“Biodiversity Conservation: A Set Up for Failure”

By Jessica Singh

The Undergraduate Research Writing Conference

• 2020 •

Rutgers, The State University of New Jersey

RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

Biodiversity Conservation: A Set Up For Failure

Jessica Singh

Rutgers University

Research in the Disciplines

Howard Swerdloff

14 December 2019

Abstract

The conservation of biodiversity is a key issue that needs to be addressed, especially with the increasing effects of climate change on the environment. Biodiversity is a vital component of Earth's ecosystems, and climate change is negatively impacting many species. Climate change is causing species to have to migrate and leave their homes in order to mitigate its effects. Although many conservation efforts have been implemented, they have been ineffective, largely due to anthropogenic factors. Protected areas and biodiversity offsets are generally ineffective due to the lack of strict regulation within the protected areas and the failure of offsets to comply with key policies, like no net loss. The theory of taxonomic bias also plays a role in its failures, as many people tend to exploit certain species due to size or popularity, which causes threatened species to receive less attention. If more effective solutions are not developed to conserve biodiversity, biodiversity rates in ecosystems will continue to decrease and will eventually lead to extinction.

Introduction

Biodiversity is one of the most vital components of life on Earth. It guides the functions of ecosystems and keeps them healthy. Biodiversity takes part in a plethora of functions, such as "hold soils together, maintain soil fertility, deliver clean water to streams and rivers, cycle nutrients, pollinate plants, and buffer against pests and diseases" (Australian Academy of Science, 2017, p.6). Without these functions, ecosystems would become impaired and the lives of many species would be at stake. The environment would then become weakened and many species would not get the proper nutrients that they need. Biodiversity is declining at a faster rate now than in the past due to the effects of climate change. A majority of climate change is caused by anthropogenic factors. These factors include carbon emissions, deforestation, and pollution. Climate change has a large scale effect on Earth's biodiversity. Research shows that "on the basis of mid-range climate-warming scenarios for 2050, 15-37% of species in our sample of regions and taxa will be committed to extinction" (Thomas et al, 2004, p.2). This means that a large amount of species living on earth have the potential to become extinct if climate change continues. In addition, many organisms are being forced to migrate away from their homes because their current living conditions have become inhabitable. Due to an event known as land-covering, animals are being forced to migrate and "interaction of climate change with land-cover change could increase the impact of land-cover change on birds and mammals by up to 43% and 24% respectively" (Mantyka-Pringle et al., 2015, p.1). Land covering combined with climate change causes many detrimental impacts to biodiversity. While migrating, they are then met with "unfavourable environmental parameters, geographical or human-made barriers and competition" (Australian Academy of Science, 2017, p.2). This causes the rate of many species

to go on a decline. In spite of conservation efforts, "biodiversity continues to decline, even though worldwide conservation efforts are increasing" (Rands et al., 2010, p.298). So the major question that needs to be addressed is, in spite of all the conservation efforts that exist to protect biodiversity, why are these efforts ineffective?

Although there have been many efforts to lessen the effects of climate change on biodiversity, their efforts have gone in vain. Two popular conservation practices are biodiversity offsetting and protected areas. Protected areas are certain parts of land with ecological value that are supposed to be preserved by the government to allow the biodiversity inhabiting that area to thrive. Biodiversity offsetting is basically attempting to compensate for the loss of biodiversity in an impacted area by replaced it in another area. Protected areas and biodiversity offsetting could be promising concepts on paper, however, when it comes to actually implementing them into policy they have not shown successful results. Protected areas lack the strict management needed to control the effect of anthropogenic interference, which leads to "land-use change" (Environmental Literacy Council, 2015). Biodiversity offsets lack the fulfillment of key "no-net-loss" policies that are vital for increasing the value of the offset (Leung, Spenceley, Hvennegaard, Buckley, & Groves, 2018). Many case studies provide evidence that these strategies are relatively ineffective. Aside from physical conservation practices, the rates of many species are declining simply due to the concept of taxonomic bias. Taxonomic bias is known as the idea of certain species being favored over others (Troudet, Grandcolas, Blin, Vignes-Lebbe, & Legendre, 2017). Endangered species, in theory, should receive more attention due to their conservation status. However, many cases have shown that this principle is not always followed when attempting to develop conservation plans. If better conservation plans for biodiversity are

