



# Three ways to think about the sixth mass extinction

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## ABSTRACT

A preponderance of evidence suggests humanity is causing a mass extinction event: the sixth mass extinction since the rise of complex life on Earth. This paper takes this empirical conclusion as given and asks a philosophical question: what is the meaning of the sixth mass extinction? How should we think about it, what should we do about it, and what does it tell us about humanity and our place in the world? Conservationists typically see mass extinction as an immense loss, as does most of the general public. But how best to characterize this loss is not immediately clear, and how we do so has important practical implications. This paper focuses on three common and plausible ways to think about the sixth mass extinction: as a loss of important resources (a mistake); as interspecies genocide (a crime); and as evidence that humanity is a cancer on the biosphere (as an inevitability). Considered together, these three approaches clarify the meaning of the sixth mass extinction and suggest how humanity ought to respond to it.

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## 1. Introduction

By all accounts, biodiversity is rapidly diminishing across the globe. The [Secretariat of the Convention on Biological Diversity \(2010\)](#) estimates that humanity could extinguish one out of every three species on Earth within the next one to two hundred years, while according to [Raven et al. \(2011\)](#), “biodiversity is diminishing at a rate even faster than the last mass extinction at the end of the Cretaceous Period, 65 million years ago, with possibly two-thirds of existing terrestrial species likely to become extinct by the end of this century.” Conservation biologists debate whether current extinction rates are one thousand times normal background rates ([Pimm et al., 2014](#)) or “only” perhaps half that ([He and Hubble, 2011](#)); they disagree on how quickly current rates are likely to ramp up in the future ([Laurance, 2006](#); [Monastersky, 2014](#)). But even using conservative estimates for current extinction rates and holding these rates steady, projecting them forward a few hundred years predicts an immense loss of biodiversity ([Ceballos et al., 2015](#)). It thus seems probable that humanity is now causing a mass extinction event: the sixth mass extinction since the rise of complex life on Earth ([Magurran and Dornelas, 2010](#); [McLellan et al., 2014](#)).

Earth is a storied planet, and a good part of that story involves life evolving ever more variety and complexity ([Rolston, 2010](#)). For more than three and a half billion years living organisms have survived, thrived, and diversified: from zero to one to one million to perhaps ten million species today ([Tudge, 2000](#)). From a likely origin in shallow ocean waters, living species colonized the land and the skies, and spread across a vast range of habitats from the tops of mountains to deep ocean trenches, from bone-dry deserts to frigid Arctic tundra to scalding

thermal pools. Life has evolved the mind-bending complexity of the cell, with its many intricate mechanisms for nutrition, respiration, and self-regulation; and the further complexities of multi-cellular organisms, including animals with their simple and sophisticated behaviors, their many ways of subjectively experiencing the world, and their varied social systems. All these organisms, in turn, interact with one another in numerous different ways within the varied and evolving ecosystems of the world. Although we cannot say that nature “wants” greater biodiversity or that our world was fated to evolve as it did, the long-term trend has been a richer and richer biosphere ([Wilson, 2010](#)). And as far as we know, no single species has ever significantly reduced planetary-level biological diversity—until now.

While paleontologists debate the causes of previous mass extinctions, the primary cause of the current one is clear: us. The consensus among conservation biologists is that the five most important “direct drivers” of biodiversity loss today are habitat loss, the impacts of alien species, over-exploitation, pollution, and climate change, in many cases synergistically magnifying each others’ harms ([Sodhi and Ehrlich, 2010, chapters 4–8](#); [Primack, 2014, chapters 7–10](#)). All five direct drivers are themselves primarily driven by increased human populations ([Brashares et al., 2001](#); [McKee et al., 2003](#)) and increased human economic activity ([Wood et al., 2000](#)), which are often misleadingly described as “indirect drivers” (“primary drivers” or “ultimate drivers” would be more accurate terms). According to the *Millennium Ecosystem Assessment*, the force of these extinction drivers increased immensely over the past century as human populations and human economies exploded in size ([Reid et al., 2005](#)). Subsequent research ([Butchart et al., 2010](#); [Steffen et al., 2015](#)) bears out the MEA’s further conclusion that the forces driving extinction are increasing as individuals pursue wealth, corporations pursue profit, governments pursue economic and demographic growth,

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and ever more people consume, degrade, and appropriate ever more resources.

In what follows, I take the empirical facts above as given and ask a philosophical question: what is the meaning of the sixth mass extinction? How should we think about it, what should we do about it, and what does it tell us about humanity and our place in the world? To most people mass extinction seems like an immense loss, but how best to characterize that loss is not immediately clear (Kolbert, 2015). From among numerous possibilities, this paper focuses on three of the most common and plausible ways to think about anthropogenic mass extinction: as a mistake, as a crime, and as an inevitability. Exploring and comparing these three approaches clarifies the meaning and moral importance of the sixth mass extinction, and suggests how humanity ought to respond to it.

## 2. 1st alternative: mass extinction as a waste of valuable resources (a mistake)

Perhaps the most common way contemporary conservation biologists talk about species extinction is as an immense waste of very valuable resources. From among numerous possible examples (e.g. Perrings et al., 2010), we can turn again to the *Secretariat of the Convention on Global Biodiversity's 3rd Global Biodiversity Outlook* (2010). "Biodiversity," its authors write, "underpins the functioning of ecosystems which provide a wide range of services to human societies. Its continued loss, therefore, has major implications for current and future human well-being. ... The provision of food, fibre, medicines and fresh water, pollination of crops, filtration of pollutants, and protection from natural disasters are among those ecosystem services potentially threatened by declines and changes in biodiversity."

