

Climate Timeline

Citations provided for every fact, including the truths and hopes.

1. 1856: Eunice Newton Foote was the first person to identify carbon dioxide as a greenhouse gas, and hypothesized that changes in carbon dioxide in the atmosphere would affect the Earth's temperature.* Her paper "Circumstances Affecting the Heat of Sun's Rays," was presented at the 8th annual meeting of the American Association for the Advancement of Science.
 - a. <https://www.news.ucsb.edu/2018/018985/righting-scientific-wrong>, accessed 8 September 2021
 - b. <https://time.com/6089999/climate-change-hope/>, accessed 8 September 2021
 - c. <https://time.com/5626806/eunice-foote-women-climate-science/>, accessed 8 September 2021
 - d. <https://www.smithsonianmag.com/science-nature/lady-scientist-helped-revolutionize-climate-science-didnt-get-credit-180961291/>, accessed 8 September 2021
 - e. <https://www.climate.gov/news-features/features/happy-200th-birthday-eunice-foote-hidden-climate-science-pioneer>, accessed 8 September 2021
 - f. <https://www.sothebys.com/en/buy/auction/2019/history-of-science-and-technology-including-fossils-minerals-and-meteorites/foote-eunice-newton-circumstances-affecting-the>, second page/photo, accessed 25 October 2021.

**Foote was a signatory to the 1848 Seneca Falls Convention Declaration of Sentiments, of the Women's Rights Convention.*

2. 1896: Svante Arrhenius calculated that doubling the amount of atmospheric carbon dioxide would increase surface temperatures by 5–6 degrees Celsius.
 - a. Arrhenius, Prof. Svante. (1896). *On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground*. The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science. <https://doi.org/10.1080/14786449608620846>, <https://zenodo.org/record/1431217>, accessed 17 August 2021
 - b. "He went on to become the first person to investigate the effect that doubling atmospheric carbon dioxide would have on global climate." Steve Graham, January 18, 2000, NASA earth observatory website. <https://earthobservatory.nasa.gov/features/Arrhenius>, accessed 17 August 2021.
 - c. Royal Society of Chemistry, "Contrary to some misunderstandings, Arrhenius does not explicitly suggest in this paper that the burning of fossil fuels will cause global warming, though it is clear that he is aware that fossil fuels are a potentially significant source of carbon dioxide (page 270), and he does explicitly suggest this outcome in later work. https://www.rsc.org/images/Arrhenius1896_tcm18-173546.pdf, accessed 17 August 2021.

3. 1938: First peer-reviewed published a scientific paper documenting climate change.
 - a. Callendar, G. S. (1938) *The artificial production of carbon dioxide and its influence on temperature*, Quarterly Journal of the Royal Meteorological Society, Volume 64, Issue 275 p. 223-240.
<https://rmets.onlinelibrary.wiley.com/doi/abs/10.1002/qj.49706427503>
4. 1962: Rachel Carson published *Silent Spring*. Considered by many the book that created the modern environmental movement, it has been attributed to the passage of the first major U.S. environmental laws in the early 1970s.
 - a. Published September 27, 1962. https://en.wikipedia.org/wiki/Silent_Spring, accessed 27 September 2021
5. 1965: Publication of “Restoring the Quality of our Environment”, a Report of The Environmental Pollution Panel, President’s Science Advisory Committee, The White House. Appendix Y4 in particular evaluated atmospheric carbon dioxide and its impact on climate.
 - a. <https://www-legacy.dge.carnegiescience.edu/labs/caldeiralab/Caldeira%20downloads/PSAC.%201965.%20Restoring%20the%20Quality%20of%20Our%20Environment.pdf>, accessed 23 August 2021
6. 1967: Publication of the paper “Thermal Equilibrium of the Atmosphere with a Given Distribution of Relative Humidity,” written by Syukuro Manabe and Richard T. Wetherald in the *Journal of the Atmospheric Sciences*, which showed how increased levels of carbon dioxide in the atmosphere increases temperatures on the surface of Earth. Manabe won the 2021 Nobel Prize in Physics as a result of his research on modeling the atmosphere and climate. A climate scientist noted that this paper about models is “arguably the greatest climate-science paper of all time.”
 - a. <http://climate.envsci.rutgers.edu/pdf/ManabeWetherald1967.pdf>, accessed 5 October 2021.
 - b. <https://www.nytimes.com/2021/10/05/science/nobel-prize-physics-manabe-klaus-parisi.html>, accessed 5 October 2021.
7. 1970: Environmental Protection Agency founded.
 - a. <https://www.epa.gov/history>, accessed 23 August 2021
8. 1973: Discovery by Mario Malina, in the lab of F. Sherwood Rowland, that chlorofluorocarbons (CFCs) could destroy ozone. (*Both were awarded the Nobel Prize in Chemistry in 1995 for this work.*)
 - a. <https://www.sciencehistory.org/historical-profile/mario-molina>, accessed 17 August 2021.
9. 1972: Institute for Quaternary Studies founded by Hal Borns at the University of Maine, now known as the Climate Change Institute. It was the nation’s first multidisciplinary research institute created to study Earth’s long-term climate variability.