not developed, “the threats associated with climate change will continue to increase with the failure of governments worldwide to reach a consensus around decreasing emissions of carbon dioxide and other greenhouse gases to levels that limit impacts upon biodiversity” (Australian Academy of Science, 2017, p.7). Conservation efforts in protected areas and biodiversity offsets are generally ineffective due to protected areas not being strictly regulated and biodiversity offsets not fulfilling key principles. Additionally, the theory of taxonomic bias contributes to certain species receiving more attention than others, which causes prejudice against certain species when it comes to implementing conservation efforts.

In this paper, I will analyze the effectiveness of protected areas, effectiveness of biodiversity offsets, and the concept of taxonomic bias in relation to biodiversity conservation. In the first section, “Neglected Areas”, I will introduce the framework of the lack of strict regulation in protected areas and examine them in relation to the case studies of metal mining activities in protected areas of Mexico (Armendariz-Villegas et al., 2015) , and deforestation in the Ankasa Conservation Area in Ghana (Damnyag et al., 2013). In my next section, “The Biodiversity Market”, I will lay the foundation of the framework of no-net-loss and relate it to the case studies of offsets in Perth, Western Australia (Thorn, Hobbs, & Valentine, 2018) and of fauna species in relation to biodiversity offsets (Maron, Dunn, McAlpine, & Apan, 2010). Finally, in my last section, “Species Privilege”, I will discuss the theory of taxonomic bias towards certain species (Troudet, Grandcolas, Blin, Vignes-Lebbe, & Legendre, 2017) and relate it to the research of species inequalities in scientific studies (Trimble & Van Aarde, 2009) and biases in studies of felids and canids (Tensen, 2018).

“Neglected” Areas

Protected areas are one of the most popular forms of conservation and have achieved success in many cases around the world. Protected areas are essentially setting aside land that has high biodiversity value to remain untouched, which allows the biodiversity inhabiting that area to thrive without any interferences. According to the World Wildlife Fund, "Protected areas are one of the most effective tools for conserving species and natural habitats. They also contribute to the livelihoods and well-being of local communities and society at large." (World Wildlife Fund, p.1). Protected areas are an effective way to conserve biodiversity and gives threatened species a chance to thrive. The expansion of protected areas should, in theory, increase environmental value in the area being conserved. This is an effective way of conservation, especially because they are rather uncomplicated to implement and regulate. Following an analysis of protected areas in East Africa, Riggio, Jacobson, Hijmans, and Caro argue that "the East African network of PAs is extensive in both number and area, that it protects most natural habitats effectively, and that further expansion of PAs to cover some priority biodiversity conservation areas is still possible and necessary" (2019, p.10). Since East Africa contains many threatened species, it has effectively established a number of protected areas to conserve the species. It has shown that the use of protected areas does work and definitely can be replicated. Protected areas are already effective in protecting habitats, so expanding upon the number of protected areas will be beneficial to the environment.

Although the concept of protected areas sounds promising, they are seldom effective when developed due to poor management of the area which leads to many anthropogenic threats. One of these anthropogenic threats, which is mining in or near the vicinity of the protected area, is a driving factor in the degradation of the protected area and causes land-use change. The

concept of land-use change is known as direct anthropogenic changes made to the land to alter its use (Environmental Literacy Council, 2015, para.2). Mining can be considered as land-use change because it involves directly changing the way the land is used. Metal mining continues to occur despite natural protected area boundaries being developed. According to policies, mining should be contained within specific boundaries of the park, but it was found that "in majority of the cases the concessions were within and out of these limited areas, and metal mining is definitely not a low impact activity" (Armendariz-Villegas et al., 2015, p.15). This displays a clear indication of poor management within protected areas. Allowing mining to occur within boundaries that are off limits is detrimental to the biodiversity in those areas. Despite specific policies existing for the regulation of protected areas, these policies end up not being followed at all. Developing protected areas is a promising concept, however, failing to regulate the area effectively and allowing these types of activities to occur will slowly lead to their demise. This ends up defeating the whole purpose of the practice and continues to decrease the rates of biodiversity.

