# CAUSES AND EFFECTS OF BIODIVERSITY LOSS

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## ABSTRACT

Important biological causes of the loss of biological diversity include the loss of habitats, the introduction of exotic species, over-harvesting of biodiversity resources, and homogenisation of species in agriculture. The common factor of all these elements is that they are human-driven. This paper analyzes the economic and social root causes behind biodiversity loss. The analysis is based on both theoretical considerations and case studies. It is believed that an area with higher species abundance has a more stable environment compared to an area with lower species abundance. We can further claim the necessity of biodiversity by considering our degree of dependency on the environment. We depend directly on various species of plant for our various needs. Similarly, we depend on various species of animals and microbes for different reasons.

Biodiversity is being lost due to the loss of habitat, over-exploitation of resources, climatic changes, pollution, invasive exotic species, diseases, hunting, etc. Since it provides us with several economic and ethical benefits and adds aesthetic value, it is very important to conserve biodiversity. In this article we are going to study various drivers of Biodiversity Loss and then the solution of Biodiversity Loss.

**KEYWORDS**:**Biodiversity loss, drivers,**causes,pollution, environment.

## INTRODUCTION:

**Biodiversity loss**, also called **loss of biodiversity**, a decrease in biodiversity within a species, an ecosystem, a given geographic area, or Earth as a whole. *Biodiversity*, or *biological diversity*, is a term that refers to the number of genes, species, individual organisms within a given species, and biological communities within a defined geographic area, ranging from the smallest ecosystem to the global biosphere. (A biological community is an interacting group of various species in a common location.) Likewise, *biodiversity loss* describes the decline in the number, genetic variability, and variety of species, and the biological communities in a given area. This loss in the variety of life can lead to a breakdown in the functioning of the ecosystem. The idea of biodiversity is most often associated with species richness (the count of species in an area), and thus biodiversity loss is often viewed as species loss from an ecosystem or even the entire biosphere (*see also* extinction). However, associating biodiversity loss with species loss alone overlooks other subtle phenomena that threaten long-term ecosystem health. Sudden population declines may upset social structures in some species, which may keep surviving males and females from finding mates, which may then produce further population declines. Declines in genetic diversity that accompany rapid falls in population may increase inbreeding (mating between closely related individuals), which could produce a further decline in genetic diversity. According to the Convention on Biological Diversity,

"biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" [2]. The term "biodiversity", thus, refers to the variety of all life on earth, and explicitly recognizes how the interaction of the different components of ecosystems results in the provision of essential ecosystem services on the one hand, and social and recreational opportunities on the other, including being a source of inspiration and cultural identity. A number of concepts have been developed in recent years relating to indicators and principles for biodiversity management, including "ecosystem integrity", "ecosystem health", "sustainability", and "resilience" (the ability of an ecosystem to withstand stresses and shocks). The variety of concepts and definitions that abound indicates the difficulties facing any attempts to establish a practical, working definition of biological diversity. Perhaps one of the simplest and most widely accepted definitions used is the conservation of the maximum number of species. But even then, there are difficulties, as it is not clear what actually constitutes a species. Some common concepts for differentiating species have been identified by Brookes. **Biodiversity loss refers to the decline or disappearance of biological diversity,** understood as the variety of living things that inhabit the planet, its different levels of biological organization and their respective genetic variability, as well as the natural patterns present in ecosystems. In mid-2019, the United Nations (UN), in collaboration with IPBES, presented an ambitious on biodiversity warning that out of a total of eight million, one million species are in danger of extinction.

## Cause Of Biodiversity Loss

Biodiversity has declined at an alarming rate in recent years, largely as a result of human activity. Let's take a look at some of the main causes:

Climate change impacts biodiversity at various levels: species distribution, population dynamics, community structure and the functioning of the ecosystem.

Pollution

When we talk about pollution, we may think of car exhaust fumes billowing into the atmosphere, but biodiversity is not only affected by this type, it is also affected by noise pollution and light pollution.

Destruction of habitats

Soil pollution and changes in its uses due to activities such as deforestation have a negative impact on ecosystems and the species that make them up.

## Invasive Alien Species

Invasive alien species are the second biggest cause of loss of biodiversity in the world, according to the United Nations Development Programmed (UNDP). They act as predators, compete for food, hybridize with native species, introduce parasites and diseases, etc.

## Overexploitation of the Natural Environment

The overexploitation of natural resources, that is, their consumption at a speed greater than that of their natural regeneration, has an obvious impact on the planet's flora and fauna.