- a. <https://climatechange.umaine.edu/about/history/>, accessed 23 August 2021.
 - b. <https://climatechange.umaine.edu/people/harold-borns/>, accessed 23 August 2021; 27 September 2021
10. 1974: Bigelow Laboratory for Ocean Sciences was founded by Charles and Clarice Yentsch. Bigelow researchers study the whole of the ocean, from microbes to large-scale biogeochemical processes that make up the ocean systems.
 - a. <https://bangordailynews.com/2012/09/22/news/midcoast/renowned-maine-bas-ed-scientist-known-as-beloved-maverick-dies-at-age-85/>, accessed 23 August 2021
 - b. <https://www.bigelow.org/about/>, accessed 23 August 2021
 - c. https://en.wikipedia.org/wiki/Bigelow_Laboratory_for_Ocean_Sciences, accessed 8 September 2021
11. 1987: Montreal Protocol, an international treaty that regulates the production and consumption of ozone-depleting substances. It is “to date the only UN treaty ever that has been ratified by every country on Earth.” On December 21st, 1987, President Ronald Reagan sent the treaty to the U.S. Senate for ratification.
 - a. UN Environment Programme;
<https://www.unep.org/ozonaction/who-we-are/about-montreal-protocol>, accessed 17 August 2021.
 - b. EPA press release, “President Reagan on Montreal Protocol Ratification,” 21, December 1987,
<https://archive.epa.gov/epa/aboutepa/president-reagan-montreal-protocol-ratification.html>, accessed 27 September 2021.
12. 1988: James Hansen of the NASA Goddard Space Institute gave testimony to the U.S. Senate Committee on Energy and Natural Resources, stating unequivocally that global warming had begun and was human-caused.
 - a. Pulitzer Center, *Primary Source: Excerpt of “Greenhouse Effect and Global Climate Change” the June 23, 1988 Hearing Before the Committee on Energy and Natural Resources of the United States Senate*,
https://pulitzercenter.org/sites/default/files/june_23_1988_senate_hearing_1.pdf, accessed 18 August 2021.
 - b. Shabecoff, Phillip, “Global Warming Has Begun, Expert Tells Senate” New York Times, 24 June 1988, Section A, page 1.
<https://www.nytimes.com/1988/06/24/us/global-warming-has-begun-expert-tells-senate.html>, accessed 18 August 2021.
13. 1988: Establishment of the Intergovernmental Panel on Climate Change by the United Nations and the World Meteorological Organization
 - a. <https://www.ipcc.ch/about/history/>, accessed 23 August 2021

14. 1992: United Nations Framework Convention on Climate Change signed at the Rio Earth Summit. This Convention lead to both the Kyoto Protocol (1997) and the Paris Accords (2015)
 - a. http://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf, accessed 8 September 2021.
 - b. <https://unfccc.int/resource/docs/convkp/conveng.pdf>, accessed 8 September 2021
 - c. <https://unfccc.int/about-us/about-the-secretariat>, accessed 8 September 2021
 - d. https://unfccc.int/kyoto_protocol, accessed 8 September 2021
 - e. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>, accessed 8 September 2021
15. 2006: Release of *An Inconvenient Truth*, a documentary about the former United States Vice President Al Gore and his pursuit of helping people understand global warming.
16. 2009: *Maine's Climate Future - An Initial Assessment* published. Updates were published in 2015 and 2020. "In late 2007, Governor Baldacci asked the University of Maine and its Climate Change Institute to lead a preliminary analysis of the effects of climate change in Maine during the 21st century."
 - a. https://climatechange.umaine.edu/wp-content/uploads/sites/439/2018/08/Maines_Climate_Future.pdf accessed 23 August 2021; 8 September 2021; 27 September 2021.
 - b. <https://climatechange.umaine.edu/climate-matters/maines-climate-future/>, accessed 23 August 2021
17. 2012: Introduction of the web tool Climate Reanalzer. Created and maintained by University of Maine Climate Change Institute Research Assistant Professor and Maine State Climatologist Sean Birkel, the Climate Reanalyzer, provides public access to climate models, weather forecasts, and historical weather station data.
 - a. <https://www.mghpcc.org/data-visualization-using-climate-reanalyzer/>, accessed 8 September 2021
 - b. <https://climatechange.umaine.edu/climate-matters/climate-reanalyzer/>, accessed 8 September 2021
 - c. <https://climatereanalyzer.org/about/>, accessed 8 September 2021
18. 2015: Researchers led by the Gulf of Maine Research Institute publish a paper in *Science* explaining the impact of the rapid warming of the Gulf of Maine - 99.9% faster than any other ocean - leading to the collapse of the Gulf of Maine cod fishery.
 - a. Pershing, A, et. al. (2015) *Slow adaptation in the face of rapid warming leads to collapse of the Gulf of Maine cod fishery*, *Science*, Vol. 350, Issue 6262, pp. 809-812. DOI: 10.1126/science.aac9819

