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MEMORANDUM

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

From: CMAP Staff

Date: March 2, 2017

Re: ON TO 2050 Stormwater and Flooding Strategy Paper: Existing flooding impacts – documented damages and transportation

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Urbanization and climate change are leading to more frequent and intense flooding events in northeastern Illinois. CMAP intends to build on GO TO 2040's flooding related recommendations 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, using a series of memos to explore different components of the topic.

In an earlier memo, CMAP explored the causes of flooding and the corresponding impacts to buildings, neighborhoods, and vulnerable populations; water resources; and parks and open space. In this follow-up memo, CMAP analyzed available National Flood Insurance Program (NFIP) policies, claims, and payouts, FEMA disaster relief Individual Assistance (IA) grants, and Small Business Administration (SBA) loans to better understand where flooding damages are occurring within the Chicago region. CMAP also explored the geography of documented damages in relation to socioeconomic factors. This memo closes with a review of the types of impacts flooding can have on the region's transportation network.

Flooding damages documented by federal assistance programs

To better understand the location and costs of flooding damages within the Chicago region, CMAP evaluated NFIP policies, claims, and payments, FEMA disaster relief Individual Assistance (IA) grants, and Small Business Administration (SBA) loans from 2003 to 2015[1] by zip code.[2] To understand the results, it is helpful to have a better understanding of the different features of these three programs.

[1] This exact time period of the proceeding analysis is from October 1, 2003 to February 26, 2015. This time period was chosen based on the available data from all three datasets.
[2] Zipcode geography was the smallest analysis unit available across all three datasets.

Created in 1968, the NFIP was designed to supplement private insurance policies, such as renters and homeowners insurance, that do not typically cover losses from flooding. Today, NFIP policies are mandatory for all newly constructed or renovated structures with federally-backed mortgages located within the 100-year floodplain, and are available on a voluntary basis for renters and property owners located in communities that have adopted FEMA-approved floodplain management regulations.[3] In order to file an NFIP claim, the property owner must have a policy and the damages were caused by flooding.[4] NFIP policies have been purchased in almost every applicable Chicago area community.

Following a presidentially declared disaster, local residents, business, and governments are eligible for federal relief programs through FEMA's Individual Assistance (IA) grant programs. Presidentially declared disasters are reserved for events of such severity and magnitude that the state or local governments cannot effectively respond.[5] The disasters are declared by county and are not limited to floodplain locations. The region experienced five presidentially declared disasters related to flooding between 2003 and 2015.[6] The FEMA IA grant program consists primarily of one-time grants to residents and businesses for immediate relief and structural repairs and are available to all residents regardless of income.

If a resident or homeowner experiences damages in excess of what their NFIP insurance or IA grant will cover, they may be eligible for a low-interest, long-term disaster loan through the Small Business Administration. These loans are intended to be a last resort, and are only eligible for demonstrated needs that are not covered by other relief programs. Access to SBA loans are granted following a presidentially declared disaster or additional disasters identified by the state. The region has experienced four such disasters between 2003 and 2015.[7]

Additional grant assistance, through FEMA Public Assistance and Hazard Mitigation programs, are also available for emergency preparation, service provision, and recovery work performed by government agencies and non-profit organizations. However, this data was not included in this analysis at this time.

Total damages as documented by federal assistance programs

Combined, NFIP, IA, and SBA programs provided the Chicago region with $907 million in flood relief between 2003 and 2015. Figure 1 highlights the total damage payments associated with NFIP, IA, and SBA payments by zip code normalized by 2010 households during this time period. The majority of payouts come from FEMA IA grants (65 percent), followed distantly by NFIP claims (18 percent) (Figure 2).

[3] Almost all communities with floodplains in the Chicago Region are covered by NFIP, see www.fema.gov/cis/IL.pdf
[4] If a sewer backup occurs in the basement that can be attributed to flooding, it is covered.
[5] FEMA Disaster Declaration Process. See www.fema.gov/disaster-declaration-process
[6] For purposes of this report, CMAP included only those disasters that identified flooding: August 20 - 31, 2007 (DR-1729), June 1 - July 22, 2008 (DR-1771), September 13-October 5, 2008 (DR-1800), July 19-August 7, 2010 (DR-1935), April 16-May 5, 2013 (DR-4116).
[7] For purposes of this report, CMAP reviewed SBA loans associated with the five presidentially declared disasters and four additional disasters recognized by the SBA program: March 17-April 20,2008 (IL-00014), July 27-28, 2011 (IL-00032), April 4, 2008 (IN-00022), June 18-19, 2009 (WI-00019).

Figure 1. Total flooding damage payments associated with NFIP, IA, and SBA programs per 2010 household by zip code in the Chicago region from 2003 to 2015.