**Effects of Biodiversity loss**

Biodiversity loss has many consequences, not only for the environment, but also for human beings at the economic and health level. During the presentation of the IPBES report, David Cooper, the Deputy Executive Secretary of the Convention on Biological Diversity, took the opportunity to warn about this in the midst of the

COVID-19 crisis: **"As we degrade ecosystems, the risk of future pandemics increases."** Other adverse effects are listed below:

**Extinction of species**

The alteration and destruction of habitats puts thousands of species in danger of extinction.

**Threat to human beings**

Biodiversity loss endangers human well-being by affecting soil and water, which are fundamental to food production.

**Proliferation of pests**

For example, imbalances in ecosystems can lead to the emergence of pests that damage crops.

**Increase in $CO_2$ emissions**

The capacity of forests and oceans to absorb $CO_2$ decreases if their ecosystems are adversely affected.

**REVIEW OF LITERATURE:**

Biodiversity as a multidimensional construct: Dan F. B. Flynn, Kevin Griffin, Robert Muscarella, Matthew Palmer, Stephen Wood and William Schuster

Biodiversity is inherently multidimensional, encompassing taxonomic, functional, phylogenetic, genetic, landscape and many other elements of variability of life on the Earth. However, this fundamental principle of multidimensionality is rarely applied in research aimed at understanding biodiversity's value to ecosystem functions and the services they provide. This oversight means that our current understanding of the ecological and

environmental consequences of biodiversity loss is limited primarily to what unidimensional studies have revealed. To address this issue, we review the literature, develop a conceptual framework for multidimensional biodiversity research based on this review and provide a case study to explore the framework. Our case study specifically examines how herbivory by whitetail deer (Odocoileus virginianus) alters the multidimensional influence of biodiversity on understory plant cover at Black Rock Forest, New York. Using three biodiversity dimensions (taxonomic, functional and phylogenetic diversity) to explore our framework, we found that herbivory alters biodiversity's multidimensional influence on plant cover; an effect not observable through a unidimensional approach. Although our review, framework and case study illustrate the advantages of multidimensional over unidimensional approaches, they also illustrate the statistical and empirical challenges such work entails. Meeting these challenges, however, where data and resources permit, will be important if we are to better understand and manage the consequences we face as biodiversity continues to decline in the foreseeable future.

**Biodiversity offsets from current challenges to harmonized metrics**

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Biodiversity offsets are compensatory mechanisms increasingly used to address ecological impacts resulting from human activities. We review the scientific literature on biodiversity offsets, published between 1999 and 2014. We found that biodiversity offset studies have increased through time. The majority of studies have been carried out in the USA. The development of biodiversity offsets schemes faces conceptual and practical challenges. The conceptual challenges discussed in the literature are: choice of metric, spatial delivery of offsets, equivalence, additionality, timing, longevity, ratios and reversibility. The practical challenges reported in the literature are: compliance, monitoring, transparency and timing of credits release. Amongst these, choice of metric and location are paramount and are related to the multidimensional nature of biodiversity and the values society places on biodiversity. Harmonized metrics such as the Essential Biodiversity Variables (EBVs) help to address these challenges by providing comparability of biodiversity loss and gain amongst locations.

**Biological Conservation January 2020, Brendan A.WintleDarren, Southwell, HeiniKujala**

Biodiversity offsets are increasingly employed as an approach to compensate for unavoidable development impacts. Reliance on overly simplistic metrics in assessing the impacts of development, and assigning offset requirements, generally results in offsets which fail to conserve the key ecological values they seek to protect. We conducted a cross-disciplinary quantitative review, based on 255 peer-reviewed publications from three fields of research; offsetting (n = 43), conservation planning (n = 54) and ecology (n = 158), to explore which metrics are commonly used in offsetting compared to the conservation and ecology literature. We recorded the use of biodiversity metrics from 24 categories which captured broad habitat patterns (e.g. habitat area and condition) as well as specific biological and ecological mechanisms (e.g. diversity, population density or landscape connectivity). Our review found that offset studies and programs rely heavily on habitat attributes and area-based metrics, with >70% of the offset literature having used these metrics. Habitat attributes and area-based metrics were less frequently reported in the conservation planning (56 and 59%, respectively) and ecological literature (49 and 15%). Ecological research had a higher frequency of metrics reflecting the biological and

ecological processes relevant to biodiversity, such as species' population densities and species-specific connectivity. Our results also indicate a notable disconnect in how biodiversity is measured when offsets are planned compared to when their outcomes are evaluated. This demonstrates the need to re-evaluate the way offset policies and programs value, describes and measure biodiversity, so that critical biodiversity values and important ecological processes are appropriately captured, and no net loss is achieved.

