Prairie Climate Centre

CONNECTING CLIMATE CHANGE AND HEALTH

A GUIDEBOOK OF HEALTH AND CLIMATE CHANGE CONTENT ON THE CLIMATE ATLAS OF CANADA

Health Risks of Climate Change
From heat-related illnesses to increasing infectious diseases, learn more about the many ways that climate change threatens human health

Climate and Health Maps
Explore a range of maps from the Climate Atlas of Canada that show how key climate variables may present increasing risks to health into the future

Protect Your Health
Find a range of strategies to better prepare for the health challenges of a changing world

SPRING 2022

Connecting Climate Change and Health
A guidebook of health and climate content on the Climate Atlas of Canada

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Introduction

This guidebook, created by the University of Winnipeg's Prairie Climate Centre (PCC), takes a look at some of the ways climate change is impacting the health of Canadians. It draws together the data, research, and stories on climate change and health available through the Climate Atlas of Canada (climateatlas.ca) - an interactive tool produced by the PCC - and includes links to articles, videos, and maps where more information about these health impacts can be found.

Health and Climate Change in Canada

We often think about climate change as something abstract or remote. We hear scientists talking about melting ice caps, see images of drought in faraway places, or browse through news coverage of exotic weather disasters.

But climate change is having effects right here and right now in Canada. And the risks aren't just theoretical or abstract. The effects of climate change are up close and personal, affecting the everyday lives and health of Canadians.

Increasing temperatures across Canada and changing precipitation patterns have many health implications for Canadians.

As our climate changes, some of the main health impacts we're seeing are:

- A rise in heat-related illnesses
- More illnesses from reduced air quality
- Increasing and emerging cases of diseases
- A rise in mental health impacts

We have to understand how climate change is linked to our health in order to be able to protect ourselves and make changes to reduce these short and long-term impacts of climate change. The COVID-19 pandemic has given us many lessons in the importance of adapting our behaviours and preparing our healthcare systems for the changes to come.

This guide to the materials on the Climate Atlas aims to provide a deeper understanding of these impacts and how to adapt.

The Climate Atlas of Canada

The Climate Atlas of Canada is an interactive tool for citizens, researchers, businesses, and community and political leaders to learn about climate change in Canada. It combines climate science, mapping and storytelling to bring the global issue of climate change closer to home, and is designed to inspire local, regional, and national action and solutions.

Various aspects of climate change can be explored using maps, graphs and climate data for provinces, local regions and cities across the country. We can look at climate model variables to give us an indication of how some of the health risks of climate change can be expected to change as well. To explore how climate is changing in Canada visit the interactive maps on the Climate Atlas of Canada.

In this guidebook

This guidebook includes a range of information, maps, and videos on the following health impacts of climate change:

- Climate maps for health
- Air quality illnesses
- Heat-related illnesses
- Infectious diseases
  - Vector-borne diseases
  - Waterborne diseases
- Mental Health Impacts

How is climate change impacting the health of Canadians

The changing climate can impact our health in a range of ways, from increasing heatwaves causing heat-related illnesses and fatalities, to changing temperature and precipitation affecting seasonal allergens.

The Climate Atlas of Canada has a range of maps related to health impacts of climate change, such as:

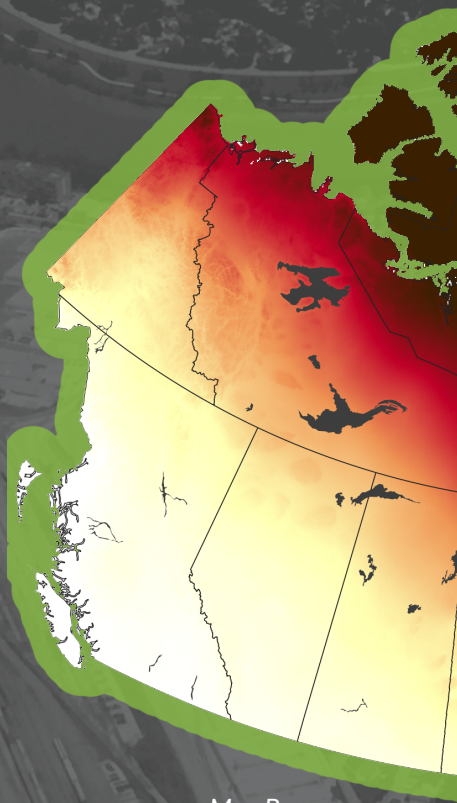
- Annual Mean Temperatures
- Number of Heatwaves and Average Length of Heatwaves
- Very Hot Days (30C+)
- Wet Days
- Precipitation
- Dry Days

These maps help visualize climate impacts in the immediate and near future, as well as through different "low carbon" and "high carbon" emissions scenarios. Two of these maps are shown on the next page.

See our article Climate Maps for Health for more information on how maps can help us understand key climate impacts facing the health of Canadians.

About the Data

The data in these maps are derived from an ensemble of 24 downscaled global climate models obtained from the Pacific Climate Impacts Consortium (PCIC; pacificclimate.org). Values and comparisons use ensemble averages across the 30-year periods 1976-2005 and 2051-2080 under the High Carbon (or RCP8.5) emissions scenario that assumes greenhouse gas emissions will continue to increase at current rates throughout this century. This latest-generation model data has been made available thanks to a partnership with Environment and Climate Change Canada, PCIC, Ouranos, and the Computer Research Institute of Montréal. See the Climate Atlas at climateatlas.ca to explore more data and to see what happens if the world reduces its greenhouse gas emissions and slows the pace of global warming.

