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Global deforestation and its relation to animal extinction

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Abstract

Deforestation and animal extinction go hand in hand, also side effect of deforestation is not only limited to wildlife but to all across globe. Global Forest cover during 1900 CE was around 5500 million hectare (MN ha) and it was just 409 MN ha in 2020. From global warming to a trophic cascade and many more are caused due to deforestation. Due to rapid deforestation native animal species are unable to endure and are perishing at a rapid rate which has accelerated significantly during the last two decades. Sustainable development and situational awareness are important to reduce the damage.

Keywords: Deforestation; Animals; IUCN; Extinct; FAO; Forest

1. Introduction

Deforestation is the elimination of a forest or stand of trees from land that is then converted to non-forest use. "About 31% of Earth's land surface is covered by forests" [1], which is about 40 MN kilometer square. Between 15 million to 18 million hectares of forest, are destroyed every year [2]. World annual deforestation is estimated around 13.7 million hectares a year. Only half of this area is recouped by new forests or forest growth. "The most concentrated deforestation occurs in tropical rainforests" [3]. In addition to directly human-induced deforestation, the growing forests have also been altered by climate change, intensifying risks of storms, and diseases. According to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, the overwhelming direct cause of deforestation is agriculture. Subsistence farming is responsible for 48% of deforestation; commercial agriculture is responsible for 32%; logging is responsible for 14%, and fuel wood removals make up 5% [4]. Another cause of deforestation is climate change. 23% of tree cover losses result from wildfires and climate change increase their frequency and power. "The rising temperatures cause massive wildfires especially in the Boreal forests" (Full of deciduous trees and conifers) [5]. Global deforestation sharply accelerated around 1852 [6]. As of 1947, the planet had 15 million to 16 million km² (5.8 million to 6.2 million sq. mi) of mature tropical forests but by 2015, it was estimated that about half of these had already been destroyed [7]. Total land coverage by tropical rainforests decreased from 14% to 6%. Much of this loss happened between 1960 and 1990, when 20% of all tropical rainforests were destroyed [8]. In 2019, the world lost nearly 12 million hectares of tree cover. Nearly one third of that loss which is about 3.8 million hectares, occurred within humid tropical primary forests, areas of mature rainforest that are especially important for biodiversity and carbon storage [9]. Russia has the largest area of forests of any country on Earth, with around 12 million km² of boreal forest, larger than the Amazon rainforest. Russia's forests represent 11% of biomass on Earth. Africa had the largest annual rate of net forest loss in 2010 to 2020 which was around 9.6 million (MN) acres, followed by South America, at 6.4 million acres. Around 30 million acres of forests are lost every year to deforestation, which results in the release of more than 1.5 billion tons of Carbon dioxide. Countries with largest forested areas in 2005 are Russia-809 MN hectare; Brazil-478 MN

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hectare; Canada-310 MN hectare; US-303 MN hectare; China-197 MN hectare; Australia-164 MN hectare; Congo-134 MN hectare; Indonesia-88 MN hectare; Peru-69 MN hectare; India-68 MN hectare; Others-1333 MN hectare [8].

“A species is declared extinct after exhaustive surveys of all potential habitats eliminate all reasonable doubt that the last individual of a species, whether in the wild or in captivity, has died” [10]. Globally about 900 species of plants-122 species- and animals-778 species- are extinct due to deforestation and climate change. Extinction due to non-human activities are not taken into account. Around 294 animal species are extinct and 19 are extinct in the wild, which makes a total of 313 animal species extinct, because as natural forest shrink the native habitat of these animals are erased and due to that they become vulnerable-critically endangered-extinct in the wild and ultimately become extinct [11]. During the decade 2010-2019, the International Union for the Conservation of Nature (IUCN) declared the extinction of 160 animal species. From around 1500 CE to 2010 CE only 153 animal species were declared extinct due to habitat loss, which is less than half the number of extinct animals compared to the last decade. The rate of animal extinction is alarming. For many people, wildlife is their main source of income. According to the World Economic Forum, \$44 trillion (more than half the world’s GDP) is tied to nature. In the Global South, 1.6 billion people depend on forests. Globally, ¾ jobs depend on water. As wildlife and their habitats shrink, jobs are lost. Wildlife conservation areas and preserved natural habitats attract visitors from all over the world. Many places depend on wildlife for tourism, which makes up over 10% of the world’s GDP. Countries like Brazil, Australia, Kenya, and more are especially dependent on tourism. Without wildlife, the economy of many countries would suffer significantly. Historically, wildlife has played a huge part in the day to day life of many cultures. As a part of religious ceremonies, community events, and community bonding, wild animals still have a huge role in many third world countries. *For example, common animals such as the kangaroo still play a huge role in the tribal rituals and beliefs of many indigenous communities in Northern Australian.* Wild animal migration, distribution, and behavioral patterns can be a vital indicator into the health of an ecosystem and the deeper impacts of climate change. Animal behavior can also be an important indicator of unprecedented events, such as earthquakes, tsunamis, or large storms. Historical information shows that wildlife can behave differently when they sense an imminent threat. If this knowledge could be harnessed effectively, it could save countless lives through early warning systems, allowing people to adequately prepare [12].

