

Humans have caused major changes to the Earth's environment. Some of the major changes include: dumping drastic amounts of carbon dioxide into the atmosphere, acidification of oceans, and production of copious amounts of trash, among other things. However, one of the catastrophic byproducts of human activity on the environment is an increased rate of species loss. It is argued that this increased rate constitutes a mass extinction, thus being the sixth mass extinction in Earth's history. This essay will briefly explore Earth and its relationship with extinctions and then evaluate if the current rate of species loss can be considered a mass extinction. According to current data, the Earth is currently experiencing a sixth mass extinction.

Over the course of the Earth's 4.5-billion-year lifespan, life has existed for about 3.5 billion years.¹ Over this timespan, Earth has experienced 5 mass extinctions. These mass extinctions are attributed to life within the Phanerozoic, as this is where abundant multicellular animal life exists. A mass extinction is defined by the "extinction of a large number of species within a relatively short period of geological time..."². This definition is vague, so we will interpolate a more specific definition by evaluating the 5 confirmed past mass extinction events. Exact numbers vary from source to source, but I will use the numbers provided by our textbook (pg. 277)¹. The first of the 'Big Five' was the Ordovician-Silurian extinction which occurred ~444Mya and resulted in a loss of 86% of species. The second is the Late Devonian extinction occurred ~372Mya and 75% of species were lost. The largest of the extinctions, the Permian-Triassic (or "Great Dying") was ~252Mya and killed off 90% of species (many other sources state between 90-96% of species loss^{3 4}). Next, the End-Triassic extinction was ~201 Mya with 80% species mortality. Finally, the Cretaceous-Paleogene (K-Pg) extinction which killed off the non-avian dinosaurs occurred ~65.5 Mya with 75% species lost. This allows us to know when the events occurred, but we still do not know the amount of time constitutes a 'short period of geologic time.' According to MIT, the End-Permian extinction likely took about 20,000 years to play out⁵. Now we can create a basic outline of a mass extinction event. To add a little bit of buffer from the numbers given, we will define a mass extinction as: at least ~70% of species loss over the span of ~50,000 years.

With a specific definition of 'mass extinction,' we can begin to evaluate the current events and determine if it constitutes one. It is believed that the current 'sixth extinction' has been caused by humans. According to Smithsonian, "within just the past 12,000 years, our species, *Homo sapiens*, made the transition to producing food and changing our surroundings."⁶ This timescale falls nicely within our definition of mass extinction. In fact, the time period in which we live has often been dubbed the 'Anthropocene' and began about 10,000 years ago.⁷ The leading characteristic of the Anthropocene is the impact humans have had on the environment. Evidence of these major changes are seen in Elizabeth Kolbert's book *The Sixth Extinction – An Unnatural History*:

¹ Textbook

² <https://www.dictionary.com/browse/mass-extinction>

³ https://en.wikipedia.org/wiki/Extinction_event#cite_note-ucr-8

⁴ <https://cosmosmagazine.com/palaeontology/big-five-extinctions>

⁵ <http://news.mit.edu/2011/mass-extinction-1118>

⁶ <http://humanorigins.si.edu/evidence/human-fossils/species/homo-sapiens>

⁷ <http://www.anthropocene.info/>

“[1] Human activity has transformed between a third and a half of the land surface of the planet. [2] Most of the world’s major rivers have been dammed or diverted. [3] Fertilizer plants produce more nitrogen than is fixed naturally by all terrestrial ecosystems. [4] Fisheries remove more than a third of the primary production of the oceans’ coastal waters. [5] Humans use more than half of the worlds readily accessible fresh water runoff.

Most significantly...people have altered the composition of the atmosphere. Owing to a combination of fossil fuel combustion and deforestation, the concentration of carbon dioxide in the air has risen by forty percent over the past two centuries, while the concentration of methane, an even more potent greenhouse gas, has more than doubled.”⁸

These major environmental impacts humans have had on the environment has drastic effects on the organisms that live there. By 2050, 30-50% of all species could be heading towards extinction.⁹ Though this does not meet the 70% threshold we set, this value is the final species extinction, whereas the 30-50% is just the short-term estimate of extinction. As time progresses, more species will likely become endangered and eventually become extinct. We should also take into consideration ‘background extinction’ rates. Extinction is a slow process that is always occurring. The natural rate of background extinction is one to five species per year. However, the current rate of background extinction is estimated to be up to 1000 times the natural rate, with dozens of species going extinct every day.⁹

This evidence suggests that the natural rate of extinction is drastically increased, with a significant cause being human interaction with the environment over the past 10,000-12,000 years. These parameters are trending towards our definition of a ‘mass extinction’ event. Because we look back on extinctions as something that has already occurred in full, and not something that is happening in the present, we can say that the Earth is experiencing a sixth mass extinction. However, this mass extinction is not over. When it is, it will likely match values akin the other 5 mass extinctions.

⁸ *The Sixth Extinction – An Unnatural History*. Elizabeth Kolbert

⁹ https://www.biologicaldiversity.org/programs/biodiversity/elements_of_biodiversity/extinction_crisis/