# VANISHING ICONS

How population growth is driving our most-loved animals to extinction

A Population Matters report

POPULATION MATTERS™

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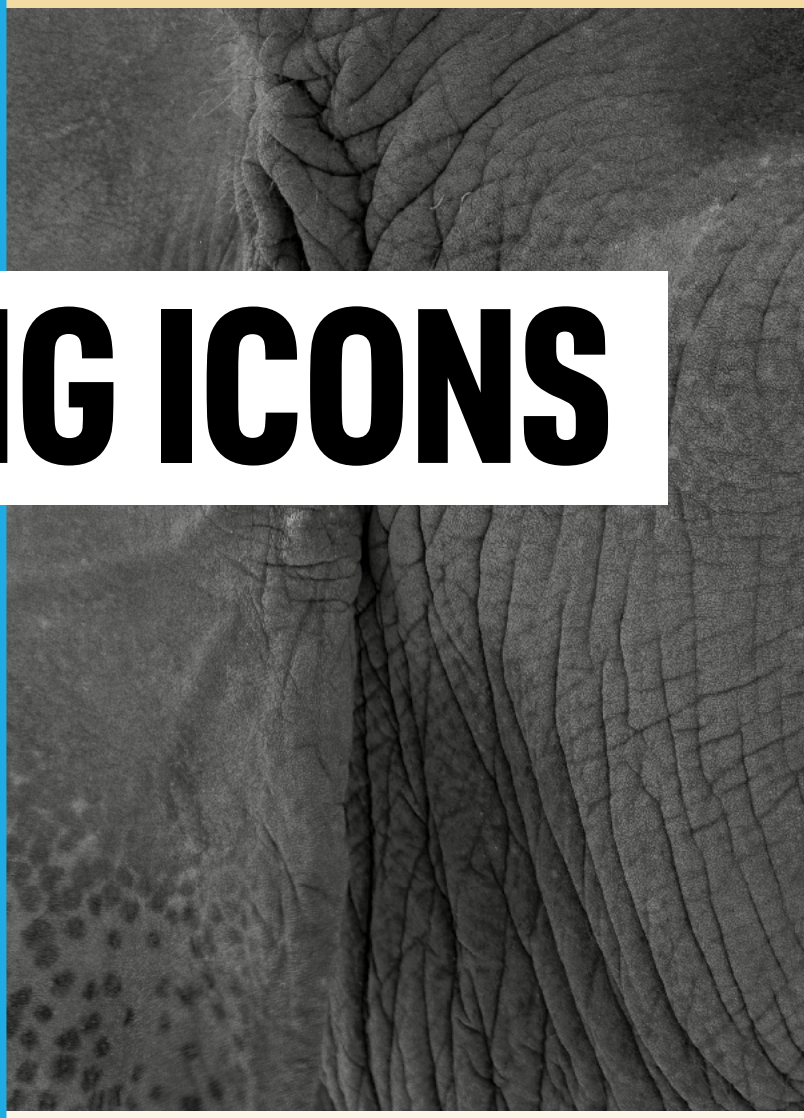

Scientists have declared the start of a new era, the Anthropocene[1]. Humans have altered our natural environment to such an extent that we have kickstarted a new geological age, and no species on Earth has been spared from our impact. Since 1970, the global human population has increased from 3.7 billion to now over 8 billion in 2023[2]. Obtaining the resources necessary to house, feed, and meet the energy demands of a human population that has more than doubled has accelerated the destruction of natural habitats, leading to biodiversity loss on an unprecedent scale. The most authoritative survey of the state of the natural world in recent years, the IPBES Global Assessment in 2019, was absolutely clear when it stated, "Our increasing numbers drive degradation"[3].

## Contents



WWF's Living Planet Report 2022 calculated that average global wildlife populations have plummeted by 69% on average since 1970[4]. To understand this dramatic decline, we must turn to the five key threats to biodiversity: habitat loss, resource exploitation, invasive species, pollution, and climate change[5].

As we will explore in this report, one of the most devastating drivers of habitat loss is land clearing due to the expansion of agriculture. Between 1962 and 2017, an estimated 470 million hectares of wild habitats, equivalent to half the area of China, were converted into pasture[6]. Agricultural expansion is intrinsically linked to human population growth, as simply put, more people mean the world needs to produce more food. That expansion comes at the expense of increased deforestation, water scarcity, and pesticide runoff destroying and degrading remaining areas of wildlife habitat, causing biodiversity loss. Agriculture alone has been identified as a threat to more than 86% of the 28,000 species currently known to be at risk of extinction[7].

Meanwhile, the human population is only set to increase. The UN projects that it will continue to increase throughout this century. Its medium projection is for a population of 10.4 billion in 2100, with a 95% certainty range of 8.9 – 12.4 billion[8].

All these extra billions of people will not only require more food but also drive up demand for energy and other resources, both finite and, critically, renewable – critical, because it is nature which renews them, and each year we reduce its capacity to do so, while increasing our demand. Accompanying a growing population is a rapidly increasing per capita consumption, another grave threat to biodiversity. From the imported avocadoes and bananas in our shopping baskets, grown on large plantations created through the land clearing of natural ecosystems, to the pollution from the mining of the minerals in our mobile phones, nature pays more than we do for what we buy.*

* See Population Matters' 2023 report *iCon: Apple, consumption and the future of the planet*

Inequities in consumption are stark and unacceptable. Currently, 10% of the world's population in the G7 countries consume 40% of the Earth's biological productivity[9]: rising levels of affluence elsewhere will alter the proportions, but also increase total demand. In a literal sense, we are consuming more: the average amount of calories increased 31% from 2,196 to 2,884 kcal per day from 1961-2013[10]. By contrast, as we'll detail later, southern resident orcas have lost 17% of the calories available to them[11].

Climate change, meanwhile, threatens more than just polar bears. Temperatures rises may threaten as many as one in six species across the globe[12], with vulnerable ecosystems such as coral reefs and mountain slopes collapsing. The Intergovernmental Panel on Climate Change is unambiguous about the role of population in driving climate change, stating in 2022: "*globally, GDP per capita and population growth remained the strongest drivers of CO2 emissions from fossil fuel combustion in the last decade*".[13]

The global economy has also facilitated the cross-continent transport of invasive species, another key driver of biodiversity loss. With increased transport of goods across further distances allowing invasive species to cross terrestrial borders and even oceans. For example, zebra mussels native to the Caspian Sea in Central Asia were transported to the Great Lakes of North America, after being stuck to tanker ships that travelled between the two regions[14]. There are now so many invasive zebra mussels in the Great Lakes they threaten native species. Population growth will only increase demand across different ends of the global economy, increasing traffic on trade links and providing more opportunities for invasive species to migrate.

Global biodiversity decline is driven by multiple factors, and underlying all of those are our numbers, our consumption and our choices. We must address all three. As put in one paper in Biological Conservation, "*Speaking out about population matters can be challenging, but failure to address the root causes of biodiversity loss will doom conservationists' efforts.*"[15]

The Anthropocene era is here, but our dominance provides us with the opportunity to change its trajectory. Through the following six case studies of some of the world's most charismatic animals, we will examine human-driven pressures on all of nature, before concluding with what can be done to counteract these pressures and reverse nature's catastrophic decline.

# Fading Icon
# Tigers

Our patron, Sir David Attenborough once said, "*It seems to me that the natural world is the greatest source of excitement; the greatest source of visual beauty; the greatest source of intellectual interest. It is the greatest source of so much in life that makes life worth living.*"

And if one creature can live up to that quote, it must be the majestic and captivating Bengal tiger. The largest of the big cats, tigers are often thought one of the most beautiful of all animals. Unfortunately, tigers are also one of the most well-known creatures permanently on the endangered species list – if not for the panda, WWF could have chosen the symbol of the tiger.

Across their range, tigers face unrelenting pressures from habitat loss, and are now confined to less than a tenth of their historic range[16]. They are forced to compete for space in areas with some of the fastest growing human populations. Over 70% of the remaining global tiger population is found in India[17]. The current population of India is 1.4 billion people, having recently overtaken China as the world's most populated country, and will keep growing into the second half of this century[18]. The effect is not only limiting available habitat space, but increasing demand for natural resources, driving deforestation, resource extraction and road building which further fragments and degrades remaining tiger habitats.

