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MEMORANDUM

To: **CMAP's Environment and Natural Resources Working Committee**

From: CMAP Staff

Date: February 2, 2017

Re: Causes of flooding and existing impacts

Urbanization and climate change are leading to more frequent and intense flooding events in northeastern Illinois. GO TO 2040 calls for integrating land use policies and site planning with water resources and identifies compact development, redevelopment, water conservation, and green infrastructure as techniques. Amidst growing evidence of increasing frequency and intensity of storm events, the extent and costs of urban flooding, and the continued costs of riverine flooding, CMAP intends to build on GO TO 2040's approach and refine how stormwater management is addressed in ON TO 2050, the next regional plan. Recommendations for this refinement will ultimately be summarized in a stormwater strategy paper. This memo is the first in a series to develop the strategy paper and focuses on providing a better understanding of the causes and impacts of flooding in the Chicago Region.

Flooding is a temporary condition where an area of normally dry land is partially or completely inundated with water, either from the overflow of water from a stream or river (riverine flooding) or from rainfall overwhelming the capacity of drainage systems, such as storm sewers, or local ponding of water (urban flooding).

Causes and drivers of flooding

While flooding is a natural process, development and changing precipitation patterns due to climate change have changed the way water flows through the landscape. The reasons behind flooding can be quite complex and are the result of a combination of factors. CMAP staff have identified the main causes of flooding in the region to establish a core understanding for future recommendations. The interrelated factors have been organized into five different categories: environmental conditions, climate change, development extent and location, stormwater system design and maintenance, and regulatory structure. CMAP also identified several drivers that perpetuate flooding of particular areas or continue to place homes and businesses at risk.

Environmental Conditions

Flat topography: The largely flat topography of the Chicago region contributes to flooding in two different ways. Flat topography means that the drainage areas of our region are relatively large and this broad area accumulates larger volumes of water as it moves down the system. At the same time, the flat or gently sloping terrain contains depressional areas in the landscape. During rain events, water can start to pool in these locations and, absent a secondary drainage system, may have nowhere to go until infiltrated into the ground.

Saturated or poorly drained soils and high groundwater table: The Chicago region is home to a variety of soil types, including both clay and hydric soils that each can contribute to flooding in different ways. Clay soils largely prevent the infiltration of water, so rainwater can pool or become runoff. In areas of saturated or poorly drained soils, precipitation cannot be easily absorbed into the ground. Some portions of the Chicago region have a high water table, which can result in flooding due to fully saturated soils.

Climate change

Northeastern Illinois has already experienced, and is projected to see even greater, changes in temperature and precipitation from climate change. This can result in increases in flooding due to increased frequency and intensity of storm events, reduced soil capacity from drought, and increases in winter rain and denser, heavier snow.

Increased frequency and intensity of storm events: Nationwide, the heaviest rainfall events have become heavier and more frequent. Between 1979 and 2009, the region experienced 40 percent more precipitation than the prior 30-year period. Storm events are also getting bigger: up to 40 percent of total annual precipitation in recent years came from the top 10 rainiest days.[1] This has important implications for flooding as the amount and time interval of precipitation can impact how much of the rainwater is absorbed by soils or handled by drainage systems. Storm events with steeper and higher peak discharges can result in more flooding as the soils and sewers quickly reach capacity. A higher frequency of heavy storms can create wet periods, with a higher risk of flooding from a subsequent storm due to saturated soils, full detention ponds, and higher water levels of rivers and streams. A two to three-inch storm during a wet period may do more damage than the same precipitation falling during a more typical period.

Reduced soil capacity from increases in temperatures and drought: Climate change is expected to also bring extended dry periods to the region, particularly in the summer months.[2] Coinciding with high temperatures, these droughts could dry soils and reduce stormwater infiltration. While on the face of it, drought could be thought to reduce flooding, the impact on soils could result in more stormwater runoff when storm events return.

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[1] State of Illinois Department of Natural Resources. 2015. Report for the Urban Flooding Awareness Act. www.dnr.illinois.gov/WaterResources/Documents/Final_UFAA_Report.pdf.

