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Biodiversity Loss And Why We Should Be Concerned About It

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Biodiversity loss damages essential **services** provided by **the nature**, and results in:

- reduced variety of **foods** and **other products**;
- **poorer gene pools** for animals & plants leading to weaker crops & livestock;
- **climate change** due to rainforest destruction, and a lot more.

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This article aims to analyze major causes

and effects of global **biodiversity loss**.

Like the dinosaurs 65 million years ago, humanity now finds itself in the midst of a mass extinction: a global evolutionary convulsion with few parallels in the entire history of life. But unlike the dinosaurs, we are not simply the contemporaries of a mass extinction - we are the reason for it. John Tuxill, Chris Bright ([Ref. 1](#))

Until recently, **biodiversity** was a subject of purely academic discussions in narrow scientific circles.

But the signing of the **Convention on Biological**

Diversity

by more than 190 countries at the Earth Summit



Coral Reefs. Red Sea, Egypt
© Tatiana Morozova

in Rio de

Janeiro in 1992 put this subject at the top of international environmental agenda and brought a sense of urgency to the issue of biological conservation.

Indeed, the **value** of biodiversity must never be underestimated.

We completely agree with the following statements:

*Biodiversity ... is not only fundamental to the quality of human life. It is **essential** for human survival. (Ref. 2)*

and

*The **future** of biodiversity signifies the future of **humankind**. Its pathways to restoration or destruction are for humans to choose. By being cognisant, and by being morally alive, humanity can work to save its own body and soul. (Ref. 3)*

Before looking further into the subject of biodiversity loss, let's first try to define the term "biodiversity".

Biodiversity Loss: Biodiversity Definition

The most common definition of biodiversity agreed upon by many experts in the field is:

***Biodiversity** is the variety of all **life forms** including animals & plants that can be found either in just one location, or on the whole planet.*

It is also very common to define biodiversity in terms of a number of **species** present in a particular environment, or in total in the world.

For example:

*Biodiversity is the variety of plant and animal **species***

present in the natural environment. (Ref. 4)

and

*Biodiversity is the number of **species** in a given habitat.*
(Ref. 5)

Because of that, biodiversity is used interchangeably with the term *species diversity* as well.

Having said that, it is very important to note that the concept of biodiversity is much wider than that.

All in all, biodiversity encompasses three main factors, that is:

- **species** diversity
- **genetic** diversity
- **ecosystem** diversity

As you can see, we also have genetic & ecosystem dimensions alongside the species dimension.

From this perspective, the following formulation of the concept of biodiversity appears to be a good one:

*Biodiversity is the **variety** and **variability** of living organisms and the **ecological patterns** of which they are a part.* (Ref. 6)

We analyze the species, genetic & ecosystem types of biodiversity in more detail in the section below.

Biodiversity Loss: Biodiversity Types

Although species, genetic & ecosystem dimensions can be classified as distinct **types of biodiversity**, they are closely related and should be analyzed alongside each other.

Species Diversity

Species diversity is a measure of variety of all living species in a given habitat.

A general encyclopedic definition of this term usually includes **two** aspects (Ref. 7):

- *Species richness*: the total number of species within a biological



Scientists identified nearly
20,000 species of bees
on our planet
© Lady Dragonfly

community, and

- *Species abundance*: the number of individuals per each species within this community.

Species richness is a simple tool that helps us compare several communities in respect of their species' numbers.

While species **richness** is a straightforward count of identified living species in a certain community, species **abundance** goes further than that to determine the weighted presence of each species within this community.

Here is a good example in order to describe this idea better:

*Two communities may be
equally rich in species but
differ in relative abundance.*

*For example, each
community may contain
5 species and 300
individuals, but in one
community all species are
equally common (e.g., 60
individuals of each species),
while in the second
community
one species significantly
outnumbers the other four.*

(Ref. 8)

So which community is more species-diverse?

The answer is: The one that is **equally rich** in species and **equal** in relative **abundance**.

In other words, the community with 5 species of 60 individuals each is more species-diverse than the one that has one species significantly outnumbering the other four.

Up to now, only about **1.8 million species** have been identified throughout the world. (Ref. 9)

All these species are further

categorized into the following kingdoms of living organisms ([Ref. 10](#)):

Animalia	Bacteria	Fungi	Protozoa
Archaea	Chromista	Plantae	Viruses

Scientists estimate that the number of species yet to be described ranges from **4 million** to **40 million**. ([Ref. 11](#))

This lack of complete knowledge about the number of species on Earth makes it harder for us to understand the rates of biodiversity loss & species extinction.

Now let's take a look at another type of biodiversity - genetic diversity.