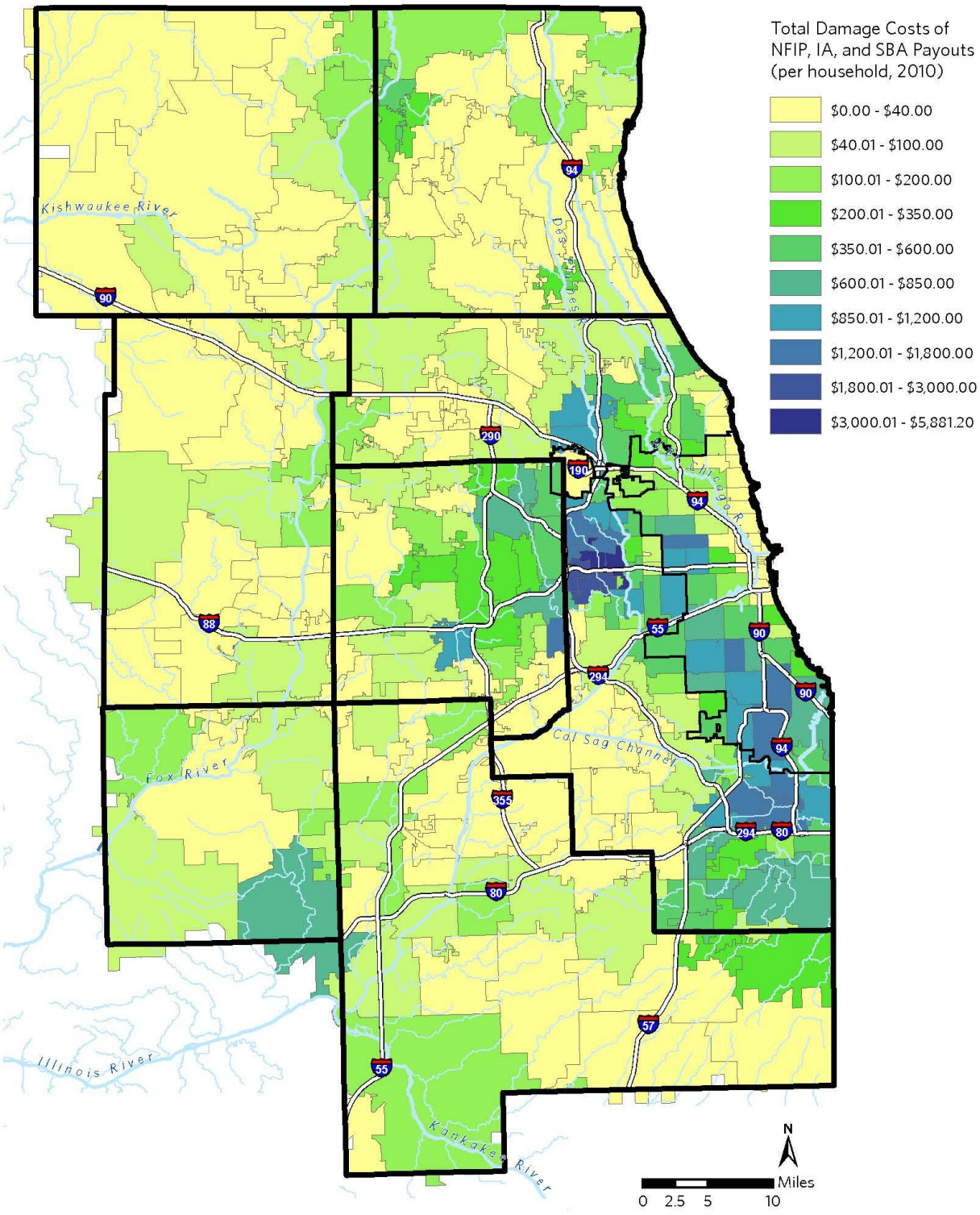

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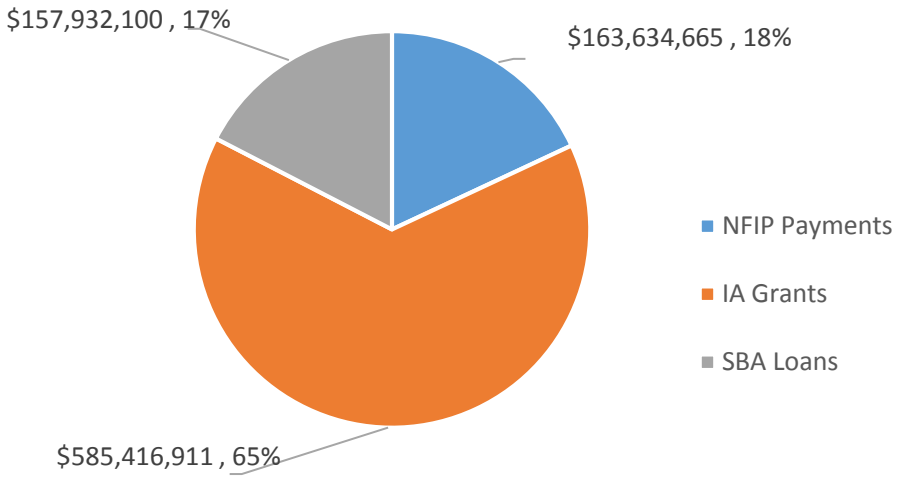
Figure 2. Total flooding damage payments by federal program - NFIP, IA, and SBA - in the Chicago region from 2003 to 2015.

