DuPage County

Natural Hazard Mitigation Plan

2018

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Chapter 1 – Introduction

1.1 Overview

Exhibit 1-1
Map of Illinois

DuPage County, located approximately 20 miles west of Chicago in northeastern Illinois, is home to approximately 929,368 (Illinois Demographics, N.D., P. 1) residents. The County seat, Wheaton, is located near the center of the County's approximately 334 square miles. The County includes nine townships (Exhibit 1-6) and 39 municipalities that partially or completely reside within the County boundaries (Exhibit 1-6). DuPage is the second largest County in the State, bordered by Cook County (the largest County) to the east, Lake and McHenry Counties to the north, Kane County to the west, and Will County to the south. Like its neighbors, DuPage is vulnerable to natural hazards that threaten life safety, public health, business and economy, and critical infrastructure.

DuPage County has experienced 13 State and Federally declared disaster declarations since 1967 (Table 2-1). Hazard mitigation, according to the Federal Emergency Management Agency (FEMA) is "the effort to reduce loss of life and property by lessening the impact of disasters. It is most effective when implemented under a comprehensive, long-term mitigation plan. State, tribal, and local governments engage in hazard mitigation planning to identify risks and vulnerabilities associated with natural disasters, and develop long-term strategies for protecting people and property from future hazard events." (FEMA, 2017a, P. 1). "Hazard mitigation" does not mean that all hazards are stopped or prevented. Natural forces are powerful and most natural hazards are well beyond our ability to control. In addition, natural hazards can be compounded by manmade hazards and vice versa. Hazard mitigation means a long-term, permanent, and comprehensive approach to minimizing and reducing hazard vulnerability.

Purpose of Planning: Planning is one of the best ways to assess hazards and resources to produce a long-term and sustainable program of activities to mitigate the impact of hazards. A well-prepared plan will ensure that activities are reviewed and implemented so that the problem is addressed by the most appropriate and efficient solutions. It can also ensure that activities are coordinated with each other and with other goals and activities, preventing conflicts and reducing the costs of implementing each individual activity.

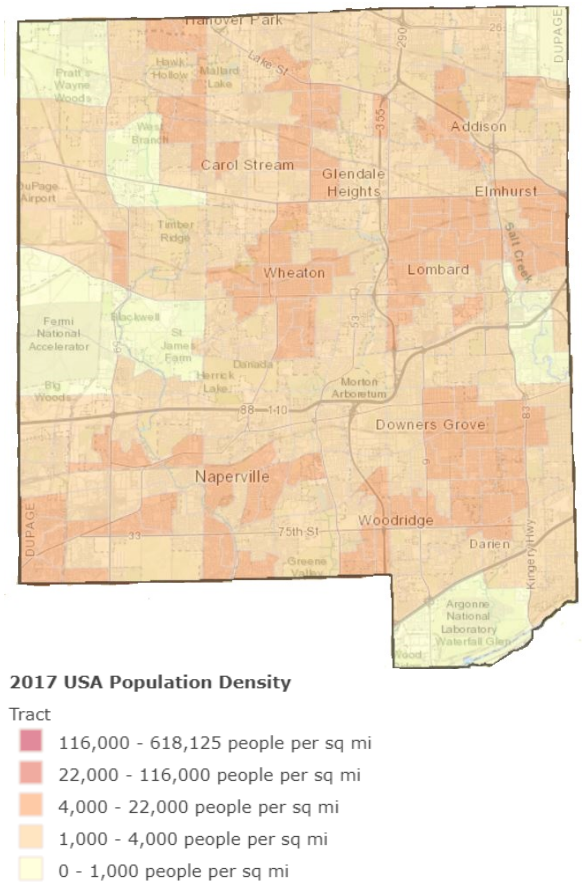
Purpose of this *Plan*: This *Plan* identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage caused by natural hazards. The *Plan* focuses on the seven major natural hazards facing DuPage County: floods, winter storms, tornadoes, severe summer storms, earthquakes, drought, and extreme heat.

A mitigation plan is a requirement for many pre and post disaster mitigation funds (FEMA, 2017b, P.1). In addition, communities that participate in FEMA's Community Rating System (CRS), a program that reduces National Flood Insurance Program (NFIP) premiums, and are designated as a "Category C" repetitive loss community (as defined in Section 502), must prepare a Floodplain Management Plan (FMP) or a Repetitive Loss Area Analysis (RLAA). (FEMA, 2017c, p. 401). The CRS program allows multi-hazard and multi-jurisdictional plans to fulfill this requirement, as long as the planning process follows a process (outlined in Exhibit 1-7).

This *Plan* fulfills the federal requirements for mitigation funding outlined in 44 Code of Federal Regulations, section 201.6 (U.S. Government Publishing Office, 2013, P. 1), and U.S. Code 42, section 5165 (U.S. Government Publishing Office, 2011, P. 1), the CRS program, and provides the County with a blueprint for reducing the impacts of natural hazards. A list of municipalities with general information, including the community number for FEMA's NFIP and participation in CRS, are shown in Table 1-2. The NFIP and CRS programs are discussed in Chapter 4.

Exhibit 1-2

DuPage County Population Density Map



1.2 DuPage County

Population, Employment, and Housing: While surrounding counties may be experiencing suburban sprawl, DuPage County is already considered to be primarily urban. As of 2017, the County's average population density was estimated to be 2,871 people per square mile, compared to the State average of 235 people per square mile (ArcGIS, 2017a). Exhibit 1-2 (right) shows the County's population density – identified by U.S. Census tract – increases towards the central and south eastern portions of the County (ArcGIS, 2017a). While the County's population estimates show a slight decline since 2014, (Illinois Demographics, N.D., P. 1), as shown in Table 1-1, urbanization shows no signs of slowing down. As urbanization continues, emergency management and other public sectors must evolve to support challenges that come with a greater population density.

In 2015, the County had approximately 357,016 total housing units (248,508 owned and occupied; 89,575 rental units; 18,933 vacant housing units), with an average family size of 2.6 (American Fact Finder, 2016, P. 1). That number has since declined to approximately 345,039 total housing units, with an average family size of 2.7 (ArcGIS, 2017b). The average household income and median home values have also increased:

Table 1-1
DuPage County Population Estimates

Census Year	Population Estimate
2000	904,161
2010	916, 924
2011	924,245
2012	927,668
2013	931,296
2014	932,419
2015	930,412
2016	929,368

Home Values 2017 (ArcGIS, 2017c)
DuPage Median Home Value: $304,449
Illinois Median Home Value: $195,300
U.S. Median Home Value: 307,344

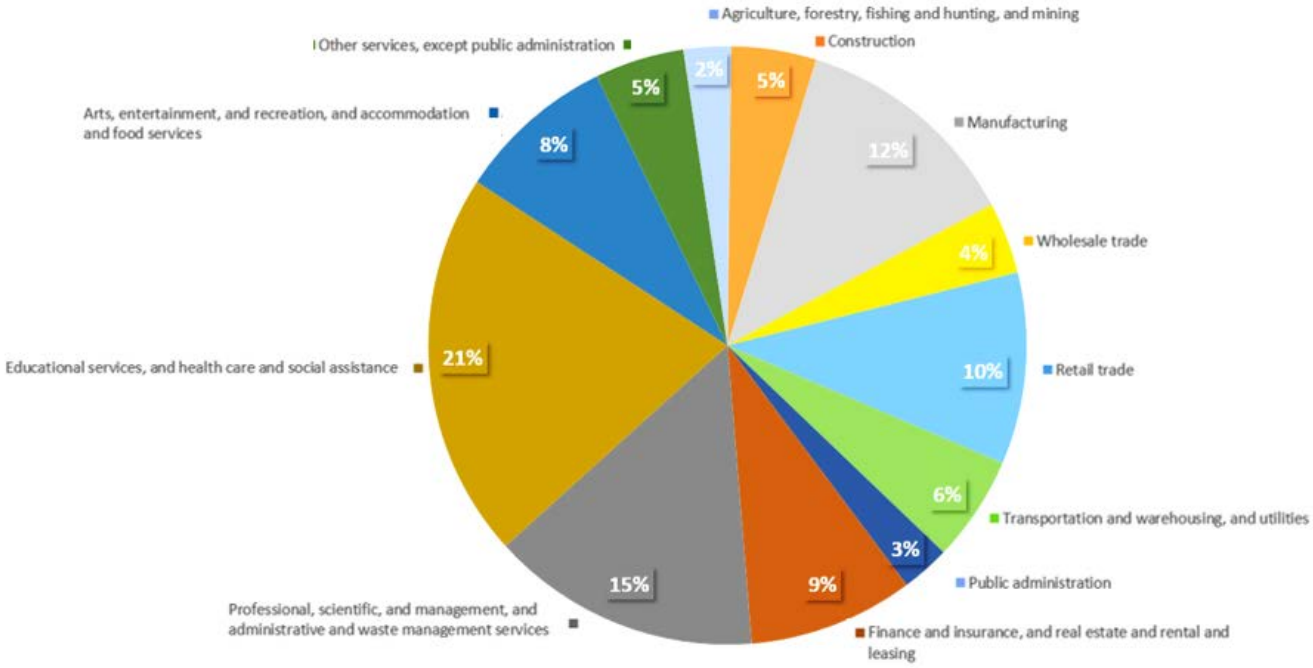
Home Values 2015 (ArcGIS, 2015a)
DuPage Median Home Value: $295,974
Illinois Median Home Value: $199,064
U.S. Median Home Value: $200,000

Income Levels 2017 (ArcGIS, 2017d)
DuPage Average Income: $113,107
Illinois Average Income: $84,983
U.S. Average Income: $80,675

Income Levels 2015 (ArcGIS, 2015b)
DuPage Average Income: $108,066
Illinois Average Income: $78,861
U.S. Average Income: $74,699

Within DuPage County, 45% of persons over the age of 25 have a Bachelor's degree or higher, and 91% of residents over 15 have a high school degree or higher" (Choose DuPage, N.D.a, P. 1). Of the 929,368 County residents, 514,030 are of working age (American Fact Finder, 2017, P. 1). Exhibit 1-3 shows employment industries within DuPage County (American Fact Finder, 2017, P.1). Approximately 6.1% of that number is

Exhibit 1-3
DuPage County Employment Industries



estimated to be unemployed, and approximately 7% of the total population is considered to be at or below the poverty level (American Fact Finder, 2017, P.1). Employed residents commute to work locations, both inside and outside the County, primarily alone and within a personal vehicle (367,244 people); secondary methods include carpooling (35,649), and public transportation such as commuter rail (30,972) and walking (7,621) (American Fact Finder, 2017, P.1). Those who commute travel an average of 29.1 minutes one way (American Fact Finder, 2017, P.1) and 21,800 miles per year (CMAP, 2017, P. 5). According to Choose DuPage "Nearly 700,000 jobs and 40,000 business locations make [the] County [a] proven and premier business location" (Choose DuPage, N.D.a, P. 1). Navistar, Ace Hardware, Blue Cross Blue Shield, Microsoft, McDonalds, Commonwealth Edison, Nicor Gas, and BP all have large corporate offices located within the County, in addition to backup data centers for large Chicago financial and banking institutions.

Exhibit 1-4
Equalized Assessed Value by Property Category within DuPage County

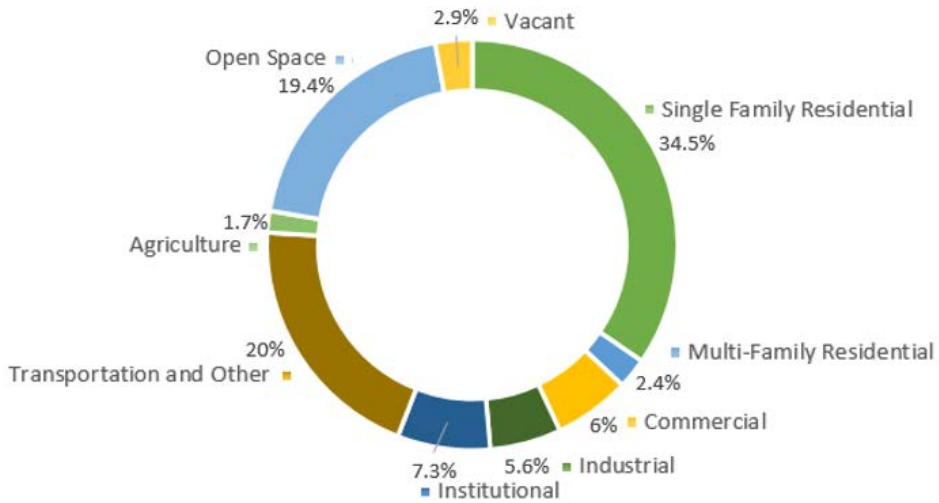
Residential	$25,583,305,234
Commercial	$5,728,648,276
Industrial	$2,546,924,540
Railroad	$39,270,054
Farm	$2,148,686
Mineral	$0
TOTAL	$33,900,296,790

Land Use and Infrastructure: Nearly 80% of DuPage County is developed (i.e. non-open space) (CMAP, 2017, P. 6), with a large amount of critical infrastructure. Exhibit 1-5 outlines how the County's land is used by sectors (CMAP, 2017, P. 6). Assessed property values in DuPage County are maintained by the township assessor offices. Residential property market value can be estimated by multiplying the assessed valuation of the home and property by three. Exhibit 1-4 shows the estimated equalized assessed property value by category within DuPage County (CMAP, 2017, P. 6). Note that when the words "critical infrastructure" are used, this *Plan* is referring to the 16 sectors identified by the Department of Homeland Security. According to DHS, the definition of critical infrastructure is "assets, systems, and networks, whether physical or virtual, so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof" (Department of Homeland Security, 2017, P. 1). Further information on critical infrastructure can be found within Chapter 8.

The County is served by 39 fire and emergency medical services (EMS) agencies, 37 law enforcement agencies, and 46 public works agencies. The County also has 22 wastewater facilities and 53 drinking water systems, with the DuPage Water Commission being the largest for the latter, with approximately 749,636 served annually (New York Times, N.D., P. 1). The County has 43 school districts, which are regularly rated among the best in the Country, and approximately 19 accredited Colleges and Universities. DuPage has eight hospitals (Adventist, Glen Oaks, Adventist Hinsdale, Advocate Good Samaritan, Northwestern Memorial Central DuPage, Edward, and Elmhurst), five public safety answering points (PSAP) (DuPage County Sheriff, Addison Consolidated Dispatch (ACDC), DuPage Public Safety Communications (DU-COMM), Naperville, and NORCOM), and two federal laboratories (Fermi National Accelerator Laboratory located in Warrenville

and Batavia, and Argonne National Laboratory located in Lemont). The Federal Bureau of Investigation (FBI) operates an office out of Lisle, and a United States Postal Service (USPS) distribution center is located in Carol Stream.

Exhibit 1-5
DuPage County Land Usage

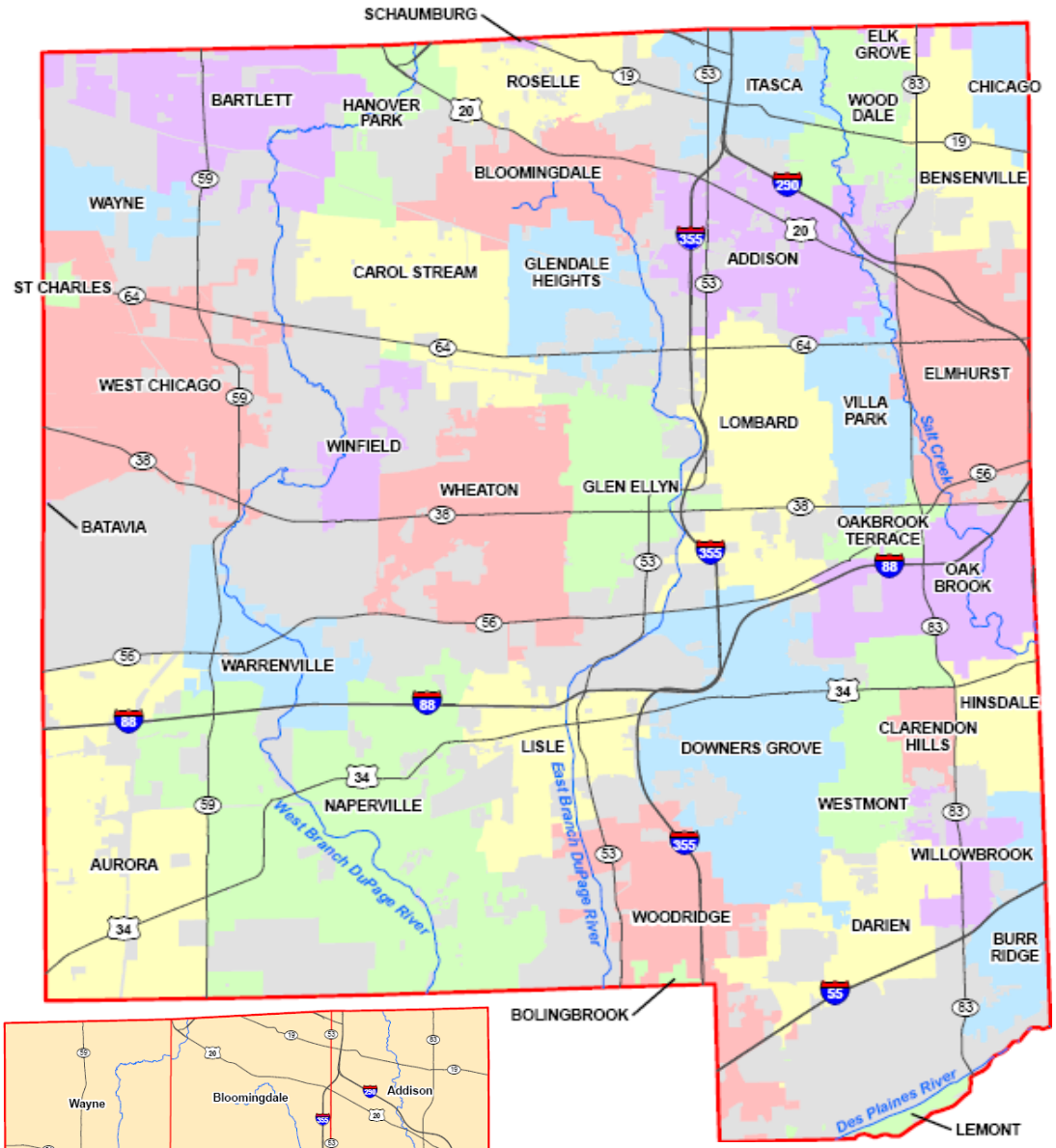


Transportation within the County includes three interstates and toll roads, and nine other State and U.S highways. Center line miles for all roadways within DuPage County (excluding residential) totals 1,113.47; and the total number of vehicle miles traveled (excluding residential) per day for Cook County, DuPage County, Illinois Department of Transportation (IDOT), Illinois State Tollway Authority, and municipal roads equals 24,090,597. The County has approximately 321 bridges (pedestrian, road, and rail), two airports (DuPage and O'Hare International), four pipelines for refined petroleum products, one waterway for petroleum movement, and 329 miles of railroad track which run approximately 422 trains daily (DuPage County Office of Homeland Security and Emergency Management, 2017, P. 2). Approximately 50% of all U.S. freight cargo passes through DuPage County (Choose DuPage, N.D.b, P. 1); and all six Class-One North American Rail Lines touch DuPage, operated by four companies (Burlington Northern Santa FE (BNSF), Canadian Pacific (CP), Canadian National (CN), and Union Pacific). Three passenger rail lines are operated by Metra (Union Pacific / West Line, Milwaukee District / West Line, and BNSF Line), and four additional passenger rail lines are operated by Amtrak (California Zephyr, Illinois Zephyr, Carl Sandburg, and Southwest Chief) (DuPage County Office of Homeland Security and Emergency Management, 2017, P. 2).

Agricultural land includes farmhouses, nurseries, agricultural businesses, and improved farmland. In addition, open space also includes the nearly 26,000 acres of land owned by the DuPage County Forest Preserve District (Forest Preserve District of DuPage County, N.D., P.1) and approximately 52 miles of recreational biking and walking trails.

Chapter 2 discusses critical facilities that are impacted by the various types of natural hazards. Hazard mitigation measures for critical facilities are identified in Chapters 4 through *8.*

Exhibit 1-6
Map of DuPage County Municipalities



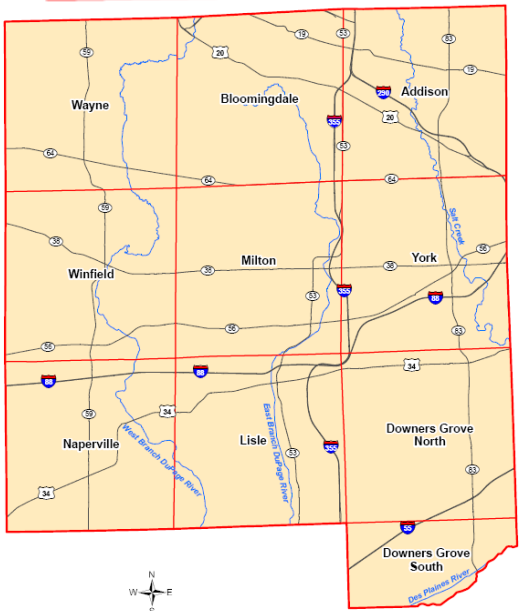


Exhibit 1-6 (Left)
Map of DuPage County Townships

Table 1-2
DuPage County Community Information

Community Name	Population, 2010 Census		Home Rule	NFIP Number (FEMA, 2016a)	*CRS Participant	Incorporation Date	Area in square miles		
	Total Population	In DuPage					Total area	DuPage Area	Area in Other Counties
Addison, Village of	37,198	37,198	Yes	170198	Yes	1884	9.98	9.98	0
Aurora, City of	197,899	49,433	Yes	170320	Unknown	1857	45.80	19.65	26.15
Bartlett, Village of	41,208	24,411	Yes	170059	Yes	1891	15.86	10.85	5.01
Batavia, Village of	25,983	2,117	No	170321	Unknown	1891	9.70	0.53	9.17
Bensenville, Village of	18,352	18,352	No	170200	No	1884	5.62	5.41	0.21
Bloomingdale, Village of	22,047	22,018	Yes	170201	No	1889	7.04	7.04	0
Bolingbrook, Village of	73,366	1,571	Yes	170812	Unknown	1965	24.26	3.88	20.38
Burr Ridge, Village of	10,559	6,719	No	170071	No	1956	7.14	4.69	2.45
Carol Stream, Village of	39,740	39,740	Yes	170202	No	1958	9.42	9.42	0
Chicago, City of	2,707,123	2,703,466	Yes	170074	--	1833	234.1	2.41	231.7
Clarendon Hills, Village of	8,427	8,427	No	170203	No	1924	1.81	1.81	0
Darien, City of	22,086	22,086	No	170750	No	1969	6.30	6.30	0
Downers Grove, Village of	47,833	47,833	Yes	170204	Yes	1873	14.45	14.45	0
Elk Grove Village, Village of	33,127	0	Yes	170088	Unknown	1956	11.41	1.02	10.39
Elmhurst, City of	44,121	44,121	Yes	170205	Unknown	1881	10.31	10.28	0.03
Glendale Heights, Village of	34,208	34,208	Yes	170206	Yes	1959	5.51	5.51	0
Glen Ellyn, Village of	27,450	27,450	Yes	170207	Yes	1892	6.77	6.77	0
Hanover Park, Village of	37,973	17,337	Yes	170099	No	1958	6.43	3.38	3.05
Hinsdale, Village of	16,816	14,589	No	170105	No	1873	4.64	3.71	0.93
Itasca, Village of	8,649	8,649	No	170210	No	1890	5.07	5.07	0
Lemont, Village of	16,000	10	No	170117	Unknown	1873	8.35	2.46	5.89
Lisle, Village of	22,390	22,390	No	170211	Yes	1956	7.02	7.02	0
Lombard, Village of	43,165	43,165	No	170212	No	1869	10.45	10.45	0
Naperville, City of	141,853	94,533	Yes	170213	No	1857	39.32	29.01	10.31
Oak Brook, Village of	7,883	7,876	No	170214	No	1958	8.28	8.27	0.01
Oakbrook Terrace, City of	2,134	2,134	No	170215	No	1958	1.27	1.27	0
Roselle, Village of	22,763	19,040	No	170216	Unknown	1922	5.48	4.81	0.67
St. Charles, City of	32,974	543	Yes	170158	Yes	1834	14.93	1.17	13.76
Schaumburg, Village of	74,198	73,333	Yes	170330	Unknown	1914	19.33	0.33	19
Villa Park, Village of	21,904	21,904	No	170217	No	1915	4.75	4.75	0
Warrenville, City of	13,140	13,140	Yes	170218	No	1967	5.62	5.62	0
Wayne, Village of	2,431	1,570	Yes	170865	No	1958	5.87	3.16	2.71
West Chicago, City of	27,086	27,086	No	170219	No	1873	15.14	15.14	0
Westmont, Village of	24,685	24,685	No	170220	No	1922	5.14	5.14	0
Wheaton, City of	52,894	52,894	Yes	170221	Yes	1859	11.44	11.44	0
Willowbrook, Village of	8,540	8,540	No	170222	Yes	1960	2.75	2.75	0
Winfield, Village of	9,080	9,080	No	170223	No	1921	3.03	3.03	0
Wood Dale, City of	13,770	13,770	No	170224	Yes	1928	4.84	4.84	0
Woodridge, Village of	32,971	32,949	Yes	170737	No	1958	9.58	8.94	0.64
Unincorporated DuPage Co.	--	97,758	--	170197	Yes	1884	97.35	97.35	0
Totals:		**923,222**						**334**	

*Information obtained from the 2017 Natural Hazard Mitigation Plan Annual Report

Watersheds, Topography and Soils: DuPage County has six major watershed areas: Salt Creek, the East Branch of the DuPage River, the West Branch of the DuPage River, Sawmill Creek, the Des Plaines River Tributaries, and the Fox River Tributaries. Additional information on watersheds can be found in Exhibit 2-3 and Table 2-3. The northeastern part of the County is drained by Salt Creek, which flows to the south-southeast. The central part of the County is drained by the West and East Branches of the DuPage River, which generally flow south. The southeast corner of the County is drained by the Des Plaines Rivers, which flows to the southwest. The northwest and southwest corners of the County are drained by tributaries that flow to the Fox River.

Most of the County topography is relatively flat. The land surface elevation is highest in the northwestern part of the County, and gradually slopes to the southeast. The highest natural elevation in the County is about 855 feet above sea level at Mt. Hoy. The lowest elevation is about 585 feet above sea level in the Des Plaines River Valley at the southeast part of the County.

DuPage County soils are predominately silt loams and silty clay loams. Portions of the County are underlain by sand and gravel. Groundwater is available from one shallow and one deep aquifer system. The bedrock of DuPage County consists primarily of dolomites.

Climate: DuPage County experiences four seasons (winter, spring, summer, and fall), with an average of 189 sunny days per year (Best Places, N.D., P. 1), and occasionally seeing large temperature changes from week to week. On average, the County receives 37 inches of rain and 26 inches of snow annually (Best Places, N.D., P. 1).

1.3 Planning Approach

This *Plan* reviews mitigation activities and selects those that will work best for DuPage County and participating municipalities, agencies, and institutions. It provides carefully considered directions to the County government and to the participating municipalities by studying the overall damage potential and ensuring that public funds are well spent. This *Plan* was updated followed a 10-step process, based on the CRS program and taking into consideration the FEMA's hazard mitigation planning process, outlined within Exhibit 1-7. The update was coordinated by the DuPage County Office of Homeland Security and Emergency Management (OHSEM), DuPage County Stormwater Management, and the DuPage County Building and Zoning Department, with assistance from the DuPage County Department of Transportation, the DuPage County Public Works Department, and Molly O'Toole & Associates, Ltd., a hazard mitigation planning consulting firm.

Mitigation Workgroup: The first iteration of the *Natural Hazards Mitigation Plan* was developed under the guidance of a Hazard Mitigation Workgroup, created by a resolution of the DuPage County Board on August 8, 2006. The municipalities within DuPage County were invited to participate. Interested municipalities passed a resolution stating their commitment to the plan development. The County updated the resolution formally recognizing the Workgroup in 2012, with the second iteration of the plan.

Exhibit 1-7
Planning Process

Step one (1) of the planning process was to organize. The OHSEM and Stormwater Management sought to increase participation in the Workgroup by engaging current members of the Natural Hazard Mitigation Workgroup, municipal emergency management coordinators, members of the Stormwater Ordinance Administrator's Workgroup, and public works officials appointed to the DuPage County Public Works Directors Working Group throughout late 2016 and 2017. In December of 2016, participants of the 2016 Natural Hazard Mitigation Annual Report were sent a survey requesting input for the plan update. The survey inquired about the action items within the 2012 plan, provided ideas for potential collaborative projects moving forward, asked for the top five natural hazards the municipality faces, priority projects within the community, and mitigation funding. A second survey was disseminated in September of 2017 to all municipal contacts requesting similar information. The County OHSEM engaged members of the DuPage County Local Emergency Management Coordinators Group in October 2017, and OHSEM and Stormwater Management engaged members of the DuPage County Municipal Engineers Group (MEG) in October 2017. At these meetings, the purpose and update process for the Natural Hazard Mitigation Plan was introduced, the September 2017 survey was promoted, and first plan update meeting was announced. Information collected from the surveys, and feedback from the workgroup meetings, was used to establish the agenda for the Natural Hazard Mitigation Plan Re-Write Kick-Off Meeting Agenda. This meeting was held on November 6, 2017 and hosted by OHSEM, Stormwater Management, and the Building and Zoning Department. All municipal representatives engaged throughout the processes previously outlined were invited. In November 2017, Municipal and County Workgroup participants no longer employed with their respective departments were removed and new individuals were appointed from those engaged earlier in the year. A list of Workgroup members can be found within Appendix A.

Public Involvement: Step two (2) of the planning process was to involve the public. In November 2017, the County OHSEM established a Natural Hazard Mitigation section within its *Protect DuPage* website, and shared by the Building and Zoning Department, providing a place for the public to obtain information about the plan and the update

process. This website was updated throughout the planning process, and will continue to be updated throughout this *Plan's* life cycle. The website included: an overview with the *Plan* purpose, history, and update process; meeting dates, times, and agendas; the definition of hazard mitigation per the Federal Emergency Management Agency (FEMA); a link to the 2012 plan; and links to the annual reports from the years 2014 to present.

In November 2017, the OHSEM also developed and distributed a Public Input Survey. This survey was promoted via OHSEM's Facebook and Twitter page, and allowed the full month of December for responses. Municipalities were notified of the website and survey, and were encouraged to share the information with their residents. For information on the Public Input Survey findings, see Appendix D. The survey, which collected 49 responses, asked residents to identify:

- Their jurisdiction (i.e. city, town, village, etc.);
- Natural hazards they or someone close to them had experienced within their community and within last 10 years;
- Hazards that most concern them when considering their family's health and safety;
- Hazards that most concern them when considering their community as a whole;
- Their feelings regarding community education and their level of preparedness;
- Steps they've taken to prepare for a natural disaster.

The OHSEM incorporated these survey findings into the plan. A draft plan was posted on the *Protect DuPage* website, and made available for public and municipal comment through a survey, on January 2, 2018. In addition to the Workgroup meetings being open to the public, the County held a public meeting / open house on January 4, 2018 to obtain input on the draft and answer questions. A press release was provided to the public by the County on December 29, and was promoted by the communities. The Villages of Lisle and Downers Grove a hosted a second public meeting on January 10, 2018. This meeting was promoted by the County and other communities. See Appendix B press releases and social media postings.

Coordination: Step three (3) was conducted throughout the planning process. The OHSEM contacted ten County stakeholders asking for data or information related to natural hazards – specifically flooding – including plans, studies, and/or current and expected mitigation projects. In most cases, these agencies did not provide any information or comments in response to this effort. Direct discussions with several of them did prove helpful. These agencies were given the opportunity to comment on the draft *Plan*.

Chicago Metropolitan Agency for Planning (CMAP)
McHenry County Emergency Management
Lake County Emergency Management
National Oceanic and Atmospheric Administration (NOAA)
National Weather Service (NWS)
U.S. Army Corps of Engineers
National Flood Insurance Program (NFIP)
Federal Emergency Management Agency (FEMA)
Illinois Emergency Management Agency (IEMA)
American Red Cross of Greater Chicago

Existing plans and programs were reviewed throughout the planning process as well. It should be noted that this *Plan* is intended to complement existing plans or programs, and does not replace other County or municipal planning efforts. Plans and programs reviewed include:

DuPage County Capital Improvement Plan
DuPage County Strategic Plan
DuPage County Stormwater Management Annual Report
DuPage County Stormwater Management Program Assessment
DuPage County Solid Waste Management Plan
DuPage County Emergency Operations Plan
State of Illinois Natural Hazard Mitigation Plan
Lake County All Natural Hazard Mitigation Plan
McHenry County Natural Hazard Mitigation Plan
Cook County Multi-Jurisdictional Hazard Mitigation Plan
Chicago Metropolitan Agency for Planning Community Snapshots
Illinois State Water Survey Topographic Wetness Index
Illinois Department of Natural Resources DuPage River Basin Inventory
U.S. Army Corps of Engineers DuPage River Feasibility Study

Hazard Assessment: The Workgroup met for a second time on December 7, 2017 to address step four (4), assess the hazard. Meeting attendees discussed hazards identified by the County: tornadoes, flood, severe summer storms to include lightening, hail, high winds, and microbursts, sever winter storms to include blizzards, extreme cold, and ice storms, extreme heat, earthquakes, and drought. Specific emphasis was placed on discussing repetitive loss areas, surface flooding identified within other studies, and historical damage from past incidents. Following their discussion, each participant completed a worksheet focusing on these seven hazards. The OHSEM developed the worksheet to mirror the Illinois Emergency Management Agency's (IEMA) Threat and Hazard Identification and Risk Assessment (THIRA). Participants provided their assessment of each hazard using eight categories:

Probability: Likelihood the hazard will occur within the next year	Probability: Likelihood the hazard will occur within the next 5 years	Frequency: Likelihood the hazard will occur multiple times in the next year	Frequency: Likelihood the hazard will occur multiple times in the next 5 years	Human Impact: Possibility of death or injury	Business Impact: Potential for service interruptions	Property Impact: Potential for physical losses and/or damages	Area Affected: Potential incident size

In providing their assessment for the first seven categories, participants used the following percentages:

Low = 1% to 20%
Guarded = 21% to 40%
Elevated = 41% to 60%
High = 61% to 80%
Severe = 81% to 100%

For the last category, participants identified whether the hazard would impact a single community, multiple communities, or would affect the entire County. Following the meeting, the OHSEM collated all worksheet answers. The hazard data and Workgroup findings are covered in Chapter 2 of this *Plan*.

The December 7 meeting was made available to Workgroup participants via conference call. All virtual participants were allowed to engage in the hazards conversation, and worksheets from each attendee was collected via email after the conclusion of the meeting.

Problem Evaluation: The Workgroup also addressed step five (5), evaluate the problem, during the December 7, 2017 meeting. Meeting participants were asked to split into three groups to discuss the potential impacts from the identified hazards within step four. Participants attending via conference call were placed with the smallest group and allowed to participate through the phone. Each group was provided a list of topics to get the discussion started. These topics were: life safety, public health, public outreach and education, economic losses, partnerships, critical infrastructure protection, climate change, sustainable development, historic preservation, natural resource protection, cultural considerations, cost-effective projects, and public information and warning. Workgroup members were instructed to consider the term "critical infrastructure" to include all of the 16 sectors identified by the Department of Homeland Security (DHS): chemical, commercial facilities, communications, critical manufacturing, dams, defense industrial base, emergency services, energy, financial services, food and agriculture, government facilities, healthcare and public health, information technology, nuclear reactors, materials and waste, transportation systems, and water and wastewater systems. When considering critical infrastructure, special emphasis was placed on critical facilities in hazard areas / zones, power outages, dam and/or levee failure, and public service interruptions.

Goal Development: Step six (6), set goals, was addressed through an exercise during the December 7, 2017 meeting. Working within the same groups from step five, meeting participants utilized the talking points from step five to develop a minimum of three priority goals. They were instructed to combine topics and/or include new topics as needed. The OHSEM utilized the products developed within the exercise to create comprehensive goals and guidelines for the plan. The Workgroup reviewed, revised, and approved these goals – which can be found within Chapter 3 – during the January 4, 2018 meeting.

Mitigation Strategies: Step seven (7), review possible activities, was conducted during the Workgroup's third meeting on January 4, 2017. Working within three small groups, the Workgroup examined the mitigation efforts from the 2012 plan as outlined within the action items, current mitigation efforts outside of the plan, and then considered a variety of measures that could affect the impact of these hazards. Special emphasis was placed on collaborative activities that would allow for multi-jurisdictional participation, projects that would allow for cost sharing and therefore would be cost effective, and projects involving sustainable development. Strategies were reviewed in relationship to the developed mitigation goals and the CRS's six mitigation categories, then prioritized to develop guidelines for completing the goals. To see the prioritized guidelines, see Chapter

3. In addition, the mitigation strategies served as a basis for the development of an action plan. The mitigation strategies are the subject of Chapters 4 – 9 in this *Plan*. The action plan may be found within Chapter 10. Mitigation activities discussed by the Workgroup on January 4, 2018:

- Preventative: Encouraging the adoption of current building codes.
- Property Protection: Requiring deeper foundations / basements especially in floodplain areas to prevent erosion, enforcement of sub-surface damn improvements, and increase overhead sewer rebates.
- Natural Resource Protection: Streambank stabilization, better protection of wells, enhance water quality by minimizing lead and copper levels, and urban forestry programs (i.e. Tree City USA).
- Emergency Services: More collaboration with public sectors, to include more frequent exercises (i.e. tabletops), safe rooms, Storm Ready certification, emergency generation, and enhanced communications.
- Structural Projects: Upgrade detention basins within floodplain areas, increase downstream flood storage, and private damn stabilization repairs.
- Public Information: Siren messages, social media messages, utilization of websites and newsletters.

Action Plan: Step eight (8), draft an action plan, was conducted during an in-person meeting, held on January 4, 2018, and a virtual approval process that took place from January 9 to January 17. After the review of potential mitigation projects, the Workgroup conducted an activity to develop a draft "Action Plan" that specifies recommended efforts and projects. Just as in the December meeting, the workgroup split into three smaller groups. Each group was asked to identify action items that align with the six mitigation areas. Below are examples of action items discussed during the meeting:

- Identify the types of generation systems at critical facilities and if there is an automatic switchover (i.e. if an electrician is needed to start the generated power)
- Increase communications capabilities for local public works departments (i.e. obtain radios, designated frequency, etc.), and enhance daily operational communications between public works and emergency management/emergency services.
- Participate in Storm Ready program.
- Participate in Tree City USA program.
- Participate in Community Rating System (CRS) program.
- Establish exercises for the workgroup focusing on hazard response, communication, and documentation for reimbursement.
- Enhance coordination between emergency services and school districts.
- Increase utilization of substantial damage and substantial improvement requirements of the Countywide DuPage County Stormwater and Flood Plain Ordinance.

The action items discussed within the meeting were collated by the OHSEM, and additional County-wide initiatives were introduced to form the Action Plan that can be found within Chapter 10. The Action Plan describes who is responsible for implementing each mitigation measure, an estimate of cost of implementation, and the benefits of

implementing each action item. The Action Plan took into consideration the countywide coordination that takes place through the Stormwater Ordinance Administrator's Workgroup, the DuPage County Public Works Directors Working Group, and the Local Emergency Management Coordinators Group.

It should be noted that this *Plan* serves only to recommend mitigation measures. Implementation of these recommendations depends on adoption of this *Plan* by the DuPage County Board and the city council or board of trustees of each participating municipality. It also depends on the cooperation and support of the offices designated as responsible for each action item. In addition, each community was encouraged to include additional community specific goals and action items. Products that were provided to the County prior to the draft submittal are included within Appendix E.

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Chapter 2 – Hazard Analysis

This chapter will discuss the natural hazards that could impact DuPage County. A list of potential hazards was reviewed and assessed by the Hazard Mitigation Workgroup on December 7, 2017, and priority hazards were selected for analysis. For each hazard, there is a hazard and vulnerability analysis. The hazard analysis includes a description of the hazard, past occurrences and damages, and likelihood or probability of the hazard occurring in the future. The vulnerability analysis compares the probability of the hazard occurring against the possible impacts on resident health and safety, including warning and evacuation, and property, including impacts to critical infrastructure.

The Mitigation Workgroup met to discuss and prioritize natural hazards identified by the County on December 7, 2017. The DuPage County Office of Homeland Security and Emergency Management (OHSEM) collated the workgroup's information and produced an overall DuPage County Natural Hazard Assessment, which can be seen in Exhibit 2-1. The following natural hazards were identified by the County, and will be the subjects of this chapter: tornadoes, flood, severe summer storms to include lightening, hail, high winds, and microbursts, severe winter storms to include blizzards, extreme cold, and ice storms, extreme heat, earthquakes, and drought. For more information on the Workgroup's process, see Chapter 1. For comparison, Exhibit 2-2 shows the State of Illinois's Hazard Rankings for DuPage County (IEMA, 2013).

Exhibit 2-1

DuPage County Natural Hazards

Natural Hazard:	Probability: Likelihood the hazard will occur within the next year	Probability: Likelihood the hazard will occur within the next 5 years	Frequency: Likelihood the hazard will occur multiple times in the next year	Frequency: Likelihood the hazard will occur multiple times in the next 5 years	Human Impact: Possibility of death or injury	Business Impact: Potential for service interruptions	Property Impact: Potential for physical losses and/or damages	Area Affected: Potential incident size
Severe Summer Storm	High	High	Low	High	Low	Guarded	Elevated	Multiple
Floods	High	High	Low	Elevated	Low	Low	Elevated	Multiple
Severe Winter Storm	Elevated	High	Low	Elevated	Low	Guarded	Low	County
Extreme Heat	Elevated	Elevated	Guarded	Elevated	Low	Low	Low	County
Tornado	Low	Low	Low	Low	Low	Elevated	Elevated	Multiple
Drought	Low	Low	Low	Low	Low	Low	Low	County
Earthquake	Low	Low	Low	Low	Low	Guarded	Guarded	County

Exhibit 2-2

State of Illinois Hazard Ranking for DuPage County

Severe Storms	Floods	Severe Winter Storms	Drought	Extreme Heat	Earth- quake	Tornado
Severe	High	High	Guarded	Elevated	Guarded	Elevated

While flooding has been the most significant natural hazard DuPage has experienced, tornadoes, severe summer storms, and severe winter storms have all created damage

that has received a federal disaster declaration over the past 39 years. Table 2-1 lists the presidential, or federal, disaster declarations for the County since 1967. Table 2-2 lists the estimated frequency of each hazard within 5, 10 and 30 years.

Table 2-1
State and Federal Disaster Declarations for DuPage County

	Fall	Winter	Spring	Summer	Declaration Date	FEMA Disaster Number	Location	Public Assistance*
Tornado			X		4/25/1967	227	Unknown	Unknown
Flood				X	9/5/1972	351	Unknown	Unknown
Flood				X	6/25/1974	438	Unknown	Unknown
Flood			X		9/13/2008	1800	Countywide	$2,328,929
Flood			X		7/24/2010	1935	Eastern DuPage	Unknown
Flood				X	8/21/1987	798	Eastern DuPage	Unknown
Severe Storms				X	6/18/1976	509	Unknown	Unknown
Severe Storms		X			1/16/1979	3068	Unknown	Unknown
Severe Storms			X		5/10/2013	4116	Countywide	Unknown
Severe Storms				X	7/25/1996	1129	Western DuPage	$2,460,000
Winter Storms		X			1/8/1999	3134	Countywide	$2,300,000
Winter Storms		X			1/18/2001	3161	Countywide	$1,880,000
Winter Storms		X			1/31/2011	1960	Countywide	$3,041,412

* Dollar amount of public assistance communities received. This estimate does not include individual assistance provided to individual property owners.

Table 2-2
DuPage County Natural Hazard Frequency

Hazard	Area affected or potentially affected (Location)	Past Frequency		
		Occurrences in the last number of years		
		Last 5 years	Last 10 years	Last 30 years
Dam Failure	Downstream areas	0	0	--
Drought	Countywide	9	--	--
Earthquake	Countywide	0	0	--
Extreme heat	Countywide	0	2	--
Extreme cold	Countywide	3	4	--
Flood occurrences	Countywide	14	19	--
Hail*	Storm location	32	56	75+
Lightning*	Storm location	5	--	--
Thunderstorm-microburst*	Storm location	26	56	86+
Tornado	Storm location	0	1	6
Winter Storm – Ice	Countywide	0	0	1
Winter Storm – Snow	Countywide	8	16	--

* Elements of severe summer storms -- No data available.

2.1 Floods

According to the National Oceanic and Atmospheric Administration (NOAA), a watershed is “a land area that channels rainfall and snowmelt into creeks, streams, rivers, and eventually to outflow points such as reservoirs, bays, and the ocean” (NOAA, 2017a). There are six main watersheds in DuPage County: Salt Creek, the East Branch DuPage River, the West Branch DuPage River, Sawmill Creek, Des Plaines River Tributaries, and Fox River Tributaries. The watersheds associated with these streams encompass most of DuPage County. Exhibit 2-3 shows the DuPage County watersheds. Table 2-3 lists DuPage County’s watersheds and sub-watersheds. During times of high precipitation, or during a

Exhibit 2-3
DuPage County Watershed Reference Map

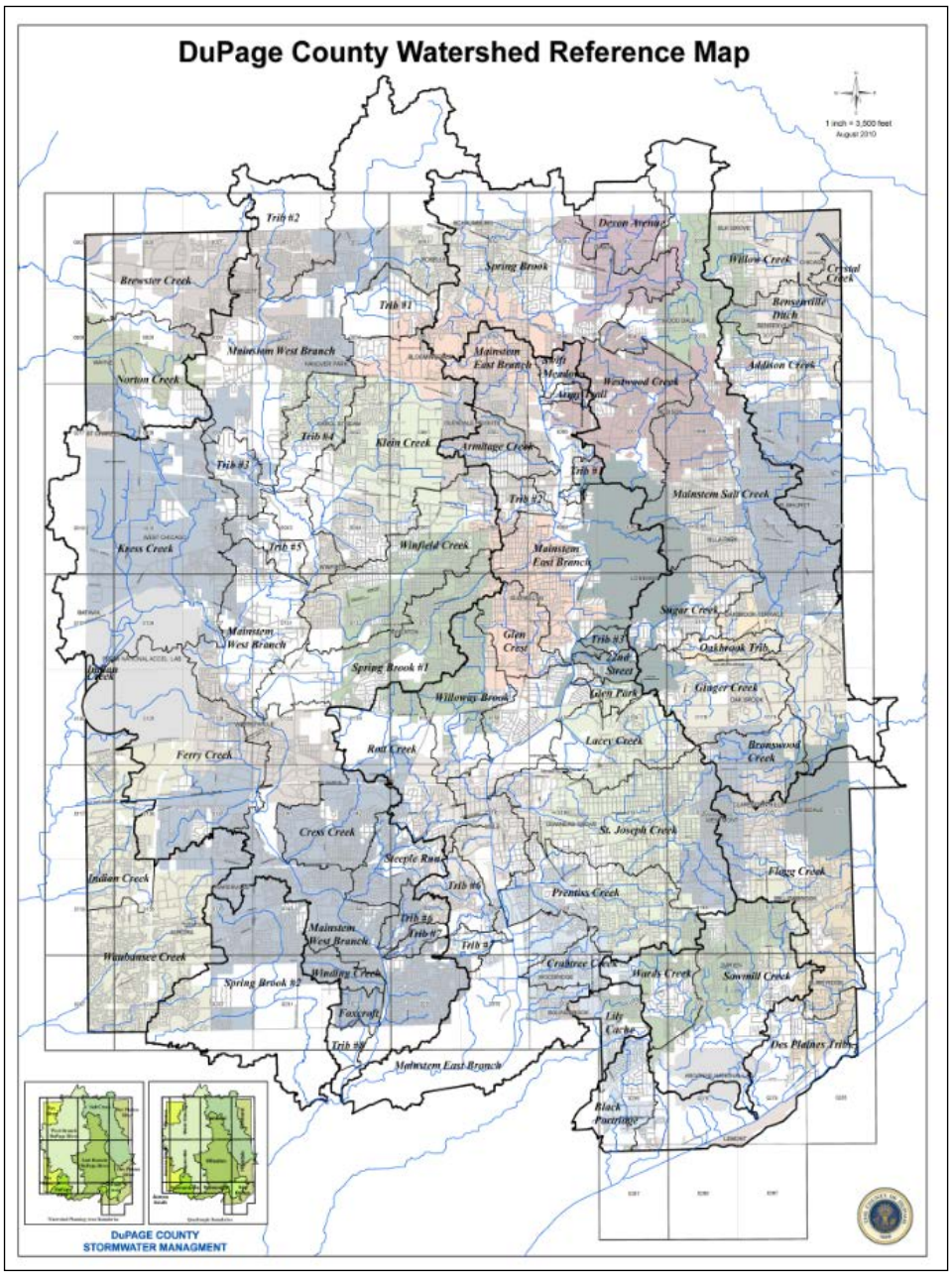


Table 2-3
DuPage County Watersheds

Watershed	Total Area	Area Within DuPage County
Sub-watershed	**Square Miles**	**Square Miles**
Des Plaines River Tributaries	**39.60**	**38.51**
Addison Creek	9.09	9.09
Bensenville Ditch	2.56	2.56
Black Partridge	2.73	2.43
Crystal Creek	0.42	0.42
Des Plaines Main Stem	7.82	7.79
Flagg Creek	11.89	11.14
Willow Creek	5.09	5.09
DuPage River Tributaries	**14.39**	**10.88**
Lily Cache	1.84	1.84
Spring Brook 2	12.55	9.03
East Branch DuPage River	**81.29**	**75.22**
Armitage Creek	2.13	2.13
Army Trail	0.44	0.44
Crabtree Creek	1.54	1.54
Tributary 1	0.67	0.67
Tributary 2	1.23	1.23
Tributary 3	0.49	0.49
Tributary 6	1.85	1.85
Tributary 7	0.86	0.86
DuPage River Main Stem	33.61	27.54
Glencrest Creek	2.72	2.72
Glen Park	0.71	0.71
Lacey Creek	4.62	4.62
Prentiss Creek	7.04	7.04
Rott Creek	5.99	5.99
St. Joseph Creek	11.26	11.26
Swift Meadows	0.87	0.87
22nd Street	0.77	0.77
Willoway Bay	4.50	4.50
Fox River Tributaries	28.08	28.08
Brewster Creek	7.00	7.00
Indian Creek	5.16	5.16
Norton Creek	6.56	6.56
Waubansee Creek	9.36	9.36

Watershed	Total Area	Area Within DuPage County
Sub-watershed	**Square Miles**	**Square Miles**
Salt Creek	**65.23**	**57.92**
Bronswood Creek	3.27	3.27
Devon Avenue	3.08	1.81
Ginger Creek	5.36	5.36
Oakbrook	1.20	1.20
Spring Brook	14.68	11.82
Salt Creek Main Stem	27.64	24.45
Sugar Creek	4.06	4.06
Westwood Creek	5.95	5.95
Sawmill Creek	**12.55**	**12.55**
Sawmill Creek Main Stem	9.48	9.48
Wards Creek	3.07	3.07
West Branch DuPage River	**127.64**	**113.15**
Cress Creek	4.21	4.21
Ferry Creek	12.38	12.35
South of Foxtrot	0.92	0.88
Klein Creek	12.65	12.65
Kress Creek	18.93	15.95
Spring Brook 1	7.69	7.69
Steeple Run	2.75	2.75
Tributary 1	2.69	2.69
Tributary 2	4.69	2.16
Tributary 3	1.69	1.69
Tributary 4	2.95	2.95
Tributary 5	1.37	1.37
Tributary 6	1.21	1.21
Tributary 7	0.59	0.59
South of 87th	0.77	0.04
West Branch Main Stem	42.54	34.36
Winfield Creek	8.47	8.47
Winding Creek	1.14	1.14

rapid snowmelt, if “water enters the watershed too quickly for the land to absorb” (NOAA, N.D.a), causing “surface runoff” flooding (NOAA, 2017). This overflow can also cause water to “run onto and off of impervious surfaces such as parking lots, roads, buildings, and other structures”, causing urban flooding. Urban flooding, as defined in the Urban Flooding Awareness Act, 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. '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 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. These impacts include damage to buildings and infrastructure, economic disruption, and negative effects on health and safety (IDNR, 2015, P. 2).

"When surface water runoff introduced into streams and rivers exceeds the capacity of the natural or constructed channels to accommodate the flow, water overflows the stream banks, spilling out into adjacent low lying areas. Riverine flooding occurs as a consequence. (FEMA, N.D.a)". Rivervine flooding can cause two types of floods: overbank flooding and flash floods. Overbank flooding is the "increase in volume of water within a river channel and the overflow of water from the channel onto the adjacent floodplain (FEMA, N.D.a)". "Flash floods are the most dangerous kind of floods, because they combine the destructive power of a flood with incredible speed and unpredictability. Flash floods occur when excessive water fills normally dry creeks or river beds along with currently flowing creeks and rivers, causing rapid rises of water in a short amount of time. They can happen with little or no warning (NOAA, N.D.b)". Additionally, a levee or dam failure can also produce a flash flood. Flooding is one of the most common natural hazards that occur within DuPage County, and within the Country.

Probability and Frequency: On average, the County receives 37 inches of rain and 26 inches of snow annually (Best Places, N.D., P. 1). In DuPage County, a 24-hour precipitation amount between 7 and 8 inches, depending on your location within the County, is considered to be a 100-year rainfall event (NOAA, 2006). For a relatively short, intense rainfall event of 3 hours, the 100-year rainfall amount is approximately 4.1 inches (NOAA, 2006).

"DuPage County has grown dramatically over the last half decade. From 1950 to 2002 DuPage County saw a 600% increase in population alone. This rapid urbanization from what was mostly agricultural land to large residential, commercial, and industrial areas have had a profound impact on many of DuPage County's rivers and streams (DuPage County, N.D.a)". DuPage County has experienced several major flood events over the past 30 years, the most notable events where overbank flooding has occurred and damages have been documented to be the following flood events which all were declared state and/or federal disasters: August 1987, July 1996, September 2008, and April 2013. Overbank flooding occurs when water rises overflows over the edges of a river or stream and expands beyond the banks. This is the most severe type of flooding and can occur in any size channel — from small streams to huge rivers.

In Lower Salt Creek, the most urbanized portion of DuPage County, overbank flooding occurs quickly within a storm duration where the water surface elevation rises rapidly due to the high percentage of impervious areas within this watershed, this stream description is commonly termed "flashy" in addition to the flood events listed above, the Salt Creek

Watershed has been highly impacted by the more extreme events that produce less overall rainfall but occur over a short time duration (ie 4.25 inches of rain in 6 hours).

The East Branch DuPage River watershed is less urbanized but the floodplain within this watershed is extremely flat, therefore elevation rise in the stream has a broad geographical expansion but is less likely to be impacted by the smaller, more extreme events the region has been experiencing with climate change. Areas within this watershed experience flooding from both overbank flooding and depressional flooding (Urban Flooding). Because of the flatter topography within the East Branch DuPage River, there often isn't a conveyance mechanism to move water from the topographical depression areas to the floodplains. Due to this occurrence, areas outside of the mapped floodplain are experiencing flooding due to this poor conveyance, this type of flooding is also often termed as "urban flooding" within this region and has been documented to occur at a higher frequency than overbank flooding within the East Branch DuPage River watershed.

The West Branch DuPage River watershed has the largest land area of the County's three major watershed. In addition to the large land area, it also has areas that are urbanized therefore it also experiences urban flooding within the flatter areas outside of the floodplain and overbank flooding in large event. Due to the large land area tributary to the river, the "extreme" event result in a higher peak later in the event. This does allow for emergency assistance for sandbagging, pumping and in some cases evacuation.

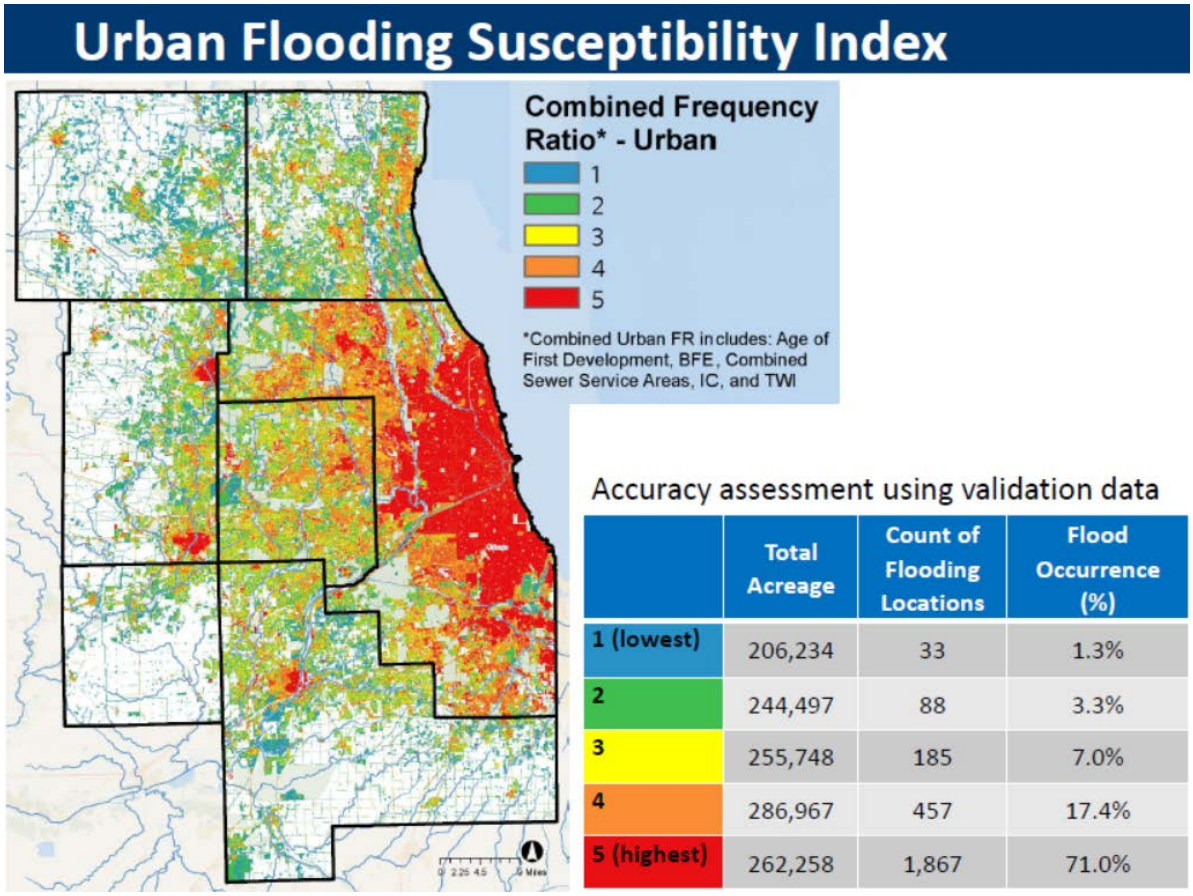
"In the late 1970s and early 1980s the Federal Emergency Management Agency issued Flood Insurance Rate Maps (FIRM) that established the 1% annual chance (100-year) floodplains for DuPage County. These and other FIRMs have since been rendered obsolete due to changes in land use, topography, modeling standards and technologies (DuPage County, N.D.a)". "The Stormwater [Management] has been conducting new watershed studies that will conform to current topographical conditions and meet today's standards and practices in hydrologic and hydraulic analysis (DuPage County, N.D.a)".

"The County is unique in its development of the hydrologic and hydraulic models used in its watershed planning and flood plain mapping [and incorporating the County's flood control facilities]. Rather than using single event, steady state models such as HEC1 and HEC2, the Stormwater Management utilizes continuous simulation and dynamic routing models. The reasons DuPage County selected this methodology was; (1) the continuous simulation hydrologic model is used to capture the effects of antecedent moisture on runoff volumes and peaks, and to account for a non-uniform precipitation distribution over the watershed; (2) the effects of backwater, flood plain storage, and complex urban stream systems have a significant impact on the hydraulics of DuPage County streams (DuPage County, N.D.b)". Utilization of this system allow for flood warnings to be distributed to communities and emergency operator to prepare for the potential flood event. This forecasting is posted to the County's public access webpage with stream height predications and an updated blog to assist with data interpretation. In addition to this system, staff is also working on a real time inundation map to assist with emergency response and coordination, this is expected to be "rolled out" for countywide usage in July 2018.

Table 2-4 shows DuPage County's current 100-year flood elevation calculations for specific points along major rivers, which are included in the FEMA Flood Insurance Studies. Table 2-5 provides additional calculations, for specific locations, including flood stage, 10-year flood, 50-year flood, and 100-year flood calculations. Exhibit 2-4 shows the Chicagoland region's susceptibility to urban flooding (CMAP, 2017). This map shows the risk for flooding outside of the FEMA mapped floodplain. Instead of proximity to floodplain as the primary risk factor, this map uses age of development, base flood elevation compared to parcel elevation, combined sewer service areas, impervious cover, and soils to determine how prevalent flooding – resulting from overwhelmed drainage systems – would be. Exhibit 2-5 shows the Chicagoland region's susceptibility to riverine flooding (CMAP, 2017). This map shows flooding caused by streams and rivers within the FEMA mapped floodplain, which is the primary focus of hydraulic modeling. Exhibit 2-7 shows a map of the DuPage County 100-Year Flood Map. For additional information on hazard mapping, including floodplain maps, see Chapter 4.

