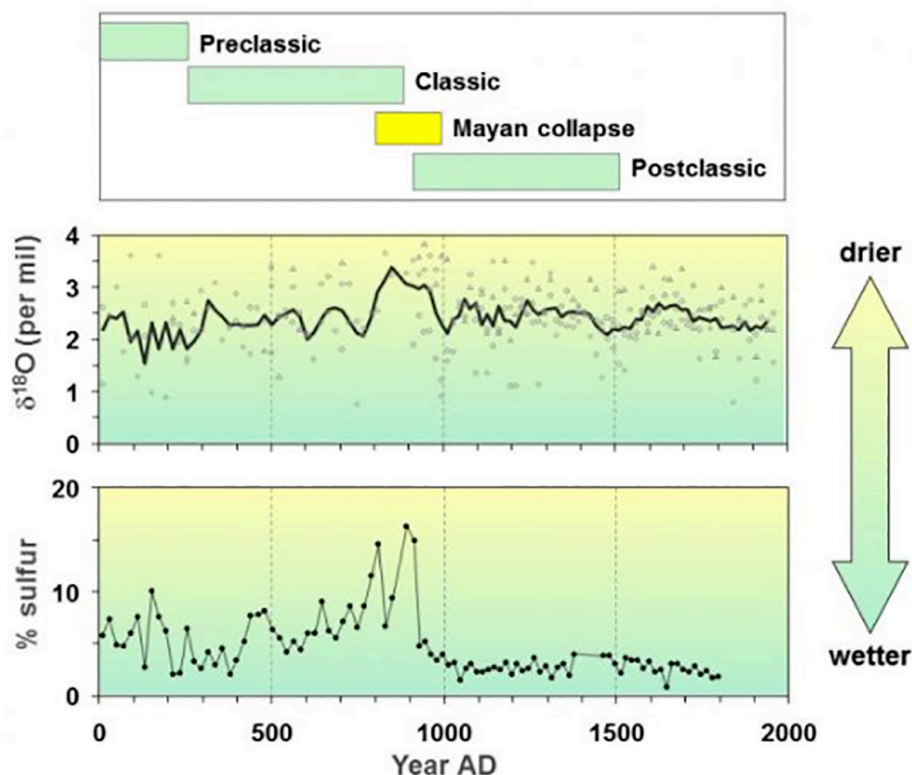


# Drought and the Ancient Maya Civilization

Originating in the Yucatan Peninsula, the ancient Maya civilization occupied a vast area of Mesoamerica between 2600 BC and 1200 AD.

Constructing thousands of architectural structures and developing sophisticated concepts in astronomy and mathematics, the Maya civilization rose to a cultural florescence between 600 and 800 AD. Then, between 800 and 950 AD, many southern cities were abandoned and most cultural activities ceased. This period is known by archaeologists as the collapse of the Classic Maya civilization. The Maya, never able to regain their cultural or geographical prominence, were assimilated into other Mesoamerican civilizations until the time of the Spanish Conquest in 1530 AD.

The cause of the collapse of the Classic Maya civilization is one of the great archaeological mysteries of our time, and scholars have debated it for nearly a century. Some scientists suggest that a period of intense drought occurred in conjunction with the Classic Maya collapse and could have contributed to the Mayans' misfortune.



Scientists reconstructed changes in the balance between precipitation and evaporation using the percent of sulfur in sediments and the oxygen isotopes of shells of gastropods and ostracods from Lake Chichancanab on the Yucatan Peninsula ([Hodell et al. 1995](#)).

Scientists have reconstructed climate at the time of the Mayan civilization by studying lake sediment cores from the Yucatan Peninsula ([Hodell et al. 1995](#); [Curtis et al. 1996](#); [Hodell et al. 2005](#)). It is possible to reconstruct changes in the balance between precipitation and evaporation (P–E), a common indicator of drought, by measuring oxygen isotope data from the shells of gastropods and ostracods. Lake H<sub>2</sub>O molecules containing the isotope <sup>18</sup>O evaporate less easily than H<sub>2</sub>O molecules with <sup>16</sup>O. Thus, during periods of strong evaporation, the lake water becomes enriched in <sup>18</sup>O (values of δ<sup>18</sup>O are high). These isotopic values are incorporated into the growing shells of gastropods and ostracods that live in the lake.

Another proxy for P–E is the percent of sulfur in the lake sediments. Evaporation concentrates sulfur in the lake water. If the sulfur concentration becomes high enough, salts such as gypsum (CaSO<sub>4</sub>) will start to precipitate from the lake water and add sulfur to the lake sediments. The variations of sulfur percentage match the variations in oxygen isotopes closely. Corroborating one paleoclimate proxy with another is an important check on proxy records and gives us more confidence in them.



Nohoch Muul Temple, the tallest pyramid at the Coba archaeological site of Pre-Colombian Maya civilization, in the jungle near Riviera Maya, Mexico. Image credit: ©Getty/Blaine Harrington III

**Findings support a strong correlation between times of drought and a major cultural discontinuity in Classic Maya civilization. It is also important to remember that other factors such as overpopulation, deforestation, soil erosion, and disease could have contributed to the demise of the Mayans.**

Distinct peaks in these two proxies reflect times of aridity on the Yucatan Peninsula. The most arid time of the last 2,000 years occurred between 800 and 1000 AD, coincident with the collapse of the Classic Maya civilization. A newer high-resolution analysis of rainfall proxies from cave deposits in the Yucatan and in Belize indicates that multiple, decadal-scale severe droughts occurred during this interval ([Medina-Elizalde et al. 2010](#); [Kennett et al. 2012](#)). Similar, though not necessarily synchronous, droughts appear to have happened in central Mexico as well ([Stahle et al. 2011](#); [Lachniet et al. 2012](#)). These findings support a strong correlation between times of drought and a major cultural discontinuity in Classic Maya civilization. It is also important to remember that other factors such as overpopulation, deforestation, soil erosion, and disease could have contributed to the demise of the Mayans.

### Some important datasets related to drought and the collapse of the Mayan civilization:

- [Hodell et al. \(1995\)](#), sediment geochemistry data from [Lake Chichancanab](#), Mexico
- [Curtis et al. \(1996\)](#), sediment data from [Punta Laguna](#), Mexico
- [Hodell et al. \(2005\)](#), high-resolution sediment data from [Lake Chichancanab](#), Mexico
- [Medina-Elizalde et al. \(2010\)](#), speleothem record from [Tzabnah Cave](#), Mexico
- [Stahle et al. \(2011\)](#), tree ring records of [Mesoamerica](#)
- [Kennett et al. \(2012\)](#), speleothem record from [Yok Balom Cave](#), Belize
- [Lachniet et al. \(2012\)](#), speleothem record from [Juxtlahuaca Cave](#), Mexico