

## The Wolf in its Environment



The wolf greatly affects the ecosystem within which it lives. Many of these effects are obvious, however some are subtle and one would not immediately think wolves would have such influence. Those impacts deemed to have a positive effect for people are known as ecosystem services. It is hard to put a monetary value on these services but many provide benefits that would cost a great deal of money for humans to operate themselves.

Wolves have been found to provide top down control (acting from the top of the food chain impacting processes lower in the food chain) in forested ecosystems and impact upon plants and herbivores in an intimately linked food chain. The recent reintroduction of wolves to the Greater Yellowstone ecosystem is a great example of the ecological benefits and important role wolves play within their ecosystems. Wolves were found to provide valuable ecosystem services.

It is well known that large carnivores such as wolves help promote healthy herds of prey species, targeting elderly, young or sick animals as the easiest prey targets, inadvertently maintaining a strong and healthy herd. During the reintroduction of wolves to Yellowstone National park some interesting impacts of wolf presence were revealed. Through control of ungulate populations, wolves inadvertently promoted vegetation growth on the side of the river bank aiding nutrient cycling (the movement of nutrition between organisms) in the river system. By predated upon ungulates such as deer and moose, wolves limit the population numbers of ungulates. This in turn prevents overgrazing of vegetation at the riverside and allows vegetation to establish on the river banks. Vegetation on the riverside is utilised by birds and pollinator species such as bees. This is good for the spread of further vegetation but is also good for humans. Pollinators are pivotal in pollinating food crops and are highly important to agricultural production of food. So habitat for pollinators provided by wolf control of ungulates, promotes pollinator populations which beneficially help us grow our food.

Establishment of vegetation at the bank side also helps to stabilise soils and prevents erosion of river banks, this helps stabilise the river course and helps protect local towns from flooding. River stabilisation is also beneficial for other organisms utilising the river course such as invertebrates and fish, this is of course good for fishermen and other predators that prey upon fish. Knock-on effects such as those described that are put in motion by wolves' initial actions upon ungulate populations are known as trophic cascades, with effects being passed on down different trophic levels of a food chain.

Prey carcasses, whether or not they were well utilized by predators and scavengers, create significant input of nutrients to soils at kill sites that have been found to last 2-4 growing seasons. These changes are found to alter organism communities and increase plant tissue quality and growth at carcass sites relative to control sites without carcasses present. Processes such as the re-input of nutrients from those plants that initially grew due to the carcass nutrients, droppings from animals visiting the sites etc ... likely enhance the effects because kill sites become focal points for other species. The spatial distribution of carcasses was found to have been influenced by the predatory behaviour of large carnivores. The chemical and physical changes at carcass sites create resource pulses and disturbances that contribute to variances/ differences in habitat features such as vegetation cover and type across the ecosystem. Large predators influence habitat diversity through carcass distribution and are thereby linked to the maintenance of biodiversity.

In many areas, and to many interest groups large carnivores are suspected to impact upon the availability of wild game and livestock for human subsistence. In many instances this can be true and conflicts between large carnivores and humans may occur. It must not be assumed that wolves will always have a wholly positive impact upon their ecosystem. However, in systems where carnivores are absent such as Scotland, it would be economically beneficial for deer estates to have wolves present through the removal of need for culling deer populations. So it can be seen that although humans and large carnivores compete for the same resource of game animals, in many cases where human hunting alone cannot keep ungulate populations stable, the wolf is pivotal in this role to keep a balanced ecosystem. It is often a misconception that wolves will reduce game population size; they will indeed reduce the number of game animals available for humans but will in general stabilise ungulate populations, the overall benefits of their presence outweigh this so human game hunting quotas should be adjusted accordingly.

Wolves also help provide scavengeable food sources for species such as Ravens, Red foxes and Coyotes but also help regulate Red fox and coyote populations directly by killing these competitors. Regulation of species deemed vermin/pests by some are viewed as another positive of wolf presence for humans. Interestingly wolves also have somewhat of a mutualistic relationship with Ravens Whereby Ravens scavenge from wolf kills and use wolf movements as an indicator to potential food sources, and wolves have been known to use Ravens to guide them to carcasses from which they can scavenge.

Conflicts increase greatly as agricultural activities increasingly encroach and overlap with wolf territories. Livestock predation by wolves is recorded but they appear to prefer wild prey if available. No reported livestock was killed by wolves after the reintroductions to Yellowstone. Given the right livestock husbandry methods wolf predation on livestock can be minimised. Some areas suffer more from livestock predation than others, for example in areas of Spain, wolves have been known to live amicably in close quarters with man, even sourcing 70% of their diet from discarded livestock meat. Many factors of the surrounding environment such as the landscape itself, available wild prey, wolf prey preference behaviours and human factors all play key roles in determining the level of livestock predation for any given situation.

Conservation actions for large carnivores such as wolves can also impact upon the ecosystem and the habitats and organisms within it. Large mammals such as Brown Bears (*Ursos arctos*) and Grey Wolves (*Canis lupus*) have territories spanning vast areas which incorporate habitat used by many other species. By protecting habitat areas for large carnivores, conservation actions can also benefit many other organisms utilising that area. For example work by the Valhalla wilderness society in the USA protecting Bears and other large carnivores has had knock-on effects, preventing habitat areas being broken up and improving accessibility of Salmon habitat.

As has been mentioned, keystone species such as the Wolf play a vital role in ecosystems regulating and promoting healthy populations of many species, maintaining ecosystem functions which would otherwise cease or become unbalanced. No doubt wolves have many more effects upon their ecosystem than have been mentioned in this overview and they certainly have wider impacts outside of the ecosystem, such as cultural influences. The importance of these interactions can be huge in maintaining a healthy balanced ecosystem which is beneficial for all organisms involved, including humans. Nature has evolved to be balanced and the role that organisms such as wolves play needs to be preserved and if lost can have devastating consequences.