Globally, over 60% of tiger subpopulations occur within protected areas; with 65% of India's tiger populations found in tiger reserves[19]. Even these designated habitats aren't fully protected from human pressures, however, as many tiger conservation areas have concessions for resource extraction including logging, plantations, oil drilling, and mining.

## Roads to ruin

An under-recognised but significant threat is the proliferation of roads, dividing and segmenting tiger habitat. A study published in *Science Advances* in 2020, calculated the extent and potential impacts of road networks across the 13-country range of remaining tiger habitats[20]. They found that roads totalled 134,000 km across tiger conservation landscapes, even in priority protected areas. Approximately 43% of the area where tiger breeding occurs and 57% of their total available habitat fell within the road affected zones, defined as 5 km from the nearest road[21]. The study concluded that these road networks also drive down available prey abundance by more than 20%[22], leaving tigers with both less room and less food. Pressures from road use are only likely to increase as nearly 24,000 km of new roads will be built in tiger conservation landscapes by 2050, funded through major investment projects such as China's Belt and Road Initiative[23]. The continent across which tigers once roamed freely is becoming more and more subdivided by human development.

Roads are most commonly built to facilitate extractive industries, such as logging and mining, this leads to habitat degradation, and facilitates poaching. Road expansion into remote areas opens up transport links between wild habitat and urban areas, meaning endangered species, such as tigers, can be poached and smuggled to be sold in underground markets by criminal networks[24]. Within Vietnam and China, demand for tiger products is high, the rising affluence of consumers across the region has also increased the consumption of tiger products[25].

## People pressure

Another significant pressure on tigers is loss of prey species, such as wild boar and deer, which make it harder for remaining tigers to survive. Many people living alongside tiger habitats are reliant on the forests for timber and livestock pasture[26], this can drive deforestation causing insufficient habitat to support healthy wild pig and deer populations, limiting the availability of prey species for tigers[27]. As tigers struggle to survive in shrinking homes, there is greater risk of conflict between them and local people[28]. However, it's not just the impact of local people that can cause unintended harm towards tigers but visiting tourists too.

Tigers are a beloved species the world over, but a study published in *Conservation Physiology* in 2019, found wildlife tourism, such as tiger safaris, can be harmful as it increases species stress[29]. The study found elevated levels of stress hormones for tigers in proximity to human settlements or frequent interactions with wildlife safaris[30]. Just like humans, when animals deal with prolonged periods of stress this can have a detrimental impact on their health, weakening their immune system and making them more susceptible to disease, as well as less likely to effectively reproduce[31].

**Species Name**
**Tiger** (Panthera Tigris)

**Species Size:**
**5,574**

**Conservation Status**
**Endangered**

**Main Threats**
**Poaching and habitat loss**

It's not enough for the world to declare its love for tigers; serious efforts need to be made to minimise the impacts of population growth and resource demand to ensure the future preservation of one of nature's most breathtaking creatures.

# The Last Wilderness of America
# Mountain Lions

Big cats are under threat in our wealthiest countries too. Cougars, pumas, panthers – they go by many different names, but mountain lions have long been a fixture of the landscape across North America. Perhaps one of the most famous cats of the decade being the "Hollywood Mountain Lion" or P-22, who was captured in an iconic national geographic photograph strolling past the lit-up Hollywood Sign. Unfortunately, P-22's reign in the Hollywood Hills was cut short after he succumbed to injuries from a vehicle collision[32]. P-22's story poignantly highlights the plight of these extraordinary big cats fighting to survive under the bright lights of a human dominated landscape.

Today, the Florida panther, a subspecies of mountain lion, is only found in the southwestern tip of Florida, occupying only 5% of its original range[33].

Researchers have identified habitat loss and fragmentation due to Florida's expanding human population as a key factor undermining the survival of the Florida panther. Habitat loss is largely due to human driven development of natural lands, particularly converting forest cover to agricultural and urban areas[34]. Human infrastructure development not only destroys panther habitat, but fragments and degrades remaining habitat. Divided and isolated populations lead to inbreeding that makes panthers more vulnerable to genetic faults[35] such as heart defects[36].

## More people

Florida is the third most populated state in the U.S. with 22,661,557 people, behind only California and Texas[37]. In addition, Florida is a smaller landmass than these two states, with a higher population density, of 353.4 people per square mile[38]. It's also the most rapidly growing state in the U.S[39].

The human population of Florida is expected to increase to 33.7 million in 2070 based on medium growth projections[40]. Thus, an estimated 11.1 million new people will have to be accommodated by 2070, but this population increase will not be evenly distributed. According to one study's projections, most of the new residents will be absorbed into central and South Florida[41], causing disruption and further fragmentation to existing Florida panther habitats. The study predicts an expected loss of 34% to the cats' primary habitats, including core breeding zones[42].

In addition, all these extra millions of people will generate higher traffic volume, causing increased panther deaths due to vehicle collisions. Traffic reduction during the COVID-19 pandemic closures during March-July 2020 showed a 58% drop in the rate of mountain lion killed on California highways, there was a similar fatality rate drop for Florida panthers also observed at this time[43]. More people, more cars, more lions' bodies at the side of the road.

## The invasive species

Even when we're peacefully engaging with nature, we can cause unintended harm. Wild animals don't enjoy our company, and avoiding us comes at a cost.

The COVID-19 pandemic shutdowns of 2020 provided a unique opportunity for researchers to study the behaviour of wildlife at a time when human activity was effectively put on pause, as the pandemic lockdowns meant we stayed primarily in our homes. Researchers took the opportunity to study the behaviour of a select group of mountain lions in the greater LA area.

Contrary to predictions that wildlife would range further afield now that human activity was reduced, resident mountain lions in greater LA responded by using smaller areas and moving shorter distances[44]. In Greater Los Angeles, parks closed from 27 March to 9 May 2020[45], and researchers found that mountain lions relaxed avoidance of hiking trails during the closure. Instead, they were able to travel in a more efficient manner with reduced human activity on the landscape, as they were no longer diverting course to avoid areas of high human activity such as roads, hiking trails, and construction.

The results supported theories that animals should use the smallest area possible within which they can obtain sufficient resources[46]. The study concludes that mountain lions can use fragmented landscapes in a more efficient manner when human activity declines, implying there are increased energy costs for coexistence with humans, driving down the relative

Photo © Adobe

health and fitness of the species[47]. The results conclude that mountain lions generally prefer to avoid us – humans – rather than any manmade infrastructure[48].

Akin to the plight of the Florida panther, an isolated population of mountain lions in southern California are also at risk of extinction due to habitat fragmentation and the corresponding declining health of the species[49]. Gene diversity is a vital mechanism for the long-term health of a species[50], when there isn't a large enough local population for sufficient gene exchange to occur, this results in accelerated inbreeding, genetic faults, and reduced survivability. One 2016 study of an isolated population of mountain lions in the Santa Monica Mountains predicted the chances of extinction at nearly 100% within 50 years if the continued isolation and inbred gene pool persisted[51].

Population growth inevitably leads to elevated levels of human activity, more footfall on hiking trails, more cars on the road, more houses needing to be built. This has a corresponding impact on wildlife, forcing animals to roam further to avoid us, segmenting suitable habitats and isolating pockets of the population until they're subject to inbreeding and disease.

**Species Name**
**Florida Panther** (Puma Concolor Coryi)

**Species Size**
**120-230 Adult Panthers**

**Conservation Status**
**Endangered**

**Main Threats**
**Habitat fragmentation, automobile collisions, population inbreeding & disease**

It's clear that big cats and other forms of wildlife prefer to avoid human activity, but population growth means we're increasingly developing further into their territories and eroding suitable habitat. To preserve the health and wellbeing of other species, it's vital we consider the impact of our own.

# Fall of the Giants
# Elephants

Elephants have long been admired for their gentle giant grace and deep familial bonds. They are a fixture of the African savanna, recognisable by only their silhouette. However the largest land animal on our planet is in trouble.

The African savanna elephant is classified as endangered on the IUCN red list, and the African forest elephant critically endangered[52]. Like every animal under threat, a constellation of factors contributes, and among those factors is population growth on the continent from which these animals take their names. The main threats to elephant's survival are poaching for the ivory trade, and habitat fragmentation[53]. Currently, two-thirds of the African continent still provides suitable habitat for elephants, but only 17% of that habitat is available to them[54] due to the development of roads, farms and urban centres.