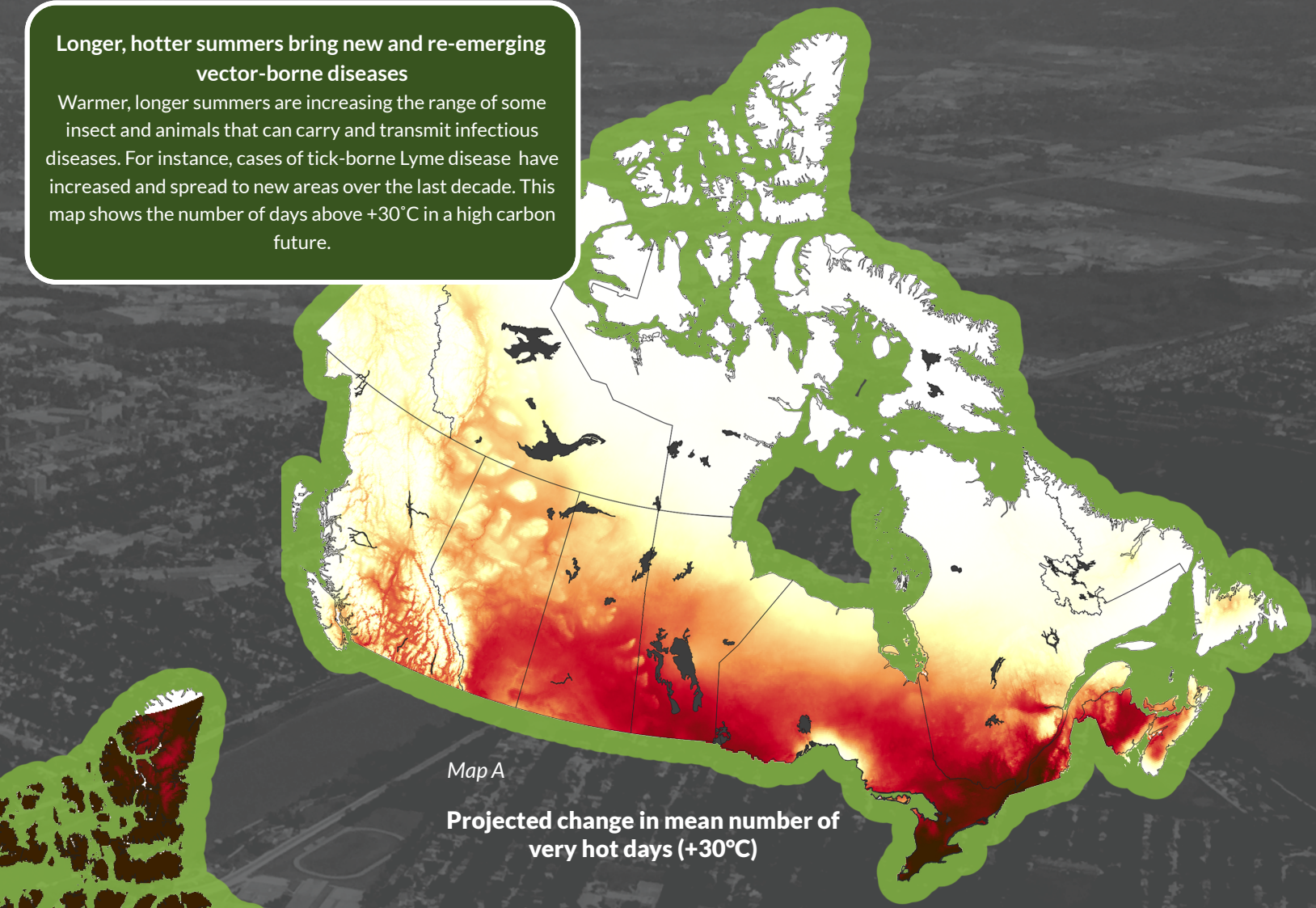


Map B

Projected change i very cold da

Longer, hotter summers bring new and re-emerging vector-borne diseases

Warmer, longer summers are increasing the range of some insect and animals that can carry and transmit infectious diseases. For instance, cases of tick-borne Lyme disease have increased and spread to new areas over the last decade. This map shows the number of days above +30˚C in a high carbon future.



Map A

Projected change in mean number of very hot days (+30°C)

The loss of cold causes mental health stress

The Arctic regions of Canada are warming two to three times faster than anywhere else. Changing sea ice, loss of snow, and milder winters are having profound impacts on the health and wellbeing of Indigenous communities in the region. This map shows the expected change in very cold days at or below -30˚C in a high carbon future.

n mean number of ays (-30°C)

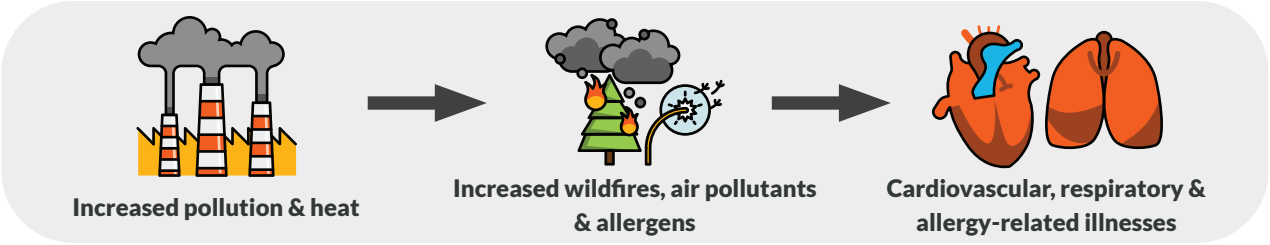
Change (in days)

A	-40	0	40
B	70	0	-70

Both maps represents RCP8.5 projected changes for 2051 - 2080, relative to the baseline period of 1976 - 2005

Air Quality Illnesses

Understanding the connection between climate change and air quality is critical to protect our immediate and long-term health. Poor air quality can come from wildfire smoke, increased pollution from burning of fossil fuels, and increased allergens from a changing environment. Some of these impacts involve immediate breathing problems, but increasingly we're seeing that chronic diseases can also develop from long-term exposure to air pollution.



