How will global warming of 2ºC affect New York?

Observed and projected changes in climate and their impacts
“To prevent dangerous interference with the climate system, the scientific view is that the increase in global temperature should be below 2°C [relative to pre-industrial levels]”.

- United Nations Framework on Climate Change, 2010
How will global temperatures change in the future?

The global average temperature has already increased by about 1°C (1.8°F) relative to pre-industrial levels.

Current CO₂ emissions are tracking the ‘higher emissions’ scenario; unless emissions are reduced, the 2°C threshold will be crossed before 2050.

- Higher Emissions: 4.0-6.1°C
- High Emissions: 2.6-3.7°C
- Lower Emissions: 2.0-3.0°C
Warming in New York

OBSERVATIONS

The annual mean temperature in NY has already increased by about 2.4°F (1.3°C) since 1895 – faster than the rise in global mean temperature.

Source: NOAA

The annual mean temperature in NY exceeded the 20th-century average every year since 1998 (the last 18 years).
In the next 50-60 years, when global warming crosses the 2°C threshold, NY average summer and winter temperatures are projected to increase by over 5°F (2.8°C) relative to pre-industrial levels.
Warming in New York

How warm will Winter and Summer temperatures become?

PROJECTIONS

Winter

**Observed**

**Modeled**

Higher Emissions

Lower Emissions

The coldest winters in future will be like the warmest of recent years

Summer

hottest summers ...

...will become the coolest

Source: USGS
Migrating New York City Climate

PROJECTIONS

Summer in New York City by the end of this century could feel like a present-day typical summer in Savannah, Georgia.

Consequences:

*Negative impacts on human health, ecosystems, and the economy.*

Analysis is based on changes in average summer heat index (a measure of how it actually feels for a given temperature and humidity).

Source: UCSUSA
Migrating Upstate NY Climate

PROJECTIONS

Summer in Upstate New York by the end of this century could feel like a present-day typical summer in South Carolina or Georgia.

Consequences:
Negative impacts on human health, ecosystems, and the economy.

Analysis is based on changes in average summer heat index (a measure of how it actually feels for a given temperature and humidity).

Source: UCSUSA
Extreme Heat

OBSERVATIONS

Summer daytime high temperatures in New York City rarely go above 90°F in today’s climate.

PROJECTIONS

The number of days with dangerously high temperatures (above 100°F) is projected to increase significantly in the future.

Source: UCSUSA
Rain and Snow in New York

OBSERVATIONS

Annual total precipitation (rain + snow) has increased over the last few decades.

In 9 out of the last 10 years, New York received more precipitation than the 20\textsuperscript{th} century average.

Source: NOAA
Very Heavy Rainfall

OBSERVATIONS

The amount of precipitation falling during intense multi-day events has increased significantly in the Northeast US.

Observed increase in very heavy precipitation* from 1958 to 2012
(* the top 1% of storm totals)

Source: NCA 2014
Rain and Snow in New York

Due to increasing temperatures, there will be more rain and less snow.

PROJECTIONS

Winter precipitation is projected to increase through the 21st century.

Total Precipitation

Higher Emissions
Lower Emissions

Snowfall

Projected changes in rainfall in summer are uncertain.

Source: USGS
Lake Effect Snow in Upstate NY

PROJECTIONS  The total lake-effect precipitation is projected to increase in the future in the Great Lakes basin, but with increased rainfall at the expense of snowfall.

Source: Notaro et al., 2015
Over the last century, sea level has risen by about 0.9 feet around The Battery, NY. Seemingly small increases in sea level can have large impacts along the coast due to storm surges and exceptionally high tides.
Storm Surge

Storm surge caused by Hurricane Sandy flooded parts of NYC in Oct 2012

Source: Charles Sykes / AP

Source: Newsday
Sea Level Rise

**PROJECTIONS**

Sea level will continue to rise throughout this century

**OBSERVATIONS**

Recent studies indicate that we are likely to experience more than 1m (3.3ft) of sea level rise by 2100

**PROJECTED INUNDATION IN NYC**

Source: [Climate Central](#)
Immediate action on local and global scales is required to limit the global mean temperature increase to 2°C (3.6°F).

Average warming (°C) projected by 2100

- If countries do not act: 4.5°C
- Following current policies: 3.6°C
- Based on Paris pledges: 2.7°C

Source: Climate Action Tracker, data compiled by Climate Analytics, ECOFYS, New Climate Institute and Potsdam Institute for Climate Impact Research.
**Strategies and Actions**

**National Climate Assessment:**

The National Climate Assessment summarizes the impacts of climate change in the US, now and in the future.

**Integrating Climate Change into State Wildlife Action Plan (SWAP):**

The goals of SWAP are to generate proactive, comprehensive wildlife conservation strategies that assess the health, challenges, and potential actions each State would like to accomplish during the coming decade and beyond.

**Climate and Health Assessment:**

This scientific assessment examines how climate change is already affecting human health in the US and the changes that may occur in the future.

This report was created by Prof. Raymond Bradley, Dr. Ambarish Karmalkar, and Kathryn Woods

**Climate System Research Center (CSRC)**
University of Massachusetts Amherst

**CONTACT**
climate-inquiry@geo.umass.edu