[2] Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

Increases in winter rain and denser, heavier snow: Climate change is anticipated to result in more winter precipitation falling in the form of rain rather than snow. When snowfall does occur, it is projected to be more intense, with more snowfall accumulation per event and denser, heavier snow.[3] Snowfall can result in flooding if large amounts of it melt in a short period of time. The risk of flooding can increase if the ground is frozen, the drainage systems are blocked by snow or ice, and if rain falls on top of packed snow.

Regulatory Structure

Standardized approach: Driven by efforts to maintain a more level playing field between different areas as well as logistically administer regulations and anticipate requirements, fairly static and standardized requirements are often used to manage stormwater management despite unique site conditions. For development, stormwater management regulations are often required on a site-by-site basis unless part of a larger subdivision process. As such, more shared, distributed systems are often harder to execute under current rules. Most detention release rates, which establish rates of flow out of a detention area so that downstream areas are not flooded or eroded, are set at the county scale and may not reflect conditions unique to that watershed.

Outdated floodplain boundaries: Floodplain boundaries can change in response to new development upstream as well as changes in precipitation over time. However, the pace at which regulated floodplain boundaries are updated as well as the precipitation data on which they are based has not kept pace with changing conditions.[4] As a result, more currently existing development could now be within the actual floodplain and new development may not be designed based on existing or future conditions. In addition, not all streams have been modeled and lack delineated floodplains, which therefore cannot be part of the development review process.

Static precipitation design standards: Stormwater management and floodplain management standards are based on specific sized storm events that rely on historically observed data as an indicator of future events. Given climate change, the changing nature of precipitation means that past data is no longer a good estimate of future conditions.[5] Yet regulations require adherence to these stationary precipitation design standards and do not account for the changing nature of precipitation and flooding.[6] While new regulations typically refer to updated floodplain boundaries in a reasonable amount of time, the incorporation of new precipitation data into infrastructure design standards has been slow. For example, some

[3] Jaffe, M. and Woloszyn, M. 2014. An Initial Assessment of Winter Climate Change Adaptation Measures for the City of Chicago. *Sea Grant Law and Policy Journal*, Vol. 6, No. 2, pp. 5-25.
[4] National Public Radio Morning Edition. September 15, 2016. Outdated FEMA Flood Maps Don't Account for Climate Change. See http://www.npr.org/2016/09/15/492260099/outdated-fema-flood-maps-dont-account-for-climate-change
[5] Markus, Momcilo, et al. 2007. Changing estimates of design precipitation in Northeastern Illinois: Comparison between different sources and sensitivity analysis. Journal of Hydrology (2007) 347, 211– 222. Recent research explored the translation of future climate scenarios into a product that engineers and planners could use to quantify climate change impacts and levels of uncertainty
[6] UFAA

communities referred to rainfall frequency data published in the 1960s long after the release of Bulletin 70 in 1989.[7]

Development extent and location

Development has been constructed in a variety of locations that either contribute to downstream flooding or are in locations that are more prone to flooding due to environmental conditions.

Increased impervious cover: Development results in the creation of impervious cover, which prevents the infiltration of rainwater into the ground and generates stormwater runoff absent other infiltration, retention, or detention measures. As the volume of stormwater runoff increases, areas downstream from these locations can be impacted by higher runoff volumes and experience urban flooding. These increased volumes ultimately enter rivers and streams, contributing to overbank flooding. County stormwater regulations require new development above specific area thresholds to retain or detain a portion of stormwater runoff, while smaller development sites are not subject to these same requirements.[8,9]

Lack of coordination and expertise in development process: Development decisions in one location can have localized or downstream impacts, yet those impacts are not always properly understood or evaluated during the development process. Lower capacity communities may lack the time or expertise to adequately review development proposals. In addition, development decisions can have impacts across department and jurisdictional boundaries.

Development in the floodplain: Construction of homes and businesses have occurred within the floodplain, which is an area where there is a one percent chance of flooding each year. Starting nationally in 1968, floodplains were recognized in development regulations to keep people and investments out of flood risk areas. In the Chicago region, a significant portion of development predates these regulations. Other development has been allowed to occur in the floodplain if it is designed to specific design standards.

