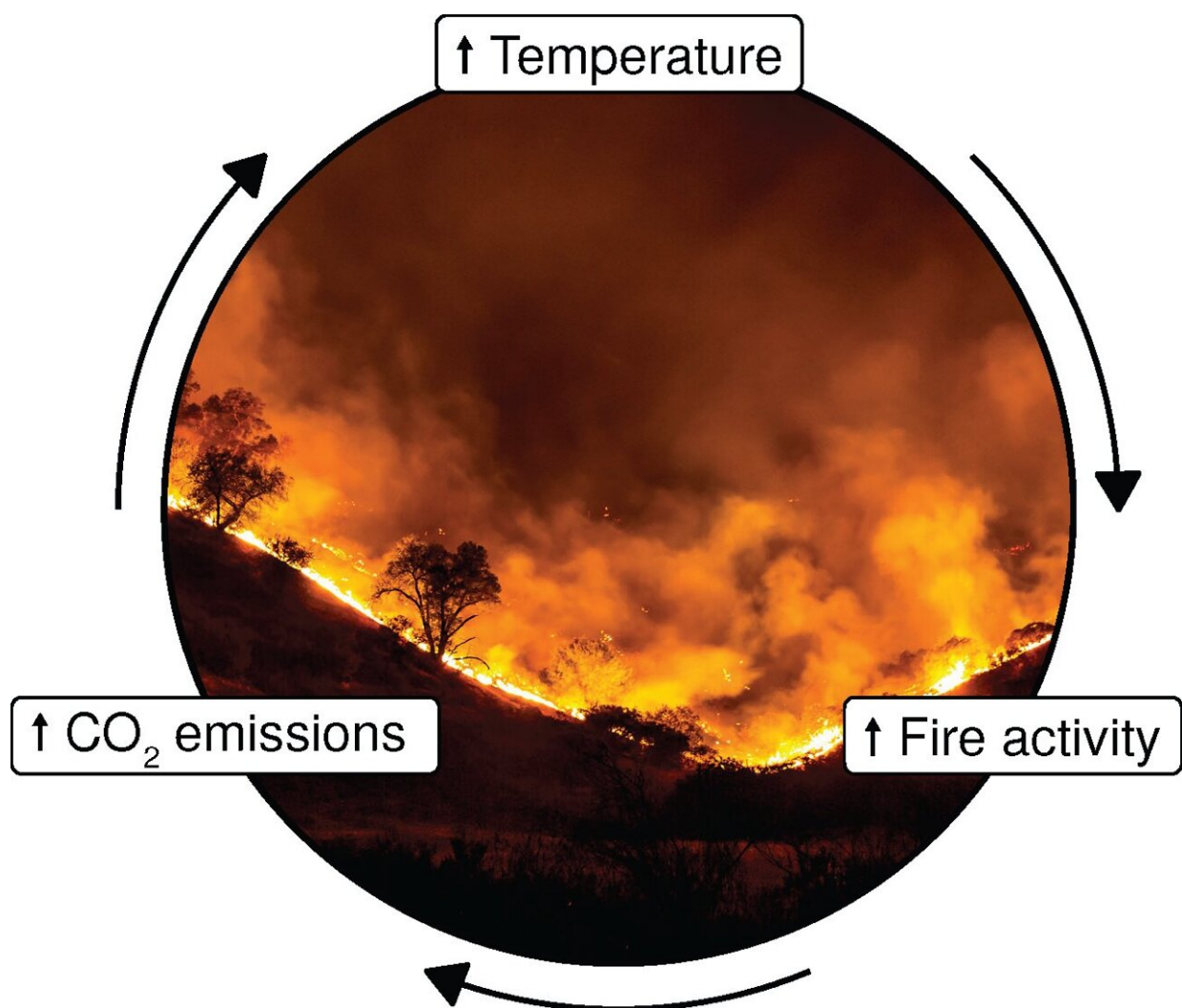


Scientists warn that many dangerous feedback loops make climate action more urgent

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The wildfire-climate change feedback loop. Credit: Chris Wolf, William Ripple, background photo by Peter Buschmann

A new report written by an international team of researchers, including scientists from Oregon State University (OSU), warns of many risky climate feedback loops and the need for action in both research and policy. Published in the journal *One Earth* today (February 17), the report states that partly due to amplifying climate feedbacks, "a very rapid drawdown in emissions will be required to limit future warming."

Researchers from the United States and Europe listed and described 41 climate [feedback loops](#) that have major implications for the outlook on [climate change](#). Climate feedback loops are processes that can either amplify or diminish the effects of our greenhouse gas emissions, initiating a cyclical chain reaction that keeps repeating again and again. There are many large amplifying feedbacks that accentuate warming. In total, the researchers identified 27 amplifying feedbacks, 7 dampening feedbacks, and 7 uncertain feedbacks.

The lead authors, Christopher Wolf, a postdoctoral researcher at OSU, and William Ripple, a distinguished professor of ecology at OSU, were joined by several US and international scientists who are credited as co-authors on the report. Ripple is also an affiliate scientist with the Conservation Biology Institute.



Permafrost. Credit: Brandt Meixell, USGS

The authors highlight several particularly troubling feedback loops such as the permafrost feedback wherein rising temperatures lead to permafrost thawing, which results in more [carbon dioxide](#) and [methane emissions](#), leading to further warming. Other potentially dangerous feedbacks include drying or smoldering peatlands and forest dieback.

Because these feedbacks may not yet be fully incorporated into [climate models](#), current emissions drawdown plans could fail to adequately limit future warming. In addition, "some climate feedback loops are

associated with tipping points, which will make it difficult to reverse their effects," said co-author Jillian Gregg, a scientist at Terrestrial Ecosystems Research Associates.



Sea ice. Credit: Patrick Kelley, U.S. Coast Guard

Motivated by the many amplifying climate feedbacks, the authors make two recommendations. With regard to climate research, a rapid transition toward integrated Earth system science is needed in order to fully account for biological, social, and other interactions that may influence the climate. In terms of climate policy, more ambitious plans for emissions drawdown should be pursued given both ongoing climate

disasters and long-term catastrophic risks.

Such plans could include employing nature-based solutions to sequester more carbon from the atmosphere. "The strategic establishment of large natural carbon sinks such as forests is a critical step toward reaching carbon neutrality," said Ripple.



Wildfire. Credit: Peter Buschmann

The authors concluded by issuing a call for transformative change to address the climate crisis and dangers posed by feedback loops. According to Wolf, "policies are needed to facilitate transformative and

socially just changes across many sectors, including energy and food production."

The paper is accompanied by the launch of a [feedback loops website](#) with animated feedback loops inspired by the study.

More information: Many risky feedback loops amplify the need for massive climate action, *One Earth* (2023).

[www.cell.com/one-earth/fulltext ... 2590-3322\(23\)00004-0](http://www.cell.com/one-earth/fulltext ... 2590-3322(23)00004-0)

Provided by Conservation Biology Institute

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