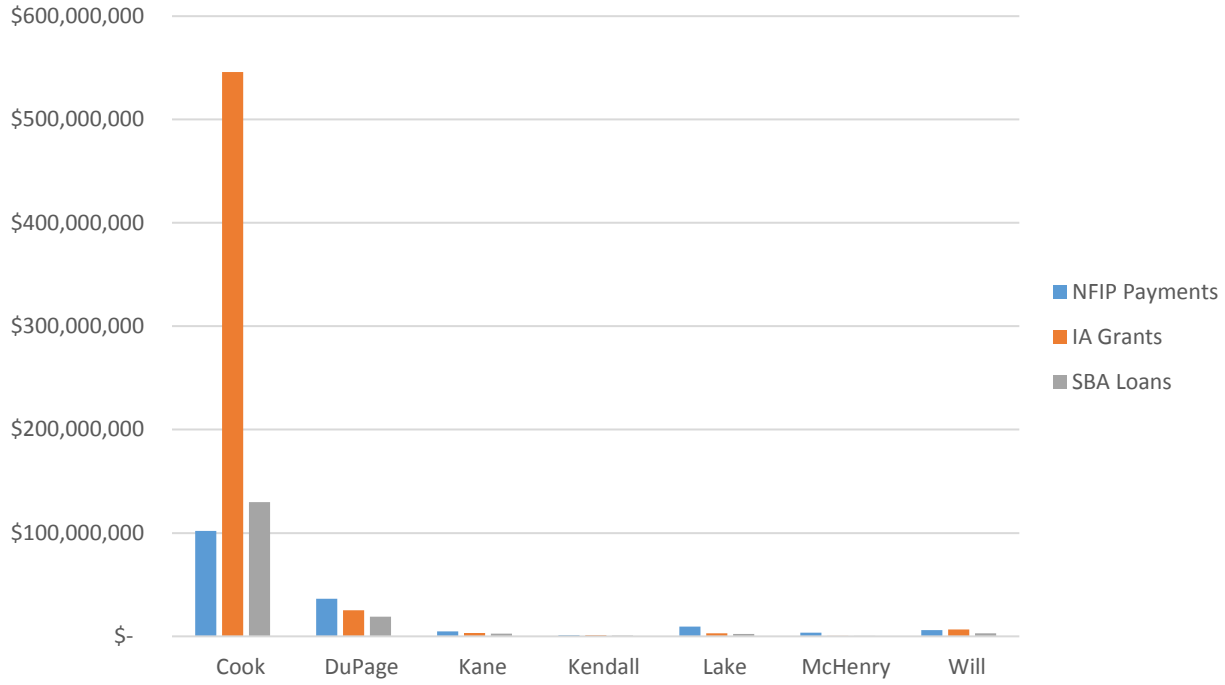


Source: 2017 Federal Emergency Management Agency.

Spatial distribution of payouts vary by federal program

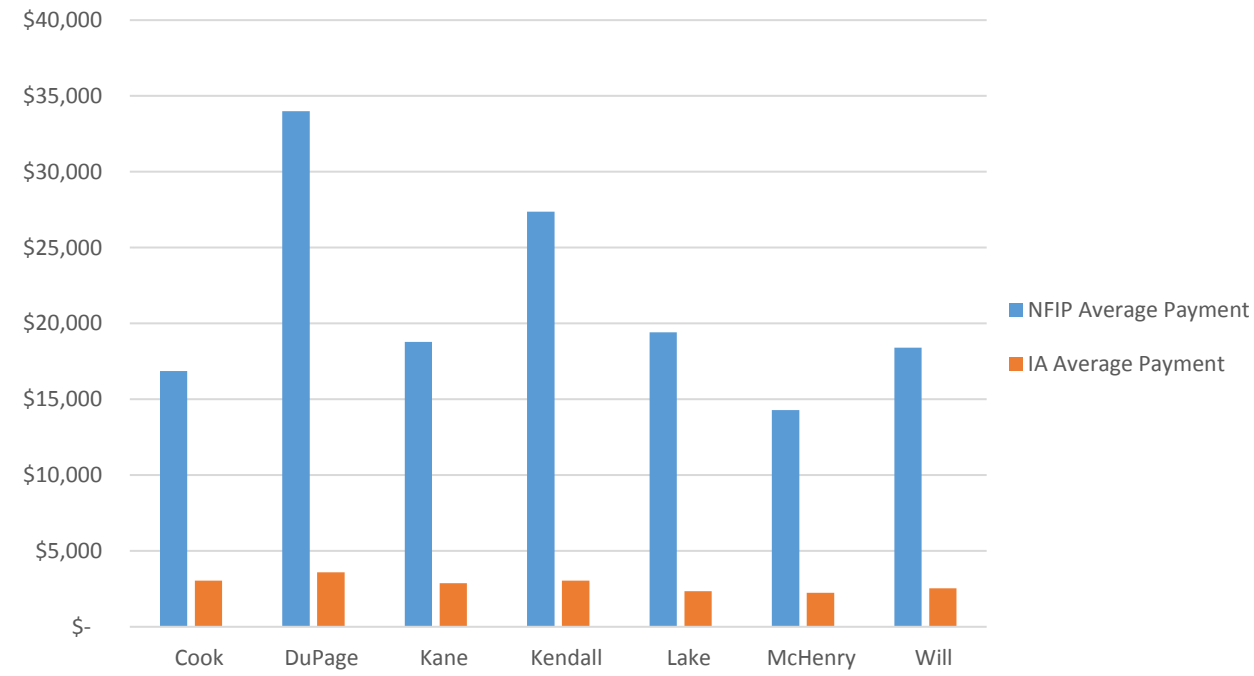
The spatial distribution of total damages paid from 2003 to 2015 were compared across the different federal programs by county and zip code. The majority of damage payments occurred in Cook County (62 percent), followed by DuPage County (22 percent) (Figure 3). During this time period, NFIP paid 8,491 claims, totaling $164 million with an average of $19,272 per claim (Figure 4). Areas with the largest payments by zip code went to communities along the Des Plaines River in northwest Cook County and Salt Creek and the DuPage River in DuPage County (Figure 5).

Figure 3. Total flooding damage payments associated with NFIP, IA, and SBA programs by county from 2003 to 2015.



