recovery of large carnivores in North America reflects the legacy of large protected areas, low risk of carnivores killing humans, and an improvement of the public’s views toward carnivores.

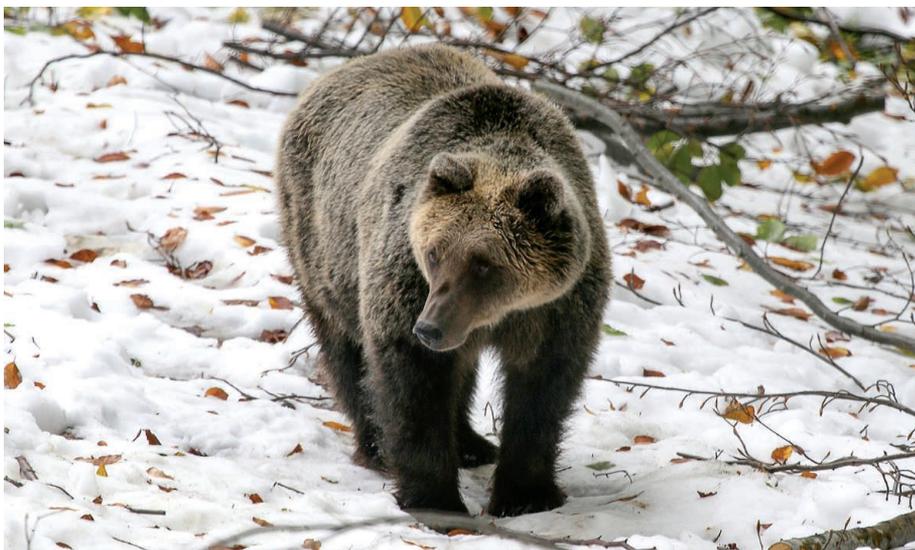
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The stability of brown bear populations in populated areas may depend on the preservation of nearby wilderness.

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Carnivore coexistence: Trophic cascades

G. CHAPRON *ET AL.* present a compelling case that large carnivores and people can successfully share the same landscape (“Recovery of large carnivores in Europe’s modern human-dominated landscapes,” Report, 19 December 2014, p. 1517). However, the conclusions of Chapron *et al.* are a beginning, not an end, to an inquiry into the possibilities and implications of coexistence. In remote areas with low human densities, large carnivores play vital roles through trophic cascades in regulating prey, smaller carnivores, and ecosystems (1). A key question in light of the findings of Chapron *et al.* is whether large carnivores in human-dominated landscapes perform a similar ecological role. The research to date suggests that they may not, or that common models of coexistence inhibit large carnivores fulfilling their roles as apex predators.

For example, where high human densities are accompanied by relaxed environmental policies, large carnivores frequently supplement their diets with garbage, crops, livestock, and carcasses managed by humans (2). This can influence their abundance, life histories, and space use, in turn altering how they interact with co-occurring predators and prey (2). Human presence and human infrastructure can also alter predator-prey relationships by providing an opportune “shield” for one species from the other (3). This has given rise to a three-way interaction involving people, predators, and prey. Complicating things further is that humans often facilitate hybridization between large carnivores (especially canids) and nonindigenous or domesticated species, either through

purposeful introductions or habitat modifications (4).

If we seek transformative change about the way in which large carnivores are managed, we need to better understand how to prevent ecological outcomes that undermine restoration goals. A successful model of coexistence will need to achieve not merely the fact of coexistence, but one that preserves to the greatest extent possible the critical role played by large carnivores on ecosystem processes.

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Ferns to fulfillment

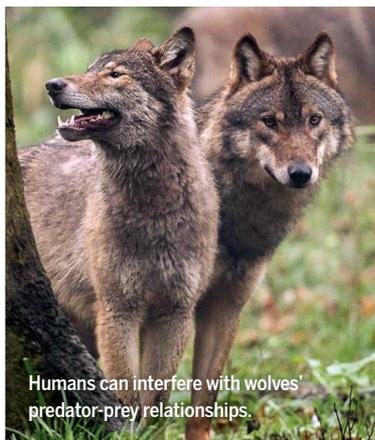
AT FIRST, I was saddened when I read the Working Life article “For the love of ferns” (19 December 2014, p. 1586), in which K. Perkins describes getting into science by accident, pursuing her graduate degree

in a top lab at Albert Einstein College of Medicine, accepting a tenure-track position at Johns Hopkins, and subsequently withdrawing from biomedical sciences. The pressures of funding and establishing one’s own lab, along with life circumstances including an unexpected divorce, ended what by all appearances was a promising career.

However, after a little reflection, I saw the story through a different lens. Perkins’ relatively convoluted path led to a career as a high school physiology teacher, which she describes as “a life of work but also a life of people and play.” It seems she ultimately found the elusive work-life balance, and that is indeed something to celebrate.

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Humans can interfere with wolves' predator-prey relationships.