Chain of command: Wolves help trees thrive

These days, ranchers, environmentalists, and policy makers are fiercely debating the pros and cons of reintroducing wolves into U.S. wilderness areas. But if trees had their say, they would vote overwhelmingly in favor of the furry carnivores. At least, that's what new research indicates.

Trees lose fewer leaves if wolves are around to keep large grazing animals in check, two wildlife ecologists report in the Dec. 2 SCIENCE.

In their natural environment, plants and animals align into food chains. Plants fueled by sunlight become fodder for herbivores — vegetarians of the wild. Then meat-eating predators hunt the herbivores.

While biologists often have no trouble identifying these "links" in the chain, they cannot agree about what causes the number of plants or animals to vary over time.

To make matters worse, few places have intact food chains that include large carnivores, says Stanley I. Dodson of the University of Wisconsin-Madison.

Some researchers assert that the plants at the base of the chain ultimately determine the populations of other organisms. Climate and other physical conditions set the growth rate for plants, thus indirectly influencing the entire food chain. "That's the classical argument, that everything is resource-dependent," explains Rolf O. Peterson, a wildlife ecologist at Michigan Technological University in Houghton. Fewer plants results in fewer herbivores and, consequently, fewer predators.

But a food chain in Isle Royale National Park, a 544-square-kilometer island in Lake Superior, doesn't work that way.

There, wolves prey on moose, which munch extensively on balsam fir foliage. For the past 35 years, biologists have tracked the island's moose and wolves to study the influence of predator and prey populations on each other.

Then Brian E. McLaren, a member of Peterson's team, began adding plants to the equation by studying the tree rings of balsam firs. He discovered that these rings narrowed periodically, an indication of suppressed growth.

When he and Peterson charted the fluctuations in tree-ring width along with the populations of both wolves and moose over time, they discovered that rings narrow only after wolf populations decline and moose numbers increase. The researchers found a lag of a year or two between each link in the chain.

In the early 1980s, the number of wolves declined sharply, most likely because of disease. Fewer aging and newborn moose became meals for these carnivores. As a result, the tree rings indicate, these extra animals grazed very heavily on balsam firs between 1988 and 1991, the two ecologists report.

National Park Service

Sampling sites (red dots) on Isle Royale.


Richard Frear/National Park Service

Christmas trees — balsam firs — provide sustenance for local moose.

McLaren and Peterson have therefore ruled out the idea that food availability regulates the abundance of moose and have instead embraced the concept of top-down regulation of food-chain populations.

"There are people who are not going to believe [this result] and other people who will say it proves [top-down regulation]," says Dodson. "I think its significance is in between." He emphasizes that while such a conclusion requires more data, "the important thing is this is all [the data] we have."

"[The study] illustrates the manifold repercussions of a few top-level carnivores in an ecosystem," Peterson emphasizes. "The world is entirely different when you have a top carnivore." — *E. Pennisi*

Prostate cancer: Diagnosis by computer

In the battle of man versus machine, chalk one up for the machine. A new study shows that a computer, given the same medical history and screening information as a physician, can determine with greater accuracy whether or not a man has prostate cancer. What's more, it can predict in many cases whether the disease will recur.

The computer relies on a neural network to make its predictions. A form of artificial intelligence, neural networks approximate the way the brain processes information and can be taught to recognize complex patterns in data.

"These results suggest that one day we may be able to reduce the number of unnecessary biopsies of the prostate gland," says William J. Catalona, head of urologic surgery at the Washington University School of Medicine in St. Louis and a coauthor of the study. "On average, for every three patients who undergo prostate biopsy based on abnormal results from prostate screening tests, only one patient is found to have cancer," he explains. The computer did far better.

Catalona and his colleagues present their findings in the November JOURNAL OF UROLOGY.

For now, prostate screening tests remain the primary tools for detecting the cancer. These tests include a rectal exam, an ultrasound exam, and the prostate-specific antigen (PSA) blood test, which measures the concentration of PSA, a protein produced by the prostate. But PSA tests often give false positive results, indicating cancer when none exists, or false negative results, concealing the disease.

For their study, Catalona and his colleagues randomly selected 1,787 men who had participated in an earlier, 4-year study of prostate cancer screening. The men in the test group had each had at least one abnormal PSA test. About 40 percent of them had also had a rectal exam that raised suspicions of cancer and had undergone ultrasound exams and biopsies.

To train the neural network, the researchers entered data on 1,578 of the men, including age, race, and results of PSA tests, rectal and ultrasound exams, and biopsies. They then tested the neural network by giving it the same kinds of data from the remaining 209 men — except for the biopsy findings. Overall, 87 percent of the network's findings matched the biopsy results.

The researchers used a similar method to predict recurrence of cancer. They selected at random four groups of 240 patients, all of whom had undergone surgery to remove a cancerous prostate. Catalona and his colleagues then trained the neural network by entering data for 95 percent of these men into the computer. Using the remaining 5 percent to test the network, the researchers found the computer's predictions to be 90 percent accurate overall. — *A.C. Brooks*