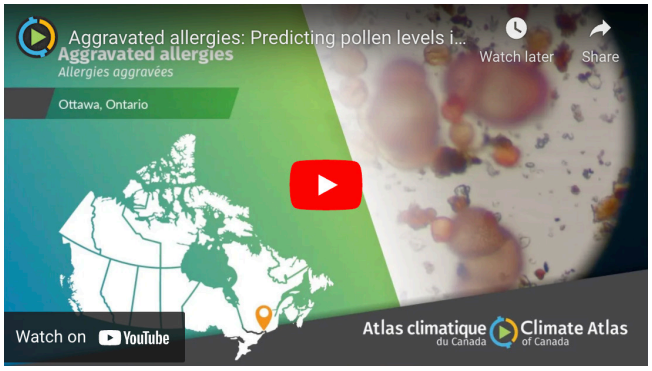
Health Concerns

Cardiovascular health
Short-term exposure to poor air quality can increase the risk of heart attack, stroke, arrhythmias and heart failure in susceptible people, such as the elderly or those with pre-existing medical conditions.[1]

Respiratory health
Climate change is a large threat to respiratory health as it can directly cause and further aggravate pre-existing conditions. Climate change can increase pollutants and create other air quality issues, such as increased wildfire smoke, which can result in breathing problems and damage to lung tissue.[2]

Increased allergies
Those of us with allergies and asthma know these seasonal irritants all too well, and the sneezing, wheezing, and itchy eyes that accompany them. Allergens like pollen, mold, and mildew are also beneficiaries of climate change thanks to higher temperatures and longer growing seasons. Longer allergy seasons allow for more of this matter to develop and spread in our environment. This means longer and worse seasonal allergies for many people across Canada.

Watch the video below for more information on allergies and climate change.



Watch a Video: Aggravated Allergies: Predicting pollen levels in a changing climate

Air Pollution

Air pollution can have an impact on cardiovascular illness and respiratory illness. Some of the primary air pollutants that affect our health are nitrous oxides, particulate matter (from sources such as vehicle emissions and wildfire smoke), and ozone (often called smog at ground level).[3] While not all sources of pollutants are human-made, increased temperatures from climate change will increase the ability of these pollutants to harm our health. Read more about air pollutants and climate change on the Climate Atlas of Canada.

Record-breaking wildfire seasons have made headlines across Canada every summer in recent years. This will only continue as climate change makes summers longer and drier, leading to more and more wildfire risk for Canadians.

One of those growing risks is exposure to smoke. More wildfires mean more wildfire smoke, and more smoke means more smoke-related health problems. Since smoke travels easily, these health problems don't only affect people who live in fire-prone areas. They can affect people's health all across the country and beyond.

Read more about wildfire smoke and climate change on the Climate Atlas of Canada.

Who's at Risk?

We all breathe, which means that all of us are vulnerable to the impacts of air pollutants. And a majority of us are especially vulnerable, including:

- People who work, play, or spend significant time outdoors
- People with existing heart or lung issues (including asthma, allergies, etc.)
- People with limited economic means
- Children
- Older adults
- Pregnant people

Protect Your Health

What you can do to lower air pollution exposure according to Health Canada:

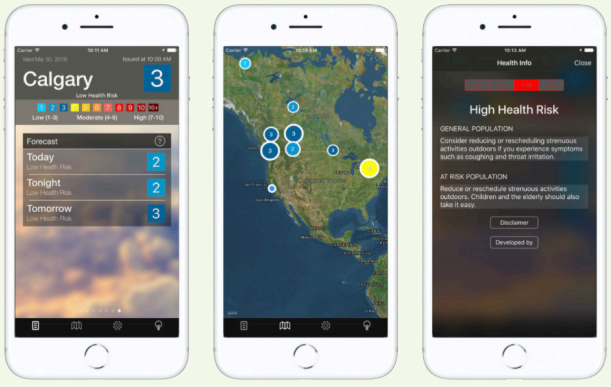
- Limit outdoor activity and strenuous physical activities as much as possible. If you have difficulty breathing, reduce your activities or stop altogether.
- Try to avoid highly polluted areas, such as high-traffic areas, where possible
- Be aware of potential hazards in your indoor environment and try to reduce exposure.
- Close your windows and turn off your furnace and air conditioner if they are drawing smoke or irritants indoors.
- Use HEPA air filters if you can.
- In a vehicle, keep the windows closed and set the ventilation system to recirculate.

Consult your family doctor or a health-care professional if you have concerns or want more advice.

There's an App for that!

The Air Quality Health Index from Health Canada provides a straightforward air quality risk rating for your community. The rating is on a scale of 1 to 10; the higher the number, the greater the risk.