2. Effects of Deforestation

2.1. Atmospheric

Deforestation is a contributor to global warming, and is often cited as one of the major causes of the enhanced greenhouse effect. Tropical deforestation is responsible for approximately 20% of world greenhouse gas emissions [13]. In deforested areas, the land heats up faster and reaches a higher temperature, leading to localized upward motions that enhance the formation of clouds [14]. Rainforests are widely believed by laymen to contribute a significant amount of the world’s oxygen, although it is now accepted by scientists that rainforests contribute little net oxygen to the atmosphere and deforestation has only a minor effect on atmospheric oxygen levels [15, 16]. The incineration and burning of forest plants to clear land releases large amounts of CO₂, which contributes to global warming [17]. Deforestation disrupts normal weather patterns creating hotter and drier weather thus increasing drought, desertification, crop failures, melting of the polar ice caps, coastal flooding and displacement of major vegetation regimes.

2.2. Hydrological

The water cycle is also affected by deforestation. Trees extract groundwater through their roots and release it into the atmosphere. When part of a forest is removed, the trees no longer transpire this water, resulting in a much drier climate. Deforestation reduces the content of water in the soil and groundwater as well as atmospheric moisture [18].

2.3. Soil

Due to surface plant litter, forests that are undisturbed have a minimal rate of erosion. The rate of erosion occurs from deforestation, because it decreases the amount of litter cover, which provides protection from surface runoff [19]. Soils are reinforced by the presence of trees, which secure the soil by binding their roots to soil bedrock. Due to deforestation, the removal of trees causes sloped lands to be more susceptible to landslides [20].

2.4. Biodiversity

Deforestation on a human scale results in decline in biodiversity, and on a natural global scale is known to cause the extinction of many species [21, 22]. Brazil, has shown that deforestation also removes the microbial community which is involved in the recycling of nutrients, the production of clean water and the removal of pollutants [23]. It has been

estimated that we are losing 137 plant, animal and insect species every single day due to rainforest deforestation, which equates to 50,000 species a year [24].

2.5. Health Effects

The degradation and loss of forests disrupts nature's balance. Deforestation eliminates a great number of species of plants and animals which also often results in an increase in disease, and exposure of people to zoonotic diseases (Transmitted from Animals to Humans) [25, 26]. Forest-associated diseases include malaria, Chagas disease (also known as American trypanosomiasis), African trypanosomiasis (sleeping sickness), and leishmaniasis, Lyme disease, HIV and Ebola. The majority of new infectious diseases affecting humans, may be linked to habitat loss due to forest area change and the expansion of human populations into forest areas, which both increase human exposure to wildlife [27].

