

# 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.*  
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## ISSUES IN STORMWATER MANAGEMENT: FLOODPLAINS

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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 description of how floodplains and floodplain management will be affected by climate change.

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### Defining the Floodplain

All Federal Emergency Management Agency (FEMA) flood maps within the Huron River watershed are currently based on a 24-hour 1% annual chance event of 4.36 inches of rain. This event size is based on the 1992 document Rainfall Frequency Atlas of the Midwest (Bulletin 71). The data in the bulletin is now over 30 years old. In 2013 NOAA published Atlas 14 Volume 8 (version 2) which redefines the 24-hour 1% annual chance event for the Ann Arbor area as 5.11 inches of rain. This is a 17.2 % increase and does not take into account future climate change. Due to impervious surfaces and piped stormwater conveyance systems, the increased rainfall intensity will result in even higher increases in peak discharges within floodplains (in the 25% range), which will result in higher floodplain elevations and larger floodplains. This trend will continue as we experience further climate change.

### Actions

The following represents a list of options to mitigate impacts associated with an expanding floodplain.

1. **Adopt the 2013 NOAA Atlas 14 precipitation frequency estimates** – Local and County governments should adopt these current precipitation frequency estimates for stormwater management regulation and infrastructure design. State agencies should also move to these current standards for floodplain mapping. Adopting the new NOAA precipitation frequency estimates will only bring us up to date with weather observations, it will not take into account the future changes.
2. **Revise Flood Insurance Rate Maps** – Communities and Counties could work with the State and FEMA to expedite Flood Insurance Rate Map revisions to represent the current NOAA Atlas 14 precipitation frequency estimates. Again, this would not take into account future climate change; just bring the maps up to date.
3. **Add a 15 to 20 % safety factor to stormwater management requirements** – In addition to adopting the 2012 NOAA Atlas 14 precipitation frequency estimates, counties and communities could add a 15 to 20 percent safety factor to rain event sizes. This action would take into account the expected future increases in precipitation intensity, and ensure that new stormwater infrastructure is capable of handling future events.
4. **Regulate to the 0.2% annual chance event** – FEMA and State law requires communities to regulate to the 1% annual chance event. Based on

the current NOAA precipitation estimates the 0.2% event is approximately 30% larger than the 1% event. As climate change continues the 1% event will increase and at some point equal the current 0.2% event. Since the 0.2% floodplain boundaries are shown on flood insurance rate maps, communities could choose to regulate to that event. This would take into account that the future 1% storm will be larger and adds a safety factor.

5. **Encourage or require Green Infrastructure (GI)** – GI is an adaptable term used to describe an array of products, technologies, and practices that use natural systems – or engineered systems that mimic natural processes – to enhance overall environmental quality and provide utility services. The common denominator with most GI is stormwater infiltration. Even though GI is typically thought of as a water quality technique, the infiltration process is also a water quantity control. Reducing runoff quantity will help reduce downstream flooding.

*Dive Deeper*

*The No Adverse Impact Tool Kit can be found on the ASFPM web site at:*

<http://www.floods.org/index.asp?menuID=460&firstlevelmenuID=187&siteID=1e>

*NOAA Atlas 14 data and analysis*

<http://hdsc.nws.noaa.gov/hdsc/pfds>

### Considerations

Climate change will amplify the need for sound floodplain management techniques and mitigation. The Association of State Floodplain Managers (ASFPM) recommends an approach they call No Adverse Impact, which includes actions such as:

- A. Prepare flood studies using future conditions hydrology
- B. Zoning overlay districts to restrict floodplain development
- C. Prohibit building in the floodway
- D. Higher regulatory standards for building and development codes
- E. Prohibiting new critical facilities in hazard areas
- F. Greenway establishment
- G. Transfer of development rights programs

### Example



Floodplain map showing the change in inundated area between FEMA floodplain maps and the City of Ann Arbor's Stormwater Model. FEMA maps use the 0.2% chance storm definition from Bulletin 71 data. The Ann Arbor model uses the 0.2% chance storm definition from Atlas 14. New data results in a larger area of inundation which includes eight new structures in this section of the river.

-  Structures in effective and modelled floodplain
-  Structures model removed from floodplain
-  Structures model added to floodplain