Development in saturated or poorly drained soils and areas with high groundwater table: Development in areas with hydric and poorly draining soils, absent an adequate drainage system, can cause yard flooding and basement flooding or seepage. Rainwater can enter a basement through cracks in the foundation, joints between the foundation wall and floor, or basement window wells. Poor soil drainage is exacerbated by building construction which often compacts the surrounding ground and further restricts its ability to infiltrate water.

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[7] For example, the Metropolitan Water Reclamation District of Greater Chicago (MWRD) adopted Bulletin 70 Rainfall Data in 2014 with their extensive update that created the Watershed Management Ordinance (WMO).
[8] Area thresholds vary by county, for a comparison, wee State of Illinois Department of Natural Resources. 2015. Report for the Urban Flooding Awareness Act. County ordinances and standards, p. 36. See https://www.dnr.illinois.gov/WaterResources/Documents/Final_UFAA_Report.pdf.
[9] Some municipalities apply a lower area threshold for stormwater requirements. For example, the City of Berwyn reduced the area threshold by half of what Cook County requires.

Stormwater system design and maintenance

In addition to the location and extent of development, the specific design and maintenance of our built environment may be directly contributing to downstream or localized flooding.

Legacy of conveyance design: Much of the Chicago region was constructed before the advent of modern stormwater management principles. The designs of this earlier development focused on conveying runoff from impervious surfaces as quickly as possible and eliminated natural drainage and infiltration capacity. Often these developments rely on the local sewer or street infrastructure, such as curbs, gutters, and ditches, to send stormwater to a local waterbody, instead of managing it close to its source. Roof downspouts, driveways, parking lots, and streets were directly connected to the local sewer network without employing methods to reduce the rate or volume of runoff. Given their structure -- without a focus on managing the stormwater onsite or establishing overland flowpaths -- storm events that overwhelm a portion of the system often lead to problems elsewhere.

Reduced vegetated groundcover and compacted soils: New development often results in compacted soils and landscaping changes that favor non-native plants with shallow root systems, which can reduce rainwater infiltration and generate runoff.

Inadequate design capacity and maintenance: Green and grey infrastructure is designed to handle specific sized storm events. Issues with the data used in the original design as well as additional runoff being generated from increased urbanization, land use change, and/or increases in precipitation can overwhelm the design capacity. Overwhelmed capacity of combined sewer systems can lead to basement backups as well as sewage overflows into water bodies.

Lack of maintenance of both grey and green infrastructure, including waterways, can reduce the capacity of our existing drainage systems and lead to flooding. This is largely due to a combination of factors, including competing priorities and a lack of understanding of the importance of maintaining these systems as well as a dedicated revenue source for doing so. In addition, some communities do not maintain accurate information about their sewer network and do not have a good understanding of where problems are located.

On private property, many landowners lack an understanding of how to maintain proper drainage. Without a solid understanding of how rainwater moves through the landscape, structures or fill may be placed in locations that impede the flow of runoff.[10] In addition, when property owners fail to perform routine maintenance, from cleaning out gutters to maintaining vegetated green infrastructure, they are not only increasing localized flood risk on their property, but may also contribute to drainage issues on neighboring properties as well.

[10] Federal Emergency Management Agency. 2005. Reducing Damage from Localized Flooding: A Guide for Communities. Chapter 4. P. 4-18. See https://www.fema.gov/media-library/assets/documents/1012

Drivers that perpetuate flooding

Implementation of better techniques depends on redevelopment: While new stormwater management techniques continue to evolve and are more frequently incorporated into new development, the implementation of these practices in previously developed areas hinges on redevelopment of a size that meets regulatory thresholds. While much of the region's residential land uses may remain in their current condition for decades, some land uses as well as the public right-of-way will see more frequent transformation. In addition, many communities may not wish to impose stormwater requirements that exceed their neighbors in order to appear more attractive to development.

