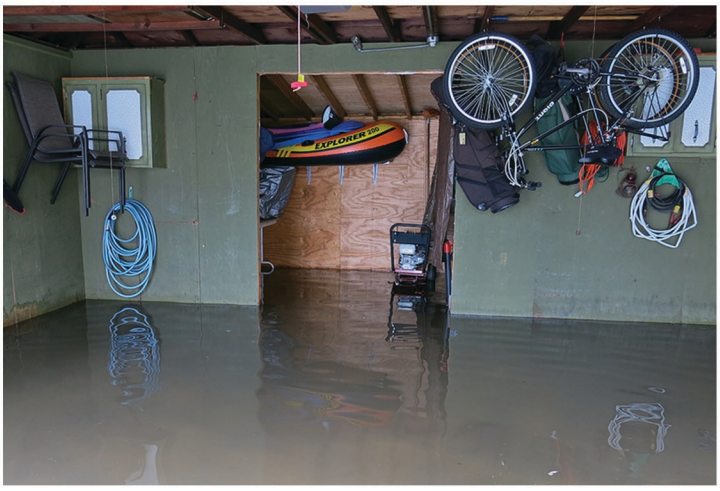
State of Illinois
Illinois Department of Natural Resources

APPENDIX FOR THE

Urban Flooding Awareness Act



JUNE 2015

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Appendix A: Urban Areas and Urban Demographics

Urban Areas

Urban areas are defined by the U.S. Department of Commerce, Census Bureau (USCB) as densely developed residential, commercial and other nonresidential areas. For the 2010 Census, the USCB identified two types of urban areas: urbanized areas for 50,000 or more people and urban clusters of at least 2,500 and less than 50,000 people (USCB, 2012). USCB delineates urban areas based on population density of census block tracks. An urban area is a census block with a population density of 1,000 people per square mile and any census block groups around the core (contiguous) having a density of 500 people per square mile (USCB, 2010). The U.S. Census urban areas are delineated without regard to municipal boundaries. After the 2010 census, USCB designated 7.4% of Illinois as urban while 90.5% of the total population lives within the urban areas (USCB, 2010).

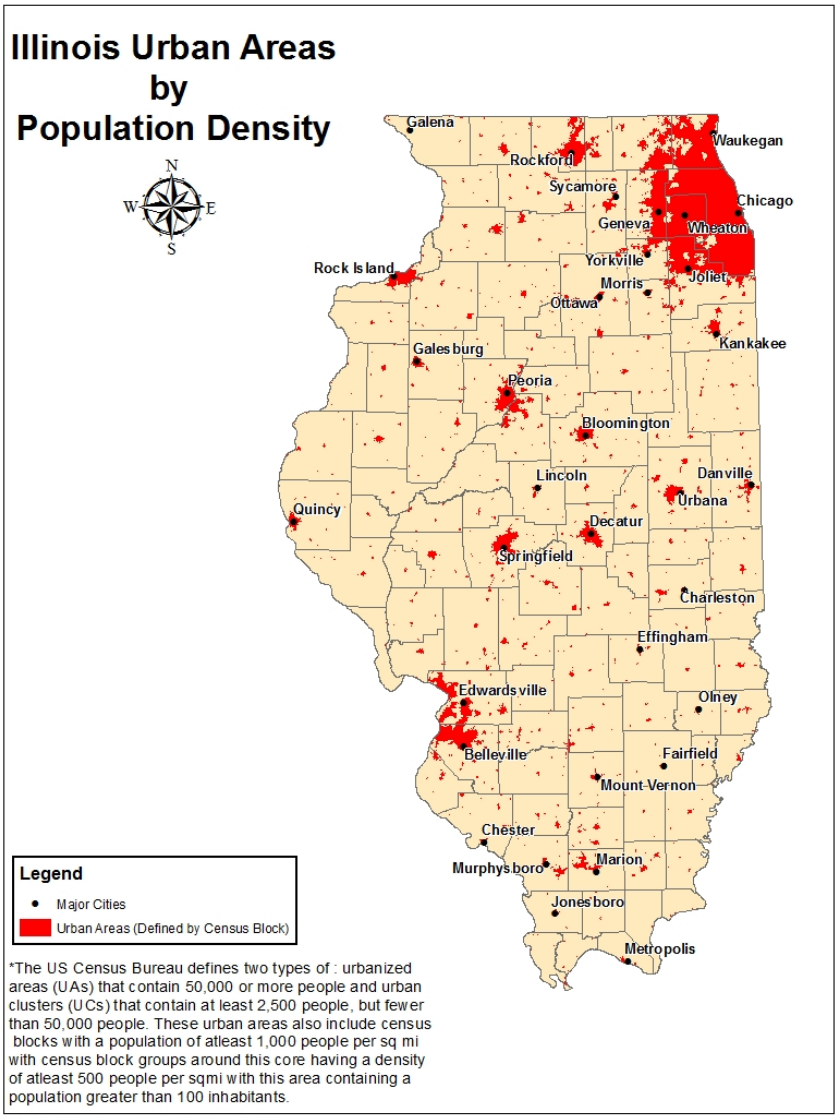


Figure A.1: Urban Areas of Illinois

The same methodology was used for delineating urban areas with regard to urban flooding in Illinois (Figure A.1). The 2010 census data were used to determine urban areas meeting the population density requirements given above. The *Urban Flooding Awareness Act* defines urban flooding as "the inundation of property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers..." Since stormwater infrastructure and urban flooding can occur in areas where the population density is high but the total population is less than 2,500, the population minimum was not considered with regards to designating urban areas for the purposes of urban flooding.

In total, 291,988 census blocks are designated as urban in Illinois for the purposes of urban flooding, including at least a substantial part of 1,193 municipalities. See the conclusion of this appendix for a complete list of urban municipalities. Total urban land area in Illinois shown in Figure 1 is 4,170 square miles out of 56,350 square miles (7.4 %). Fifty-two percent (52%) of Illinois urban area is located in the six-county Chicago Metropolitan Area of Cook, DuPage, Lake, McHenry, Kane, and Will Counties, and 7.8% of urban area is located in the St. Louis Metro East area (Madison, St. Clair, and Monroe Counties). The remaining 37.2% of urban area is located throughout Illinois, a significant portion of which includes Bloomington-Normal, Champaign-Urbana, Danville, Decatur, Peoria, Rockford, Springfield, the Quad Cities, Carbondale, and numerous county seats.

Urban Area Demographics

The following sections use the 2010 Census data (USCB, 2010) to determine the social and economic makeup of Illinois' urban areas as defined above.

Social

A total of 12.8 million people live in Illinois, of which 11.7 million (90.5%) live in urban areas as delineated in Figure 1. Approximately 70% of the urban population lives in the six-county Chicago Metropolitan Area (Cook, DuPage, Kane, Lake, McHenry, and Will Counties), 4% live in the St. Louis Metro East area (Madison, Monroe, and St. Clair Counties), and the remaining 26% are located in the remaining Illinois urban areas (Figure A.2). Cook County accounts for 5.1 million (63%) of the 8.2 million living in the Chicago Metro area, or over 44% of all urban dwellers in Illinois.

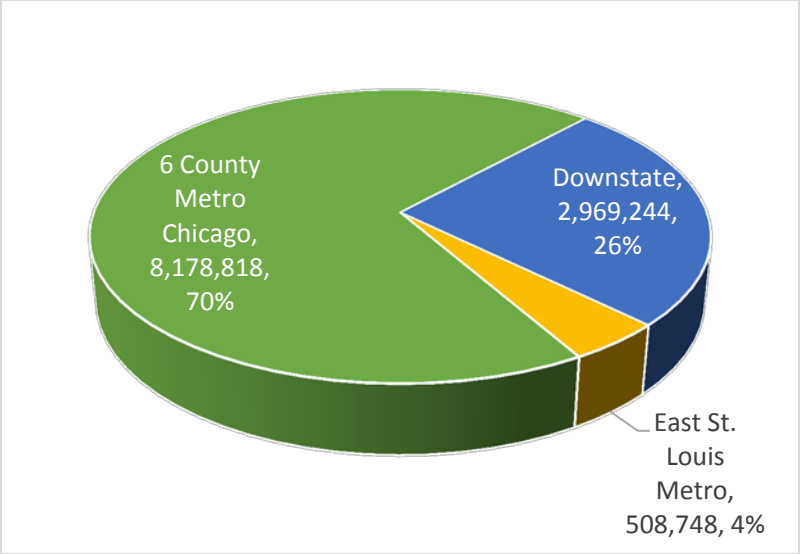


Figure A.2: Illinois urban population by region.

The urban population is 48.8% male and 51.1% female. While 25% are less than 16 years old, 63% are between the ages of 16 and 65, and 12% are over 65 (Figure A.3). The racial makeup is 61.9% percent white (non-Hispanic), 17.2% are Hispanic, 4.9% are Asian, 15.6% are black/African American, and 0.3% are native American, Pacific Islander, and others (Figure A.3).

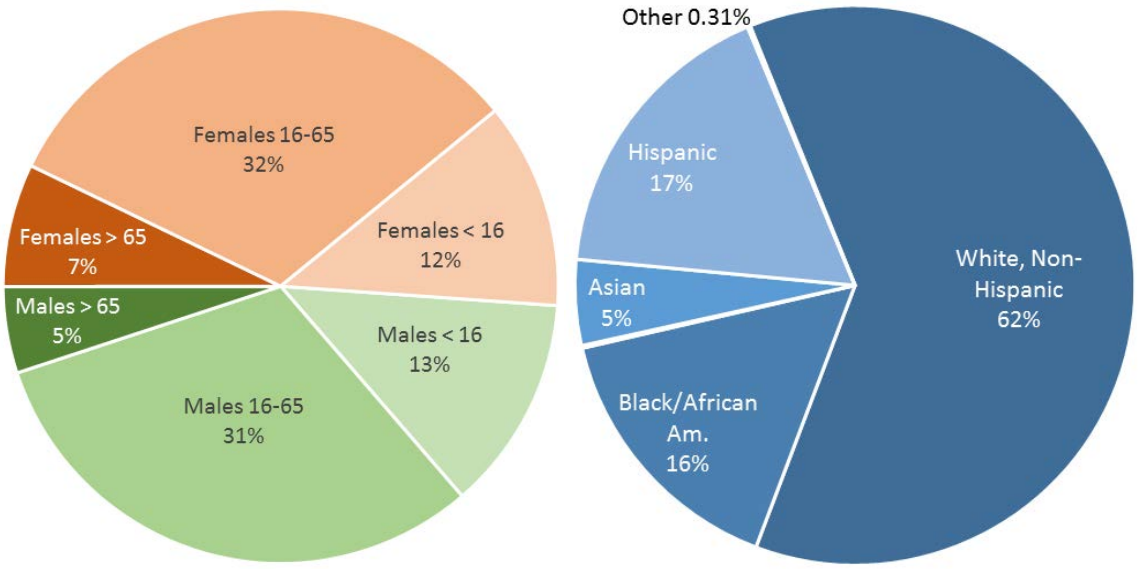


Figure A.3: Age, sex, and race distribution of Illinois' urban areas. Native American and Pacific Islander included in "Other"

Economic

The median household income in 2013 in urban Illinois was $55,439, compared to $57,196, the median for all of Illinois. The median household income of the six-county area is $60,833 and $54,094 for Cook County alone. Downstate, the remainder of Illinois had a median household income of $46,107. Taken as a whole, the six-county urban areas are more affluent than downstate urban areas (Figure A.4). Also, the counties around Cook County are more affluent than Cook County. However, certain urban areas within northeast Illinois are also very economically disadvantaged. Further analysis of the income distribution of urban Illinois is provided in Chapter 1 of the *Urban Flooding Awareness Act* report.

Figure A.4 shows the distribution of urban Illinois annual household incomes. The lower middle horizontal lines are the medians, and the upper middle horizontal lines are the means, the bottom of the boxes are the 1st quartiles, the top of the boxes are the 3rd quartiles, and the whiskers are one standard deviation above and below the mean of the data.

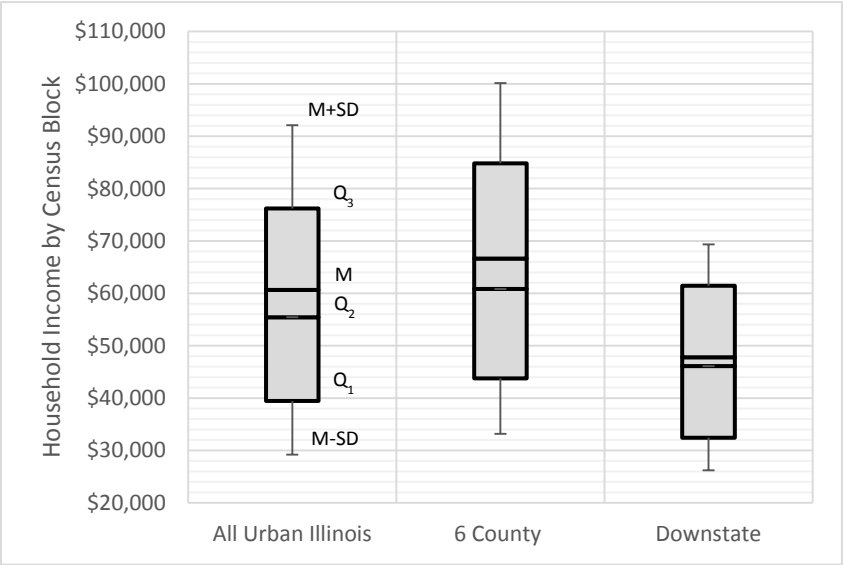


Figure A.4: Household income in Illinois' urban areas. Data is broken out for the six-county area and downstate Illinois. Each box-plot shows the mean (M), one standard deviation (SD) above (M+SD) and below the mean of the data (M-SD), the 1st quartile (Q_1), the median (Q_2) and the 3rd quartile (Q_3). Means are higher than medians for all three distributions.

Citations

U.S. Department of Commerce, Bureau of the Census. (2010, August). *Proposed Urban Area Criteria for the 2010 Census*, Vol. 75, Fed. Reg. No. 163. Retrieved from http://www2.census.gov/geo/pdfs/reference/fedreg/fedregv75n163.pdf

Qualifying Urban Areas for the 2010 Census, Vol. 77, Fed. Reg. No. 59. (2012, March 27). Retrieved from http://www.gpo.gov/fdsys/pkg/FR-2012-03-27/pdf/2012-6903.pdf

Urban Municipalities

Municipality	County
City of Quincy	Adams County
Village of Camp Point	Adams County
Village of Clayton	Adams County
Village of Coatsburg	Adams County
Village of Golden	Adams County
Village of Liberty	Adams County
Village of Lima	Adams County
Village of Loraine	Adams County
Village of Mendon	Adams County
Village of Payson	Adams County
Village of Plainville	Adams County
Village of Ursa	Adams County
City of Cairo	Alexander County
Village of East Cape Girardeau	Alexander County
Village of McClure	Alexander County
Village of Tamms	Alexander County
Village of Thebes	Alexander County
City of Greenville	Bond County
Village of Donnellson	Bond County
Village of Keyesport	Bond County
Village of Mulberry Grove	Bond County
Village of Panama	Bond County
Village of Pierron	Bond County
Village of Pocahontas	Bond County
Village of Smithboro	Bond County
Village of Sorento	Bond County
City of Belvidere	Boone County
City of Loves Park	Boone County
City of Rockford	Boone County
Village of Caledonia	Boone County
Village of Capron	Boone County
Village of Cherry Valley	Boone County
Village of Poplar Grove	Boone County
Village of Timberlane	Boone County
City of Mount Sterling	Brown County
Village of Versailles	Brown County
City of Peru	Bureau County
City of Princeton	Bureau County
City of Spring Valley	Bureau County
Town of Annawan	Bureau County
Village of Arlington	Bureau County
Village of Buda	Bureau County
Village of Bureau Junction	Bureau County
Village of Cherry	Bureau County
Village of Dalzell	Bureau County
Village of De Pue	Bureau County
Village of Dover	Bureau County
Village of Hennepin	Bureau County
Village of Hollowayville	Bureau County
Village of La Moille	Bureau County
Village of Ladd	Bureau County
Village of Malden	Bureau County
Village of Manlius	Bureau County
Village of Mineral	Bureau County
Village of Neponset	Bureau County
Village of Ohio	Bureau County
Village of Seatonville	Bureau County
Village of Sheffield	Bureau County
Village of Tiskilwa	Bureau County
Village of Walnut	Bureau County
Village of Wyanet	Bureau County

Municipality	County
Village of Hamburg	Calhoun County
Village of Hardin	Calhoun County
Village of Kampsville	Calhoun County
City of Lanark	Carroll County
City of Mount Carroll	Carroll County
City of Savanna	Carroll County
Village of Chadwick	Carroll County
Village of Milledgeville	Carroll County
Village of Shannon	Carroll County
Village of Thomson	Carroll County
City of Beardstown	Cass County
City of Virginia	Cass County
Village of Arenzville	Cass County
Village of Ashland	Cass County
Village of Chandlerville	Cass County
City of Champaign	Champaign County
City of Urbana	Champaign County
Village of Allerton	Champaign County
Village of Bondville	Champaign County
Village of Broadlands	Champaign County
Village of Fisher	Champaign County
Village of Gifford	Champaign County
Village of Homer	Champaign County
Village of Ivesdale	Champaign County
Village of Longview	Champaign County
Village of Ludlow	Champaign County
Village of Mahomet	Champaign County
Village of Ogden	Champaign County
Village of Pesotum	Champaign County
Village of Philo	Champaign County
Village of Rantoul	Champaign County
Village of Royal	Champaign County
Village of Sadorus	Champaign County
Village of Savoy	Champaign County
Village of Sidney	Champaign County
Village of St. Joseph	Champaign County
Village of Thomasboro	Champaign County
Village of Tolono	Champaign County
City of Assumption	Christian County
City of Pana	Christian County
City of Taylorville	Christian County
Village of Bulpitt	Christian County
Village of Edinburg	Christian County
Village of Harvel	Christian County
Village of Jeisyville	Christian County
Village of Kincaid	Christian County
Village of Morrisonville	Christian County
Village of Mount Auburn	Christian County
Village of Moweaqua	Christian County
Village of Owaneco	Christian County
Village of Palmer	Christian County
Village of Stonington	Christian County
Village of Tovey	Christian County
City of Casey	Clark County
City of Marshall	Clark County
City of Martinsville	Clark County
Village of Westfield	Clark County
City of Flora	Clay County
Village of Clay City	Clay County
Village of Edgewood	Clay County
Village of Louisville	Clay County
Village of Xenia	Clay County
City of Breese	Clinton County
City of Carlyle	Clinton County
City of Centralia	Clinton County
City of Trenton	Clinton County
City of Wamac	Clinton County
Village of Albers	Clinton County
Village of Aviston	Clinton County
Village of Bartelso	Clinton County
Village of Beckemeyer	Clinton County
Village of Damiansville	Clinton County
Village of Germantown	Clinton County
Village of Hoffman	Clinton County
Village of Huey	Clinton County
Village of Keyesport	Clinton County
Village of New Baden	Clinton County
City of Charleston	Coles County
City of Mattoon	Coles County
City of Oakland	Coles County

Municipality	County
Village of Ashmore	Coles County
Village of Humboldt	Coles County
Village of Lerna	Coles County
City of Berwyn	Cook County
City of Blue Island	Cook County
City of Burbank	Cook County
City of Calumet City	Cook County
City of Chicago	Cook County
City of Chicago Heights	Cook County
City of Country Club Hills	Cook County
City of Countryside	Cook County
City of Des Plaines	Cook County
City of Elgin	Cook County
City of Elmhurst	Cook County
City of Evanston	Cook County
City of Harvey	Cook County
City of Hickory Hills	Cook County
City of Highland Park	Cook County
City of Hometown	Cook County
City of Lockport	Cook County
City of Markham	Cook County
City of Northlake	Cook County
City of Oak Forest	Cook County
City of Palos Heights	Cook County
City of Palos Hills	Cook County
City of Park Ridge	Cook County
City of Prospect Heights	Cook County
City of Rolling Meadows	Cook County
City of Wood Dale	Cook County
Town of Cicero	Cook County
Village of Alsip	Cook County
Village of Arlington Heights	Cook County
Village of Barrington	Cook County
Village of Barrington Hills	Cook County
Village of Bartlett	Cook County
Village of Bedford Park	Cook County
Village of Bellwood	Cook County
Village of Bensenville	Cook County
Village of Berkeley	Cook County
Village of Bridgeview	Cook County

Municipality	County
Village of Broadview	Cook County
Village of Brookfield	Cook County
Village of Buffalo Grove	Cook County
Village of Burnham	Cook County
Village of Burr Ridge	Cook County
Village of Calumet Park	Cook County
Village of Chicago Ridge	Cook County
Village of Crestwood	Cook County
Village of Crete	Cook County
Village of Deer Park	Cook County
Village of Deerfield	Cook County
Village of Dixmoor	Cook County
Village of Dolton	Cook County
Village of East Dundee	Cook County
Village of East Hazel Crest	Cook County
Village of Elk Grove Village	Cook County
Village of Elmwood Park	Cook County
Village of Evergreen Park	Cook County
Village of Flossmoor	Cook County
Village of Ford Heights	Cook County
Village of Forest Park	Cook County
Village of Forest View	Cook County
Village of Frankfort	Cook County
Village of Franklin Park	Cook County
Village of Glencoe	Cook County
Village of Glenview	Cook County
Village of Glenwood	Cook County
Village of Golf	Cook County
Village of Hanover Park	Cook County
Village of Harwood Heights	Cook County
Village of Hazel Crest	Cook County
Village of Hillside	Cook County
Village of Hinsdale	Cook County
Village of Hodgkins	Cook County
Village of Hoffman Estates	Cook County
Village of Homer Glen	Cook County
Village of Homewood	Cook County
Village of Indian Head Park	Cook County
Village of Inverness	Cook County
Village of Itasca	Cook County

Municipality	County
Village of Justice	Cook County
Village of Kenilworth	Cook County
Village of La Grange	Cook County
Village of La Grange Park	Cook County
Village of Lansing	Cook County
Village of Lemont	Cook County
Village of Lincolnwood	Cook County
Village of Lynwood	Cook County
Village of Lyons	Cook County
Village of Matteson	Cook County
Village of Maywood	Cook County
Village of McCook	Cook County
Village of Melrose Park	Cook County
Village of Merrionette Park	Cook County
Village of Midlothian	Cook County
Village of Mokena	Cook County
Village of Morton Grove	Cook County
Village of Mount Prospect	Cook County
Village of Niles	Cook County
Village of Norridge	Cook County
Village of North Riverside	Cook County
Village of Northbrook	Cook County
Village of Northfield	Cook County
Village of Oak Brook	Cook County
Village of Oak Lawn	Cook County
Village of Oak Park	Cook County
Village of Olympia Fields	Cook County
Village of Orland Hills	Cook County
Village of Orland Park	Cook County
Village of Palatine	Cook County
Village of Palos Park	Cook County
Village of Park Forest	Cook County
Village of Phoenix	Cook County
Village of Posen	Cook County
Village of Richton Park	Cook County
Village of River Forest	Cook County
Village of River Grove	Cook County
Village of Riverdale	Cook County
Village of Riverside	Cook County
Village of Riverwoods	Cook County

Municipality	County
Village of Robbins	Cook County
Village of Roselle	Cook County
Village of Rosemont	Cook County
Village of Sauk Village	Cook County
Village of Schaumburg	Cook County
Village of Schiller Park	Cook County
Village of Skokie	Cook County
Village of South Barrington	Cook County
Village of South Chicago Heights	Cook County
Village of South Holland	Cook County
Village of Steger	Cook County
Village of Stickney	Cook County
Village of Stone Park	Cook County
Village of Streamwood	Cook County
Village of Summit	Cook County
Village of Thornton	Cook County
Village of Tinley Park	Cook County
Village of University Park	Cook County
Village of Westchester	Cook County
Village of Western Springs	Cook County
Village of Wheeling	Cook County
Village of Willow Springs	Cook County
Village of Wilmette	Cook County
Village of Winnetka	Cook County
Village of Woodridge	Cook County
Village of Worth	Cook County
City of Robinson	Crawford County
Village of Flat Rock	Crawford County
Village of Hutsonville	Crawford County
Village of Oblong	Crawford County
Village of Palestine	Crawford County
City of Casey	Cumberland County
City of Neoga	Cumberland County
Village of Greenup	Cumberland County
Village of Jewett	Cumberland County
Village of Montrose	Cumberland County
Village of Toledo	Cumberland County
City of DeKalb	Dekalb County
City of Genoa	Dekalb County

Municipality	County
City of Sandwich	Dekalb County
City of Sycamore	Dekalb County
Town of Cortland	Dekalb County
Village of Hinckley	Dekalb County
Village of Kingston	Dekalb County
Village of Kirkland	Dekalb County
Village of Lee	Dekalb County
Village of Malta	Dekalb County
Village of Maple Park	Dekalb County
Village of Shabbona	Dekalb County
Village of Somonauk	Dekalb County
Village of Waterman	Dekalb County
City of Clinton	DeWitt County
City of Farmer City	DeWitt County
City of Maroa	DeWitt County
Village of De Witt	DeWitt County
Village of Kenney	DeWitt County
Village of Wapella	DeWitt County
Village of Waynesville	DeWitt County
Village of Weldon	DeWitt County
City of Arcola	Douglas County
City of Newman	Douglas County
City of Tuscola	Douglas County
City of Villa Grove	Douglas County
Village of Arthur	Douglas County
Village of Atwood	Douglas County
Village of Camargo	Douglas County
Village of Garrett	Douglas County
Village of Hindsboro	Douglas County
Village of Longview	Douglas County
City of Aurora	DuPage County
City of Batavia	DuPage County
City of Chicago	DuPage County
City of Darien	DuPage County
City of Elgin	DuPage County
City of Elmhurst	DuPage County
City of Naperville	DuPage County
City of Northlake	DuPage County
City of Oakbrook Terrace	DuPage County
City of St. Charles	DuPage County
City of Warrenville	DuPage County
City of West Chicago	DuPage County
City of Wheaton	DuPage County
City of Wood Dale	DuPage County
Village of Addison	DuPage County
Village of Bartlett	DuPage County
Village of Bensenville	DuPage County
Village of Berkeley	DuPage County
Village of Bloomingdale	DuPage County
Village of Bolingbrook	DuPage County
Village of Burr Ridge	DuPage County
Village of Carol Stream	DuPage County
Village of Clarendon Hills	DuPage County
Village of Downers Grove	DuPage County
Village of Elk Grove Village	DuPage County
Village of Glen Ellyn	DuPage County
Village of Glendale Heights	DuPage County
Village of Hanover Park	DuPage County
Village of Hinsdale	DuPage County
Village of Itasca	DuPage County
Village of Lemont	DuPage County
Village of Lisle	DuPage County
Village of Lombard	DuPage County
Village of Oak Brook	DuPage County
Village of Roselle	DuPage County
Village of Schaumburg	DuPage County
Village of Villa Park	DuPage County
Village of Wayne	DuPage County
Village of Westmont	DuPage County
Village of Willow Springs	DuPage County
Village of Willowbrook	DuPage County
Village of Winfield	DuPage County
Village of Woodridge	DuPage County
City of Chrisman	Edgar County
City of Paris	Edgar County
Village of Brocton	Edgar County
Village of Hume	Edgar County
Village of Kansas	Edgar County
Village of Metcalf	Edgar County
Village of Redmon	Edgar County

Municipality	County
Village of Vermilion	Edgar County
City of Albion	Edwards County
City of Grayville	Edwards County
Village of Bone Gap	Edwards County
Village of Browns	Edwards County
Village of West Salem	Edwards County
City of Altamont	Effingham County
City of Effingham	Effingham County
Town of Mason	Effingham County
Village of Beecher City	Effingham County
Village of Dieterich	Effingham County
Village of Edgewood	Effingham County
Village of Montrose	Effingham County
Village of Shumway	Effingham County
Village of Teutopolis	Effingham County
Village of Watson	Effingham County
City of St. Elmo	Fayette County
City of Vandalia	Fayette County
Village of Bingham	Fayette County
Village of Brownstown	Fayette County
Village of Farina	Fayette County
Village of Herrick	Fayette County
Village of Mulberry Grove	Fayette County
Village of Ramsey	Fayette County
Village of St. Peter	Fayette County
City of Gibson City	Ford County
City of Paxton	Ford County
Village of Cabery	Ford County
Village of Elliott	Ford County
Village of Kempton	Ford County
Village of Melvin	Ford County
Village of Piper City	Ford County
Village of Roberts	Ford County
Village of Sibley	Ford County
City of Benton	Franklin County
City of Christopher	Franklin County
City of Orient	Franklin County
City of Sesser	Franklin County
City of West Frankfort	Franklin County
City of Zeigler	Franklin County

Municipality	County
Village of Buckner	Franklin County
Village of Ewing	Franklin County
Village of Freeman Spur	Franklin County
Village of Hanaford	Franklin County
Village of North City	Franklin County
Village of Royalton	Franklin County
Village of Thompsonville	Franklin County
Village of Valier	Franklin County
Village of West City	Franklin County
City of Canton	Fulton County
City of Cuba	Fulton County
City of Farmington	Fulton County
City of Havana	Fulton County
City of Lewistown	Fulton County
Town of Astoria	Fulton County
Village of Avon	Fulton County
Village of Bryant	Fulton County
Village of Dunfermline	Fulton County
Village of Fairview	Fulton County
Village of Ipava	Fulton County
Village of Liverpool	Fulton County
Village of Norris	Fulton County
Village of Smithfield	Fulton County
Village of St. David	Fulton County
Village of Table Grove	Fulton County
Village of Vermont	Fulton County
City of Shawneetown	Gallatin County
Village of Equality	Gallatin County
Village of New Haven	Gallatin County
Village of Old Shawneetown	Gallatin County
Village of Omaha	Gallatin County
Village of Ridgway	Gallatin County
City of Carrollton	Greene County
City of Greenfield	Greene County
City of Roodhouse	Greene County
City of White Hall	Greene County
Village of Eldred	Greene County
Village of Hardin	Greene County
Village of Kampsville	Greene County
Village of Kane	Greene County

Municipality	County
Village of Rockbridge	Greene County
City of Braidwood	Grundy County
City of Morris	Grundy County
Village of Braceville	Grundy County
Village of Carbon Hill	Grundy County
Village of Channahon	Grundy County
Village of Coal City	Grundy County
Village of Diamond	Grundy County
Village of Dwight	Grundy County
Village of East Brooklyn	Grundy County
Village of Gardner	Grundy County
Village of Godley	Grundy County
Village of Mazon	Grundy County
Village of Minooka	Grundy County
Village of Seneca	Grundy County
Village of South Wilmington	Grundy County
Village of Verona	Grundy County
City of McLeansboro	Hamilton County
Village of Broughton	Hamilton County
Village of Dahlgren	Hamilton County
City of Carthage	Hancock County
City of Dallas City	Hancock County
City of Hamilton	Hancock County
City of La Harpe	Hancock County
City of Nauvoo	Hancock County
City of Warsaw	Hancock County
Village of Augusta	Hancock County
Village of Bowen	Hancock County
Village of Elvaston	Hancock County
Village of Ferris	Hancock County
Village of Plymouth	Hancock County
Village of West Point	Hancock County
City of Rosiclare	Hardin County
Village of Cave-In-Rock	Hardin County
Village of Elizabethtown	Hardin County
City of Dallas City	Henderson County
Village of Biggsville	Henderson County
Village of Gladstone	Henderson County
Village of Gulf Port	Henderson County
Village of Lomax	Henderson County
Village of Oquawka	Henderson County
Village of Raritan	Henderson County
Village of Stronghurst	Henderson County
City of Colona	Henry County
City of Galva	Henry County
City of Geneseo	Henry County
City of Kewanee	Henry County
Town of Annawan	Henry County
Town of Atkinson	Henry County
Village of Alpha	Henry County
Village of Andover	Henry County
Village of Cambridge	Henry County
Village of Cleveland	Henry County
Village of Coal Valley	Henry County
Village of Hooppole	Henry County
Village of Orion	Henry County
Village of Windsor	Henry County
Village of Woodhull	Henry County
City of Gilman	Iroquois County
City of Watseka	Iroquois County
Village of Ashkum	Iroquois County
Village of Beaverville	Iroquois County
Village of Buckley	Iroquois County
Village of Chebanse	Iroquois County
Village of Cissna Park	Iroquois County
Village of Clifton	Iroquois County
Village of Crescent City	Iroquois County
Village of Danforth	Iroquois County
Village of Donovan	Iroquois County
Village of Iroquois	Iroquois County
Village of Loda	Iroquois County
Village of Martinton	Iroquois County
Village of Milford	Iroquois County
Village of Onarga	Iroquois County
Village of Papineau	Iroquois County
Village of Sheldon	Iroquois County
Village of Thawville	Iroquois County
Village of Wellington	Iroquois County
Village of Woodland	Iroquois County
City of Ava	Jackson County

Municipality	County
City of Carbondale	Jackson County
City of Grand Tower	Jackson County
City of Hurst	Jackson County
City of Murphysboro	Jackson County
Village of Cambria	Jackson County
Village of Campbell Hill	Jackson County
Village of De Soto	Jackson County
Village of Dowell	Jackson County
Village of Elkville	Jackson County
Village of Vergennes	Jackson County
City of Newton	Jasper County
Village of Ste. Marie	Jasper County
Village of Willow Hill	Jasper County
City of Centralia	Jefferson County
City of Mount Vernon	Jefferson County
City of Nason	Jefferson County
Village of Belle Rive	Jefferson County
Village of Bluford	Jefferson County
Village of Bonnie	Jefferson County
Village of Dix	Jefferson County
Village of Ina	Jefferson County
Village of Waltonville	Jefferson County
Village of Woodlawn	Jefferson County
City of Grafton	Jersey County
City of Jerseyville	Jersey County
Village of Brighton	Jersey County
Village of Elsah	Jersey County
Village of Fidelity	Jersey County
Village of Fieldon	Jersey County
Village of Godfrey	Jersey County
Village of Medora	Jersey County
City of East Dubuque	Jo Daviess County
City of Galena	Jo Daviess County
Village of Apple River	Jo Daviess County
Village of Elizabeth	Jo Daviess County
Village of Hanover	Jo Daviess County
Village of Scales Mound	Jo Daviess County
Village of Stockton	Jo Daviess County
Village of Warren	Jo Daviess County
City of Marion	Johnson County

Municipality	County
City of Vienna	Johnson County
Village of Goreville	Johnson County
Village of Karnak	Johnson County
City of Aurora	Kane County
City of Batavia	Kane County
City of Elgin	Kane County
City of Geneva	Kane County
City of St. Charles	Kane County
City of West Chicago	Kane County
City of Yorkville	Kane County
Village of Algonquin	Kane County
Village of Barrington Hills	Kane County
Village of Bartlett	Kane County
Village of Big Rock	Kane County
Village of Burlington	Kane County
Village of Campton Hills	Kane County
Village of Carpentersville	Kane County
Village of East Dundee	Kane County
Village of Elburn	Kane County
Village of Gilberts	Kane County
Village of Hampshire	Kane County
Village of Hoffman Estates	Kane County
Village of Huntley	Kane County
Village of Kaneville	Kane County
Village of Lily Lake	Kane County
Village of Maple Park	Kane County
Village of Montgomery	Kane County
Village of North Aurora	Kane County
Village of Pingree Grove	Kane County
Village of Sleepy Hollow	Kane County
Village of South Elgin	Kane County
Village of Sugar Grove	Kane County
Village of Wayne	Kane County
Village of West Dundee	Kane County
City of Kankakee	Kankakee County
City of Momence	Kankakee County
Village of Aroma Park	Kankakee County
Village of Bonfield	Kankakee County
Village of Bourbonnais	Kankakee County
Village of Bradley	Kankakee County

Municipality	County
Village of Buckingham	Kankakee County
Village of Cabery	Kankakee County
Village of Chebanse	Kankakee County
Village of Essex	Kankakee County
Village of Grant Park	Kankakee County
Village of Herscher	Kankakee County
Village of Limestone	Kankakee County
Village of Manteno	Kankakee County
Village of Reddick	Kankakee County
Village of Sammons Point	Kankakee County
Village of St. Anne	Kankakee County
Village of Sun River Terrace	Kankakee County
City of Aurora	Kendall County
City of Joliet	Kendall County
City of Plano	Kendall County
City of Sandwich	Kendall County
City of Yorkville	Kendall County
Village of Lisbon	Kendall County
Village of Millbrook	Kendall County
Village of Millington	Kendall County
Village of Minooka	Kendall County
Village of Montgomery	Kendall County
Village of Newark	Kendall County
Village of Oswego	Kendall County
Village of Plainfield	Kendall County
City of Abingdon	Knox County
City of Galesburg	Knox County
City of Knoxville	Knox County
City of Oneida	Knox County
Village of Altona	Knox County
Village of East Galesburg	Knox County
Village of Henderson	Knox County
Village of Rio	Knox County
Village of Wataga	Knox County
Village of Williamsfield	Knox County
Village of Yates City	Knox County
City of Highland Park	Lake County
City of Highwood	Lake County
City of Lake Forest	Lake County
City of North Chicago	Lake County

Municipality	County
City of Park City	Lake County
City of Waukegan	Lake County
City of Zion	Lake County
Village of Antioch	Lake County
Village of Arlington Heights	Lake County
Village of Bannockburn	Lake County
Village of Barrington	Lake County
Village of Barrington Hills	Lake County
Village of Beach Park	Lake County
Village of Buffalo Grove	Lake County
Village of Deer Park	Lake County
Village of Deerfield	Lake County
Village of Fox Lake	Lake County
Village of Fox River Grove	Lake County
Village of Grayslake	Lake County
Village of Green Oaks	Lake County
Village of Gurnee	Lake County
Village of Hainesville	Lake County
Village of Hawthorn Woods	Lake County
Village of Indian Creek	Lake County
Village of Island Lake	Lake County
Village of Kildeer	Lake County
Village of Lake Barrington	Lake County
Village of Lake Bluff	Lake County
Village of Lake Villa	Lake County
Village of Lake Zurich	Lake County
Village of Lakemoor	Lake County
Village of Libertyville	Lake County
Village of Lincolnshire	Lake County
Village of Lindenhurst	Lake County
Village of Long Grove	Lake County
Village of Mettawa	Lake County
Village of Mundelein	Lake County
Village of North Barrington	Lake County
Village of Old Mill Creek	Lake County
Village of Palatine	Lake County
Village of Port Barrington	Lake County
Village of Riverwoods	Lake County
Village of Round Lake	Lake County
Village of Round Lake Beach	Lake County

Municipality	County
Village of Round Lake Heights	Lake County
Village of Round Lake Park	Lake County
Village of Third Lake	Lake County
Village of Tower Lakes	Lake County
Village of Vernon Hills	Lake County
Village of Volo	Lake County
Village of Wadsworth	Lake County
Village of Wauconda	Lake County
Village of Wheeling	Lake County
Village of Winthrop Harbor	Lake County
City of Earlville	LaSalle County
City of LaSalle	LaSalle County
City of Marseilles	LaSalle County
City of Mendota	LaSalle County
City of Minonk	LaSalle County
City of Oglesby	LaSalle County
City of Ottawa	LaSalle County
City of Peru	LaSalle County
City of Sandwich	LaSalle County
City of Streator	LaSalle County
City of Wenona	LaSalle County
Village of Cedar Point	LaSalle County
Village of Dalzell	LaSalle County
Village of Dana	LaSalle County
Village of Grand Ridge	LaSalle County
Village of Kangley	LaSalle County
Village of Leland	LaSalle County
Village of Leonore	LaSalle County
Village of Lostant	LaSalle County
Village of Millington	LaSalle County
Village of Naplate	LaSalle County
Village of North Utica	LaSalle County
Village of Ransom	LaSalle County
Village of Rutland	LaSalle County
Village of Seneca	LaSalle County
Village of Sheridan	LaSalle County
Village of Somonauk	LaSalle County
Village of Tonica	LaSalle County
Village of Troy Grove	LaSalle County
City of Bridgeport	Lawrence County

Municipality	County
City of Lawrenceville	Lawrence County
City of St. Francisville	Lawrence County
City of Sumner	Lawrence County
City of Amboy	Lee County
City of Dixon	Lee County
City of Rochelle	Lee County
Village of Ashton	Lee County
Village of Compton	Lee County
Village of Franklin Grove	Lee County
Village of Harmon	Lee County
Village of Lee	Lee County
Village of Nelson	Lee County
Village of Paw Paw	Lee County
Village of Steward	Lee County
Village of Sublette	Lee County
Village of West Brooklyn	Lee County
City of Chenoa	Livingston County
City of Fairbury	Livingston County
City of Pontiac	Livingston County
City of Streator	Livingston County
Town of Chatsworth	Livingston County
Village of Campus	Livingston County
Village of Cornell	Livingston County
Village of Cullom	Livingston County
Village of Dwight	Livingston County
Village of Emington	Livingston County
Village of Flanagan	Livingston County
Village of Forrest	Livingston County
Village of Gridley	Livingston County
Village of Long Point	Livingston County
Village of Odell	Livingston County
Village of Reddick	Livingston County
Village of Saunemin	Livingston County
City of Atlanta	Logan County
City of Lincoln	Logan County
City of Mount Pulaski	Logan County
Village of Broadwell	Logan County
Village of Elkhart	Logan County
Village of Emden	Logan County
Village of Hartsburg	Logan County

Municipality	County
Village of Latham	Logan County
Village of Middletown	Logan County
Village of New Holland	Logan County
Village of San Jose	Logan County
City of Decatur	Macon County
City of Macon	Macon County
City of Maroa	Macon County
Village of Argenta	Macon County
Village of Blue Mound	Macon County
Village of Cerro Gordo	Macon County
Village of Forsyth	Macon County
Village of Harristown	Macon County
Village of Long Creek	Macon County
Village of Mount Zion	Macon County
Village of Niantic	Macon County
Village of Oreana	Macon County
Village of Warrensburg	Macon County
City of Benld	Macoupin County
City of Bunker Hill	Macoupin County
City of Carlinville	Macoupin County
City of Gillespie	Macoupin County
City of Girard	Macoupin County
City of Mount Olive	Macoupin County
City of Staunton	Macoupin County
City of Virden	Macoupin County
Town of Nilwood	Macoupin County
Town of Shipman	Macoupin County
Village of Brighton	Macoupin County
Village of Chesterfield	Macoupin County
Village of East Gillespie	Macoupin County
Village of Lake Ka-Ho	Macoupin County
Village of Medora	Macoupin County
Village of Modesto	Macoupin County
Village of Mount Clare	Macoupin County
Village of Palmyra	Macoupin County
Village of Sawyerville	Macoupin County
Village of Standard City	Macoupin County
Village of Williamson	Macoupin County
Village of Wilsonville	Macoupin County
City of Alton	Madison County

Municipality	County
City of Collinsville	Madison County
City of Edwardsville	Madison County
City of Granite City	Madison County
City of Highland	Madison County
City of Madison	Madison County
City of Troy	Madison County
City of Venice	Madison County
City of Wood River	Madison County
Village of Alhambra	Madison County
Village of Bethalto	Madison County
Village of Brooklyn	Madison County
Village of East Alton	Madison County
Village of Fairmont City	Madison County
Village of Glen Carbon	Madison County
Village of Godfrey	Madison County
Village of Grantfork	Madison County
Village of Hamel	Madison County
Village of Hartford	Madison County
Village of Livingston	Madison County
Village of Marine	Madison County
Village of Maryville	Madison County
Village of New Douglas	Madison County
Village of Pierron	Madison County
Village of Pontoon Beach	Madison County
Village of Roxana	Madison County
Village of South Roxana	Madison County
Village of St. Jacob	Madison County
Village of Williamson	Madison County
Village of Worden	Madison County
City of Centralia	Marion County
City of Kinmundy	Marion County
City of Salem	Marion County
City of Wamac	Marion County
Village of Alma	Marion County
Village of Central City	Marion County
Village of Farina	Marion County
Village of Iuka	Marion County
Village of Junction City	Marion County
Village of Odin	Marion County
Village of Patoka	Marion County

Municipality	County
Village of Sandoval	Marion County
City of Henry	Marshall County
City of Lacon	Marshall County
City of Minonk	Marshall County
City of Toluca	Marshall County
City of Wenona	Marshall County
Village of La Rose	Marshall County
Village of Lostant	Marshall County
Village of Rutland	Marshall County
Village of Sparland	Marshall County
Village of Varna	Marshall County
Village of Washburn	Marshall County
City of Havana	Mason County
City of Mason City	Mason County
Village of Bath	Mason County
Village of Easton	Mason County
Village of Forest City	Mason County
Village of Kilbourne	Mason County
Village of Manito	Mason County
Village of San Jose	Mason County
City of Brookport	Massac County
City of Metropolis	Massac County
Village of Joppa	Massac County
City of Bushnell	McDonough County
City of Colchester	McDonough County
City of Macomb	McDonough County
Village of Bardolph	McDonough County
Village of Blandinsville	McDonough County
Village of Good Hope	McDonough County
Village of Industry	McDonough County
Village of Plymouth	McDonough County
Village of Prairie City	McDonough County
City of Crystal Lake	McHenry County
City of Harvard	McHenry County
City of Marengo	McHenry County
City of McHenry	McHenry County
City of Woodstock	McHenry County
Village of Algonquin	McHenry County
Village of Barrington Hills	McHenry County
Village of Bull Valley	McHenry County

Municipality	County
Village of Cary	McHenry County
Village of Fox Lake	McHenry County
Village of Fox River Grove	McHenry County
Village of Gilberts	McHenry County
Village of Greenwood	McHenry County
Village of Hebron	McHenry County
Village of Holiday Hills	McHenry County
Village of Huntley	McHenry County
Village of Island Lake	McHenry County
Village of Johnsburg	McHenry County
Village of Lake in the Hills	McHenry County
Village of Lakemoor	McHenry County
Village of Lakewood	McHenry County
Village of McCullom Lake	McHenry County
Village of Oakwood Hills	McHenry County
Village of Port Barrington	McHenry County
Village of Prairie Grove	McHenry County
Village of Richmond	McHenry County
Village of Ringwood	McHenry County
Village of Spring Grove	McHenry County
Village of Trout Valley	McHenry County
Village of Union	McHenry County
Village of Wonder Lake	McHenry County
City of Bloomington	Mclean County
City of Chenoa	Mclean County
City of El Paso	Mclean County
City of Le Roy	Mclean County
City of Lexington	Mclean County
Town of Normal	Mclean County
Village of Anchor	Mclean County
Village of Arrowsmith	Mclean County
Village of Bellflower	Mclean County
Village of Carlock	Mclean County
Village of Colfax	Mclean County
Village of Cooksville	Mclean County
Village of Danvers	Mclean County
Village of Downs	Mclean County
Village of Ellsworth	Mclean County
Village of Gridley	Mclean County
Village of Heyworth	Mclean County

Municipality	County
Village of Hudson	Mclean County
Village of McLean	Mclean County
Village of Saybrook	Mclean County
Village of Stanford	Mclean County
Village of Towanda	Mclean County
City of Athens	Menard County
City of Petersburg	Menard County
Village of Greenview	Menard County
Village of Oakford	Menard County
Village of Tallula	Menard County
City of Aledo	Mercer County
City of Keithsburg	Mercer County
City of New Boston	Mercer County
Village of Alexis	Mercer County
Village of Joy	Mercer County
Village of Matherville	Mercer County
Village of North Henderson	Mercer County
Village of Reynolds	Mercer County
Village of Seaton	Mercer County
Village of Sherrard	Mercer County
Village of Viola	Mercer County
Village of Windsor	Mercer County
City of Columbia	Monroe County
City of Red Bud	Monroe County
City of Waterloo	Monroe County
Village of Dupo	Monroe County
Village of Hecker	Monroe County
Village of Maeystown	Monroe County
Village of Valmeyer	Monroe County
City of Coffeen	Montgomery County
City of Hillsboro	Montgomery County
City of Litchfield	Montgomery County
City of Nokomis	Montgomery County
City of Witt	Montgomery County
Village of Butler	Montgomery County
Village of Coalton	Montgomery County
Village of Donnellson	Montgomery County
Village of Farmersville	Montgomery County
Village of Fillmore	Montgomery County
Village of Harvel	Montgomery County

Municipality	County
Village of Irving	Montgomery County
Village of Panama	Montgomery County
Village of Raymond	Montgomery County
Village of Schram City	Montgomery County
Village of Taylor Springs	Montgomery County
Village of Waggoner	Montgomery County
Village of Wenonah	Montgomery County
City of Jacksonville	Morgan County
City of Waverly	Morgan County
Village of Arenzville	Morgan County
Village of Chapin	Morgan County
Village of Concord	Morgan County
Village of Franklin	Morgan County
Village of Lynnville	Morgan County
Village of Meredosia	Morgan County
Village of Murrayville	Morgan County
Village of South Jacksonville	Morgan County
Village of Woodson	Morgan County
City of Sullivan	Moultrie County
Village of Allenville	Moultrie County
Village of Arthur	Moultrie County
Village of Bethany	Moultrie County
Village of Dalton City	Moultrie County
Village of Gays	Moultrie County
Village of Hammond	Moultrie County
Village of Lovington	Moultrie County
City of Byron	Ogle County
City of Oregon	Ogle County
City of Polo	Ogle County
City of Rochelle	Ogle County
City of Rockford	Ogle County
Village of Creston	Ogle County
Village of Davis Junction	Ogle County
Village of Forreston	Ogle County
Village of Hillcrest	Ogle County
Village of Leaf River	Ogle County
Village of Monroe Center	Ogle County
Village of Mount Morris	Ogle County
Village of Stillman Valley	Ogle County
City of Chillicothe	Peoria County

Municipality	County
City of East Peoria	Peoria County
City of Elmwood	Peoria County
City of Farmington	Peoria County
City of Pekin	Peoria County
City of Peoria	Peoria County
City of West Peoria	Peoria County
Village of Bartonville	Peoria County
Village of Bellevue	Peoria County
Village of Brimfield	Peoria County
Village of Creve Coeur	Peoria County
Village of Dunlap	Peoria County
Village of Glasford	Peoria County
Village of Hanna City	Peoria County
Village of Kingston Mines	Peoria County
Village of Norwood	Peoria County
Village of Peoria Heights	Peoria County
Village of Princeville	Peoria County
City of Du Quoin	Perry County
City of Pinckneyville	Perry County
Village of Cutler	Perry County
Village of Du Bois	Perry County
Village of St. Johns	Perry County
Village of Tamaroa	Perry County
Village of Willisville	Perry County
City of Monticello	Piatt County
Village of Atwood	Piatt County
Village of Bement	Piatt County
Village of Cerro Gordo	Piatt County
Village of Cisco	Piatt County
Village of De Land	Piatt County
Village of Hammond	Piatt County
Village of Ivesdale	Piatt County
Village of Mansfield	Piatt County
City of Barry	Pike County
City of Griggsville	Pike County
City of Pittsfield	Pike County
Town of New Canton	Pike County
Village of Baylis	Pike County
Village of Hull	Pike County
Village of Kinderhook	Pike County
Village of Meredosia	Pike County
Village of Milton	Pike County
Village of Nebo	Pike County
Village of Perry	Pike County
City of Golconda	Pope County
City of Cairo	Pulaski County
City of Mound City	Pulaski County
City of Mounds	Pulaski County
Village of Karnak	Pulaski County
Village of Olmsted	Pulaski County
Village of Ullin	Pulaski County
City of Henry	Putnam County
City of Spring Valley	Putnam County
Village of De Pue	Putnam County
Village of Granville	Putnam County
Village of Hennepin	Putnam County
Village of Magnolia	Putnam County
Village of Mark	Putnam County
Village of McNabb	Putnam County
Village of Standard	Putnam County
City of Chester	Randolph County
City of Red Bud	Randolph County
City of Sparta	Randolph County
Village of Baldwin	Randolph County
Village of Coulterville	Randolph County
Village of Ellis Grove	Randolph County
Village of Evansville	Randolph County
Village of Percy	Randolph County
Village of Prairie du Rocher	Randolph County
Village of Ruma	Randolph County
Village of Steeleville	Randolph County
Village of Tilden	Randolph County
Village of Willisville	Randolph County
City of Olney	Richland County
City of Sumner	Richland County
Village of Calhoun	Richland County
Village of Claremont	Richland County
Village of Noble	Richland County
Village of Parkersburg	Richland County
City of East Moline	Rock island County

Municipality	County
City of Moline	Rock island County
City of Rock Island	Rock island County
City of Silvis	Rock island County
Village of Andalusia	Rock island County
Village of Carbon Cliff	Rock island County
Village of Coal Valley	Rock island County
Village of Cordova	Rock island County
Village of Hampton	Rock island County
Village of Hillsdale	Rock island County
Village of Milan	Rock island County
Village of Oak Grove	Rock island County
Village of Port Byron	Rock island County
Village of Rapids City	Rock island County
Village of Reynolds	Rock island County
City of Eldorado	Saline County
City of Harrisburg	Saline County
Village of Carrier Mills	Saline County
Village of Galatia	Saline County
Village of Muddy	Saline County
Village of Raleigh	Saline County
Village of Stonefort	Saline County
City of Auburn	Sangamon County
City of Leland Grove	Sangamon County
City of Springfield	Sangamon County
City of Virden	Sangamon County
Village of Ashland	Sangamon County
Village of Buffalo	Sangamon County
Village of Chatham	Sangamon County
Village of Clear Lake	Sangamon County
Village of Curran	Sangamon County
Village of Dawson	Sangamon County
Village of Divernon	Sangamon County
Village of Grandview	Sangamon County
Village of Illiopolis	Sangamon County
Village of Jerome	Sangamon County
Village of Loami	Sangamon County
Village of Mechanicsburg	Sangamon County
Village of New Berlin	Sangamon County
Village of Pawnee	Sangamon County
Village of Pleasant Plains	Sangamon County

Municipality	County
Village of Riverton	Sangamon County
Village of Rochester	Sangamon County
Village of Sherman	Sangamon County
Village of Southern View	Sangamon County
Village of Spaulding	Sangamon County
Village of Thayer	Sangamon County
Village of Williamsville	Sangamon County
City of Rushville	Schuyler County
City of Winchester	Scott County
Village of Alsey	Scott County
Village of Bluffs	Scott County
Village of Manchester	Scott County
City of Pana	Shelby County
City of Shelbyville	Shelby County
City of Windsor	Shelby County
Town of Sigel	Shelby County
Village of Cowden	Shelby County
Village of Findlay	Shelby County
Village of Herrick	Shelby County
Village of Moweaqua	Shelby County
Village of Oconee	Shelby County
Village of Stewardson	Shelby County
Village of Strasburg	Shelby County
Village of Tower Hill	Shelby County
City of Belleville	St. Clair County
City of Centreville	St. Clair County
City of Collinsville	St. Clair County
City of Columbia	St. Clair County
City of East St. Louis	St. Clair County
City of Fairview Heights	St. Clair County
City of Lebanon	St. Clair County
City of Madison	St. Clair County
City of Mascoutah	St. Clair County
City of O'Fallon	St. Clair County
Village of Alorton	St. Clair County
Village of Brooklyn	St. Clair County
Village of Cahokia	St. Clair County
Village of Caseyville	St. Clair County
Village of Dupo	St. Clair County
Village of East Carondelet	St. Clair County

Municipality	County
Village of Fairmont City	St. Clair County
Village of Fayetteville	St. Clair County
Village of Freeburg	St. Clair County
Village of Hecker	St. Clair County
Village of Lenzburg	St. Clair County
Village of Marissa	St. Clair County
Village of Millstadt	St. Clair County
Village of New Athens	St. Clair County
Village of New Baden	St. Clair County
Village of Sauget	St. Clair County
Village of Shiloh	St. Clair County
Village of Smithton	St. Clair County
Village of St. Libory	St. Clair County
Village of Summerfield	St. Clair County
Village of Swansea	St. Clair County
Village of Washington Park	St. Clair County
City of Toulon	Stark County
City of Wyoming	Stark County
Village of Bradford	Stark County
Village of La Fayette	Stark County
City of Freeport	Stephenson County
Village of Cedarville	Stephenson County
Village of Dakota	Stephenson County
Village of Davis	Stephenson County
Village of German Valley	Stephenson County
Village of Lena	Stephenson County
Village of Orangeville	Stephenson County
Village of Pearl City	Stephenson County
Village of Ridott	Stephenson County
Village of Rock City	Stephenson County
Village of Winslow	Stephenson County
City of Delavan	Tazewell County
City of East Peoria	Tazewell County
City of Marquette Heights	Tazewell County
City of Pekin	Tazewell County
City of Peoria	Tazewell County
City of Washington	Tazewell County
Village of Armington	Tazewell County
Village of Creve Coeur	Tazewell County
Village of Deer Creek	Tazewell County

Municipality	County
Village of Goodfield	Tazewell County
Village of Green Valley	Tazewell County
Village of Hopedale	Tazewell County
Village of Kingston Mines	Tazewell County
Village of Mackinaw	Tazewell County
Village of Manito	Tazewell County
Village of Minier	Tazewell County
Village of Morton	Tazewell County
Village of North Pekin	Tazewell County
Village of Peoria Heights	Tazewell County
Village of South Pekin	Tazewell County
Village of Tremont	Tazewell County
City of Anna	Union County
City of Jonesboro	Union County
Village of Alto Pass	Union County
Village of Cobden	Union County
Village of Dongola	Union County
Village of McClure	Union County
City of Danville	Vermilion County
City of Georgetown	Vermilion County
City of Hoopeston	Vermilion County
Village of Allerton	Vermilion County
Village of Alvan	Vermilion County
Village of Belgium	Vermilion County
Village of Bismarck	Vermilion County
Village of Catlin	Vermilion County
Village of Fairmount	Vermilion County
Village of Fithian	Vermilion County
Village of Henning	Vermilion County
Village of Indianola	Vermilion County
Village of Muncie	Vermilion County
Village of Oakwood	Vermilion County
Village of Potomac	Vermilion County
Village of Rankin	Vermilion County
Village of Ridge Farm	Vermilion County
Village of Rossville	Vermilion County
Village of Sidell	Vermilion County
Village of Tilton	Vermilion County
Village of Westville	Vermilion County
City of Grayville	Wabash County

Municipality	County
City of Mount Carmel	Wabash County
Village of Allendale	Wabash County
Village of Bellmont	Wabash County
Village of Browns	Wabash County
Village of Keensburg	Wabash County
City of Galesburg	Warren County
City of Monmouth	Warren County
Village of Alexis	Warren County
Village of Avon	Warren County
Village of Kirkwood	Warren County
Village of Little York	Warren County
Village of Prairie City	Warren County
Village of Roseville	Warren County
City of Ashley	Washington County
City of Centralia	Washington County
City of Nashville	Washington County
City of Wamac	Washington County
Village of Addieville	Washington County
Village of Du Bois	Washington County
Village of Hoyleton	Washington County
Village of Irvington	Washington County
Village of New Minden	Washington County
Village of Okawville	Washington County
Village of Radom	Washington County
Village of Richview	Washington County
Village of St. Libory	Washington County
Village of Tilden	Washington County
City of Fairfield	Wayne County
Village of Cisne	Wayne County
Village of Jeffersonville	Wayne County
Village of Mill Shoals	Wayne County
Village of Wayne City	Wayne County
City of Carmi	White County
City of Grayville	White County
Village of Crossville	White County
Village of Enfield	White County
Village of Maunie	White County
Village of Mill Shoals	White County
Village of New Haven	White County
Village of Norris City	White County

Municipality	County
City of Fulton	Whiteside County
City of Morrison	Whiteside County
City of Prophetstown	Whiteside County
City of Rock Falls	Whiteside County
City of Sterling	Whiteside County
Village of Albany	Whiteside County
Village of Erie	Whiteside County
Village of Hillsdale	Whiteside County
Village of Lyndon	Whiteside County
Village of Tampico	Whiteside County
City of Aurora	Will County
City of Braidwood	Will County
City of Crest Hill	Will County
City of Joliet	Will County
City of Lockport	Will County
City of Naperville	Will County
City of Wilmington	Will County
Village of Beecher	Will County
Village of Bolingbrook	Will County
Village of Braceville	Will County
Village of Channahon	Will County
Village of Coal City	Will County
Village of Crete	Will County
Village of Diamond	Will County
Village of Elwood	Will County
Village of Frankfort	Will County
Village of Godley	Will County
Village of Homer Glen	Will County
Village of Lemont	Will County
Village of Manhattan	Will County
Village of Matteson	Will County
Village of Minooka	Will County
Village of Mokena	Will County
Village of Monee	Will County
Village of New Lenox	Will County
Village of Orland Park	Will County
Village of Park Forest	Will County
Village of Peotone	Will County
Village of Plainfield	Will County
Village of Richton Park	Will County

Municipality	County
Village of Rockdale	Will County
Village of Romeoville	Will County
Village of Sauk Village	Will County
Village of Shorewood	Will County
Village of Steger	Will County
Village of Tinley Park	Will County
Village of University Park	Will County
Village of Woodridge	Will County
City of Carbondale	Williamson County
City of Carterville	Williamson County
City of Creal Springs	Williamson County
City of Herrin	Williamson County
City of Hurst	Williamson County
City of Johnston City	Williamson County
City of Marion	Williamson County
Village of Bush	Williamson County
Village of Cambria	Williamson County
Village of Colp	Williamson County
Village of Crainville	Williamson County
Village of Energy	Williamson County
Village of Freeman Spur	Williamson County
Village of Pittsburg	Williamson County
Village of Spillertown	Williamson County
Village of Stonefort	Williamson County
Village of Whiteash	Williamson County
City of Loves Park	Winnebago County
City of Rockford	Winnebago County
City of South Beloit	Winnebago County
Village of Cherry Valley	Winnebago County
Village of Davis Junction	Winnebago County
Village of Durand	Winnebago County
Village of Machesney Park	Winnebago County
Village of New Milford	Winnebago County
Village of Pecatonica	Winnebago County
Village of Rockton	Winnebago County
Village of Roscoe	Winnebago County
Village of Winnebago	Winnebago County
City of El Paso	Woodford County
City of Eureka	Woodford County
City of Minonk	Woodford County
City of Peoria	Woodford County
Village of Bay View Gardens	Woodford County
Village of Benson	Woodford County
Village of Congerville	Woodford County
Village of Deer Creek	Woodford County
Village of Germantown Hills	Woodford County
Village of Goodfield	Woodford County
Village of Kappa	Woodford County
Village of Metamora	Woodford County
Village of Peoria Heights	Woodford County
Village of Roanoke	Woodford County
Village of Secor	Woodford County
Village of Spring Bay	Woodford County
Village of Washburn	Woodford County

Appendix B: Stakeholder Engagement and Data Gathering

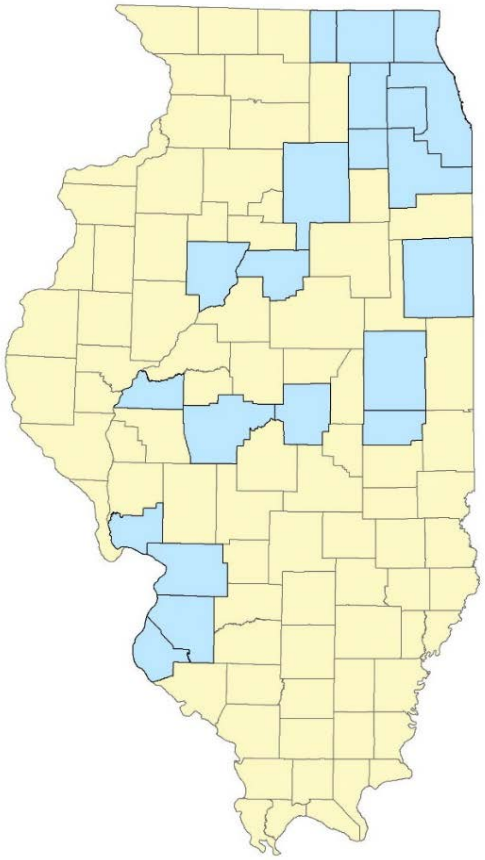
Illinois Urban Flooding Awareness Act Report of Survey Responses

Introduction

Urban flooding is a multifaceted issue with different causes and impacts throughout the State of Illinois. To ensure the *Urban Flooding Awareness Act* report addresses common concerns and issues surrounding urban flooding, a brief survey was developed to gather knowledge and the perspectives of Illinois flood risk professionals. The survey created an opportunity for community, county and state officials with specific knowledge of urban flood issues to provide input in the initial phase of the report. Survey results were used to guide further discussion at meetings and confirm that the report topics represented key concerns and issues.

Methodology

The survey was drafted by the Illinois Department of Natural Resources and hosted on the online site Survey Monkey. Links to the survey were distributed in October 2014, and the survey remained open until November 12, 2014.



The survey was designed to collect uniform data from communities about urban flooding including: amount, type, cause, what has been done, how projects are funded, and general design criteria. The survey was voluntary and not all of those contacted participated.

Respondent Information

Invitations to the online survey were sent to more than 300 individuals (16 federal, 134 county representatives, 64 city representatives, and 107 other stakeholders), and 123 responses were received.

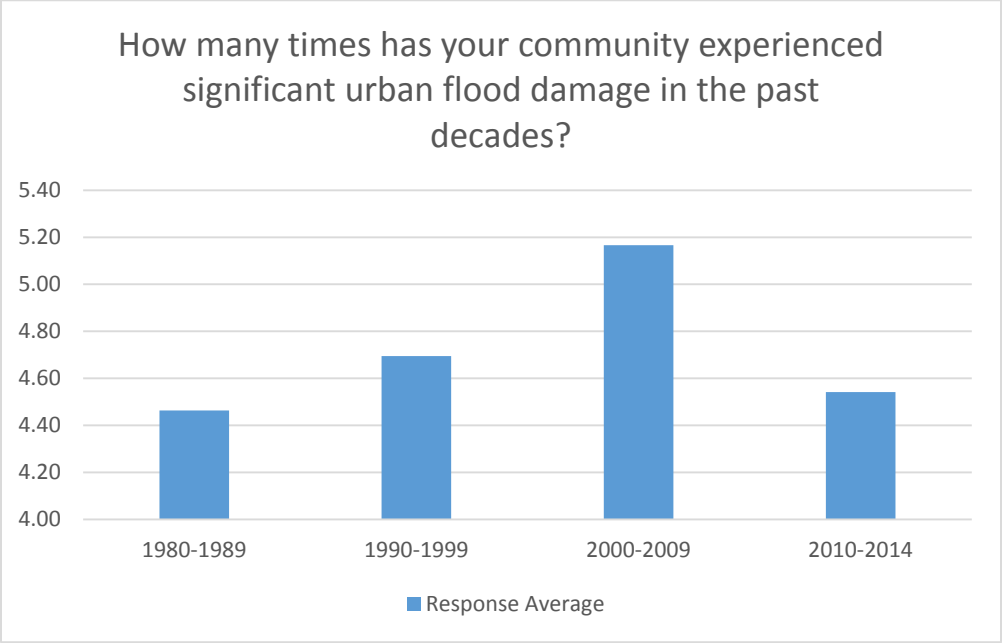
Survey respondents represent 120 municipalities, townships, counties or other entities located within 21 Illinois counties.

Summary of Survey Findings

Survey questions 1-3 requested respondent contact information. The following section summarizes responses for questions 4-17 in the survey.

Question 4: How many times has your community experienced significant urban flood (non-riverine) damage in the past decades?

Of the 109 respondents who answered this question, the majority indicated an increase in flood damage in the more recent decades. In fact, 72% of respondents reported the number of significant flood events during the 15-year period 2000-2014 to be greater than or equal to the number of significant flood events during the 20-year period 1980-1999. Additionally, 63% of respondents reported the number of significant flood events during the most recent 5-year period (2010-2014) to be greater than or equal to the number of significant flood events during the entire previous decade (2000-2009).



Decade	Response Total	Response Count	Response Average
1980s	424	95	4.46
1990s	446	95	4.69
2000s	527	102	5.17
2010s*	495	109	4.54

*Note: 2010s only includes 2010-2014

Question 5: What time of year does urban flooding typically occur?

The majority of survey respondents indicated that spring was the season when urban flooding most typically occurred. Rarely was spring selected as the only season when urban flooding occurred, but rather it was usually selected along with one or more other seasons. However, 37% of respondents indicated that there was no seasonal pattern to the urban flooding.

Time of Year	Response Count
Spring	86
Summer	61
Fall	42
Winter	15
No Pattern Noted	45

Question 6: Please describe the type of rainfall likely to cause urban flood damage: number of inches, duration of event, time of year, etc.

The 119 responses to this question illustrated the diversity and complexity of causes of urban flood damage in Illinois. The majority of respondents reported that it is not simply the magnitude of rainfall or the duration of the event, but rather the intensity of the rainfall that tends to cause flood damage.

Sixty-nine respondents (58%) provided a quantity of rainfall above which flooding tends to occur; however, fifty-three of those responses included a specific duration associated with that rainfall. The inches of rainfall that leads to urban flooding ranged from 1.2 to 12 inches.

