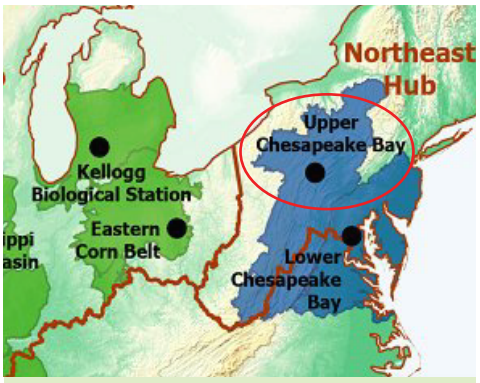
UPPER CHESAPEAKE BAY (UCB)



LTAR Network and USDA Climate Hubs are working to develop knowledge and technology for sound resource management **via research with partners.** The goal is to ensure **sustained crop and livestock production and ecosystem services** from agroecosystems, and to forecast and verify the effects of environmental changes, public policies, and emerging technologies.

Location and Climate

The Upper Chesapeake Bay (UCB) is within the USDA Northeast Climate Hub region. The climate is typical of the eastern deciduous forest ecoregion, with warm summers, cold winters, and year-round precipitation. The topography is complex, with ridges and valleys.

Historic Temperature

Historic average annual temperature in University Park, PA (1895-2018) is 49.5°F. Over the last twenty years, the annual temperature has increased to 50.2°F. Mean maximum temperature is highest in July (71°F). Mean minimum temperature is lowest in Jan (27°F).

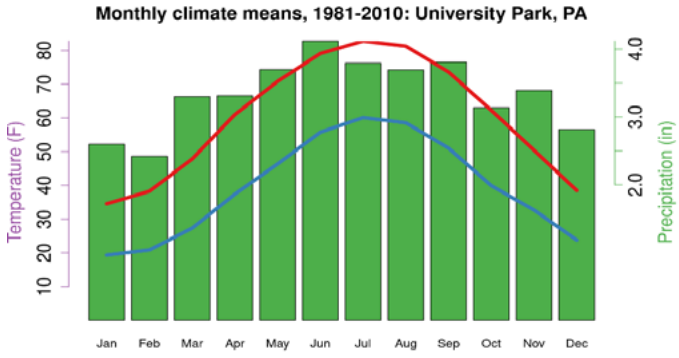
Historic Precipitation

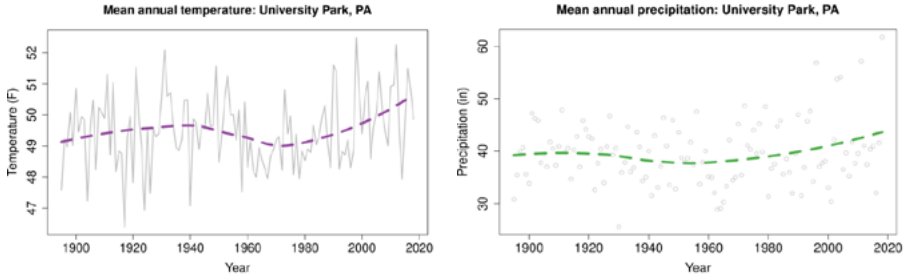
Long-term average annual precipitation is 39.5 inches. Annual precipitation has increased to 41.7 inches during the last twenty years. Precipitation occurs year-round, with slightly higher monthly totals in the summer.

Growing Season

The effective growing season, when both precipitation and temperature are favorable, is normally late April through early October.

Average monthly temperatures and total precipitation from 1981-2010 show the "normal" situation we are used to.





Over the past century, temperatures and precipitation have both increased and become more variable year to year.

Measuring Weather and Climate

UCB research incorporates longterm monitoring of weather and hydrology.

- Sampling at the Mahantango Creek Watershed began in 1968, and includes a network of weather stations, rain gauges, and stream monitoring points.

- In the Conewago Creek Watershed, weather and stream monitoring began in 2012.
- Runoff studies in the Spring Creek Watershed also began in 2012.

Impacts to Agriculture

Agriculture in the Upper Chesapeake Bay region is diverse. The area produces both crops and livestock with major commodities including: beef cattle, dairy cattle, poultry, corn, soybeans, small grains (wheat, barley, oats, rye), forages.

Our goal is to support cropping and grazing systems that are productive and profitable in the face of weather variability and extreme events.

