Investigating the reintroduction of wolves in Yellowstone National Park

1.0 Introduction.

After an absence of nearly 70 years, wolves inhabit the greater Yellowstone area. In 1995, the United States Fish and Wildlife Service reintroduced the grey wolf to Yellowstone Park where the last resident wolf had been killed in 1927. Not only wolves, other predators such as bears, cougars and coyotes were also killed to protect livestock and 'more desirable' wildlife species, such as deer and elk. Between 1914 and 1926, at least 136 wolves were killed in the park; by the 1940s, wolf packs were rarely reported. By mid-1900s, wolves had been almost entirely eliminated from the 48 states. The reintroduced wolves, *Canis lupus* are the same species of grey wolf that used to inhabit Yellowstone, however this can be further split into five separate geographical subspecies. The 31 wolves released into the park in 1995 came from wild packs in Canada.

2.0 Elimination of the grey wolf - 1920s

In 1872 when Yellowstone National Park was established there was yet no legal protection for wildlife in the park. In the early years of the park, administrators, hunters and tourists were free to kill any game or predator they came across. In 1883 there were regulations to prohibit hunting of most park animals, except wolves, coyote, mountain lions and bears. Federal agencies banded together in 1922 to eliminate the wolves, which were shot, trapped, poisoned and bludgeoned. Citizens supported the governmental actions, believing all predators should be destroyed in order to protect game species, like bighorn sheep. The government declared war on the wolf and had won. There were once over 2 million wolves had roamed, only a few hundred remained in Minnesota by 1930.

3.0 Trophic cascade effect of top predator being removed from ecosystem

Trophic cascade is an ecological phenomenon triggered by the addition or removal of top predators which result in cascading effects throughout the ecosystem, affecting ecosystem structure and even nutrient cycling. It can result in the stabilisation of an ecosystem in an 'alternate state'. Ripple et al. (2016) propose that trophic cascades specify the effects of predators that propagate downward through food webs across multiple trophic levels.

In Yellowstone National Park, wolves help to maintain and even improve the health of elk herds by preying on the young, old and weak members. So, when the grey wolf was killed off in the 1920s, the population of elk boomed.

Yellowstone was without wolves for almost 70 years, during which time, elk over browsed the streamside willows, and shrubs that prevent erosion of the river banks. Birds lost nesting space due to the reduction in trees and tree height, as elk ate nearly all the new sprouts. Habitat for

fish and other aquatic species declined as waters became broader and shallower and, without shade from streamside vegetation, waters became warmer. Coyote numbers climbed, though they often kill elk calves, they prey mainly on small mammals, reducing the food availability for red foxes, badgers and raptors.

Studies undertaken before and just after the wolves were introduced predicted that the form and function of the Yellowstone ecosystem would change because of wolf recovery (Smith et al. 2003).

4.0 Reintroduction

Due to the misconception surrounding wolves, it became government policy not only in Yellowstone, but in Montana, Wyoming and Idaho to eradicate the wolves from the ecosystem (Keiter 1994).

However, the U.S. National Park Service persisted with the understanding that their role was to preserve the National Environment and resolve any missing component (Keiter 1994). As such, in 1973 the passage of endangered species act was declared and the grey wolf was listed, and thus were a key component in preserving Yellowstone National Park (Beicher 1994: Lowry 2009).

Many groups disagreed with this understanding in favor of the reintroduction of wolves to Yellowstone and saw the proposed reintroduction as a means to an end. One of which was to control rising elk populations which had been highlighted as an issue by biologists in 1966 (Beicher 1994). Thus through reintroducing wolves, not only would elk populations stabilise but other species would be able to recover.

Despite this, there was still much opposition and a bill to reintroduce the wolves to Yellowstone in 1987 was passed to congress but was unsuccessful (Fritts et al. 1997). One reason included the notion that wolf packs were already present in the park and that the public were weary for their livestock (Fritts et al. 1997). A survey in 1991 challenged this and showed visitors of Yellowstone National Park whom came from the Rocky Mountains did not oppose the reintroduction, whilst concerns predominantly arose from rural areas (Fritts et al. 1997). Furthermore, it was foreseen that the reintroduction of wolves would not only help recover grey wolf populations, and help establish a more stable ecosystem but would generate around US$ 23 million in economic benefits annually (Fritts et al. 1997). An extensive search for wolves in the Yellowstone area, showed that no packs were established and that a reintroduction, which has now resulted in greater genetic variability, method was favored over re-colonization, which was unsuitable because although some packs had reached Yellowstone they did not breed (Fritts et al. 1997). Thus, Yellowstone was a suitable location to re-establish wolves because not only does Yellowstone cover a large enough area (8,991 km²) but there was a greater chance of success because of a small chance of human conflicts (Fritts et al. 1997: Beicher 1994).

5.0 Wolf recovery – trophic cascade effects of predator being reintroduced

Twenty years on, there are clear changes in the vegetation, which is likely a result of wolves re-establishing a trophic cascade. This has decreased ungulate herbivory on woody plants, allowing height increases to go beyond upper browse level, meaning elk can no longer graze on the new sprouts. This type of top-down trophic cascade means that reintroduced wolves, in conjunction with other large predators, mediate the behavior and density of elk, as well as other species. An inverse relationship between browsing intensity and the growth of young woody plants is central to a wolves-elk-vegetation trophic cascade as it clearly defines the mechanism connecting the two lower trophic levels (Beschta and Ripple 2016).