Poor regulation and management of protected areas are caused by the need for others to make profit off of these negatively impacting activities, despite the area being protected. According to the IUCN, it sometimes becomes a challenge to well-regulate protected areas because "they become another 'commodity' or resource to be exploited by an industry that is more interested in profits, access, and providing new experiences than supporting conservation" (Leung et al., 2018, p.5). Protected areas becoming a "commodity" is an issue because the need for people to make profits takes over the need for conservation. The interest in profits is valued more highly than conserving the biodiversity in those areas. People often overlook the motive of

protecting the value of the area, and continue to use it for their own selfish gains. The results of a case study regarding deforestation located in the Ankasa Conservation Area in Ghana discovered that one of the main causes of deforestation was "the desire by some of the community members to get rich quickly by engaging in activities that degrade the forest" "(Damnyag et al., 2013, p.92). These community members are more interested in making profits for themselves and therefore end up not complying with the rules of the park. Even though people are making profits and are becoming rich, they are doing it at the sake of losing biodiversity. Profits can be attained in a plethora of activities not involving biodiversity and can always come and go. However, once biodiversity is lost it will not return, which is why regulating protected areas more effectively is vital to the survival of biodiversity.

The Biodiversity Market

Biodiversity offsetting is a rather new, yet controversial, approach to conservation and has shown some success. Offsetting is essentially compensating for the loss of biodiversity in a site impacted by climate change in one area by replacing it in another area. Kumaraswamy and Udayakumar claim that "the concept has dual benefits of restoration of livelihood support systems and conservation of biodiversity that provides ecological services and economic benefits to civil society" (2011, p.1155). They argue that the concept shows promise and can restore support systems. Offsetting can also provide benefits to society through an economic point of view. Studies have shown that although it has some success, it is limited. When studying offset programs in Southern New Wales, Australia, research concluded that "the operation of the scheme was consistent with a maintain-or-improve outcome for biodiversity" (Drielsma, 2016, p.67). This essentially means that the offset was at a baseline of success, the rates did not

decrease and are maintained, but the offset itself needs improving to increase the rates of species. This conclusion can be considered an acceptable start, considering that the rates did not decrease. However, the strategy still needs significant improvement.

The key component of biodiversity offsetting is the no-net-loss principle, and the fulfillment of this principle is often missing from many offset programs. Moreno-Mateos et al. argue that "no-net-loss is not a progressive step toward no-loss, as the design of offset policies may worsen the present state of biodiversity and existing policies to protect it" (2015, p.553). The no-net-loss principle seems like a good idea when developed, as the purpose of developing biodiversity offsets is to increase environmental value of the area. If the environmental value of the area is not increasing, then it shows that the offset is not effective. The failure of satisfying no-net-loss is displayed in a case study of biodiversity offsets in Perth, Western Australia. Compared to initial surveys of the black cockatoo habitats that were measured in the impacted site, "only 64% of the amount of black cockatoo habitat that was said to be at the offset sites" (Thorn et al., 2018, p.297) was found when assessing the quality of the offset site. This does not satisfy the principle of no-net-loss, in fact, it is the opposite of what should have occurred. The amount of black cockatoo habitats decreased, which defeated the entire purpose of the development of the offset. If the key principle of developing offsets is not satisfied in practice, this indicates that the practice is not effective and something needs to be changed in order to bring success. Therefore, the question that needs to be addressed is, why are offsets not fulfilling these no-net-loss principles?