## Population, poverty, and poaching

Elephant poaching is driven by external demand and a complex network of factors. Among those is human population. In countries where legitimate economic opportunities are scarce, some citizens turn to poaching to generate income[55]. A 2019 article published in *Nature Communications* drew a clear link between rates of elephant poaching and local poverty[56] - and poverty in turn is correlated with high population growth. A 2023 report issued by UNICEF emphasised population growth as one of the causes of increased rates of child poverty in Africa[57]. The burden of large families can be a significant factor in this, as it puts greater financial pressures on individuals. With limited economic opportunities and the burden of large families, this can form a poverty trap that drives individuals to exploitation by the poaching industry.

Across sub-Saharan Africa, family sizes are coming down, as the pressures that drive high fertility are alleviated, and the opportunities for people to control their own fertility through access to contraception improve. But progress is halting and, in some places, stalled, and population will continue to rise. In 2020 Africa had around 1.34 billion inhabitants and is forecast to reach nearly 2.5 billion by 2050[58].

Poaching requires multilateral and quicker action than tackling population growth – action that must also respect the rights of individuals and communities – but the contribution of that growth is a reminder that poverty, as well as affluence, is a driver of biodiversity loss (as we shall also see in the context of chimpanzees).

## Nowhere to go

But what remains a critical threat to the elephant population is habitat fragmentation – not simply loss of habitat area but loss of continuous areas of habitat in which animals can freely roam – which is worsened by continued human population growth driving development. The IUCN Red List elephant report states, "*Currently the most important perceived threat is the loss and fragmentation of habitat caused by ongoing human population expansion and rapid land conversion*."[59]

Elephants have a life expectancy of 60 to 70 years[60], and their survival depends on regular migration over large distances to search for food, water, and potential mates. As mega-herbivores, elephants consume 150kg of vegetation and 190 litres of water daily[61]. Meeting these dietary needs requires a large foraging area, as their habitats shrink due to the developments of roads, farms, and expanding cities, elephants are progressively forced into closer contact with people.

The most common form of human-elephant conflict is due to elephant crop-raiding. Evidence suggests these raids peak during harvest, impacting vulnerable communities with food scarcity[62]. Many of the areas worst affected by elephant and human conflict, are also home to the poorest communities, with 1.2 billion people who live on <$1.25USD per day residing in elephant range countries[63]. These poor communities are less resilient to deal with the aftermath of elephant raids, which can lead to revenge killings that further undermine conservation efforts[64].

These low-income communities are increasingly having to compete with elephants, for space and resources. Subsistence farmers often live near forests and permanent water sources to secure water access for their crops and livestock, due to lacking irrigation infrastructure[65]. This puts pressure on natural

resources, driving deforestation and increasing water scarcity, and increases the likelihood of elephant and human conflicts. This region is also experiencing rapid population growth[66]. Research suggests that elephant populations will co-exist with human communities until a threshold of about 15-20 people per km$^2$ is reached[67]. Currently, the average population density of Zimbabwe is 41 people per km$^2$,[68] this gives a sense of the pressure put upon remaining elephant habitats due to high population density.

## Protecting people

Nor are elephants the only victims of these stresses. Displacement and human rights abuses of people in the name of conservation are now finally starting to get the attention they need[69]. Responsibility for ending these practices lies with the governments and institutions perpetrating or tacitly encouraging them. Morally and practically, conservation must address the drivers of biodiversity loss and can and must benefit indigenous and marginalised human communities.

Elephants and humans can cohabit peacefully as long as sufficient space and resources are provided for both species, which will not occur if rapid population growth continues. As we describe in the conclusion, measures which reduce population growth are precisely those which benefit human communities – not just family planning, but tackling poverty and promoting gender equality and education.

Addressing all these factors in conservation efforts can hep secure a future for both humans and elephants.

**Species Name**
**African Elephant** (Loxodonta Africana)

**Species Size**
**415,000**

**Conservation Status**
**Vulnerable**

**Main Threats**
**Poaching and habitat loss**

# Human Echo
# Orcas

Orcas were originally called 'killer whales' due to sailors' accounts of these intelligent creatures successfully hunting down larger whale species[70,*]. Their intelligence also contributes to orcas being highly social creatures who develop distinct cultures unique to each family pod[71]. Orca culture revolves around taught behaviour and is what allows orcas to have adapted to live across multiple marine ranges, as they are found in every ocean[72]. Many individuals have paid a high price for that intelligence, languishing, and abused in aquaria and theme parks. Nor is it protecting them from human impacts on their true homes in the wild.

The southern resident orca is a genetically distinct subspecies of orca that lives off the Pacific Northwest coast; as of April 2023, the population numbers only 73 individuals, divided between three matrilineal family pods[73]. A critical habitat for their survival is the Salish Sea, a marginal sea bordering the Canadian province of British Columbia and the American state of Washington. This body of water is also one of the busiest shipping routes in the world[74].

Orcas have a lifespan of 50 to 90 years, with female orcas giving birth every five years after an 18-month pregnancy[75]. However, research conducted between 2008 and 2014 revealed that up to 69% of all southern resident orcas' pregnancies were unsuccessful[76], a key reason cited for this low fertility rate is the reduced availability of Chinook salmon.

* Orcas are actually part of the dolphin family.


## Whose food?

Orcas are picky eaters – once they select a food source, they tend to stick to it[77]. Southern resident orcas primarily prey on Chinook salmon, itself a species classified under the Endangered Species Act. This salmon species can make up to 90% of the southern resident orca's diet during summer, however, it has seen a 60% reduction in abundance since 1984[78]. In the late 1980s, the Canadian government applied restrictive fishing regulations to protect the Chinook salmon, but the population has continued to decline[79]. What was originally driven by over exploitative fishing practices has now been exacerbated by other anthropogenic pressures, such as deforestation, urbanisation, and coastal modifications that have impacted the quality and quantity of salmon habitat[80] preventing the species from bouncing back to healthy levels.

Studies have shown due to the decline in Chinook salmon, southern resident orcas have lost 17% of their necessary calorie requirements for six of the last 40 years[81]. This is the equivalent to an adult forgoing their daily breakfast for the last 6 years[82].

## Drowned out

It's not just a decline in salmon that is affecting the southern resident orca population, as several studies have confirmed what's also affecting these orcas is underwater noise pollution. The Salish Sea is a busy international shipping corridor that hosts commercial vessel traffic, including fuel tankers, fishing boats and barges. And in the same way it's hard for two humans to hear one another by a busy road, noise generated by vessel propulsion can mask sounds that marine mammals use to communicate, navigate, find mates, and hunt for food[83]. This means southern resident orcas are not only struggling due to the lack of available food, but because of the noise we create, struggling to hunt what prey we've left them.

For proper recovery of southern resident orcas, what's needed is not only an increased abundance of Chinook salmon, but a reduction in vessel noise. A 2018 study published by Western Washington University, estimated that a 50% reduction of vessel noise in the Salish Sea could be achieved by targeting the noisiest 15% of the shipping fleet[84]. However, this noise reduction is unlikely to occur, as the Salish Sea is set

to only become louder. The Trans Mountain Pipeline project which has begun construction in Canada, will add 980 km of new pipeline to the region and include three news berths for tankers to collect oil from the Westridge Marine Terminal in British Columbia[85].

In their 2021 *Salish Sea Vessel Traffic Projections*, Friends of the San Juans reported there were 10,480 commercial vessel transits through the Salish Sea in 2020. By the time the Trans Mountain Pipeline project is completed, they estimate this could increase traffic by up to 46% at 13,000 vessels annually[86]. This will increase underwater noise pollution, putting increased pressures on the already struggling species of southern resident orcas and Chinook salmon.

Trade is driven by many factors, of which population growth is only one. Globally, GDP – a crude measure of economic activity based on transactions rather than value – has grown faster than population with a global GDP growth of 2.8%[87] compared to 0.88% population growth in 2023[88]. Nevertheless, more people – especially in a highly developed, high consumption country, matters. Canada's current population is 38.8 million people, but according to Statistics Canada could hit the 50-million mark by 2043[89]. A high-growth scenario could put it at 52.5 million people 20 years from now[90]. This will drive an increased demand for energy and trade, ensuring the Salish Sea remains one of the busiest and noisiest stretches of ocean.

