Berks Nature

STATE OF THE ENVIRONMENT

• BERKS COUNTY, PA •

EXTREME WEATHER:

THE EFFECTS OF CLIMATE ON EVERYDAY LIFE

WHAT CAN YOU DO?

- Consult a professional to learn if rooftop solar electric and water heating systems would be a good fit for your home
- Can't generate your own renewable electricity? Use a renewable energy supplier or purchase clean power through PA Power Switch

- Urge the Pennsylvania legislature to require increases in clean electricity generation
- Install energy efficient lighting and appliances
- Conserve energy by moderating your thermostat, turning off unused devices and lights, unplugging devices when not in use or charging, and simply using natural light when available
- Let smart thermostats or other smart controls manage your energy use for you
- Choose alternative forms of transportation when possible, including public transit, carpooling, walking or biking

- Next time your car needs an upgrade, look for a vehicle that is labeled either fuel-efficient, low-emission, or "flex-fuel"
- Reduce household water use by installing water-efficient showerheads, faucets, and appliances
- Support sustainable farming at your grocery store or farmer's market
- Choose native plants for your garden and install rain barrels to conserve water and help wildlife
- Volunteer to support and protect nature! Berks Nature manages three active watershed associations in the Tulephocken, Angelica, and Hay Creek watersheds who monitor stream health, plant trees, and educate their neighbors on the benefits of healthy, resilient watersheds.
- Reduce greenhouse gas emissions by keeping your car tuned up
- Trim your waste and reduce emissions produced by landfills by composting kitchen scraps and recycling
- Plant trees near offices and homes to shade buildings as a natural, energy-efficient way to stay cool

CLIMATE, EXTREME WEATHER, AND you

IT'S NOT JUST NOSTALGIA, BACK IN THE DAY OUR WEATHER LOOKED DIFFERENT. PENNSYLVANIA'S WINTERS AREN'T AS WHITE, SPRING SHOWERS BRING MORE CONSEQUENCES THAN FLOWERS, AND THERE'S LITTLE ESCAPE FROM THE SUMMER HEAT.

Major changes to regional temperature, precipitation, wind patterns (among other features of weather) are all indicators of a changing climate.

Although related, climate and weather are two very different things. Weather refers to short-term changes in the atmosphere, these are discrete events happening over a few hours or days. The temperature today, an incoming thunderstorm, or high winds all describe the weather. Climate describes the average weather conditions of a specific region over a long period of time.

In other words, climate is what you expect, but weather is what you get.

More and more often, what we're getting is not what we were expecting. This is because our planet's climate is changing, spurred by increasing global temperatures.

Extreme weather events – from heatwaves and torrential rain to hurricanes and wildfires – are a consequence of our changing weather patterns and inflict deep and reoccurring socioeconomic costs that threaten public health, critical infrastructure, and economic stability.

In 2021, the United States was barraged with 20 billion-dollar weather and climate disasters. Among others, freezing temperatures provoked power outages in Texas, a historic drought paired with record-breaking heatwaves fueled catastrophic wildfires, and Hurricane Ida, with winds gusting up to 150 mph, left a trail of destruction from Louisiana to the Northeast.

Collectively, these 20 disastrous events resulted in $145 billion in damages and 688 lives lost. Extreme and catastrophic weather events like these are happening more often straining the precious resources needed to respond and recover.

In this State of the Environment issue, we'll look at what the data tells us about the changes Pennsylvania's climate is already experiencing, the extreme consequences of these new weather patterns, and what can be done to live through these changes.

SINCE THE LATE 1800S, EARTH'S TEMPERATURE HAS INCREASED BY ABOUT 1.8°F

That may not seem like much, but our global climate is very sensitive. Consider that during the Ice Age, some 11,500 years ago, Pennsylvania was covered by a frozen tundra similar to the modern day Arctic. The global temperatures that supported these frigid conditions were just about 7-8°F cooler than temperatures today.
At our current pace, global temperatures could climb 3.6-7.2°F by the end of the century; a similar magnitude of change that melted the Ice Ages and rose sea levels by 400 ft, but 50 times faster.

