

The effects of deforestation on the sloth and methods for its conservation

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The sloth is a species of nocturnal, herbivorous tree-dwellers endemic to Central and South America (Stewart et al., 2022). They are the coldest warm-blooded organisms on the planet, with an average internal temperature of 92 degrees (Carmichael, pers. comm., 2022). As canopy dwellers, they occasionally visit the forest floor for food and resources while having an average lifespan of forty years. However, the rise in deforestation is adversely influencing their very existence both directly and indirectly. A primary push factor of extinction is habitat loss, a common consequence of deforestation as sloths lose their homes. The loss of trees means less absorption of carbon dioxide, causing global temperatures to skyrocket. As a result, the threat of natural disasters significantly increases. To analyze the consequences of these events, the extinction vortex model can be used, which is a theoretical framework in which scientists can analyze the variables that lead to the vanishing of a species (Westley, pers. comm., 2022). Without further action to conserve the sloth, they could spiral into the extinction vortex, causing irreversible damage to both the species and their respective ecosystems.

Deforestation leads to a loss of genetic diversity in the sloth species. With habitat loss materializing due to tree loss, the beginning of an extinction vortex is likely as the sloth population begins to decline. Consequently, genetic variation and fitness would decrease with the rise of inbreeding and genetic drift. While using genetic comparison in assessing the effects of habitat loss, Lara-Ruiz et al. (2008) concluded that sloth populations isolated due to habitat loss in Brazil exhibited the lowest genetic diversity amongst all recorded mammal species. Indeed, low genetic variability is correlated with smaller populations because of the allopatric fragmentation due to widespread habitat loss (Lara-Ruiz et al., 2008). The biome in which the maned sloth *Bradypus torquatus* resided has been reduced to 7% of its original size, causing significant habitat fragmentation (Lara-Ruiz et al., 2008). Furthermore, the significant rise in population is creating a larger demand in industries such as agriculture, which increases land loss and decreases biodiversity (Vaughan et al., 2007). With the significant increase in carbon emissions in the last decade, environmental catastrophes are likely to escalate and affect the sloth. Combined with a lack of deforestation regulation, sloths will have an increasingly difficult time surviving. It is plausible that the sloth could become extinct in the distant future unless measures are taken to conserve them.

Luckily, numerous researchers around the world are undertaking the initiative to protect the sloth from such outcomes. With the belief that genetic divergence is due to allopatric fragmentation – due to habitat loss and no gene flow – Lara-Ruiz et al. (2008) discovered that several sloth species have extremely genetically diverged from each other in Brazil. Preventing their mixture is key to sustaining population levels to reduce the risk of inbreeding. Simply preserving the existing sloth populations by protecting them from deforestation could ensure population growth (Lara-Ruiz et al., 2008). Additionally, conservation enthusiasts, such as Rob Carmichael, raised Hazel the Sloth and ensured her survival after her parents were victims of deforestation. She was born three months premature and had a 5% chance of survival (Carmichael, pers. comm., 2022). Had it not been for Rob and his team, sloths like Hazel would undoubtedly not be alive today. Sloths like Hazel could be implemented in breeding programs that would revitalize its population, thus ensuring their continuation.

Additionally, methods to improve the accessibility of valuable resources could increase the sloth population. According to Vaughan et al. (2007), cacao trees should be planted to combat deforestation, poverty, and the loss of genetic diversity. Because cacao trees offer a suite of products – medicine, fruits, timber, etc. – they could provide a livelihood to farmers who otherwise would have explored environmentally harmful practices, such as shifting cultivation and deforestation (Vaughan et al., 2007). Sim-

ply growing more cacao trees serves a dual purpose: it combats the root issue, poverty, which perpetuates deforestation, while providing satisfactory nourishment to the sloth population. Conversely, Stewart et al. (2022) noticed the importance of mineral licks, which provide essential nutrients to the sloth's diet. Sloths lick areas with high concentrations of minerals to procure vital nutrients, thus making such a mechanism crucial to its survival. Habitats nearest to rivers or streams often have soils with higher nutrient concentrations, making such areas attractive to the sloth. Therefore, efforts at conservation could involve relocating the populations to areas near water sources.

Furthermore, maintaining the protection of sloths through the means of fences provides a feasible method of conservation. In research conducted on sloth visitation, Vaughan et al. (2007) found that forests with higher levels of diversity were more frequented by sloths, highlighting the importance of conserving biodiverse areas. However, sloths may have been more attracted to those areas due to the abundance of living fences, which provides a barrier against the outside world (Vaughan et al., 2007). Indeed, sloths may be attracted to certain forests due to their various features, including elevation and slope, which could offer protection against predators (Stewart et al., 2022). Because of deforestation, minerals and other valuable resources are increasingly becoming scarce, adversely affecting the sloth. As a result, they are required to travel significant distances on the forest floor to find food, which creates multiple scenarios for predation. Considering the sloth is a slow-moving animal, they are particularly vulnerable to external attacks, making it of paramount importance to protect them from predators. Identifying areas that are difficult to access by predators and relocating the sloths accordingly would naturally safeguard them. Naturally, improving the number of living fences would offer greater protection to the species.

In sum, the rise in carbon emissions due to deforestation is adversely risking the existence of sloths, potentially causing them to enter the extinction vortex. Because deforestation leads to population decline, genetic diversity takes a toll, which leads to low genetic fitness and a further decrease in the population. Nonetheless, conservation methods – such as regulating deforestation, mineral licks, and replanting preferred cacao trees – are giving the species a glimmer of hope amidst a climate emergency. However, it is imperative for conservation efforts to be multifactorial – recognizing that conservation is a complex undertaking. Despite the conservation efforts being made, they do not include the issue of climate change. Instead, efforts focus on alleviating its aftermath. Quite paradoxically, Hazel the Sloth was being cared for by the very people who caused her terrible condition in the first place. Although climate change is still occurring, there have been no concrete efforts made to alleviate its devastating effects. By improving the sloth's diet, habitat, safety, and accessibility to vital resources, conservation organizations can increase the sloth's resilience against the increasingly deteriorating situation. However, that may not be enough. Issues such as poverty are widespread and perpetuate unsustainable deforestation. Unless the global organization seriously tackles climate change and its nuances, current conservation methods – despite their effectiveness – may be a lost cause.

References

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