Time for Nature

The wolf has a story to tell

A trophic cascade in Banff National Park of Canada

Keeping national park ecosystems healthy is a priority for Parks Canada. But this is not easy. An ecosystem is complex, and scientists need concrete data to understand how all of its parts are faring.

Sometimes, that information comes from an unusual source. In Banff National Park of Canada, wolves are providing park managers with important ecological insights to guide their decisions.

In Banff National Park, the wolf is an important factor in controlling herbivore numbers. © Parks Canada, Guindon, A., 1998.

How wolves affect the food chain

Most people know that predators such as wolves affect ecosystems by preying on elk and other herbivores. The wolves control these species' populations.

However, the wolves' impact on an ecosystem does not end there. Changes in herbivore numbers can in turn affect plant communities and other animals that depend on these plants for food or shelter.

Therefore, whatever affects the wolf should have a cascading effect all the way down the food chain. This is known as a "trophic cascade".

Testing a theory

Trophic cascades had been witnessed in other areas, but did they occur in national parks?

Large numbers of elk can reduce the growth of the aspen and willow vegetation that other species depend upon. © Parks Canada, Cliff White.

It seemed likely, but scientists had little real-world evidence from Canadian parks. Then, quite by chance, the wolves of Banff National Park provided a perfect research opportunity.

In the past, hunting, trapping and other human activities had driven wolves from much of southern Alberta, including the Bow Valley in Banff National Park. However, Parks Canada had worked hard to encourage the wolves to return. By the mid-1980s, the first wolf pack re-colonized the Bow Valley.

In short order, some parts of the valley became high-wolf areas. However, some adjacent areas remained low-wolf areas, primarily due to high levels of human activity.

How wolves affect willows

Wolf and elk numbers also have implications for beavers as part of the trophic cascade documented in Banff National Park. © Parks Canada, Cliff White.

Researchers investigated the effects of different levels of wolf activity between the two areas. They looked at wolf predation on adult female elk and their calves. They also considered effects on the vegetation that elk eat.

More elk would likely mean reduced growth of aspen and willow. Finally, the researchers considered how these vegetation changes might affect other species such as beavers (which eat willow) and riparian songbirds, whose habitat includes willow vegetation.

As the researchers had expected, elk were much more numerous in the low-wolf area than the high-wolf area. Because elk were plentiful in these areas, both willow and aspen showed decreased growth: more elk were feeding on the vegetation.

Additionally, because the growth of willow and aspen was reduced, the area had fewer beaver lodges. There were also reduced numbers and fewer species of riparian songbirds.

It was a text-book case of the trophic cascade concept at work. In fact, researchers had not expected that ecosystems in the low-wolf and high-wolf areas would be so different. “We were quite surprised it was such a dramatic effect,” said researcher Mark Hebblewhite. Human activity, which kept wolf numbers low in some areas, had clearly made a big difference.

The research has provided valuable data for park managers who need to balance populations of wolves and elk as part of a healthy park environment.

For more information visit www.pc.gc.ca/banff