EarthFix Conversations: The Case For Carnivore Conservation

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-  A leopard. Ecologists, including OSU's William Ripple, are arguing that large carnivores play a key role. credit: Kristin Abley.

Oregon State University Ecologist William Ripple is known for his groundbreaking research on the ecological role of the grey wolf. Ripple has documented the cascade of effects triggered when wolves were reintroduced to Yellowstone National Park. Deer and elk populations dramatically decreased, which led to recovery of plants like aspen trees and berries, which in turn benefited beavers and bears.

In a new paper published in *Science*, Ripple has worked with a multinational team of a dozen carnivore biologists to make the case that the world's largest predators are declining just as researchers begin to understand their key ecological effects. The researchers found that 61 percent of the largest land carnivores are threatened with extinction.

We spoke to Ripple about the paper and the ecology of lions, tigers, and bears. And also dingoes and otters and cougars.

EarthFix: What is the main argument that you make in the article that's coming out in *Science?*

William Ripple: We are just now learning about the ecological effects of large carnivores around the globe and at the same time we're finding these species are declining and threatened with endangerment. So ironically, they're declining as we're finding out about the important roles they play in ecosystems.

EarthFix: So why might a large carnivore be more important to an ecosystem than a butterfly or a mouse?

Ripple: Large carnivores are called top predators. At the top of the food web, they have these incredible effects on the organisms below them. They're sometimes called highly interactive species. We get these knock-on effects, when something happens to the carnivore. These cascading effects can ripple right through the ecosystem to a number of different organisms, both plants and animals.

EarthFix: You give lots of examples in the paper, but do you have a favorite personal example of an unexpected effect that happens when you take a particular predator out of an ecosystem?

Ripple: I could go to our example in Africa. The African lions and leopards keep baboons in check. In cases where the lions and leopards are disappearing, the baboon population increases dramatically. In some cases, these baboons increase their raiding of croplands, and when the baboons eat the farmers' crops, sometimes the farmers have to keep their children home from school to help guard the fields. I find that an interesting and unexpected cascade of events.

EarthFix: One example I thought was interesting was dingoes in Australia, and the fact that you have this really large scale experiment on dingoes that's taking place because they've been fenced out of livestock areas.

A dingo. Credit: Ken Shaw

Ripple: Dingoes are a close cousin of the grey wolf, and the Australians long ago fenced off a big portion of the continent, for a couple thousand miles. They made this dingo-proof fence to protect their sheep. Dingoes are abundant on one side of the fence, but rare on the other side. What this allows us as scientists to do is a natural experiment. And in (the absence of dingoes), researchers are finding that the invasive red fox is much more abundant, because the dingoes are

larger and control them. The red fox causes additional predation pressure on their prey, and some of them are at risk of becoming endangered, for example some Australian desert mice.

EarthFix: How in this study did you define large carnivores?

Ripple: We defined large carnivores as any land carnivore any place in the world that weighs at least 15 kilograms, a little less than 40 pounds. There are several hundred carnivores, but only 31 are large enough to meet those criteria.

EarthFix: So 15 kilograms, is that the size of a house cat or a Labrador dog?

Ripple: It's more the size of a Labrador dog.[…]