These principles are not satisfied simply because people fail to understand the function of ecosystems and the concept of interchangeability within them. According to Walker, Brower,

Stephens, and Lee, "because biodiversity is complex and its elements non-interchangeable, there is no simple currency to measure fairness of exchange" (2009, p.155). The elements of biodiversity cannot be interchanged as done in biodiversity offsets. Species are being treated as items to be traded, which is not how ecosystems function. It is simply not practical to compensate for the loss of biodiversity in one area by replacing it in another. After all, the biodiversity that has been lost is not going to return and cannot be brought back just by replacing it in another area. Due to this, the development of offsets are already set up for failure. This is evident in the analysis of a case study of endangered fauna species. It often takes many years before a species is able to adjust to a new habitat, and "a reduction in habitat availability of such duration may result in extinction of endangered fauna species before the resources provided by the habitat offset are able to compensate for the lost habitat" (Maron et al., 2010, p. It becomes difficult for organisms to adapt to new habitats easily and quickly, which leads to their low survival rates. Species have been accustomed to their way of life in their previous habitats, so transplanting them to another place would cause them to have to assimilate to a new environment. Conserving biodiversity is not as simple as just transplanting species elsewhere because it alters their whole way of living and they must adapt to a new environment. Because people fail to grasp the concept of the function of ecosystems, they are putting existing biodiversity at risk as well continuing to lose more biodiversity.

Species Privilege

Aside from physical practices developed to conserve biodiversity, protecting keystone species is a key component of keeping biodiversity rates stable. The World Wildlife Fund aims conservation efforts towards keystone species, which are species that an ecosystem largely

depends on. They claim that "by focusing on keystone species, conservation actions for that species may help to preserve the structure and function of a wide range of habitats which are linked with that species during its life cycle" (World Wildlife Fund, para.3). Keystone species play a vital role in ecosystems, and focusing on conserving them will conserve many habitats that are coordinated with that species. Keystones provide the means necessary (habitats, nutrients, etc.) for neighboring species to thrive on. This is important because many habitats are able to be saved by focusing efforts towards one important species that drives the function of the ecosystem. Following a case study done on *ficus* trees as a keystone species, research suggests that conserving it "could be critical in conservation efforts aimed at halting and even reversing the decline of insectivorous bird species declining in fragmented and degraded landscapes in multiple environments and regions around the world" (Mackay, Gross, & Rosetto, 2018, p.9). Mackay et al. argue that focusing on conserving keystone species, such as *ficus* trees, can be an important component of biodiversity conservation, especially because other species are also benefited through its conservation. The conservation of keystone species is a promising concept because it helps out the entire ecosystem by directing efforts towards one species.

On many occasions, the concept of protecting keystone species is not practiced effectively due to the theory of taxonomic bias. Taxonomic bias is the concept that certain species receive more attention than others and are "more likely to raise funds or are considered more ecologically important than others" (Troudet et al., 2017, p.1). Because people are biased, they tend to favor certain animals over others, resulting in the concept of protecting keystone species to go in vain. Taxonomic bias is an issue because threatened species species are not getting the proper attention that they need, giving rise to their decline. Endangered species

should be receiving more conservation efforts due to their threat of extinction, but this is not actively being practiced in cases. Even though scientists study threatened species more than others, research on species inequality shows that "scientists seemed to focus on lower-risk small mammals and amphibians rather than threatened species" (Trimble & Van Aarde, 2010, p.889). Contrary to the amount of research conducted on threatened species, lower-risk species still received more attention than them. Species that play a larger role in the survival of ecosystems, such as keystones, are being overlooked by less critical animals. Threatened species are not receiving the correct amount of attention, and this will lead to a further decrease in their rates and eventually, extinction.