Lack of adequate information: Disclosures of previous flooding are required during points of sale or lease, but existing property owners have a financial incentive to suppress this information given the potential impact to the value of the property. This leaves new tenants or owners unaware of the potential risk of future flooding events and potentially distorts the market for these locations. Additionally, data on previous National Flood Insurance Program (NFIP) payments are protected and cannot be used by buyers to make a more informed purchase.

Subsidized flood insurance: The NFIP provides subsidized flood insurance rates to property owners living in vulnerable areas. Established because private insurance found these properties uninsurable, this program has been recognized as perpetuating development and redevelopment in flood-prone areas despite floodplain regulations.[11]

Existing flooding impacts and extent

Flooding impacts the region in variety of ways, from damage to homes and businesses to larger scale issues of habitat and water quality degradation. It often results in damages that are difficult to quantify. In order to get a better understanding of the scale of the problem, CMAP staff reviewed existing data and literature to get a better understanding of the types of impacts and their extent for both urban and riverine flooding. Specifically, CMAP reviewed the findings of the Illinois Department of Natural Resources (IDNR) Report for the Urban Flooding Awareness Act (UFAA) for documented damages to homes and businesses as reported through private insurance and federal insurance and relief programs. In addition, CMAP explored several focus areas where flooding impacts are less widely known or documented that are particularly relevant to core CMAP functions: impacts to buildings, neighborhoods, and vulnerable populations; water resources; and parks and open space.

In a follow-up memo, CMAP will explore how flooding can impact our transportation network and analyze available NFIP policies, claims, and payouts, disaster relief Individual Assistance and Public Assistance grants, and Small Business Administration (SBA) loans to better understand where the flooding damages are occurring within the Chicago region. CMAP will

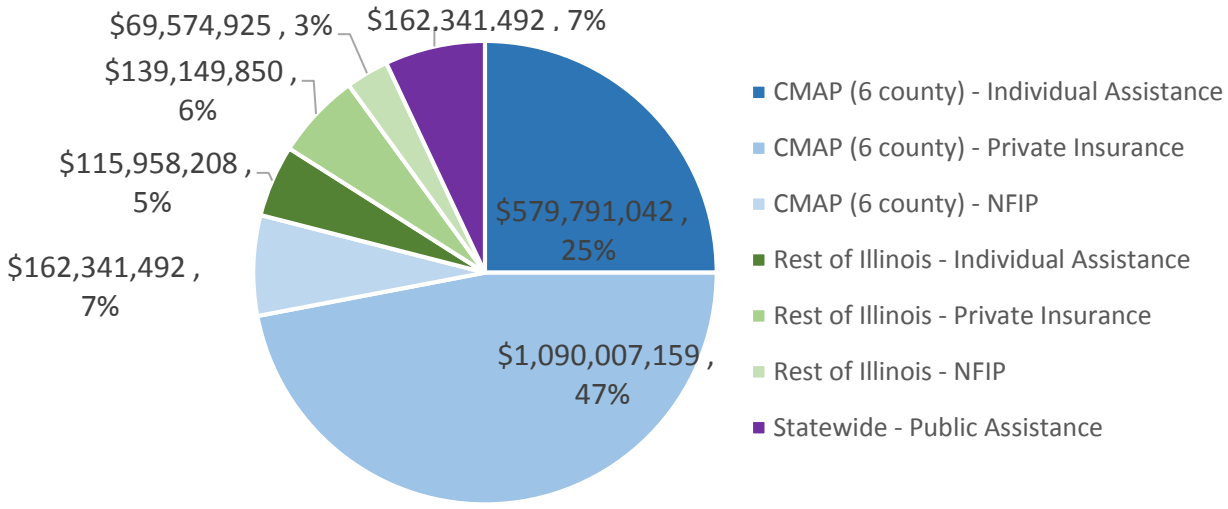
[11] Hayat, Becky and Robert Moore. 2015. Addressing affordability and long-term resiliency through the National Flood Insurance Program. Environmental Law Reporter. 45 ELR 10338

also explore the geography of documented damages in relation to socioeconomic and demographic factors.

