The Return of Apex Predators—
Ecological and Conservation Considerations

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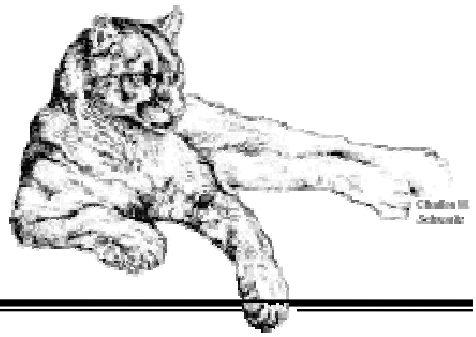

When most ecologists think about large carnivores, the Midwest receives scant attention. Yellowstone? Absolutely. Alaska? Of course. Missouri? No. Yet over the past several years, the state of Missouri has briefly seen the reappearance of some interesting predators. Wolves, including one originally captured and tagged in Michigan, have surfaced in Missouri. Recent road-killed mountain lions suggest the possibility of transient pumas entering from western states. These sightings reflect the broad range expansions occurring for these species elsewhere in North America. As of yet, there is no evidence of a local breeding population for either of these species. There is, however, a slowly but steadily expanding black bear population in the Ozarks. One could, therefore, argue based on current trends that within the next decade we will see portions of the state where bears and mountain lions co-occur in an eastern deciduous forest landscape. Moreover, within the next several decades breeding populations of gray wolves could also conceivably enter this landscape.

The conservation of large carnivores, perhaps more than any other faunal guild, is fraught with politics (Clark et al. 2001). There is no doubt that these animals can sometimes cause economic losses, especially to livestock producers, and that these animals represent a perceived safety threat to some people. On the other hand, there are potential economic gains in the form of hunting and tourism, and for some, spiritual and esthetic benefits from having these carnivores in our midst. So, the pressures to augment or impede the return of these animals make predicting restoration timeframes problematic. But independent of one's love, hate, or apathetic relationship with this group of organisms, and independent of whether the end result of these range expansions is a management strategy designed to facilitate or limit these fledging populations, it benefits all to understand that the ecological impact of recolonizing top predator populations could be significant.

It is increasingly realized that just a few individual members of a population of top-predators holds the potential to disproportionately influence animal and plant communities. The importance of this phenomenon, known as a "top-down" effect, has been demonstrated by several recent studies. For example, as few as four individual killer whales may be responsible for a shift in Alaska's Aleutian Island near-shore community structure from one dominated by kelp forests with few herbivores to one of high sea urchin numbers and low kelp densities (Estes et al. 1998). Similarly, in Michigan's 544 km^2 Isle Royale National Park, just two or three wolf packs indirectly control tree community organization by regulating moose numbers (Post et al. 1999). Thus, in the context of understanding the possible impact of a return of top carnivores to the Midwest, the lesson is that it will not take a large number of animals to affect ecological change. Indeed, the question should not be whether ecological change will result from the return of top carnivores, but rather what types of change will occur.

Unfortunately, it is at this point that our predictive abilities weaken. The complexities of predicting change are exemplified by the Greater Yellowstone Ecosystem wolf restoration effort. Wolves were reintroduced to Yellowstone in 1995 and the population has expanded steadily since. Ecological impacts of this restoration are now becoming clear (Arjo et al. 2002, Ripple et al. 2001, Smith et al. 2003, Soulé et al. 2003). The most intriguing impacts have been the altered behavioral and foraging ecology of putative prey and competitors, and the direct and indirect impact of these changes. For instance, coyote numbers seem to have declined, but those that remain are using a novel resource—the carcasses of ungulates killed by wolves, which has resulted in coyotes living in bigger packs and themselves killing

more ungulates than before wolves returned. Altered behavior of ungulates, such as elk and moose, has reduced browsing pressures on vegetation such as aspen and willow. If wolf-based shifts in the foraging strategies of ungulates continue, one might expect broad changes to riparian vegetation structure and associated faunal richness—changes observed in cross-site comparisons that differed in moose browsing pressures (Berger et al. 2001). The strength of the effects of wolves on prey behavior, and its ensuing indirect importance for the surrounding community was unforeseen.

Would the variety of changes that occurred in Yellowstone also occur in an eastern deciduous forest? At a very basic level—a shift in prey and mid-sized predator behavior resulting in altered direct effects on the biotic and abiotic systems—the answer is undoubtedly yes. What these shifts and the associated indirect effects are likely to be, however, is unclear. Underlying our lack of insight is the inherent complexity of areas like the Ozarks, which are far more diverse than western ecosystems. In thinking about potential changes, however, conservationists and natural resource managers might start by asking how habitat use by potential prey such as deer or raccoon would change, and how interactions within the broader carnivore guild, from coyotes to weasels, might shift. The dynamics of the latter group has been shown time and again to be strongly influenced by the arrival of novel top carnivores (e.g. Crooks & Soulé 1999, Johnson et al. 1996). What might a shift in the numbers and distribution of animals like raccoons, foxes, or skunks mean for an organism or community of conservation concern?

The return of apex predators to eastern deciduous forests is a natural experiment that is likely to happen within the next few decades. From a conservation perspective, regional managers are faced with two options: ignore these animals until their return and then respond to the impact (a default option) or plan for the return based on the insights, albeit limited, gained from elsewhere in the world, and then modify the plan as necessary. Although the second strategy is likely safer, in either scenario the clock is ticking.

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