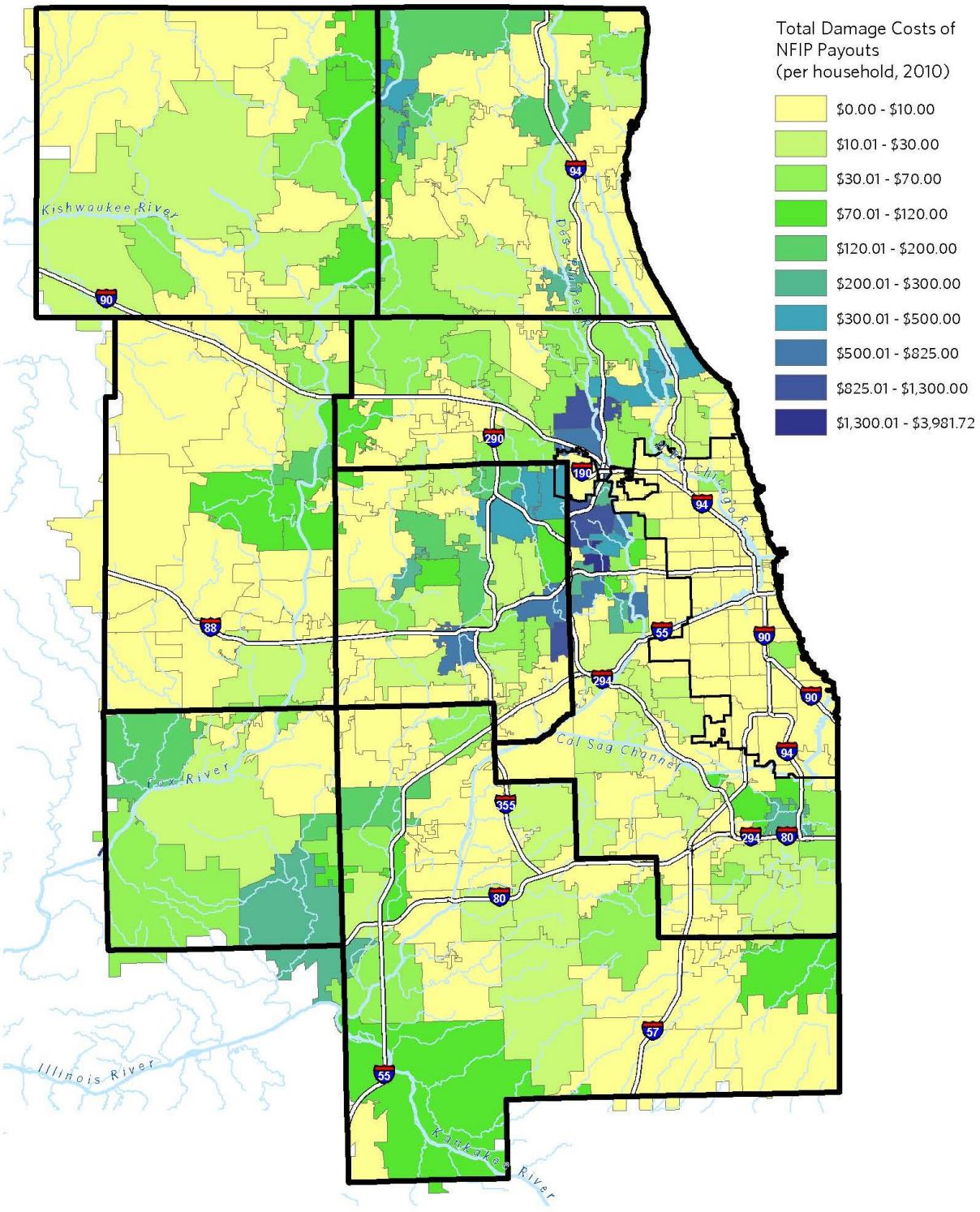
Source: 2017 Federal Emergency Management Agency.

Figure 4. Average payment per NFIP claim and IA grant by county from 2003 to 2015.



Source: 2017 Federal Emergency Management Agency.

Figure 5. NFIP claim payments per 2010 household by zip code in the Chicago region, from 2003 to 2015.



Chicago Metropolitan Agency for Planning, 2017.

In the Chicago region, 63 percent of paid NFIP claims were located within the 100-year floodplain. Paid claims in the floodplain accounted for 72 percent or $115 million of the total payments from NFIP (Table 1). The average payment for claims in the 100-year floodplain was slightly higher than payments made outside of this area. Approximately 37 percent of paid NFIP claims and 28 percent of all NFIP payments are generated by policyholders who are not required to purchase NFIP flood insurance.

Table 1. NFIP claims and payments in relation to the 100-year and 500-year floodplain, in the Chicago region from 2003 to 2015.[a]

	Filed Claims	Claims with Payment	Average Payment	Total NFIP Payouts
100-year floodplain	6,250	5,261	$ 21,984	$ 115,659,786
500-year floodplain[b]	1,273	1,005	$ 12,806	$ 12,869,589
Outside floodplain	2,816	2,101	$ 15,169	$ 31,869,155
Total	10,339	8,367	$ 19,170.38	$ 160,398,530

[a] Does not include claims/payments for addresses that could not be matched using geo-coding.
[b] The percentage of claims filed for locations within the 500-year floodplain does not include the area also identified in the 100-year floodplain.
Source: 2017 Federal Emergency Management Agency.