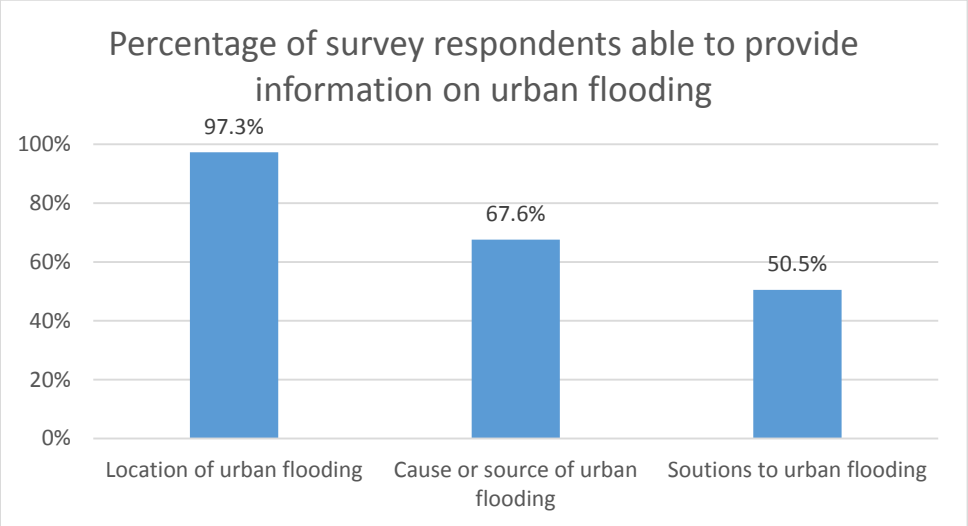
Seventy-two respondents (61%) indicated some type of duration in their response, whether specified in number of hours or more generally like a short period or overnight. Again the intensity of the rainfall was identified as being critical.

Only thirty-five respondents (29%) included a comment on the time of year urban flooding tends to occur. Several respondents noted that frozen grounds and antecedent moisture conditions can also play a significant role in the extent of urban flooding that can result from a given rainfall.

Twenty-respondents (17%) provided a recurrence interval to categorize the type of rainfall likely to cause urban flooding. While most responses indicated 50-year and 100-year events were the most likely storms to cause damage, there were 3 communities that reported experiencing urban flood damage during 1-5 year storm events.

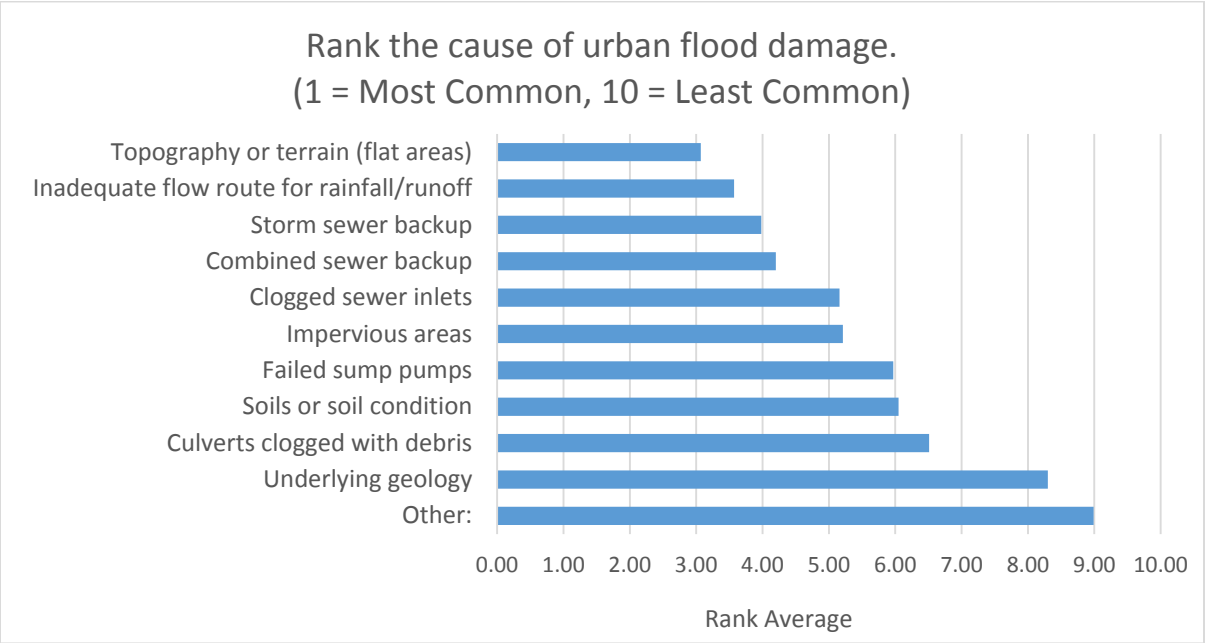
Question 7: My community is able to provide IDNR information on:

Of the 111 respondents who indicated they were able to provide more information on urban flooding, 97% indicated the community could provide the location of urban flooding in a community, but only 50.5% indicated the community could provide solutions to urban flooding issues. Forty-five percent (45%) of respondents indicated they would be able to provide all 3 types of information on urban flooding (location, cause or source, and solutions), while 25% of respondents had information on 2 types of information and 30% of respondents would be able to provide only 1 type of information on urban flooding in their community.



Question 8: Rank the cause of urban flood damage. (1 most common, 10 least common)

Participants were asked to rank 10 specific causes of urban flood damage, as well as an 'Other' category. Note that the shorter the bar, the more often this cause was reported. Fifty-six respondents ranked 'Topography or terrain (flat areas)' as the most or second most common cause of urban flood damage.



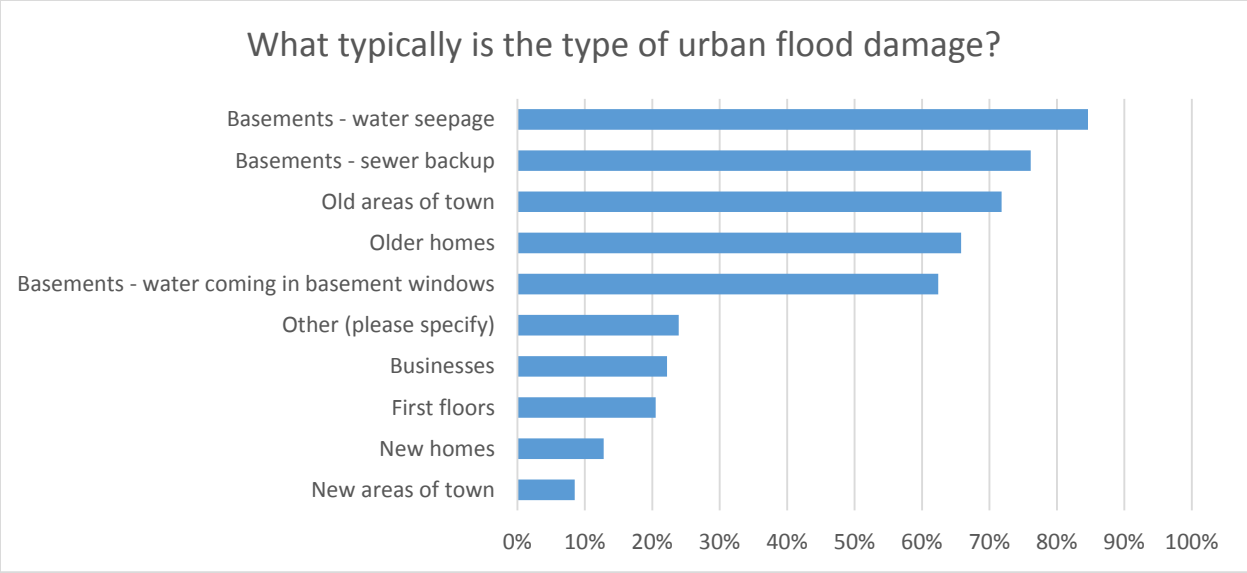
The three most common causes of urban flood damage - (1) Topography or terrain (flat areas), (2) Inadequate flow route for rainfall/runoff, (3) Storm sewer backup – all had at least 30% of respondents rank them as 1 or 2.

The two least common causes of urban flood damage were 'Underlying geology' and 'Other', with more than 50% of respondents ranking these causes as 9, 10, or 11.

Question 9: What typically is the type of urban flood damage?

Those surveyed indicated the most common type of urban flood damage is water seepage in the basement, with 85% of respondents selecting that type. The survey clearly indicated basement flooding in older homes in older areas of town is considered typical urban flooding, with more than 60% of respondents selecting each of the following type:

- Basements - water seepage: 84.6%
- Basements - sewer backup: 76.1%
- Old areas of town: 71.8%
- Older homes: 65.8%
- Basements – water coming in basement windows: 62.4%



Twenty-eight respondents (24%) specified other types of urban flood damage. Those responses included street and alley flooding, the failure and/or overwhelming of sump pumps, and riverine flooding.

Question 10: Please describe the success or failures/pitfalls of any program (e.g. reimbursement) or projects your community has undertaken to assist property owners with urban flood problems.

Only 84 respondents answered this question providing examples of programs in their community. Some examples of activities and programs identified were:

- Hooking sump pumps to storm sewers
- Community drainage improvement projects, grey infrastructure solutions
- Cost sharing programs for residential backflow prevention such as overhead sewers, check valves, ejector and sump pumps
- Cost sharing programs for residential green infrastructure projects
- Cost sharing for floodproofing structures and backyard drainage issues
- Purchasing and knocking down (buyout) flood prone properties
- Downspout disconnection from sanitary sewers
- Community drainage system maintenance program
- Installation of storm sewer backwater valves

However, not all respondents had programs to assist property owners with urban flood problems. In fact, eight respondents (10 %) indicated their community had no such programs.

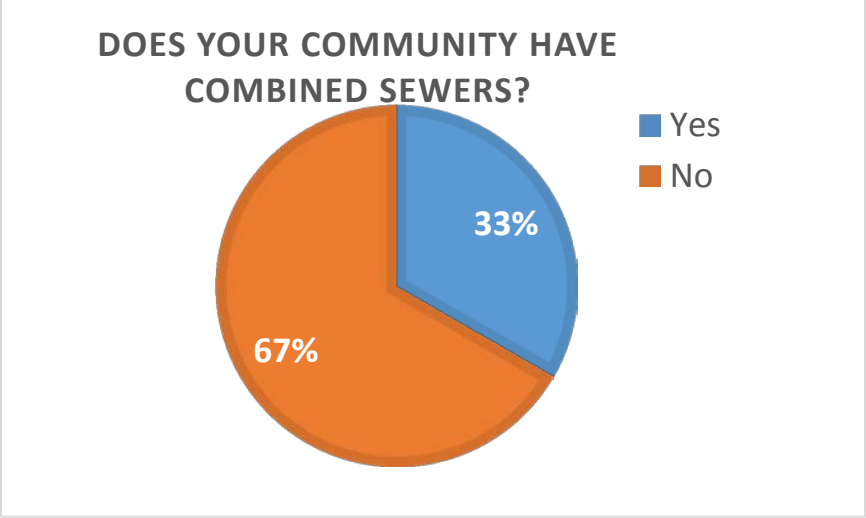
Several programs were indicated to be successful programs including buyouts, relief sewer installation, detention projects, and connection of sump pump to storm sewers. Thirteen respondents provided

pitfalls or failures they have encountered with their programs. A common problem identified was the lack of available funding.

Cost sharing programs to address single property flood mitigation was the most common type of program indicated. Several communities indicated these were successful, and other respondents indicated very few residents take advantage of reimbursement programs or the reimbursement programs do not cover enough of the total expense.

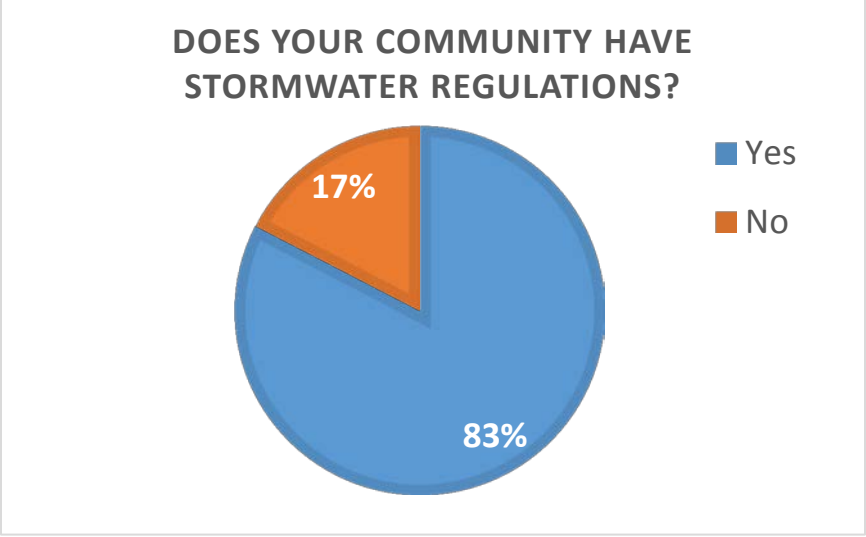
Question 11: Does your community have combined sewers?

Of the 117 respondents who answered this question, 33% (39) stated that their community has combined sewers.



Question 12: Does your community have stormwater regulations?

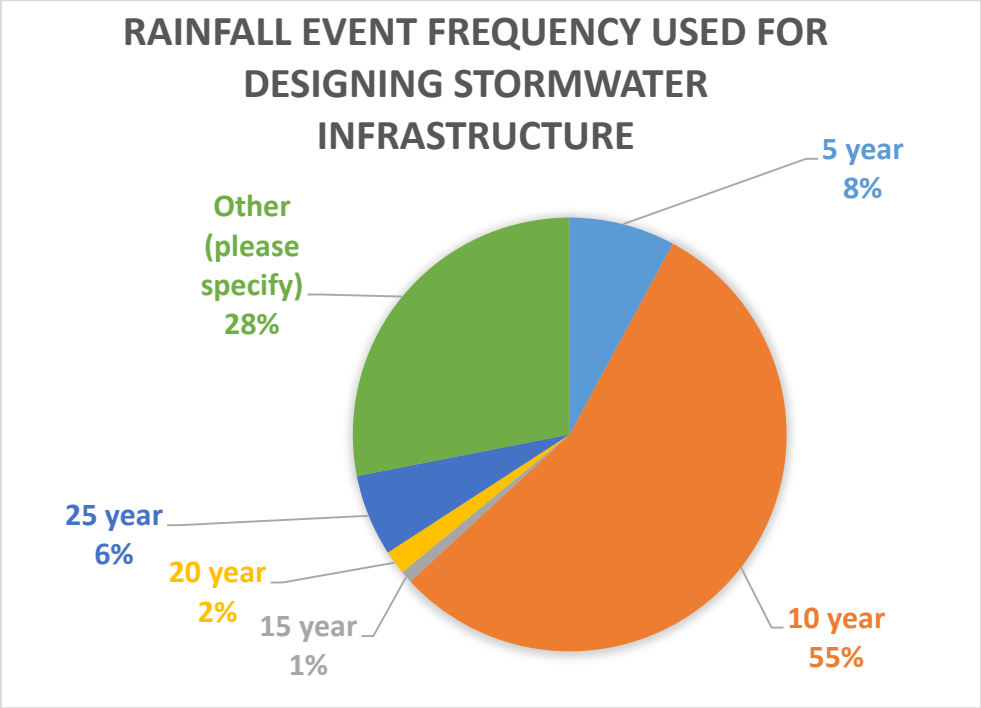
Of the 109 respondents who answered this question, 83% (90) stated that their community has stormwater regulations.



Question 13: What frequency of rainfall event does your community use for design/sizing of stormwater infrastructure (collector/trunk lines)?

The most common rainfall event frequency used for designing stormwater infrastructure was the 10-year event.

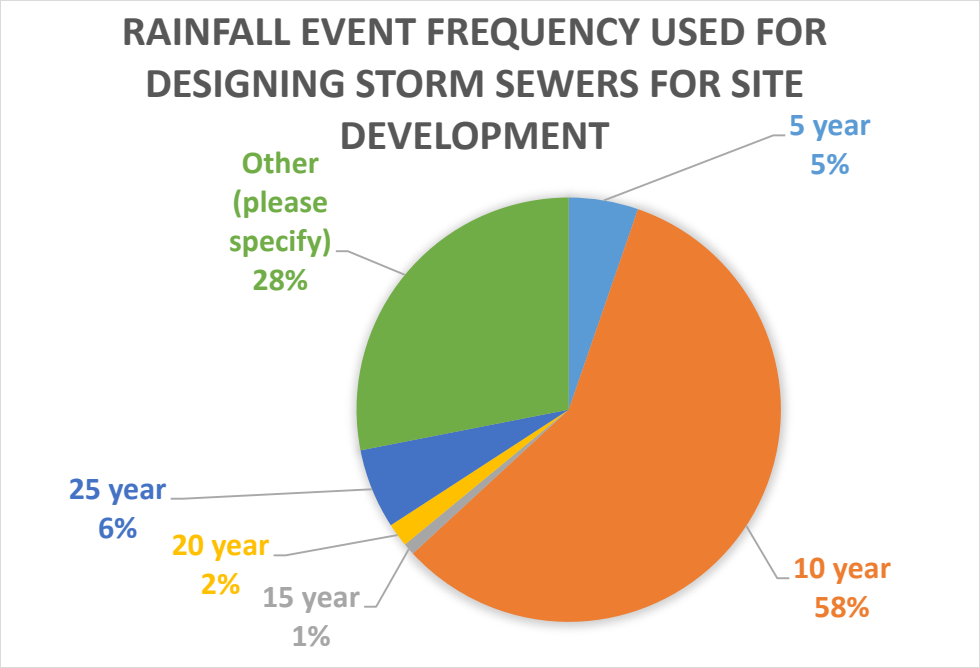
Thirty respondents specified other rainfall event frequencies. Three common 'other' responses included a 100-year design standard, following Metropolitan Water Reclamation District of Greater Chicago Watershed Management Ordinance (MWRD WMO)requirements, and the fact that the design standard can vary with funding availability.



Question 14: What frequency of rainfall event does your community use for design/sizing storm sewers for site development (sites >1 acre)?

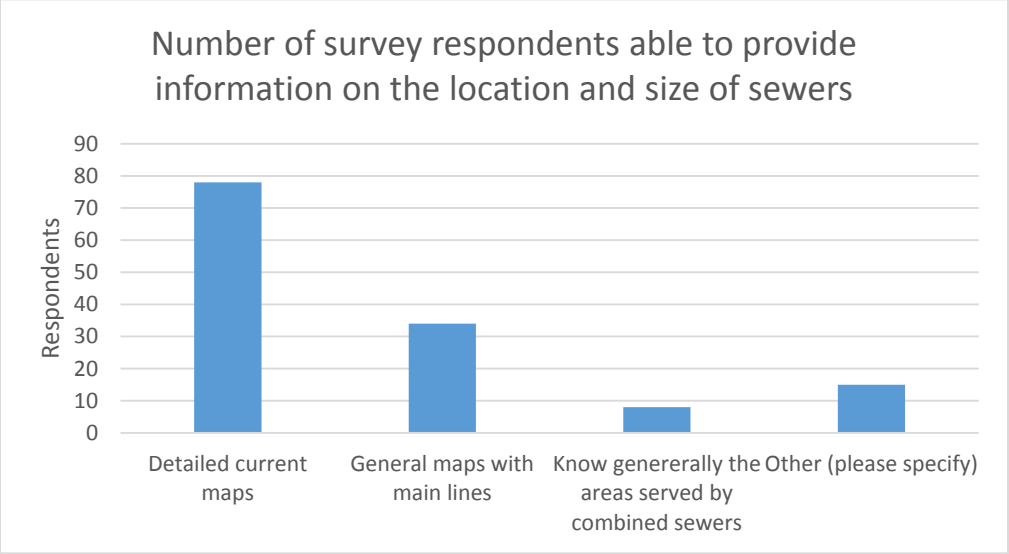
The most common rainfall event frequency used for designing/sizing storm sewers for site development of sites greater than 1 acre was the 10-year event.

Twenty-nine respondents specified 'other' as the rainfall event frequency used for site development. The most common 'other' responses included a 100-year design standard, following MWRD regulations, with the caveat that 10-year storms may be used for conveyance but 100-year storms were used for detention, and the fact that the older infrastructure was not designed to the current standard.



Question 15: Does your community have information on the location and size of storm sewers and/or combined sewers?

Of the 115 respondents who indicated they were able to provide the location and size of their sewers, 68% indicated they are able to provide detailed current maps. Twenty-three percent (23%) of respondents indicated they would only be able to provide general maps with main lines.

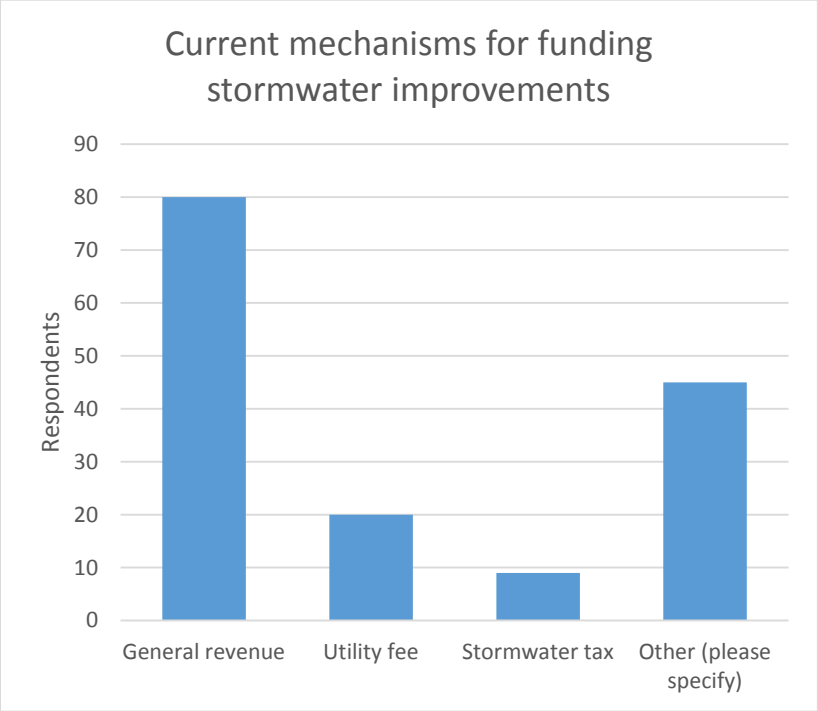


Fifteen respondents specified they would be able to provide 'other' types of information as to the location and size of their sewers. This information was most typically an explanation of the limitations to the data that were available. For example, one survey respondent indicated that general location and size information is available but not invert or rim elevations. Other respondents indicated this type of information is available for newer subdivisions.

Question 16: How does your community currently fund stormwater improvements?

Of the 121 respondents who answered this question, the majority (66%) selected general revenue as a source of funds for stormwater improvements. Of the 80 respondents who selected general revenue, 60 of those indicated general revenue was the only source; the remaining 20 respondents selected general revenue in combination with one or more of the other funding options.

Twenty respondents (17%) indicated that utility fees were a source of funding for stormwater improvements. Only 7 of those respondents indicated utility fees were the only source; the remaining 13 respondents indicated utility fees were used in conjunction with general revenue, grants, bonds, or special sales taxes.



Forty-five respondents specified their community funded stormwater improvements through other mechanisms. The most common 'other' sources of funding were grants, bonds, sales tax, stormwater fees, and property specific sources. Additionally, five of the respondents who selected 'other' indicated that there was no funding for their communities.

Question 17: Please add any additional information or comments.

Forty-one respondents took the opportunity to provide additional information. The most common responses were to provide websites or contacts for additional information. A few respondents commented that they disagreed with the Act's definition of urban flooding. While other respondents used this question to provide more detailed location information as to flood prone areas and current stormwater regulations in effect in their communities.

Observations

- Urban flooding is becoming more frequent.
- Locals know where flooding occurs but do not how to fix it, with funding identified as a major issue.
- Flat terrain with no identified overflow path and sewers that are under current design capacity are common causes of urban flooding.
- Urban flooding is generally considered to be basement flooding in old neighborhoods.
- Many communities' programs included some funding for single-structure mitigation efforts.
- General revenue is the primary source of funds for stormwater management.

Conclusions based on responses

- Urban flooding is often due to a lack of options to move the water away from the high flood risk area due to flat topography and low capacity sewers.
- Gray infrastructure projects are limited due to the high cost. Lack of available space may prohibit detention projects.
- If the water cannot be moved away, the remaining options are protecting structures that have high risk on an individual basis and looking to green infrastructure to infiltrate water in available pervious soils.
- Funding is identified as a common limitation to mitigating urban flooding damages.

Urban Flooding Awareness Act Meetings

Minutes: IDNR Building, Springfield, IL
Tuesday, October 7, 2014 1:00 PM

1. Welcome and meeting information by Brad Winters.
2. Office of Water Resources (OWR) Director Arlan Juhl explained that the Act is an invitation by the legislature for us to explain the problems and potential solutions available for the urban flood problem in the state. The study is funded through grants from the State of Illinois Community Development Board and FEMA.
3. Brad explained that the OWR vision, safer more flood resilient Illinois communities, lines up with the goals of the Act.
4. The agencies listed in the Act were mentioned
5. The definitions in the Act were examined.
    a. **Urban Flooding** is the inundation of property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers.
    b. Urban flooding is explicitly not in undeveloped or agricultural areas.
    c. Urban flooding includes:
        i. **Stormwater** as it enters building through windows, doors, or other openings
        ii. **Backup** through sewer pipes, showers, toilets, sinks, and floor drains
        iii. **Seepage** through walls and floors and
        iv. **Accumulation** of water on property or public rights of way
6. The requirements of the Act were combined into their logical groups.
    a. Define the prevalence, costs, and trends of urban flooding in the state.
    b. Describe the factors impacting urban flooding including; climate change, county stormwater programs, and stormwater policies.
    c. Review the existing technologies to determine risk for urban flooding. This might include making a map that shows properties that are subject to urban flooding.
    d. List the strategies we can use to fix and fund the problem, with a focus on rapid, low cost approaches.
    e. Create a primer on the differences in criteria between IDNR, IEMA, and DCEO for funding flood control projects.
    f. Identify strategies to increase participation in existing programs such as the NFIP and Community Rating System, and to increase the availability, affordability and effectiveness of flood insurance and basement back up insurance?
    g. Another task that is included in the process, but was not in the act is:
        i. Updating the state model stormwater ordinance. This is a requirement for funding that was received from FEMA.
7. The work we have done to date was summarized.
    a. The Department of Insurance has sent out a data call to all of the insurance carriers in the state. This included a request for information on all of the claims for basement

backup insurance in the last 7 years. This information will be aggregated into census tracts to keep from identifying specific properties as a requirement from the Department of Insurance.

b. The Chicago Corps of Engineers has a damage model that gives the amount of basement damage for different flooding levels throughout the TARP area excluding the Des Plaines River and O'Hare sections and they are willing to provide these data.
c. We are in the process of contracting with the Illinois State Water Survey (ISWS) to provide data analysis and report writing services. We are also looking at small contracts with others to gather NFIP and CRS data in a timely manner.
d. Loren Wobig, the President of the Illinois Association for Floodplain and Stormwater Managers, explained they are in the process of organizing a symposium in February 2015 that will bring together experts from across the country to discuss specific urban flooding questions. The notes from the symposium will be published to allow the findings to be used in reducing urban flooding.

8. The estimated timeline for work was explained.
    a. October 7th and 8th is the kickoff meeting that explains the reason for the study and what the committee can offer to the study
    b. November 7th is the deadline for information from the committee.
    c. The ISWS will have 3 months to analyze and process the data.
    d. February 1 the committee will meet again on February 1 to review the data.
    e. The ISWS will have 3 months to write the report draft.
    f. May 1 the committee will meet to review the draft report.
    g. Then the report will be finalized and made ready for the June 30, 2015 deadline.
9. Loren Wobig moderated the next section of the meeting that included discussion among the committee.
    a. We are looking for information about how the committee would use the report when it is complete. We are going to tell the General Assembly the scope and magnitude of the urban flooding issue, what can be done about it, and what needs there are. The report will most likely have recommendations and potential funding sources listed.
    b. Amy Walkenbach from IEPA said that they could list water quality impacts for runoff and CSO's.
    c. Mary Cave from Decatur said that some very quick flooding they have is hard to determine the source of and is not a typical design storm issue.
    d. Discussion on the causes of flooding. It could be seasonal (leaf clogged inlets), depressional, combined sewer related, geological related, sump pumps connected to storm sewers make a difference. Could mine subsidence create depressional flooding?
    e. Loren Wobig said that OWR could install crest stage gages if it would be helpful to catch high water elevations.
    f. Hal Sprague said there are IBM sensors that could be used to detect moisture and strength of storm water pipes. Also maybe there should be a designated flooding risk vs. type of flooding matrix for explaining how flooded a house could get.

g. Molly O'Toole said it is important to define causes of flooding. In her neighborhood the old houses do not flood because the earth around the structures is compacted and the new houses flood because it is not as compact, which allows the water to infiltrate around the foundation and come in the sump quicker.
h. Hal Sprague noted that the climate changes and imperviousness increases, but the conveyance of structures are staying the same, which causes flooding.
i. Sally McConkey said it would be good to know the age of the infrastructure and what storms they were built for.
j. Jim Angel said there is a wetter climate now and precipitation has increased in the last few decades. There is also a high variability in storm depths over cities of even medium size.
k. Mike Sutfin noted that there are too many variables for why basements flood to make blanket statements about rainfall depth versus damage.
l. Mary Cave noted that it is hard to quantify the amount of damage when people do not call in. There is an incomplete picture.
m. In many counties there is more inundation to local roads than along state highways because they are built to higher requirements for overtopping.
n. Encroachment on waterways and poor maintenance of waterways is a problem, but a unified development ordinance would help.
o. Bill Pluta says historically funding from declared disasters is in the form of a community development block grant. There is only an 18 month window for elimination of public safety issues, but that window is too small because of the red tape. State disaster declarations should qualify for federal funds. This would allow for infrastructure improvements. Most flooding funding is after a disaster declaration.
p. Kevin Kothe said that they have an overhead sewer cost share program. There are usually overland flood routes through new subdivisions, but there are issues with landscaping and fencing that end up blocking the flood routes. It is also important to direct sump pump discharge correctly so there are no groundwater issues.
q. Ron Davis said it is harder to get federal disasters declared now. Previously it was only 25 major damaged structures and now it is 800 major damaged structures.
r. Arlan Juhl said that there are issues with disclosure of flooding that impact housing values. Questioned the group whether there is a desire to make maps of inundated areas and maintain the maps and what would the requirements be?
s. Mapping has implications for insurance.
t. Bill Pluta said that the 1994 NFIP Act update strengthened the requirements for mandatory flood insurance.
u. Jim Angel noted that road flooding, airport delays, and business damages all have cascading impacts to the state.
v. There need to be funds to determine what the problems are in different areas.
w. Maybe there should be a public relations campaign to let the public know how storm systems in their areas were designed. Water in streets and backyards might be good because that means that water is not in basements.

x. Mark Mahoney said the expectations of citizens are increasing. They have downtown area flooding and are installing more gaging. CMT is going to do a study.
y. Paul Osman noted that NFIP does not cover finishing in basements. Basement backup flooding rider on your insurance to cover only backup flooding. NFIP only covers overland flooding.
z. Yoko Copeland said that basement backup riders can be cancelled if claims become excessive.
aa. Mark Mahoney said Springfield pays $600 for overhead sewer conversion. Other cities have cost share programs that are very successful.
bb. Mary Cave said they need an easier path to get to a stormwater utility. It is hard to balance development opportunities versus not increasing storm water. Locals need to be able to get funding for themselves.
cc. Kevin Kothe said public education for stormwater needs to be done. There is political resistance to stormwater utilities because of tax implications.
dd. A couple ways to fund stormwater is through property taxes or sales taxes.
ee. Flooding can be riverine, regional, house specific, and sewer backup.
ff. Sally McConkey asked if other counties need to have county wide regulations.
gg. Hal Sprague said except for 2, counties do not have authority for countywide stormwater utilities. Municipalities can have stormwater fees. Hal clarified that there are two statewide revolving loans: clean water and stormwater. He asked if there was a desire for new revolving loan programs for flood projects. One yes, one no.
hh. Paul Osman asked if there should be public-private partnerships for solving the urban flood problem.

10. Participants want guidance on what type of data we would like from them. We agreed to send out a survey to all involved.
11. It was reiterated that we would like the data back in a month to make sure that there is enough time for data analysis.
12. Meeting adjourned.

Attendance List Springfield Urban Flood Awareness Act Meeting October 7, 2014

Number	Agency / Entity	Contact name
1	Bloomington	Kevin Kothe
2	Bloomington	Greg Kallevig
3	Cass County	Timothy L. Icenogle
4	Center for Neighborhood Technologies	Hal Sprague
5	Decatur	Mary Cave
6	Decatur	Troy Hall
7	Governor's Office	Lauren Eiten
8	IDNR	Mike Stevens
9	IDNR - Water Resources	Arlan Juhl
10	IDNR - Water Resources	Rick Gosch
11	IDNR - Water Resources	Loren Wobig
12	IDNR - Water Resources	Paul Osman
13	IDNR - Water Resources	Brad Winters
14	Illinois Assoc. of Realtors	Julie Sullivan
15	Illinois Department of Insurance	Yoko Copeland
16	Illinois Emergency Management Agency	Ron Davis
17	Illinois Environmental Protection Agency	Amy Walkenbach
18	Illinois Housing Development Authority	Charlotte Flickinger
19	Illinois Housing Development Authority	Bill Pluta
20	Illinois State Water Survey of the University of Illinois	Sally McConkey
21	Illinois State Water Survey of the University of Illinois	Glenn Heistand
22	Illinois State Water Survey of the University of Illinois	Jeanne Handy
23	Illinois State Water Survey of the University of Illinois	Momcilo Markus
24	Illinois State Water Survey of the University of Illinois	Jim Angel
25	Madison County	Steve Brendel
26	Menard County	Thomas R. Casson
27	Molly O'Toole & Associates	Molly O'Toole
28	Ottawa	Michael Sutfin
29	Ottawa	David Noble
30	Peoria	Andrea Klopfenstein
31	Sangamon County	Brian Davis
32	Springfield	Thomas Heavisides
33	Springfield	Mark Mahoney
34	U.S. Army Corps of Engineers, St. Louis District	Hal Graef
35	U.S. Army Corps of Engineers, St. Louis District	Michael Feldmann
36	Williamson County	Jeffrey Robinson
37	Winnebago County	Don Krizan

Minutes: IDNR Building, Bartlett, IL
Wednesday, October 8, 2014 1:00 PM

1. Welcome and meeting information by Brad Winters.
2. Office of Water Resources (OWR) Director Arlan Juhl explained that the Act is an invitation by the legislature for us to explain the problems and potential solutions available for the urban flood problem in the state. The study is funded through grants from CDB and FEMA.
3. Brad explained that the OWR vision, Safer more flood resilient Illinois communities, lines up with the goals of the Act.
4. The agencies listed in the Act were mentioned
5. The definitions in the Act were examined.
    a. **Urban Flooding** is the inundation of property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers.
    b. Urban flooding is explicitly not in undeveloped or agricultural areas.
    c. Urban flooding includes:
        i. **Stormwater** as it enters building through windows, doors, or other openings
        ii. **Backup** through sewer pipes, showers, toilets, sinks, and floor drains
        iii. **Seepage** through walls and floors and
        iv. **Accumulation** of water on property or public rights of way
6. The requirements of the Act were combined into their logical groups.
    a. Define the prevalence, costs, and trends of urban flooding in the state.
    b. Describe the factors impacting urban flooding including; climate change, county stormwater programs, and stormwater policies.
    c. Review the existing technologies to determine risk for Urban Flooding. This might include making a map that shows properties that are subject to Urban Flooding.
    d. List the strategies we can use to fix and fund the problem, with a focus on rapid, low cost approaches.
    e. Create a primer on the differences in criteria between IDNR, IEMA, and DCEO for funding flood control projects.
    f. What strategies are there to increase participation in existing programs such as the NFIP and Community Rating System, and to increase the availability, affordability and effectiveness of flood insurance and basement back up insurance?
    g. Another task that is included in the process, but was not in the act is:
        i. Updating the state model stormwater ordinance. This is a requirement for funding that was received from FEMA.
7. The work we have done to date was summarized.
    a. The Department of Insurance has sent out a data call to all of the Insurance Carriers in the State. This included a request for information on all of the claims for basement backup insurance in the last 7 years. This information will be aggregated into census tracts to keep from identifying specific properties as a requirement from the Department of Insurance.

b. The Chicago Corps of Engineers has a damage model that gives the amount of basement damage for different flooding levels throughout the TARP area excluding the Des Plaines River and O'Hare sections and they are willing to provide these data.
c. We are in the process of contracting with the State Water Survey to provide data analysis and report writing services. We are also looking at small contracts with others to gather NFIP and CRS data in a timely manner.
d. Loren Wobig, the President of the Illinois Association for Floodplain and Stormwater Managers, explained they are in the process of organizing a symposium in February 2015 that will bring together experts from across the country to discuss specific urban flooding questions. The notes from the symposium will be published to allow the findings to be used in reducing urban flooding.

8. The estimated timeline for work was explained.
    a. October 7&8 is the kickoff meeting that explains the reason for the study and what the committee can offer to the study
    b. November 7th is hopefully when the information from the committee will be received.
    c. The State Water Survey(SWS) will have 3 months to analyze and process the data.
    d. February 1 the committee will meet again to review the data.
    e. The SWS will have 3 months to write the report draft.
    f. May 1 the committee will meet to review the draft report.
    g. Then the report will be finalized and made ready for the June 30, 2015 deadline.
9. Loren Wobig moderated the next section of the meeting that included discussion among the committee.
    a. Karen Daulton Lange said not all flood damages have known causes; Downers Grove had basement problems and most didn't know how the water got there because it was there when they woke up and looked in the basement.
    b. Jeff Junkas said the damage numbers received from the insurers might not be good information because it is an optional coverage with a cap of 5-10k. Maybe 1 in 10 damaged structures have a policy so it will not show the total extent of problem.
    c. It was asked if the study includes depresional flooding in yards. We answered yes.
    d. Mike Warner asked what the definition of urban is. It is anything that is undeveloped and not agricultural.
    e. Gene Ryan said the flooding that they are responding to most of the time is non NFIP flooding.
    f. Steve Vinezeano said very few houses are in their floodplain, but 800 houses flood in the middle of town because the system is too flat and there is poor drainage.
    g. Some are concerned about small communities not having funding to conform. Small communities might not have a public works department so do not have information to give.
    h. Jeff Junkas said there should be a survey or questionnaire sent to get information
    i. Bruce Mackie said he would like mapping to help structures get funding, because it is hard to find if you are not in a NFIP floodplain.

j. Tony Charlton said the map on the slide is the amount of flooding for the April 2013 flood and buyouts are not available for some houses because they are not in a floodplain. They have a significant problem outside the mapped floodplain.
k. Frank Shockey said flooding is predictable in a riverine area. Could we build a model to predict the urban flooding risk? Looking backward at historical flooding is not the best way to determine risk.
l. Mike Warner they a local BFE approval could be used to create small floodplain areas. This could give regulatory elevation for basements and depressional areas.
m. Sally McConkey wanted to make sure that everyone knew for the Act that spatial analysis is different than mapping for regulatory purposes, because we are looking at a large scale issue not individual property scale for the Act.
n. Gene Ryan said that we should map the flooding so that pumps and equipment could be pre-deployed based on maps. Don't treat people like children everyone should have the information.
o. Molly O'Toole said that the mapped areas are highly dependent on storm tracks and almost everyone is at risk for urban flooding.
p. Tony Charlton said there shouldn't be a competitive standard to not know about flooding, so there should be a unified mapping standard for area wide fairness. Good graphics make funding easier because you can see the flooding.
q. Jana Bryant said combined sewer areas were the worst damaged. They have people that can't get insurance because they are damaged too often.
r. Karen Daulton Lange said they use maps a lot for funding. They use them to prioritize capital improvements. They study depressional areas with a consultant. Help people help themselves, and public outreach might be a good idea.
s. Joe Johnson said focus shifted away from 10 year storm sewers. You can use topo maps to look at overland flow paths. Can't afford to pay to make 100 year storm sewers.
t. Kurt Baumann said – Many communities have a successful cost share program. They look at a cost share to do home evaluations for homeowners. They look at low cost action items, like raising window wells, extending downspouts, etc.
u. Shauna Urlacher said their cost share program is not successful because the residents only want water in storm sewers not overland flow, but it is too expensive.
v. Jon Duddles said they have a program that pays 30% up to $2000 max for check valves, overhead sewers, and battery backup sump pumps. Footer tiles do not seem to work.
w. Jeff Junkas said we should bring in permaseal or other basement flood proofing contractors to help with ideas.
x. Jodie Wollnik said Kane County has dedicated funding from casino. There is a 1993 cost sharing program up to $500,000 for storm sewer projects in unincorporated Kane County residential neighborhoods. Looking for other funding to do bigger projects. Most of the easy projects are already done by now.
y. Nancy Williams said Hey and Assoc. developed a way to complete small watershed planning in depressional urban areas.

z. Hal Sprague asked how many would be interested in a low interest (2% currently) revolving loan programs for stormwater. 7 to 10
aa. Kristin Rehg noted that smaller communities don't have someone that could fill out funding paperwork to get a revolving loan. Maybe grants for small communities to fill out paperwork.
bb. It was asked if the report will define where the funding is prioritized.
cc. Brain Eber mentioned that one community went through a sales tax and was able to fund infrastructure improvements including stormwater. Their plan had a sunset clause so that it would have to be voted on every 5 years.
dd. Molly O'Toole asked if there are ways to incentivize people to not have lower basements.
ee. Hal Sprague asked if in a stormwater fee there is a way that you could incentivize better building techniques. What could the state do to make it easier to create a stormwater fee? If you would go to fee based, would you lose the property taxes and that would be ok?
ff. Karen Daulton Lange said they created an enterprise fund. By law that money couldn't go to other parts of the government so it was easier to pass.
gg. Sump pump failure is a huge problem and there could be a fee when sites are being redeveloped based on bmp usage.
hh. Tony Charlton said there is a problem with stormwater fees and others complaining about taxes. If the state could help with setting up some public information campaign that might make the necessity for the fee more clear.
ii. Shauna Urlacher said Franklin Park has a 1% sales tax for road improvements and have increased their water and sewer rates to fund water and sewer infrastructure projects.
jj. Kurt Baumann said that there shouldn't be a disincentive for communities that are funding stormwater projects out of the general fee.
kk. Jon Duddles said pervious concrete alleys can hold a 2 inch rainfall. Have definitely seen an improvement in the amount of runoff.
ll. Kristin Rehg said they need for guidance for green infrastructure so that it is put in right and not done poorly. Need better access to expert information.
mm. Helen Lekavich would like to have information on how to do more to help with infrastructure like permeable pavement, etc. They need evidence and documentation to prod agencies to help.
nn. People want to conceal the mapping, but residents need documentation to prove that there are problems with the structure.
oo. Public works directors don't want to make the mapping public.
pp. There are issues with confidentiality and FOIA.
qq. David Bucaro said they have an overland and basement flooding survey that was sent out on the April 2013 flooding. Their FOIA rules don't allow personal data to be sent out.
rr. Karen Daulton Lange said they need a way to get into streams and creeks to do maintenance and stabilization work, but there are private property issues.

ss. Shauna Urlacher said they have a citizen's advisory board that helps prioritize where the next steps should be taken for stormwater projects.
tt. Should there be a new standard for stormwater improvements?
uu. Should we prescribe a retrofit for stormwater management?
vv. NAIC (insurance) is looking at climate change and industry is having a problem quantifying the problem.
ww. Arlan Juhl said we need to look forward to update rainfall, but bulletin 70 is significantly similar to atlas 14. Maybe there are more frequent smaller frequency storms.
xx. David Bucaro asked how often before new precipitation maps are produced.
yy. Brian Eber said it seems 1"-2" storms are causing higher frequency and more severe problems.
zz. When there are dry years it is hard to keep the funding levels up because people think it is fixed.
aaa. Frank Shockey asked if there should be site specific analysis to determine the flood problems. Maybe this is a new state program.
bbb. Maybe we should look at design standards and what level can we afford to build.
ccc. It might be important to do some projects that would help people even though it is a small project that only makes a small difference.
ddd. Education might be a good idea. Start with small projects to fix something, but 6 inches in a basement is basically the same as 18 inches as far as damage goes.
eee. It was asked what the goal of the report is. Is it to keep all water out of basements or to change expectations of citizens?

10. It was reiterated that we would like the data back in a month to make sure that there is enough time for data analysis.
11. Meeting adjourned.

Attendance List Bartlett Urban Flood Awareness Act Meeting October 8, 2014

Number	Agency / Entity	Contact name
1	Addison	Rudy Espedido
2	Addison	Kai Tak Liu
3	Baxter & Woodman	Kurt Baumann
4	Bellwood	Peter Tsiolis
5	Bellwood	Marty Walker
6	Bono Consulting Civil Engineers	Bernard Bono
7	Center for Neighborhood Technologies	Hal Sprague
8	Cook Co. Dept. of Homeland Sec. & Em. Management	Gene Ryan
9	Des Plaines	Jon Duddles
10	DHS FEMA Region V	Frank Shockey
11	DHS FEMA Region V	William Heyse
12	Downers Grove	Karen Daulton Lange
13	DuPage County Stormwater management	Anthony Charlton
14	DuPage County Stormwater management	Greg Phillips
15	Evanston	Kristin Rehg
16	Fehr Graham	Shelly Griswold
17	Glenview	James Tigue
18	HDR Engineering	Rajat Das
19	IDNR	Nancy Williamson
20	IDNR - Water Resources	Arlan Juhl
21	IDNR - Water Resources	Rick Gosch
22	IDNR - Water Resources	Loren Wobig
23	IDNR - Water Resources	Paul Osman
24	IDNR - Water Resources	Brad Winters
25	IDNR - Water Resources	Brian Eber
26	Illinois Assoc. of Realtors	Jeff Merrinette
27	Illinois State Water Survey of the University of Illinois	Sally McConkey
28	Illinois State Water Survey of the University of Illinois	Glenn Heistand
29	Illinois State Water Survey of the University of Illinois	Jeanne Handy
30	Illinois State Water Survey of the University of Illinois	Momcilo Markus
31	Infrastructure Engineering	Raspal Bajwa
32	Kane County	Jodie Wollnik
33	Kane County	Scott Hajek
34	Kane County	Michael Zakosek
35	Lake County Stormwater Management	Mike Warner
36	Lombard	Jana Bryant
37	Maki and Company	Bruce Maki
38	Matthew and Lazdins	Bruce Matthews
39	Metropolitan Water Reclamation District of Greater Chicago	Bill Sheriff
40	Metropolitan Water Reclamation District of Greater Chicago	Mike Cosme
41	Midlothian	Helen Lekavich

Attendance List Bartlett Urban Flood Awareness Act Meeting October 8, 2014

Number	Agency / Entity	Contact name
42	Midlothian	Jackie Hill
43	Midlothian	Marihelen Neu
44	Molly O'Toole & Associates	Molly O'Toole
45	Mount Prospect	Jeff Wulbecker
46	MWH Americas	Wade Moore
47	MWH Americas	Joe Johnson
48	Natural Resources Defense Council	Rob Moore
49	Niles	Steve Vinezeano
50	Park Ridge	Nick Webber
51	Property Casualty Insurers Assoc. of America	Jeff Junkas
52	Smith LaSalle	Shauna Urlacher
53	Stantec	Mike Anderson
54	Stantec	Stephanie Nurre
55	Stantec	Chris Ide
56	Thomas Engineering Group	Nicholas Orf
57	Tinley Park	Dale Schepers
58	U.S. Army Corps of Engineers, Chicago District	David Bucaro
59	U.S. Army Corps of Engineers, Chicago District	Dan Linkowski
60	U.S. Army Corps of Engineers, Chicago District	Joel Schmidt
61	Village of Midlothian	Joseph Sparrey

Minutes: IDNR Building, Springfield, IL
Tuesday, March 24, 2015 1:00 PM

1. Welcome and meeting information given.
2. The definition of Urban Flooding was examined.
    a. The Act Definition was compared and contrasted with the working definition for the report.
        i. Working definition includes root causes
            1. Wet soil
            2. Inadequate infrastructure
            3. Overbank flooding
            4. Impervious surfaces
            5. Inadequate site drainage
            6. Climate uncertainty
    b. The Urban Flood Symposium outcomes were discussed
        i. Who is responsible for the flooding is important
        ii. Damage is key to flooding
        iii. Everyone has some risk
        iv. Flood elimination is not possible, only reduction
3. The definition of Urban was examined.
    a. US Census Bureau definition was compared to working definition
        i. Working definition does not use the minimum population requirement, but keeps the same density requirements used by the US Census Bureau
4. The coordinating partners were listed.
5. The data collection done to date was listed.
    a. Basement backup claims were gathered by Department of Insurance
    b. Individual and public assistance disaster claims were gathered by FEMA
    c. NFIP claims were gathered by FEMA
    d. Local government web survey was undertaken by State Water Survey
    e. Combined sewer outfall locations were given by IEPA
    f. Other data from counties, municipalities, and other agencies
6. The work completed to date by the Illinois State Water Survey was summarized and examples were presented
    a. The prevalence, costs, and trends in the flooding data
    b. The impact of climate change
    c. The impact of county stormwater programs
    d. The evaluation of stormwater policies
    e. Review of technology to evaluate risk
    f. Strategies to minimize damage
    g. Report editing
    h. Model stormwater ordinance creation
7. The section on consistency of funding between IDNR, IEMA, and DCEO was presented.

8. The strategy for flood and basement backup insurance section was explained.
9. The NFIP and CRS strategies for increasing participation were reviewed.
10. The draft report outline that was sent out to the meeting attendees was explained.
    a. The Report will contain an executive summary of a couple of pages
    b. Then the report will be a brief (4-5 pages per section) overview of the information.
    c. The appendices will contain the background information for the report and will be what the report is summarized from and will be as long as necessary.
11. The state model stormwater ordinance was explained as being a template for those that need an ordinance and don't know where to start. It will not be required of anyone.
12. The estimated timeline for future work was explained.
    a. In mid- May the committee will meet to review the 95% draft report.
    b. The report will be finalized and made ready for the June 30, 2015 deadline.
    c. The state model stormwater ordinance will be ready in the July – September 2015 timeframe.
13. Discussion / Comments
    a. The limits per basement backup claim are usually $5000 with a max of $10,000 so that could skew the amount comparison between the private and NFIP claims. Is there a cap on NFIP claims?
    b. It was questioned whether there is a correlation between hurricanes and flooding in Illinois
    c. Could there be a GIS product that compares the loss in pervious area in the last 10-20 years?
    d. ISWS studied 12 urbanizing watersheds and found an increase in runoff over 50 years and an increase in annual maximum series. There is an increase in flows in the last 50 years and also in large storms
    e. We could show increasing annual maximums on a USGS urban gage.
    f. One important factor could be an increase in groundwater saturation from more frequent storms.
    g. Could there be a recommendation for future rainfall trends in a Bulletin 70 upgrade? It shouldn't be as drastic of an increase in the upgrade with the next update.
    h. Maybe storm sewer/detention pond design should be based on future precipitation amounts.
    i. Unintended accumulation of water is one part of urban flooding, but damage is another. As opposed to Green infrastructure where the detention of stormwater is desirable.
    j. Maintenance should be included in the definition of urban flooding.
    k. Management issues are also a problem with urban flooding and stormwater systems.
    l. Basement backup claims do not cause a homeowners insurance policy to be "dropped" but "non-renewed" and there are enough insurance companies in Illinois that there should never be a problem with someone not being able to get the coverage. As a last resort there is always state sponsored insurance. All claims go into a database and all insurers can see them.

m. CNT is working on legislation that would create a state revolving fund for stormwater. IEPA might already have the authority to start this program with IDNR cooperation on application selection.
n. City tort immunity from flooding damage lawsuits is a hotly debated topic from both cities and the insurance industry sides. This could be a recommendation that the issue be looked into.

14. Review of the draft outline was requested from participants as soon as possible.
15. Meeting adjourned.

Attendance List Springfield Urban Flood Awareness Act Meeting March 24, 2015

Number	Contact name	Agency / Entity
1	Greg Kallevig	Bloomington
2	Kevin Kothe	Bloomington
3	Mary Cave	Chastain & Assoc.
4	Henry Schmitz	CM&T
5	Troy Hall	Decatur
6	Robert Rapp	Illinois Department of Insurance
7	Brad Winters	Illinois Department of Natural Resources
8	Amy Walkenbach	Illinois Environmental Protection Agency
9	Clayton Ballerine	Illinois State Water Survey
10	Jim Angel	Illinois State Water Survey
11	Momcilo Marcus	Illinois State Water Survey
12	Sally McConkey	Illinois State Water Survey
13	Steve Brendell	Madison County
14	Jeff Junkas	Property Casualty Insurers Assoc. of America
15	Brian Wright	Springfield
16	Nathan Bottom	Springfield
17	T.J. Heavisides	Springfield
18	Dale Schepers	Tinley Park
19	Hal Graef	U.S. Army Corps of Engineers, St. Louis District
20	Gary Johnson	U.S. Geological Survey

Minutes: James R. Thompson Center, Chicago, IL
Wednesday, March 25, 2015 1:00 PM

1. Welcome and meeting information given.
2. The definition of Urban Flooding was examined.
    a. The Act Definition was compared and contrasted with the working definition for the report.
        i. Working definition includes root causes
            1. Wet soil
            2. Inadequate infrastructure
            3. Overbank flooding
            4. Impervious surfaces
            5. Inadequate site drainage
            6. Climate uncertainty
    b. The Urban Flood Symposium outcomes were discussed
        i. Who is responsible for the flooding is important
        ii. Damage is key to flooding
        iii. Everyone has some risk
        iv. Flood elimination is not possible, only reduction
3. The definition of Urban was examined.
    a. US Census Bureau definition was compared to working definition
        i. Working definition does not use the minimum population requirement, but keeps the same density requirements used by the US Census Bureau
4. The coordinating partners were listed.
5. The data collection done to date was listed.
    a. Basement backup claims were gathered by Department of Insurance
    b. Individual and public assistance disaster claims were gathered by FEMA
    c. NFIP claims were gathered by FEMA
    d. Local government web survey was undertaken by State Water Survey
    e. Combined sewer outfall locations were given by IEPA
    f. Other data from counties, municipalities, and other agencies
6. The work completed to date by the Illinois State Water Survey was summarized and examples were presented
    a. The prevalence, costs, and trends in the flooding data
    b. The impact of climate change
    c. The impact of county stormwater programs
    d. The evaluation of stormwater policies
    e. Review of technology to evaluate risk
    f. Strategies to minimize damage
    g. Report editing
    h. Model stormwater ordinance creation
7. The section on consistency of funding between IDNR, IEMA, and DCEO was presented.

8. The strategy for flood and basement backup insurance section was explained.
9. The NFIP and CRS strategies for increasing participation were reviewed.
10. The draft report outline that was sent out to the meeting attendees was explained.
    a. The Report will contain an executive summary of a couple of pages
    b. Then the report will be a brief (4-5 pages per section) overview of the information.
    c. The appendices will contain the background information for the report and will be what the report is summarized from and will be as long as necessary.
11. The state model stormwater ordinance was explained as being a template for those that need an ordinance and don't know where to start. It will not be required of anyone.
12. The estimated timeline for future work was explained.
    a. In mid- May the committee will meet to review the 95% draft report.
    b. The report will be finalized and made ready for the June 30, 2015 deadline.
    c. The state model stormwater ordinance will be ready in the July – September 2015 timeframe.
13. Discussion / Comments
    a. Maybe there should be a disclaimer on the damage maps directing people to the definition of urban flooding and what kind of damages were used.
    b. Most Chicago soils are "B" type soils that don't drain as well and this could cause more flooding due to less infiltration. DuPage county is 2/3 hydric soils.
    c. Can damages be correlated to imperviousness?
    d. We should zoom in on focus areas throughout the report.
    e. Maybe we shouldn't use damage averages in the report since the 2010/2013 floods would throw off the averages.
    f. We should look at the change in extreme events for climate change.
    g. Don't just show the amount of increase in the rainfall between Bulletin 70 and TP40 also show the base amount so that there can be a comparison of how much it has increased.
    h. Zoning ordinances in dealing with the amount of impervious coverage allowed is different for different cities. Lisle (34%) Lombard (50%)
    i. CRS has data for communities that provide assistance
    j. CMAP has a checklist for imperviousness.
    k. We should be looking at the practices of the basement contractors to keep them from taking advantage of people.
    l. The numbers of policies are impacted by recession as well.
    m. Show the inconsistencies and lack of coordination between state agencies.
    n. Show how each agency prioritizes projects to fund.
    o. Include IEPA (revolving fund) 319 funds into the state agency section.
    p. DNR Coastal Management funds green infrastructure.
    q. Should we highlight the difference between states on the amount of state staff per community served?
    r. State programs are understaffed.
    s. HUD grants might not require good floodplain management. There is an executive order, but it is not always followed.

t. IDNR Eco-cat and CERP permitting could be required to coordinate with floodplains.
u. Can any state programs provide funding directly to private property
v. Sewer insurance reminders could be placed on water bills to remind people to get the coverage.
w. Kane County has some areas that are urban but are not shown that way on the map. Can all 6 counties be shown as urban or urbanizing?
x. Property taxes are sometimes lowered after flooding. This could be a source for data on flooding.
y. The amount of deductible for the insurance claims is different for different people so the amount of payout is not necessarily the amount of damage.
z. The deductibles are not the same over the whole period that we have damages for.
aa. Basement backup insurance could also be sold through water bill.
bb. Older populations generally have less insurance. They have a higher tolerance and no mortgage requirements.
cc. There should be continuing education for insurance companies for flood insurance
dd. Mandatory requirements are a problem for the insurance industry they have a hard time making sales if there are too many add-ons.
ee. One way to fund buyouts is to map depressional areas as flood prone and include them in the NFIP.
ff. IDNR's CERP approval should include floodplain regulation so that other parts of IDNR are required to follow floodplain regulations.
gg. Buyouts should be added into the Strategies for prevention and control of urban flooding section.

14. Review of the draft outline was requested from participants as soon as possible.
15. Meeting adjourned.

Attendance List Chicago Urban Flood Awareness Act Meeting March 25, 2015

Number	Contact name	Agency / Entity
1	Brad Winters	Illinois Department of Natural Resources
2	Bruce Maki	Maki and Company
3	Charles Burhan	Liberty Mutual
4	Chris Ide	STARR
5	Gene Ryan	Cook County Department of Homeland Security & Emergency Management
6	James Tigue	Glenview
7	Jeff Julkowski	Christopher B. Burke Engineering
8	Jeff Wulbecker	Mount Prospect
9	Jim Song	Will County
10	Jodie Wollnik	Kane County Environmental Management
11	Jon Duddles	Des Plaines
12	Karen Daulton Lange	Downers Grove
13	Laurent Kanago	Candid Sustainability
14	Lisa Cotner	IDNR - Coastal Program
15	Loren Wobig	Illinois Department of Natural Resources
16	Marilyn Sucoe	Lisle
17	Mark Phipps	Baxter & Woodman
18	Mick Cosme	MWRD
19	Mike Warner	Lake County Stormwater Management
20	Molly O'Toole	Molly O'Toole & Associates
21	Nicholas Orf	Thomas Engineering Group
22	Shauna Urlacher	Smith Lasalle
23	Stephanie Nurre	STARR
24	Tom Liliensiek	Civiltech Engineering
25	Tylon McGee	Cook County Department of Homeland Security & Emergency Management
26	Rick Gosch	Illinois Department of Natural Resources
27	Paul Osman	Illinois Department of Natural Resources
28	Brian Eber	Illinois Department of Natural Resources
29	Jim Angel	Illinois State Water Survey
30	Sally McConkey	Illinois State Water Survey
31	Clayton Ballerine	Illinois State Water Survey
32	Momcilo Markus	Illinois State Water Survey
33	Frank Shockey	Federal Emergency Management Agency
34	Anthony Charlton	DuPage County Stormwater Management
35	Sarah Hunn	DuPage County Stormwater Management
36	Yonah Freemark	Metropolitan Planning Council
37	Norah Beck	Metropolitan Planning Council
38	David Bucaro	US Army Corps of Engineers
39	Other	
40	Other	

Minutes: IEPA Building, Springfield, IL
Tuesday, May 19, 2015 1:00 PM

Minutes: Mt. Prospect Village Hall, Mt. Prospect, IL
Wednesday, May 20, 2015 1:00 PM

1. Welcome and meeting information given.
2. The timeline for the remaining work to be done on the report was explained
    a. Draft report out to stakeholders May 14th
    b. Request comments back by May 21st
    c. No chapter changes after May 31st
    d. Final editing done by June 21st
    e. Forwarded to printer June 22nd
    f. Delivered to Governor and General Assembly June 30th
3. The recommendations in the report were examined and comments were taken at the meeting and also by email and every recommendation is recorded below. The recommendations and changes below are grouped by chapter and then original recommendation. The changes are nested below the originals and additions or subtractions are shown in color. Text added is in red and removed in lined through green.
    a. All recommendations should be more specific and list the entities that should be doing the recommended action
    b. Chapter 1
        i. Insurance companies only retain claims data for eight years. Private claims data should be assimilated by the state every five to eight years to develop a long term database.
            1. Insurance companies only retain claims data for eight years. The Illinois Department of Insurance should collect private claims data every five to eight years and develop a long term database that is available to the public.
        ii. More research is needed to determine if lower income households have adequate private insurance as they appear to have fewer private insurance claims.
            1. The Illinois Department of Insurance should conduct research to determine if lower income households have adequate private basement backup insurance as they appear to have fewer private insurance claims than higher income households.
        iii. The amount of flood insurance training should be increased for insurance agents.
            1. The Illinois Department of Insurance should increase the amount of flood insurance training required for insurance agents.
        iv. Outreach and education efforts should be incentivized at the local level to help make citizens aware of the differences between flood insurance and sewer backup coverage.

1. The Illinois Department of Insurance should encourage outreach and education efforts at the local level to ensure that citizens understand the differences between flood insurance and sewer backup coverage.

v. Establish a state Urban Flood Mitigation Pool funded from a very minimal surcharge on all homeowner's policies in Illinois. This mitigation funding stream could be used to IDNR to identify, study, and mitigate the most egregious urban flood areas in the state.
    1. Establish a state Urban Flood Mitigation Pool. This mitigation funding stream could be used to IDNR to identify, study, and mitigate the most egregious urban flood areas in the state.

c. Chapter 2
    i. Continue monitoring climate and flood data to better validate and fine tune the present climate projections and their effects on urban flooding; continue monitoring progress in climate model developments; and keep abreast of the new scientific approaches to account for climate and other uncertainties.
        1. The Illinois Department of Natural Resources should continue monitoring climate and flood data to better validate and fine tune the present climate projections and their effects on urban flooding; continue monitoring progress in climate model developments; and keep abreast of the new scientific approaches to account for climate and other uncertainties.
    ii. Continue monitoring climate and flood data to better validate and fine tune the present climate projections and their effects on urban flooding; continue monitoring progress in climate model developments; keep abreast of the new scientific approaches to account for climate and other uncertainties; and partner with USGS to fund the stream gage network.
        1. Provide cost share funding to maintain and expand the USGS stream gage network. Encourage state agencies to partner more closely with USGS to better utilize stream gage data.
            a. Provide cost share funding to maintain and expand the USGS stream gage network. Encourage state agencies to partner with USGS to expand stream flow data collection.
        2. The Illinois General Assembly should provide cost share funding to allow the Department of Natural Resources to maintain and expand the USGS stream gage network. The ILGA should also encourage relevant state agencies to partner more closely with USGS to better utilize stream gage data.
    iii. Local stormwater infrastructure planning should take into consideration climate projections for more intense precipitation events. The uncertainty of rainfall and flood projections could be quantified through confidence limits that account for major sources of uncertainty.

1. When planning stormwater infrastructure modifications and enhancements, local governments should take into consideration climate projections for more intense precipitation events. The uncertainty of rainfall and flood projections should be quantified through confidence limits that account for major sources of uncertainty.

iv. Expand and utilize real-time flood mapping in areas of the state most prone to urban flood damages.
    1. The Illinois Department of Natural Resources should expand and utilize real-time flood mapping of the areas of the state prone to urban flood damages. This information should be shared with all local and county governments. The State should update Bulletin 70 using the 30 years of additional rainfall gauge data that is available and take into account the future trends in rainfall.
    2. Expand and utilize real-time flood mapping in areas of the state most prone to urban flood damages. Not realistic for urban flooding.

v. An update of Bulletin 70 should be conducted with the 30 years of additional rainfall gauge data that is available and include the future trends in rainfall.
    1. An update of Bulletin 70 should be conducted with the 30 years of additional rainfall gauge data that is available and include the future trends in rainfall.
    2. Fund the update of Bulletin 70 to add the 30 years of additional rainfall gauge data that is available and include the future trends in rainfall.

d. Chapter 3
    i. Topographic wetness indices should be studied and developed further for the identification of areas of likely urban flooding.
        1. Topographic wetness indices should be studied and developed further for the identification of areas of likely urban flooding
        2. The State of Illinois should provide funding to the Illinois State Water Survey to study and further develop the topographic wetness indices used for the identification of areas likely prone to urban flooding issues.
    ii. Communities should track storm sewer infrastructure sizes and design data to allow for evaluation of the effect of changing rainfall patterns on system capacity.
        1. Communities should track storm sewer infrastructure sizes and design data to allow for evaluation of the effect of changing rainfall patterns on system capacity to better predict areas at risk for urban flooding and to inform stormwater management planning.
            a. Communities should track storm sewer infrastructure sizes and design data to allow for evaluation of the effect of changing rainfall patterns on system capacity, predict more accurately areas at risk for urban flooding and better inform stormwater management planning.

iii. Construction should be avoided below grade in hydrologic soil groups C and D without special design consideration.
    1. Construction should be avoided below grade in hydrologic soil groups C and D without special design consideration such as (insert type of consideration here).
    2. Construction should be avoided below grade in hydrologic soil groups C and D without special design consideration such as overland flow paths and increased flood proofing of structural components located below grade.
    3. Local governments should update their building codes to preclude construction below grade in hydrologic soil groups C and D without special design consideration such as overland flow paths and increased flood proofing of structural components located below grade. Below grade construction should be regulated by a statewide building code.
    4. Construction should be avoided below grade in hydrologic soil groups C and D and in areas with seasonally high groundwater levels without special design consideration.
    5. Construction should be avoided below grade without special design consideration.
    6. Construction below grade should be regulated by building codes statewide.
    7. Construction below grade should be regulated by the adoption of statewide building codes.

iv. Urge US EPA to continue development of EPASWMM Modelling Software to include 2D capabilities allowing local agencies to more efficiently model flood prone areas.
    1. The Illinois Department of Natural Resources should request that U.S. EPA continue development of EPASWMM Modelling Software to include 2D capabilities allowing local agencies to more efficiently model flood prone areas.

v. Reverse 9-1-1 technologies should be expanded in Illinois for real time warnings to citizens of impending flood risk.
    1. Local Illinois governments should expand their reverse 9-1-1 technologies and programs to include real time warnings to citizens of impending flood risk.

e. Chapter 4
    i. County Stormwater Management Authority should be granted to all Illinois counties to generate revenue and to implement sound stormwater management practices.
        1. Consider county Stormwater Management Authority should be granted to all Illinois counties to generate revenue and to implement sound stormwater management practices.

2. Municipal and County Stormwater Management Authority should be granted to all Illinois counties to generate revenue and to implement sound stormwater management practices.
3. The General Assembly may want to consider expanding the authority for county stormwater management to all counties to implement sound stormwater management, projects, programs and policies.
4. County Stormwater Planning and Management Authority should be granted to all Illinois counties, as well as the authority to establish stormwater utilities, adopt stormwater ordinances countywide, generate revenue from fees, and implement sound stormwater management practices.
5. County Stormwater Management Authority should be granted to all Illinois counties for comprehensive planning, the ability to generate revenue, and to implement sound stormwater management practices.
6. The authority to generate revenue from fees to plan, implement and maintain stormwater management/drainage programs/facilities should be granted to all County Stormwater Planning and Management Agencies (55 ILCS 5/5-1062), County's (55 ILCS 5/Div. 5-15) and municipalities.

ii. A state model stormwater ordinance should be developed that can be used as a template by communities.
    1. A state model stormwater ordinance should be developed that can be used as a template by municipalities and counties. The following items should be included in this model ordinance…..
    2. A state model local stormwater ordinance should be developed that can be used as a template by communities.
    3. Include regulations for re-development and encourage green infrastructure in this model ordinance.
    4. A state model stormwater ordinance should be developed which ~~that~~ can be used as a template by communities.
    5. A state model stormwater ordinance should be developed which can be used as a template by counties and local communities.

iii. Municipal powers should be used to set up stormwater utilities to maintain and upgrade stormwater infrastructure.
    1. Home rule communities should set up stormwater utilities or use XXXX funding to maintain and upgrade stormwater infrastructure.
    2. Municipalities should review and discuss funding options to maintain and upgrade stormwater infrastructure.
    3. Municipal powers should be used to set up stormwater utilities with adequate fees to maintain and upgrade stormwater infrastructure.

