WEATHER - EXTREME TRENDS

The Minnehaha Creek Watershed Stormwater Adaptation Study

Spring 2013

Contents

Resources

A report will be completed and distributed summer 2013 to provide the technical information as well as community outreach tips and hints for communities.

Please go to www.minnehahacreek.org/WET for any follow up materials, study summaries, and technical papers written.

Events

2013 LID Pre-Symposium Short Course

Register
Sunday, August 18, 2013
1:00-5:00 p.m.

Mark Seeley presenting at the Forum

How to Proceed

Representatives from communities within the Minnehaha Creek watershed have had several conversations on the state of stormwater adaptation planning. Barriers have been identified as well as some key opportunities we have to overcome these barriers. Action plans were developed with key steps that we can take to address major concerns for enhancing our stormwater systems to account for future changes in weather patterns.

On January 22, 2013 at the Eisenhower Community Center, Hopkins small groups worked on developing action plans for stormwater adaptation. These action plans were themed by four work groups: education, outreach, and stakeholder engagement; land use planning and policy; stormwater infrastructure (gray/green) and Low Impact Development; and sustainable funding for stormwater infrastructure. Action plans were then prioritized by the whole group, which resulted in six plans:

1. Convene a summit to educate local policy makers about creating resilient stormwater infrastructure.
2. Adapt development and zoning codes to preserve natural corridors and conveyance systems, and reduce structural conveyance systems associated with transportation infrastructures.
3. Develop and implement an ordinance that protects soil from compaction or requires de-compacting soil and incorporates organic matter.
4. Integrate reuse in development plans to reduce the amount of water going into stormwater systems.
5. Assess needed infrastructure upgrades to accommodate current and predicted stormwater runoff.
6. Evaluate the immediate versus the long term economic impacts of stormwater management issues by commissioning reports to evaluate the impact climate change will have on stormwater management to better evaluate these costs.

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Box culvert installed by City of Minneapolis

Bancroft Meadows Flood Basin at Bloomington and 42nd. Built 1989.

Photos courtesy of City of Minneapolis

Community meetings are being planned to disseminate the results of this study directly to cities within the watershed. The study team is working with the Northland Education for Municipal Officials (NEMO) program to develop a workshop that can be disseminated to communities beyond the scope of this study.

Study Results

The project team has completed modeling for two areas. One in Minneapolis and another in Victoria to uncover the effects of future precipitation patters on stormwater infrastructure. The use of these two sites provided a glimpse into the different challenges both a fully developed city and a developing city. The goal was to come up with action plans for what communities can do to prevent the most serious impacts from extreme events. A participation process engaged community members on what can be done and how, resulting in prioritized approaches and action plans. The study results include technical information gathered during the study, an economic evaluation of using low impact development, and a localized downscaled model of climate predictions.

Minneapolis and Victoria have different options in how they can adapt their cities for the future. Minneapolis must redevelop with stormwater in mind, whereas Victoria has the opportunity to grow with stormwater in mind. Retrofitting can become costly and Victoria has many opportunties to prevent these costs in the future.

Victoria's pipe system goes primarily to ponds which sends overflow to wetlands or recreational areas. Resilience was built directly into the system as it has been growing. Currently the system can account for the 100 year storm. Figure 1 demonstrates the change in impact on the community, which starts at 6 inches and then with current land use in blue, and future in red you can see the different impact as the city continues to grow, and how important planning based on their stomwater infrastructure is will be.

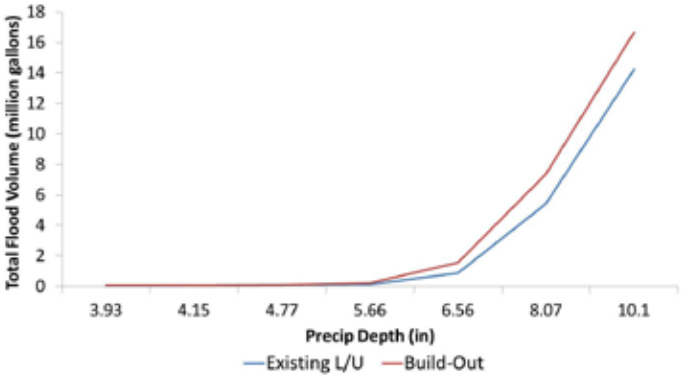


Figure 1.Percent Increase in Flood Volume in Victoria with and without Buildout

Minneapolis has more significant impacts from increases in precipitation. In Figure 2, you can see the impact of undersized pipes increasing as the Hiawatha watershed receives heavier rain events. Minneapolis has already taken steps to build capacity into the system. Projects have helped protect receiving waters, houses and property, and have incorporated large recreation areas as well as underground storage to protect the community from overflows during more extreme events.