Findings of the Urban Flooding Awareness Act

Using data available from insurance payouts and disaster relief programs can provide insight on the extent and severity of flooding. In 2015, IDNR conducted a study of the cost and prevalence of urban flooding.[12] Using data from private insurance claims,[13] National Flood Insurance Program (NFIP) claims, and Federal disaster relief claims from Individual Assistance (IA) and Public Assistance (PA) programs, IDNR found that flooding in urban areas across the state resulted in $2.319 billion in damages between 2007 and 2014 (Figure 1). Over 85 percent, or $1.975 billion, of those payouts were located in six of the seven counties of the CMAP region.[14] IDNR found that a majority of the payments could be tied to five specific storm events and that 90 percent of damage claims were for locations outside of the mapped 100-year floodplain.

Figure 1. Total insurance and disaster relief payouts by claim type and region for the State of Illinois, 2007-2014.



Source: State of Illinois Department of Natural Resources. 2015. Report for the Urban Flooding Awareness Act.

Impacts to buildings, neighborhoods, and vulnerable populations

Property damages from reoccurring flooding can contribute to larger scale disinvestment that is not fully captured in insurance claim or disaster relief data. Flooded areas can become less desirable places to live and work which may stymie redevelopment and increase disinvestment in the area. Socioeconomic conditions such as age, income, and ethnicity also play a key role in determining the degree to which an individual or a community will be affected by a flood event.

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[12] State of Illinois Department of Natural Resources. 2015. Report for the Urban Flooding Awareness Act. Prevalence and Cost, p.8. See www.dnr.illinois.gov/WaterResources/Documents/Final_UFAA_Report.pdf.

[13] Private insurance claim data represents data from riders focused on basement/foundation flooding, including sump pump failure and sewage backup not due to riverine flooding.

[14] The UFAA report did not include Kendall County in the CMAP region.

Decreased property values. Areas that flood show signs of deterioration, including worn building facades, streets, and sidewalks, and flooding also contributes to the devaluation of property. CNT found that wet basements can decrease property values by 10 to 25 percent and is cited as a primary reason for not purchasing a home.[15] According to FEMA, nearly 40 percent of small businesses never reopen following a flooding disaster.[16] These vacant storefronts can decrease property values and vibrancy in downtowns and other commercial areas.

Increased maintenance and repair costs. Reoccurring flooding also increases maintenance and repair costs for households, businesses, and local governments. Property owners with underwater mortgages are even less likely to perform adequate maintenance or repair, as they have no equity to borrow against. Low income residents may struggle to afford private insurance and for those who can afford flood insurance, filing repeated flooding claims often leads to rate and deductible increases. To combat the effects of reoccurring flooding on public assets, local governments face high repair and maintenance costs of transportation and sewer infrastructure in flooded areas, which may result in lower service performance.

Increased foreclosures, vacancies, and disinvestment. The compounded costs of reoccurring flooding may cause property owners to walk away from their properties or slip into foreclosure. A study of communities in Atlanta found a relationship between the decline of neighborhood incomes with increased risks of flooding and foreclosure. Neighborhoods with the most risk of foreclosures and flooding were lower income with a larger minority population and a lower homeownership rate.[17] In these areas, managing vacant flood-damaged or foreclosed homes while stabilizing the property values of the remaining residences is a challenge.

Decline in health and quality of life. Residents impacted by flooding could experience a range of health and quality of life issues. Vulnerability to flooding impacts appears to be greater in individuals already facing social vulnerability due to socio-economic, demographic, and health factors.[18] Flooding can increase exposure to mold and mildew, contributing to allergies, asthma, and respiratory infections, which can disproportionately impact children, the elderly, and immune-comprised individuals. Flood waters could introduce gasoline, pesticides, and other chemicals into dwelling units and result in long-term health problems. The elderly and residents with disabilities or illnesses are most vulnerable to acute, disruptive flooding, particularly when power outages and transportation disruptions interrupt daily needs and medical treatment.