**Species Name**
**Southern Resident Orcas**

**Species Size**
**73** (J-Pod: 25 , K-Pod: 16, L-Pod: 32)

**Conservation Status**
**Critically Endangered**

**Main Threats**
**Food scarcity & noise pollution**

The impacts of population growth aren't just felt by the numbers of people, but the contributing demand they require for energy and shipped goods. Though we may not be able to see the effects of this directly, orcas are many other creatures will be suffering from hearing its effects.

# Bad Business
# Chimpanzees

We share a remarkable 98.7% of our DNA with chimpanzees[91], and like us, chimpanzees are noted for their adapt tool making and problem-solving skills. However, even this intelligent and adaptable species is struggling to survive, due to the pressures imposed by expanding human settlements. In 2016, the IUCN updated its classification of the western chimpanzee from "Endangered" to "Critically Endangered"[92], reflecting their dire survival prospects.

The geographic range of western chimpanzees spans eight West African countries and a diverse array of habitats. Humans and chimpanzees have coexisted in this region for thousands of years. But the increasing pressures of human-driven development in the region over the last two decades has resulted in an 80% decline in chimpanzees in West Africa[93].

The main threats to chimpanzees are habitat loss, disease, and hunting, especially for bushmeat. Bushmeat is any wild animal killed for food, a common practice across the forests and savannas of Africa. This wild meat provides a valuable source of protein for people in rural communities where farming domesticated animals is too expensive or impractical[94]. Even though the killing of great apes is illegal in all range states, poaching still occurs[95]. Estimates suggest that chimpanzee carcasses constituted 1–3% of bushmeat sold in urban markets[96].

## Just like us

Chimpanzees can live up to 35 years in the wild, females only giving birth every 5 years[97]. As a result, even low levels of hunting can decimate entire groups of chimpanzees due to the low replacement rate[98].

The scale of bush meat hunting is increasing, due to road building in more remote areas to facilitate logging and mining operations. These roads can establish commercial networks making chimpanzee habitats more accessible for poachers, providing transport links for bush meat to reach urban markets[99]. Population growth has been cited as a key driver in the increasing rates of bushmeat consumption, as for many low-income communities, bushmeat is a necessity, and constitutes a nutritional 'safety net', where domestic meat is not commonplace[100].

According to the IUCN 2020 report, only 17% of western chimpanzees occur in areas designated as national parks, with 83% of the population living in unprotected remote areas[101]. However, what remains of remote habitat will continue to dwindle, as nearly 40% of chimpanzees already live within 5 km of a human settlement and nearly 60% are within 5 km of a road[102]. This increased proximity between humans and chimpanzees can also endanger them due to the risk of disease transfer. Chimpanzees' close genetic relation to humans means they are vulnerable to more than 140 human diseases[103]. As the number of people grows into and around their habitat, chimps are more likely to fall victim.

## Losing ground

Chimpanzees are also under threat from deforestation – the rate of which is increasing. A 2018 study found that chimpanzee habitats are often in areas characterized by high levels of human poverty[104]. People in poverty often rely on forests for firewood and clear land for agriculture. As impoverished communities grow, deforestation will only increase[105].

The IUCN 2020 report has forecast that approximately 10% of remaining African ape habitat will be impacted by human development by the year 2030[106]. This will come at the cost of intact forests and vital chimpanzee habitat being converted for agriculture and industrial projects such as roads, railroads, hydroelectric dams, and power lines[107]. Whilst this major infrastructure development will be considered an economic boon for West African nations, the unfortunate trade-off is that it comes at the cost of biodiversity loss.

**Species Name**
**Western Chimpanzee**
(Pan troglodytes verus)

**Species Size**
**170,000-300,000**

**Conservation Status**
**Critically Endangered**

**Main Threats**
**Poaching, disease and habitat loss**

The current population of Sub-Saharan and Central Africa is estimated at 900 million today and is estimated to reach 2.1 billion people by 2050[108]. The UN Population Division estimates this will increase the urbanization of Sub-Saharan Africa, currently at 38%, to 56.5% in 2050[109], this increased urbanisation will result in losing intact African forests and biodiverse habitats. Whilst it's vital this population is provided with the necessary infrastructure it needs, if the rapid rate of population growth continues it will only lead to an expanding scale of development that may come at an irreversible cost, the loss of chimpanzees.

Chimpanzees play a vital role in the ecosystems of Africa's forests, with the large tree seeds they eat and disperse through their faeces too big for most other animals to ingest[110]. Without chimpanzees, Africa's remaining forests would be irreversibly changed.

# On the Smaller Scale
# Hedgehogs

Because the British killed off their bears and wolves centuries ago, there are no charismatic megafauna left to attract attention to the shocking reality that the UK has become one of the world's most nature-depleted countries, in the bottom 10%[111]. According to the 2023 State of Nature report, one in six of 10,000 animal and plant species evaluated are at risk of extinction[112]. Whilst countries such as Finland have retained 88.6% of their biodiversity levels, the UK has retained only 50.3%[113].

This is reflected in the European hedgehog being classified as a species of Least Concern across most of the European continent, apart from the UK where in 2020 it was put upon the IUCN Red List for British Mammals as vulnerable to extinction in Great Britain[114].

In just the last two decades, hedgehog numbers in the UK have plummeted by half, due to habitat fragmentation, increased road use, and intensifying agriculture[115], all three of which are driven by population growth.

## More people, more cars

Hedgehogs are foraging creatures that need to be able to move across a range of connected green spaces to find food, mates, and areas to nest. Radio-tracking studies have showed that hedgehogs can travel up to 2km a night in urban areas[116], thus it's vital for them to be able to safely move across urban landscapes. However, roads act as barriers to hedgehog movement, cutting through and dividing their available habitats, as well as a large driver of mortality. According to a 2020 study by Nottingham Trent university, casualties from road use may be as high as 335,00 hedgehogs per year in the UK.[117].

There has been a steady increase in the numbers of cars upon Britain's roads, from 27.2 million in 2000, to 32.7 million in 2020[118]. As the UK population continues to grow, so will road use and traffic increase, posing a greater threat to hedgehogs due to habitat fragmentation and vehicular collisions – a killer of all our land animals. The Road Lab[119], a citizen science project at Cardiff University makes records of roadkill, they report that 90% of people in the UK have never seen a live badger[120] – only a dead one on the roadside, and they receiver regular reports of other dead native species such as otters and hedgehogs. It is reflective of the poor state of Britain's native wildlife that most of us are familiar with them as discarded roadkill than the thriving woodland creatures they once were.

Despite the mortality risks related to road use, hedgehogs are fairing better in urban areas than rural landscapes, as suggested by reports by British Hedgehog Preservation Society[121]. The matrix of gardens and green spaces in town and villages can support a higher density of hedgehogs and may act as a refuge from intensive agricultural practices[122]. Public campaign initiatives discouraging the use of weed killers, slug pellets, and leaving areas of the garden to grow wild with holes in fencing for hedgehog highways have allowed hedgehog populations to stabilise in urban areas[123].

The 2023 State of Nature report notes that the governments of all four of the UK's countries are seeking to ensure everyone lives in proximity to green spaces - in England, for instance, no more than 15 minutes' walk. Good for people perhaps, but as it cautions: "*These shifts in land ... usage are in the context of a UK human population predicted to grow by four million by 2050. Population changes necessitate substantial house building targets and targets for increased access to local natural spaces*"[124].

## Loss of the wild

Evidence shows that hedgehog populations are continuing to decline in rural areas, however. This is due to habitat loss from the disappearance of 50% of Britain's wild hedgerows[125], following more intensive agriculture leading to larger field sizes, increased pesticide usage and limited areas of scrub and decaying wood to host sufficient insect populations for hedgehog to forage[126].

Farmland covers 69% of the total area of England[127]. Since the 1970s, farming has intensified, providing less and less suitable habitat for native wildlife[128]. Hedgehogs prefer village areas to open farmland[129], due to the heavy use of machinery and pesticides, that makes farmland an intensely inhospitable environment for them[130].

The UK has a current population of 67 million people and is expected to increase to an expected 69.2 million people in 2030[131]. As population growth continues, this puts further demands on agricultural intensification and expansion, causing a corresponding loss of native wildlife as a result. As an island state, human pressures on resources are even more concentrated in a smaller area[132].

