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Trophic Cascades?

Ever since wolves were reintroduced into Yellowstone National Park, scientific studies have claimed that the wolves were improving the ecosystem through "trophic cascades." Popular videos and articles have now echoed, and perhaps exaggerated, those claims. "Trophic" refers to food; a trophic cascade is a set of reactions down through a food pyramid starting with an animal like the wolf at the top, elk in the middle and plants at the base. A Yellowstone trophic cascade, then, involves the changes in plants caused by changes in the elk population caused by actions of wolves. Wolves kill elk, which helps reduce their numbers. Wolves also might scare elk, making them change their behavior such as living in larger herds or in safer areas. Fewer elk and/or elk living differently on the land could change how plants grow. Those changes could affect other creatures such as birds that nest in trees or shrubs. How much of this theoretical cascading actually occurs in Yellowstone has been the subject of scientific controversy. To try to clarify the issue *International Wolf* interviewed Dr. L. David Mech, senior research scientist for the U.S. Geological Survey, who has written about the subject.

***International Wolf:* Do wolves cause trophic cascades?**

Mech: Yes, they can. Science has long known that after wolves and other carnivores were exterminated from many areas, their prey such as deer overpopulated and overbrowsed plants. Researcher Rolf Peterson, Michigan Technological University, also demonstrated that balsam fir growth on Isle Royale was linked to how many moose wolves killed.

***International Wolf:* Why is there a controversy, then, about trophic cascades in Yellowstone?**

Mech: Yellowstone is a much more complicated system. Not only do wolves prey on elk, but so, too, do black and grizzly bears, coyotes, cougars, and humans (when Yellowstone elk migrate out of the park). Thus scientists disagree on how much impact wolves have on the elk population. If wolves are not the main factor reducing elk numbers, then any effect that changes in elk numbers might bring cannot be attributed solely to wolves.

***International Wolf:* What are other changes in Yellowstone that some scientists have attributed to the wolf?**

Mech: The return of beavers; reduction of coyotes and possible release of animals that coyotes kill and thus an increase in coyote competitors; improving the system for scavengers (ravens, eagles, coyotes, beetles) that feed on wolf kills; and others.

***International Wolf:* What does "release of animals that coyotes kill" mean?**

Mech: Release means an increase in coyote prey such as mice and ground squirrels. With fewer coyotes, more such prey could support an increase in other creatures that feed on them such as hawks, owls, foxes and weasels.

***International Wolf:* Is there any evidence this has happened?**

Mech: Not really. A few years after wolves were reintroduced, they did kill a lot of coyotes and reduced their numbers. However, there was no evidence of an increase in foxes or other carnivores. And more recently coyotes have increased again, although wolves still keep killing them.

***International Wolf:* What about improving the system for scavengers?**

Mech: With or without wolves, everything dies, and scavengers feed on the dead. Many scavengers do feed on wolf kills, but if wolves reduce elk numbers, there would be fewer elk carcasses on which scavengers can feed, so that could be detrimental to scavengers rather than beneficial. Moreover, wolves usually eat almost all of a carcass, leaving far less food for scavengers than if the animal just died without wolves.

***International Wolf:* Are there other disagreements?**

Mech: Several others. Although some scientists seemed to show increased plant growth after wolves were reintroduced, other scientists dispute those findings. Also some studies showed changes in elk behavior after wolves, but other studies challenged those findings.

***International Wolf:* Why do scientists disagree so much about these subjects?**

Mech: Scientists disagree on many things. That is the way science works. Science is self-correcting. One study concludes something; then other scientists scrutinize the study and sometimes see problems with the first study's methods, analyses, results or interpretations.

***International Wolf:* Can you give a specific example?**

Mech: One of the biggest flaws in some of the Yellowstone studies has been some scientists concluding that because a change in something occurred after wolves were reintroduced, therefore wolves caused that change. In reality there could have been any number of other causes. Soon after wolves were reintroduced to Yellowstone, Doug Smith, who is project leader for the Yellowstone Gray Wolf Restoration Project in Yellowstone, put it this way: "The danger we perceive is that all changes to the system, now and in the future, will be attributed solely to the restoration of the wolf."

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***International Wolf:* So many of the changes that people think happened after wolf reintroduction included increases in the height and number of aspen trees and willows. What other types of causes besides wolves could bring major changes to plants?**

Mech: Changing weather patterns. For example, since 1995 when the first wolves were reintroduced, the growing season has increased by about 27 days. Thus if any great increases in Yellowstone plant growth since 1995 are proven, the longer growing season could have caused them.

