Mesocarnivore Response to Wolf Presence, Prey Availability, and Snow

National Park Service
U.S. Department of Interior

Denali National Park and Preserve

Photo: Casey Pozzanghera

A Mesocarnivore is a mid-sized predator, such as a coyote, lynx, fox, wolverine, or marten. They are thought to compete with one another and may be limited by wolves.

"Coyotes move within a landscape of attentiveness… They have watched me. And all the times that I saw no eyes, that I kept walking and never knew, there were still coyotes. When I have seen them trot away… and watched them as they watched me over their shoulders, I have been aware for that moment of how much more there is. Of how I have only seen an instant of a broad and rich life."

— Craig Childs, *The Animal Dialogues: Uncommon Encounters in the Wild*

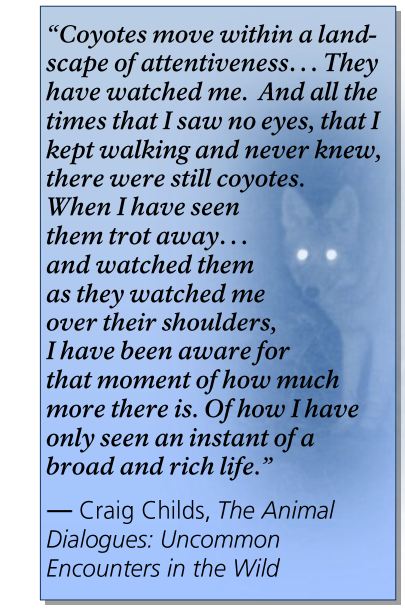


Photo: Patricia Del Vecchio

The Coyote Has Introduced Himself

In July 1928, Harry Karstens, superintendent of what was then called Mt. McKinley National Park, noted in his monthly report the increasing presence of coyotes in the area as well as fluctuations in wolf numbers:

> *"From 1921 to 1927, the wolves in the park were not many. The coyote has introduced himself in the past three years, as previous to that there were no coyotes in this section of Alaska but since 1927 wolves are becoming alarmingly plentiful and causing considerable havoc among our game, also the coyote is multiplying fast."*

And thus began a decades-long controversy of wildlife management in and around Denali National Park and Preserve that continues today, as scientists and managers try to understand the complex relationships among species.

Initially, biologist Adolph Murie was hired to study the wolf "problem" in 1939. His landmark research gave new insight into studies of predators and their prey. Since then, biologists have begun looking beyond simple predator-prey relationships to consider whole ecosystems, which have many interwoven parts, much like the many players in a symphonic orchestra that make up its sound.

Ripples and Cascades

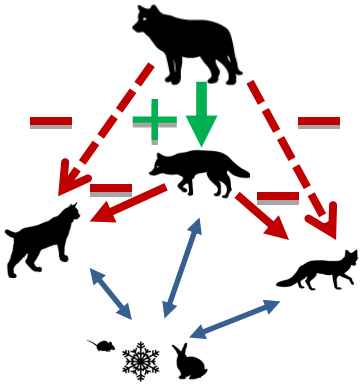
What happens in an ecosystem when the abundance of an integral species – such as wolves or hares – changes? In March of 2012, Denali park biologists again noticed an apparent increase in the coyote population as the number of wolves – top predators in the park – declined. Were these changes related? Increased coyote abundance throughout western North America has been attributed to the extirpation of wolves and is considered by many to be an example of "mesopredator release."

Mesopredator release is defined as the expansion in range and/or abundance of a smaller predator following the reduction or removal of a larger predator. These effects can extend beyond the small carnivores to include their prey. For example, studies in Alaska have shown that wolves may suppress coyote populations, and high coyote populations can greatly reduce the survival of Dall sheep lambs. These "ripple effects" throughout an ecosystem are known as trophic cascades. But determining how and when these cascades occur is very complex.

Who's Pushing Who?

Because wolves often kill coyotes, wolf presence could be a factor that limits coyote abundance. However, wolves also provide food subsidies to coyotes in the form of ungulate carrion, so the net effect of wolves on coyote populations is unknown. In northern ecosystems, coyote populations fluctuate along with changes in abundance of their primary prey: snowshoe hares and voles. Population cycles of coyote prey could influence the degree that coyotes scavenge from wolves, which might directly affect coyote survival. Meanwhile, competition between coyotes and other mesocarnivores is thought to be influenced by habitat characteristics, such as snow depth, hardness, and vegetation, which are also changing in response to our changing climate.

Hypothesis A:



Wolves **benefit** coyotes by providing carrion; coyotes limit smaller predators, thus wolves indirectly **limit** fox and lynx.

Photo: Steve Thomas

NPS Photo

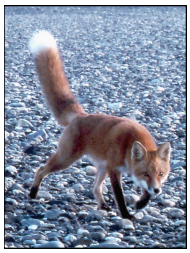
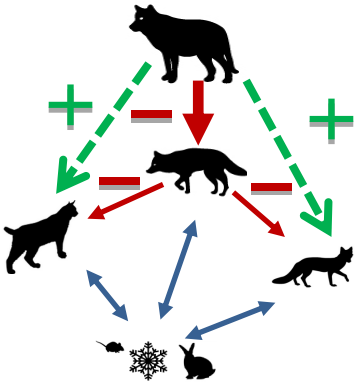


Photo: Steve Arthur

Hypothesis B:

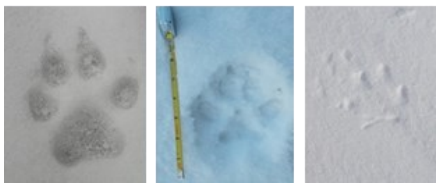


Wolves **limit** coyotes, which reduces negative effects of coyotes on smaller predators. Thus, wolves indirectly **benefit** fox and lynx.

Research Techniques

Researchers from the Institute of Arctic Biology at the University of Alaska Fairbanks initiated a study in the summer of 2012 to answer these questions. The study continues today as a collaborative research effort between UAF and Denali National Park and Preserve. The goal of this study is to assess how wolf activity, prey availability, and habitat (vegetation and snow characteristics) affect the dynamics of mesopredator release and the resulting cascading effects on the mesocarnivore community. These questions are addressed by conducting winter track surveys and snow depth measurements, collecting carnivore scats, and assessing prey abundance.

Photo: Laura Prugh



Photos: Kelly Sivy

Snow track surveys are used to estimate abundance and distribution of predators and prey in relation to habitat and snow characteristics.

Photo: Kaija Klauder

Carnivore scats (feces) are analyzed to assess diets and to determine the number of individual animals in the area through DNA identification.

Photos: Kelly Sivy

Prey populations are estimated by counting fecal pellets of hares and by live-trapping studies of voles and other small rodents.

The results of this study will enhance scientific understanding of factors that determine the strength of mesopredator release, while providing important baseline information about the mesocarnivore community in Denali. Evaluating the response of the mesocarnivore community to changes in their environment will provide critical insights as the pace of climate change increases.

For more information
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