**OBJECTIVE OF PROPOSED WORK**:

1) To identify various drivers of Biodiversity Loss.
2) To estimate the solution of Biodiversity Loss

## MATERIAL AND MATHODOLOGY

Biodiversity refers to the variation across all different organisms from the smallest bacteria to the largest plants and animals. It is this variety that has allowed life to thrive in all types of different habitats for millions of years on this planet.But thanks to us, this diversity is decreasing. With latest estimates suggesting the extinction rate is 1000 times higher than it was before humans took the place as the dominant species. This is due mainly to habitat loss and fragmentation, overexploitation of resources, introduction of invasive species and of course climate change. So to halt and even reverse this worrying trend in biodiversity loss, these are the things we need to tackle. That is mainly going to come through significant change at policy and at a collective individual level. But on this blog we like to look to innovation for a helping hand too.

### Reforestation Drones

Habitat loss and fragmentation caused by deforestation is a leading cause of biodiversity loss. Often due to uncontrolled logging, urban expansion and agricultural land use change. Current estimates predict all tropical forests could be lost in under 250 years. The simplest solution is to stop cutting so many trees down in the first place. But to help regenerate areas of forest quickly and to fill in gaps that are segregating habitats, tree planting will give a helping hand with the process of natural regeneration. But tree planting by hand is slow and labor intensive. So a company from the UK called Biocarbon Engineering has come up with a potential solution. Their solution was the brain child of a NASA engineer, a drone that shoots trees into the ground! Firstly, the area of regeneration is mapped by the drone. Then the done will fly around 2 to 3 meters above the surface shooting biodegradable seed pods into the soil which contains all the nutrients the tree needs to start growing

### Vertical Ocean Farming

Biodiversity loss isn't just limited to the land, with human actions impacting the oceans too. Sea life has been impacted through pollution and climate change but the ecosystem has also been heavily impacted by overfishing. Overfishing occurs when fish are caught from the ocean at a faster rate than the populations can replenish. The change from the traditional methods of catching fish on a line to the larger and larger fishing trawlers towing industrial size nets has led to some shocking declines. Cod off the coast of Canada down 90% since 1950, global populations of Pacific bluefish tuna are at just 3.3% of its unfished level.

Many other sea creatures such as oysters have been severely overfished and the practices to catch them now involve scrapping the bottom of the ocean, catching all sorts of unintended fish and also destroying the habitat at the same time.

These shocking declines made fisherman Bren Smith realize he had to come up with a solution, in order to stop the oceans from completely being emptied of life. So he co-founded GreenWave, a charity which promotes the use of restorative vertical ocean farming. Vertical ocean farming is described by Bren as an 'underwater garden' where they grow kelp, mussels, scallops and oysters mimicking the habitats that would have previously existed.

Having these gardens removes the need to trawl the ocean floor with large nets and they can even provide food for other wildlife such as fish and seals. But perhaps the most amazing thing about the seaweeds and shellfish is that they require no fresh water, feed or fertilizer, dramatically reducing the overall environmental impact and keeping costs down.

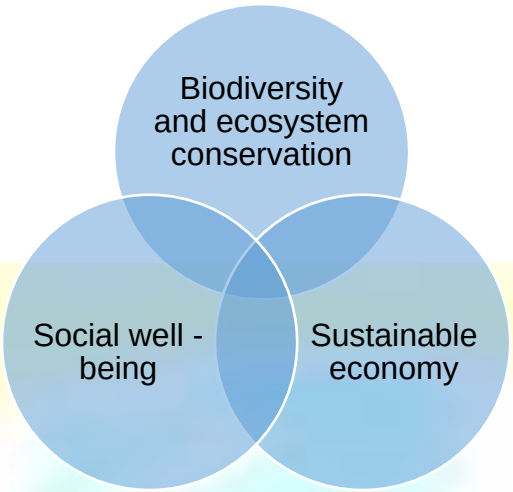
**Microalgae as a palm oil alternative**

It wasn't until the last few years that people have begun to appreciate the true impact of palm oil on biodiversity. When pictures of rainforest being felled to make room for palm oil plantations went viral, many people then realized the oil was in virtually every household product from shampoo to chocolate. Palm oil is now the biggest cause of deforestation in Indonesia; these are rainforests which are home to high levels of biodiversity. The International Union for Conservation of Nature (IUCN) predicts 54% of the worlds threatened mammals and 65% of our threatened birds are affected by the industry. But the problem is we are now so reliant on the oil and its properties for so many products we use daily. And simply switching to other oils could actually be much worse as they often require more land due to lower yields. A big part of the solution is using less of the substance and where we do use it to source it sustainably. But scientists are also trying to come up with alternatives that could have similar properties, but without the need for such large areas of land.TerraVia are a California based biotechnology company that are pioneering the use of microalgae for use in biodiesel but are beginning to expand the technology into manufacturing of soaps and cosmetics, replacing the need for palm oil.