Federal disaster relief grants through the Individual Assistance program to residents and businesses totaled $585 million, making it the largest program providing flood payments in the Chicago region. IA grants are available to residents after a presidentially declared disaster, which is declared by county (Table 2). Between 2003 and 2015, IA payments were heavily concentrated in Cook County (93 percent) (Figure 3). The IA grant program paid 192,220 claims, with an average of $3,046 per claim (Figure 4). A quick comparison between IA and NFIP payments shows different distributions – with IA damages concentrated in southeastern and western Cook County (Figure 6).

Table 2. Presidentially declared disasters eligible for IA grants by county.

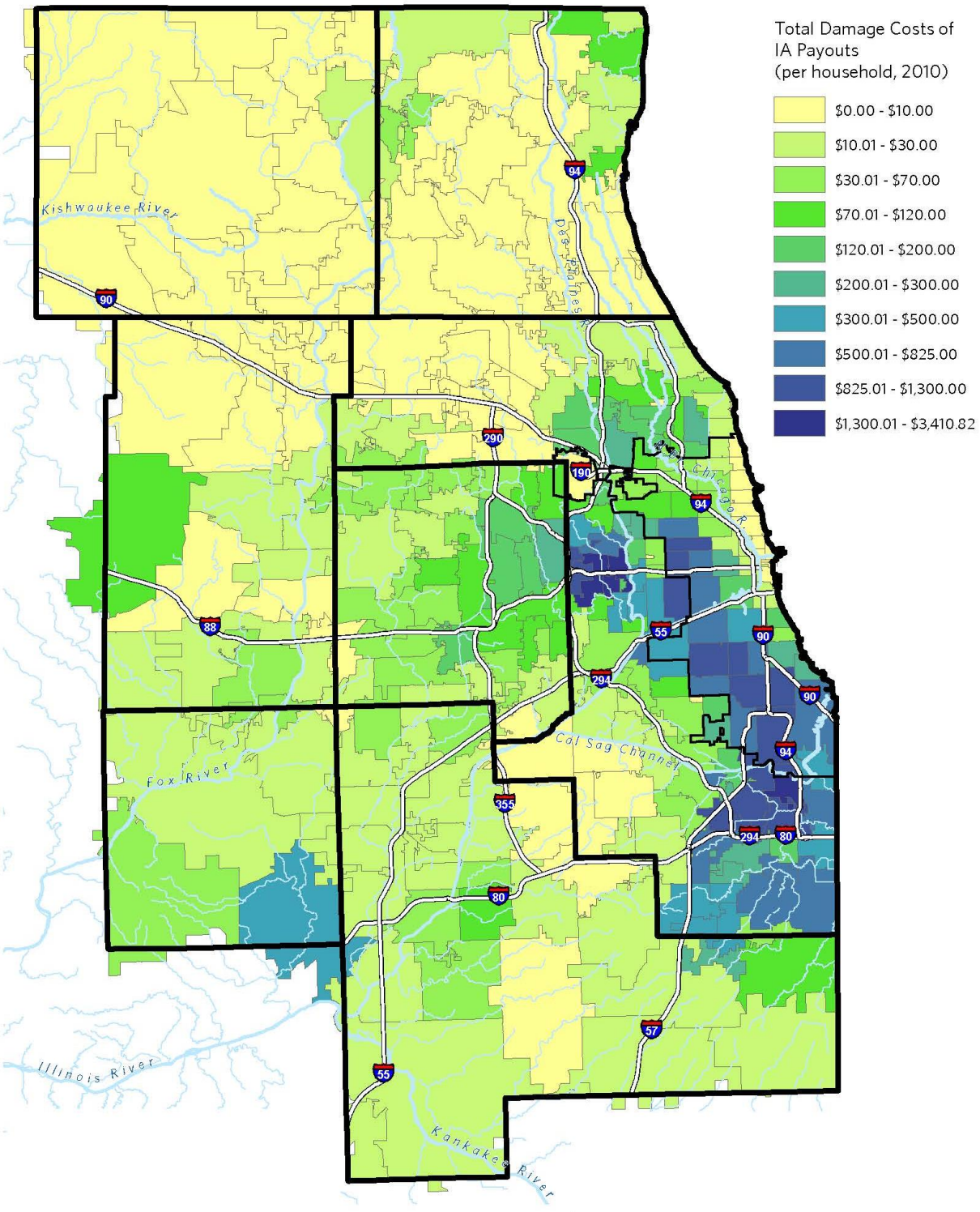
Disaster Period	County
August 20 - 31, 2007 (DR-1729)	Kane, Lake, and Will
June 1 - July 22, 2008 (DR-1771)	Lake
September 13-October 5, 2008 (DR-1800)	Cook, DuPage, Kane, and Will
July 19-August 7, 2010 (DR-1935)	Cook, DuPage
April 16-May 5, 2013 (DR-4116)	Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will

Source: 2017 Federal Emergency Management Agency.

The Small Business Administration provided the region with $157 million in low-interest disaster loans between 2003 and 2015 (Figure 7).[8] Approximately 87 percent of this total, or $137 million, were made to individuals. The remaining $21 million went to local businesses. Similar to the IA program, SBA loans were heavily concentrated in Cook County (82 percent) (Figure 3). An average loan amount was not available at this time.