With almost half of Britain's food imported[133], concerns about food security have risen up the agenda in recent years. While transition to more sustainable forms of farming is essential, currently just 3% of farmed land is organic – less than in 2010[134]. The tension between the food demands of a growing population and sustainable agriculture is hard to reconcile, and, just as with demand for infrastructure, traffic and housing, hedgehogs – among the rest of British wildlife – are paying the price.

**Species Name**
**Western European hedgehog**
(Erinaceus europaeus)

**Species Size in UK**
**170,000-300,000**

**Conservation Status**
**Vulnerable**

**Main Threats**
**Habitat loss, intensive agriculture and traffic deaths**

# CONCLUSION

The case studies in this report outline the plights of six animals, but population growth affects more than just the charismatic megafauna we choose to admire.

The cumulative results of biodiversity loss have been so dire that scientists have declared the start of a sixth mass extinction – the fifth being the disappearance of the dinosaurs. Consensus in the scientific community has been reached that population growth is a key underlying driver. 20,000 scientists have endorsed the World Scientists' Warning to Humanity: A Second Notice, published in Bioscience in 2017, this paper identifies *"continued rapid population growth as a primary driver behind many ecological and even societal threats."*[135]

Perhaps of most concern is the frightening loss of insect populations due to the destruction of wild habitats for farming, urbanisation, pesticide use and light pollution[136]. Insects are a vital pillar of the ecosystem, providing prey for small animals such as hedgehogs, as well as ensuring the vital pollination of native plant species. A 2021 paper published in the Proceedings of the US National Academy of Sciences concluded:

*"To mitigate the effects of the Sixth Mass Extinction event that we have caused and are experiencing now, the following will be necessary: a stable (and almost certainly lower) human population, sustainable levels of consumption, and social justice that empowers the less wealthy people and nations of the world, where the vast majority of us live."*[137]

To give nature a fighting chance, the proliferating demands of the most invasive species of all – us – must be limited to what the planet can afford. That means bringing our per capita consumption down where it is unsustainable, and ending and reversing human population growth. The first is hard, though essential; the latter is, or should be, easy: a recipe of positive, choice-based, empowering actions including gender equality, improved access to modern contraception, promoting girl's education, and promoting the benefits of choosing smaller families.* Projections of future population growth all affirm that accelerated progress on these issues can bring our growth down by billions and could even ensure a population at the end of this century lower than at its start[138].

Almost all of the actions needed are already enshrined in the UN's Sustainable Development Goals, a list of 17 targets for 2030, intended to achieve a decent quality of life for all on a healthy planet. Shockingly, though, almost all of the SDGs are currently set to be missed[139]. For instance, an estimated 250 million women of reproductive age worldwide are still in need of but without modern contraception[140], while another UN assessment projects that gender equality will not be achieved until the 22nd century[141]. Targets off track include not just "development" goals related to poverty, gender, health, and education, but also those addressing unsustainable consumption and climate change, where the actions and commitments of high-income nations are hopelessly inadequate.[142]

A global effort on a massive scale to put the SDGs back on track is essential. On a more local level, solutions are already being implemented. The Population Health Environment (PHE) model recognises the valuable interaction and mutual benefits of improving the conditions of human communities in achieving local conservation goals, including through the provision of family planning services to reduce local human population pressures on natural resources[143]. PHE approaches work holistically to create healthier communities and healthier ecosystems by focusing on development and conservation targets such as the sustainable management of natural resources, improving livelihoods, and by maintaining or restoring vital habitats and ecosystem functions[144]. This effective, empowering, and ethical action offers hope for change.

To tackle the key drivers of biodiversity loss effectively on a global scale, we can't ignore human population pressure. Fortunately, solutions are at hand, and are extremely effective. By addressing population through positive, ethical, and choice-based means, we give ourselves the opportunity to enhance the quality of people's lives and maximise the effectiveness of all the solutions to the biodiversity crisis that must be implemented.

Earth's biodiversity is under threat as never before and this crisis demands consistent and united action now on multiple fronts. The future survival of numerous species across the globe depends on it. It is time for the era of the Anthropocene to transition from environmental destruction to environmental stewardship.

* See Population Matters' 2023 report *Power to the people: how population policies work for more information.* https://populationmatters.org/resources/power-to-the-people-how-population-policies-work/

# RECOMMENDATIONS

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Governments must commit to the achievement of the Sustainable Development Goals. In particular, that requires the necessary level of financial support from the wealthiest nations, as well as their commitment to addressing unsustainable consumption within their own borders.

Where evidence indicates negative population impacts domestically, governments should identify and implement ethical, choice-based and appropriate measures which mitigate population growth in their National Biodiversity Strategy and Action Plans, including utilising the PHE model.

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Conservation organisations and funders should recognise and support action which mitigates population growth where evidence indicates it would be beneficial.