4. Stormwater Planning and Management authority should be granted to all Illinois counties to adopt countywide stormwater ordinances, projects and programs.

iv. Communities should be granted the authority to establish storm sewer utilities and collect fees regardless of home rule status.

f. Chapter 5

i. An update of Bulletin 70 should be conducted since 30 years of additional rainfall gauge data is available, with updates every 10-15 years afterward.

ii. Community stormwater ordinances should also be applied to redevelopment.

1. Local stormwater ordinances for redevelopment projects should be flexible and focus on a comparison of pre-development and post-development conditions rather than imposing absolute standards that may be more difficult for redevelopment sites to meet. Single family home projects should be exempt. (NOTE: Often redevelopment sites will have existing infrastructure and there may be grading issues associated with constructing access points or driveway that, as a result, limit the opportunity for surface collection or treatment practices)
2. Remove redevelopment grandfathering allowance in community stormwater ordinances for existing imperviousness, especially on parcels that redevelop in known flood problem areas.

iii. Funding and development of USGS and other streamflow and precipitation networks should be continued.

1. Funding and development of USGS and other streamflow and precipitation networks should be continued in order to acquire the best available data on the environment for forecasting and predicting flood stages and designing stormwater infrastructure.

iv. Consideration should be given to implementing statewide building codes.

1. Consideration should be given to implementing appendix G on stormwater from the statewide building codes.
2. State of Illinois should continue to strive for the adoption of statewide building codes (used by the overwhelming majority of states east of the Mississippi) particularly appendices providing consistent stormwater and floodplain regulations.

v. Overland stormwater conveyance areas should be regulated.

1. Communities should protect overland flow conveyance areas.
2. Overland stormwater conveyance areas should be ~~regulated~~ created and protected by municipalities.
3. Communities should establish overland stormwater conveyance areas in all new development areas and these flow paths should be maintained and regulated.

vi. The amount of open space should be increased and the current open space protected to allow for increased evapotranspiration, infiltration and stormwater storage.
    1. Property owners should be incentivized to dedicate property as open space to allow for increased evapotranspiration, infiltration and stormwater storage
    2. In highly developed areas the amount of open space should be increased and the current open space protected to allow for increased evapotranspiration, infiltration, stormwater storage and to provide natural runoff reduction functions.
    3. The amount of open space should be increased and the current open space protected to allow for increased evapotranspiration, infiltration and stormwater storage, especially in depressional storage areas.
    4. Developers and property owners should be incentivized to dedicate property as the amount of open space should be increased and the current open space protected to allow for increased evapotranspiration, infiltration and stormwater storage.
        a. Developers and property owners should be incentivized to dedicate property to increase open space in developed areas and the current open space protected to allow for evapotranspiration, infiltration and stormwater storage.

vii. Municipalities and counties should verify that restrictions on green infrastructure during development are removed.
    1. Municipalities and counties should remove restrictions on green infrastructure during development.

viii. Stormwater infiltration, evapotranspiration and storage should be incorporated into new development and redevelopment wherever possible.

ix. The State should consider allowing stormwater harvesting for non-potable indoor use. (I haven't been following this too closely, so I am not aware of whether the rules have changed in the past 5 years)

x. Funding and development of USGS and other streamflow and precipitation networks should be continued in order to acquire the best available data on the environment for forecasting and predicting flood stages and designing stormwater infrastructure.

g. Chapter 6

i. Obtain needed funding for state-funded mitigation and to leverage federal money.
    1. Obtain needed funding for state-funded mitigation and to leverage federal money. Also add a position at IEMA to provide technical assistance to communities for mitigation.
    2. Continue (and increase) a consistent source of state-funded mitigation programs to allow the leverage of Federal mitigation funds.

a. The ILGA should continue (and increase) its funding of mitigation programs to allow state agencies to better leverage of Federal mitigation funds.

ii. Establish a consistent funding source for county stormwater management.
    1. Counties should establish a consistent funding source for stormwater management.

iii. Identify and prioritize flood mitigation plans.
    1. Identify and prioritize flood mitigation planning in Illinois so existing mitigation actions can occur quickly and efficiently as funds become available.

iv. Explore state-funded structural mitigation program.

v. Explore the use of a state group for discussing project overlap.
    1. Explore the use of a state group for discussing project overlap at different state agencies.
    2. Explore the use of a state agencies working group to coordinate grant programs and planned or ongoing projects between agencies and to leverage state funding efficiently.
    3. Establish a state committee with representatives from various state agencies to coordinate grant programs and projects to ensure consistent funding requirements, leverage state funding efficiencies, and avoid project overlap.
        a. The ILGA should establish a state committee with representatives from various state agencies to coordinate grant programs and projects to ensure consistent funding requirements, leverage state funding efficiencies, and avoid project overlap.

vi. Require consistent funding criteria for prioritizing state funding.
    1. The ILGA should require consistent funding criteria for prioritizing state funding.

vii. Increase the amount of pre-disaster planning to increase the amount of funding that is available through IEMA.
    1. Increase the amount of pre-disaster and mitigation planning to increase the amount of funding that is available through IEMA.
    2. Increase the amount of pre-disaster planning to increase the amount of funding that is available through IEMA in an effort to ensure funding is not reliant on disaster declarations.
    3. Increase the amount of pre-disaster resilient hazard planning to increase the amount of funding that is available through IEMA.
    4. Encourage pre-disaster planning to increase the amount of funding that is available through IEMA in an effort to ensure funding is not reliant on disaster declarations.

a. The Illinois Emergency Management Agency should encourage local governments to conduct more pre-disaster planning to increase the amount of funding that is available through IEMA in an effort to ensure funding is not reliant on disaster declarations.

viii. Provide additional funding to revise FEMA Floodplain maps that are out-of-date and do not accurately depict flooding risk along waterways.
   1. Provide additional state funding to leverage Federal funding used to revise FEMA Floodplain maps that are out-of-date and do not accurately depict flooding risk along waterways.
      a. The ILGA should provide additional state funding to leverage Federal funding used to revise FEMA Floodplain maps that are out-of-date and do not accurately depict flooding risk along waterways.

ix. Support local cost share overhead sewer conversion activities.

x. Find ways to streamline application processes such as joint RFPs between multiple complementary funding sources, ensuring that the timeframe for state money better matches the timeframe for federal programs and to enable municipalities to leverage funds.

xi. Require local participation in the National Flood Insurance Program (NFIP) as a prerequisite for all types of state funding or grant assistance.
   1. Local and county governments should be required to participate in the National Flood Insurance Program (NFIP) as a prerequisite for all types of state funding and grant assistance.
   2. Require local participation in the National Flood Insurance Program (NFIP) as a prerequisite for state funding or grant assistance.

h. Chapter 7

i. The State of Illinois should create an awareness campaign about the risk of urban flooding and options available to reduce it, including purchasing flood insurance and water/sewer back-up insurance. This could include a Flood Awareness week in conjunction with the National Flood Awareness Week.
   1. The Illinois Department of Natural Resources should develop an awareness campaign about the risks associated with urban flooding and options available to reduce it, including purchasing flood insurance and water/sewer back-up insurance. This could include a Flood Awareness week in conjunction with the National Flood Awareness Week.

ii. The State of Illinois should develop a statewide mitigation rebate, low-interest loan or state tax incentive program for property owners who complete pre-qualified mitigation projects to reduce the risk of urban flooding on their property, which may then reduce their cost of insurance.

iii. The Illinois Department of Insurance should create a waiver or declination form that all home and business owners and renters must sign declining water/sewer back-up and/or flood insurance.
    1. Work with insurance groups to implement a flooding education campaign.
    2. Increase the availability of flooding continuing education classes for insurance agents.
        a. Increase the availability of continuing education classes on flooding to insurance agents.

iv. Further study should be made regarding insurability and community tort immunity implications of flooding.

v. Create an insurance pool for flood mitigation that is funded through a nominal insurance policy charge.

vi. State revolving fund administered by IEPA should be expanded to include stormwater management.

vii. An educational flyer should be developed by IEPA, IDNR, and IDOI to provide home buyers at closing. This flyer should provide basic information and resources on flood insurance, sewer backup insurance, flood mitigation, and available programs.

viii. IDOI should further study affordability issues for flood insurance and basement coverage. Including pools and incentive programs used by other states.

ix. Illinois' Congressional delegation should encourage FEMA to consider state-based flood insurance underwriting to more accurately reflect flood loss history in Illinois and establish actuarial premiums within Illinois.

i. Chapter 8
    i. Expand CRS outreach and the use of the Community Visit Report/Community Rating System Checklist (CAV/CRS Checklist). The IDNR-OWR utilizes the CAV/CRS Checklist when NFIP communities are visited to determine if the minimum NFIP and Illinois floodplain management requirements are being met. A copy of the CAV/CRS Checklist is included in Appendix I. Not every NFIP community is visited every year, and information about the CRS may not be reaching new community staff. Resources should be provided to create annual CRS outreach efforts to Illinois communities.
    ii. Expand CRS training to Illinois communities. Most CRS training is provided through FEMA and the training is directed towards a nationwide audience. Resources should be provided to Illinois to modify and expand the FEMA CRS training courses for Illinois communities. Training courses (4-day, 1-day and half-day) should be offered at least annually and focus on assisting new communities in applying to the CRS and assisting in CRS classification improvements for communities already participating.
        1. Expand CRS training to Illinois communities (can we be more specific?). Most CRS training is provided through FEMA and the training is directed

towards a nationwide audience. The Governor of Illinois should request that FEMA provide resources to Illinois to modify and expand the FEMA CRS training courses for Illinois communities and implement additional CRS activities. Communities can receive CRS credit for activities implemented by the State or by the community. Illinois should consider additional flood damage reduction efforts that could be implemented at the state level to provide additional CRS credit to all Illinois communities.

iii. Implement additional CRS activities. Communities can receive CRS credit for activities implemented by the State or by the community. Illinois should consider additional flood damage reduction efforts that could be implemented at the state level to provide additional CRS credit to all Illinois communities.

iv. Support of CRS users groups. Illinois CRS communities have formed an Illinois CRS users group and meet when possible. Current and interested communities are invited. The users group is unfunded and would benefit from dedicated resources from state agencies.
    1. Support of CRS users groups. The users group is unfunded and would benefit from dedicated resources from state agencies.
    2. Support of CRS users groups. The users group is unfunded and should be provided dedicated resources by state agencies such as DNR and IEMA.

v. Expand CRS ratings to states. Allow CRS points for state programs to count for all CRS communities in that state.
    1. General Assembly should actively pursue federal support for state CRS.

vi. Increase the staffing levels of the IDNR-OWR for CRS and flood insurance duties. Currently the Illinois staff-to-workload ratio is the worst of any state.
    1. Increase the staffing levels of the IDNR-OWR for floodplain management and CRS duties. Currently the Illinois has the nation's worst workload per staff ratio.
    2. The ILGA should provide support to allow for an increase in the staffing levels of the IDNR-OWR for floodplain management, and CRS duties. Currently the Illinois has the nation's worst workload per staff ratio.
    3. Increase the staffing levels of the IDNR-OWR for CRS and flood insurance duties. Currently the Illinois staff-to-workload ratio is the highest of any state.

vii. Use successful towns as models for educating other towns.
    1. Use successful municipalities as models for educating other municipalities.

viii. Encourage non-CRS municipalities to use CRS principles in stormwater management.

j. Chapter 9
    i. Require property owners to inform basement rentals of flooding history.

1. Landlords have a duty to repair and are obligated to perform structural repairs. Tenants are also are protected by lease provisions.
2. Require property owners to inform renters of flooding history.
    a. ILGA should require property owners to inform renters of flooding history.

ii. A model stormwater ordinance should be developed incorporating green infrastructure into community development regulations and best practices for including green infrastructure in capital improvement projects when possible.
    a. IDNR should develop a model stormwater ordinance for Illinois municipalities. This ordinance should incorporate green infrastructure into community development regulations and ensure that green infrastructure is incorporated in capital improvement projects when possible.

iii. The State of Illinois should adopt legislation that provides counties with statutory authority to implement stormwater utility programs and fees.
    1. The State of Illinois should adopt legislation that provides all counties and municipalities with statutory authority to implement stormwater utility programs and fees.
    2. The General Assembly may want to consider expanding the authority for county stormwater management to all counties to implement sound stormwater management, projects, programs and policies.
    3. The ILGA should adopt legislation that clearly provides all counties and municipalities with statutory authority to implement stormwater utility programs and fees.

iv. The State of Illinois should adopt the expanded authority of WRRDA to assist with urban flood reduction projects. Funding and prioritization for these projects should be coordinated among state agencies.
    1. The ILGA should require state agencies, as appropriate, to adopt the expanded authority of WRRDA to assist with urban flood reduction projects, and to coordinate their funding prioritization criteria for these projects.

v. Consider implementing statewide building codes.
    1. Consider implementing baseline state floodplain regulations.
        a. Consider implementing baseline state floodplain regulations such as those being developed by an increasing number of states.
            i. The IDNR should adopt minimum state regulations that address flooding that occurs both inside and outside floodplains.
    2. Continue with efforts to adopt statewide building codes particularly those sections establishing consistent stormwater and floodplain regulations.

3. The ILGA should adopt a statewide building code, and ensure the establishment of consistent stormwater and floodplain regulations.

vi. Consider real time monitoring of combined and storm sewers with a reverse 911 system to alert property owners of imminent flooding.
    1. Provide local incentives to develop real time monitoring of combined and storm sewers with a reverse 911 system to alert property owners of imminent flooding.

vii. Educate property owners about their flooding through programs to analyze their homes.
    1. Counties and municipalities should educate property owners about their flood risk through programs to analyze their homes.

viii. Support local cost share overhead sewer conversion activities.
    1. The State, counties, and municipalities should support local cost share overhead sewer conversion activities.

ix. Buy out repetitive flood loss properties for sewershed storage sites within communities.
    1. The state, counties, and municipalities should partner to buy out repetitive flood loss properties for sewershed storage sites within communities.
    2. The state should provide a funding stream for IDNR or IEMA to buy out repetitive flood loss properties for storage sites within communities.

x. Require a licensed plumber to check if there is a sump pump connection to sanitary sewers when houses are sold.

xi. The state, counties, and municipalities should incorporate best practices for green infrastructure into capital improvement projects wherever possible.

4. Requested all written comments by May 21st.
5. Meeting adjourned.

Attendance List Springfield Urban Flood Awareness Act Meeting May 19, 2015

Number	Contact name	Agency / Entity
1	Greg Kallevig	Bloomington
2	Kevin Kothe	Bloomington
3	Hal Sprague	Center for Neighborhood Technologies
4	Eleanor Blackmon	Champaign
5	Mary Cave	Chastain & Associates
6	Troy Hall	City of Decatur
7	Tim Sumner	CM&T
8	Julie Sullivan	Illinois Assoc. of Realtors
9	Brad Winters	Illinois Department of Natural Resources
10	Loren Wobig	Illinois Department of Natural Resources
11	Paul Osman	Illinois Department of Natural Resources
12	Rick Gosch	Illinois Department of Natural Resources
13	Ron Davis	Illinois Emergency Management Agency
14	Amy Walkenbach	Illinois Environmental Protection Agency
15	Jeff Hutton	Illinois Environmental Protection Agency
16	Scott Tomkins	Illinois Environmental Protection Agency
17	Amanda Flegel	Illinois State Water Survey
18	Clayton Ballerine	Illinois State Water Survey
19	Glenn Heistand	Illinois State Water Survey
20	Sally McConkey	Illinois State Water Survey
21	David Noble	Ottawa
22	Mike Sutfin	Ottawa
23	Jeff Junkas	Property Casualty Insurers Assoc. of America
24	Molly Berns	Sangamon County
25	Tim Zahrn	Sangamon County
26	Mark Mahoney	Springfield
27	Nathan Bottom	Springfield
28	T.J. Heavisides	Springfield
29	Randy Georgen	St. Clair County
30	Gary Johnson	U.S. Geological Survey

Attendance List Chicago Urban Flood Awareness Act Meeting May 20, 2015

Number	Agency / Entity	Contact name
1	Candid Sustainability	Laurent Kanago
2	Center for Neighborhood Technologies	Hal Sprague
3	CMAP	Nora Beck
4	Cook County Department of Homeland Security	Gene Ryan
5	Cook County Department of Planning and Development	Dominic Tocci
6	Des Plaines	Jon Duddles
7	DuPage County Public Works	Greg Phillips
8	Evanston	Kristin Rehg
9	Federal Emergency Management Agency	Frank Shockey
10	Gewalt Hamilton Associates	Dan Strahan
11	Glenview	James Tigue
12	HDR Engineering	Rajat Das
13	Illinois Association of Realtors	Jeff Merrinette
14	Illinois Department of Natural Resources	Brad Winters
15	Illinois Department of Natural Resources	Paul Osman
16	Illinois Department of Natural Resources	Rick Gosch
17	Illinois Housing Development Authority	Spencer Skinner
18	Illinois State Water Survey	Clayton Ballerine
19	Illinois State Water Survey	Sally McConkey
20	Kane County Environmental Management	Jodie Wollnik
21	Maki and Company	Bruce Maki
22	McHenry County Planning and Development	Joanna Colletti
23	Molly O'Toole & Associates	Molly O'Toole
24	Mount Prospect	Jeff Wulbecker
25	MWRDGC	Michael Cosme
26	Natural Resources Defense Council	Joel Scata
27	North Cook County Soil & Water Conservation District	Mark Toberman
28	Oswego	Mark Runyon
29	Park District Risk Management Agency	Dane Mall
30	Rockford	Marcy Leach
31	STARR	Chris Ide
32	U.S. Army Corps of Engineers, Chicago District	Joel Schmidt
33	Village of Addison	Kai Liu
34	Village of Addison	Rick Federighi
35	Will County	Jim Song
36	Winnebago County Highway Department	Don Krizan
37	Unknown	Dennis Addison

Data Sources

Subject: Sewer Backup Insurance Claims Data

Data: All sewer backup claims made in Illinois in the last 7 years.
Source: Illinois Department of Insurance data call to Illinois insurers
Limitations: The data is Privacy Act protected so individual claims are not allowed to be traced back to the specific structures. The data has been aggregated to census blocks for this reason. Sewer backup coverage is a voluntary rider on home insurance so not all households will have the coverage. Low income individuals are less likely to have this coverage.

Subject: Disaster Assistance Claims Data

Data: All disaster assistance claims made in Illinois in the last 20 years.
Source: Federal Emergency Management Agency
Limitations: The data is Privacy Act protected so individual claims are not allowed to be traced back to the specific structures. The data has been aggregated to census blocks for this reason. This data is only available when there is a federally declared disaster.

Subject: National Flood Insurance Claims Data

Data: All National Flood Insurance claims made in Illinois in the last 20 years.
Source: Federal Emergency Management Agency
Limitations: The data is Privacy Act protected so individual claims are not allowed to be traced back to the specific structures. The data has been aggregated to census blocks for this reason. Flood Insurance is required when a structure in a 100-year floodplain has a federally backed loan so not all households will have the coverage. Those structures located outside of the 100-year floodplain are less likely to have this coverage. In addition, NFIP coverage is limited to overland flow (flooding). Therefore claims data may not reflect seepage or basement flooding.

Subject: Combined Sewer Overflow Locations

Data: Locations of combined sewer overflow (CSO) locations in Illinois.
Source: Illinois Environmental Protection Agency
Limitations: Approximately 20% of the CSO locations only have city names and not specific locations. There is no way to tell which homes are served by combined sewers with only the outfall data.

Subject: Stormwater Codes

Will County Stormwater Codes

Source: Will County Stormwater Management Planning Committee

North Lake Stormwater Codes

Source: Christopher B. Burke Engineering, Ltd.

Evanston Stormwater Codes

Source: Evanston Utilities Department

Rochester Stormwater Codes

Source: Crawford, Murphy, & Tilly

Willow Springs Stormwater Codes
Source: K-Plus Engineering

Decatur Stormwater Codes
Source: City of Decatur

Rosemont Stormwater Codes
Source: Christopher B. Burke Engineering, Ltd.

Richton Park Stormwater Codes
Source: Clark Dietz, Inc.

Orland Park Stormwater Codes
Source: Christopher B. Burke Engineering, Ltd.

Skokie Stormwater Codes
Source: Village of Skokie

Metropolitan Water Reclamation District of Greater Chicago Watershed Management Ordinance
Source: MWRD

Kane County Stormwater Codes
Source: Kane County

Evanston Stormwater Codes
Source: City of Evanston

Franklin Park Stormwater Codes
Source: Village of Franklin Park

DuPage County Stormwater Codes
Source: DuPage County Stormwater Management Committee

Appendix C: Illinois Flood Risk Symposium

Executive Summary

The Illinois Association for Stormwater and Floodplain Management with the Association of State Floodplain Managers Foundation hosted a one day symposium to address flood risk in Illinois. The topic of the Symposium was urban flooding, which has been highlighted by recent Illinois Urban Flooding Awareness legislation. Significant flood damages are occurring on many properties in urban areas outside of the designated floodplain. This flooding is not communicated or mitigated as part of the National Flood Insurance Program. Local floodplain managers from Chicago and downstate Illinois, state and federal officials, urban planners, insurance and realtor representatives, hydrologists, hydraulic engineers and experts in key topics participated in the Symposium to discuss urban flooding issues, including policy improvement and reduction of damages. The 80 Symposium attendees included a diverse representation of professionals led in a “think tank” type discussion of three topics: how to identify urban flood risk, how to reduce urban flood risk and how to pay for urban flood risk reduction. This report provides an overview of the discussion, captures consensus of these professionals with respect to key urban flooding topics, and identifies recommended actions toward addressing urban flooding issues.

The group reached a consensus that urban flooding has a number of causes and creates significant impacts on Illinois communities. Homes, businesses and infrastructure are impacted by urban flooding throughout the State. The Symposium provided an opportunity to highlight efforts being made by some municipal and county agencies to address urban flood impacts, however limited funding and technical resources for both problem identification and flood damage reduction measures was a theme raised by all participants.

A summary of the discussion topics, consensus items and proposed action items are provided in this report. There is consensus that urban flooding and flood impacts need to be more fully defined and identified. The proposed action items call for the examination and dissemination of "best practices" for infrastructure, new development and redevelopment. Education of Illinois residents and property owners about urban flooding, incentive programs and additional local government funding approaches are recommended.

Host Partnership and Purpose

This State of Illinois Flood Risk Symposium was affiliated with the Association of State Floodplain Managers (ASFPM) Foundation's Gilbert F. White National Flood Policy Forum, where groups of selected national and international experts and leaders met to discuss the topic of flood risk, establish priorities for improving policy and program implementation, and to formulate recommendations and directions for the future. The ASFPM Foundation supports development of similar state-level programs designed to establish meaningful indicators of local-level flood risk management progress. The ASFPM Foundation's desired objective of the symposium was that discussion of local and regional issues by a diverse representation of host-state floodplain management professionals would result in the identification of methods and activities to reduce flood risk to people and property, and to better inform decision-makers and stakeholders on how to measure and identify risk and resources. The ASFPM Foundation presentation, which served as an introduction for the Symposium, is included in Appendix A of this report.

The Illinois Association for Floodplain and Stormwater Management (IAFSM) applied to host the symposium in order to address urban flooding issues highlighted by recent Illinois Urban Flooding Awareness legislation. Sponsored by Illinois Senator Steans and Illinois Representative Cassidy and signed into law on August 3, 2014 the Act requires that the Illinois Department of Natural Resources (IDNR), in consultation with numerous partners, prepare and submit to the General Assembly and the Governor a report that: 1. reviews and evaluates the latest information, research, laws, regulations, policies, procedures, and institutional knowledge on urban flooding and 2. provides recommendations for measures that could reduce urban flooding. This Symposium was intended to help develop and record institutional knowledge on urban flooding for inclusion in the IDNR's report to the Illinois General Assembly in 2015. Focal topics of the Symposium included: how to identify urban flood risks, how to reduce urban flood risk, and how to pay for urban flood risk reduction. Inclusion of the symposium findings in the Urban Flood Awareness Report will help the General Assembly, the Governor, and the general public to better understand the scope of the urban flood problem in Illinois and could lead to new programs and funding to address the growing issues associated with urban flooding.

Agenda

7:30 am	Registration and Coffee (continental breakfast provided)
8:00 am	Welcome and Self Introduction – Loren Wobig, IAFSM Chair/Matt Koch, ASFPM)
9:00 am	Introduction to the day (Matt Koch/Doug Plasencia, ASFPM)
9:30 am	Setting the Stage for Urban Flood Awareness (introduction – Matt Koch)
	Hal Sprague, Center for Neighborhood Technology – What is Urban Flooding?
	Honorable Heather Steans, Illinois State Senate District 7 –The purpose and role of the Urban Flooding Awareness Act
	Honorable Kelly Cassidy, Illinois State House District 14 –How will the Urban Flooding Awareness Act Report be handled in the Illinois General Assembly?
10:30 am	Introduction of Topics, Groups, Charge to Participants, and Logistics – Matt Koch
10:30 am	Break
10:45 am	Facilitated Breakout sessions (led by Jeff Sparrow, Brad Anderson, Matt Koch)
12:00 pm	Break for box lunch
2:10 pm	Break
2:25 pm	Reconvene in General Assembly and Group Picture (facilitator – Matt Koch)
2:30 pm	Group Breakout Reports
4:00 pm	Action Plan and Wrap Up (Loren Wobig/Matt Koch)
4:15 pm	Closing Remarks (Doug Plasencia)
4:30 pm	Adjourn

Honorable Heather Steans

Honorable Kelly Cassidy

Urban Flooding

To support the symposium discussion, the following definition of urban flooding was prepared by the Urban Flooding Awareness Act Technical Advisors and provided to attendees.

The Urban Flooding Awareness Act defines urban flooding as "the inundation of property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers. 'Urban flooding' does not include flooding in undeveloped or agricultural areas. 'Urban flooding' includes (i) situations in which stormwater enters buildings through windows, doors, or other openings, (ii) water backup through sewer pipes, showers, toilets, sinks, and floor drains, (iii) seepage through walls and floors, and (iv) the accumulation of water on property or public rights-of-way." Urban flooding is stormwater flooding in an urban environment.

Urban flooding is characterized by its repetitive, costly and systemic impacts on communities, regardless of whether or not these communities are located within formally designated floodplains or near any body of water. In an urban environment, any of the issues described below can independently or in combination cause urban flooding, impacting vital infrastructure with increasing consequences in more densely populated areas.

Mitigation of these impacts requires an understanding of the root causes. These may include:

High groundwater/ saturated soils

- Basements located in saturated, poorly drained soils are likely to experience seepage.

Aging and Inadequate Storm Sewers

- Combined sewer capacity exceeded: Older areas of communities may have combined sanitary and storm sewers, which can be overwhelmed during precipitation events.
- Storm sewer capacity is exceeded: Storm sewers are designed to convey specified precipitation events that, if exceeded, will result in water ponding in streets, yards, public right of ways and potentially entering structures through lowest openings.
- Storm sewers that cannot drain due to flooded open channel receptors: During major precipitation events impacting a larger geographic area, receiving rivers and streams may rise to a depth which prevents the discharge from storm sewer outlets, even to the extent of backflow through the sewer system.
- Lack of overland flow routes and detention in older areas

Out of bank flow from rivers, streams, and lakes

- Overbank flooding is a natural process that occurs when rivers, streams, and lakes flow outside of their banks. In an urban setting, this natural process can be exacerbated by development pressures, leading to frequent and chronic flooding.

Impervious surfaces

- As more land is converted to urban and suburban areas, the amount of surface area available for water infiltration into the soils decreases.

Inadequate site drainage

- In an urban setting, overland water paths may not be provided or can be obstructed by development, causing localized drainage problems that lead to flooding.

Hal Sprague, with the Center for Neighborhood Technology (CNT), provided an overview of the urban flooding issues in Chicago and the work that CNT completed, leading the way for the resulting Urban Flooding Awareness Act. Appendix A includes the presentation slides. CNT completed surveys of communities and outreach to individual homeowners in the Chicago area documenting the impact of urban flooding. Findings of their research indicate that the majority of flood losses were outside of the regulatory (FEMA) floodplain. Contributing factors to urban flooding include observed changes in heavy precipitation, increased development and aging infrastructure. The results are more flooded basements, more combined sewer overflow, and more frequently flooded streets.

Figure C.1: Harlem & Irving Park, April 2013, (WGNTV)

Figure C.2: Lake Zurich basement, June 2013 (Chicago Tribune, Dan Waters)

Legislative Perspective

Honorable Kelly Cassidy (Illinois House District 14) and Honorable Heather Steans (Illinois Senate District 7), sponsors of the Urban Flooding Awareness Act, spoke to the purpose of the bill and how they would continue to encourage legislative action to support urban flood reduction. Legislators need to understand the gaps in policy that homeowners face when they experience significant losses and the true costs of urban flooding. The bill requires a report that reviews and evaluates the available knowledge, policy and practice concerning urban flooding. Hon. Cassidy and Hon. Steans emphasized the need for the report to inform legislators on the causes and cost of urban flooding and provide institutional knowledge and research-based recommendations on how to best address the issue. Hon. Cassidy and Hon. Steans thanked the audience for participating in the Symposium as part of the process to capture both the impact of urban flooding on communities and individuals in Illinois and best practices occurring throughout Illinois. Both Representative Cassidy and Senator Steans are prepared to champion the report and work to ensure the issue gets the attention it requires.

Facilitated Discussion Notes

How to Identify Urban Flood Risk

Moderator: Matt Koch
Scribe: Brad Winters
Presenter: Paul Osman

Summary

It is necessary to communicate to the public urban flood risk to reduce urban flood damages and support mitigation strategies. When buyers are unaware of the risk they do not take appropriate mitigation actions and suffer significant loses. The current Flood Disclosure requirement is not resulting in informed property buyers, and there is a gap concerning flood risk disclosure for rental properties.

Mapping urban flood risk is a technical challenge due to the many causes of urban flooding, the data required for analysis and the rate at which urban flood risk changes. In addition to technical consideration, it is anticipated there will be a negative public and political response regarding the potential impact on property values. Mapping urban flood risk areas for regulation in a method similar to the National Flood Insurance Rate maps is not feasible. Identification of urban flood risk should be completed at a structure level and more rigorous home inspections should be evaluated as a method to communicate urban flood risk.

Mapping of urban flood areas for community evaluation should remain at a local level and not become and unfunded mandate. Local communitywide regulations appear to be the most efficient way to address urban flooding. Best practices should be developed to encourage regulation for re-development and infill areas, and it is the community's responsibility and liability to inform the public concerning urban flood risk.

Notes

Q1 – Do you agree with the definition of urban flooding presented in the UFAA legislation?

Discussion:

- The use of urban to define flooding does not provide clarity on the "type" of flooding, who has responsibility to address the flooding, or the damage or impact of the flooding. It is not clear how urban flooding is different from non-riverine flooding or flooding due to manmade causes. Some professionals do not consider seepage or sewer back up to be flooding, while others do. Since the term includes flooding due to a wide variety of cause and impact, a hierarchy of flooding types should be considered and who is responsible should be addressed. The definition should be refined.
- The definition of urban also impacts the analysis of the existing problem for the Urban Flooding Awareness Act Report and should be clearly defined for the report.
- Language concerning urban flood risk should emphasize that we can reduce the risk of flooding, but we cannot solve the problem.

Consensus:

- IAFSM recommend the Urban Flooding Awareness Act authors should consider clarifying the definition of urban flooding as indicated above.

Q2 – What level of flood risk is acceptable? How frequent? How severe?

Discussion:

- Prioritizing types of flooding was discussed as a method to evaluate acceptable flood risk, but it is the results of flooding that define the risk. Basement flooding is often minimalized in the level of flood risk. However, basement flooding can cause basement renters to lose everything or impact the entire structure if utilities are in the basement.
- Acceptable flood risk should be related to damages, emergency services and critical facilities. For example, flooded roads may be the designated overland flow path, but emergency services to an area are still required.
- Urban flooding damages do not correlate as readily as riverine flooding to flood frequency and may be better defined based on damages or depth of flooding.

Q3 – Should urban flood risk areas be mapped? What are the ramifications of such mapping?

Discussion:

- Concerns with urban flood risk mapping:
    - People are more scared of property devaluation by being mapped as having flood risk than of flooding damages. For this reason, it is politically challenging.
    - Since the risk for flooding is unique for each structure, the maps would have to be excruciatingly detailed or ineffectively broad.
    - Mapping could be based on the hydraulic grade line if storm sewer analysis was completed. This would provide a technical basis for identifying risk. However, completing this engineering analysis is expensive and keeping an engineering analysis updated would be difficult.

  - Only certain types of urban flooding could be identified with engineering analysis. Other urban flood risk is based on specific structure issues.
  - Urban flood mapping by communities for their use seems the most appropriate. However, the ethical, political and legal responsibility for the community to communicate known risk comes into question.
- Value in mapping urban flood risk.
  - Current flood disclosure laws are not effectively informing people of known flood risk associated with a property. When buyers are unaware of the risk they do not take appropriate mitigation actions and suffer significant losses.
  - There are currently no statewide requirements to notify renters of basement flood risk. Renters often cannot get insurance to assist with recovering from a flood event.
  - Communities cannot evaluate capital improvement projects without knowledge of the causes and damage urban flooding is causing.

Consensus:

- Mapping of urban flood areas for regulation is not feasible.

Q3b – What are some common means to document the local extent of urban flood risk? (for communities and planning purposes)

Discussion:

- Many communities document general local knowledge and history of complaints from property owners to evaluate flooding concerns. This information is often for the community's planning purposes and not provided to the public.
- Local efforts to map known flooding issues may be damped by concerns over liability, impact to property values, and responsibility to fix the issue.
- Mosquito abatement districts have a list of standing water areas which may indicate locations without appropriate overland flow paths.

Consensus:

- Mapping of urban flood areas for community evaluation should remain at a local level, and not become an unfunded mandate.

Q3c – What technologies are useful for identifying urban flood risk?

Discussion:

- Sewer hydraulic analysis could be completed to identify urban flooding issues due to storm or combined sewer system constriction or limitations. However, the engineering analysis is expensive and data intensive.
- A detailed Geographic Information System (GIS) based sewer map recording where sewer systems are in place and details concerning the size and maintenance would serve as a planning tool for determining action.
- Documentation of property owner complaints as well as general historical knowledge can be mapped to identify local areas with urban flooding concerns.

- Insurance claim data can be used as an indicator of flooding, and will be completed for the Urban Flooding Awareness Report. However, this information is not available to communities due to privacy rights.
- Documentation, analysis and mapping of many urban flood risk indicators can be completed with GIS and become a planning tool identifying risk. Examples include high water marks, residential requests and complaints, land use or impervious area mapping, sewer mapping, and soil type maps.
- Cloud based mobile applications could be utilized by local residents to document flooding through geographically referenced photographs.
- The Urban Flooding Awareness Report could serve to recommend best practices for communities to identify zones in urban areas with low to high flood risk and how that information can be utilized.

Consensus:

- Local communitywide regulation is the most efficient way to address urban flooding.

Q4 – Should urban flood risk areas be regulated (no basements, minimum floor elevations)?

Discussion:

- Regulation of areas with a high risk for urban flooding would require reliable identification of "high risk."
- Regulations of specific urban flood risk areas would encounter local resistance.
- Communitywide regulation of new construction connecting to an existing system that has capacity concerns would mitigate urban flood damages without mapping specific high risk areas. Ottawa, Addison and Tinley Park all require overhead sewer with new construction and/or substantial improvements.
- A statewide building code could require overhead sewers for new construction in areas with combined sewer, but there is substantial resistance to a statewide building code. The existing state plumbing code could be modified easier.

Q5 – Is there a meaningful correlation between urban flood problems and mapped soil types?

Discussion:

- Yes, but its value as an indicator is limited due to contributing factors such as ground cover type and frozen conditions. Impervious area plays a more important role for runoff in urban areas, but soil data is more critical to limitations of green infrastructure.

Q6 – Older areas versus newer areas – are recently developed areas flooding?

Discussion:

- Older areas are often seeing more flooding due to a combination of factors. If the infrastructure in older areas has not been improved, the old sewer systems that were often designed for a 2 year event rather than current standard of a 10 year event will cause more flooding than if they have been upgraded. Further, the intensity of rainfall, the amount of new development and increased impervious area has all resulted in more urban flooding.

Q7 – How do we assess damages/costs from urban flooding (wet basements versus flooded septic systems or ruined landscaping)?

Discussion:

- Assessing cost of damages caused by urban flooding is necessary to support a positive benefit/cost ratio for mitigation projects. Economic impacts should be included when determining the cost of urban flooding. USACE and IEMA have developed methods and damage depth curves for this purpose.
- One way to assess damages is to prioritize types of flood damages. This provides local governments a way to determine their post disaster funding priorities.
- The legislative perspective is important to keep in mind when evaluating the state perspective of urban flooding. High income areas may result in higher cost benefit ratios, however economic impact and creating a positive business environment is also valued.

How to Reduce Urban Flood Risk

Moderator: Brad Anderson
Scribe: Shauna Urlacher, Dan Gambill
Presenter: Mary Cave

Summary

Urban flooding is a local problem requiring local knowledge and solutions. The issue of appropriate level of government for mitigating urban flood losses varies based on the geographic region and the level of urbanization. Communities generally have the local knowledge and framework to address the issue, but are lacking funding and technical expertise. Unfunded mandates are a concern.

New development areas must comply with current regulations and, therefore, have fewer instances of urban flooding. Low impact development, properly sized stormwater management and conveyance systems are used in these areas. Older areas can benefit from adding green infrastructure to the existing gray infrastructure. The standards for gray infrastructure design, such as sewer relief and detention, which have proven successful in new development areas, are impractical for retrofitting urban areas. Instead, incorporating green infrastructure and reducing risk as indicated by damage should be the goal in areas of high flood risk. There is a need to address design criteria and guidelines for re-development and a need to incorporate green infrastructure in design standards.

Successful flood risk reduction at the property level has been achieved through a combination of property drainage system education for property owners and cost-share programs. Successful measures enacted at the community level include limiting development and impervious areas to limit runoff or completing buyouts in strategic areas to reduce runoff or provide space to mitigate current urban flooding issues.

Notes

Q1 – What factors determine the appropriate level of government for managing stormwater? (what are the pros, cons of countywide stormwater management?)

Discussion:

- The issue of appropriate level of government for managing stormwater varies based on the geographic region and the level of urbanization. Generally, downstate local governments do not want statewide regulations. However, in the Chicagoland and other very urban areas, county guidance and regulation have been welcome to assist smaller urban communities technically, with enforcement and promotion of consistent minimum policies.
- Urban flooding is a local problem requiring local knowledge and solutions. Communities seem more agreeable to support but not regulation from counties or state government. Unfunded mandates are a concern.
- Urban flood regulation for new development is already addressed with a local stormwater ordinance. It is the management and mitigation of existing areas with high urban flood risk that are not being addressed.
- The current system is not working. Communities generally have the local knowledge and framework to address the issue but are lacking funding and technical expertise. Specifically, there are small communities surrounding Chicago that are struggling.

Q2 – Are the current stormwater design criteria still sufficient? What should change?

Discussion:

- Stormwater management design criteria are a tradeoff between investment and acceptable damage and should remain local.
- Rainfall being used for design standards should be updated. The State analysis, Bulletin 70, is becoming dated. While the NOAA analysis uses an extended history of record, rain gage data collected at O'Hare Airport continues to set records.
- New development design standards are being used in Illinois but there is a need to address design criteria and guidelines for re-development and a need to incorporate green infrastructure in design standards.
- A balance of grey and green infrastructure is needed to address urban flooding. More data is needed to understand the performance of green infrastructure facilities. Maintenance should also be addressed in design criteria.

Actions:

- Support development of model stormwater ordinance with design standards or best practices for evaluation of existing facilities, re-development that includes green infrastructure and maintenance issues.

Q2b – Should urban stormwater systems be able to convey and or store a 1% chance storm event?

Discussion:

- The current common design standards for new development to manage the 1% storm are appropriate. Existing systems are conveying something closer to the 5 year storm. It is important to know current capacity of systems in areas with urban flooding issues and be able to communicate the resulting risk to homeowners.
- In urbanized areas, retrofitting to convey infrequent storms is expensive and impractical. Instead, incorporating green infrastructure and reducing risk as indicated by damage should be the goal.

Actions:

- Provide best practices to communicate urban flood risk to the public.
- Support redevelopment design standards that support practical solutions for reducing urban flood risk, if the new development standard is not achievable.

Q3 – What is the role of green infrastructure measures in conventional flood control projects?

Discussion:

- There is a role for green infrastructure in flood control improvements, and it should be evaluated as part of the solution. Green infrastructure is an engineering option to augment grey infrastructure and becomes an important part of the equation when addressing urban flooding areas.
- There is a need for more information on the impact of local variables on green infrastructure effectiveness and maintenance.
- Green infrastructure should be implemented if possible when redoing other infrastructure.
- Low impact development should be evaluated whenever possible in areas with high risk of urban flooding. It is easier to reduce impervious area when compared to green infrastructure design.

Actions:

- Support evaluation and summarize performance-based criteria for green infrastructure for the purpose of rainfall runoff reduction.
- Encourage incentives to incorporate green infrastructure and low impact development at a state or local level.

Q3b – What is the long term effectiveness of green infrastructure and stormwater BMP measures in flood reduction?

Discussion:

- Long term data on effectiveness of green infrastructure was unknown by the group but believed to be associated with maintenance issues.
- The responsibility of green infrastructure maintenance often falls on homeowner associations or owners. Ordinances are used in Urbana to create a special taxing district if the owner no longer provides support so the city can maintain the drainage as necessary.
- There are green infrastructure methods that do not require maintenance, such as stormwater trees.
- Green infrastructure maintenance can be handled the same way as other grey infrastructure stormwater management.

Actions:

- Keep updated on the long term effectiveness of green infrastructure projects as it becomes available.
- Support communication of best practices for green infrastructure maintenance and responsibility including collection of fees or taxes and easement rights.

Q4 – What measures have proven successful? What measures have not worked?

Discussion:

- Education of property owners about their property drainage system combined with cost-share programs has successfully reduced property damage due to urban flooding issues.
- Successful measures include limiting development and impervious areas to limit runoff or completing buyouts in strategic areas to reduce runoff or provide space to mitigate current urban flooding issues.
- A holistic approach to green and gray infrastructure is a successful method to reduce urban flood damages. Gray infrastructure measures such as sewer relief and detention have proven successful.
- Pre-disaster mitigation funding has been shown to reduce flood losses at a 4 to 1 ratio when compared with post-disaster mitigation. The same concept should be applied to urban flood reduction.

Q5 – Should urban flood risk areas be regulated (no basements, minimum floor elevations)?

Discussion:

- Urban flood risk varies at each structure making it difficult to regulate areas.
- Urban flood risk should be regulated but would be politically challenging and would impact property values.
- Instead, we should focus on public education and possibly incorporate flood risk information and evaluation into home inspections.

Actions:

- Contact professional home inspection organizations to start conversation about communicating flood risk during home inspections

Q6 – What level of flood risk is acceptable? How frequent? How severe?

Discussion:

- Acceptable urban flood risk must be made at a local/personal level and based on cost-benefit for the responsible party. Each community evaluated acceptable flood risk differently based on cost-benefit analysis.
- Improvements need to be made to the communication of flood risk and the loss associated with flooding to determine what is acceptable. People are more afraid of the flood insurance than the flooding.
- Addressing flood risk is less economical during re-development and for urban infill, so the acceptable level of risk is higher than during new development.

- Identifying acceptable flood risk can also be evaluated at the watershed scale. Reducing flooding upstream can result in increased risk downstream based on the mitigation method.

Q6b – Do we trade basement flooding for greater overland and street flooding?

Discussion:

- Overland flooding should be considered as an option to relieve basement flooding. However, street flooding may also result in flooding of vehicles and the total flood risk should be considered.
- To reduce urban flood damage in basements, strategic green infrastructure projects and flood-proofing for specific structures should also be considered.
- Available funding to property owners is critical to solving basement flooding issues.

How to Pay for Urban Flood Risk Reduction

Moderator: Jeff Sparrow
Scribe: Glenn Heistand
Presenter: Scott Cofoid

Summary

Many communities report that adequate stormwater management funding is difficult to establish and maintain as part of their general budget. Some communities are using alternate funding options for stormwater management projects. Sales tax, flat fees, stormwater utilities, and special service areas were all indicated as alternative funding methods used by communities to fund stormwater management projects. Efficiency, cost savings, and increased return on investment can be leveraged by coordinating and planning stormwater management projects with other planned capital infrastructure projects. Thus, certain mobilization, demolition, and material expenses can be shared, resulting in cost savings for the stormwater management project. Federal and state grant programs can encourage sporadic and disjointed projects and planning instead of encouraging comprehensive long- term projects and planning, which are facilitated by reliable, steady sources of funding.

Stormwater utilities, which charge fees for services (stormwater conveyance) provided by the community, not only present a steady and reliable financial solution, but also have the benefit of bringing greater awareness and education to the stakeholders who pay the fees. Because the expense is usually buried in the general budget, many people do not realize that a stormwater service is being provided by the community or that it costs money to maintain and improve services. It is easy for people to take for granted the underground infrastructure and conveyance systems that they cannot see. Once implemented, the stormwater utility fee also increases expectations from residents for stormwater services provided. Stormwater utilities can also incentivize commercial properties to mitigate stormwater runoff from their property. State requirements for stormwater funding or other incentives could be utilized to encourage communities to enact utility fees and overcome local political barriers that may be holding them back. Best practices in setting fees and addressing known political impediments should be accessed. IAFSM and the Urban Flooding Awareness Report should suggest that the Illinois General Assembly explicitly grant non-home rule communities and counties the power to establish stormwater utilities.

Notes

Q1 – What funding measures have proven successful? (in the UFAA survey, communities noted overhead sewer cost share programs are very successful)

Discussion:

- Sales tax, flat fees, stormwater utilities, and special service areas were all indicated as methods that communities had utilized.
- Regulations require an upfront cost from developers to invest in stormwater management, which is a more efficient way to address stormwater issues.
- Incorporating urban flood risk reduction measures into planned capital infrastructure projects leverages allocated funding for multiple uses.
- Stormwater utilities present a financial solution and have the benefit of raising awareness and education among stakeholders. Once implemented, the stormwater utility fee also increases expectations from residents for stormwater services being provided. State requirements for funding or other community incentives could be utilized to encourage communities to establish stormwater utilities and overcome local political barriers. However, there is concern at the administrative level that existing stormwater utility fees in Illinois are currently set too low, only covering stormwater management program current costs, and not reflecting the true financial need for future capital improvement projects.
- Federal and state grant programs can discourage a comprehensive approach toward planning and funding stormwater management by incentivizing communities to make projects fit the constraints of the grants instead of the constraints that make the most sense for the community

Action:

- Support community's assessment of stormwater utility programs with training and documentation of best practices.
- Review grant funding opportunities to evaluate how to encourage and prioritize their use to support innovative practices or for planning and assessment efforts that result in stronger and more self-reliant communities.

Q1b – What are good methods to encourage Private-Public Partnerships (insurance industry, developers, health departments, realtors, etc.)

Discussion:

- HUD has great success in using a tax credit program to bring in the private market. How could something similar be used in stormwater management to get credits for new projects or to retrofit projects for stormwater issues?
- Other PPP involvement could be outside of monetary funding, such as political pressure. The seat belt and automotive industry is an example. The technology for seat belts and air bags was pushed by the insurance industry.
- Planning was indicated as a critical component toward outreach and communication to gain support. Identification of community goals is required to identify common goals with other organizations and entities in private sector.

- Stormwater utilities provide potential for incentives to encourage private companies to mitigate stormwater runoff. However, it was unclear if there were current communities in Illinois that saw runoff reduction due to stormwater utility incentives. Downers Grove indicated that, while the monthly fees for large businesses could be substantial, the property owners seemed to prefer to pay the fee, instead of making onsite physical improvements.
- Performance-based contracts could be used to encourage public-private partnerships.

Action:

- Assess successful stormwater utility examples in Illinois and surrounding states to evaluate best practices for encouraging public-private partnerships.

Q2 – What are the impediments to establishing a stormwater utility in communities with urban flooding?

Discussion:

- Major impediments included political will and churches or other not-for-profit organizations with large amounts of impervious surfaces.
- Proper planning of the implementation of a stormwater utility fee could address some of the concerns of churches and other tax exempt organizations. For example, if fees are phased in so that non-profits are included at final phase of fee assessment, funds from the initial phases could be used to provide grants to non-profits for the purpose of reducing their runoff and reducing their bill based on the community incentive program.
- Downers Grove exempted tax-exempt properties from paying the stormwater utility fee.
- Bloomington reported that the SWU was accepted based on outreach that focused on the service provided.
- Education and outreach are key components to enacting a stormwater utility fee. Outreach should be framed in terms of public and economic interest. The mayor does not want their town to be the town that floods. Another example is emphasizing how enacting a stormwater utility fee will enable the community to fix existing stormwater problems and then shift focus on other critical issues in the community.
- The state could support creation of SWU by providing benefits for communities with SWU. A comparison was drawn based on the requirement that the state pass a law to require a legal drinking age of 21 to receive full Federal Highway Authority funding. Benefits could include reduced amount of cost share for the community for some state grants, or reduced state review times on permits or grant applications.
- The State could also require communities to enact stormwater utilities. The State of Maryland has done this; however, the current governor is campaigning to appeal the new law.

Action:

- Evaluate successful stormwater utility examples in Illinois and surrounding states to make recommendations to plan for known political impediments.

Q2b – Should the General Assembly explicitly grant non-home rule communities the power to establish stormwater utility fees? Statutory authority for all government categories (cities/towns/sewer districts, watershed districts)?

Discussion:

- Municipalities, home rule and non-home rule, already have the power to create stormwater utilities. Counties do not. The exceptions, based on specific legislation, are DuPage and Peoria Counties.
- There was a consensus that the state should give counties authority, but also discussion on how it will be necessary to address concerns about duplication of fees in municipalities. To address this, any legislation will need to incorporate appropriate language to ensure counties only have power to charge SWU where they are providing stormwater services.
- Currently, in counties with stormwater utilities, an executive board requires a 50/50 balance of county and municipal members to balance actions.
- Approximately twenty counties in Illinois have MS4 requirements but cannot create SWU.
- It was generally agreed that other entities, such as drainage districts, do not need to be included in such legislation. Intergovernmental agreements would be appropriate.

Actions:

- IAFSM and Urban Flooding Awareness Report should suggest the General Assembly explicitly grant counties and non-home rule communities the power to establish stormwater utilities.

Q3 – Is it economical for insurance companies to invest in urban flood risk reduction measures to reduce claims?

Discussion:

- Insurance companies are for-profit organizations. While reducing flooding may reduce some financial losses for the insurance company, it is the overall balance of policies and losses that would provide financial incentive for the insurance industry to consider incentivizing owner actions to lower property flood risk with reduced premiums, or funding research into lowering urban flood risk. The insurance representatives were skeptical that there would be incentive for the insurance industry to make changes at a national level and suggested that other industries may be more appropriate. The comparison to the insurance industry's support of seat belts is not relevant due to the difference in scale.
- One way to approach changing behavior is underwriting (requiring use of specific action/technology to be eligible for insurance coverage).
- The Insurance Institute for Business and Home Safety was noted as an appropriate partner for education, outreach and developing practices to reduce urban flooding.

Action:

- Reach out to the Insurance Institute for Business and Home Safety to evaluate coordination and cooperation opportunities.

Q3b – Should Insurance cover urban flood risk?

Discussion:

- There are gaps in flood insurance coverage that are not well known. The NFIP does not cover all losses caused by many urban flooding issues, and the insurance is not actuarial. Basic NFIP coverage includes the building, and separate personal property and content coverage can also be purchased. NFIP basement coverage is limited to equipment essential to the building unless content coverage is also purchased. Seepage and sewer backup is only covered by NFIP if it is caused by a flood impacting two or more structures or two or more acres.
- Insurance reform options, such as mandatory purchase of flood insurance for homes below ground level in the floodplain or incorporation of flood coverage in all home policies, were discussed. These options were considered very limited due to political will.
- Identification of known urban flood risk is necessary to implement regulations requiring insurance for homes in high risk areas. Mapping similar to the FIRM is not considered feasible for urban flooding.
- Property owners and renters must have a general understanding of their flood risk, urban and riverine, and understand the insurance options that are available to evaluate appropriate mitigation options.
- Gaps also exist in notification of historical flooding problems and known flood risk. The state-required flood disclosure law is not comprehensive enough and does not address notification of flooding history to basement renters who may not be able to purchase appropriate coverage. What is the community/engineer responsibility to communicate known flood risk? Can communities be required to provide any information known about a property via a FOIA?
- Flood insurance should be required if a property receives government assistance. Recipients of Federal Disaster Assistance are required to carry flood insurance on the flooded building. If the requirement is not met, the individual is not eligible for future financial assistance.
- There is a need for regulation of disclosure of flood risk for rental agreements.

Actions:

- Education on urban flood issues, identifying urban flood risk, and insurance options is necessary.
- Support legislation, local or state, to require flood risk communication when transferring property and in rental agreements.

Q4 – What level of government is best suited to deal with funding efforts to reduce urban flood risk?

Discussion:

- All levels are appropriate for different efforts. The appropriate level of funding needs to be based on what is in the public interest.
- Preventative measures are the most efficient way to reduce flood risk and funding of these measures.
- Local knowledge is required to determine need and administer the funding, but a state program, such as the state revolving fund, would bring in financial support required to result in action.
- In large disasters, federal assistance is just as appropriate for urban flooding as riverine flooding.

- Focus should be on leveraging existing funding by identifying stakeholders and projects that can be leveraged for multiple benefits such as transportation and school renovation capital improvements. Policy changes should be made to encourage and enable this type of collaboration which results in urban flood mitigation by including new aspects into existing projects.
- Rather than mandating a specific level of government, marketplace incentives and disincentives should be utilized. State or local tax breaks for mitigation efforts like pervious pavement or "sin tax" on impervious pavement could be considered.

Q4b – Are government funds / subsidies appropriate for reducing urban flood risk?

Discussion:

- Subsidies and government funds are currently used to reduce urban flood risk using stormwater utilities and tax breaks at a local level.
- NFIP has incentivized the wrong kind of behavior with the current pre-FIRM structure insurance rates. These subsidized insurance rates misrepresent the flood risk and market influences.
- Government funding should have appropriate cost-benefit ratio that incorporates indirect costs and benefits to society such as loss of life, mental health issues, and homelessness. These real costs are often unaccounted for in standard benefit-cost analysis completed for capital improvement projects.

Q5 – What level of flood risk is acceptable? How frequent? How severe?

Discussion:

- Getting flooded is like being assaulted.
- Flood risk is a personal determination, similar to healthcare. Lower risk is tolerated by those who can afford insurance.
- To facilitate determination of acceptable risk, we need to communicate known flood risk. Everyone is in a floodplain and has some risk, especially with respect to urban flooding.

Summary of Consensus Items

- Local communitywide regulation is the most efficient way to address urban flooding.
- Mapping of urban flood areas for community evaluation should remain at a local level and not become an unfunded mandate.
- Mapping of urban flood areas for regulation is not feasible.
- IAFSM should recommend that the Urban Flooding Awareness Act authors consider clarifying the definition of urban flooding as indicated above.

Summary of Proposed Action Items

- Contact professional home inspection organizations to start conversation about communicating flood risk during home inspections.
- Keep updated on the long term effectiveness of green infrastructure projects as it becomes available.
- Support communication of best practices for green infrastructure maintenance and responsibility including collection of fees or taxes and easement rights.
- Support evaluation and summarize performance-based criteria for green infrastructure for the purpose of rainfall runoff reduction.
- Encourage incentives to incorporate green infrastructure and low impact development at a state or local level.
- Provide best practices to communicate urban flood risk to the public.
- Support redevelopment design standards that support practical solutions for reducing urban flood risk, if the new development standard is not achievable.
- Support development of model stormwater ordinance with design standards or best practices for evaluation of existing facilities, re-development that includes green infrastructure and maintenance issues.
- Reach out to the Insurance Institute for Business and Home Safety to evaluate coordination and cooperation opportunities.
- IAFSM and Urban Flooding Awareness report should suggest the General Assembly explicitly grant counties and non-home rule communities the power to establish stormwater utility fees.
- Assess successful stormwater utility examples in Illinois to make recommendations to plan for known political impediments and to evaluate best practices for encouraging public private partnerships.
- Encourage education on urban flood issues, identifying urban flood risk, and insurance.
- Support legislation, local or state, to require flood risk communication when transferring property and in rental agreements.
- Support community's assessment of stormwater utility programs with training and documentation of best practices.
- Review grant funding opportunities to evaluate how to encourage and prioritize their use to support innovative practices or for planning and assessment efforts that result in stronger and more self-reliant communities.

Attendees

Planning team:

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Loren Wobig, PE, CFM, Chair IAFSM, Illinois Department of Natural Resources, Office of Water Resources (IDNR-OWR)
Amanda Flegel, PE, CFM, Interorganizational Chair IAFSM, Illinois State Water Survey (ISWS)
Diane Brown, Outreach and Events managers ASFPM

Speakers:

Loren Wobig, PE, CFM, Chair IAFSM, IDNR-OWR
Doug Plasensia, PE, CFM, ASFPM Foundation President
Hal Sprague, Center for Neighborhood Technology
Honorable Kelly Cassidy, Illinois House District 14
Honorable Heather Steans, Illinois Senate District 7

Breakout Teams:

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Scott Cofoid, CFM, ISO Community Hazard Mitigation
Shauna Urlacher, PE, CFM, CPESC, Smith Lasalle
Bradley Anderson, PE, CFM, Anderson Consulting Engineers
Dan Gambill, PE, CFM, Illinois State Water Survey
Mary Cave, PE, CFM, City of Decatur
Matthew Koch, PE, CFM, AECOM
Brad Winters, PE, CFM, IDNR-OWR
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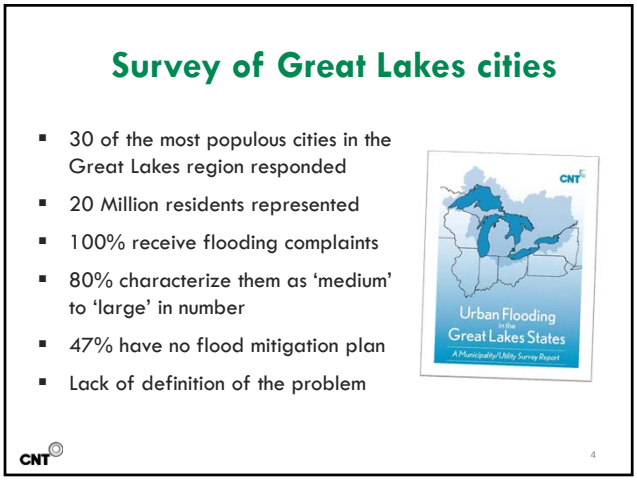
Recommended Reading Materials

Title	Description	Online location
Rain Ready website	The Rain Ready website, a Center for Neighborhood Technology (CNT) initiative, includes fact sheets and recommendations to homeowners, cities and towns and states to find solutions to urban flooding.	http://rainready.org/
The Prevalence and Cost of Urban Flooding	A case study of urban flooding in Cook County by the Center for Neighborhood Technology.	http://www.cnt.org/media/CNT_PrevalenceAndCostOfUrbanFlooding20141.pdf
Urban Stormwater Management in the United States	An assessment of stormwater issues and regulation by the National Academies.	http://dels.nas.edu/resources/static-assets/materials-based-on-reports/reports-in-brief/stormwater_discharge_final.pdf
Funding Stormwater Programs	General information on types of stormwater funding options summarized by the EPA.	http://water.epa.gov/infrastructure/greeninfrastructure/upload/FundingStormwater.pdf
Value of Stormwater Utilities for Local Governments in the Chicago Region	The Chicago Metropolitan Agency for Planning CMAP report provides information on the benefits of a stormwater utility and details for communities considering this option.	http://www.cmap.illinois.gov/documents/10180/11674/stormwater_utilities_for_local_govts.pdf/866a64a4-ef11-47ce-b4ec-2293686d4a70
Environmental Protection Agency, Green Infrastructure website	Website includes basic information as well as case studies in Illinois and economics of green infrastructure.	http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm
Upgrade your Infrastructure, Green Infrastructure Portfolio Standard	The report outlines a planning process for communities to set long term goals to achieve measured progress in addressing stormwater issues.	http://www.cnt.org/media/CNT_UpgradeYourInfrastructure.pdf

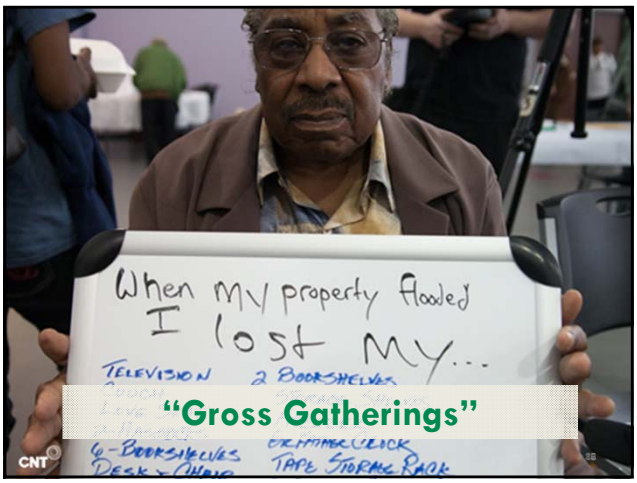
WHAT IS URBAN FLOODING?

by Hal Sprague, Center for Neighborhood Technology



Qualitative interviews

- Personal interviews with residents in Chicago area
- Private problem, impacts on health and mental well-being, lost time, financial losses, apparent randomness



"Gross Gatherings"

Study: Prevalence and Cost

- Flood damage **claims paid out**, Cook County, IL
- Sources: private insurance, FEMA (NFIP, disaster relief, public assistance), Small Business Administration
- 2007 – 2011, aggregated by zip code

Major Findings:

1. Claims in 97% of zip codes (900 sq.mi.; 130 communities)
2. Average pay-out > $4,000
3. Low income areas suffered most
4. Impacts included impaired health, property loss, lost time and wages
5. Most suffered repetitive losses
6. Remedial measures did not solve the problem
7. Majority of claims outside floodplain

CNT

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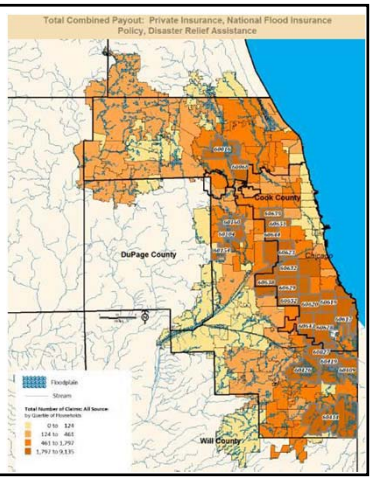
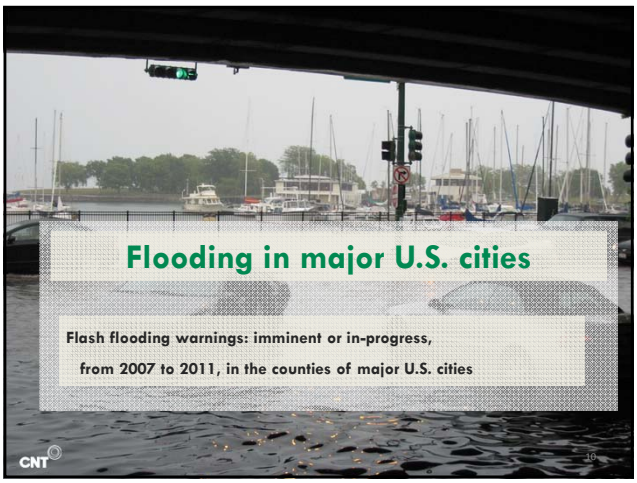
Majority of claims outside any designated floodplain






MEMPHIS
227 flood warnings
CNT
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CHICAGO
198 flood warnings
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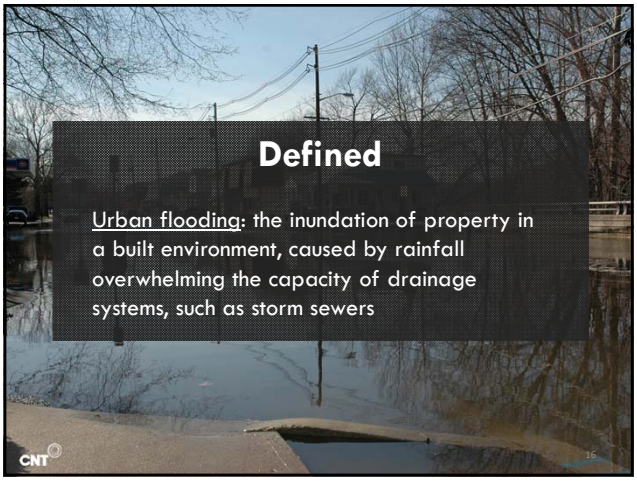
What is “urban flooding”?
CNT


Defined
Urban flooding: the inundation of property in a built environment, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers
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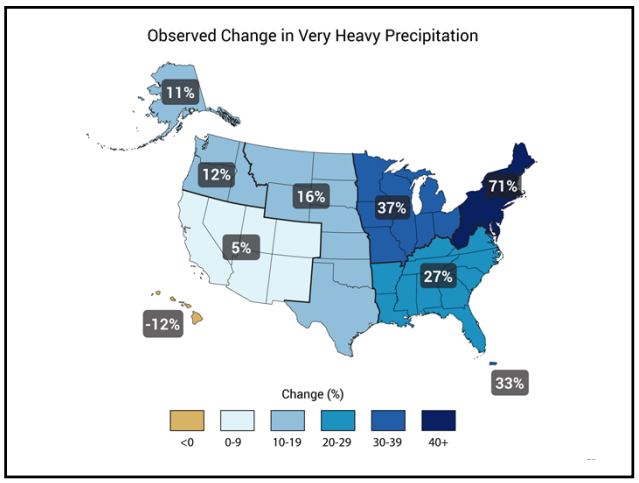
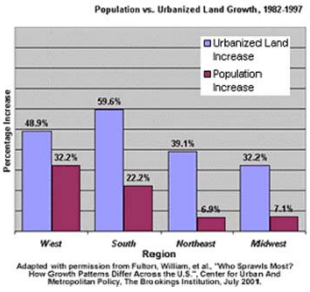


Increasing Development Intensity

- Between 1982 and 1997 (15 yrs) Chicago Population increased 12%
- Developed Land increased 25%
- 10-24 Billion Gallon loss in infiltration



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Aging Infrastructure

Some of the Problems

CSO Pollution

Flooded Basements

Flooded Streets

Eroded Streams

Property analyses (Wetrofit)

Buildings: foundation cracks, mold growth, moisture or seepage, water damage, standing water, high water marks, plumbing & building sewer, obstructed/collapsed building sewer, roots in pipes or catch basin

Landscapes: ponding, blocked gutters, poor drainage, low spot, excess soil, high water table, hillside, trees/shrubs over building sewer

Neighborhoods: street flooding reported, neighbor flooding reported, obstructed catch basin, poor alley drainage, permeable alley, recent street repair, etc.

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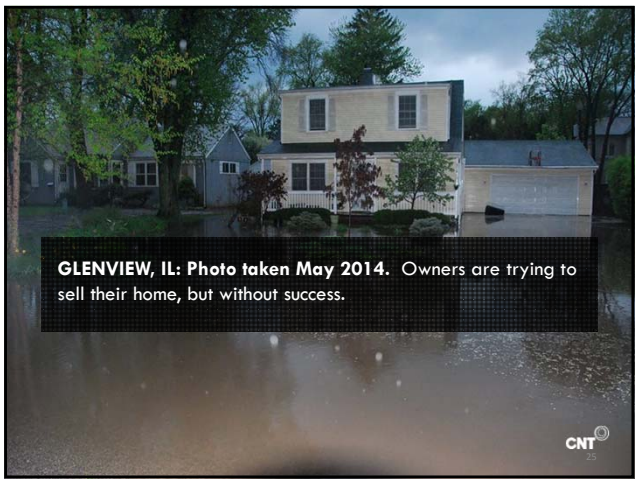

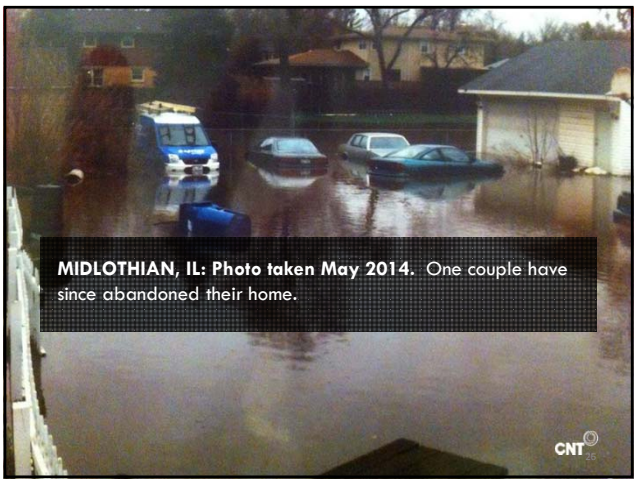

State-wide Study

- Define and describe "urban flooding" state wide
- Risk evaluation mechanisms
- Mitigation solutions
- Funding strategies

Urban Flooding Awareness Act

CNT
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ILLINOIS URBAN FLOOD RISK SYMPOSIUM

by Doug Plasencia, ASFPM Foundation

A message from our attorney

By attending this Illinois State Symposium is it possible that you may be photographed and or electronically recorded during this event. Accordingly you hereby consent to the use and distribution of your name and likeness for instructional or promotional purposes without compensation by or liability to IAFSM and the ASFPM Foundation.