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[15] Center for Neighborhood Technology. 2014. The Prevalence and Cost of Urban Flooding: A Case Study of Cook County, IL. See www.cnt.org/sites/default/files/publications/CNT_PrevalenceAndCostOfUrbanFlooding2014.pdf

[16] Federal Emergency Management Association. "Make Your Business Resilient," 2016. https://www.fema.gov/es/media-library/assets/images/116921

[17] Carpenter, Ann, "Under Water in More Ways Than One: Assessing the Impact of Historic Flooding and Foreclosures on Atlanta's Vulnerable Communities," Federal Reserve Bank of Atlanta,

[18] Lowe, Dianne, Kristie L. Ebi, and Bertil Forsberg. "Factors Increasing Vulnerability to Heath Effects before, during, and after Floods," International Journal of Public Health, 2013. 10, 7015-7067; doi:10.3390/ijerph10127015.

Flooding also causes stress as residents cope with the clean-up and repair costs, lost personal belongings, and the potential for future flood events.[19] Renters insurance does not cover flood damage, and most landlords purchase structure-only policies, leaving tenants' possessions unprotected. Residents may be unaware of home maintenance strategies that could reduce their exposure. In addition, some populations, particularly immigrant and minority communities, may lack knowledge of public assistance programs and emergency response procedures.

Impacts to water resources

CMAP is exploring current issues and policy recommendations related to water supply, water quality, and wastewater planning in a related ON TO 2050 water strategy paper. Stormwater management and flooding in particular have clear connections and impacts to other water resources, which are outlined in this section.

Delivers pollutants. Stormwater runoff carries non-point source pollutants, which in general can impair water quality and habitat in streams and rivers. Stormwater runoff can also carry pollutants into shallow groundwater sources via infiltration, which can impact the quality of the groundwater for use as water supply, either directly by contaminating individual wells, or indirectly by increasing treatment costs in municipal and other collective supply systems. Polluted groundwater can also impair ecosystems that rely on clean and functional groundwater hydrology to sustain organisms and habitats. For example, runoff of chlorides applied to control snow and ice can infiltrate into groundwater tables and impair the use of the water for drinking and other uses. Chlorides also impair water quality for organisms that are not adapted to more saline conditions.

Alters hydrology and reduces infiltration. By capturing and moving rainwater quickly away from the landscape, traditional stormwater management systems can significantly reduce infiltration and recharge of rainwater into groundwater systems and modify the movement of groundwater that supports groundwater-fed ecosystems. Stormwater management systems also modify the hydrology of surface water systems to the extent that stream and riparian habitat are impaired by the "flashy" increase and decrease in water levels, as well as the velocity with which "managed" stormwater flows through stream channels, causing damage including erosion of stream beds and banks and sedimentation of stream and riparian habitat.

Overwhelms capacity of storm and wastewater infrastructure. In combined sewer systems, excessive stormwater runoff volumes can cause overflows of combined sewage and stormwater into receiving rivers, thereby impairing aquatic habitat and potentially increasing downstream drinking water treatment costs, particularly on the Fox and Kankakee Rivers. Stormwater entering either a combined sewer system or through inflow and infiltration of a separate sewer system increases the demand on wastewater treatment facilities as it works to treat both sewage and stormwater. Wastewater treatment is expensive and energy intensive, and such investments are wasted if used to treat stormwater, which is relatively clean to begin with. In addition, rising floodwaters can impair infrastructure and facilities used to convey and treat water, such as wastewater and water supply treatment facilities and distribution systems.

[19] The Center for Neighborhood Technology conducted an online survey of flooding victims and found that 84 percent reported suffering stress from the event and 13 percent reported ill help as a result of the flooding. Center for Neighborhood Technology. 2014. The Prevalence and Cost of Urban Flooding: A case study of Cook County, IL.

