

A satellite photograph of Earth showing the Americas, with the title 'The Mother of All Extinctions' overlaid in white text.

The Mother of All Extinctions

By: Kale M. Jones

Snapshot of the Permian

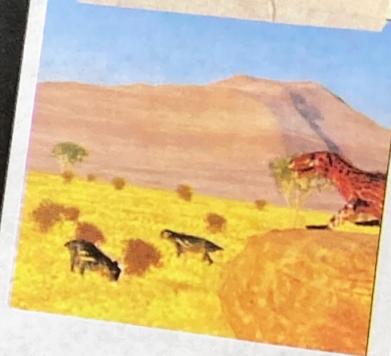
The Permian was a very diverse time in our planet's history. At this time, many of the families of flora and fauna we are familiar with today got their roots. (Erwin)



All the continents were unified into one landmass known as Pangea

Life in the Permian Cont...

Vast deserts and savannas formed in the interior of the continent as the climate became more dry and arid



Along the coast and rivers, many forests dominated the landscape, descended from the survivors of the Carboniferous Rainforest Collapse

(Erwin)

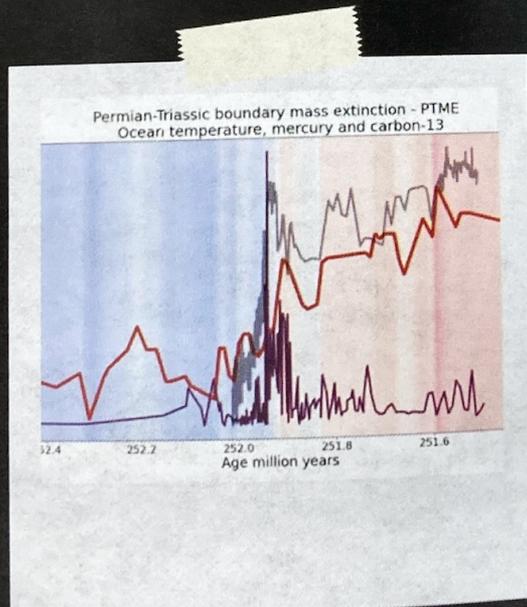
Extinction Unearthed



Paleontologists excavating deep within the ground discovered droves of fossils from roughly 300 million years ago in the Permian Basin in Texas (Erwin)

This photo depicts one of the fossil sites found in China where the most preserved fossils can be seen

Scientists in China examined the soils and found evidence for lava flows as well as severe climate cooling that lead to mass death in the ecosystem(Wang , Yue)



Beginning of the End



The high levels of Mercury and Sulfur Dioxide in the soils points to volcanism being the main driver behind the extinction and possibly some of the climate change

At the same time, climate change was significant due to the volcanic activity, large clouds of debris blocked out the sun, dampening photosynthesis and cooling the planet



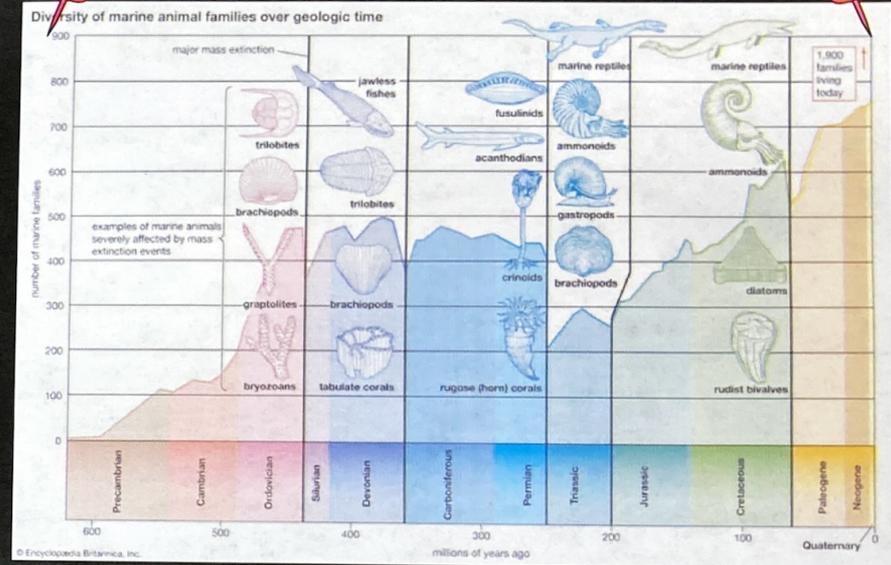
(Burgess)

The Extinction

The fossil record shows a short period of roughly 10-60 thousand years, over 90% of marine and over 70% of terrestrial flora and fauna became extinct



In Numbers



About 57% of all families in the global ecosystem were made extinct
56% of the genera were made extinct
8 Orders of insects
2/3rds of Tetrapods (Erwin)

Marine Impact

With the lack of sunlight, many of the marine plants suffered. In conjunction with the global cooling, many of the marine plants, the baseline of the foodchain, perished.