- <https://science.sciencemag.org/content/350/6262/809>, accessed 17 August 2021.
- b. “Their new study explains how rapid warming of Gulf of Maine waters — faster than 99.9 percent of the global ocean — reduced the capacity of cod to rebound from fishing, leading to collapse.”
(<https://www.gmri.org/stories/pershing-paper-gets-national-attention/>, accessed 17 August 2021.
19. January 2019: The Maine Science Festival commissions Lucas Richman to write *The Warming Sea*.
- a. Commission Agreement, Lucas Richman and the Maine Science Festival, 12 January 2019, accessed 27 September 2021
20. June 2019: Creation of the Maine Climate Council “to develop a four-year plan to put Maine on a trajectory to reduce emissions by 45% by 2030 and at least 80% by 2050.”
- a. <https://climatecouncil.maine.gov/about> accessed 23 August 2021; 27 September 2021 (date of creation: June 26th)
21. June 2019: National Geographic and Rolex Perpetual Planet Everest Expedition. This was the largest scientific expedition to Mount Everest, led by the University of Maine Climate Change Institute Director Paul Mayewski.
- a. <https://www.nationalgeographic.org/projects/perpetual-planet/everest/>, accessed 23 August 2021; 2 November 2021.
- b. <https://climatechange.umaine.edu/2019/06/13/umaine-researchers-take-part-in-national-geographic-rolex-expedition-to-mt-everest-2/>, accessed 23 August 2021
22. July 2020: Maine artist and scientist Jill Pelto commissioned by TIME magazine for the cover of the climate issue.
- a. <https://time.com/5864356/one-last-chance-time-cover/> , accessed 8 September 2021
23. December 2020: The Maine Climate Council releases “Maine Won’t Wait” a four-year plan for climate action; Maine is the first state to have a climate action plan. This report is the result of 16 months of meetings among more than 200 Mainers who are volunteering their time and expertise. They are part of the Maine Climate Council’s six working groups and a subcommittee charged with putting Maine on track to decrease greenhouse gas emissions by 45% by 2030 and 80% by 2050, as well as carbon neutrality by 2045.
- a. <https://climatecouncil.maine.gov/>, accessed 23 August 2021.
- b. https://www.maine.gov/future/sites/maine.gov/future/files/inline-files/MaineWontWait_December2020.pdf, accessed 8 September 2021.
24. August 2021: Publication of the Sixth Assessment Report from the United Nations Intergovernmental Panel on Climate Change, an all-volunteer team of thousands of

scientists from 195 countries. It states: “It is unequivocal that human influence has warmed the atmosphere, ocean, and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere, and biosphere have occurred.”

The *New York Times* reported, “Earth is getting so hot that temperatures in about a decade will probably blow past a level of warming that world leaders have sought to prevent, according to a report released Monday that the United Nations called a ‘code red for humanity.’”

- a. <https://www.ipcc.ch/about/> , accessed 8 September 2021
 - b. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Headline_Statements.pdf , accessed 8 September 2021
 - c. <https://www.nytimes.com/2021/08/13/podcasts/the-daily/climate-change-IPCC.html>, accessed 8 September 2021
25. November 2021:2021 United Nations Climate Change Conference (COP26). While no large agreements were coming out of this Glasgow conference, there were agreements that countries would meet next year to pledge cuts in carbon dioxide emissions; there will be an increase in money available to poor countries to help them address the effects of climate change; and for the first time, a plan to reduce the use of coal.
- a. <https://www.bbc.com/news/science-environment-56901261>, accessed 16 December 2021
 - b. <https://www.ieta.org/resources/Resources/COP/COP26-Summary-Report.pdf>, accessed 16 December 2021
 - c. <https://www.carbonbrief.org/cop26-key-outcomes-agreed-at-the-un-climate-talks-in-glasgow>, accessed 16 December 2021
26. March 19, 2022. The world premiere of *The Warming Sea*, an exploration of hope in the face of the climate crisis. Commissioned by the Maine Science Festival, composed by GRAMMY award winner Lucas Richman, and performed by the Bangor Symphony Orchestra.