Reintroducing wolves is only effective at large scales June 18, 2014Conservation This Week0 Comments

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It is a rule in ecology that big animals outcompete little animals. Sometimes the big animals kill the little animals, sometimes the big animals eat the little animals, and sometimes the big animals drive the little animals out of one territory and into another, safer one. That basic pattern – “interspecific competitive killing” – has pushed scientists to try to understand how large carnivores shape entire ecosystems.

That apex predators are critical to maintain a healthy ecosystem isn’t all that surprising. At least not anymore. When wolves were exterminated from most of the lower United States, a set of perhaps unexpected consequences followed: deer numbers increased, which meant that plant populations declined. Bears, who eat many of the same plants that deer eat, suffered from having to share their food. When wolves were reintroduced to Yellowstone, the entire community shifted back into relative balance.

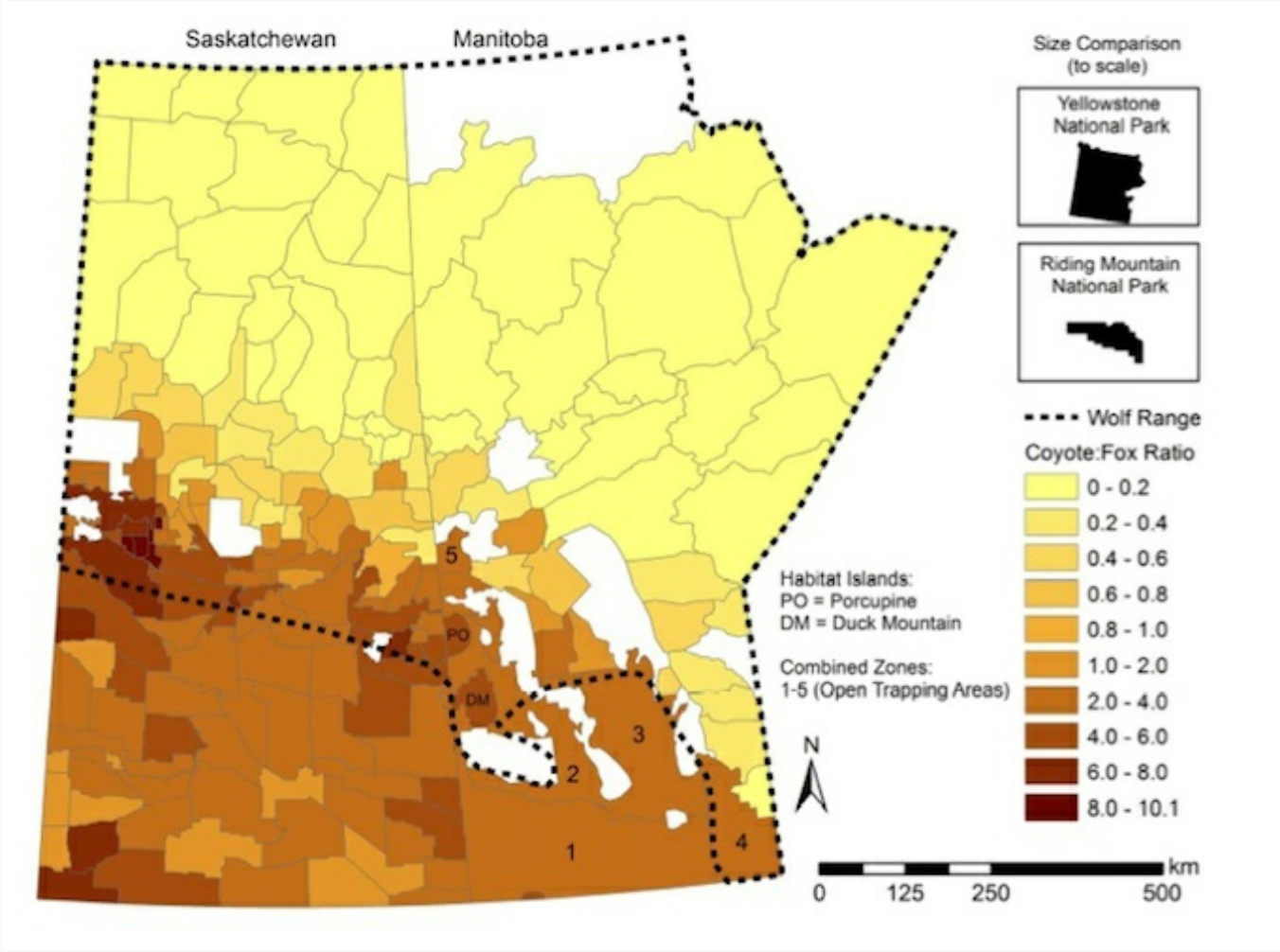
But studies of wolves’ impact on ecosystems like Yellowstone National Park don’t typically cover all that much land, relatively speaking. Yellowstone Park incorporates some 8900 square kilometers, while the “Greater Yellowstone Ecosystem” covers an expanse more than eight times larger. Findings from within the park may not apply more broadly, simply because ecosystems aren’t limited to the artificial boundaries we impose.

