IMPLICATIONS OF PRECIPITATION CHANGES IN SOUTHEAST MICHIGAN AND OPTIONS FOR RESPONSE: A GUIDE FOR MUNICIPALITIES

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This fact sheet is part of a guide supporting decision makers and water resource managers as they adapt policies and practices in stormwater management in response to a changing climate. *hrwc.org/stormwater-and-climate*

Changing Precipitation in Southeast Michigan

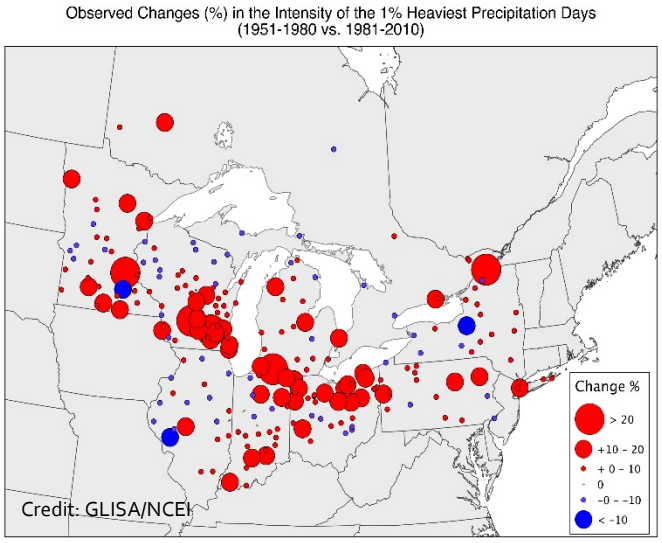
Across the region, patterns in precipitation have been changing. Historical records and projected trends indicate that these changes require modifications to the practice of stormwater management. Below is a summary of climate change in southeast Michigan as indicated by the historical data record and climate models designed to predict future trends.

The form, amount, and timing of precipitation in the Great Lakes region is changing. In Southeast Michigan, total precipitation has increased, the strongest storms have become stronger and more frequent, and snow has been replaced with rain.

Total Precipitation	**Increased by 15% across Southeast Michigan and 44% in Ann Arbor.[1]** **In the future, the wet season may get wetter as the dry season gets drier.**
Heavy Storms	**Heavy storms have become stronger and more frequent throughout the region.[2]** **Larger storms have grown faster than total precipitation, meaning more precipitation is concentrated in heavier events.**
Seasonal Patterns	**Shortening winters yield less snow accumulation and rain instead of snow in the fall and spring.**

Total Precipitation

Total Precipitation has changed in the Great Lakes region over the last several decades. Most areas are receiving more precipitation now than in the past, and Southeast Michigan is in line with this regional trend. Annual precipitation totals increased by about 12% from 1950-2014 but the magnitude of the change varies from location to location. Total annual precipitation in Ann Arbor has increased by 44% while in other nearby areas it has only increased slightly. Climate scientists anticipate the broader regional trend will continue or accelerate, with approximately 5-25%[3] more precipitation falling on the region through most of the coming century.



Extreme Precipitation

Heavy and extreme precipitation events have become dramatically more frequent in the Great Lakes region. The amount of precipitation falling in the most intense 1% of precipitation events increased by 37% in the Midwest and 71% in the Northeast from 1958 through 2012.[4] In the extreme western extent of the Great Lakes region, as much as 50% of annual total precipitation falls during 10 days of the year. Ann Arbor has seen a 48% increase in the number of daily precipitation events that exceed 1.25" of precipitation (above which nuisance and problematic flooding occur).

Seasonal Patterns

Even as most climate models project that total annual precipitation will rise in the Southern Great Lakes basin, many models also suggest that summer precipitation will remain stable or decline in the future. This could lead to a polarizing of the wet and dry seasons in the region, with more precipitation falling from autumn through spring and less precipitation falling during the summer.

Winters have become shorter throughout the region. In the Midwest, the freeze-free season has grown by 9 days and in the Northeast by 10. Warmer winter temperatures have reduced snow accumulation totals by melting snow more quickly and replacing snowfall with rain. This trend is projected to accelerate rapidly. By the end of the century, the region could see 1-2 months less of freezing temperatures[4], substantially altering the nature of winter precipitation in many locations.

Geographic Patterns

Precipitation has changed throughout the Great Lakes region, but the changes are uneven. Some communities have recorded large changes while others have been relatively stable, and there are some exceptions to the overall regional trends.

Increasing precipitation totals and changes in extreme precipitation have been greatest across the southern areas of the Great Lakes basin. Nearer Lake Superior, across the Upper Peninsula of Michigan, Northern Wisconsin, and Northern Minnesota, precipitation has actually declined slightly.

Lake-effect snowfall has increased, particularly in northern areas of the region as snowfall in the southern areas has declined. Warmer lake surface water and less ice cover on the lakes allows for more evaporation and more fuel for lake-effect snow, while warmer temperatures to the south simply reduce the chance of precipitation falling as snow rather than rain.

Notes

1. Based on changes in the linear best-fit of annual precipitation totals from 1950-2014.

2. Ann Arbor has seen a 48% increase in days exceeding 1.25" of precipitation, based on changes in linear best-fits of annual values from 1951-2014.

3. Based on values from CMIP3, CMIP5, and NARCCAP projections for late-mid or end of century.

4. From the National Climate Assessment, 2014.http:// nca2014.globalchange.gov