3. Statistics of Continental Deforestation and animal extinction

3.1. Asia

Table 1 Animal extinctions 1900-2010 (Asia) [11]

Scientific name	Common name	Last occurrence
<i>Psephurus gladius</i>	Chinese Paddlefish	2007
<i>Lipotes vexillifer</i>	Yangtze River Dolphin	2006
<i>Rhachistia aldabrae</i>	Aldabra Banded Snail	1997
<i>Eurychelidon serintarea</i>	White-eyed River Martin	1978
<i>Panthera tigris sondaica</i>	Javan Tiger	1976
<i>Boliveria multocarinata.</i>	Round Island Burrowing Boa	1975
<i>Panthera tigris virgata</i>	Caspian Tiger	1970s
<i>Gazella bilkis</i>	Queen of Sheba's Gazelle	1951
<i>Zalophus japonicus</i>	Japanese Sea Lion	1951
<i>Discoglossus nigriventer</i>	Hula Painted Frog	1955
<i>Rhodonessa caryophyllacea</i>	Pink-headed Duck	1949
<i>Paracoelops megalotis</i>	Vietnam Leaf-nosed Bat	1945
<i>Vanellus macropterus</i>	Javanese Lapwing	1940s
<i>Rucervus schomburgki</i>	Schomburgk's Deer	1938
<i>Panthera tigris balica</i>	Bali Tiger	1937
<i>Columba jouyi</i>	Ryukyu Wood-pigeon	1936
<i>Psittacula wardi</i>	Seychelles Parakeet	1907
<i>Rattus macleari</i>	Maclear's Rat	1903
<i>Rattus nativitatis</i>	Bulldog Rat	1903

33.4% —or about 283,127,000 hectares of Asia is forested. Of this, none is classified as primary forest, the most biodiverse form of forest. Change in Forest Cover: Between 1990 and 2000, Total Asia lost an average of 2,577,600 hectares of forest per year. The amounts to an average annual deforestation rate of 0.80%. Between 2000 and 2005, the rate of forest change increased by 20.2% to 0.96% per annum. In total, between 1990 and 2005, Asia lost 12.4% of its forest cover, or around 40,029,000 hectares. Measuring the total rate of habitat conversion (defined as change in forest area plus change in woodland area minus net plantation expansion) for the 1990-2005 interval, Total Asia lost 12.4% of its forest and woodland habitat [28]. 5 most endangered forests are situated in Asia-Pacific region namely Indo-

Burma forest with remaining habitat of only 5%, New Caledonia forest with remaining habitat of 5% followed by Sunderland forest with remaining habitat of 7%, Philippines forest with remaining habitat of 7% and Southwest China forest with remaining habitat of 8% [68]. Southeast Asia is home to nearly 15 percent of the world's tropical forests. It is also one of the world's deforestation hotspots. As of 2019, Southeast Asia was reported to be the home to 15 percent of the world's tropical forests. But it was also ranked as one of the world's major hotspots in terms of severe biodiversity loss due mostly to the conversion of intact forests into plantations used to produce palm oil [29]. Since 1990, 38.7 million hectares of primary and other naturally regenerated forest have been lost in the Asia-Pacific region [30]. It is estimated that 20,000 km² are deforested each year in Russia [31]. The present scale of deforestation in Russia is most easily seen using Google Earth. Areas nearer to China are most affected, as it is the main for the timber [32]. Cambodia is one of the world's most forest endowed countries that has not yet been drastically deforested. However, massive deforestation for economic development threatens its forests and ecosystems. As of 2015, the country has one of the highest rates of deforestation in the world [33]. Indonesia had lost over 72% of intact forests and 40% of all forests completely in 2005 [34]. Between 1990 and 2010 Malaysia lost 8.6% of its forest cover, or around 1,920,000 hectares [35]. Over the course of the 20th century, the forest cover of the country dropped from 70 percent down to 20 percent. Philippines [36]. According to a 2005 report conducted by the Food and Agriculture Organization of the United Nations (FAO), Vietnam has the second highest rate of deforestation of primary forests in the world [37]. Sri Lanka in the 1920s, the island had a 49 percent forest cover but by 2018 this had fallen by approximately 29.46 percent [38]. Between 2001 and 2018 India lost 1,625,397 ha tree cover [39]. As of 2020 Asia lost 42 animal species, from which 9 were from East Asia, 4 from North Asia, 21 from South and Southeast Asia and 8 from West and Central Asia [11].

