

Extreme heat

Climate change amplifies the intensity, duration and frequency of heat waves, drought, and wildfires.

Our planet's atmosphere and oceans are heating up ten times faster than anytime in the last 65 million years. This has been particularly noticeable in the past twenty years, where the ten hottest years ever recorded have all occurred since 1998.

That heat has contributed to deadly heat waves, more severe droughts and extended the reach of wildfires. In 2015, India experienced its worst heatwave ever recorded, with the loss of over 2,300 lives. While heatwaves are an annual occurrence in India, global warming has meant recent heat waves are hotter and as a result more deadly.

Wildfires are an indicator of our rapidly warming atmosphere. An extremely dry winter coupled with unseasonably hot weather fueled devastating wildfires across North America in 2016. These included the disastrous fires in Fort McMurray — which led to one of the biggest evacuations in the country's history and went on record as the most expensive disaster in Canadian history with losses expected to total \$3.58 billion.



A helicopter uses a drip torch to light a controlled burn on a mountainside near Alberta's Kananaskis Village in 2011. The prescribed burn, which took years of planning, was aimed at reducing the overall fuel load of the forest to lessen the likelihood and severity of a future forest fire, and to create a buffer zone near the village. (Photo: Jesse Winter/jessewinter.net)



A 2016 wildfire in Fort McMurray, Alberta, Canada burned 590,000 hectares, destroyed roughly 2400 buildings and homes, and caused over \$9 billion in damages. (Photo: Jupm Studios)

Thanks to 350.org and [Canadian Geographic](http://CanadianGeographic.com)

Storms

Storms and extreme rainfall events have always happened. But warm area takes up more water and energy — so storms are more deadly.

For every extra degree (C°) of warming, the atmosphere holds about 7% more water vapour. Over the past 25 years alone, satellites have measured a 4% rise in atmospheric water vapor, matching the rapid warming of the atmosphere.

Because of human-caused climate change, the storms, cyclones, hurricanes and typhoons we see today are bringing noticeably heavier rainfall, causing more flooding, blowing with stronger winds and causing bigger storm surges.

The unusually warm waters (attributable to global warming) in the Caribbean in September, 2016 lead to the incredibly rapid intensification of Hurricane Matthew, consistent with the trend of rapidly intensifying tropical hurricanes. In just 36 hours Hurricane Matthew went from a tropical storm to a Category 5 hurricane, causing havoc in Haiti, Cuba, the Bahamas and the Southeastern United States as it progressed.

The cost of burning more fossil fuels is very real — it is already making storms, hurricanes, typhoons and cyclones more deadly and costly. Keeping fossil fuels in the ground is the best way to protect people from untold destruction.



The super flood that washed across the southern quarter of Alberta and heaved through downtown Calgary, shown here at Stampede Park, in June 2013 caused an estimated \$6 billion in damages and displaced about 100,000 people. (Photo: James Anderson)



British Columbia had its wettest spring followed by its driest summer, sparking the province's worst recorded wildfire season. Hot temperatures and stormy weather plagued the rest of the West, shown here in Three Hills, Alta. Calgary had its hottest May-to-August period since 1881. Intense rain flooded Ontario and Quebec, the latter of which saw the most spring rain in 147 years, and blizzards hit Newfoundland in March. (Photo Craig Hilts/prairiefirephoto.com)

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Ocean warming and acidification

While record-breaking warming is being felt on land, most of the extra heat energy being trapped in our atmosphere is being stored deep into our oceans causing rapid changes and the decline of key ecosystems.

Since 1955, more than 90 percent of the energy trapped by the atmosphere as a result of increased greenhouse gasses has been absorbed into the oceans. This has prevented far more severe heating on land — but has had major effects on the ocean.