Illinois Urban Flood Risk Symposium

Doug Plasencia

Michael Baker International

Foundation President

IAFSM

Illinois Association for Floodplain and Stormwater Management

Overview

The MISSION of the ASFPM Foundation is to promote public policy through select strategic initiatives and serve as an incubator for long-term policy development that promotes sustainable floodplain and watershed management.

Facts

Founded in 1996

Separate Corporate Body with its own Board of Trustees and Bylaws.

501(c)(3) Tax Exempt Non-Profit Foundation

Seeks to help ASFPM meet its Goals

Where the Money Goes

The Gilbert F. White National Flood Policy Forum

College Scholarships

No Adverse Impact (NAI)

"National Flood Programs in Review" Report

FloodManager Interactive Simulator

Designing for Disasters

NATIONAL BUILDING MUSEUM
Telling the stories of architecture, engineering, and design

Where the Money Goes

State Symposia

- Indiana
- Colorado
- Texas
- Georgia
- Florida
- *Illinois*
- *Arizona*

Why State Symposia?

- 2010 Flood Risk Forum Recommendation
- Federal Policy is important but…..

……Flood Mitigation is primarily local

Foundation Objectives

- Facilitate and be a catalyst for policy debate State by State
- Inform National policy with this debate
- Create a lasting policy initiative and ethic

Contemplation #1

URBAN FLOOD RISK MANAGEMENT

Value Proposition

- Who Benefits?
- Who Pays?
- Why is this important to Illinois future?

Contemplation #2

- Climate Change

Contemplation #3

URBAN FLOOD RISK MANAGEMENT

QUALITY of LIFE

– Flooding

– Open space and habitat

– Economic viability

Contemplation #4

- How will IAFSM as an organization and you as individuals make a difference?

Appendix D: Prevalence and Cost

In 2014, the Center for Neighborhood Technology (CNT) produced a report addressing the cost and prevalence of urban flooding in Cook County, IL (CNT, 2014). Insurance claims data, primarily from the Federal Emergency Management Agency (FEMA) and private insurers, was used to study the cost and distribution of claims in Cook County. Topics included the location of claims with regard to floodplains, impervious areas, and average household income. However, the claims data available to CNT did not include all private insurers, was limited to only Cook County, and was aggregated by zip code. To conduct a statewide, comprehensive analysis of the cost and prevalence of urban flooding in Illinois, this appendix utilizes all available FEMA claims and all private insurance claims, aggregated by street address or zip code, to study the cost and prevalence of urban flooding in Illinois.

Insurance Claims Data

Insurance claims data for Illinois was requested by the Illinois Department of Natural Resources, Office of Water Resources (IDNR-OWR) from private insurers and FEMA.

All private claims data represents basement/foundation flooding, included sump pump failure and sewage backup not due to riverine flooding. The private insurance data included location (street address), date of loss, date of claim received, and final payment amount for 184,716 claims from 2007 through September 2014.

FEMA provided National Flood Insurance Program (NFIP) claims and Disaster Relief Claims. The NFIP claims data represents flooding due to overland flow (primarily riverine), which may or may not include urban flooding as defined for this report. NFIP data is included but only an unknown portion of claims and payouts can be attributed to urban flooding. The NFIP data included location, date of loss, and final payment amount for 47,713 claims from 1976 through October, 2014.

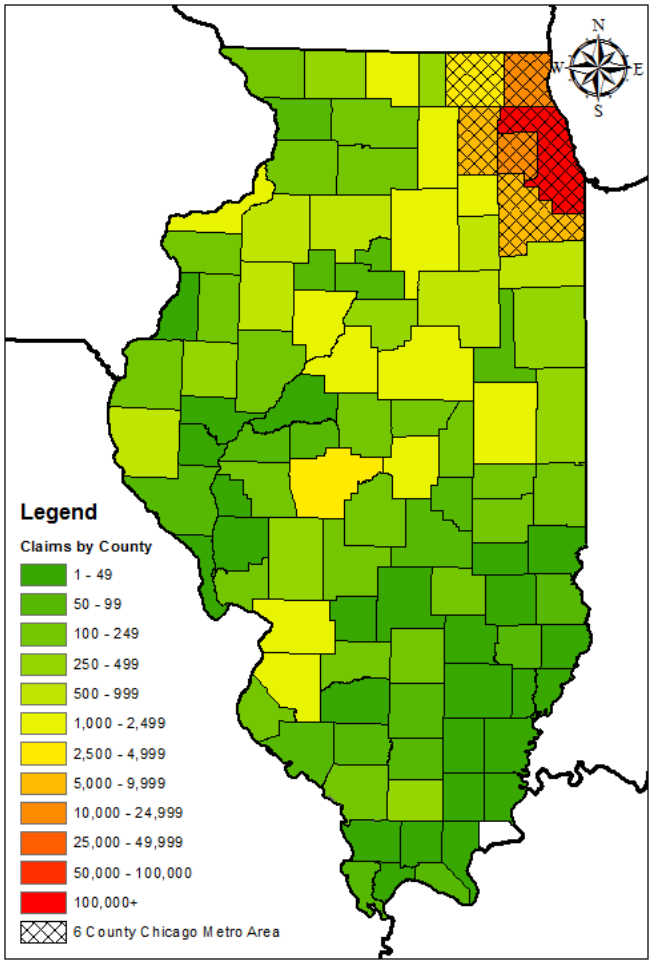


Figure D.1: All available Private, NFIP, and Disaster Relief Claims by county.

Urban flooding is not concentrated to small areas but is far-reaching and affects much of the urban landscape. Figure D.2 displays the number of NFIP and private claims per census block between 2007 and 2014 within the Rock Island urban area.

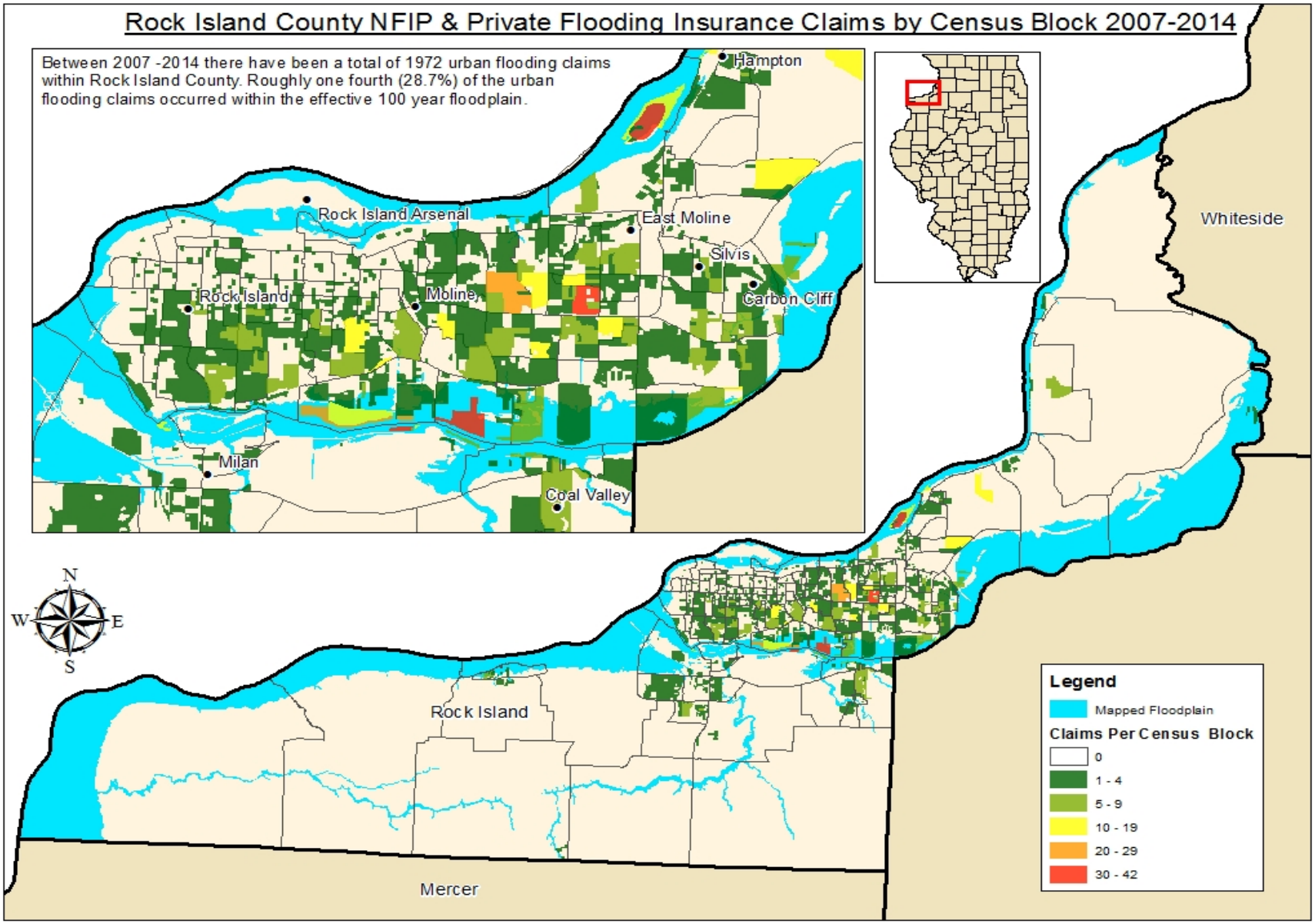


Figure D.2: NFIP and private claims per census block between 2007 and 2014 within the Rock Island urban area

The Disaster Relief claims data represents damage due to flooding, wind, winter storms, and tornados. Only disasters related to flooding and severe storm events were included in the urban flooding analysis. The Disaster Relief provides Individual assistance (IA) and Public assistance (PA). IA provides money and services to people in presidentially declared disaster areas and included both housing and personal assistance. The PA program offers assistance to state, local, and tribal governments after a declared major disaster or emergency for eligible disaster-related damage.

The data included location by zip code, number and type of claim, total award and reason for award, total loss value, and other statistics regarding insurance coverage of award recipients and causes of damages. PA provides grant assistance to communities to quickly respond to and recover from presidentially declared disasters. PA data was only available statewide by disaster declaration without specific location information.

All private and NFIP claims located within the urban areas delineated as described in the Definitions and Demographics Section (Appendix A) were included in the following urban flooding analyses. All claims located outside of the urban areas were considered rural. 175,988 out of 184,716 (95.28%) private insurance claims and 31,711 out of 47,713 (66.46%) NFIP claims were located in urban areas. A total of 94.63% of all claims were located within urban areas and were located in 101 out of 102 counties (Figure D.1). The only county without a single urban insurance claim for the specified time frame is Hardin County in southeastern Illinois. Hardin County is the least populated county in Illinois. A total of 11 claims were filed but none fell within the delineated urban areas.

Some spatial analyses were not possible with the Disaster Relief data due to claim locations being provided only by zip code. There are 1,278 zip codes covering Illinois and 1,080 contain IA claims. Of those, 986 (91.3%) contain urban areas as delineated above. Given the nature of Disaster Relief, which focuses mostly of urban areas, all data from 2007 to 2014 within zip codes containing urban areas was considered for this report.

General Prevalence and Cost of Flooding

The private and NFIP claims data (with street addresses) gathered by IDNR-OWR was very helpful in determining the cost and prevalence of urban flooding in Illinois' urban areas. Private insurers have paid out $1,240 million since 2007. Since 1976 the NFIP has paid out $425 million and $230 million since 2007 for urban flooding claims. FEMA has paid $692 million in Individual Assistance and $158 million in Public Assistance since 2007. That is a total of $2.514 billion and almost $2.319 billion since 2007. Urban flood insurance payouts since 2007 total $479 per Illinois urban household and $197 per capita. All claims payment data is adjusted for inflation and presented in 2014 dollars.

Out of 516,026 urban insurance claims, about 71% resulted in a monetary payment. All others were closed without payment. The average payout per NFIP claim was about twice that for private insurance claims and private claims payout about three times that for IA. See Table D.1and Figure D.3 for claim payment data.

Table D.1: Insurance Claims Payments 2007-2014

Claims Source	Total Payout ($)	Urban Claims	Urban Claims Paid	% Paid	Avg Payment per Claim	Avg Payment per Paid Claim
Private	$1,239,984,361	175,775	136,687	77.76%	$7,054	$9,072
NFIP	$229,743,519	12,950	10,662	82.33%	$13,307	$21,548
IA	$691,868,175	308,540	206,126	66.81%	$2,242	$3,357
PA	$157,568,563	-	-	-	-	-
Total	$2,319,164,168	497,265	353,603	71.08%	-	-

From 2007 to 2014, private insurance payouts totaled $1.2 billion or 53% of all payouts. 88% of those payments went to claims located in the six-county Chicago Metropolitan Area of Cook, DuPage, Kane, Lake, McHenry, and Will. The remainder went to downstate Illinois. NFIP payments totaled $230 million or 10% of all payouts. 73% of NFIP payments were located in the six-county area with the remainder downstate. Disaster Relief Individual Assistance totaled $690 million, or 30% of all payouts. 84% went to the six-county area. Disaster relief Public Assistance totaled $157 million, or 7% of all payouts. The six-county area contains 70% of the urban Illinois population.

On average there are 21,999 private claims per year and 813 NFIP claims per year, however, the variability from year to year can be large (Figure D.4). For example, in 2012, 5,266 private and 62 NFIP claims were filed and in 2013, 40,036 private and 3,755 NFIP claims were filed. This was an increase of 660% and 5,900% from the previous year, respectively. IA and PA are naturally variable from year to year as a presidential disaster declaration is required before those funds are available. No disaster assistance was required in Illinois is 2009, 2012, or 2014.

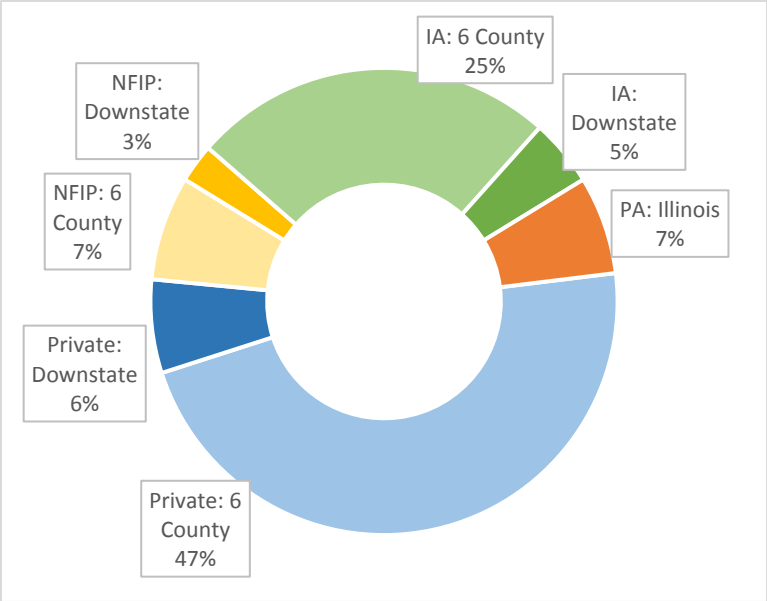


Figure D.3: Total payouts (2007-2014) by claim type and region.

The average total annual private insurance payout in urban Illinois is $155 million with an average payout of $7,048 per claim. The average total annual NFIP insurance payout in urban Illinois is $10.9 million with an average payout of $13,404 per claim. Noted, most private insurance sewer backup and water coverage is limited to $5,000 to $10,000 while NFIP has a coverage limit of $250,000.Total annual payout can vary greatly from year to year depending on the number of total claims (Figure D.4). In 2012 and 2013 total private insurance payouts in urban Illinois were $32 million and $304 million, respectively. Total NFIP payouts in those years were $0.3 million and $81.6 million, respectively.

These amounts are in line with the variability in the number of claims per year. Three out of five of the worst years with regards to NFIP claims and total payment have occurred since 2008.

Disaster relief assistance is dependent on a disaster declaration and is therefore variable from year to year. Total annual disaster relief payments in Illinois have averaged $50 million per year since 1999 with a range of $0 in 2000, 2009, 2012, and 2014 to over $400 million in 2010.

Average annual private payment per claim ranged from $3,679/claim in 2014 to $8,382/claim. NFIP average annual payment per claim ranged from $2,883/claim in 1992 to $21,740/claim in 2013. Average annual IA payments ranged from $1,592/claim in 2008 to $2,798/claim in 2010.

The average annual payments per claim vary by year and location within the state though the largest variability is seen with NFIP claims (Figure D.5). PA provides grant assistance to communities and so is not comparable to private insurance, NFIP, and IA on an average payout per claims basis.

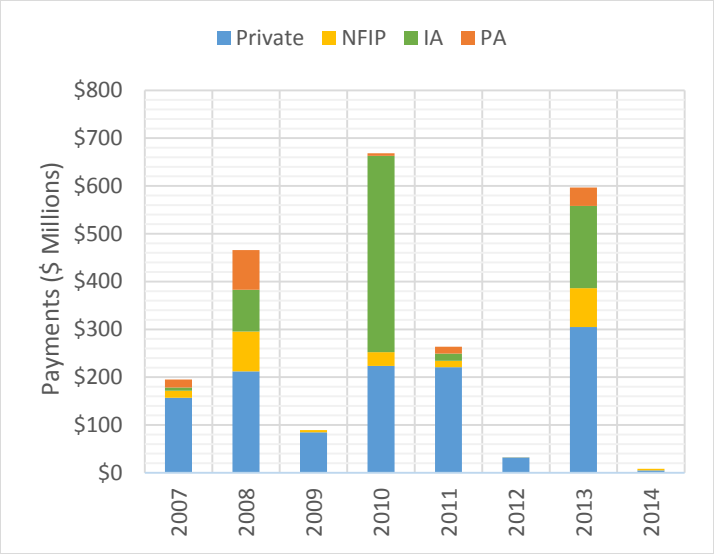


Figure D.4: Total flooding insurance payouts per year, partitioned by claim type. Private insurance covers the majority of urban flooding claims from on average, however, disaster relief assistance payouts can be significant in some years. Private claims current through September 2014 and NFIP current through October 2014.

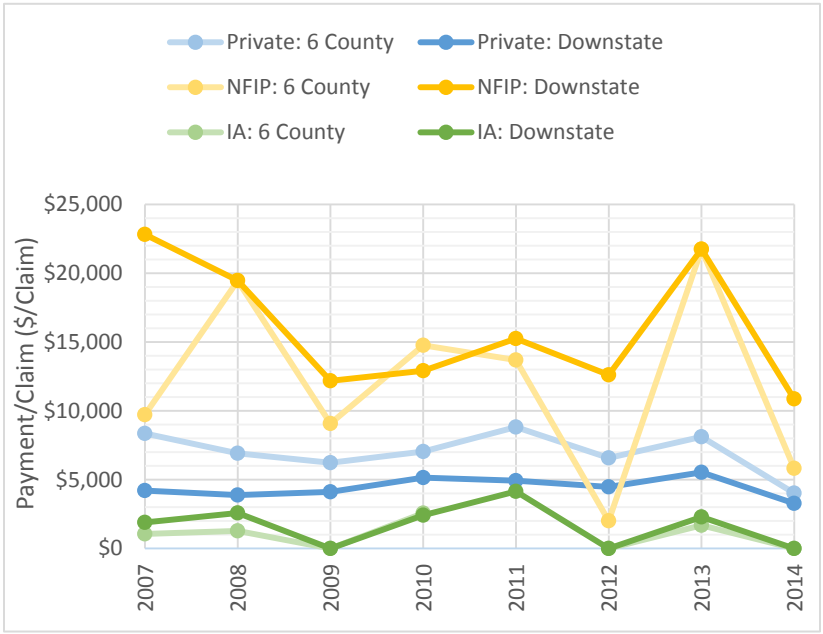


Figure D.5: Insurance payouts per claim by year, insurance type, and location. NFIP pays the most over average per claim, followed by private insurance, and then disaster assistance. However, the different types of insurance cover different types of flood-related damage. NFIP insurance covers damages from riverine flooding events (with extensive damage to multiple stories) while the private insurance covers basement flooding, including sewer backups. IA reimbursements are means tested based on household income or supplement costs not covered by insurance. These factors contribute to the differences in average payouts.

Timing of Urban Flooding

The timing and variability of urban flooding insurance claims is influenced by the timing and variability of rainfall events. Approximately 84% of private, 78% of NFIP, and 99% of IA claims occur from April to September (Figure D.6). On average, 58% of total annual Illinois precipitation falls between April and September, with the most occurring in May. The

majority of claims occur during the heaviest precipitation month (April-Sept), as expected, but the monthly claim totals do not follow the rainfall trend.

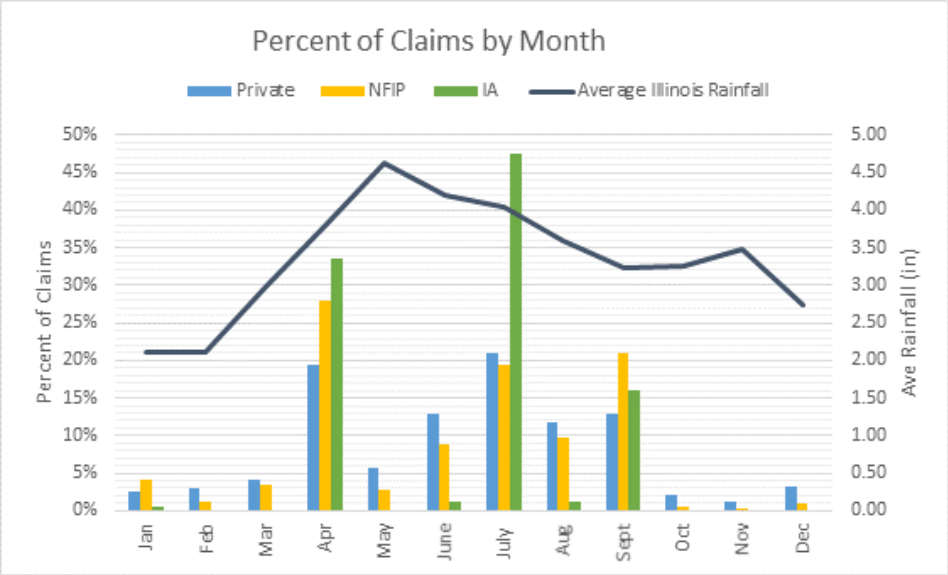


Figure D.6: Insurance claims by month as a percent of total claims for each type. The majority of flooding claims occurs during the spring and summer months, which coincides with the timing of severe rainfall events in Illinois. Average monthly Illinois rainfall is also provided.

Average monthly precipitation does not account for rainfall intensity or storm severity. The private and IA claims, and to a lesser degree the NFIP claims, are dominated by three severe storm events in September 2008, July 2010, and April 2013.

The timing, location, and magnitude of a single severe storm event greatly affect the corresponding urban flooding and insurance claims and payouts. The five storm events resulting in the highest total NFIP payouts (1976-2014), the highest total private payouts (2007-2014), and the highest total payouts (2007-2014) are shown in Table D.2. The top three storm events were the same for both the NFIP and Private claims. Four of the top five storm events in terms of total NFIP and private insurance payouts prompted disaster declarations and so IA and PA was also distributed.

Table D.2: Storm Event Ranks by NFIP, Private, and Total Payments

Rank	NFIP (1976-2014)	Private (2007-2014)	NFIP + Private (2007-2014)
1st	4/17-18/2013	4/17-18/2013	4/17-18/2013
2nd	9/13-14/2008	9/13-14/2008	9/13-14/2008
3rd	7/23-24/2010	7/23-24/2010	7/23-24/2010
4th	7/17-18/1996	7/22-23/2011	7/22-23/2011
5th	8/14/1987	8/23-24/2007	8/23-24/2007

The April 17-18, 2013 storm event involved rain falling in the top northwest third of Illinois on a line from Quincy to Peoria to Chicago. The payouts totaled $498 million. The April 17-18 storm accounted for 84% of all payouts in 2013 and 21% of total payouts between 2007 and 2014.

The September 13-14, 2008 storm event was similar to the April, 2013 event. Rain fell along a line from the Quad Cities and Peoria to Chicago. Payouts totaled $275 million. The storm accounted for 59% of all payouts in 2008 and 12% of total payouts between 2007 and 2014.

The July 23-24, 2010 storm event resulted in rainfall in northern Illinois on a line from Rockford to Chicago. Large sections of urban DuPage and Cook Counties received over 10 inches of rainfall. Payouts totaled $563 million, 74% of which was IA and PA. Over 97% of private insurance and 90% of IA payments were made within Cook, DuPage, Kane, Lake, McHenry, or Will Counties. The storm accounted for 84% of all payouts in 2010 and 24% of all payouts between 2007 and 2014.

The July 22-23, 2011 storm and the August 23-24, 2007 storm resulted in total payouts of $139 million and $134 million, respectively. The storms accounted for 53% and 69% of all payouts in the respective years and around 6% each of all payouts between 2007 and 2014.

The top five most expensive storm events heavily impacted the six-county Chicago Metropolitan Area of Cook, DuPage, Kane, Lake, McHenry, and Will Counties. This highly urbanized area is particularly prone to flood damages caused by heavy rainfall events. See Figure D.7 and Figure D.8.

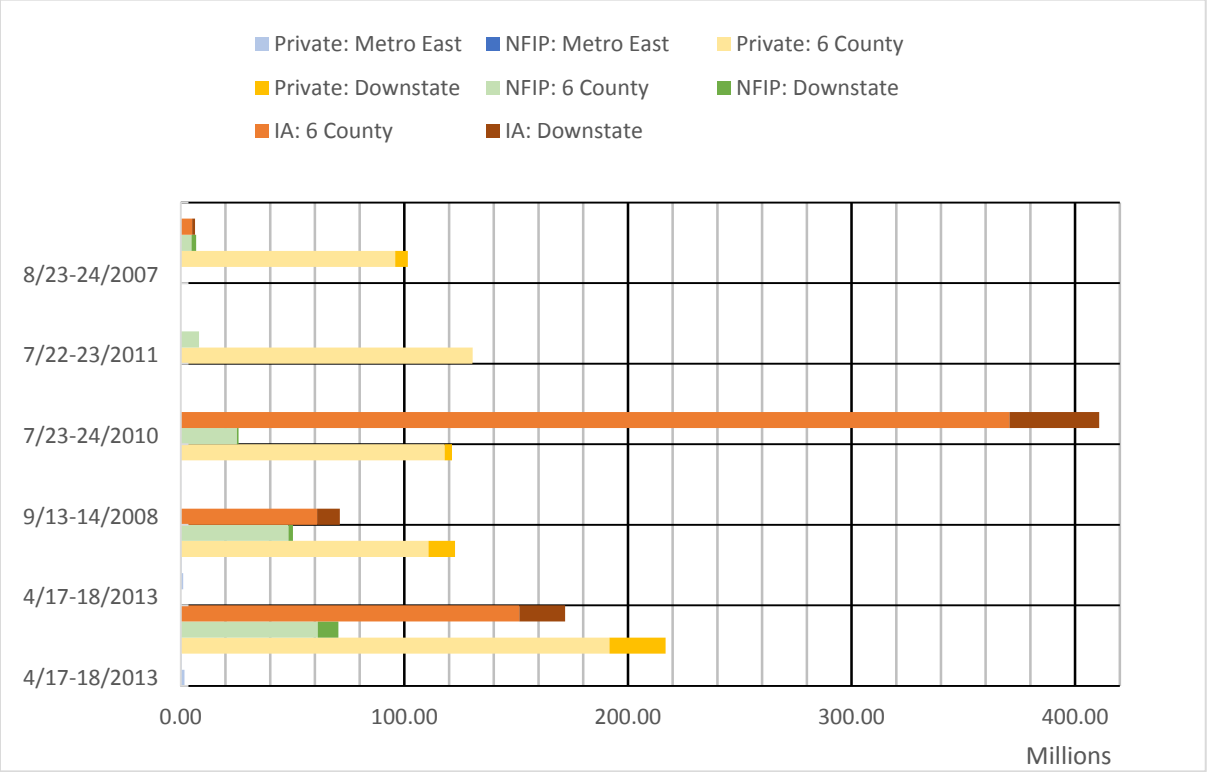


Figure D.7: Payments for the five most expensive storm events 2007-2014 for private insurance, NFIP, IA, and PA for the six-county and downstate regions. Total payment located within the six-county Chicago Metropolitan Area are shown in the lighter color and total payments in the rest of Illinois are shown in the darker color. Total payouts were $498 million, $275 million, $563 million, $139 million, and $134 million for the April-2013, the September-2008, the July-2010, the July-2011, and the August-2007 storms, respectively. IA and PA accounted for 42%, 37%, 74%, 0%, and 19% of total payments for each event.

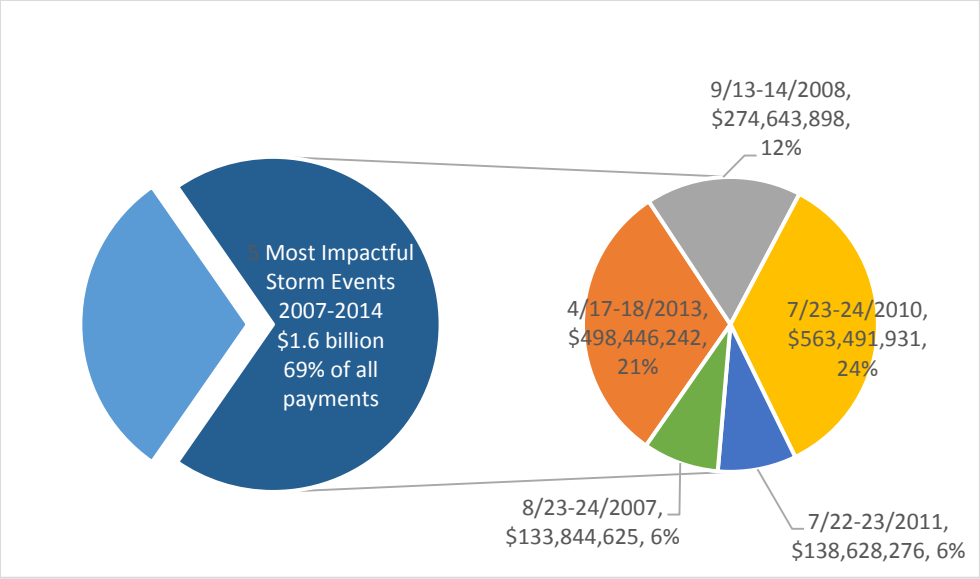


Figure D.8: Total payouts by storm event. Combined, the top five more impactful storm events 2007-2014 totaled $1.6 billion and 69% of all payments. The top two events (April 2013 and July 2010) total 65% of the top five events (representing 45% of all payments 2007-2014).

Trends of Urban Flooding: Claims and Payouts

NFIP urban claims and payouts ranged from $6.1 million to $8.7 million during the 1970s, 1980s, and 1990s. NFIP claims and payouts have trended up steeply during the last 15 years, driven by the three largest events (Figure D.9). The July 2010 event and the April 2013 event resulted in over $88 million in payouts and account for 69% of all NFIP payouts over the last five years, which greatly increases the average payout over that time. The September 2008 event resulted in over $50 million in payouts and accounts for 40% of all NFIP payouts from 2000-2009.

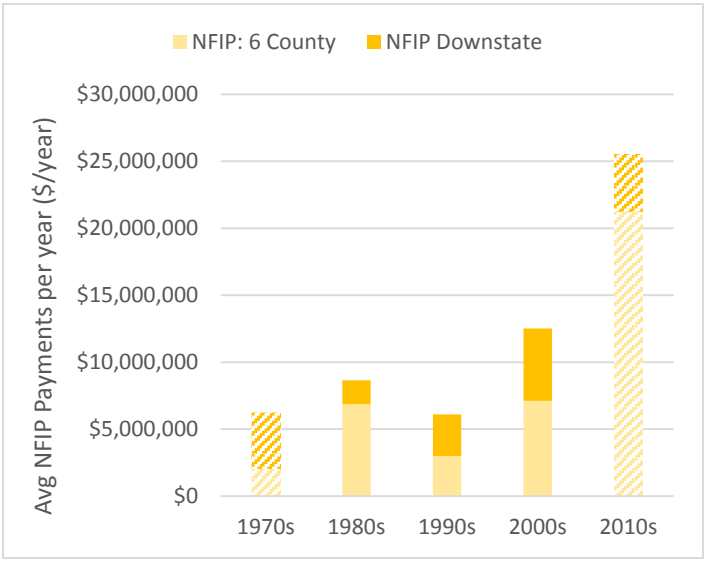


Figure D.9: NFIP claims and payouts have trended up steeply during the last 15 years primarily due to 3 large storm events. It is too early to determine if the first half of the 2010s is the beginning of a trend but this analysis can be readdressed in 5 years. Hatching denotes decades with partial data (1976-1979 and 2010-2014).

The limited time frame (2007-2014) of the private insurance claims and disaster assistance claims makes determining the presence (or lack of) a trend difficult. The private claims were equally affected by the recent large storm events. However, it is too early to determine if these kinds of storm events signal a new norm. Over the last eight years private insurance payouts have average $155 million per year.

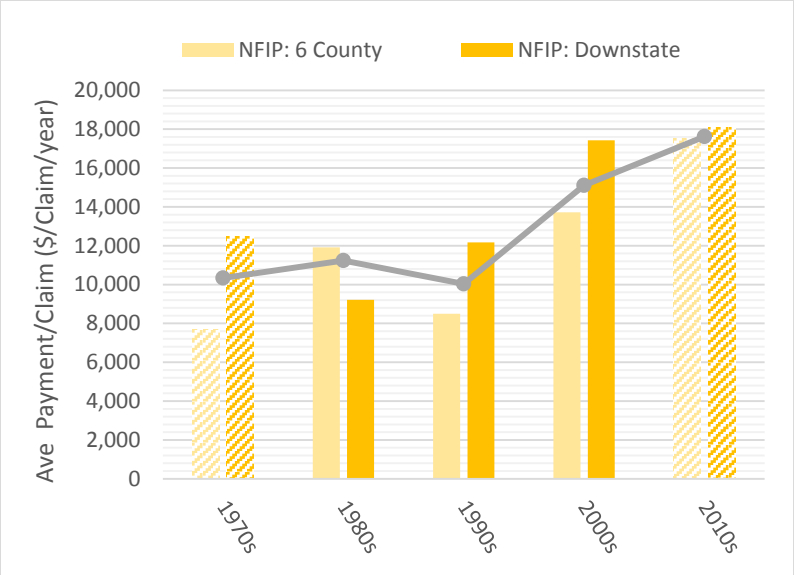


Figure D.10: Average NFIP payouts ranged between $10,000 and $11,200 in the 1970s, 1980s, and 1990s. The average payout has increased since 2000 from $15,100 per claim during the 2000's to $17,500 per claim during the last five years. Hatching denotes decades with partial data (1976-1979 and 2010-2014).

Illinois IA payouts average $10.6 million per year in the 2000s and $120 million per year in the first half of the 2010s. However, the August 2010 storm event skews the IA data, therefore, determining a trend from the limited data set is not possible.

Average private insurance payout per claim, in 2014 dollars, has been $7,000 per claim. In the 1970s, 1980s, and 1990s, average NFIP payouts per claim ranged between $10,000 and $11,200 per claim (Figure D.10). The average payout per claim has increased since 2000 from $15,000 per claim during the 2000s to $17,500 per claim during the last five years. IA payouts are means tested based on the annual income of the payees. Therefore, the average payout per claim is greatly affected by the geographic location of the disaster and the corresponding average income of those households seeking assistance.

Urban Flooding in the Floodplain

To determine the prevalence of urban flooding in relation to riverine floodplains, the NFIP and private claims data were compared with the best available 1% annual chance floodplain data for Illinois. The digital floodplain data used in these analyses was derived from the following sources: National Flood Hazard Layer (NFHL), preliminary Flood Insurance Rate Maps, and the 21 counties without digital regulatory floodplain data were digitized from historical paper FIRMs. The disaster assistance data was not used due to the course zip code aggregation of the data.

The 1% annual chance floodplain data was combined with the national land cover data set (see Chapter 5) to determine how much developed floodplain is located within Illinois urban areas. Urban areas in Illinois cover 4170 sq. miles. Within the urban areas there is 471.14 sq. miles (11.3%) of 100-year floodplains. In total, there are 241.4 sq. mi. (5.8%) of developed 100-year floodplain within the Illinois urban areas.

The percentage of urban flooding claims between 2007 and 2014 within developed floodplain is roughly proportional to the percentage of developed floodplains within Illinois urban areas (7.5% to 5.8%). In general, NFIP claims were over represented and private claims were proportionally represented within urban floodplains.

Urban Flooding and Income

US Department of Commerce, US Census Bureau (USCB) 2013 average annual household income for each census track was used to assign an average annual household income to each NFIP and private insurance claim. The disaster assistance data was not used due to the course zip code aggregation of the data. The average household income for Illinois' urban areas is $60,645. The average household income by NFIP and private insurance claims are $61,626 and $76,913, respectively. Figure D.11 shows the distribution of annual household income for Illinois' urban areas, regardless of claims data, and the distributions of annual household income for the NFIP and private insurance claimants. The NFIP distribution is very similar to the distribution for the urban area income. The private insurance distribution is shifted slightly towards higher annual income households.

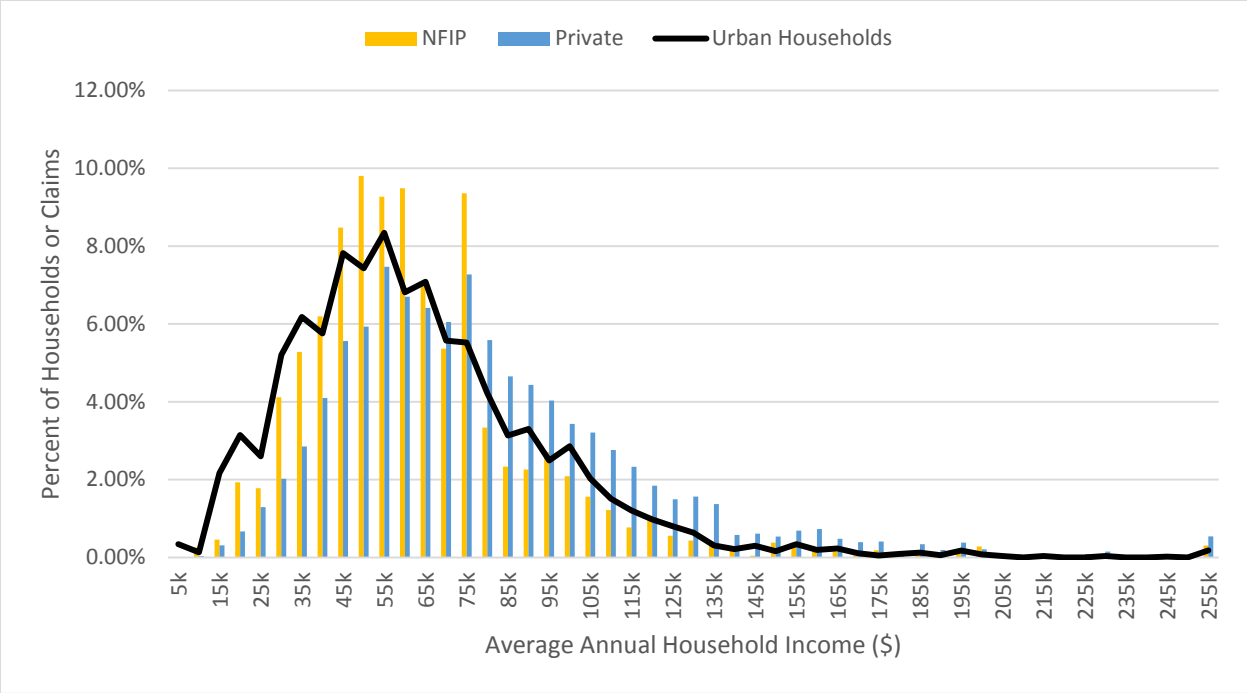


Figure D.11: Distribution of annual household income for Illinois' urban areas and the distributions of annual household income for the NFIP and private insurance claims. The NFIP distribution is very similar to the distribution for the urban area income. The private insurance distribution is shifted slightly towards higher annual income households.

The following plots (Figure D.12) show the distribution of Illinois urban annual household incomes and the distributions of NFIP and private insurance annual household incomes. The lower middle horizontal lines are the medians, and the upper middle horizontal lines are the means, the bottom of the boxes are the 1st quartiles, the top of the boxes are the 3rd quartiles, and the whiskers are one standard deviation above and below the mean of the data. The NFIP household income distribution and general urban household distribution are similar when considering all urban areas in Illinois or the six-county area and downstate Illinois separately.

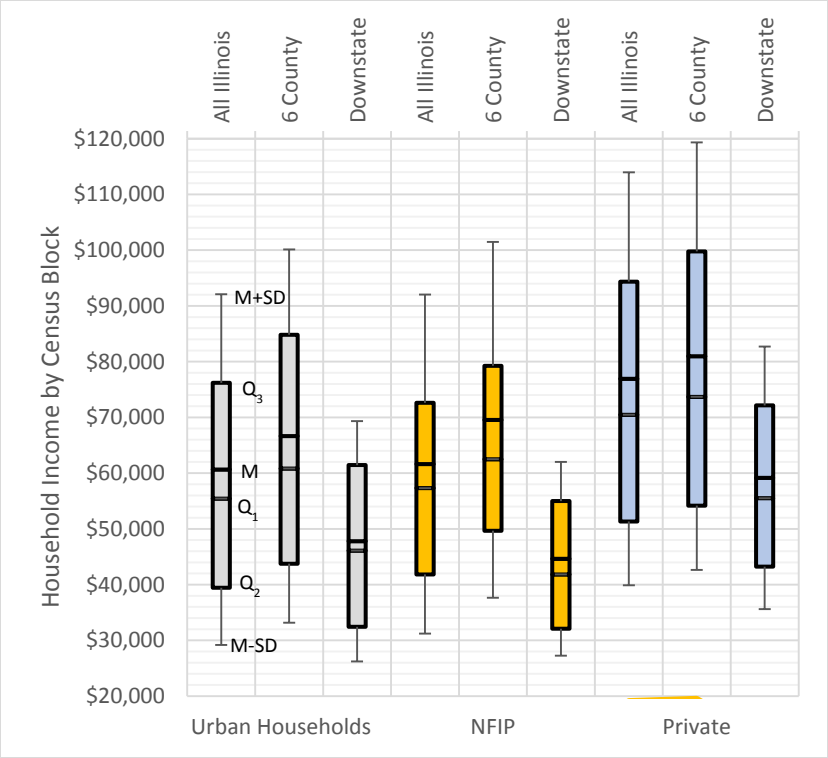


Figure D.12: Household income in Illinois' urban areas and household income for the urban NFIP and private insurance claims. Data is also broken out for the 6 County Area and Downstate Illinois. Each box-plot shows the mean (M), one standard deviation (SD) above (M+SD) and below the mean of the data (M-SD), the 1st quartile (Q_1), the median (Q_2) and the 3rd quartile (Q_3). The private insurance income distributions are towards more affluent households than the corresponding urban income and NFIP income distributions. Also, the six-county urban areas are on average more affluent than downstate urban areas.

The private insurance household income distributions are shifted towards higher incomes than the general urban household distribution but the two distributions are also statically similar. Taken as a whole, the six-county urban areas are more affluent than downstate urban areas; however, certain urban areas within northeast Illinois are also very economically disadvantaged.

The income distributions of NFIP and private insurance claimants may be affected by the characteristics of the insurance. NFIP coverage is required to obtain a mortgage, and so is at least partially independent of household income, which may explain the similarities between the NFIP income distributions and the general urban income distributions. Basic private insurance (home owners insurance) coverage is also required in order to receive a mortgage, but the additional insurance riders that cover basement flooding and/or sanitary sewer backup are not always required. Many less affluent home owners (or rental property owners) may forgo the additional cost of such insurance riders. Less affluent renters may also forgo renters insurance. Such issues may partially explain why the income distribution of private insurance claim is shifted towards higher incomes.

The income distribution of IA claim requests would presumably be independent of individual household incomes because eligibility to received funds is determined geographically by disaster decree. However, the amount of IA available to an individual household is determined by household income, and so IA may be skewed towards less affluent areas. Unfortunately, disaster assistance data could not be used due to the course zip code aggregation of the data.

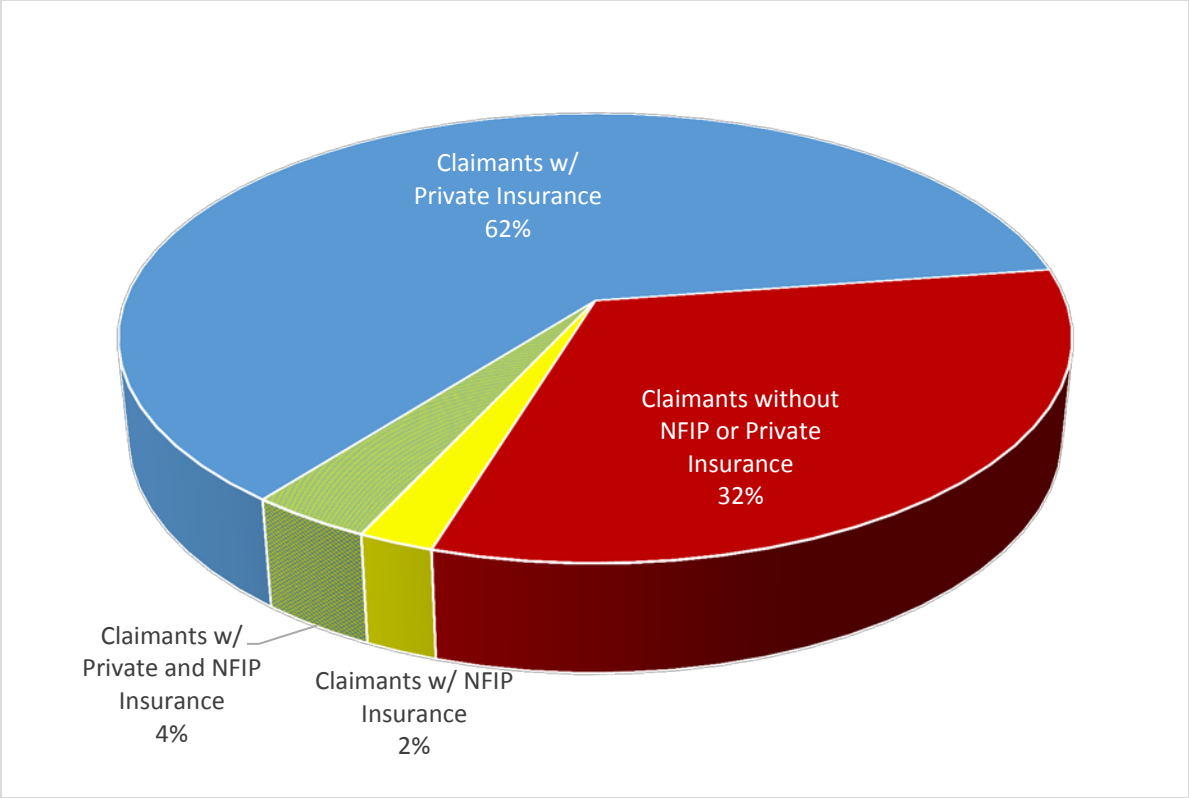


Figure D.13: According to the IA dataset, of those households requesting disaster assistance, about 32% lack NFIP or private insurance. 62% of households seeking disaster assistance have private home owners insurance, 2% of households have NFIP coverage only, and the other 4% carry both NFIP and private insurance. 7% of those carrying private insurance have sanitary sewer back up protection.

Data Limitations

The insurance and assistance data compiled and analyzed above is useful for determining the approximant cost, timing, and trends of urban flooding in Illinois. However, it is only a partial picture since a claim can only be made if the flood victim carries applicable insurance and then decides to make a claim. In addition, the payout for a claim does not usually cover the entire cost incurred. The IA data shows that of those households requesting disaster assistance, about 32% lack NFIP or private insurance and only 7% of those with private insurance also carry sewer backup riders. As a result, the full cost of urban flooding in Illinois is underreported (Figure D.13).

As noted previously, the NFIP claims represent flooding due to overland flow (primarily riverine), which may or may not include urban flooding as defined for this report. Also, the aggregation of the Disaster Relief data by zip code limited the usefulness of the data for certain analyses. The various claim datasets may not be completely accurate with regards to the information recorded or may be missing an unknown quantity of information. The various kinds of insurance provide insight skewed by the nature, purpose, and coverage of a specific insurance product.

Appendix E: Climate Trends and Climate Change

Precipitation Patterns in Illinois

Illinois receives between 36 and 48 inches of precipitation from north to south on average. Illinois is much wetter than states to the west because of its closer proximity to the Gulf of Mexico, our major source of moisture. About half of the precipitation in Illinois comes from thunderstorms during the warmer months of the year. By their nature, thunderstorms are usually short and intense rainfall events, which can be especially challenging in urban areas. The rest of the precipitation is produced by passing warm and cold fronts and slow moving low-pressure systems. Some of that precipitation can fall as snow. In this report, precipitation refers to rain events and the water content of snowfall events.

While most daily precipitation amounts are an inch or less, the number of days with over an inch of precipitation ranges from 7 to 10 days across northern and central Illinois to 10 to 15 days across southern Illinois south of Interstate 70 (Figure E.1). In fact, up to 40 percent of the total precipitation in any given year comes from the 10 days with the most rain. In the urban environment, wet months or even wet weeks can increase the risk of flooding from a subsequent storm by saturating the soils, filling retention ponds, and increasing levels of rivers, lakes, and streams. As a result, a 2 to 3 inch storm at the end of a wet week or month may do more damage than the same storm falling during a dry week or month.

On rare occasions, Illinois has received large amounts of rain from the remains of tropical systems as they move up from the Gulf of Mexico. Examples of this include the remains of Hurricanes Ike and Gustav in 2004 and Hurricane Isaac in 2012. While no longer at hurricane strength, these were capable of producing 3 to 6 inches of rain over very wide areas in 1 to 3 days.

Snowfall is common in Illinois. On average, winter snowfall totals can range from 12 inches in southern Illinois to 36 inches in northern Illinois. Amounts are typically a little higher in the Chicago area due to the additional impact of lake-effect snows. Snowfall can be a contributor to urban flooding if large amounts of it are melted in short order. This can be compounded by melting over still-frozen soils, blocking of storms drains by snow and ice, and rainfall falling on top of the snow pack.

Figure E.1: Average number of days per year with at least an inch of precipitation.

Trends in Total Precipitation in Illinois

Historical records since 1895 (Figure E.2) illustrate the large year- to-year variability in precipitation in Illinois, a trademark of our climate. These data indicate that the statewide average precipitation has increased from 36 to 40 inches or 10% over the last century. Illinois has been more likely to experience exceptionally wet years in recent decades. The year 1993 was the wettest on record with 51.18 inches. The next two wettest years were 2009 with 50.96 inches and 2008 with 50.18 inches. All three years were noted for widespread flooding issues in Illinois.

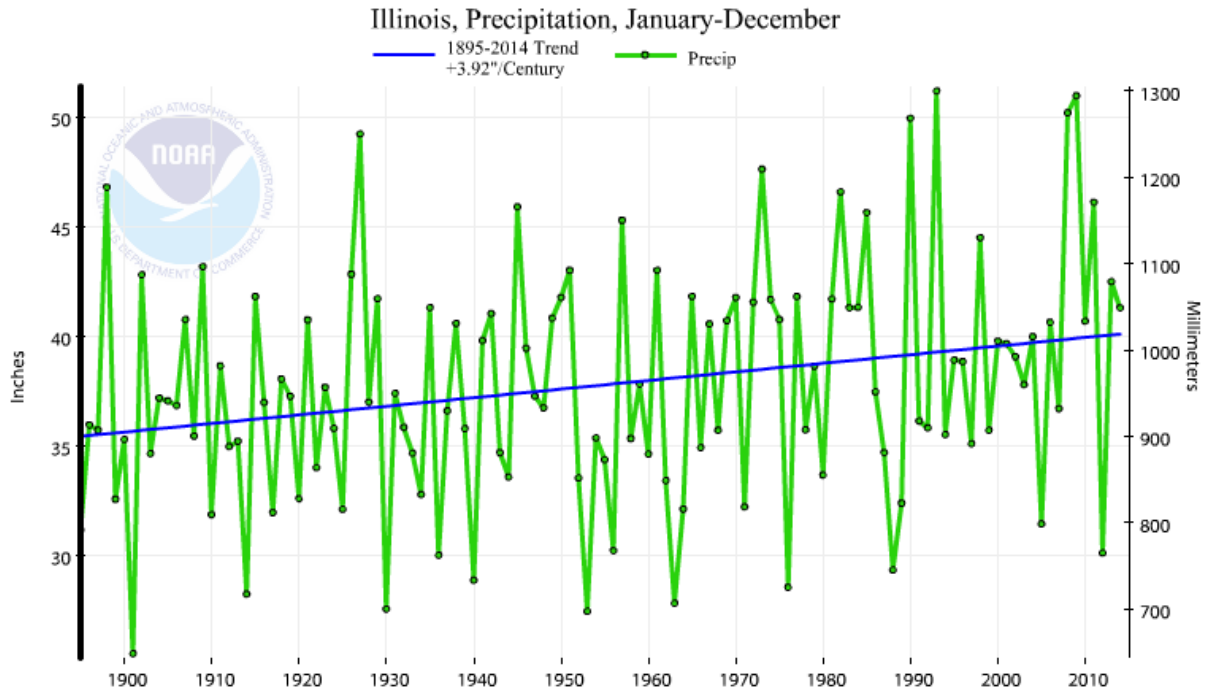


Figure E.2: Statewide average annual precipitation for Illinois from 1895 to 2014. The green line represents the year to year variation. The blue line is the trend line.

Trends in Heavy Precipitation Events between Major Illinois Cities

A recent study of changes in heavy precipitation events (Groisman et al., 2012) over the central U.S., including Illinois, found little change in the number of storms between ½ to 1 inches. However, heavy storms (1 to 3 inches), very heavy storms (3 or more inches), and extreme precipitation (more than 6 inches) were becoming more frequent. In fact, the extreme precipitation events increased by as much as 40% during the second half of the study period (1979-2009) compared to the first half of the study period (1948-78).

For this report, daily precipitation records for the last 100 years were examined for several major cities in Illinois. These cities include Chicago, Rockford, Moline, Peoria, Springfield, Bloomington-Normal, Champaign-Urbana, Edwardsville, and Carbondale. Daily precipitation amounts were placed into three categories: 1 to 2 inch storms, 2 to 4 inch storms, and 4 or more inch storms. This slightly different list of

categories was chosen to better reflect the kinds of storms found in Illinois. The results are summarized in Figure E.3 for the entire state. The results for individual cities are provided in Figures E.4-E.12.

The 1 to 2 inch storm events per city showed modest changes between decades and a small increase over time. The most recent decade, 2005-14, was the highest with an average of 81 events per city.

The statewide average number of 2 to 4 inch storm events per city showed more changes between decades and a moderate increase over time. The lowest decade was 1935-1944 and was likely associated with the number of severe droughts during that period. One of the busiest decades was 1965-1974, when the cities averaged 19 events per decade. The statewide average number of storm events exceeding 4 inches per city has increased steadily over the last century with 2005-2014 the busiest with an average of 1.8 events per city.

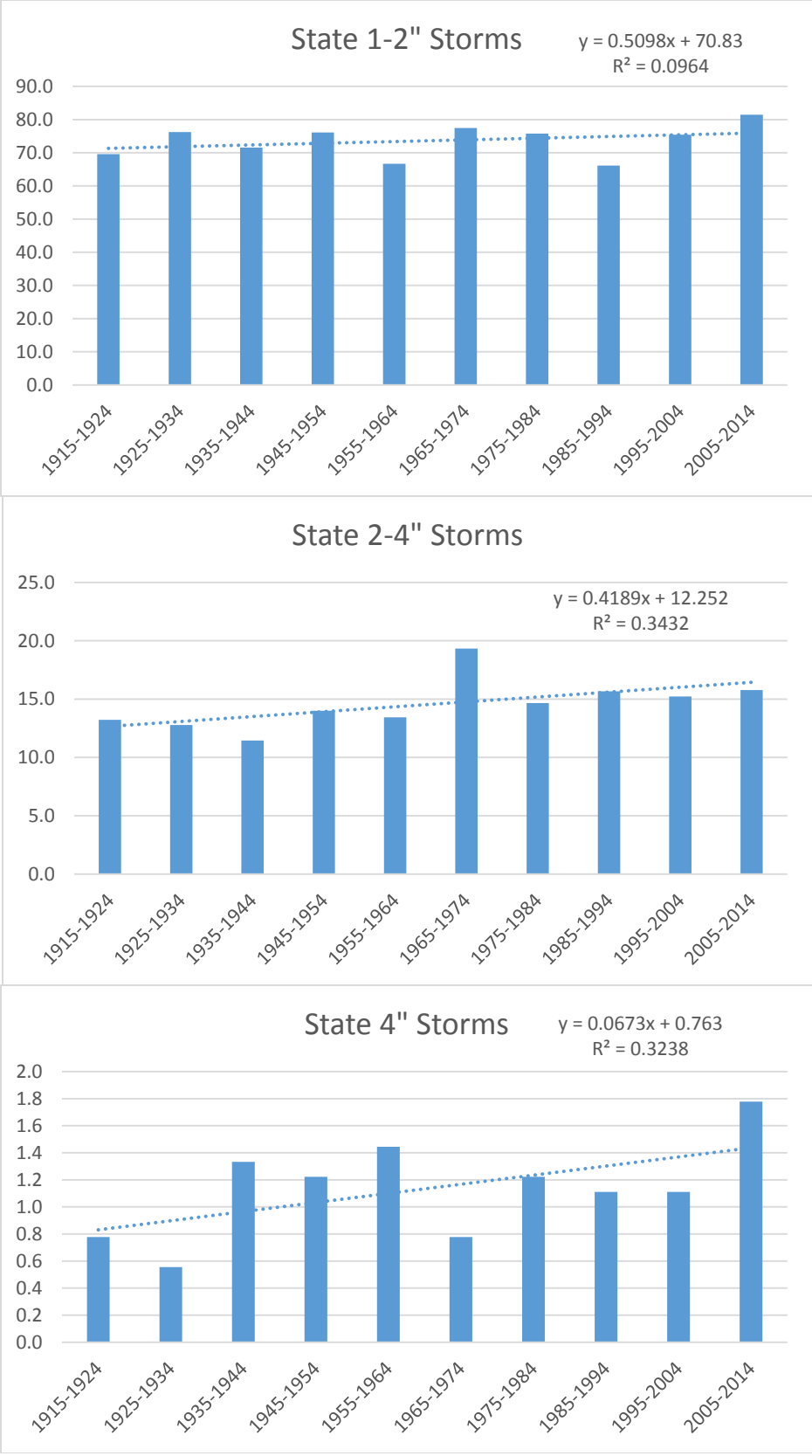


Figure E.3: Trends in major storms for the state of Illinois.

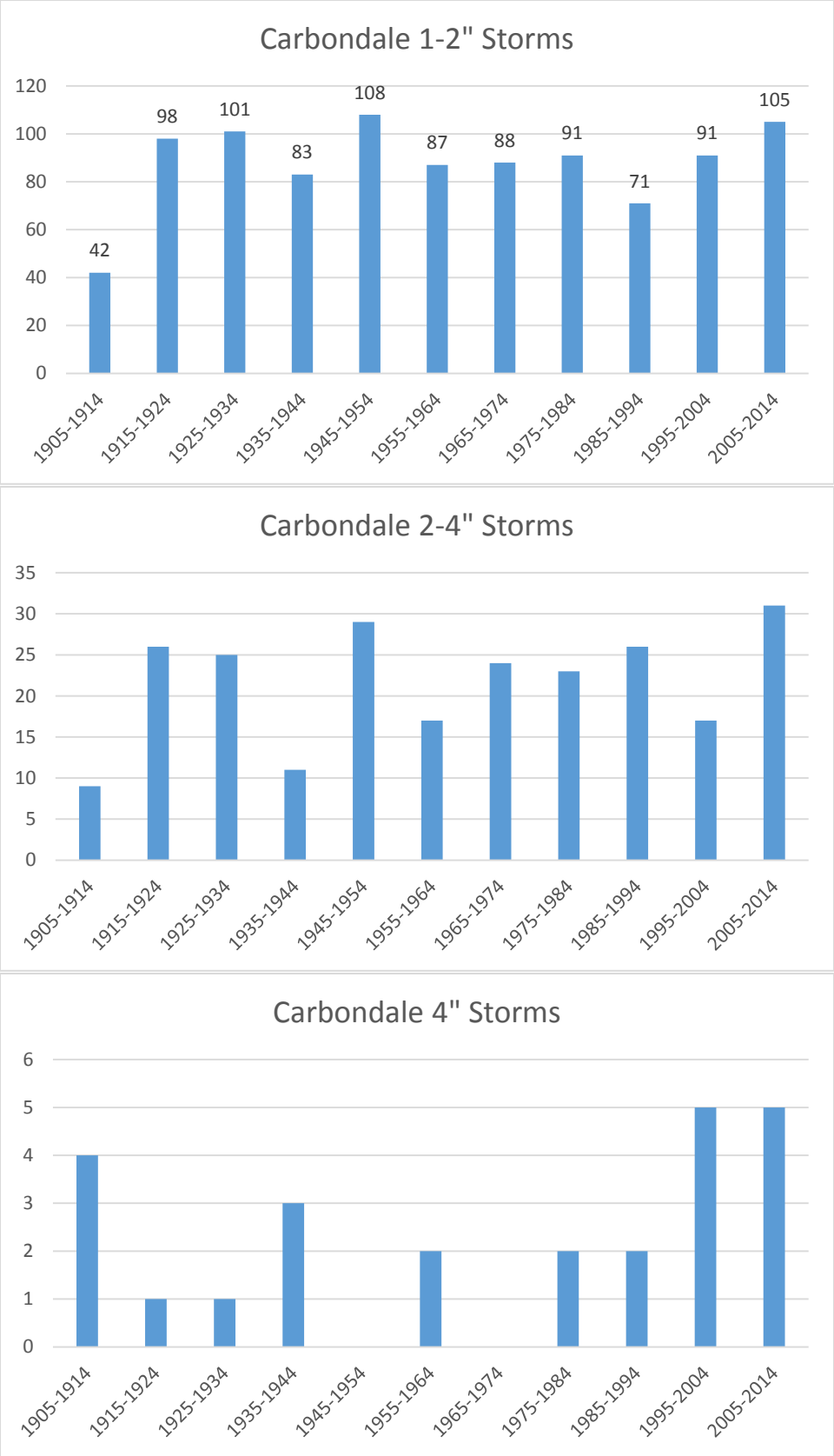


Figure E.4: Trends in major storms for Carbondale.

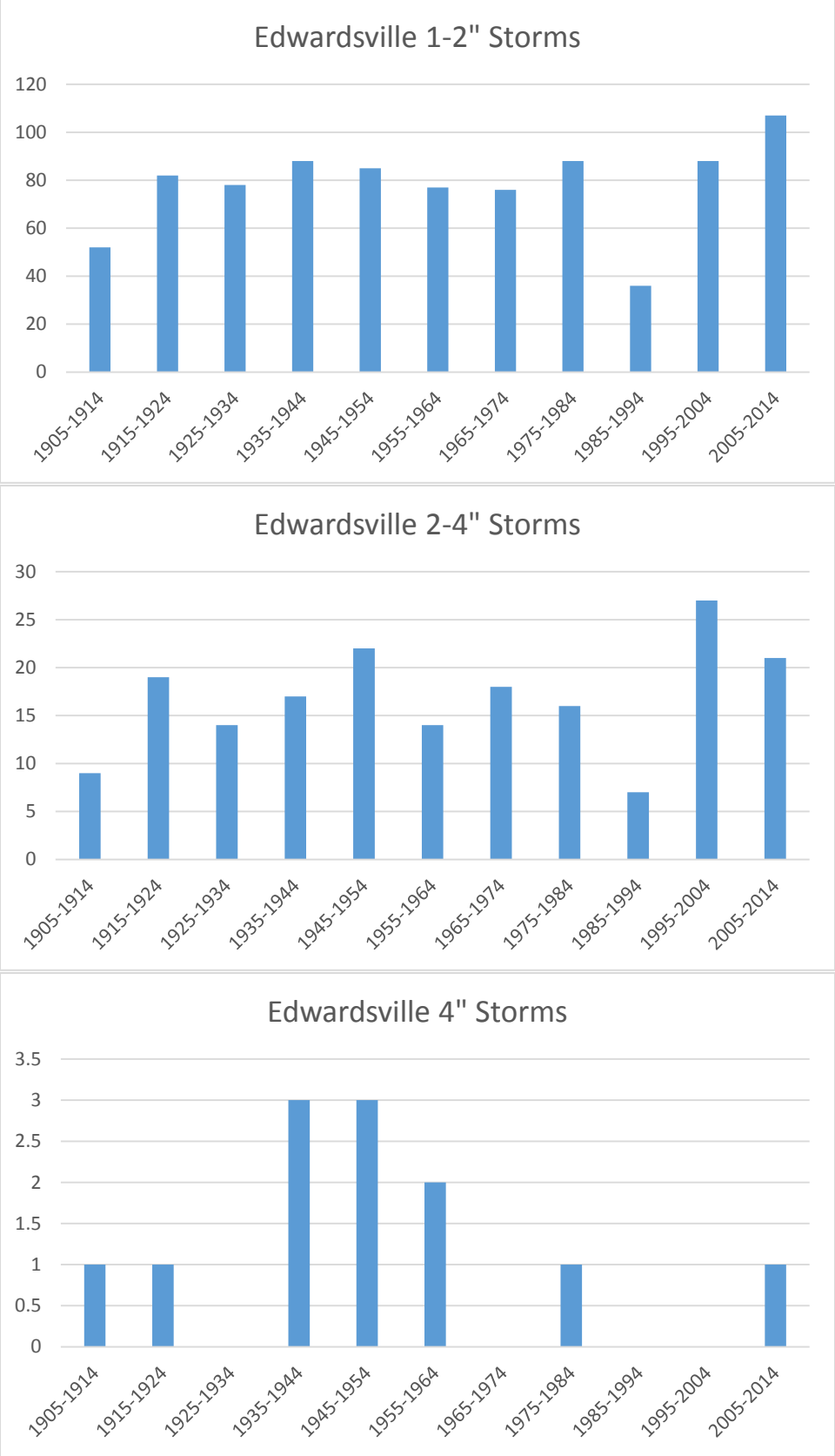


Figure E.5: Trends in major storms for Edwardsville.