Download **Air Quality Health Index** from the App Store or Google Play



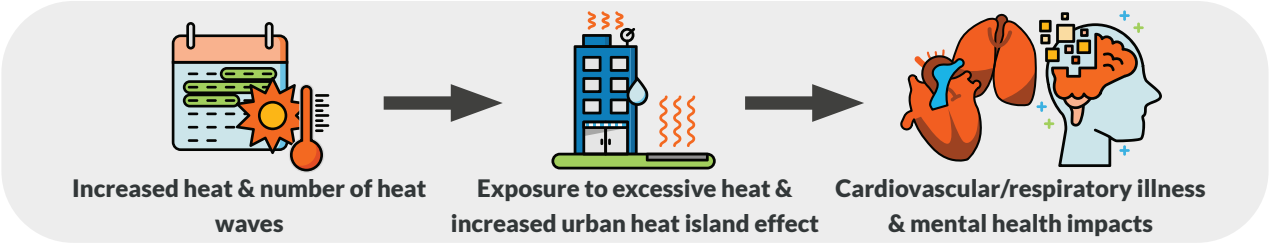
More information on air quality and health under climate change currently available on the Atlas:

Climate Change Decreases the Quality of the Air We Breathe
How Air Pollution is Destroying Our Health
Air Pollution and Heart Disease, Stroke
Climate and Health Concerns for Asthma and Allergies

Heat Illnesses

Many Canadians welcome the arrival of hot summer days as respite from our long, cold winters. Understandably, we tend to think of more summer heat as a good thing. But too much heat can be dangerous.

An increase in heat waves and extreme heat, especially in urban areas, means increases in cardiovascular health issues, respiratory health issues, and mental health issues.



Health Concerns

Cardiovascular health
On hot days, your heart beats faster and pumps harder in order to lower your body temperature. Heat exhaustion and heatstroke are common health concerns in extreme heat and in the most extreme circumstances, being unable to lower your body temperature could result in death. Protect your heart in the heat and know the symptoms of heat-related illnesses such as heat stroke and heat exhaustion.

Respiratory health
High temperatures "bake" vehicle exhaust, turning it into harmful surface-level ozone/smog when breathed in. Smog is often concentrated in big cities, but air-quality problems can be just as bad in rural and suburban areas, especially as Canada experiences more wildfires. Heat can make breathing more difficult, especially for those with asthma or chronic obstructive pulmonary disease (COPD).[4]

Mental Health
Occurrences of mood disorders, anxiety disorders, dementia, and psychological distress have all been shown to increase with higher temperatures. Heat can have an impact on interpersonal interactions, with increases in irritability and aggression. Domestic violence and violent crimes have also been shown to spike during heat events. See our mental health articles for more information on mental health and climate change.

Read more about the health impacts of heat on the Climate Atlas of Canada's Heat Waves and Health Report.

Who's at Risk?

Canadian cities have a higher increase in heat due to the urban heat island effect. The urban heat island effect occurs in cities because of their low natural land cover. Surfaces such as pavement and buildings retain heat and increase the overall air temperature of the area. Therefore, people living in cities may have higher risk of suffering from heat-related illnesses.

Other populations at risk include:

- Those with inadequate access to resources, such as air conditioning and a sufficient supply of drinking water
- Socially isolated individuals or those with mobility issues
- Those with barriers to accessing public health information
- Those with pre-existing medical conditions
- Seniors
- Children

Protect Your Health

Tips to stay healthy in the heat from Health Canada:

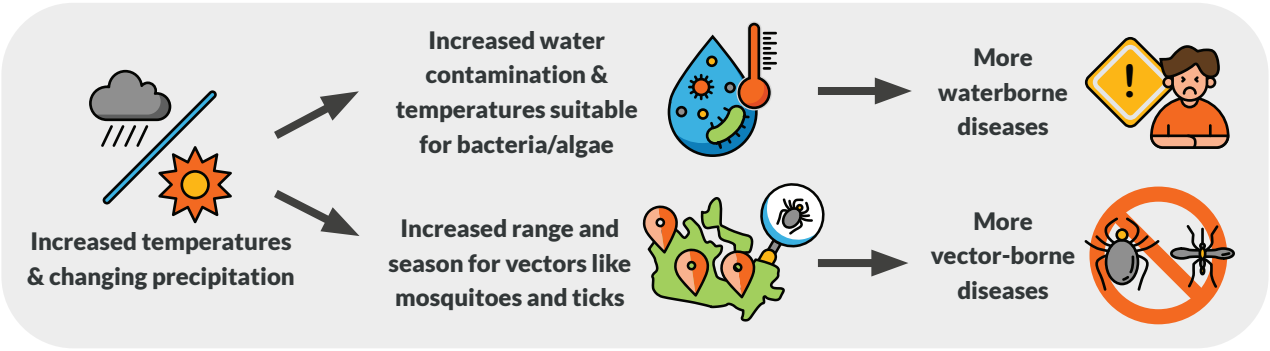
- Prepare for the heat, tune in regularly to weather forecasts.
- Know the signs of heat illness
- Pay attention to how you and those around you feel
- Drink plenty of liquids
- Stay cool
  - Dress light
  - Take cool showers
  - Minimize strenuous outdoor activities
  - Stay in the shade or air-conditioned facility

Watch a Video: Heatwaves and Hope

Near the end of the century, the City of Toronto could experience nearly two months of +30 °C days a year, according to climate projections. To address the growing risk of future heat waves, local faith leaders have created a network of cooling centres in churches, mosques, temples and synagogues, and are mobilizing their congregations to provide support for susceptible populations. For City Counsellor Gord Perks, this example of grassroots community resilience makes him hopeful about the future.

Infectious Diseases

Canadians might be surprised to hear that climate change can also increase the spread of certain types of infectious diseases. Infectious diseases are caused by bacteria, viruses, or parasites that are spread through food, water, or animal and insect "vectors" such as mosquitoes and ticks. Impacts of climate change, such as increases in temperature, precipitation, floods, and droughts, are changing the range and spread of these diseases.



