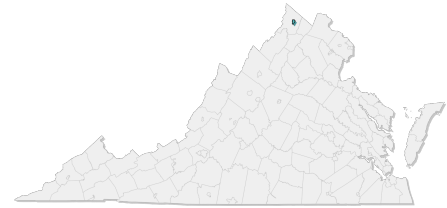


Winchester, VA

Winchester residents will face increasingly severe weather-related hazards, such as heat waves, flooding, and shifting seasons.

As the frequency and intensity of local hazards change, it is important for all of us to protect communities and local habitats. Using the best data, scientists can project how long-term averages in daily weather will change in the future, and the effects this will have on localities.

Information on extreme weather and hazards can empower citizens, decision-makers, and other stakeholders to make informed risk-reduction decisions. With planning and preparation, Winchester can reduce risks for all residents.



Changing Temperature Patterns

Human health, stream and river health, and infrastructure are all threatened by higher temperatures. At 95°F, it is hard to keep indoor areas and our bodies cool. Winchester's summers are getting hotter and this is intensified by the Heat Island effect¹. On average, Winchester sees 3 days per year in excess of 95°F. Within the next 50 years (by 2070), Winchester can expect a yearly average of 22 to 43 days above 95°F, with associated increases in cooling costs, reduced air quality, and heat-related illnesses.



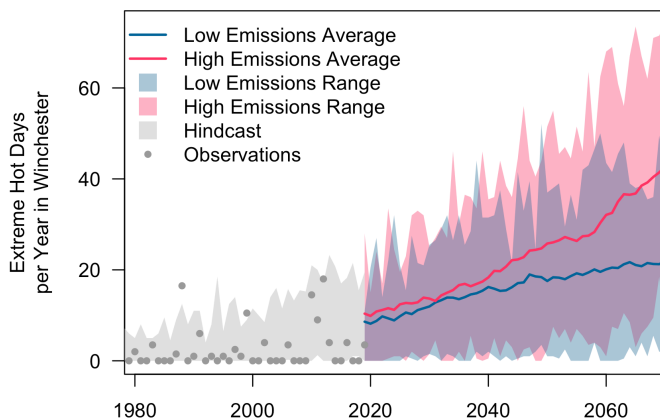
HEAT-RELATED ILLNESSES

Heatwaves can kill people and pets. More than 100 Virginians have died from extreme heat between 2010 and 2019. Individuals at higher risk include children, pregnant women, older adults, outdoor workers, and lower-income residents.



ENERGY USE

Heat islands increase the demand for air conditioning. In the US, electricity demand for cooling will increase by 5-20% for every added degree C. During heatwaves, increased demand can overload systems causing power companies to conduct rolling brownouts or blackouts to avoid system failure.



The graph shows the number of days in a year with temperatures above or equal to 95°F. Dots represent observed annual days of extreme temperatures and the gray shading shows the hindcast². Two scenarios of the future are shown as a high-emissions scenario (RCP 8.5) in red and a low-emissions scenario (RCP 4.5) in blue.

Data:

- Future scenarios: Multivariate Adaptive Constructed Analogs (MACA)
- Observed data: Gridded Surface Meteorological Dataset (gridMET)

¹Heat islands are urban areas where temperatures are higher than the surrounding areas due to high concentrations of infrastructure and limited green space.

²Hindcasts are model results for a historical period. Hindcasts are useful for comparing observations with model estimates.

Changing Rainfall Patterns

Heavy rainfall in Winchester is increasing in frequency and intensity, causing property damage, septic backups, well contamination, mold and indoor air quality issues, and impacts to water quality in local streams and the Chesapeake Bay. Annual rainfall in Winchester will likely increase by an average of 2 inches (2050-2079 average compared to the 1990-2019 average).



