Mass Extinctions

What Causes Animal Die-Offs?

More than 90 percent of all organisms that have ever lived on Earth are extinct. As new species evolve to fit ever changing ecological niches, older species fade away. But the rate of extinction is far from constant. At least a handful of times in the last 500 million years, 50 to more than 90 percent of all species on Earth have disappeared in a geological blink of the eye.

Though these mass extinctions are deadly events, they open up the planet for new life-forms to emerge. Dinosaurs appeared after one of the biggest mass extinction events on Earth, the Permian-Triassic extinction about 250 million years ago. The most studied mass extinction, between the Cretaceous and Paleogene periods about 65 million years ago, killed off the dinosaurs and made room for mammals to rapidly diversify and evolve.

The causes of these mass extinction events are unsolved mysteries, though volcanic eruptions and the impacts of large asteroids or comets are prime suspects in many of the cases. Both would eject tons of debris into the atmosphere, darkening the skies for at least months on end. Starved of sunlight, plants and plant-eating creatures would quickly die. Space rocks and volcanoes could also unleash toxic and heat-trapping gases that—once the dust settled—enable runaway global warming.

An extraterrestrial impact is most closely linked to the Cretaceous extinction event. A huge crater off Mexico's Yucatán Peninsula is dated to about 65 million years ago, coinciding with the extinction. Global warming fueled by volcanic eruptions at the Deccan Flats in India may also have aggravated the event. Whatever the cause, dinosaurs, as well as about half of all species on the planet, went extinct.

Massive floods of lava erupting from the central Atlantic magmatic province about 200 million years ago may explain the Triassic-Jurassic extinction. About 20 percent of all marine families went extinct, as well as most mammal-like creatures, many large amphibians, and all non-dinosaur archosaurs. An asteroid impact is another possible cause of the extinction, though a telltale crater has yet to be found.

Largest Ever Die-Off

The Permian-Triassic extinction event about 250 million years ago was the deadliest: More than 90 percent of all species perished. Many scientists believe an asteroid or comet triggered the massive die-off, but, again, no crater has been found. Another strong contender is flood volcanism from the Siberian Traps, a large igneous province in Russia. Impact-triggered volcanism is yet another possibility.

Starting about 360 million years ago, a drawn-out event eliminated about 70 percent of all marine species from Earth over a span of perhaps 20 million years. Pulses, each lasting 100,000 to 300,000 years, are noted within the larger late Devonian extinction. Insects, plants, and the first proto-amphibians were on land by then, though the extinctions dealt landlubbers a severe setback.

The Ordovician-Silurian extinction, about 440 million years ago, involved massive glaciations that locked up much of the world's water as ice and caused sea levels to drop precipitously. The event took its hardest toll on marine organisms such as shelled brachiopods, eel-like conodonts, and the trilobites.

Happening Now?

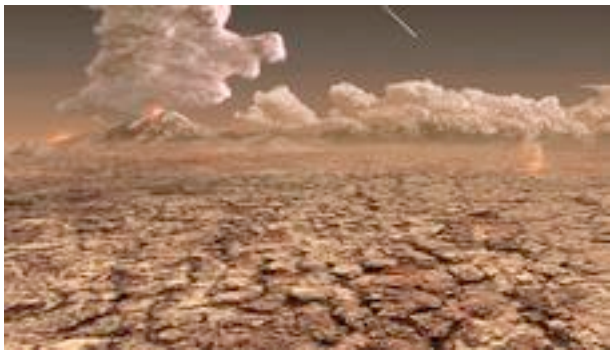
Today, many scientists think the evidence indicates a sixth mass extinction is under way. The blame for this one, perhaps the fastest in Earth's history, falls firmly on the shoulders of humans. By the year 2100, human activities such as pollution, land clearing, and overfishing may have driven more than half of the world's marine and land species to extinction.

Big Five mass extinction events

Although the Cretaceous-Tertiary (or K-T) extinction event is the most well-known because it wiped out the dinosaurs, a series of other mass extinction events has occurred throughout the history of the Earth, some even more devastating than K-T. Mass extinctions are periods in Earth's history when abnormally large numbers of species die out simultaneously or within a limited time frame. The most severe occurred at the end of the Permian period when 96% of all species perished. This along with K-T are two of the Big Five mass extinctions, each of which wiped out at least half of all species. Many smaller scale mass extinctions have occurred, indeed the disappearance of many animals and plants at the hands of man in prehistoric, historic and modern times will eventually show up in the fossil record as mass extinctions. Discover more about Earth's major extinction events below.

Ordovician-Silurian mass extinction Ordovician-Silurian mass extinction
The third largest extinction in Earth's history, the Ordovician-Silurian mass extinction had two peak dying times separated by hundreds of thousands of years. During the Ordovician, most life was in the sea, so it was sea creatures such as trilobites, brachiopods and graptolites that were drastically reduced in number. In all, some 85% of sea life was wiped out. An ice age has been blamed for the extinctions - a huge ice sheet in the southern hemisphere caused climate change and a fall in sea level, and messed with the chemistry of the oceans.

Late Devonian mass extinction Late Devonian mass extinction
Three quarters of all species on Earth died out in the Late Devonian mass extinction, though it may have been a series of extinctions over several million years, rather than a single event. Life in the shallow seas were the worst affected, and reefs took a hammering, not returning to their former glory until new types of coral evolved over 100 million years later. In fact, much of the sea bed became devoid of oxygen, rendering it effectively out of bounds for anything except bacteria. Changes in sea level, asteroid impacts, climate change and new kinds of plants messing with the soil have all been blamed for these extinctions.



Permian mass extinction Permian mass extinction
The Permian mass extinction has been nicknamed The Great Dying, since a staggering 96% of species died out. All life on Earth today is descended from the 4% of species that survived. The event turns out to have been complex, as there were at least two separate phases of extinction spread over millions of years. Marine creatures were particularly badly affected and insects suffered the only mass extinction of their history. Many causes have been proposed for the event: asteroid impact, flood basalt eruptions, catastrophic methane release, a drop in oxygen levels, sea level fluctuations or some combination of these.

Triassic-Jurassic mass extinction Triassic-Jurassic mass extinction
During the final 18 million years of the Triassic period, there were two or three phases of extinction whose combined effects created the Triassic-Jurassic mass extinction event. Climate change, flood basalt eruptions and an asteroid impact have all been blamed for this loss of life. Many types of animal died out, including lots of marine reptiles, some large amphibians, many reef-building creatures and large numbers of cephalopod molluscs. Roughly half of all the species alive at the time became extinct. Strangely, plants were not so badly affected.

Cretaceous-Tertiary mass extinction Cretaceous-Tertiary mass extinction
The Cretaceous-Tertiary mass extinction - also known as the K/T extinction - is famed for the death of the dinosaurs. However, many other organisms perished at the end of the Cretaceous including the ammonites, many flowering plants and the last of the pterosaurs. Some groups had been in decline for several million years before the final event that destroyed them all. It's suggested that the decline was due to flood basalt eruptions affecting the world's climate, combined with drastic falls in sea level. Then a huge asteroid or comet struck the seabed near the Yucatan Peninsula in Mexico and was the straw that broke the camel's back.