CLIMATE CHANGE PROJECTIONS FOR WASHINGTON, DC

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Projecting local climate change - Downscaling

Downscaling is the process of incorporating local data into global climate models in order to translate the results to the local level.

Daily temperature, precipitation, and humidity projections for 1960-2100

Climate projections are averaged over 20-year periods:

Baseline (1981-2000)	2020s (2015-2034)	2050s (2045-2064)	2080s (2075-2094)

Climate Indicators

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Precipitation

Extreme Events

- # of days/year with rainfall at or above 1 in
- # of days/year with rainfall at or above 2 in
- 1-yr 24 hr storm (in)
- 2-yr 24 hr storm (in)
- 15-yr 24 hr storm (in)
- 25-yr 24 hr storm (in)
- 100-yr 24 hr storm (in)
- 200-yr 24 hr storm (in)
- 2-yr 6 hr storm (in)
- 15-yr 6 hr storm (in)
- 100-yr 6 hr storm (in)
- 200-yr 6 hr storm (in)
- 80^{th} Percentile storm (in)
- 90^{th} Percentile storm (in)
- 95^{th} Percentile storm (in)

Temperature

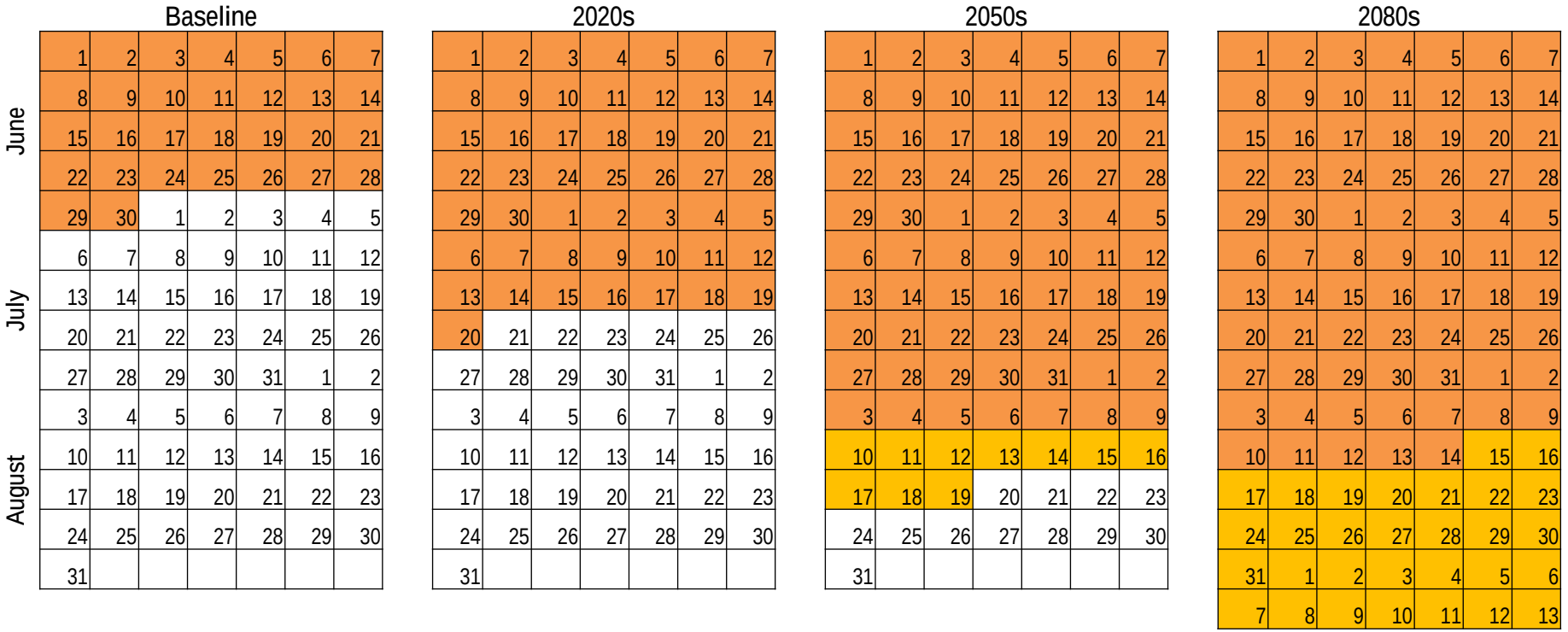
Average Temperature

- Summer Maximum Temperature (daytime)
- Summer Minimum Temperature (nightime)