# REFERENCES


1 HOOD, M. (2023) *Welcome to the anthropocene, Earth's new chapter, Phys.org.* Available at: https://phys.org/news/2023-07-anthropocene-earth-chapter.html (Accessed: 20 September 2023).
2 *World population 1950-2023* (2023) *MacroTrends.* Available at: https://www.macrotrends.net/countries/WLD/world/population (Accessed: 21 September 2023).
3 *Ipbes Global Assessment Report Chapter 2.1 status and Trends (2021) - Researchgate.* Available at: https://www.researchgate.net/publication/355717497_IPBES_GLOBAL_ASSESSMENT_REPORT_CHAPTER_21_STATUS_AND_TRENDS_-_DRIVERS_OF_CHANGE (Accessed: 21 September 2023).
4 *69% average decline in wildlife populations since 1970, says new WWF report* (2022) *WWF.* Available at: https://www.worldwildlife.org/press-releases/69-average-decline-in-wildlife-populations-since-1970-says-new-wwf-report (Accessed: 21 September 2023).
5 *Five drivers of the Nature Crisis* (2023) *UNEP.* Available at: https://www.unep.org/news-and-stories/story/five-drivers-nature-crisis (Accessed: 21 September 2023).
6 *How does the growing global population affect biodiversity?: Royal Society* (no date) Available at: https://royalsociety.org/topics-policy/projects/biodiversity/how-does-the-growing-global-population-and-increasing-consumption-affect-biodiversity/ (Accessed: 21 September 2023).
7 *Our Global Food System is the primary driver of Biodiversity loss* (no date) *UN Environment.* Available at: https://www.unep.org/news-and-stories/press-release/our-global-food-system-primary-driver-biodiversity-loss (Accessed: 21 September 2023).
8 *World population prospects 2022: Summary of results | population division* (2022) *United Nations.* Available at: https://www.un.org/development/desa/pd/content/World-Population-Prospects-2022 (Accessed: 21 September 2023).
9 *How does the growing global population affect biodiversity?: Royal Society* (no date) Available at: https://royalsociety.org/topics-policy/projects/biodiversity/how-does-the-growing-global-population-and-increasing-consumption-affect-biodiversity/ (Accessed: 21 September 2023).
10 *Consumption Patterns and biodiversity* (no date) *Royal Society.* Available at: https://royalsociety.org/topics-policy/projects/biodiversity/consumption-patterns-and-biodiversity/ (Accessed: 21 September 2023).
11 COUTURE, F (2023) *As chinook salmon get thinner and fewer, southern resident killer whales struggle to find enough food, The Conversation.* Available at: https://theconversation.com/as-chinook-salmon-get-thinner-and-fewer-southern-resident-killer-whales-struggle-to-find-enough-food-186866 (Accessed: 21 September 2023).
12 *Five drivers of the Nature Crisis* (2023) *UNEP.* Available at: https://www.unep.org/news-and-stories/story/five-drivers-nature-crisis (Accessed: 21 September 2023).
13 *Climate change 2022: Mitigation of climate change* (no date) *IPCC.* Available at: https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/ (Accessed: 21 September 2023).
14 *Invasive species* (no date) *National Geographic Education.* Available at: https://education.nationalgeographic.org/resource/invasive-species/ (Accessed: 21 September 2023).
15 CAFARO, P *et al.* (2022) *Overpopulation is a major cause of biodiversity loss and smaller human populations are necessary to preserve what is left, Biological Conservation.* Available at: https://www.sciencedirect.com/science/article/abs/pii/S0006320722001999 (Accessed: 21 September 2023).
16 *Amazing species: Tiger - IUCN red list.* Available at: https://nc.iucnredlist.org/redlist/amazing-species/panthera-tigris/pdfs/original/panthera-tigris.pdf (Accessed: 21 September 2023).
17 *Where do tigers live?* (2023) *World Animal Protection.* Available at: https://www.worldanimalprotection.us/blogs/where-do-tigers-live (Accessed: 21 September 2023).
18 *UN DESA Policy Brief No. 153: India overtakes China as the world's most populous country Department of Economic and Social Affairs* (no date) *United Nations.* Available at: https://www.un.org/development/desa/dpad/publication/un-desa-policy-brief-no-153-india-overtakes-china-as-the-worlds-most-populous-country/ (Accessed: 21 September 2023).
19 Goodrich, J., Wibisono, H., Miquelle, D., Lynam, A.J., Sanderson, E., Chapman, S., Gray, T.N.E., Chanchani, P. & Harihar, A. (2022). *Panthera tigris. The IUCN Red List of Threatened Species 2022.* Available at: https://images.assettype.com/ncfindia/2022-09/af66cf19-429a-4df5-8332-5de974587ff2/Goodrich_et_al____2022__RedList.pdf (Accessed: 21 September 2023).
20 Carter N, Killion A, Easter T, Brandt J, Ford A. Road development in Asia: *Assessing the range-wide risks to tigers. Sci Adv.* 2020 Apr 29;6(18) Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7190336/ (Accessed: 21 September 2023).
21 Ibid
22 Ibid
23 Ibid
24 WJC, T. (2022) *How organised crime exploits captive tiger facilities, Wildlife Justice Commission.* Available at: https://wildlifejustice.org/new-report-on-tiger-farms-how-organised-crime-exploits-captive-tiger-facilities/ (Accessed: 21 September 2023).
25 Ibid
26 *Tiger conservation success in 2023* (no date) *ZSL.* Available at: https://www.zsl.org/news-and-events/feature/tiger-conservation-success-2023 (Accessed: 21 September 2023).
27 Goodrich, J., Wibisono, H., Miquelle, D., Lynam, A.J., Sanderson, E., Chapman, S., Gray, T.N.E., Chanchani, P. & Harihar, A. (2022). *Panthera tigris. The IUCN Red List of Threatened Species 2022.* Available at: https://images.assettype.com/ncfindia/2022-09/af66cf19-429a-4df5-8332-5de974587ff2/Goodrich_et_al____2022__RedList.pdf (Accessed: 21 September 2023).
28 Ibid
29 Tyagi A, Kumar V, Kittur S, Reddy M, Naidenko S, Ganswindt A, Umapathy G. Physiological stress responses of tigers due to anthropogenic disturbance especially tourism in two central Indian tiger reserves. Conserv Physiol. 2019 Jul 12;7(1) Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6626984/ (Accessed: 21 September 2023).
30 Ibid
31 Ibid
32 *'He changed us': The remarkable life of celebrity mountain lion p-22* (2022) *The Guardian.* Available at: https://www.theguardian.com/us-news/2022/dec/20/p-22-mountain-lion-los-angeles-death-reaction (Accessed: 21 September 2023).
33 *Florida panther.* Available at: https://www.biologicaldiversity.org/species/mammals/Florida_panther/index.html (Accessed: 21 September 2023).
34 *Potential impacts of the southwest central Florida connector on the Florida Panther and its Habitat* Available at: https://www.nature.org/content/dam/tnc/nature/en/documents/Potential_Impacts_of_the_Southwest_Central_Florida_Connector_on_the_Florida_Panther_and_Its_Habitat.pdf (Accessed: 21 September 2023).
35 *Florida panther* (no date) *National Wildlife Federation.* Available at: https://www.nwf.org/Educational-Resources/Wildlife-Guide/Mammals/Florida-Panther (Accessed: 21 September 2023).
36 *Florida Panthers Dodge Extinction | science | AAAS.* Available at: https://www.science.org/content/article/florida-panthers-dodge-extinction (Accessed: 21 September 2023).
37 *US states - ranked by population 2023.* Available at: https://worldpopulationreview.com/states (Accessed: 21 September 2023)
38 *Florida – US states - ranked by population 2023.* Available at: https://worldpopulationreview.com/states/florida-population (Accessed: 21 September 2023)
39 *US states - ranked by population 2023.* Available at: https://worldpopulationreview.com/states (Accessed: 21 September 2023)
40 *Potential impacts of the southwest central Florida connector on the Florida Panther and its Habitat* Available at: https://www.nature.org/content/dam/tnc/nature/en/documents/Potential_Impacts_of_the_Southwest_Central_Florida_Connector_on_the_Florida_Panther_and_Its_Habitat.pdf (Accessed: 21 September 2023).
41 Ibid
42 Ibid
43 Shilling F, Nguyen T, Saleh M, Kyaw MK, Tapia K, Trujillo G, Bejarano M, Waetjen D, Peterson J, Kalisz G, Sejour R, Croston S, Ham E. *A Reprieve from US wildlife mortality on roads during the COVID-19 pandemic. Biol Conserv. 2021* Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8457620/ (Accessed: 21 September 2023)
44 John F. Benson, Heather N. Abernathy, Jeff A. Sikich, Seth P.D. Riley, Mountain lions reduce movement, increase efficiency during the Covid-19 shutdown, Ecological Solutions and Evidence (2021) Available at: https://besjournals.onlinelibrary.wiley.com/doi/full/10.1002/2688-8319.12093 (Accessed: 21 September 2023)
45 Ibid
46 Ibid
47 Ibid
48 Ibid
49 Ibid
50 *Preserving genetic diversity gives wild populations their best chance at long-term survival, NOAA.* Available at: https://www.fisheries.noaa.gov/feature-story/preserving-genetic-diversity-gives-wild-populations-their-best-chance-long-term (Accessed: 21 September 2023).
51 Schmerker, J. (2020) *Southern California's Mountain Lions face long-term survival challenges, Integrated DNA Technologies.* Available at: https://eu.idtdna.com/pages/community/blog/post/pretty-threatened-southern-california-s-mountain-lions-face-serious-long-term-survival-challenges (Accessed: 21 September 2023).
52 *African elephant species now endangered and Critically Endangered - IUCN Red list* (2023) *IUCN.* Available at: https://www.iucn.org/news/species/202103/african-elephant-species-now-endangered-and-critically-endangered-iucn-red-list (Accessed: 21 September 2023).
53 Ibid
54 *Shrinking spaces for the world's largest Land Animal* (2022) *IUCN.* Available at: https://www.iucn.org/news/species-survival-commission/202108/shrinking-spaces-worlds-largest-land-animal (Accessed: 21 September 2023).
55 Ann and Linder (1970) *Full title name: detailed discussion of elephants and the Ivory Trade, Animal Law Legal Center.* Available at: https://www.animallaw.info/article/detailed-discussion-elephants-and-ivory-trade (Accessed: 21 September 2023).
56 Hauenstein, S., Kshatriya, M., Blanc, J. *et al.* African elephant poaching rates correlate with local poverty, national corruption and global ivory price. *Nat Commun* (2019) Available at: https://www.nature.com/articles/s41467-019-09993-2 (Accessed: 21 September 2023).
57 *Children bearing brunt of stalled progress on Extreme Poverty Reduction Worldwide* (no date) *UNICEF.* Available at: https://www.unicef.org/press-releases/children-bearing-brunt-stalled-progress-extreme-poverty-reduction-worldwide (Accessed: 21 September 2023).
58 Galal, S. (2023) *Africa: Total population forecast 2020-2050, Statista.* Available at: https://www.statista.com/statistics/1224205/forecast-of-the-total-population-of-africa/ (Accessed: 21 September 2023).
59 Blanc, J. (2008) *Loxodonta africana. The IUCN Red List of Threatened Species 2008:* Available at: http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T12392A3339343.en (Accessed: 21 September 2023).
60 *Our top 10 facts about elephants* (no date) *WWF.* Available at: https://www.wwf.org.uk/learn/fascinating-facts/elephants (Accessed: 21 September 2023).
61 Shaffer, L.J. *et al.* (2018a) *Human-elephant conflict: A review of current management strategies and Future Directions, Frontiers.* Available at: https://www.frontiersin.org/articles/10.3389/fevo.2018.00235/full (Accessed: 21 September 2023).
62 Ibid
63 Ibid
64 Ibid
65 Ibid
66 Galal, S. (2023) *Africa: Total population forecast 2020-2050, Statista.* Available at: https://www.statista.com/statistics/1224205/forecast-of-the-total-population-of-africa/ (Accessed: 21 September 2023).
67 Shaffer, L.J. *et al.* (2018a) *Human-elephant conflict: A review of current management strategies and Future Directions, Frontiers.* Available at: https://www.frontiersin.org/articles/10.3389/fevo.2018.00235/full (Accessed: 21 September 2023)..
68 *Population density (people per sq. km of land area)* (no date) *World Bank Open Data.* Available at: https://data.worldbank.org/indicator/EN.POP.DNST?locations=ZW (Accessed: 21 September 2023).
69 *Statement on human rights abuses in conservation* (2022) *IUCN.* Available at: https://www.iucn.org/story/202206/statement-human-rights-abuses-conservation (Accessed: 22 September 2023).
70 *Facts about orcas (killer whales): Whale and dolphin conservation* (2023) *Whale & Dolphin Conservation UK.* Available at: https://uk.whales.org/whales-dolphins/facts-about-orcas/ (Accessed: 21 September 2023).
71 *How smart are orcas?* (2023) *American Oceans.* Available at: https://www.americanoceans.org/facts/how-smart-are-orcas/ (Accessed: 21 September 2023).
72 *Killer whale, NOAA* (2023) Available at: https://www.fisheries.noaa.gov/species/killer-whale (Accessed: 21 September 2023).
73 *Southern resident killer whales* (2023) *Georgia Strait Alliance.* Available at: https://georgiastrait.org/work/species-at-risk/orca-protection/southern-resident-orcas/ (Accessed: 21 September 2023).
74 *Vessel Traffic ▪ Georgia Strait Alliance* (2016) *Georgia Strait Alliance.* Available at: https://georgiastrait.org/issues/vessel-traffic/ (Accessed: 21 September 2023).
75 *Killer whale, NOAA* (2023) Available at: https://www.fisheries.noaa.gov/species/killer-whale (Accessed: 21 September 2023).

