

Q&A: Scientist explains effects of Canadian wildfires on local air quality

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As wildfires rage in Canada, officials warned that the country was on track for its worst-ever year of wildfire destruction as warm and dry conditions are forecast to persist through to the end of the summer after

an unprecedented start to the fire season.

Much of our area is feeling the effects, with hazy skies that smell like campfire for the second day in a row throughout most of New Jersey and surrounding states. Earlier today, the New Jersey Department of Environmental Protection (NJDEP) issued a Code Red Air Quality Alert for Wednesday, June 7 and forecasted a Code Orange for June 8. Photos from the web and social media showed smoky, haze filled skies that look like stills from an apocalyptic film.

We asked Yuan Gao, Professor in the Department of Earth and Environmental Sciences at Rutgers University-Newark, about the current and long-term effects of the fires on air quality locally and afar.

Gao's research is in the fields of atmospheric chemistry, focusing on air quality and pollution and atmospheric deposition to aquatic systems. She and her team seek to understand the processes affecting the atmospheric composition and its impact on the human environment and global biogeochemical cycles.

Her current research spans the globe, from air quality and urban air pollution around the metropolitan areas of New Jersey to studying [atmospheric particles](#) and nutrient iron deposition to the Arctic Ocean, Southern Ocean and Antarctica. During the COVID-19 period, the Gao group collected and are now analyzing [observational data](#) to address the COVID-19 impact on air quality in NJ.

How did the smoke from Canada get to this area?

The smoke from Canada gets to our area by wind, that is, winds blow from northwest to southeast, and we are downwind of the Canadian wildfires.

Can you explain the science behind how fires affect the air quality of surrounding areas?

Fires can affect air quality of not only surrounding areas but also far away regions. This is because fires generate and release large amount of substances into the air that are pollutants and that reduce air quality. For example, [volatile organic compounds](#) and nitrogen oxides emitted from fires can form ozone in the air, which is an air pollutant that has negative impact on air quality.

In addition, fires also release lots of tiny particles or debris into the air, and such small particles reflect and scatter sunlight, reducing visibility. These small particles could be enriched with toxic metals such as mercury, causing [health effects](#) when they are inhaled. The fire-generated pollutants can be transported by winds to regions far away from the fire sources, and therefore local fires can have profound negative impact on regional and even global scales.

Is this the first time this has ever happened on the East Coast?

Similar things may have happened in the past, but this time the impact is so obvious due to the extremely intense and widespread wildfires in Canada.

What can we do to protect ourselves if outside? Should we cancel outdoor events?

Such degradation of air quality negatively impacts people's health. During the episode we are experiencing today, outdoor activities should be limited. Sensitive groups, including the elderly, children, and those

with heart disease and with respiratory conditions should stay indoors. We should limit the time or intensity of outdoor exercises and avoid doing physical activities near the areas with high pollution, such as high traffic areas.

People also should pay attention to the guidance from local authorities, such as the university alert we received today.

How long will these effects last? Is this a temporary problem or are there long-term ramifications for what's happening right now?

The effects of fires on air quality can be reduced and disappear with time after the fires stop in the fire-impacted areas, as winds can disperse those substances derived from fires and particles from fires may also settle down through the air. However, health effects from fires may stay for quite a long time.

Forest fires generate smoke that irritates our eyes, nose, throat, and lungs, and thus exposure to fires can surely affect our health. One way is by inhaling toxic substances emitted from fires, and health effects from this may stay for quite long time. Some people may have an asthma attack from the inhalation of high levels of smoke or particles in the fire-impacted areas. Hospital admissions may increase due to lung complaints during and after fire seasons. All of these could be long-term health effects, lasting over months and even a year or longer.

What are some things people should do in affected areas to protect themselves? And what should they avoid?

People in the fire affected areas should try their best to reduce and avoid their exposure to smoke. Things people could do include:

1. Stay indoors; keep a respirator handy or tightly snug to your face to filter out smoke if needed,
2. try to stay in an isolated space away from outside impacted air, such as a room with windows closed,
3. put up a filter or a portable air cleaner in the room where you stay to keep air clean.
4. Pay close attention to local weather warnings and local air quality index readings, and follow safety and emergency instructions.

Are there certain types of filters or air cleaners that are better than others? What should someone look for when purchasing a filter?

With respect to maintaining clean air indoors, there are different kinds of air filters that can be used indoors. People should be encouraged to install high efficiency particulate air (HEPA) filters, based on rating such as by MERVs. MERVs stand for Minimum Efficiency Reporting Values that report the efficiency of a filter in capture of air particles between 0.3 and 10 micrometers in diameter.

The higher the MERV rating, the more efficient the filter. For homes with individuals in at-risk groups including [older adults](#) and young children, people with heart and lung disease, and pregnant women, installing the filters with MERV 13 or higher is encouraged if all possible. People should closely follow the advice and instructions from their local public health agencies in selecting air filters appropriate for different situations.

Will this cause any long-term or permanent changes

in air quality? Will it have other long-term effects?

Yes. This is because fires release large amounts of carbon dioxide, [black carbon](#), brown carbon, small particles and ozone precursors into the atmosphere. These greenhouse gases and particles affect the atmosphere, radiation levels, cloud formation, and climate on regional and even global scales. Such changes in the atmospheric composition could be long lasting.

Greenhouse gases and particles emitted by fires affect the atmosphere, radiation levels, cloud formation, and climate on regional and even global scales.

The carbon dioxide and other [greenhouse gases](#) released from the fires will stay in the atmosphere for a long time and that will continue to warm the planet for many years to come. As consequences, such warming could fuel more dangerous wildfires. The fires can damage forests, reducing their ability to remove carbon dioxide from the air. Fires also contribute to the formation of ozone in the air, and ozone is an air pollutant and has degenerative impact on the growth of plants.

Some fires are preventable, as such fires often started by human error. We should equip ourselves with sufficient knowledge about wildfire prevention. We should also plan ahead of time in fire-prone regions and strictly follow safety and evacuation instructions issued by local and regional public health agencies.

With climate change and other circumstances, can we expect to deal with this more frequently in the future?

Warming and the changes in precipitation and atmospheric circulation would be among the factors affecting the frequency of wildfires.

Is there anything we as individuals or as a society can or should be doing to help prevent this from happening in the first place?

As fires emissions reduce [air quality](#), we should be cautious with all activities in a wildfire-prone area and try to stop fires from starting. We should never leave a fire unattended, not start a fire on a high-wind day, dispose used matches in a cup of water, etc.

Is this damage something that can be reversed? How?

I think that the damage would be hard to reverse.

Provided by Rutgers University

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