Extreme Events

- # of heat waves per year
- Avg heat wave duration (in days)
- # of days/yr with heat index at or above 95 ^{o}F
- # of days/yr with ambient temp at or above 95 ^{o}F
- Increase in frequency of the 2012 heat wave

Extreme Heat Events
Days over 95°F Heat Index



Extreme Heat Events
Heat Wave Length & Frequency

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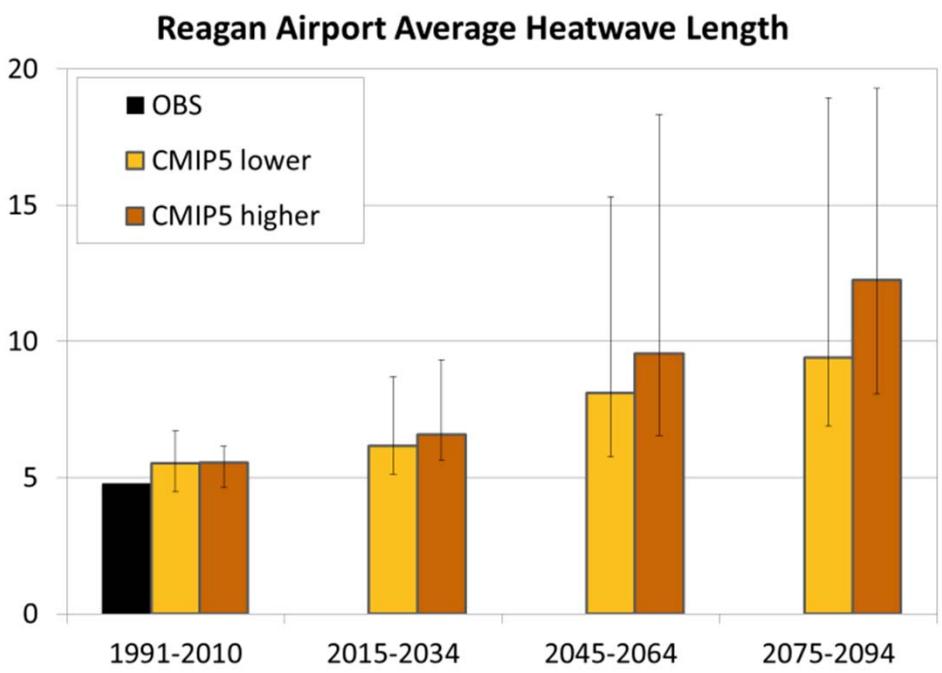
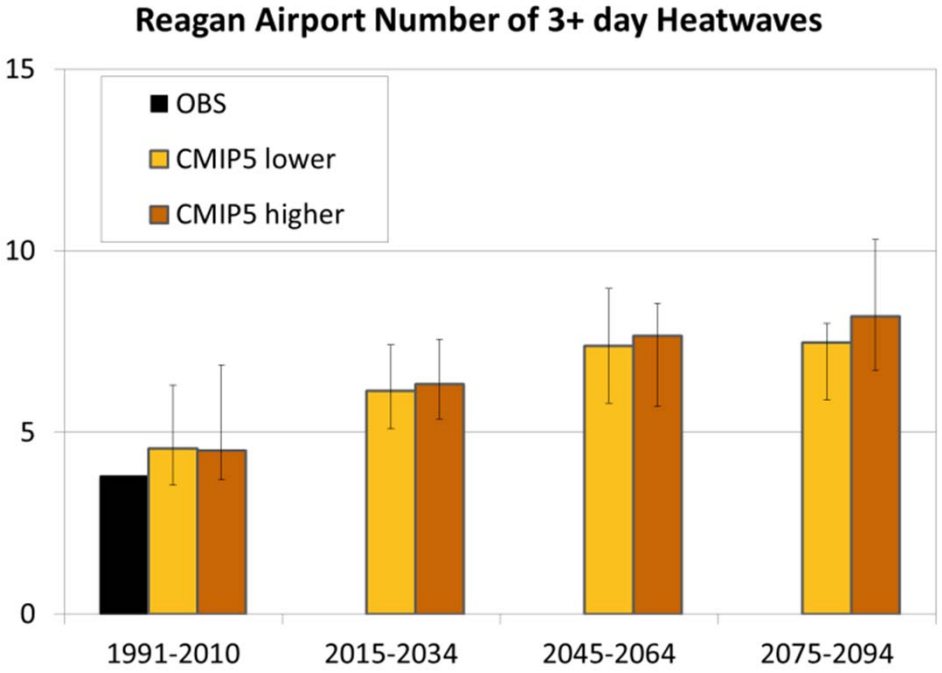