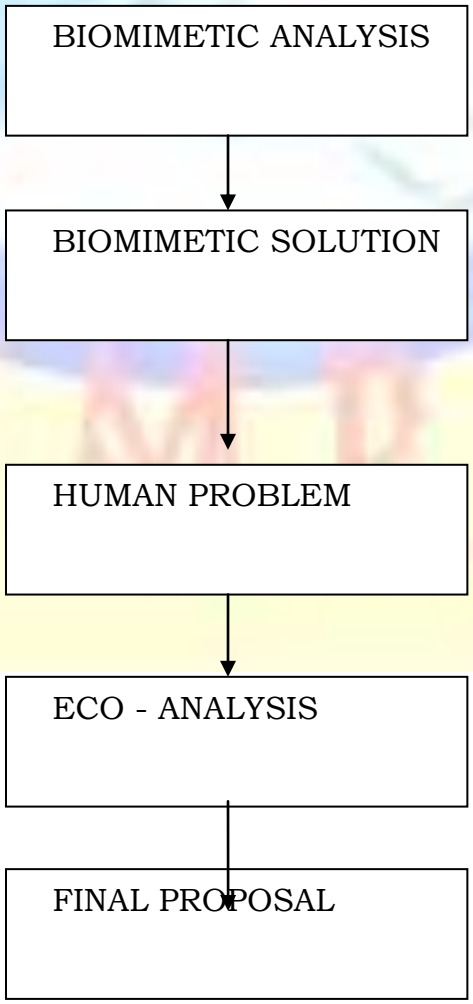
**RESULT:**

Biocarbon Engineering estimate this speeds up planting of trees 10 xs and at 15% of the cost. This has led them to predict by 2022 they will be planting 1 billion trees each year.

**BIODIVERSITY CAUSES**




**BIOMIMICRY**



## DISCUSSION

The aim is to give these drones to reforestation organizations to allow them to scale up much more quickly and kick start forest recovery. Organizations such as Save the Elephants are now putting the technology to the test by using the it from anti-poaching aircraft. The plane can fly over vast landscapes, capturing footage of the ground below. The AI can then identify specific herds and even individuals that may be very tricky to spot with the human eye and quickly distinguish from other animals such as cattle.

Many companies around the world are working on this technology and trying to get it to market, with the main barriers being cost and ensuring the taste matches the real thing. But if they succeed the outlook is promising for biodiversity as scientists predict for every hectare used to produce cultured meat, 10 to 20 hectares can be returned to its natural state and biodiversity will hopefully return to those areas.I spoke to cultured meat startup Superheat from Israel in the podcast, click below to listen and find out more:

Professor Gates and the team sought out the corals that seem to be able to survive the warmest temperatures, then selectively bred with them with one another to produce the very best. These corals were then exposed to stressful conditions in the lab which will allow them to be more prepared for the same conditions in the wild. And finally, they provided the coral with algae and bacteria which will help it deal with harsher conditions. After this they were left with a series of 'super corals' which would be much better adapted to life in warmer oceans. A team of designers have come up with a potential solution to this problem that could help prevent the spread of invasive species. For this they looked to the process of 'biomimicry'.

Biomimicry is the idea of copying processes from nature in human design. The designers looked at how fish maintain balance underwater and realized the inflatable swim bladder could be copied in ships too. The invention is a series of inflatable bladders that can be inflated with air when the ship departs and deflated when it arrives, therefore ridding the need to take in water and transport invasive species. To find out more about the process of biomimicry, listen to the below episode of the podcast where I spoke to someone from the Biomimicry Institute.