Genetic Diversity

Genetic diversity defines a number of genetic parameters which are present in a certain species and which determine all possible genetic variations within this species.

While *species diversity* looks **externally** at each species as a member of a bio-community, *genetic diversity* looks **internally** at the species' chemical composition to understand how good this species potentially is at adapting to changes in its environment.

Yes, that's correct. It is the genetic diversity that determines how well a species will do to protect itself from external dangers, such as bacterial invasions.

For example, a genetically-poor plant is much more likely to be destroyed by a certain type of bacteria than a genetically-rich one.

This is because the bacteria can adapt better to a simpler genetic makeup of the genetically-poor plant than to a more complicated genetic nature of the genetically-rich species.

Genetic and species types of diversity are closely related to each other, and the loss of one may ultimately lead to the loss of the other.

Let's also remember that living organisms don't exist in a vacuum but rather become genetically-rich by being part of their bio-diverse ecosystems.

Ecosystem Diversity

For the purposes of this article, we offer

the following definition of an ecosystem:

An ecosystem is "a **terrestrial or aquatic** environment whose ecological and biological **functions are independent** of other systems." (Ref. 12)

Ecosystem diversity usually refers to a variety of such environments found on our planet, including among others the following types (also often referred to as *biomes*):

- Coastal environments
- River & inland water environments
- Uplands & mountain environments
- Savannas
- Deserts
- Tropical forests
- Temperate forests

Each ecosystem creates a *unique* living environment for certain kinds of species which may only be found within that specific ecosystem.

In a way, such a macro-ecosystem **defines** species & genetic diversity of a certain geographical area as it effectively forms the basis of all life of that region.

If some ecosystems start disappearing for one reason or another, this process will inevitably lead to the loss of species & genetic diversity as well.

Biodiversity Loss & Species Extinction

It is impossible to put an exact number on global extinction rates. But it is possible, and very important indeed, to look at the big picture and understand the trend.

Biodiversity Loss: Background (or Natural) Extinction Rates

Species extinction is usually treated as one of the most important components of biodiversity loss.

Many experts are worried that the current species extinction rates are much higher than historically recorded (background or natural) ones.

Here is how John Tuxill and Chris

Bright describe this:

Species declines and extinctions have always been a natural part of **evolution**, but there is something disturbingly different about **current** extinction patterns.

Examinations of the fossil record of marine invertebrates suggest that the **natural or "background" rate of extinctions** - the rate that has prevailed over millions of years of evolutionary time - claims approximately **one** to **three** species per year.

In stark contrast, most estimates of the **current** situation are that at least **1,000 species** are lost a year - an extinction rate **1,000 times** the natural rate even with the most conservative assumptions. ([Ref. 13](#))

So what kinds of species are most vulnerable to this threat?

[Biodiversity Loss: Mammals, Birds, Fish & Other Species \(Ref. 14\)](#)

Some estimates suggest that **25% of all mammal species** may become extinct in the near future. As many as 50% of primates, 37% of hoofed mammals (ex., rhinos, horses, deer) and 26% of bats and carnivores (ex., bears & raccoons) are currently at high risk of total disappearance.

Although, as of 1996, only about **11%** of all identified bird species were officially classified as threatened with extinction, the trend for birds isn't encouraging - more and more of them are clearly **in decline** throughout the world.

As for the fish, they are not doing better than other species - it has been assessed that **30%** of all known fish species are now threatened with extinction as well.

We observe a similar pattern with other species such as reptiles (**20%** threatened) and amphibians (**25%** threatened).

So what causes such dramatic rates of potential extinction of different life forms?

Causes of Biodiversity Loss

Causes of biodiversity loss have become all too apparent and it is really painful to realize that we - the human race - are one major problem as far as biodiversity preservation is concerned.

We covered this topic to a certain degree in our [Animal Extinction](#) article, and we also summarize the main points below.

Biodiversity Loss: Habitat Loss

Habitat loss is not only a physical destruction of natural treasures, it is also an egregious violation of animal rights.

We cannot describe it better than the following statements:

Habitat loss is by far the leading factor [of biodiversity loss]: At least **three-quarters of all threatened bird species** are in trouble because human activities have transformed and fragmented unique habitats. **Forests, wetlands, and grasslands** have been altered by *intensive agriculture, heavy livestock grazing, commercial plantation forestry, and suburban sprawl*. ...

[As an example, migratory songbirds] winter in coffee plantations, where coffee bushes have traditionally been grown under a shady canopy of native forest trees. Unfortunately, this **habitat is disappearing** as plantations intensify and replant with higher-yielding, sun-tolerant coffee varieties that do not require shade. The result is that neotropical migrants *must search even harder* to find suitable wintering territory. ...