Researchers Thomas M. Newsome and William J. Ripple, from Oregon State University, argue that they’ve achieved a better understanding of wolves’ roles in North American ecosystems because they’ve looked at data from an area covering nearly 1.3 million square kilometers of wilderness: the two large Canadian provinces of Saskatchewan and Manitoba. To assess the abundance of three carnivorous canids – wolves, coyotes, and foxes – they relied mainly on fur trap data.

In North America, wolves are known to kill coyotes, and coyotes are known to kill red foxes. Wolves are the apex predators, and coyotes and foxes are called mesopredators (since they are both predator and prey). As humans killed off the wolves, coyotes began to take over the continent, since their main competitor was suddenly missing. Then, we began to re-introduce wolves to parts of their historical range. That gave Newsome and Ripple a sort of “natural experiment” – how do coyotes and foxes cope with the presence or absence of wolves?

Theoretically, the absence of wolves would lead to an increase in coyotes. And that, in turn, would be bad news not just for foxes, but also for the variety of smaller animals that coyotes eat: jackrabbits, cottontail rabbits, and pygmy rabbits, among others. Indeed, that’s what Newsome and Ripple predicted: “that in the presence of wolves there will be relatively more fur returns for red foxes than coyotes. In the absence of wolves we predict there will be relatively more fur returns for coyotes than red foxes.” That’s because wolves exert control over coyote populations. Where they’re present, the pressure on coyotes allows foxes to flourish; where they’re absent, coyotes proliferate, and foxes suffer.

On taking a first pass through the data, their initial hypotheses were confirmed. “Across multiple jurisdictions and spatial scales, we show in areas where wolves are present that red fox fur returns outnumber coyote fur returns,” they write. And “in the absence of wolves we show that coyote fur returns outnumber red fox fur returns.”



The darker the plot, the more coyotes relative to foxes. Even within wolf territory, coyotes dominate for up to 200 kilometers. Compare the study area with the relative sizes of the National Parks, on the right.

But it turns out that the inter-carnivore dynamics among wolves, coyotes, and foxes aren’t quite that simple. Because the area of land they investigated was so large, Newsome and Ripple discovered a large-scale “transition zone” at the edge of wolf territory, in which the ratio between foxes and coyotes shifts according to how far a population is from the center of wolf territory. That’s because wolves become more rare closer to the edge of their territory than in the center. That transition zone stretches for an impressive 200 kilometers. In other words, it is only 200 kilometers away from the edge of wolf territory that foxes begin to outnumber coyotes.

That means that the wolf-coyote-fox relationship is not linear. It suggests that wolves exert greater control over coyotes in some areas, but less control in others. The pattern that results is a sort of “ramp,” where coyotes dominate foxes farther away from wolf territory, but are increasingly subject to the wolf effects closer in. The “ramp” pattern also underscores coyotes’ remarkable ability to disperse. It explains why the reintroduction of wolves within Yellowstone National Park had the expected result of reducing coyote numbers, but also why the overall coyote populations within the Greater Yellowstone Ecosystem did not change. If wolves move into the neighborhood, coyotes simply pack up and move next door.

From a conservation perspective, this study highlights the wolves’ need to occupy large areas to carry out their “ecosystem services” of controlling mesopredators and maintaining healthy wildlife communities. “No study,” write

Newsome and Ripple, “has previously quantified the size of the ‘border region’ or ‘transition zone’ that influences the effectiveness of top-down mesopredator control. Nor has it previously been appreciated that the border region may be of this magnitude.” Large carnivores like wolves may need large, continuous territories in order to effectively control the balance of their ecosystems. What does that mean for efforts to reintroduce wolves to bits of protected land in North American, increasingly surrounded by coyote-friendly agricultural fields? It might mean that wolves would be unable to control the coyote populations at all!

Taken together, Newsome and Ripple demonstrate that fully understanding ecosystem dynamics requires surveying much larger swaths of land than what’s contained within (relatively) tiny national parks. By focusing on smaller bits of land, researchers may be missing the proverbial forest for the trees. **– Jason G. Goldman | 18 June 2014**

Source: Newsome T.M. & Ripple W.J. (2014). A continental scale trophic cascade from wolves through coyotes to foxes., The Journal of animal ecology, PMID:

Header image: Top row: blue fox, red fox. Bottom row: wolf, coyote. Public Domain (Wikimedia Commons)