LOWER CHESAPEAKE BAY (LCB)

LTAR Network and USDA Climate Hubs are working to develop knowledge and technology for sound resource management **via research and collaboration with stakeholders.** 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 Lower Chesapeake Bay (LCB) is the southeastern half of the Chesapeake Bay watershed comprised of the Piedmont and, Coastal Plain physiographic regions and bridges both the USDA Northeast and Southeast Climate Hubs. The climate is humid subtropical.

Historic Temperature

Historic average annual temperature in Prince Georges County (1901-2000) is 55 °F. Since 1983 the average annual temperature was greater than the long-term average, with only four exceptions. Mean maximum temperature is highest in July (87 °F). Mean minimum temperature is lowest in January (25 °F).

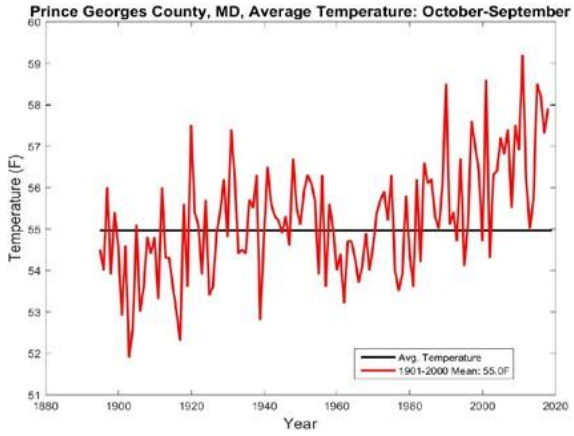
Historic Precipitation

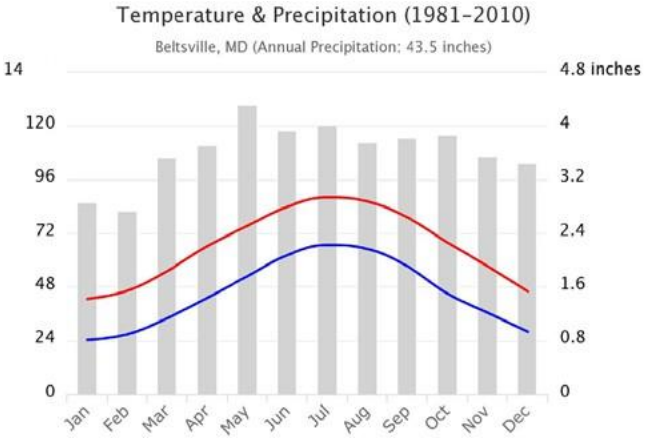
Average annual rainfall is in the low 40's (inches) and is fairly uniform throughout the year, although winters are slightly drier than the remainder of the year.

Growing Season

The frost-free season is from April 5 through November 1. Precipitation is favorable to growing through this period, though irrigation is growing more prevalent with time to augment yield and safeguard against drought.

Average annual temperature variation compared to mean temperature for (1901 -2000) (data obtained from NOAA)





Historic maximum (red line) and minimum (blue line) temperatures and mean precipitation (gray bars) (1981-2010) (credit: Climate Toolbox).

Measuring Weather and Climate

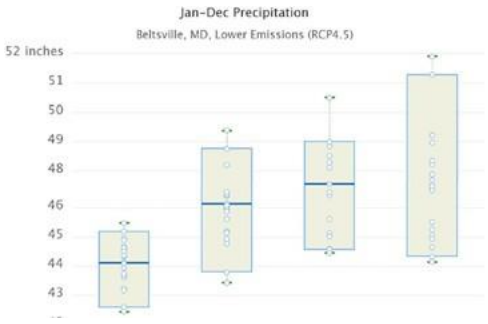
Rainfall in the humid sub-tropical LCB region is primarily frontal from October through May and primarily convective from June through September. Hurricane extremes of rainfall and/or damaging winds are occasionally experienced in late summer or early autumn.