The concept of taxonomic bias can be explained by its correlation with the theory of wildlife charisma. Wildlife charisma is known as the concept that certain "species that are used to anchor a conservation campaign because it arouses public interest and sympathy" (Dunlop, Luque, & Courchamp, 2012, p.1). Certain species are being exploited by industries for their features in order to receive benefits. This should not be the case, as species should not be evaluated by their features, but instead by their conservation status. Just because a species has specific features that others do not, does not indicate that they should receive more attention. Following a study of the biases in conservation research, it was discovered that large mammals received the most attention, in spite of conservation status. A possible explanation of this "is also likely to be explained by charisma, as large animals are generally less elusive, gain more public popularity, and more frequently involve flagship species" (Tensen, 2018, p.7). It is likely that large animals receive more attention because they are more well known and popular among the public. Larger animals are easier to identify and are more well known to the public, which leads

to them receiving more attention. Charisma is something that needs to be addressed and given more attention to because an effective solution needs to be developed if threatened species are to protected efficiently. If certain species are constantly being prioritized over others, it will inevitably cause the rates of more threatened species to decrease.

Conclusion

Protecting biodiversity is vital to the survival of Earth's ecosystems. There are numerous conservation efforts currently in place, however their rates of failure are higher than their rates of success. In protected areas, the lack of strict regulations is a key component that causes land-use change. If they were regulated more effectively, these mining activities would not be occurring outside of their boundaries. The conservation effort is often overlooked because people are more concerned with gaining profits. Offsets, on the other hand, are set up for failure from the beginning because their main principle of no-net-loss cannot be satisfied. In theory, the ecological value of the offset site should be higher than the impact site, but this cannot occur if people do not understand the function of ecosystems. Beyond physical practices, the concept of taxonomic bias causes people to overlook the conservation status of species. Due to the taxonomic bias, people focus on the features or size of the species, which is known as wildlife charisma. All of these issues need to be addressed when considering further conservation efforts. The underlying problem of all these practices seems to be that people only care about themselves and do not understand the way ecosystems work. If more effective biodiversity conservation strategies are not developed to mitigate the effects of climate change, then many species will cease to exist, along with the beloved planet Earth.

References

Armendariz-Villegas, E.J., Covarrubias-Garcia, M., Troyo-Diequez, E., Lagunes, E., Arreola-Lizarraga, A., Nieto-Garibay, A., ...& Ortega-Rubio, A. (2015). Metal mining and natural protected areas in Mexico: Geographic overlaps and environmental implications, *Environmental Science and Policy,* 48, 9-19, http://dx.doi.org/10/1016/j.envsci.2014.12.016

Australian Academy of Science. (2017). Climate change and biodiversity [Website]. Retrieved from http://www.science.org.au/curious/earth-environment/climate-change-and-biodiversity

Damnyag, L., Saastamoinen, O., Blay, D., Dwomoh, F.K., Anglaaere, L.C.N., Pappinen, A. (2013). Sustaining protected areas: Identifying and controlling deforestation and forest degradation drivers in the Ankasa Conservation Area, Ghana, *Biological Conservation,* 106, 86-94, https://doi.org/10.1016/j.biocon.2013.05.024

Drielsma, M.J., Foster, E., Ellis, M., Gill, R.A., Prior, J., Kumar, L., …& Ferrier, S. (2016). Assessing collaborative, privately managed biodiversity conservation derived from an offsets program: Lessons from the Southern Mallee of New South Wales, Australia, *Land Use Policy,* 59, 59-70, http://dx.doi.org/10.1016/j/landusepol.2016.08.005

Ducarme, F., Luque, G.M., Courchamp, F. (2012). What are charismatic species for conservation biologists, *BioSciences,* 1-8

Environmental Literacy Council. (2015). Land use changes and climate [Website]. Retrieved from https://enviroliteracy.org/air-climate-weather/climate/land-use-changes-climate/

Kumaraswamy, S. & Udayakumar, M. (2011). Biodiversity banking: A strategic conservation mechanism, *Biodiversity Conservation,* 2011, 20, 1155-1165, https://doi.org/10.1007/s10531-011-0020-5