3.2. Africa

Table 2 Animal extinctions 1900-2010 (Africa) [11]

Scientific name	Common name	Last occurrence
<i>Diceros bicornis longipes</i>	Western Black Rhinoceros	1997
<i>Panthera pardus adersi</i>	Zanzibar Leopard	1996
<i>Tachybaptus rufolavatus</i>	Alaotra Grebe	1985
<i>Nesillas aldabrana</i>	Aldabra Warbler	1983
<i>Hippopotamus laloumena</i>	Lesser Madagascan Hippopotamus	1976
<i>Hippopotamus lemerlei</i>	Madagascan Dwarf Hippopotamus	1976
<i>Hippopotamus madagascariensis</i>	Madagascan Pygmy Hippopotamus	1976
<i>Panthera leo</i>	Barbary Lion	1942
<i>Struthio camelus syriacus</i>	Arabian Ostrich	1941
<i>Alcelaphus buselaphus</i>	Bubal Hartebeest	1924
<i>Phelsuma edwardnewtoni</i>	Rodrigues Day Gecko	1917

21.4% —or about 635,412,000 hectares—of Total Africa is forested. Of this, none is classified as primary forest, the most biodiverse form of forest. Change in Forest Cover: Between 1990 and 2000, Total Africa lost an average of 4,374,800 hectares of forest per year. The amounts to an average annual deforestation rate of 0.63%. Between 2000 and 2005, the rate of forest change decreased by 1.5% to 0.62% per annum. In total, between 1990 and 2005, Total Africa lost 9.1% of its forest cover, or around 63,949,000 hectares. Measuring the total rate of habitat conversion (defined as change in forest area plus change in woodland area minus net plantation expansion) for the 1990-2005 interval, Total Africa lost 9.1% of its forest and woodland habitat [28]. As of 2008, Africa is suffering deforestation at twice the world rate which is more than 4 MN (million) hectares per year [40, 41, 42]. Deforestation has already wiped out roughly 90% of West Africa's original forests [43, 44]. Deforestation is accelerating in Central Africa [45]. Africa lost the highest percentage of tropical forests of any continent during the 1980s, 1990s, and early 2000s [46]. According to the figures from the FAO (1997), only 22.8% of West Africa's moist forests remain, much of this degraded. One factor contributing to the continent's high rates of deforestation is the dependence of 90% of its population on wood as fuel for heating and cooking [47]. Three most endangered forest are situated in Africa, namely Coastal forest of Eastern Africa with remaining habitat of 10%, Madagascar and Indian Ocean Islands with remaining habitat of 10% followed by Eastern Afromontane forest with remaining habitat of 11% [68]. In Congo, Deforestation caused by subsistence living

is an acute threat to the park in general, and to the habitat of the critically endangered animals [48]. At the beginning of the 20th century, around 420,000 km² or 35% of Ethiopia's land was covered with forests. Recent reports indicate that forests cover less than 14.2% [49]. Between 1990 and 2005, the country lost 14% of its forests or 21,000 km² [50]. Madagascar has lost more than 90% of its original forest. Most of this loss has occurred since independence from the French, and is the result of local people using slash-and-burn agricultural practices as they try to subsist [51, 52]. Nigeria has the world's highest deforestation rate of primary forests. Almost 90% of West Africa's rainforest has been destroyed [53]. As of 2020 Africa had lost 63 animal species from which 5 were from North Africa and 58 from Sub-Saharan Africa [11].

3.3. Europe

Europe has lost more than half of its forests in the past 6,000 years. This has primarily been due to agricultural expansion and demand for wood fuel [54]. According to satellite data, the loss of biomass in EU's forests increased by 69% in the period from 2016 to 2018, compared with the period from 2011 to 2015 [55]. 44.3% —or about 1,001,394,000 hectares—of Total Europe is forested. Of this, none is classified as primary forest, the most biodiverse form of forest. Change in Forest Cover: Between 1990 and 2000, Total Europe gained an average of 877,100 hectares of forest per year. The amounts to an average annual reforestation rate of 0.09%. Between 2000 and 2005, the rate of forest change decreased by 25.4% to 0.07% per annum. In total, between 1990 and 2005, Total Europe gained 1.2% of its forest cover, or around 12,074,000 hectares. Measuring the total rate of habitat conversion (defined as change in forest area plus change in woodland area minus net plantation expansion) for the 1990-2005 interval, Total Europe gained 1.2% of its forest and woodland habitat [28]. In Finland forests are cut down for buildings, roads and new fields total 19,000 hectares annually. In Italy, Sicily is an oft-cited example of man-made deforestation, the island was made an agricultural region, this gradually aridified the climate, leading to decline of rainfall and drying of rivers. Today, the entire central and southwest provinces are practically without any forests [56]. As of 2020 Europe had lost 19 animal species [11].