RISING TEMPERATURES AND HEAT WAVES

THE DATA

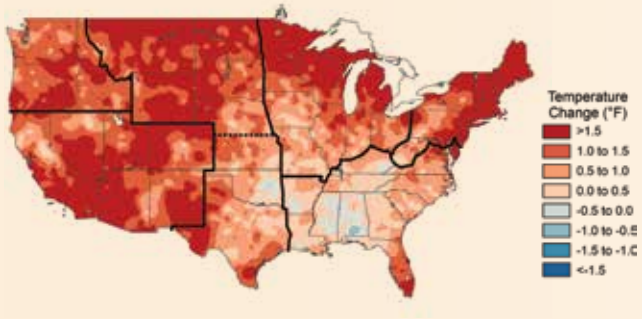
The last 22 years have been Pennsylvania's hottest. Temperatures in the Commonwealth have risen almost 2°F since the beginning of the 20th century and is expected to warm another 5.9°F by 2050.

Extreme heat and heat waves are also on the rise. Summer days registering temps above 90°F have been historically rare for Pennsylvania, occurring about five or so days a year, on average. By 2050, hot days with temperatures of 90°F or more are expected to occur a blistering 37 times per year.

THE CHANGING CLIMATE

Floating in the Earth's atmosphere, "greenhouse gases" – like carbon dioxide and methane – capture and retain heat, which warms the planet, making it habitable for life as we know it. However, human activities have added more greenhouse gases to the atmosphere than the planet is used to. More greenhouse gases trap more heat which creates a warmer planet. How warm? About 1.8°F since the late 1800s, according to the United Nation's Intergovernmental Panel on Climate Change (IPCC).

OBSERVED U.S. TEMPERATURE CHANGE

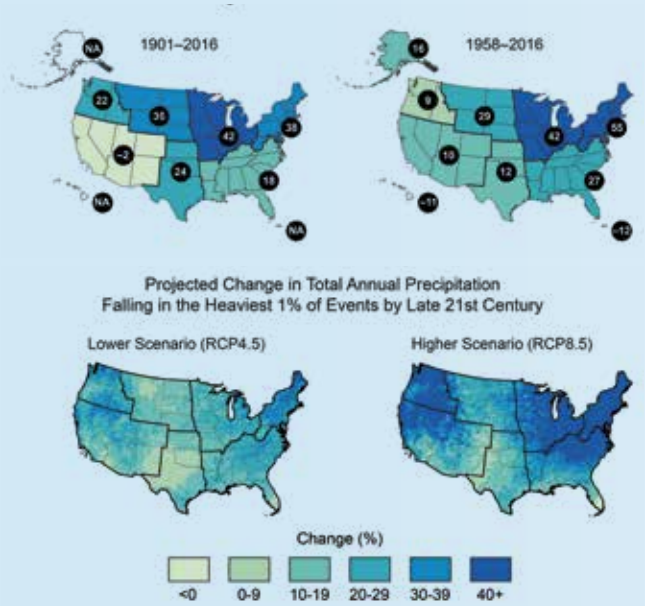


The colors on this map show temperature changes over the past 22 years (1991–2012) compared with the 1901–1960 average for the contiguous United States. Source: Climate change impacts in the United States: The third National Climate Assessment (2014)

Although extreme heat is more noticeable in the summer, other seasons are warming up too! In Pennsylvania, it's the winter and spring that are experiencing the greatest changes. Since the 1990s, occurrences of very cold nights have declined, indicating a long-term winter warming trend.

EXTREME STORMS AND FLOODING

FALLING IN THE HEAVIEST 1% OF EVENTS



This map shows the observed change in precipitation. Numbers in black circles give the percentage change. The trend is averaged over each National Climate Assessment region (bold, black outlines). Source: Climate change impacts in the United States: The third National Climate Assessment (2014)

THE DATA

The 6-year period between 2015 and 2020 were Pennsylvania's wettest years on record. Not only is more rain falling in Pennsylvania, but the magnitude, frequency, and intensity of extreme rainfall events, dropping 2 or more inches of rainwater at a time, are also increasing.

The result of this new weather pattern is counter-intuitive: more extreme but irregularly timed rain events will make Pennsylvania wetter, while dry, drought conditions between storms are also expected to increase.

THE CHANGING CLIMATE

Thunderstorms are formed by warm, rising air. The amount of energy available for this rising air is called convective available

In the last 20 years, Pennsylvania has been soaked with an extra 4.6 inches of rainfall each year, compared to trends measured between 1971 and 2000. Feeling waterlogged already? Then it's time to start waterproofing: Pennsylvania's annual precipitation is expected to increase by another 8% by 2050.

As average temperatures for Pennsylvania increase, so too does the probability and severity of hot and extremely hot weather.

