

AIR QUALITY AND CLIMATE CHANGE

Summary produced by the Blackfeet Environmental Office
in cooperation with the Center for Large Landscape Conservation

For more information visit blackfeetclimatechange.com

Climate change is impacting air quality, and evidence indicates that climate change is related to increased instances of asthma, respiratory allergies, and airway diseases. These health challenges, due to air quality, have already been on the rise within our Blackfeet community. Airborne allergens and contaminants are increasing, as are risks to indoor air quality. Rodent populations are also increasing, amplifying risk of exposure to the pathogens and allergens they carry and that are transmitted through the air. Our decisions and actions can influence the degree to which our community will experience these impacts to our health. Being proactive and making decisions now to safeguard health will help us be more resilient.

AIRBORNE CONTAMINANTS AND ALLERGENS ARE INCREASING.

Contaminants and allergens can irritate people's lungs, aggravate existing health conditions like asthma, and exacerbate chronic obstructive pulmonary diseases. Levels of particulate matter (fine particles in the air that are harmful to breathe) are influenced by both vehicle and industry emissions, along with changes in weather. In particular, climate change is impacting wildfire, airborne dust, pollen, and mold spores, as discussed below.

WILDFIRES AND OZONE

Wildfires are growing more frequent and severe and fire seasons are lasting longer. Wildfires emit fine particles and ozone precursors into the air. Fine particles, or particulate matter (pm) from wildfires, can increase the risk of hospital visits and premature death.



You may have heard about the “ozone layer” or “ozone pollution” when hearing in the news about global warming. Ozone precursors are a type of pollutant that comes from the use of fossil fuels. When fossil fuel exhaust reacts with sunlight, something called “ground-level ozone pollution” occurs. Climate change will likely increase ground-level ozone, and heat can amplify the effects of ozone on cardiovascular disease. Ground-level ozone is “bad ozone” because it is harmful to people. It is not the same thing as the “good ozone” in the atmosphere that shields us from the sun's ultraviolet rays. Even rural areas can experience high levels of ozone since it can be transported by the wind. Ozone forms when emissions from cars or power plants (nitrogen oxides) react with pollutants from other sources (volatile organic compounds) in the presence of sunlight. This type of airborne contamination (ground-level ozone) causes:

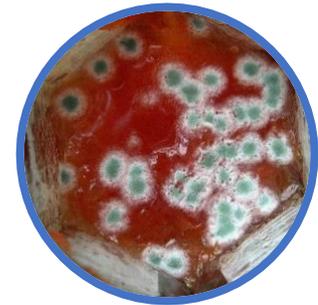
- Irritation of the respiratory system, including throat irritation and coughing.
- Difficulty in breathing, caused by reduced lung function. Also, breathing restrictions from increased ground-level ozone pollution could cause physical activities to be minimized, most especially outdoors.
- Asthma becomes worse when ozone levels increase. Community members with pre-existing asthma could have more frequent attacks that necessitate a doctor's care or hospitalization. The reason this happens is because ozone makes people more sensitive to allergens that trigger asthma attacks.
- Increased ground-level ozone means increased susceptibility to respiratory infections.

- Increased ozone also causes inflammation and damage to the lining of the lungs. By understanding that lung tissue is very fragile, like tissue paper, we can also understand how it is easily damaged. When lung cells become damaged (from fine particulate or an unhealthy ground-ozone level), the damaged cells slough off (like skin cells when dry or sunburned). Over time, the repeated shedding of these damaged cells causes scarring. Scarred lung tissue cannot absorb oxygen, nor continue to do the job that Creator has made lungs to do.

Although the Blackfeet Nation is not a large urban community, we can still pay attention to what is happening around us. Researchers have learned that there is a growing association between premature death and ground-level ozone increases.

MOLD SPORES

With changes in precipitation patterns (like earlier snowmelt and increased precipitation in the late winter and early spring), the risk of indoor dampness may increase, especially in homes that are already in poor condition or homes located in a flood-prone area. Damp homes are more likely to produce mold, dust mites, and bacteria, and to release volatile organic compounds that negatively impact human health. Moisture encourages mold growth. We have seen increased mold events within the Blackfeet Community. One only needs to think about the mold problems in Glacier Homes to know that mold is a common health stressor in Blackfeet Country. Mold spores may increase in areas seeing increased precipitation, triggering health problems.