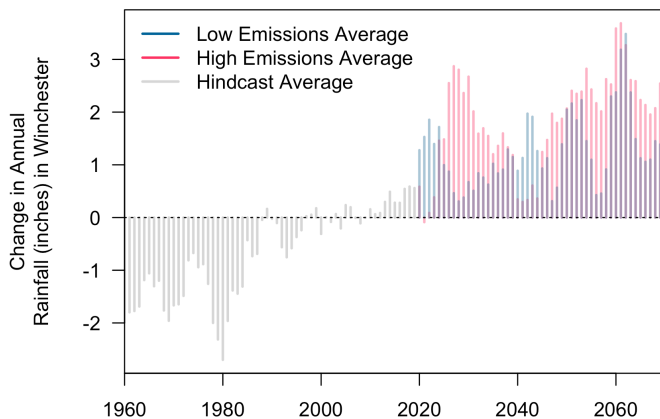
FLOODING

Heavy rain overwhelms infrastructure and drainage systems, causing property damage and covering roads.



REDUCED HUMAN HEALTH

Changing moisture levels impact the spread of mold and illness, including tick- and mosquito-borne diseases. High humidity allows ticks to travel further and promotes mold growth. Flooded areas from rainfall promote mosquito reproduction leading to more mosquitoes.



The graph shows the change in annual rainfall compared to the average between 1990 and 2019. The gray lines show the hindcast. Two scenarios of the future are shown as a high-emissions scenario (RCP 8.5) in red and a low-emissions scenario (RCP 4.5) in blue. Data for the future scenarios are retrieved from MACA.

Data:

- Future scenarios: Multivariate Adaptive Constructed Analogs (MACA)

Shifting Seasons

Seasons are changing in length and timing in Winchester with an earlier spring, delay of fall, and shorter winter. While a longer frost-free period can benefit some crops or allow for double cropping, it can limit plant diversity, encourage invasive species, and threaten human and ecosystem health. Within the next 50 years (by 2070), the frost-free period will average 3 to 6 weeks longer in Winchester.



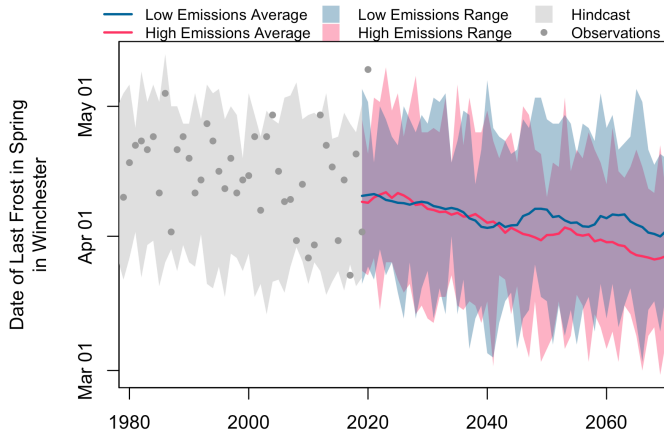
REDUCED HUMAN HEALTH

Milder winters help more ticks and mosquitos survive the winter and earlier springs make their biting season longer. Earlier springs also cause trees and flowers to bloom earlier leading to a longer allergy season.



FALSE SPRINGS

A false spring is a period of warm weather in late winter or early spring that causes plants to grow too early leaving gardens exposed to frost. It can cause early migration of waterfowl and songbirds leading them to miss out on key food for reproduction. Reduced snow cover from mild winters impacts winter sports and helps cause drought, increasing fire risk and water restrictions.



The graph shows the date of the last frost (less than or equal to 32°F) in spring. Dots represent observed dates of the last frost in spring and the gray shading shows the hindcast. Two scenarios of the future are shown as a high-emissions scenario (RCP 8.5) in red and a low-emissions scenario (RCP 4.5) in blue.

Data:

- Future scenarios: Multivariate Adaptive Constructed Analogs (MACA)
- Observed data: Gridded Surface Meteorological Dataset (gridMET)

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