More than 40,000 large dams and hundreds of

thousands of smaller barriers plug up the world's rivers, altering water temperatures, sediment loads, seasonal flow patterns, and other river characteristics to which native fish are adapted. Levees disconnect rivers from their floodplains, eliminating backwaters and wetlands that are important fish spawning grounds. Engineering projects alter river inflows, and agricultural and industrial pollution of waterways further **reduces fish habitat**.

([Ref. 15](#))

Biodiversity Loss: Deforestation

Deforestation is of course a big part of the habitat loss issue since forests are homes to thousands and thousands of animal & plant species.

You can read more about recent deforestation trends in our [Rainforest Destruction](#) article here.

We single this problem out because rainforests are by far **the** biggest and most important storages of our planet's natural treasures - learn more about [rainforest biodiversity](#) here.

Rainforests are complex **ecosystems** which sustain numerous relationships of all types of life forms between each other. Losing rainforests means losing this incredible wealth that the nature has endowed us with.

It is interesting to note that while the indigenous peoples were "guardians" of tropical rain forests for many centuries - up to the end of the 19th - beginning of the 20th century, the forest cover didn't show any significant signs of degradation.

But the advent of *new technologies*, explosions in *population numbers* and a seemingly insatiable *human demand* for natural resources have accelerated the process of tropical deforestation and certainly led to high levels of **biodiversity loss** in different parts of the world.

Biodiversity Loss: Excessive

Exploitation of Wild Animals

Excessive exploitation of wildlife by humans is truly a sad reality of our times.

Wild animals, especially those inhabiting rainforests, are exploited for **pet trade**, **bushmeat trade**, for their **furs** and **body parts** and for **biomedical research**. Read some more about [international wildlife trade](#) here.

Orangutans - among the most endangered animal species on Earth - have fallen victim to such humans actions as well as. Not only is their habitat being consistently destroyed, [orangutans are also illegally traded](#) as pets to satisfy the whims of the unaware (or quite simply uncaring) public.

In another shocking example, boa constrictor snakes had been used for both drug and wildlife smuggling when they arrived from Colombia to Miami Airport in 1993 and were found to carry inside them 39 kg of cocaine. All of the snakes subsequently died.

Biodiversity Loss: Alien Species Invasion

Species which are taken from one habitat and introduced into another (i.e. alien species) often end up **exterminating** some **native species** that were present there before.

A very good example of that is an infamous extinction of the dodo - a bird native to the island of Mauritius in the Indian Ocean.

Historians claim that many alien species, ex. dogs, pigs, cats and Macaques, that were introduced to the island by humans, plundered the dodo nests thus causing dodo populations to collapse and ultimately become extinct.

The same may happen to many other native species living in different habitats.

Biodiversity Loss: Environmental Pollution

Although effects of environmental pollution on animals have not been measured in as much detail as its effects on humans, we are pretty safe

to assume that animals suffer just as much from pollution as the human populations.

For example, fish and other aquatic animals have been severely affected by acid rain during the last decades of the 20th century, although this issue is now mostly under control. (Ref. 16)

While excessive ultraviolet radiation coming through the ozone layer in the upper atmosphere can cause skin cancer in animals, ozone in the lower atmosphere may damage their lung tissues. (Ref. 17)

Extreme pollution cases, as well as slow but **steady rates of pollution**, may also unfortunately lead to biodiversity loss and animal extinction.

Biodiversity Value & Effects of Biodiversity Loss

While we attempt to assess the effects of biodiversity loss (with the emphasis on rainforest biodiversity), let's also have a look at the value and benefits that we all derive from biodiversity.

Rainforests As The Global Climate Regulators

Rainforests - the biggest *storages* of Earth's **biodiversity** - are extremely important **global climate regulators**.

Rainforests act as *pollution filters* by absorbing *carbon dioxide* from the atmosphere. Carbon dioxide (CO₂) is a powerful air pollutant which contributes to global warming and therefore to the de-stabilisation of climate patterns throughout the world.

By removing carbon dioxide from the atmosphere, rainforests help keep the global climate stable and functioning properly.

But it is exactly a full spectrum of **animal & plant diversity** within the rainforests which *sustains* these complex ecosystems and *maintains* their health.

In other words, rainforest biodiversity is the basis without which the rainforests simply cannot exist.

So what happens when this biodiversity is lost?

Effect of biodiversity loss:

Rainforests become weaker, disintegrate and lose their capacity to absorb carbon dioxide leading to more global warming and other climate change problems.