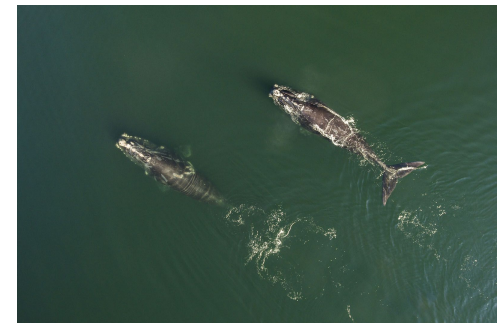
Prior to the 1980s there were no signs of any global coral bleaching events for the past ten thousand years, and probably much longer. It's only in the last 35 years that global coral reef bleaching has occurred. Since then nearly every part of the world with coral reefs has been going through extensive coral bleaching. From the Great Barrier Reef to the Andaman Islands of the Indian Ocean, what were once bright colorful coral reefs full of life have turned bleached white as they've died off.

As water heats up, it expands. This simple phenomena, alongside the influx of water into the oceans from melting ice in the polar regions and the world's glaciers, is driving rapid sea level rise.

The current rate of sea level rise is around 3.4mm/year, but this rate is growing over time, on top of year-to-year ups and downs.



Bleaching at Heron Island in February 2016, near the southern most point of the Great Barrier Reef. (Photo: Richard Vevers / The Ocean Agency)



Few species have made more headlines lately than the North Atlantic right whale, shown here in the Bay of Fundy. Increased fishing traffic in the whales' northeastern range combined with ocean acidification that stresses the marine ecosystem, means this species is on the brink of extinction. (Photo Nick Hawkins/nickhawkinsphotography.com)

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Sea level rise and melting ice

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Due to warming of the oceans and atmosphere, the amount of ice on Earth is declining — from glaciers to the Arctic & Antarctic. This is driving sea level rise, reducing the earth's ability to reflect heat energy back out to space, and endangering unique ecosystems.

In 2016 sea ice in the Arctic Ocean continued to melt during the polar winter — the first time this has been observed in modern history. Some parts were 20 degrees C warmer than usual.

Glaciers are very sensitive to temperature change and as a result of climate change, glaciers around the world are in irreversible retreat. Glaciers provide an important year-round source of water to many towns and cities around the world.

The difference we can make now by keeping fossil fuels in the ground is astounding: if we act now, we can keep the Antarctic ice sheet largely intact. If we don't, Antarctic ice will begin an irreversible slide into the ocean, causing trillions of dollars of damage to people all over the world.



In late February 2018, temperatures at the North Pole reached an unprecedented 2 C — 30 degrees above normal. The cause? An intense storm had injected a wave of heat into the Greenland Sea that trickled throughout the Arctic. (Photo: Daisy Gilardini/daisygilardini.com)



Over the last century or so, Lennox Island, a sandy-shored spit of land off the coast of Prince Edward Island, has lost almost 160 hectares of land from coastal erosion. In 50 years, climate scientists estimate half of Lennox Island could be underwater. (Photo: Mike Grandmaison/grandmaison.mb.ca)

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Shifting seasons, habitats & climatic zones

The warming of the atmosphere is changing the timing of seasons, the distribution of habitats and moving warmer climate zones toward the poles.

The spread of mosquito-borne diseases like Zika and dengue fever is increasing as tropical and subtropical climate zones move toward the poles, expanding the habitat zones of mosquitos. As the earth continues to warm, diseases will increase.

The amount of habitat available for temperate and tundra ecosystems is declining as tropical and subtropical climate zones expand, pushing species like polar bears to toward extinction.

Migration patterns are also changing. For example, many migratory birds have been observed over the past decade to migrate weeks earlier than usual. This unpredictability is causing mass bird die-offs.

This unpredictability is true for farmers, too. It's becoming much harder to know when to plant & harvest. Droughts and extreme rain are becoming more common across the globe as weather patterns shift.



Female *Aedes albopictus* mosquito capable of spreading Zika virus. (Photo: James Gathany/CDC)



What we once thought we knew about water patterns in Canada's Prairies is no longer true in the face of climate change. For instance, earlier-than-usual snowpack melt in the mountains means less spring runoff for Prairie watersheds. Add to that hotter temperatures, less precipitation and greater demands on watersheds from agriculture and industry, and this perfect storm of drought-causing factors is expected to increasingly plague the Prairies, like this field in St. Jean Baptiste, Man. (Photo: Mike Grandmaison/grandmaison.mb.ca)

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