Table 3 Animal extinctions 1900-2010 (Europe) [11]

Scientific name	Common name	Last occurrence
<i>Capra pyrenaica</i>	Pyrenean Ibex	2000s
<i>Partula turgida</i>	Swollen Raiatea Tree Snail	1996
<i>Pieris brassicae wollastoni</i>	Madeiran Large White	1970s
<i>Podarcis sicula sanctistephani</i>	Santo Stefano Lizard	1965
<i>Gallotia simonyi</i>	Roque Chico de Salmor Giant Lizard	1940s
<i>Coregonus oxyrinchus</i>	Houting	1940s
<i>Podarcis lilfordi rodriguezii</i>	Ratas Island Lizard	1936
<i>Equus hemionus hemippus</i>	Syrian Wild Ass	1928
<i>Bison bonasus caucasicus</i>	Caucasian Wisent	1927
<i>Haematopus meadewaldoi</i>	Canary Islands Oystercatcher	1913

3.4. North America

32.7% —or about 677,464,000 hectares—of Total North America is forested. Of this, none is classified as primary forest, the most biodiverse form of forest. Change in Forest Cover: Between 1990 and 2000, Total North America gained an average of 17,000 hectares of forest per year. The amounts to an average annual reforestation rate of 0.00%. Between 2000 and 2005, the rate of forest change decreased by 696.3% to 0.01% per annum. In total, between 1990 and 2005, Total North America lost 0.1% of its forest cover, or around 337,000 hectares. Measuring the total rate of habitat conversion (defined as change in forest area plus change in woodland area minus net plantation expansion) for the 1990-2005 interval, Total North America lost 0.1% of its forest and woodland habitat [28]. North America is also home of an endangered forest which is California Floristic Province forest with remaining habitat of 10% [68]. In Canada, prior to 2000, less than 8% of the boreal forest was protected from development and more than 50% has been allocated to logging companies for cutting [57]. Prior to the Europeans coming to the United States half the area of land was covered as forest. The land was covered with about 4,000,000 Square kilometers (990,000,000 acres) in 1600. However, today there is only 3,000,000 square kilometers (740,000,000 acres). At least 2 million square km of forests have been

cleared for grazing lands in North America. Also, roughly 5 to 9 million square km (1.9 to 3.5 million square miles) of humid tropical forests and some dried drier tropical woodlands have been cleared for grazing. By the 1870s about half of eastern North America was deforested. As of 2020 North America had lost 112 animal species, which is highest in the world. 23 species from Caribbean Islands, 23 species from Mesoamerica/Central America and 66 from other areas [11]. More than half of the documented extinct animals were in the 20th Century which is from 1900 CE to 2000 CE, and majority of the extinct species were endemic and were from either phylum Aves or Pisces. This concludes the fact that during the 20th century North America's rivers, lakes were heavily polluted due to rapid industrialization and infrastructure development. Also most of the continent's endemic birds went extinct concludes that many of the islands natural forestation were heavily mutilated and the favorable temperature of the region was affected leading to forest loss and which in turn affected the native Aves species.