Counts against Lake Michigan allocation. The Chicago region's use of Lake Michigan water is governed by a U.S. Supreme Court Consent Decree, which establishes a limit to the Illinois diversion of Lake Michigan water to the Illinois River. Over half of the allocation is typically used for public drinking water supplies, while a significant portion (27.7 percent) of the diversion is attributed to the stormwater runoff that occurs within the Great Lakes basin.[20] Instead of returning to the Lake Michigan watershed, the stormwater runoff is diverted by sewer systems that redirect this amount to the Illinois River. This portion of the diversion contributes to the limit in the public drinking water withdrawals that can be made within the allocation.

Impacts to parks and open space

The region's green infrastructure network provides a range of ecosystem services, including an estimated $4.2 billion in flood control annually.[21] Maintaining biodiverse ecosystems can help the region mitigate and prepare for climate change, but open space areas will be faced with increasing flood events or pressures to handle stormwater runoff to the potential detriment of other habitat goals. CMAP interviewed several land managers from Forest Preserve Districts and municipal public works to better understand the impacts of flooding to our natural areas.[22] Given habitat and connectivity goals, many of the region's conservation and recreation open spaces are located along streams and rivers and contain wetlands. Given these landholdings, land managers expect these areas to flood and seek to harness this natural process for native habitats. However, the magnitude and frequency of flooding is greater than pre-settlement conditions and presents several challenges to open space managers who are working to maintain native habitats and recreational amenities:

Exacerbated invasive species and increased restoration demands. Flood waters can impact native plant habitats in a number of ways. Flood waters are composed of the stormwater runoff from our streets and neighborhoods, which picks up pollutants and the seeds of invasive species on its way to the stream or river. The lower water quality can damage native species and allow more tolerant, invasive plants to take over. This can increase habitat restoration demands on land managers as they work to maintain native habitats.

Increased erosion and sedimentation. Flood waters can also increase erosion and lead to downstream sedimentation. Land managers discussed the slow impacts of erosion over time as well as the more catastrophic events that happen less frequently. In a natural landscape, wetlands would naturally silt up and water would move onto the next area over time. But land managers often do not have this flexibility given their limited land holdings. This requires dredging out of wetland areas and replanting in order to maintain natural habitats. Some land managers described the erosion impacts of extreme winter conditions – particularly freezing events followed by substantial rains – that cause massive shifts in the landscape and requiring

[20] CMAP. 20109. Water 2050: Northeastern Illinois Regional Water Supply/Demand Plan. See www.cmap.illinois.gov/livability/water/supply-planning/water-2050

[21] CMAP. 2015. Green Infrastructure Vision 2.3: Ecosystem Service Valuation. See https://datahub.cmap.illinois.gov/dataset/green-infrastructure-vision-2-3-ecosystem-valuation

[22] CMAP conducted several phone interviews with the Kane County Forest Preserve District, Will County Forest Preserve District, Cook County Forest Preserve District, Village of Riverside, and Village of South Holland.

them to redo native plantings. Some discussed how there is less funding available for erosion management and that most maintenance activities are focused on vegetative management.

Reduced recreation opportunities. Flooding within parks and open space can also result in the closure of specific trails or picnic areas. While these closures are temporary, they do impact residents use of the trails and open spaces. Many of the more active amenities of our parks and open spaces were designed in recognition of the floodplain and largely remain intact after floodwaters recede. However, some land managers have relocated campgrounds and other facilities to reduce the continual maintenance costs associated with repairs after floods. In addition, as land managers update trails or other structures, they are often redesigning these facilities to accommodate today's stormwater runoff volumes and flows.

Stormwater issues on adjacent properties. Open space land managers are often engaged in figuring out potential stormwater management solutions for adjacent private property. Either in advance of a development proposal, where a municipality is seeking their input on the stormwater strategies, or post-development where the original design or lack of maintenance has led to flooding problem. Many of these situations represent an opportunity to improve or restore hydrologic functions and meet habitat restoration goals. However, some land managers are seeing an increase in staff time and resources dedicated to solving nearby drainage issues.

Next steps

In a follow-up memo, CMAP will explore how flooding can impact our transportation network and analyze available documented damages to better understand where the flooding damages are occurring within the Chicago region. Next, CMAP will summarize the region's current strategies to flood mitigation and prevention.