76 Wasser SK, Lundin JI, Ayres K, Seely E, Giles D, Balcomb K, et al. (2017) Population growth is limited by nutritional impacts on pregnancy success in endangered Southern Resident killer whales (*Orcinus orca*). Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0179824 (Accessed: 21 September 2023).
77 Smithsonian Magazine. (2011) *Understanding orca culture, Smithsonian.com.* Available at: https://www.smithsonianmag.com/science-nature/understanding-orca-culture-12494696/ (Accessed: 21 September 2023).
78 *Chinook salmon* (2014) *EPA.* Available at: https://19january2017snapshot.epa.gov/salish-sea/chinook-salmon_.html (Accessed: 21 September 2023).
79 COUTURE, F (2023) *As chinook salmon get thinner and fewer, southern resident killer whales struggle to find enough food, The Conversation.* Available at: https://theconversation.com/as-chinook-salmon-get-thinner-and-fewer-southern-resident-killer-whales-struggle-to-find-enough-food-186866 (Accessed: 21 September 2023).
80 *Chinook salmon* (2014) *EPA.* Available at: https://19january2017snapshot.epa.gov/salish-sea/chinook-salmon_.html (Accessed: 21 September 2023).
81 COUTURE, F (2023) *As chinook salmon get thinner and fewer, southern resident killer whales struggle to find enough food, The Conversation.* Available at: https://theconversation.com/as-chinook-salmon-get-thinner-and-fewer-southern-resident-killer-whales-struggle-to-find-enough-food-186866 (Accessed: 21 September 2023).
82 Ibid
83 Williams, R., Elliser, C.R., and Broadhurst, G. (2023). *How Much Noise is Too Much for Southern Resident Killer Whales in the Salish Sea? The Case for a Carrying Capacity Study. Salish Sea Institute, Western Washington University.* Available at: https://cedar.wwu.edu/cgi/viewcontent.cgi?article=1034&context=salish_pubs (Accessed: 21 September 2023).
84 Ibid
85 *Expansion project* (2017) *Trans Mountain.* Available at: https://www.transmountain.com/project-overview/ (Accessed: 21 September 2023).
86 *Salish Sea Vessel Traffic Projections* (2022) *Friends of the San Juans.* Available at: https://sanjuans.org/ssvtp/ (Accessed: 21 September 2023).
87 *IMF.* Available at: https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD (Accessed: 22 September 2023).
88 *Current world population* (no date) *Worldometer.* Available at: https://www.worldometers.info/world-population/ (Accessed: 22 September 2023).
89 *Government of Canada, Statistics Canada* (2022) Available at: https://www150.statcan.gc.ca/n1/pub/91-520-x/91-520-x2022001-eng.htm (Accessed: 21 September 2023).
90 Ibid
91 Jose Yong (2023) *Bonobos and chimps: What our closest relatives tell us about humans, The Conversation. Available at:* https://theconversation.com/bonobos-and-chimps-what-our-closest-relatives-tell-us-about-humans-202265 (Accessed: 21 September 2023).
92 *IUCN SSC Primate Specialist Group (2020). Regional action plan for the conservation of western chimpanzees (Pan troglodytes verus) 2020–2030. Gland, Switzerland: IUCN. Available at:* https://iucn.org/resources/publication/regional-action-plan-conservation-western-chimpanzees-pan-troglodytes-verus (Accessed: 21 September 2023).
93 *New report highlights challenges and opportunities for offsetting private sector damage to western chimpanzee habitat in West Africa (2021) IUCN. Available at:* https://www.iucn.org/news/species-survival-commission/202110/new-report-highlights-challenges-and-opportunities-offsetting-private-sector-damage-western-chimpanzee-habitat-west-africa (Accessed: 21 September 2023).
94 *Hall, J. (2021) Bushmeat: How wild meat can be a threat to wildlife and human health, Animals. Available at:* https://www.nationalgeographic.com/animals/article/bushmeat-explained (Accessed: 21 September 2023).
95 *Platt, J.R. (2013) Great Apes in crisis: Thousands poached and stolen from the wild annually, Scientific American Blog Network. Available at:* https://blogs.scientificamerican.com/extinction-countdown/great-apes-thousdands-poached-stolen/ (Accessed: 21 September 2023).
96 *IUCN SSC Primate Specialist Group (2020). Regional action plan for the conservation of western chimpanzees (Pan troglodytes verus) 2020–2030. Gland, Switzerland: IUCN. Available at:* https://iucn.org/resources/publication/regional-action-plan-conservation-western-chimpanzees-pan-troglodytes-verus (Accessed: 21 September 2023).
97 *Chimpanzees are at risk of being eaten into extinction (2018) Natural History Museum. Available at:* https://www.nhm.ac.uk/discover/news/2018/november/chimpanzees-are-at-risk-of-being-eaten-into-extinction.html (Accessed: 21 September 2023).
98 Ibid
99 *IUCN SSC Primate Specialist Group (2020). Regional action plan for the conservation of western chimpanzees (Pan troglodytes verus) 2020–2030. Gland, Switzerland: IUCN. Available at:* https://iucn.org/resources/publication/regional-action-plan-conservation-western-chimpanzees-pan-troglodytes-verus (Accessed: 21 September 2023).
100 *The bushmeat trade - UK parliament. (2005) Available at:* https://www.parliament.uk/globalassets/documents/post/postpn236.pdf (Accessed: 21 September 2023).
101 *IUCN SSC Primate Specialist Group (2020). Regional action plan for the conservation of western chimpanzees (Pan troglodytes verus) 2020–2030. Gland, Switzerland: IUCN. Available at:* https://iucn.org/resources/publication/regional-action-plan-conservation-western-chimpanzees-pan-troglodytes-verus (Accessed: 21 September 2023).
102 *Ibid*
103 *Chimpanzees WCS.org. Available at:* https://www.wcs.org/our-work/species/chimpanzees (Accessed: 21 September 2023).
104 Estrada A, Garber PA, Mittermeier RA, Wich S, Gouveia S, Dobrovolski R, Nekaris KAI, Nijman V, Rylands AB, Maisels F, (2018). *Primates in peril: the significance of Brazil, Madagascar, Indonesia and the Democratic Republic of the Congo for global primate conservation. Peer)* https://peerj.com/articles/4869/ (Accessed: 28 September 2023).
105 Dye, S. *Reversing deforestation: Conservation + chimp corridors, Jane Goodall's Good for All News. (2019) Available at:* https://www.news.janegoodall.org/2018/12/20/reversing-deforestation-community-centered-conservation-chimp-corridors/ (Accessed: 28 September 2023).
106 IUCN SSC Primate Specialist Group (*2020). Regional action plan for the conservation of western chimpanzees (Pan troglodytes verus) 2020–2030. Gland, Switzerland: IUCN. Available at:* https://iucn.org/resources/publication/regional-action-plan-conservation-western-chimpanzees-pan-troglodytes-verus (Accessed: 21 September 2023).
107 *Ibid*
108 *Population growth in Sub-Saharan and Central Africa: Grid-arendal (no date) GRID. Available at:* https://www.grida.no/resources/7490 (Accessed: 21 September 2023).
109 *Ibid*
110 Aguado, W, Rogers H, Pruetz, J, *Chimpanzees as ecosystem service providers Biotropica Volume 54. Available at:* https://onlinelibrary.wiley.com/doi/10.1111/btp.13080 (Accessed: 21 September 2023).