Exhibit 2-4

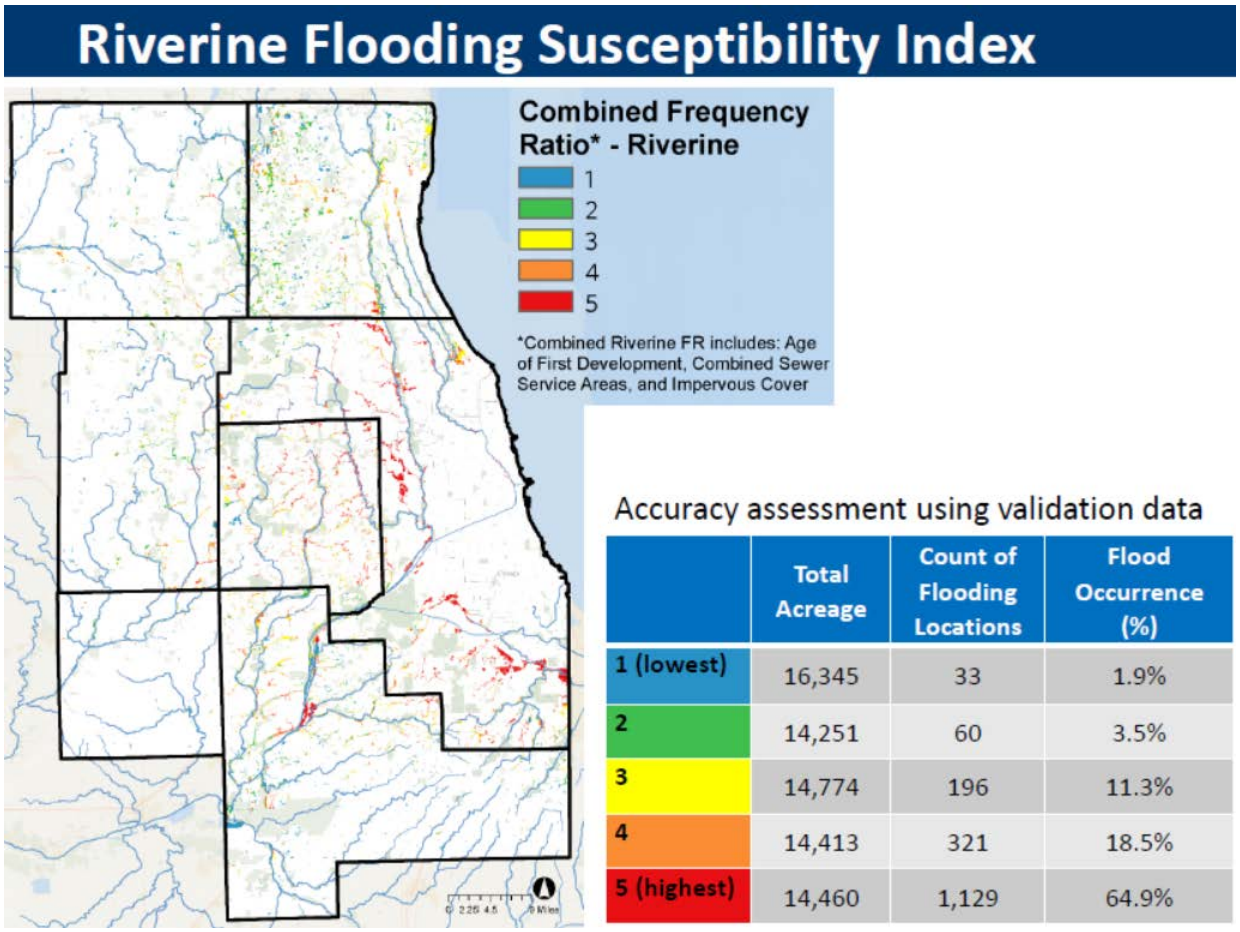
Chicago Metro Area Urban Flooding Susceptibility Index



Accuracy assessment using validation data

	Total Acreage	Count of Flooding Locations	Flood Occurrence (%)
1 (lowest)	206,234	33	1.3%
2	244,497	88	3.3%
3	255,748	185	7.0%
4	286,967	457	17.4%
5 (highest)	262,258	1,867	71.0%

Exhibit 2-5
Chicago Metro Area Riverine Flooding Susceptibility Index



Accuracy assessment using validation data

	Total Acreage	Count of Flooding Locations	Flood Occurrence (%)
1 (lowest)	16,345	33	1.9%
2	14,251	60	3.5%
3	14,774	196	11.3%
4	14,413	321	18.5%
5 (highest)	14,460	1,129	64.9%

Table 2-4
DuPage County 100-year Flood Elevations

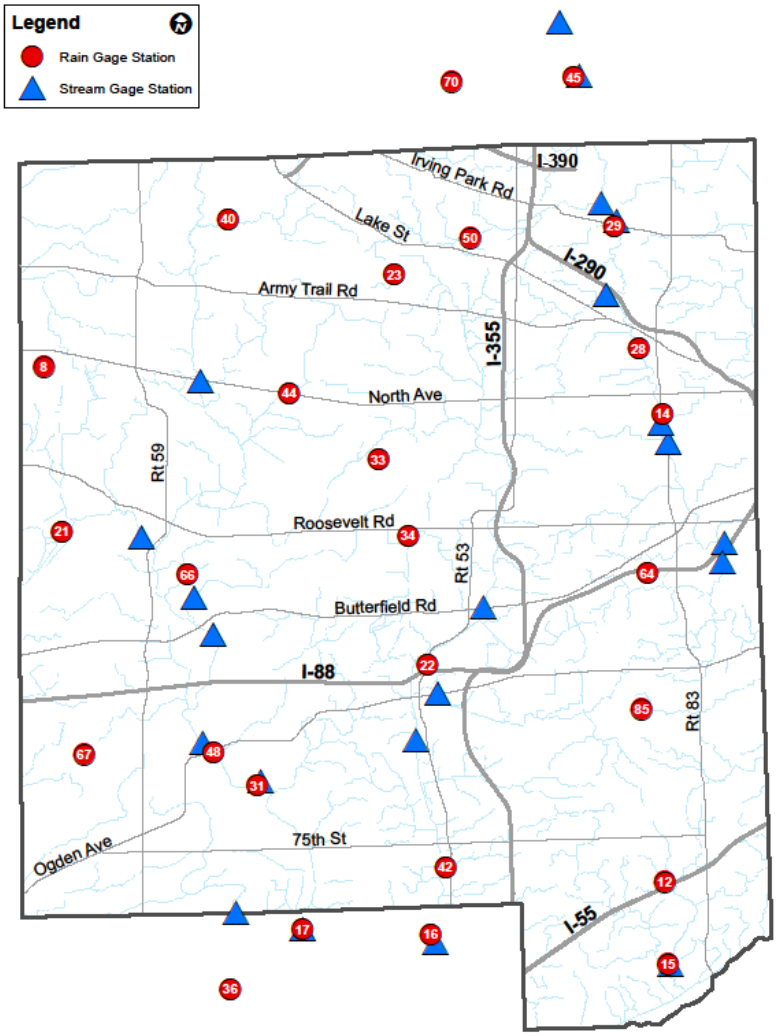
River	Location	Approximate 100-year Flood Elevation
East Branch DuPage River	Butterfield Rd (Rte. 56)	677.3 feet
East Branch DuPage River (downstream)	DuPage-Will County Line	649.0 feet
Salt Creek	North Avenue (Rte. 64)	672.6 feet
Salt Creek (downstream)	DuPage-Cook County Line	643.5 feet
West Branch DuPage River	Lake Street (Rte 20)	674.5 feet
West Branch DuPage River (downstream)	DuPage-Will County Line	646.2 feet

Table 2-5
DuPage County Comparison of Flood Elevations (In feet)

Stream	10-Year	50-year	100-Year
East Branch DuPage River at Rte 34 in Lisle	665.6	667.0	668.5
Salt Creek at North Avenue in Addison	670.5	671.8	672.6
West Branch DuPage River at Lake Street near Bartlett	673.7	674.2	674.5

During a precipitation or snowmelt event, the County can use their hydrologic and hydraulic modeling statistics, in coordination with their real-time monitoring of rain and stream gages, to predict when and where flooding will occur. Exhibit 2-6 shows the locations of the County's gages. Blue dots with numbers are rain gage and stream gage locations. Red dots with numbers are rain gages only.

Exhibit 2-6
DuPage County Rain and Stream Gage Locations



Past Events: Utilizing information from the National Weather Service and OHSEM report logs, Table 2-6 provides a summary of all flood events that have occurred within the County (excluding localized flooding) from June 1967 to May 2016. A historical summary of damages from select floods within Table 2-6 Is provided immediately following the table.

Exhibit 2-7
DuPage County Revised Preliminary DFIRM 100-Year Flood Map

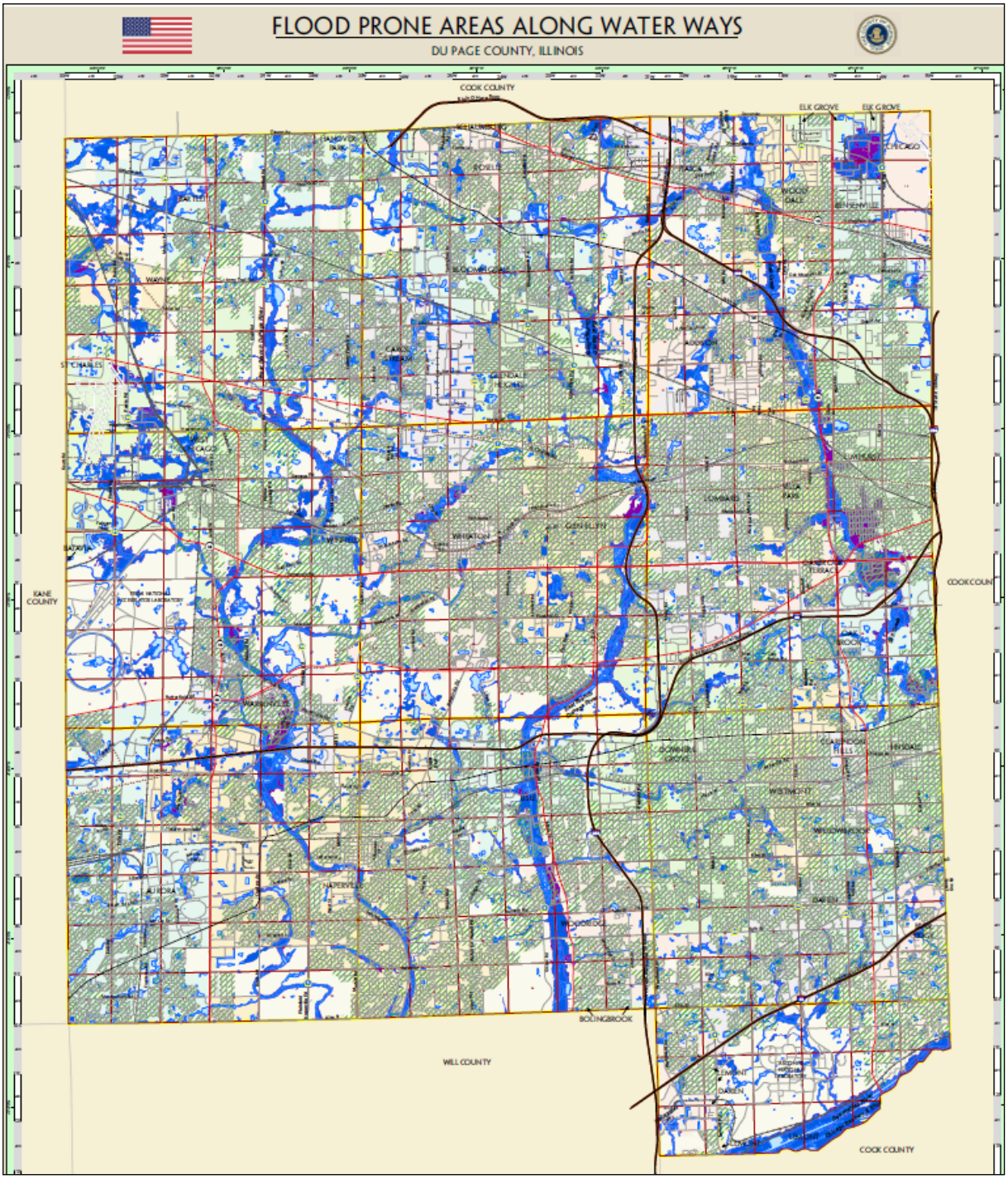


Table 2-6
DuPage County Recorded Flood Events

Location:	Date:	Time:	Description:
Western DuPage	6/10/1967	Unknown	Flooding in Winfield and West Chicago.
Central and Eastern DuPage	8/27/1972	Unknown	Flooding in Elmhurst. Residents in Glen Hill area in Glendale Heights were evacuated in boats.
West and Central DuPage	4/18/1975	Unknown	Flooding in Lisle, Winfield and West Chicago.
Eastern DuPage	3/5/1976	Unknown	Flooding in Wood Dale.
Eastern DuPage	9/19/1977	Unknown	Flooding in Wood Dale.
Central DuPage	5/13/1978	Unknown	Flooding in Lisle.
Central and Eastern DuPage	3/4/1979	Unknown	Flooding in Lisle, Wood Dale.
Western DuPage	3/19/1979	Unknown	Flooding in Winfield and West Chicago.
Eastern DuPage	12/3/1982	Unknown	Flooding in Elmhurst at Route 83 and North Avenue. 23 businesses in the area received major damages; 3 with minor damage.
Western DuPage	12/2/1982	Unknown	Flooding in Winfield and West Chicago.
Central DuPage	7/2/1983	Unknown	Flooding in Lisle.
Countywide	8/14/1987	Unknown	Flooding through County.
South and Central DuPage	7/17/1996	6:00 PM	Damage estimates between $74 and $150 million.
South and Central DuPage	2/20/1997	6:00 PM	4 inches of rain in Aurora; 3.6 inches of rain in Wheaton. Woman died in Matteson after driving into a barricaded flooded railroad viaduct.
Northeast DuPage	8/16/1997	6:00 PM	3 to 9 inches of rain over northeast DuPage County into north-central Cook County.
Bolingbrook	8/3/1998	11:00 PM	5 inches of rain in Will County; 3.5 inches in Bolingbrook. Roads with underpasses flooded.
Southwest DuPage	8/4/1998	11:00 AM	6 inches of rain in Bolingbrook and 5 inches in Naperville. Lisle experienced flooding.
Wheaton	7/21/2001	7:35 PM	1 foot of water over Main Street in Wheaton.
Countywide	10/13/2001	3:25 PM	Numerous streets and major roads flooded and closed, including Route 53 where several motorists were trapped in their vehicles and had to be rescued.
Countywide	10/24/2001	1:30 PM	Minor street flooding in DuPage.
Wheaton and West Chicago	7/9/2002	2:00 AM	2.92 inches of rain in Wheaton 5.6 inches in Batavia. Street and basement flooding in Wheaton and West Chicago.
Carol Stream	8/22/2002	3:00 AM	Basement flooding in Carol Stream
Southeast DuPage	11/4/2003	7:30 PM	2.4 inches of rain in Westmont; 1.68 inches in Wheaton. Low areas in Clarendon Hills flooded.
Clarendon Hills	3/28/2004	5:00 PM	1.5 to 2 inches of rain in 3 hours in Clarendon Hills.
Lisle	5/13/2004	5:00 PM	Flooding on Route 53 south of Burlington railroad tracks in Lisle.
Naperville	5/21/2004	8:54 PM	Washington Avenue and Route 34 flooded in Naperville.
Central-west DuPage	5/30/2004	10:05 AM	Street flooding in Naperville, Winfield, Clarendon Hills, and Wheaton. Park and Main Streets in Wheaton closed.
Naperville	6/12/2004	12:25 AM	River Road and Wilshire Blvd., and Route 59 and North Aurora Road in Naperville flooded, along with 59th Street and Fairview Avenue in Downers Grove.
Glendale Heights	10/2/2005	2:30 PM	1 foot of water over North Avenue in Glendale Heights.
Countywide	10/2/2006	8:50pm	Underpasses were flooded and buildings took on water throughout the County.
Countywide	9/13/2008	5:00am	Lowell and hurricane Ike moved across the region. These two features combined to produce heavy rain and flash flooding across many areas of northern Illinois.
Central DuPage	12/27/2008	Unknown	Flooding in Glen Ellyn and Lisle resulting in flood insurance claims
Countywide	7/24/2010	12:13am	Thunderstorms developed in the late evening of July 23rd and lasted in the early morning hours of July 24th producing very heavy rain and widespread flash flooding in many parts of the Chicago Metro Area. Rainfall rates were as much as two to three inches per hour.
North Half of DuPage	7/1/2012	11:00AM	A Severe thunderstorm (equivalent to 4-F2 Tornados) struck causing 56% of the County to lose power for up to 7 days.
Countywide	4/18/2013	4:00PM	This was a massive flood that activated the DuPage EOC for (5) days and initiated a Presidentially declared disaster, with Public and Individual Assistance approval.
Countywide	8/22/2014	2:20AM	Widescale flooding was experienced across the County.
Central DuPage	5/25/2016	5:50PM	A severe thunderstorm struck Wheaton causing power outages.

August 1987: On August 13 to 14, 1987, 3 inches to 9.4 inches of rain fell on DuPage and Cook Counties. Four deaths were attributed to the flood. An estimated 400 vehicles were stranded at depths as much as six feet. At least 30 intersections and stretches of roadway were closed due to flooding. 3,000 homes were damaged. Total damage estimates range from $75 to $150 million.

DuPage County suffered the worst damage in the Salt Creek watershed. The Village of Addison estimated that 30% of the community was affected, and over 100 homes were damaged. Businesses were significantly impacted, along with critical facilities, such as treatment plants. Damage totaled to several million dollars.

In Elmhurst the southwest third of the City was impacted, 3,100 homes were damaged, their wastewater treatment facility was flooded, and 3,500 phones were lost due to submerged phone cables. Damage totaled over $33 million.

Flooding extended to the East Branch DuPage River watershed. For example, in Glendale Heights several businesses flooded at the intersection of North Avenue (Illinois State Route 64) and Glen Ellyn Road. In Wheaton, homes and businesses in the floodplain were flooded, and City Hall was damaged. Also impacted were two water mains, storm and sanitary sewers and a bridge abutment. Some businesses and schools were forced to close due to the impact of the flood in the region.

July 1996: Beginning on July 17, 1996, rain from thunderstorms began to fall across northeastern Illinois. Naperville reported that the first of the thunderstorms began around 10:00 a.m. By 7:00 p.m. Route 59 in Naperville was closed. The thunderstorms continued into the next day. Record rainfall came from several thunderstorms that tracked along a stalled west to east low-pressure front. Around 1:45 a.m. on July 18, 1996 the National Weather Service issued a flash flood warning. Around 2:00 a.m. By 6:00 a.m. the mayors of Naperville and Lisle declared a state of emergency. The County worked to evacuate portions of Steeple Run subdivision in Lisle Township. The West Branch DuPage River crested around 6:00 p.m. on July 18th.

The heaviest rainfall concentrated over southeastern Kane County and northeastern Kendall County. An Aurora rain gage recorded 16.91 inches in 24 hours, a record for the state. Record peak flows were recorded at 19 stream flow gages in the area. The US Geological Survey estimated that the flooding was greater than a 100-year flood on Blackberry Creek near Yorkville and the Fox River at Dayton.

The severity of the July 1996 flood was due to a combination of wet conditions (July was the wettest month on record for Aurora) and heavy local rain. The Cities of Naperville and Aurora were hit extremely hard. Naperville estimated total public damage at $2.2 million. Private property damage was estimated at $30.7 million. Many businesses were forced to close temporarily. Downtown businesses with basements were adversely affected.

For the 1996 flood, the cost to the Village of Woodridge for response and clean-up was $256,061. The flooding was village-wide. Homes and cars were flooded throughout the village. Some businesses were closed temporarily. Woodridge also experienced streambank erosion, sewer back-ups and street flooding. Total damages were not recorded in the Village of Lisle, but the Village was reimbursed $28,590 by the Illinois

Emergency Management Agency for emergency response and recovery costs. In Downers Grove an estimated 180 homes were damaged. Damage was estimated at $1,020,000.

September 2008: On September 13, 2008 major flooding was experienced throughout much of DuPage County. The severe storm and flood event was a result of the remnants of Hurricane Ike that struck the Gulf coast and traveled up through the Midwest of the United States. The Chicago area rainfall for September 13, 2008 set a new daily rainfall record. As shown on the figure to the right, the northeast portion of DuPage County received over six inches of rain. Thirteen counties in Illinois, including DuPage County, received a federal disaster declaration on October 3, 2008 (FEMA 1800-DR, Illinois) for the severe storms and flooding.

From a survey of municipalities (conducted for the 2009 Natural Hazard Mitigation Plan Annual Report), 30% of streets within several municipalities were impacted by the September 13, 2008 flooding. Entrance and exit ramps of Interstates 290 and 88 were affected, along with a notable number of major intersections in the northern and eastern halves of the County. Eighteen communities reported residential flooding, and nine communities reported flooding in downtown or commercial areas.

July and August 2010: During a period from Monday July 19th, 2010 through Saturday, August 7th, 2010, several severe rainstorms produced record rainfall totaling over 11 inches. This rainfall resulted in serious roadway and residential flooding throughout DuPage County. The heaviest rain fell across north central DuPage County during the early morning hours of July 24th producing widespread flooding and flash flooding.

Widespread street and basement flooding was reported. North Avenue at Interstate 290 was flooded with a car stuck in the water. Lake Ellyn overflowed its banks with six inches or more of water covering nearby streets. The Village Links Golf Course was flooded with waist high water and a mail truck was submerged in the flood waters. In Elmhurst, Interstate 290 was closed near York Street with two cars floating in water at least four feet deep; Route 83 was flooded and closed under the Union Pacific tracks with several cars floating in the water; Robert Palmer Drive was flooded and closed below the railroad tracks and all roads near Elmhurst Memorial Hospital were impassable. In Lombard, the Main Street viaduct was flooded with stranded cars in the flood waters and 15 residents were evacuated by boat along Finley Road. In Villa Park, significant flooding occurred near Wildwood and Monterey Avenues. Salt Creek quickly rose out of its banks and flooded nearby areas. In the Graue Mill Condominiums, 250 residents were evacuated after four feet of water surrounded the community when Salt Creek overflowed its banks. Storm total rainfall amounts included 7.26 inches one mile northwest of Villa Park; 7.19 inches near Carol Stream; 7.08 inches one mile northwest of Glen Ellyn; 7.01 inches two miles west of Elk Grove Village; 6.98 inches in Oak Brook; 6.92 inches one mile northwest of Lombard; 6.52 inches near Wheaton; 5.57 inches two and a half miles north of West Chicago; 4.51 inches two miles southwest of Burr Ridge; 4.40 inches one mile southeast of Westmont and 3.45 inches in Lisle.

Throughout the entire event (including response and recovery) the DuPage County Emergency Operations Center (EOC) conducted and facilitated conference call briefings with subject matter experts including the National Weather Service, DuPage County Storm Water Department, FEMA and IEMA, to over 121 DuPage County stakeholders.

Additionally, during the ongoing recovery phase of the disaster, the OHSEM facilitated individual community damage assessment tours with FEMA, IEMA, and Small Business Association (SBA). As a result of these meetings, DuPage County residents were able to recover $17.5 million. Additional data can be found within Table 2-7 and Exhibit 2-8.

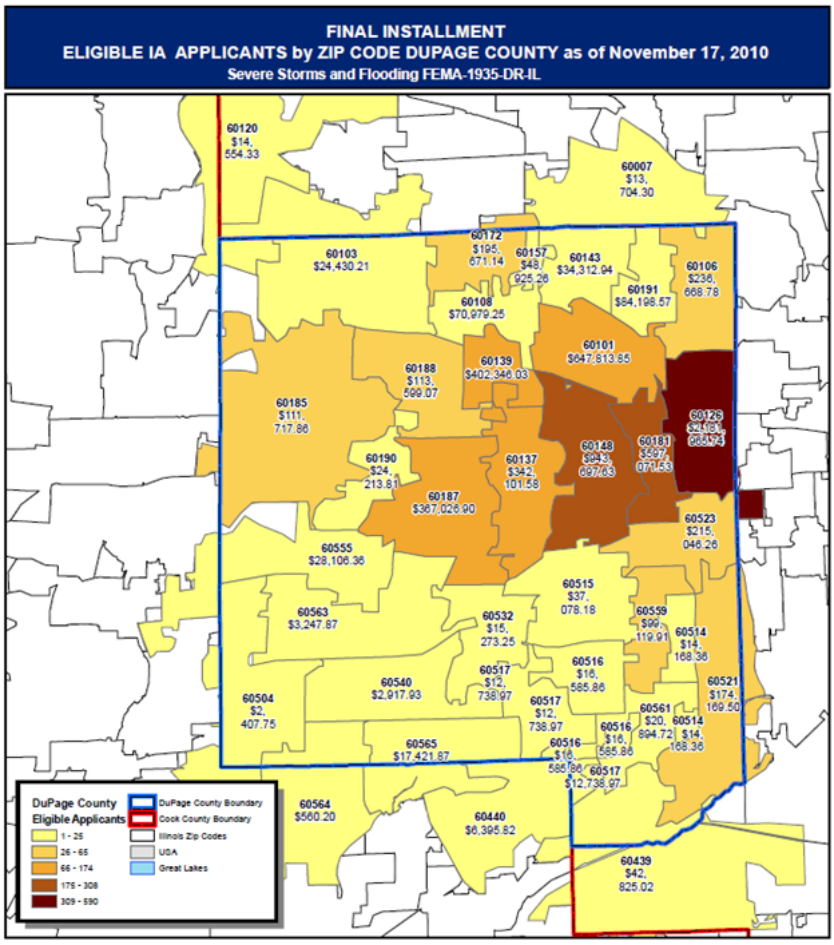
Table 2-7

DuPage County 2010 Flood Federal Reimbursement Totals

Individual Assistance:	$7,228,007.12
Housing Assistance:	$6,717,179.88
Other Needs Assistance:	$510,827.24
Small Business Loans Approved:	$3,116,400.00
Total Assistance Granted for DuPage County:	$17,572,414.24

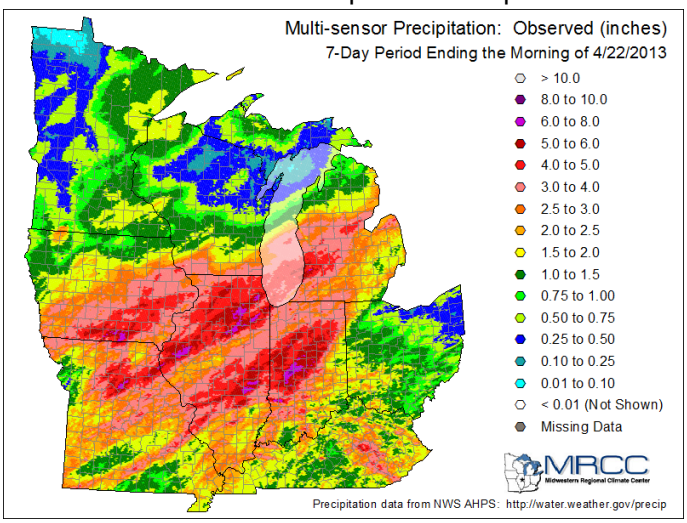
Exhibit 2-8

DuPage County 2010 Flood Federal Individual Assistance Applications



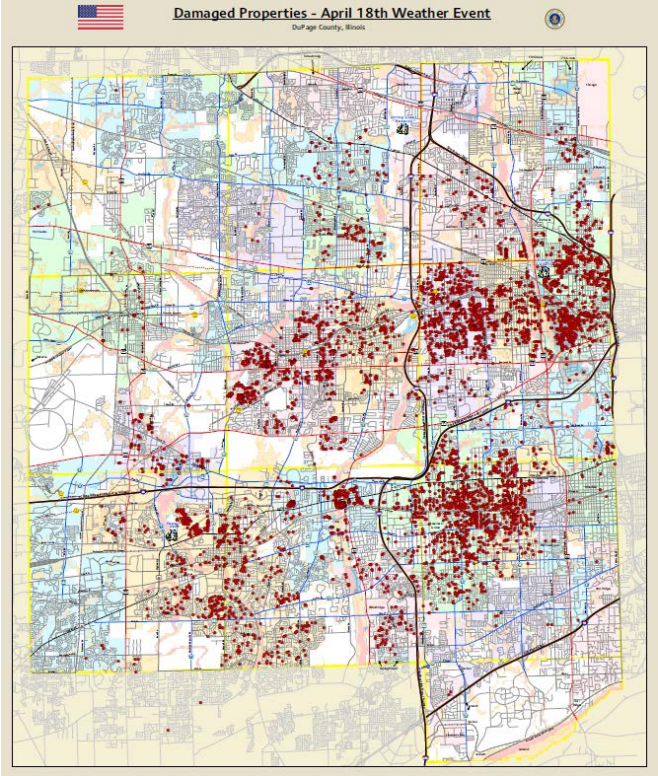
April 2013: In April 2013, flooding occurred throughout DuPage County. The East Branch of the DuPage River experiencing record breaking flood depths, the result of a severe storm. Rainfall amounts of more than 6-inches (Exhibit 2-9) was recorded in 24 hours from a slow-moving system, falling on pre-saturated ground (DuPage County, 2013). Road closures were required in Lisle, Downers Grove and unincorporated DuPage; including portions of Route 53, Maple Avenue, Highland Avenue and 55th Street.

Exhibit 2-9
Northern Illinois Precipitation – April 2013



In Lisle, over 200 properties were flooded along the East Branch DuPage River and St, Joseph Creek. Flood depths of 4 feet were recorded requiring rescues by boat. Lisle estimated over $7 million in private, real property damage within the regulatory floodplain and 113 flood insurance claims were paid. Over 500 vehicles were also lost, many located in below grade parking structures. The Tower of Four Lakes Villages apartment complex suffered a reported $4 million in damage due to flooding of the underground parking garage, lobby, building's electrical system, and elevators. Tower residents were displaced due to the damage, finally returning in June. Downers Grove experienced flooding throughout the St. Joseph Creek watershed, including numerous residential structures and downtown businesses. An overflow from a detention pond in Westmont reportedly overtopped a home's foundation flooding a basement with enough force to tear basement doors from their hinges. A summary of all reported housing damage from the event can be found in Exhibit 2-10.

Exhibit 2-10
DuPage County Damage - April 2013



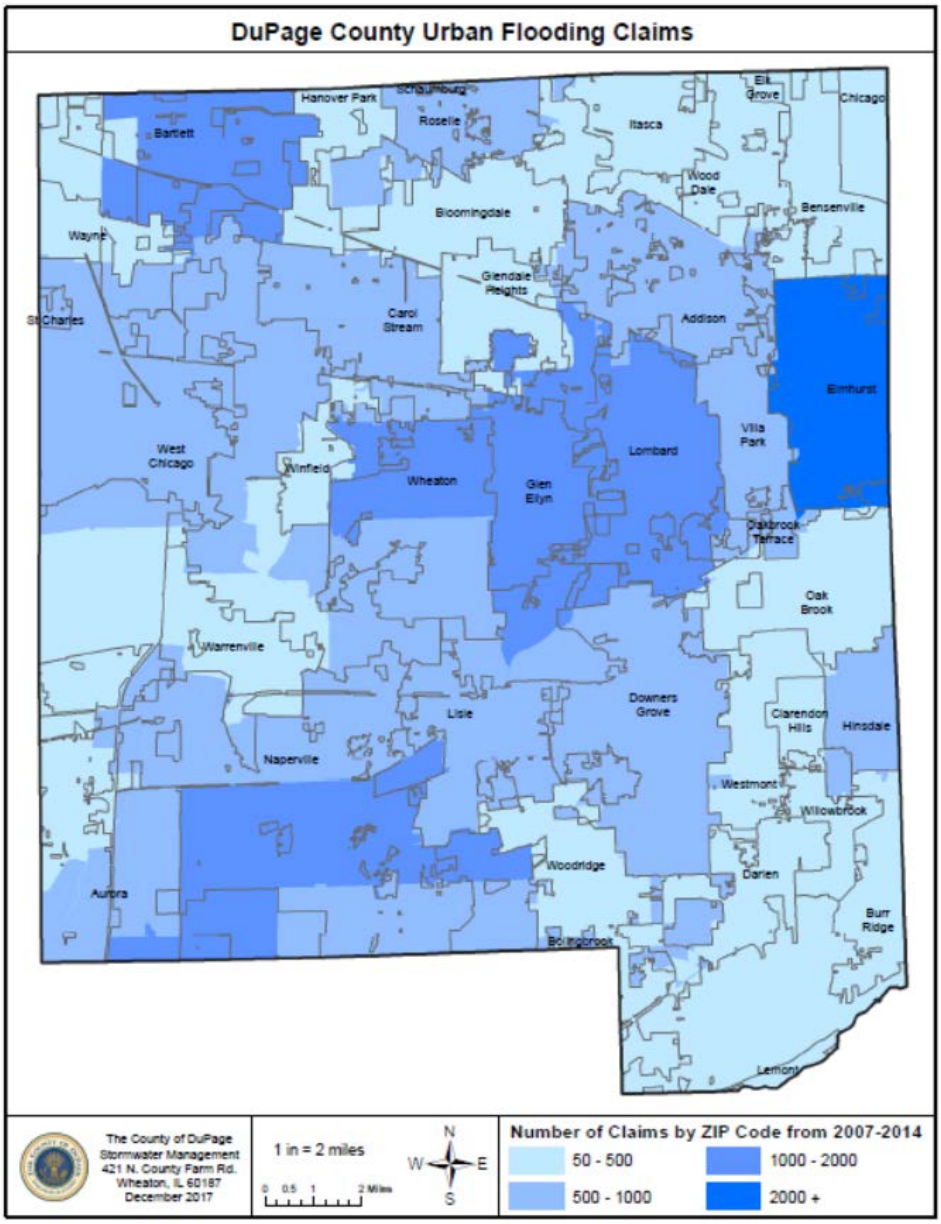
The DuPage County EOC was activated from April 17 to April 19. During that time, the OHSEM facilitated conference calls, collaborated with subject matter experts, and coordinated resource procurement and deployment to affected communities. A shelter was established at Benedictine University, approximately 60 individuals utilized the

facility. Carol Stream, Naperville, Oak Brook, Bartlett, Downers Grove, Addison, and West Chicago activated their EOC's on April 18. During the recovery phase of the disaster, the OHSEM facilitated individual community damage assessment tours with FEMA and IEMA. As a result of these meetings, DuPage County as a whole was able to recover approximately $17.6 million. Approximately 3,935 families qualified for Individual Assistance, totaling approximately $14.7 million. And 26 communities, including DuPage County, qualified for approximately $2.9 million.

Other Flooding: While in-depth data similar to riverine flooding does not exist for urban flooding, DuPage County Stormwater Management has collated all claims for urban flooding from 2007 to 2014. This information can be found within Exhibit 2-11.

Exhibit 2-11

DuPage County Urban Flooding Claims from 2007 to 2014



Life Safety and Public Health: Safety and health concerns during a flood range greatly. One of the primary issues communities experience, especially during flash floods, are vehicles getting stuck and/or swept away by rapidly moving waters. These scenarios also present danger to first responders and bystanders attempting to rescue vehicle occupants. "It's easy to misjudge the depth of floodwater, particularly at night. Sometimes the bridge or road masked by flood water may have been undermined or completely washed out (The Weather Channel, 2015)". According to the Federal Emergency Management Agency:

- "Six inches of water will reach the bottom of most passenger cars, causing loss of control and potential stalling.
- A foot of water will float many vehicles.
- Two feet of rushing water will carry away most vehicles, including SUVs and pickups."
  (The Weather Channel, 2015)

Just as it is recommended for vehicles to stay away from standing and/or moving flood waters, the same is recommended for individuals. Flood waters can be both unsanitary and dangerous. According to Dr. Greg Forbes, a severe weather expert for The Weather Channel, water flowing at just 6 miles per hour (mph) can exert the same force as the winds of an EF5 tornado (The Weather Channel, 2015). And, water moving at approximately "25 mph has the pressure equivalent of wind blowing at 790 mph, faster than the speed of sound" (The Weather Channel, 2015). When individuals do get stuck within flood waters, some experience heart attacks and other medical conditions while trying to free themselves from the water.

Contact with flood waters can increase the possibility of contracting a communicable disease (WHO, N.D., P. 1), and other medical issues as a result of pollutants, chemicals, waste, and an increased number of insects (CDC, N.D.). When receding, flood waters can also saturate the ground which leads to infiltration into sanitary sewer lines. When wastewater treatment facilities are flooded, there is often nowhere for the treated sewage to be discharged or inflowing sewage to be stored. Infiltration and lack of treatment lead to overloaded sewer lines which back up into low-lying areas and some homes. Even though diluted by flood waters, raw sewage can be a breeding ground for bacteria, such as E. coli, and other disease-causing agents. Because of this threat, tetanus shots are given to people affected by a flood.

Stagnant water is often a perfect breeding ground for insects, specifically mosquitoes, known to carry and distribute various types of diseases. Standing water also creates mold, which can be a health issue to everyone, but is an extreme hazard to those with breathing issues, children, and the elderly. If forced-air systems are affected by floods, and are not subsequently cleaned properly, individuals may inadvertently breathe in pollutants. If the water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

The force of flood waters can damage gas lines, which creates the potential for secondary hazards such as gas leaks and fires. This force, along with standing water, can also damage the structural integrity of buildings, which can cause injuries if issues go-unnoticed or unrepaired. While fires have not resulted from flooding within DuPage

County, history shows that floods can prevent fire departments and protection agencies from successfully combating and sometimes even accessing a fire, allowing it to spread.

In addition to the National Weather Service (NWS) flood warnings and watches, DuPage County maintains the ability to predict flooding throughout the County, as previously mentioned. Using these gages, the County can assist municipalities in determining if an evacuation may be needed in the event of a severe flooding scenario.

Property Damage and Critical Infrastructure: To examine the exposure of buildings to flooding, the DuPage County Geographic Information System (GIS) department, estimated the total number of buildings within in the 100-year floodplain. Approximately 2,895 buildings were located within the FEMA floodplain, which represent a range of land uses.

Table 2-8 summarizes the findings for buildings exposed to the 100-year flood event and the estimate of losses that could occur. Note, the estimated values are from 2012, using 2001 guidance from FEMA (FEMA, 2001). For residential structures, contents are valued at 50 percent of the building's value. For non-residential structures, 100 percent is used.

These numbers are provided as a rough reference. Given the increase in property and structure values since 2012, and that these numbers do not include economic losses, and repairs to transportation and environmental infrastructure, it is estimated that the true value of losses from a 100-year flood would be much greater.

Table 2-8

Estimate of Vulnerable Structures within the DuPage County 100-Year Floodplain

Building:	Number of Buildings:	Estimate of Structure Value:	Estimate of Contents	Estimate of 100-year Flood Floodplain Exposure:
Residential (90%)	2,605	$301,000	$150,500	$1.176 billion
Non-Residential (9%)	260	$2,500,000	$2,500,000	$1.130 billion
Critical Facilities (1%)	29	$2,500,000	$2,500,000	$0.145 billion
Total	2,895			$2.421 billion

Repetitive Loss Properties*:* There are several different definitions of a "repetitive loss property." The current FEMA definition of a repetitive loss property is:

> "**Repetitive Loss Structure:** An NFIP-insured structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978." (FEMA, 2017a)

Additionally, the definitions of a severe repetitive loss building and severe repetitive loss property are:

> **"Severe Repetitive Loss Building:** Any building that:
>
> 1. Is covered under a Standard Flood Insurance Policy made available under this title;

2. Has incurred flood damage for which:
   a. 4 or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or

   b. At least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss" (FEMA, 2017a).

"Severe Repetitive Loss Property: Either a severe repetitive loss building or the contents within a severe repetitive loss building, or both" (FEMA, 2017a).

"More than 2,100 properties across the U.S. enrolled in the National Flood Insurance Program have flooded and been rebuilt more than 10 times since 1978, according to a new analysis of insurance data by the Natural Resources Defense Council (NRDC) (Yale Environment 360, 2016)". These severe repetitive loss properties "make up just 0.6 percent of federal flood insurance policies. But they account for 10.6 percent of the program's claims — totaling $5.5 billion in payments (Yale Environment 360, 2016)."

FEMA encourages the mitigation of severe repetitive loss and repetitive loss properties through distribution of mitigation grants, the NFIP's Increased Cost of Compliance program and the Community Rating System (CRS) program. Depending on the number of repetitive loss properties within a CRS community, the community may be required to develop a specific plan to determine the causes of the repetitive claims and ways to mitigate the causes for the repetitive claims. At a minimum, each CRS community must conduct an annual outreach project to these properties advising the owners of their location in the regulatory floodplain, property protection measures, any funding options for property protection and flood insurance.

There are several FEMA programs that encourage communities to identify the causes of their repetitive losses and develop a plan to mitigate the losses. These include the Community Rating System (CRS) program, which as stated within Chapter one, this *Plan* meets the requirements for. Based on an initial review of 1,546 paid insurance claims, there are potentially 326 properties that at one time were repetitive loss properties in the County. There are relatively few remaining repetitive loss properties in DuPage County municipalities and the unincorporated areas. For additional information on repetitive loss properties within DuPage County, see Chapter 5.

2.2 Severe Summer Storms

In this *Plan*, severe storms are considered to be thunderstorms, lightning events, microbursts or damaging wind events, and hail storms.

Thunderstorms: "A thunderstorm is a rain shower during which you hear thunder. Since thunder comes from lightning, all thunderstorms have lightning" (NOAA, 2017a). "A thunderstorm is classified as "severe" when it contains one or more of the following: hail one inch or greater, winds gusting in excess of 50 knots (57.5 mph), or a tornado (NOAA,

2017a)". "Three basic ingredients are required for a thunderstorm to form: moisture, rising unstable air (air that keeps rising when given a nudge), and a lifting mechanism to provide the "nudge"" (NOAA, 2017a).

"The sun heats the surface of the earth, which warms the air above it. If this warm surface air is forced to rise—hills or mountains, or areas where warm/cold or wet/dry air bump together can cause rising motion—it will continue to rise as long as it weighs less and stays warmer than the air around it. As the air rises, it transfers heat from the surface of the earth to the upper levels of the atmosphere (the process of convection). The water vapor it contains begins to cool, releases the heat, condenses and forms a cloud. The cloud eventually grows upward into areas where the temperature is below freezing" (NOAA, 2017a).

"As a storm rises into freezing air, different types of ice particles can be created from freezing liquid drops. The ice particles can grow by condensing vapor (like frost) and by collecting smaller liquid drops that haven't frozen yet (a state called "supercooled"). When two ice particles collide, they usually bounce off each other, but one particle can rip off a little bit of ice from the other one and grab some electric charge. Lots of these collisions build up big regions of electric charges to cause a bolt of lightning, which creates the sound waves we hear as thunder" (NOAA, 2017a).

Lightning: Lightning is a giant spark of electricity in the atmosphere between clouds, the air, or the ground. In the early stages of development, air acts as an insulator between the positive and negative charges in the cloud and between the cloud and the ground. When the opposite charges build up enough, this insulating capacity of the air breaks down and there is a rapid discharge of electricity that we know as lightning. The flash of lightning temporarily equalizes the charged regions in the atmosphere until the opposite charges build up again. (NOAA, 2017b)

Lightning can occur between opposite charges within the thunderstorm cloud (intra-cloud lightning) or between opposite charges in the cloud and on the ground (cloud-to-ground lightning). (NOAA, 2017b)

Lightning is one of the oldest observed natural phenomena on earth. It can be seen in volcanic eruptions, extremely intense forest fires, surface nuclear detonations, heavy snowstorms, in large hurricanes, and obviously, thunderstorms. (NOAA, 2017b)

Microbursts (Damaging Winds): A microburst is a small concentrated downburst that produces an outward burst of strong winds at or near the surface. Microbursts are small — less than 4 km across — and short-lived, lasting only five to 10 minutes, with maximum windspeeds sometimes exceeding 100 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground. (NOAA, 2017c)

Hail Storms: Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into balls of ice. Hail can damage aircraft, homes and cars, and can be deadly to livestock

and people (NOAA, 2017c). Table 2-9 outlines the potential sizes of hail, and provides a description of physical items for comparison (NOAA, 2017d).

Table 2-9
National Weather Service Hail Descriptions

Description	Diameter (inches)
Pea	0.25
Marble or Mothball	0.50
Penny or Dime	0.75
Nickel	0.88
Quarter	1.00
Half Dollar	1.25
Walnut or Ping Pong Ball	1.50
Golf ball	1.75
Hen's Egg	2.00
Tennis Ball	2.50
Baseball	2.75
Tea Cup	3.00
Grapefruit	4.00
Softball	4.50

Hailstones grow by colliding with supercooled water drops. Supercooled water will freeze on contact with ice crystals, frozen raindrops, dust or some other nuclei. Thunderstorms that have a strong updraft keep lifting the hailstones up to the top of the cloud where they encounter more supercooled water and continue to grow. The hail falls when the thunderstorm's updraft can no longer support the weight of the ice or the updraft weakens. The stronger the updraft the larger the hailstone can grow (NOAA, 2017d).

“Hailstones can have layers like an onion if they travel up and down in an updraft, or they can have few or no layers if they are “balanced” in an updraft. One can tell how many times a hailstone traveled to the top of the storm by counting the layers. Hailstones can begin to melt and then re-freeze together - forming large and very irregularly shaped hail” (NOAA, 2017d).

Past Events: During the July 6, 2003 hail event, 4,400 to 5,000 properties in Glendale Heights suffered roof or siding damage from 2-inch hail. In the summer of 1992, a microburst in Woodridge knocked down a wall under construction. Multiple injuries were sustained with one fatality from falling debris. In November 2004, a wind event in Woodridge cost the Village around $40,000 for the removal of tree debris.

In the June 2017, Itasca and Wood Dale experienced a microburst which encompassed approximately 5 square miles. DuPage County assisted in the response. In the end, DuPage County Department of Transportation alone spent approximately 2,000 man hours assisting in the recovery operation. With an approximate total of $35,000 spent from DuPage County in equipment and man hours in three days. In theory, the local level probably spent at least three times that amount. Exhibit 2-12 provides an estimate of the costs incurred by DuPage County during this incident by category.

Exhibit 2-12
DuPage County Assistance to Itasca, IL

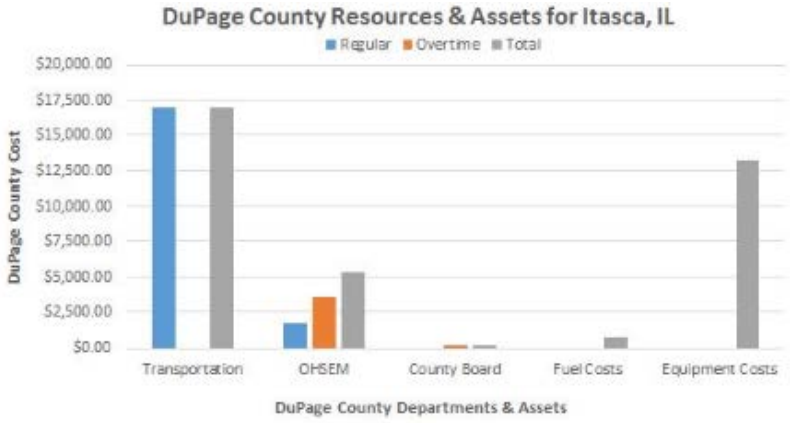


Exhibit 2-13 summarizes severe wind and hail events within Northern Illinois from 2003 to July 2017 (NOAA, 2017e). Table 2-11 shows the top 10 states within the U.S. for hail loss claims (NOAA, 2017e). Exhibits 2-14, 2-15, 2-16, and 2-17 outlines information from the National Weather Service database between January 1, 1997 and December 1, 2017 for the severe types of storms listed in this plan within DuPage County (NOAA, 2017e).

Exhibit 2-13
Northern Illinois Record Wind / Hail Events

July 19-23, 2017: Multiple rounds of heavy rain producing storms bring flooding & areas of wind damage
June 14, 2017: Storms bring scattered wind damage and near three inches of rain to parts of northern IL
May 15, 2017: Hail to golf ball size in the Rockford Area
March 7, 2017: Early season line of storms brings strong winds
July 21-24, 2016: Humid and hot weather brings multiple days of storms, with scattered wind damage in Chicago and flash flooding in Belvidere
May 25, 2016: Isolated wind damage and locally heavy rainfall
August 10, 2015: Severe microburst in Glen Ellyn, IL; the role of boundaries in severe weather
August 2, 2015: Large hail in DeKalb, IL and damaging winds in Wood Dale and Evanston, IL
June 8, 2015: Many hail-producing storms, including up to golf ball size
May 30, 2015: Cold and windy with heavy rainfall & high waves
June 30, 2014: Widespread wind damage across northern IL & northern IN within the second of two derechoes
June 21, 2014: Damaging winds & heavy rainfall event
May 20, 2014: Baseball size hail in Chana, IL & damaging winds in DeKalb, IL
May 11, 2014: Scattered large hail & damaging winds
April 12, 2014: Large hail up to golf ball size in the north Chicago metro
August 30, 2013: Severe storms impact the north Chicago metro
August 4, 2012: Severe wind producing complex of storms with thousands of lightning strikes crosses area
July 26, 2012: Downburst over O'Hare International Airport brings 70 mph gust
May 3-4, 2012: Hail and heavy rain across Chicago
July 11, 2011: Derecho brings widespread wind damage to northern IL, including six injuries in Palos Heights, IL
June 18, 2010: Two bow echoes with severe winds move across the area
June 19, 2009: Widespread hail, winds, and flooding across northern IL
July 25, 2007: Microbursts in Burr Ridge & Homer Glen, IL in Cook County
March 31, 2007: Microburst in Carol Stream & Glendale Heights, IL in DuPage County
May 18 & 20, 2004: Multiple severe weather episodes across northern IL & northwest IN
July 27, 2003: Damaging winds & heavy rain across the far southwest & southern suburbs
July 6, 2003: Golf ball size hail in Buffalo Grove & Carol Stream, IL

Table 2-11
Hail Loss Claims by Top 10 States in U.S. (66% total)

Hail Loss Claims 2013 - 2015: Top 10 Hail Loss States					
State	**2013**	**2014**	**2015**	**Total**	**State % of US Hail Claim Total**
Texas	122,005	134,028	138,539	394,572	19%
Colorado	32,741	99,565	50,285	182,591	9%
Nebraska	45,860	80,293	22,193	148,346	7%
Kansas	52,404	39,222	36,337	127,963	6%
Illinois	24,002	63,723	32,788	120,513	6%
Oklahoma	60,131	11,760	26,302	98,193	5%
Missouri	14,703	45,264	34,953	94,920	4%
Minnesota	45,860	16,688	30,641	93,189	4%
South Dakota	27,819	30,634	16,428	74,881	4%
Indiana	30,733	21,996	12,552	65,281	3%
Yearly Top 10 State Totals	**456,258**	**543,173**	**401,018**	**1,400,449**	
Top 10: % of Yearly Total	**63%**	**66%**	**70%**	**66%**	

Exhibit 2-14
National Weather Service Thunderstorms and Damaging Wind Events

Number of County/Zone areas affected:	1
Number of Days with Event:	87
Number of Days with Event and Death:	2
Number of Days with Event and Death or Injury:	9
Number of Days with Event and Property Damage:	23
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Exhibit 2-15
National Weather Service Lightning Events

Number of County/Zone areas affected:	1
Number of Days with Event:	18
Number of Days with Event and Death:	2
Number of Days with Event and Death or Injury:	3
Number of Days with Event and Property Damage:	15
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Exhibit 2-16
National Weather Service Hail Events

Number of County/Zone areas affected:	1
Number of Days with Event:	74
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	0
Number of Days with Event and Property Damage:	0
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Exhibit 2-17
National Weather Service Hail Events

Number of County/Zone areas affected:	1
Number of Days with Event:	74
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	0
Number of Days with Event and Property Damage:	0
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Probability and Frequency: The DuPage County area averages 5.8 thunderstorm events each year with winds in excess of 50 miles per hour. They average an hour in duration. It is estimated that only five storms each year have the hailstorms and high winds to be considered a severe thunderstorm. Assuming the average severe storm affects 100

square miles, the odds of a severe thunderstorm hitting any particular square mile in DuPage County are 1:1 or 100 percent. Based on the data collected for this plan, it is reasonable to assume the probability for these types of storms to happen in the future is high. Not all of these storms amount in death, but the damage of these storms is measurable.

Life Safety and Public Health: The threat to life and the cause of death vary by the type of storm. Exhibits 2-14, 2-15, 2-16, and 2-17 provide injury and death information from severe summer storms that occurred between January 1, 1997 and December 1, 2017 within DuPage County (NOAA, 2017e).

Property Damage and Critical Infrastructure: As with tornadoes, mobile homes are at a high risk for damage from thunderstorms, because of their lightweight building construction and vulnerability to flying debris. (Insurance Institute for Business & Home Safety, 2017). Wind and water damage can result when windows are broken by flying debris or hail. Lightning can cause direct damage to structures (especially those without lightning protection systems) and can cause fires that damage forests and structures.

If you divide the County's total number of housing units, 305,016 (American Fact Finder, 2016, P. 1), by the County's total square miles, 334, the County's housing density is approximately 1,069 homes per square mile. If a severe summer storm impacts a 100-square mile area of the County, then approximately a third of the of the County would be affected (DuPage County area equals 334 square miles). If 1 percent of the homes in that area were subject to damage, based on the average home price in DuPage County (ArcGIS, 2017), then the vulnerability of DuPage County buildings would be approximately:

(100 square miles x 1,069 housing units per square mile x $304,449 per home) x 1% =
= $325.45 million in property value exposed

Critical facilities are susceptible to the same damage and disruption from thunderstorms as other buildings. Emergency operations can be disrupted as thunderstorms and lightning affect radio communications and antennas are a prime target for lightning. To date, there is not record of critical facilities in DuPage County having incurred any damages due to severe storms.

Thunderstorms can impact transportation and utilities. Automobiles and their windshields are subject to damage by hail. Power lines can be knocked out by lightning or knocked down by wind and debris. In Addison, at Lake Street and 4th Avenue, a billboard was damaged due to high winds on March 31, 2006. Repair costs were in the tens of thousands. Lightning can also cause power surges that damage appliances, electronic equipment and computers. Cost of clean-up by towns can add up.

2.3 Severe Winter Storms

The Illinois Emergency Management Agency defines a severe winter storm as a storm that meets one or more of the following criteria (IEMA, 2013, P. 159):

- "A snowstorm that produces six inches or more of snow within 48 hours or less,

- An ice storm in which 10 percent of the cooperative National Weather Service stations in Illinois report glaze, and/or
- A snowstorm or ice storm in which deaths, injuries, or property damage occurs." (IEMA, 2013, P. 159)

"A winter storm is an event in which the main types of precipitation are snow, sleet or freezing rain" (NOAA, 2017f). "Blizzards are dangerous winter storms that are a combination of blowing snow and wind resulting in very low visibilities. While heavy snowfalls and severe cold often accompany blizzards, they are not required. Sometimes strong winds pick up snow that has already fallen, creating a ground blizzard" (NOAA, 2017f). "An ice storm is a storm which results in the accumulation of at least .25" of ice on exposed surfaces. They create hazardous driving and walking conditions. Tree branches and powerlines can easily snap under the weight of the ice" (NOAA, 2017f). "Lake effect storms are not low-pressure system storms. As a cold, dry air mass moves over the Great Lakes regions, the air picks up lots of moisture from the Great Lakes. This air, now full of water, dumps the water as snow in areas generally to the south and east of the lakes" (NOAA, 2017f). "Snow squalls are brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant. Snow squalls are best known in the Great Lakes region" (NOAA, 2017f).

"Just like any other storm at other times of the year, the right combination of ingredients is necessary for a winter storm to develop" (NOAA, 2017f): Three essentials are necessary to make a winter storm:

- "Cold air. Below freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice.
- Lift. Something to raise the moist air to form the clouds and cause precipitation. An example of lift is warm air colliding with cold air and being forced to rise over the cold dome. The boundary between the warm and cold air masses is called a front. Another example of lift is air flowing up a mountainside.
- Moisture. To form clouds and precipitation. Air blowing across a body of water, such as a large lake or the ocean, is an excellent source of moisture." (NOAA, 2017f)

Snow: "Most precipitation that forms in wintertime clouds starts out as snow because the top layer of the storm is usually cold enough to create snowflakes. Snowflakes are just collections of ice crystals that cling to each other as they fall toward the ground. Precipitation continues to fall as snow when the temperature remains at or below 0 degrees Celsius from the cloud base to the ground" (NOAA, 2017f).

- "Snow Flurries. Light snow falling for short durations. No accumulation or light dusting is all that is expected.
- Snow Showers. Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- Snow Squalls. Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant. Snow squalls are best known in the Great Lakes Region.
- Blowing Snow. Wind-driven snow that reduces visibility and causes significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.

- Blizzards. Winds over 35mph with snow and blowing snow, reducing visibility to 1/4 mile or less for at least 3 hours.
- On average, thirteen inches of snow equals one inch of rain in the US, although this ratio can vary from two inches for sleet to nearly fifty inches for very dry, powdery snow under certain conditions." (NOAA, 2017f)

Exhibit 2-18
How snow is formed

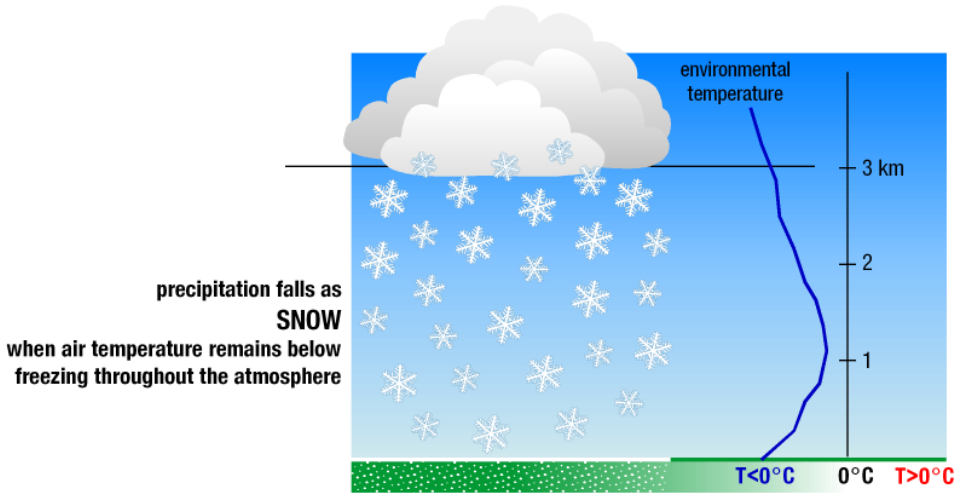
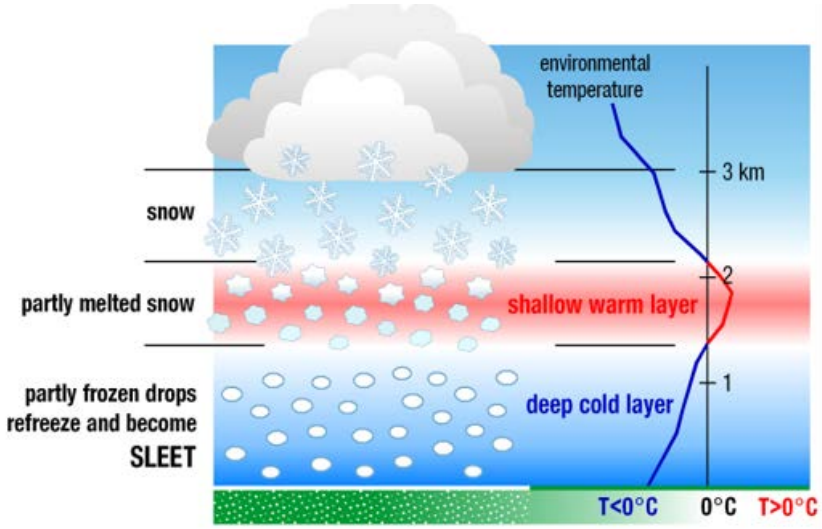


Exhibit 2-18 provides an illustration on how snow is formed (NOAA, 2017f).

Sleet: "Sleet occurs when snowflakes only partially melt when they fall through a shallow layer of warm air. These slushy drops refreeze as they next fall through a deep layer of freezing air above the surface, and eventually reach the ground as frozen rain drops that bounce on impact (NOAA, 2017f)." "Sleet falls when snowflakes partially melt as they fall, and then refreeze before they reach the ground (NOAA, 2017f)." Exhibit 2-19 shows how sleet is formed (NOAA, 2017f).

Exhibit 2-19
How sleet is formed



Freezing Rain: "Freezing rain occurs when snowflakes descend into a warmer layer of air and melt completely. When these liquid water drops fall through another thin layer of freezing air just above the surface, they don't have enough time to refreeze before reaching the ground. Because they are "supercooled," they instantly refreeze upon contact with anything that that is at or below 0 degrees C, creating a glaze of ice on the ground, trees, power lines, or other objects. A significant accumulation of freezing rain lasting several hours or more is called an ice storm (NOAA, 2017f)."

Exhibit 2-20
How freezing rain is formed

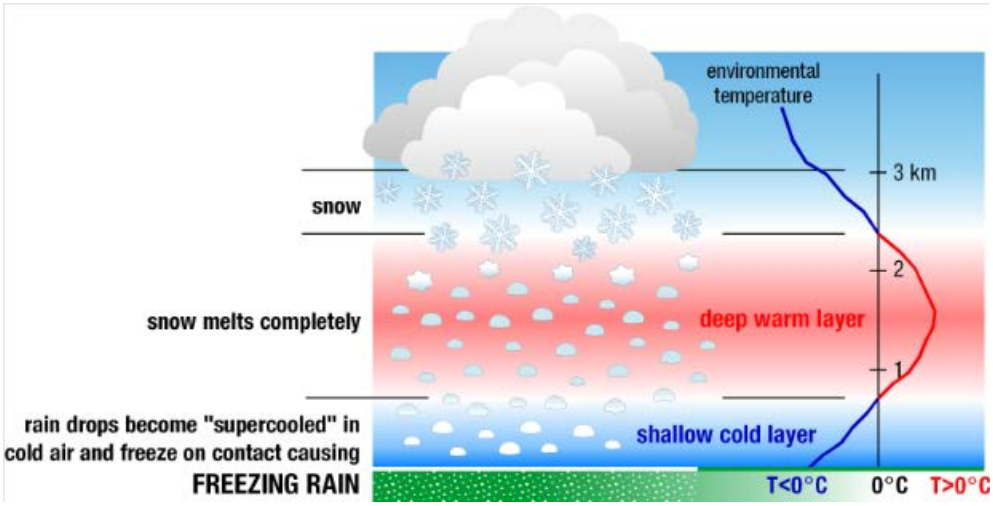


Exhibit 2-20 provides an illustration on how freezing rain is formed (NOAA, 2017f).

Forecasting: "Accurately forecasting winter weather is a complicated process. It starts with a wide network of observing systems such as satellites, Doppler radars and automated surface observing systems. Computer forecast models take this information and estimate what will happen next. Forecasters then use their experience to write and issue forecasts" (NOAA, 2017f).

"Knowing the **climatology** for a given area is very important to be able to forecast winter weather. Severe Winter storms come in different sizes and are created by different combinations of atmospheric conditions and local geography" (NOAA, 2017f).

When snow, or the potential for snow, is detected by the National Weather Service (NWS), several types of winter weather notices can be issued:

> **"Blizzard Warning:** Issued when winds of 35 mph or greater are combined with blowing and drifting snow with visibilities of ¼ mile or less. Seek indoor shelter immediately and stay indoors until the severe conditions end.
>
> **Winter Storm Warning:** Issued when a combination of hazardous winter weather in the form of heavy snow, heavy freezing rain, or heavy sleet is imminent or occurring. Winter Storm Warnings are usually issued 12 to 24 hours before the event is expected to begin.
>
> **Winter Storm Watch:** Issued 12-48 hours in advance of the onset of severe winter conditions. The watch may or may not be upgraded to a winter storm warning, depending on how the weather system moves or how it is developing.
>
> **Winter Storm Outlook:** Issued prior to a Winter Storm Watch. The Outlook is given when forecasters believe winter storm conditions are possible and are usually issued 3 to 5 days in advance of a winter storm.
>
> **Winter Weather Advisories:** Issued for accumulations of snow, freezing rain,

freezing drizzle, and sleet which will cause significant inconveniences and, if caution is not exercised, could lead to life-threatening situations.

Lake Effect Snow Warning: Issued when heavy lake effect snow is imminent or occurring.

Lake Effect Snow Advisory: Issued when accumulation of lake effect snow will cause significant inconvenience.

Wind Chill Warning: Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure.

Wind Chill Advisory: Issued for a wind chill situation that could cause significant inconveniences, but do not meet warning criteria. Criteria for issuing Windchill Warnings and Advisories are set locally.

Dense Fog Advisory: Issued when fog will reduce visibility to ¼ mile or less over a widespread area.

Snow Flurries: Light snow falling for short durations. No accumulation or light dusting is all that is expected.

Snow Showers: Snow falling at varying intensities for brief periods of time. Some accumulation is possible.

Blowing Snow: Wind-driven snow that reduces visibility and causes significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind" (NOAA, 2017f).

Past Events: Recorded [severe] winter storm events are shown Table 2-12 (NOAA, 2017g).

January 1999: The January 1999 snow event blanketed the entire County. In Naperville, 11 inches of snowfall was recorded. The event brought a federal disaster declaration. DuPage County spent $187,000 over their regular costs. Woodridge spent over $102,000, Downers Grove spent over $44,000, and Wheaton over $82,000. Elmhurst spent over $90,000 and Lisle over $40,000.

December 2000: December 2000 snow event cost Elmhurst $74,000, Lisle $21,500, and Wheaton $51,103. Numerous deaths of people had been recorded for people suffering heart attacks following snow shoveling.

February 2007: Heavy snow fell across northern Illinois on February 13th with some areas receiving over one foot of snow. In addition, wind gusts were frequently blowing at or above 35 mph, creating blizzard and whiteout conditions across many areas. Willowbrook measured 11.8 inches of snowfall, Oak Brook measured 11.0 inches of snowfall, Winfield measured 10.5 inches of snowfall and Wheaton measured 10.1 inches of snowfall.

January and February 2011: Between January 31 and February 3, 2011, Northern Illinois, including all of DuPage County, experienced heavy snowfall. Most areas in DuPage County received over 20 inches of snow. O'Hare and Midway airports reported totals of 21.2 and 20.9 inches, respectively. Both airports were closed for several days. Peak wind gusts were measured at over 65mph. Major roadways such as Lake Shore Drive were shut down and impassable. While there were no blizzard-related deaths reported in DuPage County, every community in DuPage County was significantly impacted. Response cost countywide related to this event was estimated at over $3 million, resulting in State and Presidential Disaster Declarations (IEMA, 2013) As a result of the Presidential Declaration, Public Assistance reimbursements totaling $3,041,412 were received by 133 entities throughout DuPage County (FEMA, 2011).