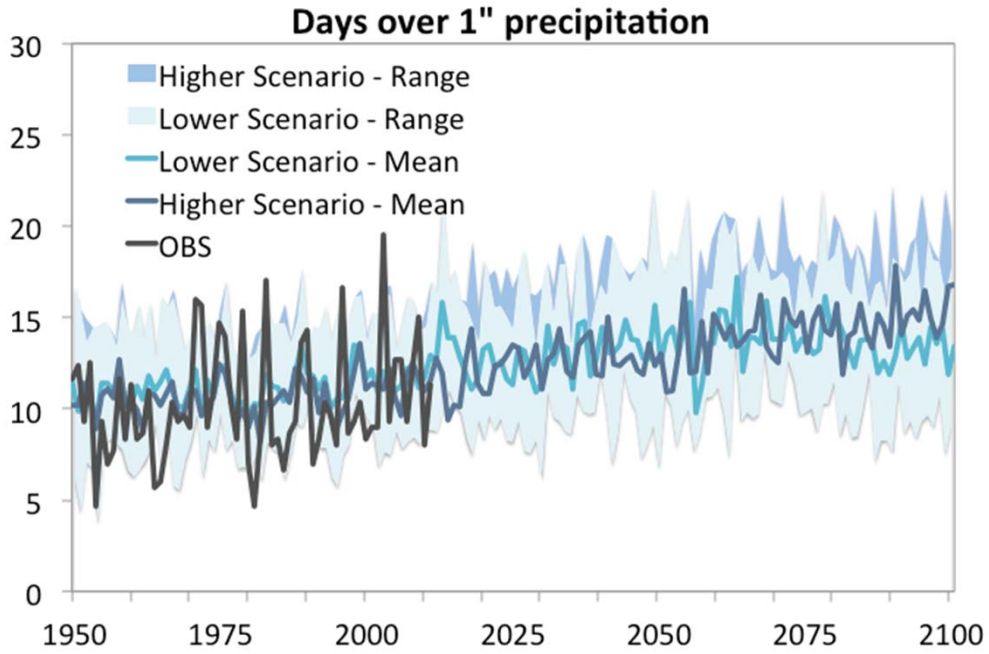
Heat waves, defined as 3 consecutive days when the heat index is above 95°F, are projected to be more **frequent** and last **longer.**

