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The Positives of Predators

by Raymond P. Hill | February 2014

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The American author and ecologist Aldo Leopold long ago advanced the idea that all parts of an ecological system (humans, lower mammals, reptiles, birds, insects and plants) are interdependent. He called for "the role of *Homo sapiens*" to be viewed not as that of a "conqueror" of the natural world but as that of a "citizen." Leopold, who died in 1948, is now widely credited with being among the pioneers of the concept of wildlife management.



Jim Pfitzer/WPR

The American author, ecologist and academic Aldo Leopold (long a professor at the University of Wisconsin) is considered to be one of the most influential conservationists of the 20th century. His book *A Sand County Almanac* documents his legacy in wildlife management, conservation biology, sustainable agriculture, restoration ecology and private land management. ABOVE: Leopold is portrayed on stage by Jim Pfitzer in the one-man show "A Standard of Change."

But Leopold was not always a conservationist. As a young man he worked as a forest ranger and, while stationed in New Mexico, enthusiastically hunted down bears, wolves and cougars at the request of local ranchers, who regarded the beasts as threats to their livestock. In his posthumously published memoir, *A Sand County Almanac* (1949), Leopold recalled having had a flash of insight after killing a wolf: Wiping out the local wolves would have a domino effect on the area's ecological system. That moment was pivotal in turning him toward wildlife preservation.

Decades after young Leopold's crucial insight, it would be enshrined as an ecological principle known as "[top-down trophic cascade](#)." This refers to the effects—usually unforeseen and negative—on an entire [ecosystem](#) when a key predator disappears from the top of the food chain. Some scientists claim that, in reality, top-down trophic cascades have been few and far between to date. However, a group of 14 ecologists and biologists from the U.S., Italy, Sweden and Australia firmly disagrees with that assertion. The group has concluded not only that populations of the world's major wild

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carnivores are in steep decline but also that several serious instances of top-down trophic cascades are currently under way around the globe.



Oregon State University/William Ripple

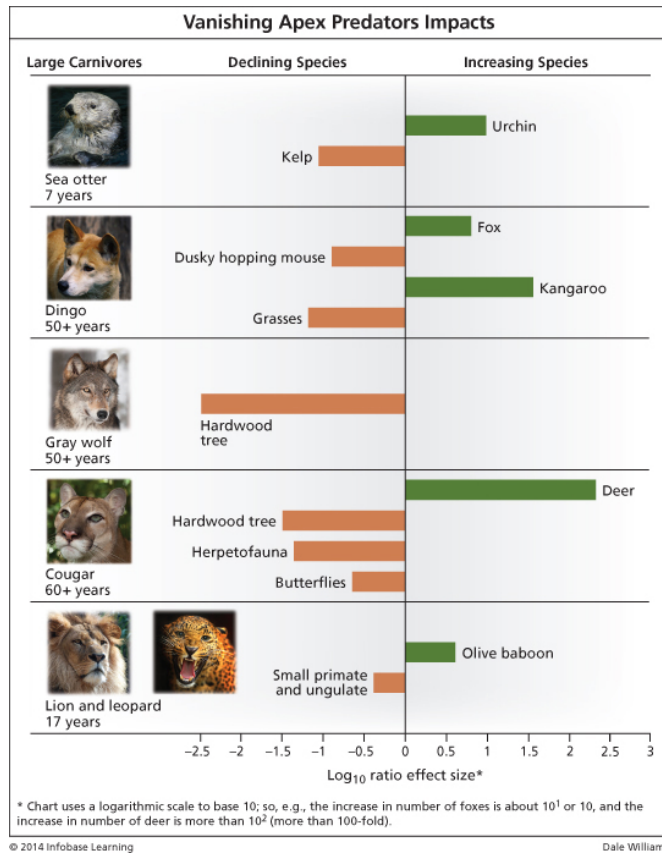
William Ripple, a professor of ecology at Oregon State University and lead author of the paper on apex predators, describes the positive impact of gray wolves on the ecology of Yellowstone National Park.

The findings were published online on January 10, 2014 by the journal *Science*. In presenting their findings, the group called for an international commitment to protect top predators as a way of staving off the collapse of ecosystems. The lead author of the *Science* paper is William Ripple, a professor of ecology at Oregon State University in Corvallis. "We are now obtaining a deeper appreciation of the impact of large carnivores on ecosystems, a view that can be traced back to the work of landmark ecologist Aldo Leopold," Ripple wrote in a guest column at *The Conversation*, a British academic blog site. "The perception that predators are harmful and deplete fish and wildlife is outdated. Many scientists and wildlife managers now recognize the growing evidence of carnivores' complex role in ecosystems, and their social and economic benefits."