Table 2-12
DuPage County Recorded Winter Events

1/9/1997	Winter Storm
1/15/1997	Winter Storm
3/9/1998	Heavy Snow
1/1/1999	Heavy Snow
3/5/1999	Heavy Snow
3/8/1999	Heavy Snow
2/18/2000	Heavy Snow
12/11/2000	Blizzard
1/30/2002	Winter Storm
3/2/2002	Winter Storm
3/4/2003	Winter Storm
1/4/2004	Heavy Snow
1/4/2005	Heavy Snow
1/21/2005	Heavy Snow
12/8/2005	Winter Storm
1/20/2006	Winter Storm
11/30/2006	Winter Storm
12/1/2006	Winter Storm
2/3/2007	Extreme Cold/wind Chill
2/13/2007	Blizzard
2/25/2007	Winter Storm
1/29/2008	Winter Storm
1/31/2008	Winter Storm
2/1/2008	Winter Storm
2/5/2008	Winter Storm
2/10/2008	Extreme Cold/wind Chill
2/25/2008	Winter Storm
3/21/2008	Winter Storm
12/18/2008	Winter Storm
12/21/2008	Extreme Cold/wind Chill
1/9/2009	Winter Storm
1/15/2009	Extreme Cold/wind Chill
2/5/2009	Extreme Cold/wind Chill
12/26/2009	Winter Storm
1/7/2010	Winter Storm
2/8/2010	Winter Storm
12/11/2010	Winter Storm
2/1/2011	Blizzard
1/12/2012	Winter Storm
1/20/2012	Winter Storm
2/26/2013	Heavy Snow
3/5/2013	Winter Storm
1/4/2014	Heavy Snow
1/6/2014	Extreme Cold/wind Chill
1/27/2014	Extreme Cold/wind Chill
2/1/2014	Heavy Snow
2/4/2014	Heavy Snow
2/17/2014	Heavy Snow
1/8/2015	Extreme Cold/wind Chill
2/1/2015	Heavy Snow
11/20/2015	Heavy Snow
12/4/2016	Heavy Snow

Thousands of motorists and their vehicles became stranded during the evening hours as conditions deteriorated and snow quickly accumulated. The National Guard was activated to assist stranded motorists traveling on interstates but large sections of interstates, including Interstate 80 and Interstate 39 were eventually closed. Many communities began assisting stranded motorists using plow trucks and many police officers began riding with plow truck drivers to respond to emergency calls because their cars were getting stuck in the snow. Many communities also had plow trucks escort ambulances and fire trucks. Other rescue personnel used snowmobiles to respond to emergency calls (IEMA, 2013).

During the height of the storm from the evening of February 1st into the morning of February 2nd, many communities pulled their plow trucks off the roads out of concern for the safety of their drivers. Many communities declared roads closed to traffic with little hope of a rescue for anyone who ventured out into the blizzard and needed help. Whether roads were officially closed or not, most were impassible.

The high winds also blew down tree limbs and power lines causing numerous power outages. A

portion of a garden center roof collapsed under the weight of heavy snow in Naperville. On Sunday February 13th, a 10-foot section of brickwork on the parapet along the roof of a building collapsed on Westmore Avenue in Lombard. Heavy snow and ice slid into the parapet and knocked it down.

Probability and Frequency: Since 1994 when the National Climate Data Center (NCDC) started recording events, DuPage County has been impacted by one to three snow or ice events each winter. Therefore, the odds of a severe winter storm hitting DuPage County in any given year are 1:1 or a 100 percent chance.

Life Safety and Public Health: Severe winter storms bring the following two types of safety hazards. The first, weather-related hazards, includes hazardous driving and walking conditions and heart attacks from shoveling snow. The second type, Extreme cold, is from the low temperatures, wind chill, and loss of heat due to power outages.

In the United States, the number of deaths peaks in midwinter and reaches a low point in late summer. Certain populations are especially vulnerable to the cold, including the elderly, the homeless, and lower income families with heating problems. (Mayo Clinic, 2017). "Most deaths from [severe] winter storms are not directly related to the storm itself:

- People die in traffic accidents on icy roads.
- People die of heart attacks while shoveling snow.
- People die of hypothermia from prolonged exposure to cold."
  (NOAA, 2017f)

"Everyone is potentially at risk during [severe] winter storms. The actual threat to you depends on your specific situation. Recent observations show that:

- Of injuries related to ice and snow:
  - About 70% occur in automobiles.
  - About 25% are people caught out in the storm.
  - Majority are males over 40 years old.
- Of injuries related to exposure to cold:
  - 50% are people over 60 years old.
  - Over 75% are males.
  - About 20% occur in the home."
    (NOAA, 2017f)

"The effect of cold on people is usually made more severe by the impact of wind chill factors. Wind chill is reported as a temperature, but is not the actual temperature. Rather it is how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature. Extreme cold can result in people and animals suffering from frostbite and hypothermia. Frostbite is damage to tissue caused by the effects of ice crystals in frozen tissue. Extremities (hands, feet, ears, and nose) with more circulation difficulties are most frequently affected" (Mayo Clinic, 2017).

"Hypothermia is the lowering of the core body temperature. It is "clinically significant" when the body temperature is below 95°F. Severe hypothermia occurs when the body's temperature drops below 85°F, resulting in unconsciousness. If help does not come,

death follows. Great care is needed to properly re-warm a person, even mild cases" (Mayo Clinic 2017).

Property Damage and Critical Facilities: Historically, roofs would collapse due to heavy snow loads, but most buildings are now constructed with low temperatures, snow loads and ice storms in mind. With today's energy consciousness, buildings are much better insulated than they were 50 years ago. Severe winter storms do not have a major impact on buildings. The major impacts of snow and ice storms on property are to utilities and roads. Power lines and tree limbs are coated with heavy ice resulting in disrupted power and telephone service, often for days. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians. Bridges and over passes are particularly dangerous because they freeze before other surfaces.

Loss of power means businesses and manufacturing corporations must consider closure. Loss of access due to snow or ice-covered roads has a similar effect. There are also impacts when people cannot get to work, to school, or to the store. Proper planning is critical in winter weather situations.

2.4 Tornadoes

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Since wind is invisible, tornados are hard to see unless one forms from water droplets, dust, and /or debris. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be more than one mile wide and 50 miles long. Most tornadoes, have wind speeds of 112 mph or less.

"Dr. T. Theodore Fujita first introduced The Fujita Scale in the SMRP Research Paper, Number 91, published in February 1971 and titled, "Proposed Characterization of Tornadoes and Hurricanes by Area and Intensity". Fujita revealed in the abstract his dreams and intentions of the F-Scale. He wanted something that categorized each tornado by intensity and area. The scale was divided into six categories which can be seen below and in Table 2-13 (NOAA and NWS, 2017):"

- F0 (Gale)
- F1 (Weak)
- F2 (Strong)
- F3 (Severe)
- F4 (Devastating)
- F5 (Incredible)

Table 2-13
EF Scale

Derived EF Scale		Recommended EF Scale
EF Classes	3-Second Gust Speed, mph	3-Second Gust Speed, mph
EF0	65 - 85	**65 - 85**
EF1	86 - 109	**86 - 110**
EF2	110 - 137	**111 - 135**
EF3	138 - 167	**136 - 165**
EF4	168 - 199	**166 - 200**
EF5	200 - 234	**>200**

"Dr. Fujita's goals in his research in developing the F-Scale were:

- Categorize each tornado by its intensity and its area
- Estimate a wind speed associated with the damage caused by the tornado

Dr. Fujita and his staff showed the value of the scale's application by surveying every tornado from the Super Outbreak of April 3-4, 1974. The F-Scale then became the mainstay to define every tornado that has occurred in the United States. The F-Scale also

became the heart of the tornado database that contains a record of every tornado in the United States since 1950" (NOAA and NWS, 2017). "Tornadoes occur in many parts of the world, including Australia, Europe, Africa, Asia, and South America. Even New Zealand reports about 20 tornadoes each year. Two of the highest concentrations of tornadoes outside the U.S. are Argentina and Bangladesh" (NOAA and NWS, 2017).

"About 1,200 tornadoes hit the U.S. yearly. Since official tornado records only date back to 1950, we do not know the actual average number of tornadoes that occur each year. Plus, tornado spotting and reporting methods have changed a lot over the last several decades" (NOAA and NWS, 2017). Tornadoes come in all shapes and sizes and can occur anywhere in the U.S. at any time of the year. In the southern states, peak tornado season is March through May, while peak months in the northern states are during the summer months.

Past Events: Table 2-14 shows the recorded tornado events for DuPage County from 1950 to 2011, as recorded by NOAA's National Climate Data Center (NOAA, 2017h). From 1950 to 2011, DuPage County has had one F3 tornado and one F4 tornado during the same month, June 1976. There have been seven F2 events. There were no deaths attributed to the tornadoes shown in Table 2-14, however there were several injuries.

Table 2-14
Tornadic Activity in DuPage County, Illinois (1950-2017)

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	44	12.463M	0.00K
DU PAGE CO.	DU PAGE CO.	IL	04/28/1955	21:05	CST	Tornado	F1	0	3	2.500M	0.00K
DU PAGE CO.	DU PAGE CO.	IL	09/26/1959	17:45	CST	Tornado	F2	0	0	250.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	09/30/1961	13:30	CST	Tornado	F1	0	0	25.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	05/26/1965	07:45	CST	Tornado	F2	0	11	250.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	06/23/1965	17:50	CST	Tornado	F1	0	0	2.50K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	11/12/1965	14:48	CST	Tornado	F2	0	0	25.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	04/19/1966	22:27	CST	Tornado	F2	0	0	250.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	04/21/1967	17:10	CST	Tornado	F1	0	0	25.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	04/21/1967	17:10	CST	Tornado	F1	0	0	250.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	07/26/1969	15:50	CST	Tornado	F1	0	0	25.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	08/24/1971	19:15	CST	Tornado	F2	0	2	250.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	07/17/1972	19:10	CST	Tornado	F2	0	0	2.500M	0.00K
DU PAGE CO.	DU PAGE CO.	IL	06/20/1974	18:40	CST	Tornado		0	0	0.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	06/18/1975	12:50	CST	Tornado	F0	0	0	2.50K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	03/12/1976	12:57	CST	Tornado	F3	0	3	2.500M	0.00K
DU PAGE CO.	DU PAGE CO.	IL	03/12/1976	13:20	CST	Tornado	F2	0	25	2.500M	0.00K
DU PAGE CO.	DU PAGE CO.	IL	06/13/1976	16:48	CST	Tornado	F4	0	0	250.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	08/02/1978	15:30	CST	Tornado	F0	0	0	0.00K	0.00K
DU PAGE CO.	DU PAGE CO.	IL	04/23/1991	12:50	CST	Tornado	F1	0	0	2.50K	0.00K
WHEATON	DU PAGE CO.	IL	07/18/1997	14:30	CST	Tornado	F1	0	0	0.00K	0.00K
WINFIELD	DU PAGE CO.	IL	08/23/2007	14:08	CST-6	Tornado	EF1	0	0	15.00K	0.00K
CLOVERDALE	DU PAGE CO.	IL	08/04/2008	18:45	CST-6	Tornado	EF1	0	0	40.00K	0.00K
BLOOMINGDALE	DU PAGE CO.	IL	08/04/2008	18:47	CST-6	Tornado	EF1	0	0	250.00K	0.00K
THE MEADOWS	DU PAGE CO.	IL	06/21/2011	19:31	CST-6	Tornado	EF1	0	0	500.00K	0.00K
WOODRIDGE	DU PAGE CO.	IL	08/18/2015	18:57	CST-6	Tornado	EF0	0	0	0.00K	0.00K
DOWNERS GROVE	DU PAGE CO.	IL	08/18/2015	19:06	CST-6	Tornado	EF0	0	0	50.00K	0.00K
Totals:								0	44	12.463M	0.00K

2007: On August 23rd, 2007, an EF1 tornado touched down near Prince Crossing Road south of Geneva Road in Winfield. The tornado had a path length of 2.67 miles and a path width of 300 to 500 yards. The tornado lifted just west of Gary Avenue south of

Geneva Road. The main damage from the tornado included several large uprooted hardwood trees. Shingles and power lines were also blown down.

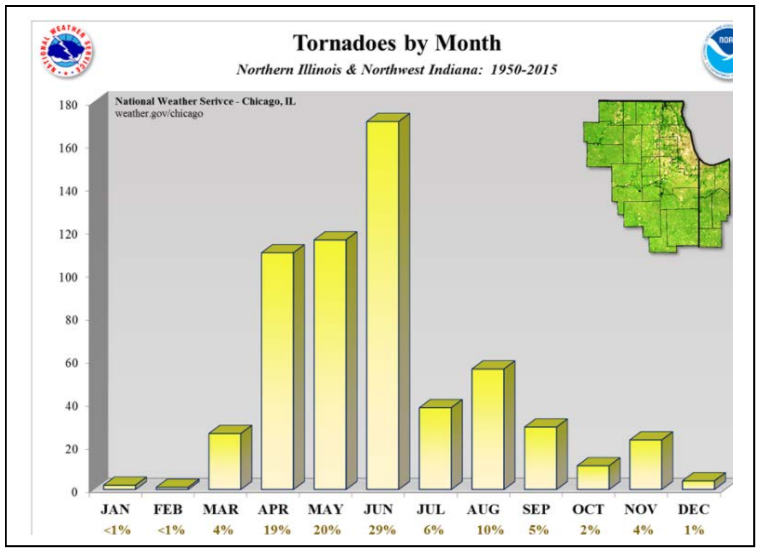
2008: On August 4th, 2008, a brief EF1 tornado touched down in an industrial area near Fox Court. It continued east northeast across South Gary Drive and dissipated near Stratford Square Mall. A large warehouse had a wall blown out near Fox Court and Madsen Drive (NOAA, 2008).

A second, brief tornado touched down in Bloomingdale near an apartment complex on Century Point Lane (NOAA, 2008). There was roof and window damage at two apartment buildings. Significant damage was done to roofs of houses and to trees from Cardinal Drive east across Bloomingdale Road through Norton Lane and into the area around Sterling Drive (NOAA, 2008).

2011: On June 21st, 2011, the National Weather Service storm survey confirmed an EF1 tornado touched down near Sunnydale Park and lifted near 55th and Main in Downers Grove. Most of the damage was to trees. Many mature hardwood trees had been snapped or knocked down. An estimated 35 homes were damaged by falling trees.

Probability and Frequency: For DuPage County, most tornadoes appear to occur March through September (Exhibit 2-21) (NWS, 2017). In the 2013 Illinois Natural Hazard Mitigation Plan (IEMA, 2013), DuPage County had 24 of the 2,199 tornadoes recorded in Illinois between 1950 and 2012. This ranks DuPage County 8th in the State for the highest normalized number of tornadoes per 100 square miles. DuPage County is classified as having an "elevated" tornado risk based on historic tornado wind speeds and the number of recorded tornadoes per 1,000 square miles.

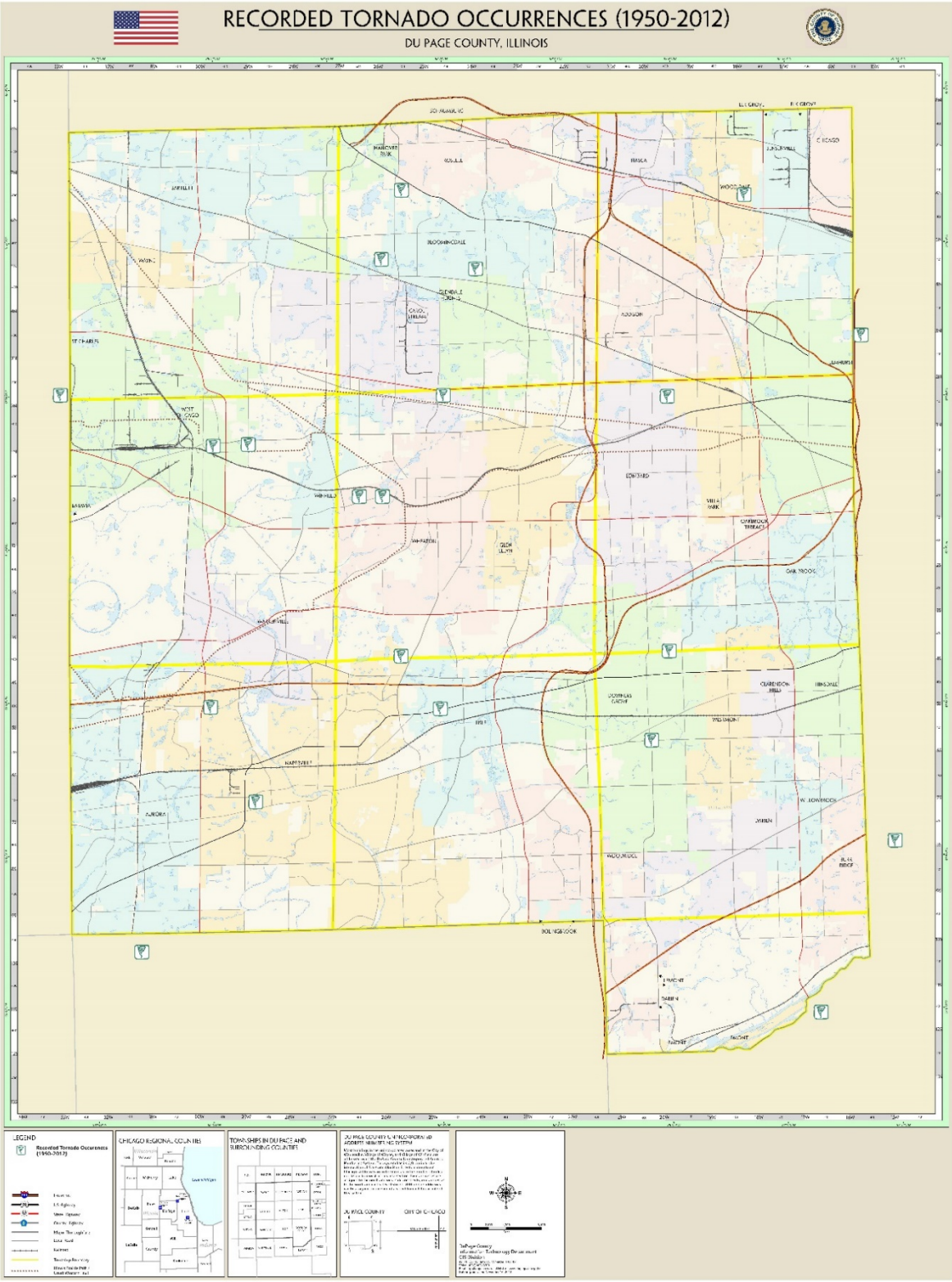
Exhibit 2-21
Tornadoes by Month in Northern Illinois and Northwest Indiana



Though there are no official recurrence intervals calculated for tornadoes, with 20 occurrences over 57 years (1950 to 2007), the likelihood of a tornado hitting somewhere in the county is 35% in any given year. The width and the length of a tornado's path can vary greatly, but with an assumption that a tornado affects one square mile of land, and there are 334 square miles in DuPage County, the odds of a tornado hitting any particular square mile in the County is 1 in 960 each year, or a 0.001% chance (NOAA, 2017h). While at times DuPage County has experienced lulls in tornadic activity of nearly 10 years, when examining the intervals between tornadoes, outlined in Table 2-13, DuPage

County experiences a tornado approximately every 2 years. The paths of tornadoes from 1950 to 2012 can be seen in Exhibit 2-22.

Exhibit 2-22
DuPage County Recorded Tornado Occurrences (1950-2012)



Life Safety and Public Health: Although no deaths have been attributed to a tornado in DuPage County, the risk of loss of life is still great. The August 1990 twister in Plainfield, Illinois caused 28 deaths. The Utica, Illinois tornado of 2004 killed eight people in one location (NOAA, 2017h).

The major health hazard from tornadoes is physical injury from flying debris or being in a collapsed building or mobile home. Based on national statistics for 2007 – 2016, there were 1,051 people killed, and 7,438 people injured by tornados. The August 1990 tornado in Plainfield, Illinois injured 350 people (NOAA, 2017h).

Within a building, flying debris or projectiles are generally stopped by interior walls. However, if a building has no partitions, any glass, brick or other debris blown into the interior is life threatening. Following a tornado, damaged buildings are a potential health hazard due to instability, electrical system damage, and gas leaks. Sewage and water lines may also be damaged.

DuPage County has lost a life to a tornado and had injuries. Residents living in mobile homes are more vulnerable than people in permanent homes. People can inadvertently put their lives in danger during a tornado, or have little or no warning.

Property Damage and Critical Facilities: Although tornadoes strike at random, making all buildings vulnerable, three types of structures are more likely to suffer damage:

- Mobile homes,
- Homes on crawlspaces (more susceptible to lift), and
- Buildings with large spans, such as airplane hangars, gymnasiums and factories.

In areas subject to extreme wind events, those responsible for public safety—including building owners, schools, hospitals, and neighborhood associations—should consider building accessible community safe rooms. People who live or work in structures with inadequate protection, such as mobile homes or buildings with long-span roofs, also should discuss the option of building a community safe room or shelter. (FEMA, 2014)

In 1999, FEMA conducted an extensive damage survey (FEMA, 2009) of residential and non-residential buildings in Oklahoma and Kansas following an outbreak of tornadoes on May 3, 1999, which killed 49 people. The assessment found:

- The failure for many residential structures occurred where the framing wasn't secured to the foundation, or when nails were used as the primary connectors between the roof structure and the walls. A home in Kansas, for example, was lifted from its foundation. The addition of nuts to the foundation anchor bolts (connected to the wood framing) may have been all that was needed to prevent this.
- Roof geometry also played a significant role in a building's performance.
- Failure of garage doors, commercial overhead doors, residential entry doors or large windows caused a significant number of catastrophic building failures.
- Manufactured homes on permanent foundations were found to perform better than those that were not on solid foundation walls.

If you divide the County's total number of housing units, 357,016 (American Fact Finder, 2016, P. 1), by the County's total square miles, 334, the County's housing density is approximately 1,069 homes per square mile. If a tornado impacts a 5-square mile area of the County, approximately 5,000 to 5,500 homes would be affected (DuPage County area equals 334 square miles). If 50% percent of the homes in that area were subject to damage, based on the average home price in DuPage County (ArcGIS, 2017), then the vulnerability of DuPage County buildings would approximately be:

(5 square miles x 1,069 housing units per square mile x $304,449 per home) x 50% =
= $16.27 million in property value exposed

Because a tornado can hit anywhere in the County, all of them are susceptible to being hit. Schools are a particular concern, though for two reasons:

- They have large numbers of people present, either during school or as a storm shelter, and
- They have large span areas, such as gyms and theaters.

The 1990 Plainfield tornado was an unfortunate example of this. It struck the Plainfield High School, Grand Prairie Elementary School, St. Mary Immaculate Church and the gymnasium to the Church's elementary school. Cost to repair the two public schools was estimated at up to $35 million. The cost for the church and its school was $5 million.

Large span buildings were also affected in 1990. In addition to the schools and their gyms, hangers at the Aurora airport and Joliet's Essington Road Fire Station were damaged. At this time, it is unknown which critical facilities in DuPage County may have large span structures.

2.5 Drought

A drought is a prolonged period in which an area or community has a shortage of water. This often occurs during an absence of precipitation for an extended period of time. There are four types of drought:

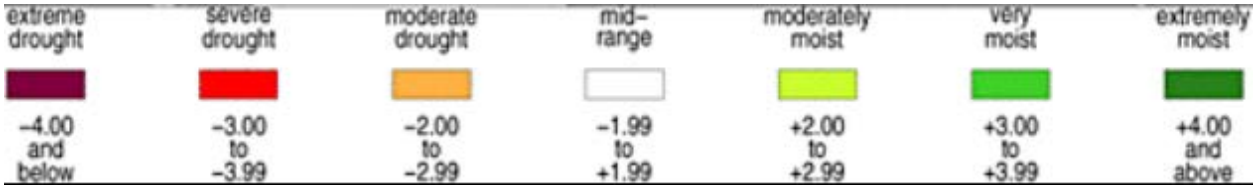
- Meteorological drought: "Meteorological drought happens when dry weather patterns dominate an area (NOAA, N.D.c)".
- Hydrological drought: "Hydrological drought occurs when low water supply becomes evident, especially in streams, reservoirs, and groundwater levels, usually after many months of meteorological drought (NOAA, N.D.c)".
- Agricultural drought: "Agricultural drought happens when crops become affected (NOAA, N.D.c)".
- Socioeconomic drought: "Socioeconomic drought relates the supply and demand of various commodities to drought (NOAA, N.D.c)".

Probability and Frequency: "Meteorological drought can begin and end rapidly, while hydrological drought takes much longer to develop and then recover. Many different indices have been developed over the decades to measure drought in these various sectors. The U.S. Drought Monitor depicts drought integrated across all time scales and differentiates between agricultural and hydrological impacts (NOAA, N.D.c)". The National Oceanic and Atmospheric Administration, uses the Palmer Drought Severity Index to

determine drought conditions. Exhibit 2-23 shows the steps of this index (NOAA, 2017i). The 2013 Illinois Hazard Mitigation Plan (IEMA, 2013) estimated that historically, moderate to severe drought occurs about 17% of the time in Illinois. However, southern Illinois is generally more vulnerable to drought due to soils that hold less water and water supplies that are more likely to rely on shallow groundwater and surface water (IEMA, 2013).

Exhibit 2-23

Palmer Drought Severity Index



Past Events: "The nine months from March 1, 2005 to November 30, 2005, [which] was the driest Spring, Summer and Fall period ever recorded at Chicago O'Hare Airport and Rockford Airport. During the nine month period, Chicago O'Hare measured 16.54 inches of rain. Normal rainfall during that same nine month period is 30.46 inches. Rockford Airport measured 17.83 inches for the nine month period. Normal rainfall during that same nine month period is 31.82 inches (NOAA, N.D.d)" Drought conditions developed within April 2005 across northern Illinois (NOAA, N.D.e). By June, the conditions had been elevated to severe, water use restrictions and bans began to be put into effect, and several counties began to declare agriculture disasters (NOAA, N.D.f). And, by July, the drought level had been elevated to extreme, and "most farmers were estimating half or more of their corn crops were lost (NOAA, N.D.f)". In August, most of Illinois declared an agriculture disaster, and water restrictions and bans were put in place. Kane County experienced wells running dry, and high algae within water retrieved from the Fox River (NOAA, N.D.g). Severe to extreme drought conditions continued across northern Illinois through February 2006 (NOAA, N.D.h). In 2012, DuPage County experienced extremely dry conditions. While other regions of the State experienced drought conditions, some even extreme, DuPage County remained below a D4 (Illinois State Climatologist, 2012).

Life Safety and Public Health: Droughts affect life safety and public health in several ways. Health problems can arise from poor water quality, poor food quality, and increased dust in the air. In addition, droughts make the occurrence of fires more likely, spread more quickly, and more difficult to put out. In addition, poor air quality and a lack of water may reduce residents engagement in recreational activities, reducing overall mental and physical well-being (University of Nebraska, National Drought Mitigation Center, N.D).

Property Damage and Critical Infrastructure: Droughts significantly impact natural resources, and the animals that inhabit them. These effects include sometimes destroying natural habitats, increasing the likelihood of soil erosion, affecting wildlife migration patterns, and reducing the health of animals (University of Nebraska, National Drought Mitigation Center, N.D). In addition, the National Drought Mitigation Center, has identified several infrastructure sectors that could be directly, and sometimes even severely impacted, by a drought:

- "Farmers may lose money if a drought destroys their crops.

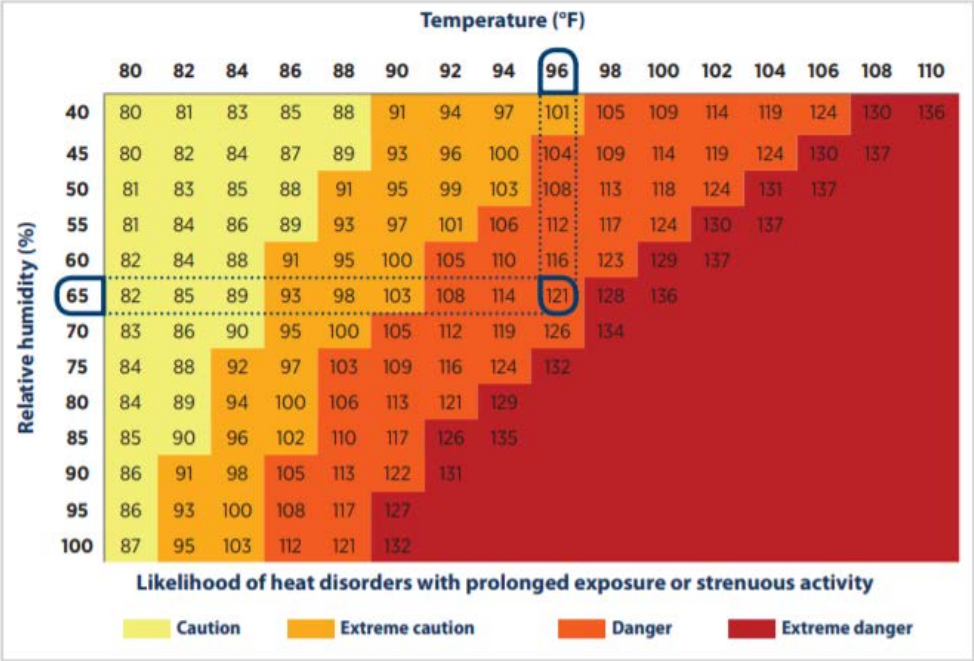
- If a farmer's water supply is too low, the farmer may have to spend more money on irrigation or to drill new wells.
- Ranchers may have to spend more money on feed and water for their animals.
- Businesses that depend on farming, like companies that make tractors and food, may lose business when drought damages crops or livestock.
- People who work in the timber industry may be affected when wildfires destroy stands of timber.
- Businesses that sell boats and fishing equipment may not be able to sell some of their goods because drought has dried up lakes and other water sources.
- Power companies that normally rely on hydroelectric power (electricity that's created from the energy of running water) may have to spend more money on other fuel sources if drought dries up too much of the water supply. The power companies' customers would also have to pay more.
- Water companies may have to spend money on new or additional water supplies.
- Barges and ships may have difficulty navigating streams, rivers, and canals because of low water levels, which would also affect businesses that depend on water transportation for receiving or sending goods and materials.
- People might have to pay more for food."
  (University of Nebraska, National Drought Mitigation Center, N.D).

2.6 Extreme Heat

"The definition of extreme heat varies based on many different factors, such as location, weather conditions (such as temperature, humidity, and cloud cover), and the time of year (U.S. EPA and CDC, 2016, P. 3)". In general, extreme heat is defined as an instance when the climate is 10 degrees hotter than average, usually above 90 degrees Fahrenheit.

"The heat index is a measure of how hot it feels when relative humidity is factored in with the actual air temperature. Relative humidity is the

Exhibit 2-24
National Oceanic and Atmospheric Administration
National Weather Service Heat Index



percentage of moisture in the air compared with the maximum amount of moisture the air can hold. Humidity is an important factor in how hot it feels because when humidity is high, water doesn't evaporate as easily, so it's harder for your body to cool off by sweating (U.S. EPA and CDC, 2016, P. 3)". Exhibit 2-24 Shows the NOAA's Heat Index (U.S. EPA and CDC, 2016, P. 3).

When an extreme heat event occurs, the National Weather Service may issue an excessive heat warning, an excessive heat watch, a heat advisory, or a heat outlook. The NWS defines these as the following:

- "Excessive Heat Warning—Take Action! An Excessive Heat Warning is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Warning is when the maximum heat index temperature is expected to be 105° or higher for at least 2 days and night time air temperatures will not drop below 75°; however, these criteria vary across the country, especially for areas not used to extreme heat conditions. If you don't take precautions immediately when conditions are extreme, you may become seriously ill or die.
- Excessive Heat Watches—Be Prepared! Heat watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain.
- Heat Advisory—Take Action! A Heat Advisory is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Advisory is when the maximum heat index temperature is expected to be 100° or higher for at least 2 days, and night time air temperatures will not drop below 75°; however, these criteria vary across the country, especially for areas that are not used to dangerous heat conditions. Take precautions to avoid heat illness. If you don't take precautions, you may become seriously ill or even die.
- Excessive Heat Outlooks are issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead-time to prepare for the event."
- (NOAA, N.D.j)

Probability and Frequency: On average, the U.S. has been experiencing warming summers throughout the past decade. This warming is correlated to recent changes in climate. "Without big steps to reduce greenhouse gas emissions, the average number of extremely hot days in the United States is projected to more than triple from the year 2050 to 2100 (U.S. EPA and CDC, 2016, P. 6)." Exhibit 2-25 Explains why the occurrence of extreme heat events is become more frequent (U.S. EPA and CDC, 2016, P. 4).

Exhibit 2-25
U.S. Environmental Protection Agency (EPA) and the Centers for Disease Control and Prevention (CDC) Climate Change and Extreme Heat

Why Is Extreme Heat on the Rise?

The chances are increasing that an extreme heat event could happen where you live. That's because average temperatures are rising, both in the United States and around the world:

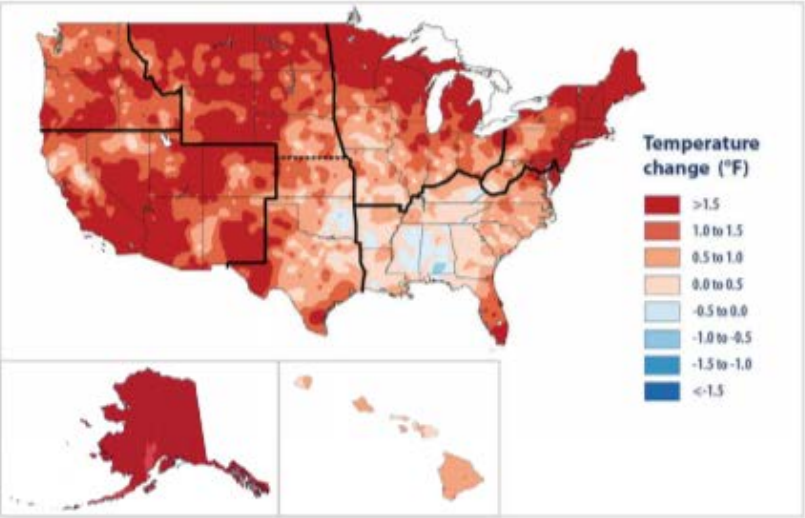
- Globally, the annual average temperature has been rising since the beginning of the 20th century, and temperatures are expected to continue to rise through the end of this century.
- Worldwide, 15 of the 16 warmest years on record have occurred since 2000, with the exception of 1998.[2]

Temperatures Worldwide, 1901–2015

This graph shows global annual average temperatures, compared with the 1901–2000 average. These data come from land-based weather stations and sea surface temperature measurements. The red bars indicate above-average surface temperatures and the blue bars indicate below-average temperatures (averaged across land and ocean). Source: U.S. EPA, 2016[2]

The United States is warming too, but some parts of the United States have experienced more warming than others. The North, the West, and Alaska have seen temperatures increase the most, while some parts of the Southeast have experienced little change.[2]

Observed U.S. Temperature Change



The colors on this map show temperature changes over the past 22 years (1991–2012) compared with the 1901–1960 average for the contiguous United States. Temperature changes for Alaska and Hawaii were compared with the 1951–1980 average for those states. Thick borders represent National Climate Assessment regions. Source: Melillo et al., 2014[4]

Past Events: "Northern Illinois experienced an intense heat wave during the first week of July. High temperatures at Chicago O'Hare Airport reached 102 on the 4th, 103 on the 5th and 6th and 98 on the 7th. Low temperatures remained in the upper 70s to lower 80s during much of the heat wave with a low temperature of just 82 degrees on the morning of the 6th. Maximum heat index values were mostly in the range of 105 to 115 each day across northeast Illinois. A cold front moved across the area during the late morning and early afternoon of July 7th, bringing several days of near normal temperatures for mid-July (NOAA, N.D.i)".

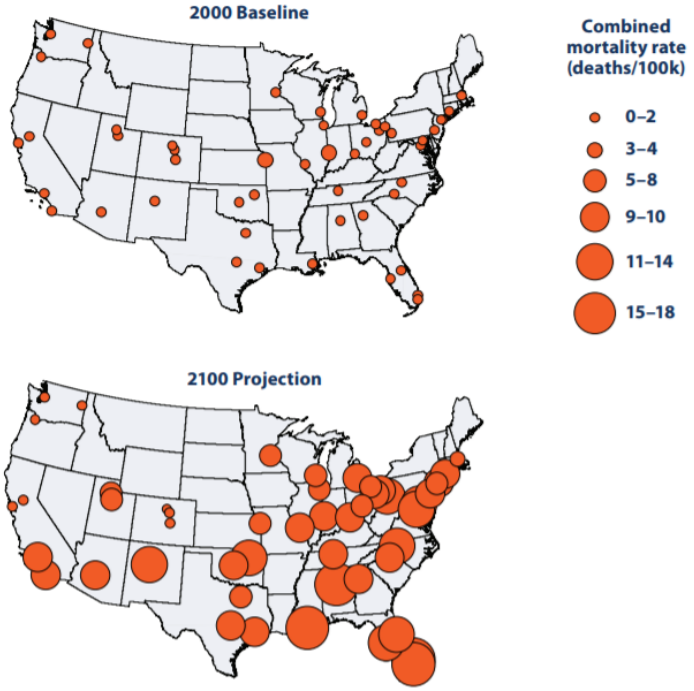
Life Safety and Public Health: According to The Weather Channel, extreme heat can affect the human body in several ways (The Weather Channel, 2016). "Some of the first signs that your body is beginning to have trouble due to extremely hot temperatures are increased sweating and muscle cramps. When you sweat, you are losing water, and if you do not replace the amount you are losing, an imbalance in salt can result, causing cramps" (The Weather Channel, 2016). The most common symptoms of heat exposure are due to what is called "heat exhaustion", these are: dizziness, confusion, fainting, nausea, diarrhea, headaches, rapid or weak pulse, and dehydration (The Weather Channel, 2016). "Another issue that can occur is heat edema, which is when your body dilates your blood vessels in order to avoid overheating, and blood can pool in the legs, especially if the balance of salt in your body is off" (The Weather Channel, 2016).

On a more serious note, prolonged exposure to extreme heat can cause a "heat stroke and even death" (The Weather Channel, 2016). "Symptoms of a heat stroke include:"

- Body temperature above 103 degrees
- No sweating
- Severe headache
- Confusion or disorientation
- Red, hot and dry skin
- Nausea or vomiting
- Rapid pulse
- Seizures
- Loss of consciousness
- Muscle weakness or cramps"
  (The Weather Channel, 2016)

Exhibit 2-26

Expected Deaths from Increased Extreme Heat Events



As extreme heat events become more common, and more severe, the U.S. EPA and the CDC estimate that deaths due to extreme heat events will increase. Exhibit 2-26 outlines the expected outcomes from increased events (U.S. EPA and CDC, 2016, P. 8). The U.S. EPA and CDC have also determined that those who live in primarily urban areas, like DuPage County are also more at risk for experiencing adverse side

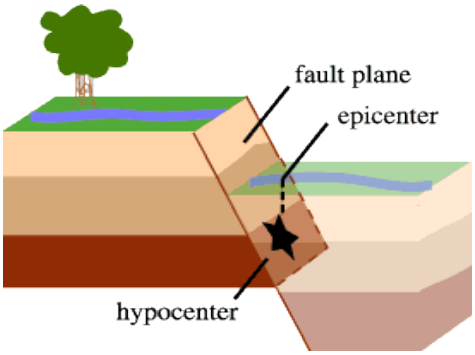
effects of extreme heat events. “Less vegetation means less shade and moisture to keep urban areas cool. Conventional roofs and pavement reflect less and absorb more of the sun’s energy, which leads to higher temperatures near these structures. Additionally, tall buildings and narrow streets can reduce air flow, further trapping the heat that gets absorbed during the day, as well as heat generated by vehicles, factories, and air conditioning vents. All these factors contribute to urban heat islands, which can worsen the impacts of climate change, particularly as more extreme heat events occur. Compared with surrounding rural areas, urban heat islands have higher daytime maximum temperatures and less nighttime cooling. Temperatures in urban areas can be 1.8–5.4°F warmer than their surroundings during the day. In the evening, this difference can be as high as 22°F because the built environment retains heat absorbed during the day (U.S. EPA and CDC, 2016, P. 14).”

Property Damage and Critical Infrastructure: Heat has little or no impact on structures. The demand on electric utilities will be elevated, given higher use of cooling systems.

2.7 Earthquakes

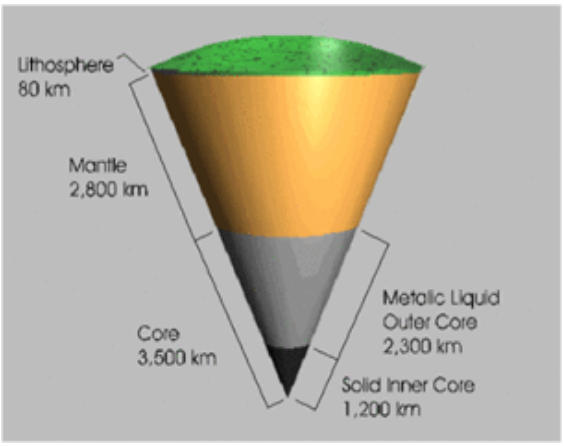
“An earthquake is what happens when two blocks of the earth suddenly slip past one another. The surface where they slip is called the fault or fault plane. The location below the earth’s surface where the earthquake starts is called the hypocenter, and the location directly above it on the surface of the earth is called the epicenter” (USGS, 2017a). Exhibit 2-27 shows how this phenomenon occurs (USGS, 2017a).

Exhibit 2-27



Sometimes an earthquake has foreshocks. These are smaller earthquakes that happen in the same place as the larger earthquake that follows. Scientists can’t tell that an earthquake is a foreshock until the larger earthquake happens. The largest, main earthquake is called themainshock. Mainshocks always have aftershocks that follow. These are smaller earthquakes that occur afterwards in the same place as the mainshock. Depending on the size of the mainshock, aftershocks can continue for weeks, months, and even years after the mainshock!” (USGS, 2017a). “The earth has four major layers: the inner core, outer core, mantle and crust. (figure 2) The crust and the top of the mantle make up a thin skin on the surface of our planet. But this skin is not all in one piece – it is made up of many pieces like a puzzle covering the surface of the earth. Not only that, but these puzzle pieces keep slowly moving around, sliding past one another and bumping into each other. We call these puzzle pieces tectonic plates, and the edges of the plates are called the plate boundaries. The plate boundaries are made up of many faults, and most of the earthquakes around the world occur on these faults. Since the edges of the plates are rough, they get stuck while the rest of the plate keeps moving. Finally, when the plate has moved far enough, the edges unstick on one of the faults and there is an earthquake” (USGS, 2017a). Exhibit 2-28 outlines these layers (USGS, 2017a).

Exhibit 2-29



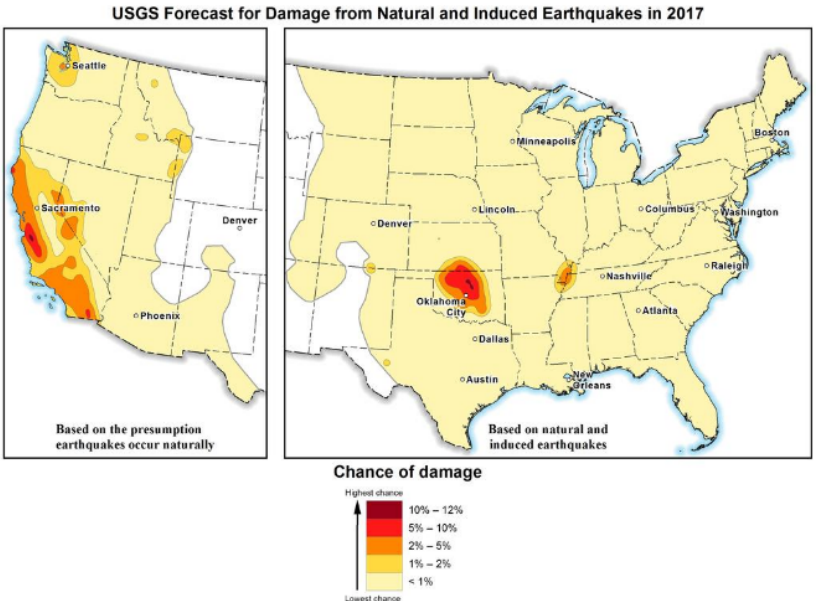
Earthquakes are one of nature's most damaging hazards. Earthquakes, and the potential damage from earthquakes, are more widespread than people realize. Earthquakes are caused by the release of strain between or within the Earth's tectonic plates. The severity of an earthquake depends on the amount of strain or energy that is released along a fault or at the epicenter of an earthquake. The energy released by an earthquake is sent to the earth's surface and released (USGS, 2017a).

USGS maps and other earthquake resources were examined to determine DuPage County's exposure to earthquakes. A major earthquake near the New Madrid Fault or other fault areas in the Midwest will be felt in Chicago. However, it was concluded that DuPage County is not vulnerable to serious earthquake damage. Earthquakes are discussed here in the event that DuPage County opted in the future to put more emphasis on the potential earthquake hazard.

Earthquake Measurements: "There are several common measures of earthquakes, including the Richter Scale and the Modified Mercalli Intensity (MMI) scale. The Richter Scale is a measurement of the magnitude, or the amount of energy released by an earthquake. Magnitude is measured by seismographs. The Modified Mercalli Intensity is an observed measurement of the earthquake's intensity felt at the earth's surface. The MMI varies, depending on the observer's location to the earthquake's epicenter (USGS, 2017b)". Exhibit 2-29 outlines potential damages from earthquakes (USGS, 2017b).

Exhibit 2-29

Forecast for Damage from Natural and Induced Earthquakes in 2017

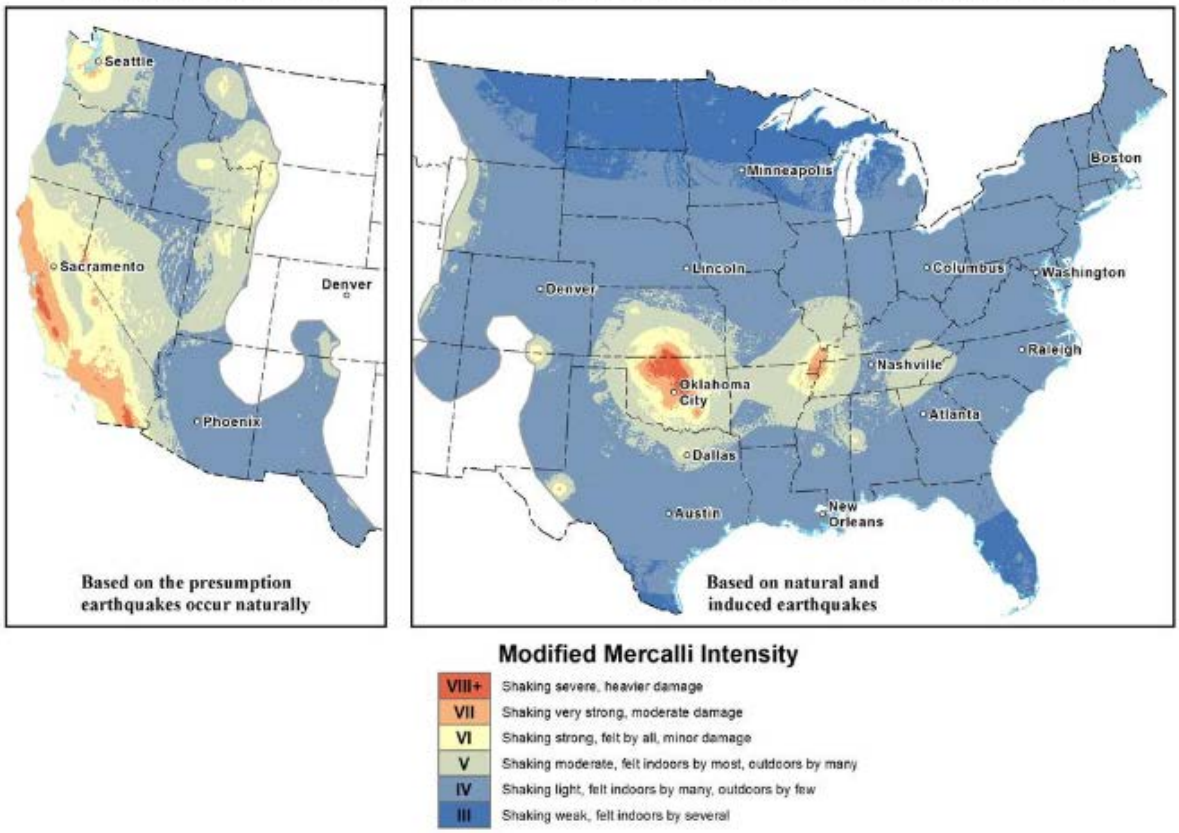


An earthquake's intensity depends on the geologic makeup of the area and the stability of underlying soils. The effects of earthquakes can be localized near its epicenter or felt significant distances away. For example, a 6.8-magnitude earthquake in the New Madrid Fault in Missouri would have a much wider impact than a comparable event on the California Coast. The thick sandstone and limestone strata of the central United States behave as "conductors" of the earthquake's energy, and tremors can be felt hundreds of miles away. By contrast, the geology of the West Coast allows the energy to be dissipated relatively quickly which keeps the effects of the earthquake more localized (USGS, 2017b).

Earthquakes can trigger other types of ground failures which could contribute to the damage. These include landslides, dam failures, and liquefaction. In the last situation, shaking can mix groundwater and soil, liquefying and weakening the ground that supports buildings and severing utility lines. This is a special problem in floodplains where the water table is relatively high and the soils are more susceptible to liquefaction (USGS, 2017b). Exhibit 2-30 outlines forecasted ground shaking from potential earthquakes (USGS, 2017b).

Exhibit 2-30

USGS Forecast for Ground Shaking Intensity from Natural and Induced Earthquakes in 2017



Past Events: In the United States, the most frequent reports of earthquakes come from the West Coast, but the largest earthquakes felt in the U.S. occurred in Missouri in 1811 and 1812 along the New Madrid Fault (IEMA, 2013). The Great New Madrid Earthquakes are the benchmarks from which all earthquakes in the Midwest are measured. An

important fact is that the earthquakes of 1811 and 1812 were not single events. Rather the earthquakes were a series of over 2,000 shocks in five months.

Five of these quakes were larger than a magnitude of 8.0 on the Richter Scale, which completely destroyed the town of New Madrid. The earthquakes caused the land to roll in visible waves that raised and sank land as much as 20 feet. The tremors of these earthquakes were no doubt felt throughout all of Illinois, since the quakes are said to have rung church bells in New England (IEMA, 2013).

Probability and Frequency: At risk in DuPage County, given the low threat of an earthquake at a Mercalli Intensity of VII or greater, are unreinforced masonry structures. Most of these structures are considered to be historic masonry buildings located in downtown areas. An estimate of damage is two percent of the value of non-residential structures in the County. The impact of an earthquake would be on the local economy if any damage was sustained to businesses and infrastructure. Public expenditures for repairs to public facilities and clean-up and disposal of debris can be high, especially if the structures are not insured for earthquakes.

Life Safety and Public Health: While injury and loss of life are important factors in other parts of Illinois when assessing earthquakes, they are of low concern for DuPage County. During an earthquake, injuries are expected to be few. However, should a major earthquake impact southern Illinois, there exists the potential for damage to natural gas pipelines. This would be of greatest concern in the winter in northeastern Illinois.

Property Damage and Critical Infrastructure: Generally, wood frame buildings and structures on solid ground fare best during an earthquake. Wood frame buildings are flexible enough to withstand ground shaking and swaying. Evaluations of recent earthquakes found that damage was primarily caused to:

- Unreinforced masonry structures.
- Older buildings with some degree of deterioration.
- Buildings without foundation ties.
- Multi-story structures with open or “soft” first floors.

Most building codes have standards related to the first three concerns. This means that the most threatened buildings are older ones (built before current codes), masonry ones, and taller ones with open first floors.

In addition to the building type, damage is related to the underlying soils. Buildings on solid ground fare better, while those on loose or sandy soils will suffer more from shaking. These can be found in floodplains. If there is enough water present, the shaking can liquefy the underlying soils, which removes the support under the foundation.

2.8 Conclusions

1. DuPage County is a highly populated county, with 75.1 percent of the land developed, and similar topography throughout. Total property value in the floodplain of DuPage County, Illinois is estimated to be over $2.4 billion.
2. All communities and agencies involved in this *Plan* share the same vulnerability to natural hazards.
3. The priority hazards identified by the Mitigation Workgroup are floods, severe summer storms, severe winter storms, tornadoes, drought, and extreme heat.
4. Identification and analysis of natural hazards is consistent with the State of Illinois' *2013 Natural Hazard Mitigation Plan*.
5. Floods have the highest impact on property impact in DuPage County based on occurrence and floodplain location.
6. While injury and loss of life are important factors in other parts of Illinois when assessing earthquakes, they are of low concern for DuPage County.
7. Tornadoes have a high potential impact on both property damage and loss of life.
8. Extreme heat is not just a nuisance; it kills hundreds of Americans every year and causes many more to become seriously ill.

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Chapter 3 – Goals

The goals and guidelines for this *Plan* were developed during the Workgroup's December 7 meeting and January 4 meetings. The goals reflect current priorities within each community, as identified by municipal and County representatives, and community priorities identified by the public. In addition, the goals align with the CRS's six hazard mitigation areas (preventative measures, property protection, natural resource protection, emergency services, structural flood control projects, and public information) and with the emergency management/first responder sector's priorities of: life safety, incident stabilization, property protection, and environmental conservation. For further information on the activities conducted during these meetings see section 1.3, Planning Process, within Chapter 1.

3.1 Community Priorities

During the December 7 meeting, the workgroup was asked to discuss and prioritize the potential impacts of natural hazards. The following topics were identified by the Workgroup to be of priority. It is important to note that topics not mentioned below are still of importance and have been included to reflect this.

- Life Safety
- Public Health
- Critical Infrastructure Maintenance and Protection
- Climate Change
- Public Outreach, Education, and Awareness
- Public Information and Warning
- Inter-governmental Coordination
- Public-Private Partnerships
- Repetitive Loss Properties

3.2 Plan Direction

The Workgroup conducted an additional exercise to develop guidelines for completing the Plan's goals during the January 4 Workgroup meeting. The Workgroup discussed mitigation strategies, compared these strategies to the goals, and prioritized them. For more information on this activity, see section 1.3, Planning Process, within Chapter 1.

Mitigation activities discussed by the Workgroup on January 4, 2018:

- Preventative: Encouraging the adoption of current building codes.
- Property Protection: Requiring deeper foundations / basements especially in floodplain areas to prevent erosion, Enforcement of sub-surface dam improvements, and increase overhead sewer rebates.

- Natural Resource Protection: Streambank stabilization, better protection of wells, enhance water quality by minimizing lead and copper levels, and urban forestry programs (i.e. Tree City USA).
- Emergency Services: More collaboration with public sectors, to include more frequent exercises (i.e. tabletops), safe rooms, Storm Ready® certification, emergency generation, and enhanced communications.
- Structural Projects: Upgrade detention basins within floodplain areas and increase downstream flood storage, and private damn stabilization repairs.
- Public Information: Siren messages, social media messages, utilization of websites and newsletters.

3.3 Goals and Guidelines

The following goals (shown in order of importance) were developed by the Workgroup for the purpose of guiding and directing the plan in accordance with governmental requirements, community priorities, and changing circumstances. These goals were also compared with other DuPage County and Chicago Metro Area County Plans to ensure aligning viewpoints are used regionally. Given the importance of mitigating flooding within DuPage County, the workgroup also ensured this *Plan's* goals are also consistent with Countywide Stormwater and Flood Plain Ordinance, adopted by DuPage County and the municipalities, which addresses stormwater, floodplain, wetland, and water quality management associated with new and re-development.

Goal 1. Prioritize the health and safety of DuPage County residents from the impacts of natural hazards.

Goal 2. Protect critical infrastructure within DuPage County by identifying and reducing vulnerabilities to the impacts of natural hazards.

Goal 3. Strengthen relationships between the public sector, private sector entities, and residents to enhance community resilience through a whole community approach.

Goal 4. Increase the preparedness and awareness of natural hazards among DuPage County residents through targeted and coordinated outreach campaigns.

Goal 5. Promote better coordination between public service sectors, and encourage multi-jurisdictional participation in sustainable and cost-effective mitigation projects.

Goal 6. Safeguard historic and cultural aspects of DuPage County from the effects of natural hazards.

Goal 7. Encourage systematic updates and adoptions of regulations to ensure new developments address changing environmental concerns and natural resource protection.

Goal 8. Protect properties and structures within DuPage County from the impacts of natural hazards through the implementation of flood control projects, green infrastructure, mitigation activities, and advanced warning systems.

The following guidelines were developed by the Workgroup for purpose of achieving the goals and to facilitate the development of hazard mitigation action items in Chapter 9. These guidelines are shown in order of importance:

Guideline 1. Prioritize hazards mitigation projects on the hazards that pose the greatest threat on the community.

Guideline 2. Center public education strategies for the community around the need to take steps to protect themselves, their families, and their property.

Guideline 3. Create and foster public-private partnerships to accomplish hazard mitigation activities.

Guideline 4. Encourage interdepartmental and multijurisdictional collaboration and shared resources when developing and conducting hazard mitigation exercises and projects.

Guideline 5. Strive to improve and expand communication between public works and emergency services before, during, and after a disaster response.

Guideline 6. Seek County, State, and Federal support for mitigation projects.

Chapter 4 – Preventive Measures

Preventative activities keep problems related to natural hazards from escalating, and to ensure new developments have reduced vulnerability to hazards. The following examples of preventative measures are usually carried out by building, planning, zoning, and/or code enforcement officials (FEMA, 2017a, P. 510-20):

- Floodplain mapping and data
- Open Space Preservation
- Floodplain Regulations
- Erosion Setbacks
- Planning and Zoning
- Stormwater Management
- Drainage System Maintenance
- Building Codes

The information within this Chapter largely focuses on building codes, planning and zoning, stormwater runoff, floodplain management, water quality protection, and soil erosion control into their operations. Activities such as river restoration and wetland protection are resource protection activities aimed at preserving or restoring natural areas. These activities enable the naturally beneficial functions of the land, such as fields, floodplains or wetlands to be better realized. Further information on stormwater activities can be found in Chapters 5, 6 and 7).

DuPage County is responsible for establishing Countywide minimum standards for permitting of developments affecting stormwater runoff. In response to increasing flood damages due to increasing urbanization in the Chicagoland area, the State authorized the counties in northeastern Illinois to adopt countywide stormwater and flood plain management programs. In addition to providing funding for regional watershed planning and flood control efforts, the law allowed for the creation of countywide ordinances for the prevention of future damages due to development. The County-wide Stormwater and Flood Plain Ordinance (herein referred to as “ordinance”) was adopted in October of 1991 and went into effect in February of 1992. The Ordinance addresses every aspect of stormwater and floodplain management, including stormwater runoff and storage, post-construction best management practices (BMPs), sediment and erosion control, floodplain and floodway impacts, buffer area impacts, wetland impacts and water quality impacts. The Ordinance also sets administrative requirements regarding permitting procedures, performance security, enforcement and penalties, appeals and variance procedures. Unincorporated DuPage County is a Non-Waiver Community under the Ordinance, where Stormwater Management reviews and administers all areas of the Ordinance within the Unincorporated area.

4.1 Building Codes

Updating and adopting new building codes, as well as addressing the effectiveness of these codes, can be one of the best ways to conduct mitigation. When properly designed and constructed, many buildings can withstand the impacts of high winds, a flood, or a tornado. Many communities in Illinois are working with various versions of the International Codes published by the International Code Council, Inc. (ICC). These codes include:

- International Building Code (IBC)
- International Residential Code (IRC)
- International Fire Code (IFC)
- International Mechanical Code (IMC)
- International Fuel Gas Code (IFGC)
- International Existing Building Code (IEBC)
- International Wildland-Urban Interface Code (IWUIC)
- International Property Maintenance Code (IPMC)
- International Swimming Pool and Spa Code (ISPSC)
- International Zoning Code (IZC)

Additionally, Illinois Communities are required by the State to enforce the Illinois Energy Efficient Building Code, Illinois State Plumbing Code, and the Illinois Accessibility Code. The following communities have updated their building codes within the last two years: Darien, Winfield, Warrenville, Downers Grove, Westmont, Lisle, Lombard, Bloomingdale, Carol Stream, Oak Brook, Hanover Park, Bensenville.

In 2016, responding to the County's efforts over the past three years to actively participate in the Federal Emergency Management Agency's (FEMA) NFIP Community Rating System (CRS), the County Board vetted and adopted codes from the 2015 International Code Council (IBC, IFC, IMC, IFGC, and IPMC), the 2014 National Electric Code, the 2015 Illinois Energy Efficient Building Code, and the current Illinois State Plumbing Code. This effort included, specific language responsive to the FEMA requirements regarding substantial damage and loss requirements, as well as elevation certificates. Amendments made relative to the County's participation in the CRS program are as follows:

- The County of DuPage sought and gained active participation in the CRS program so unincorporated residents will qualify for discounted flood insurance premiums.
- Per guidance from the FEMA, the County coordinated with and the Insurance Services Office, Inc. (ISO) and the CRS program to ensure that credited activities were fully warranted.
- In 2014 and 2015, FEMA identified areas of the County's programs that can be enhanced to improve CRS ratings including the development of programs

relative to issuance of Elevation Certificates for properties that have structures in Special Flood Hazard Areas.

- The Building Code text amendments passed by the County Board in 2016 have enabled the County to implement a program for the issuance of flood elevation certificates which will enable practical improvements to properties located within the floodplain and improve the County's CRS rating.
- The Building Code text amendments passed by the County Board in 2016 have enabled the County to keep pace with changes in the industry standards providing more clarity in the enforcement of our codes and reduction in redundancies in our codes.

Flood Standards: The I-Codes include definitions and standards that are FEMA complaint. The 2015 IBC I-Codes recommends the separate adoption of Appendix G Flood Resistant Construction at the time the IBC is adopted. Appendix G is intended to fulfill the floodplain management and administrative requirements of the NFIP that are not included in the IBC. DuPage County is currently working to follow through on this recommended action.

Overhead sanitary sewers provide protection from sanitary sewer backups during periods of heavy rains or flooding. The I-Codes and the Illinois State Plumbing Code do not require the use of overhead sewers. The following communities require overhead sewers be installed with new construction: Addison, Bartlett, Bloomingdale, Burr Ridge, Clarendon Hills, Downers Grove, Hinsdale, Roselle, Villa Park, Wheaton, Willowbrook, and Woodridge. Additional information on overhead sewers can be found in Chapter 5.

Code Administration: Enforcement of code standards is very important to hazard mitigation. Adequate inspections are needed during the course of construction to ensure that the builder understands and implements the requirements. The Building Code Effectiveness Grading Schedule (BCEGS) is a national program used by the insurance industry to determine how well new construction is protected from wind, earthquake and other non-flood hazards. It is similar to the CRS program and the fire insurance rating scheme: building permit programs are reviewed and scored, a class 1 community is the best, and a class 10 community is the most basic rating. As a result of code improvements and upgrades, many DuPage County communities have received improved BCEGS ratings. Improvements noted within the 2016 and 2017 Natural Hazard Mitigation Plan Annual Reports are listed below. Additional BCEGS information for each community can be found within Table 4-1.

- In 2016, the County's (unincorporated) BCEGS rating was upgraded from a five (5) to a four (4).
- In 2016, Lisle's BCEGS rating was upgraded from a five to a four.
- In 2016, Addison's BCEGs rating was upgraded from a five to a four. And, in 2017 Addison again was upgraded from a four to a three.
- In 2017, Downers Grove's BCESs rating was upgraded from a four to a three.

Training of code officials is also very important for code enforcement. Training of code officials and inspectors is a large part of the BCEGS rating for a community. Courses are offered through the building code associations to help local officials understand standards that apply to seismic, wind and flood hazards.