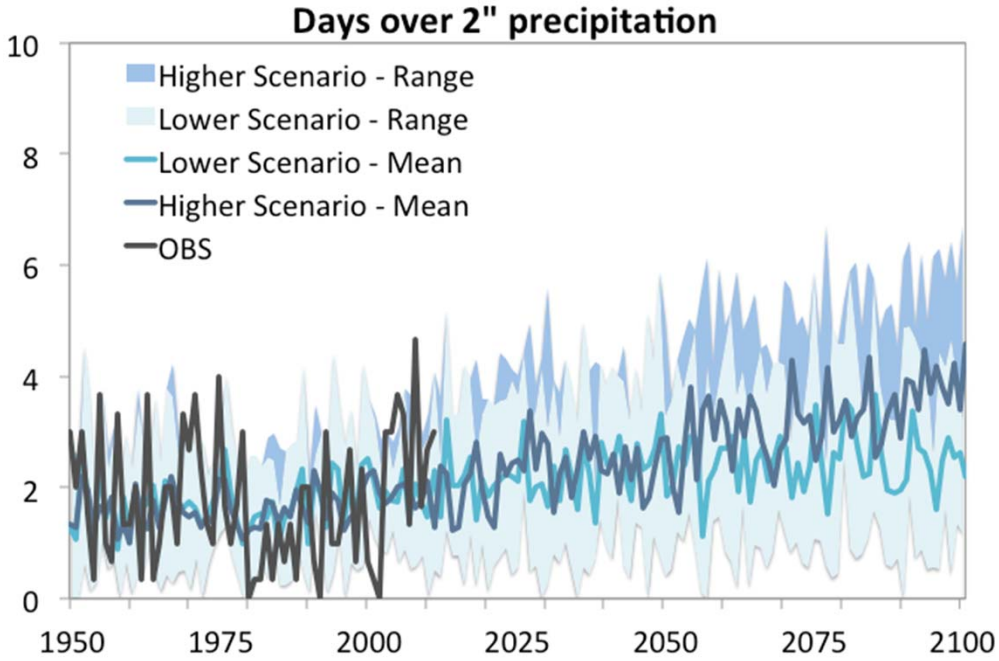
Precipitation Projections for DC

Observed trends in measures of extreme precipitation are expected to continue to increase.

Charts show the number of days per year with more than 1” (top) and 2” (bottom) of precipitation in 24h.

By the 2080s the number of days per year with more than 2” of rain are expected to more than double from 2 days to 4.5 days under the higher scenario.





Design Storm Events

Changes in rainfall volumes have a significant impact on infrastructure.

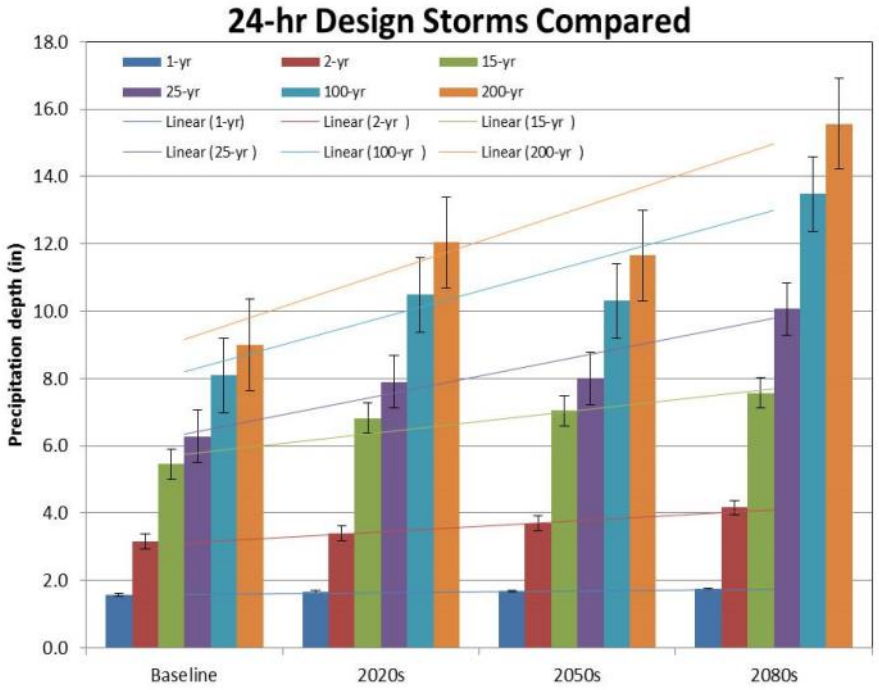
Design storms are the selected events that engineers use to design drainage infrastructure, bridges, culverts, etc.