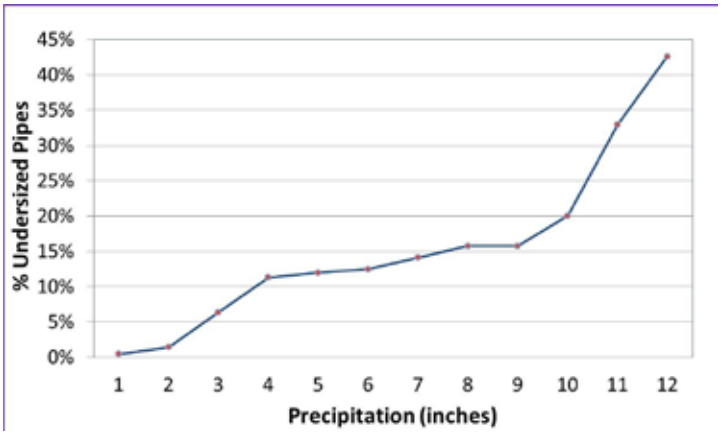


Figure 2. Percent Increase of Undersized Pipes in Hiawatha Watershed with Increasing Rainfall

52nd and Morgan Avenue S. in 1987
Photo courtesy of City of Minneapolis

Technical Results

A focus was put on the "10 year storm", which is the storm that has a 10% chance of returning in any given year. Another key storm is the "100 year storm", the storm that has a 1% chance of returning in any given year. This is the storm that the 100 year flood plains are based on. The "10 year storm" is a benchmark storm for planners to use when they are evaluating the capacity needed in stormwater infrastructure. In the figure below you can see the changes in return periods for the recent climate, optimistic, moderate, and pessimistic scenarios for future precipitation trends. To get these numbers scientists on the technical team for the study did several different combinations of downscale models and came up with a population of numbers to derive these from. We can expect at least a 9% increase in the amount of precipitation we receive in a given storm event.

Return Period: Current and Future

Return period (years)	Recent climate	mid-21st cent. Optimistic		mid-21st cent. Moderate		mid-21st cent. Pessimistic	
2.5	2.5	2.84		3.3		6.86	
5	3.17	3.47		4.11		8.4	
7.5	3.57	3.88		4.66		9.39	
10	3.86	4.19	**9%**	5.1	**32%**	10.13	**162%**
25	4.84	5.28		6.74		12.75	
50	5.67	6.22		8.31		15.03	
75	6.2	6.82		9.39		16.5	
100	6.59	7.27		10.23		17.59	

Upsizing is not the only answer to this increase in storm intensity. In Minneapolis researchers found that upsizing pipes is only feasible to 6.56 inches due to the volume overwhelming receiving waterbodies. Therefore, we need some other options for runoff storage. In Minneapolis as well as in Victoria this is currently answered with strategic open spaces that are dual use recreational areas. This issue is not as significant in Victoria as they still have the opportunity to preserve high priority flood zones for runoff as they develop.

Cost estimates and an overview of the potential for using low impact development options to mitigate runoff from extreme events is still underway. Preliminary cost estimates were presented at the January 22nd work group meeting. To review the presentation and see Michael Simposn, co-Investigator present on the latest technical output visit the WET work group page:

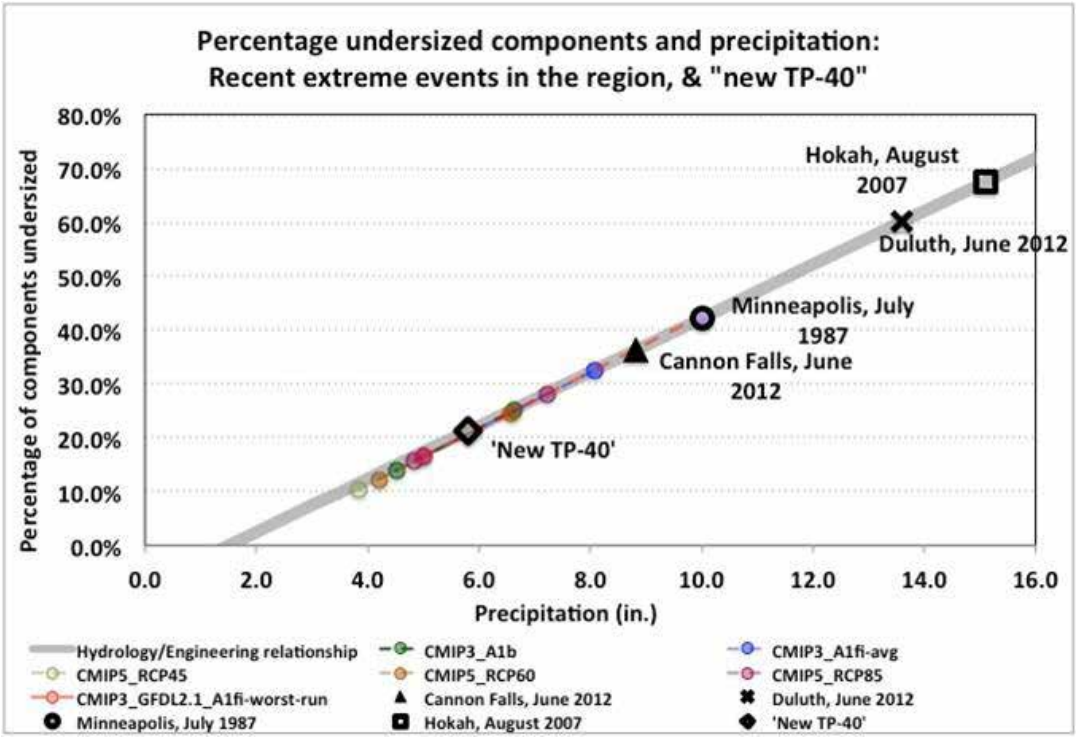
www.minnehahacreek.org/wetworkgroup

Atlas 14 and Beyond

Mallory Anderson, Minnehaha Creek Watershed District

Photo Credit: Jamie McCartney

Highway 60 near Excelsior, WI on August 20, 2007.



Atlas 14, the upgrade to TP-40 will require planners to review their design storm standards. Better statistics and spatial interpolation provide more accurate precipitation rates. It is important to note that these changes in the Atlas 14 are not due to changes in climate, but rather the statistical analysis of a denser network of data. It also covers a longer period of time. This changes the risk our communities are facing now, as well as into the future.

Can we afford to plan based on patterns of the past? Or must we look into the future and plan based on what's to come?

Beyond Atlas 14, and the changes that it will bring to our planning, questions over future predictions and flooding scenarios demand further inquiry. How accurately can we predict change in the future? More importantly how can we design our infrastructure to ensure it will protect our communities, our economy, or lakes, streams, and wetlands from frequent disruption?

Downscaling global climate models to the local level has been a rapidly growing field of inquiry. The reliability of this data, as well as how it can be used is evolving to make the most accurate predictions possible. This information can provide a window through which we can see what the future will look like. The message to take away from what we've learned from this work is that we can expect change, and that we can expect more extreme events. You can see in the figure above the predictions coming out of an assortment of climate models, and then extreme events are labeled including Minneapolis in 1987, Hokah in 2007, and Duluth in 2012. At what level can our cities and infrastructure handle these events? That's up to the community and our cities to decide.

Photo Credit: John Thomas, MPCA

Resources

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Photo Credit: City of Minneapolis

Thank you to all those that participated in the study and attended work group meetings.

This project is funded through Syntectic International, LLC, under a grant from The Climate Program Office of the National Oceanic and Atmospheric Administration.

2013 Low Impact Development Pre-Symposium Short Course

Community Stormwater Response to a Changing Landscape and Climate:

Identifying Barriers and Opportunities for Adaptation

Many regions of the country are experiencing more frequent and intense storms, and will continue to do so. The capacity of existing stormwater infrastructure may be inadequate resulting in more frequent flooding, increased property damage, public safety concerns, and impacts to the quality of downstream water bodies. Development and redevelopment can exacerbate the problem, but also provide an opportunity for communities to make sound planning decisions that reflect adaptation to our new environment.

Understanding tools and techniques that facilitate planning at a community level is the first step towards shaping a community's response to a changing climate. This interactive workshop will provide practical information on how to:

- Assess stormwater infrastructure vulnerability and required capacity under both existing and future precipitation conditions
- Identify stormwater adaptation options and costs - including the role of Low Impact Development (LID) - to mitigate impacts from changing precipitation patterns
- Manage uncertainty associated with modeling future conditions
- Effectively communicate technical information to local stakeholders and decision-makers to promote stormwater adaptation planning.

Attendees will leave with an understanding of the need for action, the knowledge and resources required to act, and skills for empowering decision-makers in their community to respond to a changing climate.

Participants in this short course include those involved in stormwater management, community development and redevelopment, municipal operations, design professionals, developers, contractors, local policy makers, and others concerned about local stormwater adaptation planning.

Register at: http://www.cce.umn.edu/2013-International-Low-Impact-Development-Symposium/Registration/index.html
Sunday, August 18, 2013
1:00-5:00 p.m.
Registration fee before July 15, 2013: $75; Registration fee after July 15, 2013: $115