Construction of state buildings and some other government buildings is exempt from municipal or county regulations. The Illinois Capital Development Board (CDB) is the construction management agency for state projects, such as prisons, college and university classroom buildings, mental health hospitals and state parks (Capital Development Board, N.D.). The CDB recognizes local building codes, but does not require a permit or inspection from the local building department. The agency will soon be adopting the International Codes for its use.

The DuPage County Building and Zoning Department participates in the plan review of all buildings and structures for County Buildings, and for developments by the DuPage County Forest Preserve District to provide an added dimension of review to ensure life safety.

Table 4-1 lists building code adoptions in use within DuPage County.

Safe Rooms: A safe room is a room or structure designed and constructed to resist wind pressures and wind-borne debris impacts during an extreme-wind event. Communities in DuPage County that adopt the 2015 IBC, sections 423.3 and 423.4, now have the requirement that a storm shelter (that meets or, exceeds ICC 500) must be constructed in any new schools, 911 call stations, emergency operation centers, fire stations and police stations. Communities may choose to expand this requirement to other new construction in their community. Although school construction does not require a local building permit, the State of Illinois, as of January 1, 2015, requires storm shelters for all new school construction. The school building code language from 105 ILCS 5/2-3.12 reads as follows:

> "After the effective date of this amendatory Act of the 98th General Assembly, all new school building construction governed by the "Health/Life Safety Code for Public Schools" must include in its design and construction a storm shelter that meets the minimum requirements of the ICC/NSSA Standard for the Design and Construction of Storm Shelters (ICC-500), published jointly by the International Code Council and the National Storm Shelter Association. Nothing in this subsection (e-5) precludes the design engineers, architects, or school district from applying a higher life safety standard than the ICC-500 for storm shelters" (Illinois General Assembly, 2015).

Within the 2017 Natural Hazard Mitigation Plan Annual Report, 23 communities listed the development of safe rooms as a continued priority. Communities are also encouraged to include safe rooms within their emergency operations plans.

Table 4-1
Building Codes Used in DuPage County and BCEGS Ratings

	Building Code Residential	**BCEGS Residential***	**Building Code Commercial**	**BCEGS Commercial***
Village of Addison	IRC 2012	3	IBC 2012	3
City of Aurora	IRC 2015	4	IBC 2015	4
Village of Bartlett	IRC 2012	4	IBC 2012	3
Village of Bloomingdale	IRC 2015	3	IBC 2015	3
Village of Bensenville	IRC 2015	--	IBC 2015	--
Village of Burr Ridge	IRC 2012	4	IBC 2012	4
Village of Carol Stream	IRC 2012	2	IBC 2012	2
Village of Clarendon Hills	IRC 2006	--	IBC 2006	--
City of Darien	IRC 2012	--	IBC 2012	--
Village of Downers Grove	IRC 2015	3	IBC 2016	3
City of Elmhurst	IRC 2012	--	IBC 2012	--
Village of Glendale Heights	IRC 2006	2	IBC 2006	2
Village of Glen Ellyn	IRC 2009	--	IBC 2009	--
Village of Hanover Park	IRC 2012	2	IBC 2012	2
Village of Hinsdale	IRC 2006	--	IBC 2006	--
Village of Itasca	IRC 2006	9	IBC 2006	9
Village of Lisle	IRC 2015	4	IBC 2015	4
Village of Lombard	IRC 2012	4	IBC 2012	3
City of Naperville	IRC 2012	4	IBC 2012	4
Village of Oak Brook	IRC 2015	4	IBC 2015	4
City of Oakbrook Terrace	IRC 2009	--	IBC 2009	--
Village of Roselle	IRC 2006	8	IBC 2006	8
Village of Villa Park	IRC 2009	5	IBC 2009	5
City of Warrenville	IRC 2015	9	IBC 2015	9
Village of Wayne	IRC 2015	4	IBC 2015	3
City of West Chicago	IRC 2015	--	IBC 2015	--
Village of Westmont	IRC 2012	--	IBC 2012	--
City of Wheaton	IRC 2012	4	IBC 2012	4
Village of Willowbrook	IRC 2009	4	IBC 2009	4
Village of Winfield	IRC 2015	--	IBC 2015	--
City of Wood Dale	IRC 2012	--	IBC 2012	--
Village of Woodridge	IRC 2012	--	IBC 2012	--
DuPage County	County	4	IBC 2015	4

* Information is based on Natural Hazard Mitigation Plan Annual Reports / existing County data and may not be accurate.

4.2 Planning and Zoning

Planning and zoning activities, such as land use plans, transportation plans, subdivision ordinances, zoning code and economic re-development plans, can be used to direct development away from hazardous areas. For example, comprehensive land use plans can designate floodplains and wetlands as areas for open space, wetlands, or low density residential. Table 4-2 shows the communities in DuPage County with adopted comprehensive plans, zoning ordinances, and subdivision ordinances. The table also highlights communities where flood or other hazards are addressed.

Comprehensive Plans: Comprehensive Plans are the primary tools used by communities to address future development. They can reduce future flood-related damages by indicating open space or low density development within floodplains and other hazardous areas. Natural hazards should be emphasized in specific land use recommendations. In addition to developing community specific plans, over the last several years the County and several communities have engaged in the Local Technical Assistance (LTA) Planning Grant Program, offered by the Chicago Metropolitan Agency for Planning (CMAP). This program enables communities within the Chicago Land Region to gain funding for projects if deemed appropriate by CMAP within the areas of transportation, land use, environmental, and stormwater planning. Examples of comprehensive planning can be found in both the text below and Table 4-2.

Addison: On January 7, 2013, the Addison Village Board unanimously adopted a new comprehensive plan, developed through CMAP's LTA Program. "Despite being a "built-out" community with a range of thriving land uses, Addison presents unique opportunities for improvements to its built and unbuilt environment. Infill development will continue to shape the community's physical, economic, and social character, while regional changes caused by the O'Hare airport expansion project and new western access to O'Hare will impact development decisions in the Village's foreseeable future. As a result, Addison will be faced with numerous near — and long-term decisions. Having an up-to-date Comprehensive Plan in place provides a context in which decisions affecting the future of Addison can be made with some certainty that today's choices — whether large or small — contribute to achieving the long-term goals and vision of the community" (Village of Addison, 2013, P. 2).

Aurora: Currently, the City of Aurora is developing an updated Downtown Master Plan through CMAP's LTA Program. "The City of Aurora is leading an effort to update, complement, and enhance the 2005 Seize the Future Master Plan, with a component dedicated to developing the transportation opportunities and walkability of downtown. The new Downtown Master Plan will provide policy direction in the areas of sustainability, economic development, open space and recreation, arts and culture, and other quality-of-life factors. Once complete, the plan will recommend policies to help the City and its residents address identified challenges" (CMAP, 2017a).

Bensenville: The Village of "Bensenville has been impacted and shaped by the multi-billion dollar O'Hare Modernization Program. To help the community take advantage of this major capital project (CMAP, 2017b)" the CMAP LTA Program helped the Village develop a new Comprehensive Plan. The Comprehensive Plan was adopted by the Village on January 28, 2015. The Comprehensive Plan built upon the Airport Compatibility Study from April 2013, addressed stormwater issues, including Silver Creek and Addison Creek Watersheds, storm sewer and detention basin projects, and outreach and education programs. In addition, Bensenville is currently working with CMAP's LTA Program to update its zoning ordinance regulations to better align with the Comprehensive Plan and updated land use practices (CMAP, 2017c).

Carol Stream: The Village of Carol Stream adopted a new Comprehensive Plan, developed through CMAP's LTA Program, on June 6, 2016. The plan serves elected leadership, residents, and businesses focusing on "land use and development, transportation, parks and open space, infrastructure, and capital improvements throughout the Village (Village of Carol Stream, 2016, P. 9).

Downers Grove: "In 2011, the Village of Downers Grove applied for [CMAP LTA Program] assistance to update their existing bicycle and pedestrian plans, which are both over ten years old, to better integrate the two plans while aligning them with regional goals. The three main objectives are to develop a comprehensive biking and walking network, to increase safety throughout the Village by developing a public education and outreach plan, and to market bicycling and walking throughout the community as viable transportation options. The effort will include a Pedestrian Infrastructure Report to assist the Village in developing a biking and walking network that is compliant with the Americans with Disabilities Act (ADA). While the plan will cover the entire Village, special attention will be paid to the downtown area, key employment centers, the three Metra commuter stations, and Pace stops to increase access to jobs and connections to transit. The Plan was approved by the Village Board in August 2013" (CMAP, N.D.a).

Glen Ellyn: "In 2011 the Village of Glen Ellyn applied to CMAP [LTA Program] for a Downtown Streetscape and Parking Garage Study that would be used to establish a pedestrian-friendly downtown, evaluate the locations for two potential parking garages, explore parking management strategies, improve way-finding, and improve bicycling conditions for the Village of Glen Ellyn. Following recommendations from the 2009 Downtown Strategic Plan, this plan aims to improve the Village's existing infrastructure and support current and future downtown residents (when new planned housing units are added). The proposed streetscape improvements will encourage developers to construct new housing in the downtown area and increase the density, adding to the downtown's livability. The study of the potential parking garage locations would evaluate pros and cons of 5 identified locations to be narrowed down to two. The study would also build off of several downtown initiatives including: the establishment of a National Downtown Historic District, a two-way traffic study, and investments made by Metra and

the Union Pacific Railroad to improve pedestrian safety near railroad tracks" (CMAP, N.D.b).

Hanover Park: "Building upon priorities in [the Village of] Hanover Park's 2010 Comprehensive Plan, now CMAP's Local Technical Assistance (LTA) Program will help the Village explore revitalization of the Irving Park Road Corridor between Astor Avenue to the east and Wise Road to the west. CMAP and the Village of Hanover Park selected the Urban Land Institute Chicago as a partner to advance the project with a two-day Technical Assistance Panel (TAP). On Monday, December 17, 2012, the Urban Land Institute Chicago (ULI Chicago) released the Irving Park Corridor Technical Assistance Panel (TAP) report" (CMAP, 2014).

DuPage County: In 2011 and 2012, DuPage County was awarded two LTA Gants. Working with its partner communities (The Roosevelt Road corridor involved Lombard, Villa Park, Oakbrook Terrace, Oak Brook, and Elmhurst; the Lake Street corridor involved Addison, Bloomingdale, Itasca, Roselle, and Hanover Park), DuPage set out to update both County and municipal land use plans relative to specific transportation corridors of Lake Street and Roosevelt Road. The combined effort of these projects was to comprehensively address existing conditions and future developments throughout these corridors. Activities included special management of stormwater and drainage issues that exist and have come into play in the redevelopment of these corridors. These planning efforts have ensured that development is not focused on the benefit of a single community, but holistically addressed with the myriad of factors that goes into redevelopment of properties, roadways, and infrastructure. Since the Lake Street and Roosevelt Road Corridors LTA were so successful, DuPage applied to receive an additional grant in 2017. The County (both Building and Zoning and the Department of Transportation) along with the municipalities of Bensenville, Addison, Wooddale, Itasca and Villa Park, were awarded an even more robust LTA Grant from CMAP. This grant will allow a study of the Rt. 83 Corridor in 2018.

Finally, throughout 2016 and 2017, the DuPage County Department of Transportation also coordinated with CMAP's LTA Program to develop an Elgin O'Hare Area Bicycle and Pedestrian Plan. "The approximately 70-square-mile study area include[d] ten municipalities, two counties, and multiple jurisdictions, including several transportation agencies responsible for the facilities and services used by travelers" (CMAP, 2017d).

Zoning Regulations: Zoning codes are the primary tool used to implement comprehensive plan guidelines for how land should be developed. Zoning ordinances usually set minimum lot sizes for each zoning district. Often, developers will produce a

standard grid layout. The ordinance and the community can allow flexibility in lot sizes and location so developers can avoid hazardous areas.

One way to encourage flexibility is to use the planned unit development (PUD) approach. The PUD approach "is both a type of development and a regulatory process" which allows developers "flexibility in the configuration of buildings and/or uses on a site than is allowed in standing zoning ordinances", and encourages unified plans (Bengford, B., 2012, P. 1). Protection of open space, critical areas, and floodplain preservation are important and common aspects of PUD designs.

"A typical PUD [project] would include a cluster of small lots in conjunction with a common usable open space with some recreational amenities and a protected natural area functioning as permanent open space. This arrangement can benefit both sides: A developer gets extra flexibility in configuring lots and buildings and perhaps a density bonus and/or reduced infrastructure cost, while the city/county gets permanent open space and/or other desired amenities." (Bengford, B., 2012, P. 1) An example of the PUD approach to planning subdivisions, considering floodplains can be seen in Exhibit 4-1 (Bengford, B., 2012, P. 2). A second example of the PUD approach can be seen in Exhibit 4-2 (Bengford, B., 2012, P. 7), depicting how this method can be used throughout an entire area of the community.

Exhibit 4-1
PUD Zoning Example

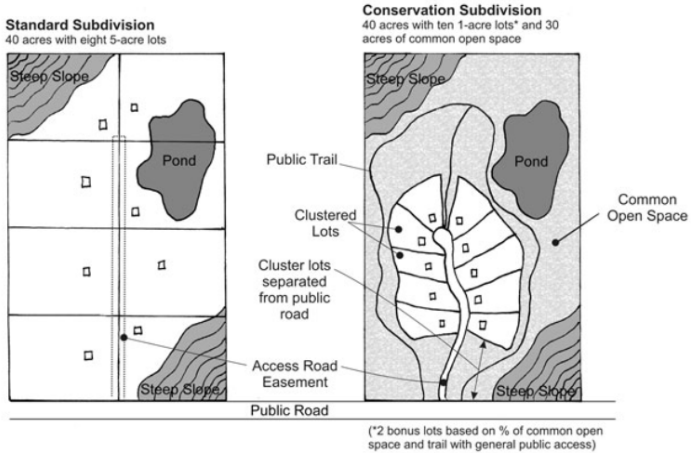


Exhibit 4-2
PUD Zoning Example

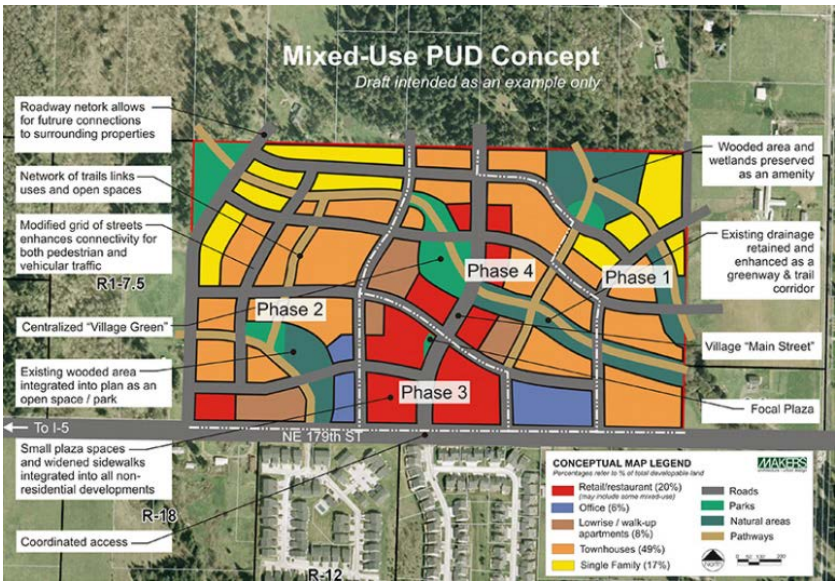


Table 4-2
DuPage County Planning and Land Use Ordinances

Community	Comprehensive Plan	Flooding or other hazards included in Comprehensive Plan	Zoning Ordinance	Flood hazards or drainage provisions in Subdivision Ordinance	Requirement to bury utilities in Subdivision Ordinance
Village of Addison	2013	Yes	1973/2005	Yes	Yes
City of Aurora	1984/2009	Yes	1923/2015	Yes	Yes
Village of Bartlett	1989	Unknown	1978	County*	Yes
Village of Bensenville	2015	Unknown	2007	County*	Yes
Village of Bloomingdale	1998	Unknown	1969/2006	County*	Yes
Village of Burr Ridge	1999	Unknown	1961/1997	County*	Unknown
Village of Carol Stream	2016	Unknown	2017	Yes	Yes
Village of Clarendon Hills	1991/2006	Unknown	1930/2006	County*	Yes
City of Darien	2002	Unknown	2000	County*	Unknown
Village of Downers Grove	2017	Yes	2014	Yes	Yes
City of Elmhurst	2007	Unknown	2007	County*	Unknown
Village of Glendale Heights	1995	Yes	1999/2006	Yes	Unknown
Village of Glen Ellyn	2001	Unknown	1989/2013	County*	Unknown
Village of Hanover Park	1998	Unknown	1991/2004	Yes	Unknown
Village of Hinsdale	1989	Unknown	1989/2006	County*	Yes
Village of Itasca	1994	Yes	1959/2006	Yes	Unknown
Village of Lisle	2004	Unknown	1970/2005	Yes	Yes
Village of Lombard	1998	Yes	1924/1990	County*	Unknown
City of Naperville	2002	Unknown	2006	Yes	Yes
Village of Oak Brook	1990	Unknown	2002	Yes	Yes
City of Oakbrook Terrace	1986/2003	Unknown	1990/2006	County*	Unknown
Village of Roselle	1995	Yes	1985 & amended	Yes	Unknown
Village of Villa Park	2009	Yes	1970	County*	No
City of Warrenville	1984	Yes	1989/2012	Yes	Yes
Village of Wayne	2005	Unknown	2007	County*	Unknown
City of West Chicago	2006	Unknown	2005	County*	Unknown
Village of Westmont	1998	Unknown	1979	County*	Unknown
City of Wheaton	1999	Yes	Yes	Yes	Yes
Village of Willowbrook	1993	Unknown	1960	Yes	Yes
Village of Winfield	2001	Unknown	1921/1999	Yes	Unknown
City of Wood Dale	1997	Yes	1948/2005	Yes	Yes
Village of Woodridge	2007	Yes	1986/2005	Yes	Yes
DuPage County (Unincorporated)	2013	Yes	2010	County*/Yes	Yes

* Rely on DuPage Countywide Stormwater and Flood Plain Ordinance

Capital Improvement Plans: Communities use Capital Improvement Plans or Community Investment Programs to guide major public expenditures for the next 5 to 20 years. Capital expenditures can include roadways, water and sewer lines, acquisition of floodplain open space, and retrofitting of existing public structures to withstand hazards. The Village of Downers Grove maintains a Community Investment Program which includes $43 million in stormwater improvements from 2017 to 2021. In the aftermath of the 2013 storm / flood event, Downers Grove completed a Stormwater Project Analysis that identified a total of 21 locations that would be part of a prioritized list of recommended projects to be completed, valued at over $16 million. The Village also has a cost share program for local drainage problems to assist residents on private property ($60,000 budgeted each year). DuPage County (unincorporated) updates its capital improvement plan annually (DuPage County, 2017); projects include:

- Purchasing repetitive loss properties and install additional water sewers, storm sewer mains, and culverts throughout the County.
- Working to rehabilitate damaged and aging bridges around the County.
- Updating traffic signal software and installing uninterruptable power supplies (UPS) to alleviate congestion during power outages and enhance signal management capabilities during evacuation scenarios.
- Working to increase flood storage within the communities along the East Branch of the DuPage River that experience frequent flooding.
- Retrofitting Fawell Dam to allow for proper wildlife migration.
- Extending current drinking water supplies to unincorporated residents.
- Repair and replace aging sanitary sewer pipes, and update technology within Wastewater Treatment Plants.

4.3 Subdivision Regulations

Subdivision regulations govern how land will be subdivided and sets construction standards. These standards generally address roads, sidewalks, utilities, storm sewers and drainageways. They can include the following hazard protection standards:

- Requiring that the final plat show all hazardous areas.
- Road standards that allow passage of firefighting equipment and snow plows
- Requiring power or phone lines to be buried
- Minimum water pressures adequate for fire fighting
- Requiring that each lot be provided with a building site above the flood level
- Requiring that all roadways be no more than one foot below the flood elevation.

Table 4-2 shows the communities in DuPage County that have adopted subdivision regulations, comprehensive plans, and the last update of their zoning ordinance.

4.4 Stormwater Management

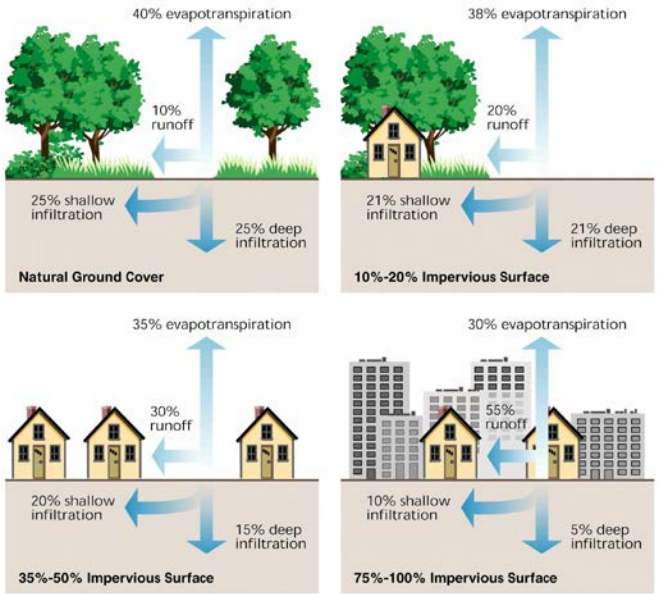
New construction in the floodplain increases the amount of development exposed to damage and can aggravate flooding on neighboring properties. Development outside a floodplain can also contribute to flooding problems. Stormwater runoff is increased when natural ground cover is replaced by urban development (see Exhibit 4-3). Development in the watershed that drains to a river can aggravate downstream flooding, overload a community's drainage system, cause erosion, and impair water quality. An example of this can be found within Exhibit 4-3 (Muth C., Brinson L., and Bernhardt, E., 2010, P. 1).

Stormwater management encompasses approaches to protecting existing downstream properties and new construction from damage by surface water, including (but not limited to):

- Regulating development in the floodplain to ensure that it will be protected from flooding and that it won't divert floodwaters onto other properties.
- Regulating all development to ensure that the post-development peak runoff will not be greater than under pre-development conditions.
- Stormwater runoff regulations require developers to build retention or detention basins to minimize the increases in the runoff rate caused by impervious surfaces and new drainage systems.

Exhibit 4-3

Floodplain Development and Stormwater Runoff



DuPage County Stormwater Management is responsible for administering and enforcing the ordinance. Communities, based on their regulatory resources, are granted partial or complete waiver of County review of permit application reviews. Community status is outlined within Table 4-3.

DuPage County and all municipalities have adopted the DuPage County Countywide Stormwater and Flood Plain Ordinance (DuPage County, 2013). The Stormwater Ordinance established stormwater management and detention requirements, meets or

exceed all of the state and NFIP floodplain regulatory requirements, provides for wetland management, and addresses soil erosion and sediment control. As a result of this ordinance, all DuPage County communities participate in the NFIP; and, all communities are compliant with Illinois Department of Natural Resources (IDNR) minimum requirements for regulating development in the floodplain and in the floodway: all new buildings must be protected from the base or 100-year flood and no development can cause an increase in flood heights or velocities. Some of the requirements of the County's Stormwater Ordinance include:

- Buildings must be elevated at least one foot above the base (100-year) flood level.
- Fill must meet certain standards to protect it from erosion and scour.
- Flood storage lost due to filling and construction must be compensated for by
- removal of an equal volume of storage.
- Only appropriate uses are allowed in the floodway.
- Standards for retention and detention basins, requirements for erosion and sedimentation control should be established.
- The requirement to incorporate best management practices into all plans.

Some communities, such as Downers Grove, have established additional more stringent regulations.

Best Management Practices: *Point source* pollutants come from pipes such as the outfall of a municipal wastewater treatment plant. They are regulated by the U.S. and Illinois Environmental Protection Agencies. *Nonpoint source* pollutants come from non-specific locations and are harder to regulate.

Table 4-3
DuPage Countywide Stormwater and Flood Plain Ordinance Waiver Status

Community	County Stormwater Ordinance Waiver
Village of Addison	Complete
City of Aurora	Opt Out
Village of Bartlett	Partial
City of Batavia	Non-Waiver
Village of Bensenville	Partial
Village of Bloomingdale	Complete
Village of Burr Ridge	Partial
Village of Carol Stream	Complete
City of Chicago	Non-Waiver
Village of Clarendon Hills	Partial
City of Darien	Partial
Village of Downers Grove	Complete
City of Elmhurst	Partial
Village of Glendale Heights	Partial
Village of Glen Ellyn	Complete
Village of Hanover Park	Partial
Village of Hinsdale	Partial
Village of Itasca	Partial
Village of Lemont	Non-Waiver
Village of Lisle	Partial
Village of Lombard	Partial
City of Naperville	Partial
Village of Oak Brook	Complete
City of Oakbrook Terrace	Partial
Village of Roselle	Partial
City of St. Charles	Opt Out
City of Schaumburg	Non-Waiver
Village of Villa Park	Complete
City of Warrenville	Complete
Village of Wayne	Partial
City of West Chicago	Partial
Village of Westmont	Partial
City of Wheaton	Partial
Village of Willowbrook	Complete
Village of Winfield	Partial
City of Wood Dale	Complete
Village of Woodridge	Complete
DuPage County (Unincorporated)	Non-waiver

Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams.

The term "best management practices" (BMPs) refers to design, construction and maintenance practices and criteria that minimize the impact of stormwater runoff rates and volumes, prevent erosion, protect natural resources and capture nonpoint source pollutants (including sediment). They can prevent increases in downstream flooding by attenuating runoff and enhancing infiltration of stormwater. They also minimize water quality degradation, preserve beneficial natural features onsite, maintain natural base flows, minimize habitat loss, and provide multiple uses of drainage and storage facilities.

Best management practices have been incorporated throughout the County Stormwater Ordinance. The County and communities are also working to meet the requirements of the Clean Water Act, Total Maximum Daily Load (TMDL), and the National Pollutant Discharge Elimination System (NPDES) Phase II requirements.

Erosion and Sedimentation Control: Erosion also occurs along streambanks and shorelines as the volume and velocity of flow or wave action destabilize and wash away the soil. Sediment suspended will settle out where flowing water slows down. It can clog storm sewers, drain tiles, culverts and ditches, and reduce the water transport and storage capacity of river and stream channels, lakes and wetlands.

Additionally, the sediment often brings chemicals, heavy metals and other pollutants, and light and oxygen are reduced in the stream which impairs water quality. Sediment has been identified by the US Environmental Protection Agency (EPA) as the nation's number one nonpoint source pollutant for aquatic life.

Techniques to minimize erosion include phased construction, minimal land clearing, and stabilizing bare ground as soon as possible with vegetation and other soil stabilizing practices. If erosion occurs, other measures are used to capture sediment before it leaves the site. Silt fences, sediment traps and vegetated filter strips are commonly used to control sediment transport. Runoff from the site can be slowed down by terraces, contour strip farming, no-till farm practices, hay or straw bales, constructed wetlands, and impoundments (e.g., sediment basins and farm ponds). Slowing surface water runoff on the way to a drainage channel increases infiltration into the soil and reduces the volume of topsoil eroded from the site.

Standards for soil erosion and sediment control during and following project construction are components of the County Stormwater Ordinance. Erosion and sediment control planning is required in the initial site planning process.

4.5 Hazard Mapping

Floodplain maps may be used to help determine whether or not a DuPage County property is located in the regulatory floodplain. The current effective Digital Flood Insurance Rate Maps (DFIRMs), issued by the FEMA, identify various flood zones and are used by the NFIP for rating flood insurance policies and enforcing federal mandatory insurance purchase requirements. On June 1, 2017, the FEMA issued Revised Preliminary Digital Flood Insurance Rate Maps (DFIRM) to all communities in DuPage County. It is projected that these maps will become effective sometime in 2018 or later. It should be noted that while the current effective DFIRMs are based on the National Geodetic Vertical Datum (NGVD) of 1929, the Revised Preliminary DFIRMs are based on the North American Vertical Datum of 1988 (NAVD 88). DuPage County has created a Revised Preliminary DFIRM Map Compare Application that allows the public to quickly compare the new Revised Preliminary DFIRMs to the 2004 DFIRMs" (DuPage County, N.D.).

Development in the Floodplain: "The DuPage County Regulatory Flood Maps (RFMs) are for use in administering the DuPage Regulatory Flood Program. For all development in the floodplain, it is required that users consult the current RFM, current effective DFIRM and the Preliminary DFIRM. The DuPage County RFMs were created using the same information used to create the 2004 DFIRMs. The maps are used as a planning tool only and cannot be used to definitively determine whether or not a property is located in the floodplain. Floodplain maps do not necessarily identify all areas subject to flooding. Site specific floodplain, depressional storage areas and local drainage sources of small size are not always represented on the floodplain maps. Actual floodplain boundaries may be slightly different than those shown on the maps due to variations in topography. The community map repository should be consulted for possible updated or additional flood hazard information, such as FEMA Letter of Map Change (LOMC) or Letter of Map Revision (LOMR) information. Please reference the DuPage County Countywide Stormwater & Flood Plain Ordinance for regulatory information" (DuPage County, N.D.).

Several communities, including Glen Ellyn and Downers Grove, have also developed community specific hazard maps for local depressions in the topography. There are additional restrictions on development within these areas. Downers Grove requires compensatory storage and other floodplain type restrictions within the areas referred to as Locally Poor Drainage Areas (LPDA). There are over 100 of these mapped areas throughout Downers Grove.

4.6 Conclusions

1. Building codes are the prime preventive measure for tornadoes, high winds, snow storms, and earthquakes. Rigorous enforcement of the latest available building codes, with an adequately trained staff provides a more sustainable community. In addition, it is important for communities to continue to update its Building and Zoning Codes on a regular basis as DuPage County has done in 2016 to implement new trends in design and safety standards promulgated by the industry.

2. The County and many communities have adopted the International Code series such as the 2015 International Code Council (International Building Code, International Fire Code, International Mechanical Code, International Fuel Gas Code, International Property Maintenance Code), 2014 National Electric Code, 2015 Illinois Energy Efficient Building Code and the current Illinois State Plumbing Code, which provides better protection from natural hazards.

3. Based on the National Building Code Effectiveness Grading Schedule (BCEGS), administration of building codes in DuPage County is generally good. Most communities have residential and commercial ratings of 5, and many have achieved a rating of 4 or better.

4. The majority of the comprehensive and land use plans address floodplains and the need to preserve these hazardous areas from intensive development. However, many zoning ordinances do not designate flood prone areas for any special type of land use.

5. The County Stormwater Ordinance's provisions for floodplain development and stormwater management regulations exceed minimum national and State standards and will be helpful in preventing flood problems from increasing.

4.7 Recommendations

1. All communities should adopt the latest International Codes, the new national standard that is being adopted throughout the country. Current efforts by multi-community organizations of building departments to develop local amendments for regional consistency should be pursued, provided they produce equivalent natural hazard protection features.
2. Communities should work to improve their BCEGS rating, with a target of reaching or maintaining at least a Class of 5 or better in time for their next cycle visit by the Insurance Services Office.
3. On a regional basis, municipal and County code enforcement staffs should work together to:

- Develop building code language to strengthen new buildings against damage by high winds, tornadoes, and hail.
- Adequately regulate mobile/manufactured structure installation for all uses, including residential, commercial, and schools.

4. On a regional basis, municipal and county planning and engineering staff should develop example subdivision ordinance language that requires new infrastructure to have hazard mitigation provisions, such as secondary access to subdivisions.
5. Offices responsible for design, construction or permitting critical facilities should ensure that the design accounts for natural hazards and adjacent land uses.
6. The public, developers, builders, and decision makers should be informed about the hazard mitigation benefits of these preventive measures and the procedures that should be followed to ensure that new developments do not create new problems.
7. Communities need to understand and consistently enforce the County-Wide Stormwater and Flood Plain Ordinance provisions. All communities should enforce the wetland protection, erosion and sediment control and best management practices provisions of the County-Wide Stormwater and Flood Plain Ordinance. The DuPage County municipal engineers group should continue their efforts in these areas.

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Chapter 5 – Property Protection

Property protection mitigation (FEMA, 2017) measures are used to modify a building or a property that is subject to a hazard; reducing potential damage. Property protection measures fall under three approaches:

- Modify the site to keep the hazard from reaching the building,
- Modify the building so it can withstand the impacts of the hazard, and
- Insure the property to provide financial relief after the damage occurs.

Property protection activities include (FEMA, 2017a, P. 510-20):

- Relocation
- Acquisition
- Building Elevation
- Retrofitting
- Sewer Backup Protection
- Insurance

"For floodplain management purposes, a structure is a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home. The terms "structure" and "building" are interchangeable in the National Flood Insurance Program (NFIP). Residential and non-residential structures are treated differently. A residential building built in a floodplain must be elevated above the Base Flood Elevation (BFE). Non-residential buildings may be elevated or floodproofed." (FEMA, 2017b).

5.1 Barriers, Elevation, Relocation, and Acquisition

For the hazards considered in this plan, flooding is the one hazard that can be kept away from a building (FEMA, 2017c). There are four common methods to do this:

- Erect a barrier between the building and the source of flooding
- Move the building out of the flood prone area
- Elevate the building above the flood level
- Demolish the building

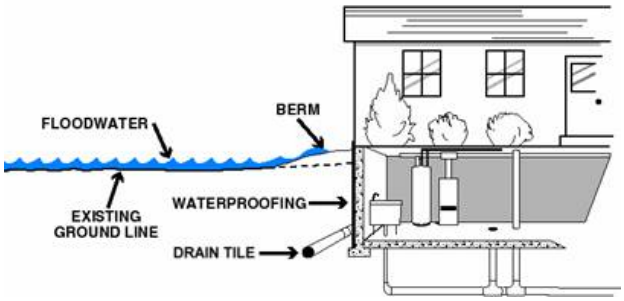
The advantages and disadvantages to these four methods will be discussed below. Generally, floods do not damage vacant areas. The major impact of hazards is to people and improved property. In some cases, properties can be modified so the hazard does not reach the damage-prone improvements. A fire break is an example of this approach – brush and other fuel are cleared away from the building so a fire may not reach it. Exhibit 5-1 outlines barrier effectiveness (Village of South Holland, 2017).

Barriers: A flood protection barrier can be built of dirt or soil ("berm") or concrete or steel ("floodwall"). Berms take up more space than floodwalls, but floodwalls are more expensive than berms.

Careful design is needed so as not to create flooding or drainage problems on neighboring properties. If the ground is porous and if floodwaters will stay up for more than an hour or two, the design needs to account for leaks, seepage of water underneath, and rainwater that falls inside the perimeter.

Exhibit 5-1

Small barriers can be effective against shallow flooding.



Barriers can only be built so high and can be overtopped by a flood higher than expected. Barriers made of earth are susceptible to erosion from rain and floodwaters if not properly sloped, covered with grass, and maintained. A berm can settle over time, lowering its protection level. A floodwall can crack, weaken, and lose its watertight seal. Therefore, barriers need careful design and maintenance (and insurance on the building, in case of failure).

Relocation: Moving a building to higher ground is the surest and safest way to protect it from flooding. Relocation of a building can be to a new property outside of the floodplain, or, for large lots, to a higher location (outside of the floodplain) on the existing property. Any building can be moved; however, the cost goes up for heavier structures, such as those with exterior brick and stone walls, and for large or irregularly shaped buildings. Exhibit 5-2 shows an example of a building being relocated (FEMA, 2017d).

Exhibit 5-2

Small wood frames are the easiest to relocate

Building Elevation: Raising a building above the flood level can be almost as effective as moving it out of the floodplain. Water flows under the building, causing little or no damage to the structure or its contents.

Exhibit 5-3

Home Elevation

Raising a building above the flood level is cheaper than moving it and can be less disruptive to a neighborhood. Elevation has proven to be an acceptable and reasonable means of complying with floodplain regulations that require new, substantially improved, and substantially damaged buildings to be elevated above the base flood elevation.

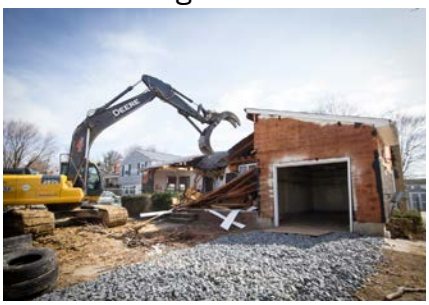
Elevating a building will change its appearance. If the required amount of elevation is low, the result is very much like putting a building on a 2 or 3 foot-high crawlspace (see example to the right). If the building needs to be raised more than four feet, owners are concerned that it will stick out like a sore thumb, and they may decline to implement an elevation project. Yet, many owners have successfully and attractively (with stairs and

landscaping) elevated their homes more than eight feet. Exhibit 5-3 illustrates a home elevation (FEMA, 2017e).

Another problem with this approach is with basements. Only the first floor and higher are elevated on a new flow through foundation. All utilities are elevated and the basement is filled in to protect the walls from water pressure. The owner loses the use of the basement, which may deter him or her from trying this approach.

A third problem with elevation is that it may expose the structure to greater impacts from other hazards. If not braced and anchored properly, an elevated building may have less resistance to the shaking of an earthquake and the pressures of high winds. Careful design and construction, however, should prevent these secondary problems.

Exhibit 5-4
Building Demolition



Demolition: If a home has been heavily damaged and susceptible to future damage, it is safest for owners to relocate. Acquisition, followed by demolition, is most appropriate for buildings that are dilapidated and are not worth protecting, but acquisition and demolition should also be considered for structures that would be difficult to move—such as larger, slab foundation, or masonry structures. Generally, demolition projects are undertaken by a government agency, so the cost is not borne by the property owner, and the land is converted to public use, such as a park. Exhibit 5-4 shows an example of a building being demolished (FEMA, 2017f).

One problem that sometimes results from an acquisition and demolition project is a "checkerboard" pattern in which nonadjacent properties are acquired. Creating such an acquisition pattern in a community adds to the maintenance costs that taxpayers must support (FEMA, 2017g).

The Village of Lisle has elevated four homes since the floods of 2013, has completed the demolition of two homes, and as of 2016 was working to demolish an additional four.

Local Implementation: the DuPage County Countywide Stormwater and Floodplain Ordinance includes floodplain building protection standards, see below for details:

> **15-28.A** Within the boundary of the regulatory flood plain, all usable space in new buildings, or added to existing buildings, shall either be elevated, flood proofed, or otherwise protected such that the lowest entry shall be at least one foot above the nearest base flood elevation to prevent the entry of surface stormwater. Floodproofing devices shall be operational without human intervention. If electricity is required for protection against flood damage, there shall be a backup power source which will activate without human intervention. Floodproofing measures shall be certified by a professional engineer.

15-28.B All usable space in new buildings or added to existing buildings, shall be elevated, floodproofed, or otherwise protected to at least one foot above the design elevation to prevent the entry of surface stormwater. The design elevation is the higher elevation of either Article X or the elevation associated with the design rate as determined in Section 15-81.B.2.

15-28.C Other building protection standards for structures that may be implemented in the flood plain are listed in Section 15-81.B in Article X.

Following the April 2013 floods, the Village of Lisle declared more than 25 structures substantially damaged. In addition to Village and County buyouts and demolitions, three structures – a single family home, a restaurant, and a nursing home – were privately demolished. Three homes in Lisle have been elevated, and five more are planned. Table 5-1 lists the flood prone property acquisitions throughout the County since the 1980s. Communities like Carol Stream, Downers Grove and Lisle have had structures experience flooding/repetitive flooding over the last 15-20 years, through local funds and federal grants these communities and/or DuPage County Stormwater has been able to acquire nearly 50 flood prone properties since 2013.

Table 5-1
DuPage County Flood Prone Property Acquisitions

Community	Watershed	Location	Number of Acquisitions	Participating Agencies
Village of Addison	Salt Creek	Salt Creek	4	IDNR, FEMA
Village of Carol Stream	West Branch / Klein Creek	Ilini/Silverlead/Mohican	6	Village/IEMA.DCSM
City of Darien	Sawmill Creek	Crest Road	4	DCSM
Village of Downers Grove	East Branch DuPage River	St. Joseph Creek	4	Village
City of Elmhurst	Salt Creek	Monterey Avenue	3	IDNR
Village of Lisle	East Branch DuPage River	Garfield/Lincoln River/Dumoulin	43	Village, DCSM
Village of Roselle	Salt Creek/Spring Brook	Roselle Road	2	Village/DCSM
Village of Villa Park	Salt Creek	Riverside Court/Elsworth/Monterey/Euclid	7	Village/HMPG/DCEO-PBP/HMGP-DR
City of Warrenville	West Branch DuPage River	River Rd	2	DCSM, IDNR
City of Wheaton	East Branch DuPage River/Winfield Creek	Main Street/Dorchester/Williston	6	DCSM, City
Village of Winfield	West Branch DuPage River	Park Street/Beecher Ave	3	DCSM
City of Wood Dale	Salt Creek	Forest Ave	10	FEMA, IDNR, DCFPD, City, Park District
DuPage County	East Branch DuPage River	Valley View (Uninc. DuPage)	47	DCSM, FEMA

DuPage County Stormwater Management (DCSM)

DuPage County Forest Preserve District (DCFPD)

Illinois Department of Natural Resources, Office of Water Resources (IDNR)

Federal Emergency Management Agency (FEMA)

5.2 Retrofitting – Modify the Building

Section 5.1 focuses on keeping the hazard from reaching a building or damage-prone part of a property. An alternative is to modify or "retrofit" the site or building to minimize or even prevent damage. There are a variety of techniques to do this. This section looks at the measures that can be implemented to protect existing buildings from damage by floods, sewer backup, earthquakes, tornadoes, summer and winter storms.

Flood Retrofitting – Buildings: Flood retrofitting measures (FEMA, 2012) include dry floodproofing where all areas below the flood protection level are made watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings (doors, windows, and vents) are closed, either permanently, with removable shields, or with sandbags.

Dry floodproofing: Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under State, FEMA and County regulations. Dry floodproofing of existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Owners of buildings located outside the regulatory floodplain can always use dry floodproofing techniques.

Wet Floodproofing: The alternative to dry floodproofing is wet floodproofing: water is let in and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater, and laundry facilities are permanently relocated to a higher floor. Where the flooding is not deep, these appliances can be raised on blocks or platforms.

Wet floodproofing has one advantage over the other approaches: no matter how little is done, flood damage is reduced. Thousands of dollars in damage can be prevented by simply moving furniture and electrical appliances out of a basement.

A third flood protection modification addresses flooding caused by overloaded sanitary or combined sewers. Four approaches may be used to protect a structure against sewer backup: floor drain plugs, floor drain stand-pipes, overhead sewers, and backflow protection valves.

The first two devices keep water from flowing out of the lowest opening in the building, the floor drain. However, if water becomes deep enough in the sewer system, it can flow out of the next lowest opening, such as a toilet or tub, or it can overwhelm a drain plug by hydrostatic pressure and flow into the building through the floor drain. The other two measures, overhead sewers and backflow protection valves keep water in the sewer line during a backup. These are more secure, but more expensive. For dry floodproofing, wet floodproofing, and sewer backup prevention, it is important to consider what contents of a building are suitable for keeping in basements or crawl spaces. Valuable and invaluable items, such as, photographs, should be kept elsewhere if the seepage or flooding occurs even with the retrofitting measures in place.

Overhead Sewers: Most floodproofing activities in the County consist of overhead sewer installations. Communities that have programs related to overhead sewers, including rebates, include: DuPage County, Lisle, Bensenville, Aurora, Addison, Bloomingdale, Darien, Elmhurst, Roselle, Downers Grove Sanitary District (which serves Downers Grove and parts of Westmont, Woodridge, Lisle, Oak Brook, and Darien), Glen Ellyn, Villa Park, Wheaton Sanitary District (which serves Wheaton and parts of Carol Stream, Glen Ellyn, and Winfield), and Lombard. In addition, some communities such as Downers Grove and Lombard also provide assistance for backyard drainage. For more information on community assistance, see Table 5-2.

Table 5-2
DuPage County Floodproofing Assistance Efforts

Community	Overhead Sewers or Floodproofing	Financial Assistance	Technical Assistance	Other Efforts
Village of Addison	Yes	Yes	Yes	Overhead sewer required with new construction
City of Aurora	Unknown	Yes	Unknown	Unknown
Village of Bartlett	Yes	Yes	Yes	Overhead sewer required with new construction
Village of Bensenville	Yes	Yes	Unknown	Back-Yard /Side-Yard Elevation Program
Village of Bloomingdale	Unknown	Yes	Yes	Overhead sewer required with new construction
Village of Burr Ridge	Unknown	Unknown	Unknown	Overhead sewer required with new construction
Village of Carol Stream	No	No	Yes	Unknown
Village of Clarendon Hills	Unknown	Unknown	Yes	Overhead sewer required with new construction
City of Darien	No	Yes	Unknown	Unknown
Village of Downers Grove	Yes	Yes	Yes	Overhead sewer required with new construction
City of Elmhurst	Some	Yes	Unknown	Unknown
Village of Glendale Heights	Unknown	Unknown	Yes	New sewer system and WTP has reduced problems
Village of Glen Ellyn	Yes	Yes	Yes	Overhead sewer required with new construction
Village of Hanover Park	Unknown	Unknown	Unknown	Unknown
Village of Hinsdale	Unknown	Unknown	Unknown	Overheads required by sanitary district
Village of Itasca	Unknown	Unknown	Unknown	Unknown
Village of Lisle	Yes	Yes	Yes	Unknown
Village of Lombard	Yes	Yes	Yes	Backyard program
City of Naperville	Yes	Unknown	Unknown	Overhead sewer required with new construction
Village of Oak Brook	Unknown	Yes	Unknown	Unknown
City of Oakbrook Terrace	Unknown	Unknown	Unknown	Unknown
Village of Roselle	Unknown	Yes	Unknown	Overhead sewer required with new construction
Village of Villa Park	Unknown	No	Yes	Overhead sewer required with new construction
City of Warrenville	No	No	Yes	Overhead sewer required with new construction
Village of Wayne	No	No	Unknown	Site visits to determine if sanitary sewer problems
City of West Chicago	Unknown	Unknown	Unknown	Unknown
Village of Westmont	Unknown	Yes	Unknown	Ejectors required
City of Wheaton	Unknown	Yes	Yes	Overhead sewer required with new construction
Village of Willowbrook	Unknown	Unknown	Yes	Overhead sewer required with new construction
Village of Winfield	Yes	Yes	Unknown	Unknown
City of Wood Dale	No		Yes	Unknown
Woodridge	Unknown	Yes	Unknown	In village code and through program
DuPage County	--	Yes	--	--

Exhibit 5-5
Tornado Safe Room

Tornado Retrofitting: Tornado retrofitting measures include constructing an underground shelter or "safe room" at the first-floor level to protect the lives of the occupants. Their worth has been proven by recent tornadoes in Oklahoma, as shown in Exhibit 5-5 (FEMA, 2017h).

Safe rooms are built by connecting all parts of the shelter together (walls, roof and foundation) using adequate fasteners or tie downs. These help hold the safe room together when the combination of high wind and pressure differences work to pull the walls and ceiling apart. The walls of the safe room are constructed out of plywood and metal sheeting to protect people from windborne missiles (flying debris) with the strong winds of a tornado.

Another retrofitting approach for tornadoes and high winds is to secure the roof, walls and foundation with adequate fasteners or tie downs. These help hold the building together when the combination of high wind and pressure differences work to pull the building apart. This measure also applies to manufactured homes.

Severe Summer Storm Retrofitting: Retrofitting approaches to protect private or public buildings from the effects of thunderstorms include:

- storm shutters
- lightning rods
- strengthening connections and tie-downs
- impact-resistant glass in window panes
- surge protectors at electrical outlets

Roofs could be replaced with materials less susceptible to damage by hail, such as modified asphalt or formed steel shingles.

Severe Winter Storm Retrofitting: Winter storm retrofitting measures include improving insulation on older buildings and relocating water lines from outside walls to interior spaces. Windows can be sealed or covered with an extra layer of glass (storm windows) or plastic sheeting. Roofs can be retrofitted to shed heavy loads of snow and prevent ice dams that form when snow melts.

Earthquake Retrofitting – Buildings: Earthquakes, or seismic events, present two hazards for buildings and people – a hazard for the structure itself and a hazard for the building's contents (non-structural hazard). Earthquake retrofitting measures for the structure include:

- removing masonry overhangs that will fall onto the street during shaking
- bracing the walls of the building provides structural stability
- bolting sill plates to the foundation

These measures can be very expensive and should be considered for buildings on a case by case basis.

Measures that protect against non-structural seismic hazards (California Seismic Safety Commission, 2006) typically involve small modifications. Retrofitting activities for non-structural hazards include:

- Tying down appliances, water heaters, bookcases, and fragile furniture so they won't fall over during a quake
- Installing latches on drawers and cabinet doors
- Mounting picture frames and mirrors securely
- Installing flexible utility connections for water and gas lines
- Anchoring and bracing propane tanks and gas cylinders

These approaches can be very cost effective and have little or no impact on the appearance of a building, yet they are important measures for keeping buildings safer and protecting lives during earthquake events.

While these simple and inexpensive measures may be cost effective for a home or business, they may not be sufficient for protection of critical facilities. Fire stations need to be sure that they can open their doors and hospitals must be strong enough to continue operating during the shocks and aftershocks. Again, critical facilities should be evaluated on a case by case basis.

Earthquake Retrofitting – Infrastructure and Lifelines: Infrastructure hardening, attention to lifelines and bridge strengthening are important elements of earthquake mitigation (FEMA, 1996).

> Lifelines are the public works and utility systems that support most human activities: individual, family, economic, political, and cultural. The various lifelines can be classified under the following five systems: electric power, gas and liquid fuels, telecommunications, transportation, and water supply and sewers.

The first step in protecting lifeline systems is the prioritization of critical facilities, utility systems, and other infrastructure. The involvement of state agencies, such as the Illinois Department of Transportation, is important. The involvement of private owners of utility systems is also important. FEMA, through the National Earthquake Hazard Reduction Program (NEHRP) and the Central United States Earthquake Consortium offer technical guidance on retrofitting approaches.

5.3 Insurance

Technically speaking, insurance does not mitigate damage caused by a natural hazard. However, it does help the owner repair, rebuild and (hopefully) afford to incorporate some of the other mitigation measures in the process.

Insurance has the advantage that, as long as the policy is in force, the property is protected and no human intervention is needed for the measure to work. A standard homeowner's insurance policy will cover a property for the hazards of tornado, wind, hail,

and winter storms. Separate endorsements are usually needed for earth movement (e.g., earthquake) coverage, sump pump failure, and sanitary backup.

Flood Insurance: Although most homeowner's insurance policies do not cover a property for flood damage, an owner can insure a building for damage by surface flooding through the National Flood Insurance Program. Flood insurance (FEMA, 2017i) coverage is provided for buildings and their contents damaged by a "general condition of surface flooding" in the area. Some people have purchased flood insurance because it was required by the bank when they got a mortgage or home improvement loan. Usually these policies just cover the building's structure and not the contents. Renters can buy contents coverage, even if the owner does not buy structural coverage on the building. There is limited coverage for basements and the below grade floors of bi-levels and tri-levels.

Several insurance companies have sump pump failure or sewer backup coverage that can be added to a homeowner's insurance policy. Each company has different amounts of coverage, exclusions, deductibles, and arrangements. Most are riders that cost extra. Most exclude damage from surface flooding that would be covered by a National Flood Insurance policy.

Earthquake Insurance: Earthquakes are not covered under standard homeowners or business insurance policies, but coverage is usually available for earthquake damage in the form of an endorsement to a home or business insurance policy. Cars and other vehicles are covered for earthquake damage under the comprehensive part of the auto insurance policy. In DuPage County, property owners can obtain earthquake insurance.

Earthquake insurance provides coverage for your dwelling, for your personal property, and for any additional living expenses. Coverage can include costs for the following:

- Temporary rental home, apartment, or hotel room
- Restaurant meals
- Telephone or utility installation in a temporary residence
- Relocation and storage
- Furniture Rental
- Laundry

Local Implementation: Larger local governments can self-insure and often absorb the cost of damages to one facility, but if many facilities are exposed to damage by one event, self-insurance can be a major drain on the community. Many communities in DuPage County are part of an Intergovernmental Risk Management Agency (IRMA), a member-owned public risk pool of governmental units located in northeastern Illinois, or are part of the Illinois Municipal League Risk Management Association (IMLRMA).

Communities should not rely on federal disaster assistance to make up the difference. The Stafford Act, Section 406(d), as amended, states:

> "(1) Reduction of Federal Assistance - If a public facility or private nonprofit facility located in a special flood hazard area identified for more than 1 year by the Administrator pursuant to the National Flood Insurance Act of 1968 (42 U.S.C. 4001

> et seq.) is damaged or destroyed, after the 180th day following November 23, 1988, by flooding in a major disaster and such facility is not covered on the date of such flooding by flood insurance, the Federal assistance which would otherwise be available under this section with respect to repair, restoration, reconstruction, and replacement of such facility and associated expenses shall be reduced in accordance with paragraph (2).
>
> (2) Amount of Reduction - The amount of a reduction in Federal assistance under this section with respect to a facility shall be the lesser of –
>
> (A) the value of such facility on the date of the flood damage or destruction, or
>
> (B) the maximum amount of insurance proceeds which would have been payable with respect to such facility if such facility had been covered by flood insurance under the National Flood Insurance Act of 1968 on such date"
>
> (FEMA, 2016, P. 35).

In other words, the law expects public agencies to be fully insured as a condition of receiving Federal disaster assistance.

5.4 The Government's Role

Property protection measures are usually considered the responsibility of the property owner. However, local governments should be involved in all strategies that can reduce flood losses, especially acquisition and conversion of a site to public open space. There are various roles the County or a municipality can play in encouraging and supporting implementation of these measures.

Government Facilities: One of the first duties of a local government is to protect its own facilities. Fire stations, water treatment plants and other critical facilities should be a high priority for retrofitting projects and insurance coverage.

Often public agencies discover after the disaster that their "all-hazard" insurance policies do not cover the property for the type of damage incurred. Flood insurance is even more important as a mitigation measure because of the Stafford Act provisions discussed above.

Public Information: Providing basic information to property owners is the first step in supporting property protection measures. Owners need general information on what can be done. They need to see examples, preferably from nearby.

Financial Assistance: Communities can help owners by helping to pay for a retrofitting project. Financial assistance can range from full funding of a project to helping residents find money from other programs. Some communities assume responsibility for sewer backups, street flooding, and other problems that arise from an inadequate public sewer or public drainage system.

Less expensive community programs include low interest loans, forgivable low interest loans and rebates. A forgivable loan is one that does not need to be repaid if the owner

does not sell the house for a specified period, such as five years. These approaches don't fully fund the project but they cost the community treasury less and they increase the owner's commitment to the flood protection project. Often, small amounts of money act as a catalyst to pique the owner's interest to get a self-protection project moving.

The City of Guthrie, Oklahoma has a rebate program for installation of tornado shelters and safe rooms. The City provides up to $1,500 per house, which can cover the majority of the cost.

The more common outside funding sources are listed below. The last three are only available after a disaster, not before, when damage could be prevented. Following past disaster declarations, FEMA, the Illinois Emergency Management Agency (IEMA) and the Illinois Department of Natural Resources have provided advice on how to qualify and apply for these funds.

Pre-disaster funding sources

- FEMA's Pre-Disaster Mitigation (PDM) grants (administered by IEMA)
- FEMA's Flood Mitigation Assistance (FMA) grants (administered by IEMA)
- Community Development Block Grant (administered by the Department of Commerce and Economic Opportunity
- Illinois Department of Natural Resources
- Conservation organizations, such as the Conservation Foundation and Cortlands, although generally these organizations typically purchase vacant land in natural areas, not properties with buildings on them.

Post-disaster funding sources

- Insurance claims
- The National Flood Insurance Program's Increased Cost of Compliance provision (which increases the claim payment to cover a flood protection project required by code as a condition to rebuild the flooded building)

Post-disaster funding sources, Federal disaster declaration needed

- FEMA's Public Assistance Program (FEMA, 2017j) (for public properties, however, after a flood, the amount of assistance will be reduced by the amount of flood insurance that the public agency should be carrying on the property) (administered by IEMA)
- Small Business Administration disaster loans (for non-governmental properties) (U.S. Small Business Administration, 2017)
- FEMA's Hazard Mitigation Grant Program (administered by IEMA) (FEMA, 2017k)

Acquisition Agent: The community can be the focal point in an acquisition project. Most funding programs require a local public agency to sponsor the project. The County or a municipality could process the funding application, work with the owners, and provide some, or all, of the local share.

Mandates: Mandates are considered a last resort if information and incentives aren't enough to convince a property owner to take protective actions. An example of a retrofitting mandate is the requirement that many communities have that downspouts be disconnected from the sanitary sewer line.

There is a local mandate for improvements or repairs made to a building in the regulatory floodplain. If the project equals or exceeds 50 percent of the value of the original building it is considered a "substantial improvement". The building must then be elevated or otherwise brought up to current flood protection codes.

Another possible mandate is to require less expensive hazard protection steps as a condition of a building permit. For example, many communities require upgraded electrical service as a condition of a home improvement project. If a person were to apply for a permit for electrical work, the community could require that the service box be moved above the base flood elevation or the installation of separate ground fault interrupter circuits in the basement.

5.5 Repetitive Flood Loss Properties

Chapter 2 explains the criteria for designation of the County's repetitive loss properties. Repetitive loss properties deserve special attention because they are more prone to damage by natural hazards than any other properties in the County. Further, protecting repetitive loss buildings is a priority with FEMA and IEMA mitigation funding programs.

When repetitive loss properties are reviewed, the key factors listed below should be used to determine appropriate property protection measures. The criteria used are based on several studies that have identified appropriate measures based on flood and building conditions. While a cost/benefit study was not conducted on each property, these guidelines show which measures are cost-effective.

- "High hazard areas" are areas in the floodway or where the 100-year flood is two or more feet over the first floor.
- Buildings in high hazard areas or in less than good condition should be acquired and demolished.
- Buildings with basements and split-level foundations in high hazard areas should be acquired and demolished. They are too difficult to elevate and the hydrostatic pressures on the walls from deeper flooding make them too risky to protect in place.
- Buildings subject to shallow flooding from local drainage should be protected through area-wide flood control or sewer improvement projects.
- Buildings in good condition on crawlspaces should be elevated or relocated.
- Buildings in good condition on slab, basement or split-level foundations subject to shallow flooding (less than 2 feet) can be protected by barriers and dry floodproofing.
- Recent flood claims. Some properties have not had a flood insurance claim for 20 years, indicating that some measure has probably been put in place to protect the property from repetitive flooding.

These criteria are general, and recommendations for individual structures should be made only after a site inspection. Other extenuating circumstances may also alter the recommendations.

The DuPage County 'Repetitive Loss Areas', shown in Exhibit 5-6, summarizes FEMA repetitive loss properties in DuPage County. DuPage County maintains a list of all flood prone properties that qualify for acquisition, and the list includes repetitive loss properties. Properties have been identified for acquisition throughout DuPage County based on watershed modeling done by the County. The properties are identified by watershed (or sub-watershed) utilizing a Benefit Cost Analysis (BCA) Model that predicts frequencies and damages of structures within a flood prone area rather than "repetitive loss areas." Funding of acquisitions, or matching funds, is/are provided through County stormwater management program and supplemented by FEMA/IEMA/IDNR/HUD grant funds. The acquisition list also includes all properties that have been acquired by local, state and federal agencies (see Table 5-1).

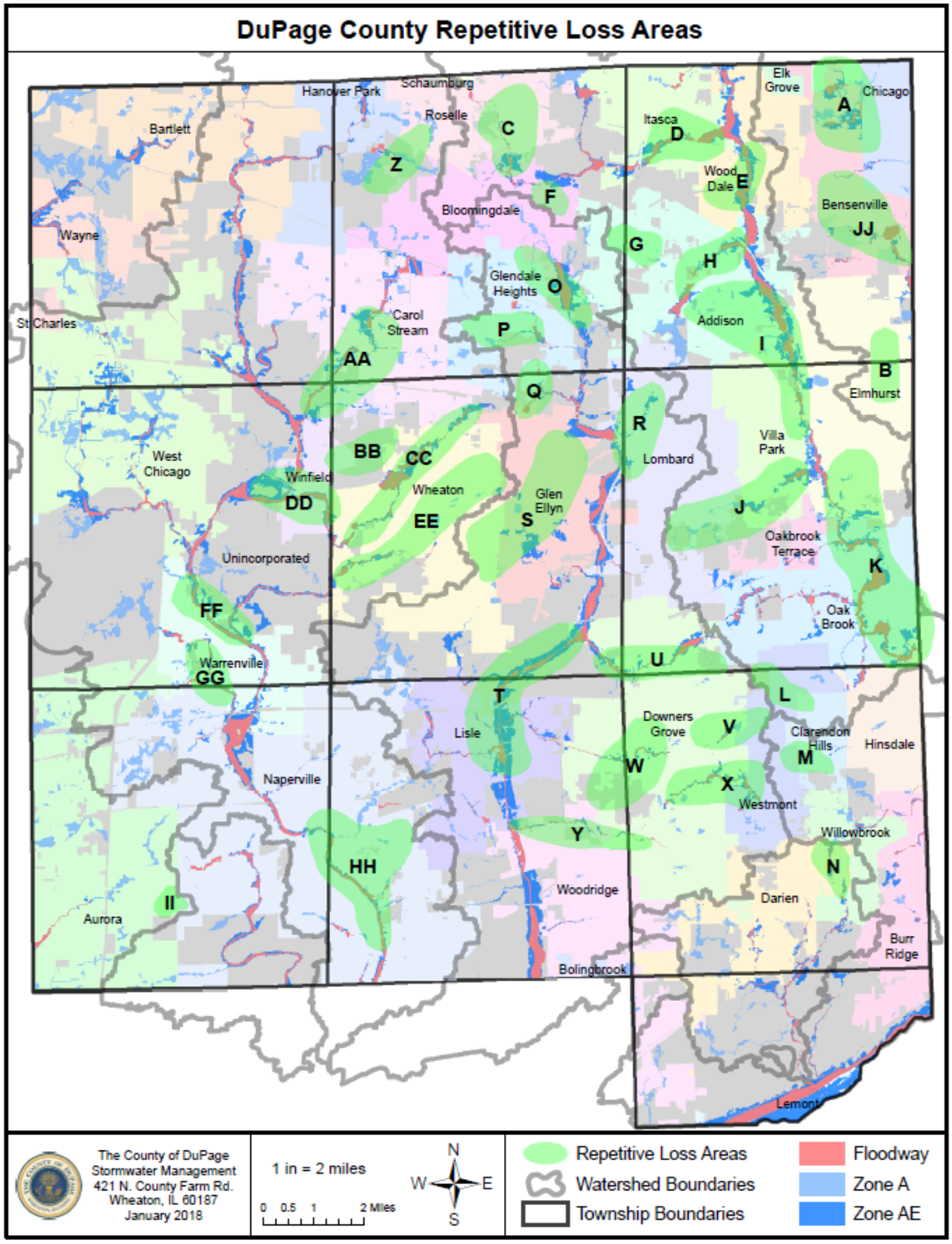
The effort of the Countywide Stormwater Management Program has greatly reduced the number of repetitive loss properties in DuPage County. Municipalities and DuPage County are continuing repetitive loss acquisition efforts as grant dollars and matching funds become available.

Table 5-3 explains the source of water, cause and depth of flooding, and the velocity of flood waters for each area shown within Exhibit 5-6.