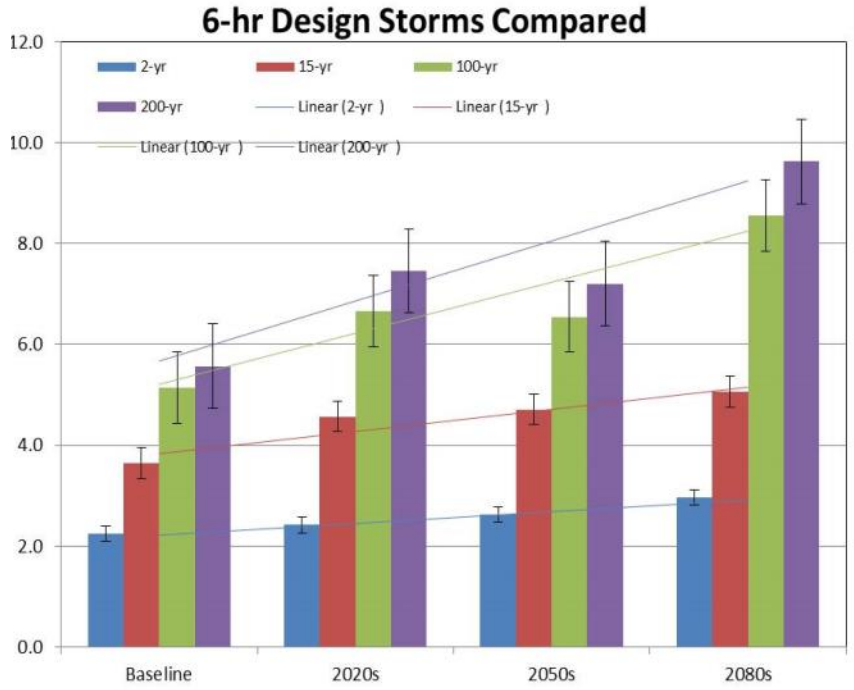
Input from DC Water, DDOT and DDOE's Stormwater Management Division informed the selection of events that are used as standards for stormwater, wastewater, and transportation infrastructure.

The chart shows how rainfall volumes are projected to increase across the relevant design storm events, especially for the more extreme (100 and 200 year) events.

Design Storm	Baseline 1981-2000	2020s	2050s	2080s
1-yr 24 hr. storm (in)	1.6	1.7 (1.5 - 1.8)	1.7 (1.5 - 1.8)	2 (±<1)
2-yr 24 hr. storm (in)	3.2	3.4 (3.2 - 3.7)	3.7 (3.5 - 3.9)	4 (4 - 5)
15-yr 24 hr. storm (in)	5.5	6.8 (6.0 - 7.3)	7.1 (6.7 - 7.6)	8 (4 - 9)
25-yr 24 hr. storm (in)	6.3	7.9 (6.8 - 8.6)	8 (7.5 - 8.8)	10 (8 - 12)
100-yr 24 hr. storm (in)	8.1	10.5 (8.9 - 12.4)	10.3 (9.0 - 11.9)	14 (10 - 16)
200-yr 24 hr. storm (in)	9	12 (10.1 - 14.7)	11.7 (9.8 - 13.6)	16 (11 - 19)
2-yr 6 hr. storm (in)	2.3	2.4 (±<0.1)	2.6 (2.6 - 2.7	3 (±<1)
15-yr 6 hr. storm (in)	3.6	4.6 (4.3 - 4.8)	4.7 (4.6 - 4.8)	5 (4 - 6)
100-yr 6 hr. storm (in)	5.1	6.7 (6.5 - 6.8)	6.5 (6.4 - 6.7)	9 (7 - 10)
200-yr 6 hr. storm (in)	5.6	7.5 (7.2 - 7.7)	7.2 (±<0.1)	10 (8 - 11)
80th Percentile storm (in)	0.8	0.9 (0.1)	0.9 (0.1)	0.95 (0.1-0.15)
90th Percentile storm (in)	1.14	1.24 (0.1)	1.24 – 1.34 (0.1-0.2)	1.24 – 1.39 (0.1-0.25)
95th Percentile storm (in)	1.5	1.6 – 1.65 (0.1-0.15)	1.6 – 1.75 (0.1-0.25)	1.75 – 1.85 (0.15-0.35)

Design Storms Compared





Bar charts compare 24-hour and 6-hour design storms for each of the planning horizons. Trend lines show increase in rainfall volumes over time.

Changes in Design Storm Events
Implications & Opportunities for Further Modelling

Example:

Drainage infrastructure is generally designed to handle rainfall from a 15-year event.

Historically, that meant 5.5” of rain.

In the future, a storm with the same frequency will bring rainfall of:

- 6.8” in the 2020s
- 7.1” inches in the 2050s
- 8” inches in the 2080s

The result, without upgrades, could mean more frequent flooding and CSO discharges.

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