In addition to biodiversity's role in securing health, physical security, and economic well-being, the authors appeal to further human interests, stating: "Cultural services such as spiritual and religious values, opportunities for knowledge and education, as well as recreational and aesthetic values, are also declining" with the worldwide reduction of biodiversity. The awkwardness of this wording ("spiritual values" provide people with "cultural services"?) suggests a problem articulating what is truly at stake in these non-economic aspects of biodiversity loss within a resource-oriented framework. Yet the authors hope that reminding readers of the full scope of human benefits derived from biodiversity strengthens their central message: "Changes in the abundance and distribution of species may have serious consequences for human societies" (*Secretariat of the Convention of Global Biodiversity*, 2010). Mass extinction of Earth's biodiversity is imprudent: a serious mistake that humanity will come to regret.

There is a solid core of truth in this way of talking about species loss. Maintaining crucial ecosystem services does sometimes depend on preserving native species and communities (Brandt et al., 2014). Arguably we are foreclosing important human possibilities through extinction and the loss of wild lands (Wilson, 2014). Beyond its truth, nature lovers hope that such resource talk will prove *useful*, giving them a means to convince those personally indifferent to species loss that they should support efforts to prevent it (Cimon-Morin et al., 2013). This potential usefulness appears to have motivated the authors of the influential *Millennium Ecosystem Assessment* to structure their analyses of biodiversity loss and ecological change within an ecosystem services framework (Wall, 2013); many conservation biologists have subsequently followed suit.

Still, this approach cannot capture the full meaning of the sixth mass extinction, for several reasons. First, it keeps the focus squarely on human beings' wants and needs, and locates the potential loss in a failure to meet them, now or in the future. But this seems perverse, since it is precisely humanity's efforts to satisfy our wants and needs that are driving global biodiversity loss (Jabado et al., 2015). Preventing mass extinction would necessarily involve reining in people's self-interested economic activities (Mushet et al., 2014; Pidgeon et al., 2014)—as well

as limiting the overproduction of human selves, each of whom inevitably places significant demands on the same limited resources needed by other organisms (Cincotta and Gorenflo, 2011; Mora and Sale, 2011). But resource talk does not lend itself to considering such limits; instead, it focuses attention on efficiently meeting ever-growing demands.

Second, the concept of "resource" strongly implies "substitutability" and hence the acceptability of extinguishing other species (Gorke, 2003; McCauley, 2006). Even quite valuable resources may be liquidated, on a standard economic view, if doing so will further human well-being. Many species, particularly rare ones, are likely of no economic value in any case, and their extinction is unlikely to affect ecosystem services (Vucetich et al., 2015). Yet many of us sense that the value of Emperor penguins or Bengal tigers cannot be fully explained by their usefulness to human beings (even on a broad understanding of 'useful'), nor can their extinction be balanced out morally by the potential benefits to people of degrading or appropriating their habitat.

Third, a focus on resource use tends to mean a focus on the short-term: attending to the next few decades in the case of particularly responsible corporate executives; looking a full century out among particularly far-seeing political leaders. But many species have existed for millions of years and could potentially exist and evolve for millions more; for example, crane (*Gruidae*) subfamilies were apparently distinct by the Late Eocene and present genera may be some 20 million years old. Many species of cranes are endangered, and ending such ancient careers through an inevitably present-centered resource consumption seems an important part of what is so wrong about the sixth mass extinction (van Dooren, 2014).

None of this means that species extinction does not involve an important loss of resources to humanity, or in some cases an unfair reallocation of resources away from human societies' poorer members. It does. Considering biodiversity as a human resource helps us capture some aspects of these losses and hence is necessary.

However, mass extinction is not just a mistake, and as a partial truth it is misleading when taken for the whole. A focus on prudent resource use cannot capture and in fact may systematically blind us to important moral aspects of the meaning of the sixth mass extinction (Deliège and Neuteleers, 2014). In particular, it obscures the independent histories and intrinsic value of other species (Agar, 2001; Cafaro and Primack, 2014). Attending to these seems likely to be particularly important if we hope to understand what it means to *end* these independent histories, or to subsume them, as tamed and ready-to-hand resources, within our own stories. Most worrying, an exclusive focus on their value as resources helps to justify the anthropogenic extinction of species that hold little or no value to humans, or that stand in the way of satisfying our interests.

## 3. 2nd alternative: mass extinction as interspecies genocide (a crime)

Many of those who study anthropogenic species extinction see it as immoral: an injustice toward other species (Callicott and Grove-Fanning, 2009; Shoreman-Ouimet and Kopnina, 2015). One forceful way to capture such a moral claim involves describing the extinction of other species as interspecies genocide. In his recent book *Planet Without Apes* (2012), for example, Craig Stanford claims that: "humans have carried out a campaign of extermination against the great apes that has reached epic proportions." "If it were a slaughter of human beings," he writes: "it would be called by its rightful name: genocide. ... Like the European colonists of the tropics who encountered widespread indigenous civilizations but declared the land to be 'empty', those who carry out the ape genocide today do it blithely, without considering their actions a violation of any natural law. Like all colonists, we kill in the name of progress and denigrate the victims to rationalize the genocide. After all, they are animals, we are humans."

The great apes may be particularly plausible candidates for such a moral claim, due to their advanced cognitive abilities, varied cultures,

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