Table 5-3
Repetitive Loss Areas: Source of Water, Cause, Depth of Flooding, and Velocity

Rep Loss Area	Peak Discharge (CFS)				Mean Velocity	100yr elevation	Source	Cause	Approx. Depth
	10yr	50yr	100yr	500yr	(FPS)				
1	202	346	429	693	2.2	669.2	Willow Creek Trib to Salt	Overbank	0-6"
2	--	--	--	--	--	664.5	Depressional Flooding/Site Specific	Depressional	0-6"
3	197	296	370	445	2.2	734.8	Upper Spring Brook Trib to Salt Creek	Overbank	0-6"
4	642	1040	1264	1800	1.9	683.1	Lower Spring Brook Conf Salt Creek	Overbank	0-12"
5	2110	3090	3502	4490	1.3	678.2	Lower Salt Creek Main Stem 1	Overbank	6-12"
6	115	195	235	328	1.1	704.4	Upper Spring Brook 2 Trib to Salt Creek	Overbank	0-6"
7	62	135	180	296	0.4	701.8	Westwood Creek Trib 1 to Salt Creek	Overbank	0-6"
8	171	282	323	438	0.6	676.2	Westwood Creek Trib 2 to Salt Creek	Overbank	0-6"
9	2267	3350	3857	5240	1	675.5	Lower Salt Creek Main Stem	Overbank	0-12"
10	570	780	850	1000	1.3	687.4	Sugar Creek Trib to Salt Creek	Overbank	6-12"
11	2162	3258	3665	4427	2.5	661.1	Lower Salt Creek Main Stem 2	Overbank	12"+
12	225	350	384	451	1.7	691.1	Bronzewood Creek Trib to Salt	Overbank	0-6"
13	1420	2300	2720	3850	3	691.8	Flagg Creek Trib to Des Plaines River	Overbank	0-6"
14	294	476	566	800	2.1	694.6	Sawmill Creek	Overbank	0-6"
15	885	1150	1435	1820	5.3	680.4	East Branch Main Stem 1	Depressional	0-6"
16	140	235	305	605	2.3	737.7	Armitage Creek Trib to East Branch	Overbank	0-6"
17	145	218	302	396	1.6	724.1	Tributary #2 East Branch	Overbank	0-6"
18	--	--	--	--	--	707.2	Unnamed Tributary to East Branch	Depressional	0-6"
19	455	730	870	1200	2.7	715.9	Glencrest Creek Trib to East Branch	Overbank	0-6"
20	1810	2510	2900	3880	4.2	663.3	East Branch Main Stem 2	Overbank	0-12"
21	450	720	860	1180	1.6	698.5	Lacey Creek Trib to East Branch	Overbank	0-6"
22	690	1090	1290	1770	2.5	699.8	St Joseph Trib 1 to East Branch	Overbank	0-6"
23	145	195	230	320	1.9	719.5	St Joseph Trib 3 to East Branch	Overbank	12"+
24	155	250	295	405	2.5	727.7	St Joseph Trib 2 to East Branch	Overbank	0-6"
25	420	665	795	1100	1.4	722.7	Prentiss Creek Trib to East Brnach	Overbank	0-6"
26	--	--	--	--	--	779.1	Trib #1 West Branch	Depressional	0-6"
27	445	592	655	947	2.4	748.4	Klein Creek Trib to West Branch	Overbank	6-12"
28	--	--	--	--	--	760.1	Depressional Flooding/Site Specific	Depressional	0-6"
29	370	510	590	855	2.1	734	Winfield Creek Trib 1 to West Banch	Overbank	0-6"
30	430	585	665	935	1.5	713.7	Winfield Creek Trib 2 to West Banch	Overbank	12"+
31	305	425	490	705	1.3	711.2	West Branch, SpringBrook Trib	Overbank	0-6"
32	65	140	190	305	0.5	771.8	West Branch Main Stem	Overbank	0-6"
33	380	540	615	805	2.4	706	Ferry Creek Tributary to West Branch	Overbank	0-6"
34	3075	4000	4400	5250	3.6	654.2	West Branch Main Stem 2	Overbank	0-6"
35	--	--	--	--	--	708.1	Depressional Flooding/Site Specific	Depressional	0-6"
36	54	96	122	185	0.7	657.1	Addison Creek Trib to Salt Creek	Overbank	0-6"

Exhibit 5-6
DuPage County Repetitive Loss Areas



5.6 Conclusions

1. Property protection measures for natural hazards are important for DuPage County given the number of hazards and the number of buildings for which the County is at risk.

2. There are several ways to protect individual properties from damage by natural hazards. The advantages and disadvantages of each should be examined for each situation.

3. Property owners can implement some property protection measures at little cost, especially for sites in areas of low hazards (e.g., shallow flooding, sewer backup, summer, and winter storms).

4. For other measures, such as relocation, elevation and safe rooms, the owners may need financial assistance.

5. Limited and inaccurate data from FEMA makes it difficult to assess repetitive flood loss properties.

6. Government agencies can promote and support property protection measures through activities ranging from financial incentives to public information.

7. The County is unable to determine if government properties, including critical facilities, have measures to protect them from flooding, tornadoes, and other natural hazards.

8. About 2,200 of the buildings in the County's floodplains are covered by flood insurance.

5.7 Recommendations

1. Available property protection public education materials should be consolidated and tailored for DuPage County. Materials should address measures that can help owners reduce their exposure to damage by natural hazards and the various types of insurance coverage that are available.

2. The County and municipalities should provide information and technical advice to floodplain property owners for reading floodplain maps.

3. The County and municipalities should consider the feasibility of providing information and technical advice to floodplain property owners for protecting their property.

4. Repetitive flood loss areas should be investigated and mitigated.

5. Most property protection projects should be voluntary.

6. Structural elevation or acquisition alternatives should be investigated for flood prone properties when a regional project is not feasible.

7. Feasible structural elevation or acquisitions should be funded through grants or through capital funding.

8. Positive incentives should be maintained and created by the County and municipalities to encourage property protection by property owners.

9. Communities should consider cost-sharing programs, such as rebates, to encourage low cost property protection.

10. All property owners should be encouraged to determine if they are adequately insured for natural hazards.

11. DuPage County should seek property protection financial assistance for flood and tornado mitigation projects for properties at risk.

12. A standard checklist should be developed to evaluate a property's exposure to damage from the hazards most prevalent in DuPage County. The checklist should be provided to each agency participating in this planning process and made available to the general public.

13. Each public entity should evaluate its own properties using the standard checklist. A priority should be placed on determining critical facilities' vulnerability to damage and whether public properties are adequately insured.

14. Each public entity should protect its own publicly-owned facilities with appropriate mitigation measure(s), except where efficiencies allow for joint funding and joint projects.

15. All critical facilities in the floodplain, with priority given to facilities in the floodway, should be mitigated, to the extent that the measures are cost effective and feasible.

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Chapter 6 – Structural Projects

Structural projects are projects that are constructed to protect people and infrastructure from damage due to natural hazards. Structural projects are usually funded by public agencies. Structural projects keep flood waters away from an area by constructing barriers, storing floodwater elsewhere, or by redirecting flood flows. Large structural flood control projects are most often planned, funded and implemented at a regional level by agencies, such as DuPage County Stormwater Management the Illinois Department of Natural Resources (IDNR), Office of Water Resources, the U.S. Army Corps of Engineers, the U.S. Department of Agriculture's Natural Resources Conservation Service. Many projects are jointly planned and funded between these agencies in cooperation with the municipalities or the DuPage County Forest Preserve District. Six approaches are reviewed in this chapter (FEMA, 2017, P. 418):

- Reservoirs
- Levees
- Floodwalls
- Diversions
- Channel modifications
- Storm drain improvements

The DuPage County Stormwater Management Plan was adopted in 1989. This Plan consolidated the existing stormwater effort throughout the County into a "unified, countywide structure" (DuPage County, 1989, P. 5). The Plan was adopted in accordance with Illinois Public Act 85-905 which gives DuPage County to authority to conduct planning, adopt regulations and implement projects, including structural projects, relating to stormwater management.

The planning of structural flood control projects usually involves an alternative assessment, and that assessment is typically part of, or a product of, a watershed plan. Watershed plans, flood control studies, and reports published for DuPage County communities can be found within Table 6-1. Along with the survey of DuPage County communities, these plans and projects implemented by the DuPage County Stormwater Division form the basis of this chapter.

6.1 Reservoirs and Detention

Reservoirs reduce flooding by temporarily storing flood waters behind dams or in storage or detention basins. Reservoirs lower the flood height by holding back, or detaining, runoff before it can flow downstream. Flood waters are detained until the flooding has subsided, then the water in the reservoir or detention basin is released or pumped out slowly at a rate that the river can accommodate downstream. Reservoirs can be dry and remain idle until a large rain event occurs. Or they may be designed so that a lake or pond is created (FEMA, 2015, P. 2). Reservoirs are most commonly built for one of two purposes. Large reservoirs are constructed to protect property from existing flood problems. Smaller reservoirs or detention basins are built to protect property from the impacts of new development (i.e., more runoff) (FEMA, 2015, P. 1).

Table 6-1
DuPage County Publications

1988	Adopted Willow Way Brook Watershed Plan
1991	Adopted Ginger Creek Watershed Plan
1991	Adopted Salt Creek Watershed Plan
1991	Adopted Willow Creek Watershed Plan
1992	Adopted Salt Creek Watershed Capital Improvement Plan
1992	Adopted Tributary #4 Watershed Plan
1994	Adopted Black Partridge Watershed Plan
1994	Adopted Winfield Creek Watershed Plan
1994	Adopted Westwood Creek Watershed Plan
1994	Adopted Klein Creek Watershed Plan
1996	Adopted Valley View Flood Control Plan
1996	Adopted Sawmill Creek Watershed Plan
1996	Adopted Tributary #2 Watershed Plan
1997	Adopted Flagg Creek Watershed Plan
1997	Adopted Steeple Run Watershed Plan
1998	Adopted the Sawmill Creek Watershed Plan Addendum
1999	Amended the Salt Creek Watershed Plan
1999	Adopted Ferry Creek Watershed Plan
2002	Adopted West Branch Tributary #1 Watershed Plan (Keeneyville)
2003	Adopted Addison Creek Watershed Plan
2004	Adopted the River-Dumoulin Flood Control Plan for inclusion in the East Branch DuPage River Watershed Plan
2004	Adoption of Route 53 North Flood Control Plan for inclusion in the East Branch DuPage River Watershed Plan
2004	Adopted the Upper Des Plaines River Tributaries Watershed Plan
2006	Adopted West Branch DuPage River Watershed Plan
2006	Adopted Spring Brook Tributary to Salt Creek Watershed Plan
2010	Adopted West Branch DuPage River Interim Watershed Plan Addendum
2010	Adopted Klein Creek Watershed Plan Addendum No 2

Regardless of size, reservoirs protect the development that is downstream from the reservoir site. Unlike levees and channel modifications, they do not have be built close to or disrupt the area to be protected (FEMA, 2015, P. 2).

There are several considerations when evaluating use of reservoirs and detention (FEMA, 2013a, P. 16):

- The expense for management and maintenance of the facility.
- Flooding can still occur if their design level is exceeded.
- Sediment deposition may occur and reduce the storage capacity over time.
- They can impact water quality as they are known to affect temperature, dissolve oxygen and nitrogen, and nutrients.

In urban areas such as DuPage County, reservoirs are an important part of floodwater management. Table 6-2 shows reservoirs that have been constructed. Significant detention has been provided in the Salt Creek watershed to address the damage that occurred from the 1987 flood. Examination of detention opportunities is a part of watershed planning for DuPage County. Also, the DuPage County Countywide Stormwater and Flood Plain Ordinance require stormwater detention with most new developments.

Table 6-2
DuPage County Detention Projects – Constructed

Watershed	Project	Storage (Acre-Feet)	Year Completed	Maintenance
Salt Creek	Elmhurst Quarry Reservoir	8,300	1996*	DuPage County
Salt Creek	Wood Dale - Itasca Reservoir	1,775	2003*	DuPage County
Salt Creek	Meacham Grove Reservoir	600	1997*	DuPage County
Salt Creek	Lake-Villa Reservoir (Louis Reservoir)	210	1994*	Addison
	Wayne Oaks Dam	70	1995*	
East Branch DuPage River	Willoway Brook Reservoir	345	1990*	DuPage FPD
West Branch DuPage River	Upper DuPage Reservoir	230	1977	
West Branch DuPage River	Winfield Creek	110	1997*	
West Branch DuPage River/Klein Creek	Gary/Kehoe Reservoir	140	1999*	DuPage County
	Cricket Creek Wetland Bank	1	1996*	
	Steeple Run Drainage Improvement.	30	2000*	
Sawmill Creek	Marion Hills Dale Basin	14	2002*	
Sawmill Creek	Marion Hills Crest Road Basin	34	2004*	
	Eldridge Park Reservoir Modification	120	2002*	
	Huffman Street Flood Control Project – Phase I	13.5	2006*	
	Kress Creek Regional Flood Control facility	200	2006*	
East Branch	8th and Cumnor	4.6	2009	Downers Grove
East Branch	Washington Park	9	2010	Downers Grove
East Branch	2nd and Cumnor	5.7	2011	Downers Grove
Brewster Creek	Brewster Creek Flood Control Reservoir	50	2012	DuPage County
West Branch DuPage River/Klein Creek	Armstrong Park Reservoirs	113	2015	DuPage County
	Total Storage:	12,355.5 ac-ft		

*Constructed since the adoption of the 1989 DuPage County Countywide Stormwater Management Plan

Other detention projects that have been sponsored by DuPage municipalities include:

- Lufkin Reservoirs/Jackson Detention Area in Villa Park in the Sugar Creek watershed (100-year design)
- Reservoir at Prospect/Coolidge in Wheaton (built in 1976) with pump station
- Twin Lakes Park Detention Area in Villa Park
- Terrace-Douglas Basin in Villa Park with a 100-year design
- Off-Track Betting Detention Basin in Villa Park with a 100-year design
- Prospect/Norfolk detention basin in Clarendon Hills (10-year design) built in 1989
- Schiller Street Basin in the Salt Creek watershed, built in 1987 in Itasca
- Meacham Creek Tributary 3 reservoir constructed in 2004 in Roselle, in the Salt Creek watershed
- Lake Manor Pond in Addison (100-year design) in the Salt Creek watershed
- Plamondon-Mulloy Pond in Addison (100-year design) in the Salt Creek watershed
- Steeple Run watershed projects in Naperville (Old Plank Park and Huffman Street)
- Carol Stream Venture subdivision

6.2 Levees and Barriers

This flood control measure is a barrier of earth (levee) or concrete (floodwall) erected between the watercourse and the property to be protected. Levees and floodwalls confine water to the stream channel by raising its banks. They must be designed to account for large floods, underground seepage, pumping of internal drainage, erosion and scour. Key considerations when evaluating the use of a levee include (FEMA, 2013b, P. 48):

- Removal of fill to compensate for the floodwater storage that will be displaced by the levee
- Internal drainage of surface flow from the area inside the levee.
- Cost of construction and maintenance
- Design limitations (while levees may reduce flood damage for smaller more frequent rain events, they may overtop or breach in extreme flood events and create more flood damage than would have occurred without the levee).

Levees can push floodwater onto other properties upstream or downstream and need to be designed with this in mind. To reduce environmental impacts and provide multiple use benefits, a setback levee (set back from the floodway) is the best project design. The area inside a setback levee can provide open space for recreational purposes and provide access sites to the river or stream (FEMA, 2013b, P. 49).

Floodwalls perform like levees except they are vertical-sided structures that require less surface area for construction. Floodwalls are constructed of reinforced concrete, which makes the expense of installation cost prohibitive in many circumstances. Floodwalls also degrade adjacent habitat and can displace erosive energy to unprotected areas of shoreline downstream (FEMA, 2013b, P. 2). Levees and floodwalls are appropriate when the cost of relocating structures out of the flood prone area exceeds that cost of the levee or floodwall construction and maintenance, and when upstream and downstream impacts can be mitigated (FEMA, 2013b, P. 54). Constructed levees in DuPage County are shown in Table 6-3.

Table 6-3
DuPage County Levee and Barrier Projects – Constructed

Watershed	Project	Year Completed	Maintenance
Salt Creek	Addison Dam and Pump (Westwood Creek backflow prevention)	1995	Addison
Salt Creek	Kingery West Levee (east side of Salt Creek)	1982	DuPage County
Salt Creek	Elmhurst Levee	1991	DuPage County
East Branch DuPage River	East Branch DuPage River and St. Joseph Creek in Lisle (Levee)	1968	DuPage County
West Branch DuPage River	Winfield Creek in Wheaton	1977	--
East Branch DuPage River	Dumoulin Pump Stations	2008	DuPage County
West Branch DuPage River	River Road Levee	2016	DuPage County
Salt Creek	Graue Mill Levee	2017	Hinsdale

In 1977, a levee was constructed to protect homes in the Winfield Creek watershed in Wheaton (100-year design). A portion of the levee eroded during the 1987 flood. The levee was repaired. The Elmhurst levee was constructed in 1991 to protect homes from Salt Creek flooding (100-year design). The levee was constructed as the Elmhurst Quarry reservoir was being designed to provide storage of floodwaters. In Villa Park a berm was constructed at Rotary Park in the Salt Creek watershed (50-year design). In the 1960s, channel improvements were made and levees constructed along the East Branch of the DuPage River (from Middleton Avenue to Maple Avenue) and St. Joseph Creek (from confluence with the East Branch DuPage River to Illinois State Route 53) in Lisle. As part of the River Dumoulin Flood Control Study, the County has proposed repair of the Lisle levees. However, easements from private property owners for this work have been difficult to obtain and the repairs have not been completed as a result.

DuPage County Stormwater Management oversaw the design and construction of the Bower School berm enhancement project to protect the school from flooding from the adjacent West Branch DuPage River. The improvement to the school's existing berm follows a flood in 2008 that caused the school to close for a week. The project removed the school from the high-risk flood zone and protected the school in the April 2013 flood event. Following this project, a berm was constructed along River Road – upstream from the school – which protected approximately 60 additional structures. This was completed in 2016.

The West Branch DuPage River Flood Control and Re-meander Project was the final phase of work to address the flooding concerns along River Road in Warrenville. The project was completed in October 2016. Improvements included: the extension of a flood control berm and multi-use path along River Road, creation of compensatory storage in Leone Schmidt Heritage Park, realignment of the West Branch DuPage River, and associated river restoration. The DuPage County Division of Transportation reduced the existing water surface elevations by the re-meander realignment of the river with the replacement of the Warrenville Road bridge in 2015.

DuPage County in cooperation with the Village of Hinsdale, IDNR-OWR and IEMA have been working on the multi-phase Graue Mill Levee project which will provide enhanced protection for its residents. This project is undergoing the final phase of work necessary which includes floodwalls, berms and pump stations. The anticipated final project completion is May 2018.

6.3 Channel Improvements and Diversions

By improving channel's conveyance, more water is carried away at a faster rate. Three types of channel improvements are reviewed here: projects that make the channel wider, straighter or smoother; dredging the channel bottom; and diversion of high flows to another channel or body of water.

Straightening, deepening and/or widening a stream or river channel, commonly referred to as "channelization" (Encyclopedia, 2016), which is commonly used for local drainage

or flooding problems. In DuPage County, detention projects are usually considered with channel improvements.

Dredging for the purpose of floodwater management is often viewed as a form of conveyance improvement. However, it has the following limitations (Environmental Protection Agency, 1998):

- Dredging is often cost prohibitive because the dredged material must be disposed of somewhere else (out of the floodplain).
- Unless instream and/or tributary erosion are corrected upstream, the dredged areas usually fill back in within a few years.
- If the channel has not been disturbed for many years, dredging will destroy the habitat that has developed.
- To protect the natural values of the stream, federal law requires a Corps of Engineers permit before dredging can proceed. This can be a lengthy process that requires much advance planning and many safeguards to protect habitat.

A diversion is a new channel that sends floodwaters to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During flood flows, the floodwaters spill over to the diversion channel or tunnel, which carries the excess water to a receiving lake or river. Diversions are limited by topography; they will not work in some areas. Unless the receiving water body is relatively close to the flood prone stream and the land in between is low and vacant, the cost of creating a diversion can be prohibitive (Environmental Protection Agency, 1999).

The channel enlargement on Willoway Brook in the East Branch DuPage River watershed (100-year design) constructed in 1990 in Wheaton performed well during the 1996 flood. DuPage County channel improvement projects are included in Table 6-4.

Table 6-4
DuPage County Channel Improvement Projects – Constructed

Watershed	Project	Year Completed	Maintenance
Salt Creek	Salt Creek Channel Improvement	1992	Oak Brook, Elmhurst
Salt Creek	Bensenville Ditch	1998	Bensenville
East Branch DuPage River	St. Joseph Creek Channel Improvement	1990	Downers Grove
East Branch DuPage River	Willoway Brook	1990	Wheaton
West Branch DuPage River	West Branch DuPage River Channel Improvement	1992	Hanover Park
West Branch DuPage River	Long Meadow Road Channel Improvement	1981	Hanover Park
West Branch DuPage River	West Branch DuPage River Improvements (10 mile project)	2015	Property Owners
East Branch DuPage River	Lacey Creek Streambank Stabilization	2017	Downers Grove

6.4 Crossings and Roadways

In some cases buildings may be elevated above floodwaters but access to the building is lost when floodwaters overtop local roadways, driveways, and culverts or ditches. Depending on the recurrence interval between floods, the availability of alternative access, and the level of need for access, it may be economically justifiable to elevate some roadways and improve crossing points.

For example, if there is sufficient downstream channel capacity, a small culvert that constricts flow and causes localized backwater flooding may be replaced with a larger culvert to eliminate flooding at the waterway crossing point. The potential for worsening adjacent or downstream flooding needs to be considered before implementing any crossing or roadway drainage improvements.

The bridges shown in Table 6-5 have been identified by DuPage County communities as those which impede or obstruct flow. The roadways included in the table are those that could be elevated to provide continued access during flooding.

Table 6-5
DuPage County Bridges and Roadways that Impede Flood Flows

Community	Bridge or Roadway
Village of Downers Grove	Highland Avenue
Village of Downers Grove	55th Street and Grand Avenue
Village of Downers Grove	Fairview Avenue and Maple Avenue Creek, East Branch
Village of Downers Grove	Fairview Avenue and 56th
Village of Itasca	Maple Street Bridge
Village of Itasca	Irving Park Road Bridge
Village of Itasca	Elm Street (private bridge to Itasca Country Club)
Village of Itasca	North Prospect Avenue
Village of Lisle	Burlington Northern railroad culvert at south end of Elm Street
Village of Roselle	Foster Avenue Bridge (Improvement proposed)
Village of Villa Park	Possibly St. Charles Road at Salt Creek
Village of Villa Park	Possibly Villa Avenue at Sugar Creek
City of Wheaton	1700 Block of North Main Street
City of Wheaton	Bridge at Marianjoy Rehabilitation Hospital
Village of Winfield	Winfield Road at Winfield Creek (aka Spring Brook)
Village of Winfield	Park Street at Winfield Creek
Village of Winfield	Church Street at Winfield Creek
Village of Winfield	Summit Drive at Winfield Creek
Village of Winfield	East Street at Winfield Creek
Village of Winfield	Manchester Road at Winfield Creek
Village of Winfield	Roosevelt & Shaffner Roads at Winfield Creek
City of Wood Dale	Irving Park Road at Salt Creek (in design)

6.5 Drainage and Storm Sewer Improvements

Manmade ditches and storm sewers help drain areas where the surface drainage system is inadequate, or where underground drainageways may be safer or more practical. Storm sewer improvements include installing new sewers, enlarging small pipes, and preventing back flows. Particularly appropriate for depressions and low spots that will not drain naturally, drainage and storm sewer improvements usually are designed to carry the runoff from smaller, more frequent storms.

The DuPage County Department of Public Works administers and manages the Residential Drainage Assistance Program (RDAP). The objective of this program is to assist County residents in correcting drainage concerns within unincorporated areas. The department can offer technical support and/or guidance to residents if a drainage concern does not qualify for construction improvements.

Many contributing factors can result in standing water on your property, ranging from the type of soils to topographical information. Some properties simply take longer to drain than others. Improvements projects are only recommended for small local problems where the receiving stream or river has sufficient capacity to handle the additional volume and flow of water. To reduce the cumulative downstream flood impacts of numerous small drainage projects, additional detention or run-off reduction practices should be provided in conjunction with the drainage system improvements.

A combination of restored wetland detention, vegetated swales, infiltration trenches and other best management practices that increase infiltration (reducing runoff), and improve water quality can be implemented in conjunction with stormwater system improvements.

Most DuPage County communities include storm sewer and drainage improvements annually in their capital budgets. Many communities have also implemented projects to address areas with combined sewers.

Drainage System Maintenance: The drainage system may include detention ponds, stream channels, swales, ditches and culverts. Drainage system maintenance is an ongoing program to clean out blockages caused by an accumulation of sediment or overgrowth of weedy, non-native vegetation or debris, and remediation of streambank erosion sites.

“Debris” refers to a wide range of blockage materials that may include tree limbs and branches that accumulate naturally, or large items of trash or lawn waste accidentally or intentionally dumped into channels, drainage swales or detention basins (West’s Encyclopedia of American Law, 2005). Maintenance of detention ponds may also require revegetation or repairs of the restrictor pipe, berm or overflow structure.

Maintenance activities normally do not alter the shape of the channel or pond, but they do affect how well the drainage system can do its job. Sometimes it is difficult to determine what separates debris that should be removed from natural material that helps form habitat. Therefore, written procedures that are consistent with state laws and

environmental concerns are usually needed (Federal Emergency Management Agency, 2014).

Government agencies usually accept responsibility for maintaining facilities on public property. However, in Illinois, the responsibility for drainageway maintenance on private property, when no easements have been granted, is with the individual private property owner. This often results in very little maintenance being accomplished. Table 6-6 shows drainage system maintenance activity in DuPage County.

Table 6-6
DuPage County Drainage System Maintenance

Community	Regular Drainage System Maintenance*	Written Procedures
Village of Addison	Yes	Unknown
City of Aurora	Yes	Unknown
Village of Bartlett	Yes	Unknown
Village of Bensenville	Yes	No
Village of Bloomingdale	Yes	Unknown
Village of Burr Ridge	Yes	Unknown
Village of Carol Stream	Yes	Yes
Village of Clarendon Hills	Yes	Unknown
City of Darien	Yes	Unknown
Village of Downers Grove	Yes	Unknown
City of Elmhurst	Yes	Unknown
Village of Glendale Heights	Yes	Yes
Village of Glen Ellyn	Yes	No
Village of Hanover Park	Yes	Unknown
Village of Hinsdale	Yes	Unknown
Village of Itasca	Yes	Unknown
Village of Lisle	Yes	Yes
Village of Lombard	Yes	Unknown
City of Naperville	Yes	No
Village of Oak Brook	Yes	No
City of Oakbrook Terrace	Yes	Unknown
Village of Roselle	Yes	Unknown
Village of Villa Park	Yes	Unknown
City of Warrenville	Yes	No
City of West Chicago	Yes	Unknown
Village of Westmont	Yes	Unknown
City of Wheaton	Yes	Unknown
Village of Willowbrook	Yes	Yes
Village of Winfield	Yes	Unknown
City of Wood Dale	Yes	Unknown
Village of Woodridge	Yes	Yes
DuPage County	Yes	--

*Based on information received for the 2017 Natural Hazard Mitigation Plan Annual Report

6.6 DuPage County Planned Structural Projects

DuPage County Stormwater Management is continually conducting and identifying structural mitigation projects. Table 6-7 lists the structural projects identified by the DuPage County Stormwater Division through the developed watershed plans. Table 6-8 shows projects not yet funded.

Table 6-7
DuPage County Planned Stormwater Management Projects with Identified Funding

Planned Project	Estimated Cost	Estimated Completion Date	Funding Source
Kress Road – Union Pacific RR Culvert	$1,850,000	Completed - 2008	--
Kress Creek – Prairie Path, Western Drive, and Downs Dr Culvert	$800,000	Completed - 2008	--
Kress Creek – Airport Diversion	$650,000	Completed - 2012	--
Springbrook Creek Watershed Plan Implementation	$450,000	Completed - 2016	--
Brewster Creek Flood Mitigation	$5,200,000	Completed - 2012	--
Klein Creek/Armstrong Park Flood	$11,000,000	Completed - 2015	--
Winfield Creek – Main Street	$400,000	Completed - 2013	--
West Branch/Warrenville Flood Mitigation	$5,500,000	Completed - 2016	--
Busse Woods Dam Modification	$1,100,000	Completed - 2015	--
Spring Brook No.1 Watershed Plan	$600,000	Completed - 2016	--
River Dumoulin Levee Maintenance	$70,000	In Progress - 2018	--
Spring Creek Reservoir Gate	$950,000	In Progress - 2018	DuPage County
Redmond Reservoir Expansion Project	$3,000,000	In Progress - 2018	HUD
Pearl Avenue Drainage Project	$100,000	In Progress - 2018	DuPage County
Voluntary Flood-Prone Buyouts	$9,596,285	In Progress - 2018	HUD, FEMA
Liberty Park Flood Control Project	$3,000,000	In Progress - 2019	HUD

Table 6-8
DuPage County Planned Stormwater Management Projects Without Funding

Planned Project	Location	Estimated Cost
River Dumoulin Levee Flood Control	Lisle	$15,000,000
Valley View Storage Alternatives	Glen Ellyn	$6,500,000
St. Joseph Creek Storage Project	Lisle/Glen Ellyn	$5,000,000
High Ridge Forest Preserve Storage Basin	Lombard	$1,800,000
Voluntary Flood-Prone Buyouts (27 Properties)	Countywide	$6,750,000
Lufkin Pond & Jackson Pond Expansions	Villa Park	$2,400,000
Winfield Creek Watershed Flood Control	Winfield	$3,150,000
Westmore-Meyers Culvert Replacement &	Lombard	$1,400,000
Arrowhead Subdivision Drainage Project	Wheaton	$300,000
Luther & Roosevelt Drainage & Flood Control	Lombard	$750,000
Nelson's Highview Drainage & Flood Control	Glendale Heights	$300,000
Woods & Geneva Drainage Project	Winfield	$300,000
Yorkfield Drainage & Flood Control Project	Elmhurst	$300,000
East of Main Street Drainage Project	Glen Ellyn	$250,000
Total:	**--**	**$44,200,000**

Bensenville: In 2012, the Village of Bensenville completed a Storm Sewer Master Plan, and further studied recommended master plan projects in 2014, including for the Addison Creek watershed. Table 6-9 outlines current projects within the Village that are identified by unfunded. In addition, the Bensenville Ditch watershed is currently being studied by an outside consultant, and two projects are currently underway. The first, Addison Creek -Alt 5 – George St. Bypass storm sewer improvements has an estimated total cost of $1,670,000, and is projected to be complete in 2018. The second, Addison Creek -Storage Alternative 2 – Redmond Reservoir partial expansion has an estimated total cost of $2,750,000, and is projected to be complete in 2018.

Table 6-9

Village of Bensenville Planned Projects Without Funding

Planned Project	Estimated Cost
Bensenville Ditch- Area B1- Center/Roosevelt - Storm sewer Improvements*	$1,190,000
Bensenville Ditch- Area B2- Grove/Wood - Storm sewer Improvements*	$360,000
Bensenville Ditch- Area B3- Church/Green- Storm sewer Improvements*	$1,460,000
Bensenville Ditch- Area B4- Fenton HS- Basin/Storm sewer Improvements*	$6,610,000
Bensenville Ditch- Area B5- IL83/Hillside/IL19- Storm sewer Improvements*	$5,950,000
Bensenville Ditch- Area B6- Glendale/Franzen - Storm sewer Improvements*	$1,860,000
Addison Creek - Area A1 - Wood/Addison/Evergreen- Storm Sewer Improvements #	$13,779,000
Addison Creek - Area A2 - Belmont/David- Storm Sewer Improvements #	$2,800,000
Addison Creek - Area A3 – Entry/Bernice- Storm Sewer Improvements #	$1,100,000
Addison Creek - Area A4 – 3rd Ave/Jefferson St- Storm Sewer Improvements #	$4,000,000
Total	**$39,109,000**

(*) 2012 Estimated Cost / (#) 2014 Estimated Cost

Downers Grove: The Village of Downers Grove has identified projects with funding (Table 6-10) and two projects without an an identified funding source. The first, Curtiss Avenue stormwater improvements, has an estimated cost of $750,000 and a proposed completion date of 2020.The second, Lee/Cornell/Stonewall stormwater improvements, has an estimated cost of $650,000 and a proposed completion date of 2024.

Table 6-10

Village of Downers Grove Planned Projects with Funding

Planned Project	Estimated Cost	Estimated Completion Date
Chase/Fransisco Stormwater Improvements	$800,000	Actual completion November 2017
Jefferson/Middaugh Stormwater Improvements	$600,000	Actual completion November 2017
Hitchcock Stormwater Improvements	$500,000	In Progress - Summer 2018
Elm and Earlston Stormwater Improvements	$500,000	In Progress - Summer 2018
Drendel Road Stormwater Improvements	$750,000	In Progress - Summer 2018
Black Oak Stormwater Improvements	$500,000	In Progress - Summer 2018
Debolt/Linden/Gierz Stormwater Improvements	$2,000,000	Spring/Summer 2019
Forest/Franklin/Prince/Prairie	$300,000	In Progress - Summer 2018
Hobson Triangle Stormwater Improvements	$650,000	In Progress - Summer 2018
40th and Downers Stormwater Improvments	$1,000,000	Spring/Summer 2019
Deer Creek Floodplain Stormwater Improvements	$2,000,000	2020
St. Joe's Creek Stormwater Improvements (Hummer Park)	$3,000,000	2020
St. Joe's Creek Stormwater Improvements (Elmwood/Maple)	$1,000,000	2020

Villa Park: In 2015, the Village of Villa Park completed two flood studies, the Sugar Creek Watershed Drainage Project and the Villa Park Comprehensive Flood Study, which identified 17 projects to improve drainage in various areas of Villa Park. These 17 proposed projects are currently unfunded. Table 6-11 outlines the proposed estimated cost for the entirety of each project.

Table 6-11
Village of Villa Park Planned Projects Without Funding

Planned Project	Estimated Cost
Sugar Creek Watershed Drainage Improvement Project - Project alternative 1c	$6,744,000.00
Sugar Creek Watershed Drainage Improvement Project - Project Alternative 2a	$21,000.00
Sugar Creek Watershed Drainage Improvement Project - Project Alternative 3a, 3b, 3c	$2,272,000.00
Sugar Creek Watershed Drainage Improvement Project - Project Alternative 4a	$1,856,000.00
Villa Park Comprehensive Flood Study - 400 S Monterey Avenue	$3,792,000.00
Villa Park Comprehensive Flood Study - Washington Street Alt. #2	$9,372,000.00
Villa Park Comprehensive Flood Study - Astor Ct. and Myrtle Ave.	$1,533,000.00
Villa Park Comprehensive Flood Study - Elm Street - #1	$4,368,000.00
Villa Park Comprehensive Flood Study - Summit Avenue	$955,000.00
Villa Park Comprehensive Flood Study - Villa and Summit Avenues	$2,051,000.00
Villa Park Comprehensive Flood Study - Twin Lakes	$3,313,000.00
Villa Park Comprehensive Flood Study - Odeum	$1,131,000.00
Villa Park Comprehensive Flood Study - Michigan Avenue	$3,861,000.00
Villa Park Comprehensive Flood Study - Riordan Road	$440,000.00
Villa Park Comprehensive Flood Study - Charles Avenue	$1,692,000.00
Villa Park Comprehensive Flood Study - Rotary Park	$846,000.00
Villa Park Comprehensive Flood Study - Brer Rabbit Motel	$1,710,000.00
Total	**$45,957,000.00**

Additionally, other projects that have been identified by DuPage County communities – including those that are in progress, proposed with funding, and proposed without funding - include:

- A reservoir to alleviate flooding on Sugar Creek in Villa Park
- North Main Street at Winfield Creek is being studied by the City of Wheaton for potential culvert and channel enlargements
- Lake Ellyn Outlet Control Structure Improvements Project in Glen Ellyn
- Detention and floodplain improvements in the Town Center area in Winfield
- Levee repair and restoration in Lisle; part of the River Dumoulin Flood Control Study
- Klein Creek stream bank rehabilitation, which is a tributary to the West Branch of the DuPage River
- Stormwater detention pond shoreline stabilization efforts, with the consideration of bio-engineering techniques and native, erosion-resistant, plant material in Carol Stream
- DuPage River Feasibility Study with the U.S. Army Corps of Engineers, DuPage County Stormwater Management, and Lisle
- Indian Lakes Subdivision open space drainage improvements in Bloomingdale

- North Avenue Flood Alleviation Project in Glendale Heights
- Relocating the Route 53 Stormwater Pumping Station with a higher flow rate capacity to reduce flooding in the northwest part of Lombard
- Gatz Pond Outfall Project and associated North Broadway Interim Pump Station and Forced Main Project in Lombard
- Graue Mill Flood Protection Project, funded by a $2,576,475 grant through the Hazard Mitigation Grant Program, in Hinsdale

6.8 Conclusions

1. The DuPage County Stormwater Management Program is important to DuPage County and its municipalities. Proper funding of the program is necessary.

2. Structural projects, including reservoirs, channel improvements and levees, have been effective in reducing flood damage in DuPage County, to the extent that they have been tested.

3. It is understood that structural projects can have adverse impacts on downstream properties and on the environment.

4. Structural measures should continue to be used in DuPage County to address flood problems. It is understood new flood problem areas can be identified at any time; after any flood event.

5. Structural projects can be effective in protecting critical facilities from natural hazards.

6. There are a number of locations where bridge or culvert replacement or enlargement should be investigated.

7. Local drainage and stormwater flooding (both in and outside the floodplain) could be reduced through drainage system improvements.

8. Drainage maintenance programs in communities are important throughout the County.

6.7 Recommendations

1. Structural flood control projects, including drainage and bridge and culvert improvements, should be pursued and funded, provided they meet the following criteria:

- Each project's study looks beyond the immediate project site to ensure that no other properties will be adversely impacted.
- Each project should be based on a watershed master plan or, at a minimum, coordinated with other projects in the same watershed.
- Each project's study considers protecting the natural functions of the stream and floodplain, in addition to flood protection.
- Each project's study considers alternative non-structural approaches to protect the affected properties from flood damage.

- The design and construction is certified by a licensed professional engineer.
- Opportunities for stream and natural areas restoration are incorporated wherever feasible.
- Communities and property owners that may be affected by the project are notified.
- All relevant federal, state and local permits are obtained, including Corps of Engineer's permits and IDNR floodway permits.

2. The DuPage County Stormwater Management program should continue to be funded through appropriate funding mechanisms.

3. The DuPage County Stormwater Management program and municipalities should continue to identify, plan and implement structural flood control projects both before and following flood events.

4. Funding for municipal or regional structural measures in DuPage County should be sought as it is made available through FEMA hazard mitigation programs.

5. Flood problem areas in DuPage County that should be considered for structural mitigation are not limited to those identified in this Plan. Flood problems should be addressed as they are identified.

6. Each municipality and the County should implement a formal and regular drainage system maintenance program.

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Chapter 7 – Natural Resource Protection

Natural Resource Protection "activities preserve or restore natural areas or the natural functions of floodplain and watershed areas" (FEMA, 2017, P. 510-20). Examples of these activities include (FEMA, 2017, P. 510-20):

- Wetlands Protection
- Erosion and Sediment Control
- Natural Area Preservation
- Natural Area Restoration
- Water Quality Improvement
- Coastal Barrier Protection
- Environmental Corridors
- Natural Functions Protection

For information on erosion and sediment control, see Chapter 4.

7.1 Open Space Preservation

Keeping the floodplain and other hazardous areas open and free from development is the best approach to preventing damage to new developments. Open space can be parks, greenway corridors, and golf courses. Capital improvement plans and comprehensive land use plans can identify areas to be preserved through any or all of the following means:

- Acquisition,
- Dedication by developers,
- Dedicating or purchasing an easement to keep the land open,
- Specifying setbacks or buffer zones where development is not allowed, and
- Subdivision regulations need to ensure that streets and other public facilities can handle emergency vehicles during an emergency.

"For over a century, the Forest Preserve District has been acquiring land in support of its mission "to acquire and hold lands containing forests, prairies, wetlands and associated plant communities or lands capable of being restored to such natural conditions for the purpose of protecting and preserving the flora, fauna and scenic beauty for the education, pleasure and recreation of its citizens" (Forest Preserve District of DuPage" County, N.D.).

"To guarantee future residents the benefits of a healthy balance between urban development and natural areas, [the Forest Preserve District Board] established a target ratio of 25 acres of forest preserve land for every 1,000 residents" (Forest Preserve District of DuPage County, N.D.). As of 2017, the Forest Preserve met that goal and established a new goal of using tax dollars to both maintain and improve the existing land under their care. Examples include, restoring native habitats, developing new trails, and increasing the use of the land by County residents.

7.2 Wetland Protection

Wetlands often found in floodplains and depressional areas of a watershed "generally include swamps, bogs, marshes, wooded wetlands, ponds, streams, wet meadows and similar areas. "For regulatory purposes under the Clean Water Act, the term wetlands means 'those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas' [taken from the EPA Regulations listed at 40 CFR 230.3(t)]" (DuPage County, N.D.).

Three factors are used to determine the presence of wetlands (according to the 1987 Army Corps of Engineers Delineation Manual):

1. "Hydric Soils - Soils which present certain characteristics when saturated
2. Hydrophytic vegetation – Plants which grow in water or saturated soils
3. Hydrology - Soils saturated with water"
   (DuPage County, N.D.)

Wetlands provide several natural benefits, including pollutant removal, flood control, groundwater regeneration, and a natural habitat for plants and animals to live and grow (DuPage County, N.D.). For additional information on each of these natural benefits, see Exhibit 7-1 (DuPage County, N.D.)

Exhibit 7-1
Natural Watershed Benefits

Pollutant Removal	Flood Control	Groundwater Regeneration	Natural Habitat
"Wetlands help to filter pollutants out of the water and filter nutrients into the soil, enriching the soil for future plant growth. When water flows through thick wetland vegetation and open water, it slows down allowing sediment and certain pollutants to settle to the bottom. Over time, the sediment becomes incorporated into the wetland soil. Over a very long period of time, sediments build up so much that the wetland may fill in and eventually become dry land. This process is called natural succession."	"Wetlands can contain and slow down large amounts of water runoff from heavy storms resulting in less flooding. In fact, one acre of wetlands has the potential to store 1 to 1 ½ million gallons of floodwater."	"Wetlands also help to regenerate our groundwater supply by filtering stormwater runoff though the system to remove pollutants and returning it to underground aquifers. When water is allowed to pond in a wetland, it may begin to soak into the soil to an aquifer below. The soil acts as a filter which removes most contaminants before it reaches the groundwater supply."	"Many species of animals and plants depend on wetlands for habitat and nourishment. Birds use wetlands for nesting and migratory purposes. Nearly half of all endangered species depend on wetlands for survival! Wetlands also provide habitat to diverse plant life. Wetlands make up approximately 5% of land in the continental U.S., but almost 1/3 of our plant species can be found in wetlands."

DuPage County has been recognized for having a comprehensive stormwater management program. A component of this program is based on protecting the many benefits provided by wetlands and buffers, primarily by enforcing the DuPage County Countywide Stormwater and Flood Plain Ordinance. Since many wetland and buffer functions are difficult, expensive, and sometimes impossible to replace, the Ordinance requires that an applicant avoid or minimize impacts to wetland if possible. Wetland

impacts are to be replaced, or mitigated, in the same watershed. Impacted buffer functions are replaced in kind. Wetland replacement ratios and buffer widths are based on the quality of a wetland which is determined by analyses of habitat and vegetation quality, and the presence of endangered or threatened species.

DuPage County Stormwater Management hosts training for environmental professionals on regulations, wetland soils, botany, water quality, and more. County staff regularly participates in professional seminars and community events as speakers, organizers, and facilitators. Information about wetlands, wetland and riparian buffers, and water quality is available on the County website.

Examples of wetland protection projects conducted by Stormwater Management, DuPage County Building and Zoning, and municipal partners can be found within Table 7-1. A map of County wetlands can be found within Exhibit 7-2.

Table 7-1
DuPage Wetland Protection Projects

Project	Location	Status
Native Demonstration Garden	421 County Farm Rd, Wheaton	Completed - 2009
Cricket Creek Wetland Bank	Cricket Creek Forest Preserve, Addison	Completed - 2008
Downers Grove Wetland Mitigation Project	40th St and Glendenning Rd, Downers Grove	In Progress
Springbrook Wetland Migration Bank	Springbrook Prairie Forest Preserve, Naperville	In Progress

7.3 Stream Restoration

Stream restoration activities have several names, such as “stream conservation”, “bioengineering”, or “riparian corridor restoration.” The objective of these approaches is to return streams, streambanks, and adjacent land to a more natural condition, including natural meanders. Another term is “ecological restoration” which restores native indigenous plants and animals to an area.

A key component of these efforts is to use appropriate native plantings along the banks that resist erosion. This may involve retrofitting the shoreline with willow cuttings, wetland plants, and/or rolls of landscape material covered with a natural fabric that decomposes after the banks are stabilized with plant roots.

In all, restoring the right vegetation to a stream has the following advantages:

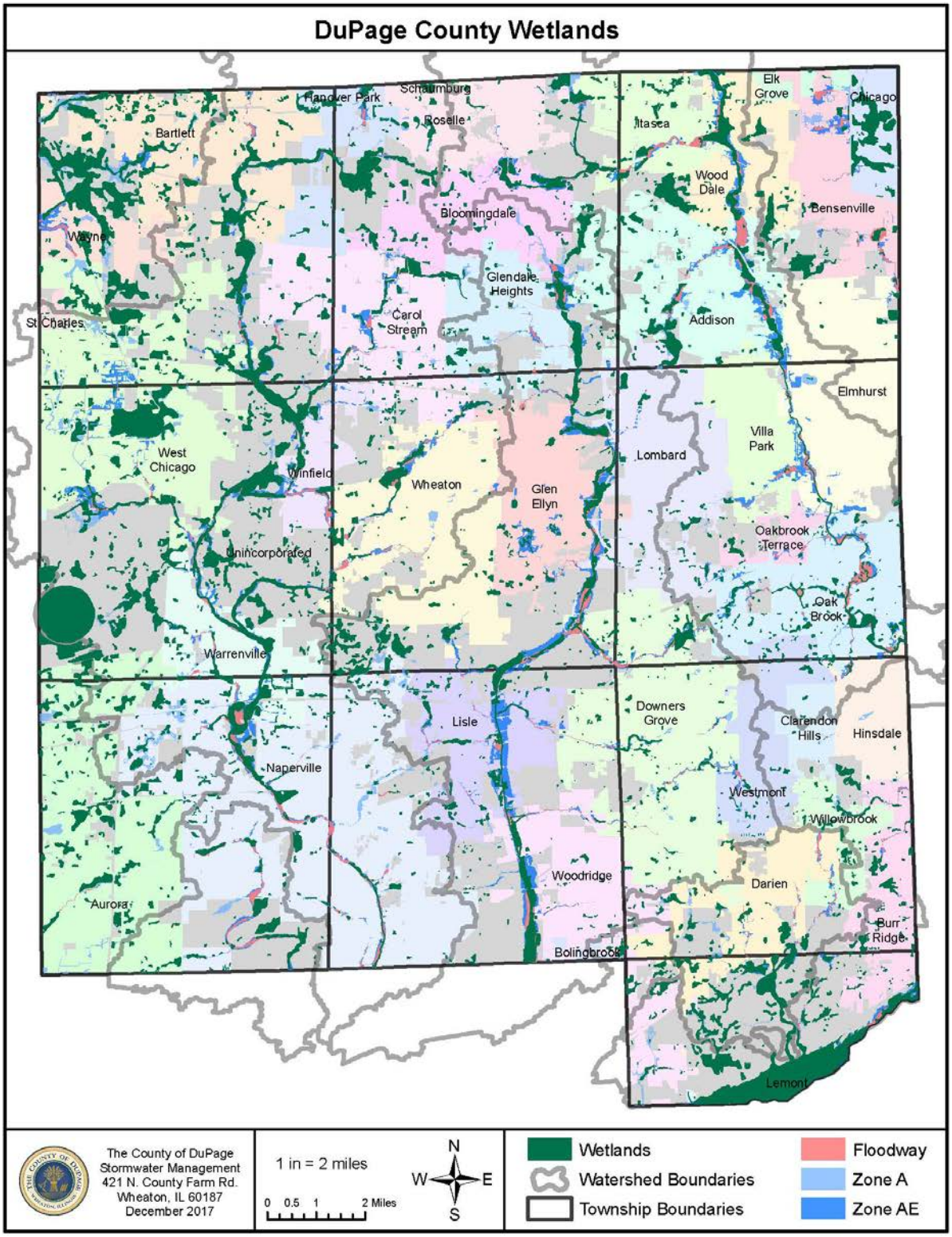
- Reduces the amount of sediment and pollutants entering the water
- Enhances aquatic habitat by cooling water temperature
- Provides food and shelter for both aquatic and terrestrial wildlife
- Can reduce flood damage by slowing the velocity of water
- Prevents property loss due to erosion
- Provides recreational opportunities, such as hunting, fishing, and bird watching
- Reduces long-term maintenance costs

The increased quantity of stormwater runoff entering receiving waters results in the loss of equilibrium in natural water features and associated negative impacts such as shoreline and stream bank erosion, channel down cutting, and wetland sedimentation. Development within wetlands, floodplains, and riparian areas results in the loss of the stormwater benefits provided by these water resource features further exacerbating negative impacts to the watershed. Eventually, a point may be reached where the social and economic costs due to the loss of water resources becomes unacceptable to the populace. The cost to mitigate for lost water resource benefits due to development can be taxing on local and State government.

Maintaining Native Vegetated Open Spaces: An area of open space that is a minimum of 25 feet in width shall be maintained or established adjacent to Waters of DuPage where the riparian environment or buffer is not present or is less restrictive than 25 feet. The ground cover in this area shall be native, non-invasive vegetation. Enhancement of an existing special management area may be considered a BMP where no enhancement would be proposed as enhancement for impacts to Special Management Areas caused by development. Maintaining or establishing natively vegetated open spaces that are not considered a Special Management Area under the DuPage County Countywide Stormwater and Flood Plain Ordinance (“ordinance”) may also serve as an appropriate Best Management Practices (BMP). These areas will be reviewed on a case by case basis.

The ordinance is identified as Appendix F of the DuPage County Stormwater Management Plan. The ordinance is enforced Countywide through cooperation with County municipalities. The ordinance is the primary regulation affecting new development within the County. It regulates all activities that affect the discharge of stormwater. The ordinance includes permit requirements for stormwater runoff, stormwater detention, wetlands, floodplain, floodway, riparian, and water quality BMPs. The ordinance is typically updated on an annual basis. It is important to refer to the current ordinance.

Exhibit 7-2
DuPage County Wetlands



7.4 Urban Forestry

According to Tree City USA, a national program sponsored by the Arbor Day Foundation in partnership with the U.S. Forest Service and the National Association of State Foresters, maintaining an urban forestry program offers both direct and indirect benefits to a community and its residents. These benefits are outlined within Exhibit 7-4 (Arbor Day Foundation, N.D.a) By meeting four fundamental standards a community can become a certified Tree City USA member, joining more than 3,400 other communities nationwide. The Tree City USA four core standards of sound urban forestry management are (Arbor Day Foundation, N.D.b):

- Maintaining a tree board or department.
- Having a community tree ordinance.
- Spending at least $2 per capita on urban forestry.
- Celebrate Arbor Day.

Exhibit 7-3 lists communities within DuPage County that participate in Tree City USA (Arbor Day Foundation, 2017).

Exhibit 7-3
Tree City USA Participants

Community Name	Years Participated	Community Name	Years Participated
Addison	29	Lisle	25
Bensenville	26	Lombard	27
Bloomingdale	22	Naperville	27
Burr Ridge	23	Roselle	31
Clarendon Hills	27	Villa Park	32
Downers Grove	33	Warrenville	30
Elmhurst	37	Wayne	20
Glen Ellyn	33	Westmont	21
Glendale Heights	20	Wheaton	31
Hanover Park	32	Wood Dale	12
Hinsdale	25	Woodridge	26
Itasca	32		

Exhibit 7-4
Tree City USA Benefits

Reduce costs for energy, stormwater management, and erosion control. Trees yield 3–5 times their cost in overall benefits to the city.

Cut energy consumption by up to 25%. Studies indicate that as few as three additional trees planted around each building in the United States could save $2 billion annually in energy costs.

Boost property values across your community. Properly placed trees can increase property values from 7–20%. Buildings in wooded areas rent more quickly, and tenants stay longer.

Build stronger ties to your neighborhood and community. Trees and green spaces directly correlate to greater connections to neighbors.

Honor your community and demonstrate your commitment to a healthier environment through Arbor Day celebrations and Tree City USA recognition.

Benefit from a framework for action provided by the four core standards. Many communities use the Tree City USA standards as a way to begin caring for city trees. Others regularly enhance urban forest management through improved ordinances, innovative programs and increased emphasis on planting and care.

Educate people living in your city about the value of trees and the importance of sustainable tree management. Annual participation as a Tree City USA community provides this opportunity and makes it easier to engage individuals and organizations throughout the city. Tree City USA status can also create a strong working relationship with your state forestry agency and other groups.

Improve community pride. Participation in the Tree City USA program helps residents feel good about the place they live and work. Annual recognition shows visitors and prospective residents that trees, conservation, and the environment are important to your community.

Gain publicity with recognition materials. Tree boards, parks departments, public works officials and volunteers are recognized for the valuable work they provide to the community. Many communities share their Tree City USA recognition across city departments as well as with elected officials, students and business leaders.

7.5 Waste Management and Recycling

In 1988, Illinois enacted the Solid Waste Planning and Recycling Act. This Act mandated that “counties must each submit to the Illinois Environmental Protection Agency an officially adopted plan for the management of municipal waste generated within its boundaries. The Act serves to encourage the continuous planning for solid waste management and pushes local governments to perpetually move forward with a waste reduction and recycling agenda” (DuPage County, 2017, P. 3).

The 2017 DuPage County Solid Waste Management Plan “evaluates the waste disposal capacity of the County, electronic recycling coverage, and identifies food scrap collection and compost feasibility within the County. The initial Solid Waste Management Plan included multiple recommendations to reduce, recycle and handle solid waste. The

County, along with many valuable local government and private sector partners successfully completed several goals including: construction and operation of a regional recycling center and a household hazardous waste facility; the establishment of several recycling drop-off locations; a latex paint recycling and reuse program; an environmental education program as well as supporting reduced requirements on construction and demolition debris recycling" (DuPage County, 2017, P. 3).

"In 2014, the Illinois Department of Commerce and Economic Opportunity commissioned the Illinois Recycling Association who utilized CDM Smith to complete an update to the 2008 Illinois Commodity/Waste Generation Study 21. The report developed metrics for municipal solid waste and industrial, commercial and institutional solid waste generated throughout the State of Illinois. Their methodology included sampling at landfills, modeling to account for moisture content and calculations for commercially generated waste. The data provides the State with a better understanding of what items are being landfilled and enables entities to prioritize efforts based on recycling, diversion availability, and quantity of varying categories of waste. The data can also be folded into strategic planning efforts at the county level" (DuPage County, 2017, P. 5). Based on this study's findings, study updates, and data collected by DuPage County, estimates on total Municipal Solid Waste (MSW) across the County for residential, institutional, commercial, and light-industrial (ICI), and construction and demolition (C&D) have been collected. This data can be found in Exhibit 7-5 (DuPage County, 2017, P. 8). In addition, waste and recycling data broken down by each municipality can be found within Exhibit 7-6 (DuPage County, 2017, P. 18).

Exhibit 7-5

Historical Waste Generation Estimates for DuPage County Solid Waste Management Plans

Year	Population	lbs./Capita/Day	Estimated tons of MSW/day (Residential, ICI, C&D)	Countywide estimated tons /year
1990	781,200	8.0	3,124	1,140,260
1996	843,067	7.17	3,022	1,103,030
2001	904,161	6.9	3,119	1,138,564
2007	932,670(1)	6.9	3,217	1,276,592
2012	929,760(1)	9.19(2)	4,272	1,537,842
2017	929,368(1)	8.7(2)	4,042	1,475,604

Table 3

(1) Population based on growth estimates not actual U.S. Census data.

(2) Rate taken from Illinois Commodity/Waste Generation and Characterization Studies

In 2014, the Solid Waste Hauling and Recycling Program Act was adopted, requiring waste management facilities provide recycling services to commercial facilities within the Chicagoland area (DuPage County, 2017, P. 3). "Although commercial waste franchises are not typically found in DuPage County there are a few municipalities that maintain these agreements, the Village of Addison, the Village of Lombard and the City of Oakbrook Terrace. The commercial waste franchise agreement cover businesses and multi-family structures waste and recycling services" (DuPage County, 2017, P. 9).

Exhibit 7-6
Municipal Waste and Recycling

	Refuse Tonnage	Recycled Tonnage	Landscape Waste Tons	Total Recycled	Total Waste	Recycling Rate
Addison	10547	2386	2074	4,460.00	15,007.00	30%
Bartlett	12919	4491.53	2509.61	7,001.14	19,920.14	35%
Bensenville	5553.32	1242.26	1897.89	3,140.15	8,693.47	36%
Bloomingdale	7198.95	2084.84	588.87	2,673.71	9,872.66	27%
Bolingbrook	21862.41	6780.04	4811.8	11,591.84	33,454.25	35%
Carol Stream	9639.43	3534.51	13.58	3,548.09	13,187.52	27%
Clarendon Hills	2176	1092	525	1,617.00	3,793.00	43%
Darien	4536.35	2546.26	766.64	3,312.90	7,849.25	42%
Downers Grove	11708.75	5965.78	1975.22	7,941.00	19,649.75	40%
Elk Grove Village	10467	3904	1204	5,108.00	15,575.00	33%
Elmhurst	12561.2	5421.46	1924	7,345.46	19,906.66	37%
Glen Ellyn	6946.6	3526.59	2420.07	5,946.66	12,893.26	46%
Hanover Park	11251	2455	1126	3,581.00	14,832.00	24%
Hinsdale	5327	2428	563	2,991.00	8,318.00	36%
Itasca	3272.32	970.35	782.43	1,752.78	5,025.10	35%
Lisle	8204	2898	521	3,419.00	11,623.00	29%
Lombard	10626	4091	1923	6,014.00	16,640.00	36%
Naperville	37405.1	15655.08	6591	22,246.08	59,651.18	37%
Oak Brook	2995	1221	130	1,351.00	4,346.00	31%
St Charles	7231.34	892.95	892.95	1,785.90	9,017.24	20%
Warrenville	2039	1116	335.5	1,451.50	3,490.50	41%
West Chicago	5756.05	2819.54	773.77	3,593.31	9,349.36	38%
Westmont	4265	1915	619.2	2,534.20	6,799.20	37%
Wheaton	17164	6592	3657	10,249.00	27,413.00	37%
Willowbrook	1033.31	548.62	34.95	583.57	1,616.88	36%
Winfield	2034	856	449	1,305.00	3,339.00	39%
Wood Dale	4386	1145	834	1,979.00	6,365.00	31%
TOTAL/AVERAGE	**239,105.13**	**88,578.81**	**63,67.92**	**80,853.41**	**234,009.56**	**34%**

Hazardous Waste: "Since the last solid waste plan update, 2012, the City of Naperville relocated the Household Hazardous Waste Facility to their Environmental Collection Campus next to the City's Public Works facility. The transition was made to simplify and consolidate recycling for residents. The new facility reported a significant increase in participation during the first year of operation. In 2016, the site collected an additional 67,000 gallons of household hazardous waste. The City reported that in 2016 there were over the 20,766 drop offs of which 12,594 were from DuPage. As partially funded through the Illinois Environmental Protection Agency, the facility is open to all Illinois residents and the City of Naperville receives financial support from DuPage, Kane and Will counties and the City of Aurora" (DuPage County, 2017, P. 10).

"Residents have other opportunities to dispose or recycle specific sectors of household hazardous waste. The City of Addison has partnered with a local business to recycle various types of batteries from their residents. Other items that are collected by businesses include compact fluorescent bulbs, paint, automotive fluids, fire

extinguishers, propane tanks. The County publishes an Online Recycling Guide to assist residents in locating these recycling services. SCARCE, through the County's environmental education contract and with private grant funding, has worked with various entities to launch eight permanent, used cooking oil collection sites. These collections are augmented by communities hosting one-day collection events following holidays like Thanksgiving. The recycling of cooking oil is beneficial in that it can be made into a new fuel source. It also reduces the amount of cooking oil and grease poured down drains causing blockages in the sanitary system and treatment plants" (DuPage County, 2017, P. 10).

Electronics: As of 2017, there are 17 items that cannot be disposed of through normal household trash. "In 2016, the County pursued a system using a recycling fee for the harder to handle items and relaunched two weekday collection sites and two collection sites that are open one Saturday per month, both week day and Saturday programs are staffed by the recycler. These are conducted through valuable partnerships with the municipalities Burr Ridge, Lisle, Wheaton and Naperville. These communities have voluntarily participated and have agreed to accept items from residents throughout the County" (DuPage County, 2017, P. 10-11).

Additionally, "the Electronic Products Recycling and Reuse Act was significantly amended in 2017 and mandated a specified number of collection sites in counties based upon population density. The changes are effective starting January 1, 2019 and the County of DuPage is expected to receive 5 collection sites. The electronics manufacturers or a manufacturer clearinghouse will be working with Illinois counties to identify the locations, hours, and other details for collection sites. The County continues to provide information and outreach materials on electronics recycling through flyers, social media, newsletters, advertising, the online recycling guide and the website. A map of locations was developed to display all available recycling options as well as aid in strategic planning of future sites" (DuPage County, 2017, P. 11).

Sharp Items and Needles: "Sharps remain a difficult item to manage in the waste stream. While the Illinois EPA allows households to place needles in a puncture proof container for landfill disposal, this is not the preferred method" (DuPage County, 2017, P. 11). "The City of Westmont included a sharps drop-off kiosk in their municipal waste contract issued to Waste Management. The Village of Lisle offers a drop off point with the Rx Box at the police station for residents and the Glenside Fire District recently launched a collection that is free for residents and for a small fee will accept the needles from residents outside their district" (DuPage County, 2017, P. 12). The DuPage County Geographic Information System (GIS) department developed a publicly available map of prescription drug drop-off locations.

Landscape Waste and Food Scraps: "Diversion of landscape waste has been a statewide priority since 1990 when the waste was banned from Illinois landfills. DuPage County encourages the composting or reuse of landscape waste and prohibits the burning of the waste for disposal in unincorporated areas" (DuPage County, 2017, P. 12). In addition, the diversion of food scraps from landfills is also becoming a regional focus. "In response to this measured increase statewide, the Illinois Food Scrap Coalition ("Coalition") was

formed as a statewide effort to divert food scraps from landfills. DuPage County is a founding partner with the Coalition and has staff that participate on the Executive Board" (DuPage County, 2017, P. 12). "Waste Management, Inc. has a permitted landscape waste and food scrap composting site in Romeoville and Midwest Compost, LLC has locations in West Chicago and Elgin that are permitted to accept and transfer food scraps with yard waste" (DuPage County, 2017, P. 13). "Communities currently with a voluntary curbside food scrap collection include; Glen Ellyn, Naperville, and Wheaton. In addition to the curbside collections, Lombard provides alternative funding to support backyard composting of food scraps" (DuPage County, 2017, P. 12).

Dumping Regulations: Best Management Practices (BMP)s usually address pollutants that are liquids or suspended in water that are washed into a lake or stream. Dumping regulations address solid matter, such as landscape waste, trash, shopping carts, and appliances that can be accidentally or intentionally thrown into channels or wetlands. Such materials may not pollute the water, but they can obstruct even low flows and reduce the channels' and wetlands' ability to convey or clean stormwater.

Many communities have nuisance ordinances that prohibit dumping garbage or other "objectionable waste" on public or private property. Waterway dumping regulations need to also apply to "non-objectionable" materials, such as grass clippings or tree branches which can kill ground cover or cause obstructions in channels. Regular inspections to catch violations should be scheduled.

- For example, the DuPage County Building and Zoning Department works closely with our partner agencies including all local townships within DuPage County, the County Sheriff's Office and the County Health Department to enforce dumping regulations on properties, in public rights-of-way and waterways in DuPage County.
- DuPage County has also partnered with the Illinois Environmental Protection Agency (IEPA) and has entered into a delegation agreement for enforcement of IEPA regulations within regards to land management.
- To facilitate more efficient compliance with these regulations, the County has created a Code Hearing Adjudication Program (AAP); to wit:
    - The AAP enables the County to use existing County staff to administer the program and will reduce the department's dependency on the staff of the County Circuit Court Clerk, the County Sheriff's Department, the Judicial System and the County States Attorney's Office. As such, the AAP provides an expedited and cost effective means to obtain compliance for time sensitive violations and violations that have a direct negative impact on the quality of life for the citizens of the County.
    - To expedite judgments for time sensitive violations such as failure to obtain permits, dangerous and unsafe buildings and structures, junk and debris and zoning violations.