***International Wolf:* Have there been any other major changes in Yellowstone since 1995 besides wolves and growing season that might have caused changes that some attribute to wolves?**

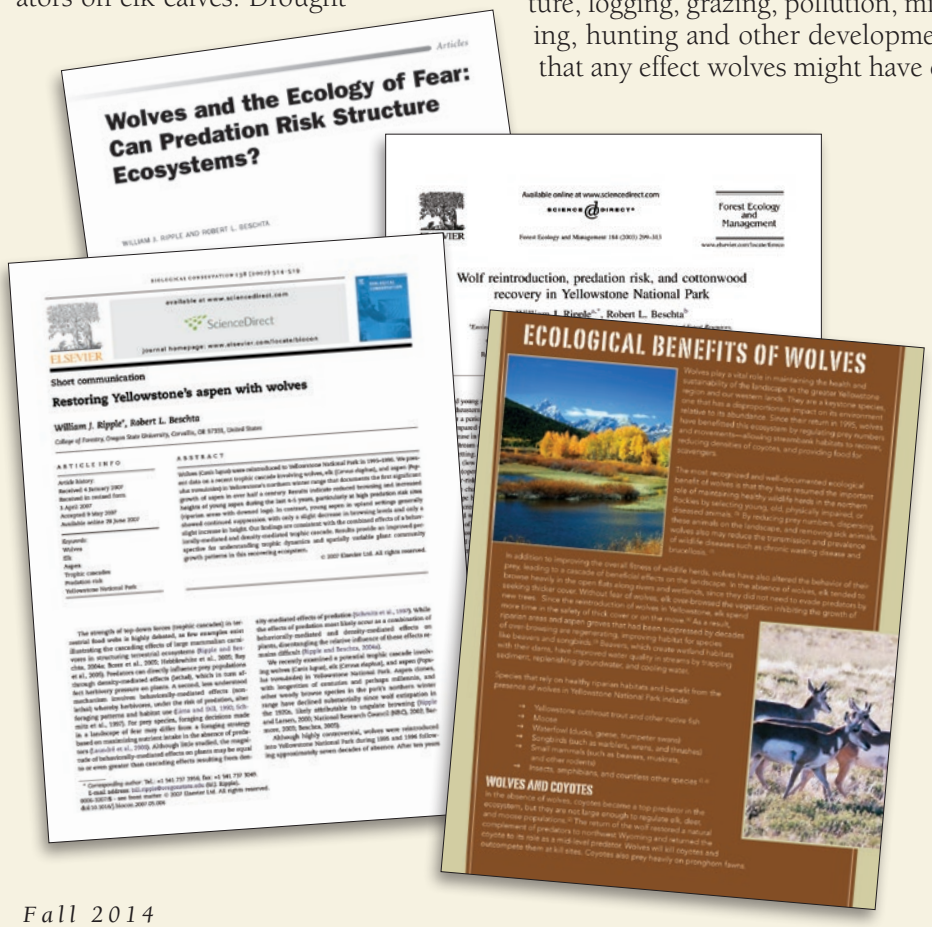
Mech: The number of grizzly bears has increased, and bears are important predators on elk calves. Drought has also affected the Yellowstone area for many years, further plaguing elk populations. In addition, bison numbers have doubled, and they are distributed more widely in the park. Some bison carry brucellosis, which can spread to elk.

***International Wolf:* Is there good evidence that wolves have caused trophic cascades in any area other than the one you mentioned on Isle Royale?**

Mech: Yes. There seems to be good evidence that wolves in Banff National Park, Canada, have reduced elk numbers, which increased willows and the songbirds that depend on them.

***International Wolf:* Most wolves live outside national parks. What about wolf effects there?**

Mech: Unfortunately most areas outside national parks have been so comprised by human activities including agriculture, logging, grazing, pollution, mining, hunting and other development that any effect wolves might have on these degraded ecosystems would be inconsequential.



***International Wolf:* Don't wolves sometimes help reduce deer herds?**

Mech: Wolves can reduce deer herds, and that can release plants that deer depend on. However, compared with the effect of human activities, the results make little difference. This was recently shown in some Wisconsin studies.

***International Wolf:* Are there any other positive ecological effects of wolves that are well documented wherever wolves live, national parks or elsewhere?**

Mech: For wolves to trigger a very effective trophic cascade they would have to live at a high density for a long period, which probably could only be the case in national parks. Wherever wolves live, however, they tend to take prey that is more feeble or debilitated, for example older animals, the very young and those that are diseased, parasitized or abnormal. In the long run, that is beneficial to prey populations. Also in national parks, which generally are as close to pristine as any area these days, at least in the lower 48 states, wolves fill out the natural complement of creatures, and I and many others consider that fact positive regardless of whether science can document any trophic cascades they might cause. ■

For a perfect example of the exaggerations that have been made about wolves and trophic cascades, see the YouTube video "How Wolves Change Rivers" at http://www.youtube.com/watch?v=ysa5OBhXz-Q.

Dr. L. David Mech is a senior research scientist for the U.S. Geological Survey and founder and vice chair of the International Wolf Center. He has studied wolves for more than 50 years and has published several books and many articles about them.