Table 4 Animal extinctions 1900-2010 (North America) [11]

Scientific name	Common name	Last occurrence
<i>Melamprosops phaeosoma</i>	Po'o-uli	2004
<i>Hemignathus lucidus</i>	Nukupuu	1998
<i>Incilius periglenes</i>	Golden Toad	1989
<i>Podilymbus gigas</i>	Atitlan Grebe	1986
<i>Moho braccatus</i>	Kaua'i 'O'o	1985
<i>Gambusia amistadensis</i>	Amistad Gambusia	1984
<i>Gambusia georgei</i>	San Marcos Gambusia	1983
<i>Myadestes myadestinus</i>	Kama'o	1983
<i>Rhinichthys cataractae smithi</i>	Banff Longnose Dace	1981
<i>Coregonus alpenae</i>	Longjaw Cisco	1975
<i>Notropis orca</i>	Phantom Shiner	1975
<i>Cyprinodon arcuatus</i>	Santa Cruz Pupfish	1971
<i>Cyprinodon nevadensis calidae</i>	Tecopa Pupfish	1970s
<i>Pogonichthys ciscoides</i>	Clear Lake Splittail	1970s
<i>Sander vitreus glaucus</i>	Blue Pike	1970s
<i>Coregonus nigripinnis</i>	Blackfin Cisco	1969
<i>Notropis amecae</i>	Ameca Shiner	1969
<i>Hemignathus ellisianus</i>	Greater Akialoa	1969
<i>Epioblasma torulosa</i>	Tubercled-blossom Pearly Mussel	1969
<i>Gila bicolor isolata</i>	Independence Valley Tui Chub	1966
<i>Coregonus kiyi orientalis</i>	Lake Ontario Kiyi	1964
<i>Notropis simus</i>	Rio Grande Bluntnose Shiner	1964
<i>Paroreomyza flammea</i>	Kakawahie	1963
<i>Vermivora bachmanni</i>	Bachmann's Warbler	1962
<i>Notropis aulidion</i>	Durango Shiner	1961
<i>Empetrichthys latos concavus</i>	Raycraft Ranch Poolfish	1960s
<i>Empetrichthys latos pahrump</i>	Pahrump Ranch Poolfish	1958
<i>Gila crassicauda</i>	Thicktail Chub	1957

<i>Empetrichthys merriami</i>	Ash Meadows Poolfish	1955
<i>Cyprinella lutrensis blairi</i>	Maravillas Red Shiner	1954
<i>Coregonus johannae</i>	Deepwater Cisco	1952
<i>Monachus tropicalis</i>	Caribbean Monk Seal	1952
<i>Geocapromys thoracatus</i>	Little Swan Island Hutia	1950s
<i>Neotoma martinensis</i>	San Martin Island Woodrat	1950s
<i>Porzana palmeri</i>	Laysan Crake	1944
<i>Lithobates fisheri</i>	Vegas Valley Leopard Frog	1942
<i>Rhinichthys deaconi</i>	Las Vegas Dace	1940s
<i>Epioblasma arcaeformis</i>	Arc-form Pearly Mussel	1940s
<i>Nesoryzomys darwini</i>	Darwin's Galápagos Rice Rat	1940s
<i>Rhinichthys osculus reliquus</i>	Grass Valley Speckled Dace	1938
<i>Lepidomeda altivelis</i>	Pahrnagat Spinedace	1938
<i>Turdus ravidus</i>	Grand Cayman Thrush	1938
<i>Cerithidae fuscata</i>	Horn Snail	1935
<i>Loxops sagittirostris</i>	Greater amakihi	1901
<i>Caracara lutosa</i>	Guadeloupe Caracara	1900s

3.5. South America

Table 5 Animal extinctions 1900-2010 (South America) [11]

Scientific name	Common name	Last occurrence
<i>Azurina eupalama</i>	Galapagos Damsel fish	1982
<i>Mesocapromys minimus</i>	Little Earth Hutia	1978
<i>Podiceps andinus</i>	Colombian Grebe	1977
<i>Juscelinomys candango</i>	Brasilia Burrowing Mouse	1960s
<i>Cryptonanus ignitus</i>	Red-bellied Gracile Mouse Opossum	1962
<i>Leucopeza semperi</i>	Semper's Warbler	1961
<i>Anodorhynchus glaucus</i>	Glaucous Macaw	1951
<i>Merulaxis stresemanni</i>	Stresemann's Bristlethroat	1945
<i>Orestias cuvieri</i>	Lake Titicaca Orestias	1940s
<i>Nesoryzomys indefessus</i>	Indefatigable Galápagos Rice Rat	1934
<i>Lagostomus crassus</i>	Peruvian Plains Viscacha	1910s
<i>Heliangelus zusii</i>	Bogota Sunangel	1909