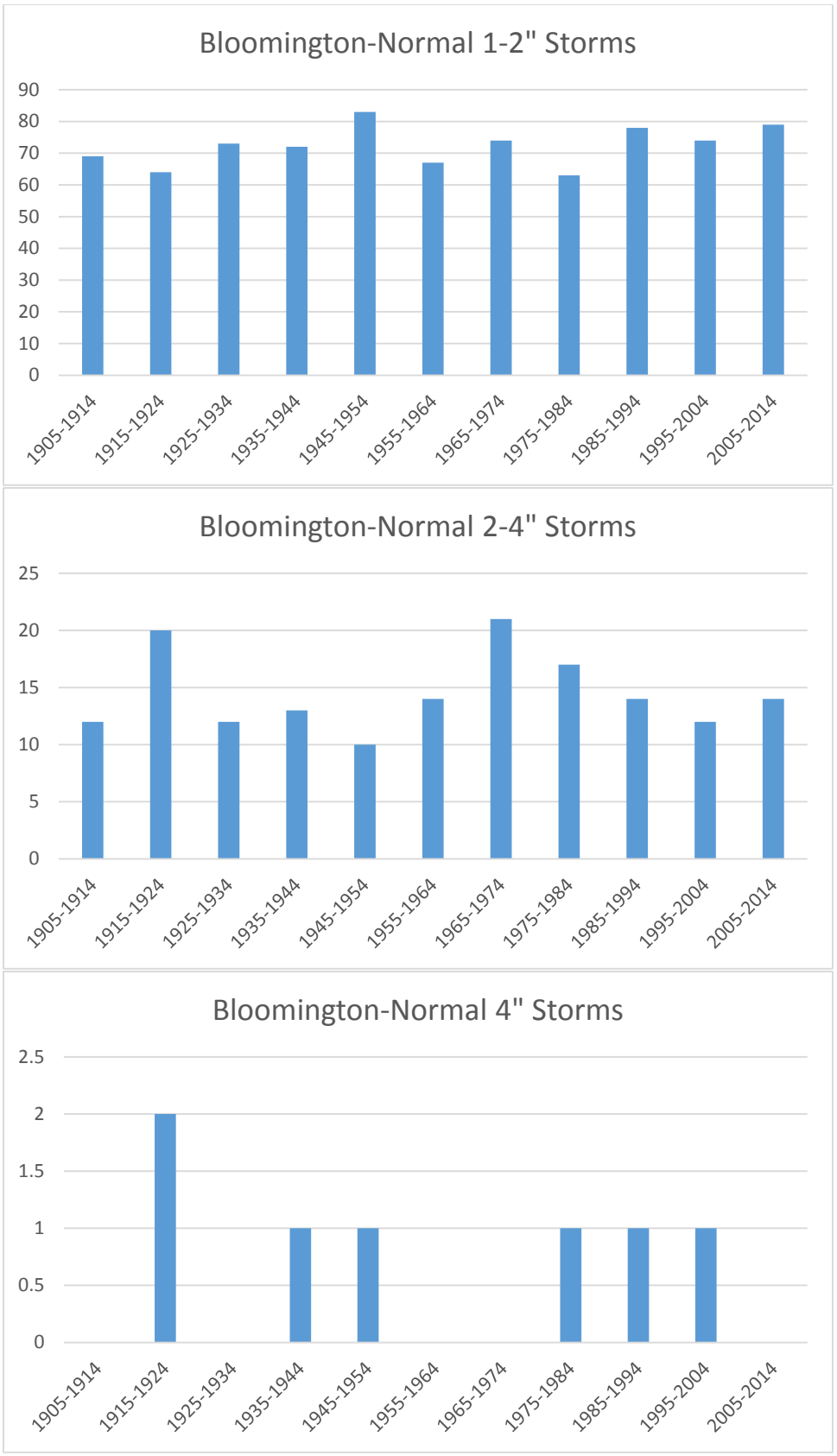


Figure E.6: Trends in major storms for Bloomington-Normal.

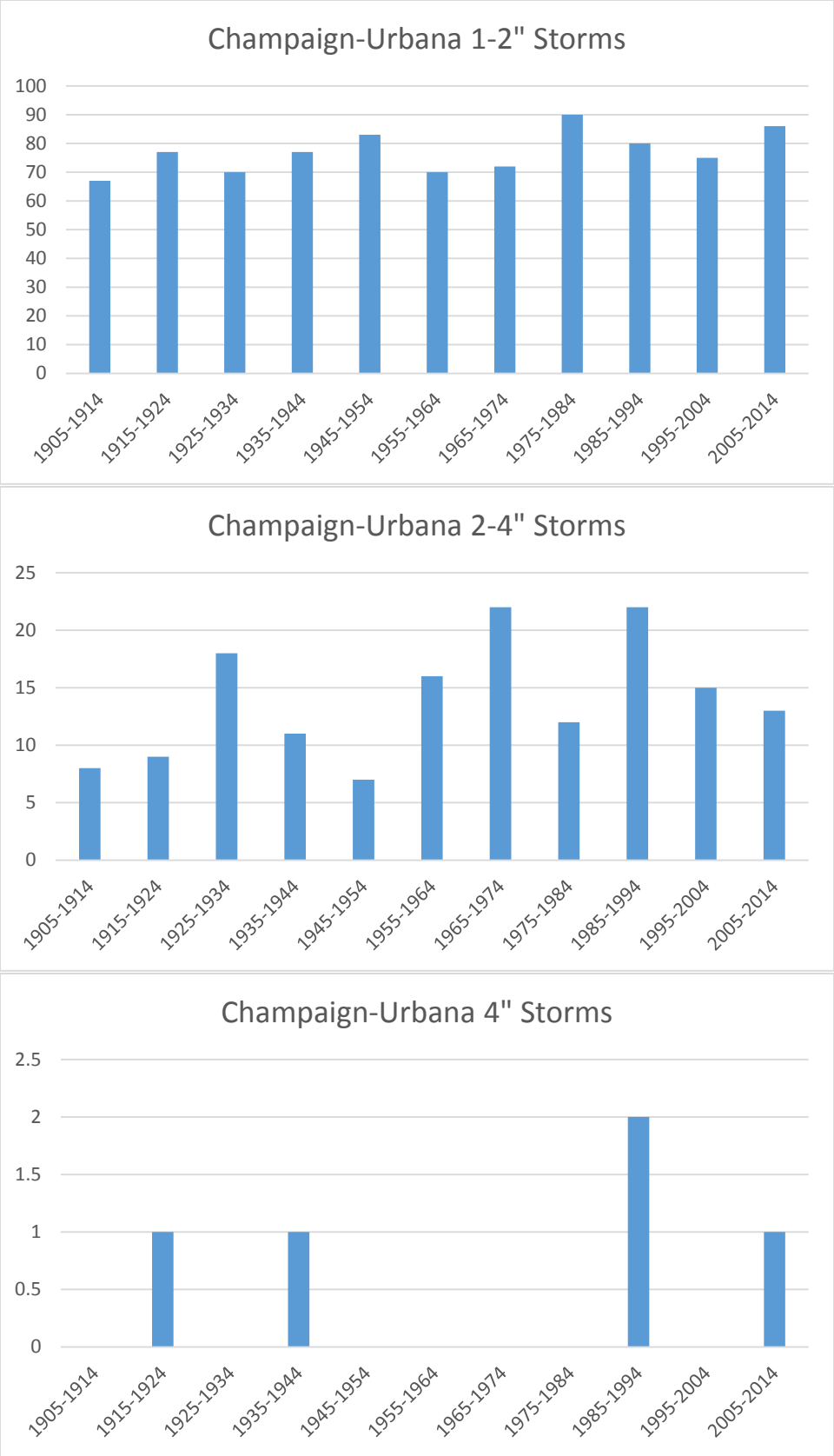


Figure E.7: Trends in major storms for Champaign-Urbana.

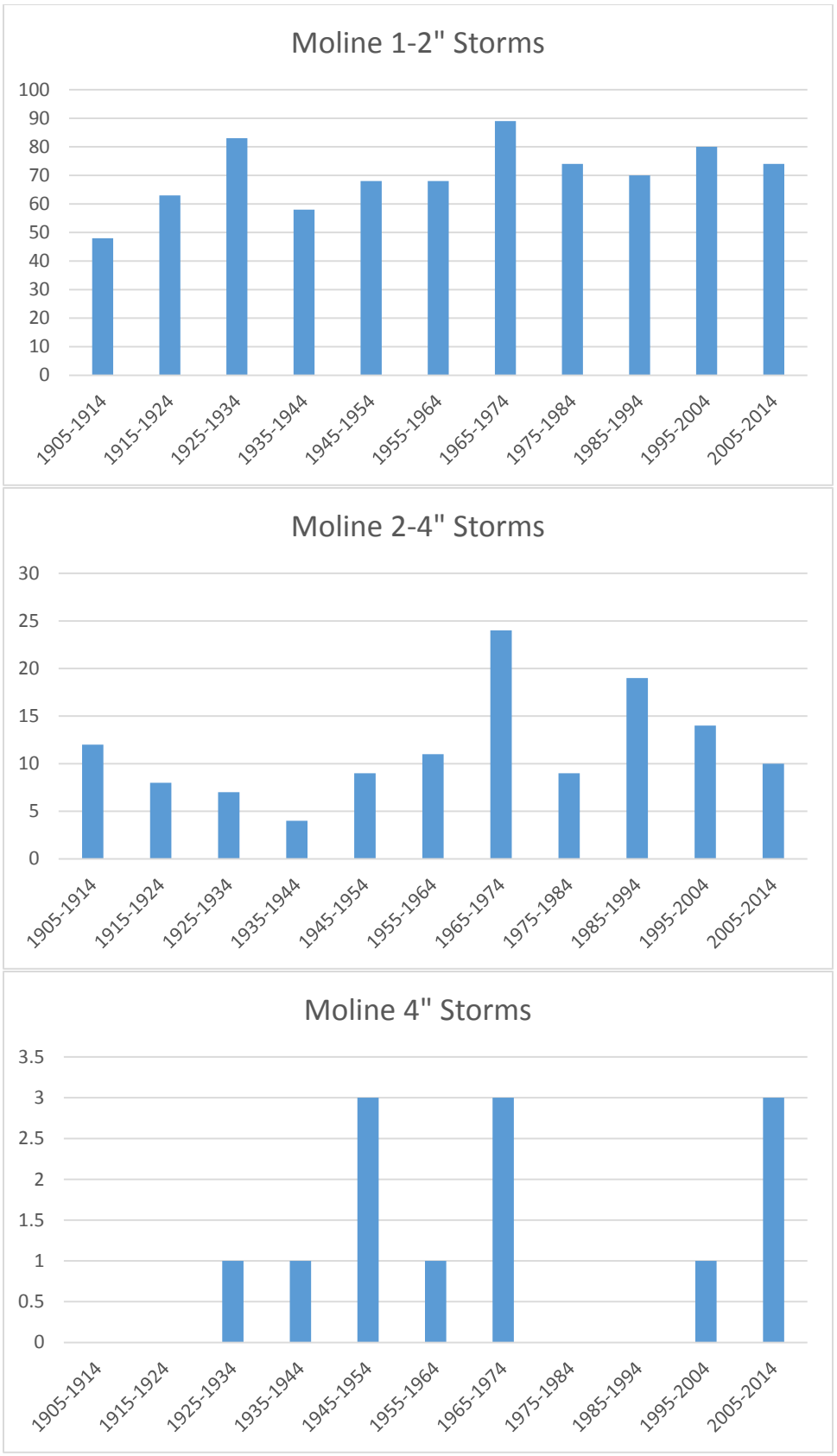


Figure E.8: Trends in major storms for Moline.

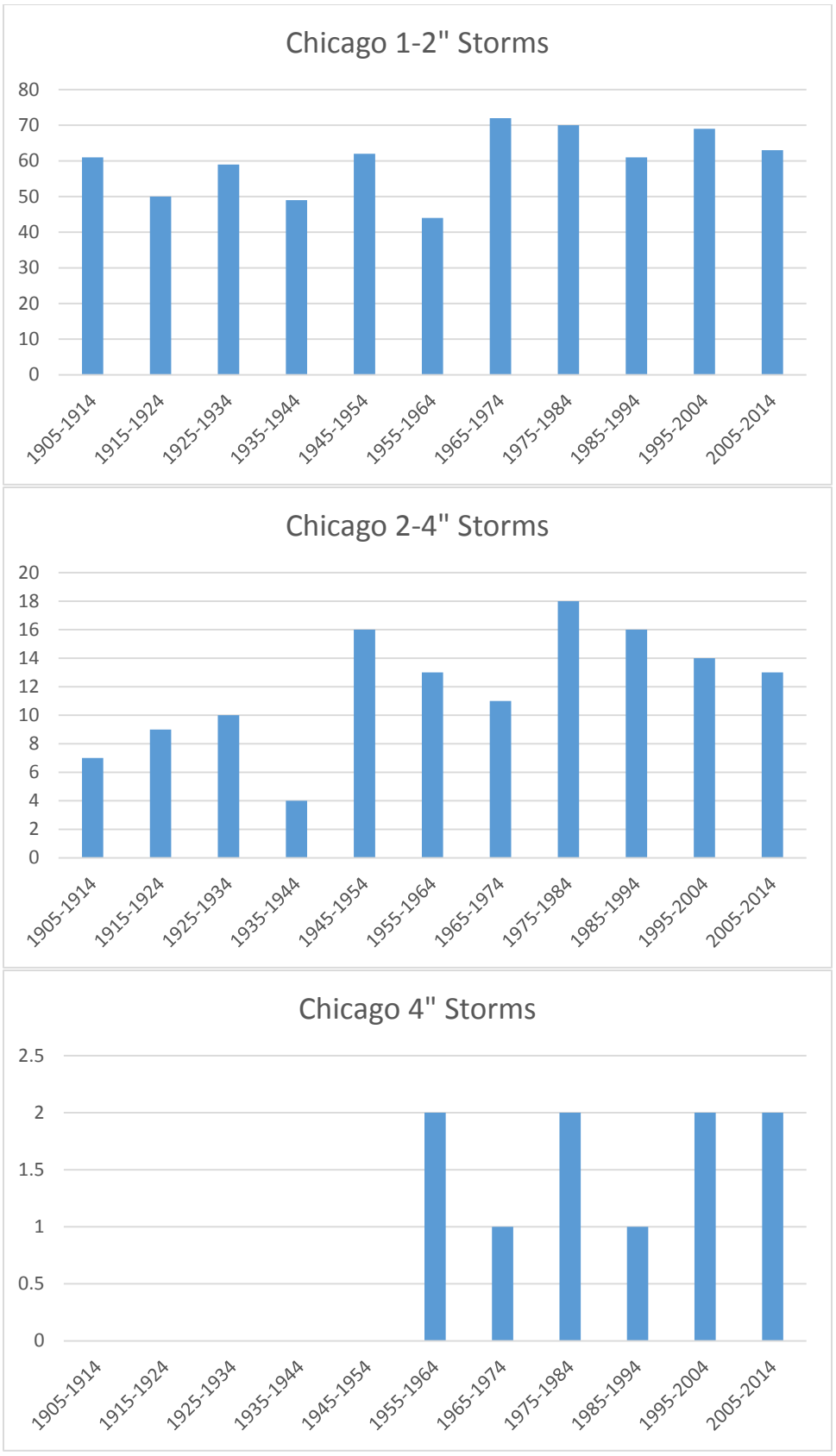


Figure E.9: Trends in major storms for Chicago.

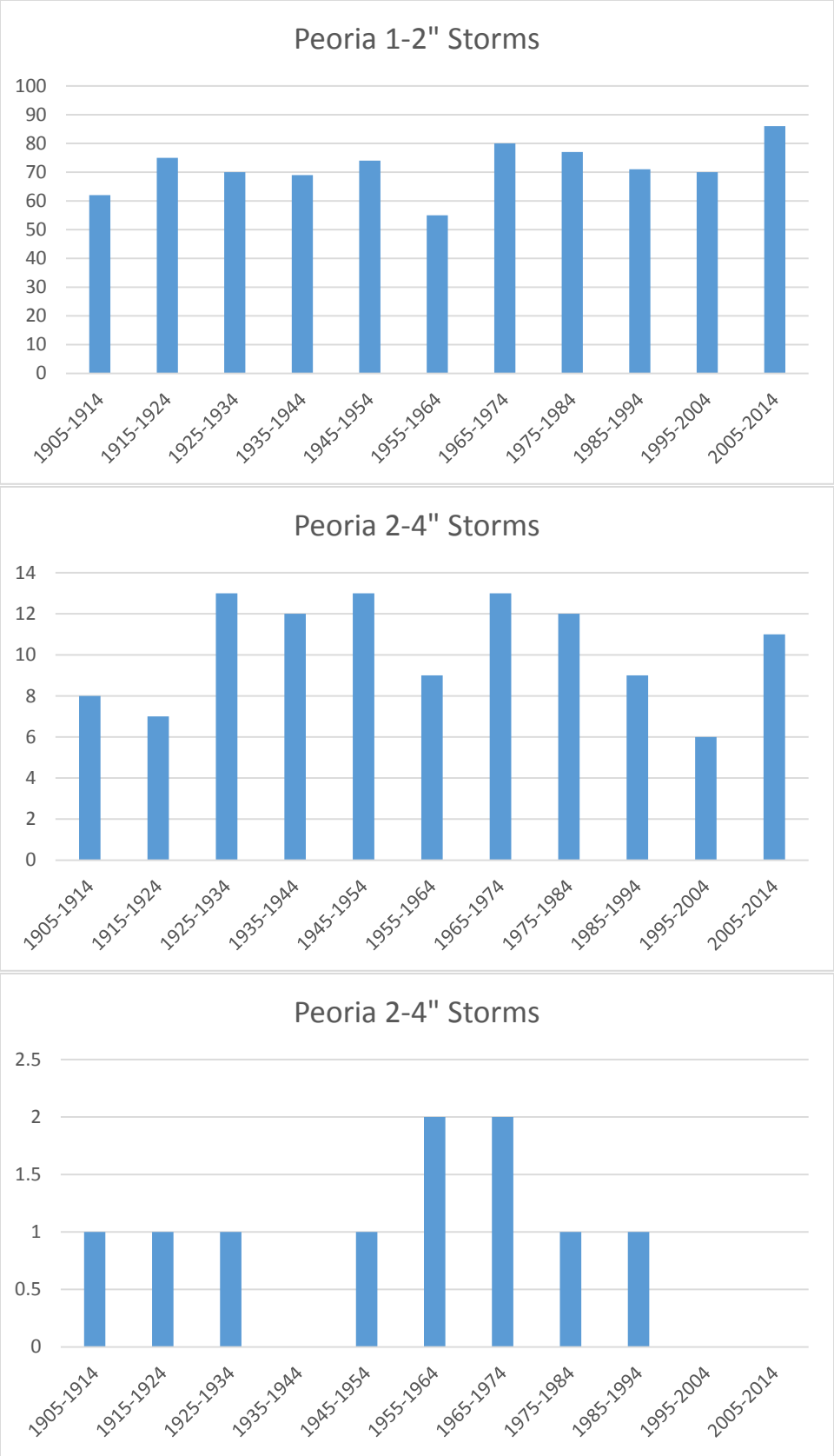


Figure E.10: Trends in major storms for Peoria.

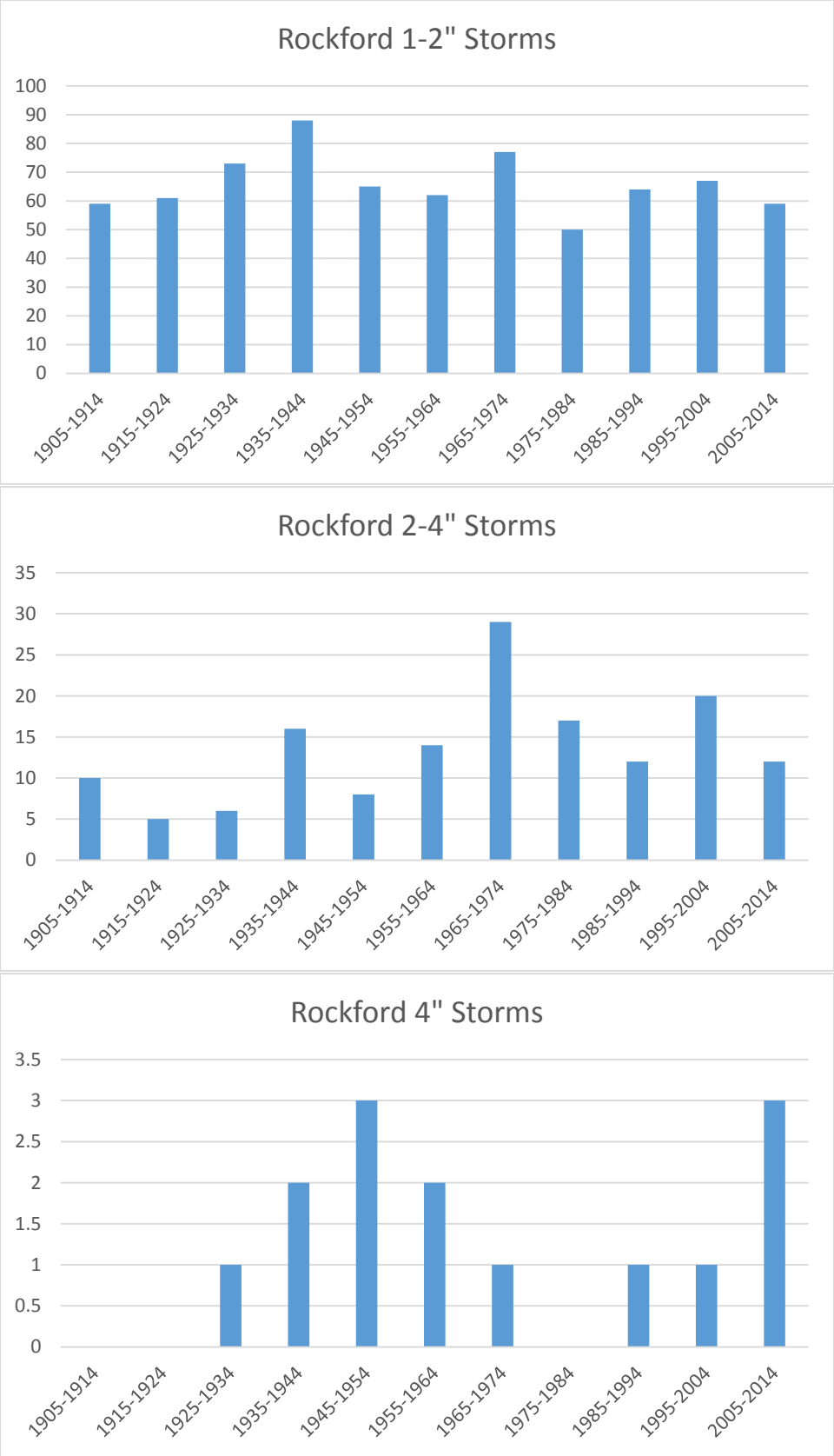


Figure E.11: Trends in major storms for Rockford.

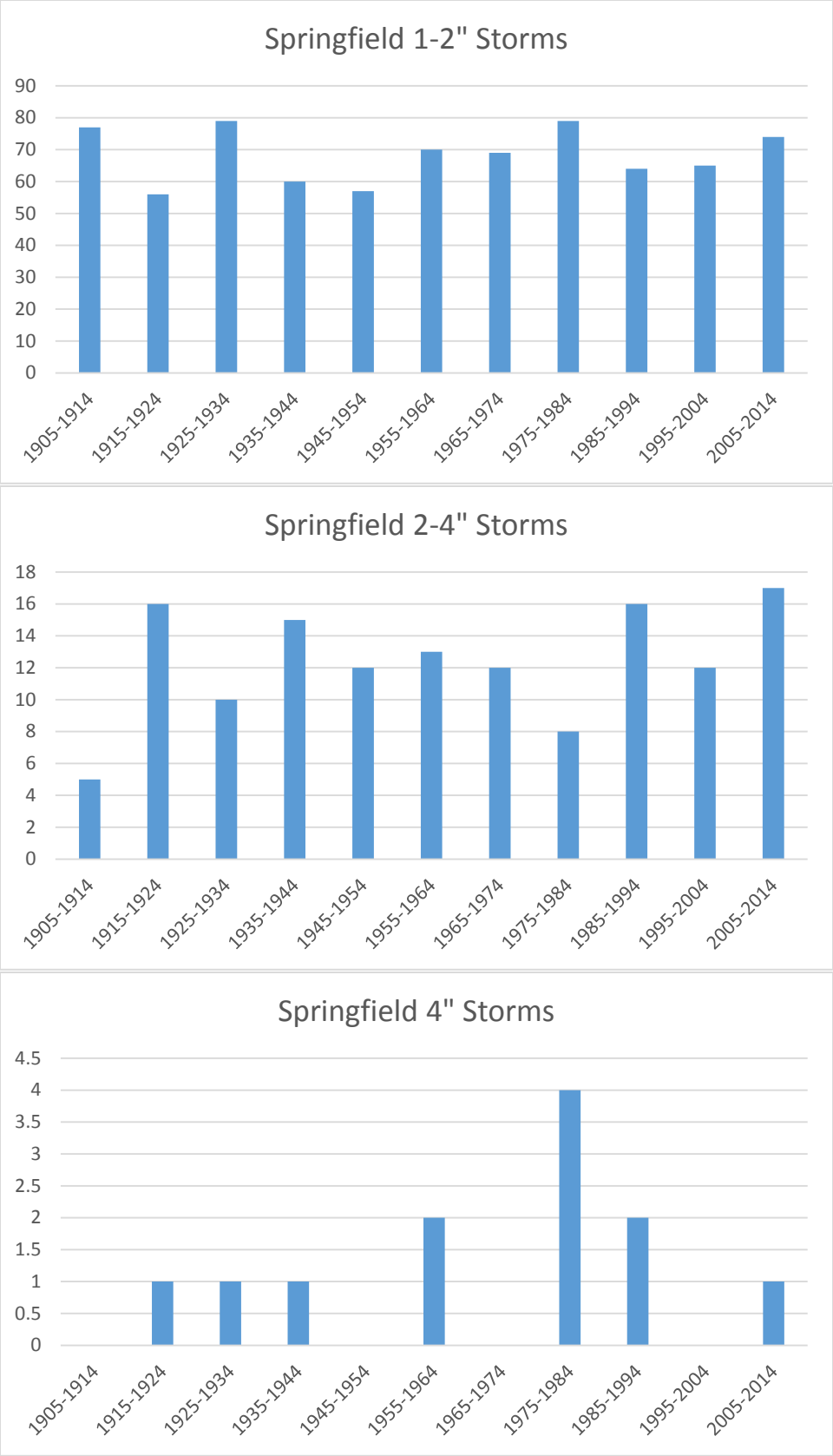


Figure E.12: Trends in major storms in Springfield.

Supporting Evidence for Increased Precipitation and Intense Storms

This pattern of overall wetter conditions and more intense storms has been found in several scientific studies for Illinois and much of the U.S. The latest and most comprehensive study on climate and climate change in the United States is the National Climate Assessment (NCA, 2014) (http://nca2014.globalchange.gov/).

The NCA noted the following: *Since 1900, average annual precipitation over the U.S. has increased by roughly 5%. This increase reflects, in part, the major droughts of the 1930s and 1950s, which made the early half of the record drier. There are important regional differences. For instance, precipitation since 1991 (relative to 1901-1960) increased the most in the Northeast (8%), Midwest (9%), and southern Great Plains (8%), while much of the Southeast and Southwest had a mix of areas of increases and decreases.(source:http://nca2014.globalchange.gov/report/our-changing-climate/precipitation-change#narrative-page-16568*) (seeFigure E.13).

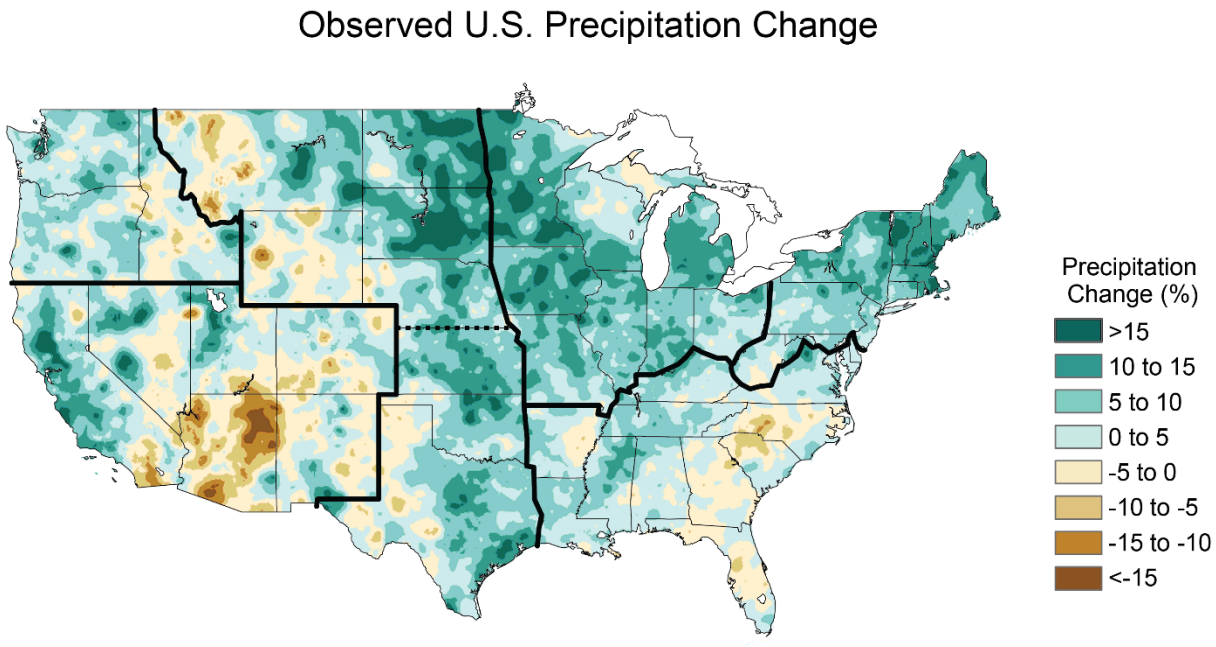


Figure E.13: The colors on the map show annual total precipitation changes for 1991-2012 compared to the 1901-1960 average, and show wetter conditions in most areas. (Figure source: adapted from Peterson et al., 2013).

With regard to heavy precipitation events, the NCA noted the following: *Across most of the United States, the heaviest rainfall events have become heavier and more frequent. The amount of rain falling on the heaviest rain days has also increased over the past few decades. Since 1991, the amount of rain falling in very heavy precipitation events has been significantly above average. This increase has been greatest in the Northeast, Midwest, and upper Great Plains – more than 30% above the 1901-1960 average … There has also been an increase in flooding events in the Midwest and Northeast where the largest increases in heavy rain amounts have occurred. (source:http://nca2014.globalchange.gov/report/our-changing-climate/heavy-downpours-increasing#narrative-page-16569)* (see Figure E.14).

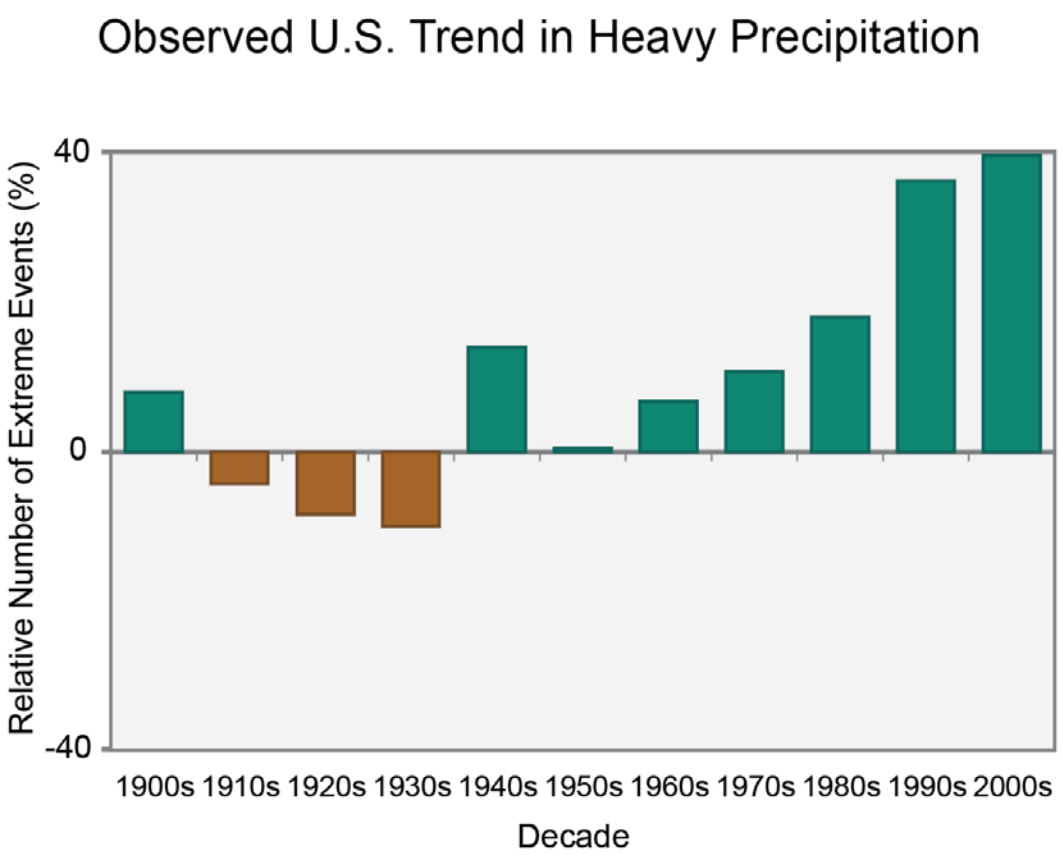


Figure E.14: The colors on the map show annual total precipitation changes for 1991-2012 compared to the 1901-1960 average, and show wetter conditions in most areas. (Figure source: adapted from Peterson et al., 2013).

Another figure on heaviest rainfall events from the NCA report is shown as Figure E.15 in this report. It represents the change in the top 1% storms from 1958 to 2012 across the United States. For the Midwest, these most extreme storms, roughly equivalent to the once in a 100-year storms, have increased by 37 percent since 1958.

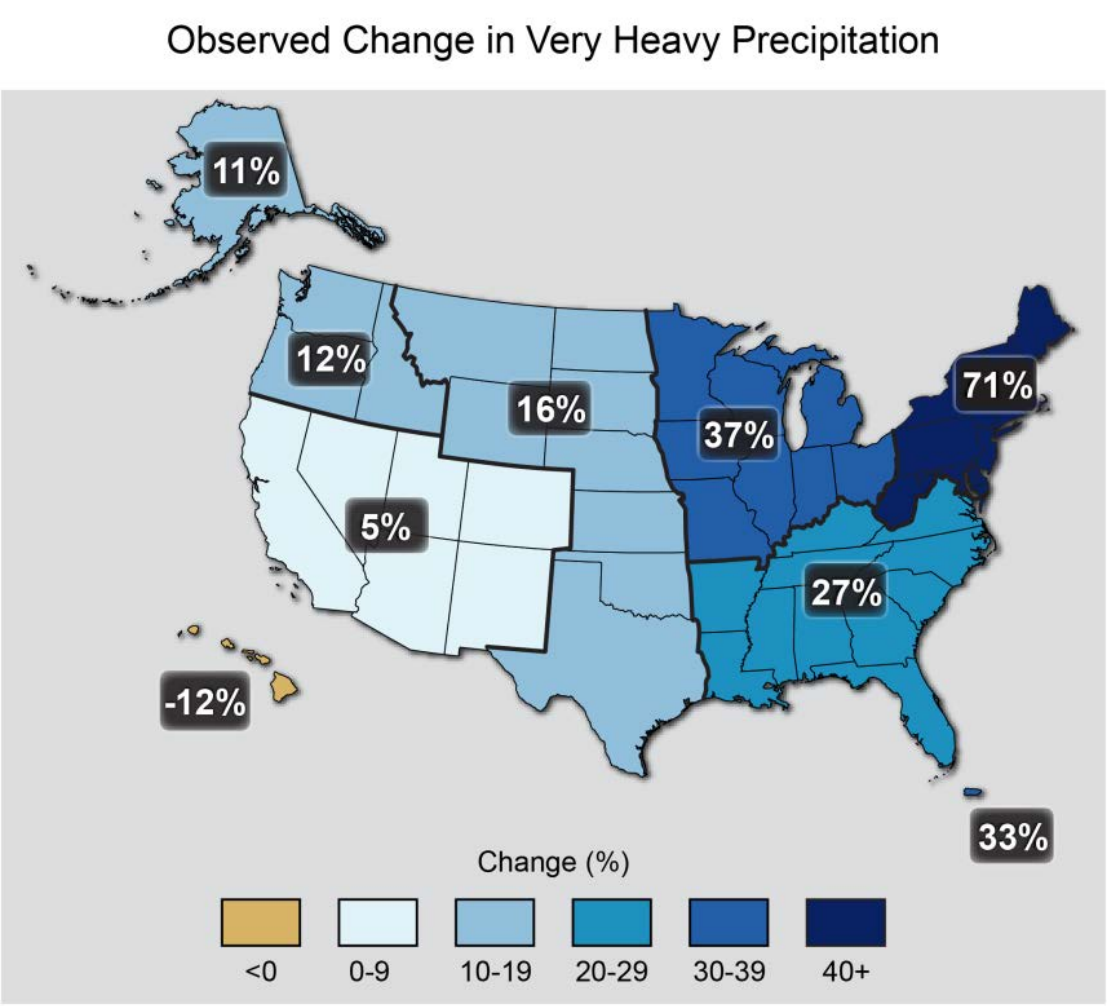


Figure E.15: The map shows percent increases in the amount of precipitation falling in very heavy events (defined as the heaviest 1% of all daily events) from 1958 to 2012 for each region of the continental United States. These trends are larger than natural variations for the Northeast, Midwest, Puerto Rico, Southeast, Great Plains, and Alaska. The trends are not larger than natural variations for the Southwest, Hawai'i, and the Northwest. The changes shown in this figure are calculated from the beginning and end points of the trends for 1958 to 2012. (Figure source: NCA (2014) and updated from Karl et al., 2009).

Discussion on precipitation and heavy rain events

There are a number of factors contributing to more precipitation and more heavy rain events in recent decades. First is that temperatures in the U.S. have warmed by about 1.5 to 1.9 degrees (depending on the calculation used) over the last century. Meanwhile, temperatures in Illinois have warmed by about 1.0 degree over the last century. Warmer air has the ability to hold more water vapor. This ability increases by almost 4% with each degree increase. This means that on average storms have slightly more water available for precipitation. It is also possible that the characteristics of storms are changing as the U.S. gets warmer. For example, a longer warm season increased the opportunity for thunderstorms. Additional work in Illinois suggests that the increasingly intense agricultural practices of the Midwest (more acreage and more plants per acre) have elevated summer humidity levels as well (Chagnon, Sandstrom, & Bentley, 2007).

Another contributing factor is natural variability in precipitation, as is illustrated in analysis of heavy storms in Illinois cities– some areas of the state are just stormier than others.

There are several lines of evidence suggesting that the current patterns will continue in the future. The first line of evidence is that past studies in Illinois and elsewhere have suggested that the most recent 5 to 15 years are the best predictor of conditions for the next 1 to 5 years (Easterling, Angel, & Kirsch, 1990). So this suggests that the current wetter and more intense conditions will likely continue in the short term.

The U.S. Global Change Research Program (USGCRP), which was established by presidential Initiative in 1989 and mandated by congress in the Global Change Research Act of 1990 to "assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change," has prepared the National Climate Assessment indicating that temperatures in the U.S. and Midwest will increase over the next century. The magnitude of this increase is closely tied to the amount of future emissions of heat-trapping gases. One of the higher emission scenarios results in mid-century temperature increases of 3.8 to 4.6 degrees across Illinois (Figure E.16). Over the years, a variety of models and scenarios have all resulted in some degree of warming over the next century. As mentioned earlier, warmer air is able to hold more water vapor at the rate of almost 4% per degree increase. This line of evidence suggests that future storms will produce more precipitation and more intense storms as the U.S. and Illinois warms.

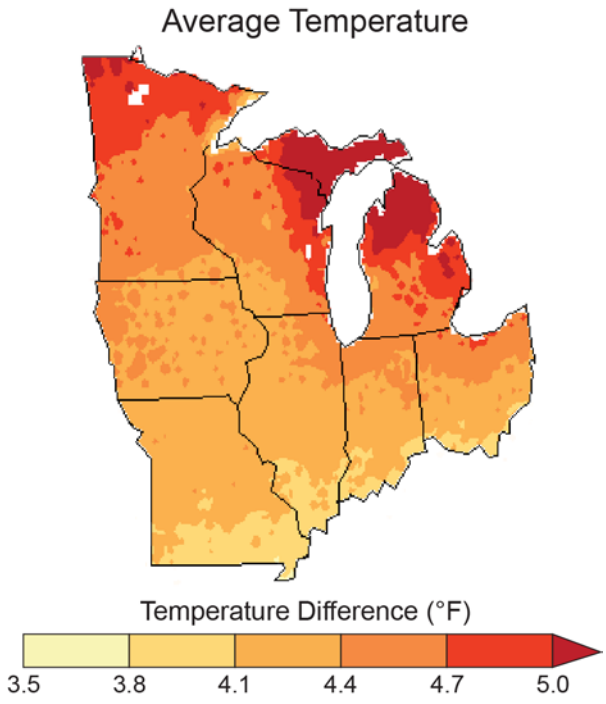


Figure E.16: Possible increases in the temperature from the 1971-2000 base period to the period 2041-2070 based on the A2 high-emission scenario. Source: NCA (2014).

The final line of evidence is based directly on the possible future changes in precipitation found in global and regional climate models. It is important to note that model projections of future precipitation patterns are less certain than temperature. As noted earlier, while the models have consistently shown warming over the next century, some models indicate that conditions will get wetter while others indicate conditions will get drier across the Midwest. The NCA report based on the most recent research indicates that the Midwest is expected to be wetter by the 2041-2070 timeframe (Figure E.17). Overall, the Midwest is expected to be wetter in winter and spring and less so in fall while summers could be drier. The NCA report indicates that the Midwest is expected to experience more heavy rain events in the future (Figure E.18).

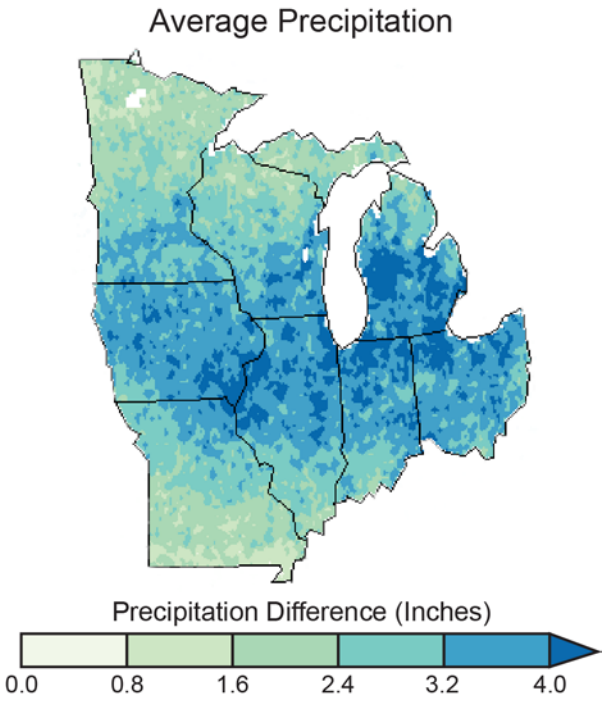


Figure E.17: Possible increased in precipitation from the 1971-2000 base period to the period 2041-2070 based on the A2 high emission scenario. Source: NCA(2014).

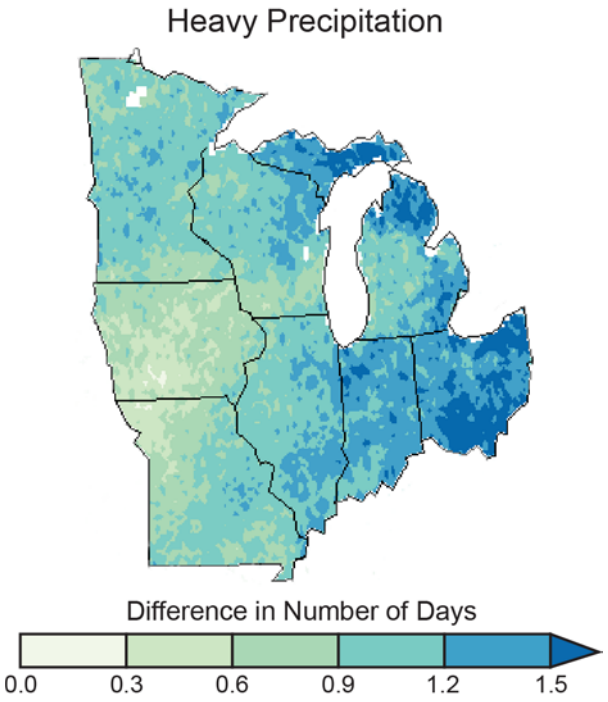


Figure E.18: Possible increases in the heaviest 2 percent storms from the 1971-2000 base period to the period 2041-2070 based on the A2 high emission scenario. Source NCA (2014).

Climate Change Considerations

The average Earth surface temperatures increased by 0.83 °C (1.5 °F) from 1880 to the present (IPCC, 2013). Many scientists attribute global warming to human-induced increase in concentrations of greenhouse gasses. According to the U.S. National Climate Assessment (NCA, 2014) "many lines of independent evidence demonstrate that the rapid warming of the past half-century is due primarily to human activities." The NCA Assessment also points to the accumulating evidence of human-induced climate change which further expands our understanding of the observed trends in climate variables.

Traditionally, infrastructure design concepts relied on the assumption that past events can be used to predict future events. Statistical analyses of precipitation and discharge data are used to estimate the magnitude of precipitation or streamflow likely to occur within a time period, such as once in ten years, or once in 100 years on average. No change in the frequency of extremes over time was considered in manuals used by engineers, climate scientists and hydrologists (Perica et al. 2013, Bulletin 17B, Soong et al 2004). However, numerous publications indicate that the frequency of extremes has been changing and is likely to continue changing in the future (Milly et al. 2008; IPCC 2007). Due to the changing (nonstationary) nature of precipitation and flood extremes we can no longer rely on analyses of past data to estimate future events. Thus, to estimate the magnitudes and frequencies of future events, it is necessary to account for the nonstationary nature of precipitation and flooding.

Climate models are a primary tool used in climate projections to study the effects of increasing concentrations of greenhouse gasses. Global climate models (GCMs) simulate interactions of the atmosphere, oceans, land surface and ice, and project future climates for various scenarios. Recent analyses (NCA, 2014) indicated that climate models have become more comprehensive and that the earlier predictions have been confirmed. Despite the continuous improvements of these models, the GCM output is averaged over large areas and is not suitable for flood studies. The typical GCM output grid-cell size is approximately 50×70 miles in Illinois. Given that coarse GCMs poorly represent local-scale precipitation, methods have been devised to translate the data to smaller areas. This is called spatial downscaling. There are different techniques that can be applied in spatial downscaling and also to downscale the time increments of the GCM climate data to smaller time increments, making them more usable in flood studies. However, the process and techniques for spatial and temporal downscaling are still evolving.

Decision-making under uncertainty can be particularly challenging. The projected climatic variables, such as temperature and precipitation, are very uncertain. Figure E.19 shows the projected global temperature change based on two Intergovernmental Panel on Climate Change (IPCC) climate scenarios: A2 which assumes continued increases in emissions throughout this century, and B1, which assumes significant emissions reductions. Because of uncertainties in average temperature and precipitation, the projected changes in their extremes are even more uncertain, making it very difficult to predict future flooding.

Nonetheless, some studies (Mills 2005) have offered evidence of the direct and significant effects of climate change on increased flooding. Seneviratne et al. (2012) suggest that flood characteristics have changed over time, but the causes and patterns of these changes are complex and regionally

dependent. Thus, these changes should be studied separately for different regions. NCA (2014) states "Increases in the frequency and intensity of extreme precipitation events are projected for all U.S. regions." Furthermore, the same source indicates that the large observed increases of heavy downpours in the Midwest are among the largest in the U.S. As a result of a direct link of urban flooding and heavy precipitation, it is expected that urban flooding will also increase (NCA, 2014), particularly in urban areas in the Midwest.

While projections of flood frequency are uncertain, including data, sampling variability, modeling, and scenario uncertainties, there is an increasing need to incorporate uncertain scientific information of varying confidence levels into flood frequency estimates. Numerous attempts to quantify these sources of uncertainty have been published using multi-model (ensemble) analysis (Christiansen et al. 2010, Smith et al. 2014). These studies can be used not only for determining the expected magnitudes of projected precipitation and floods, but they also offer tools for determining the uncertainty in these projections, typically expressed through the confidence limits around the projected rainfall or flood magnitudes. The confidence limits are of critical importance for making decisions in uncertain environments.

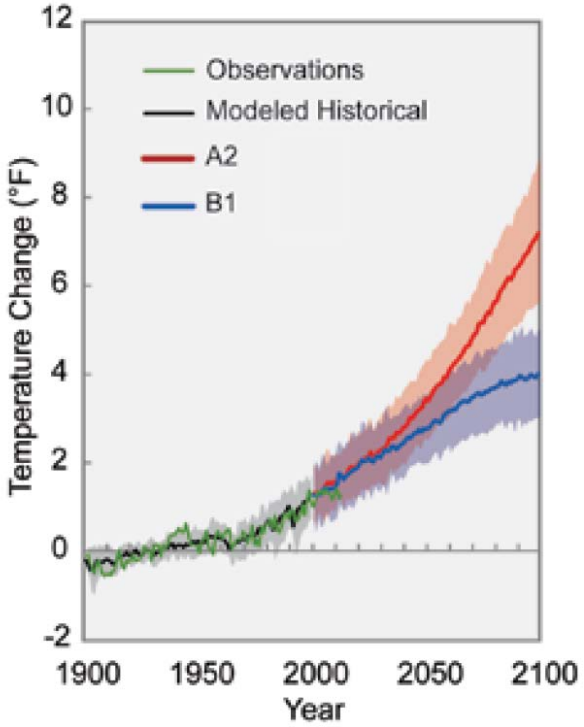


Figure E.19: Projected global temperature change showing two scenarios: A2 which assumes continued increases in emissions throughout this century, and B1, which assumes significant emissions reductions. Shading indicates the range (5th to 95th percentile) of results. (NCA, 2014).

References

Changnon, D. M., Sandstrom, M. & Bentley, M. (2007). Midwestern high dew point events 1960-2000. *Physical Geography, 27,* 494-504.

Christensen, J.H., Kjellström, E., Giorgi, F., Lenderink, G. & Rummukainen, M. (2010) *Weight assignment in regional climate models*. Clim Res 44:179-194.

Easterling, W. E., Angel, J. R. & Kirsch, S. A. (1990). The appropriate use of climatic information in Illinois natural-gas utility weather normalization techniques. Illinois State Water Survey, Report of Investigation 112.

Groisman, P. Y., Knight, R. W. & Karl, T. R. (2012). Changes in intense precipitation over the central United States. *Journal of Hydrometeorology, 13,* 47-66.

Intergovernmental Panel on Climate Change (IPCC). (2007). *Climate change 2007*. Synthesis report. A contribution of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press.

IPCC. (2013). The physical Science basis. Contribution of working group I to the fifth assessment report of the intergovernmental panel on climate change. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press. doi: 10.1017/CB09781107415324

Mills, E. (2005). Insurance in a climate of change. *Science* 309(5737):1040-44, doi:10.1126/science. 1112121, LBNL-57943. Retrieved from http://www.sciencemag.org/cgi/content/full/ 309/5737/1040

Milly, P.C.D., Betancourt, J., Falkenmark, M., Hirsch, R.M., Kundzewicz, Z.W., Lettenmaier, D.P. & Stouffer, R.J. (2008). Stationarity is dead: Whither water management? *Science* 319:573-574.

National Climate Assessement (NCA). Melillo, J. M., Richmond, T.C. & Yohe, G. W. (Eds.). (2014) *Climate change impacts in the United States: The third national climate assessment*. U.S. Global Change Research Program. doi:10.7930/ J0Z31WJ2. http://www.globalchange.gov/

Perica, S., Martin, D., Pavlovic, S. Roy, I., St. Laurent, M. Trypaluk, C. Unruh, D. Yekta, M. Bonnin, G. (2013) *National Oceanic Atmospheric Administration Atlas 14: precipitation-frequency atlas for the United States,* Volume 8 Version 2.0: Midwestern States, U.S. Department of Commerce, NOAA, NWS, Silver Spring, MD.

Peterson, T. C. et al. (2013). *Monitoring and understanding changes in heat waves, cold waves, floods, and droughts in the United States: state of knowledge*. Bull. Amer. Meteor. Soc. 94, 821-834.

Smith, L. A., Du, H., Suckling, E. B., & Niehörster, F. (2014). Probabilistic skill in ensemble seasonal forecasts. *Quarterly Journal of the Royal Meteorological Society*. doi:10.1002/qj.2403.

Soong, D. T., Ishii, A. L., Sharpe, J. B. & Avery, C. F. (2004). *Estimating flood-peak discharge magnitudes and frequencies for rural streams in Illinois*. Scientific Investigations Report 2004-5103. U.S. Geological Survey, Reston, Virginia.

U.S. Geological Survey (USGS). (1982*). Guidelines for determining flood flow frequency, Bulletin 17B*. Reston, Virginia.

Appendix F: Technology and Data for Identification of Urban Flooding Potential

Background

Geographic Information Systems (GIS) is a dynamic computerized data system designed to interpolate, analyze, manage, store, and present geographical and spatial information. GIS data that can be applied in the analyses of urban flooding include soils data, topography, land cover and density of urban development, topological wetness index, census data, historical rainfall data, existing infrastructure design, plans, and functionality, and documented flooding problems or flooding.

Hydrologic and hydraulic models, storm sewer assessment models and others similar tools use various data to evaluate flooding potential and design and evaluate stormwater infrastructure. Individual homeowners can also utilize some data to identify flooding issues and corrective actions on their property.

The follow sections provide an overview and examples of technologies and data sources that can be used to evaluate the risk of urban flooding.

Census Data Analysis

United States Census Bureau compiles the most current census, economic, and governmental boundary data in GIS format in their Topologically Integrated Geographic Encoding and Referencing (TIGER) product and makes it available to the general public (USCB, 2014). The 2014 TIGER dataset includes demographic information from the 2010 census and economic data from 2012.

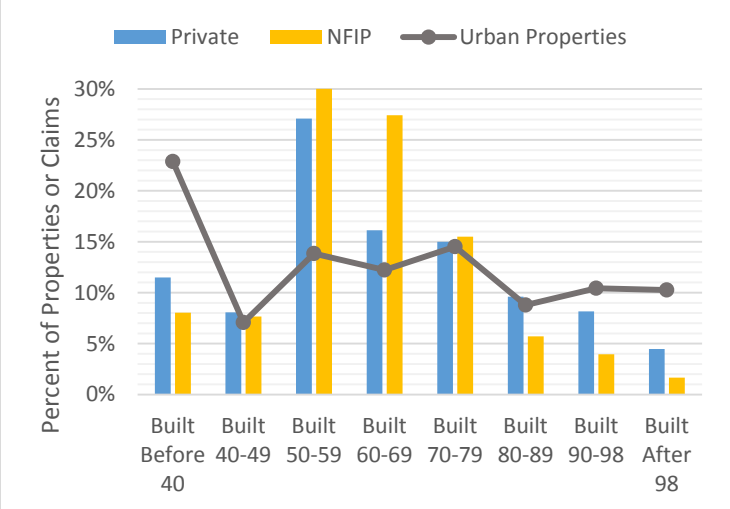


Figure F.1: Percentage of private and NFIP claims and urban properties with regards to the decade in which the corresponding properties were built.

The TIGER data provides insight into the socioeconomic demographics of the urban landscape. For example, TIGER products can be used in combination with historical flood data, insurance claims data, or public polling to determine the impacts of urban flooding in a community with regard to age, gender, race, median household income, household development, or population density.

An example of the use of TIGER products is provided in Figure F.1, where the percentage of private and NFIP claims and urban properties are plotted with regard to the decade in which the corresponding properties were built. Such information can be used in combination with locally specific information to determine the probable causes or locations of urban flooding in a community. TIGER products were used for this report to define and delineate urban areas

in Illinois and determine the demographic and economic makeup of Illinois urban areas. The economic distribution of insurance claims was also derived in part from TIGER products and can be found in Chapter 1 and Appendix D: Prevalence and Cost.

Topographic Data/LiDAR

Large scale topographic information is typically developed from light detection and ranging (LiDAR) data, which can be used to observe drainage patterns on the landscape (Figure F.2). LiDAR is a remote sensing technology that emits and captures light off the earth surface to generate a highly accurate 3-dimensional representation of the earth's surface characteristics. These captured characteristics include topography, infrastructure, and biomass data. Airplanes and helicopters are the most commonly used platforms for acquiring LiDAR data over broad areas. Low lying areas can have an increased risk of urban flooding due to limited overland flow paths and susceptibility to ponding.

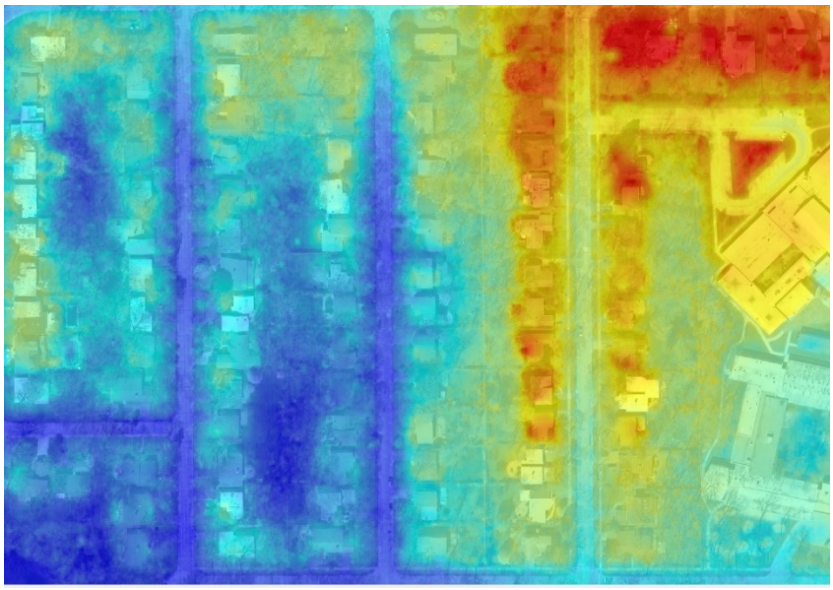


Figure F.2: LiDAR topography displaying low lying areas (blue) that are susceptible to increased runoff and ponding. An orthophoto of an urban area that is susceptible to urban flooding has been overlaid on a Digital Elevation Model (DEM), a topographic LiDAR derivative.

LiDAR may also be utilized in the development of hydrologic and hydraulic models when producing engineering design plans and creating topographic wetness indices (see discussion of Topographic Wetness Index in this section).

Digital Floodplain Mapping

FEMA initiated the Flood Map Modernization Program (FMMP) in 2003. The goal of the national FMMP was to update paper Flood Insurance Rate Maps (FIRM) flood hazard data and mapping to create accurate Digital Flood Insurance Rate Map (DFIRM) products to improve floodplain management. In 2010 FEMA initiated the Risk Mapping, Assessment, and Planning (Risk MAP) program to improve upon flood hazard data and mapping at a local and state wide level.

In Illinois 72 counties currently have an effective DFIRM, 6 counties have digital preliminary maps, and 21 counties are still without digital data (Figure F.3). The digital data developed during these ongoing initiatives can be viewed through the National Flood Hazard Layer (NFHL). The NFHL can be accessed and downloaded through the FEMA Map Service Center.

Urban flooding, which may not be directly attributed to riverine flooding, can and does occur within developed urban floodplains. Floodplain extent, in conjunction with soils, land cover, and existing infrastructure data, help to determine this urban flooding risk.

For example, floodplain data, land cover data, and flood insurance claims data were used to determine the prevalence of urban flooding in relation to riverine floodplains in urban areas of Illinois.

Land Cover Data

The National Land Cover Database (NLCD) is a nationwide, satellite-based, 30-meter resolution, land cover dataset. NLCD provides spatial reference and descriptive data for characteristics of the land surface such as urban, agriculture, grassland, and forest and is accessible through the Multi-Resolution Land Characteristics Consortium (Jin et al., 2013). The Multi-Resolution Land Characteristics Consortium (MRLC) has collected and categorized land cover datasets to 1992, 2001, 2006, and 2011.

With regard to urban flooding, this dataset can be utilized to determine urbanization rates, the prominence of land cover types within urban areas, and any correlation to insurance claims or documented locations of repeated flood damages. The land cover dataset could also be utilized for the development of hydrologic and hydraulic model development.

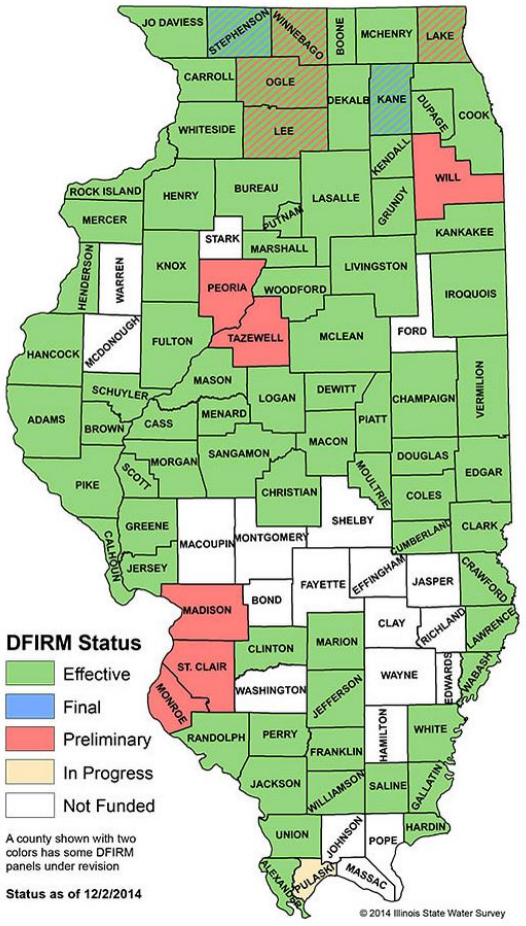


Figure F.3: Illinois DFIRM Status: In Illinois 72 counties currently have an effective DFIRM, 6 counties have digital preliminary maps, and 21 counties are still without digital data.

The population increase in Illinois over the course of the past two decades has resulted in a corresponding increase in urban areas. Urban development activities such as removing vegetation and soil, grading the land surface, and constructing drainage networks all increase runoff which, with the associated decrease in natural areas to absorb these impacts, exacerbates urban flooding problems.

This expansion of the urbanizing areas can be seen in more detail in Figure F.4. This figure displays the land cover change within the urban areas as defined in this report) from 1992-2011. This delineated urban land area is 7.4% (4,170.45 sq. mi. out of 56,349.74 sq. mi.) of the total land area in Illinois. In 1992, within current urban areas there were 1,815 sq. mi. of land cover classified as developed urban and 2,354 sq. mi. classified as undeveloped (forest, agriculture, et cetera). . In 2011, within the current urban area, there were 3,237.7 sq. mi. of developed urban land cover and 931.4 sq. mi. of undeveloped land cover, a 79.8% increase in developed area. Agricultural fields, wetlands, and forested areas decreased. The total depressional water storage areas and potential riverine areas decreased 14.42%.

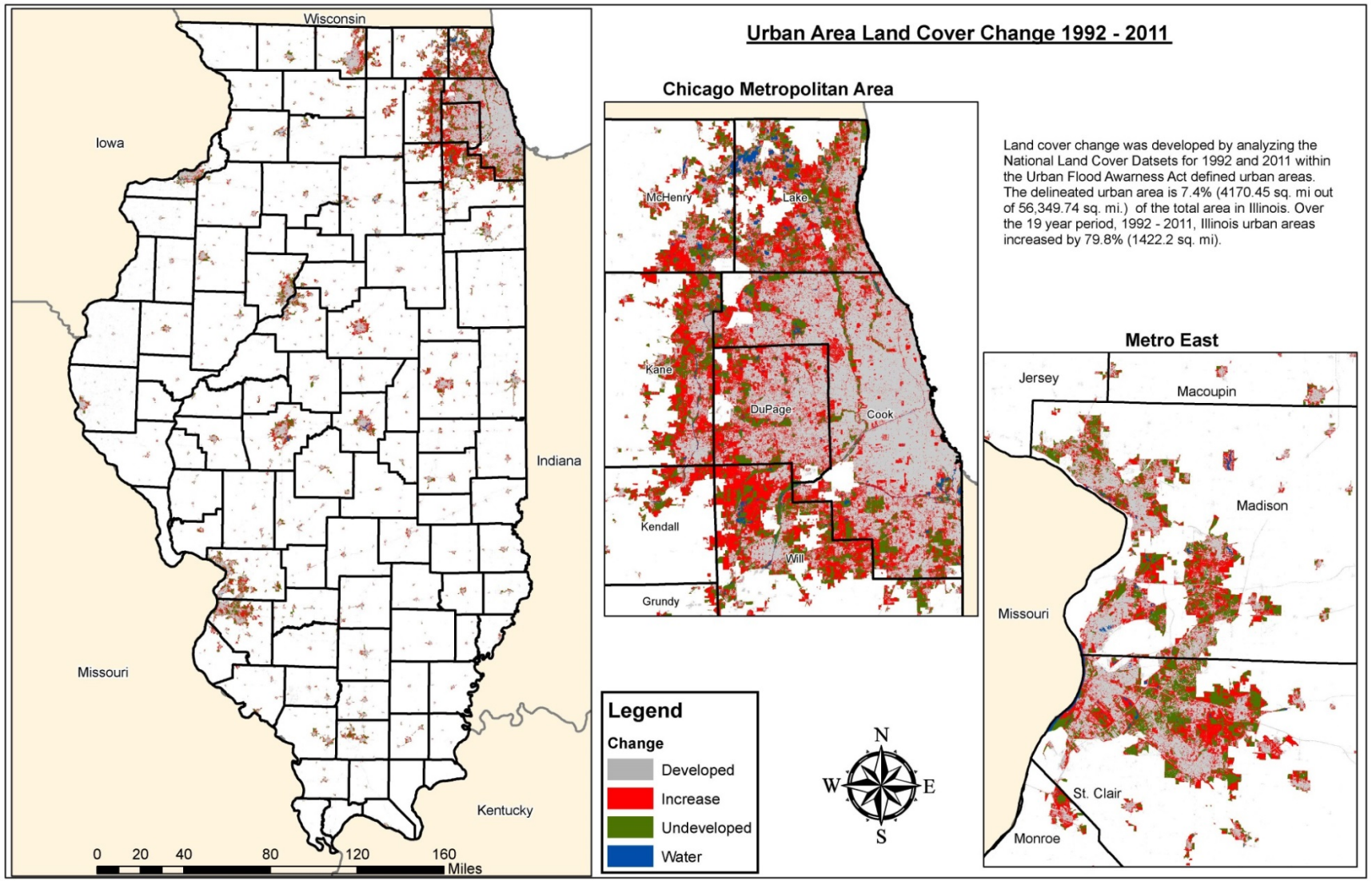


Figure F.4: Land cover change within the defined urban areas from 1992 - 2011. Over this 19 year period developed areas have increased by 43.9%. Areas in grey represent areas developed in 1992, red represent areas developed as of 2011, blue areas represent water, and green are areas left undeveloped.

Figure F.5 uses claims data and land cover classifications (Table F.1) to display the correlation between the two data sets. Developed land covers 77.67% of the urbanized areas and 99.03% of all insurance claims. The land cover to claim distribution is a follows: High intensity areas consist of 7.48% of the urban area and 2.74% of claims; medium intensity areas consist of 17.44% of the urban area and 24.86% of claims; low intensity areas consist of 37.84% of urban areas and 59.44% of claims; open space consists of 15.12% of the urban area; open water consists of 2.11% of the urban area, and the undeveloped cover 20.22% of urban areas. As an artifact of the data resolution a small percentage of the claims are assigned to these land use types.

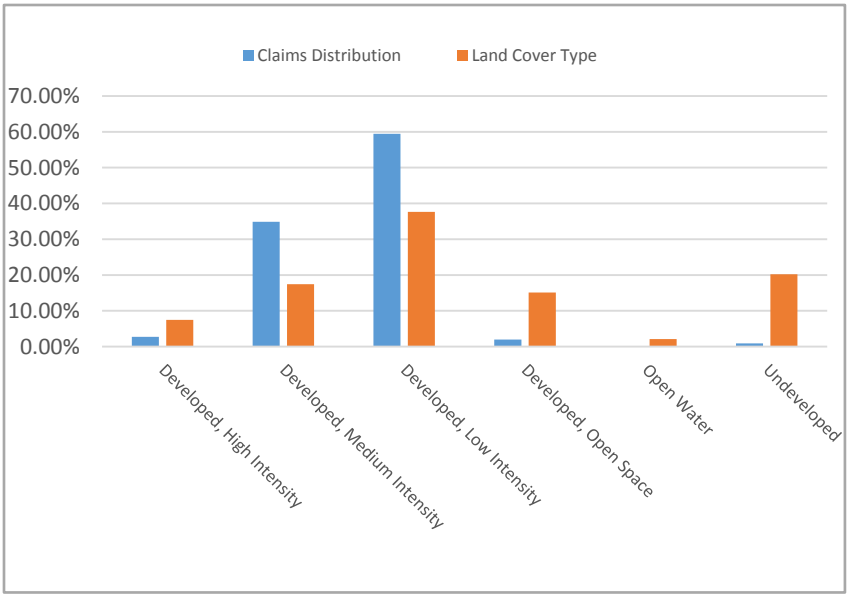


Figure F.5: The percentage of NFIP and Private insurance claims and the land cover they fall within is shown. The graph also displays the percentage each land cover classification cover in the urban area. Developed land covers 77.67% of the urbanized areas and accounts for 99.03% of all insurance claims.