POLLEN

Growing season lengths for ragweed and other plants, that can trigger allergic and asthmatic reactions, are increasing in many places. These longer growing seasons are causing more pollen to be released into the air. Not only are plants that people are allergic to increasing, but the pollen itself is becoming more allergenic, meaning the same amount of pollen -or even less- is becoming more likely to trigger an allergic reaction. The geographic range of such plants is spreading as well. At the same time, it is also possible that as some areas become drier, allergic and asthmatic responses may decrease, since plant stress might reduce the length of pollen season. Both scenarios are possible in Blackfeet Country.



AIRBORNE DUST

As climate change increases drought conditions within the Blackfeet Nation and around the world, airborne dust may increase. If this airborne dust, or particulate matter (pm), is small enough (pm2.5), it can travel deeply into the lungs and cause damage. Pm 2.5 means particulate matter that is the size of 2.5 microns. A micron is a measurement, just like inches, but there are about 25,000 microns in an inch. Larger particulate matter in airborne dust will become lodged in the respiratory tract before reaching the lungs. Smaller airborne dust particles can travel deep into the lungs, causing scarring and increased lung and heart disease, due to inability to absorb oxygen at a healthy level. We have experienced the pain of family and community members leaving us, or suffering still, due to lung diseases not related to smoking. These unexplained lung diseases could be related to airborne dust. We are beginning a research project to learn if there is any relationship and how we can prevent this from continuing within our people.



RISKS TO INDOOR AIR QUALITY ARE INCREASING

Indoor air contaminants can include carbon monoxide, particulate matter, nitrogen-dioxide, formaldehyde, radon, mold, and pollen. As the climate changes, people may change the amount of time they leave their windows open, influencing how much indoor air mixes with outdoor air. This is



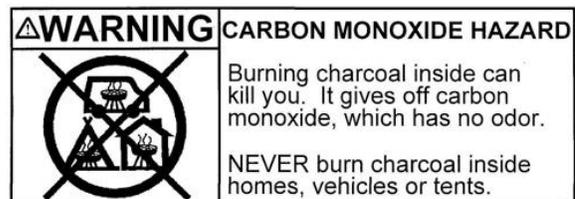
Photo by Chemical Heritage Foundation, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=43111881>

relevant because concentrations of contaminants can change according to how much fresh air mixing with indoor air occurs in a building. While opening windows and doors may decrease concentrations of indoor air contaminants (when the air outside is cleaner), it can also reduce indoor air quality when outdoor air has more contaminants. For example, when wildfire smoke is in the air or when plants are producing large amounts of pollen, opening windows could bring more contaminants inside. On the other hand, keeping windows closed most of the time could increase concentrations of volatile organic compounds

(VOCs) and other chemicals released from carpet, furniture, and the building structure. Many people spend most of their time indoors, especially during winter seasons, therefore air pollution exposure can most often occur from within a building.

A very good example of potential air quality risk in our community from volatile organic compounds (VOCs) was the introduction of FEMA trailers to the landscape. As these trailers were for the most part new, as they were only used for temporary disaster remediation housing, people complained of the strong odors from the building materials used to quickly construct them. A community member, Rikki Ollinger, undertook an independent research project focused on keeping Blackfeet Nation residents safe. She wanted to determine if the amount of VOCs being produced within the FEMA trailers was great enough to negatively impact health. By putting continuous air-sampling devices inside 22 FEMA trailers, in different rooms, she found that the level of harmful VOCs was not significant. The research actually exposed a greater amount of VOCs found inside automobiles, especially those with windows closed during summer months.