Based on Exhibit 7-1, most land development and many land use activities involve more than one, if not all of the targeted pollutant categories. Therefore, consideration must be given to the magnitude of each pollutant category with respect to the development or activity so that correct, efficient, and cost effective BMPs can be selected for each

targeted category. Numerous studies have been completed in recent years identifying that one of the more critical pollutants caused by most types of urban development and activity is Total Suspended Solids (TSS). Common TSS constituents in urban areas are sediment, floating debris, and dissolved chlorides and sulfates. Fortunately, BMPs commonly used to reduce TSS, also effectively mitigate stormwater pollutants in other pollutant categories. For instance, heavy metals such as lead, nickel, copper, and zinc are often attached to sediment. This helps simplify the selection process in many cases as selecting BMPs that target TSS will likely be more cost effective and efficient then selecting a BMP for each targeted category. As a result, many types of BMP designs and premanufactured products are now available to address TSS.

Stormwater pollutants enter receiving waters from "point" and "non-point" sources. Point sources refer to pollutants originating from sources such as regulated discharges, and accidental or illegal dumping. Non-point sources originate from stormwater runoff that picks up and transports natural and man-made substances into receiving waters. Common pollutants found in DuPage County and their associated impacts are shown in Exhibit 7-6 (DuPage County Water Quality Best Management Practices Technical Guidance, 2008).

Exhibit 7-6

Common Pollutants in Urban Runoffs and Associated Impacts

Pollutant	Sources	Impacts
Solids (suspended sediment, floatables, dissolved chloride, sulfates)	Litter, road runoff, soil erosion from construction, streambanks, croplands and untreated sites, cleared vegetation, human & animal waste, vehicle fuels & fluids, vehicle wear, industrial/household chemicals, industrial processes, pool waters discharged improperly, road salt used for de-icing, snow runoff	Increased turbidity, reduced light penetration, impaired respiration for aquatic life, impairment of fishing resources, increased sedimentation, toxic to aquatic life, prevents vertical spring mixing
Biochemical Oxygen Demand	Decaying vegetation, excessive growth of vegetation, soil erosion, human & animal waste, vehicle fuels & fluids, vehicle wear, industrial/household chemicals, industrial processes, pesticides	Kills aquatic life
Metals (Cadmium, Chromium, Copper, Iron, Lead, Mercury, Nickel, Silver, Zinc)	Road runoff, tire wear, wear of clutch and brake linings, soil erosion, human & animal waste, vehicle fuels & fluids, vehicle wear, industrial/household chemicals, industrial processes, paints, pesticides	Toxic to aquatic life, potential for ground water contamination, accumulates in fish and shellfish tissues that may be consumed by humans
Pathogens (bacteria, fecal coliform)	Septic tank overflows/leaks/failures, illicit discharge from sanitary sewers into storm sewers, sanitary sewer over flows, untreated or inadequately treated sewage, animal waste	Unsafe conditions for human contact/swimming, closed beaches, contaminated ground and drinking water
Oil (oil, grease, fuels, lubricants)	Industrial spills, runoff from streets, gas stations, & parking lots, improper disposal of used oil into storm drains, business districts, shopping centers, office parks, vehicle fuels & fluids, fuel combustion, industrial/household chemicals, industrial processes, paints	Kills aquatic life, builds up in sediment and remains for a long time
Nutrients (Nitrogen, Phosphorus, Nitrates)	Agriculture, improper composting and yard waste disposal, septic tanks, soil erosion, cleared vegetation, fertilizers, animal waste, fuel combustion, industrial/household chemicals, industrial processes, atmospheric deposition onto impervious surfaces that become runoff	Depressed dissolved oxygen levels, elevated phytoplankton populations, fish kills by hypoxia & anoxia, release of toxins from sediments, decreased fisheries yields, may contaminate ground water, excessive plant growth
Herbicides, Pesticides, Insecticides	Improper or excessive use of lawn chemicals, agriculture	Algae blooms, fish kills

7.6 Conclusions

1. The County recognizes the importance of stream restoration and wetland protection, and incorporates best management practices throughout projects.

2. The County has an effective and comprehensive waste management and recycling plan, and is working to expand related programs in partnership with DuPage municipalities.

3. There is no countywide ordinance that prohibits dumping of yard waste and other debris in streams or other parts of the drainage system.

4. Many DuPage communities have effective urban forestry programs in place.

5. The DuPage County Forest Preserve District has successfully accomplished its initial goal to preserve open space, and is working to establish secondary goals of maintaining and enhancing this space.

7.7 Recommendations

1. Municipal comprehensive plans, land use plans and zoning ordinances should incorporate open space provisions that will protect properties from flooding and preserve wetlands and farmland.
2. Communities should continue to enhance waste management and recycling programs, with an enhanced focus on specialty disposal programs (i.e. hazardous waste, electronics, needles, landscape waste, and food scraps).
3. Each community should ensure that it has enforceable stream and wetland dumping regulations.
4. Every community should develop or continue to implement an urban forestry program that qualifies them to become a Tree City, USA.

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Chapter 8 – Emergency Services

Emergency services activities are conducted prior to and during an emergency to minimize the impact of a hazard. This mitigation category primarily focuses on life safety and property protection. The emergency services, or emergency management, sector follows guidance from the Federal Emergency Management Agency (FEMA). The FEMA recommends emergency management agencies strive to achieve the National Preparedness Goal by being successful within 32 core capability areas, which span five different mission areas: Prevention, Protection, Response, Recovery, and Mitigation. Given that Prevention focuses mostly on made-made events, such as terrorism, this chapter will exclude this mission area.

> *National Preparedness Goal*
> *"A secure and resilient nation with the capabilities required across the whole community to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk"*
> (FEMA, 2017a, P. 1).

Emergency services activities are usually the responsibility of municipal and/or or County emergency managers. In smaller communities, the designated emergency manager may also be a full-time police officer or firefighter. Emergency services activities can also be conducted by private industries responsible for critical facilities or providing critical services such as communication and energy. Activities may include, but are not limited to (FEMA, 2017b, P. 510-20):

- Hazard Threat Recognition
- Critical Facilities Protection
- Hazard Warning
- Health and Safety Maintenance
- Hazard Response Operations
- Post-Disaster Mitigation Actions

The DuPage County Office of Homeland Security and Emergency Management (OHSEM) coordinates emergency management services in DuPage County. Activities of the OHSEM include: activating the County Emergency Operations Center (EOC) during disasters; coordinating resource procurements and logistics during an emergency; coordinating and overseeing the Local Emergency Management Coordinators (LEMC) Workgroup; participating in the National Weather Service's (NWS) StormReady® certification program; conducting an annual Threat Hazard Identification Risk Assessments (THIRA) in coordination with the Illinois Emergency Management Agency (IEMA); developing a County-Wide community profile with critical infrastructure and incident data; coordinating and overseeing the DuPage County Citizen Corps; overseeing the development and maintenance of this Natural Hazard Mitigation Plan; and developing other emergency plans focused on natural hazards.

8.1 Protection

Preparedness Planning: The objective of preparing emergency plans is to create the capacity for County and local government to: save the maximum number of lives in the event of a major emergency or disaster, to minimize injuries; protect property; preserve functioning civil government; and to maintain and support economic activities essential for the survival and eventual recovery from the emergency or disaster (DuPage County, 2016, P. 2). The DuPage County has an Emergency Operations Plan (EOP), formally approved by the County Board Chairman, which includes hazard specific plans for natural hazards. The County's EOP is approved every two years by IEMA. In addition, the OHSEM coordinates the certification of local emergency management and emergency services disaster agency EOPs every two years. As of December 2017, all DuPage County municipalities had up to date certifications. The County, and most DuPage municipalities, have designated spaces to serve as an Emergency Operations Center (EOC) during an emergency. Table 8-2 provides information about some of the content within each municipality's EOP. The OHSEM is currently working to update policies and procedures for damage assessment and disaster recovery, per FEMA's new guidance from 2018. Once complete, the County plans to encourage similar changes within municipal emergency planning. In addition, the OHSEM is currently working to coordinate the development of a Countywide Continuity of Operations / Continuity of Government Plan. This project includes the identification of secondary locations for all departments, which may be applicable to municipalities in the future.

"Citizen Corps Councils helps drive local citizen participation by coordinating Citizen Corps programs, developing community action plans, assessing possible threats and identifying local resources."

Stakeholder Engagement: In addition to the Local Emergency Management Coordinators (LEMC) Workgroup, which meets quarterly to coordinate planning efforts and share information, multiple communities have established volunteer programs to expand the County's capability to respond to emergencies through volunteers. The USA Freedom Corps, and is a local council that coordinates federal, state and local volunteer program efforts, sponsored by the federal government. Nationally, programs that are coordinated under the Citizen Corps council are the Community Emergency Management Teams (CERT), the Neighborhood Watch, Volunteers in Police Service (VIPS), and the Medical Reserve Corps (MRC). Specific community information can be found within Table 8-1.

Annually, the OHSEM hosts outreach events where weather radios are provided to residents, at no charge, in coordination with the City of Chicago as part of the Regional Catastrophic Preparedness Grant Program. And in the past, the OHSEM has coordinated the distribution of weather radios to childcare, daycare, health department, and other government buildings.

Mutual aid agreements are in place throughout the County for Fire (Mutual Aid Box Alarm System (MABAS)), Police (Illinois Law Enforcement Alarm System (ILEAS)), Emergency Management (Illinois Emergency Management Mutual Aid System (IEMMA)), Public Health (Illinois Public Health Mutual Aid System (IPHMAS)), and Public Works (Public

Works Mutual Aid System (PWMA)). These agreements can be utilized in any phase of an emergency or disaster.

Table 8-1
Community Volunteer Programs

	Community Emergency Response Team (CERT) Program	Volunteers in Police Service (VIPS) Program	Fire Corps Program	Medical Reserve Corps (MRC) Program	Other Emergency Services Volunteer Program
Village of Addison	Yes	Yes	No	No	Unknown
City of Aurora	Yes	Yes	No	No	Unknown
Village of Bartlett	No	No	No	No	Unknown
Village of Bensenville	No	No	No	No	Yes
Village of Bloomingdale	No	Yes	No	No	Unknown
Village of Burr Ridge	No	No	No	No	Unknown
Village of Carol Stream	Yes	Yes	No	No	Unknown
Village of Clarendon Hills	No	No	No	No	Unknown
City of Darien	No	Yes	No	No	Unknown
Village of Downers Grove	No	No	No	No	Unknown
City of Elmhurst	No	Yes	No	No	Unknown
Village of Glendale Heights	No	No	No	No	Unknown
Village of Glen Ellyn	No	No	No	No	Unknown
Village of Hanover Park	Yes	No	Yes	No	Unknown
Village of Hinsdale	No	Yes	No	No	Unknown
Village of Itasca	Yes	Yes	No	No	Unknown
Village of Lisle	No	No	No	No	Unknown
Village of Lombard	No	No	No	No	Unknown
City of Naperville	Yes	Yes	Yes	No	Unknown
Village of Oak Brook	No	No	No	No	Unknown
City of Oakbrook Terrace	No	No	No	No	Unknown
Village of Roselle	No	Yes	No	No	Unknown
Village of Villa Park	No	No	No	No	Unknown
City of Warrenville	No	No	No	No	Yes
Village of Wayne	No	No	No	No	Unknown
City of West Chicago	Yes	No	No	No	Unknown
Village of Westmont	Yes	Yes	Yes	No	Unknown
City of Wheaton	No	No	No	No	Unknown
Village of Willowbrook	No	Yes	No	No	Unknown
Village of Winfield	No	Yes	No	No	Unknown
City of Wood Dale	No	Yes	No	No	Unknown
Village of Woodridge	No	Yes	No	No	Unknown
DuPage County	Yes	Yes	No	Yes	Yes
Milton Township	Yes	No	No	No	Unknown

Table 8-2
Municipal Emergency Operations Plan Procedures and Mitigation Actions

	Natural Hazard Assessment Included	Critical Infrastructure Identification Included	Capability Assessment Included	Special Populations Considered	Activation and Notification Process Outlined	Declaration Process Outlined	Community Profile Included
Village of Addison	Yes	Yes	No	No	Yes	Yes	Yes
Village of Bartlett	No	No	No	No	No	Yes	No
Village of Bensenville	No	Yes	Yes	No	Yes	Yes	Yes
Village of Bloomingdale	Yes	Yes	Yes	No	Yes	Yes	Yes
Village of Burr Ridge	No	Yes	Yes	No	Yes	Yes	Yes
Village of Carol Stream	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village of Clarendon Hills	No	Yes	Yes	Yes	No	No	Yes
City of Darien	Yes	Yes	Yes	No	Yes	Yes	Yes
Village of Downers Grove	Yes	Yes	Yes	Yes	Yes	No	Yes
City of Elmhurst	Yes	Yes	No	No	No	No	Yes
Village of Glendale Heights	Yes	Yes	Yes	Yes	No	No	Yes
Village of Glen Ellyn	Yes	Yes	Yes	No	Yes	Yes	Yes
Village of Hanover Park	Yes	No	Yes	Yes	Yes	No	Yes
Village of Hinsdale	Yes	Yes	Yes	No	Yes	No	Yes
Village of Itasca	Yes	Yes	Yes	Yes	Yes	No	Yes
Village of Lisle	Yes	Yes	Yes	No	Yes	Yes	Yes
Village of Lombard	Yes	Yes	Yes	No	Yes	No	Yes
City of Naperville	No	No	No	No	No	No	No
Village of Oak Brook	No	No	No	No	No	No	Yes
City of Oakbrook Terrace	No	Yes	Yes	Yes	Yes	No	Yes
Village of Roselle	No	Yes	Yes	No	Yes	Yes	Yes
Village of Villa Park	No	Yes	Yes	No	Yes	Yes	Yes
City of Warrenville	Yes	Yes	Yes	No	No	Yes	Yes
Village of Wayne	No	No	Yes	No	Yes	No	Yes
City of West Chicago	No	No	No	No	No	No	Yes
Village of Westmont	Yes	Yes	Yes	No	Yes	No	Yes
City of Wheaton	Yes	Yes	Yes	No	Yes	No	Yes
Village of Willowbrook	Yes	Yes	Yes	No	No	No	Yes
Village of Winfield	Yes	Yes	Yes	No	Yes	No	Yes
City Wood Dale	Yes	No	Yes	Yes	Yes	Yes	Yes
Village of Woodridge	Yes	Yes	No	No	Yes	Yes	Yes

Threat Recognition: The first step in being able to effectively respond to a natural hazard is to identify the threats associated with the hazard, specific vulnerabilities, and capabilities the community has to respond to hazard if it were to occur. Every two years, the OHSEM completes a Threat Hazard and Identification Risk Assessment (THIRA) as

required by IEMA. The OHSEM works with subject matter experts from the County and other private stakeholders to address and rank natural hazards, identifying further needs to increase community resiliency. For more information on threat recognition specific to each hazard, see Chapter 2.

Critical Infrastructure Identification and Protection: While protecting critical infrastructure from a disaster is the responsibility of the owner or operator, utilizing public-private partnerships to mitigate and respond to the effects of hazards is a best practice. When critical infrastructure is affected by a natural disaster, an entire community can experience impacts. When referencing critical infrastructure, this plan utilizes the 16 sectors identified by the Department of Homeland Security (DHS). Exhibit 8-1 shows each of the sectors and their federal oversight agencies (DHS, 2017, P. 1).

Exhibit 8-1

Department of Homeland Security Critical Infrastructure Sectors

Chemical Sector
The Department of Homeland Security is designated as the Sector-Specific Agency for the Chemical Sector.

Commercial Facilities Sector
The Department of Homeland Security is designated as the Sector-Specific Agency for the Commercial Facilities Sector.

Communications Sector
The Communications Sector is an integral component of the U.S. economy, underlying the operations of all businesses, public safety organizations, and government. The Department of Homeland Security is the Sector-Specific Agency for the Communications Sector.

Critical Manufacturing Sector
The Department of Homeland Security is designated as the Sector-Specific Agency for the Critical Manufacturing Sector.

Dams Sector
The Department of Homeland Security is designated as the Sector-Specific Agency for the Dams Sector. The Dams Sector comprises dam projects, navigation locks, levees, hurricane barriers, mine tailings impoundments, and other similar water retention and/or control facilities.

Defense Industrial Base Sector
The U.S. Department of Defense is the Sector-Specific Agency for the Defense Industrial Base Sector. The Defense Industrial Base Sector enables research, development, design, production, delivery, and maintenance of military weapons systems, subsystems, and components or parts to meet U.S. military requirements.

Emergency Services Sector
The Department of Homeland Security is designated as the Sector-Specific Agency for the Emergency Services Sector. The sector provides a wide range of prevention, preparedness, response, and recovery services during both day-to-day operations and incident response.

Energy Sector
The U.S. energy infrastructure fuels the economy of the 21st century. The Department of Energy is the Sector-Specific Agency for the Energy Sector.

Financial Services Sector
The Department of the Treasury is designated as the Sector-Specific Agency for the Financial Services Sector.

Food and Agriculture Sector
The Department of Agriculture and the Department of Health and Human Services are designated as the co-Sector-Specific Agencies for the Food and Agriculture Sector.

Government Facilities Sector
The Department of Homeland Security and the General Services Administration are designated as the Co-Sector-Specific Agencies for the Government Facilities Sector.

Healthcare and Public Health Sector
The Department of Health and Human Services is designated as the Sector-Specific Agency for the Healthcare and Public Health Sector.

Information Technology Sector
The Department of Homeland Security is designated as the Sector-Specific Agency for the Information Technology Sector.

Nuclear Reactors, Materials, and Waste Sector
The Department of Homeland Security is designated as the Sector-Specific Agency for the Nuclear Reactors, Materials, and Waste Sector.

Transportation Systems Sector
The Department of Homeland Security and the Department of Transportatior are designated as the Co-Sector-Specific Agencies for the Transportation Systems Sector.

Water and Wastewater Systems Sector
The Environmental Protection Agency is designated as the Sector-Specific Agency for the Water and Wastewater Systems Sector.

The OHSEM is working to develop a Geographic Information System (GIS) based County-wide community profile, to include critical infrastructure locations and characteristics.

The completion of this project will allow the County and partnering municipalities to: identify vulnerabilities before a disaster strikes, develop strategies for reducing these vulnerabilities, and to respond quicker in identifying impacted infrastructure following a natural disaster. In addition, DuPage County Stormwater Management is working to identify and map critical facilities, already identified, that are within flood prone areas.

Some critical facilities such as hospitals and nursing homes are required by state statute to establish and maintain backup generators to ensure electrical power can be maintained at minimal levels. DuPage County has several critical facilities on its County Campus such as the Jail, DuPage Care Center, and the Emergency Operations Center. DuPage County invested in backup generation for all County campus buildings. Most police and fire stations throughout the County currently have backup generators. Municipalities should continue to identify key facilities and establish backup systems as budgets allow. Table 8-1 shows communities that have incorporated critical infrastructure within their EOPs. Additional information on protecting critical facilities can be found in Chapter 5, which discusses the importance of protecting critical facilities from damage.

StormReady® Participation: The National Weather Service established the StormReady® program to help local governments improve the timeliness and effectiveness of hazardous weather-related warnings for the public. To be officially StormReady®, a community must:

- Establish a 24-hour warning point and Emergency Operations Center (EOC)
- Have more than one way to receive severe weather warnings from the National Weather Service (NWS) and provide forecasts and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.

Being designated as a StormReady® community by the Weather Service is a good measure of a community's emergency warning program for weather hazards. Unincorporated DuPage County, as well as many municipalities and even Colleges and Universities within DuPage County, are certified through this program (NWS, 2017, P. 1).

8.2 Response

The protection of life and property is the foremost important task of emergency responders. It is important to note, that emergency responders go beyond just police, fire, and emergency medical response. This category can also include public works, engineers, and many more. Two factors that can increase a community's resilience are adequate and timely threat recognition and public warning systems. The National Weather Service (NWS) is the primary agency for detecting meteorological threats, such as storms (snow, rain, hail, etc.) and tornadoes. The NWS primarily issues notices to the public using three levels of notifications: advisory, watch, and warning. Severe weather warnings are transmitted to emergency service agencies by NOAA, via phone call, text, email, and the Weather Radio System. When an advisory, watch, or warning has been issued, or when a natural disaster has struck, emergency management representatives from the County,

municipality, and even private companies and non-profits often take or coordinate the following actions to respond:

- Activate warning and monitoring systems not yet operational.
- Activate an Emergency Operations Center to enhance coordination, oversee resource procurement, and assist with logistics.
- Close streets or bridges to prevent the public from encountering hazards, and prioritize clearing critical transportation routes.
- Declare a state of emergency or disaster.
- Shut off power to threatened areas.
- Distribute supplies to residents and businesses (i.e. sandbags and clean-up kits).
- Order and begin conducting evacuations.
- Open and staff shelters, multi-agency resource centers, and other assistance centers.

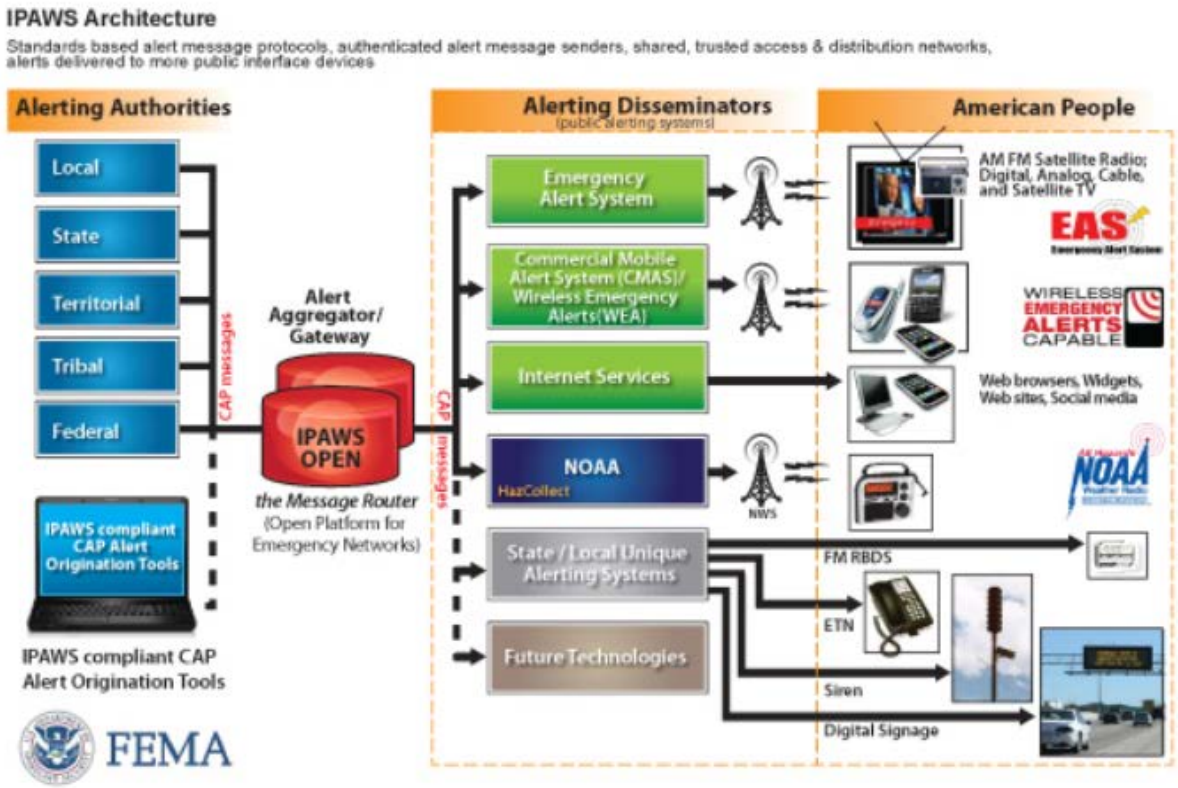
For further information on threat recognition and the NWS information associated with each natural hazard, see Chapter 2.

Public Warning Systems: When the County and local governments need to share critical and time sensitive information with the public, emergency services agencies use multiple notifications systems made available through the Federal Emergency Management Agency's (FEMA) Integrated Public Alert and Warning System (IPAWS). The system "is a comprehensive, coordinated, integrated system that can be used by authorized public officials to deliver effective alert messages to the American public" (FEMA, 2013, IS-247.A: Integrated Public Alert and Warning System) via multiple emergency communication and warning platforms such as:

- The Emergency Alert System (EAS), which may be used by State, County, and local authorities, in cooperation with the broadcast community, to deliver important emergency information, (i.e. weather information, imminent threats, and AMBER alerts) via radio (AM/FM/Satellite), television, analog and digital phone lines (DHS, 2017a, Emergency Alert System (EAS).
- Wireless Emergency Alerts (WEA), which may be used by State, County, and local authorities to deliver important emergency information through the cellular phone network (DHS, 2017b, Wireless Emergency Alerts (EAS).
- The National Oceanic and Atmospheric Administration (NOAA) weather radio system, which can be tied to tone-activated receivers in key facilities, such as schools, hospitals, and government facilities, through the Emergency Alert Radio System (EARS) (DHS, 2017c, NOAA Weather Radio All Hazards (NWR)).

In addition to these systems, the IPAWS coordinated with internet service providers to disseminate information through social media platforms. Also, local public safety answering points (PSAPs) are responsible for activating local outdoor sirens for weather related incidents. The earlier and the more specific the warning, the greater the number of people who can implement protection measures. Exhibit 8-2 (DHS, 2017d) outlines the IPAWS.

Exhibit 8-2
Integrated Public Alert and Warning System



Multiple or redundant systems are most effective – if people do not hear one warning, they may still get the message from another part of the system. Each has advantages and disadvantages:

- Radio and television provide a lot of information, but people need know when to turn them on.
- NOAA Weather Radio can provide short messages of any impending weather hazard or emergency and advise people to turn on their radios or televisions, but not everyone has a Weather Radio.
- Outdoor warning sirens can reach many people quickly as long as they are outdoors. They do not reach people in tightly-insulated buildings or those around loud noise, such as in a factory, during a thunderstorm, or in air-conditioned homes. Outdoor sirens do not explain what hazard is coming, but people should know to turn on a radio or television.
- Automated telephone notification services are also fast, but can be expensive and do not work when phone lines are down. Nor do they work for unlisted numbers and call screening services, although individuals can sign up for notifications.
- Where a threat has a longer lead time, going door-to-door and manual telephone trees can be effective.

Just as important as issuing a warning is informing people what action(s) to take. A warning program should have a public information aspect. People need to know the

difference between a tornado warning (when they should seek shelter in a basement) and a flood warning (when they should stay out of basements).

Communication: Since 2007, DuPage County first response agencies have maintained interoperable communications, between disciplines and jurisdictions, through the STARCOM21 system. The DuPage County Emergency Telephone System Board (ETSB) has oversight of the enhanced 9-1-1 systems for citizens of the County of DuPage and portions of Cook, Kane and Will counties. Within the last five years, the DuPage County Office of Homeland Security and Emergency Management has also increased interoperable communications capacity throughout the County by:

- Obtaining and maintaining a cache of deployable tactical radios, available for first responder agencies throughout the County.
- Enhancing the County's Illinois Transportable Emergency Communications System (ITECS) Unit, coordinated through the IEMA, through a robust training curriculum and holding regular Unit exercises.
- Maintaining the DuPage County Emergency Radio Network (DCERN) system.
- Maintaining a high-tech video conference system.
- Conducting monthly tests of all communications systems.
- Participating in committees and associations whose priorities include strategic and interoperable communications, such as the:
    - Emergency Telephone Safety Board (ETSB) Committee
    - Public Safety Answering Points (PSAP) Supervisor Committee
    - DuPage Police Chiefs Association
    - DuPage Fire Chiefs Association

8.3 Recovery and Mitigation

Just as the federal government has a National Preparedness Goal, the FEMA has also developed a framework for disaster recovery. The *National Disaster Recovery Framework* defines recovery as a three-phase process, outlined within Exhibit 8-4 (FEMA, 2011, P. 8), and provides recovery principles (Exhibit 8-3), success factors (Exhibit 8-3), roles and responsibilities, and guidelines for leading a successful recovery process (FEMA, 2011, P. 13). While this process and the goals within may be seen differently based on a community's "circumstances, challenges, recovery vision, and priorities" (FEMA, 2011, P. 13), there are common characteristics that each community shares throughout its recovery process:

- "The community successfully overcomes the physical, emotional and environmental impacts of the disaster.
- It reestablishes an economic and social base that instills confidence in the community members and businesses regarding community viability.
- It rebuilds by integrating the functional needs of all residents and reducing its vulnerability to all hazards facing it.
- The entire community demonstrates a capability to be prepared, responsive, and resilient in dealing with the consequences of disasters"
  (FEMA, 2011, P. 8).

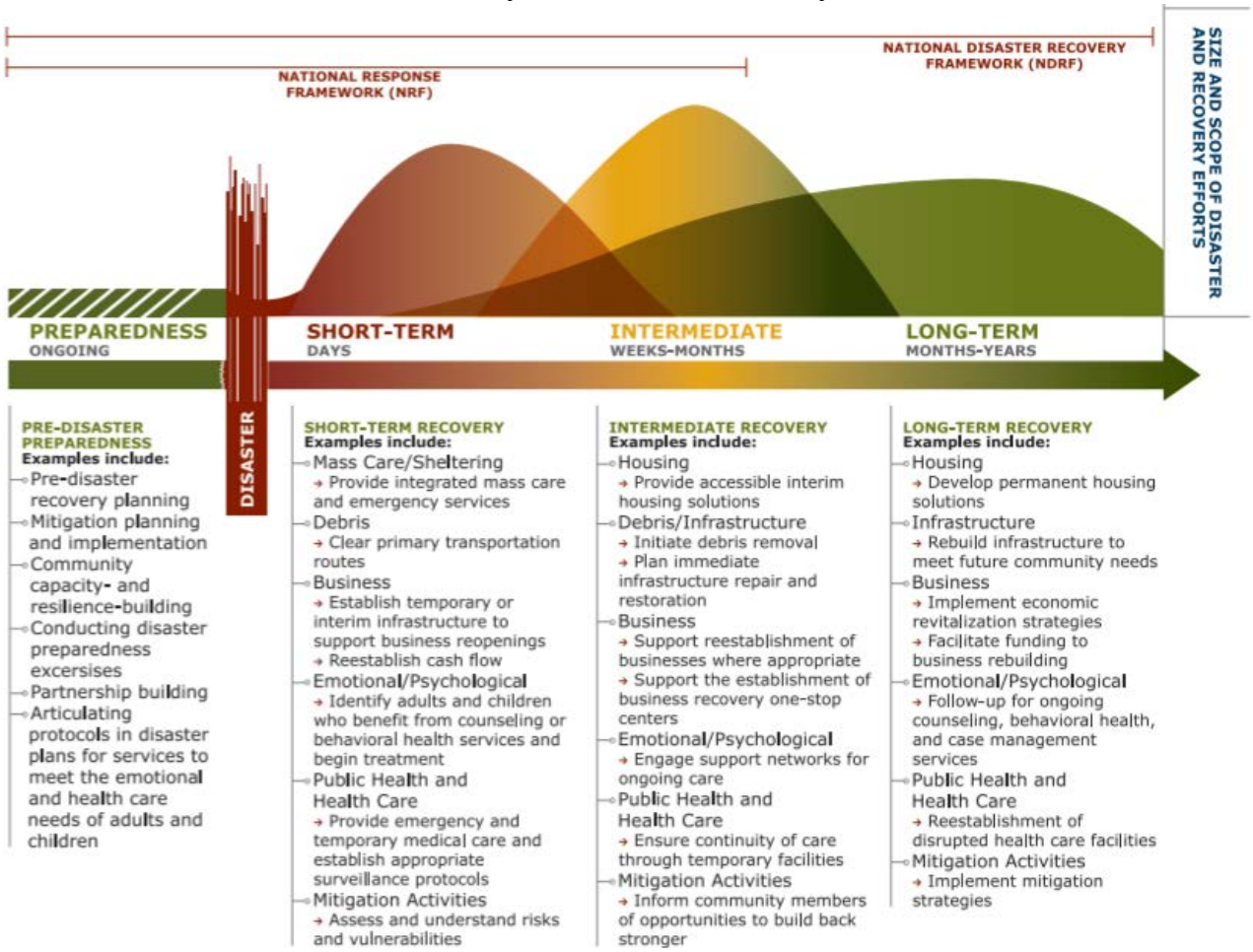
Exhibit 8-3
National Disaster Recovery Framework Concepts

Recovery Core Principles	Success Factors
Individual and Family Empowerment Leadership and Local Primacy Pre-Disaster Recovery Planning Partnerships and Inclusiveness Public Information Unity of Effort Timeliness and Flexibility Resilience and Sustainability Psychological and Emotional Recovery	Effective Decision-Making and Coordination Integration of Community Recovery Planning Processes Well-Managed Recovery Pro-Active Community Engagement, Public Participation and Public Awareness Well-Administered Financial Acquisition Organizational Flexibility Resilient Rebuilding

Following a disaster, one of the ways the OHSEM begins the process of coordinating recovery is through the collection of damage assessment information. This can be done through “windshield” assessments, door-to-door canvassing, and the collection of internet-based surveys. In addition to damaged buildings, the DuPage County EOC also collects information on utility outages, transportation and communications interruptions, and public health needs. This information is used to develop a “big picture” and a prioritized recovery plan. In addition to providing assistance to residents following a disaster, the County also prioritizes business recovery, especially the recovery of small businesses. The FEMA has concluded that approximately 40% of businesses in a community will close following a disaster, and approximately 25% will never re-open (The Gazette, 2016, P. 1). Most businesses that do re-open after a disaster will take several months to do so (The Gazette, 2016, P. 1). Business closures can financially and psychologically impact a community, leaving residents out of work, damaging local economy, and sometimes slowing regional growth.

Exhibit 8-4

National Recovery Framework – Recovery Continuum



The County and municipalities are continually active in single and multi-jurisdictional mitigation projects focused on life safety, public health, localized and major flood reduction, infrastructure hardening, and natural resource preservation. Projects include (DuPage County, 2017):

- Purchasing repetitive loss properties and install additional water sewers, storm sewer mains, and culverts throughout the County.
- Working to rehabilitate damaged and aging bridges around the County.
- Updating traffic signal software and installing uninterruptable power supplies (UPS) to alleviate congestion during power outages and enhance signal management capabilities during evacuation scenarios.
- Working to increase flood storage within the communities along the East Branch of the DuPage River that experience frequent flooding.
- Retrofitting Fawell Dam to allow for proper wildlife migration.
- Extending current drinking water supplies to unincorporated residents.
- Repair and replace aging sanitary sewer pipes, and update technology within wastewater treatment plants.

8.4 Conclusions

1. Emergency management planning in the County is ongoing and generally comprehensive.
2. Numerous mutual aid agreements are in place throughout the County.
3. Most communities within the County, including County government, maintain an Emergency Operations Center (EOC).
4. Adequate and comprehensive warning systems exist and are used throughout the County.
5. Schools, hospitals, nursing homes, and government buildings have NOAA weather radios.
6. Some emergency response plans do not cover all critical facilities that will be affected by various types of hazards.
7. Many plans do not include adequate guidance on post-disaster inspections and capitalizing on post-disaster mitigation opportunities.

8.5 Recommendations

1. Continue to update Emergency Operations Plans for the County and municipalities every two years with a NIMS compliant template.
2. Assessments and response procedures for floods and other hazards should be incorporated in all emergency operations planning and response where appropriate.
3. Emergency Operations Centers at the County and in municipalities should be evaluated for effectiveness and functionality, and modified appropriately.
4. The County and municipalities should establish a continuity of operations plan for emergency services, including establishing a secondary location for their EOC.
5. Develop emergency transportation plans that allow for emergency coordination and evacuation (routing).
6. The Mitigation Workgroup should continue to collaborate with other municipal and County workgroups to coordinate the implementation of mitigation projects.
7. Conduct annual emergency response training exercises. Look for multi-jurisdiction training opportunities.
8. Provide training on NIMS and ICS for all first responders and other identified personnel for compliance.
9. The County and municipalities should continue to coordinate the identification and mapping of critical infrastructure to enhance emergency planning and response.
10. DuPage communities should continue to strive to obtain or renew StormReady certification.

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Chapter 9 – Public Information

Public information activities "advise property owners, potential property owners, and visitors about the hazards, ways to protect people and property from the hazards, and the natural and beneficial functions" of natural hazards (FEMA, 2017, P. 510-20). A successful hazard mitigation program involves a public information strategy and involves both the public and private sectors. Public information activities include (FEMA, 2017, P. 510-20):

- Map information
- Outreach Projects
- Real Estate Disclosure
- Libraries
- Technical Assistance
- Environmental Education

9.1 Public Information Program Strategy

Outreach projects are the first step in the process of motivating residents and business owners to take the steps necessary to protect themselves and others. "Research has shown that awareness of the flood hazard is not enough to motivate people to take action to protect themselves and their property. People need to be told repeatedly, through various means, what specific actions to take before they will change their behavior. Research has also shown that a properly run local information program is more effective in bringing about change than are national advertising or publicity campaigns" (FEMA, 2017, P. 330-2). The Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) suggests an outreach program should:

- "Focus on their community's public information needs,
- Decide what their residents need to know most,
- And, what they want their residents to do with the information they receive" (FEMA, 2017, P. 330-2).

The Workgroup discussed public information strategies and program development during the January 4, 2018 update meeting. Topics discussed are incorporated within the recommendations section of this chapter, and are included within this *Plan's* Action Plan. For more information on this, see Chapters 1 and 10.

DuPage County and Community Outreach Projects: As mentioned within Chapter 8, the DuPage County Office of Homeland Security and Emergency Management (OHSEM) regularly attends and hosts outreach events. In 2015, the OHSEM participated in 66 outreach events, in 2016 it was 49, and in 2017 it was 29. While the focus of each event may differ, the OHSEM's overall theme includes making the public more aware of the hazards they face and the options they have to make their families and their communities more resilient. Additional outreach activities include:

- Tours of the County Emergency Operations Center (EOC) to students studying emergency management and criminal justice at nearby colleges.

- Distributing weather radios in coordination with the City of Chicago as part of the Regional Catastrophic Preparedness Grant Program.
- Collecting public input on natural hazard mitigation through public surveys.
- Coordinating and participating in television and radio interviews.
- Developing press releases in coordination with the County Board Office.
- Providing brochures and handouts to stakeholders, upon request.

Annually, the OHSEM hosts the Advanced Severe Weather Seminar. This event is geared toward individuals who will be on the front line of the weather warning system, including spotters, amateur radio operators, emergency management personnel, police, fire, educators, public works and utility workers. This severe weather seminar is designed to provide continuing education to trained spotters who wish to broaden their understanding of advanced weather phenomena. Anyone can become a trained spotter.

DuPage County Stormwater Management works with the School and Community Assistance for Recycling and Composting Education (SCARCE) in Wheaton on physical models of watershed runoff and groundwater flow that are brought into schools to education children. In addition, they regularly hold wetland educational trainings.

In addition to in-person outreach, the OHSEM also maintains an online presence through its Protect DuPage website, and social media accounts such as Twitter, Instagram, and Facebook. The OHSEM utilizes the Illinois Emergency Management Agency (IEMA) and the Illinois Department of Public Health's (IDPH) monthly preparedness topics, customizing posts to share each month with followers. Municipalities are encouraged to share the OHSEM's social media postings on their own websites, social media accounts, and within local electronic and paper newsletters.

Both the OHSEM and the DuPage County Department of Stormwater Management maintain a portion of their webpages dedicated to sharing publications for residents to become more educated and prepared. The OHSEM regularly promotes the use of FEMA, Illinois Emergency Management Agency (IEMA), and American Red Cross brochures and publications on safety measures to take for fires, floods, winter storms, excessive heat, etc. The American Red Cross' publications are tailored for different age groups. They also host specialized programs on topics such as "home alone safety," first aid and cardio-pulmonary resuscitations (CPR), and what to do during a disaster.

The OHSEM is developing a Community Outreach Plan that will incorporate all of the outreach activities the office already regularly conducts, and identifies new methods and themes the County can to engage the public.

9.2 Community Resources

A community's library, website, and municipal office are locations residents often seek information from first. Local libraries can obtain books and pamphlets from Non-Profits, the County, the State, and Federal agencies free of charge. Municipal websites, offices, and newsletters are also great resources for providing hazard mitigation and preparedness information to residents. The OHSEM provides information about hazard

mitigation on its *Protect DuPage* website, and DuPage County Stormwater Management provides information on how to find and use floodplain maps on its website. Municipalities are encouraged to provide links to these pages on their websites. Table 9-1 provides a summary of how each municipality communicates with their residents, specific to natural hazards and mitigation. For more information on floodplain maps, see the section on Hazard Mapping within Chapter 4.

Table 9-1
DuPage Local Community Resources

Community	Hazard Information in a Regular Newsletter	Hazard Information on Community Website	Assistance on Reading Flood Maps	Property visits
Village of Addison	Yes	Yes	Yes	Unknown
City of Aurora	No	Yes	Unknown	Unknown
Village of Bartlett	Yes	Yes	Yes	Unknown
Village of Bensenville	No	No	Yes	Unknown
Village of Bloomingdale	No	No	Unknown	Unknown
Village of Burr Ridge	No	No	Unknown	Unknown
Village of Carol Stream	Yes	Yes	Yes	Yes
Village of Clarendon Hills	No	No	Unknown	Unknown
City of Darien	No	No	Unknown	Unknown
Village of Downers Grove	No	Yes	Yes	Unknown
City of Elmhurst	No	No	Unknown	Unknown
Village of Glendale Heights	No	Yes	Yes	Unknown
Village of Glen Ellyn	No	No	Unknown	Unknown
Village of Hanover Park	No	No	Unknown	Unknown
Village of Hinsdale	No	Yes	Yes	Yes
Village of Itasca	No	Yes	Unknown	Unknown
Village of Lisle	Yes	Yes	Yes	Yes
Village of Lombard	No	Yes	Unknown	Unknown
City of Naperville	No	No	Unknown	Unknown
Village of Oak Brook	No	Yes	Yes	Unknown
City of Oakbrook Terrace	No	No	Unknown	Unknown
Village of Roselle	Yes	No	Unknown	Unknown
Village of Villa Park	No	Yes	Yes	Yes
City of Warrenville	No	Yes	Yes	Yes
Village of Wayne	No	No	Unknown	Unknown
City of West Chicago	No	No	Unknown	Unknown
Village of Westmont	No	Yes	Unknown	Unknown
City of Wheaton	No	Yes	Yes	Yes
Village of Willowbrook	No	No	Unknown	Unknown
Village of Winfield	No	Yes	Yes	Yes
City of Wood Dale	No	Yes	Unknown	Unknown
Village of Woodridge	No	No	Unknown	Unknown
DuPage County	No	Yes	Yes	Unknown

Technical Assistance: In addition to providing links to floodplain maps and hazard mitigation materials, communities may provide assistance such as interpreting hard to understand materials and maps, and submitting requests for map amendments and revisions when a resident has evidence their property should not be included within the mapped floodplain. Local building department staffs are experts in construction; some communities may provide free advice to residents regarding retrofitting and other protective measures. Examples of these activities may include:

- Recommending or identifying qualified or licensed contractors.
- Inspecting homes for anchoring of roofing and the home to the foundation.

- Providing advice on protecting windows and garage doors from high winds.
- Providing advice on protecting homes from flooding through mitigation activities such as: re-grading, window well barriers, down spout extensions, etc.
- Explaining when building permits are needed for home improvements.

Table 9-1 shows communities that provide at least one of the technical assistance options mentioned above.

9.3 Real Estate Disclosure

When purchasing or renting property, whether it be a home or a business location, it is common for residents to be unaware of the hazards that property is exposed to. Whether it is a flood or a tornado, residents often communicate following a disaster that they wish they would have known more about natural hazards so they could have taken extra steps to be prepared. Both federal and state laws exist regarding real estate disclosure, helping to protect potential buyers and increase awareness of hazards.

Federally, potential sellers must abide by the Residential Lead-Based Paint Hazard Reduction Act of 1992 (U.S. Environmental Protection Agency, 1992). In addition, regulated lending institutions must advise applicants for a mortgage or other loan if a property is in a floodplain, as shown on the Flood Insurance Rate Map. Flood insurance is required for buildings located within the base floodplain if the mortgage or loan is federally insured.

In Illinois, the Residential Real Property Disclosure Act (Illinois General Assembly, 1994, P. 4-5) requires sellers to report if their property has any identified issues as outlined within 23 categories. A list of these categories can be found within Exhibit 9-1 (Illinois Association of Realtors, 2015, P. 1). However, it is important to note that this State law relies on the seller being aware of a problem and complying with the State's laws. A property owner may legitimately not be aware of potential flooding problems with a property being sold or purchased. Therefore, it is important for potential real estate buyers to do their homework before purchasing a property. For more information on the resources available to potential buyers, see the Technical Assistance section within this Chapter. In addition, Illinois Statute also requires that a subdivision map and/or plat must, include whether any part of the area "is located within a special flood hazard area as identified by the Federal Emergency Management Agency (FEMA)" (Illinois General Assembly 1996).

Exhibit 9-1

Illinois Residential Real Property Disclosure Act Requirements

	YES	NO	N/A	
1.	____	____	____	Seller has occupied the property within the last 12 months. (No explanation is needed.)
2.	____	____	____	I am aware of flooding or recurring leakage problems in the crawlspace 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).
5.	____	____	____	I am aware of leaks or material defects in the roof, ceilings or chimney.
6.	____	____	____	I am aware of material defects in the walls, windows, doors or floors.
7.	____	____	____	I am aware of material defects in the electrical system.
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).
9.	____	____	____	I am aware of material defects in the well or well equipment.
10.	____	____	____	I am aware of unsafe conditions in the drinking water.
11.	____	____	____	I am aware of material defects in the heating, air conditioning, or ventilating systems.
12.	____	____	____	I am aware of material defects in the fireplace or woodburning stove.
13.	____	____	____	I am aware of material defects in the septic, sanitary sewer, or other disposal system.
14.	____	____	____	I am aware of unsafe concentrations of radon on the premises.
15.	____	____	____	I am aware of unsafe concentrations of or unsafe conditions relating to asbestos on the premises.
16.	____	____	____	I am aware of unsafe concentrations of or unsafe conditions relating to lead paint, lead water pipes, lead plumbing pipes or lead in the soil on the premises.
17.	____	____	____	I am aware of mine subsidence, underground pits, settlement, sliding, upheaval, or other earth stability defects on the premises.
18.	____	____	____	I am aware of current infestations of termites or other wood boring insects.
19.	____	____	____	I am aware of a structural defect caused by previous infestations of termites or other wood boring insects.
20.	____	____	____	I am aware of underground fuel storage tanks on the property.
21.	____	____	____	I am aware of boundary or lot line disputes.
22.	____	____	____	I have received notice of violation of local, state or federal laws or regulations relating to this property, which violation has not been corrected.
23.	____	____	____	I am aware that this property has been used for the manufacture of methamphetamine as defined in Section 10 of the Methamphetamine Control and Community Protection Act.

9.4 Conclusions

1. The County and many municipalities communicate natural hazard and mitigation information to residents throughout the year.
2. The County is establishing a public outreach program which encourages municipal involvement.
3. The County and DuPage municipalities are successfully coordinating the update of floodplain maps.
4. The most efficient ways to communicate with residents are:
    - Outreach Events
    - Community Newsletters
    - Websites and links to other sources
    - Social Media

9.5 Recommendations

1. The County and municipalities whom adopt this plan should develop and agree upon a common public outreach program, to be updated annually. This outreach program could include:

- A coordinated social media campaign.

- A review of publications from other agencies, and a cooperative agreement to promote and distribute similar publications to distribute to residents.
- The promotion of natural hazard mitigation within community newsletters across the County.

2. The County and communities should provide an order form for local libraries to order free state and federal hazard mitigation publications.
3. The County and communities should coordinate with private organizations to promote natural hazard information to employees and customers.
4. Communities in the National Flood Insurance Program should provide floodplain information for property owners.

References

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Chapter 10 – Action Plan

The findings, conclusions, and recommendations presented in Chapters 1 through 9 of the DuPage County Natural Hazard Mitigation Plan have been collated into this Action Plan. In addition, the guidelines and goals developed by the Workgroup, and presented in Chapter 3, set the context for these Action Items. The following Action Items align with the six mitigation areas outlined by the Federal Emergency Management Agency (FEMA) within their Community Rating System (CRS) Program. The Action Plan presented in this chapter establishes an overall direction for the County regarding natural hazard mitigation. The Action Plan can be considered the most important part of this Plan as it incorporates an awareness of local risks, resources, needs, and plans a path forward.

Action Items: The Workgroup met to discuss mitigation activities and develop a draft action plan on January 4, 2018. The action items discussed within the meeting were collated by the DuPage County Office of Homeland Security and Emergency Management (OHSEM). Thirteen action items were established as a result:

Action Item 1: Establish Sub-Workgroups within the Mitigation Workgroup
Action Item 2: Enhance Public Participation in Mitigation Workgroup
Action Item 3: National Weather Service StormReady Participation
Action Item 4: Critical Infrastructure Identification and Verification
Action Item 5: Critical Facility Back-Up Generation Assessment
Action Item 6: Adopt County-Wide Public Outreach Monthly Topics
Action Item 7: Flood Control and Property Protection Projects
Action Item 8: Improve Building Code Ratings
Action Item 9: Incorporate Mitigation Concepts into Future Planning
Action Item 10: Participate in Tree City USA
Action Item 11: Participate in Community Rating System (CRS) Program
Action Item 12: Participate and Support Floodplain Management Studies

Each Action Item within this Action Plan describes who is responsible for implementing each mitigation measure, an estimate of cost of implementation, and the benefits of implementing each action item. The Action Plan took into consideration the countywide coordination that takes place through the Stormwater Ordinance Administrator's Workgroup, the DuPage County Public Works Directors Working Group, and the Local Emergency Management Coordinators Group.

It should be noted that this *Plan* serves only to recommend mitigation measures. Implementation of these recommendations depends on adoption of this *Plan* by the DuPage County Board and the city council or board of trustees of each participating municipality. It also depends on the cooperation and support of the offices designated as responsible for each action item. In addition, each community was encouraged to include additional community specific goals and action items. Products that were provided to the County prior to the draft submittal are included within Appendix E.

A summary of the previous plan's action items through the final annual report, along with the mitigation activities communities completed to achieve each action item, can be found within Appendix F.

10.1 Plan Maintenance

The Natural Hazard Mitigation Workgroup should continue to develop an annual report to formally summarize the hazard mitigation activities of DuPage County and its communities, specifically focusing on progress towards each action item within the Natural Hazard Mitigation Plan. The Workgroup shall also meet annually to discuss the report's findings, progress each community has made, issues each community has experienced, and proposed projects. The annual meeting shall also give Workgroup members the opportunity to discuss needed revisions/amendments to this Plan.

Developing an annual report and meeting annually to discuss progress keeps the Workgroup involved in the plan maintenance process, formalized the maintenance process, and provides a level of accountability to work towards accomplishing the action items within the Plan. DuPage County departments and staff assigned to the Workgroup shall be responsible for coordinating and overseeing the development of the annual report and its associated meeting. DuPage County coordination shall be overseen by the OHSEM.

Per the Federal Emergency Management Agency (FEMA), this Plan shall be updated every 5 years. Again, DuPage County departments and staff assigned to the Workgroup shall be responsible for coordinating and overseeing the next plan update. DuPage County coordination shall be overseen by the OHSEM. Action Items 1 (Establish Sub-Workgroups within the Mitigation Workgroup) and 2 (Enhance Public Participation in Mitigation Workgroup) focus on strengthening the Workgroup so it is better prepared to conduct the next update. In addition, it is recommended that the next 5-year update be conducted over the process of one to two years. This will provide the sub-workgroups ample time meet, develop drafts, involve the public, coordinate with stakeholders, and finalize the plan.

10.2 Action Items

Action Item 1: Establish Sub-Workgroups within the Mitigation Workgroup

Action Item Description: The Natural Hazard Mitigation Workgroup should establish quarterly sub-workgroup meetings, based on subject matter expertise, to oversee the plan maintenance and update process.

Responsible Agency: All County and municipal participating agencies.

Cost: There should be a minimal cost associated with this action item. The primary cost would be additional staff time designated to allow Workgroup participants to attend sub-workgroup meetings.

Benefits: Developing sub-workgroups to oversee the plan maintenance and update process will increase the Workgroup participation, build and enhance relationships, enhance the output from this plan, and improve plan content by ensuring subject matter experts have the proper influence.

Action Item 2: Enhance Public Participation in Mitigation Workgroup

Action Item Description: The Natural Hazard Mitigation Workgroup membership should be enhanced to incorporate representatives of the public (i.e. residents) and private stakeholders.

Responsible Agency: County departments shall lead this effort.

Cost: There should be minimal cost associated with this action item. The primary cost for this item would be staff time associated with recruiting public and private stakeholders.

Benefits: Including representatives of the public (i.e. residents) and private industry would both broaden the plan's perspective, build and enhance relationships, and provide additional Community Rating System (CRS) points to municipalities that participate and adopt the plan.

Action Item 3: National Weather Service StormReady Participation

Action Item Description: DuPage County communities should participate in the National Weather Service StormReady program.

Cost: There is no cost to become a StormReady community, however communities may need to update their emergency preparedness infrastructure to quality and a community will need to allocate a small amount of staff time to complete the application and fulfill any site visits. It is estimated the total amount of hours it would take a community to complete or update an application is between five to 10 hours. In addition, a sign that states a community is StormReady certified is less than $50.

Benefits: In addition to ensuring a community has up-to-date warning systems, which can prevent injuries and save lives, StormReady certification has the potential to enhance a community's Community Rating System (CRS) rating.

Responsible Agency: County and Municipal emergency management agency.

Action Item 4: Critical Infrastructure Identification and Verification

Action Item Description: DuPage County communities should verify aspects of the 16 Critical Infrastructure Sectors within their jurisdiction and share findings with the County to identify mitigation opportunities, to include advanced warning systems.

Responsible Agency: County and Municipal emergency management agencies, public works departments, storm water administrators, and engineers.

Cost: The total cost of this action item is highly dependent on the community. The primary cost associated with this action item is the staff time that will be required. Communities that have a greater awareness of the infrastructure within their community will have an easier time verifying all of the 16 sectors.

Benefits: Identifying critical infrastructure and the hazards each may face will enhance a community's capability to complete a comprehensive threat and hazard identification process. In addition, allowing the County to compile data from all communities will enable the County as a whole to develop a more in-depth community profile, and could potentially enhance a common operating picture during incident response. When a community is aware of its critical infrastructure, and the potential hazards it can face, all aspects of planning becomes easier (i.e. hazard mitigation, financial and strategic, project cost-sharing, etc.).

Action Item 5: Critical Facility Back-Up Generation Assessment

Action Item Description: DuPage County communities should identify backup generation capabilities and ensure facilities meet minimum emergency power requirements of current code.

Responsible Agency: County and Municipal emergency management agencies, public works departments, storm water administrators, and engineers.

Cost: The total cost of this action item is highly dependent on the community. The primary cost associated with this action item is the staff time that will be required. Communities that have a greater awareness of the critical facilities within their community will have an easier time verifying back-up generation capabilities.

Benefits: Ensuring critical facilities have adequate back-up generation capabilities, including automatic switchover, and heat/air capabilities, helps to reduce potential life safety and public health issues. The benefits of using back-up generation may include preventing an evacuation of a facility and allowing government services to continue.

Action Item 6: Adopt County-Wide Public Outreach Monthly Topics

Action Item Description: DuPage County communities should adopt the Illinois Emergency Management Agency's (IEMA) Monthly Preparedness Topics.

Responsible Agency: County and Municipal public information offices / officers.

Cost: No cost should be associated with this action item.

Benefits: Having all communities share the same themed information to residents will serve as a force multiplier within the region, increasing public awareness and resiliency, and aligning County government through a "one voice" approach.

Action Item 7: Flood Control and Property Protection Projects

Action Item Description: DuPage County and its communities should continue to partner on flood control – both structural and green infrastructure – and property protection projects.

Responsible Agency: County and Municipal stormwater administrators, community planners, and building and zoning officials.

Cost: The costs associated with this action item will be community and project specific.

Benefits: Flood control and property protection projects can benefit multiple communities by targeting the source of a problem. Enhanced project participation will increase overall benefits (i.e. cost-sharing, resources, etc.).

Action Item 8: Improve Building Code Ratings

Action Item Description: DuPage County communities should seek to improve their Building Code Effectiveness Grading Schedule (BCEGS) rating.

Responsible Agency: County and municipal building and zoning departments.

Cost: The costs associated with this action item will be community and project specific.

Benefits: Improved building codes can reduce an existing buildings' vulnerability to natural hazards, ensure future developments will not be hindered by hazards, reduce potential public health and life safety issues, and enhance the overall welfare of a community.

Action Item 9: Incorporate Mitigation Concepts into Future Planning

Action Item Description: DuPage County and its communities should incorporate hazard mitigation and climate change concepts into updated codes, ordinances, comprehensive plans, strategic initiatives, and capital improvement plans.

Responsible Agency: County and Municipal emergency management agencies, public works departments, storm water administrators, and engineers.

Cost: The costs associated with this action item will be community and project specific.

Benefits: Including hazard mitigation and climate change concepts into future planning efforts ensures these concepts will remain at the forefront of a community's activities.

Action Item 10: Participate in Tree City USA

Action Item Description: DuPage County communities should participate in the Arbor Day Foundation's Tree City USA program.

Responsible Agency: County and municipal environmental departments.

Cost: Participating in this program will cost a community at minimum $2 per capita, plus staff time to apply for and coordinate the program.

Benefits: Participating in Tree City USA will enhance the County's natural resource protection capabilities, improve air quality, reduce costs for natural resource protection and other associated projects, improve property values, and reduce energy costs.

Action Item 11: Participate in Community Rating System (CRS) Program

Action Item Description: DuPage County communities should participate in the Federal Emergency Management Agency's Community Rating System.

Responsible Agency: County and Municipal departments designated for land use and floodplain planning.

Cost: Participating in the Community Rating System program is free. However, costs may be associated with implementing credible activities and staff time for applying and maintaining program status.

Benefits: Participating in the Community Rating System (CRS) program can maintain a community's good standing in the National Floodplain Insurance Program (NFIP), can lower resident's insurance premiums, reduce life safety and public health issues, and reduce a community's vulnerability to hazards.

Action Item 12: Participate and Support Floodplain Management Studies

Action Item Description: DuPage County and its communities should continue to support floodplain management studies, and review and update watershed plans.

Responsible Agency: County and Municipal stormwater administrators, engineers, and public works departments.

Cost: The costs associated with this action item will be community and project specific.

Benefits: Conducting thorough studies allows for the development of in-depth plans and hazard mitigation projects, reducing life safety and public health issues, and protecting property and critical infrastructure.

Appendix A - Workgroup Participants

The following individuals participated in the development of the DuPage County Natural Hazard Mitigation Plan:

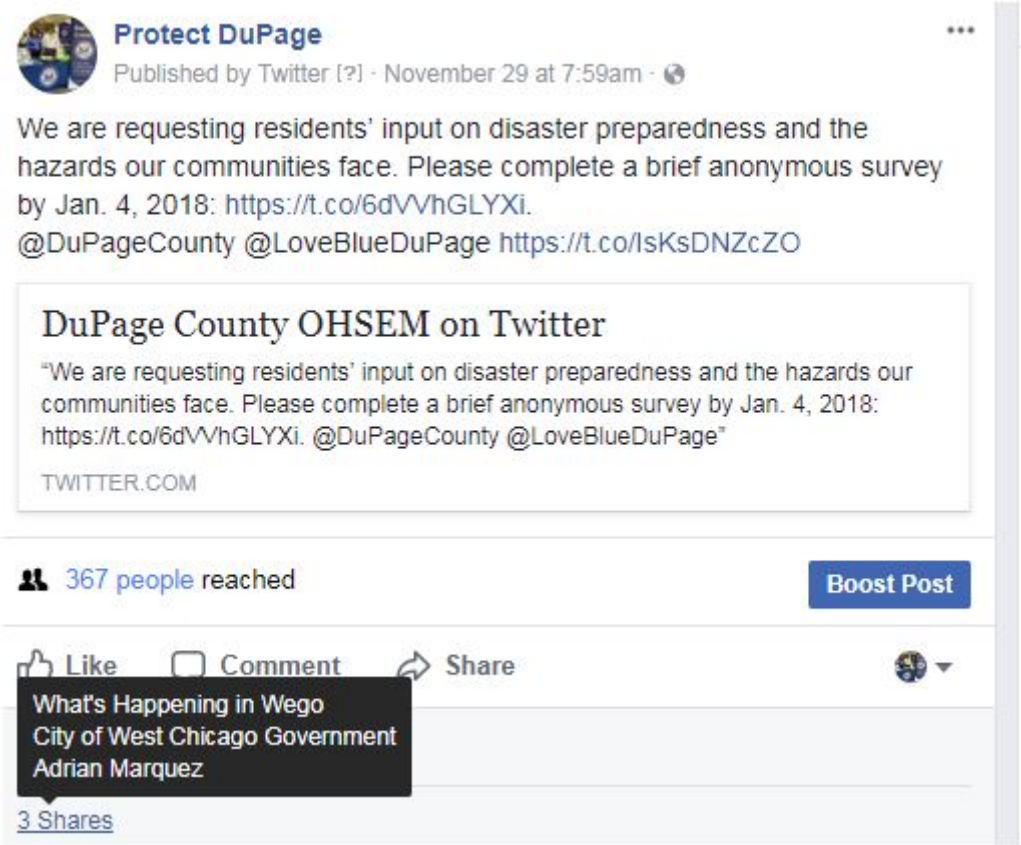
J. Rogers	DuPage OHSEM
K. Thomas	DuPage OHSEM
D. Adler	DuPage OHSEM
S. Hunn	Stormwater Management
M. Mitros	Stormwater Management
G. Phillips	Public Works
P. Hoss	Building & Zoning
J. Stran	Building & Zoning
C. Heffter	Building & Zoning
J. Maranowicz	Village of Addison
R. Selvik	Village of Addison
J. Berley	Village of Addison
J. Melin	Village of Addison
K. Liu	Village of Addison
R. Federighi	Village of Addison
J. Jones	City of Aurora
K. Schroth	City of Aurora
M. McGuigan	Village of Bartlett
B. Goralski	Village of Bartlett
D. Dinges	Village of Bartlett
D. Rosenwinkel	Village of Bensenville
D. Schultz	Village of Bensenville
J. Caracci	Village of Bensenville
K. Katz	Village of Bensenville
F. Giam	Village of Bloomingdale
A. Machek	Village of Bloomingdale
R. Prohaska	Village of Bloomingdale
J. Monkemeyer	Village of Bloomingdale
M. Marchi	Village of Bloomingdale
M. Loftus	Village of Burr Ridge
D. Preissig	Village of Burr Ridge
B. Hoff	Village of Carol Stream
R. Schultz	Village of Carol Stream
J. Jungers	Village of Carol Stream
G. Ulreich	Village of Carol Stream
P. Modaff	Village of Carol Stream
B. Leahy	Village of Clarendon Hills
D. Ungerleider	Village of Clarendon Hills
M. Millette	Village of Clarendon Hills
G. Piccoli	City of Darien
S. Manning	City of Darien
D. Gombac	City of Darien
M. Pratt	Village of Downers Grove
K. Behr	Village of Downers Grove
J. Lomax	Village of Downers Grove
N. Newlon	Village of Downers Grove
K. Johnson	City of Elmhurst
H. Killian	City of Elmhurst
D. Novak	City of Elmhurst
J. Sulak	Village of Glendale Heights
J. Kalchbrenner	Village of Glendale Heights
R. Kaplan	Village of Glendale Heights
R. Acton	Village of Glen Ellyn
D. Buckley	Village of Glen Ellyn
R. Daubert	Village of Glen Ellyn
J. Hansen	Village of Glen Ellyn
A. Johnson	Village of Hanover Park
M. Menough	Village of Hanover Park
K. Lange	Village of Hanover Park
A. Sikich	Village of Hanover Park
K. Votava	Village of Hinsdale
D. Deeter	Village of Hinsdale
G. Peluso	Village of Hinsdale
R. O'Connor	Village of Itasca
N. Hill	Village of Itasca
R. Hitchcock	Village of Itasca
D. Canik	Village of Lisle
M. Sucoe	Village of Lisle
J. Elias	Village of Lisle
R. Sander	Village of Lombard
B. Stuart	Village of Lombard
J. Bryant	Village of Lombard
C. Goldsmith	Village of Lombard
D. Nelson	City of Naperville
W. Novack	City of Naperville
D. Dublinski	City of Naperville
J. Cates	Village of Oak Brook
R. Ginez	Village of Oak Brook
R. Valent	Village of Oak Brook
T. Budzikowski	Village of Oak Brook
D. Patchin	Village of Oak Brook
C. Calvello	City of Oakbrook Terrace
D. Lynch	City of Oakbrook Terrace
D. Anderson	Village of Roselle
V. Ramirez	Village of Roselle
D. Lawry	Village of Schaumburg
M. Hall	Village of Schaumburg
R. Rakosnik	Village of Villa Park
V. Juskelis	Village of Villa Park
R. Salerno	Village of Villa Park
J. Lukowicz	Village of Villa Park
C. Wiencek	City of Warrenville
J. Clark	City of Warrenville
K. Hocking	City of Warrenville
P. Kuchler	City of Warrenville
J. Naydenoff	Village of Wayne
E. Phipps	Village of Wayne
R. Peterson	City of West Chicago
W. Ganek	City of West Chicago
R. Flatter	City of West Chicago

E. Samuel	City of West Chicago
D. Lincoln	Village of Westmont
D. Weiss	Village of Westmont
N. Noriega	Village of Westmont
M. Ramsey	Village of Westmont
B. Schultz	City of Wheaton
P. Redman	City of Wheaton
V. Laoang	City of Wheaton
R. Schalle	Village of Willowbrook
T. Halik	Village of Willowbrook
F. Vollmer	Village of Winfield
P. Krumins	Village of Winfield
T. Loomis	Village of Winfield
C. Celia	City of Wood Dale
M. Rivas	City of Wood Dale
M. York	City of Wood Dale
K. Ostarello	Village of Woodridge
R. Myers	Village of Woodridge
C. Bethel	Village of Woodridge

Appendix B – Public Involvement Activities

Below are samples of public information and public involvement activities that were used during the development of the *DuPage County Natural Hazard Mitigation Plan*, including:

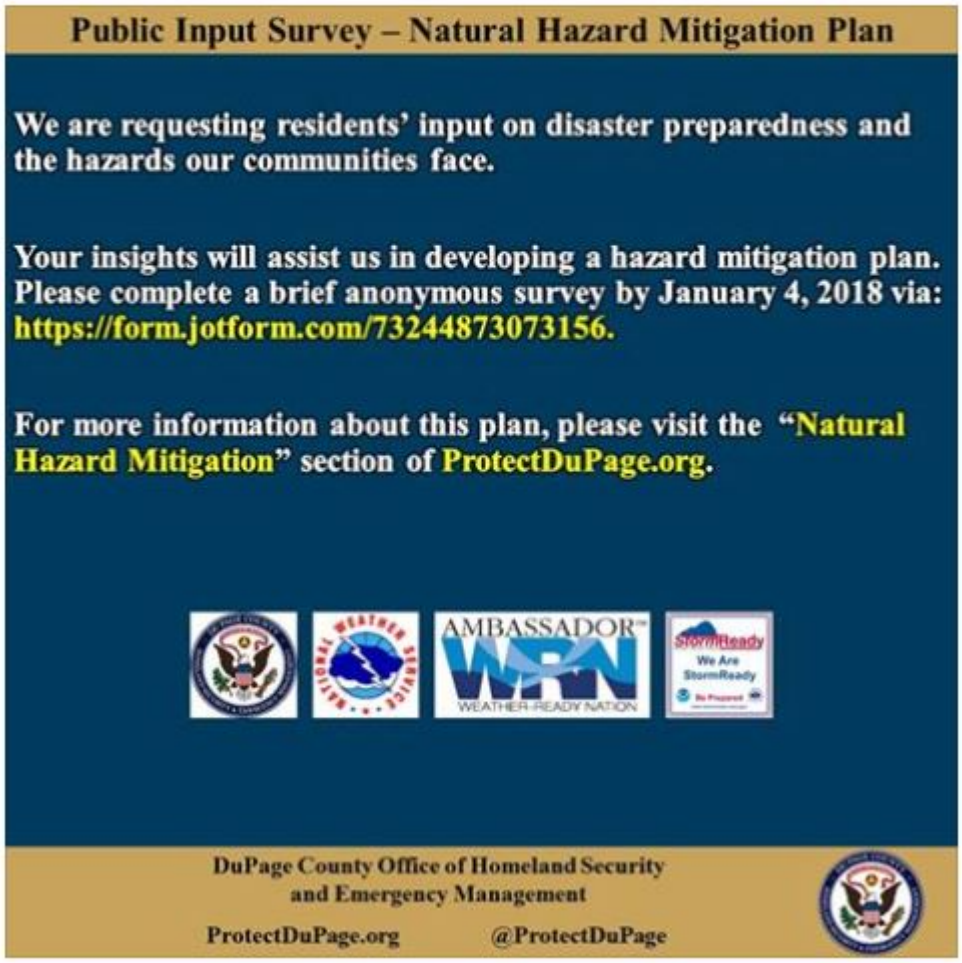
- Press Releases
- DuPage County Website Content
- Social Media Announcements



Protect DuPage
November 29, 2017 ·

We are requesting residents' input on disaster preparedness and the hazards our communities face. Please complete a brief anonymous survey by Jan. 4, 2018: https://form.jotform.com/73244873073156.

