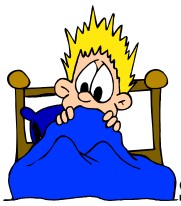

ScienceWatch-The Ecology of Fear

Now that the wolves are back young aspen are growing again for the first time in more than 50 years due to the "fear factor".

Who's afraid of the big, bad wolf? The elk in Yellowstone National Park! In a controversial program, wolves (*Canis lupis*) were released in 1995-1996 in the northern section of the park, known as the Lamar Valley, where elk (*Cervus elaphus*) spend the winter. Their return has yielded unexpected benefits.

An earlier, misguided effort by the Department of Interior to wipe out wolves by hunting, trapping and poisoning succeeded in extirpating them by 1925. Once the wolves were gone, observers noticed a change in the park's ecology. Aspen (*Populus tremuloides*) were not replacing themselves, and, as older trees died off stream erosion accelerated. Beaver dams declined. Fewer nesting songbirds were found. The intricate web of the park's natural ecology began to collapse.

Now that the wolves are back young aspen are growing again for the first time in more than 50 years and the ecological degradation is being reversed. The wolves in Lamar Valley - currently about 50 - eat about one elk per wolf per month. So it may seem logical that predation by wolves reduced elk numbers, thereby decreasing browsing of aspen saplings. However, two forestry researchers at Oregon State University, Corvallis, OR, have shown that something else is involved.

In the September 2007 issue of *Biological Conservation*, William Ripple and Robert Beschta present evidence showing that the "fear factor" of wolves by elk is responsible for the aspen's return. In 1997, Ripple and a graduate student, Eric Larson, examined tree rings and found that, as expected, the aspen stopped regenerating right after the wolves were extirpated from the park. Aspen are an elk favorite, and by browsing the tender, leading shoot they can stunt sapling growth.

In 2006 Ripple and Beschta searched out lowland aspen clumps, which are out in the open near river banks (riparian), as well as others in upland areas of the valley where pine forests provide more cover for elk. As a measure of the impediment for escape by elk they also looked at lowland and upland groves with downed logs within 10 feet of the trees. Ripple and Beschta found that, since the wolves return, riparian aspen have fared much better than upland ones, and saplings in both areas have grown more where the escape impediment, downed logs, is present. Sites with downed logs averaged 167 cm

(5.5 ft) in sapling height, compared to only 105 cm (3.4 ft) at sites lacking nearby logs. Upland trees averaged only 105 cm (3.5 ft). In contrast, riparian trees, where cover is lacking, were tallest of all, on average 214 cm (7.0 ft), and with crowns high enough to finally avoid loss to browsing elk.

Over the last 10 years other researchers showed that browsing of aspen had decreased as the wolf population grew and the elk numbers dropped. But even an apex predator like the wolf is subject to disease and in the summer of 2005 about 40 percent of the Lamar valley wolves died from a virus and the elk population rose. That winter 6,500 elk roamed the study area, as many as were present in the mid-1960s when aspen trees were declining. Yet riparian aspen height continued to increase. If simple predation of elk by the wolves were the cause for increased tree growth, increased browsing should have slowed growth, but it didn't.

Apparently, elk are more reluctant to browse in the open along river banks, and loathe spaces where they can't easily run away. Ripple and Beschta clearly demonstrate that saplings in areas where elk are more likely to be caught by wolves are doing best of all. According to Ripple, "We think these elk need to balance the risk of being killed versus eating in their favorite place. So it's a trade-off between food risk and an ecology of fear."

This study shows that the reintroduction of a key predator like the wolf can lead to a healthier, more diverse ecosystem and supports theories of "trophic cascades"- removal of top predators affects all levels of an ecosystem beyond what they eat.

So next time you read a fairy tale about Little Red Riding Hood or the three little pigs, remember that fear of wolves can be good for the environment.

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