Fact Sheet

Title: Climate Impacts to Restoration Practices

Program: Chesapeake Bay Trust Restoration Research, Award No. 16928

Funders: The Maryland Department of Natural Resources, the Maryland Department of Transportation State Highway Administration, the National Fish and Wildlife Foundation through the U.S. Environmental Protection Agency's Chesapeake Bay Program Office, and the Chesapeake Bay Trust

Research Question:

This work addresses the CBT 2019 Research Restoration Research Question B.5: Climate Impacts to Restoration Practices: *Climate change models predict that frequency and intensity of rain events will increase, that growing season will lengthen, and that other processes related to the Chesapeake community's approved set of BMPs will change. As a result, some suggest that standards for stormwater practices, stream restoration, and other BMPs should change (e.g., plan to treat a two-inch rain event versus a one-inch rain event; design stream restoration practices for more frequent storms) …Funders are looking…to compare outcomes (pounds of nitrogen treated, sediment reduced) …*

Key Products and Results:

- Developed methods and Python code to update NOAA Atlas 14 Precipitation Intensity-Duration-Frequency (IDF) Curves for projected future climate conditions for 1 through 1,000-year recurrences as well as a peaks-over-threshold approach to estimating events with less than 1-year recurrence interval.
- Provided a database of future IDF curves and 90th percentile event magnitudes for all 79 Atlas 14 weather stations in the State of Maryland for intervals centered at 2055 and 2085. For each year range results are provided for four statistically downscaled global climate models (GCMs) representing low, median, and high rates of change in annual precipitation volume.
- Developed methods and Python code to link IDF curve results to SWMM simulations of storm event runoff from urban areas at varying levels of imperviousness.
- Used project tools and output to analyze potential effects on stream stability, best management practice (BMP) performance, and adequacy of existing design guidelines for road culverts and Environmental site Design.

- The risk of intense rainfall events is likely to increase; however, different GCMs show a wide range of precipitation predictions for many Maryland stations.
- Largest increases in rainfall are likely to be focused in low frequency extreme events.
- The risk of instability in existing stream channels will increase, but actual impacts will depend on site-specific conditions.
- Road culverts, which must address low-recurrence extreme events are likely to be under-sized under future climate if built to existing design standards.
- On average, large increases are not projected for the magnitude of events with a recurrence frequency of less than a year. As a result, stormwater runoff from development that follows Environmental Site Design requirements and urban BMP design guidelines is likely to achieve intended water quality benefits through the end of the century.

All results are conditional on the LOCA statistical downscaling of CMIP5 global climate model experiments. The analyses would benefit from additional experiments with other statistically and dynamically downscaled climate projections.

For further details please visit the CBT Restoration Research website.