DuPage County Board
Love Blue Live Green



Like Comment

Itasca Park District
@ItascaParkDist
Tweets 2,260 Following 90 Followers 504 Likes 119
Itasca Park District Retweeted
DuPage County OHSEM @ProtectDuPage · 29 Nov 2017
We are requesting residents' input on disaster preparedness and the hazards our communities face. Please complete a brief anonymous survey by Jan. 4, 2018:
form.jotform.com/73244873073156.
@DuPageCounty @LoveBlueDuPage
Public Input Survey – Natural Hazard Mitigation Plan
We are requesting residents' input on disaster preparedness and the hazards our communities face.
Your insights will assist us in developing a hazard mitigation plan. Please complete a brief anonymous survey by January 4, 2018 via: https://form.jotform.com/73244873073156.
For more information about this plan, please visit the "Natural Hazard Mitigation" section of ProtectDuPage.org.
DuPage County Office of Homeland Security and Emergency Management
ProtectDuPage.org @ProtectDuPage

Village of Itasca
@ItascaMeans
Tweets 1,077 Following 2,128 Followers 849 Likes 528 Lists 5
Village of Itasca
@ItascaMeans
Top Itasca, IL #business #jobs #industry news and updates with an #EcoDev spin and #LocalGov flavor
Itasca, IL
itasca.com
Joined January 2015
213 Photos and videos
Village of Itasca Retweeted
DuPage County OHSEM @ProtectDuPage · 29 Nov 2017
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DuPage County Office of Homeland Security and Emergency Management
ProtectDuPage.org @ProtectDuPage

Village of Itasca
@ItascaIL
Tweets 2,109 Following 96 Followers 700 Likes 1
Village of Itasca Retweeted
DuPage County OHSEM @ProtectDuPage · 29 Nov 2017
We are requesting residents' input on disaster preparedness and the hazards our communities face. Please complete a brief anonymous survey by Jan. 4, 2018:
form.jotform.com/73244873073156.
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DuPage County Office of Homeland Security and Emergency Management
ProtectDuPage.org @ProtectDuPage

Village of Lisle
@villageoflisle
Tweets 1,766 Following 9 Followers 2,259 Likes 2 Lists 6
Village of Lisle Retweeted
DuPage County OHSEM @ProtectDuPage · 29 Nov 2017
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DuPage County Office of Homeland Security and Emergency Management
ProtectDuPage.org @ProtectDuPage

Woodridge PD
@WoodridgePolice
Tweets 1,046 Following 158 Followers 845 Likes 160
Woodridge PD Retweeted
DuPage County OHSEM @ProtectDuPage · 29 Nov 2017
We are requesting residents' input on disaster preparedness and the hazards our communities face. Please complete a brief anonymous survey by Jan. 4, 2018:
form.jotform.com/73244873073156.
@DuPageCounty @LoveBlueDuPage
Public Input Survey – Natural Hazard Mitigation Plan
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For more information about this plan, please visit the "Natural Hazard Mitigation" section of ProtectDuPage.org.
DuPage County Office of Homeland Security and Emergency Management
ProtectDuPage.org @ProtectDuPage

DuPage County OHSEM @ProtectDuPage · Jan 2

DuPage OHSEM hosts public meeting on Natural Hazard Mitigation Plan from 1-2 p.m. (Thurs., Jan. 4). View the attached press release and below links.

- Draft Plan Summary: goo.gl/QdjCLW
- Draft Plan: goo.gl/5KbsTQ
- Public Comment: goo.gl/zbZS1W

DU PAGE COUNTY

NEWS RELEASE

421 N. County Farm Road • Wheaton, Illinois 60187 • 630-407-6060
Website: WWW.DUPAGECO.ORG • **Twitter**: @dupagecounty • **Facebook**: DuPage County Board

Immediate release
December 29, 2017

Contact: Sabit Abbasi
(630) 407-2936

DuPage County Hosts Public Meeting on Natural Hazard Mitigation Plan

Wheaton, IL - The DuPage County Office of Homeland Security and Emergency Management will host a public meeting regarding a countywide Natural Hazard Mitigation Plan from 1 p.m. to 2 p.m. on Thursday, January 4th in the County Board Room at the JTK Administration Building, 421 N. County Farm Rd., Wheaton.

The Natural Hazard Mitigation Plan helps community leaders evaluate and recognize the types of natural hazards that impact DuPage County. During the planning process, communities will work together to establish goals and develop strategies to reduce the long-term effects of natural hazards.

For more information about the DuPage County Office of Homeland Security and Emergency Management, including the Natural Hazard Mitigation Plan, please visit www.ProtectDuPage.org.

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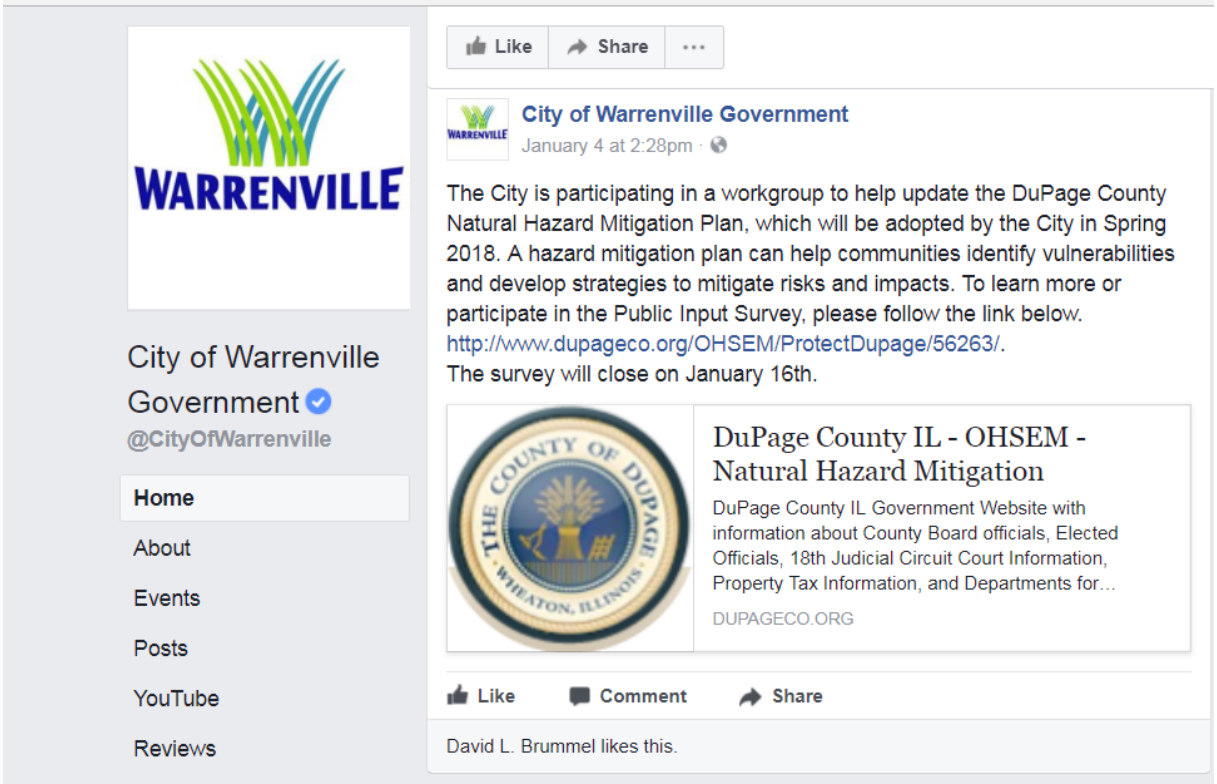
Like
Share
City of Warrenville Government
January 4 at 2:28pm
The City is participating in a workgroup to help update the DuPage County Natural Hazard Mitigation Plan, which will be adopted by the City in Spring 2018. A hazard mitigation plan can help communities identify vulnerabilities and develop strategies to mitigate risks and impacts. To learn more or participate in the Public Input Survey, please follow the link below.
http://www.dupageco.org/OHSEM/ProtectDupage/56263/.
The survey will close on January 16th.
DuPage County IL - OHSEM - Natural Hazard Mitigation
DuPage County IL Government Website with information about County Board officials, Elected Officials, 18th Judicial Circuit Court Information, Property Tax Information, and Departments for...
DUPAGECO.ORG
Like
Comment
Share
David L. Brummel likes this.
WARRENVILLE
City of Warrenville Government
@CityOfWarrenville
Home
About
Events
Posts
YouTube
Reviews

City of West Chicago
@WestChicagoIL
Tweets 3,003
Following 152
Followers 1,219
Likes 211
Moments 1
City of West Chicago @WestChicagoIL · Jan 3
Important information about tomorrows public meeting on DuPage County's Natural Hazard Mitigation Plan.
DuPage County OHSEM @ProtectDuPage
DuPage OHSEM hosts public meeting on Natural Hazard Mitigation Plan from 1-2 p.m. (Thurs., Jan. 4). View the attached press release and below links.
- Draft Plan Summary: goo.gl/QdjCLW...
NEWS RELEASE

City of Wheaton
@CityOfWheaton

Tweets 2,975 | Following 134 | Followers 2,710 | Likes 56

361 Photos and videos

$25.800. wheaton.il.us/295/Housing-Co...

City of Wheaton Retweeted

DuPage County OHSEM @ProtectDuPage · Jan 2

DuPage OHSEM hosts public meeting on Natural Hazard Mitigation Plan from 1-2 p.m. (Thurs., Jan. 4). View the attached press release and below links.
- Draft Plan Summary: goo.gl/QdjCLW
- Draft Plan: goo.gl/5KbsTQ
- Public Comment: goo.gl/zbZS1W

DU PAGE COUNTY

NEWS RELEASE

421 N. County Farm Road • Wheaton, Illinois 60187 • 630-407-6060
Website: www.DUPAGECO.ORG • **Twitter**: @dupagecounty • **Facebook**: DuPage County Board

Immediate release
December 29, 2017

Contact: Sabit Abbasi
(630) 407-2936

DuPage County Hosts Public Meeting on Natural Hazard Mitigation Plan

Wheaton, IL - The DuPage County Office of Homeland Security and Emergency Management will host a public meeting regarding a countywide Natural Hazard Mitigation Plan from 1 p.m. to 2 p.m. on Thursday, January 4th, in the County Board Room at the JTK Administration Building, 421 N. County Farm Rd., Wheaton.

The Natural Hazard Mitigation Plan helps community leaders evaluate and recognize the types of natural hazards that impact DuPage County. During the planning process, communities will work together to establish goals and develop strategies to reduce the long-term effects of natural hazards.

For more information about the DuPage County Office of Homeland Security and Emergency Management, including the Natural Hazard Mitigation Plan, please visit www.ProtectDuPage.org.

###

3 | 2

Vil. of Carol Stream
@carol_stream

Tweets 1,203 | Following 18 | Followers 629 | Likes 93

4

Vil. of Carol Stream Retweeted

DuPage County OHSEM @ProtectDuPage · Jan 2

DuPage OHSEM hosts public meeting on Natural Hazard Mitigation Plan from 1-2 p.m. (Thurs., Jan. 4). View the attached press release and below links.
- Draft Plan Summary: goo.gl/QdjCLW
- Draft Plan: goo.gl/5KbsTQ
- Public Comment: goo.gl/zbZS1W

DU PAGE COUNTY

NEWS RELEASE

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For more information about the DuPage County Office of Homeland Security and Emergency Management, including the Natural Hazard Mitigation Plan, please visit www.ProtectDuPage.org.

###

3 | 2

Lisle
THE ARBORETUM VILLAGE

Village of Lisle Hosts Hazard Mitigation Open House

925 Burlington Avenue, Lisle, IL 60532 • 630-271-4100 • www.villageoflisle.org

FOR IMMEDIATE RELEASE

Contact: Catherine Schuster
Marketing & Communications Director
cschuster@villageoflisle.org
(630) 271-4148

Village of Lisle to Host Natural Hazards Mitigation Plan Open House

January 3, 2018 – The Village of Lisle will host a public Open House to present the draft countywide Natural Hazards Mitigation Plan on Thursday, January 11, 2018 from 7 p.m. to 8:30 p.m. at Village Hall, 925 Burlington Avenue, Lisle. The meeting will be an informal gathering, providing community members the opportunity to provide comments on the draft plan and speak with Village staff.

The Natural Hazards Mitigation Plan helps community leaders recognize and evaluate the types of natural hazards that impact DuPage County, including floods, severe winter storms and extreme heat. During the planning process, communities work together to establish goals and develop strategies to reduce the long-term effects of natural hazards in our area.

The draft copy of the Natural Hazards Mitigation Plan, along with an Executive Summary of the plan may be reviewed at Village Hall or accessed at the following links:
Draft Plan Executive Summary: https://goo.gl/QdjCLW
Draft Plan: https://goo.gl/5KbsTQ

Comments will be taken during the Open House and may also be made online at:
https://goo.gl/zbZS1W

For questions, please contact the Village of Lisle Stormwater Administrator Marilyn Sucoe at msucoe@villageoflisle.org or at (630) 271-4107.

Home » Top Stories » Open House: Countywide Natural Hazards Mitigation Plan

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Open House: Countywide Natural Hazards Mitigation Plan

Last updated: Public Relations Specialist | Friday, January 05, 2018

The Village of Lisle will host a public Open House to present the draft countywide Natural Hazards Mitigation Plan. All DuPage County residents are welcome to attend.

Thursday, January 11, 2018 from 7 p.m. to 8:30 p.m.
Lisle Village Hall, 925 Burlington Ave.

The meeting will be an informal gathering, providing community members the opportunity to provide comments on the draft plan. Staff from Downers Grove will also be present to gather feedback and answer questions.

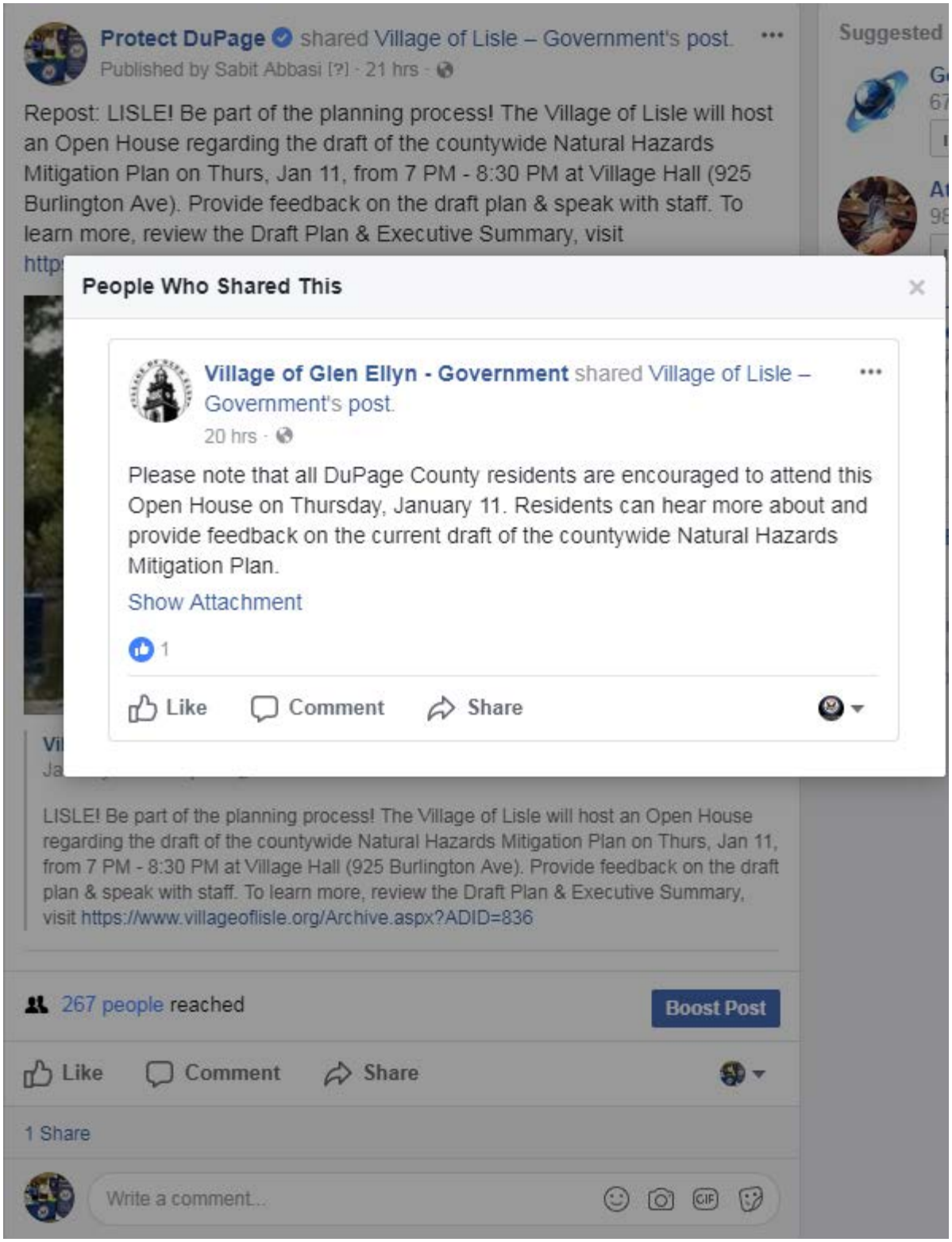
The Natural Hazards Mitigation Plan helps community leaders recognize and evaluate the types of natural hazards that impact communities in DuPage County, including floods, severe winter storms and extreme heat. During the planning process, communities work together to establish goals and develop strategies to reduce the long-term effects of natural hazards in our area.

The draft copy of the Natural Hazards Mitigation Plan, along with an Executive Summary of the plan can be accessed through the following links:

- Draft Plan Executive Summary
- Draft Plan

Comments will be taken during the Open House and can also be made online at: Natural Hazards Mitigation Plan Comments

For questions, please contact Village of Downers Grove Stormwater Administrators Julie Lomax or Kerry Behr at (630) 434-5600.


Protect DuPage shared Village of Lisle – Government's post.
Published by Sabit Abbasi [?] · 21 hrs ·
Repost: LISLE! Be part of the planning process! The Village of Lisle will host an Open House regarding the draft of the countywide Natural Hazards Mitigation Plan on Thurs, Jan 11, from 7 PM - 8:30 PM at Village Hall (925 Burlington Ave). Provide feedback on the draft plan & speak with staff. To learn more, review the Draft Plan & Executive Summary, visit
Suggested
People Who Shared This
Village of Glen Ellyn - Government shared Village of Lisle – Government's post.
20 hrs ·
Please note that all DuPage County residents are encouraged to attend this Open House on Thursday, January 11. Residents can hear more about and provide feedback on the current draft of the countywide Natural Hazards Mitigation Plan.
Show Attachment
1
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LISLE! Be part of the planning process! The Village of Lisle will host an Open House regarding the draft of the countywide Natural Hazards Mitigation Plan on Thurs, Jan 11, from 7 PM - 8:30 PM at Village Hall (925 Burlington Ave). Provide feedback on the draft plan & speak with staff. To learn more, review the Draft Plan & Executive Summary, visit https://www.villageoflisle.org/Archive.aspx?ADID=836
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THE COUNTY OF DUPAGE
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Homeland Security and Emergency Management (OHSEM)

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  - Natural Hazard Mitigation
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  - Social Media Feeds
  - Training
  - Volunteering
- Special Needs Registration
- Weather Seminar
- FOIA for OHSEM

Home > Departments > OHSEM > Protect DuPage

Purpose of the Natural Hazard Mitigation Plan

- Ensure DuPage County and its municipalities qualify for federal funding, before and after a disaster occurs.
- Identify common threats and hazards the County faces.
- Develop common mitigation strategies, ensuring a comprehensive and regional approach is used.
- Develop intergovernmental partnerships within the County.
- Gain public insight and share public information, increasing residents' knowledge and preparedness against the County's threats and hazards.

What is Hazard Mitigation?

According to the Federal Emergency Management Agency (FEMA), hazard mitigation is:

"the effort to reduce loss of life and property by lessening the impact of disasters. It is most effective when implemented under a comprehensive, long-term mitigation plan. State, tribal, and local governments engage in hazard mitigation planning to identify risks and vulnerabilities associated with natural disasters, and develop long-term strategies for protecting people and property from future hazard events."

Federal Emergency Management Agency. (2017). *Hazard Mitigation Planning.* Retrieved on November 15, 2017. Retrieved from: https://www.fema.gov/hazard-mitigation-planning

History of the DuPage County Natural Hazard Mitigation Plan (NHMP)

The DuPage County NHMP was first developed in 2007, through a grant awarded to DuPage County Stormwater Management. In 2010, the DuPage County Office of Homeland Security and Emergency Management (OHSEM) became the official governing body of the plan and the associated workgroup. Personnel from the OHSEM coordinated the 2012 plan update and 2013 plan adoption. Following the County's adoption in May 2013, DuPage County municipalities adopted the plan.

2012 Natural Hazard Mitigation Plan and Annual Reports

The plan was written in 2012 and adopted by the DuPage County Board on May 14, 2013. To review the plan or subsequent annual reports, click the links below.

- 2012 Natural Hazard Mitigation Plan
- 2014 Natural Hazard Mitigation Plan Report
- 2015 Natural Hazard Mitigation Plan Report
- 2016 Natural Hazard Mitigation Plan Report

2017 Plan Update

On November 8th, 2017 the DuPage County's Office of Homeland Security and Emergency Management, Stormwater Management, Building and Zoning Department, and the Department of Public Works, held a kick-off meeting to begin the 5 year update to the NHMP. Municipal representatives from Emergency Management, Stormwater, and Public Works were invited from all municipalities, cities, towns, and villages within and touching the County borders. Prior to the meeting, the County distributed a survey to each municipality requesting feedback on both the 2013 plan and the update.

Currently, the County is working to form a collaborative County and municipal workgroup to assist with the plan update, and is coordinating a public outreach meeting and survey. The workgroup will meet to assess the County's hazards, problems associated with each hazard, develop goals for the County as a whole, and develop mitigation strategies. The workgroup will work to ensure these strategies encompass the following seven categories of mitigation:

- Preventative Measures
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Flood Control Projects
- Public Information

Once the plan update is complete, the plan will be reviewed by the Illinois Emergency Management Agency (IEMA) and FEMA. Once the plan has been approved, the County Board and participating municipal boards will adopt the plan through a formal resolution. For updates on meeting dates, times, locations, and publicly available surveys please check this page.

What's New?

Public Input Survey for the DuPage County Natural Hazard Mitigation Plan 2017 Update. (Now closed)

Prior Meetings:

2017 Plan Update Kick-Off Meeting. Agenda here.

2018 Natural Hazard Mitigation Plan 2nd Update Meeting on December 7th, 2017 at 8:30-9:30 am. Agenda here.

2018 Natural Hazard Mitigation Plan 3rd Update Meeting on January 4th, 2018 at 8:30-9:30 am. Agenda here.

2018 Natural Hazard Mitigation Plan Public Meeting on January 4th, 2018 at 1:00-2:00 pm in the County Board Room at 421 N. County Farm Rd, Wheaton, IL 60187.

Draft Materials for 2018 NHMP and Public Comment:

2018 DRAFT Executive Plan Summary. Summary here.

2018 DuPage County DRAFT DuPage Natural Hazard Mitigation Plan. Plan here.

2018 NHMP Public Comment. Link here.

Additional Information

- Federal Emergency Management Agency. (2017). *What is Mitigation?* Retrieved on: November 15, 2017. Retrieved from: https://www.fema.gov/what-mitigation
- Illinois Emergency Management Agency. (N.D.) *Mitigation Planning*. Retrieved on: November 15, 2017. Retrieved from: https://www.illinois.gov/iema/Mitigation/Pages/Planning.aspx

421 N. County Farm Road, Wheaton, IL 60187, 630-407-6500

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THE COUNTY OF DUPAGE
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- My Permit Status
- Green Building Incentive Program
- Link to Building Permits
- Informational Building Brochures

Home > Departments > Building & Zoning > Building Division

Building Projects and Permits for Unincorporated Areas of DuPage County

The following list includes projects that require permits from the County

Residential Projects

BUILDING PROJECTS

- Build a house
- Build an addition

News

More »

Natural Hazard Mitigation Plan - to review and make comments please check the link

Owner's signature is required on the application at the time of submittal or a notarized signature on our owner authorization form

Appendix C – Resolution Examples

Below are examples of resolutions that were used during the development of the *DuPage County Natural Hazard Mitigation Plan*, including:

- Resolution Example for Creation of Mitigation Workgroup
- Resolution Example for Joining the Mitigation Workgroup
- Resolution Example for DuPage County to Adopt this Plan
- Resolution Example for Communities to Adopt this Plan

R E S 0 L 0 T I 0 N

JPS-006-13

Adoption of the
DuPage County Natural Hazard Mitigation Plan

WHEREAS, the County of DuPage is subject to natural hazards, such as floods, severe summer and winter storms, tornados, extreme heat events; and

WHEREAS, natural hazards can threaten lives, damage property, close businesses, disrupt traffic, and present public health and safety hazards; and

WHEREAS, the DuPage County Hazard Mitigation Plan Workgroup, originally created by resolution of the DuPage County Board of Commissioners (SM-0008-06), has prepared and updated the DuPage County Natural Hazards Mitigation Plan that reviews the County' s options to protect people and reduce damage from the hazards; and

WHEREAS, the County has participated in the development and update of the DuPage County Natural Hazards Mitigation Plan; and

WHEREAS, the recommended DuPage County Natural Hazards Mitigation Plan has been presented for review by residents, federal, state and regional agencies.

NOW, THEREFORE, BE IT RESOLVED that:

1. The DuPage County Natural Hazards Mitigation Plan is hereby adopted as an official plan of DuPage County.
2. The DuPage County Natural Hazards Mitigation Plan identifies a series of action items. The following action items are hereby assigned to the noted department, division or office of the County. The designated department, division or office shall be responsible for the implementation of the action item, provided that resources are available, by the deadline listed in the Plan.

Action Item 1: Establish Sub-Workgroups within the Mitigation Workgroup
Action Item 2: Enhance Public Participation in Mitigation Workgroup
Action Item 3: National Weather Service StormReady Participation
Action Item 4: Critical Infrastructure Identification and Verification
Action Item 5: Critical Facility Back-Up Generation Assessment
Action Item 6: Adopt County-Wide Public Outreach Monthly Topics
Action Item 7: Flood Control and Property Protection Projects
Action Item 8: Improve Building Code Ratings
Action Item 9: Incorporate Mitigation Concepts into Future Planning
Action Item 10: Participate in Tree City USA
Action Item 11: Participate in Community Rating System (CRS) Program
Action Item 12: Participate and Support Floodplain Management Studies

BE IT FURTHER RESOLVED, that the County Clerk be directed to transmit certified copies of this Resolution to the Illinois Emergency Management Agency, 2200 S. Dirksen Parkway, Springfield, Illinois, 62703 and the Federal Emergency Management Agency, 536

South Clark Street, Chicago, Illinois, 60605.

Enacted and approved this 08th day of May, 2018 at Wheaton, Illinois.

_____
Daniel J. Cronin, Chairman
DuPage County Board

ATTEST: _____
Paul Hinds, County Clerk

R E S O L U T I O N

SM-0008-12

DuPage County Natural Hazards Mitigation Plan
Work Group Participation

Whereas the County of DuPage is subject to natural hazards, such as, floods, earthquake, tornadoes, severe winter and summer storms that can damage property, close businesses, disrupt traffic, and present a public health and safety hazard; and

Whereas DuPage County is undertaking a natural hazards mitigation plan for the County; and

Whereas the County has invited the Cities and Villages located within DuPage County to participate in and benefit from this planning effort; and

Whereas several Federal programs require that DuPage County have an adopted hazard mitigation plan to qualify for their benefits;

Now, therefore, be it resolved that:

1. DuPage County hereby states its interest in coordinating the County's mitigation planning process.

2. County Staff is hereby appointed as our representative on the County's Mitigation Workgroup. He/she is charged with:

   a. Attending the regular meetings of the County's Mitigation Workgroup;

   b. Keeping County staff and this Board informed of the Workgroup's activities and recommendations;

   c. Assisting the County's efforts to collect information about the hazards facing the Cities, Villages, and Unincorporated areas of DuPage County and our current policies and programs that can mitigate the impacts of those hazards; and

   d. Obtaining input from County staff on mitigation issues relevant to their work.

3. When the County's Mitigation Workgroup has completed its work and presents its recommended plan, this Board will

review it with the intention of adopting all or parts of it. It is understood that this resolution of commitment to participate in the planning process does not constitute a commitment to enact the recommended plan.

BE IT FURTHER RESOLVED that the County Clerk be directed to transmit certified copies of this **Resolution …..**

Enacted and approved this 8th day of August 2012 at Wheaton, Illinois.

_____

Daniel Cronin, Chairman
DuPage County Board

ATTEST: _____

Gary A. King, County Clerk

Community Resolution to Join Workgroup:

Resolution No. _____

Whereas the City/Village of _____ is subject to natural hazards, such as, floods, earthquake, tornadoes, winter and summer storms, and manmade hazards, such as, utility disruption and transportation incidents; and

Whereas the DuPage County is undertaking a natural hazards mitigation plan for the County; and

Whereas the County has invited the City/Village of _____ to participate in and benefit from this planning effort; and

Whereas several Federal programs require that the City/Village of _____ have an adopted hazard mitigation plan to qualify for their benefits;

Now, therefore, *be it resolved* that:

1. The City/Village of _____ hereby states its interest in participating in the County's mitigation planning process.

2. _____ is hereby appointed as our representative on the County's Mitigation Workgroup. He/she is charged with:

a. Attending regular meetings of the County's Mitigation Workgroup;

b. Keeping City/Village staff and this Council/Board of Trustees informed of the Workgroup's activities and recommendations;

c. Assisting the County's efforts to collect information about the hazards facing the City/Village of _____ and our current policies and programs that can mitigate the impacts of those hazards; and

d. Obtaining input from City/Village staff on mitigation issues relevant to their work.

3. When the County's Mitigation Workgroup has completed its work and presents its recommended plan, this Council/Board of Trustees will review it with the intention of adopting all or parts of it. It is understood that this resolution of commitment to participate in the planning process does not constitute a commitment to enact the recommended plan.

ADOPTED this the _____ day of _____, 2012

_____
Clerk of the City/Village of _____, Illinois

APPROVED this the _____ day of _____, 2012

_____
Mayor/President of the City/Village of _____, Illinois

DuPage County Resolution to Adopt Mitigation Plan and Continue Workgroup:

R E S O L U T I O N
SM-____-12

Adoption of the
DuPage County Natural Hazards Mitigation Plan
and
Continuation of the Natural Hazard Mitigation Workgroup

Whereas the County of DuPage is subject to natural hazards, such as, floods, severe summer and winter storms tornadoes, extreme heat events; and

Whereas natural hazards can damage property, close businesses, disrupt traffic, can threaten lives, and present public health and safety hazards; and

Whereas the DuPage County Hazard Mitigation Workgroup, created by resolution of the DuPage County Board of Commissioners, has prepared the DuPage County Natural Hazards Mitigation Plan that reviews the County's options to protect people and reduce damage from the hazards; and

Whereas the County has participated in the development of the DuPage County Natural Hazards Mitigation Plan; and

Whereas the recommended DuPage County Natural Hazards Mitigation Plan has been presented for review by residents, federal, state and regional agencies;

Now therefore, be it resolved that:

1. The DuPage County Natural Hazards Mitigation Plan is hereby adopted as an official plan of DuPage County.

2. The DuPage County Natural Hazards Mitigation Plan identifies a series of action items. The following action items are hereby assigned to the noted department, division or office of the County. The designated department, division or office shall be responsible for the implementation of the action item, provided that resources are available, by the deadline listed in the Plan.

Action Item 1: Establish Sub-Workgroups within the Mitigation Workgroup
Action Item 2: Enhance Public Participation in Mitigation Workgroup
Action Item 3: National Weather Service StormReady Participation
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Action Item 5: Critical Facility Back-Up Generation Assessment
Action Item 6: Adopt County-Wide Public Outreach Monthly Topics
Action Item 7: Flood Control and Property Protection Projects
Action Item 8: Improve Building Code Ratings
Action Item 9: Incorporate Mitigation Concepts into Future Planning
Action Item 10: Participate in Tree City USA
Action Item 11: Participate in Community Rating System (CRS) Program
Action Item 12: Participate and Support Floodplain Management Studies

3. The DuPage County Hazard Mitigation Workgroup is hereby established as a permanent advisory body. It shall be comprised of representatives from:

a. The County's emergency management, stormwater management, Public Works, GIS and any other office that might be directly involved in the implementation of the Plan's action items as determined by the lead agency.

b. Those municipalities that pass a resolution to adopt the DuPage County Natural Hazards Mitigation Plan and send a representative to attend the meetings of the Workgroup.

c. Representatives of other interested agencies and organizations and associations appointed by the Chair of the County Board of Commissioners to represent stakeholders in hazard mitigation and the general public.

3. The Workgroup shall meet as often as necessary to prepare or review mitigation activities and progress toward implementing the DuPage County Natural Hazards Mitigation Plan. It shall meet at least once each year to review the status of ongoing projects.

4. The schedule of Workgroup meetings shall be posted in appropriate places. All meetings of the Workgroup shall be open to the public.

5. The Workgroup shall prepare an annual report of the DuPage County Natural Hazards Mitigation Plan for the County Board and the municipalities. The report will cover the following points:

a. A review of the original plan.

b. A review of the natural or manmade disasters that occurred during the previous calendar year.

c. A review of the action items in the original plan, including how much was accomplished dint eh previous year.

d. A discussion of why action items were not completed or why implementation is behind schedule.

e. Recommendations for new projects or revised action items. Such recommendations shall be subject to the approval of the County Board and the affected municipality's governing bodies as amendments to the Plan.

6. The Workgroup shall update the DuPage County Natural Hazards Mitigation Plan every five years, according to requirements provided by the Federal Emergency Management Agency, for the consideration of the County Board and the participating municipalities.

BE IT FURTHER RESOLVED that the County Clerk be directed to transmit certified copes of this Resolution …___ to the Illinois Emergency Management Agency in Springfield, Illinois, and the Federal Emergency Management Agency in Chicago, Illinois.

Enacted and approved this ___ day of _____ 2012 at Wheaton, Illinois.

_____

Dan Cronin, Chairman
DuPage County Board

ATTEST:_____

Gary A. King, County Clerk

Community Resolution to Adopt Mitigation Plan:

Resolution No. _____

Whereas the City/Village of _____is subject to natural hazards, such as, floods, severe summer and winter storms tornadoes, extreme heat events, and

Whereas natural hazards can damage property, close businesses, disrupt traffic, can threaten lives, and present public health and safety hazards; and

Whereas the DuPage County Natural Hazards Mitigation Workgroup has prepared a recommended *DuPage County Natural Hazards Mitigation Plan* that reviews the City/Village's options to protect people and reduce damage from the hazards; and

Whereas the City/Village has participated in the development of the *DuPage County Natural Hazards Mitigation Plan*; and

Whereas the recommended *DuPage County Natural Hazards Mitigation Plan* has been presented for review by residents, federal, state and regional agencies;

Now therefore, be it resolved that:

1. The *DuPage County Natural Hazards Mitigation Plan* is hereby adopted as an official plan of the City/Village.

2. The *DuPage County Natural Hazards Mitigation Plan* identifies a series of action items. The following action items are hereby assigned to the noted person or department of the City/Village. The designated person or department shall be responsible for the implementation of the action item, provided that resources are available, by the deadline listed in the Plan.

Action Item 1: Establish Sub-Workgroups within the Mitigation Workgroup
Action Item 2: Enhance Public Participation in Mitigation Workgroup
Action Item 3: National Weather Service StormReady Participation
Action Item 4: Critical Infrastructure Identification and Verification
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Action Item 8: Improve Building Code Ratings
Action Item 9: Incorporate Mitigation Concepts into Future Planning
Action Item 10: Participate in Tree City USA
Action Item 11: Participate in Community Rating System (CRS) Program
Action Item 12: Participate and Support Floodplain Management Studies
Development of a Public Information Strategy
Property Protection References

3. [_____ name] is hereby appointed as the City/Village's representative on the DuPage County Natural Hazards Mitigation Workgroup. The offices charged with implementation of action items in Section 2 shall keep the representative advised of their progress and recommendations.

ADOPTED this the _____ day of _____, 2012.

_____Clerk

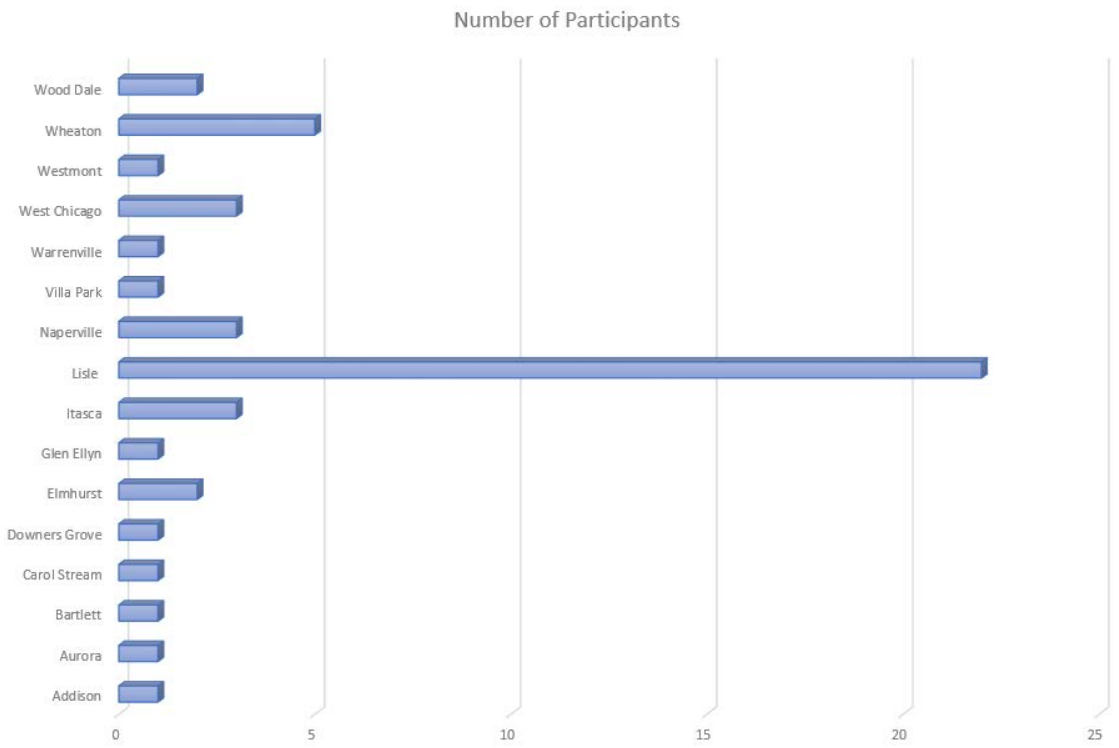
APPROVED this the _____ day of _____, 2012

_____Mayor/Village President

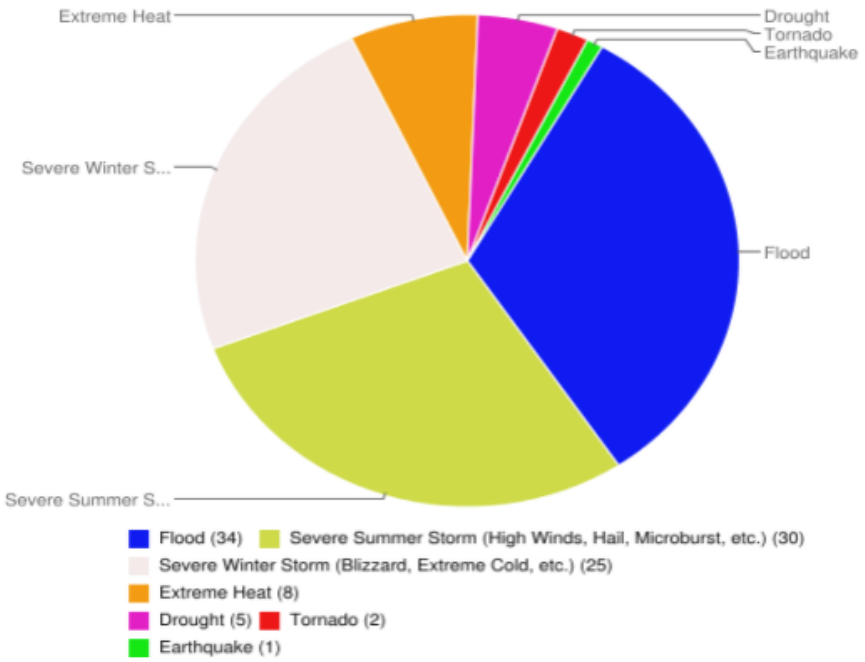
Appendix D – Public Input Survey Results

Below are the results from the Public Input Survey conducted by the workgroup, throughout the month of December 2017, to obtain resident input during the development of the *DuPage County Natural Hazard Mitigation Plan*. The survey, which collected 49 responses, asked residents to identify:

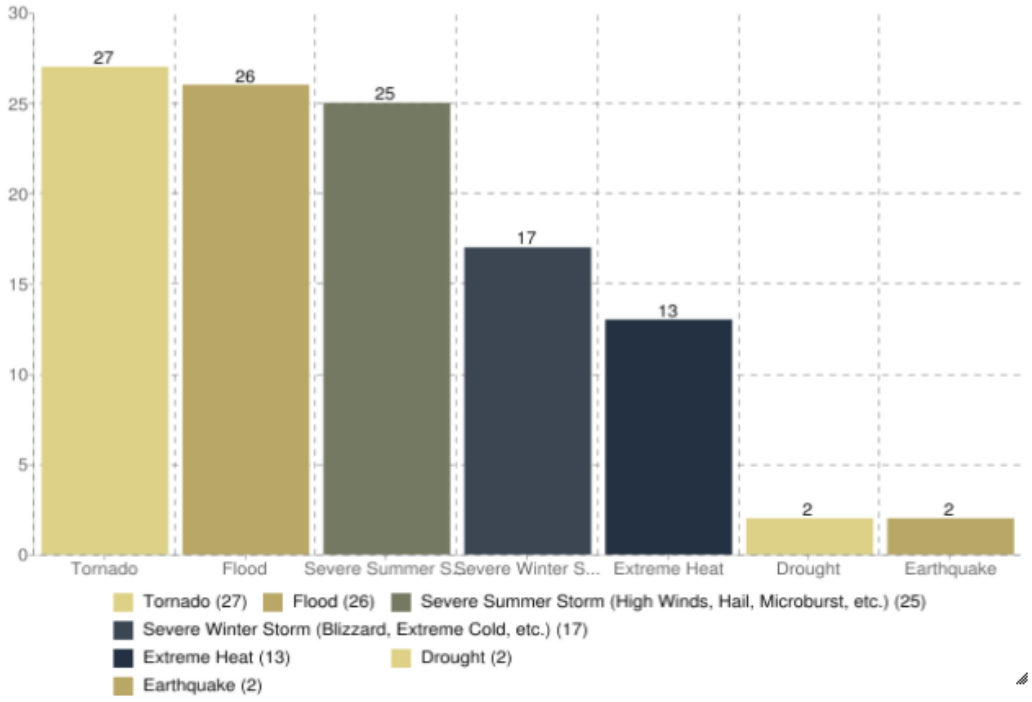
- Their jurisdiction (i.e. city, town, village, etc.);
- Natural hazards they or someone close to them had experienced within their community and within last 10 years;
- Hazards that most concern them when considering their family's health and safety;
- Hazards that most concern them when considering their community as a whole;
- Their feelings regarding community education and their level of preparedness;
- And, steps they've taken to prepare for a natural disaster.



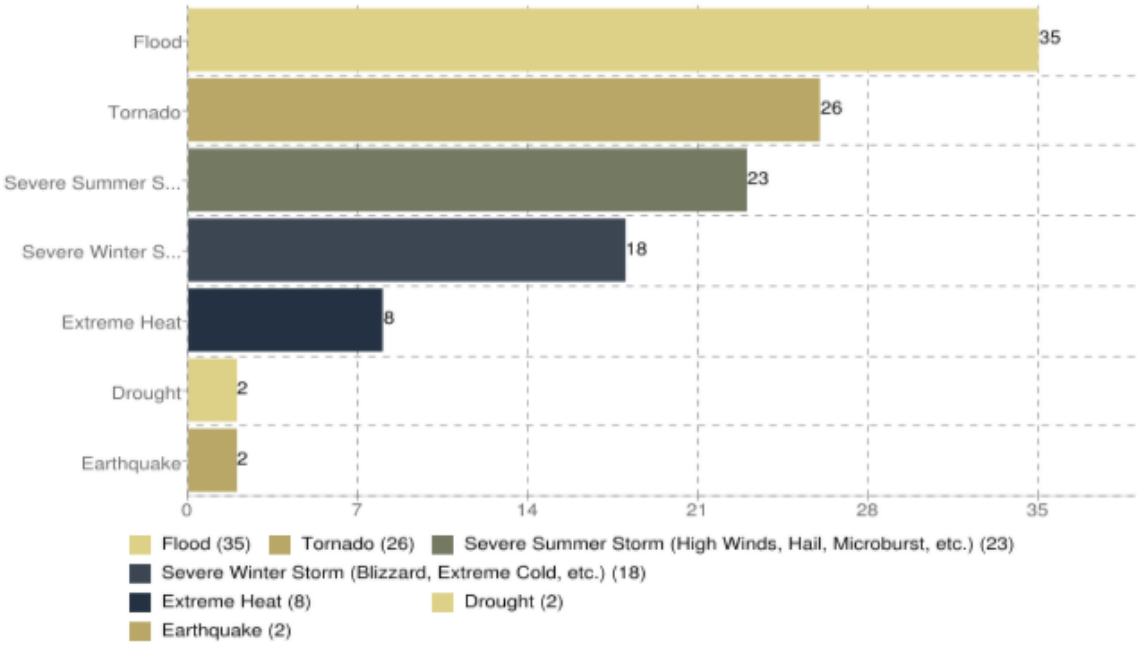
In the past 10 years, have you or someone close to you experienced a natural disaster within your community?



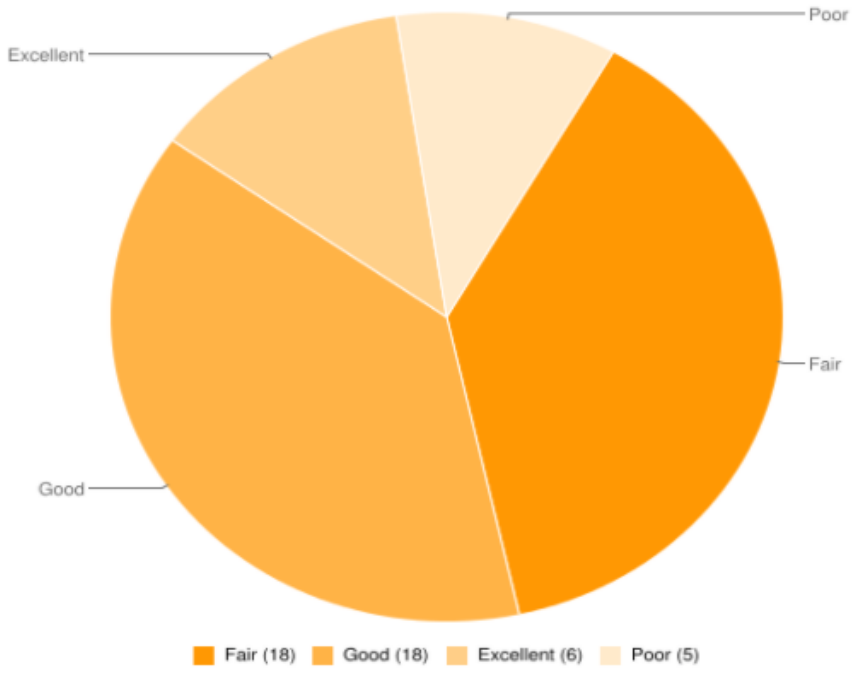
Of the following, what hazards concern you the most when considering your family's health and safety?



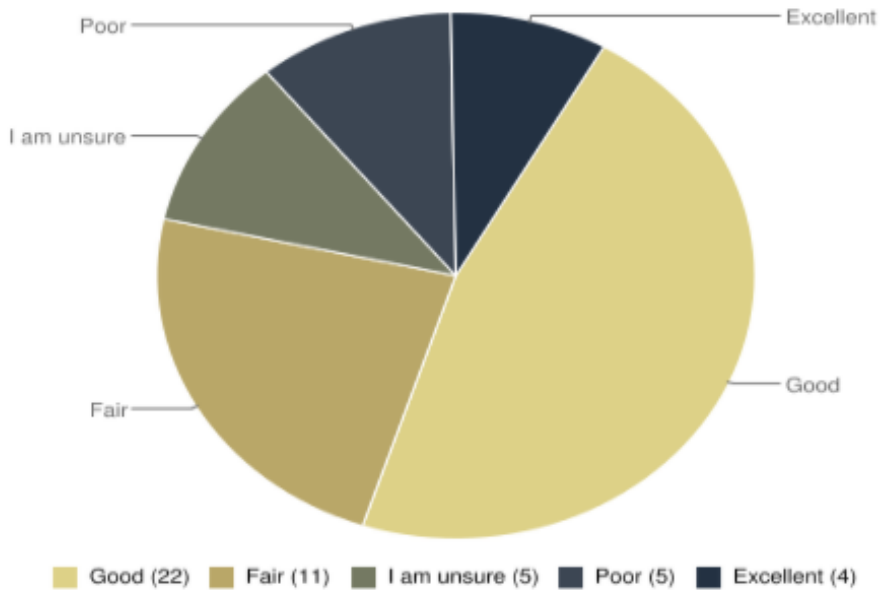
Of the following, what hazards concern you the most when considering your community as a whole?



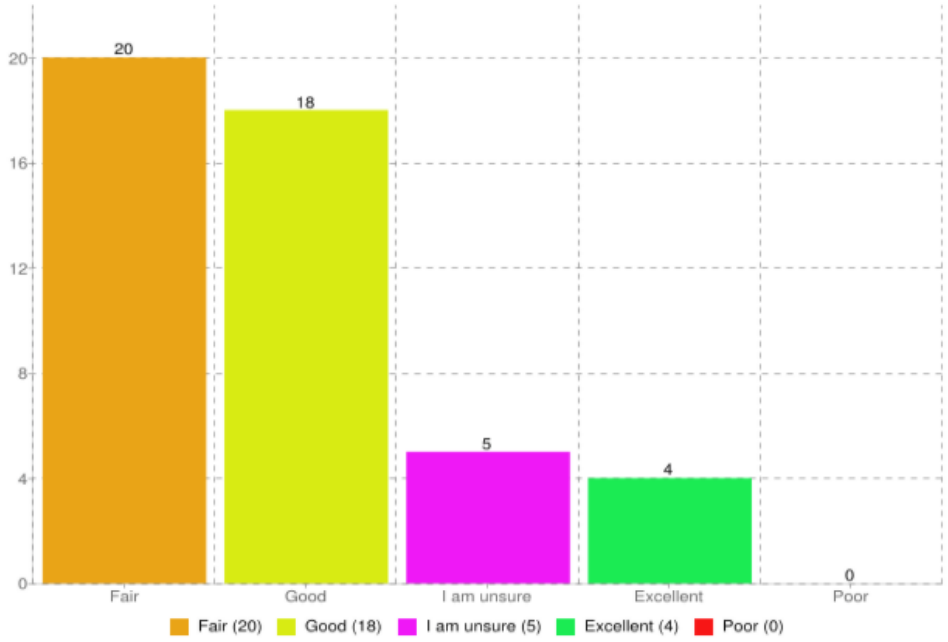
How prepared do you feel to handle a natural disaster?



How do you feel your community is doing to educate residents about hazards and how to be prepared?



How prepared do you feel your community is to handle a natural disaster?



What steps has your household taken to prepare for a disaster?

- I own an extra flashlight. (10%)
- I have extra batteries. (10%)
- I have a can opener. (9%)
- I own a first aid kit. (9%)
- I have a fire extinguisher. (8%)
- I have a poncho or other item to protect me from rain. (7%)
- I have tarp. (6%)
- I store copies of important documents in another place, electronically, and/or in a fire and waterpr...
- I have received First Aid/CPR training. (5%)
- I store extra water. (5%)
- I store 3 days worth of extra non-perishable food. (5%)
- I store extra non-perishable food. (5%)
- I store 3 days worth of extra water. (4%)
- I own a battery powered and/or crank weather radio. (4%)
- I have a first aid or other book for reference. (4%)
- My family has designated an out of town contact for emergencies. (4%)
- I have taken copies of important documents. (2%)

- I have a basic tool kit for repairs (i.e. hammer, screw driver, etc.) (9%)
- I have duct tape for emergency repairs. (8%)
- I have towels, towelettes, and/or garbage bags for sanitation. (8%)
- I have a sleeping bag and/or extra blankets. (8%)
- I have extra clothing, including long pants, a long shirt, and sturdy shoes. (7%)
- I have an extra pad of paper and a pen/pencil. (7%)
- I have extra matches to light a fire. (7%)
- I have protective gloves. (6%)
- I have extra personal hygiene products. (6%)
- I have extra money and/or checks. (6%)
- I have extra and/or disposable plates, silverware, cups, and napkins. (5%)
- My emergency items are readily accessible. (5%)
- I have a dust mask or other protective mask. (5%)
- I have extra medication, copies of my prescriptions, and/or extra glasses. (4%)
- I have a whistle to signal for help. (4%)
- I have extra pet supplies (i.e. food, water, etc.). (3%)
- I have paper maps of my area. (2%)
- My emergency items are ready in a bag that is easy to carry. (1%)

Appendix E – Community Specific Information

VILLAGE OF BENSENVILLE - Action Items

Action Item #1:	Continue to seek funding for the stormwater projects identified in the Master Plan.
Description:	Work to develop a 5-year Capital Improvements Projects incorporating the stormwater improvements.
Responsible Agency:	Public Works.
Cost:	Staff time and cost of construction improvements.
Benefits:	Flood protection.

Action Item #2:	Develop a storage location to handle debris from large scale disasters.
Description:	Work to develop a plan to handle, stage and store large amounts of debris from a tornado, flood, etc.
Responsible Agency:	Public Works.
Cost:	Staff time and potential cost of property.
Benefits:	Provide direction to Village following emergency situations.

Action Item #3:	Continue to provide public outreach to encourage all residents to sign up and update CodeRED.
Description:	Advertisement on Village website, newsletters, utility bills, etc.
Responsible Agency:	Emergency Management/Village Manager's Office.
Cost:	Staff time.
Benefits:	Prevention, public education and awareness.

Action Item #4:	Maintain participation in StormReady.
Description:	Stay involved and up to date with changes to the program.
Responsible Agency:	Emergency Management/Public Works.
Cost:	Staff time.
Benefits:	Prevention, property protection.

Action Item #5:	Provide public outreach to the residents regarding the availability "cooling or warming center" during times of extended high temperatures and severe winter weather.
Description:	Advertisement on Village website, newsletters, utility bills, etc.
Responsible Agency:	Emergency management/Village Manager's Office.
Cost:	Staff time.
Benefits:	Prevention, public education and awareness.

Action Item #6:	Obtain additional stream gauges/monitoring equipment.
Description:	During large storm events a number of locations in town experience severe flooding.
Responsible Agency:	Public Works.
Cost:	Staff time and Equipment cost.
Benefits:	Obtaining stream gauges/monitoring equipment would allow staff to track water levels at all time to better alert residents and first responders.

Action Item #7:	Maintain participation in Tree City USA.
Description:	Continue to plant and maintain trees on annual basis.
Responsible Agency:	Public Works.
Cost:	Staff time, cost of trees, contractual operations costs.
Benefits:	Prevention, Property Protection, Natural Resource Protection.

Action Item #8:	Continue to maintain drainage systems.
Description:	Clean out catch basin, storm structures on routine basis.
Responsible Agency:	Public Works.
Cost:	Staff time and equipment maintenance.
Benefits:	Prevention, Property Protection.

Action Item #9:	Schedule and perform mockup emergency event tabletop exercises.
Description:	Assign roles and responsibilities in the event of an emergency.

Responsible Agency:	All Village Departments.
Cost:	Staff time.
Benefits:	Prevention, Awareness, Education.

VILLAGE OF DOWNERS GROVE –Action Items

Item #1:	Maintain CRS Class 6 Rating.
Description:	Continue various floodplain management activities including public outreach, map information, drainage system maintenance and flood protection.
Responsible Agency:	Public Works.
Cost:	Staff time, printing costs, postage.
Benefits:	Reduction in flood insurance premiums for Village property owners.
Item #2:	Develop a storage location to handle debris from large scale disasters.
Description:	Work to develop a plan to handle, stage and store large amounts of debris from a tornado, flood, etc.
Responsible Agency:	Public Works.
Cost:	Staff time and potential cost of property.
Benefits:	Provide direction to Village following emergency situations.
Item #3:	Continue to further develop our detention basin inspection and maintenance program, including securing easements for those older basins located on private property.
Description:	All basins have been inspected. Continue to work with HOA and private property owners to ensure they are properly maintained. In those cases where easements don't exist, work to secure easements.
Responsible Agency:	Public Works, Community Development, Legal Department.
Cost:	Staff time.
Benefits:	Ensure detention basins remain functioning properly to greater protect the Village during storm events.

Item #4:	Public Outreach to Streamside Land Owners.
Description:	Develop public outreach to streamside land owners regarding floodplain and wetland regulations, recommended maintenance and invasive species removal.
Responsible Agency:	Public Works.
Cost:	Staff time, printing, postage.
Benefits:	Ensure Ordinance requirements are being followed, improve water quality.

Item #5:	Secure Easements of Major Creeks/Floodplain.
Description:	Work to obtain easements for all major creeks/floodplain areas.
Responsible Agency:	Public Works, Community Development.
Cost:	Staff time.
Benefits:	Obtaining easements will allow the Village access to property to remove debris jams, or work on the property as part of a water quality improvement and/or streambank stabilization project.

Item #6:	Obtain additional stream gauges/monitoring equipment.
Description:	During large storm events a number of locations in town experience severe flooding.
Responsible Agency:	Public Works.
Cost:	Equipment cost.
Benefits:	Obtaining stream gauges/monitoring equipment would allow staff to track water levels at all time to better alert residents.
Item #7:	Continue to provide public outreach to encourage all residents to sign up for Community Wide Notification System for Village.
Description:	Currently advertised on Village website, work on other notification methods such as newsletters, utility bills, etc.
Responsible Agency:	Emergency Management/Village Manager's Office.
Cost:	Staff Time.
Benefits:	Prevention, public education and awareness.

Item #8:	Continue to update Village stormwater masterplan including property acquisition.
Description:	Village currently has a masterplan that has updates based upon 2013 Storm event. Work to expand based upon work done to date and address areas not in the plan.
Responsible Agency:	Public Works.
Cost:	Staff Time, Consultants costs – variable.
Benefits:	Prevention, flood reduction.

VILLAGE OF LISLE – Action Items

Action Item #1:	Maintain Class 5 CRS rating.
Action Item Description:	Continue various floodplain management activities including public outreach as outlined in the Board adopted Program for Public Information, map information, drainage system maintenance and flood protection assistance.
Responsible Agency:	Development Services & Public Works.
Cost:	Postage, printing and staff time.
Benefits:	Reduction in flood insurance premiums for Village property owner and improved floodplain management.