Biodiversity As An Abundant Source Of Foods

It is the rainforest biodiversity that provides us with a vast array of **foods** which have become our true favorites over the last several decades.

We cannot imagine our lives without products such as **cacao** (used to make chocolate), **coffee, tea, bananas, sugar, pineapples, avocados**, and the list goes on and on.

Nowadays, consumers in many countries are also offered even more exotic foods originating from rainforests including such popular ones as *maca*, *guarana*, *lucuma*, *acai berries* and a lot more.

So what happens if this food biodiversity is lost?

Effect of biodiversity loss:

The variety of foods that we consume will be significantly reduced which may ultimately lead to poorer health as well.

Biodiversity As An Incredible Source of Health-Supporting Natural Remedies

We completely agree with the following statement:

"Let the food be your medicine, and medicine be your food"

and the fact that the rainforest foods we mentioned above are full of super nutrients essential for human & animal health.

But we also know that rainforest biodiversity provides us with a huge variety of **medicinal / therapeutical plants & herbs** which are always there for us to use when our bodies get into a state of disease for one reason or another and require further help from the nature.

Biodiversity is almost a limitless source of such natural remedies and cures.

Until now, we have discovered and studied only a small percentage of these natural treasures, much of it is

still unknown.

So what happens if biodiversity - known and unknown - is lost?

Effect of biodiversity loss:

The variety of natural remedies we rely upon will be greatly reduced inevitably leading to poorer health and "ill-being".

Biodiversity Carries An Enormous Ethical Value

Quite simply, we don't have the right to destroy something which is beautiful and has the right for peaceful existence just because it **is**.

We, the human race, must stop thinking that we own the nature and can use it and abuse it for someone's economic or financial benefits.

We have a moral obligation to leave this world a better place than the one we inherited from our parents and grand-parents, and make it even more beautiful for our children to admire.

In other words, we have an ethical responsibility to preserve the natural beauty of our planet.

So what happens if biodiversity is lost?

Effect of biodiversity loss:

Natural beauty will vanish and future generations may never be in a position to appreciate the nature's wonders.

Other Important Issues

According to many experts, **Genetic Modification** of living organisms which has unfortunately been gaining more traction presents a real ***danger to biodiversity*** as no one can really predict how genetically-modified species will behave and what sorts of (negative) effects they will have on other, organic (i.e. non-modified) organisms.

Bioprospecting & Biopiracy are some other highly controversial issues.

Some corporations have been accused of stealing knowledge on local biology from native people living in biodiverse regions and then trying to patent such "discoveries" as their own it - all in the name of more profits. Consequent over-exploitation of such "patented" resources can also lead to biodiversity loss.

Some authors have recently coined a new term - **Geodiversity** - to draw our attention to the fact that purely geological factors, ex. soil, fossils, minerals and landforms, play a very important role in biodiversity conservation in general.

They define *geodiversity* as: (Ref. 18)

"The natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (landforms, processes) and soil features. It includes their assemblages, relationships, properties, interpretations and systems."

or

"The link between people, landscapes and culture; it is the variety of geological environments, phenomena and processes that make those landscapes, rocks, minerals, fossils and soils that provide the framework for life on Earth."

So it becomes clear that "without the variation in topography, physical processes and geological materials, there would be much less biodiversity" (ref. 19) and that geodiversity degradation can ultimately lead to biodiversity loss as well.

Biodiversity Loss - Conclusion

We would like to finish off by quoting two renowned authors - John Tuxill and Chris Bright - and their take on the importance of biodiversity to us all:

The loss of species touches everyone, for no matter where or how we live, **biodiversity is the basis for our existence.**

Earth's endowment of species provides humanity with **food, fiber**, and many **other products** and "**natural services**" for which there is simply no substitute.

Biodiversity underpins our **health-care systems**: One-fourth of drugs prescribed in

the United States include chemical compounds derived from wild organisms, and billions of people worldwide rely on plant- and animal-based **traditional medicine** for their *primary health care*.

Biodiversity also supplies a wealth of **genes** essential for maintaining the vigor of our crops and livestock.

It provides **pollination services**, mostly in the form of insects, without which we could not feed ourselves.

Frogs, fish, and birds **control pests**; mussels and other aquatic organisms **cleanse** our **water supplies**; plants and microorganisms **create our soils**.

But these essential natural goods and services constitute a minor part of the picture.

Most of what we are losing is still a **mystery** to us.

As the noted Harvard University biologist Edward O. Wilson puts it, we live on an unexplored planet. We have barely begun to decipher the intricate ecological mechanisms that keep natural communities running smoothly.

We do not know - even to a rough order of magnitude - how many species there are on earth.

([Ref. 20](#))

References for this article

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