Table F.1: Definitions of Land Cover Classifications

Land Cover Classification	Definition
Developed High Intensity	Highly developed areas where people reside or work in high numbers. Impervious surfaces account for 80% to 100% of the total cover.
Developed, Medium Intensity	Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.
Developed, Low Intensity	Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.
Developed, Open Space	Areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, and golf courses.

The NLCD was further analyzed with the best available 1% annual chance floodplain data to determine the number of square miles of development within the floodplain located within Illinois urban areas. The digital floodplain data used in these analyses was derived from the following sources: the NFHL,

preliminary FIRMs, and the 21 counties without digital regulatory floodplain data, which were digitized from historical paper FIRMs.

Figure F.6 displays an example of the floodplains and the NLCD. Urban areas in Illinois cover 4,170 square miles. Within the urban areas there is 471.14 square miles (11.3%) of 1% annual chance floodplains. In total, there are 241.4 square miles (5.8%) of developed 1% annual chance floodplain within the Illinois urban areas.

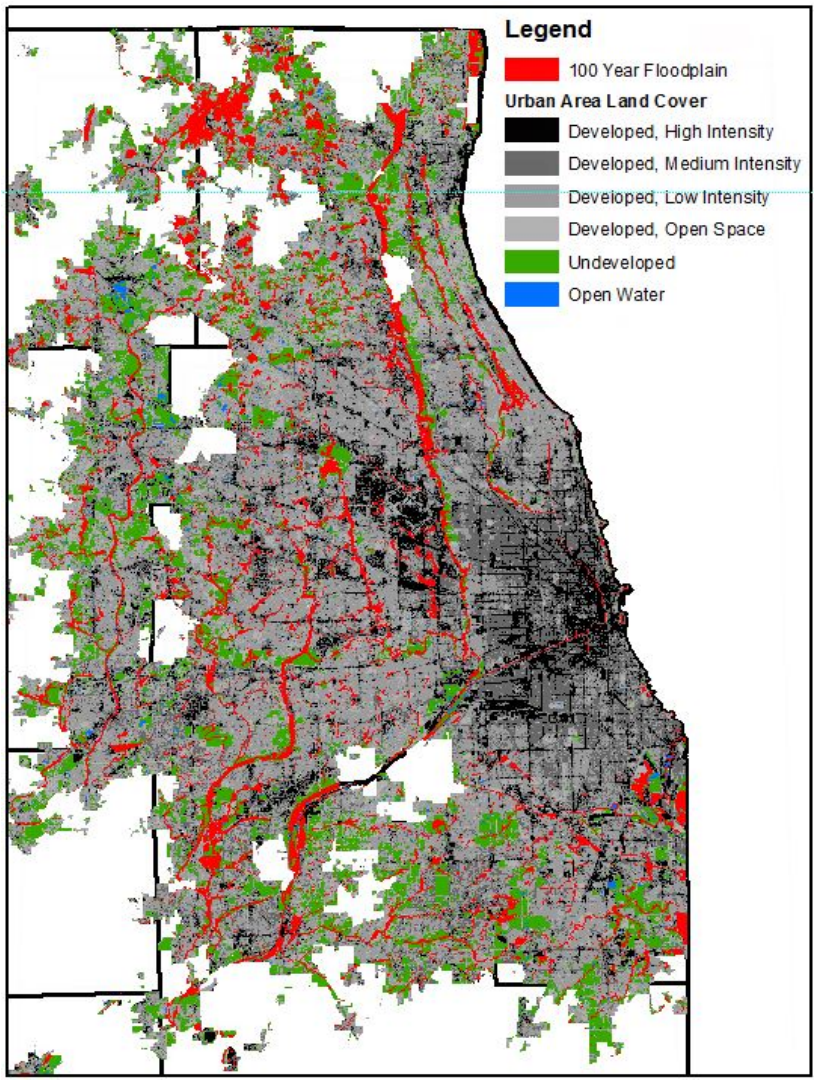


Figure F.6: Effective floodplains with the National Land Cover Dataset in DuPage and Cook Counties. Analyses were performed between these dataset to determine the land cover types that fall within the 1% annual chance floodplain.

Soil Survey Data

The U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS) Soil Survey has developed a nationwide survey of the soils. These surveys provide descriptions of the soils based on their unique properties. Information gathered from the surveys has been incorporated into a Soil Survey Geographic database (SSURGO), which can be utilized for analyzing various soil attributes through maps and tables.

The SSURGO database contains the hydrologic soil group (HSG) for all soils. The HSG is determined based on a soil's minimum rate of infiltration corresponding to a subsequent period of rainfall. Hydrologic soils groups are split into four groups: A, B, C, and D. These groups are defined in Table F.2. Through the process of urbanization, soil profiles in metropolitan areas have been significantly disturbed and their original classifications no longer apply. These areas have been identified by the USDA and re-classified as "urban." Hydrologic soil groups are typically applied in hydrologic modeling when predicting water storage capacities and direct runoff rates of soils. The HSG can also be useful when assessing urban flooding, in identifying areas of flood-prone soils.

Table F.2: Hydrologic soil groups in Illinois and their infiltration rates.
From Technical Release 55, Urban Hydrology for Small Watersheds (USDA, 1986)

Hydrologic Soil Group	Description	Texture	Infiltration Rates (inches/hour)
A	Low runoff potential and high infiltration rates even when wetted	Sand, loamy sand, or sandy loam	>0.30
B	Moderate infiltration rates when wetted	Silt loam or loam	0.15-0.30
C	Low infiltration rates when wetted	Sandy clay loam	0.05-0.15
D	High runoff potential and very low infiltration when wetted	Clay loam, silty clay loam, sandy clay, silty clay or clay	0-0.05
Disturbed	Unidentifiable soils in urban areas		

Within the defined urban area 91% of the combined NFIP and private insurance flooding claims are distributed within C, D and Disturbed (urban) soil groupings, which cover 78% of the urban landscape. Hydrologic soil group C and D, soils with very low infiltration and high run off potential, these soils are distributed over 68% of the defined urban area and accounts for 62.65% of the filed flooding claims. The disturbed urban areas, due to increased impervious surface areas, also have a potential for high runoff rates. Disturbed urban areas consist of 28.11% of urban claims distribution and 9.58% of the urban area (Figure F.7). With the lack of soil infiltration and high run off potential it is highly recommended to avoid construction below grade in these areas without special design consideration.

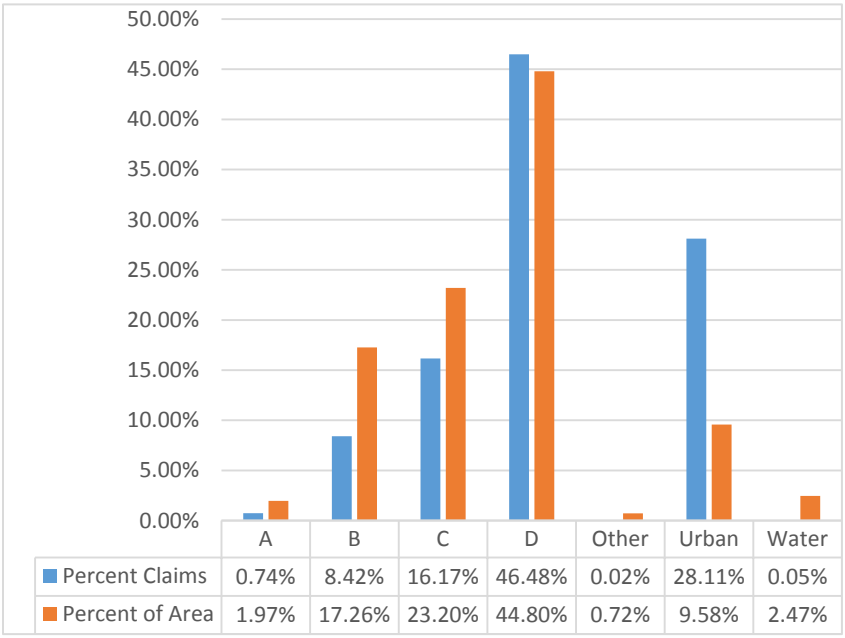


Figure F.7: Correlation of NFIP and private insurance claims and soil types within the defined urban area.

This analysis suggests that a disproportionate number of claims occur in the urban, disturbed soil group. However, this is a preliminary analysis with various data limitations. Other factors, such as old and inadequate infrastructure, high imperviousness, and economic considerations may have more to do with the high number of urban flooding claims than soil group.

National Oceanic and Atmospheric Administration Data

The National Oceanic and Atmospheric Administration (NOAA) Advanced Hydrologic Prediction Service (AHPS) provides web- based tools providing accurate historic and current forecast products. One of these products is multi-sensor (radar and rain-gauge) precipitation data collected through the National Weather Service (NWS) River Forecast Centers (RFCs). These multi-sensors yield highly accurate precipitation estimates and can be utilized for many analyses when it comes to urban flooding.

One use of the multi-sensor data collected is the visualization of observed rainfall events in correlation with urban flooding claims. This was done when looking at the top three storm events for both the NFIP and private claims. These storm events occurred: April 17-18, 2013, September 13-14, 2008, and July 23-24, 2010. Figure F.8, Figure F.9, and Figure F.10 display these two-day events with NFIP and private homeowners' insurance claims. These maps only show a small representation of these data's capabilities.

These radar data could be used in correlation with the urban flooding claims to identify areas with frequent losses and how many inches of rainfall are needed to begin seeing significant claims. Identifying these areas would better allow municipalities to focus on storm water utility systems and infrastructure and reduce property damage.

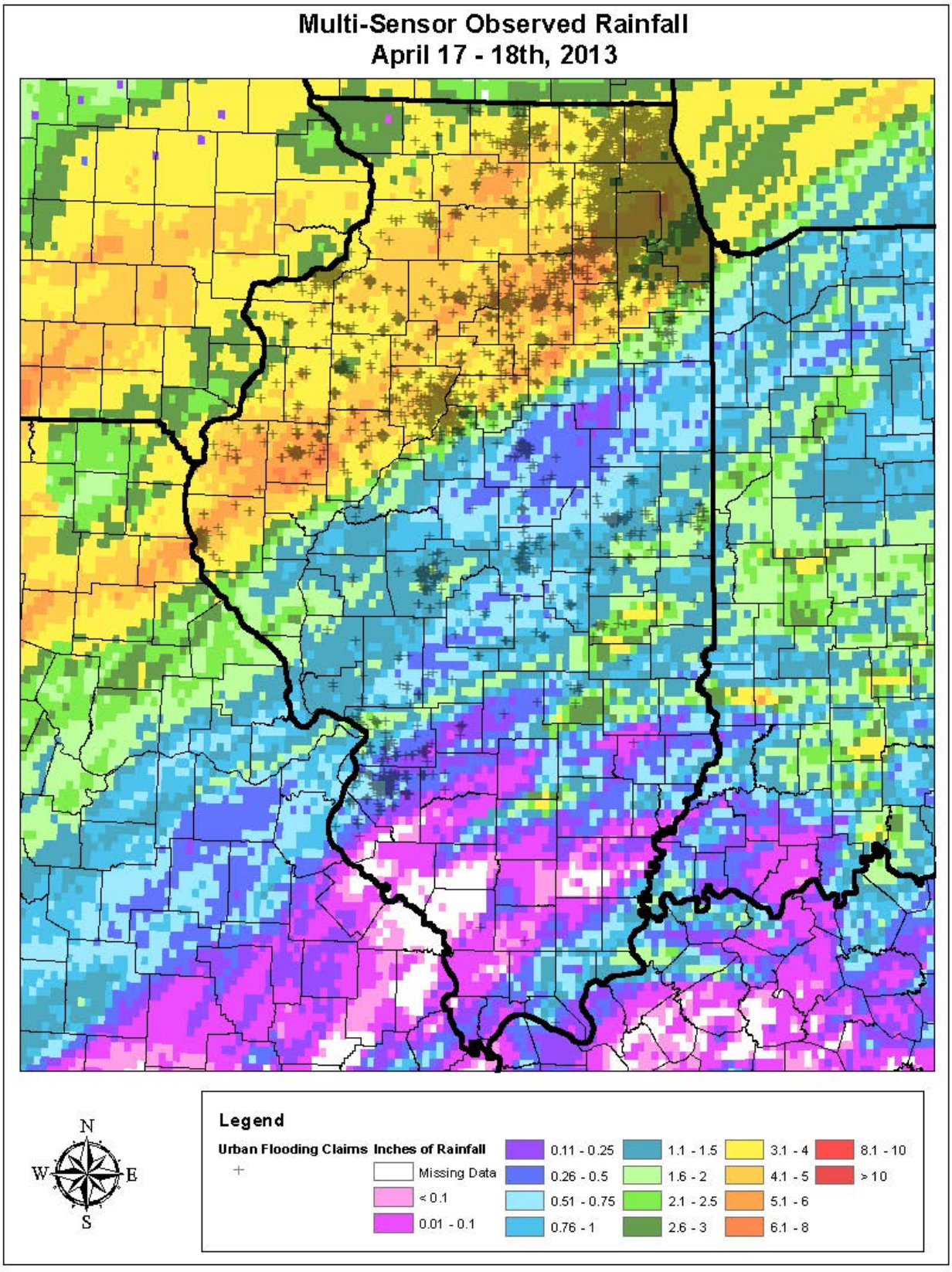


Figure F.8: April 17-18, 2013 two-day event with NFIP and private home owner's insurance claims.

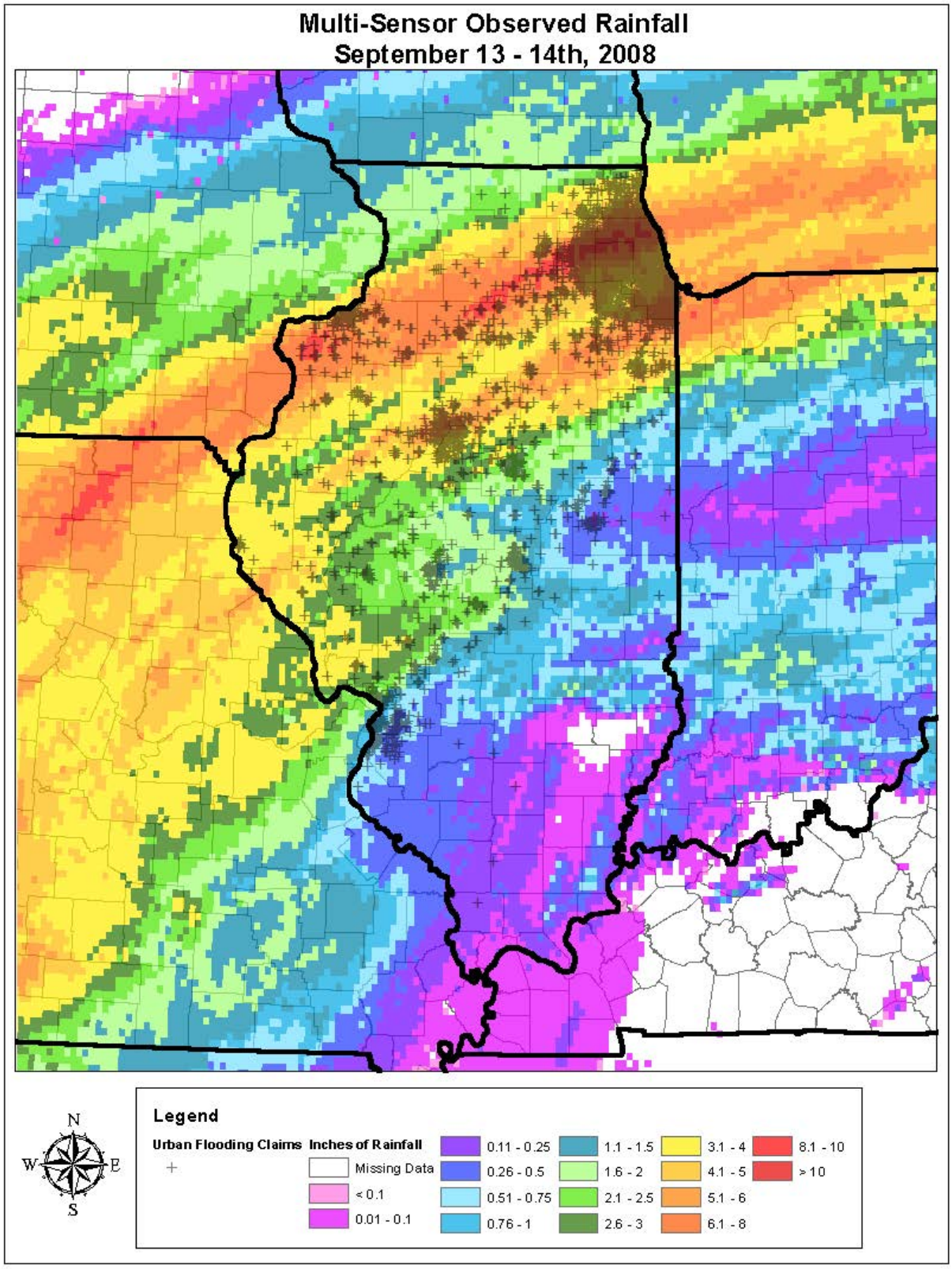


Figure F.9: September 13-14, 2008 two-day event with NFIP and private home owner's insurance claims.

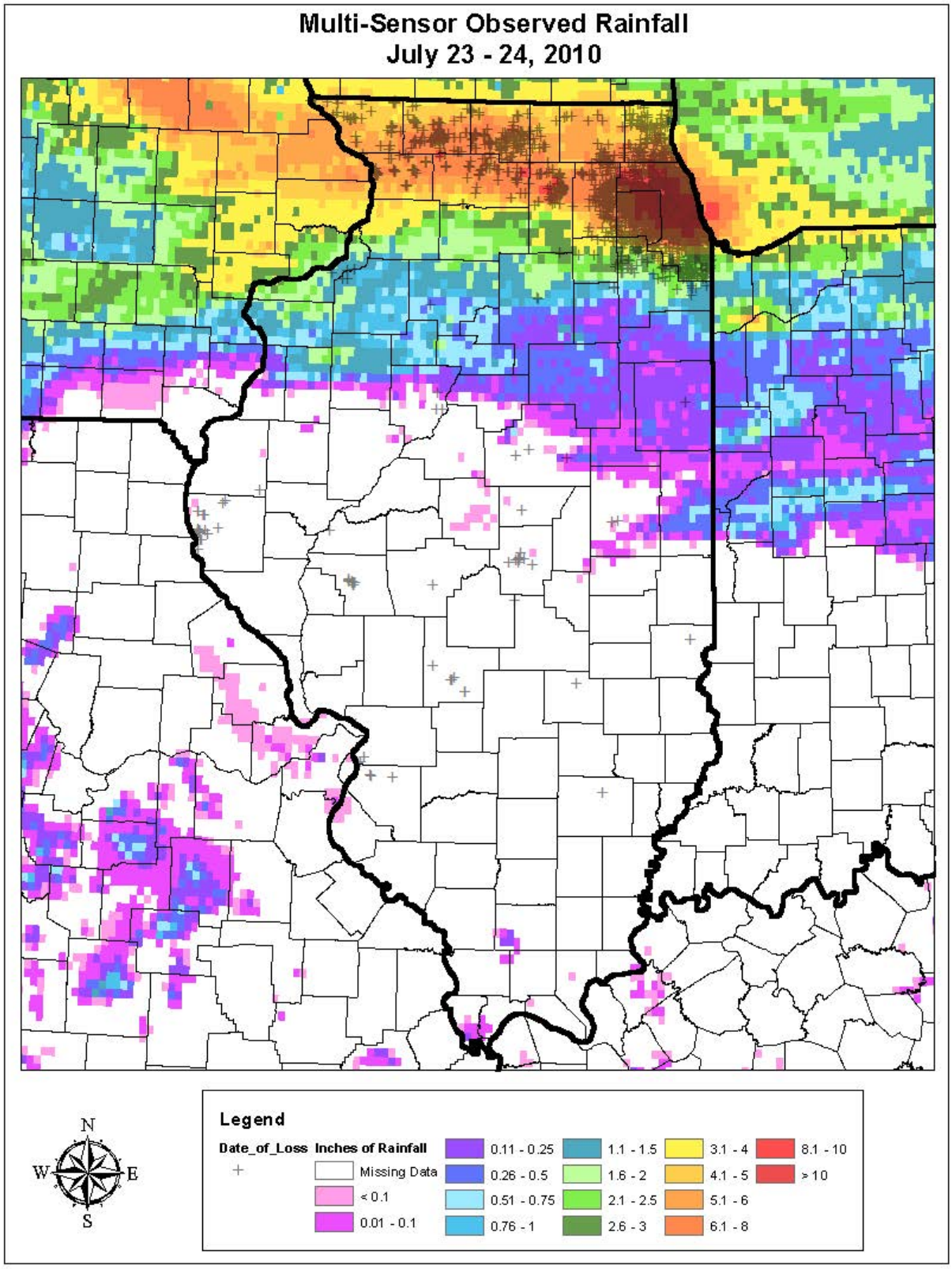


Figure F.10: July 23-24, 2010 two-day event with NFIP and private home owner's insurance claims.

Topographic Wetness Index

The topographic Wetness Index (TWI), also known as the Compound Wetness Index (CWI), is commonly used to estimate soil moisture conditions of a landscape similar to wetland areas. TWI is calculated by evaluating the flow accumulation, slope, and various geometric functions derived from GIS software. The end result is a GIS data layer (raster) that depicts areas with drainage depressions where water is likely to pond. TWI can also identify areas that are susceptible to higher water tables.

Topographic wetness indices were computed for Cook and DuPage Counties. The indices were created by coupling GIS and python, object-oriented computer programing which enhances computing capabilities. The python programing used to create the TWI analysis tool was based off of a programing script found in Pathak (2010). Areas for TWI analyses were limited to Cook and DuPage Counties due to computational time and data size.

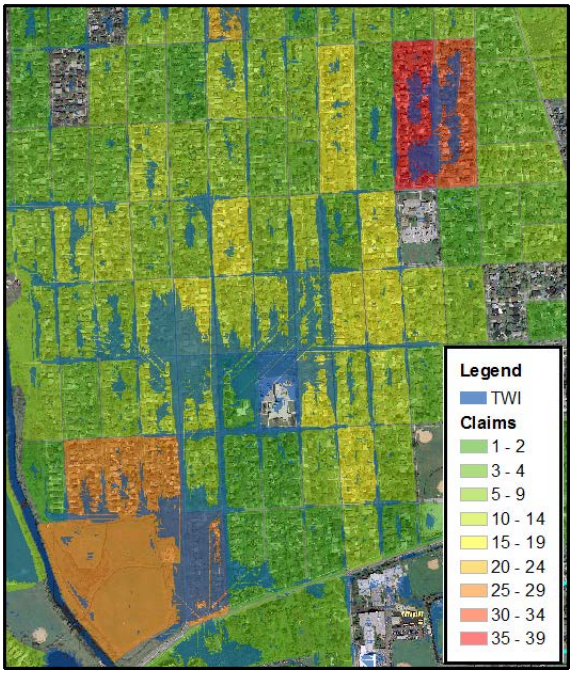


Figure F.11: Example of a topographic wetness index compiled for DuPage County. The index was overlaid with the claims per census block.

For Chicago and DuPage Counties, TWI values ranged from -2 to 26, with these values representing the estimated soil moisture in the area. When observing the TWI for these areas, it was evident that areas with values ranging between 5 and 13 displayed a significant correlation with areas with a high density of flood claims. This can be seen in Figure F.11, which shows TWI with flood claim density per census block. The areas in blue are observed as containing higher water tables; these highlighted areas include rivers, ponds, and depressional areas. This tool would be ideal for analyses of areas of potential development for planning. Performing TWI analyses in these areas would prove to be useful in identifying areas that pose a risk of urban flooding.

Storm Sewer Infrastructure Spatial Data Inventory

Combined sewers are sewers that carry both sanitary and stormwater flows. During storm events, the combined sewer system can become overwhelmed and discharge the stormwater and sanitary water directly into bodies of water, called Combined Sewer Overflows, or back up into basements and crawlspaces (CMAP, 2008). Even in communities that have dedicated storm sewers, a large percentage of these storm sewers are aging, which increases the risk of flooding due to system failure or inadequate stormwater drainage as drainage demands outpace anticipated demands of outdated systems.

Detailed GIS mapping of existing stormwater infrastructure is a good tool for community-wide stormwater management. Accurate and detailed information about existing systems allows managers and engineers to more easily and cost effectively analyze and model the functionality of those systems. Proposed improvements can also more easily be incorporated and analyzed. Some communities also

document and map existing and known flooding or sewer backup hotspots. This information can be used to validate models of the existing stormwater systems and prioritize the application of resources for system improvements. However, gathering accurate information about problem areas is dependent in many cases on the participation and awareness of the public, and databases of detailed information are only as useful as they are accurate.

Engineering Models

Hydrologic and hydraulic models allow engineers to identify flood prone areas by studying how a stream or section of stormwater infrastructure will respond to a given flow event given the current or proposed physical characteristics of a watershed, stream, and/or piece of infrastructure. Detailed hydrologic analyses using geographic information systems help identify areas contributing stormwater runoff to a particular receiving stream, inlet, or flood control structure. When coupled with historical gage data, ground trothing, and radar-rainfall analysis, engineers can describe the intensity, duration, and frequency of flood discharges. These discharges are passed through a digital representation of the stream system, sewer system, and/or some other type of stormwater infrastructure to determine constriction points and other causes of flooding.

Some models are designed to be used with geographic information and drafting systems, and have the ability to take into account sewer systems, detention and retention basins (layout, sewer size, materials, manholes, etc.), as well as hydrologic variables (topography, hydrologic soil groups, curve numbers, rainfall durations, etc.) to provide comprehensive analyses of sewer infrastructure.

Results from such models can then be associated with known urban flooding claim locations to determine weaknesses in an urban area's storm sewer infrastructure. These areas can be identified through historic flooding accounts and through the use of GIS to detect hot spot areas. With knowledge of these areas of vulnerability, municipalities can work to make improvements to the infrastructure. Funding options for such improvements can potentially come from sources stated in Chapter 4 of the report.

New Technology for Future Research

There are new forms of technology that are improving flood prevention and mitigation. Drones are now being used by some communities, such as the City of Rockford, to examine the extent of flooding in areas which are difficult to access instead of using costly helicopters or planes. Drones can operate more quickly, cheaply, and with greater flexibility than conventional aircraft and can easily send back real-time video to emergency response organizations (Figure F.12). After recent severe flooding in various parts of the country, drones have assisted post flood by taking aerial photos to make damage assessment maps, which help relief agencies coordinate their efforts while other aircraft are grounded due to weather. However, protocols for coordination of airspace with manned and unmanned aircraft need to be further developed. Currently, drones are only

Figure F.12: City of Rockford drone. Image courtesy of WREX13 News.

cleared by the FAA in limited cases to fly in the U.S., but as of February 15, 2015, the FAA proposed a framework of regulations that would allow routine use of certain small unmanned aircraft systems in today's aviation system (Federal Aviation Administration, 2015).

Recent advances in remote sensing have enabled communities to better determine when flooding is about to occur in sewers, allowing managers to potentially prevent overflows or to document occurrences to inform future management decisions with Real-time monitoring systems not only warn of impending sewer overflows, but also provide information which enables more efficient management of the collection system as a whole (Quist, Drake, and Hobbs, 2010).

One such application of real-time monitoring is being utilized by the City of Decatur, which is using SmartCover real-time monitoring devices, which attach to the underside of manhole sewer covers, send alerts about impending overflows. This allows community officials to determine when a combined sewer overflow is beginning to flow or discharge water to a larger trunk sewer, providing additional implementation time for the community's emergency response plan.

Data Limitations

Geoprocessing capabilities:

With so many resources available, time or funding did not allow for fully detailed analyses of the correlation between urban flooding geospatial analyses. Partial analyses and correlations have been achieved to show GIS capabilities in identifying areas at risk.

Claims Data:

The claims data provided by the NFIP and private insurance companies provided a great insight into the location and prevalence of urban flooding. Though it should be noted that the data provided proved to be incomplete and missing adequate details.

Private Insurance Data: The data provided only gave insight into basement flooding claims between 2000 and 2014. However, the data between 2000 and 2006 seems to be under-represented due to the lack of digital recording of such claims.

NFIP Insurance Claims: Only 77% of the claims provided by the NFIP could be spatially located on the map due to the lack of spatial indicators. The ability to spatially plot claims relies on suitable addresses, which in many cases were not provided, were entered incorrectly, or were given in township and range.

LiDAR:

Currently in Illinois as of April 2015 there are still 29 counties in Illinois that are without LiDAR data. With the lack of LiDAR data in these counties, the ability to observe the topographic variables consistent with the urban flooding is challenging.

Floodplain Data Limitations:

- 27 counties within Illinois still lack effective DFIRM products. Of these, 6 are preliminary and 21 have yet to begin the DFIRM process.
- FEMA Assistance Data was inadequate for the identification of precise claim locations.
- NFIP data contained claims lacking an adequate spatial reference.

References

Chapman, J. B. & Canaan, W.D. (2001). Flood maps are key to better flood damage control. *CE News*, 58-60.

Chicago Metropolitan Agency for Planning (CMAP). (2008). *Stormwater management strategy paper*. Retrieved from http://www.cmap.illinois.gov/documents/10180/61694/Stormwater+ Management.pdf/ 608fda0 0-30b0-43ea-b7a6-083e134b91c2

Federal Aviation Administration. (2015). *Small UAS Notice of Proposed Rulemaking (NPRM).* Retrieved from https://www.faa.gov/uas/nprm/

Federal Emergency Management Agency. (2015). *National Flood Hazard Layer(NFHL)*. Retrieved from http://msc.fema.gov/portal

Jin, S., Yang, L., Danielson, P., Homer, C., Fry, J., & Xian, G. (2013). A comprehensive change detection method for updating the National Land Cover Database to circa 2011. *Remote Sensing of Environment*, 132: 159 – 175. Available online http://www.mrlc.gov/faq_dau.php.

National Oceanic and Atmospheric Administration (NOAA), National Weather Service. Advanced hydrologic prediction service. Retrieved from http://water.weather.gov/precip/download.php

Pathak, P.A. (2010).*Geospatial analysis of lake and landscape Interactions within the Toolik Lake region, North Slope of Alaska.*

Quist, G., Drake, D., & Hobbs, J. (n.d.). Knowledge is power - using remote monitoring to optimize operations. *Proceedings of the Water Environment Federation, Collection Systems 2010*, *12,* 571-582.

Rawls, W.J., Brakensiek, D.L. & Soni, B. (1983). Agricultural management effects on soil water processes, Part I. Soil water retention and green and ampt infiltration parameters. *Transactions of the American Society of Agricultural and Biological Engineers 26(6),* 1747-1752.

United States Department of Agriculture. Natural Resources Conservation Service. *Web soil survey*. Retrieved form http://websoilsurvey.nrcs.usda.gov/

U.S. Census Bureau. (2014). *2014 TIGER/Line Shapefiles*. Retrieved from http://www.census.gov/geo/ maps- data/ data/tiger-line.html

Wolock, D.M., (1993). Simulating the variable-source-area concept of streamflow generation with the watershed model TOPMODEL. USGS Water-resource investigation report 93-4124, Lawrence, KS.

Appendix G: County Stormwater Program Impacts on Urban Flooding

Stormwater management in Illinois must be authorized by State legislation for county governments to possess the legal authority to manage stormwater, a.k.a. countywide authority. In the State of Illinois, the code currently used by authorized counties is titled 55 Illinois Compiled Statutes (ILCS) 5. Legislation 55 ILCS 5/5-1062 refers to the stormwater management authority that qualified counties may have. The purpose of the section is "to allow management and mitigation of the effects of urbanization on stormwater drainage in metropolitan counties located in the area…." The purpose is attained by three clear objectives:
"(1) consolidating the existing stormwater management framework into a united, countywide structure, (2) setting minimum standards for floodplain and stormwater management, and (3) preparing a countywide plan for the management of stormwater runoff, including the management of natural and man-made drainageways. A stormwater management planning committee shall be established to oversee the implementation of stormwater management in the county."

Sixteen counties have the state-granted authority to manage and mitigate the effects of urbanization on stormwater drainage; they include: Boone County, Cook County (via the Metropolitan Water Reclamation District of Greater Chicago, whose authority includes the City of Chicago), DeKalb County, DuPage County, Grundy County, Kane County, Kankakee County, Kendall County, Lake County, LaSalle County, Madison County, McHenry County, Monroe County, Peoria County, St. Clair County, and Will County. Of the sixteen counties with authorization to manage stormwater, fourteen of them currently have stormwater ordinances. The remaining two counties (Grundy and LaSalle Counties) are presently developing ordinances for stormwater management. See Figure G.1.

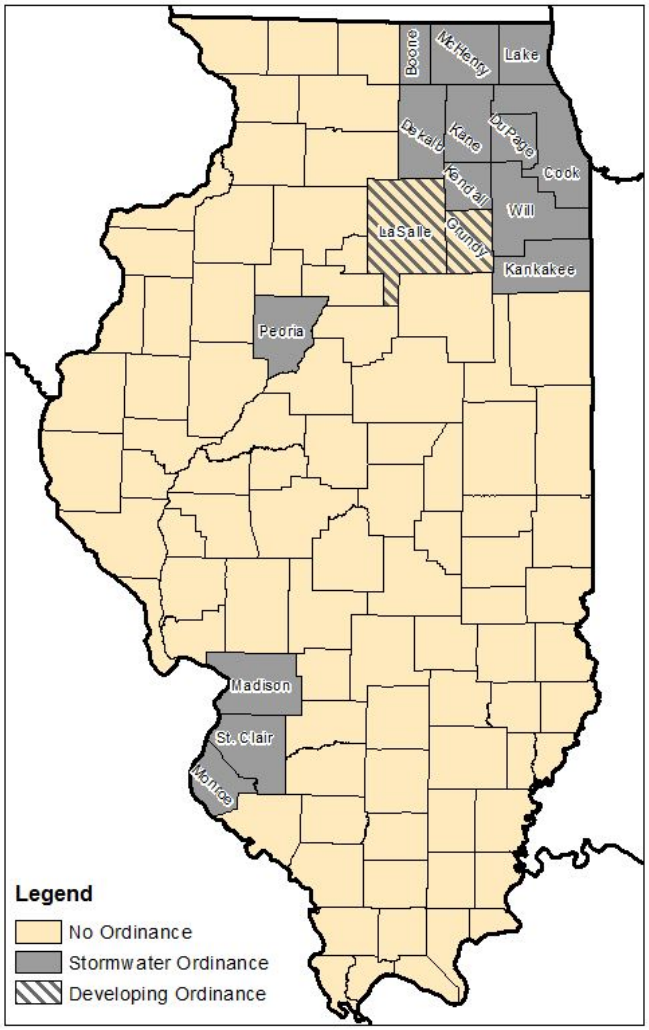


Figure G.1: Counties in gray are counties with stormwater ordinances. Counties with a hatch pattern are counties developing stormwater ordinances. The remaining counties are those without authorization to manage stormwater drainage.

Of the 102 Illinois counties, there are 86 counties that do not have authorization to manage and mitigate the effects of urbanization on stormwater runoff. The counties that do have stormwater management authorization are listed in Table G.1. The specific legislation granting stormwater management authority is included, as well as the date of their stormwater ordinance (if applicable) and the date of the most recent ordinance revision.

Table G.1: Counties with stormwater ordinances, the legislation that grants them authorization to provide stormwater management, and the date of their current ordinance and any subsequent revisions.

County Name	Legislation	Ordinance (y/n)	Date of Ordinance	Date of Revised Ordinance
Boone	55 ILCS 5/5-1062.2	n	NA	
Cook (MWRD has authority)	70 ILCS 2065/7h	y	2014	2014
DeKalb	55 ILCS 5/5-1062.2	y	2006	2010
DuPage	55 ILCS 5/5-1062	y	1991	2013
Grundy	55 ILCS 5/5-1062.2	n	NA	
Kane	55 ILCS 5/5-1062	y	2000	2009
Kankakee	55 ILCS 5/5-1062.2	y	2006	
Kendall	55 ILCS 5/5-1062	y	2015	
Lake	55 ILCS 5/5-1062	y	1992	2013
LaSalle	55 ILCS 5/5-1062.2	n	NA	
Madison	55 ILCS 5/5-1062.2	y	2000	2007
McHenry	55 ILCS 5/5-1062	y	2004	2014
Monroe	55 ILCS 5/5-1062.2	y	2004	2006
Peoria	55 ILCS 5/5-1062.3	y	1994	2013
St. Clair	55 ILCS 5/5-1062.2	y	2009	
Will	55 ILCS 5/5-1062	y	2004	2010

A number of the counties with authorization to manage stormwater have implemented programs, projects and regulations to prevent flooding, mitigate stormwater, and improve water quality. The following counties have profoundly impacted urban flooding through a myriad of programs and projects aimed to reduce stormwater runoff: Cook, DuPage, Grundy, Kane, and Lake Counties. Some of these projects were initiated under authorities other than those granted under the Stormwater Management Authority (55 ILCS 5/5-1062). Boone and Peoria Counties do not have any active programs or projects, because currently the municipalities within each county have stricter stormwater management plans than the county. The remaining counties have initiated stormwater programs. Table G.2 lists projects, programs, and regulations for the sixteen counties with stormwater authorization. The counties that have been most active have had the authority for the longest time.

Table G.2: List of projects and programs related to stormwater and urban flooding within each county and how flood damage was avoided.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Cook	Sewer Permit Ordinance	1969, amended 1999	Regulates issuance of permits for construction, operation, maintenance of sewers, sewerage systems, treatment facilities, sewer connections designed to discharge directly or indirectly into collection and treatment facilities of the District's corporate limits.	Prevent overloading the sewer system, which could cause backup flooding.
Cook	Watershed Management Ordinance	2013, amended 2014	Establishes uniform, minimum, countywide stormwater management regulations throughout Cook County. Components which are regulated under the Watershed Management Ordinance include drainage and detention, volume control, floodplain management, isolated wetland protection, riparian environment protection, and soil erosion and sediment control. The Watershed Management Ordinance also regulates the issuance of permits for the construction, operation, and maintenance of sewers, sewerage systems, treatment facilities and sewer connections designed to discharge directly or indirectly into collection and treatment facilities of the District's corporate limits, and will replace the Sewer Permit Ordinance in that capacity.	Comprehensive prevention of urban flooding.
Cook	Sewer Rehabilitation Program	1970	Removes excess groundwater infiltration and stormwater inflow from the sanitary sewer systems.	Prevents basement sewer backups, water pollution, adverse sewer surcharging.
Cook	Tunnel and Reservoir Plan (TARP): Phase I	1975-2006	Four tunnel systems (109.4 miles of tunnels, equaling 2.3 billion gallons) that capture and hold combined sewer overflow until the sewage can be pumped to the Water Reclamation Plant after a storm event.	Protect drinking water in Lake Michigan from raw sewage pollution; improve water quality of area rivers and streams; and provide an outlet for floodwaters to reduce street and basement sewage backup flooding.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Cook	Tunnel and Reservoir Plan (TARP): Phase II	1998 - 2029	Thornton Composite Reservoir, McCook Reservoir, and Majewski Reservoir will increase the TARP capacity to 17.5 billion gallons. In addition, MWRD also has an agreement to store additional 4.5 billion gallons in the Thornton Transitional Reservoir until 2020. Reservoirs connected to the tunnels will capture and hold combined sewer overflow until the sewage can be pumped to the Water Reclamation Plant after a storm event.	Primarily intended for flood control. Also enhances pollution control benefits outlined in Phase I.
Cook	Public Act 93-1049	2004	Authority for general supervision of stormwater management in Cook County.	First step in establishing the countywide stormwater management program.
Cook	Watershed Planning Councils	2005	Planning councils represent communities located within major watersheds in Cook County, and communicate the needs and interests of the members of the public and local governments to the District. Currently there are six Watershed Planning Councils: Lower Des Plaines River, Poplar Creek, Upper Salt Creek, Little Calumet River, Calumet-Sag Channel, and the North Branch of the Chicago River.	Councils identify and report on flooding and stormwater problems within their watershed.
Cook	Small Streams Maintenance Program	2006	Follows the MWRD's stormwater management mission to relieve flooding in urbanized areas through immediate and relatively simple remedies. The objective of the program is to remove obstructions and debris in the waterways that impede the natural drainage of Cook County's small streams and rivers.	Prevents flooding by removing obstructions in waterways.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Cook	Cook County Stormwater Management Plan (CCSMP)	2007 Amended 2014	The Stormwater Management Plan is a high-level organizational plan wherein the overall framework for the countywide program is established. The District was required per Public Act 98-0652 (which allows planning, implementation, and funding of local projects) to draft and adopt the Cook County Stormwater Management Plan as a first step in establishing the District's countywide stormwater management program. Nineteen stormwater management goals are included in the Stormwater Management Plan. The goals extend from protecting new and existing development from flooding to preventing the loss of water quality and habitat. The CCSMP was amended on July 10, 2014 to be consistent with P.A. 98-0652, which amends the District's statutory authority to allow for acquisition of flood-prone properties and to plan, implement, finance, and operate local stormwater management projects.	Protects development from flooding; manages stormwater drainage.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Cook	Detailed Watershed Plans	2011	The Detailed Watershed Plans in the Calumet-Sag Channel, Upper Salt Creek, Little Calumet River, Poplar Creek, North Branch of the Chicago River, and Lower Des Plaines River watersheds provide a summary of each watershed's stormwater-related areas of concern and a listing of potential regional capital improvement projects to address those concerns. The watershed planning process consisted of several steps, including the following: -Gathering, analyzing, and assessing existing data and information. Identifying stormwater management concerns through outreach to municipalities. -Classifying identified concerns as regional (to be addressed under the Detailed Watershed Plans and typically consists of overbank flooding along regional waterways and eroding stream banks that place structures, infrastructure, and/or public safety at risk) or local (i.e. inadequate local storm sewer systems). -Developing hydrologic and hydraulic models. -Identifying potential projects to address regional stormwater management concerns. -Quantifying benefits and costs of potential projects and determining other factors to allow for evaluation of projects by the District's Board of Commissioners.	Used as a tool for prioritizing projects to mitigate flooding and other stormwater management issues within the six watersheds.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Cook	Phase I Projects	NA	Capital improvement projects emanating from the Detailed Watershed Plans are separated into two categories: stream bank stabilization and flood control. Projects given the highest priority for implementation are stream bank stabilization projects, which address stream bank erosion posing an imminent threat to public safety and/or structures. Flood control projects address regional flooding issues through traditional measures, such as stormwater detention reservoirs, levees, and conveyance improvements. Preliminary engineering design, final design, and construction of projects approved by the District's Board of Commissioners are underway and will continue into the future.	Addresses areas of flooding and targets improvements to the area.
Cook	GIP (Green Infrastructure Program)	2011	Facilitates the planning, design, and construction of multiple green infrastructure projects throughout Cook County in partnership with a variety of stakeholders. Program framework and guidelines will be developed in 2015 in collaboration with stakeholders. Currently, the District is partnered with the Chicago Department of Water Management and the Chicago Public Schools to design and construct large green infrastructure projects at four Chicago Public School campuses.	Helps promote infiltration and water recycling, which reduces runoff associated with flooding.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Cook	Phas II Projects	2014	Allows the District to plan, implement, and fund local projects, where previously we only had authority for regional projects. District canvassed communities throughout Cook County a year prior to the signing, collecting a list of local flooding issues. There are over 30 projects moving forward that span immediate construction, preliminary design and design stages. These projects are community partnerships where communities are participating in cost share and maintenance obligations. In addition, the District has identified five pilot areas – one in each Council of Government region and one in the City of Chicago – to begin putting together a Cook County green and gray infrastructure stormwater plan that will protect the community against severe weather events.	Thirty local projects to solve flooding issues. Plans for green and gray stormwater plan to further manage runoff.
Cook	Rain Barrel Program	2007	The new 2014 rain barrel distribution program offers free rain barrels to municipalities enrolled in District's rain barrel program. For Cook County residents living in municipalities not enrolled, residents can still purchase a rain barrel from District.	Minimizes basement backups, combined sewer overflow volume, and flooding.
Cook	Management of Chicago Area Waterways System	NA	1. Navigation – the waterways are US Navigable waterways and waterway elevations are maintained to be in compliance with the Code of Federal Regulations 2. Stormwater conveyance – the waterways are drawn down in advance of storms to add storage capacity in the waterways and to induce flow downstream, away from Lake Michigan, the source of the region's drinking water 3. Water Quality – the waterways are controlled to promote water quality by increasing the dissolved oxygen in the waterways	Increases storage capacity to waterways to prevent backwater flooding.
Cook	Regional Detention Reservoir Operations	NA	The District operates regional stormwater detention reservoirs throughout Cook County.	Reduces flooding along rivers and streams.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Cook	Maintenance and Operation Plans for Reservoirs	NA	The District developed strict operations and maintenance procedures.	Ensures consistent operations of reservoirs during wet weather events to prevent flooding.
Cook	TARP Operations Plan	NA	The District operates the TARP system during wet weather.	Minimizes combined sewer overflows and flooding.
Cook	Pump Station Operations	NA	The District pumps directly to waterways at select pump stations within its collection system during extreme wet weather conditions.	Minimizes backups and flooding.
Cook	WRP Wet Weather Operations	NA	The District maximizes treatment at its WRPs during wet weather conditions.	Minimizes collection system back-ups, combined sewer overflows, and flooding.
DeKalb	Phase I of Floodplain and Stormwater Management	2006	Regulate and restrict uses and development within or in close proximity to existing floodplains, and regulate stormwater management associated with new growth and development throughout the county.	Protects floodplains and prevents building in them, plans for excess stormwater.
DeKalb	Phase II of Floodplain and Stormwater Management	NA	Allowing access to zoning maps for each township within the county, showing surface water data. Also encourages a watershed-based approach to stormwater management and green stormwater management techniques.	Educates landowners and developers on surface water areas, floodplains, and stormwater drainage.
DeKalb	Phase III of Floodplain and Stormwater Management	NA	Identifies important stormwater recharge areas and develops regulations to protect these areas to help ensure a clean water supply. Prioritizes the need for regional stormwater management facilities within each major watershed.	Identifies area for more stormwater facilities to increase flood capacity.
DeKalb	Pamphlet on Stormwater pollution	NA	Notifies county residents of how stormwater runoff can become polluted.	Protects lakes, streams, rivers and wetlands.
DeKalb	South Branch Kishwaukee River watershed plan	2005	Identifies flooding and problems with stormwater in a watershed-based approach.	Reduces flooding by targeting stormwater problems.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
DuPage	DuPage County Stormwater Management Plan	1989	Plan provides objectives, policies, and standards under which the stormwater management operates.	Minimizes stormwater drainage issues.
DuPage	Countywide Stormwater and Floodplain Ordinance	1991	The Ordinance promotes effective, equitable, acceptable, and legal stormwater management, wetland protection and water quality measures.	Minimizes stormwater drainage issues.
DuPage	NPDES Phase II regulations	1999	The Phase II regulations address stormwater discharges from small (<100,000 population) municipalities and construction sites disturbing between one and five acres.	Minimizes urban flooding in small municipalities.
DuPage	Stormwater Management	2008	Stormwater Management operated all flood control facilities, providing 3.8 billion gallons of flood storage for stormwater.	Relieved urban areas of potential floodwaters by providing additional flood storage.
DuPage	Watershed Models	NA	Stormwater Management utilizes models to demonstrate continuous simulation and dynamic routing models for implementation of floodplain mapping, flood forecasting, water quality protection and enhancements, wetland creation, and project analysis. Also a network of precipitation and stream flow gages has been developed for flood forecasting and model calibration. 80% of the County's watershed areas have developed models.	Predicts stream flow and flood height under various land use and storm conditions.
DuPage	Watershed plans	NA	Stormwater Management Planning Committee and County Board have approved watershed plans for more than 70% of the County.	Documents flood damages and losses requiring capital measures to address flood problems.
DuPage	Construction or upgrades to 15 stormwater facilities	NA	Stormwater Management has constructed or updated 15 stormwater facilities throughout all six watersheds.	Captures stormwater drainage and prevents downstream flooding.
DuPage	Stormwater Capital Improvement Projects	NA	$200 million has been spent on stormwater capital improvement projects since 1991.	Captures stormwater drainage and prevents downstream flooding.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
DuPage	Operations and Maintenance	NA	Flood control facilities have an operations and maintenance schedule to outline which entity is responsible for the maintenance of a specific section of the facility.	Ensures facilities are working to the capacity for which they were designed.
DuPage	Water Quality Improvement Grant	NA	The Water Quality Improvement Grant awards partial funding to projects exhibiting a regional approach to water quality improvements, including streambank stabilizations, habitat improvements, and green infrastructure.	Reduces or filters stormwater runoff, provides stormwater storage.
DuPage	Adopt-a-Stream	1994	Groups Adopt-a-Stream and partake in various restoration activities on that stream, including removing trash and debris in and along waterways, planting native vegetation, and monitoring water quality.	Increases storage capacity to waterways, encourages infiltration along stream banks and floodplains.
DuPage	Illicit Discharge Detection and Elimination Ordinance	NA	Prohibits any non-exempt discharge other than stormwater into the storm sewer system.	Reduces volume reaching sewer system.
DuPage	Streambank Stabilization	1994	Stormwater Management provides design and permitting assistance to those wanting to stabilize eroding streambank using bioengineering techniques (i.e. vegetative side slopes, lunkers, and Ajax).	Increases storage capacity in streams and rivers by limiting sedimentation in channels.
DuPage	Floodplain Mapping	2008	Grant money to support engineering studies, floodplain mapping, and community coordination being conducted in collaboration with FEMA and ISWS.	Identifies areas of flooding.
DuPage	General permit to review wetland impacts	1995	The US Army Corps of Engineers issued a general permit to DuPage delegating the authority to review wetland impacts regulated by Section 404 of the Clean Water Act on their behalf. Reauthorized in 2000 and 2009.	Preserving wetlands increases stormwater runoff capacity and reduces flooding.
DuPage	Wetland Banking	1993	Developments can opt to replace wetlands offsite, but within the same watershed. Wetland bank fees are based on a detailed cost estimate unique to the project.	Wetlands increase storage capacity of stormwater runoff and reduce flooding.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
DuPage	Wetland Maps	2013	Modernizing wetland maps to disseminate current information of wetland locations to residents, developers, and businesses.	Identifies areas of additional stormwater storage.
DuPage	Award of Excellence for outstanding efforts in stormwater management	1996	Illinois Association of Floodplain and Stormwater Managers (IAFSM) awarded DuPage County Stormwater Management the “Award of Excellence” for outstanding efforts in stormwater management to reduce urban flood risk.	Reduction of urban flood risk in county.
DuPage	Elmhurst Quarry flood control facility	1996	Named Chicago Section American Society of Civil Engineers' "Project of the Year". During large storm events, excess flow from Salt Creek is diverted into the quarry for storage until creek water reaches safe levels.	Reduces flooding along Salt Creek.
DuPage	Grant from FEMA for buyouts	1997	FEMA granted Stormwater Management $6.11 million grant for the Valley View (Glen Ellyn) buyouts following a 1996 flood event.	Eliminated future flooding on buyout properties.
DuPage	"Local Award of Excellence" for watershed management approach	1997	Association of State Floodplain Managers (AFSPM) awarded Stormwater Management the "Local Award of Excellence" for a comprehensive watershed management approach.	Reduces stormwater runoff problems.
DuPage	Fawell Dam modifications project	1998	The District modified the dam at McDowell Grove Forest Preserve in order to return a portion of the West Branch of the DuPage River to a healthier, more natural waterway.	Increases storage in the river from removal of sediment and reconnecting river to floodplain.
DuPage	Wood Dale - Itasca flood control reservoir	2001	The reservoir provides 1,750 acre-feet of storage for the Salt Creek Watershed.	Increases storage for flood control.
DuPage	"James Lee Witt Local Award of Excellence"	2004	Stormwater Management received the award from AFSPM for the Digital Flood Insurance Rate Map and Regulatory Flood Map Project.	Identification of flood-prone areas brings awareness and allocation of funds.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
DuPage	Grant from NOAA for habitat restoration	2005	Stormwater Management received a grant from National Oceanic & Atmospheric Administration (NOAA) for implementation of habitat restoration and watershed enhancement projects along the West Branch DuPage River.	Encourages infiltration and floodplain reconnection.
DuPage	Churchill Woods Dam modification	2008	Project to remove the dam and improve the area upstream of the dam.	Increases recreational activities, fish passage, reduces sedimentation and increases storage.
Grundy	Strategic Plan for Water Resource Management	2002	The plan, compiled by the National Infrastructure Protection Center, includes ideals and goals for the protection of life and property from flooding and damage due to the floodplain areas of Grundy County.	Protects flood-prone areas.
Grundy	Modernization of soil survey	2006	The soil survey is updated with the help of the Natural Resource Inventory, specifically in floodplain areas, wetlands, and the overall moisture qualities of the soil. The soil survey is used for all map amendments or zoning changes.	Identifies flood-prone areas, aides in engineering floodplain studies.
Grundy	Site development permits	2006	Site development permits required for all work that moves, excavates, or affects floodplain areas.	Protects floodplains and prevents building in them.
Grundy	County Engineer	2006	A Professional Engineer was hired contractually by Grundy County to review all subdivision plans and site development permits that are issued by the County for site work.	Ensures proper stormwater designs in developing areas.
Grundy	Aux Sable Creek watershed ordinance	2009	The Ordinance was adopted by Grundy County Board to provide for best management practices and protections for the Aux Sable Stream.	Protects the stream from destructive discharge volumes and quality.
Grundy	Land evaluation site assessment	2009	The LESA was updated for soil mapping changes. Also, evaluation tools for rezoned sites were improved.	Identified areas prone to flooding and floodplain details.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Grundy	Stormwater commission assembled	2010	Grundy County assembled and appointed a Stormwater Commission tasked with creating a countywide stormwater ordinance.	Reduces flooding, decreases stormwater runoff.
Grundy	Unified Development Ordinance	2010	The Unified Development Ordinance combines the zoning and subdivision codes and updates them with Grundy County Environmental standards, to aid in the protection of natural areas.	Regulates stormwater rules within zoning and subdivision context.
Grundy	New FIRM approved	2012	New FIRM aerial floodplain maps were approved by Grundy County. IDNR floodplain language was incorporated into the 2010 Unified Development Ordinance.	Identifies areas affected by the 1% annual chance flood event.
Grundy	Floodplain management plan	2013	Through a grant by DCEO, the development of a floodplain management plan for the Claypool/Maine Drainage District may commence.	Identifies flooding problem locations and addresses solutions to the problems.
Grundy	Grundy County Natural Hazard Mitigation Plan	2013	The mitigation plan lists the history of all natural hazards that the county may experience and is a discussion of repetitive loss, essential facilities, losses from floods in previous years for the County, and financial losses reported by communities within the County. Project priorities were listed such as permanent demolition of structures and reclamation for natural flooding areas as open spaces.	Mitigation strategies that include protecting lives and property, protecting infrastructure, educating the public on risks and protection methods, coordination/communication between key response and recovery agencies, and planning for natural areas from development for future protection measures.
Grundy	Claypool and Maine drainage plan	2014	Claypool and Maine Drainage Plan completed and adopted by Grundy County.	Protects urban areas from stormwater drainage and urban flooding.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Kane	Leveraging funds from multiple sources	NA	By working with individual property owners, road districts, and other municipalities, a solution may be implemented. This approach, however, is time-consuming as project contributions are typically voluntary. All parties involved feel ownership over the project once it is complete and are more compelled to assist in maintenance.	Encourages projects to be initiated and completed.
Kane	Shovel-ready projects	NA	Performing engineering in-house and having easements acquired has improved the ability to obtain short term grants (such as the IKE funding).	Encourages projects to be initiated and completed.
Kane	Long term maintenance fund	NA	A long term maintenance fund was established. In connection with the completion of a stormwater management project, twelve Special Service Areas have been established to provide financing for project costs as well as a means to collect funds for long term maintenance of the stormwater improvements.	Ensures stormwater projects continue to operate as designed.
Kane	Elevating basement depths	NA	New structures constructed should have basement elevations above the groundwater table elevation and means to maintain subdivision-wide stormwater infrastructure.	Prevents against basement flooding.
Kane	Flexible design criteria	NA	Design criteria are flexible to provide a measureable flood reduction at an affordable cost to residents.	Prevents flooding for everyone.
Kane	Provide project phasing	NA	The project is broken down into phases in order to work towards an overall goal and completed project.	Improves stormwater drainage and prevents flooding.
Kane	Kane County cost-share program	NA	Addresses flooding issues in neighborhoods experiencing urban flooding. Construction costs are off-set with funds from this program to match the contributions from homeowners.	Reduces urban flooding in older subdivisions.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Kankakee	Natural Hazards Mitigation Plan	2005	Identifies ways to reduce impacts of hazards on people and property. Eight major natural hazards are addressed in the plan: overbank flooding, local drainage problems, tornadoes, earthquakes, winter storms, thunderstorms, drought/heat, and wildfire.	Outlines ways to protect properties, reduce sedimentation, and address flooding and local drainage problems.
Kendall	Multi-Hazard Mitigation Plan	2011	Identifies ways to reduce or eliminate long-term risk to people and property.	Assesses flood hazards and mitigation strategies to reduce or eliminate flood risk.
Kendall	Hydrologic, Hydraulic, and Flood Analyses of Blackberry Creek Water-shed, Kendall County, Illinois	2007	Describes the data collection activities to refine hydrologic and hydraulic models to extend the flood-frequency analysis through water year 2003.	Assesses flooding along Blackberry Creek.
Lake	Ravine assessments	2011	Assessed ravines for bed properties, point source discharges, bed rank, and bank properties.	Identifies illicit discharges and potential flooding problems.
Lake	Greenbriar Subdivision drainage channel restoration	2001	Cleared vegetation in drainage ways, removed silt and sediment, replaced culverts, restored disturbed areas.	Increases storage capacity in drainage way.
Lake	Upper Des Plaines River stream gauges	2003	Installed several stream gauges on the Upper Des Plaines River.	Monitors flows to be used in flood modeling calibration.
Lake	Flood audits	2005	Properties with repetitive loss have had flood audits performed on them to determine if the property is within the floodplain and has insurance.	Identifies potential houses for buy-outs to prevent further loss. 386 properties have had flood audits.
Lake	Voluntary buyout program	NA	Properties with repetitive loss are bought out.	Prevents further flood damage. 199 properties have volunteered for the buyout program.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Lake	Ryerson Woods hydrological and ecological restoration	2007	Stabilized seven eroding channels and culverts, restored wetland hydrology via trail removal, installed rock checks to stabilize bed and riparian water table of Thorngate Creek.	Prevents sedimentation by preserving banks, increases infiltration in wetland and riparian zone.
Lake	Aptakisic Creek streambank stabilization	2003, 2009	Stabilized stream bank to preserve bike path and reduce sediment loading into the Des Plaines River.	Reduces sedimentation, improves water quality, increases stormwater storage.
Lake	Aptakisic Creek stream maintenance	1998	Removal of obstructions, stream bank stabilization and native plantings.	Increases stormwater storage for flooding.
Lake	Summerfields at Gurnee invasive species removal	2013	Removed invasive species from wetland areas.	Improves wetland functions, including stormwater capacity and infiltration to reduce flooding.
Lake	Country Club Estates Tower Lake drainage improvement	2000	Increased size of pipe to carry runoff during storm events.	Reduces flooding from incorrectly sized stormwater pipes.
Lake	St. Gilbert's Catholic Church bank stabilization	1997	Removal of brush and debris on two heavily eroded slopes and the restoration of slopes with bio-engineering techniques.	Reduces sediment to channel, increasing flood capacity.
Lake	Buffalo Creek restoration, maintenance, and stabilization	NA	Stream inventory to assess channel and bank conditions, hydraulic structures, discharge points and aquatic habitat, installation of stream bank stabilization practices.	Reduces sediment to channel, increasing flood capacity.
Lake	Bull Creek Ravine stabilization and flood control	NA	Installation of a water quality treatment device to remove suspended solids, floatables, oils and hydrocarbon films. Removed existing debris from creek. Restored stream bank with native vegetation, mitigate flooding, reduce erosion, improve water quality and restore natural areas. Completion of a watershed study.	Increases flood capacity, reduces sediment to channel.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Lake	Countryside Lake flood study and restoration project	NA	Stabilized eroding shoreline along peninsula and lagoon, restored woodland and wetland areas, developed a stormwater management plan to alleviate flooding throughout the subdivision and reduce sediment deposition into the lake.	Reduces flooding in the subdivision, reduces sediment to the lake.
Lake	Dead Dog stream restoration	2013	Stream restoration on Dead Dog Creek, completed in two phases. Phase I: upstream of Sheridan Road; Phase II: downstream of Sheridan Road.	Reduces flooding to surrounding neighborhoods, reduces sediment to the lake.
Lake	Hawthorn Woods Brierwoods Estates drainage improvement	1998	Storm sewer and culvert replacement, ditch cleaning, re-grading and stream bank restoration.	Improves stormwater runoff outflow for subdivision.
Lake	Highland Lake Rain Gardens and Luther Avenue storm sewer project	NA	Installed 2 rain gardens and new storm sewer, native vegetated swale.	Minimizes and alleviates flooding.
Lake	Stream bank stabilization projects	NA	Several projects have taken place in Lake County to stabilize stream banks with native plantings, re-grading, and other stream bank stabilization practices.	Increases flood capacity, reduces sediment to channel.
Lake	Stream maintenance	NA	Removing debris and sediment from streams to increase flood capacity.	Increases flood capacity, reduces debris from channel.
Lake	Stream and shoreline restoration	NA	Native plantings, re-grading, re-meandering and attaching stream to floodplain.	Increases stormwater storage for flooding, improves ecology.
Lake	Watershed monitoring	NA	Developed water quality monitoring plan and quality assurance project plan.	Identifies areas where projects should occur.
Lake	Stormwater system maintenance	NA	Culvert cleanouts, resizing pipes, cleaning out debris from pipes and reservoirs.	Increases capacity for floods.
Lake	Green infrastructure projects	NA	Green roof, rain gardens, permeable pavers, bio-swale, and filter.	Increases infiltration, stormwater storage.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Lake	Detention basin retrofits	NA	Retrofitting a large existing stormwater detention pond by physically modifying the fixed weir. Re-design of spillway and pond outlet to account for storm runoff.	Increases stormwater capacity.
Lake	New storm sewer construction	NA	Installation of new storm sewer pipes and reservoirs for stormwater.	Increases stormwater capacity.
Lake	Community Program for Flint Creek WMAG	2009	Funds used to produce a Best Management Practices manual and the promotion of the manual.	Educates public on how to protect the land and water they live near to maintain stormwater drainage designs and natural floodways.
Lake	Stream Inventories	NA	Stream inventory to assess channel and bank conditions, hydraulic structures, discharge points and aquatic habitat, installation of stream bank stabilization practices.	Identifies areas that need restoration, maintenance or other projects.
Lake	West and Middle Forks North Branch Floodplain Remapping	1992	An update of the FEMA Flood Insurance Study (FIS) and floodway/floodplain mapping.	Educates landowners on boundaries of floodplain.
Lake	Watershed plans	NA	Consists of the collection of data for a watershed management plan.	Identifies and prioritizes stormwater projects.
Lake	Slocum Lake Dam Modification	1995	Modifications to Slocum Dam.	Increases storage capacity, reduces sedimentation.
Lake	Liberty Prairie Homeowners Association Restoration, Education and Outreach Plan	2007	Cleared debris from the stream and created an outreach program to educate the residents who live along the creek about managing the creek.	Educates residents on how to maintain and manage the creek to prevent flooding issues.
Lake	City of Highland Park Ravine and Bluff Brochure	1994	Consists of the replacement of outdated brochures, in combination with a major change in ravine and bluff development city ordinance.	Educates residents about stormwater and flooding topics.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
LaSalle	Flood Damage Prevention Ordinance	2014	To prevent unwise developments from increasing flood or drainage hazards to others, protect new buildings and major improvements to buildings from flood damage, to promote and protect the public health, safety, and general welfare of the citizens from the hazards of flooding, to lessen the burden on the taxpayer for flood control, repairs to public facilities and utilities, and flood rescue and relief operations, maintain property values and a stable tax base by minimizing the potential for creating blight areas, make federally subsidized flood insurance available, and to preserve the natural characteristics and functions of watercourses and floodplains in order to moderate flood and stormwater impacts, improve water quality, reduce soil erosion, protect aquatic and riparian habitat, provide recreational opportunities, provide aesthetic benefits and enhance community and economic development.	Protects against flood damage; brings awareness about flood safety; moderates flood and stormwater impacts.
LaSalle	Natural Hazards Mitigation Plan	2008	Addresses dangers that nature can inflict upon a community and how to ease the harshness and pain in the aftermath of such hazards.	Prevents new construction from building within floodplain, brings awareness about flooding to a community, reduces flood risk.
LaSalle	LaSalle County Comprehensive Plan	2014	A reflection of community members' values and goals for the future, the plan lays out actions that will help the community achieve them.	Controls flooding and the loss of water supplies.
Madison	Hazard Mitigation Plan	2006	Assesses the mitigation activities in the county, evaluates additional mitigation measures that should be undertaken and outlines a strategy for implementation of mitigation projects.	Protects against flood damage; brings awareness about flood safety; moderates flood and stormwater impacts.
Madison	Stormwater Master Plan		Identifies short and long term solutions to address regional water quality and flooding issues and ensure ongoing regional economic vitality for the county.	Identifies water related assets in the county and details areas prone to flooding.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
Madison	Master Stormwater Management Plan	2010	Addresses a range of stormwater issues that guides stormwater management in the county.	Prioritizes stormwater issues to minimize problems.
McHenry	Green infrastructure Plan	2012	Presents a vision for countywide implementation of green infrastructure in land-use decisions and new development.	Encourages infiltration, floodplain reconnection, increases stormwater capacity.
McHenry	County Stormwater Management Plan	1996	Protects, preserves and restores water resources by means of controlling stormwater runoff, creates countywide plan using watershed design principles, controls development to reduce stormwater runoff, eliminates stormwater discharges which affect the public health, safety and welfare.	Reduces urban flooding by managing stormwater.
McHenry	Natural Hazards Mitigation Plan	2014	Addresses dangers that nature can inflict upon a community and how to ease the harshness and pain in the aftermath of such hazards.	Brings awareness about flooding to a community, reduces flood risk.
St. Clair	St. Clair County Comprehensive Plan	2011	Establishes a logical guidebook of land use, transportation, infrastructure and economic development policies that will influence public and private decision-making in St. Clair County.	Identifies land use and areas to avoid building.
St. Clair	MS4 Stormwater Permit Implementation and Compliance	2003	Development of a stormwater management plan with best management practices and stormwater pollution prevention plans identified.	Manages stormwater to prevent urban flooding.
St. Clair	Multi-Hazard Mitigation Plan	NA	Identifies ways to reduce or eliminate long-term risk to people and property.	Assesses flood hazards and mitigation strategies to reduce or eliminate flood risk.

County	Project name	Year	Project description	Damages avoided/ Impact on flood prevention
St. Clair, Madison, Monroe	Southwestern Illinois Flood Prevention District Council	2009	Formed in response to FEMA's announcement to de-accredit the 74-mile levee system protecting St. Louis Metro East region. Independent Flood Prevention Districts (FPDs) were formed to oversee the improvement of the Metro East levee systems so they can continue to protect the lives, property and the economic vitality of the St. Louis Metro East region.	Prevents flooding within the St. Louis Metro East region.
Will	Comprehensive Stormwater Management Plan	NA	Advises county on issues related to stormwater management, guides developments, and ensures maintenance of stormwater facilities.	Identifies ways to control stormwater runoff, prevent pollution, and increase stormwater capacity.
Will	Will County Stream and Rain Gages	NA	Network of stream and rain gages within the county.	Allows for monitoring of streams and rainfall within watersheds. Provides calibration tools for H&H models.

County Ordinances and Standards

The elements within each county's stormwater ordinance are similar. The design storm used for the stormwater conveyance system, detention requirements, and applicability for a stormwater permit are listed in Table G.3. Counties either use the 100-year (1% annual chance) event or the 10-year (10% annual chance) event for the stormwater system design. The counties specifying the 10-year event require a safe overflow pathway for the 100-year event as well. The expect total precipitation over a 24 hour period that is expected to occur on average, once every hundred years is commonly referred to as the 100-year, 24-hour storm event. It is common event to use this event for stormwater detention requirements. The thresholds for a stormwater permit requirement are somewhat varied, though several counties use 5,000 square feet, 10,000 square feet, or 1 acre as developed-area thresholds.

Overall, the ordinances, programs, and projects established by the counties given authority to manage stormwater provide a framework for controlling urban flooding. Stormwater runoff is controlled through the ordinance and permitting structure. Problem areas are targeted with specific projects and programs designed to reduce urban flooding and property damage.