47.7% —or about 831,540,000 hectares—of Total South America is forested. Of this, none is classified as primary forest, the most biodiverse form of forest. Change in Forest Cover: Between 1990 and 2000, Total South America lost an average of 3,802,200 hectares of forest per year. The amounts to an average annual deforestation rate of 0.43%. Between 2000 and 2005, the rate of forest change increased by 16.8% to 0.50% per annum. In total, between 1990 and 2005, Total South America lost 6.7% of its forest cover, or around 59,278,000 hectares. Measuring the total rate of habitat

conversion (defined as change in forest area plus change in woodland area minus net plantation expansion) for the 1990-2005 interval, Total South America lost 6.7% of its forest and woodland habitat [28]. South America is home for an endangered forest which is Atlantic forest with a remaining habitat of about 8% [68]. Between 2010 and 2020, South America lost an average of 2.6 million hectares of forest per year [58]. In Amazon rain forest, the cattle sector of the Brazilian Amazon, incentivized by the international beef and leather trades, has been responsible for about 80% of all deforestation in the region [59, 60, 61, 62]. According to 2018 satellite data compiled by a deforestation monitoring program called Prodes.

Deforestation has hit its highest rate the decade. About 7,900 km² (3,050 sq. miles) of the rainforest was destroyed between August 2017 and July 2018 [63]. Colombia loses 2,000 km² of forest annually to deforestation, according to the United Nations in 2003. Deforestation in Colombia is mainly targeted at primary rainforest which covers more than 80% of Colombia [64]. As of 2020 South America had lost 14 species, and considering its rich biodiversity the extinction rate is least in the world [11].

3.6. Oceania

According to the U.N. FAO, 22.5% or about 191,384,000 ha of Oceania is forested, according to FAO. Change in Forest Cover: Between 1990 and 2010, Oceania lost an average of 368,000 ha or 0.19% per year. In total, between 1990 and 2010, Oceania lost 3.7% of its forest cover, or around 7,360,000 ha [28]. Due to relatively recent colonization, Australia has had high rates of deforestation, primarily due to clearing for agricultural purposes much of the clearing has occurred in Tasmania and Queensland [65]. In 1998, deforestation is been responsible for around 12% of Australia's total carbon emissions. In the 800 years of human occupation of New Zealand 75% of the forests were lost. Papua New Guinea (PNG) has one of the world's largest rainforests. Illegal logging was among highest in the world in 2007 and was estimated about 70-90% of all timber export [66]. As of 2020 Oceania had lost 62 animal species which is second in the world. Most of these extinctions were because of the extreme Weather change and loss of habitat. [11]

Table 6 Animal extinctions 1900-2010 (Oceania) [11]

Scientific name	Common name	Last occurrence
<i>Pipistrellus murrayi</i>	Christmas Island Pipistrelle	2009
<i>Partula labrusca</i>	Vine Raiatea Tree Snail	2002
<i>Rheobatrachus vitellinus</i>	Eungella Gastric-brooding Frog	1985
<i>Crocidura trichura</i>	Christmas Island Shrew	1985
<i>Pomarea mira</i>	Ua Pou Monarch	1985
<i>Rheobatrachus silus</i>	Conondale Gastric-brooding Frog	1983
<i>Myiagra freycinet</i>	Guam Flycatcher	1983
<i>Anas oustaleti</i>	Marianas Mallard	1981
<i>Taudactylus diumus</i>	Southern Day Frog	1979
<i>Pomarea fluxa</i>	Eiao Monarch	1977
<i>Pteropus tokudae</i>	Guam Flying Fox	1974
<i>Hypolimnus pedderensis</i>	Lake Pedder Earthworm	1972
<i>Xenicus longipes</i>	Bush Wren	1972
<i>Callaeas cinerea</i>	South Island Kokako	1967
<i>Mystacina robusta</i>	Greater Short-tailed Bat	1967
<i>Crocidura trichura</i>	Christmas Island Shrew	1985
<i>Pomarea mira</i>	Ua Pou Monarch	1985
<i>Rheobatrachus silus</i>	Conondale Gastric-brooding Frog	1983
<i>Myiagra freycinet</i>	Guam Flycatcher	1983