Tick-borne Diseases

Health Concerns

Longer, hotter summers and more mild winters can increase the survival, growth, and reproduction of tick species such as blacklegged (deer) ticks. This means that they can survive and establish populations in areas where they previously couldn't, and increase their numbers where they were already established. Longer summers also mean a longer season where ticks are active and people are outdoors - increasing the window of opportunity for the two to meet and for people to be potentially infected with tick-borne diseases such as Lyme Disease.

Watch a video: Lyme Disease, Climate Change, and Public Health

Who's at Risk?

Children who spend lots of time outdoors as well as adults who work outdoors or participate in outdoor activities are at greater risk of tick-borne diseases.[5] You can stay up to date with currently identified risk areas in Canada according to the Public Health Agency of Canada.

Protect Your Health

Public Health Agency of Canada's advice on preventing tick-borne illnesses:

- Apply the insecticide permethrin to clothing to repel ticks when outdoors
- Wear light coloured long-sleeved clothing
- Tucking in shirts and pants
- Stay on cleared paths when walking or hiking
- Do daily tick checks and remove any found ticks

Mosquito-borne Diseases

Health Concerns

Most Canadians think of diseases carried by mosquitoes, called mosquito-borne diseases, as being limited to warm southern climates, like malaria or dengue fever. While it is true that they are far more common in the tropics, warming temperatures and increasing precipitation under climate change in Canada are expected to increase the presence of some of these diseases right here at home. Read more on mosquito-borne diseases under climate change on the Climate Atlas of Canada.

Watch a video: Mosquito-borne Diseases and Climate Change

Who's at Risk?

Those who spend more time outdoors and are exposed to mosquito bites are at greater risk of mosquito-borne diseases, especially at dusk and dawn, when mosquitoes are most active.[6]

Protect Your Health

Public Health Agency of Canada's advice on preventing mosquito-borne illnesses include:

- Wearing bug repellent
- Wearing long sleeves and long pants when outdoors
- Avoiding going out when mosquitoes are most active (dusk and dawn)
- Removing standing water around your home (in tires, flower pots, containers, etc.)
- Ensuring windows have properly fitting screens.

Watch a video: Algal Blooms, Climate Change, and Public Health

Waterborne Diseases

Health Concerns

When enjoying activities out on the water - such as boating, fishing, or swimming - people should be aware of potential risks that can come from using the water. The main risks of waterborne disease are associated with harmful algal blooms and high bacteria in the water.

While we can control how we use the water recreationally when risks are present, other uses of water are not so avoidable. Water used for livelihood and drinking can also be contaminated and many communities face the health risks associated with them. Read more about water-borne diseases under climate change on the Climate Atlas of Canada.

Who's at Risk?

Those who spend lots of time in the water, using it recreationally, and children who play in the water and sand are more at risk of water-borne illnesses. Those who live in rural communities, particularly Indigenous communities, that depend on water for livelihood and may have sensitive water treatment facilities are also at higher risk.

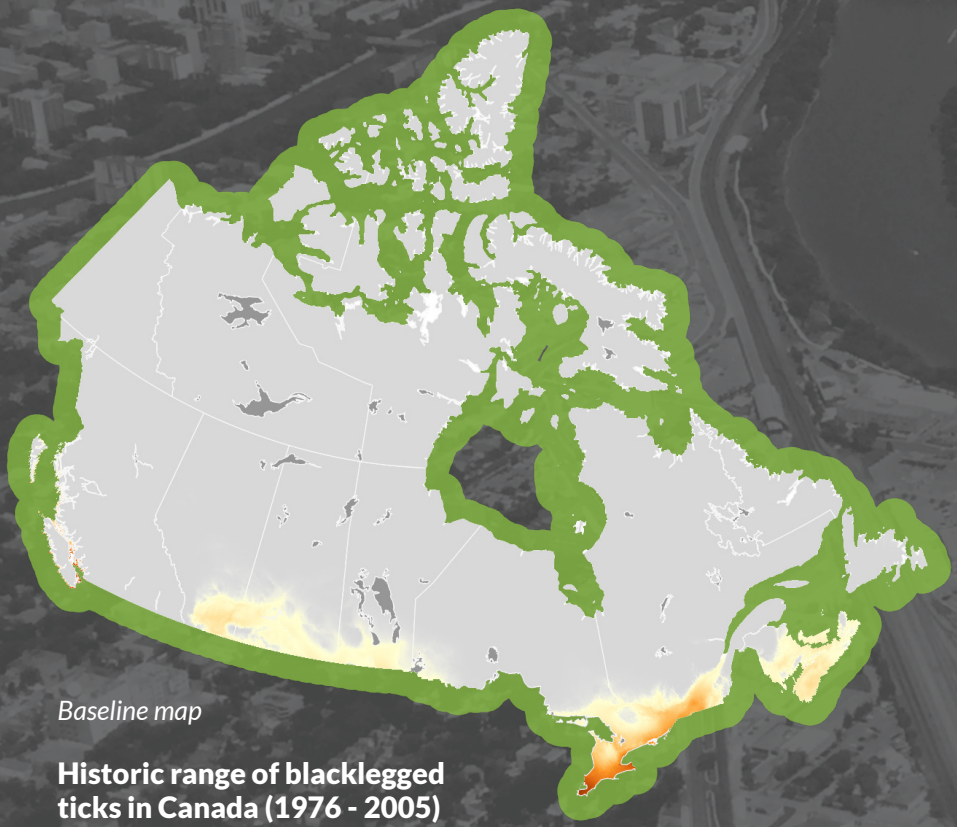
Protect Your Health

It is important to keep updated with government advisories on water quality used for drinking and recreation. Ways to protect yourself when swimming at beaches or lakes include:

- Rinsing your body with clean water immediately after swimming
- Avoid swallowing water
- Avoid swimming after a rain event
- Avoid swimming where algae is visible
- Monitor children and pets around algal blooms

Climate change and Lyme Disease Risk in Canada

Blacklegged tick range is affected by temperature, as well as other factors such as habitat suitability and animal host populations. As you can see on these maps, greater emissions will cause temperatures to increase and allow blacklegged ticks to spread further north. On the other hand, we see that taking action on climate change to lessen our emissions can help limit the future spread of blacklegged ticks, and reduce the increase of Lyme disease.

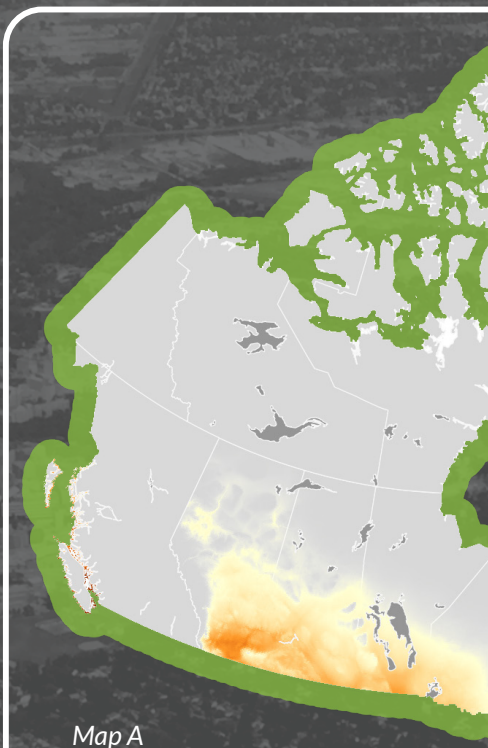


Baseline map

Historic range of blacklegged ticks in Canada (1976 - 2005)

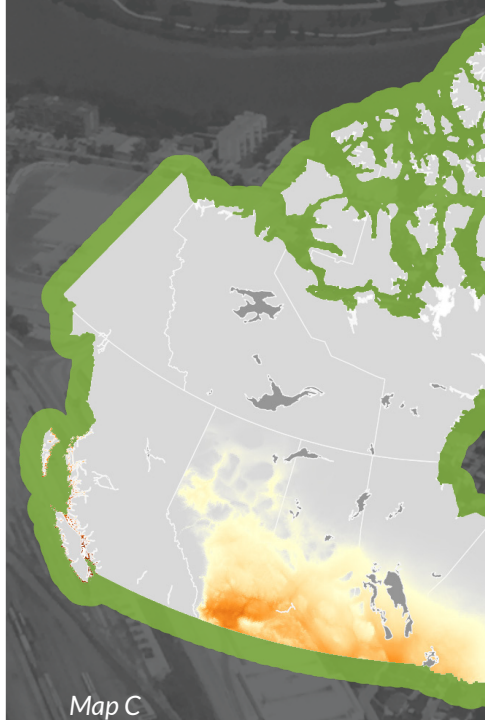
About the Maps

Temperatures sufficient for the growth and development of blacklegged ticks are at least 2800 degree days (the total of all daily temperatures above 0°C in a year). The colour scale shows 2860 degree days (beige) to 4000 degree days (rust). This map does not apply to the species of Lyme-carrying ticks that live west of the Rocky Mountains. The climate projections on these maps were made using 24 climate models running the "low carbon" (RCP4.5) and "high carbon" (RCP8.5) emissions scenarios for two time periods. Climate model data was downscaled and made available by the PCIC.



