

News in focus

weather is not unexpected as the planet warms. “Climate change is definitely a factor that is causing these extreme conditions to occur more frequently,” says Jain.

The warmth and lack of rain have left soils and forests as dry as tinder, so when a fire ignites it can grow and spread quickly – including in places where large, destructive fires are usually rare, such as the eastern provinces of New Brunswick and Nova Scotia. More than 4 million hectares of forest have already burnt across Canada this year – double the historical average and a number that is usually reached much later in the season (see ‘Early start’).

Nor is it common for the smoke to affect so many people in the eastern United States. The reason for the orange skies in New York City and elsewhere was a large low-pressure system that was sitting over Maine for several days. The system blocked transport of the smoke to the east, and its anticlockwise winds acted like a conveyor belt, dragging smoke south to the eastern seaboard, says Jain. The system started to break up at the end of last week, bringing some relief.

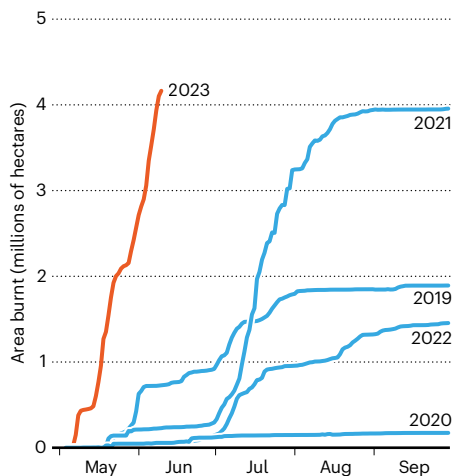
The on-the-ground causes of the fires vary across the country. Fires in the broad band burning across the middle of the province of Quebec, whose smoke travelled to New York City and other US sites, were probably ignited by lightning, says Marc-André Parisien, a research scientist at the Canadian Forest Service. Lightning is usually responsible for about half of all fires in Canada, and 85% of the area burnt each year.

Human mistakes

But this year, most of the fires in the western provinces and on the east coast came earlier than lightning is typically reported and were probably caused by human activity. One fire near St Andrews in New Brunswick province,

EARLY START

A warm, dry spring in Canada led to an earlier-than-usual start to the fire season, with the area burnt this year already surpassing that razed by the end of 2021’s extreme fire season.



for example, started when an all-terrain vehicle caught fire on a trail, igniting the surrounding woods. “The biggest thing we need to do, especially in the east, is make people aware of their role in fires,” says Taylor.

The year’s extreme fire season is part of an ongoing trend in Canada and around the world, says Parisien. Canada has more large fires, they are burning larger areas and the fire season is getting longer – it now starts about a week earlier and ends a week later than it did 50 years ago (C. C. Hanes *et al.*

Can. J. Forest Res. **49**, 256–269; 2018). Extreme weather that promotes fire – hot, dry and windy – is becoming more common, both in Canada and globally (P. Jain *et al. Int. J. Wildland Fire* **26**, 1009–1020; 2017).

Despite the huge areas that have already burnt this year, we are not out of the woods yet. Depending on the weather, the fires could continue for months with little respite. “If the warm, dry weather continues, there is lots of fuel in the forest to burn,” says Taylor. “It’s not going to be exhausted any time soon.”

UKRAINE DAM COLLAPSE: WHAT SCIENTISTS ARE WATCHING

Extensive flooding could have severe consequences for farming, health and the environment.

By Miryam Naddaf

The 66-year-old Kakhovka dam on the Dnieper River in south Ukraine collapsed on the morning of 6 June after a suspected explosion, triggering a catastrophic humanitarian and environmental crisis.

Spanning an area of more than 2,000 square kilometres, the dam’s reservoir is the country’s largest in terms of water volume. The dam has been controlled by Russian forces for more than a year.

The breach triggered extensive flooding, which peaked at a depth of 5.6 metres in Kherson on 8 June and has already displaced more than 20,000 people across dozens of settlements, including in Russian-held areas on the river’s lower-left bank. The deluge is expected to continue for at least a week.

Nature spoke to researchers about the continuing impacts of the disaster.

What are some of the immediate consequences?

Before the breach, the Kakhovka reservoir held more than 19 cubic kilometres of water. “Now, there are only 11 cubic kilometres of water left,” said Oleksandr Krasnolutskyi, Ukraine’s deputy minister of environmental protection and natural resources, in Kyiv, at a press briefing on 8 June.

The reservoir provides water for more than 700,000 people in south Ukraine. Cities on the Dnieper River, including Kherson, Nikopol, Marhanets and Pokrov, are short of water supplies, according to the United Nations.

And the flood waters themselves have

caused extensive damage – destroying homes, roads and other crucial infrastructure.

How might the flooding affect farming and food security?

As the water level continues to drop, there will not be enough water for the irrigation canals that the reservoir usually serves, says Roger Falconer, a water engineer at Cardiff University, UK, who models dam failures. “It could affect crops both downstream and upstream.”