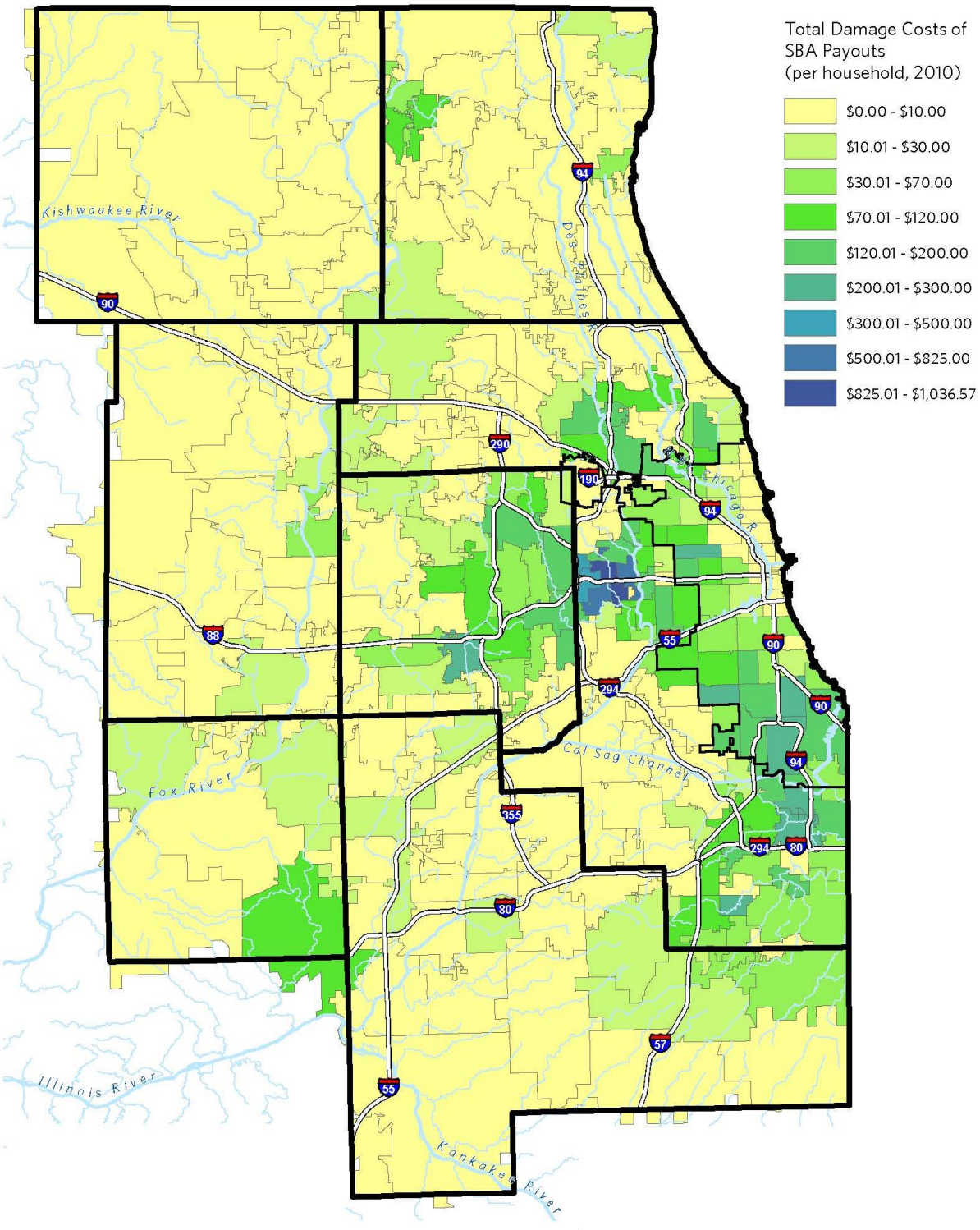
[8] SBA Disaster Loans are intended to supplement public and private relief programs. Interest rates, repayment periods, and other terms are determined by need, availability or credit, and amount of non-SBA relief received.

Figure 6. IA grant payments per 2010 household by zip code in the Chicago region, from 2003 to 2015.



Chicago Metropolitan Agency for Planning, 2017.

Figure 7. SBA disaster loans per 2010 household by zip code in the Chicago region, from 2003 to 2015.



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Flooding and socioeconomic factors

Given the impacts flooding can have on the built environment, as well as how flooding does not affect all communities equally, CMAP has begun to explore the relationship between documented flooding damages and other community characteristics. The exploration here will rely heavily on work underway in other ON TO 2050 strategy papers, including the Inclusive Growth strategy paper, which is exploring strategies to help achieve a more inclusive regional economy.[9]