Map A

Potential range in the near futu under a low emission scenario



Map C

Potential range in the near futu under a high emission scenario

2021 - 2050

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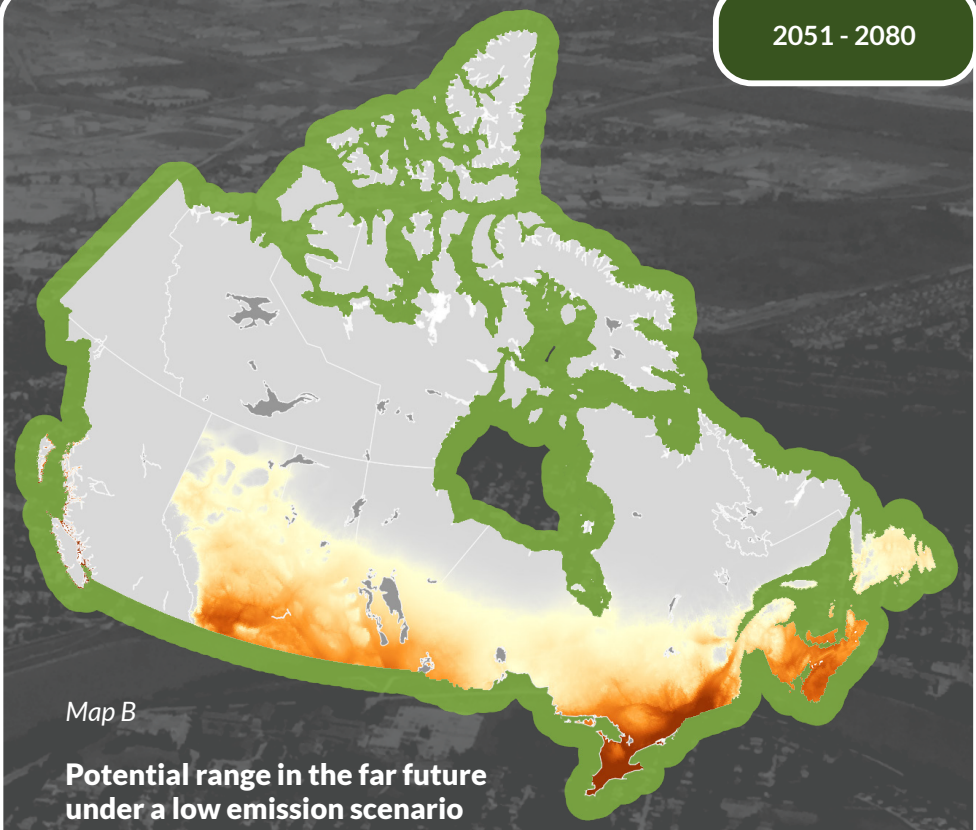
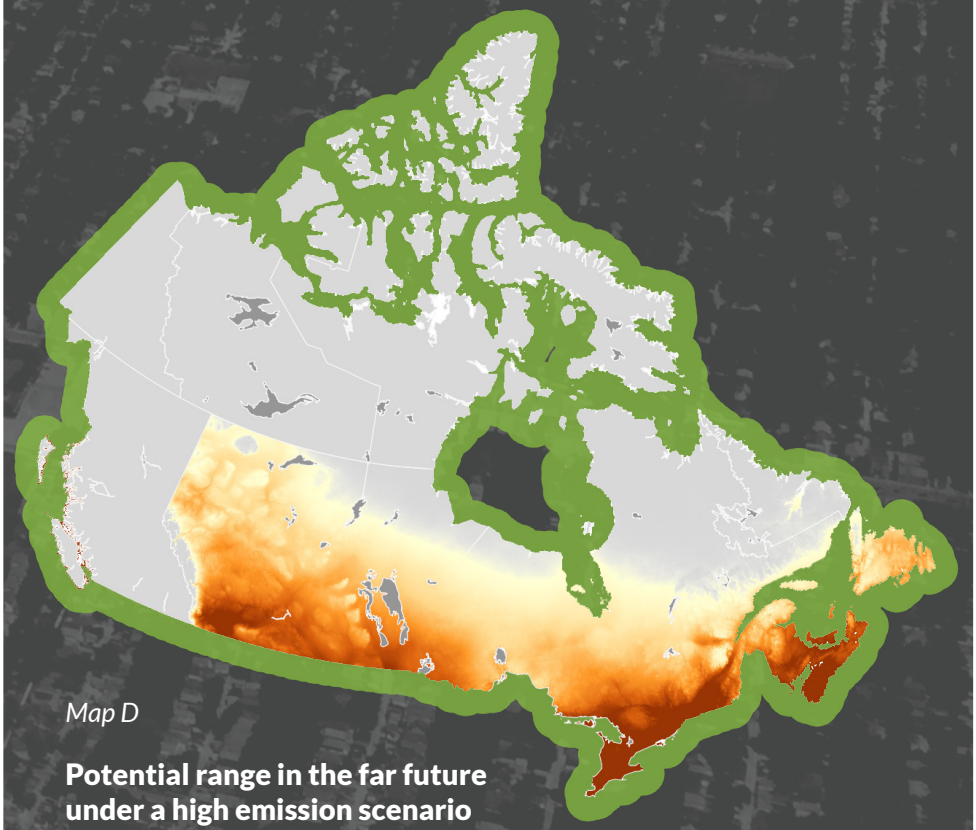
re

2051 - 2080



Map B

Potential range in the far future under a low emission scenario



Map D

Potential range in the far future under a high emission scenario

Mental Health

Previous research on the health impacts of climate change tend to focus on physical health impacts, but mental health impacts have been greatly overlooked. It is very important that we start exploring and discussing the mental health impacts of climate change, because more people - children, youth and adults alike - are experiencing emotional distress in response to climate change.

Health Concerns

Mental health impacts of climate change are diverse, and can include anxiety, depression, and post-traumatic stress disorder, among others. The mental health impacts of climate change can be categorized in 3 general pathways:

- Experiences of extreme climate-related events such as flooding, droughts and wildfires, which can cause acute stress and trauma
- Experiences of environmental change over time, such as local losses of species or changes in seasonal temperatures, which can lead to feelings of grief and loss of sense of place
- Exposure to information about the climate crisis (e.g. on social media, news, classroom), which can lead to anxiety, sadness, frustration, fear, and hopelessness

Who's at Risk?

People of all ages in Canada are experiencing mental health impacts from climate change.

Those who spend more time outdoors and who have a stronger connection to the natural environment around them such as farmers, fishers, hunters, and outdoor enthusiasts may bear witness to environmental changes more frequently and intensely, and may therefore experience more mental health effects. This is particularly true for many Indigenous communities who remain closely connected to their lands, waters, and species within their traditional territories.

Young people - described as the 'climate generation' by some - may be particularly at risk of mental health impacts, since many young people have never known a life without hearing

Watch a video: Wildfires and Community Health

When wildfires are at your community's door, there's only one thing to do: evacuate. As communities are uprooted and fires are being fought, people are put under extreme stress that leads to both short- and long-term mental health impacts. Under climate change, we'll be seeing more and more wildfires, so it's vital that we address the links between wildfires and mental health.

about climate change and how it will adversely affect their future. Research indicates that the rapidly developing brain of children and adolescents, combined with their limited ability to avoid and adapt to climate stressors, may make children worry about climate change more than any other group.