Extreme events that trigger power outages can reduce indoor air quality in various ways. Currently in Blackfeet Country, the most significant reductions of air quality from power outages could be experienced during winter. Power outages triggered by extreme weather events can be associated with carbon monoxide poisoning, as some people might make the dangerous mistake of using heaters inside that are designed for outdoor use. In addition, wood stoves produce both large and small particulate matter (such as when burning paper) and smaller particulate matter, such as pm 2.5, when burning wood. There have also been indoor and outdoor particulate matter air studies within the Blackfeet Nation, independently by community residents and via collaborations with researchers from state universities that we will include in our next brochure or on the website.



Some heaters and other equipment are meant to only be used outdoors. Making the mistake of using a heater or charcoal grill indoors during a power outage can lead to carbon monoxide poisoning. Source of image: cpsc.gov

Another way that indoor air quality can be reduced in our community, during extreme climate events that trigger power outages, would be during summer months. A power outage during this time could prevent people from operating air conditioning and other ventilation systems. Although air-conditioners are not the norm in *Amskapi Piikani* Country currently, as temperatures continue to increase there will be a greater demand for air cooling systems.

RODENT POPULATIONS THAT CAN CARRY HANTAVIRUSES MAY INCREASE.

Deer mice (*Peromyscus maniculatus*) can carry viruses that can cause Hantavirus Pulmonary or Renal Syndrome in people. Climate change may increase rodent populations, indoors and outdoors. This is especially true when periods of heavy rains follow drought, and when temperature and rainfall increase. **According to the Center for Disease Control (CDC), American Indians account for about 18% of all Hantavirus cases in the U.S.** Hantavirus is most often expressed as a severe respiratory disease that can be fatal. Anyone who comes into contact with rodents carrying Hantavirus can become infected with Hantavirus Pulmonary Syndrome. A common way people have become infected with Hantavirus is by breathing dust after stirring up fresh rodent urine, droppings, or nesting materials. This process is known as “airborne transmission”. Living or working in rodent-infested settings can expose people to Hantavirus. The primary risk for exposure is rodent infestation in and around the home, including cabins, sheds, and outbuildings like barns, garages, and storage buildings. Opening buildings that have been closed for the winter introduces risk as well.



WHO IS MOST AT RISK?

Older adults, children, people with asthma, and those with compromised immune systems are more vulnerable to air pollution. People with houses in poor condition may have higher exposures to indoor allergens, especially when houses do not withstand extreme rainfall or flooding. People with less access to healthcare are also more vulnerable because they may not get access to preventive medications. People with preexisting medical conditions like hypertension, diabetes, atrial fibrillation, and chronic obstructive pulmonary disorder are more vulnerable to impacts from outdoor air pollution. Additionally, people who live or work in places without air conditioning can be more exposed to air pollution.

HOW CAN WE ADAPT?

- Undertake comprehensive forest planning and action to help keep forests healthy, and reduce the threat of intense wildfires. Currently, the Blackfeet Forestry Department is planning for managing forests in a changing climate.
- If air quality is poor, stay indoors in a ventilated building to reduce exposure to particulate matter.
- Use alternative transportation like walking and bicycling to not only reduce toxic emissions, but also to achieve the co-benefit of increasing physical fitness. However, note that when air quality is already poor (e.g. from forest fires), walking or cycling outside could expose people to more pollution than staying indoors if air is filtered.
- Plant trees in urban areas to help reduce particulate matter, ozone, and other pollutants. A co-benefit is that trees provide shade and can help reduce amount of energy needed to cool buildings.
- Protect yourself and loved ones from exposure to allergens and pathogens carried by rodents. Prevent rodent infestation in houses and other buildings, and take precautions when opening buildings that have been unused for a while.
- Educate the community about how to prevent exposure to Hantavirus.
- Regulate and reduce emissions of ozone precursors.

For more information, visit the Blackfeet Country and Climate Change website:

blackfeetclimatechange.com

Content on this page is summarized from the U.S. Global Change Research Program’s report, “The Impacts of Climate Change on Human Health in the United States”, the National Institute of Environmental Health Sciences’ “A Human Health Perspective on Climate Change”, and the Centers for Disease Control and Prevention’s “When Every Drop Counts” to briefly describe some of the possible health outcomes that are most relevant to Blackfeet Country. This page does not include all possible health impacts and outcomes, nor does it include all possible risks and responses (December, 2017).