## CONLUSION:

The human ecological analysis looks for the reasons for biodiversity loss beyond the often-cited biological causes, such as habitat loss or the introduction of exotic species. By pointing out the economic and social drivers of habitat loss and related biodiversity threats, the human ecological analysis provides a most useful complement to the biological analysis of the biodiversity problem. Although there is ample evidence for the theoretical background behind the policy, economic and social drivers of biodiversity loss, experimental evidence for most of the causes of this loss is fragmented, meager or non-existent. Although many of these relationships are complex, it is imperative to enhance research on the causal links between biodiversity loss on the one hand and economic policy, production and consumption patterns, culture, internalization of environmental costs, globalization of the economy and poverty and

inequality on the other hand. Theory alone offers insufficient arguments to tackle the current root drivers of biodiversity loss. Of core importance in this discussion is the question as to whether conservation policies will be able to compensate for the current fundamental root causes of biodiversity loss. Current policies in this area include Rio's Biodiversity Convention, the CITES Convention to limit trade in endangered species and a wide array of national policies on nature conservation. Both the international and the national policies are characterised by a great deal of reactive reflex towards the drivers of biodiversity loss. Few regulations, such as the Biodiversity Convention and its royalties aspect proposal, entail proactive measures. Moreover, the Biodiversity Convention is outstanding in that it is not only targeted towards: O Futuro dos Recursos # 1, outubro de 2003 27 conservation, but takes the different dimensions of sustainable development into account. It is, therefore, important to develop more mechanisms and regimes of this kind, not only to prevent further degradation of the biodiversity resources, but also to reverse the current trend of continuous loss of biological species and cultural assets. The loss of biodiversity can be caused by natural phenomena; however, the biggest effects come from human intervention with nature. The loss of biodiversity causes severe adverse effects on our whole environmental system, including humanity.

It is therefore crucial to take the steps necessary in order to prevent a loss in biodiversity and thus to ensure a livable future for our children and also for a variety of animals and plants.

The problem of invasive alien species is global and for this reason, it requires intervention at the local, state and international level. Local authorities and states need to establish systems to manage and prevent invasive alien species through risk assessments as a strategy of predicting the possibility of species becoming invasive. The assessments should also aim at determining the potential ecological damages and put in place effective preventive measures to counter the likely environmental impacts.

Therefore, creating systems to stop the introduction of invasive alien species even before it happens, quickly eliminating newly detected invaders, and effectively monitoring new invasions are the most efficient strategies. International bodies and scientist can assists in research and information quantification by using more creative means such as Google street view and other advanced technological techniques. There are a multitude of solutions to the biodiversity loss crisis we are facing, including strategies that also tackle inequality, climate change and food insecurity, and as such, there is cause for optimism. The question remains, however, whether new targets will utilize these approaches and prevent a significant loss of species. Will governance, historically weak in protecting biodiversity, make a serious effort to achieve targets? New targets will likely be more ambitious to match the scale of the problem but since past goals have gone unmet, it is unclear how more ambitious targets will be achieved. The failure to reach past goals has been linked to poor investment and accountability, and poor translation of the goals to national levels. The new goals and solutions must address the real drivers of habitat and biodiversity loss as well as be easily scaled to country, regional and local levels to ensure progress is made. Unfortunately they likely won't have the scope to address the systemic drivers of biodiversity loss as governments will find it difficult to take bold steps to protect biodiversity without significant mobilization of the population towards this goal. If we do not step up and take action now to avoid the disastrous consequences of biodiversity loss, then environmental, economic and social disaster will force us to. The good news is that we know how to save biodiversity, and ourselves. The bigger question is whether we'll use this knowledge to make significant strides towards protecting biodiversity and, for the first time, reach global

biodiversity targets. Biodiversity is particularly necessary to conserve and protect all life forms from facing a threat of extinction. Everything in the nature has a role to play. Therefore, loss of any is a big loss and also it might create an imbalance in one or more ecosystems or rather say, to the environment as a whole. Biodiversity is facing many threats due to several factors such as loss, fragmentation and degradation of habitats, climatic factors, unsustainable practices of human beings, etc. Sadly many species are extinct due to human being's selfishness. And many are endangered. Though some species are threatened due to direct human activities such as poaching or overusing forest resources without sustainability, some are affected indirectly. Due to diclofenac injection given to cattle, many vulture species are affected. Similarly there are very less number of the actual house sparrow at present. Plantation of trees have to be taken very seriously as they are the lungs of earth. Similarly aquatic and marine ecosystem has to be also kept in mind. Everything should be aimed at carrying out sustainably. Non renewable resources are to be protected. Government should provide conservation incentives to private land holders as it encourages or motivates people to participate in conservation activities. All the flora and fauna are connected by a food chain and are dependent on each other. So disturb in any ecosystems will disturb everything else.

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