THE IMPACT

A hotter Pennsylvania is not only uncomfortable, it's dangerous. Warmer winters followed by hotter summers can increase the prevalence of mosquito- and tick-borne illness, extreme heat can reduce agricultural yields, and heat waves threaten public health and safety.

Just this August 2022, the average temperature in Pennsylvania was 81.3°F, that's 4.5°F above normal.

Cities like Philadelphia and Reading face an especially high risk; The "heat island"effect created by city infrastructure means that urban neighborhoods experience mid-afternoon temperatures that can be 15-20 degF hotter than rural communities.

According to the National Weather Service, extreme heat is the leading cause of death among weather-related fatalities over the past 30 years.

LOCAL EXAMPLES

July 28, 2020, just five weeks into the official summer season, and Reading recorded it's 25th day of temperatures hitting 90 degrees or more (20 of which occurred in July alone). It was the third heat wave for Reading that summer.

But winters in Berks County are warming too.

Berks County used to support a robust ice industry. Even after electric refrigeration replaced the need for traditional ice harvesting in the 1920s, Angelica Lake in Reading continued to freeze over in the winter months, to the delight of ice-skating park goers.

Today, Berks County lakes will still freeze over, but ice is not guaranteed as it was once before. The ice industry of our past would not have survived, and today winter adventurers cross their fingers for cold.

The impacts of extreme heat are not equitably distributed. The neighborhoods today facing higher intensity urban heat island effects are the same neighborhoods that were subjected to discriminatory, race-based housing practices known as redlining, putting low-income neighborhoods and communities of color at higher risk.

potential energy (CAPE) – the higher the CAPE, the higher the thunderstorm potential.

Recent warming from climate change has not only generated more warm, moist air, but has also increased CAPE values in the eastern United States.

It is difficult to quantify the impact our changing climate has on severe weather, because extreme storms are complex, local, and short-lived. However, large amounts of warm, wet air combined with higher CAPE values are two key factors that help explain why Pennsylvania has wetter days ahead.

THE IMPACT

The timing and increasing frequency of extreme storm events puts strain on local waterways and community infrastructure in the way of flooding. In fact, the Pennsylvania Department of Environmental Protection's has named flooding the highest-risk climate-related hazard facing the Commonwealth.

Alterations to the landscape are also making our communities more vulnerable to flooding. As of 2018, more than 12% of the land in Berks County was classified as impervious cover – surfaces like roads, parking lots, and buildings that impede the natural filtration of water through the soil. By preventing water from soaking into the ground, impervious cover increases surface runoff during storm events, promoting erosion and flooding.

Record-breaking rainfall in 2018 alone resulted in floods and landslides that cost Pennsylvania over $125.7 million extra in infrastructure repair and replacement.

Droughts too are likely to increase as rainfall becomes increasingly concentrated during intense and localized storm events. In Philadelphia this August, just 2.70 inches of rain fell on the city, which is 63% of the normal amount.

LOCAL EXAMPLES

Brian Potts, Township Manager of Bern Township, didn't receive his first flooding complaint from a township resident until 2017. Since then, his phone has been ringing off the hook with flood complaints.

"I've seen places flood in the last five years that I had not seen flood before," reflects Potts, recounting stories of flooded yards, waterlogged basements, and even sink holes.

In the Greenfields development near the Reading Airport, stormwater runoff flooded yards and houses before flowing like a river down the roadway; water so deep you could kayak on it. Near Leesport and the Schuylkill River, consistent flooding through 2017 and 2018 not only soaked yards, it cracked foundations.

Storms and flooding once brushed off as abnormal, have become routine for Bern Township and other municipalities in Berks County.

TAKING LOCAL ACTION

WE'RE STARTING TO BETTER UNDERSTAND WHAT TO EXPECT FROM OUR WEATHER IN THE FUTURE, NOW WHAT ARE WE DOING TO PREPARE?

CLIMATE ACTION IN THE COMMONWEALTH

Pennsylvania is a powerhouse – literally. Pennsylvania consistently ranks as one of the top three energy production states in the nation and is the top electricity exporting state. Consequently, Pennsylvania is also a leader in greenhouse gas emissions.

Building off the Pennsylvania Climate Change Act of 2008, Governor Wolf issued an executive order in January 2019 that established two statewide greenhouse gas emission goals: first, a 26% net emissions reduction from 2005 levels by 2025 and second, an 80% net emissions reduction from 2005 levels by 2050. The most recent iteration of Pennsylvania's Climate Action Plan, released in 2021, charts a path forward to reach these goals.