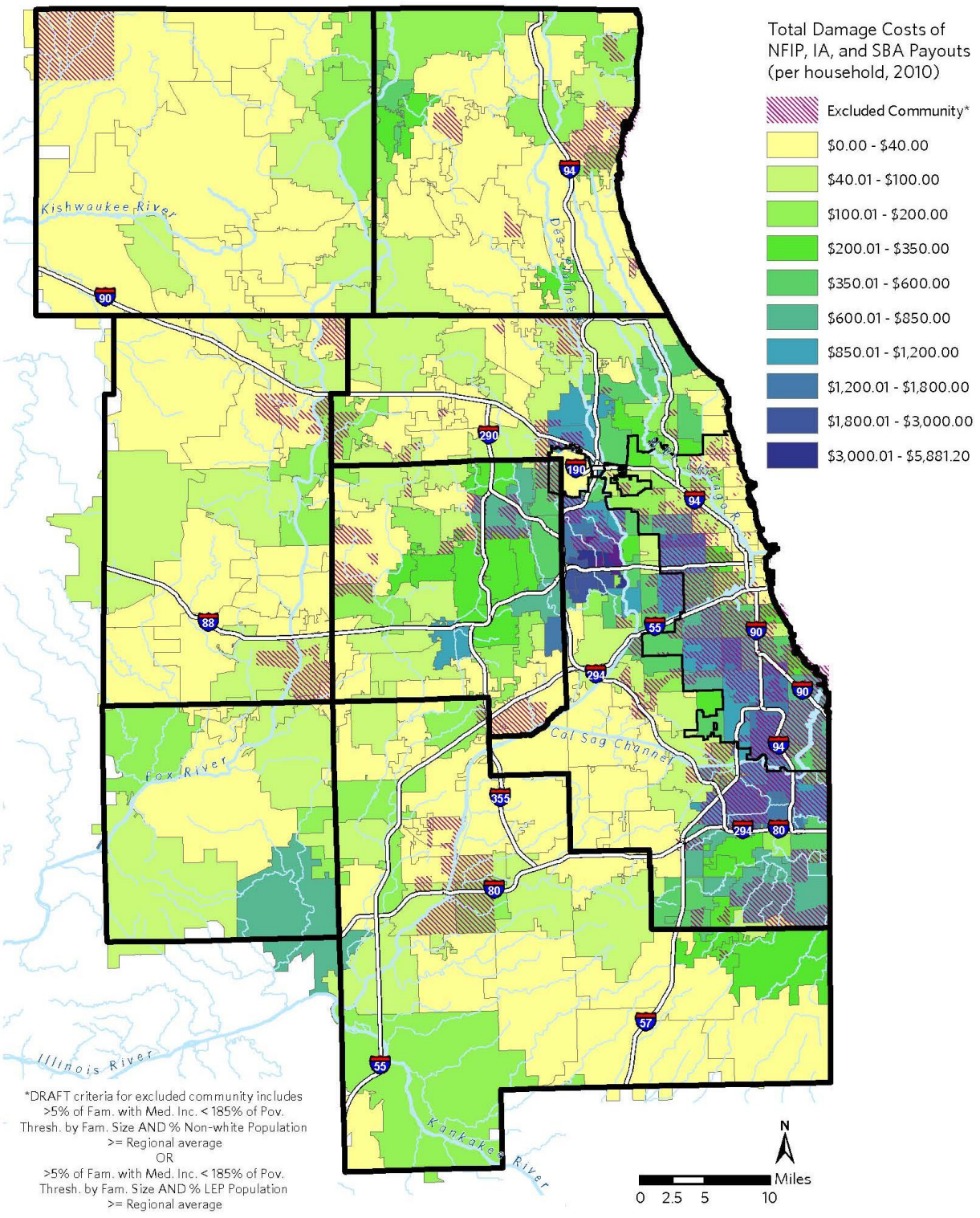
In order to facilitate the development of strategies to promote inclusive regional growth, CMAP is identifying census tracts in the region with concentrations of both low-income families and minorities or limited speakers of English. Together, these tracts are termed "excluded communities" and will serve as the basis for beginning to analyze the ways various planning topics, including flooding losses, unfold in the identified areas. Vulnerability to flooding appears to be greater in individuals already facing social vulnerability due to socioeconomic, demographic, and health factors.[10] CMAP's current metric for identifying excluded communities was compared with the above documented flooding damages (Figure 8). Many of the zip codes with the highest amount of damages correspond with the census tracts identified, particularly southeastern and western Cook County and portions of DuPage County.

In the coming months, CMAP will be identifying areas in the region that have experienced disinvestment, or a persistent lack of private and civic investment after the long-term flight of businesses and/or residents. Disinvested areas may have higher building and lot vacancies, low tax bases with high tax rates, aging or poorly maintain physical infrastructure, and their residents may experience higher rates of poverty and unemployment. How flooding contributes to disinvestment through infrastructure and property damages and increased maintenance costs will be further explored.

[9] More information on the Inclusive Growth strategy paper can be found here: www.cmap.illinois.gov/onto2050/strategy-papers/inclusive-growth

[10] 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.

Figure 8. Excluded communities and total flooding damage payments associated with NFIP, IA, and SBA programs per 2010 household by zip code in the Chicago region, from 2003 to 2015.



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Data limitations and barriers

While the damages documented through the NFIP, FEMA IA grant program, and SBA loan program help provide an understanding of the cost and extent of flooding, it is not comprehensive of the damages experienced in the region. There are a variety of limitations and barriers to consider, including the lack of private insurance data, economic barriers in obtaining insurance, flooding associated with smaller storm events, and underutilization of available resources. In addition, this analysis focused on property level damage and did not include disaster relief and hazard mitigation programs for local governments.

Lack of private insurance data

CMAP was unable to obtain the private insurance claims data on basement/foundation flooding for this analysis. Reviewing data for six counties in the Chicago region, the Illinois Department of Natural Resources (IDNR) found that private insurance claims accounted for almost $1.09 billion or 60 percent of payouts when evaluating NFIP, IA, and private insurance payments between 2007 and 2014.[11] The spatial distribution of private insurance payments in the Chicago region was not included in the IDNR report. This is a substantial amount of documented damages that is missing from CMAP's analysis.

In 2014, the Center for Neighborhood Technology reviewed the cost and prevalence of flooding within Cook County by zip code between 2007 and 2011.[12] CNT found that 28 percent of payments came from private insurance.[13] While these two studies used different time periods and geographies, the difference in private insurance amounts could be partially attributed to different rates of securing private insurance within the Chicago region.