Toxins in the water also began building up due to the falling ash from the atmosphere, which made the bodies of water extremely acidic and dangerous to most life.

Terrestrial Impact

Just like in the seas, the plants suffered on land, which collapsed the food chain. Many major predators now lacked the prey they needed to survive due to all of them starving



The cooling of the atmosphere also caused mass glaciation and the destruction of the once warm and arid climate of Pangea

Recovery

Due to the catastrophic level of death that occurred during the Permian-Triassic extinction it took the ecosystem roughly 30 million years to recover (3 times the average of most mass extinctions) (Burgess)



It takes time for species to radiate out into new ones after significant disasters. But the Permian-Triassic event was different. With so many niches to be filled, it took a very long time to recover

Adaptations

Typically, the species that did survive were smaller burrowing animals that were opportunists when it came to food.



The plants that managed to survive either had small sanctuaries tucked away in hidden places or had hardy seeds that allowed them to survive for years until the conditions were good enough for them to grow (Burgess)

The Survivors



The lystrosaurus was one of the lucky few able to survive thanks to its varied diet and ability to burrow and hibernate



The cynodonts are the direct descendants of modern mammals, and many of them also survived the extinction diversifying into the many small mammals that roamed during the Triassic



Trees like the Cycads and Ginkgos were also able to survive and diversify after the extinction

