Life and behaviour of Wolves: Wolves and climate change

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Wolf Print

Published: 01/06/2011

Other version

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It is well known that the earth is currently warming. Whether this is natural or accelerated by our actions is debatable. Regardless of the cause, global warming results in climatic change which in turn requires species to adapt to these new conditions.

Changes in precipitation, temperature and other weather patterns will change the conditions of specialised ecosystems altering features such as soil moisture levels, humidity, river flow and drainage, rising sea levels, etc. Species that cannot adapt may have to migrate to find more suitable conditions or may even become extinct. Particular stress will be placed upon those organisms that have become so specialised that they are incapable of adapting to change. Seasonal patterns of animal and insect activity will also need to adapt to those new patterns found in vegetation. Change in vegetation composition will determine the species that will remain or move from a particular habitat. Community structure is likely to shift and be upset, potentially becoming unstable. Change in climate may bring new diseases or invasive species to areas which have not experienced them before; this may be highly detrimental for an ecosystem unprepared for such threats.

Wolves are highly adaptable. This is evident from their vast distribution across a range of habitats and climatic conditions throughout the northern hemisphere. Even so, they are likely to face many problems and adapt in different ways to climate change depending on the scenario. They are likely to shift their ranges and migrate with prey populations. Prey populations will migrate to areas containing suitable vegetation, habitat and climate conditions. Suitable habitat is in short supply for wild ungulates as it is, migrating to available habitat may be problematic with corridors between them blocked or containing risks such as busy roads. Movement into populated areas may cause conflicts with people. Prey populations may move into agricultural areas and be culled leaving little prey for wolves, which may also be culled if present near populated areas.

The decline in prey numbers or movement of prey out of an area may cause wolves to switch prey and target other abundant prey sources that move into the area. They may also prey on species previously less profitable than their preferred prey. An obvious worry is that these wolves switch to domestic livestock and the management issues this would bring. This problem recently occurred in Siberia due to a low abundance of wild prey; a combination of conditions, mainly anthropogenic, caused the decline in wild prey. Factors that caused this switch include habitat destruction and fragmentation as well as illegal game poaching of wild ungulates. The consequential management decisions were unfortunately not in favour of wolves. Scenarios such as this could see temporary extinction of wolves from a region until conditions improve and the species can repopulate the area. Of course issues with genetic diversity, population connectivity and the availability of founder populations to repopulate an area where wolves have been lost all become crucial for wolf survival in the face of climate change.

Wolves of different regions are likely to experience many subtle and some more obvious changes due to climate change. Adaptions in behavioural patterns, dietary habits, physiological or phenotypic characteristics, social structure and behaviour amongst other factors are all possible. Differences between Grey Wolf (Canis lupus) subspecies give a good indication to the adaptability and range of conditions they can survive in. As a whole the grey wolf population and range distribution should remain relatively stable although wolf survival is of course greatly dependent upon the role played by man. The management of wolves in different regions will have to become flexible and adapt to situations as they evolve.

Apex predators like wolves exert considerable influence on the structure and function of the ecosystems they inhabit. Climate based alterations in wolf activity; range shifts and behaviour are likely to impact upon other species and the ecosystems they inhabit. Prey switching is likely to alter population dynamics within the food chain, taking pressure off one area and placing it upon

another, this could lead to changes in vegetation or prey species composition and abundance. Changes in wolf territory size and prey utilisation could have impacts for other predators as well as scavengers. It is well published that through predation wolves elicit many trophic cascades which are beneficial to a range of species including us; they also help to regulate many ecosystem processes, a function which may be lost or altered due to climate change.

Recent investigation has shown that wolves act as buffers to the impact of climate change, particularly in ecosystems with winter snow cover. Wolves help provide stability giving ecosystems more time to adapt to changes in climate. Studies have shown that the presence of wolves can help mitigate changes in winter snow cover that may otherwise result in detrimental changes for vegetation and scavenger species in their absence.

Fluctuations in the North Atlantic Oscillation (NAO) lead to fluctuations in winter snowfall in Isle Royale. The NAO is influenced by climatic factors and is likely to be altered with climate change. In over forty years of study it was found that during periods of increased winter snow, wolves hunted in larger packs and consequently the number of moose killed per day tripled in comparison to less snowy years when they hunted in smaller packs. Following increased predation by wolves, moose abundance declined allowing a release from heavy browsing consequently increasing growth of fir and other vegetation. Wolf control of grazers may be pivotal for the prevention of overbrowsing of vegetation especially where climate change impacts winter snowfall. If vegetation is more accessible and ungulate mortality is decreased with a lack of snowy winters, consequences could be disastrous and ecosystem stability compromised without the presence of wolves. They may also help to mitigate overgrazing by invasive species likely to be a problem with new climatic conditions.

Russian wolf by Vladimir Bologov

In Yellowstone National Park winter conditions and reintroduced grey wolves together determine the availability of winter carrion on which numerous scavenger species depend for survival and reproductive success. During fifty five years of weather analysis winters have been found to be getting shorter due to decreased snowfall and an increased number of days with the temperature above freezing. Deep snow leads to an increase in metabolic activity and reduced access to forage causing ungulates to weaken and die. In the absence of wolves, early snow thaw and shorter winters lead to a substantial decrease in late winter ungulate mortality and thus carrion availability causing food bottlenecks for scavengers. By narrowing the window of time over which carrion is available, thereby creating a temporary resource pulse, climate change is likely to favour scavengers that can quickly track food sources over great distances such as ravens and birds of prey rather than species such as foxes, coyotes and bears. Wolves mitigate the effects of shorter and milder winters by providing carrion throughout the winter period through predation; this allows scavengers more time to adapt to climatic and environmental change providing an easier transition that is more likely to be successful.

It becomes clear that climate change is to have many implications to wolf activity and behaviour, the ecosystems they inhabit and species they interact with. Wolves can help provide stability to their ecosystems and give species a chance to adapt to the new situations climate change will bring. They will face numerous challenges because of climate change; many of these will be especially exacerbated by increased conflicts and the impacts of man upon the species. Wolves are highly adaptable and capable of surviving in a range of environmental conditions; however, human factors are likely to play a key role in wolf survival and adaptation to climate change, greatly impacting ecosystems which rely on top carnivores to maintain balance.

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Pete is currently assisting with educational work at the Trust, is collaborating with Josip Kusak on a project the UKWCT supports and hopes to soon begin a doctorate of biology.

Left: Mexican wolves by Tony Norton