“We will not be able to cultivate agricultural plants on this soil for many years.”

Flood water has inundated large areas of farms and arable lands, washing away their topsoil layers, according to Ukraine’s environment ministry.

“We will not be able to cultivate agricultural plants on this soil for many years,” said Krasnolutskyi. Falconer adds that the floods could wash fertilizers used on agricultural land into the river, where they could disrupt aquatic ecosystems.

What are the other environmental impacts?

The sudden surge of water downstream has had immediate and far-reaching impacts on the biodiverse ecosystems. “Nearly 160,000 animals and 20,000 birds are under threat because of the catastrophe,” said Krasnolutskyi.

Some of those species are rare, or found only



Large sections of Ukraine's Kakhovka dam have collapsed, unleashing catastrophic floods.

in this area. They include the vulnerable Nordmann's birch mouse (*Sicista loriger*) and the endangered sand mole rat (*Spalax arenarius*), according to a report by the Ukrainian Nature Conservation Group (UNCG) in Vasyliuk.

The Kakhovka reservoir itself is home to dozens of fish species. The rapid draining of its water means that vast numbers of fishes will be either stranded in shallow, dried-up zones or swept away to sea, where they will perish in the salt water.

"What we have seen is the tip of the iceberg," says Oleksii Vasyliuk, an environmentalist and co-founder of the UNCG. "This is ecocide."

Nearby national parks have also been flooded, which will cause irreparable damage to their flora and fauna.

Nine sites in Ukraine's Emerald Network, a Europe-wide conserved area, as well as five internationally important wetlands have been flooded. Around 55,000 hectares of forest have been inundated with water that is predicted to remain stagnant for 20 days, according to the environment ministry.

Does the dam's proximity to a nuclear power plant pose a danger?

Europe's largest nuclear power plant, in Zaporizhzhia, is located around 150 kilometres upstream of the Kakhovka dam. The plant's six reactors have been shut down for more than eight months – but it needs cooling water to manage the residual decay heat. The reactor is continuing to pump cooling water in from the reservoir, according to the International Atomic Energy Agency.

If the water level in the Kakhovka reservoir drops too low to be able to supply cooling water, Zaporizhzhia can switch to alternative water supplies. There are also two cooling towers that use the atmosphere for cooling, and

require only a small amount of water to operate, says Malte Jansen, an energy scientist at the University of Sussex in Brighton, UK.

Perhaps more concerning is the potential dispersal of toxic compounds. More than 150 tonnes of machine oil from the Kakhovka hydroelectric power station, which sits on the dam, have spilt into the Dnieper River, according to the environment ministry. The

flood water also carried garbage, together with construction waste and sewage, into the Dnieper watershed, according to Krasnolutskyi, where it could potentially contaminate supplies of drinking water.

What can be done to address the situation?

If the reservoir's water level continues to fall, it will eventually return to the baseline level before the dam was built, says Falconer.

He adds that the collapse will ultimately change the reservoir's bed topography, and that it could also increase shear stress, the force of water flowing against the river bed, which would disturb any toxic sediment there.

"It will be necessary to either plant [upstream] areas with a forest, or sow meadow grasses so that the wind does not blow away this silt at the bottom of the dried reservoir, because it is contaminated with waste from Zaporizhzhia," says Vasyliuk.

The environment ministry says that a scientific survey will be needed to explore whether the dam should be rebuilt. But a complete assessment of the flood's impact is unlikely at present: Russian forces currently control the south side of the river, where most of the flooding has occurred.

"Nothing can be done to minimize the consequences," says Vasyliuk. "This is a zone of both an environmental disaster and active hostilities."

MORALITY IS DECLINING, RIGHT? SCIENTISTS SAY THAT IDEA IS AN ILLUSION

People around the world have long held that morals are decaying – but data contradict that perception.

By Mariana Lenharo

Adam Mastroianni was always bothered by anecdotal claims that people are becoming less kind, respectful and trustworthy over time. So he took a deep dive into decades' worth of survey results and other data.

Mastroianni and his collaborator have found that people worldwide have perceived a general moral decline for at least the past 70 years (A. M. Mastroianni and D. T. Gilbert *Nature* <https://doi.org/kd8g;2023>). But the data also show that individuals' evaluation of their contemporaries' morality has remained largely unchanged during that time. Mastroianni, a psychologist at Columbia

University in New York City, and his co-author Daniel Gilbert, a psychologist at Harvard University in Cambridge, Massachusetts, conclude that the perception of moral decline is an illusion. The work was published in *Nature* on 7 June.

Not so nice

To examine the idea that morality is waning, Mastroianni and Gilbert analysed US surveys about moral values conducted between 1949 and 2019. In response to around 84% of the survey questions, most participants reported that morality had declined. Similar results were seen in surveys done in 59 other countries.

The authors also conducted their own