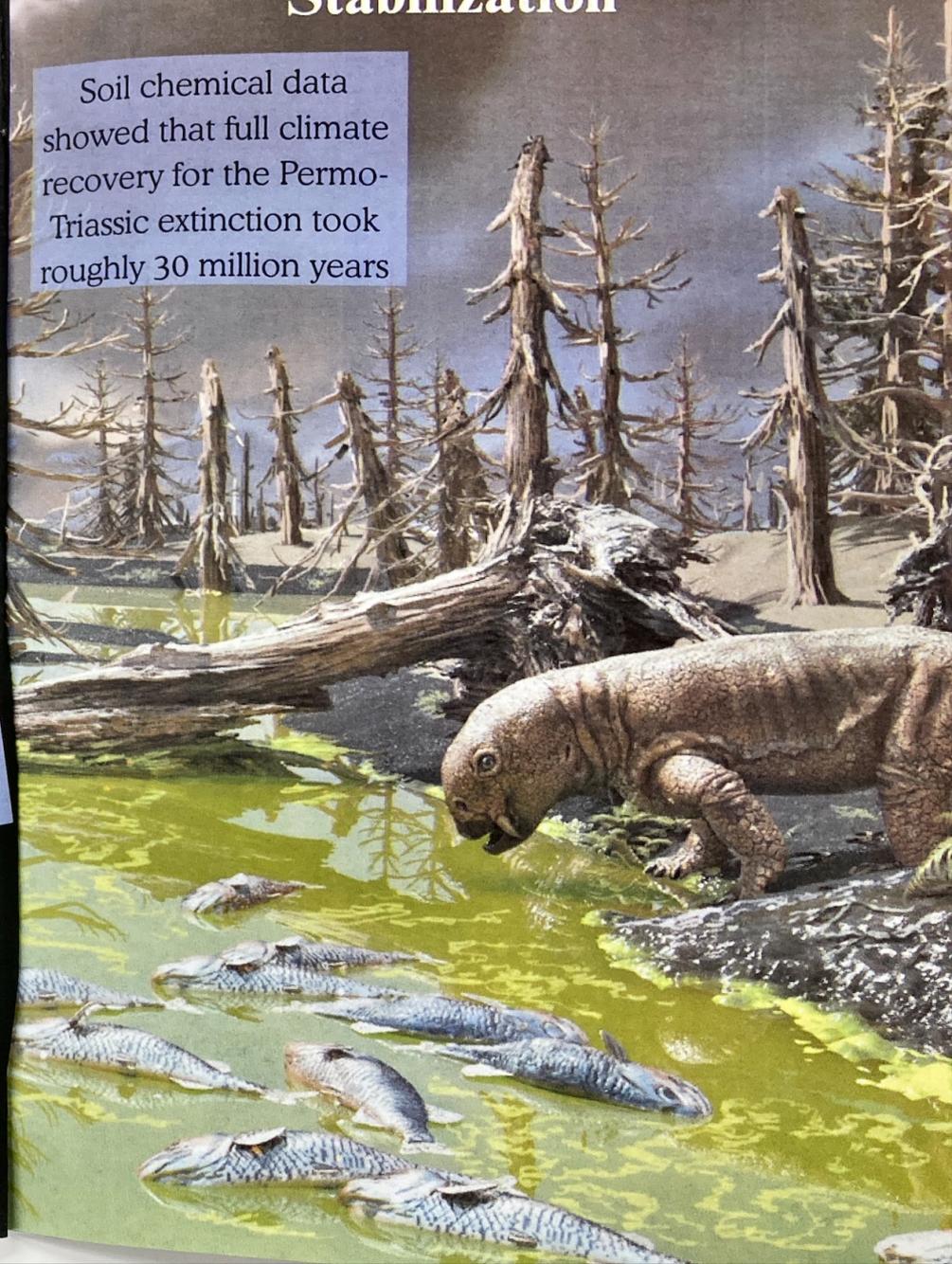


Despite the widespread devastation, many of the groups we know today survived

(Chen, Zhong-Qiang)

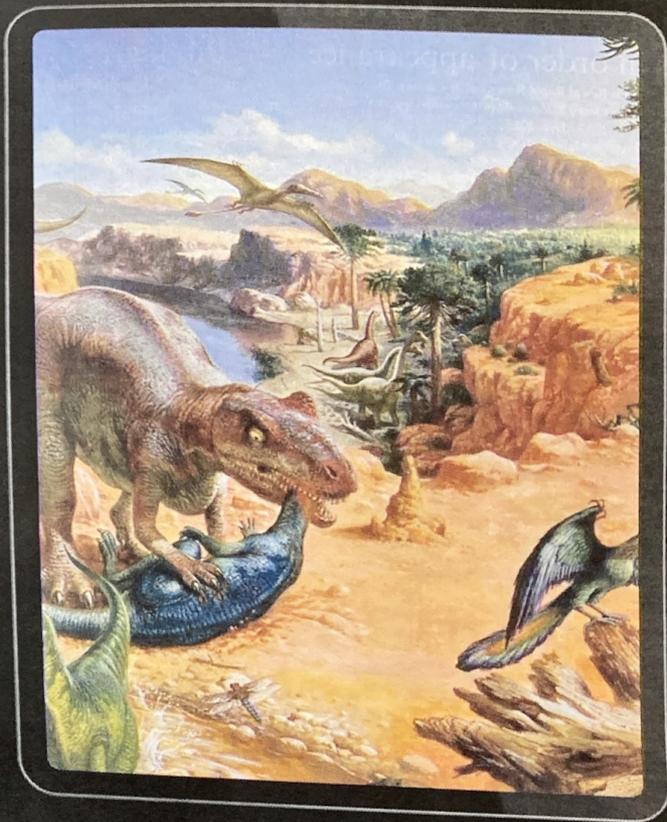
Stabilization

Soil chemical data showed that full climate recovery for the Permo-Triassic extinction took roughly 30 million years





Scientists discovered that Many of the reptilian Sauropsids evolved into the dinosaurs you know and love from later time periods (Burgess)



Relative to the Permian, the Triassic was a significantly warmer time period. This made way for the beginning of a new world order. One that would be dominated by the most amazing and interesting reptiles. The dinosaurs

