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

Solutions in Stormwater Management: Green Infrastructure

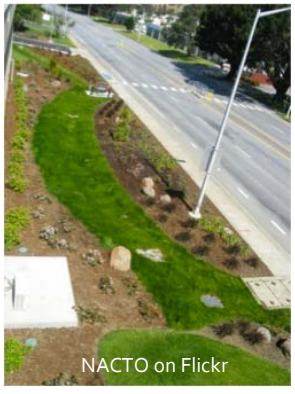
Across the region, patterns in precipitation have been changing. Historical records and projected trends indicate that these changes require modifications to the practice of stormwater management. Below is a description of Green Infrastructure and how it can be used to improve stormwater management in a changing climate.

Green Infrastructure vs. Grey Infrastructure

In recent years, the concept of Green Infrastructure (GI) has moved from broad regional planning discussions about natural resource conservation to specific uses in stormwater treatment. Naturally-occurring GI, such as wetlands and meandering streams, can be mimicked inhuman-constructed GI for the purpose of managing stormwater. Designers and engineers now construct bioswales, rain gardens, green roofs, pervious pavement, and various site-specific infiltration designs. The point of these projects is to draw stormwater into the groundwater instead of piping it (in conventional grey infrastructure) quickly into streams.

Green Infrastructure is not merely rain gardens and bioswales. Each of these features were formerly described as Low Impact Development (LID), or the implementation of best management practices at the site-specific level. GI, like grey infrastructure, expands the same idea to a community-wide scope. Its focus is on the planned, strategic placement of LID features and on the accounting of reduced stormwater volume and pollutant loads those features provide. It requires planning and inter-jurisdictional communication, in some cases.

The bottom-line is that using GI for stormwater management is cheaper than grey approaches. GI is designed to capture, treat and infiltrate runoff from the majority of storms or the first inch or so from larger storms. Each GI application is smaller than conventional, centralized detention ponds or underground storage, but many more applications are distributed over the management area. When combined, GI practices reduce the volume that needs to be stored in conventional ponds and vaults, substantially reducing the overall cost.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Green Infrastructure as Climate Change Adaptation

Making Green Infrastructure a part of a municipal stormwater management approach provides a number of climate adaptation benefits. The flexible, distributed nature of GI allows a manager to use it

to supplement an existing grey system to adjust storage capacity. Adding a little extra storage capacity may allow the system to better withstand the more frequent larger storms that are part of the climate change scenario. GI can be focused on drainage areas that are currently under capacity for targeted adaptation. Further, GI provides better infiltration of smaller storms into groundwater. This additional groundwater volume improves stream conditions during the longer drought periods that are also predicted. Finally, the vegetation used in GI practices is adapted to fluctuating conditions and should be more resilient to other climate change impacts, thereby providing stable habitat for local wildlife.

Not a Silver Bullet

Green Infrastructure practices are not the perfect solution to all climate and general stormwater stresses, however. To be part of an effective stormwater and adaptation strategy, GI requires careful planning and practice placement. GI practices have a different range of physical characteristics to consider than conventional storage and piping. By its nature, GI is distributed across a wide area and is more challenging to maintain than a single structure. Probably the most challenging drawback is that GI practices are not designed to capture and store the larger storms. Rather, they capture and infiltrate smaller storms or the initial runoff from larger storms. GI may need to be supplemented with grey storage systems to accomplish all goals. Finally, current regulatory and management rules and structures may need to be altered to accommodate GI as a partial stormwater solution. Education may be needed to make the newer approach acceptable across various interests.

Dive Deeper

Resources for GI practices are plentiful on the internet. A good place to start is U.S. EPA's GI site: http://water.epa.gov/infrastructure/greeninfrastructure/

The Huron River Watershed Council has compiled resources that are locally relevant, including tools for finding examples and mapping opportunities. www.hrwc.org/green-infrastructure

NOAA Atlas 14 data and analysis hdsc.nws.noaa.gov/hdsc/pfds

How To Develop a Green Infrastructure Strategy

If a municipality is interested in employing a GI strategy to partially address stormwater management and climate adaptation goals, a few basic steps that should be taken:

1. Develop an inventory of stormwater infrastructure assets and needs. A system inventory is important for identifying where GI would be needed to improve storage capacity and groundwater recharge, and where it is feasible.
2. Develop a GI plan. The plan should identify what types and where GI practices can be located. Projects can then be developed on a priority or opportunistic basis.
3. Identify a funding mechanism. Ideally, the municipality already has a direct funding mechanism like a stormwater utility to pay for infrastructure improvements. If not, advanced planning for project funding is important for implementation. Established funding can help leverage additional grant funds for projects.
4. Utilize NOAA Atlas 14 data for project design and consider adding a margin of safety to accommodate future increases in precipitation volumes and intensities.
5. Plan for maintenance. GI projects require regular maintenance (at least in initial years) that is different than for conventional practices. A staffing plan will be needed if GI implementation is ramped up. GI practices that are not properly maintained become community blemishes.

Example

Installation of a "green street" with bioswales in sidewalk extensions and residential rain gardens reduced bankfull runoff volume by 60%, reduced flood frequency to 1%, and reduced phosphorus runoff by 92%.