Economic barriers in obtaining insurance

Economic factors are likely influencing participation in the NFIP program and private insurance. IDNR found that the average household income for NFIP claims was $61,626, while the average household income of households who filed private insurance claims was $76,913.[14] The Chicago region's median household income is $62,903.[15] Given that over a third of NFIP claims are for locations where participation in the program is not mandated, additional households may similarly benefit from voluntarily joining the program but do not because of economic constraints. In addition, mandatory participation in NFIP is operationalized via mortgages. Once a mortgage is paid off, households may choose to exit the program due to cost concerns. Nationwide, 25 percent of property owners in high-risk areas with a mortgage did not have flood insurance, and another 25 percent did not have a loan and also had not purchased insurance coverage.[16]

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[11] 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.

[12] Center for Neighborhood Technology. 2014. The Prevalence and Cost of Urban Flooding: A case study of Cook County, IL.

[13] The private insurance percentage cited here excludes the PA and SBA data also provided by CNT's analysis for Cook County for easier comparison with the percentages cited in IDNR's Urban Flooding Awareness Act report.

[14] State of Illinois Department of Natural Resources. 2015. Report for the Urban Flooding Awareness Act. Appendix D: Prevalence and Cost, p. D-10. See www.dnr.illinois.gov/WaterResources/Documents/Final_UFAA_Report.pdf.

[15] U.S. Census. 2014 American Community Survey five-year estimates.

[16] Rand Corporation. 2006. The National Flood Insurance Program's Market Penetration Rate: Estimates and Policy Implications. http://www.rand.org/content/dam/rand/pubs/technical_reports/2006/RAND_TR300.pdf

Flooding associated with smaller storm events
Flooding is known to result in property damage under a range of different sized storms. For example, some neighborhoods experience basement backups during 2 to 5-year storm events. However, access to FEMA disaster relief grants and SBA loans is reserved for significantly larger storm events. For example, the last presidentially-declared disaster occurred in April 2013, when 5.5 inches of rain fell over two days. Without a presidentially-declared disaster, flooding damages occurring at households without NFIP or private insurance will not be documented.

Underutilization of available resources
Damages due to flooding are not typically covered by homeowners or commercial insurance policies, yet policyholders commonly misunderstand this. In addition, many people may not be aware of NFIP or the federal relief programs that could help them recover from a flooding event. Even with NFIP or private insurance, damages from small or repeated events may not be claimed for a variety of reasons, including concerns that premiums will increase or that their policy will be cancelled.[17]

Impacts to transportation

Flooding impacts the region's transportation network in two main ways – declines in performance and increased infrastructure maintenance and repair.

Declines in performance
Rain and flooding can impact the performance of the transportation network in a variety of ways. Weather related delays and corresponding traffic disruptions can occur on our streets, highways, and rail lines. Street drainage systems may become overloaded, resulting in street flooding and possible street closures and rerouting. This can impact personal travel as well as truck and bus traffic and can lead to more incidents and decreases in safety. Similarly, rail systems can be impacted as flooding occurs in tunnels and effects other vulnerable facilities. In April 2013, expressways and rail lines in the Chicago region were closed due to flooding. Road and transit closures can cause a cascade of indirect impacts, including declines in economic productivity and emergency service provision. Active forms of transportation, such as bicycling and walking, likely decline during storm events and may result in more reliance on transit or the automobile.

CMAP recently released a Highway Operations strategy paper as part of the ON TO 2050 planning process.[18] FHWA Office of Operations estimates that inclement weather causes 15 percent of congestion, increasing the number of crashes and delays and reducing road capacity. In order to understand the role of precipitation on travel speeds, CMAP obtained hourly precipitation data for Cook County from the Midwest Regional Climate Center from October 2013 to September 2015. CMAP is currently comparing precipitation events with travel speeds using data from the National Performance Measurement Research Data Set provided in 5-

[17] An NFIP flood insurance policy cannot be cancelled or non-renewed due to too many claims.
[18] CMAP. 2017. ON TO 2050 Highway Operations Strategy Paper. See www.cmap.illinois.gov/onto2050/strategy-papers/highway-operations

minute increments. It is difficult to isolate changes in traffic speeds due to precipitation versus other causes of congestion. CMAP is exploring a comparison between road performance for a rainy day versus the average performance of the road segment. Increasing precipitation due to climate changes could result in increased congestion related to rainfall events.

Increased infrastructure maintenance and repair
Flooding often results in damage to transportation infrastructure. This can come in the form of catastrophic events, like when riverine flooding washes out bridges and culverts, as well as more subtle changes that shorten the life expectancy of infrastructure. Standing water can weaken the road base, while high soil moisture levels can lead to structural declines in roads, bridges, and tunnels. These impacts can lead to more frequently repair or replacement of components of the system, also contributing to declines in performance. Areas that are already experiencing flooding will likely face more frequent and severe problems as climate change brings more frequent and intense storms. In addition, changes in precipitation can lead to increased costs for transportation projects as drainage systems are designed to accommodate more stormwater.

Next steps

In the coming month, CMAP will summarize the region's current strategies to flood mitigation and prevention to gain a better understanding of the policy gaps and barriers to addressing these issues effectively. CMAP will identify a couple priority barriers to explore further, which could include the changing precipitation and static design standards, real/perceived barriers to redevelopment, community capacity constraints, and water quality and supply regulations, among others.