111 *UK has 'led the world' in destroying the natural environment* (no date) *Natural History Museum.* Available at: https://www.nhm.ac.uk/discover/news/2020/september/uk-has-led-the-world-in-destroying-the-natural-environment.html (Accessed: 21 September 2023).
112 *State of Nature 2023 – State of Nature Partnership.* Available at: https://stateofnature.org.uk/wp-content/uploads/2023/09/TP25999-State-of-Nature-main-report_2023_FULL-DOC-v12.pdf (Accessed: 28 September 2023).
113 *UK has 'led the world' in destroying the natural environment* (no date) *Natural History Museum.* Available at: https://www.nhm.ac.uk/discover/news/2020/september/uk-has-led-the-world-in-destroying-the-natural-environment.html (Accessed: 21 September 2023).
114 *Red list for Britain's mammals* (no date) *The Mammal Society.* Available at: https://www.mammal.org.uk/science-research/red-list/ (Accessed: 21 September 2023).
115 *Hedgehogs and water voles face extinction in new red list for British mammals* (2020) *Natural History Museum.* Available at: https://www.nhm.ac.uk/discover/news/2020/august/hedgehogs-and-water-voles-face-extinction.html (Accessed: 21 September 2023).
116 *Hedgehog Street.* Available at: https://www.hedgehogstreet.org/wp-content/uploads/2022/02/SoBH-2022-Final.pdf (Accessed: 21 September 2023).
117 *Hedgehogs on roads: New Review assesses the problems and solutions* (2020) *Nottingham Trent University.* Available at: https://www.ntu.ac.uk/about-us/news/news-articles/2020/10/hedgehogs-on-roads-new-review-assesses-the-problems-and-solutions (Accessed: 21 September 2023).
118 Carlier, M. (2022) *Number of cars on the road in the UK 2000-2020, Statista.* Available at: https://www.statista.com/statistics/299972/average-age-of-cars-on-the-road-in-the-united-kingdom/ (Accessed: 21 September 2023).
119 *The Road Lab UK.* Available at: https://www.theroadlab.co.uk/ (Accessed: 21 September 2023).
120 *The realities of UK nature - in pictures WWF.* Available at: https://www.wwf.org.uk/future-of-uk-nature (Accessed: 21 September 2023).
121 *Hedgehog Street.* Available at: https://www.hedgehogstreet.org/wp-content/uploads/2022/02/SoBH-2022-Final.pdf (Accessed: 21 September 2023).
122 Ibid
123 Ibid
124 *State of Nature 2023 – State of Nature Partnership.* Available at: https://stateofnature.org.uk/wp-content/uploads/2023/09/TP25999-State-of-Nature-main-report_2023_FULL-DOC-v12.pdf (Accessed: 28 September 2023).
125 *A history of Hedges - The RSPB.* Available at: https://www.rspb.org.uk/our-work/conservation/conservation-and-sustainability/advice/conservation-land-management-advice/farm-hedges/history-of-hedgerows/ (Accessed: 21 September 2023).
126 *The British Hedgehog Preservation Society.* (2019) Available at: https://www.britishhedgehogs.org.uk/wp-content/uploads/2019/03/Hedgehog-Street-HEMP-guide.pdf (Accessed: 21 September 2023).
127 *Agricultural Land Use in England at 1 June 2022* (2022) *GOV.UK.* Available at: https://www.gov.uk/government/statistics/agricultural-land-use-in-england/agricultural-land-use-in-england-at-1-june-2022 (Accessed: 21 September 2023).
128 *The realities of UK nature - in pictures WWF.* Available at: https://www.wwf.org.uk/future-of-uk-nature (Accessed: 21 September 2023).
129 *Hedgehog Street.* Available at: https://www.hedgehogstreet.org/wp-content/uploads/2022/02/SoBH-2022-Final.pdf (Accessed: 21 September 2023).
130 *Farming with hedgehogs - Warwickshire Wildlife Trust.* (2019) Available at: https://www.warwickshirewildlifetrust.org.uk/sites/default/files/2019-10/Farming%20with%20hedgehogs.pdf (Accessed: 21 September 2023).
131 Robards, J. (2022) *National Population Projections: 2020-based interim, National population projections - Office for National Statistics.* Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2020basedinterim (Accessed: 21 September 2023).
132 *UK has 'led the world' in destroying the natural environment* (no date) *Natural History Museum.* Available at: https://www.nhm.ac.uk/discover/news/2020/september/uk-has-led-the-world-in-destroying-the-natural-environment.html (Accessed: 21 September 2023).
133 *United Kingdom Food Security Report 2021: Theme 2: UK Food Supply Sources* (no date) *GOV.UK.* Available at: https://www.gov.uk/government/statistics/united-kingdom-food-security-report-2021/united-kingdom-food-security-report-2021-theme-2-uk-food-supply-sources (Accessed: 22 September 2023).
134 Department for Environment, F.& R.A. (2023) *Organic Farming Statistics 2022, GOV.UK.* Available at: https://www.gov.uk/government/statistics/organic-farming-statistics-2022 (Accessed: 22 September 2023).
135 Ripple et al. and signatories from 180 countries (2017) *World Scientists' Warning to Humanity: A Second Notice, Bioscience* https://academic.oup.com/bioscience/article/67/12/1026/4605229
136 Wagner et al. (2021) *Insect decline in the Anthropocene: Death by a thousand cuts*, published in Proceedings of the National Academy of Sciences of the United States of America, https://www.pnas.org/content/118/2/e2023989118
137 Wagner, D. & Raven, P. (2021), *Agricultural intensification and climate change are rapidly decreasing insect biodiversity*, published in Proceedings of the National Academy of Sciences of the United States of America, https://www.pnas.org/content/118/2/e2002548117
138 See summary of main projections at Population Matters (2023) *The world of population projections* https://populationmatters.org/news/2023/01/the-world-of-population-projections/
139 United Nations (2023) *Halfway to 2030, world 'nowhere near' reaching Global Goals, UN warns* https://news.un.org/en/story/2023/07/1138777
140 UNFPA (2022) *State of world population 2022* https://www.unfpa.org/swp2022
141 UN Women (2022), *Progress on the Sustainable Development Goals: the gender snapshot 2022* https://www.unwomen.org/sites/default/files/2022-09/Progress-on-the-sustainable-development-goals-the-gender-snapshot-2022-en_0.pdf
142 United Nations (2023) *Sustainable Development Goals report 2023* https://unstats.un.org/sdgs/report/2023/
143 Sinaga, M. et al. (2015) *Effectiveness of the population health and environment approach in improving family planning outcomes in the gurage, zone south ethiopia, BMC public health.* Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4644343/ (Accessed: 27 September 2023).
144 Ibid

# ABOUT POPULATION MATTERS

Population Matters is a UK-based charity which campaigns to achieve a sustainable human population, to protect the natural world and improve people's lives. We promote positive, practical, ethical solutions – encouraging smaller families, inspiring people to consume sustainably, and helping us all to live within our planet's natural limits. We believe everyone should have the freedom and ability to choose a smaller family. We support human rights, women's empowerment and global justice.



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