For more information visit https://ltar.ars.usda.gov/sites/ucb/

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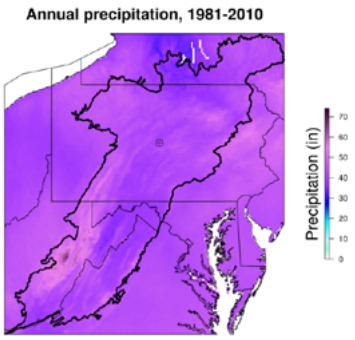
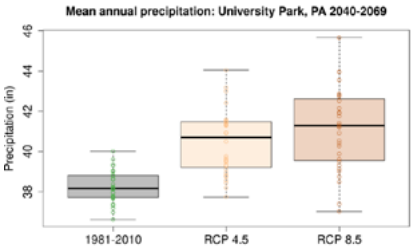
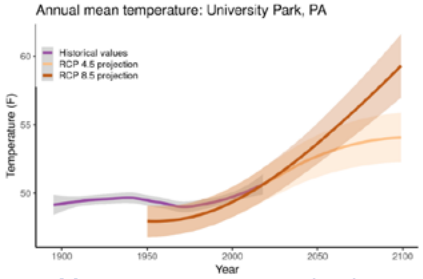


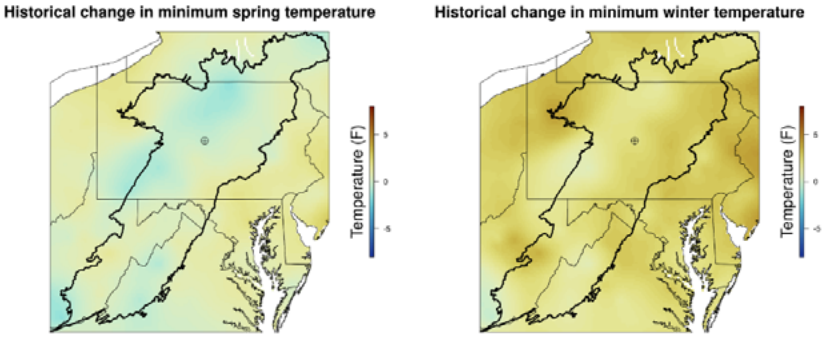
Regional annual precipitation (in),1981-2010.



Projections of annual precipitation for 2040-2069 at University Park,PA RCP4.5 is a moderate and RCP8.5 a more extreme greenhouse gas emissions scenario.



Mean temperature projections at University Park, PA, showing measured data with the moderate RCP4.5 and the more extreme RCP8.5 projections



Change in seasonal minimum temperature,1895-2019.

Climate and Climate Change

Average and extreme temperatures will continue to increase in the Upper Chesapeake Bay, while annual precipitation will increase and become more variable, with larger storms. Wetter springs lead to cooler spring temperatures, both of which delay crop planting. Warmer winters may contribute to increased pest and plant disease levels.

To manage land sustainably, consider weather and climate.

Crops and Livestock

- No-till, cover cropping, and addition of perennial crops reduces erosion while adding soil organic matter in cropping systems. Additional organic matter increases soil water holding capacity, providing resistance to drought.
- Hotter, drier summers reduce forage production. Pastures with mixtures of plant species may have greater capacity to provide forage during extreme weather.
- Hotter summers, especially hotter summer nights, increases heat stress in livestock and reduce production. New strategies for cooling and water supply may be needed.

Water Resources

- Increasing precipitation, especially large storms, also increase erosion of soil and losses of nutrients, and can reduce the water quality in the region's streams and rivers.
- UCB research into nutrient management technologies, including manure injection, drone-based sensors, and nutrient extraction systems, is providing ways to keep nutrients where they are needed, and out of waterways.
- Another promising strategy is to identify critical source areas, where both high nutrient levels and transport to streams occur, and to target those areas for additional best management practices. This improves cost effectiveness and efficiency.

Decision Support

- Fertilizer Forecaster: A web-based forecasting platform that guides daily decisions on when and where to apply manure and fertilizer.
- Beescape: An online tool that helps beekeepers assess possible temperature effects on honey bee health in their hives, as well as the quality of the floral resources in the surrounding lands.

USDA Northeast Climate Hub
U.S. Department of Agriculture

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