Citations

Images in order of appearance

- Cdn.net. "Fossils Reveal Rapid Recovery." B-Cdn.net, 2025, [scx2.b-cdn.net/gfx/news/hires/2025/fossils-reveal-rapid-1.jpg](https://www.b-cdn.net/gfx/news/hires/2025/fossils-reveal-rapid-1.jpg). Accessed 3 Dec. 2025.
- "<https://1.redd.it/82ghqfky41w51.png>." Reddit, 2025, www.reddit.com/media?url=https%3A%2F%2F1.redd.it%2F82ghqfky41w51.png. Accessed 3 Dec. 2025.
- Sci.news. "End Permian Mass Extinction ." Sci.news, 2025, cdn.sci.news/images/2020/10/image_8965f-End-Permian-Mass-Extinction.jpg. Accessed 3 Dec. 2025.
- Bbci.co.uk, 2025, ichef.bbci.co.uk/images/ic/480x/p0c38my.jpg. Accessed 3 Dec. 2025.
- Britannica.com, 2021, cdn.britannica.com/42/79542-050-F6EFCB43/families-diversity-animal-data-Precambrian-curve-value.jpg. Accessed 3 Dec. 2025.
- Utah.edu, 2025, nhmu.utah.edu/sites/default/files/news-releases/Leshyk-survivors-pressimage_2.jpg. Accessed 3 Dec. 2025.
- Amazonaws.com, 2016, s3-us-west-1.amazonaws.com/scifindr/articles/image4s/000/002/753/large/extinction2.jpg. Accessed 3 Dec. 2025.
- Britannica.com, 2025, cdn.britannica.com/98/219698-050-47F86971/Sago-Palm-Cycad-Plant-Male-Cone.jpg. Accessed 3 Dec. 2025.
- Britannica.com, 2025, cdn.britannica.com/18/187118-050-848A8F58/leaves-ginkgo-tree.jpg. Accessed 3 Dec. 2025.
- Nocookie.net, 2025, static.wikia.nocookie.net/dinosaurs/images/6/6d/Cynognathus.jpg/revision/latest?cb=20131223153510. Accessed 3 Dec. 2025.
- Gstatic.com, 2025, encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcTN3VdwPao9aW7SrAmPxBkXeWRHKwe0QrN9ug&s=612x612&w=0&k=20&c=Isl23ZuJtoTMp0DokDITGYCR_UtIgxuXWqngvPs6w=. Accessed 3 Dec. 2025.
- Istockphoto.com, 2025, media.istockphoto.com/id/1319688417/photo/volcanic-eruption-in-iceland.jpg?b=1&s=612x612&w=0&k=20&c=Isl23ZuJtoTMp0DokDITGYCR_UtIgxuXWqngvPs6w=. Accessed 3 Dec. 2025.
- Istockphoto.com, 2025, media.istockphoto.com/id/882215864/photo/malpa%20C3%ADs-grande-near-caldera-de-los-arrabales-volcano-fuerteventura.jpg?b=1&s=612x612&w=0&k=20&c=wbw8nQR1H-2_GaCpuRUioRXBj4gOtVtGCKAXqfZxIw=. Accessed 3 Dec. 2025.
- Istockphoto.com, 2025, media.istockphoto.com/id/1300107681/photo/surface-of-the-atlantic-ocean.jpg?s=612x612&w=0&k=20&c=w_5KDIGHRBKgLzjyA6KrdFHDlrO4B2M4Ltf1WAYzGhe=. Accessed 3 Dec. 2025.
- Futurecdn.net, 2021, cdn.mos.cms.futurecdn.net/ejj9WZ2ruUsA7YaeqWb8F8-970-80.jpg.webp. Accessed 3 Dec. 2025.

Bibliography

- Erwin, D. H. "The End-Permian Mass Extinction." *Annual Review of Ecology and Systematics*, vol. 21, 1990, pp. 69–91. JSTOR, <http://www.jstor.org/stable/2097019>. Accessed 26 Sept. 2025.
- CHEN, ZHONG-QIANG, et al. "ORGANISM-ENVIRONMENT INTERACTIONS DURING THE PERMIAN-TRIASSIC MASS EXTINCTION AND ITS AFTERMATH." *PALAIOS*, vol. 28, no. 9/10, 2013, pp. 661–63. JSTOR, <http://www.jstor.org/stable/43683741>. Accessed 26 Sept. 2025.
- Erwin, Douglas H. "The Mother of Mass Extinctions." *Scientific American*, vol. 275, no. 1, 1996, pp. 72–78. JSTOR, <http://www.jstor.org/stable/24993272>. Accessed 26 Sept. 2025.
- Burgess, Seth D., et al. "High-Precision Timeline for Earth's Most Severe Extinction." *Proceedings of the National Academy of Sciences of the United States of America*, vol. 111, no. 9, 2014, pp. 3316–21. JSTOR, <http://www.jstor.org/stable/23770689>. Accessed 26 Sept. 2025.
- Wang, Yue, et al. "Quantifying the Process and Abruptness of the End-Permian Mass Extinction." *Paleobiology*, vol. 40, no. 1, 2014, pp. 113–29. JSTOR, <http://www.jstor.org/stable/44017870>. Accessed 26 Sept. 2025.