<i>Anas oustaleti</i>	Marianas Mallard	1981
<i>Taudactylus diumus</i>	Southern Day Frog	1979
<i>Pomarea fluxa</i>	Eiao Monarch	1977
<i>Pteropus tokudae</i>	Guam Flying Fox	1974
<i>Hypolimnus pedderensis</i>	Lake Pedder Earthworm	1972
<i>Xenicus longipes</i>	Bush Wren	1972
<i>Callaeas cinerea</i>	South Island Kokako	1967
<i>Mystacina robusta</i>	Greater Short-tailed Bat	1967
<i>Coenocorypha iredalei</i>	South Island Snipe	1964
<i>Lagorchestes asomatus</i>	Central Hare-wallaby	1960s
<i>Perameles eremiana</i>	Desert Bandicoot	1960s
<i>Onychogalea lunata</i>	Crescent Nailtail Wallaby	1956
<i>Pseudomys glaucus</i>	Blue-grey Mouse	1956
<i>Chaeropus ecaudatus</i>	Pig-footed Bandicoot	1950s
<i>Turnagra tanagra</i>	North Island Piopio	1902
<i>Notomys longicaudatus</i>	Long-tailed Hopping Mouse	1901

4. Animal Extinction Effect on Ecosystem

Every living thing plays a role in the food chain and Earth's ecosystems, and the extinction of certain species, whether predators or prey, can leave behind significant impacts. Even one salamander or rat species matters because all species are connected through their interactions in a web of life. A balanced and biodiverse ecosystem is one in which each species plays an important role and relies on the services provided by other species to survive. Healthy ecosystems are more productive and resistant to disruptions. The loss of a species can cause a trophic cascade. It can cause in dramatic changes in ecosystem structure and nutrient cycling. "In a three-level food chain, an increase (or decrease) in carnivore's causes a decrease (or increase) in herbivores and an increase (or decrease) in primary producers such as plants and phytoplankton. For example, in eastern North America the removal of wolves (*Canis lupus*) has been associated with an increase in white-tailed deer (*Odocoileus virginianus*) and a decline in plants eaten by the deer" [67].

5. Deforestation and Wildlife Extinction

Evidently deforestation is directly related to animal extinction as deforestation reduces the natural habitat of animals due to which there is a limited number of resources available and due to this the species which falls behind in this race become extinct. Also the loss of certain species triggers a trophic cascade which destabilize the ecosystem equilibrium leading to more loss of species [67]. Also deforestation causes massive amount of carbon dioxide release in atmosphere which is about 1.6 billion tons [69]. It amplifies the greenhouse effect which increases the earth's surface temperature about 0.125 degree Celsius every year. This increase in temperature had already increased the extinction rate of species as most of them are very sensitive to temperature variation, and it also increases deforestation rates as the climate change increases the weather pattern and also cause low pressure area in certain regions which often results into storms or hurricanes which devastate the vegetation of the region.

6. Discussion

From the above data it evident that there is a direct relation between deforestation and animal extinction. And if it is not controlled then it will finally affect us as we are also an animal on the Earth.

7. Conclusion

Deforestation is a grave threat to earth as well as to all mankind. It causes minor changes but those changes have effect beyond imagination.

It causes animal extinction both directly and indirectly. To combat global warming, emergence of zoonotic diseases, soil erosion, biodiversity loss, deforestation had to be done in a sustainable manner so that the consequences of it should be minimized. Preservation of endangered forest and animals should be done as well as education and awareness about the problem should be done in a steady and precise manner. The local forest management authorities should also intervene by passing laws, acts and policies which would decrease the chances and rate of deforestation. Also use of renewable source of energy should be initiated to reduce the rate of mining which also causes deforestation. Illegal cutting of trees should be stopped and use of organic farming should be promoted especially in the third rate countries, only then the extinction rate can be controlled. Also protection of animal species is very important because if a plant went extinct it can be regrown from its seed, which has already been preserved but “if an animal species is lost then it is lost forever”, afforestation or any of the method can never bring an original animal species back.

Compliance with ethical standards

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