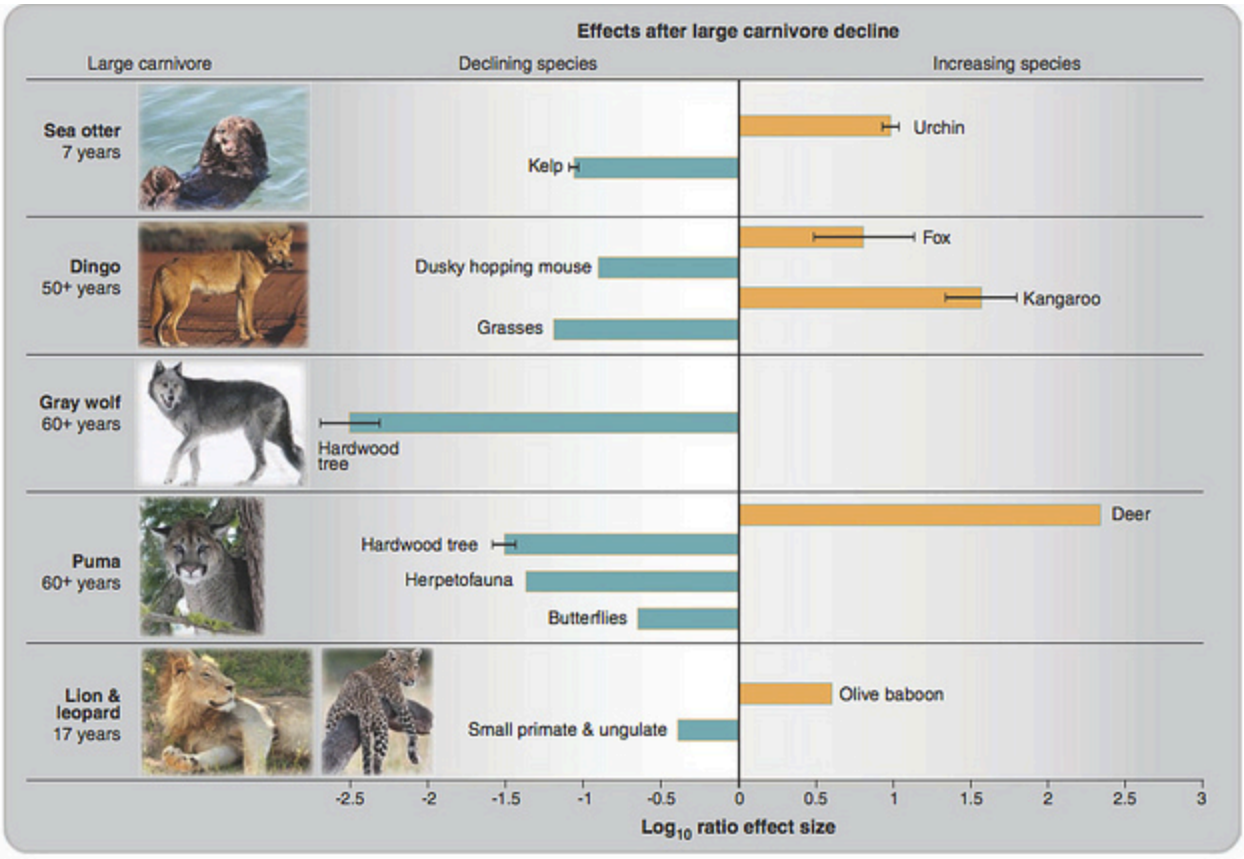
EarthFix: So one of the things in I saw in the paper was this measure of how strong of an effect carnivores have, on the other species in their ecosystem. And that confused me a little, because it seems like a strange thing to try to measure. Can you explain that?

Ripple: In ecology, we have this thing we call effect size. We can quantify how large the effect is if we make a change to a species. For example, if we lose a large carnivore we can quantify this by looking at the response before and after. […] What we found in this study was when we tabulated effect sizes for six large carnivores, we found those effects to be quite high. For example, when we lost the cougar in Zion Canyon, we found over 100 times more deer than before we lost the cougar. So that's an example of a strong effect size. This happened because the deer figured out it would be much safer to be in a place where cougars were scarce.

If you remove sea otters, their prey, sea urchins, increase in numbers, and their prey, kelp, decreases. We show how urchins increase ten times, and correspondingly kelp decreases 10 times, when you remove the sea otters.

EarthFix: So in some ways the effect on the rest of the ecosystem is even more dramatic than the loss of the predator itself?

Ripple: Yes, it can be magnified. That's why we're quite concerned with the declines of the carnivore. We're finding out they have these large effect sizes, or put simply, they have strong impacts on nature.



A table showing the effects of top predators. Credit: [Status and Ecological Effects of the World's Largest Carnivores]

EarthFix: So why is it that these larger predators have such a magnified effect on everything else? Why wouldn't you expect the deer population to just double or triple when you eliminate cougar?

Ripple: There are two types of effects that predators have. One is direct mortality, where the carnivore preys on the herbivore, and the numbers of the herbivore go down. But this other effect, which I think we're seeing in Zion Canyon, is a behavioral effect. It's part of the ecology of fear. The prey understands where it's safe to be, to the point where they're willing to crowd into a place that's really safe. …. Scientists are now starting to understand that sometimes these behavioral effects, due to fear, can be much stronger than the effect of direct mortality due to predation.

EarthFix: Do you make an argument in this paper against predator hunting in general and against wolf hunting in particular?

Ripple: The purpose of our paper is to look at the conservation status of large carnivores around the world. So it's a very broad paper, and we did not analyze the pros and cons of hunting large predators. What we're hoping for is that the public and policymakers start to consider the factors

that we're describing, the ecological effects when making decisions about how to manage large carnivores.

EarthFix: What is the conservation status of large carnivores?

Ripple: We found that in our research, that for the 31 species that we're studying, the largest carnivores in the world, that 61 percent are listed as threatened, and 77 percent are undergoing continued population declines. For those that we could measure a change in range, we found they currently occupy only 47 percent of their historic ranges. As a group these carnivores are declining rapidly and significantly.

EarthFix: What would you say makes large carnivores vulnerable to threats?

Ripple: These carnivores are vulnerable to decline and extinction because of their large size. They require a large amount of range, a lot of habitat, and in some cases pristine habitat. There's a number of threats we looked at: loss of habitat, persecution by humans, the utilization of carnivore body parts for medicine or to make furs, and one that we don't think about much, but the depletion of their pray is another significant factor in their decline.

EarthFix: Is there anything you'd like to add?

Ripple: Sometimes these large carnivores are difficult for humans to live with, and they can cause problems, particularly with livestock. Promoting tolerance with humans is our crucial challenge moving forward.