Table G.3. County Stormwater Ordinance summary of common elements

County	Design storm for stormwater systems	Retention/ Detention Requirements	Area of Development Thresholds			
			Residential	Multi-family	Non-Res	Open Space
Cook	100 year	First inch of runoff from impervious area = volume control storage	1 acre	0.5 acre	0.5 acre	0.5 acre
Kane	100 year	0.1 cfs/acre detention + 0.75" rainfall over impervious area of new development	2 or more homes on 3 or more acres	1 acre	1 acre	
DuPage	100 year	Pre-development peak discharges in a 2 year, 24 hour and 100 year event of critical duration up to a 24 hour duration	5,000 square feet, or 2,500 square feet of net new impervious			
Will	100 year	100 year, 24 hour	1 acre	1 acre	1 acre	1 acre
Lake	10 year	0.04 cfs/acre for the 2-year, 24-hour event; and 0.15 cfs/acre for the 100-year, 24-hour event	5,000 square feet of hydrologic disturbance; activities within a floodplain or create a wetland impact; drainage modifications with twenty (20) or more acres of tributary drainage area			

County	Design storm for stormwater systems	Retention/ Detention Requirements	Area of Development Thresholds			
			Residential	Multi-family	Non-Res	Open Space
DeKalb	10 year	100 year, critical duration	Any land disturbing activity affecting more than 10,000 square feet; land disturbing activity within 100 feet of a waterway			
Kankakee	10 year	100 year	Construction adding more than 500 square feet of impervious surface, land disturbing activity affecting more than 5,000 square feet, activity within 25 feet of a waterway.			
Kendall	100 year	100 year, 24 hour	< 3acre	45,000 square feet of development or 32,000 square feet of impervious area		
Madison	100 year	100 year, 24 hour	10,000 square feet total impervious surface; any activity disturbing 10,000 square feet; any activity within 25 feet of a waterbody; any activity on a slope			
McHenry	10 year	100 year, critical duration	Development disturbing 5000 square feet or more; 50% or more of a parcel; 20,000 square feet additional impervious; or within a flood hazard area or wetland.			
Monroe	100 year	pre-development = post-development runoff	Any new development or redevelopment that will meet or exceed 5,000 square feet of total impervious surface; any land disturbance activity in excess of 5,000 square feet located in a business or industrial zoning district			
Peoria	2 year, 25 year	pre-development = post-development for 2-year and 25-year events	Land disturbing activity disturbing more than 5,000 square feet			
St. Clair	2 year,	100 year, 24 hour	Any new development or redevelopment that will meet or exceed 10,000 square feet of total impervious surface; any land disturbance activity in excess of 1 acre of land; land disturbing activity within 25 feet of any waterway			

County stormwater management programs are able to address stormwater program management issues at a larger scale than many small communities, especially in a highly dense urban area. Some county programs, such as those of DuPage and Lake Counties, provide permitting and regulation only when communities choose not to administer the program themselves. Many small communities benefit from a county's efficient use of resources to support and enforce stormwater regulation and avoid competitive lowering of stormwater management standards for economic benefit. Counties are better able to facilitate watershed-based analysis of stormwater management issues. Counties have successfully implemented sources of funding that may not be viable for small communities.

While County Management provides many benefits for small communities in urban areas, there are limitations to addressing flooding caused by existing municipal infrastructure or a lack of overflow drainage path. Counties with stormwater management programs do not have jurisdiction over municipal sewer systems. Even the most active county stormwater programs typically stop short of addressing

local storm and sanitary sewer issues that can cause urban flooding damages outside of the floodplain. County programs, including capital improvements and flood reduction strategies, generally address riverine flooding. While counties with stormwater management authority provide a support framework, the responsibility for maintenance of local stormwater infrastructure, such as storm sewers and combined sewers, still falls on the municipality.

In general, the aspect of County stormwater management programs with the most impact on stormwater flooding in urban areas is pro-active design requirements for new development. Other programs addressing reduction of urban flooding outside of the floodplain vary by county. Some counties provide outreach about urban flooding risk or engineering analysis to support local flood reduction actions. Green infrastructure programs in previously developed areas reduce local rainfall runoff volume. The Cook County Stormwater Management Plan Amendment recently provided the MWRDGC authority to allow planning, implementation and funding of local stormwater drainage projects and several projects that will reduce urban flood damages are underway. The Kane County Cost Share Program provides funding to alleviate local urban flooding.

Stormwater Program Funding

A variety of funding mechanisms are used to support county stormwater programs. The access to property or other taxes and the use of these funds is dependent upon the specific authority of the program under the adopted ordinances and the specific authority of the local government. Agreements and responsibilities between the county and a community can vary. Kane county is in the unique position to use revenue from riverboats where gambling is permitted.

Appendix H: Stormwater Design Standards

Hydrologic Design and Risk

Stormwater infrastructure design is the process of assessing the impact of flow events on a stormwater system and choosing values for the key design variables of the system so that it will perform adequately (Chow et al., 1988). A key design variable, design discharge, is often defined by a return period. The return period is a way of expressing that the design discharge is expected to be equaled or exceeded on average once in a specified number of years, for example the 10-year discharge. This can also be expressed as a probability such 10% annual chance discharge that has a 10% chance of being equaled or exceeded every year. The 1% annual chance event is used by the Nation Flood Insurance Program to identify areas that have a 1% chance of inundation every year, and flood insurance is mandated for federally back loans.

RETURN PERIOD
Frequency of Occurrence in Hydrology

The return period is a way of expressing that the design discharge is expected to be equaled or exceeded on average once in the specified number of years, for example the 10-year rainfall. In the long term, the 10-year rainfall is expected to be equaled or exceeded 1 time in 10 years. It could happen 2 years in succession, then not again for 18 years. This can also be expressed as a probability, such as a 10% annual chance of occurrence, meaning it has a 10% chance of being equaled or exceeded every year.

Design Standards and Rainfall

Contemporary urban stormwater systems are commonly designed to have the capacity to convey events that occur on average once in five years or once in ten years. Excess runoff, which can result in flooding, is expected during larger events that would happen less frequently, e.g. 25–year, 50-year or 100-year events. Infrastructure with the capacity to convey these larger but less frequent events would require a larger conveyance system (pipes) and significantly higher costs than a system designed to convey relatively smaller, more frequent events.

Safety, cost, and tolerance of the system capacity being exceeded and resulting flooding are all considerations when a community sets design standards.

Design standards are not the same across the country, within a state, or even between contiguous municipalities but tend to be similar. Most current design standards were originally established at the recommendation of groups of experts in the 1960s-1970s and continue to be reviewed and debated today (ASFPM, 2004).

Design Storms

The design discharge is computed based on a design storm event (a design storm event that determines the design discharge). Design storm events are typically defined by rainfall duration, total rainfall amount, and temporal distribution of rainfall, in addition to the return period (as described above). The design storm duration is the length of time over which the event occurs and the distribution represents the varying intensity of the rainfall throughout the duration. The duration of the event used for design varies with the area drained and flow paths. The duration and type of distribution used for the design

storm influences the timing and peak design discharge. The 10-year, 2-hour design storm was selected for examination in this report as representative of storm sewer design and the 100-year, 24-hour storm is typical for detention basin design within Illinois.

Precipitation data are used to compute runoff (discharge) and size stormwater infrastructure. Rainfall intensity-duration estimates are based on statistical analyses of long-term gauge data. For Illinois, the initial source of rainfall intensity-duration estimates was the National Weather Service's "Technique Paper No. 40, Rainfall Frequency Atlas of the United States" (TP-40) (Hershfield, 1961). TP-40 contains probable rainfall intensity-duration estimates for the contiguous United States for duration of 30 minutes to 24 hours and return periods of 1 to 100 years. The rain gauge records spanned 1938-1957. The next source of intensity-duration estimates comes from the Illinois State Water Survey's "Bulletin 70: Frequency Distributions and Hydroclimatic Characters of Heavy Rainstorms in Illinois" (Huff and Angel, 1989). Bulletin 70 contains probable rainfall intensity-duration estimates for duration of 5 minutes to 10 days and return periods of 2 to 100 years. The rain gauge records spanned 1901-1983. The latest published source of rainfall intensity-duration estimates is the National Oceanic and Atmospheric Administration's "Atlas 14: Precipitation-Frequency Atlas of the United States, Volume 2, Version 3.0: Delaware, District of Columbia, Illinois, Indiana, Kentucky, Maryland, New Jersey, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia" (Bonnin et al., 2006). Atlas 14 contains probable rainfall intensity-duration estimates for duration of 5 minutes to 60 days and return periods of 1 to 1000 years. The rain gauge records spanned 1891-2000.

Based on a state-wide review, the current widely accepted state standard for rainfall intensity duration data is Bulletin 70. The Illinois Department of Natural Resources, Office of Water Resources requires the use of Bulletin 70 hydrology for flood studies requiring state permits and most stormwater ordinances in Illinois recommend the use of Bulletin 70 for design. The Federal Emergency Management Agency likewise requires Bulletin 70 hydrology when mandated by the state. The Illinois Department of Transportation also recommends the used of Bulletin 70 precipitation for all hydrologic methods and modeling. However, prior to the publication of Bulletin 70 in 1989, the National Weather Service publication Technical Paper 40 was the source of design rainfall data. Stormwater systems and infrastructure designed and constructed through the late 1980s is based on TP40 rainfall data. Cook County used TP40 data until 2014.

TP40 results are based on precipitation data that span a relatively dry period as compared to subsequent decades. In many areas of Illinois, the expected depth of rainfall during a less frequent (larger) storm event given in TP40 is less that the expected rainfall based on the results for the longer period of record presented in Bulletin 70. A comparison of TP40 and Bulletin 70 is provided in Figure H.1 for the 10-yr, 2hr and 100-yr, 24hr events. Atlas 14 uses gauge data in its analyses extending to 2000, 17 years of additional data over that available for Bulletin 70. A comparison of Atlas-14 and Bulletin 70 is provided in Figure H.2 for the 10-yr, 2hr and 100-yr, 24hr events. In areas where Bulletin 70 rainfall depths are greater than TP40 rainfall depths, it is likely that storm sewer systems designed using TP40 data would be considered undersized based on Bulletin 70 data, the outcome being the system capacity would be exceeded more frequently than anticipated.

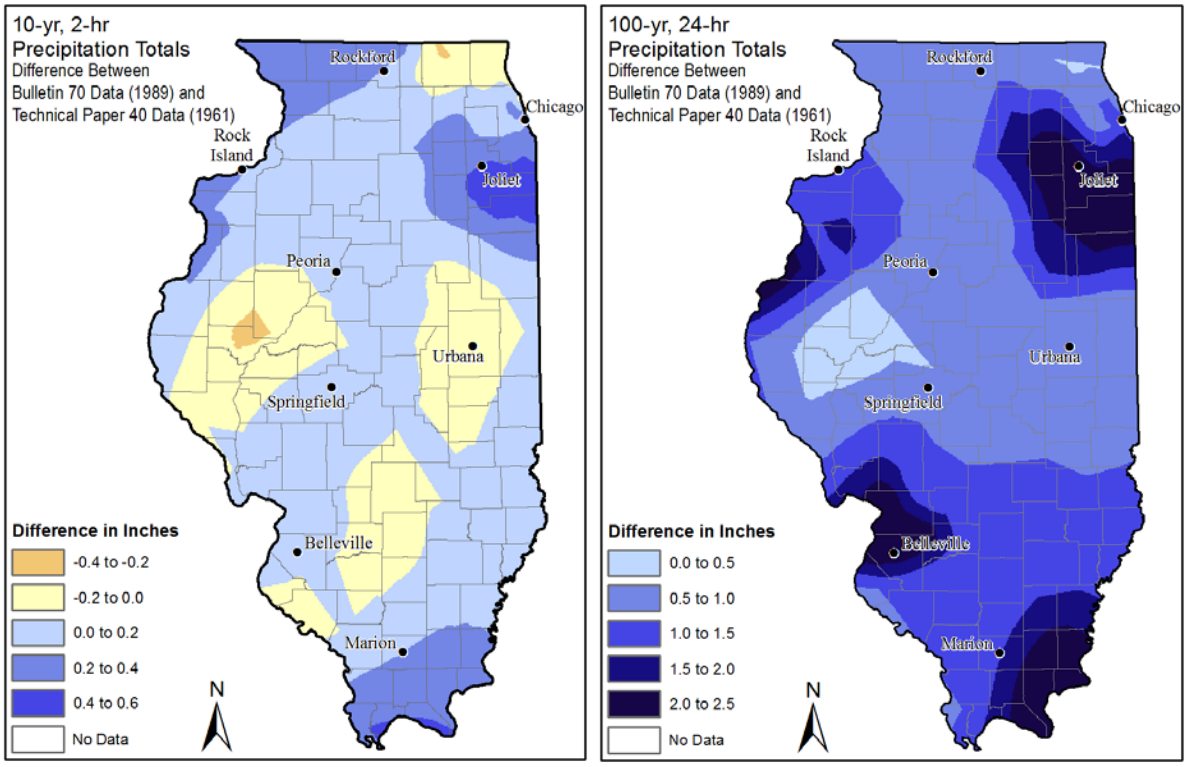


Figure H.1: Differences between Bulletin 70 and TP-40 for the 10-yr, 2hr and 100yr, 24hr design storms. Blue shows areas where Bulletin 70 has higher rainfall totals, yellow shows where TP-40 has higher totals. TP-40 shows lower rainfall totals than Bulletin 70 for the 100-yr, 24-hr event across Illinois while the rainfall totals for the 10-yr, 2-hr are similar (within 0.5 inches). TP-40 was based on a shorter record earlier in the 20th century which did not include large storms characteristic for the period after the 1950s.

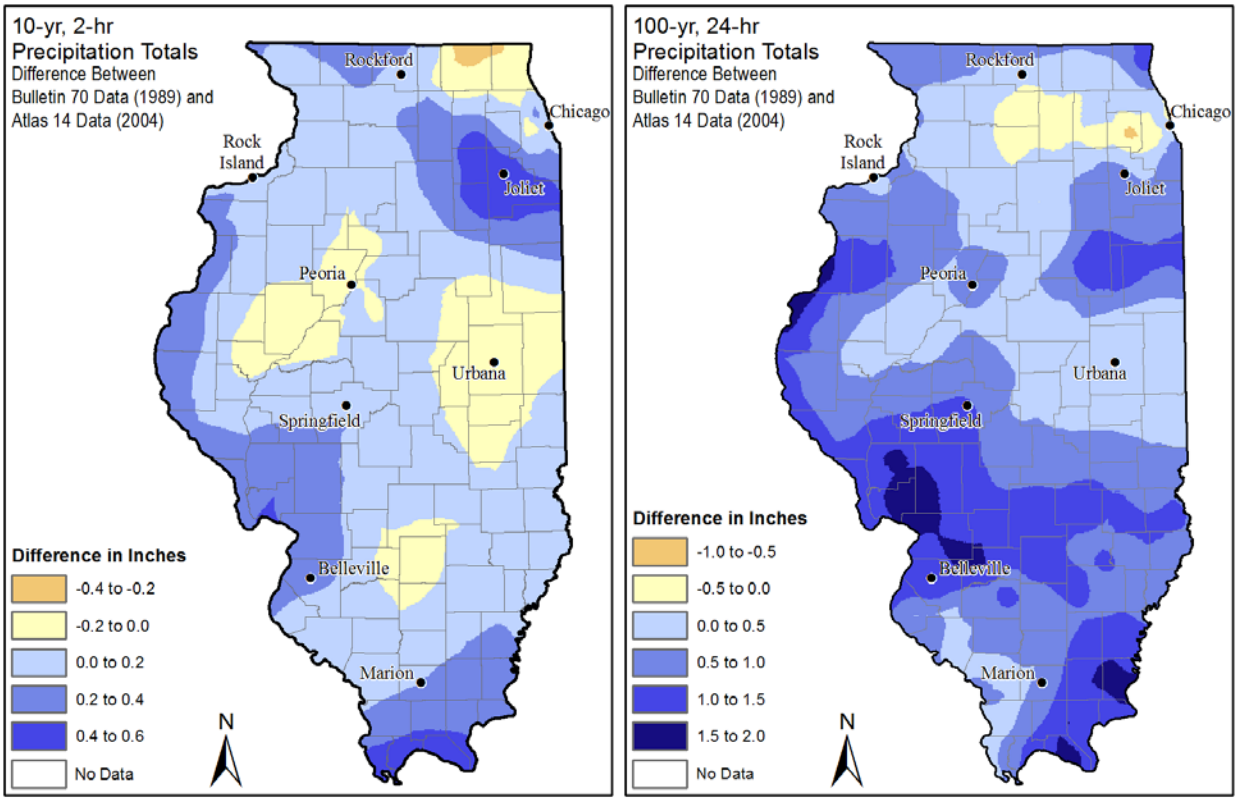


Figure H.2: Differences between Bulletin 70 and Atlas-14 for the 10-yr, 2hr and 100yr, 24hr design storms. Blue shows areas where Bulletin 70 has higher rainfall totals, yellow shows where Altas-14 has higher totals. Bulletin 70 and Atlas-14 provide similar rainfall totals for the 10-yr, 2hr storm, usually within 0.5 inches. Atlas-14 shows lower rainfall totals than Bulletin 70 for the 100-yr, 24-hr event across Illinois, except for DuPage County and areas to the west.

Table H.1 shows a comparison of average rainfall amounts for recorded at O'Hare Airport in Cook County for the 10-yr, 2-hr and 100-yr, 24-hr design storms for TP-40, Bulletin 70, and Atlas-14. The 10-year, 2-hour design storm is generally representative for storm sewer design and the 100-year, 24-hour storm is typical for detention basin design within Illinois.

Table H.1: Precipitation intensity-duration estimates for Northeastern Illinois (O'Hare Airport)

Design Storm	TP-40 (in)	Bulletin 70 (in)	Atlas-14 (in)
10yr-2hr	2.37	2.64	2.48
100yr-24hr	5.75	7.58	7.22

The selection of a source for data used in design storm approach can greatly affect the design, functionality, and lifespan of the stormwater infrastructure. For example from Table 1, a storm sewer designed to accommodate the TP-40 10-yr, 2-hr storm event would correspond to a sewer designed to convey only the 6.6-yr, 2-hr Bulletin 70 design storm. A detention basin sized to accommodate the TP-40 100-yr, 24-hr storm event would accommodate only the 31.3-yr, 24-hr Bulletin 70 design storm. Compared to Atlas-14 rainfall values, the stormwater infrastructure would be designed to accommodate the 8-yr, 2-hr and the 84-yr, 24-hr Bulletin 70 design storms, respectively. This illustrates that stormwater infrastructure, which was designed properly based on one set of intensity-duration

estimates may be undersized (10yr vs 6.6yr design storm) compared to a design based on another set of intensity-duration estimates.

Another way to demonstrate that that some areas are experience more frequent high intensity storms is to examine the trend in observed frequency of 10-year 2-hour storm events in the past 25 years. Rainfall data collected across Cook County illustrates this trend in Figure H.3. In Figure H.3, the line labeled "Expected" is the base line of one exceedance of the expected 2 hour rainfall total over a 10-year period based on TP-40 (Hershfield, 1961). The bars in Figure H.3 show data averaged over 25 stations in Cook County (Westcott, 2015). Since the 1990's the 10-year 2-hour storm based on TP40 has been exceed more frequently than expected. . The incomplete decade of 2010s (available 2010-2014) is prorated for consistent comparisons with other decades in that there were a particularly large number of exceedances in the most recent years (2010-2014).

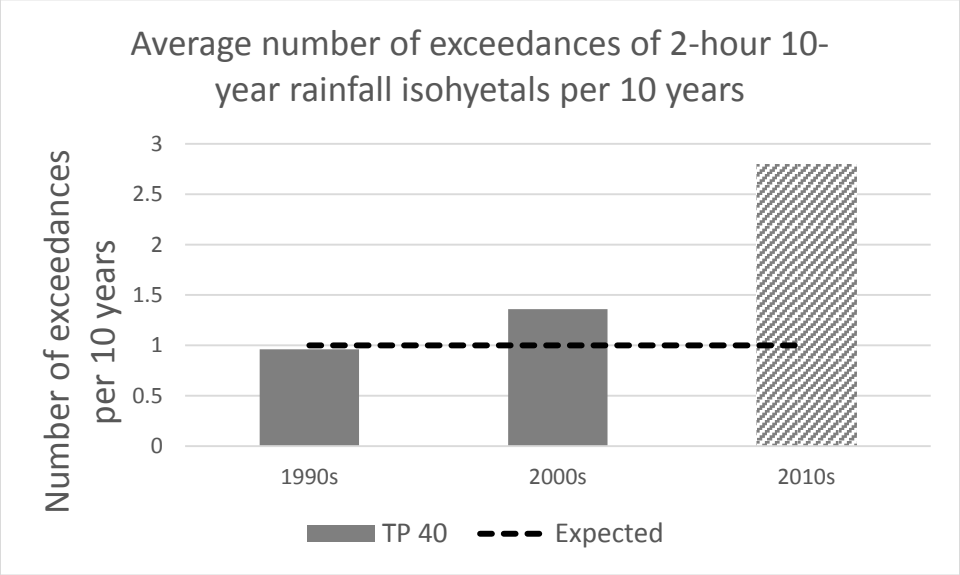


Figure H.3: Observed number of exceedances of the 2-hour 10-year rainfall amount based on TP-40 (Hershfield, 1961), averaged over the 25 gages in the Cook County Precipitation Network (Westcott, 2015)

Stormwater infrastructure design is based on design storms derived from a statistical analyses of observed rainfall. As more years of observation data become available, the inches of rainfall associated with recurrence intervals, e.g. 10-year storm, can change. The comparison of TP40, Bulletin 70 and Atlas 14 indicates that rainfall and thus design storms is increasing in areas of Illinois. Bulletin 70 analyses although similar to the tools used by the National Weather Service, takes into account known irregularities in precipitation and provides a finer tuned estimation of rainfall intensities and durations. It should continue to be used for stormwater infrastructure design; however, with 30 years of additional data available, an update of Bulletin 70 should be performed.

Existing Storm Sewer Standards in Illinois

Stormwater infrastructure designed to carry excess runoff commonly called a conveyance system. The conveyance system is divided into a minor system and a major system for design considerations. The minor system is that portion of the stormwater system consisting of street gutters, inlets, storm sewers, swales, etc., designed to convey runoff based on the local jurisdiction design requirements. The major system is that portion of the stormwater system that stores and conveys flows beyond the capacity of the minor system without causing property damage (Maki, 2007a). In a typical subdivision the minor system would be the rear yard swale, gutter inlets, and stormwater sewers, and the major system would consist of the minor system and the dedicated overflow area needed to convey the 100-year runoff to the detention basin.

In Illinois, the ordinances regarding stormwater system design vary across the state. In northeastern Illinois the standard requirement based on a review of local ordinances is for minor systems to convey the 10-year event and for major systems to convey the 100-year event. Outside of the Chicago Metropolitan Area, municipal requirements vary between the 5-year and 10-year events (a few require conveyance of a 2-year event) for minor systems; and the 50-year and 100-year events for major systems. The standards vary across the state (see Tables H.2 - H.4). The Illinois Department of Transportation (IDOT) also requires minor conveyance systems along State roads to convey the 10-year event; depressed areas where runoff can only be removed by a storm sewer should be designed to convey the 50-year event. In addition, consideration should be given to traffic volume, type and use of roadway, speed limit, flood damage potential, and the needs of the local community (IDOT, 2011).

Storm sewer design standards have changed over the years and these changes are apparent across Illinois urban areas. In the oldest urban areas stormwater if often drained by combined sewers which carry both waste water and stormwater. Slightly newer areas may be drained by storm sewers designed for the 2-year event. The newest areas of a town may be drained by storm sewers designed for the 5-year or 10-year events. In this way Illinois towns represent the evolution of stormwater conveyance system design.

Existing Detention Release Rates Standards in Illinois

Many communities have adopted ordinances to require that new developments manage runoff from the developed area so that pre-development runoff peaks are not exceeded. To accomplish this requirement, detention basins are often constructed to detain runoff and slowly release it. The design standard for a detention facility and outlet structure is commonly expressed as an allowable release rate for a specified

Figure H.4: Regional detention basin in Champaign, IL. Photo courtesy of FOTH.

return interval event; for example, release from the structures shall not exceed 0.3 cfs per acre of development during a 100-year event, and the peak discharge from the detention structure must be less than pre-development 100-year peak discharge. How and why the prescribed release rate is determined and the corresponding magnitude varies regionally across Illinois and will be discussed in more detail below. Smaller storm events, typically the 2-year, 3-year, 5-year, or 10-year events (corresponding to a 50%, 33.3%, 20%, and 10% chance of occurring every year) are usually also considered during stormwater infrastructure design. Limiting peak discharges for both a large and small flood event helps to ensure that peak flow rates are controlled downstream over a large range of storm events and event frequencies.

Stormwater detention facilities are usually sized to accommodate the runoff from the 100-year event needed to meet the prescribed maximum allowable release rate given the designed outlet structure. Detention facilities designed with typical engineering practice have one foot of freeboard (extra storage) during the design storm and an emergency overflow with corresponding overland flow path. Additional water quality, volume control, and/or safety design features are sometimes required by specific municipalities based on local needs or standard practice.

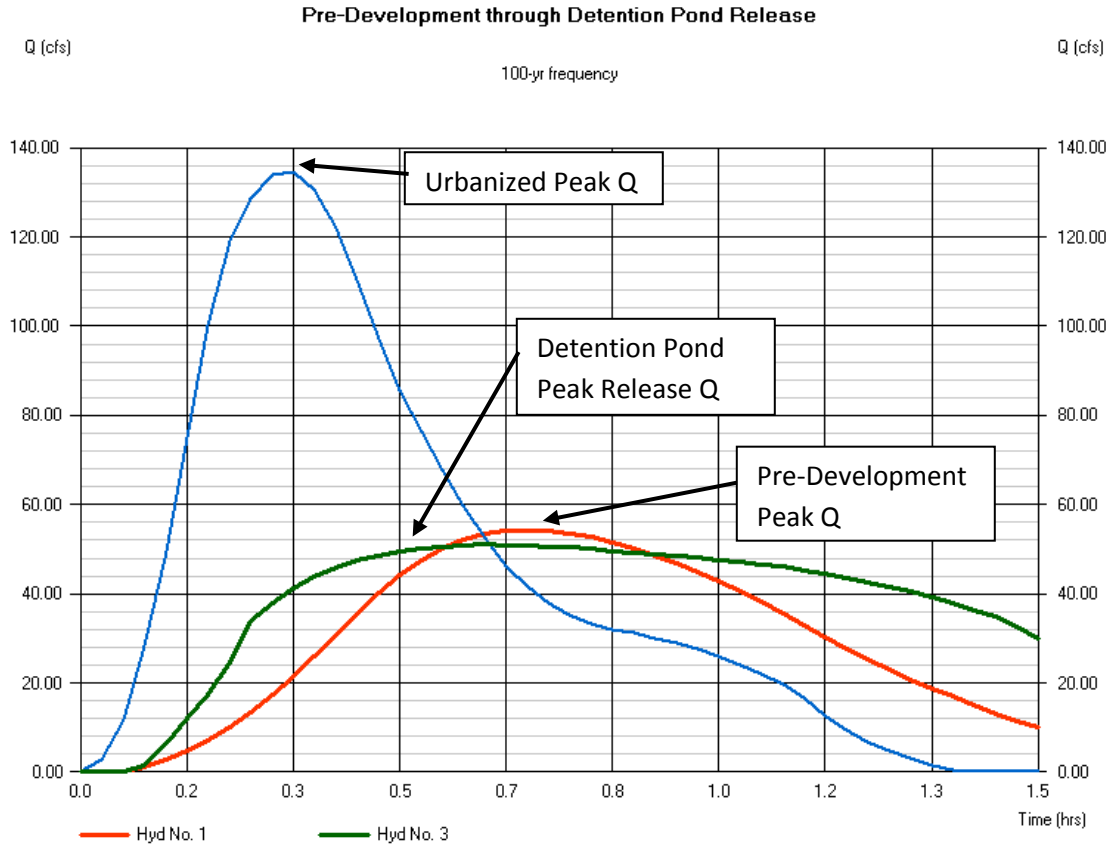


Figure H.5: Pre-development (red), post-development (blue), and detention pond (green) hydrographs: The peak discharge increases due to urbanization and is reduced below pre-development conditions by the detention pond. The volume of runoff increases between the pre-development conditions and runoff released by the detention pond.

Determining pre-development peak runoff requires knowledge of the original physical characteristic of the watershed, such as land use, soil properties, and topographic information and interpretation of several other factors. Depending on the user, the factors, such as time of concentration, can have a great degree of variability. The variability affects the determined peak flow, and the peak flow is used to determine the allowable release rate from the detention facility (Maki, 2007b).

In Illinois, pre-development conditions are usually defined as row-crop agricultural land or undisturbed forested land, as appropriate. Undisturbed prairie land is rarely defined as the pre-development condition. However, the definition and evaluation of pre-development conditions can be difficult to determine in many situations. Pre-development conditions in northeastern Illinois are disturbed lands that were potentially used for agriculture or even rural development decades ago but have been through several (sometimes more) stages of development and redevelopment since. Pre-development soil characteristics and topographic information are unknown and so pre-development peak storm discharges can't adequately be determined. Due to these difficulties the modeling of pre-development conditions can lend itself to a great amount of variability between different regions in Illinois, depending on the user and development history (Maki, 2007b).

In Central and Southern Illinois post-development peak stormwater release rates are generally based on pre-development conditions (see Table H.3). For example, the 100-year post-development peak release rate must be equal to or less than the 100-yr pre-development peak storm discharge and the 5-year post development peak release rate must be equal to or less than the 5-year pre-development peak storm discharge. Some municipalities impose more restrictive requirements, such as the Cities of Bloomington and Normal, which require all post-development release rates to be equal to or less than the 3-year pre-development runoff rate. The City of Urbana requires that the 50-year post development peak release rate must be equal to or less than the 5-year pre-development peak storm discharge. Small release rates for new developments can help to mitigate increased peak flow rates from areas in the watershed developed prior to the implementation of stormwater management guidelines. However, unless retention is required, water volume will likely increase as the retained water is slowly released from detention structures.

In 1989 the Chicago Metropolitan Agency for Planning (CMAP) (formally Northeastern Illinois Planning Commission, NIPC) released a report call "Evaluation of Stormwater Detention Effectiveness in Northeastern Illinois", which led to the implementation of uniform stormwater release rates in northeastern Illinois (Dreher et al., 1989 and Dreher and Price, 1991). The study showed that detention basins designed to limit the design storm runoff peak (100-year event) to pre-development conditions resulted in increased downstream peaks in the northeastern Illinois area due to the large volume of stormwater runoff and coincident hydrographs downstream. From the study CMAP recommended the implementation of a more restrictive uniform release rate (Maki, 2007b). CMAP determined that if local peak runoff is controlled below the pre-development runoff rate, then downstream peaks could more closely represent pre-development conditions for that event. CMAP released a Model On-Site Stormwater Detention Ordinance in which a dual-uniform release rate of 0.04 cfs/acre for the 2-year event and 0.15 cfs/acre for the 100-year event is suggested (CMAP, 1990 and 1994). Kendall County, Lake County, McHenry County, and Will County currently use these dual-uniform release rates. DuPage

County and Kane County use a single-uniform release rate of 0.1 cfs/acre for the 100-year event (Table H.2). Municipalities within these counties can impose more restrictive stormwater release rate limits as desired.

The Southwestern Illinois Planning Commission (SIPC) serves Madison, St. Clair, and Monroe counties and produced a model ordinance, similar to the CMAP model ordinance, which included the same dual-uniform release rates of 0.04 cfs/acre and 0.15 cfs/acre for the 2-year and 100-year events, respectively (SIPC, 1997). However, the dual-uniform release rates have not been widely implemented by the counties or local municipalities, where most ordinances refer to pre-development conditions (Table H.4).

Existing Volume Reduction Standards in Illinois

Modern stormwater ordinances have generally been effective at controlling the rate of stormwater runoff but have limited impact on reducing the total volume of runoff (CMAP, 2008). Detention basins can capture increased stormwater volume due to development and reduce the peak discharge, but eventually the extra stormwater volume is released downstream (Maki, 2007a). The extra stormwater volume can contribute to flooding and other environmental issues downstream, even when the peak runoff rate is relatively small and the extra volume is released over several days. Reducing the volume of stormwater runoff can be especially important in areas with combined sewer. Combined sewers are sewers that carry both sanitary and stormwater flows. During storm events the combined sewer system can frequently become overwhelmed and discharge the stormwater and sanitary water directly into bodies of water, called Combined Sewer Overflows (CSOs), or back up into basement and crawlspaces (CMAP, 2008). If the amount of stormwater runoff can be reduced, the number of CSO discharge events and sewer backups can also be reduced.

In some cases reducing the runoff volume will not reduce peak flows downstream if altered hydrographs coincide with another sub-watershed hydrograph and create a bigger flood peak at some point downstream.

Stormwater volume can be reduced by minimizing impervious surfaces on developed properties, infiltrating runoff on-site, and promoting temporary storage for secondary uses, such as irrigation. Several counties in northeastern Illinois, including DuPage, Kendall, Lake, and McHenry, have included a runoff volume reduction hierarchy in their county-wide stormwater ordnances. The hierarchy (first proposed in the CMAP Model Ordinance) calls for the preservation of a site's natural features, such as wetlands and natural streams, the minimization of impervious surfaces, and the use of vegetated swales instead of storm sewers (Maki, 2007a). Several other counties such as Kane County have included a list of best management practices (BMPs) for stormwater volume reduction. See Chapter 9 and Appendix J of this report for more information of stormwater BMP and green infrastructure uses and limitations.

Several different stormwater volume reduction standards have been adopted around the United States. Section 438 of the Energy Independence and Security Act requires no discharge of stormwater runoff from Federal Projects from all rainfall events less than the 95th percentile rainfall (USEPA, 2009). The City of Philadelphia, PA requires that the first inch of rainfall must be met by infiltrating the water volume

unless infiltration is determined to be infeasible. The Cities of Spokane, WA and Portland, OR require that the post-development peak discharge and stormwater volume must be less than or equal to a specified pre-development peak discharge and volume (Karkowski et al., 2014).

Table H.2: Northern Illinois Sample Ordinances

Community/ Agency	Stormwater Runoff Regulation / Release Rate Standard	Stormwater Detention Size Design Standard	Minor Storm Sewer Size Design Standard
MWRDGC	100-year: 0.3 cfs/acre	100yr	10yr
DuPage County	100-year, 24-hour: 0.10 cfs/acre No increase in 2-year, 24-hour discharge	100yr	10yr
Kane County	100-year, 24-hour: 0.10 cfs/acre	100yr	10yr
Kendall County	2-year, 24-hour: 0.04 cfs/acre 100-year, 24-hour: 0.15 cfs/acre	100yr	10yr
Lake County	2-year, 24-hour: 0.04 cfs/acre 100-year, 24-hour: 0.15 cfs/acre	100yr	10yr
McHenry County	2-year, 24-hour: 0.04 cfs/acre 100-year, 24-hour: 0.15 cfs/acre	100yr	10yr
Will County	2-year, 24-hour: 0.04 cfs/acre 100-year, 24-hour: 0.15 cfs/acre	100yr	10yr
Aurora	Same as Kane County Ordinance	Same as Kane County Ordinance	Same as Kane County Ordinance
Elgin	Same as Kane County Ordinance	Same as Kane County Ordinance	Same as Kane County Ordinance
Naperville	Same as applicable County Ordinances	Same as applicable County Ordinances	10yr
Joliet	2-year, 24-hour: 0.04 cfs/acre and 100-year, 24-hour: 0.15 cfs/acre	100yr	10yr
Northfield	All events less than 0.15 cfs/ac	100yr	10yr
Arlington Heights	All events less than 0.18 cfs/ac	100yr	10yr
Evanston	3-year less than 0.15 cfs/ac	100yr	Mostly Combined
Orland Park	2-year, 24-hour: 0.04 cfs/acre and 100-year, 24-hour: 0.15 cfs/acre	100yr	10yr
Rosemont	Same as MWRDGC	Same as MWRDGC	Same as MWRDGC
Skokie	Post-development must be less than 2-year pre-development	100yr	
Waukegan	Post-development must be less than 3-year pre-development	100yr	design storm assuming fully developed

Table H.3: Central and Southern Illinois Sample Ordinances

Community	Stormwater Runoff Regulation / Release Rate	Stormwater Detention Size Regulation	Minor Storm Sewer Regulation
Carbondale	10-year post-development less than 5-year pre-development	10 yr	10yr
Champaign	100-year, 24 hour post-development less than 100-year, 24 hour pre-development. Not greater than 0.18 cfs/ac	100yr	5yr
Urbana	50-year post-development less than 5-year pre-development	50yr	5yr
Bloomington	all post-development events less than 3-year pre-development	100yr	5yr
Normal	all post-development events less than 3-year pre-development	100yr	5yr
Decatur	all post-development events less than 3-year pre-development	100yr	5yr
Effingham	post-development less than pre-development for 5, 10, 25, 50, and 100-year, 24-hour events	100yr	10yr
Mt. Vernon	10-year and 100-year post-development less than 10-year and 100-year pre-development, respectively. Critical duration.	100yr	10yr
Peoria	1-year and 10-year: 0.08 cfs/acre, 100-year: 0.30 cfs/acre	100yr	10yr
Rockford	All events: 0.2cfs/ac	100yr	5yr - minor, 25yr - major
Rock Island	post-development less than pre-development for 5, 10, 25, 50, and 100-year, 24-hour events	100yr	10yr
Springfield	10-year and 100-year post-development less than 10-year and 100-year pre-development, respectively. Critical duration.	100yr	5yr

Table H.4: East St. Louis Metro Sample Ordinances

Community	Stormwater Runoff Regulation / Release Rate	Stormwater Detention Size Regulation	Minor Storm Sewer Regulation
Madison Co	2-year, 24-hour and 100-year, 24-hour post-development less than 2-year, 24-hour and 100-year, 24-hour pre-development, respectively	100yr	2yr
St. Clair Co	2-year, 24-hour and 100-year, 24-hour post-development less than 2-year, 24-hour and 100-year, 24-hour pre-development, respectively	100yr	2yr
Monroe Co	50-year post-development less than 50-year pre-development	50yr	10yr
Edwardsville	2-year, 24-hour: 0.04 cfs/acre 100-year, 24-hour: 0.15 cfs/acre	100yr	10yr
Collinsville	post-development less than pre-development for 5, 10, 25, 50, and 100-year, 24-hour events	sized based on 100yr	10yr
Alton	10-year, 24-hour and 100-year, 24-hour post-development less than 10-year, 24-hour and 100-year, 24-hour pre-development, respectively.	sized based on 100yr	Talbot's Formula
Roxana	10-year, 24-hour and 100-year, 24-hour post-development less than 10-year, 24-hour and 100-year, 24-hour pre-development, respectively.	sized based on 100yr	
Belleville	post-development less than pre-development for all events	100yr	2yr, 24hr

References

Association of State Floodplain Managers (ASFPM). (2004). *Reducing flood losses is the 1% chance flood standard sufficient?*. Report of the 2004 Assembly of the Gilbert F. White Flood Policy Forum, Washington, DC.

Bonnin, G. M., Martin, D., Lin, B., Parzybok, T., Yekta, M., & Riley, D. (2006). *National Oceanic Atmospheric Administration Atlas 14: precipitation frequency atlas for the United States, Volume 2 Version 3.0:* Delaware, District of Columbia, Illinois, Indiana, Kentucky, Maryland, New Jersey, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia. U.S. Department of Commerce. Silver Spring, MD.

Chicago Metropolitan Agency for Planning (CMAP). (1990). *Model stormwater drainage and detention ordinance*. Chicago, IL. Retrieved from http://www.cmap.illinois.gov/documents/10180/12532/Stormwater+Drainage+and+Detention+Ordinance.pdf/c2199225-64e6-40d1-8056-3ebe8e66c501

CMAP. (1994). *Addendum to model stormwater drainage and detention ordinance. Chicago, IL*. Retrieved from http://www.cmap.illinois.gov/documents/10180/12532/Stormwater+Drainage+and+ Detention+Ordinance.pdf/c2199225-64e6-40d1-8056-3ebe8e66c501

CMAP. (2008). *Stormwater management strategy paper*. Chicago, IL. Retrieved from http://www.cmap.illinois.gov/documents/10180/61694/Stormwater+Management.pdf/608fda00-30b0-43ea-b7a6-083e134b91c2

Chow, V. T., Maidment, D. R., & Mays, L. W. (1988). *Applied hydrology*. New York, NY: McGraw-Hill.

Dreher, D., Hey, D., & Schaefer, G. (1989). *Evaluation of stormwater detention effectiveness in Northeastern Illinois*. Chicago, IL: CMAP.

Dreher, D. & Price, T. (1991). *Investigation of hydrologic design methods for urban development in Northeastern Illinois*. Chicago, IL: CMAP.

Federal Interagency Stream Restoration Working Group (FISRWG). (2001). *Stream corridor restoration: principles, processes, and practices*. Part 653 of the National Engineering Handbook, U.S. Department of Agriculture, Natural Resources Conservation Service.

Hershfield, D.M. (1961). *Rainfall frequency atlas of the United States for durations from 30 min to 24 h and return periods from 1 to 100 years. Technical Paper No. 40*. Weather Bureau, U.S. Department of Commerce, Washington, DC.

Huff, F. A. & Angel, J. R. (1989). *Rainfall distributions and hydroclimatic characteristics of heavy rainstorms in Illinois (Bulletin 70)*. Champaign, IL: Illinois State Water Survey.

Illinois Department of Transportation (IDOT). (2011). *Drainage manual*. Springfield, IL: Bureau of Bridges and Structures.

Karkowski, R., Ahern, D., & Klink, R. (2014). *Volume based hydrology design it is time?* Beaufort County South Carolina, Department of Engineering and Infrastructure. Retrieved from http://www.bcgov.net/ departments/ Engineering-and-Infrastructure/stormwater-management/documents/WQ-Monitoring-page/volume-based-hydrology-design-is-it-time.pdf

Mays, L. W. (2005). *Water resources engineering* (2005 ed.). Hoboken, NJ: John Wiley and Sons.

Maki, B. (2007a). *WMO regulatory requirement recommendations, stormwater drainage and detention* [Memorandum]. Chicago, IL: Engineering Resources Associates, Inc.

Maki, B. (2007b). *WMO regulatory requirement recommendations, detention release rate and required storage* [Memorandum]. Chicago, IL: Engineering Resources Associates, Inc.

Southwestern Illinois Planning Commission (SIPC). (1997). *A model ordinance providing for the control of stormwater drainage and detention, soil erosion and sediment control*. Illinois Environmental Protection Agency, Contract No. 97-604-2.

U.S. Environmental Protection Agency (USEPA), (2009). *Technical guidance on implementing the stormwater runoff requirements for federal projects under Section 438 of the Energy Independence and Security Act,* EPA 841-B-09-001.

Westcott, N. (2015). *Continued operation of a 25-raingage network for collection, reduction, and analysis of precipitation data for Lake Michigan diversion accounting: water year 2014,* Illinois State Water Survey Contract Report 2015-01, Illinois State Water Survey, Prairie Research Institute, University of Illinois, Champaign, IL, 86 p.

Appendix I: The National Flood Insurance Program (NFIP) and Community Rating System (CRS)

The National Flood Insurance Program

Background

The National Flood Insurance Program (NFIP), currently administered by the Federal Emergency Management Association (FEMA), was created in 1968 for renters, homeowners and business owners to have access to insurance to cover the damage due to flooding. At that time – and still true today – most insurance companies were not including flood as a covered peril in their homeowner or commercial policies and flooded property owners had to rely on federal and state disaster assistance to recover.

Community participation in the NFIP is voluntary. Through a community's participation in the NFIP, flood insurance coverage is made available to all property owners and residents throughout the community. The NFIP requires communities to adopt and enforce certain minimum floodplain regulations to protect development in high-risk flood zones, known as Special Flood Hazard Areas (SFHAs), from flood damage. The NFIP requirements can be found in Chapter 44 of the Code of Federal Regulations (44 CFR). Parts 59 and 60 pertain to the minimum regulatory requirements to be administered and enforced within participating NFIP communities. Most (87%) of Illinois counties and municipalities participate in the NFIP, including all of Cook, DuPage, Kane, Lake and Will municipalities. Table I.1 provides a summary of NFIP participation in Illinois.

> **44 CFR 59.2(b)** To qualify for the sale of federally-subsidized flood insurance a community must adopt and submit to the Administrator as part of its application, flood plain management regulations, satisfying at a minimum the criteria set forth at Part 60 of this subchapter, designed to reduce or avoid future flood, mudslide (i.e., mudflow) or flood-related erosion damages. These regulations must include effective enforcement provisions.

Table I.1: NFIP Community Participation

National Flood Insurance Program (NFIP) Participation in Illinois	Quantity
Communities in the NFIP with Special Flood Hazard Area	793
Communities in the NFIP with No Special Flood Hazard Area	84
Communities in the NFIP but are Minimally Flood Prone	160
Total Illinois Communities Participating in the NFIP	**877**
Total Illinois Communities *Not* Participating in the NFIP	**128**
Source: www.fema.gov "The National Flood Insurance Program Community Status Book"	

Joining the NFIP means establishing a floodplain development permit program. Although some communities and people want to build without government regulations, a large majority of Illinois communities enforce floodplain regulations and recognize the need to protect buildings from flood damage - and to protect people's investments in their properties. The NFIP has established minimum floodplain regulations (e.g., the lowest floor, including the basement, constructed in the SFHA must be above the base flood elevation). Illinois law requires additional minimum requirements, and

communities are free to and encouraged to adopt additional, or higher, standards within the SFHA and throughout their communities. Floodplain regulations can appear to be restrictive, especially when enforced following a flood disaster, but the protection from future flood damage and the flood insurance benefits cannot be overstated.

Joining the NFIP also means identifying the flood risks. This is accomplished by FEMA partnering with the communities to create a map of the flood hazards, called a Flood Insurance Rate Map (FIRM). All properties are in a flood zone; it is just a level of risk that is different. In Illinois, the high-risk areas are identified on the FIRM in flood zones labeled with the letter "A" (e.g., A, AE, AO, AH). Moderate-risk areas are identified by the letter "B" on older FIRMs or as a shaded Zone X. Low-risk areas are identified by the letter "C" or "X" on older FIRMs or just Zone X on newer maps.

NFIP Flood Insurance

Today, homeowners and owners of 2-4 family residences in NFIP participating communities can purchase up to $250,000 in building coverage and $100,000 in contents; non-residential building owners can purchase up to $500,000 in building and $500,000 in contents coverage. See Table I.2 for coverage limits.

Table I.2: Insurance Coverage Limits

BUILDING COVERAGE	TOTAL INSURANCE LIMITS
Single Family Dwelling	$250,000
2-4 Family Dwelling	$250,000
Other Residential	$500,000
Non-Residential	$500,000
CONTENTS COVERAGE	
Residential	$100,000
Non-Residential	$500,000

There is a special coverage included in most NFIP policies called Increased Cost of Compliance (ICC) coverage. ICC coverage provides up to $30,000 of the cost to flood proof (a business), relocate, elevate or demolish when the insured building has been substantially or repetitively damaged and needs to meet current community building requirements. The total amount of the building claim plus ICC claim, however, cannot exceed the maximum building limit of coverage.

NFIP flood insurance is available through licensed property and casualty insurance agents who represent one of approximately 85 insurance companies who issue an NFIP flood insurance policy on their paper on behalf of FEMA[1] or write directly with the NFIP. Coverage is available in excess of those limits through certain private insurance companies and Lloyds of London programs.

[1] Known as Write Your Own (WYO) companies; they underwrite and settle claims on behalf of FEMA; FEMA essentially reimburses them for the claims and provide the WYO companies an Expense Allowance to cover their costs, including commission to insurance agents.

Another voluntary program within the NFIP is the Community Rating System (CRS). The goal of the CRS program is to encourage communities to exceed the minimum NFIP floodplain management requirements (e.g., require new buildings to be built higher than the minimum) and as reward, policyholders[2] will receive a discount on their annual premium, up to 45 percent. Currently, 58 communities participate out of 877 NFIP participating communities, which represents a savings of more than $1.7 million in policyholder premium.

NFIP Coverages

The NFIP definition of flood is very specific; it is "1) a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties (at least one of which is your property) from a) overflow of inland or tidal waters; b) unusual and rapid accumulation or runoff of surface waters from any source c) mudflow; or 2) collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood." Simply put, if physical damage to the building or contents is directly caused by a flood (e.g. rising or surface water), the flood insurance policy will cover it. For example, if sewer backup occurs in the basement because of flooding, it is covered; otherwise, damages due to sewer backup are not covered by an NFIP policy.

Like most insurance policies, there are limitations and exclusions. For example, there is limited coverage for basements. Building coverage will include basic structural items in the basement (e.g., foundation walls, staircases, drywall) and items to help "run" the house (e.g., circuit box, central air conditioning, furnace, water heater, sump pump); and if contents coverage is purchased, it will include washers, dryers and food freezers (not refrigerators). However, the policy will not cover items like paneling, bookcases, carpeting or tile, and most contents including items like TVs, sound systems, furniture, rugs and clothing. In other words, finished basements have limited coverage. As opposed to the possibility of a homeowners or auto policy being cancelled by the insurance company due to claim activity, the NFIP will continue to write a policy on a property as long as the community continues to participate in the NFIP, no matter how many claims it has[3]. Table I.3 provides highlights what is and is not insured from the NFIP Summary of Coverage document F-679.

[2] Preferred Risk Policyholders do not receive the CRS discount as the rates are already significantly discounted

[3] If an NFIP insured property sustains a certain number or value of claims, FEMA will place the policy in the NFIP Special Direct Facility and work with the community and policyholder to find ways to mitigate and stop or reduce the losses.

Table I.3: General Coverages

General Guidance on Flood Insurance Coverage

What is insured under Building Property coverage

- The insured building and its foundation.
- The electrical and plumbing systems.
- Central air conditioning equipment, furnaces, and water heaters.
- Refrigerators, cooking stoves, and built-in appliances such as dishwashers.
- Permanently installed carpeting over an unfinished floor.
- Permanently installed paneling, wallboard, bookcases, and cabinets.
- Window blinds.
- Detached garages (up to 10 percent of Building Property coverage). Detached buildings (other than garages) require a separate Building Property policy.
- Debris removal.

What is insured under Personal Property coverage

- Personal belongings such as clothing, furniture, and electronic equipment.
- Curtains.
- Portable and window air conditioners.
- Portable microwave ovens and portable dishwashers.
- Carpets not included in building coverage (see above).
- Clothes washers and dryers.
- Food freezers and the food in them.
- Certain valuable items such as original artwork and furs (up to $2,500).

What is not insured by either Building Property or Personal Property coverage

- Damage caused by moisture, mildew, or mold that could have been avoided by the property owner.
- Currency, precious metals, and valuable papers such as stock certificates.
- Property and belongings outside of a building such as trees, plants, wells, septic systems, walks, decks, patios, fences, seawalls, hot tubs, and swimming pools.
- Living expenses such as temporary housing.
- Financial losses caused by business interruption or loss of use of insured property.
- Most self-propelled vehicles such as cars, including their parts (see Section IV.5 in your policy).

Flood Insurance Requirement

Based on the definition above, flood insurance claims will be paid, whether there is a federally declared disasters or whether it is just localized flooding of two more properties. To protect the U.S. government's financial interest in mortgages that are federally insured or through federally regulated lenders, flood insurance is required for loans on buildings located in high-risk areas, known as Special Flood Hazard Areas (SFHAs). These are depicted on FEMA's flood maps (known as Flood Insurance Rate Maps or FIRMs) as flood zones beginning with the letter "A" (and "V" for coastal areas with wave height 3 feet or higher, which Illinois does not have at this time). While a published study has not been performed specifically related to Illinois[4], a national study by Rand (2006), based on 100 communities, found that only about half of those in high-risk areas had coverage. With another 25 percent not having a mortgage and therefore not being required to have coverage, that shows that approximately one in four properties in high-risk areas are out of lender compliance. Having a concern over lender compliance, congress tightened up enforcement of compliance in recent NFIP reform legislation by increasing the fine per infraction and removing the penalty cap.

[4] Comparing the number of total NFIP flood insurance policies (in and out of the SFHA) to the number of households in Illinois, only about 1 percent of the households have coverage. Another study performed by RAND (2007) found that only an additional 3 percent was added to the total covered when lender-placed flood insurance policies were included.

While not federally required, lenders can also require flood insurance in areas of moderate-risk (shown as Zone B or shaded Zone X) and low-risk (shown as Zone C or Zone X) as part of the loan requirements.

Flood Insurance Costs

To encourage property owners in moderate-low risk areas to purchase flood insurance, the NFIP offers the low-cost Preferred Risk Policy (PRP), with premiums starting as low as $162 for a primary residence ($20,000 in building and $8,000 in contents coverage; April 2015 rates). About 30 percent of the approximate 47,000 NFIP policies in force in Illinois are PRPs; another 8 percent are also in a moderate-low risk area but are rated using a higher standard Zone X rates, possibly due to not being eligible for a PRP because it is grandfather-rated (i.e., no longer in Zone X) or had more than the allowed flood claims to qualify for a PRP. Overall, since 1978, 20 percent of flood claims in Illinois come from policies in these moderate-low risk areas. Nationally, 25 percent of the claims and about one-third of federal disaster claims are from moderate-low risk areas.

While a large number of homes and businesses are in the moderate-low risk areas in Illinois and therefore qualify for the lower cost PRP, flood insurance for properties in the high-risk areas is more expensive. Premiums vary depending upon several factors but two major ones are the building's Lowest Floor Elevation (LFE) above where the flood waters are projected to rise to (known as the Base Flood Elevation or BFE) and if the building was built before (known as a pre-FIRM building) or after the first flood map (known as post-FIRM). Most policies for buildings in high-risk areas constructed after a community's first FIRM (post-FIRM construction) are elevation-rated and require an Elevation Certificate. The higher the LFE is above the BFE, the lower the premium (up to 4 feet above BFE). Conversely, the lower the LFE is below the BFE, the premium becomes significantly higher (see Table I.1). For buildings with basements, the basement is considered the lowest floor for insurance rating; consequently, if a building in a high-risk area is elevation-rated, it could have a very high premium.

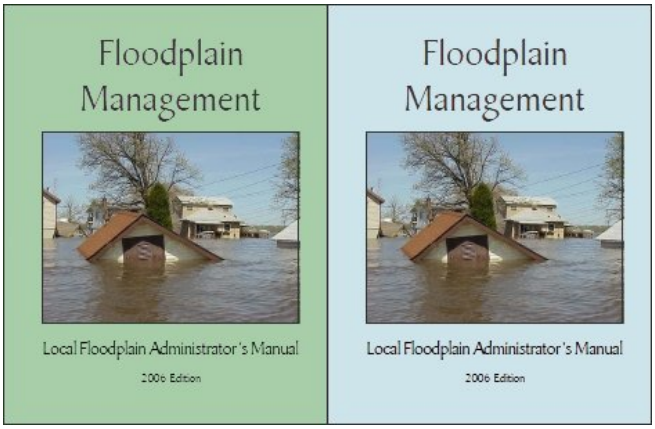
Once a community joins the NFIP, the NFIP requires that all buildings' lowest floors be at or above the BFE, including basements. However, buildings constructed before a community's first FIRM, did not have such a building ordinance to follow and may have built in what is today, the floodplain (SFHA). As a result, its lowest floor (e.g., basement) is below the BFE and the flood insurance premium would be quite high. Understanding this dilemma when the NFIP was created in 1968, Congress allowed these buildings to not be charged their full-risk rate, but instead received subsidized rates of 40-50% of the true rate. While Congress may have felt that over time the number of these buildings would decline to an insignificant number, as of 2013, close to 20% of the NFIP policies were on pre-FIRM buildings in high-risk areas, with that number being nearly 50% in Illinois.

With Hurricane Katrina, Rita and Wilma putting the NFIP in debt over $17 billion, Congress passed the Biggert-Waters Flood Insurance Reform Act of 2012 (Biggert-Waters) to help put the NFIP on a stronger financial footing. Included in the legislation was the eventual elimination of subsidized pre-FIRM rates. There was strong pushback by homeowners, realtors and other interest groups so Congress revised their legislation and slowed the path to full-risk rates in the subsequent Homeowners Flood Insurance Affordability Act of 2014 (HFIAA). Pre-FIRM non-primary residences and businesses will now feel the strongest impact as their rates will go up 25% annually until they reach full-risk rate (i.e., elevation-

rated) [5]. Pre-FIRM primary residences rates are expected to increase each year by 15-18% (a cap that HFIAA placed on annual increases). The long-term financial impact on a homeowner could be quite substantial. For example, premium for a pre-FIRM primary residence with a basement ($200,000-building, $80,000-contents coverage) in a high-risk area might pay $3,296 with pre-FIRM rates. If, for example, the floor of the basement is found to be 3 feet below the BFE, its equivalent full-risk rate today would be $8,316. If the full-risk rate had an average annual increase of 9 percent and the pre-FIRM increased at 15% annually, the two rates would eventually meet in 19 years at a full-risk rate premium of about $40,000. This could have a significant financial impact on some property owners as well as the ability to sell their home or business.

The NFIP and Illinois Floodplain Management

The IDNR-OWR works with FEMA to assist communities in understanding the minimum floodplain management requirements of the NFIP. IDNR-OWR also assists FEMA in determining if Illinois' NFIP communities are in compliance with the NFIP minimum standards through "Community Assistance Visits" or CAVs. Communities that are found to be not in compliance with the NFIP minimum standards following a CAV can be suspended from the program. The primary purpose of a CAV is to assist the community with the administration and enforcement of the NFIP and of State of Illinois regulations pertaining to floodplains and floodways.



IDNR-OWR provides communities with a "model ordinance" which includes the minimum NFIP requirements, state law requirements, and recommended "higher standards." The higher standards, if adopted, can reduce flood insurance premiums and also further protect buildings and their contents from flood damage. The model floodplain ordinances (one ordinance for northeastern Illinois and one for all other areas) are included in the IDNR-OWR's "Floodplain Management - Local Floodplain Administrator's Manual," also known as the "Green Book" for northeastern Illinois and the "Blue Book" for all other regions of the State.

Flood Zones

Each community in the NFIP is provided with a map of the SFHA. The map is called the Flood Insurance Rate Map or FIRM. The SFHA on the FIRM represents the flood level and expected flooded area for a storm with a 1% chance of occurring in any year. The 1% flood is most commonly called the 100-year

[5] Included in HFIAA was a new surcharge for all policies to financially balance out the new longer path pre-FIRM buildings would take to reach full-risk rates. An annual HFIAA surcharge of $25 for primary residences and $250 for all other buildings will be applied to all policies until all subsidized rates are eliminated. While this results in an additional financial burden to pre-FIRM secondary homes and business in high-risk areas whose rates are doubling every four years under the new legislation, there is also concern that those who voluntarily purchased flood insurance in the moderate-low risk areas (i.e., PRP) may drop their policy entirely.

flood. It is correct to say that the 100-year floodplain, or the SFHA, is the area with a 1% chance of flooding in any year or even each year. It is wrong to say that the 100 year flood means that the SFHA is expected to flood once every 100 years. 100-year floods can and have occurred in consecutive years, or twice in ten years, and so on.

The SFHA is the A Zone, and the purchase of flood insurance with a federally backed mortgage is required. The rest of the community included in a FIRM is also in a flood zone. In Illinois, most other property not in an A Zone is in an X Zone. As demonstrated by urban flooding, property in X Zones is subject to flood damage. As demonstrated by the purchase of NFIP flood insurance policies in X Zone areas, and the flood insurance claims paid, significant flood damage occurs in X Zones.

Another important aspect of flood zones that needs to be understood is that flooding along rivers and streams, and around lakes, is natural. The floodplain is nature's designated area to store and convey flood waters in any season of the year. The flood damage that occurs within the SFHA is due to buildings and infrastructure being placed within the SFHA. However, the flood water which rivers and stream must convey (and the SFHA needed) is much larger than nature expected, due to development throughout Illinois communities over the past century. In the past decades, many areas in Illinois have worked, via stormwater or watershed regulations, to limit the impact of new development or redevelopment on flooding conditions. There remains much to be done throughout all areas of Illinois.

Joining the NFIP: A community can join the NFIP at any time. To join the NFIP, a community must adopt a "resolution of intent to participate" and cooperate with FEMA. In the resolution the community agrees to "maintain in force…adequate land use and control measures consistent with the [NFIP] criteria" and to:

> (i) Assist the Administrator in the delineation of the floodplain,
>
> (ii) Provide information concerning present uses and occupancy of the flood plain,
>
> (iii) Maintain for public inspection and furnish upon request, for the determination of applicable flood insurance risk premium rates within all areas having special flood hazards, elevation and flood proofing records on new construction,
>
> (iv) Cooperate with agencies and firms which undertake to study, survey, map, and identify flood plain areas, and cooperate with neighboring communities with respect to the management of adjoining flood plain areas in order to prevent aggravation of existing hazards;
>
> (v) Notify the Administrator whenever the boundaries of the community have been modified by annexation or the community has otherwise assumed or no longer has authority to adopt and enforce flood plain management regulations for a particular area.

The community must also adopt and submit a floodplain management ordinance that meets or exceeds the minimum NFIP criteria. FEMA provides participating communities with a Flood Insurance Rate Map (FIRM) that defines the Special Flood Hazard Area. Within the SFHA, anyone provided with a federally backed mortgage must purchase flood insurance. Very important to note is that flood insurance is available to all properties and residents within a community participating in the NFIP, as discussed in the previous [section/chapter] of this [Report/Study].

In Illinois, to join the NFIP a community official may contact the Illinois NFIP State Coordinator and the IDNR-OWR or contact the FEMA Region V office in Chicago. A community is part of the NFIP once the required resolution of intent is passed by the local governing body and submitted to FEMA. Time is provided to communities to review the FIRMs and adopt the required floodplain management ordinance.

The Community Rating System (CRS)

The CRS credits floodplain and watershed management programs that exceed the minimum requirements of the NFIP. The number of CRS credits determines a community's CRS class, and NFIP flood insurance premium rates are discounted based the CRS class. Every 500 credit points means an improvement in the CRS class rating. Table I.4 shows the CRS classes and the premium discounts for buildings located in and outside the SFHA. Class 1 requires 4,500 credit points and gives the greatest premium reduction or discount. NFIP communities who do not participate in the CRS are Class 10 communities. The CRS rates a community for its current flood damage reduction efforts, and also provides incentives (i.e., flood insurance premium discounts) for additional flood damage reduction activities at the community, county and state levels of government. Table I.5 lists the Illinois communities that participate in the CRS.

Table I.4: CRS Classes and Premium Discounts

CRS Class	Credit Points	Premium Reduction	
		In SFHA	Outside SFHA*
1	4,500+	45%	10%
2	4,000–4,499	40%	10%
3	3,500–3,999	35%	10%
4	3,000–3,499	30%	10%
5	2,500–2,999	25%	10%
6	2,000–2,499	20%	10%
7	1,500–1,999	15%	5%
8	1,000–1,499	10%	5%
9	500–999	5%	5%
10	0–499	0	0
Preferred Risk Policies and minus-rated policies are not eligible for CRS premium discounts.			
Source: *CRS Coordinator's Manual*, FEMA, 2013			

The CRS credits floodplain and watershed management programs that exceed the minimum requirements of the NFIP. The number of CRS credits determines a community's CRS class, and NFIP flood insurance premium rates are discounted based the CRS class. Every 500 credit points means an improvement in the CRS class rating. The Table I.5 to the right shows the CRS classes and the premium discounts for buildings located in and outside the SFHA. Class 1 requires 4,500 credit points and gives the greatest premium reduction or discount. NFIP communities who do not participate in the CRS are Class 10 communities. The CRS rates a community for its current flood damage reduction efforts, and also provides incentives (i.e., flood insurance premium discounts) for additional flood damage reduction activities at the community, county and state levels of government. Table I.5 lists the Illinois communities that participate in the CRS.

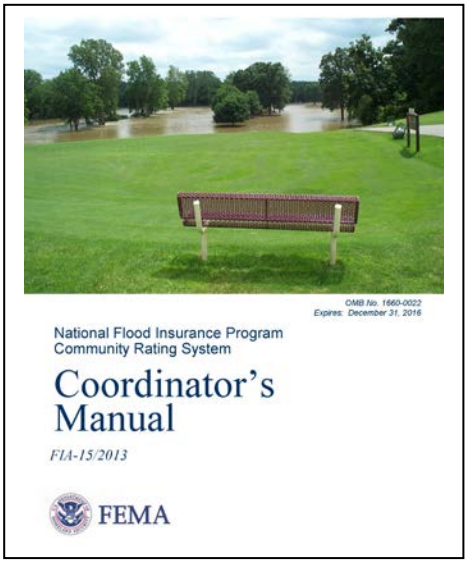
Table I.5: Illinois Communities Participating in the Community Rating System (CRS)

Community	County	CRS Class	Insurance Discount – In SFHA*	Insurance Discount – Outside SFHA*
Adams County	Adams	8	10%	5%
Addison, Village of	DuPage, Cook, Kane	6	20%	10%
Bartlett, Village of	Kane, DuPage, Cook	7	15%	5%
Calumet City, City of	Cook	6	20%	10%
Carpentersville, Village of	Kane	6	20%	10%
Champaign, City of	Champaign	8	10%	5%
Country Club Hills, City of	Cook	8	10%	5%
Crystal Lake, City of	McHenry	6	20%	10%
Deerfield, Village of	Lake	6	20%	10%
DeKalb, City of	DeKalb	8	10%	5%
Des Plaines, City of	Cook	7	15%	5%
Downers Grove, Village of	DuPage	6	20%	10%
Flossmoor, Village of	Cook	7	15%	5%
Glen Ellyn, Village of	DuPage	8	10%	5%
Glendale Heights, Village of	DuPage	6	20%	10%
Glenview, Village of	Cook	6	20%	10%
Gurnee, Village of	Lake	6	20%	10%
Hampshire, Village of	Kane	7	15%	5%
Highland Park, City of	Lake	8	10%	5%
Hoffman Estates, Village of	Cook	7	15%	5%
Jersey County	Jersey	5	25%	10%
La Salle County	La Salle	8	10%	5%
Lake County	Lake	6	20%	10%
Lake Forest, City of	Lake	7	15%	5%
Lake-In-The-Hills, Village of	McHenry	6	20%	10%
Lansing, Village of	Cook	7	15%	5%
Lincolnshire, Village of	Lake	5	25%	10%
Lisle, Village of	DuPage	5	25%	10%
McHenry County	McHenry	8	10%	5%
Moline, City of	Rock Island	8	10%	5%
Montgomery, Village of	Kane	5	25%	10%
Mount Prospect, Village of	Cook	7	15%	5%
Niles, Village of	Cook	6	20%	10%
Northbrook, Village of	Cook	7	15%	5%
Oak Brook, Village of	DuPage	7	15%	5%
Ogle County	Ogle	7	15%	5%
Orland Hills, Village of	Cook	5	25%	10%
Ottawa, City of	LaSalle	5	25%	10%
Palatine, Village of	Cook	7	15%	5%

Community	County	CRS Class	Insurance Discount – In SFHA*	Insurance Discount – Outside SFHA*
Peoria County	Peoria	5	25%	10%
Prospect Heights, City of	Cook	8	10%	5%
River Forest, Village of	Cook	7	15%	5%
Riverwoods, City of	Lake	8	10%	5%
Rock Island County	Rock Island	7	15%	5%
Roxana, Village of	Madison	8	10%	5%
Sangamon County	Sangamon	8	10%	5%
South Elgin, Village of	Kane	5	25%	10%
South Holland, Village of	Cook	5	25%	10%
St. Charles, City of	Kane/DuPage	5	25%	10%
Sugar Grove, Village of	Kane	6	20%	10%
Sycamore, City of	DeKalb	7	15%	5%
Tinley Park, Village of	Cook	6	20%	10%
Westchester, Village of	Cook	8	10%	5%
Wheeling, Village of	Cook	6	20%	10%
Whiteside County	Whiteside	8	10%	5%
Willowbrook, Village of	DuPage	6	20%	10%
Winnetka, Village of	Cook	6	20%	10%
Wood Dale, City of	DuPage	5	25%	10%
Woodstock, City of	McHenry	7	15%	5%

* Special Flood Hazard Area (SFHA)

More information regarding Illinois' participation in the CRS can be found at http://crsresources.org/200-2 under "State Profiles." The CRS maintains a list of "uniform minimum credit" (UMCs) for each state. UMC for Illinois can also be found at http://crsresources.org/200-2. Most UMCs for Illinois are based on statewide requirements and IDNR/OWR floodplain and floodway development regulations.



CRS Creditable Activities

There are 19 creditable activities in the CRS, organized under four categories, which are presented in the 300 – 600 Series of the CRS Coordinator's Manual. The Coordinator's Manual assigns credit points based upon the extent to which an activity advances the three goals of the CRS.