A healthy fear of wolves also helps keep elk from lingering at stream sides, where it can be harder to escape attack. The number of coyotes have reduced, due to wolf predation. Fewer coyote attacks may be a factor in the resurgence of the park's pronghorn. Willows, cottonwoods, and other riparian vegetation have begun to stabilise stream banks, helping restore natural water flow. Overhanging branches again shade the water and welcome birds.

The number of beaver colonies in north Yellowstone have risen, now that some stream banks are lush with vegetation, especially willows, which are a key beaver food. Beaver dams create ponds and marshes, supporting fish, amphibians, birds, small mammals, and a rich insect population to feed them. Wolves also do not cover their kill, so the carrion has boosted the food supply for scavengers, such as bald eagles, golden eagles, coyotes, ravens, magpies and bears.

6.0 Current situation

As of 2015 an estimated 528 wolves resided in the Greater Yellowstone Ecosystem, in December 2016 there were at least 108 wolves within the park boundary, numbers fluctuating from 83 to to 108 from 2009 to 2016, with 11 packs in total.

Wolves are now delisted in Montana and Idaho, but not Wyoming. The US Fish and Wildlife Service will monitor the delisted wolf populations of 5 years to ensure they continue to sustain their recovery.

Wolves are now managed by the appropriate state, tribal, or federal agencies; management in national parks and national wildlife refuges continue to be guided by existing authorising and management legislation and regulations.

7.0 Future hopes and prospects

The future of wolves in Greater Yellowstone will depend on how livestock depredation and hunting of wolves outside the park are handled. Wolf populations will also continue to be affected by the availability of elk, deer and bison, which fluctuates in response to hunting, winter severity and disease. An ongoing topic of debate is the extent that wolves contributed to the decline in northern Yellowstone elk population since in mid 1990s.

Each year the Yellowstone Wolf Project publishes a report on the Currently US$250,000 is needed annually for the Yellowstone Wolf project which manages the essential research to maintain healthy populations of the wolves. In 2016, a total 13,088 volunteer hours were provided to the Yellowstone Wolf Project (NPS 2017). This is critical if efforts to maintain healthy wolf populations, research, and educate the public are to continue.

8.0 Conclusion

Today the wolves are a key attraction for wildlife enthusiasts, with many visiting the Lamar Valley, Hayden Valley, Canyon area and the Blacktail Deer Plateau at dusk and dawn in the hope of sighting one of the packs. However, this would not have been possible without the presence of a well-balanced ecosystem.

A balance maintains an orderly working trophic cascades system, and by reintroducing the grey wolf to Yellowstone, this has been able to recover elk populations alongside other species down the trophic cascades which had suffered as a result of their elimination.

There is a clear impact that wolves, or more importantly, the top predator, has on the entire ecosystem cascading down right to the very bottom. These results, however, may not have been known had the wolves not been removed from the ecosystem in the first place.

Although times have changed since the 1920's and most people appreciate wolves as an essential part of the ecosystem despite their predatory character. The persistence of National Park rangers with cooperation from the public will determine their future. Therefore, sustainable efforts must continue to protect the wolves before it can be delisted from Wyoming without jeopardizing other species along the way.

References

Beisher, B. N., 1994. Are rancers legitimately trying to save their hides or are they just crying wolf - What issues must be resolved Wolf reintroduction to Yellowstone National Park proceeds?. *Land & Water Law Review,* 29 (2), 417-465.

Beschta, R. and Ripple, W., 2016., Riparian vegetation recovery in Yellowstone: The first two decades after wolf reintroduction. *Biological Conservation*, 198, 93-103.

Fritts, S. H., Bangs, E. E., Fontaine, J. A., Johnson, M. R., Koch, E. D. and Gunson, J. R., 1997. Planning and Implementing a Reintroduction of Wolves to Yellowstone National Park and Central Idaho. *Restoration Ecology,* 5 (1), 7-27.

Keiter, R. B., 1994. *The Greater Yellowstone Ecosystem: Redefining America's wilderness.* Yale University Press: Yale.

Lowry, W. R. 2009., *Repairing Paradise: The Restoration of Nature in America's National Parks.* Washington D. C: Brookings Institution Press.

NPS., 2017. *National Park Service* [online]. Wyoming: National Park Service. Accessed from: https://www.nps.gov/index.htm [Accessed on 20 September 2017].

Ripple et al., 2016. What is a Trophic Cascade? Trends in Ecology & Evolution 31:841-848

Smith, D.W., Peterson, R.O. and Houston, D.B., 2003. Yellowstone after wolves. *BioScience*, 53 (4), 330-340.

Yellowstone Wolf Project. 2017. *Yellowstone Wolf Project* [online]. Yellowstone National Park: Yellowstone Forever. Accessed from: https://www.yellowstone.org/what-we-do/wolf-project/ [Accessed on 20 September 2017].