When the Earth wiped her slate clean ... again and again and again and ...

Thinking of wiping the slate clean this New Year? Before deciding on what you think needs some improvement, have a look at what the Earth has done in the past to wipe Her slate.

PRACTICAL SCIENCE WITH PHIL FREDA

Whether you stick to your New Year's resolution or not, the concept is to pick something about yourself that you feel needs some improvement.

It's a chance to "wipe the slate clean."

In fact, it may be surprising to know that "Mother Earth" has also wiped her slate clean about seven times in the history of life on earth.

According to discovery.com, this has occurred in a series of extinction-level events (ELEs). Some may even call them mass-extinction events. The first occurred approximately 2.5 to 2.2 billion years ago.

Wiping the slate clean 1: poisonous oxygen

At this point in time, all life on the planet consisted of single-celled anaerobic protobacteria. These tiny bacteria lived and metabolized food in a near oxygen-free environment. Eventually microbes began to evolve with the ability to photosynthesize sugars from light energy. This was bad news for the anaerobic bacteria to which oxygen, a byproduct of photosynthesis, is poisonous. Almost all anaerobic bacteria were wiped off the earth except those that lived in mud and other oxygen-poor environments. This event was actually a huge and important evolutionary step for oxygen-breathing animals like us.

Wiping the slate clean 2: the rise of glaciers

The next ELE annihilated approximately 57 percent of existing species at the time and occurred about 445 million years ago. Current research points to an average drop in sea level as the culprit, because of shifts in the Earth's plates. Large amounts of water became frozen on the forming supercontinent Pangea, drastically lowering the average sea level. During this time, the majority of life on Earth was comprised of shallow marine life. The changes in sea level ultimately lead to their demise.

Wiping the slate clean 3: make room for the plants

The third ELE happened approximately 370 million years ago and wiped out 50 percent of species. This event also transpired due to a change in sea level, but was coupled with a global climate change. The rise of land plants may have actually set this ELE in motion. Land plants remove mass quantities of carbon dioxide, CO_2, a greenhouse gas, from the environment. Carbon dioxide helps trap heat and removing it would cause global temperatures to fall, adding to already large glacial build-ups. The resulting accumulation of frozen water affected sea levels and the viability of marine life once again.

Wiping the slate clean 4: "The Great Dying"
The fourth ELE was responsible for wiping out 83 percent of known species and happened about 250 million years ago. This event is coined as the "Great Dying" and was close to wiping out all life. Approximately 96 percent of marine life and 70 percent of land vertebrates were wiped out. Scientists believe that a culmination of methane gas (another greenhouse gas) pocket eruptions, in what is now Siberia, a possible meteor impact and the continued formation of Pangea, which altered ocean currents, were the major contributors. Increased methane levels and a shift in ocean currents would also drastically change climates and affect all life. An impact site for the alleged meteor impact has not yet been found.

Wiping the slate clean 5: Toxic atmosphere
The next extinction event occurred at the end of the Triassic period, about 200 million years ago. It claimed about 48 percent of known species at the time. This ELE is the least well known to researchers, but current work points to a large volcanic explosion as the major player. The eruption of the Central Atlantic magmatic province spewed 528 trillion gallons of magma and 4.4 quadrillion (or 10^{15}) pounds of sulfur into the atmosphere. This would have caused global climates to shift erratically by blocking out the sun, extinguishing many forms of life.

Wiping the slate clean 6: the one that killed the dinosaurs
The sixth ELE is the most famous and happened at the end of the Cretaceous period, 65 million years ago. It was responsible for wiping 50 percent of all species. The demise of almost all the dinosaurs did happen partially because of the famed impact of a meteor at what is now the Yucatan Peninsula in Mexico, but that may have just been the icing on the cake. Along with a possible meteor, evidence shows that Pangea was splitting up and more volcanic activity was occurring. The resulting change in climate and ocean currents may have been the root problem.

Wiping the slate clean 7: a close call for Homo sapiens
The last and most recent ELE happened about 73,000 years ago and was a close call for Homo sapiens. The immense eruption of the Toba super volcano on the island of present day Sumatra may have lowered the human population to a minute 10,000 individuals. Definitely a close one!

So when picking the way you would like to wipe the slate clean this New Year, let's hope that Mother Earth tends to keep us around another few millennia before She thinks that there is a little improving that needs to be done on the Earth. What can we do to ensure our survival longer?

To start, always try to recycle and be mindful of your energy usage. I don't think that everyone should go out and buy a hybrid, but if we all try to lower out carbon footprint as much as possible, we can hopefully stop or delay another global climate change. Think about it!

Philip Freda is a graduate student candidate for the Biology master's program at St. Joseph's University in Philadelphia, where he is also a teacher's assistant in several biology classes and labs. Philip spent a summer as an intern science teacher through the Philadelphia Summer Bridge Program. Some numerical data that appeared throughout this article are courtesy of discovery.com.