In response to increasingly extreme weather, the PA Department of Transportation has conducted an Extreme Weather Vulnerability study to analyze Pennsylvania's critical infrastructure in the face of climate change and increasing flood risks. In 2018, the Pennsylvania Emergency Management Agency updated the Commonwealth's Hazard Mitigation Plan to include the risk posed by climate change in the form of flooding and other natural disasters.

These policy moves accompany several other acts centered around clean, renewable, and efficient energy use as well as a suite of organizational, regulatory, and program initiatives for climate adaptation and greenhouse gas mitigation.

THE CITY OF READING AND CLIMATE RESILIENCY

Like so many post-industrial cities in the Northeast, Reading seeks to revitalize and reinvent itself in the modern age of the 21st century.

"What are the things we're going to need to do to be a living and thriving city in 50 years? This is the approach Reading is adopting," explains Bethany Ayers-Fisher, Sustainability manager with the City of Reading.

A key strategy for achieving this vision is Reading's own Climate Resiliency Plan. The Resiliency Plan envisions a Reading whose infrastructure, systems, resources, and plans can withstand and react to the unpredictable economic, social, and environmental disasters in our future.

Adaptive action is also required to address the current dangers posed by extreme weather. To this end, the City of Reading is employing a holistic approach that both improves critical infrastructure while also supporting natural systems to manage and mitigate stormwater.

New stormwater mitigation infrastructure - like permeable driveways and rain gardens - paired with engineering studies collectively reduce flooding pressures in the city. Improved stewardship practices - like reduced mowing at public parks and native tree plantings along local creeks - complement this infrastructure by naturally encouraging stormwater infiltration and sequestering carbon.

PREPARING FOR RISING WATERS IN BERN TOWNSHIP

Municipal governments in Berks County are finding proactive ways to mitigate the risk posed by climate change and extreme weather.

Bern Township, like other municipalities in Berks County, has passed new ordinances to mitigate and manage stormwater, restricting what structures can be built in a floodplain, limiting the amount of impervious cover, and supporting the natural function of riparian buffer zones.

As an operator of a municipal separate storm sewer system (MS4), which discharges untreated stormwater directly into local waterways, the United States Environmental Protection Agency requires that Bern Township develop, implement, and enforce a stormwater management program. As part of this program, Bern Township is in the midst of installing several stormwater mitigation projects designed to reduce flooding.

In the name of preparedness, Bern Township has also created an Emergency Operations Plan and a Disaster Recovery Plan. The former lays out procedures to maintain government operations following a catastrophe, climate-related or otherwise, and the latter streamlines building permits and allows for zoning relief to help communities rebuild faster.

Both help Bern Township prepare and proactively react to climate disasters like the extreme weather Pennsylvania is encountering more frequently.

PROVIDING RELIABLE ENERGY THROUGH CHANGING WEATHER

Berks County's utilities have an acute focus on reliability for their customers, a commitment that is challenged by extreme weather events.

As described by Tracey Ciesnolevicz of UGI Utilities Inc., "While our distribution pipelines are underground, which eliminates most threats from wind or storms, extreme cold and flooding may impact our facilities. Each year we spend hundreds of millions of dollars contemporizing our pipelines and mitigating those risks. But when presented with events such as the Polar Vortex of 2017 or the flooding from Hurricane Sandy, it takes an immense effort to restore and maintain our distribution systems."

Preparedness is key, according to Ron Long of Met-Ed a FirstEnergy Company, who asks, "Do we need to design or maintain our systems differently?" Conversations to answer this question are already underway between the Public Utility Commission and climatologists, who will ultimately have the final say in describing the criteria for construction and maintenance of electric utility systems. While these industry criteria have not yet changed, Met-Ed is monitoring changing weather trends closely and proactively responding as needed to provide reliable, affordable energy to their customers.

THE STATE OF THE ENVIRONMENT IN BERKS PROGRAM

evaluates specific indicators and trends in five environmental categories: Air, Energy, Land, Waste, and Water. The data has been evaluated for more than ten years in Berks County through this program. The entire State of the Environment publications can be viewed on the Berks Nature website at berksnature.org/education/state-of-the-environment

For a full list of sources cited in this publication, please visit Berksnature.org

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