300 Series – Public Information Activities: There are seven activities in this series that credit state, regional and community programs that advise people about the flood hazard, encourage the purchase of flood insurance, and provide information about ways to reduce flood damage. The 300 Series activities generally serve all members of the community.

400 Series – Mapping and Regulations: This series credits programs that provide increased protection to new development. The five activities in this series include mapping areas not shown on the FIRM, preserving floodplain open space, protect natural floodplain functions, enforcing higher regulatory standards within and outside the floodplain, and managing stormwater throughout a community.

500 Series – Flood Damage Reduction Activities: This series credits community programs that address existing development is at risk of flood damage. Credit is provided for comprehensive floodplain management planning, acquiring or retrofitting flood prone structures, and maintaining drainage systems.

600 Series – Warning and Response: This series focuses on measures that protect life and property during a flood, through flood warning and response programs, including those programs that address potential levees and/or failure.

Within each CRS activity are a number of credit "elements." The 94 CRS elements are listed by activity in Table I.6 along with the maximum credit for each element. Credit points are adjusted for a number of elements based on the "impact" that they have in a community, or the area they apply within a community. For example, if a community's SFHA is all in open space then the impact of that element is 100% or full credit for Open Space (OSP) in Activity 420 (1,450 points). If a community has half of the SFHA in open space use, then 50% of the OSP credit is provided (725 points).

The total of all credits (with impact adjustments) determines a community's CRS class. CRS communities are typically visited and CRS credit recalculated every five years to determine that the CRS activities continue to be implemented and to credit new activities that communities are encouraged to undertake.

A copy of the CRS Coordinator's Manual and more information on all CRS activities can be found at CRSresources.org.

Table I.6: CRS Activities and Elements

CRS Activity Description	Element	Maximum Credit	Illinois CRS Communities Receiving Credit
Activity 310 (Elevation Certificates)			**100%**
This activity credits the FEMA Elevation Certificates for new and substantially improved buildings in the SFHA that are maintained (both complete and correct) by the community. (Maximum credit 116 points)			
Elevation Certificates (after CRS application date)	EC	38	
Elevation Certificate on post-FIRM buildings	ECPO	48	
Elevation Certificate on pre-FIRM buildings	ECPR	30	
Activity 320 (Map Information Service)			**94%**
This activity credits local flood hazard information (explaining maps and other available information) provided to inquirers. Inquirers may include property owners or people considering a property purchase. Inquirers outside of the floodplain have the opportunity to obtain information about flood zones and whether insurance is mandatory. Providing historic flooding areas and other flooding problems not attributed to the floodplain are also credited. (Maximum credit 90 points)			
1. Basic FIRM information	MI1	30	
2. LiMWA/floodway info/CBRS area	MI2	20	
3. Other flood problems not shown on FIRM	MI3	20	
4. Flood depth data	MI4	20	
5. Special flood-related hazards	MI5	20	
6. Historical flood information	MI6	20	
7. Natural floodplain functions	MI7	20	
Activity 330 (Outreach Projects)			**94%**
This activity credits the dissemination of public information needed to increase flood hazard awareness and to motivate actions to reduce flood damage and encourage flood insurance coverage throughout the community. A variety of topics or messages are credited, including know your flood hazard, insure your property for your flood hazard, protect people from the hazard, protect property from the hazard, build responsibly and protect nature floodplain functions. (Maximum credit 350 points)			
Outreach projects	OP	200	
Flood response preparations	FRP	50	
Public information program strategy	PPI	80	
Stakeholder delivery	STK	50	
Activity 340 (Hazard Disclosure)			**100%**
This activity credits the disclosure a property's potential flood hazard to prospective buyers before the lender notifies them of the need for flood insurance. (Maximum credit 80 points)			
Real estate agents' disclosure	DFH	35	
Other disclosure requirements	ODR	25	
Real estate brochure	REB	12	
Disclosing other hazards	DOH	8	

CRS Activity Description	Element	Maximum Credit	Illinois CRS Communities Receiving Credit
Activity 350 (Flood Protection Information)			**91%**
This activity credits information provided to the public about flood protection that is more detailed than that provided through outreach projects. Information benefits the entire community. (Maximum credit 125 points)			
Flood protection library	LIB	10	
Locally pertinent documents	LPD	10	
Website	WEB	105	
Activity 360 (Flood Protection Assistance)			**80%**
This activity credits communities that provide one-on-one help to people who are interested in protecting their property from flooding. This service can be provided to all property owners and can provide information on basement flooding etc. (Maximum credit 110 points)			
Property protection advice	PPA	40	
Advise after a site visit	PPV	45	
Financial assistance advice	FAA	15	
Training	TNG	10	
Activity 370 (Flood Insurance Promotion)			**0%**
This activity is for community efforts to improve flood insurance coverage. (Maximum credit 110 points)			
Flood insurance assessment	FIA	15	
Coverage plan	CP	15	
Plan implementation	PI	60	
Technical assistance	TA	20	
Activity 410 (Floodplain Mapping)			**98%**
The objective of this activity is to improve the quality of the mapping that is used to identify and regulate floodplain development. (Maximum credit 802 points)			
New study	NS	290	
Leverage for non-FEMA cost sharing (multiplier)	LEV	%	
State review bonus	SR	60	
Higher study standards	HSS	160	
Floodway standard	FWS	110	
Special hazards mapping	MAPSH	50	
Cooperating Technical Partner	CTP	132	
Activity 420 (Open Space Preservation)			**96%**
This activity credits the amount of flood-prone land that is kept free of development, which reduces flood damage and protects and enhances the natural functions of floodplains. Credit for this activity is based on the area of the SFHA, however the entire community benefits from the preservation of open space. (Maximum credit 2,020 points)			
Preserved open space	OSP	1,450	
Deed restriction on OSP parcel	DR	50	
Natural functions open space	NFOS	350	
Special hazards open space	SHOS	50	
Open space incentives	OSI	250	
Low density zoning	LZ	600	
Natural shoreline protection	NSP	120	

CRS Activity Description	Element	Maximum Credit	Illinois CRS Communities Receiving Credit
Activity 430 (Higher Regulatory Standards)			**100%**
This activity credits local, countywide and state regulations that protect existing and future development and natural floodplain functions that exceed the minimum criteria of the NFIP. A number of the credits for the enforcement of higher standards apply to areas outside of the SFHA. (Maximum credit 2,042 points)			
Development limitations	DL	1,330	
Freeboard	FRB	500	
Foundation protection	FDN	80	
Cumulative substantial improvements	CSI	90	
Lower substantial improvements	LSI	20	
Protection of critical facilities	PCF	80	
Enclosure limitations	ENL	240	
Building code	BC	100	
Local drainage protection	LDP	120	
Manufactured home park	MHP	15	
Coastal A Zone regulations	CAZ	650	
Special hazards regulations	SHR	100	
Other higher standards	OHS	100	
State mandated standards	SMS	20	
Activity 440 (Flood Data Maintenance)			**93%**
This activity focuses on making community floodplain data more accessible, current, useful, and/or accurate so that the information contributes to the improvement of local regulations, insurance rating, planning, disclosure, and property appraisals. (Maximum credit 222 points)			
Additional map data (GIS)	AMD	160	
FIRM maintenance	FM	15	
Benchmark maintenance	BMM	27	
Erosion data maintenance	EDM	20	
Activity 450 (Stormwater Management)			**93%**
The objective of this activity is to prevent future development from increasing flood hazards to existing development and to maintain and improve water quality. Regulations credits apply to the entire community. (Maximum credit 755 points)			
Stormwater management regulations	SMR	380	
Low impact development	LID	25	
Watershed master plan	WMP	315	
Erosion and sedimentation control	ESC	40	
Water quality regulations	WQ	20	
			59%
Activity 510 (Floodplain Management Planning)			
This activity credits the development of plans that provide the community with an overall strategy of programs, projects, and measures that will reduce the adverse impact of floods and other hazards throughout the community. (Maximum credit 622 points)			
Floodplain management plan	FMP	382	
Repetitive loss area analyses	RLAA	140	
Natural floodplain functions plan	NFP	100	

CRS Activity Description	Element	Maximum Credit	Illinois CRS Communities Receiving Credit
Activity 520 (Acquisition and Relocation)			**37%**
This activity credits the acquisition or relocation of existing buildings out of the flood hazard area. (Maximum credit 2,250 points)			
Activity 530 (Flood Protection)			**20%**
This activity credits the measures to protect buildings from flood damage such as retrofitting the buildings so that they suffer no or minimal damage when flooded, and/or constructing small flood control projects that reduce the risk of flood waters reaching the buildings. (Maximum credit 1,600 points)			
Activity 540 (Drainage System Maintenance)			**67%**
The objective of this activity is to ensure that the community keeps its channels and storage basins clear of debris so that their flood carrying and storage capacity are maintained throughout the community. (Maximum credit 570 points)			
Channel debris removal	CDR	200	
Problem site maintenance	PSM	50	
Capital improvements program	CIP	70	
Stream dumping regulations	SDR	30	
Storage basin maintenance	SBM	120	
Erosion protection maintenance	EPM	100	
Activity 610 (Flood Warning and Response)			**16%**
The objective of this activity is to encourage communities to ensure timely identification of impending flood threats, disseminate warnings to appropriate floodplain occupants, and coordinate flood response activities to reduce the threat to life and property. (Maximum credit 395 points)			
Flood threat recognition system	FTR	75	
Emergency warning dissemination	EWD	75	
Flood response operations plan	FRO	115	
Critical facilities planning	CFP	75	
StormReady community	SRC	25	
TsunamiReady community	TRC	30	
Activity 620 (Levees)			**0%**
This activity credits the annual inspection and maintenance of levees, and credits the measures used to determine impending levee failures in a timely manner, disseminate warnings to appropriate floodplain occupants, and coordinate emergency response activities to reduce the threat to life and property. (Maximum credit 235 points)			
Levee maintenance	LM	95	
Levee failure recognition system	LFR	30	
Levee failure warning	LFW	50	
Levee failure operations plan	LFO	30	
Levee failure critical facilities	LCF	30	

CRS Activity Description	Element	Maximum Credit	Illinois CRS Communities Receiving Credit
Activity 630 (Dams)			**20%**
This activity credits the annual inspection and maintenance of dams, and credits the measures used to provide timely identification of an impending dam failure, disseminate warnings to those who may be affected, and coordinate emergency response activities to reduce the threat to life and property. (Maximum credit 160 points)			
State dam safety program	SDS	45	
Dam failure recognition system	DFR	30	
Dam failure warning	DFW	35	
Dam failure operations plan	DFO	30	
Dam failure critical facilities	DCF	20	

CRS Credit for IDNR-OWR Programs

State activities and initiatives can translate into CRS credits for communities provided the activities are enforced within the community. Table I.7 shows CRS credit opportunities for communities based on IDNR-OWR programs, including model floodplain ordinances recommended for community adoption.

Table I.7: CRS Credit for Illinois Communities Based on IDNR-OWR Programs

Possible CRS Credit for Illinois Communities			6 County Metro Chicago Identified Credit	Downstate Identified Credit	Based on
Activity	**Element**				
340	[Real Estate] Other Disclosure Requirements	ODR	20	20	State Law
410	Floodway Standards	FW	0 - 110	0 - 110	State Law
410	State Review	SR	0 - 30	0 - 20	State Law
410	Cooperating Technical Partnership	CTP	10	10	State Agreement
410	New Study	NS	0 - 105	0 - 105	Model Ordinance
420	Open Space Preservation	OSP	0 - 1450	--	State Law
430	State - Mandated Standards	SMS	% (bonus)	% (bonus)	State Law
430	Building Codes	BC	3	3	Local Adoption
430	Freeboard	FRB	10 - 100	10 - 100	Model Ordinance
430	Cumulative Substantial Improvement	CSI	20 - 90	20 - 90	Model Ordinance
430	Protection of Critical Facilities	PCF	2-20	2-20	Model Ordinance
430	Lower Substantial Improvement	LSI	20	20	Model Ordinance
430	Foundation Protection	FND	35	35	Model Ordinance
430	Development Limitations	DL1	195	195	Model Ordinance

Possible CRS Credit for Illinois Communities			6 County Metro Chicago Identified Credit	Downstate Identified Credit	Based on
Activity	Element				
540	Stream Dumping Regulations	SDR	15	15	Local Adoption
630	State Dam Safety Credit	SDS	0 - 30	0 - 30	State Law
	CRS points =		330 - 2,233	330 - 773	

All CRS communities may receive additional credit for going beyond the State requirements, and receive credit for other local implementation for the activities and element listed above. Illinois' strong floodway rules in northeastern Illinois provide notable credit for the six county metro Chicago area when the floodway is preserved as open space. As shown in Table 8.2 of the Report, Illinois communities do well in reach CRS Class 7 and better. This is due to the State floodplain and floodway rules, the higher standards promoted in the IDNR-OWR model ordinances, and additional community standards and flood damage reduction programs.

Participating in the CRS

To join the CRS, a community must be compliant with the NFIP requirements and submit a letter of intent to the FEMA Region V office in Chicago. Once FEMA (working in coordination with IDNR-OWR) approves a community to join CRS, the ISO/CRS Specialists assigned to Illinois from the Insurance Services Office, Inc. visits with community officials and verifies CRS credit. Not including the time needed for IDNR-OWR and FEMA to determine CRS eligibility, the verification process takes about 6 months. Communities must designate a community CRS Coordinator. The CRS Coordinator is expected to coordinate with community departments and the chief elected official for the verification, and also throughout the year to maintain the community's CRS class rating. More information about the CRS and how to participate can be found at www.FloodSmart.gov/CRS

Increasing CRS Participation in Illinois

IDNR-OWR and FEMA promote participation in the CRS through a variety of efforts (website information, conferences and workshops). The IDNR-OWR also provided communities with a "Community Visit Report/Community Rating System Checklist" following a CAV. The checklist, shown on the following pages, estimates the possible CRS credits that a community have available based on its current floodplain and watershed management program. Many Illinois communities can enter the CRS program as a Class 8 or better community due to State's floodplain management program and countywide stormwater management programs.

DEPARTMENT OF NATURAL RESOURCE
OFFICE OF WATER RESOURCES

Community Visit Report/Community Rating System Checklist

COMMUNITY _____ **I.D. NUMBER**_____

LOCAL OFFICIAL_____ **TITLE** _____

VISIT CONDUCTED BY_____ **DATE**_____

REGULATIONS		**CRS activity (ave. pts)**
Does the community have a copy of its floodplain ordinance?	Yes ☐ No ☐	
What is the date of the current floodplain ordinance?	_____	
Has the ordinance been approved by FEMA (since 1989)?	Yes ☐ No ☐	
Has the community adopted higher standards (freeboard, etc.)?	Yes ☐ No ☐	430 _____ 1'=100pts 2'=225pts 3'=350pts
Does the community prohibit hazardous materials below BFE?	Yes ☐ No ☐	430 _____(10)
Does the community have a stormwater ordinance?	Yes ☐ No ☐	450 _____(120)

MAPS AND STUDY		
Does the community have copies of the current FIRM and study?	Yes ☐ No ☐	
Does the community have adjoining (county) FIRMs and study?	Yes ☐ No ☐	
Does the FIRM have BFE's?	Yes ☐ No ☐	
Did local officials understand how to determine BFE's (if available)?	Yes ☐ No ☐	
Does the FIRM have approximate or unnumbered A-Zones?	Yes ☐ No ☐	
Did local officials understand how to determine BFE's (if unavailable)?	Yes ☐ No ☐	410 _____(10)
Does the community have mapped floodways?	Yes ☐ No ☐	410 _____(100)
Did local officials understand how to determine if a site is in the floodway?	Yes ☐ No ☐	410 _____
Does the community provide map information to inquirers?	Yes ☐ No ☐	320 _____(0)
If so, did local officials keep written records and publicize this service?	Yes ☐ No ☐	320 _____(90)
Has there been a change in the corporate limits since the maps were printed?	Yes ☐ No ☐	
Are any areas not delineated on the map subject to flooding?	Yes ☐ No ☐	
If so, does community publicize they will offer assistance to residents on how they can protect themselves in these areas	Yes ☐ No ☐	360 _____(55)
Is a map revision necessary? (If yes, explain in narrative)	Yes ☐ No ☐	

ADMINISTRATIVE & PERMITTING

Does the community have a permit application and review process?	Yes ☐	No ☐	
Does the community conduct 3 inspections (before, foundation, final)	Yes ☐	No ☐	30_____(16)
Are permits required for all forms of development (filling, etc..)?	Yes ☐	No ☐	
Did local officials understand the elevation requirements and document lowest floor elevations on all new structures?	Yes ☐	No ☐	
Does the community use the FEMA Elevation Certificate? (CRS requirement)	Yes ☐	No ☐	310 _____(38)
Does the community review the accuracy of Elevation Certificates?	Yes ☐	No ☐	
Are Elevation Certificates made available to inquirers?	Yes ☐	No ☐	
Did local officials understand the floodproofing criteria and requirements?	Yes ☐	No ☐	
Have any variances been granted? (Number?_____) understand requirements	Yes ☐	No ☐	
Did local officials understand the joint state permit process?	Yes ☐	No ☐	

MITIGATION

Is the community involved in a mitigation or buyout program? a) If 10% of SFHA or more bought out then b) If less than 10% buyout then or CF	Yes ☐	No ☐	520 _____ 190+ points 3pts per bldg., 6 pts per RL
Does the community maintain any open space in the floodplain?	Yes ☐	No ☐	420 _____(300)
Does the community have repetitive loss properties? (If yes, #_____)	Yes ☐	No ☐	
Does the community have a mitigation plan?	Yes ☐	No ☐	510 _____(150)

MISCELLANEOUS

Does the community periodically inspect and maintain channels?	Yes ☐	No ☐	540 _____(200)
Does the community have a newsletter or brochure mailed to residents?	Yes ☐	No ☐	330 _____(40)
Does the community have flood information website available to residents?	Yes ☐	No ☐	350 _____(20)
Does the community have a flood warning system?	Yes ☐	No ☐	610 _____(150)
Does the community maintain a levee or levee systems?	Yes ☐	No ☐	620 _____(50)
Has there been recent flooding in the community?	Yes ☐	No ☐	
Do local officials understand the effects of non-participation?	Yes ☐	No ☐	
Does community have a CFM that is part of review & approval	Yes ☐	No ☐	430_____ (25)
Does community have a GIS program with floodplain related layers	Yes ☐	No ☐	440_____ (80)
Is the community a potential CRS candidate?	Yes ☐	No ☐	possible pts. _____
Is the community in need of a follow up visit? (explain in narrative)	Yes ☐	No ☐	

Appendix J: Strategies to Minimize Damages from Urban Flooding

This appendix supports the information presented in Chapter 9 and provides information on strategies for minimizing damage to property from urban flooding, with a focus on rapid, low-cost approaches, such as non-structural and natural infrastructure, and methods for financing them.

The three most common types of urban flood damage reported in the survey of Illinois community officials are basement water seepage, basement sewer backup and water coming in basement windows. Urban flooding is known to cause numerous public health and safety concerns, such as mold and sewage contamination in homes and limited emergency vehicle access on city streets. Selecting appropriate strategies to reduce urban flood damages requires knowledge of the cause of the urban flooding.

Green and Gray Infrastructure

> "The City is working hard to improve our aging infrastructure, but there are 4,400 miles of sewer main in Chicago, and mere replacement is not the answer. The key is to keep as much water out of the sewer as possible during the heaviest rains."
>
> City of Chicago Basement Flooding Partnership website

Strategies to reduce urban flooding are often described as either gray or green infrastructure. Gray infrastructure is used to describe traditional engineering methods including storm sewers and detention ponds—built systems used to collect runoff and discharge it quickly through the system. Green infrastructure is used to describe methods that utilize the natural functions of soil infiltration, evaporation and transpiration, emphasizing the reduction of rainfall runoff where it is produced. Green infrastructure techniques common in Illinois include rain gardens, downspout disconnection, bioswales, stormwater trees, permeable pavement, and green roofs.

Typical stormwater management systems are based on traditional gray infrastructure solutions, such as road gutters, storm sewers, and retention ponds. Most urban communities have design requirements for these systems (see Chapters 4 and 5). Stormwater infrastructure designed to modern standards most often performs acceptably for many years. Capital projects for replacement of gray infrastructure are costly and, due to funding constraints, many communities cannot prioritize addressing appropriate maintenance needs of these systems until they fail.

Green infrastructure has several advantages over traditional gray infrastructure as well as its own limitations. Prompted by the Clean Water Act and the regulation of post-construction stormwater quality, communities are already looking to green infrastructure to achieve multi-objective benefits. In 2009, the Illinois Environmental Protection Agency (IEPA) submitted several recommendations concerning green infrastructure as required by Public Act 96-26, and reported that green infrastructure is effective in achieving stormwater quality goals as well as being cost-effective when compared to other methods (Jaffee, 2009). Recent green infrastructure pilot projects completed across the country continue to support the cost saving benefits of using green infrastructure (Copeland, 2014). Most green infrastructure projects will have some impact on reducing stormwater runoff and the result can be significant in some cases. Several green infrastructure resources are available via the IEPA. The primary limitation of green infrastructure for urban flood reduction is the dependence on soil conditions. Once

the soil is saturated, the excess runoff may still need to be controlled by gray infrastructure to avoid flood damages. Successful use of green infrastructure relies on several site-specific parameters including drainage area, groundwater table levels, soil type, ground slope and performance of maintenance. Green infrastructure is often less costly, but when used in areas that are already urbanized, successful green infrastructure projects may still require engineering design. Green infrastructure will be most successful addressing urban flooding caused by more frequent lower volume rainfall events and should be part of a comprehensive plan to reduce volume entering over taxed drainage systems (Schueler et al, 2007).

Neither green nor gray infrastructure should be considered a single solution to urban flooding. Gray infrastructure is costly and does not typically address the reduction of stormwater runoff volume. Green infrastructure has the ability to reduce runoff volume but due to the influence of location-specific parameters, its potential to reduce urban flooding damages is difficult to evaluate on a large scale.

Single Property Flood Reduction Strategies

There are a number of flood damage reduction strategies that can be used by property owners, including many that are low cost. Identification of the source of flooding is fundamental to successfully mitigating future damages. Educating property owners about their flood risk is essential to correctly address property-specific flooding problems. Coordination with the local community officials is often required to identify and confirm the most appropriate flood reduction strategy.

Common Causes and Mitigation Options

A particular structure may experience “flooding” when storm runoff enters a structure as overland flow, infiltration, or sewer backup. Figure J.1 identifies several of the typical ways water can enter a basement. Overland flow can occur when the water is directed toward the structure rather than away from the home. Storm sewer inlets can become blocked by trash, debris, ice, or snow, causing water to pond in the streets and migrate onto adjacent properties. Infiltration can occur through cracks in the floor, walls and windows when the soil around the home is saturated due to improper drainage. In areas with combined sewers, the community system may become overloaded during storm events, resulting in sewer backup. A summary of the types of flood reduction strategies at the property level are summarized in Table J.1. The “Handbook for reducing basement flooding” by Canada’s Institute for Catastrophic Loss Reduction (2009) provides specific information on actions that can be taken to reduce flood risk on the property.

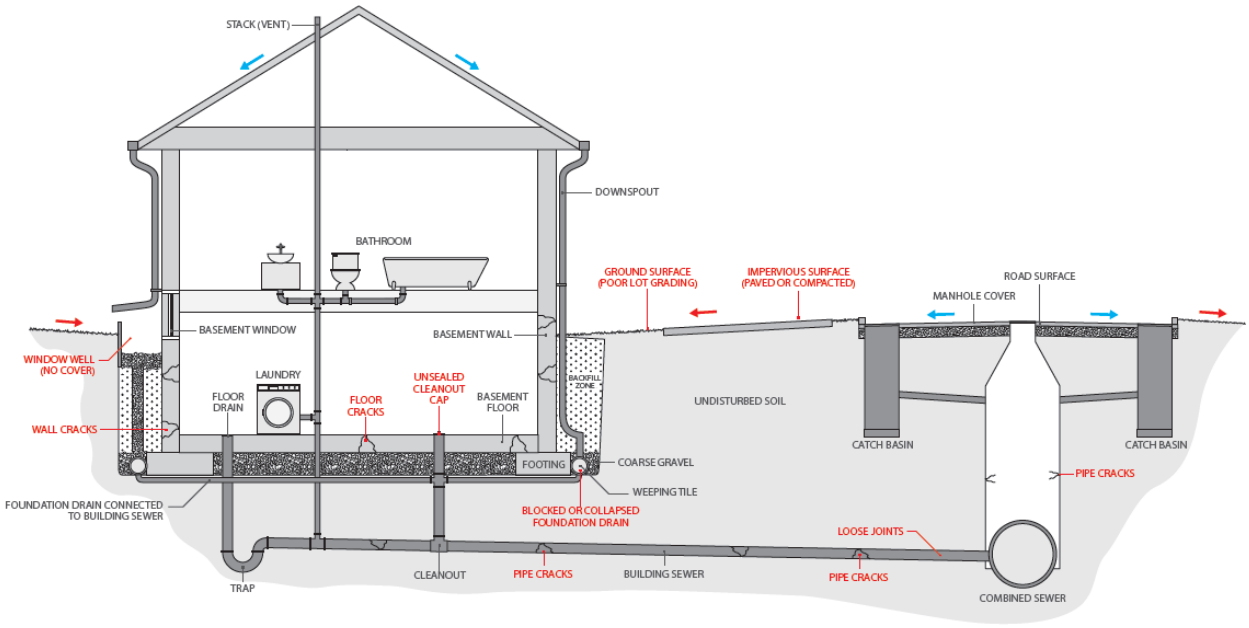


Figure J.1: Types of urban flooding that can affect a residence. (Credit: Modified from Institute for Catastrophic Loss Reduction, 2009)

Table J.1: Summary of basement flood risk reduction options to address damages on site

Mitigation Options	Cause of Flooding			Damage reduction	Estimated Cost
	Overland	Infiltration	Sewer backup		
Structural Inspection					$250-$800 each
Raise utilities and other valuable items				x	
Insurance				x	Based on coverage
Gutter maintenance	o	X	o		
Downspout disconnection			x		
Site grading, downspout extension	o	X			
Rain gardens	o				$3-40 per square foot
Permeable/porous pavement	x				$2-$10 per square foot
Exterior drain tile		X			$185 per foot
Interior drain tile		X	x		$40-50 per foot
Seal wall and floor cracks		X	o		$300-$600 each
Sump pump with check valve	x	X	x		$400-$1,000 each
Sewer backup valves			x		$3,000-$5,000
Overhead sewer installation			x		$2,000-$10,000

x - primary reduction
o - secondary reduction

Educating Property Owners

Homeowners are often not prepared to evaluate the root cause of flooding and take action to mitigate. While several resources are available online that provide information on identification of problems and appropriate strategies for prevention and maintenance that may assist homeowners in evaluating their flood risk, such as the Guide to Flood Protection in Northeastern Illinois (IAFSM, 2006), additional tools and information specific to the local area are needed to reduce flood losses. Education and outreach on identification of root causes is necessary to empower homeowners to solve flooding issues that can only be addressed on their property. Some communities, such as the City of Wheaton, offer drainage reviews for their property owners free of charge, but many communities do not have the resources for such a program. "RainReady Home" (CNT, 2015) is a CNT program that addresses this missing link and, upon completion of the preliminary phase, should be evaluated to document best practices for community response and outreach to urban flooding.

The Center for Neighborhood Technology has developed several informative factsheets as well as a website as part of their Rain Ready program that is a valuable resource for homeowners and communities. The Illinois Association for Floodplain and Stormwater Management prepared and distributed the "Guide to flood protection in Northeastern Illinois" (IAFSM, 2006), which provides an overview of steps to reduce flood damage with some technical data as well as information on what to do during a flood. The Public Works department of the City of Park Ridge, Illinois has developed " A guide to Flooded Basements" (2007) which includes basement flooding causes, possible solutions as well as actions to take after a basement flood.

Limitations and Consequences to Reporting Flooding

Evaluation of flood risk should begin at the time of purchase of a property and continue over the ownership of the property. However, flood disclosure laws have gaps, and there is not always a mechanism to disseminate certain historical information. Unlike the Flood Insurance Rate Maps produced by FEMA for riverine flooding, there is not a similar risk evaluation tool for urban flooding issues.

The State of Illinois requires disclosure at sale of the seller's knowledge of material defects to the property. Basement flood disclosure to renters is not explicitly required but is implied in the requirement to disclose any latent basement defect that would make it unfit for occupancy. Illinois' Residential Real Property Disclosure Act provides a comprehensive list of material defects that must be disclosed when property is sold. However, there is hesitancy on the part of property owners to report or disclose flooding issues typically due to a concern that it would lessen the property value. Renters are often uninformed of their risk. There are

(765 ILCS 77/35The Residential Real Property Disclosure Act Sec. 35. Disclosure Report Form Excerpts

2. I am aware of flooding or recurring leakage problems in the crawl space or basement.
3. I am aware that the property is located in a flood plain or that I currently have flood hazard insurance on the property.
4. I am aware of material defects in the basement or foundation (including cracks and bulges).
8. I am aware of material defects in the plumbing system (includes such things as water heater, sump pump, water treatment system, sprinkler system, and swimming pool).

multiple consequences of not reporting flood issues: new owners do not have the information to mitigate potential flooding and may be caught unaware; renters may experience unexpected losses; communities do not have complete information to develop plans. The issue of communities disclosing full knowledge of historic or studied risk is controversial and has legal repercussions on both sides of the issue.

Community Level Flood Reduction Strategies

Urban flood damage may be successfully addressed at the community level at the neighborhood scale. At this scale, urban flood reduction strategies begin with knowledge of recurring flood issues; when it is the result of inadequate storm sewers, maintenance and overland drainage patterns the community is in the best position to implement reduction strategies. When flooding is property specific communities can conduct outreach, education and technical assistance.

Examples of low impact development regulations to address urban flooding issues are listed below.

- Incorporation of green infrastructure practices into stormwater regulations for development
- Maximum parking space requirements rather than minimum parking space requirements, reduce minimum road width to reduce impervious area
- Increase setbacks, increase landscaping requirements, add maximum lot coverage
- Requirement of holding first inch of rainfall
- Encourage re-development rather than new development

Solving community level flooding issues can be achieved with some of the same methods used for private property, but on a larger scale within the context of a comprehensive plan. Plans may include reducing runoff with green infrastructure, addressing overland flow and repair or maintenance of the drainage system, Low impact development guidance. Runoff volume reduction and supporting of green development will support flood reduction in newly developed or redeveloped areas and may provide some flood relief downstream. By retrofitting and re-establishing natural infiltration benefits in areas that have previously been urbanized, efforts can be made to reduce flooding and reduce the volume of flow to a combined sewer system in already urbanized areas. However, local planning, regulation, public-private partnerships, and financing must all create a framework to support local solutions to urban flooding and even with rainfall reduction measures in place, maintenance and repair of existing stormwater systems cannot be ignored. Capital improvement projects may be the only solution in some circumstances.

Successful strategies for communities addressed here are not focused on a specific engineering analysis, which must be determined locally, but framework to support local solutions to urban flooding. These strategies include planning, regulation, public private partnerships and financing. Development of a comprehensive stormwater management plan is a key component in reducing urban flood loss at a neighborhood or community scale, just as it is critical for utilizing green infrastructure and addressing water quality issues (Kramer, 2014; American Rivers et al., 2012). A comprehensive plan to reduce urban flooding requires determining goals and acceptable levels of risk, financing, and long term maintenance as well as evaluating specific strategies to address precipitation runoff. Education and outreach to all stakeholders, including residents, community officials, realtors, developers and builders, should be

considered. Comprehensive planning is highlighted in the Green Infrastructure Portfolio Standard (American Rivers, et al., 2012) method for reducing runoff flow to storm sewers and streams. Often, urban flooding occurs in areas where available space for large projects is not available and a comprehensive plan becomes necessary to evaluate the potential impact of several smaller projects in a watershed. A comprehensive plan also pulls together stakeholders from many different municipal departments and the public to address urban flooding. Private owners may be more inclined to partnerships if an overall plan is clearly defined. A comprehensive stormwater plan is a large effort for a community, and requires dedicated staff as well as cooperation and coordination with other departments within the community.

Examples of successful community based programs at the county level are provided in Chapter 4. These examples demonstrate the success of county wide stormwater authority and programs.

Communities can support sustainable growth economically with municipal regulations that incorporate the stormwater management goal of minimizing runoff volume and thereby reducing urban flooding. The largest communities in Illinois already have stormwater ordinances regulating new development, but many of these could be updated to incorporate more sustainable, low impact development practices and to encourage green infrastructure methods. In addition to regulation of new development, there is a need to address stormwater solutions in urban areas that are being re-developed. Often regulations do not support a retrofitting approach. The Watershed Management Ordinance adopted in Cook County and implemented by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) includes option to encourage runoff reduction in redevelopment areas. The Center for Watershed Protection published a Code and Ordinance Worksheet to evaluate how supportive a community's regulations are toward sustainable development. Examples of low impact development regulations to address urban flooding issues are listed below.

- Incorporation of green infrastructure practices into stormwater regulations for development
- Maximum parking space requirements rather than minimum parking space requirements, reduce minimum road width to reduce impervious area
- Increase setbacks, increase landscaping requirements
- Requirement of holding first inch of rainfall
- Encourage re-development rather than new development

Cost sharing programs encourage private property owners to implement runoff reduction measures that benefit the property owner and the neighborhood or "sewer-shed". Cost share programs are often used to address limited capacity sewer systems that easily become overwhelmed and backup into basements. These programs provide financing options for the property owner and a low cost opportunity for the community to reduce damage caused by undersized sewers. Communities provide funding for a percentage of the cost to install flood mitigation options on private property as an economical way to address wider-scale urban flooding. The flood prevention measures in existing Illinois cost sharing programs include rain barrels, rain gardens, backflow prevention valves, and overhead sewer installation. These programs have been successful in reducing urban flood damages in communities,

such as Niles, Northbrook and Wheaton, which offer the 50% grant funding to their residents up to $3,000 to $5,000.

The City of Chicago Basement Flooding Partnership (BFP) is a public private partnership that does not require financial contribution from residents and has a large focus on outreach and education. This public private partnership requires that neighborhoods obtain agreement from 70% of the population to sign a statement indicating they will "pay attention and consider the options". In return, the city will inspect the local sewer system, provide expertise to talk with homeowners, conduct a computer analysis of the sewer area and host outreach meetings about causes of basement flooding and strategies to reduce it. The City will also place "Rain Blockers" at storm sewer inlets, which results in temporary street flooding, but prevents water from backing up into basements.

Financing Options

To combat urban flooding and support education and outreach to property owners experiencing flooding, a community must have funding to address local urban flooding issues. Planning, education and outreach, and gray and green infrastructure projects all require a significant level of investment and long term maintenance to achieve flood reduction. Currently, most communities are lacking stable funding to address urban flooding issues. While some communities have a dedicated source of funding for stormwater management, many Illinois communities finance stormwater management initiatives out of general revenues at a project level without a consistent source of funding (Appendix B and Appendix C). USEPA recommendations for financing the increasing cost of stormwater management include:

- service fees (often stormwater utilities)
- property taxes/general funds, sales tax,
- special assessment districts,
- system development charges,
- municipal bonds and state grants, and
- low interest loans. (USEPA, 2009).

A stormwater utility program assesses a fee, rather than a tax, to all those who benefit from the stormwater infrastructure and services provided, similar to the fees charged by sanitary sewer districts. Stormwater management services provided by communities that impact urban flooding include stormwater infrastructure, stormwater ordinances and regulation, as well as services to address stormwater quality. These services, and regulatory requirements, have grown overtime. A singular benefit of a stormwater utility program is fees are for the exclusive use of the stormwater program and is a stable, dedicated source of funding.

Consistent funding at an appropriate level enables communities to create stormwater management positions dedicated to comprehensive planning and education and outreach to accomplish urban flood risk reduction. Funding provided at a community level using stormwater utility programs supports a community's efforts to manage stormwater and reduce the urban flooding damages.

In recent years, there have been increases in the number of communities enacting stormwater utilities, as the benefits, types and best practices for stormwater utility plans become well documented. (USEPA,

2009; CMAP, 2013). Illinois still has fewer stormwater utilities than many neighboring mid-western states (Campbell, 2013). Table J.2 lists the communities with stormwater utilities, the monthly residential fees, and the year the program was established. Stormwater utilities offer a large potential source of financing for urban flooding issues and could be supported by grants to complete utility feasibility studies, and also incentivized at the state level.

Home-rule and non-home rule communities in Illinois have established stormwater utility programs. Article VIII, Section 6 of the Illinois Constitution established home-rule communities and enables implementation of stormwater fees. Home-rule communities have a more direct path to establishing stormwater utility programs, but non-home rule communities have setup stormwater utilities though they have not yet been challenged. The Illinois Municipal Code allows communities to operate utilities (CMAP, 2013), and townships also have the ability to create a stormwater program and assess a user fee per Public Works Statutes, Article 205 of the Township Code in the Illinois Compiled Statutes (60 ILCS) (Tri-County Regional Planning Commission, 2013). A Tri-State stormwater utility feasibility study determined that, per 55 ILCS 5/5-1062.3, DuPage and Peoria Counties are able to create stormwater programs and assess fees only if approved by a voter referendum (TCRPC, 2013). The remaining counties in Illinois are currently more limited as the Public Works Statute does not include separate storm sewers.

Table J.2: Communities with Utility Fee Assessments

Community	Fee Assessment	Year
Aurora	$3.45	1998
Bloomington	$4.35	2004
Champaign	$5.24	2012
Decatur	$3.67	2014
Downers Grove	$8.40	2012
East Moline	$2.61	2009
Freeport	$4.00	
Highland Park	$4.50	
Hoffman Estates	$2.00	2014
Moline	$3.75	2000
Morton	$4.74	2005
Normal	$4.60	2006
Northbrook	$9.00	
Palatine	$5.00	
Rantoul	$3.43	2001
Richton Park	$5.63	
Rock Island	$3.95	2002
Rolling Meadows	$3.36	2001
Tinley Park	$1.68	1983
Urbana	$4.75	2013
Winnetka	$29.67	2014

The USEPA currently provides funds to the State of Illinois for the Clean Water State Revolving Fund, which provides low interest loans for projects that assist with meeting the Clean Water Act goals and better the quality of the watershed (USEPA, 1999). Borrowers include municipalities, communities, businesses, homeowners, and not-for-profit organizations.

While many projects reducing stormwater runoff may already meet the requirements for loans under the Water Pollution Control Loan Program, recent federal legislation expands authority to finance stormwater projects. These new authorities outlined in the Water Resources Reform and Development Act (WRRDA) of 2014 have not yet been adopted by the State of Illinois. Collaboration is required between the Illinois Department of Natural Resources and Illinois Environmental Protection Agency to

appropriately expend portions of the state revolving fund for implementation of stormwater management measures.

The Illinois Home and Business Flood Protection and Loan Fund- (HB3525) introduced by State Representative Mike Fortner, would also expand the ability for communities to uses State Sponsored low interest loans for flood mitigation projects. HB3525 would allow communities to provide grants or loans to homeowners or fund flood mitigation projects without meeting Clean Water Act goals, which

References

American Rivers, Center for Neighborhood Technology, & The Great Lakes and St. Lawrence Cities Initiative. (2012). *Upgrade your infrastructure, a guide to the green infrastructure portfolio standard and building stormwater retrofits.* Retrieved from http://www.cnt.org/media/CNT_UpgradeYourInfrastructure.pdf

Campbell, W. (2013). *Western Kentucky University stormwater utility survey 2013*. Bowling Green, KY: Western Kentucky University.

Center for Neighborhood Technology (CNT). (2015). *A rainready nation, protecting American homes and businesses in a changing climate.* Chicago, IL. Retrieved from http://www.cnt.org/resources/a-rainready-nation-protecting-american-homes-and-businesses-in-a-changing-climate/

Chicago Metropolitan Agency for Planning. (2013). *The value of stormwater utilities for local governments in the Chicago region.* Chicago, IL. Retrieved from http://www.cmap.illinois.gov/documents/10180/11674/stormwater_utilities_for_local_govts.pdf/866a64a4-ef11-47ce-b4ec-2293686d4a70

Copeland, C. (2014). *Green Infrastructure and Issues in Managing Urban Stormwater.* Washington, DC : Congressional Research Service.

Illinois Association for Floodplain and Stormwater Management (IAFSM). (2006). *Guide to flood protection in northeastern Illinois.* Retrieved from http://www.illinoisfloods.org/documents/Guide_to_Flood_Prot--March_06.pdf

Kramer, M. (2014). *Enhancing sustainable communities with green infrastructure. A guide to help communities better manage stormwater while achieving other environmental public health, social and economic benefits.* Washington, DC: United States Environmental Protection Agency. EPA 100-R-14-006

Schueler, T., Hirschman, D., Novotney, M., Zielinski, J. (2007). *Urban subwatershed restoration manual no. 3. Urban stormwater retrofit practice, Version 1.0.* Ellicott City, MD: Center for Watershed Protection.

Tri-county Regional Planning Commission (TCRPC). (2014). *Stormwater utility feasibility study*. Peoria, IL.

United States Environmental Protection Agency (USEPA). (1999). *The clean water state revolving fund program.* Washington, DC: EPA 832-F-99-051.

USEPA. (2009). *Funding stormwater programs*. Springfield, IL: EPA 901-F-004.

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OFFICE OF PUBLIC WORKS

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CITY OF SPRINGFIELD, ILLINOIS 62701

Overhead Sewer Reimbursement Program

In order to minimize the likelihood of basement backups the City of Springfield has implemented an Overhead Sewer Program to assist city residents with the cost of plumbing modifications to their homes. This program applies to buildings constructed prior to May 1, 1975.

If you have a gravity service sewer from your basement to the city's sewer and have experienced a backup of water in your basement through a floor drain or other fixtures as a result of capacity issues in the city sewer main, this Overhead Sewer Program may be able to help protect your residence from damage.

The Overhead Sewer Plumbing Modification process involves the disconnection of all drains and fixtures in your basement from your gravity service sewer. This can typically be done by removing a section of your basement floor near the wall where your service sewer exits the basement. If the existing plumbing stack (soil pipe) is not along your basement wall, your first floor plumbing will have to be plumbed over to the basement wall and connected to the service sewer. In this same area, an excavation is made, a section of your house service is removed and a pit with a grinder pump is installed to take water from your basement floor drains and fixtures. A typical plumbing modification detail drawing is included. If you are not sure how your drains and fixtures are connected to your house service, there are several plumbing contractors in the City who have TV equipment that will be able to identify connections.

The City's plumbing modification reimbursement program will reimburse you up to 75% of the cost of the plumbing modification, excluding the cost of any carpentry work that may be required, up to a maximum amount of $3500.00. An application form is included. Submit the application form to the City Engineer and make an appointment for the City plumbing inspector to come to your building and review your basement plumbing with you. All work must be completed by a plumber licensed by the State of Illinois. The selected plumbing contractor must apply for a plumbing permit with the Department of Building and Zoning. The City will not be able to reimburse you if someone other than a licensed plumber completes the work.

Once you have the work completed, contact the Department of Building and Zoning to make an appointment to have the City plumbing inspector come to your building to make a final inspection of the work to see that it was completed satisfactorily. If the work is approved you can then submit your paid invoice to the City for the reimbursement.

The plumbing modification reimbursement program is applicable only for this type of modification. The installation of floor drain plugs, standpipes, or the installation of a backflow preventer are not included in this program.

The City Engineer can be contacted at (217) 789-2260.
The Office of Public Works
Room 201, Municipal Center West
Springfield, Illinois 62701.

The City Plumbing Inspector can be contacted at (217) 789-2171.
Department of Building and Zoning
Room 304, Municipal Center West
Springfield, Illinois 62701.

City of Springfield
Overhead Sewer Plumbing Modification Reimbursement
Application Form

SECTION 1 – Resident to complete and submit to City Engineer prior to performing work.

Name: _____

Address: _____

_____

Phone Number: _____

Date of Application: _____

Was the building constructed prior to May l, 1975? Yes No (circle one)

Is the subject building within the City of Springfield? Yes No (circle one)

Are sewer service fees paid to the City for this building? Yes No (circle one)

Have you scheduled a pre-construction plumbing review? Yes No (circle one)

a) *Call **217-789-2171** to schedule a pre-construction inspection and obtain a plumbing permit before work is started.*
b) *Call **217-789-2171** to schedule a final inspection after work is completed.*
c) *Submit paid invoice to the city engineer at the above address.*

SECTION 2 – City to complete

1) Pre-Construction Basement Plumbing Review.

Inspector: _____ Date: _____

Permit Number: _____

Plumbing Contractor: _____

2) Overhead Sewer Plumbing Modification Final Inspection.

Inspector: _____ Date: _____

3) Paid invoice Submitted:

Date: _____ Check No.:_____ Amount: _____

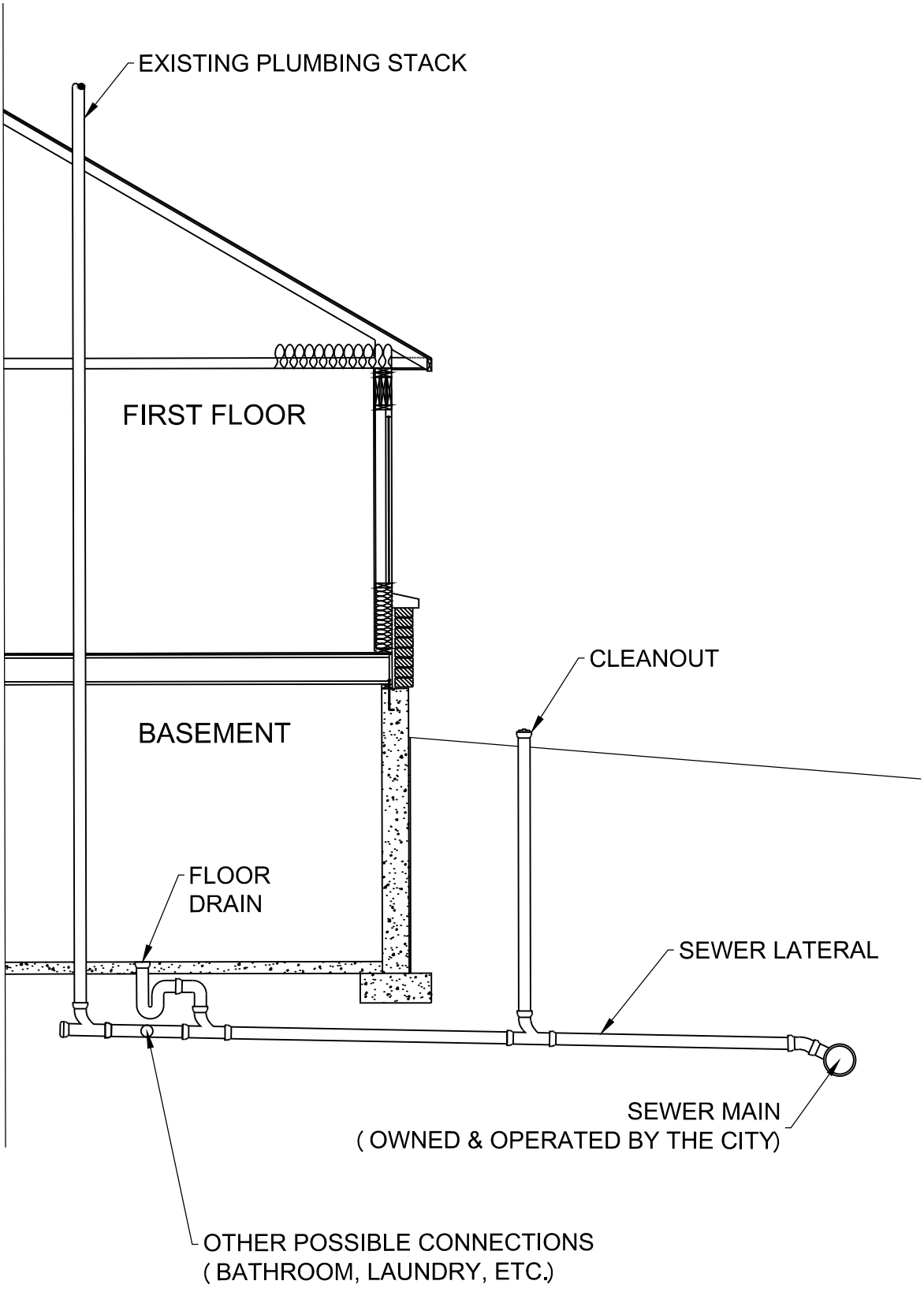
4) City Engineer Approval for Reimbursement.

City Engineer: _____ Date: _____

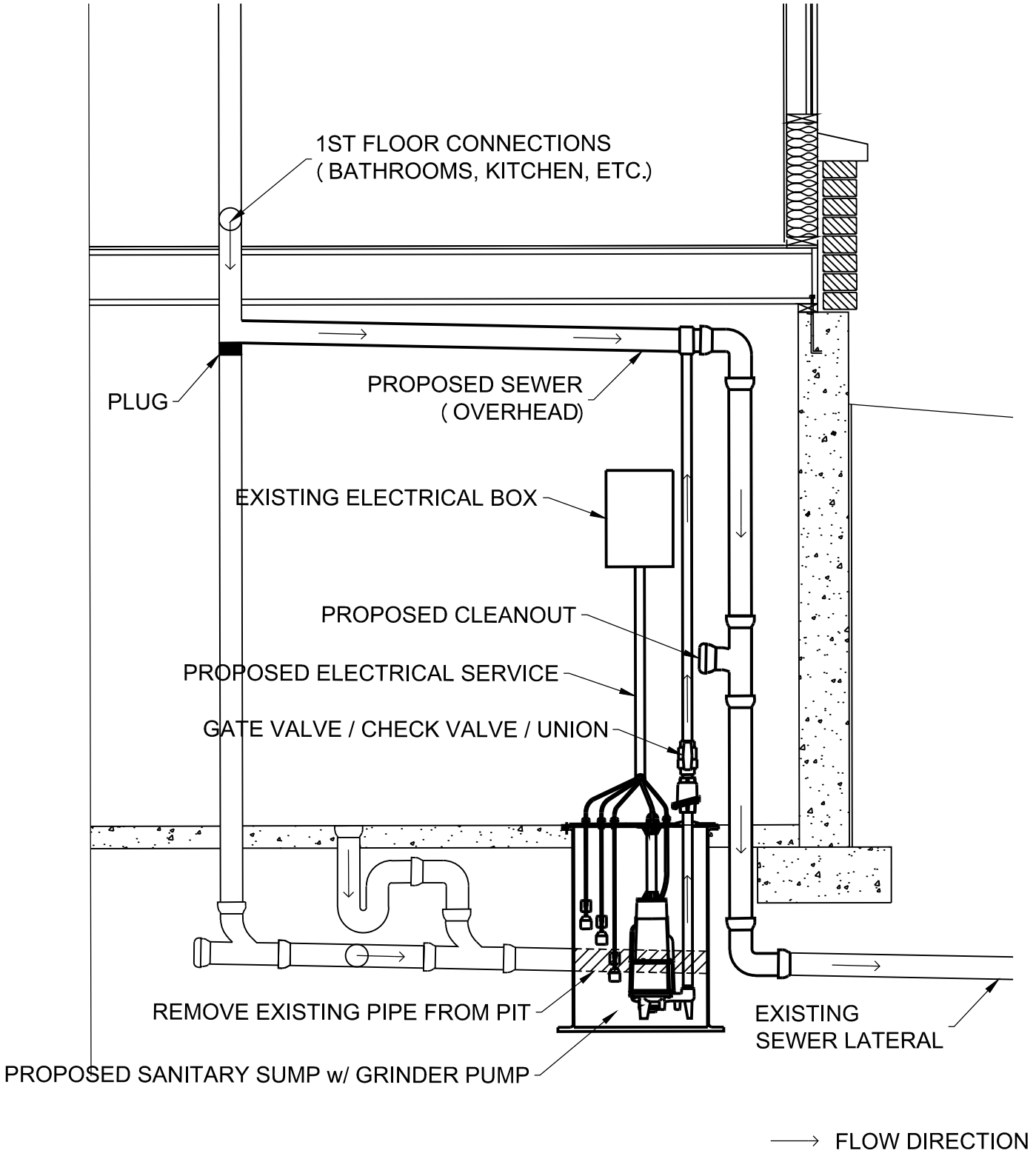
5) Plumbing Modification Reimbursement.

Date: _____ Check No.:_____ Amount: _____

(City to mail completed application form with reimbursement check.)



EXISTING SEWER CONDITION
(TYPICAL DETAIL)



BASEMENT PLUMBING MODIFICATION
(TYPICAL DETAIL)

CITY OF OTTAWA

Information regarding Ejector Pump Financial Assistance Program

Municipal Code
Sec. 106-311. Ejector Pump Program.

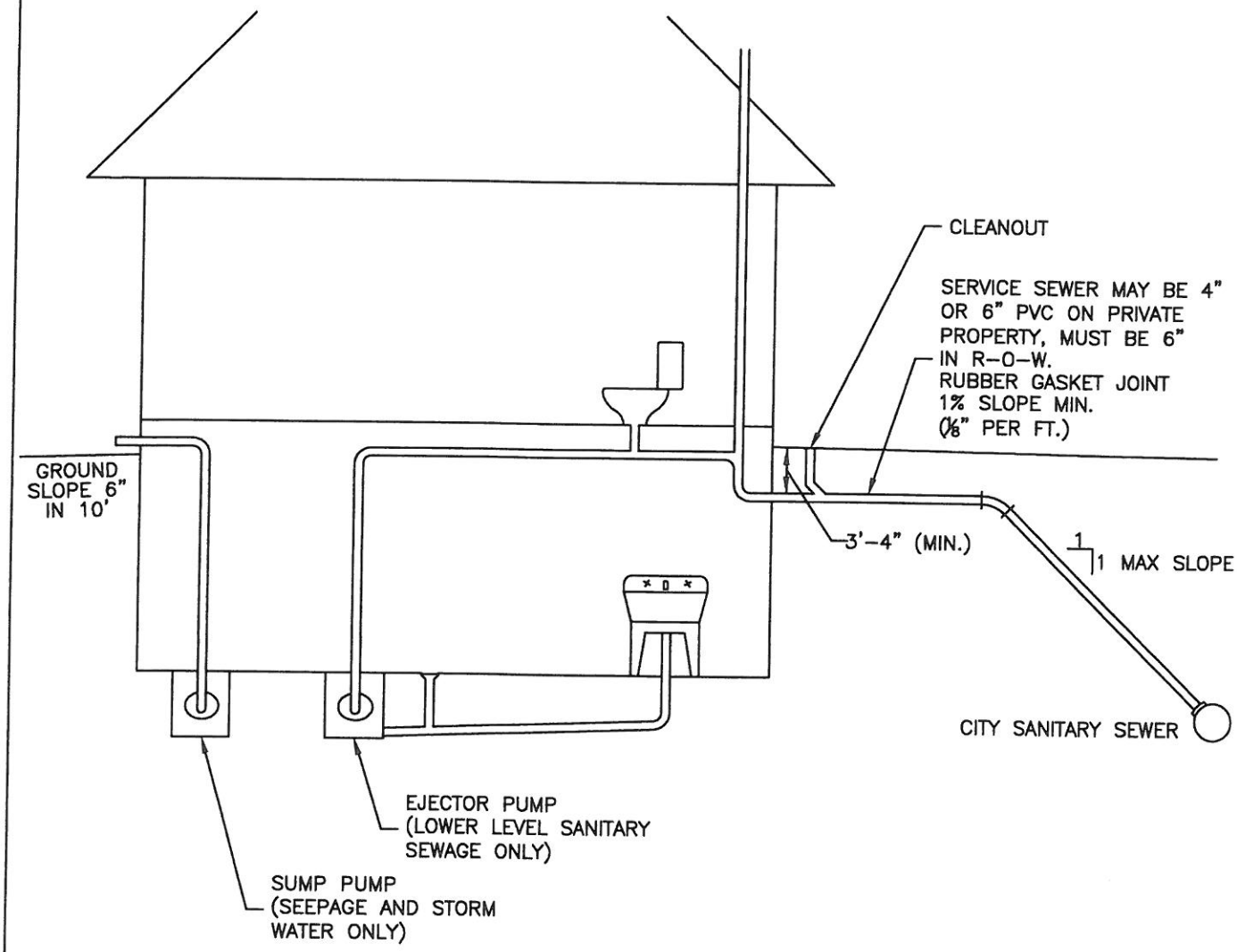
(a) The City shall set aside a limited amount of City funds each year to establish and have available a program for subsidizing the installation of ejector pumps in homes subject to chronic and/or severe flooding. Funds will be available on a "first-come-first-served" basis.

(b) Applications will be received from property owners who can establish a history of chronic and/or severe flooding. Property located in areas which were the subject of previous attempts to ameliorate flood damage by government purchase of property prone to flooding shall not be eligible for the program. The City Engineer or his/her designee shall then determine whether the application shall be accepted or rejected.

(c) Property owners whose applications have been accepted shall obtain from a licensed contractor an estimate for the work to be done. Estimates shall be submitted to the City Engineer. The City Engineer shall then authorize the property owner to begin work. When the work has been completed according to the approved specifications and has been inspected and approved by the City Engineer or his/her designee, the property owner shall submit to the City a receipt showing final payment to the contractor. In the alternative, for an owner occupied home, a property owner may elect to install the ejector pump personally. In that event, the owner shall provide to the City Engineer an estimate of the costs to be incurred. After the work is completed, the property owner may claim his/her reimbursement by presenting to the City Engineer or his/her designee receipts showing the purchase of the necessary materials.

(d) Upon receiving proof of payment from the property owner, the City shall reimburse the property owner for one-half the cost of installing the ejector pump up to the maximum City contribution of ~~$1,000.00~~. $1500.
(Added 10-21-08, Ord. 47-2008)

Revised 3/24/09



EJECTOR PUMPS ARE REQUIRED FOR ALL NEW HOMES – LOWER LEVEL SEWERS

STANDARD SEWER SERVICE

CITY OF OTTAWA DRG. 9

OCTOBER 6, 2008

Application for Ejector Pump Installation and Cost Sharing
City of Ottawa, Illinois

Date: _____ Permit No. _____

Property Owner _____

Location of Work _____
Number Street

Home Phone _____ Cell Phone _____

Contractor's Estimate

Contractor's Name _____

Phone _____

Attach estimate with description of the work: Estimated Cost $_____

Owner's Estimate *(if done himself)*

Estimated Cost $_____

Waiver

This application is made with the understanding that the City of Ottawa does not guarantee the above work in any way. The applicant agrees that if a permit for this work is issued the applicant will indemnify and save harmless the City of Ottawa, Illinois against all loss, damage or expense which the City of Ottawa, Illinois may sustain, incur or become liable for, on account of bodily injury or damage to or destruction of property resulting from execution of work provided for in this application or due to or arising in any manner from the wrongful act or negligence of the applicant and/or its employees.

_____
Signature of Applicant

Note: Please deliver or mail application to: Plumbing Inspector, Mike Allen
City of Ottawa
301 West Madison Street
Ottawa, Illinois 61350
Call for Inspection 815-433-0161 ext. 26

Confirm chronic backup problem: _____ Date: _____
WWTP Supt

Pre-construction Inspection: _____ Date: _____
Plumbing Inspector

Post-construction: _____ Date: _____
Plumbing Inspector

Final Cost: $_____ (paid receipts must be attached)

Approved for Payment

☐ one-half of cost, $_____

☐ $1,500

_____
City Engineer

This form must be completed and returned to the City Offices prior to the start of any work.

Revised: 7/18/12

WAYS TO PREVENT BACKUPS IN YOUR LATERAL AND IN THE CITY MAIN

The property owner can do many things to prevent his lateral from backing up. These very same things can help to prevent backups in the city main as well. If everyone would be careful about how they dispose of certain products, our systems would be a great deal more efficient, cause fewer backups, and cost us all less money.

□**GREASE:** Cooking oil should be poured into a heat-resistant container and disposed of after cooling in the garbage, not poured down the drain. Some people assume that washing grease down the drain with hot water is satisfactory. However, the grease goes down the drain, cools off, and solidifies either in the drain, the property owner's line or in the main sewer. When this happens, the line constricts and eventually clogs.

□**PAPER PRODUCTS:** Paper towels, disposable and cloth diapers, and feminine products cause a great deal of problems in the property owner's lateral as well as in the city main. These products do not deteriorate quickly, as does the bathroom tissue. They become lodged in the portions of the lateral/main, causing a sewer backup. These products should also be disposed of in the garbage.

□**ROOTS:** Shrubs and trees, seeking moisture, will make their way into sewer line cracks and joints. These roots can cause extensive damage. They may start out small, getting into a small crack in the pipe, but as the tree or shrub continues to grow, so does the root. After time, this causes the sewer line to break, which then allows debris to hang up in the line causing a back up. One way to prevent roots from entering your line is to replace your line and tap with new plastic pipe. The other alternative is to be careful about planting greenery around your sewer line. You may also purchase a product containing "copper sulfate" which helps to kill roots when you pour it down your drain. This product should be used with extreme caution. If you have ongoing problems with tree roots in your lateral, you may have to cut them periodically.

□**SEWER ODOR:** Another concern that the property owners have is a sewage odor in their house or building. There are many ways to prevent this from occurring. Under each drain in your plumbing system there is a "P-Trap". There should be water in this fitting, preventing odors or gasses from the sewer to enter through the drain from either the property owner's lateral or the city's main. Periodically check to make sure that unused floor drains, sinks, etc. have water in the "P-Trap." Another way to prevent sewer odor is to ensure that vents, which are located on your roof, are free from bird nests, leaves, etc. When these vents are clear, the sewer odors will escape through these vents.

□**ILLEGAL PLUMBING CONNECTIONS:** Do not connect roof gutter downspouts, French drains, sump pumps and other flood control systems to your sanitary sewer. It is illegal, and debris and silt will clog your line. Consult a professional plumber to correct any illegal connections.

□**NEEDLES:** Unfortunately, some people dispose of hypodermic needles in the sewer system. The presence of these needles in the wastewater collection system presents special and possibly deadly problems for wastewater collection and wastewater treatment employees. **PLEASE DO NOT FLUSH NEEDLES.** The proper method of disposal is to re-cap the needles and put it into a "sharps container". (This could be any rigid plastic container such as a bleach bottle...no milk bottles, please.) When it is full, tape the container securely and call your local pharmacy for advice on the proper disposal methods. **PLEASE DO NOT FLUSH NEEDLES OR THROW THEM IN THE GARBAGE.**

□**INSTALL A BACKWATER PREVENTION VALVE:** A backwater valve can prevent or greatly reduce the possibility of a sewer backup. A backwater valve is a fixture installed into a sewer line, and sometimes into a drain line, in the basement of your building to prevent sewer backflows. A properly installed and maintained backwater valve works on a one-way system. Sewage can go out, but cannot come back in. Property owners are responsible for the installation and maintenance of backwater valves. The cost to install one is dependent upon the type of plumbing in your home and the difficulty of installation. A qualified plumber can assist you in determining your needs. *A backwater valve will not totally prevent a sewer backup. However, a properly maintained backwater valve can significantly reduce the risk of damages caused by a sewer backup.*

(8 1 5) 4 3 3 - 0 2 4 5

REMEMBER TO CALL THE OTTAWA WASTEWATER TREATMENT PLANT FIRST before calling a plumber. We will check the sewer main and inform you of our findings. If the problem is not in the City main, we will advise you to contact a plumber or sewer/drain cleaning service.

FREQUENTLY ASKED QUESTIONS

Q. What is a sewer lateral? A. A sewer lateral or house lateral is the pipeline between the City's sanitary main, usually located in the street and the building. The sewer lateral is owned and maintained by the property owner including any part which may extend into the street or public right of way. More often than not, the cause of a backup in your lateral is from items that the line is not meant to handle, such as kid's toys, underwear, towels, diapers, paper products (other than toilet paper), keys and etc. To avoid flushing these items, remember to keep the toilet lid closed. What you flush may not affect you, but it might cause problems for your neighbors. Another possible cause would be roots in your lateral. The lateral maintenance is the responsibility of the owner of the property from the house to the main.

Q. What is the City's responsibility regarding private sewer laterals? A. The property owner is fully responsible for maintaining adequate sewage flow to and through the sewer lateral, from the property structure to and into the City's sewer main. When failure or stopping of a sewer lateral occurs, City crews will respond only to check the sewer main to verify that the main is open and sewage is flowing. If the sewer main is found to be clear, it is the responsibility of the property owner to call a licensed plumber or drain cleaning service to correct the problem. Verbal assistance and answers to questions can be received by calling the Wastewater Treatment Plant at (815) 433-0245.

Q. If I notice a foreign substance flowing into a storm drain inlet, whom should I call? A. If you notice a foreign substance flowing into a storm drain inlet, please call the Ottawa Wastewater Treatment Plant at (815) 433-0245 to report the location.

Q. What about the mess? A. A sewer backup can lead to disease, destruction of your valuables, damage to your house, and electrical malfunctions. Prompt cleanup and disinfection of affected property can help minimize the inconvenience and damage.

Q. How do I determine if my home or business is at risk for sewer backup? A. Your home or business is at risk if the elevation of your lowest floor, containing plumbing fixtures or floor drains, is lower than the top of a manhole near your property. Overloaded sewers can back up through house sewer lines and flow into basements that aren't protected. Even if your neighborhood has never experienced problems with basement flooding, your home can still be at risk.

Q. What other steps can I take to prevent a sewer backup? A. You can install a ***backwater prevention valve***, a fixture installed into the sewer line that allows sewage to go out, but not to come back in your basement. An automatic backup valve closes as soon as water begins to flow up the private drain from the main sewer. A simple, ***hand-operated gate valve*** is another option. It is installed in the private drain and can prevent back flow if the valve is closed before the main sewer backs up. The disadvantage with this valve is that it must be closed manually and you cannot use your sewer system until the valve is opened again. A ***combination automatic backwater valve and a sewage ejector pump*** may also be installed. This unit operates when the backwater valve closes and plumbing fixtures, etc. build up to a level behind the valve that activates the ejector pump. The pump is able to pump water against the pressure of the sewer backwater. The gates of the combination ejector need to be frequently checked to ensure they are not being blocked by debris. An ***overhead sewer system*** can also be installed. This system is probably the most effective, but also the most expensive. The overhead sewer system diverts sewage from plumbing fixtures on the first and higher floors to a new sewer line run above the basement floor. The line is connected, either in the basement or outside the foundation, to the original house sewer as it leaves the building. The old sewer system is sealed. Any drainage from the basement level is pumped up into the overhead sewer. ***Any of these systems must be installed by a licensed plumbing contractor. A permit is required.***

Plugs can also be installed to prevent sewer backup. Plugs are plastic or metal devices that are fitted into floor drains to prevent water back-up. They are generally inexpensive, easy to install, do not require a permit and can be installed flush with the basement floor. Do not use plugs if you expect flooding to exceed 3-4 inches. Severe flooding may cause ruptured pipes or cracking in the basement floor. Plugs must be removed to restore drainage.

Q. Is the City of Ottawa responsible for damage from sewer backups?

A. Unfortunately, because these blockages in the system are random and unpredictable, the City of Ottawa cannot be responsible for any damage to your property from a blockage. Our staff is available to provide you with any technical assistance as you try to prevent a backup from occurring again.

City of Ottawa w.w.t.p.

COPING WITH BASEMENT FLOODING

A sewer backup creates a stressful and emotional situation for the homeowner/renter. In some cases, it may cause health and safety concerns as well as significant property loss. A proper response to a sewer backup can greatly minimize property damage and diminish the threat of illness.

The City of Ottawa makes every effort to be responsive to a resident's needs and concerns when a sewer backup occurs. The City has a sewer crew whose sole duty is to inspect, clean and maintain sewers on a daily basis. They are available on a 7 day a week, 24 hour a day basis to minimize the possibility of sewer problems. Unfortunately, because a sewer is not a closed system, many things put into the sewer can clog the system. While the City of Ottawa has adopted rules prohibiting the discharge of any substance likely to cause a sewer obstruction, and attempts to educate the public about the problems they cause, there is really no way we can absolutely prevent it from happening.

Many homeowners' insurance policies exclude damage resulting from sewer backups. However, some insurance companies do provide sewer backup coverage. If you are concerned about the possibility of a sewer backup and want to insure that you are covered, the City of Ottawa urges you to check with your home insurer regarding the availability of sewer backup insurance.

CONTACT INFORMATION

If you experience a sewer problem, please call the Ottawa Wastewater Treatment Plant (815) 433-0245 M-F 7am-3:30pm. (Evenings, Sat.-Sun. and Holidays please call the Ottawa Police Dept. at (815)433-2131).

Please state that you are reporting a sewer emergency. Backed up sewer lines, line breaks, sewage odors and overflowing manholes are considered emergencies. If the problem is in the sewer lateral, the homeowner or business is responsible for correcting the problem. The owner of the property is responsible for maintaining and cleaning the sewer lateral from the building or home to the City's sewer main, including the connection on the sewer main. Locating the lateral is also the responsibility of the property owner.