Taking Action

Climate change is a daunting and complex threat that can lead to distressing emotions, such as anxiety, depression, grief and hopelessness. Since climate change is a long-term threat, we must learn to cope with the potentially difficult emotions that it may cause to ensure our well-being over time. If we learn to manage these feelings, we can recognize them as signs of our compassion and connection to the world around us, and harness them as important motivators for taking action on climate change.

Read more about coping with climate change on our Climate Atlas, see our article Taking Action on our Climate Emotions.

Finding Hope

Many people feel like the story of the environment and climate change is all "doom and gloom," but finding sources of hope is critically important. In her recent book entitled Hope Matters, author Dr. Elin Kelsey advocates for "evidence-based hope", which takes a critical look at the problems we face as well as the trends and advances that are moving us through these problems. "If we continue to reproduce feelings of hopelessness," Kelsey explains, "that's as big a problem as the problem [of climate change] itself."

In this video, Kelsey explains the importance of finding hope in the face of climate change, and offers tips on where to find it. She describes hope as a "brave political act" that requires courage and commitment in the face of uncertainty.

Watch a video: Dr. Elin Kelsey on Why Hope Matters

Climate Action to Protect Health

While there are actions we can take to adapt to climate change, the most important work that can be done to protect our health is to limit the impacts by reducing our emissions. Climate change solutions can start close to home, with simple actions in our own homes and families, but also require large-scale changes in our ways of thinking, planning, and acting in workplaces, neighbourhoods, and communities across the country. It is not all the responsibility of individuals; our social, political, and economic systems have a central role to play in tackling the climate challenge head on.

We need political will to create market incentives such as carbon taxes, to put a price on pollution from big industry, and to create climate-smart laws and regulations in the face of resistance and denial. And we know that political will requires public pressure, from community members and constituents voicing their concerns, writing letters, staging demonstrations, and organizing with their neighbours. We all have a role to play in making sure climate action is a top priority for our governments.

Providing health benefits

Actions we take to fight climate change also often have immediate health benefits beyond lessening future risks. Some examples of the ways that climate action can improve health are:

- Investing in public transit and active transportation, which can increase levels of physical activity and decrease air pollution, and in turn reduce chronic diseases and acute health impacts. This in turn saves the healthcare system huge amounts of money that are spent on treating these illnesses every year.
- Renewable energy, such as solar or wind power, is a clean way to get the power that runs our communities. Scaling up renewables means less water pollution and air pollution that harms us, not to mention less reliance on fossil fuels that cause pollution in the first place.
- Greening our cities through parks, trees, and urban agriculture encourages physical activity and healthy local food, while making beautiful places to live in. Smart landscape and city design can help us manage the effects of extreme heat, reduce damage from extreme events such as floods, and more.

The health risks of climate change can sound intimidating and worrying, but there are creative, innovative strategies that can promote healthy and sustainable communities and help respond to the challenge of climate change. Taking climate action seriously means building more sustainable, pleasant, thriving communities. And taking an energy-efficient and climate-friendly approach to building and living in our communities will have important health benefits above and beyond helping with climate change.

Resources

Overview of Climate Atlas health content

Articles

- Climate Change and Health
- Climate Maps for Health
- Heat Waves and Health
- Health Impacts of Extreme Heat
- Wildfires, Water, and Our Health
- Wildfire Smoke and Climate Change
- Waterborne Diseases and Climate Change
- Lyme Disease Under Climate Change
- Mosquito-borne Diseases and Climate Change
- Climate Change, Air Quality, and Public Health
- Mental Health and Climate Change
- Taking Action on Our Climate Emotions
- Take Action on Climate Change

Videos

- Aggravate allergies
- Heat waves and hope
- Lyme disease, climate change, and public health
- Mosquito-borne diseases and climate change
- Algal blooms, climate change, and public health
- Wildfires and community health
- Quality control: Wildfire, water, and our health
- Overcoming climate anxiety
- Why hope matters

More information on the health impacts of climate change

There are a wide range of additional resources to help you explore more about the how climate change can impact our health. Groups of healthcare professionals such as the Canadian Association of Physicians for the Environment (CAPE) and the Canadian Association of Nurses for the Environment (CANE) have developed thorough resources that may be particularly helpful to professionals in this field.

A few more resources include:

- Climate Change Toolkit for Health Professionals - CAPE
- Climate Change and Health - WHO
- Climate Effects on Health - CDC
- Climate Change and Health - PAHO/WHO

References

1. American Heart Association. "Air pollution and heart disease, stroke." https://www.heart.org/en/health-topics/consumer-healthcare/what-is-cardiovascular-disease/air-pollution-and-heart-disease-stroke

2. Asthma and Allergy Foundation of America. "Climate and Health." https://www.aafa.org/climate-and-health/

3. National Institute of Environmental Health Sciences. "Air Pollution and Your Health." https://www.niehs.nih.gov/health/topics/agents/air-pollution/index.cfm

4. Canadian Lung Association. "Heat and humidity." https://www.lung.ca/lung-health/air-quality/outdoor-air-quality/heat-and-humidity

5. Mayo Clinic. "Lyme Disease." https://www.mayoclinic.org/diseases-conditions/lyme-disease/symptoms-causes/syc-20374651

6. Johns Hopkins Medicine. "West Nile Virus." https://www.hopkinsmedicine.org/health/conditions-and-diseases/west-nile-virus