Action Item #2:	Develop a Long-term Flood Mitigation and Levee Policy.
Action Item Description:	Develop a long-term flood mitigation strategy and levee policy in coordination with DuPage County Stormwater Management and US Army Corps of Engineers.
Responsible Agency:	Development Services & Public Works.
Cost:	Staff time.
Benefits:	Provide direction for Village budgeting and certainty for property owners protected by the levee.

Action Item #3:	Develop a stormwater master plan and associated capital improvements program.
Action Item Description:	Collect data on existing stormwater and flooding concerns throughout the Village, develop solutions, cost estimates and prioritization for future resolution.

Responsible Agency:	Development Services & Public Works.
Cost:	Consultant fee and staff time.
Benefits:	Will provide direction for Village budgeting and certainty for property owners affected.

Action Item #4:	Develop a detention basin inspection and maintenance enforcement program.
Action Item Description:	Develop a detention basin inspection and maintenance enforcement program for all public and private stormwater storage basins.
Responsible Agency:	Development Services & Public Works.
Cost:	Staff time.
Benefits:	Improve stormwater management in the Village.

Action Item #5:	CodeRED public outreach.
Action Item Description:	Provide public outreach to encourage all residents to sign up and update CodeRED.
Responsible Agency:	Village Manager's Office.
Cost:	Staff time.
Benefits:	Increased number of residents reached with emergency messages during hazardous conditions.

Action Item #6:	Maintain Volunteers 4 Lisle.
Action Item Description:	Maintain Volunteers 4 Lisle program for assistance during emergencies and with StormReady program.
Responsible Agency:	Development Services & Public Works.
Cost:	Staff time.
Benefits:	Allows for volunteers to staff road blocks, provide door to door contact during evacuations, freeing Police and Public Works staff.

Action Item #7:	Maintain participation in StormReady.
Action Item Description:	Continue to train staff and volunteers per StormReady program requirements, including storm spotting and emergency exercises.
Responsible Agency:	Development Services & Public Works.
Cost:	Staff time.
Benefits:	Trained staff and volunteers improved our capability to predict and respond to a weather emergency.

Action Item #8:	Maintain participation in Tree City USA.
Action Item Description:	Continue forestry program throughout the community and Arbor Day tree sale.
Responsible Agency:	Public Works.
Cost:	$50,000 minimum ($2 per capita) and staff time.
Benefits:	Improve health of Village trees and reduce damages or roadway debris due to falling parkway trees and branches.

Action Item #9:	Outreach program to community members and organizations that serve individuals with functional needs.
Action Item Description:	Develop an outreach program and a process to manage community members and organizations that serve individuals with functional needs.
Responsible Agency:	Village Manager's Office & Police.
Cost:	Staff time.
Benefits:	Avoid potential conflicts when responding to emergencies that impact functional need residents, such as wheel chair bound residents, or facilities such as local senior living facilities and an autism day school.

Action Item #10:	Outreach for cooling and warming centers.
Action Item Description:	Provide public outreach to the residents regarding the availability cooling or warming center during times of extended high temperatures and severe winter weather.
Responsible Agency:	Village Manager's Office & Police.

Cost:	Staff time.
Benefits:	Increases awareness of centers for at risk residents.

Action Item #11:	Update Comprehensive Plan.
Action Item Description:	Comprehensive plan update addressing land use of the regulatory floodplain and coordination with the DuPage River Feasibility Study.
Responsible Agency:	Development Services.
Cost:	Consultant fee and staff time.
Benefits:	Avoids conflicting land use recommendations in the regulatory floodplain.

Action Item #12:	Public outreach to streamside landowners.
Action Item Description:	Develop public outreach to streamside landowners regarding floodplain and wetland regulations, recommended maintenance, and invasive species removal.
Responsible Agency:	Development Services & Public Works.
Cost:	$3,000 staff time.
Benefits:	Have a more educated and resilient community.

Action Item #13:	Update Village's Emergency Operations Plan.
Action Item Description:	Continue updates to Village's Emergency Operations Plan to meet all state and federal requirements and add local flood response planning.
Responsible Agency:	Development Services & Public Works.
Cost:	Staff time.
Benefits:	Provides a written plan for an emergency response.

Action Item #14:	Establish prioritization for floodplain acquisitions.
Action Item Description:	Establish a long-term prioritization method for implementing a floodplain acquisition program when funds are available, especially post-disaster funds.
Responsible Agency:	Development Services & Public Works.

Cost:	Staff time.
Benefits:	Creates a fair method of distributing funds when available for buyouts.

Action Item #15:	Pursue mitigation funds for floodplain structure acquisition.
Action Item Description:	Pursue mitigation funds to acquire additional floodplain residential structures.
Responsible Agency:	Development Services & Public Works.
Cost:	Staff time.
Benefits:	Reduce the cost of flooding on our community and flood insurance program.

Action Item #16:	Outreach of summer watering restrictions.
Action Item Description:	Issue social media messages and newsletter reminders of Village water restrictions.
Responsible Agency:	Village Manager's Office & Public Works.
Cost:	Staff time.
Benefits:	Reducing water consumption, especially during periods of drought.

Action Item #17:	Update Property Maintenance Code.
Action Item Description:	Update Property Maintenance Code to the latest I-code.
Responsible Agency:	Development Services.
Cost:	Staff time.
Benefits:	Insures that buildings are better able to withstand severe weather events.

Action Item #18:	Develop a written sandbag deployment policy.
Action Item Description:	Develop a written sandbag deployment policy and maintain sandbag and barricade supplies.
Responsible Agency:	Development Services & Public Works.
Cost:	Staff time.

Benefits:	Provides direction for staff during emergencies.

Action Item #19:	Maintain tornado sirens.
Action Item Description:	Continue maintenance of Village owned tornado sirens.
Responsible Agency:	Public Works.
Cost:	$2,000 and staff time.
Benefits:	Insures siren is operational during a tornado warning to allow time for people in the community to take cover.

Action Item #20:	Install staff gage on East Branch DuPage River.
Action Item Description:	Install a staff gage at Short Street bridge on East Branch DuPage River, downstream of St. Joseph Creek confluence.
Responsible Agency:	Development Services & Public Works.
Cost:	$1000 and staff time.
Benefits:	Better predictions of levee overtopping.

VILLAGE OF VILLA PARK – Action Items

Action Item #1:	Implement the projects, goals, and recommendations defined within the Village of Villa Park Comprehensive Plan.
Action Item Description:	The Village of Villa Park has dedicated resources towards research and plan development in areas of specific concern to the community. Specifically, Appendix - Chapter B of the Comprehensive Plan outlines study findings and recommendations for the combined sewer system.
Responsible Agency:	All participating agencies.
Cost:	The costs associated with this action item will be project specific.
Benefits:	Implementation of the recommendations within Appendix – Chapter B would alleviate flooding and reduce stress on the combined sewer collection system.

Action Item #2:	Implement the projects, goals, and recommendations defined within the Village of Villa Park Comprehensive Flood Plan.

Action Item Description:	The Comprehensive Flood Plan, focusing on Storm Sewer System Analysis, uses research and calibrated computer models, to outline proposed drainage improvements projects including: increased storm sewer sizes, constructing relief sewers, creating flood storage in open space, providing flood storage underground, and floodwalls.
Responsible Agency:	All participating agencies.
Cost:	The costs associated with this action item will be project specific.
Benefits:	Implementing the recommendations within this Plan will assist the community in achieving adequate protection against a 100-year flood event.

Action Item #3:	Implement the projects, goals, and recommendations defined within the Sugar Creek Watershed Plan.
Action Item Description:	The Sugar Creek Watershed is located in DuPage County in the Villages of Villa Park and Lombard and the City of Elmhurst. There are a number of areas within the watershed that have a history of flooding. The flooding levels range from minor nuisance ponding to significant flooding that causes structural damage.
Responsible Agency:	All participating agencies.
Cost:	The costs associated with this action item will be project specific.
Benefits:	The projects outlined within this plan are expected to shorten the duration of flooding and provide a positive means for water to leave the problem areas after inundation peaks have subsided.

Appendix E – 2017 Natural Hazard Mitigation Plan Annual Report

DuPage County
Natural Hazard Mitigation

2017 Annual Report

DuPage County Natural Hazard Mitigation Workgroup

January 2018

Executive Summary

The *DuPage County Natural Hazards Mitigation Plan* (NHMP), updated in 2012, was approved and adopted in May 2013 by the DuPage County Hazard Mitigation Workgroup as a multi-jurisdictional plan. For municipalities to be eligible for Hazard Mitigation grant funding, the Federal Emergency Management Agency (FEMA) and the Illinois Emergency Management Agency (IEMA) mandate the adoption of a hazard mitigation plan. This plan meets the mitigation planning requirements of both FEMA and IEMA. Municipalities are encouraged to adopt the *DuPage County Natural Hazards Mitigation Plan* in order to meet State and Federal requirements.

The *DuPage County Natural Hazards Mitigation Plan* examines natural hazards facing DuPage County, establishes mitigation goals, evaluates existing mitigation activities throughout the County, and recommends additional mitigation steps that are appropriate to protect people, property and other assets throughout DuPage County. The *Plan* provides the County, its municipalities, and other participating agencies with direction for enhancing current mitigation efforts. As required by FEMA and IEMA, mitigation plans must include actionable items that will help insure proper plan implementation and maintenance. Chapter 9 of the *DuPage County Natural Hazards Mitigation Plan* provides an "Action Plan" for implementation and maintenance.

Annual reports are intended to provide a review of the Plan direction and recommendations, a summary of natural disasters that impacted DuPage County during the reporting year, and a review of the action items implemented since the *Plan* was adopted, as appropriate.

This is the 5th and final annual report of the 2012 Natural Hazard Mitigation Plan. The DuPage County Hazard Mitigation Workgroup met on December 7th, 2017 and January 4th, 2018 at 421 North County Farm Road, in Wheaton, Illinois. The 2017 Annual Report, for the reporting period of November 2016 to November 2017, is based on information collected from the State of Illinois, County Departments, and feedback solicited from the Hazard Mitigation Workgroup.

The following Annual Report is a summary of results from the 2017 DuPage County Natural Hazard Mitigation Plan Survey provided to all DuPage County municipalities and workgroup members.

2017 Annual Report Development

Participating agencies of the DuPage County Natural Hazard Mitigation Plan and the 2017 Annual Report are listed below:

Local Municipal Jurisdictions

Addison
Bartlett
Bensenville
Bloomingdale
Burr Ridge
Carol Stream
Clarendon Hills
Darien
Downers Grove
Elmhurst
Glen Ellyn
Glendale Heights
Hanover Park
Hinsdale
Itasca
Woodridge
Lisle
Lombard
Naperville
Oak Brook
Oakbrook Terrace
Roselle
Villa Park
Warrenville
West Chicago
Westmont
Wheaton
Willowbrook
Winfield
Wood Dale

DuPage County Departments

DuPage County Office of Homeland Security and Emergency Management
DuPage County Stormwater Management
DuPage County Building and Zoning
DuPage County Public Works

Review of Action Items

The Action Plan (Chapter 9) in the *DuPage County Natural Hazards Mitigation Plan* contains 20 action items. These action items were taken from the hazard mitigation recommendations made in Chapters 4 through 8. Since the 2011-12 NHMP update, two action items have been removed and three action items have been added to this plan. Reasoning for removal is established in action items 7 and 8. The action items are identified as administrative, project or public information related items. Implementation progress of the action items are summarized in the following report.

Action Items marked complete within the 2015 Annual Report were not changed. Action Items marked In Progress for the current reporting period of November 2016 to November 2017 reflect only the answers of the municipal jurisdictions and County departments and divisions whom replied to the 2017 annual survey.

SECTION A: Administrative Action Items

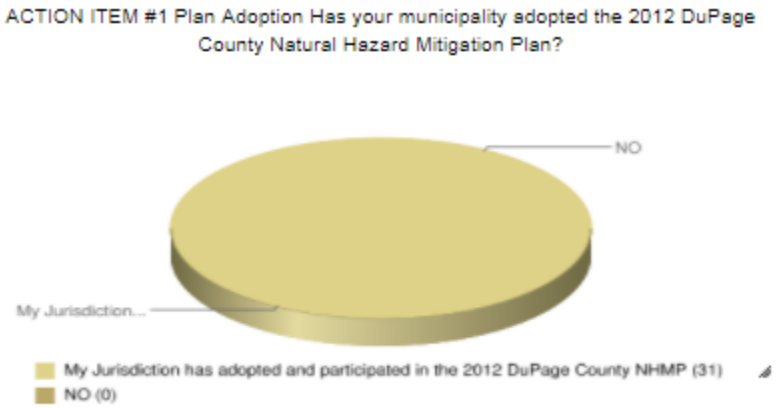
Action Item 1: Plan Adoption

Action Item Description: Adopt the DuPage County Natural Hazards Mitigation Plan by resolution of the County Board, City Councils, Boards of Trustees, and other governing boards, as appropriate.

Status: Marked complete in 2017 annual report.
31 jurisdictions (including the County) have adopted the 2012 Natural Hazard Mitigation Plan, as shown in Table 1.1.

Next 5 years*: Every jurisdiction is expected to adopt the 2012 Natural hazard Mitigation Plan*

Has your municipality adopted the 2012 DuPage County Natural Hazard Mitigation Plan?



Action Item 2: Continuation of Mitigation Workgroup

Action Item Description: The County's resolution to adopt this Plan should convert the DuPage County Natural Hazards Mitigation Workgroup to a permanent advisory body. It would:

- Act as a forum for hazard mitigation issues,
- Disseminate hazard mitigation ideas and activities to all participants,
- Allow for continued public participation in the implementation and future revisions,
- Ensure incorporation of this *Plan*'s goals and guidelines into other planning documents,
- Monitor implementation of this Action Plan, and
- Report on progress and recommended changes to the County Board and each municipality.

Status: Ongoing.

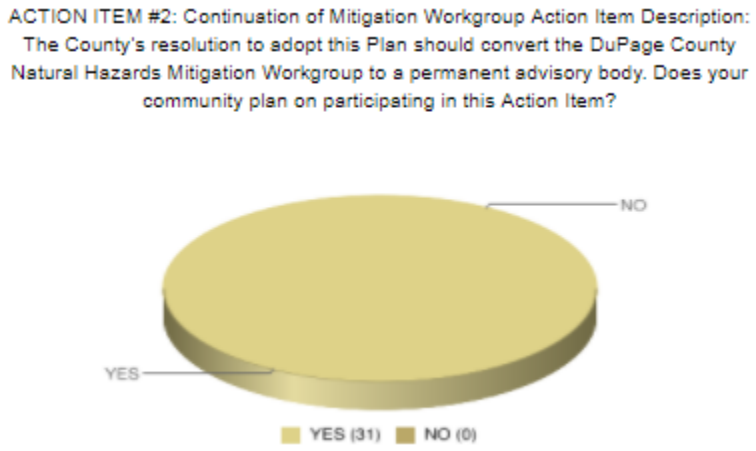
The County Board adoption resolution of November 13, 2007 states that the "DuPage County Hazard Mitigation Workgroup is hereby established as a permanent advisory body."

The Mitigation Workgroup met to develop the Plan in 2007, and every year since to share information and provide input into the Annual Reports. All annual reports are shared with the Workgroup.

Next 5 years: The Mitigation Workgroup has met in 2017 to develop an annual report to the *Plan*, and will continue to meet annually.

Action Item Description: The County's resolution to adopt this Plan should convert the DuPage County Natural Hazards Mitigation Workgroup to a permanent advisory body.

Does your community plan on participating in this Action Item?



Action Item 3: Plan Monitoring and Maintenance

Action Item Description: A Natural Hazard Mitigation Workgroup meeting will be held at least once a year to evaluate and monitor progress on implementation. This meeting is intended to solicit the input from multiple disciplines throughout multiple jurisdictions of DuPage County. An annual evaluation report will be submitted to the DuPage County Board by the current chair of the Mitigation Workgroup.

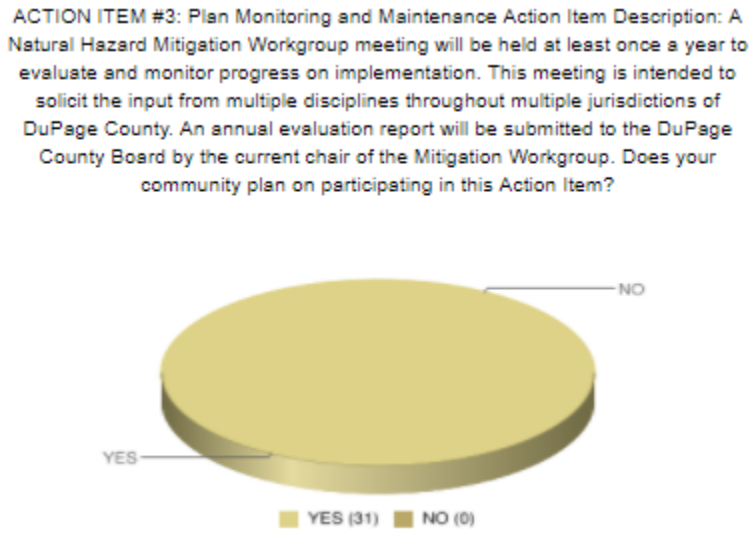
Status: Ongoing
As of 2010, the DuPage County OHSEM took responsibility of coordinating Workgroup meetings. The Plan has been updated to reflect this change.

Next 5 years: DuPage County OHSEM intends to continue coordinating meetings.

This annual evaluation report has been prepared per this action item. A meeting of the Mitigation Workgroup is held annually, usually in October/November.

Action Item Description: A Natural Hazard Mitigation Workgroup meeting will be held at least once a year to evaluate and monitor progress on implementation. This meeting is intended to solicit the input from multiple disciplines throughout multiple jurisdictions of DuPage County. An annual evaluation report will be submitted to the DuPage County Board by the current chair of the Mitigation Workgroup.

Does your community plan on participating in this Action Item?



SECTION B: Mitigation Project Action

Action Item 4: Improvement of Building Code Effectiveness Grading Schedule (BCEGS) Rating

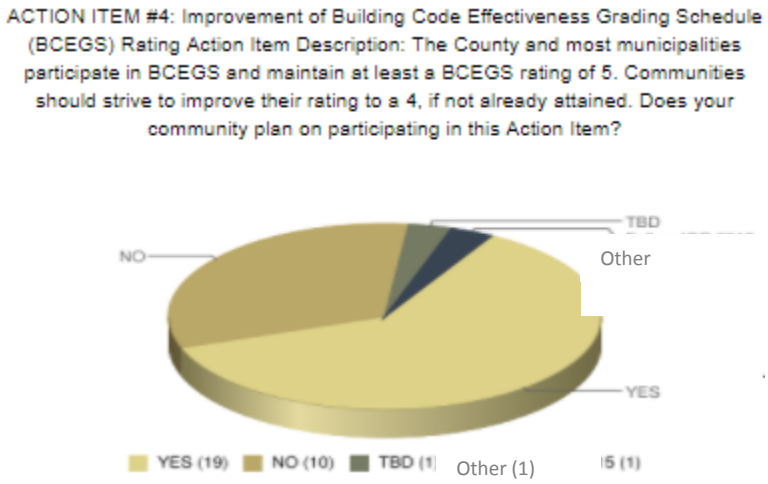
Action Item Description: The County and most municipalities participate in BCEGS and maintain at least a BCEGS rating of 5. Communities should strive to improve their rating to a 4, if not already attained.

Status: Ongoing.

Next 5 years: Municipalities are encouraged to improve their BCEGS ratings and adopt the County building codes as a minimum standard.

Action Item Description: The County and most municipalities participate in BCEGS and maintain at least a BCEGS rating of 5. Communities should strive to improve their rating to a 4, if not already attained.

Does your community plan on participating in this Action Item?



Action Item 5: Urban Forestry - Participation in Tree City USA

Action Item Description: DuPage municipalities that are Tree City USA communities will maintain their status in the nationwide program, and jurisdictions that are not in the program will consider joining the program. It is understood that each municipality will make these considerations based on available staffing and financial resources.

Status: Ongoing.

In the 2017 Annual Report, 99% (30/31) municipalities showed interest in participated in this program.

Next 5 years: The DuPage County Mitigation Workgroup will continue to encourage municipal participation in Tree City USA.

Action Item Description: DuPage County municipalities that are Tree City USA communities will maintain their status in the nationwide program. Jurisdictions that are not in the program will consider joining the program. It is understood that each municipality will make these considerations based on available staffing and financial resources.

Does your community plan on participating in this Action Item?

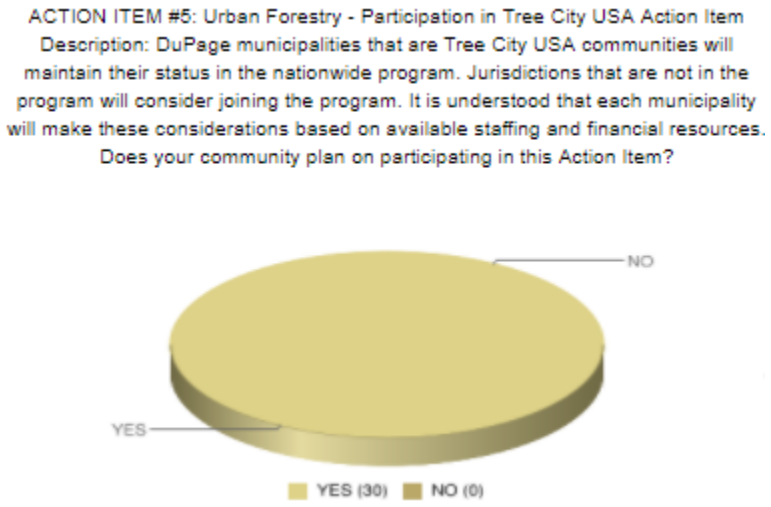


Exhibit 7-3 lists communities within DuPage County that participate in Tree City USA (Arbor Day Foundation, 2017).

Exhibit 7-3
Tree City USA Participants

Community Name	Years Participated	Community Name	Years Participated
Addison	29	Lisle	25
Bensenville	26	Lombard	27
Bloomingdale	22	Naperville	27
Burr Ridge	23	Roselle	31
Clarendon Hills	27	Villa Park	32
Downers Grove	33	Warrenville	30
Elmhurst	37	Wayne	20
Glen Ellyn	33	Westmont	21
Glendale Heights	20	Wheaton	31
Hanover Park	32	Wood Dale	12
Hinsdale	25	Woodridge	26
Itasca	32		

***Statistics taken from the website: www.arborday.org.*

Action Item 6: Community Rating System Participation

Action Item Description: DuPage County municipalities that participate in the National Flood Insurance Program's Community Rating System (CRS) will continue their participation and strive to improve their class rating. The County and municipalities not currently involved in CRS will consider joining the program, though it is understood that some communities have determined that the program is not warranted at this time.

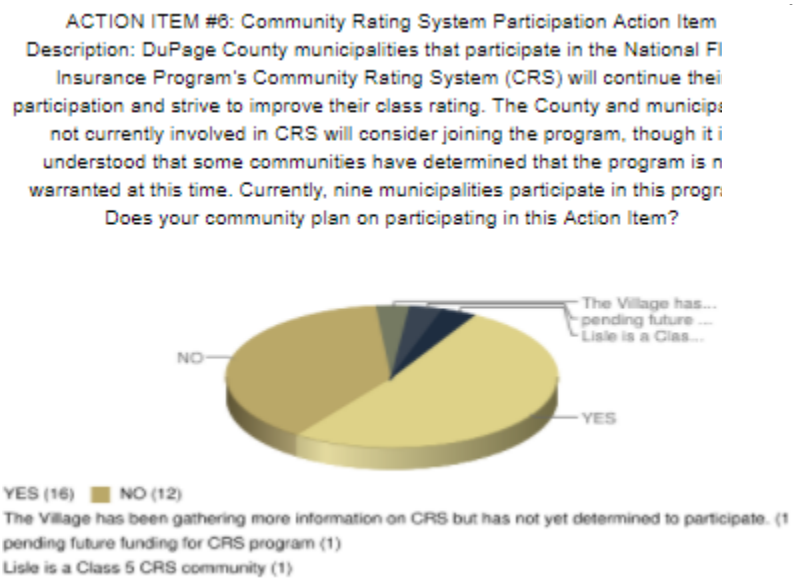
Status: Ongoing.

The following communities currently participate in the CRS program: Addison, Bartlett, Downers Grove, Glendale Heights, Lisle, Wheaton, Willowbrook, and Wood Dale. DuPage County (unincorporated) is presently completing the application process.

Next 5 years: DuPage County communities not currently participating should investigate the feasibility of participating in the CRS. Communities currently participating should continue to take steps to improve their CRS rating.

Action Item Description: DuPage County municipalities that participate in the National Flood Insurance Program's Community Rating System (CRS) will continue their participation and strive to improve their class rating. The County and municipalities not currently involved in CRS will consider joining the program, though it is understood that some communities have determined that the program is not warranted at this time.

Does your community plan on participating in this Action Item?



Action Item 7: Community Rating System Information Workshop - REMOVED

Action Item Description: DuPage County should invite FEMA, the Illinois Department of Natural Resources (IDNR), and the Insurance Services Office, Inc. (ISO) to present a workshop to the County, municipal stormwater administrators and other interested parties on CRS. The workshop should include an explanation of the program, annual requirements associated with participation, and an idea of minimum credits available to DuPage County municipalities based on ongoing, countywide efforts, such as the DuPage County Countywide Stormwater and Flood Plain Ordinance.

Status: **Completed.**

A CRS meeting was held in Bloomingdale on March 9th and 10th in 2011 to discuss mitigation activities. A CRS webinar was held for DuPage County communities on August 1, 2011. Another meeting was also held on September 22, 2011 for the CRS Group to discuss FEMA's Substantial Damage Estimator Software. All meetings and workshops were sponsored by the Illinois Association for Floodplain and Stormwater Management.

This action item has been accomplished and has been removed from the 2012 plan update.

Rationale: This action item was intended to be a one-time occurrence to educate potential CRS communities.

Action Item 8: Property Protection Checklist - REMOVED

Action Item Description: A checklist should be prepared for use by all agencies throughout the County for evaluating properties that are exposed to flood damage throughout DuPage County and protection alternatives.

Status: **Completed.**

This action item has been removed

Rationale: The Natural Hazard Mitigation Workgroup decided to discontinue efforts in 2012.

Action Item 9: Property Protection Projects

Action Item Description: Properties that are exposed to flood damage throughout DuPage County should be protected through property protection measures where regional structural projects are not feasible. Property protection measures should include, but not be limited to, acquisition, elevation, or flood proofing. Priority should be given to repetitive loss properties.

Status: Ongoing, with several completed projects.

2017

- IDNR-OWR / IEMA
  - Graue Mill Levee
- DuPage County 2017 Strategic Plan
  - Purchasing repetitive loss properties and install additional water sewers, storm sewer mains, and culverts throughout the County.
  - Working to rehabilitate damaged and aging bridges around the County.
  - Updating traffic signal software and installing uninterruptable power supplies (UPS) to alleviate congestion during power outages and enhance signal management capabilities during evacuation scenarios.
  - Working to increase flood storage within the communities along the East Branch of the DuPage River that experience frequent flooding.
  - Retrofitting Fawell Dam to allow for proper wildlife migration.
  - Extending current drinking water supplies to unincorporated residents.
  - Repair and replace aging sanitary sewer pipes, and update technology within Wastewater Treatment Plants.
- Bensenville
  - Financial & Technical assistance is provided to convert to overhead sewers. The Village also has a backyard/side yard flood alleviation program that provide financial and technical assistance. Both programs are limited to residential properties are on first come first serve basis due to limited budget. Both are 50/50 program. Village's participation is limited up to $7,500/each.
- Downers Grove
  - Maintains a Community Investment Program, which includes approximately $43 million in storm water improvements from 2017 to 2021. Eleven projects are listed, including $7 million in streambank improvements along St. Joseph Creek and $60,000 (annually) for neighborhood drainage improvements cost sharing.

2016

- HUD/HMGP Flood Prone Property Buy Outs
  - Purchase of 58 flood prone structures (Countywide)
- CDBG-DR (Recovery from April 2013)
  - $31.2 Million
  - ~50% of Total Already Spent on Projects
- CDBG-NDRC
  - DuPage County was eligible to submit
  - Damage Reports/Claims over 9000 structures
  - Insurance claims and loans totaled more than $65 million

- Upon Successful Phase 1 application, invited back to for Phase 2 (submitted in October)

2014

- Received pre-final approval of HMGP funding from IEMA to purchase 14 flood prone properties as a result of the 2013 event
- Included Voluntary buy outs in HUD action plan(s) for a total of $5,997,000 to potentially purchase 20+ properties
- Included 25% match share of local IEMA HMGP match share in HUDs action plan

2013

- Purchased 3 flood prone properties countywide (to be demolished in 2013)
- DuPage County submitted a pre-application for grant funding. If approved, DuPage County may be able to purchase up to 12 homes that are on the Flood Prone Property Voluntary Buy Out list (post 2013 flood)

2012

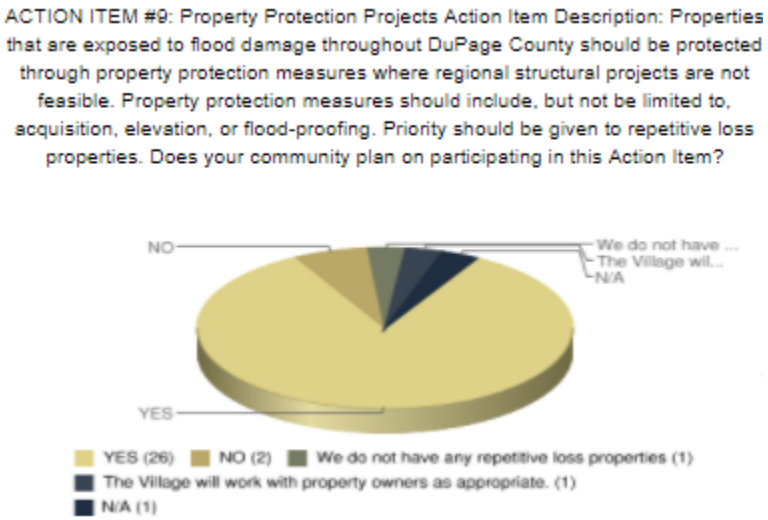
- Surveyed and collected data on flood prone properties to ensure existing list was up to date and accurate

Next 5 years:

- DuPage County will continue to work with municipalities on property protection projects similar to those identified above.
- Property Protection projects should be aligned with the overall county strategy and risk assessment (i.e., hazard prioritization)
- Projects identified by the County or municipalities will be reviewed to ensure there are no or little negative impacts to surrounding jurisdictions.

Action Item Description: Properties that are exposed to flood damage throughout DuPage County should be protected through property protection measures where regional structural projects are not feasible. Property protection measures should include, but not be limited to, acquisition, elevation, or flood-proofing. Priority should be given to repetitive loss properties.

Does your community plan on participating in this Action Item?



Action Item 10: Continued Watershed Management

Action Item Description: DuPage County should continue its watershed management efforts through continued support and funding of the countywide stormwater management program, including the regulatory efforts and watershed planning and implementation.

Status: Ongoing, with several completed projects.

Watershed planning efforts have continued within the DuPage County Stormwater Management Division. At least two municipalities undertook detailed watershed investigations to examine localized flooding since the DuPage County Natural Hazards Mitigation Plan development.

Several watershed projects have been completed, to include:

2016

- New Study Reaches
    - Salt Creek WS
    - Sawmill Creek WS
    - East Branch DuPage River WS (select reaches)
    - West Branch DuPage River WS (select reaches)
    - West Branch Phase III (Warrenville)
- Effective Study Reaches
    - Des Plaines River WS
    - DuPage River WS
    - Fox River WS
    - East Branch DuPage River WS (select reaches)
    - West Branch DuPage River WS (select reaches)
- Stormwater Management Program Assessment
    - Stakeholder Engagement/Surveys
    - Programmatic Level Analysis
    - Program Cost Analysis
- HUD
    - CDBG-DR (Recovery from April 2013)
    - $31.2 Million
    - ~50% of Total Already Spent on Projects
- CDBG-NDRC
    - DuPage County was eligible to submit
    - Hazard Mitigation Plan in place
    - Damage Reports/Claims over 9000 structures
    - Insurance claims and loans totaled more than $65 million
    - Upon Successful Phase 1 application, invited back to for Phase 2

2014

- Began Springbrook #1 Watershed Plan
- Developed Stakeholder Group for Springbrook #1 Watershed Plan
- Worked with Forest Preserve & other key stakeholders to secure funding for a portion of the Spring Brook #1 Watershed Plan's Projects
- Developed Stakeholder Group for Sugar Creek Watershed Plan
- Included Sugar Creek Watershed Projects in HUD action plan
- Initiated contract with consultant to begin re-evaluating East Branch DuPage River's Watershed Plan

2013

- Contracted with consultant to begin Sugar Creek Watershed Plan
- Contracted with consultant to assist with modeling of Winfield Creek

2012

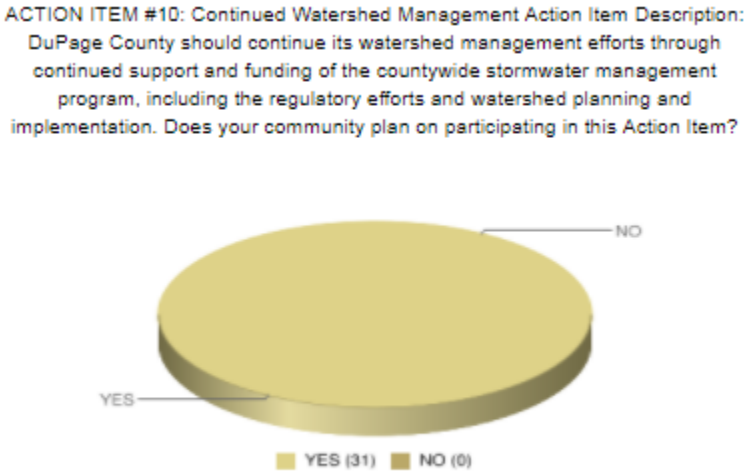
- Formed Winfield Creek Watershed Stakeholder Group

Next 5 years:

- DuPage County and municipalities should continue watershed management projects and regulatory efforts.
- Several mitigation fund applications have been submitted to IEMA/FEMA for approval.
- Watershed projects should be coordinated throughout DuPage County.

Action Item Description: DuPage County should continue its watershed management efforts through continued support and funding of the countywide stormwater management program, including the regulatory efforts and watershed planning and implementation.

Does your community plan on participating in this Action Item?



Action Item 11: Structural Flood Control Projects

Action Item Description: DuPage should continue the supporting and funding of feasible structural flood control projects as they are identified in watershed plans.

Status: Ongoing, with several completed projects.

2017

- IDNR-OWR / IEMA
  - Graue Mill Levee (DuPage / Hinsdale)
- Lombard
  - Gatz Pond Outfall Project

2016

- Completed projects 2016:
  - Armstrong Park (Carol Stream)
  - West Branch Phase III (Warrenville)
- DuPage River Feasibility Study (Began July 2016)
  - Project Partners
    - US Army Corps of Engineers
    - DuPage County
    - Will County
  - Project Parameters
    - DuPage River Watershed
      - East Branch (DuPage County)
      - West Branch (DuPage County)
      - Mainstem (Will County)
  - Study Boundary
    - Flow Rate 800cfs @ 10yr event
    - Flood Related Projects
    - 3 years/$3 Million

2014

- Completed the West Branch/Warrenville Phase II Project
- Began Construction on the Klein Creek Flood Mitigation Project in Armstrong Park
- Submitted permit plans for Private Drive Culvert Replacement in Bloomingdale. This was one of the preferred alternatives for the Springbrook/Salt Creek Watershed Plan.
- Completed the West Branch Wetland Mitigation Project in West Chicago

2013

- Completed Brewster Creek Project
- Began Construction on West Branch/Warrenville Flood Control Project Finished design & permitting for Klein Creek Flood Control Project/Armstrong Park Reservoir

2012

- Began construction on Brewster Creek Flood Mitigation Project
- Completed Bower Elementary School Berm, part of the West Branch/Warrenville Flood Mitigation Project
- Replaced Foster Ave Culvert as part of Spring Brook/ Salt Creek Watershed Plan
- Matchshare funded DuPage Airport Culvert Replacement/ Kress Creek Watershed

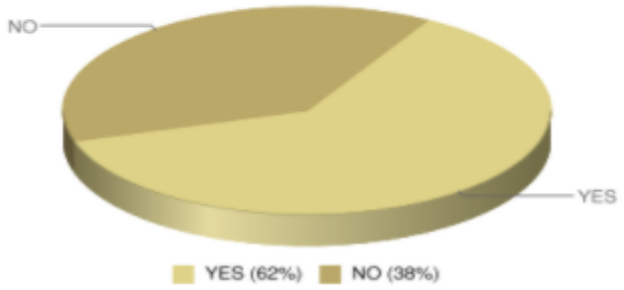
Next 5 years: DuPage County should continue to support and fund feasible structural flood control projects as they are identified in watershed plans.

- Bloomingdale
    - Indian Lakes Subdivision open space drainage improvements.
- Glendale Heights
    - North Avenue flood alleviation project
- Lombard
    - Rt 53 stormwater pumping station with a higher flow capacity
- Winfield
    - Determine options for the Winfield Creek Watershed
- Lisle
    - National Disaster Resillience Competition application for East Branch DuPage River Watershed

Action Item Description: DuPage County should continue the supporting and funding of feasible structural flood control projects as they are identified in watershed plans.

Is your community currently considering or have current plans for any flood control projects?

ACTION ITEM #11: Structural Flood Control Projects Action Item Description: DuPage County should continue the supporting and funding of feasible structural flood control projects as they are identified in watershed plans. Is your community currently considering or have current plans for any flood control projects?



Action Item 12: Stream Maintenance Programs

Action Item Description: The County, municipalities, and institutions should develop and implement a formal and regular drainage system maintenance program. This effort should include the inspection of privately maintained drainage facilities. It is understood that each municipality will make these considerations based on available staffing and financial resources.

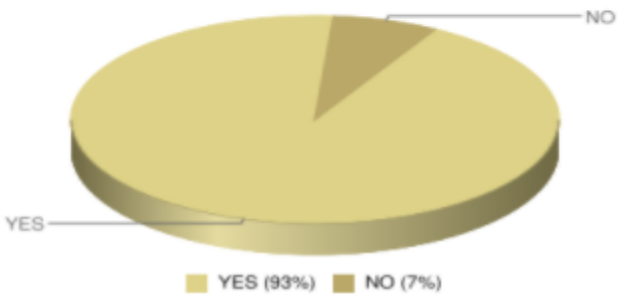
Status: Ongoing, with several completed projects.

Next 5 years: Continue to implement a formal and regular drainage system maintenance program.

Action Item Description: The County, municipalities, and institutions should develop and implement a formal and regular drainage system maintenance program. This effort should include the inspection of privately maintained drainage facilities. It is understood that each municipality will make these considerations based on available staffing and financial resources.

Does your community plan on participating in this Action Item?

ACTION ITEM #12: Stream Maintenance Programs Action Item Description: The County, municipalities, and institutions should develop and implement a formal and regular drainage system maintenance program. This effort should include the inspection of privately maintained drainage facilities. It is understood that each municipality will make these considerations based on available staffing and financial resources. Does your community plan on participating in this Action Item?



Action Item 13: Participation in StormReady

Action Item Description: DuPage County communities, other agencies, and colleges should maintain their status, or consider joining the National Weather Service's StormReady program. The StormReady program has been developed to provide communities with guidelines to improve the timeliness and effectiveness of public warning systems for hazardous weather.

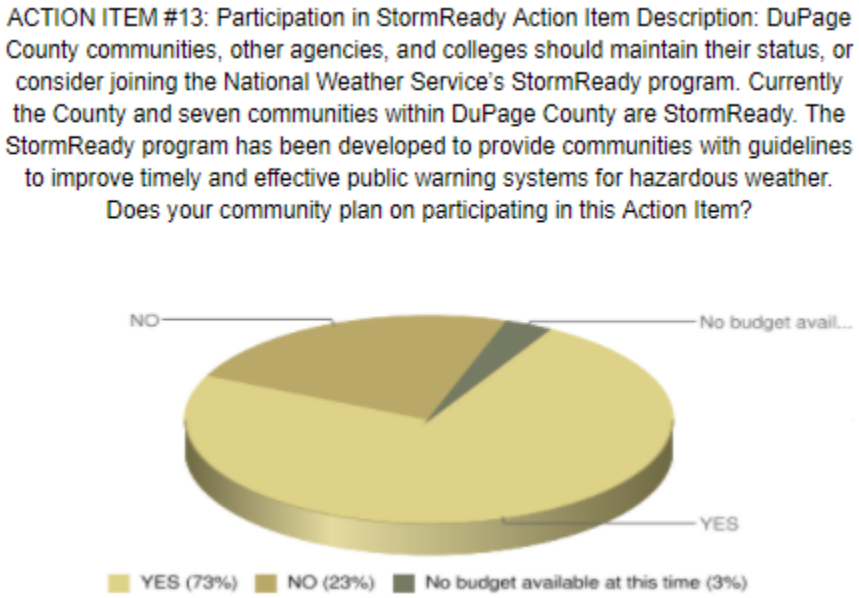
Status: Ongoing.

DuPage County OHSEM has maintained StormReady certification and was re-certified in 2014.

Next 5 years: DuPage County OHSEM plans on continuing participation in StormReady. All DuPage County municipalities should take steps to become StormReady.

Action Item Description: DuPage County communities, other agencies, and colleges should maintain their status, or consider joining the National Weather Service's StormReady program. Currently the County and seven communities within DuPage County are StormReady. The StormReady program has been developed to provide communities with guidelines to improve timely and effective public warning systems for hazardous weather.

Does your community plan on participating in this Action Item?



Action Item 14: Identification of Floodplain Structures

Action Item Description: A comprehensive list of structures located in the County's floodplains should be developed. The County continues to examine building footprints and floodplains, as part of the stormwater management program, a determination of the number of floodplain structures should be made. The developed information should be provided to communities, as appropriate.

Status: Ongoing.

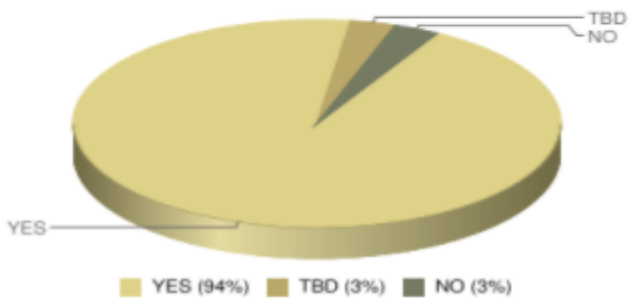
DuPage County Stormwater is currently working with the DuPage County GIS department.

Next 5 years: Continue development

Action Item Description: A comprehensive list of structures located in the County's floodplains should be developed. The County continues to examine building footprints and floodplains, as part of the stormwater management program. A determination of the number of floodplain structures should be made. The developed information should be provided to communities, as appropriate.

Does your community plan on participating in this Action Item?

ACTION ITEM #14: Identification of Floodplain Structures Action Item Description: A comprehensive list of structures located in the County's floodplains should be developed. The County continues to examine building footprints and floodplains, as part of the stormwater management program. A determination of the number of floodplain structures should be made. The developed information should be provided to communities, as appropriate. Does your community plan on participating in this Action Item?



Action Item 15: Review of Critical Facilities

Action Item Description: The location of critical facilities should be evaluated to determine if they are located in flood prone areas or other hazardous locations. Critical facilities have been mapped by the County's GIS Department. As the County further examines building footprints and floodplains as part of the stormwater management program, the review of critical facilities should be included. Where necessary, critical facilities should be protected from identified natural hazards.

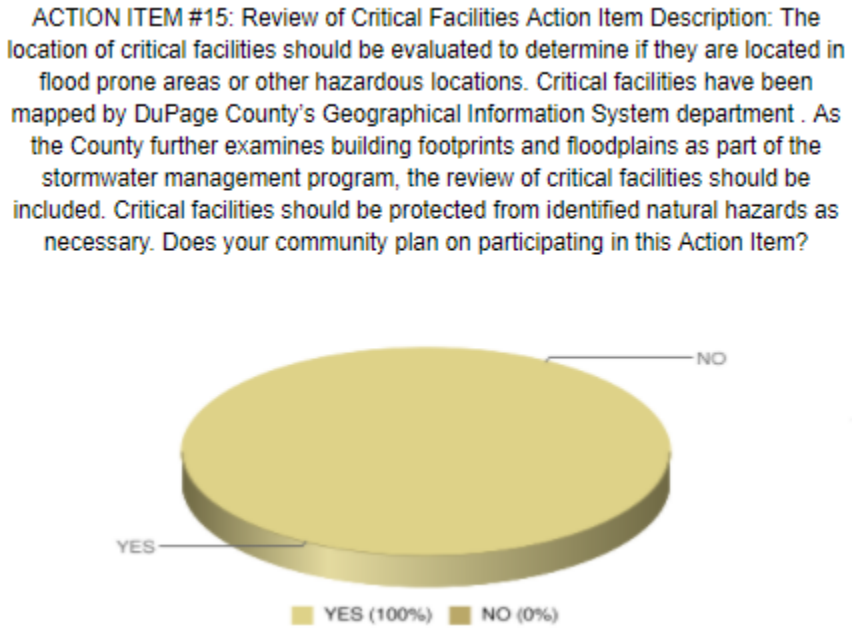
Status: Ongoing.

DuPage County has worked with municipalities to identify Critical Facilities since 2007. DuPage County GIS has worked with municipalities over the last few years to identify critical infrastructure within their jurisdiction. County GIS has recently updated their mapping service for municipal users.

Next 5 years: DuPage County to continue and update critical facility information as identified.

Action Item Description: The location of critical facilities should be evaluated to determine if they are located in flood prone areas or other hazardous locations. Critical facilities have been mapped by DuPage County's Geographical Information System department. As the County further examines building footprints and floodplains as part of the stormwater management program, the review of critical facilities should be included. Critical facilities should be protected from identified natural hazards as necessary.

Does your community plan on participating in this Action Item?



Action Item 16: Development of Flood Stage Maps

Action Item Description: Flood stage maps should be developed to show varying depths of flooding and the respective area of inundation for floodplain areas. The maps should be developed by watershed.

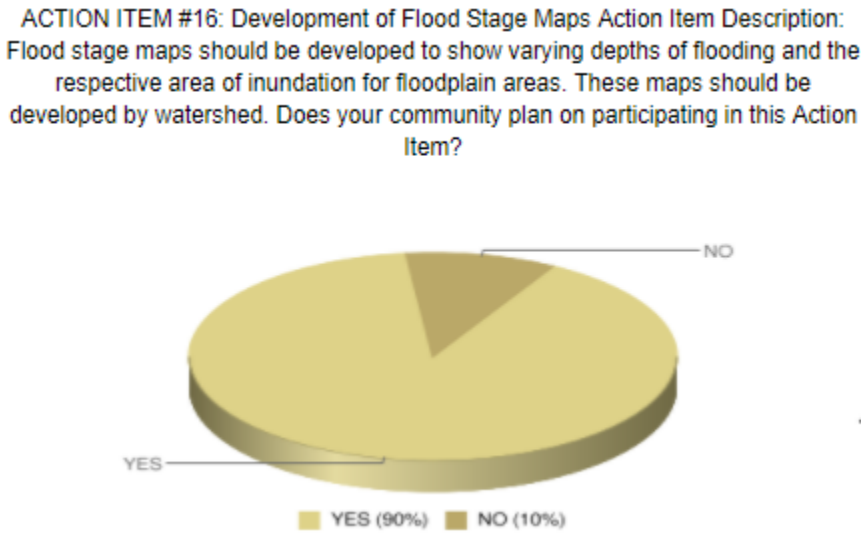
Status: Ongoing.

DuPage County Stormwater is currently working with the DuPage County Geographic Information Systems (GIS) department to develop detailed DuPage County specific flood maps. At present date, the County website has published a prelimary Digital Flood Insurance Rate Map (DFIRM); these maps have also been published by the Federal Emergency Management Agency (FEMA) and the Illinois State Water Survey (ISWS) department.

Next 5 years: Continue to maintain flood stage maps.

Action Item Description: Flood stage maps should be developed to show varying depths of flooding and the respective area of inundation for floodplain areas. These maps should be developed by watershed.

Does your community plan on participating in this Action Item?



Action Item 17: Seek Mitigation Grant Funding for Additional Mitigation Planning Cost Beneficial Projects

Action Item Description: The County, municipalities, fire protection districts, and educational institutions should apply for mitigation grant funding through available IEMA and FEMA programs for mitigation planning and mitigation projects.

Status: Ongoing.

In 2016, DuPage County OHSEM utilized Hazard Mitigation Grant Program (HMGP) funds to conduct a full-scale rail / hazardous materials exercise in conjunction with Tetra Tech and Downers Grove. In 2017, The State of Illinois utilized additional HMGP funds to conduct a Statewide commodity flow study that will be shared with all Illinois counties that focused on the transportation of hazardous materials.

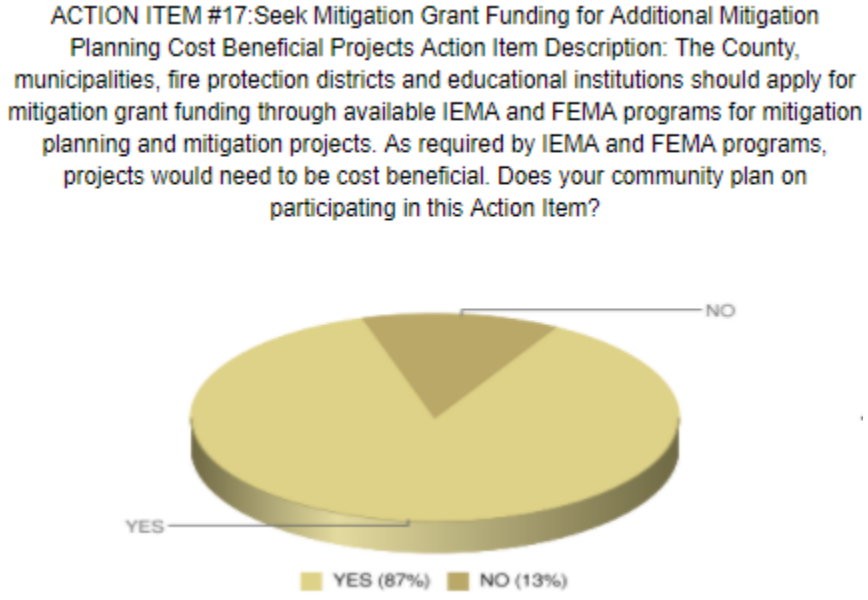
Out of the 2017 Annual Survey respondants, three municipal jurisdictions identified receiving mitigation grant dollars in the past year:

- Winfield
  - Repetitive Flood Claims (RFC), $320,000 to assist in buying floodprone property.
- Villa Park
  - CDBG-DR, $1,000,000 for Washington Street Green Storm Water Infrastrucure
- Addison
  - Disaster Recovery (HUD), received $189,000 for buyout of one flood prone property.

Next 5 years: Continue to apply for grant funding for additional mitigation planning projects.

Action Item Description: The County, municipalities, fire protection districts and educational institutions should apply for mitigation grant funding through available IEMA and FEMA programs for mitigation planning and mitigation projects. As required by IEMA and FEMA programs, projects must be cost beneficial.

Does your community plan on participating in this Action Item?



C. Public Information Action Items

Action Item 18: Development of a Public Information Strategy

Action Item Description: A countywide natural hazards public information strategy should be developed for the use of the County, municipalities, and institutions. The strategy should be consistent with the recommended approach for the CRS program. The most important topics to cover are:

Safety

- During thunderstorms and lightning
- During winter storms
- Tornado safety precautions
- Emergency protection measures

Protecting your property

- Sewer backup protection measures
- Yard drainage issues
- Sources of assistance

Understanding floods

- Why there are floods
- Why we regulate the floodplain
- Flood insurance

Protecting our watersheds

- Benefits of open space
- Protecting wetlands
- Protecting water quality
- Stream and wetland dumping issues

The most appropriate ways to provide information are:

- Community newsletters
- Mailings to residents
- Websites and links to other sources
- Newspaper articles
- Cable television access

Publications developed by other agencies should be reviewed, consolidated, and tailored for distribution to DuPage County property owners. A set of countywide publications should be developed that can be used by communities as is, but developed in a format that allows communities to customize the materials.

Status: Ongoing.

DuPage County continues to utilize its emergency website: www.protectdupage.org to provide County communities and residents with the most up to date emergency information on any hazard affecting DuPage County.

Communities are encouraged to link to www.protectdupage.org to maintain a consistent, single source of emergency information. The County also provides emergency information on Facebook and Twitter.

DuPage County OHSEM has developed a County Joint Information Center and Joint Information System to support media messaging during an emergency/disaster. Staff members identified from various County departments have been appointed to a public information team.

Approved publications are made available on the county website.

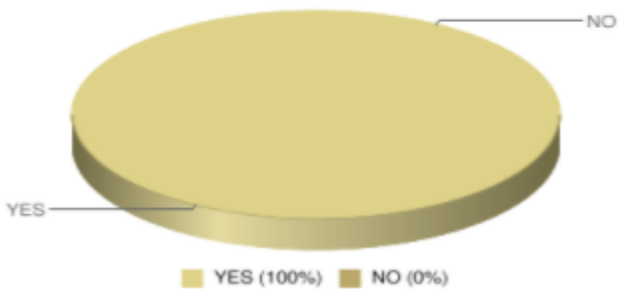
Next 5 years: DuPage County should continue conducting training and exercises involving public information components.

Municipalities with mitigation information on websites should stay consistent or link to the County website: www.dupageco.org or www.protectdupage.org (during emergencies).

Action Item Description: A countywide natural hazards public information strategy should be developed for the use of the County, municipalities, and institutions. The strategy should be consistent with the recommended approach for the CRS program. Public information topics are available from the County.

Does your community plan on participating in this Action Item?

ACTION ITEM #18: Development of a Public Information Strategy Action Item Description: A countywide natural hazards public information strategy should be developed for the use of the County, municipalities, and institutions. The strategy should be consistent with the recommended approach for the CRS program. Public information topics are available from the County. Does your community plan on participating in this Action Item?



Action Item 19: Property Protection References

Action Item Description: Provide municipal departments, libraries and other interested offices with a list of references on property protection that can be ordered for free from state and federal offices. Include a request that they make the references available for public use. A special effort should be made to identify references on insurance, emergency preparedness and property protection.

Also, identify websites that provide property protection information and provide their addresses to the County and municipal webmasters.

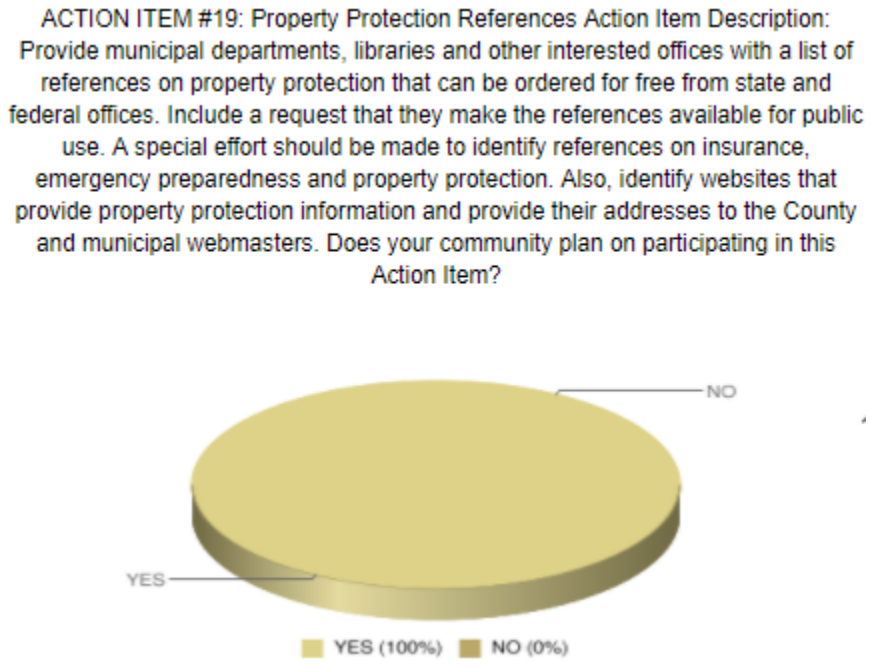
Status: Ongoing.

The OHSEM websites (www.dupageco.org/oem and www.protectdupage.org) contain information on natural hazards, including reference material to State and Federal sources. Stormwater has developed mitigation reference brochures that have been distributed throughout DuPage County for residents to utilize.

Next 5 years: These websites should be maintained and updated as necessary.

Action Item Description: Provide municipal departments, libraries and other interested offices with a list of references on property protection that can be ordered for free from state and federal offices. Include a request that they make the references available for public use. A special effort should be made to identify references on insurance, emergency preparedness and property protection. Also, identify websites that provide property protection information and provide their addresses to the County and municipal webmasters.

Does your community plan on participating in this Action Item?



D. Additional Action Items

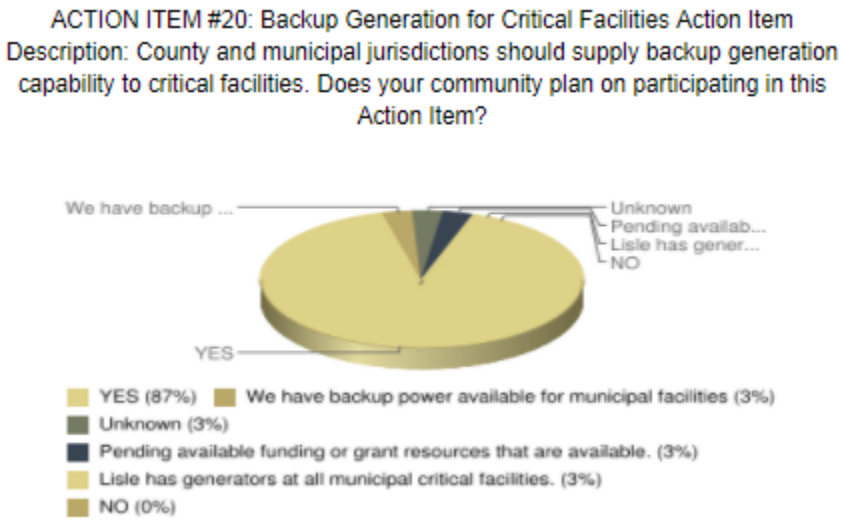
Action Item 20: Backup Generation for Critical Facilities

Action Item Description: County and municipal jurisdictions should supply backup generation capability to critical facilities. Backup generation of critical facilities such as hospitals, nursing homes, and first response facilities helps ensure the mission of lessening the effects of a disaster. DuPage County and local Emergency Management agencies are to coordinate with various appropriate agencies.

Status: Ongoing.

Action Item Description: County and municipal jurisdictions should supply backup generation capability to critical facilities.

Does your community plan on participating in this Action Item?



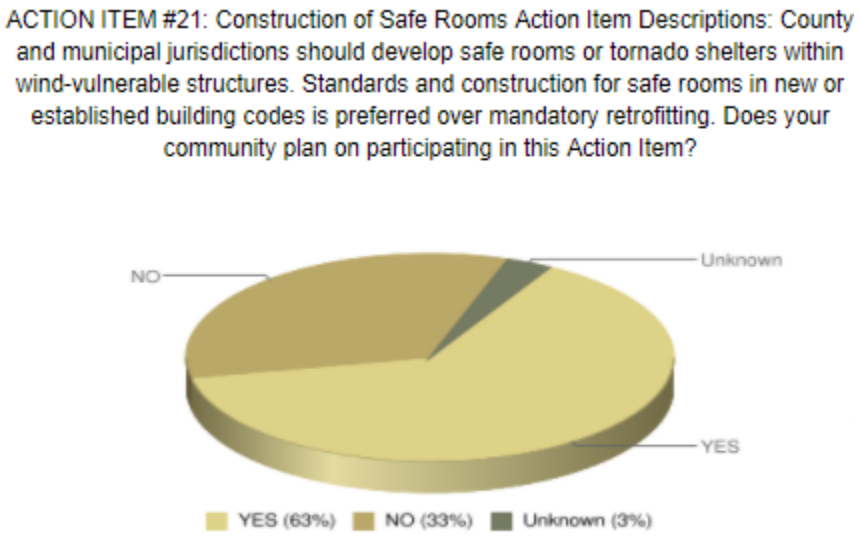
Action Item 21: Construction of Safe Rooms

Action Item Description: County and municipal jurisdictions should develop safe rooms or tornado shelters within wind-vulnerable structures. Wind-vulnerable facilities are particularly susceptible to tornadoes and storms with high wind speeds. Construction of Safe Rooms and/or tornado shelter areas in or around these facilities has the potential to save lives. The County and municipal building code departments are responsible for these updates.

Status: Ongoing.

Action Item Descriptions: County and municipal jurisdictions should develop safe rooms or tornado shelters within wind-vulnerable structures. Standards and construction for safe rooms in new or established building codes is preferred over mandatory retrofitting.

Does your community plan on participating in this Action Item?



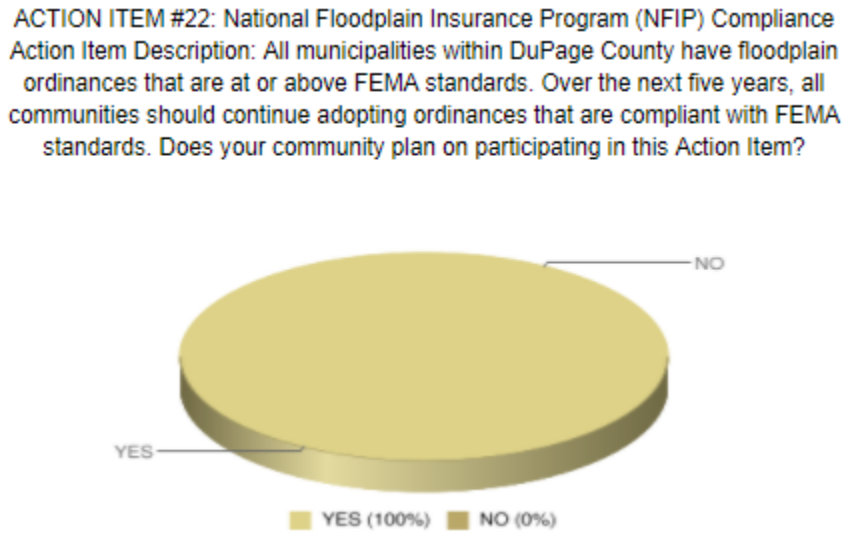
Action Item 22: National Floodplain Insurance Program (NFIP) Compliance

Action Item Description: All municipalities within DuPage County have floodplain ordinances that are at or above FEMA standards. Over the next five years, all communities should continue adopting ordinances compliant with FEMA standards. Maintaining floodplain ordinances at or above the FEMA standards ensures that DuPage County jurisdictions maintain good standing in the National Flood Insurance Program. This in turn provides residents with improved options for obtaining flood insurance for homes within a flood plain. Municipal and County Stormwater and Building departments are responsible for these updates.

Status: Ongoing.

Action Item Description: All municipalities within DuPage County have floodplain ordinances that are at or above FEMA standards. Over the next five years, all communities should continue adopting ordinances that are compliant with FEMA standards.

Does your community plan on participating in this Action Item?



Summary

The continuation of the DuPage County Natural Hazard Mitigation Workgroup is necessary for implementation of the Action Plan. The establishment of the Mitigation Workgroup as a permanent group is proposed to monitor the implementation of the *Plan*, report to the County Board, municipalities, other agencies, and colleges on its progress, and recommend revisions to this *Plan* as needed. This is explained in Action Item 2.

Maintenance and monitoring of the *DuPage County Natural Hazards Mitigation Plan* are addressed in Action Item 3. This Action Item explains how and when this *Plan* will be reviewed, revised, and updated. While Action Item 3 calls for the Mitigation Workgroup to meet at least once a year, it is anticipated that they will meet more frequently through the Stormwater Administrators' meetings and the Local Emergency Managers Coordinators group. The purpose of the Mitigation Workgroup meetings will be for the development and review of countywide mitigation activities.