Impacts to Agriculture

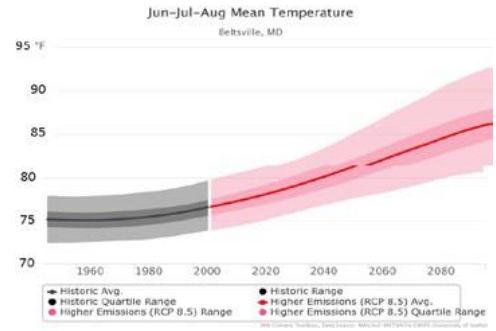
Crop production relies on available water. On an annualized basis, current annual precipitation exceeds annual potential evapotranspiration (PET). Future projections show increasing water deficits with time and, of greater concern, is the variability in timing of rainfall. The annual rainfall and PET totals might suggest minimal needs for irrigation, however, projections indicate both more intense rainfall and longer periods between rainfall events. Thus, reliance on irrigation will increasingly become the norm within the LCB, drawing down both groundwater and surface water reserves.

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

LOWER CHESAPEAKE BAY (LCB)



Historic and projected precipitation by rod. (Climate Toolbox).



Hsorc and rojcd an raur (Climate Toolbox).

Predicted Climate Change

- Average annual rainfall is projected to increase from 46 in to 47 in by 2100 and likely to be more variable.
- Mean annual temperatures are also projected to increase by approximately 10 °F during this same time period.
- The number of extremely hot days (higher than 105 °F) are projected to more than double, and will likely increase evapotranspiration to more than the annual rainfall.
- This will shift water availability from an annual surplus to an annual deficit of more than 2 inches by the end of the 21st century.

Historic and Forecasted Climate Variables: High and Low Projections

		Growing Days	Days Exceeding Heat Indices			Water Availability (inches)		
Emissions Model			90 °F	100 °F	105 °F	Annual Precipitation	Annual PET	Delta
Historic 1981-2010		210	43	8	3	44.1	42.9	1.2
Early 21st Century 2010-2039	Low	225	62	19	8	46.1	46.2	-0.1
	High	225	64	20	8	46.1	46.6	-0.5
Mid 21st Century 2040-2069	Low	237	78	31	15	46.8	48.3	-1.5
	High	243	88	42	24	47.3	50.3	-3.0
Late 21st Century 2070-2099	Low	230	85	37	21	47.0	49.3	-2.3
	High	256	112	69	48	48.6	54.1	-5.5

Weather and climate considerations to manage lands sustainably

Cropping Systems

- **The forecasted annual water balance will shift from a surplus to a deficit with greater uncertainty in the timing of rainfall. Both factors create a greater reliance on irrigation and an increased demand on groundwater resources.**
- **An increase in the length of the growing season may change cropping patterns and increase pressure from invasive species.**
- **Wetland ecosystem function will be vulnerable to increased variability of rainfall, which may reduce amount of time the wetlands are wet and result in the loss of critical habitats.**
- **Warmer winters will increase effectiveness of winter cover crops for nutrient scavenging and reducing soil erosion.**

Water Resources

- **Future water use in the Chesapeake Bay Watershed will be heavily influenced by the competing water demands of increasing urbanization and decreasing water quality decreasing related to urbanization and farmland intensification.**
- **Sustainable agricultural remediation, green water use, and green urban development, including urban farming, will be the key to sustainable use of water resources (Van Veenhuizen, 2014).**

Livestock

- **There will be increased heat stress and increased operation of ventilation fans on poultry houses, which may increase emissions of ammonia and other atmospheric pollutants.**

Decision Support

- **Modular open-access web-based applications have been constructed and are currently being regionalized nationally to aid growers, agricultural professionals, and researchers on cover and cash crop, weed, nitrogen, and water management.**
- **To make these tools adaptive, a weather application (now in beta testing) has been constructed for near- to real-time decision making.**

USDA Northeast Climate Hub
U.S. Department of Agriculture

For more information contact:

Site Lead:
Michael Cosh
michael.cosh@usda.gov

Director, Northeast Climate Hub:
Lindsey Rustad
lindsey.rustad@usda.gov

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