Vanishing "Apex Predators"

The *Science* study is a "review" paper, or a comprehensive survey of previous findings in a given field. In this case, Ripple and his colleagues analyzed more than 100 previously published scientific papers related to the status of 31 large carnivores the world over, and the impacts of those animals on their respective ecosystems. In scientific parlance, these animals are "apex predators" because they are at the top, or close to the top, of their ecological food chains.

Ripple and his team reached some alarming conclusions, including a finding that very few apex-predator populations are stable. According to their review, 77% of the 31 carnivore species in the wild are experiencing noticeable population declines, and 55% of the apex predators now occupy less than half of their historic hunting ranges. The report noted that 61% of the large carnivores are currently listed as threatened species by the nonprofit International Union for the Conservation of Nature.



"Globally, we are losing our large carnivores," Ripple insisted in an interview with the British newspaper the *Observer*. "Many of them are endangered and their ranges are collapsing. Many are at risk of extinction, either locally or globally. And, ironically, they are vanishing just as we are learning to appreciate their important ecological effects."

The *Science* paper states: "Large-carnivore population declines are typically precipitated by multiple, and sometimes concurrent, human threats, including habitat loss and degradation, persecution, utilization (such as for traditional medicine, trophy hunting, or furs), and depletion of prey."

In calling for worldwide protections for the animals, the scientists acknowledged the difficulty of changing people's attitudes about major predators. Ripple observed, "Human tolerance of these species is a major issue for conservation. We say these animals have an intrinsic right to exist, but they are also providing economic and ecological services that people value."

Current Trophic Cascades

The report cited seven examples of what the scientists maintain are top-down trophic cascades that are happening today. These involve ecosystems once dominated by **gray wolves** (*Canus lupus*), **cougars** (*Puma concolor*), **lions** (*Panthera leo*), **leopards** (*Panthera pardus*), **dingoes** (*Canus lupus dingo*), **Eurasian lynxes** (*Lynx lynx*) and **sea otters** (*Enhydra lutris*).



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The 'review' report, a comprehensive survey of previous ecosystem studies, cited a number of examples of what the scientists maintain are top-down trophic cascades that are happening today. These involve ecosystems once dominated by (clockwise from top left) gray wolves, cougars, leopards, Eurasian lynxes, dingoes and lions.

For example, in parts of North America where gray wolves and cougars are disappearing, populations of their traditional prey—deer and elk—have exploded. This, in turn, has led to over-browsed vegetation in some regions. The loss of vegetation is pushing smaller herbivores and birds out of those areas, the report contends.



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In some parts of Africa, populations of olive baboons (*Papio anubis*)—once kept in check by lions and leopards—have swelled in the absence of the big cats, according to the study. The paper states, "Baboons pose the greatest threat to livestock and crops in sub-Saharan Africa, and they use many of the same sources of animal protein and plant foods as humans. In some areas, baboon raids in agricultural fields require families to keep children out of school so they can help guard planted crops."



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Off the coast of Alaska, killer whales (*Orcinus orca*) are thriving, but to the detriment of one of their favorite foods, sea otters (a predator just below orcas in the food chain), the study points out. The diminished sea-otter population has meant a sharp rise in the numbers of their prey, sea urchins (*Echinus melo*). As a result, Alaska's kelp forests are now under attack from swarms of sea urchins. Kelp forests are important because they help protect coastal areas from storm surges and tidal erosion. They also act as a carbon sink.



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"Lions, leopards, wolves, sea otters, and all the other carnivores at the top of the food chains eat herbivores and keep their numbers under control," Ripple explained to the *Observer*. "That in turn means there are fewer animals eating plants, and so the planet has more trees or kelp that can absorb carbon dioxide and so help in some way to reduce amounts of the gas in the atmosphere."

In an interview with the *Corvallis Gazette-Times*, he remarked, "The goal here is to look at the big picture, the conservation of species and the effects they can have on ecosystems, so this information can be used when policymakers make the tough decisions."

Discussion Questions

Choose a large carnivore not mentioned in this article (say, a great white shark). As best you can, detail the possible ripple effects on its ecosystem if your chosen predator were to vanish from the top of its food chain.

Journal Abstracts and Articles

(Researchers' own descriptions of their work, summary or full-text, on scientific journal websites).

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