Leung, Y., Spenceley, A., Hvenegaard, G., Buckley, R., & Groves, C. (2018). Tourism and visitor management in protected areas: Guidelines for sustainability, *Best Practice Protected Area Guidelines Series,* 27, 1-136, https://doi.org/10.2305/IUCN.CH.2018.PAG.27.en

Mackay, K.D., Gross, C.L., & Rosetto, M. (2018). Small populations of fig trees offer a keystone food resource and conservation benefits for declining insectivorous birds, *Global Ecology and Conservation,* 14, 1-11, https://doi.org/10.1016/j.gecco.2018.e00403

Mantyka-Pringle, C., Visconti, P., Di Marco, M., Martin, T., Rondinini C., & Rhodes, J. (2015), Climate change modifies risk of global biodiversity loss due to land-cover change, *Biological Conservation,* 187, 103-111. http://dx.doi.org/10.1016/j.biocon.2015.04.016

Maron, M., Dunn, P.K., McAlpine, C.A., & Apan, A. (2010). Can offsets really compensate for habitat removal? The case of the endangered red-tailed black-cockatoo, *Journal of Applied Ecology,* 47, 348-355, https://doi.org/10.1111/j.1365-2664.2010.01787.x

Moreno-Mateos, D., Maris, V., Bechet, A., & Curran, M. (2015). The true loss caused by biodiversity offsets, *Biological Conservation,* 192, 552-559, http://dx.doi.org/10.1016/j.biocon.2015.08.016

Rands, M.R.W., Adams, W.M., Bennun, L., Butchart, S.H.M., Clements, A., Coomes, D., ...Vira, B. (2010). Biodiversity conservation: Challenges beyond 2010, *Science*, 329, 1298-1303, https://doi.org/10.1126/science.1189138

Riggio, J., Jacobson, A.P., Hijmans, R.J., & Caro, T. (2019). How effective are the protected areas of East Africa, *Global Ecology and Conservation,* 17, 1-12, https://doi.org/10.1016/j.gecco.2019.e00573

Tensen, L. (2018). Biases in wildlife and conservation research, using felids and canids as a case study, *Global Ecology and Conservation,* 15, 1-10, https://doi.org/10.1016/j.gecco.2018.e00423

Thomas, C.D., Cameron, A., Green, R.E., Bakkenes, M., Beaumont, L.J., Collingham, Y.C., ...Williams, S.E. (2004). Extinction risk from climate change, *Nature*, 427, 145-148, https://doi.org/10.1038/nature02121

Thorn, S., Hobbs, R.J., & Valentine, L.E. (2018), Effectiveness of biodiversity offsets: An assessment of a controversial offset in Perth, Western Australia, *Biological Conservation,* 228, 291-300, https://doi.org/10.1016/j.biocon.2018.10.021

Trimble, M.J., Van Aarde, R.J. (2010). Species inequality in scientific study, *Conservation Biology,* 24, 886-890, https://doi.org/10.1111/j.1523-1739.2010.01453.x

Troudet, J., Grandcolas, P., Blin, A., Vignes-Lebbe, R., & Legendre, F. (2017). Taxonomic bias in biodiversity data and societal preferences, *Scientific Reports,* 7, 1-14, https://doi.org/10.1038/s41598-017-09084-6

Walker, S., Brower, A.L., Stephens, R.T.T., & Lee, W.G. (2009). Why bartering biodiversity fails, *Conservation Letters,* 2, 149-157, https://doi.org/ 10.1111/j.1755-263X.2009.00061.x

World Wildlife Fund. (n.d). Know your flagship, keystone, priority, and indicator species [Website]. Retrieved from https://wwf.panda.org/our_work/wildlife/flagship_keystone_indicator_definition/

World Wildlife Fund. (n.d.). Protected areas [Website]. Retrieved from

https://wwf.panda.org/our_work/biodiversity/protected_areas