

Cook County Multi-Jurisdictional Hazard Mitigation Plan Update

Executive Summary - July 2019

Hazard mitigation is the use of long-term and short-term policies, programs, projects, and other activities to alleviate the death, injury, and property damage that can result from a disaster. Cook County and a coalition of 121 municipal planning partners prepared and updated the **2019 Cook County Multi-Jurisdictional Hazard Mitigation Plan** in order to identify the risks posed by hazards and find ways to reduce their impacts. The plan reduces risks for those who live in, work in, and visit the County.

1. Cook County Profile

Cook County is located in northeast Illinois on the western shore of Lake Michigan. It is the most populous of the 102 counties in Illinois, with a 2018 estimated population of 5.18 million. In terms of area, it is the sixth largest county, covering approximately 945 square miles. Cook County makes up roughly 41 percent of the population of Illinois. The surrounding counties are Lake and McHenry to the north, Kane, and DuPage to the west, and Will to the southwest. Lake Michigan is the county's eastern border along with the State of Indiana.

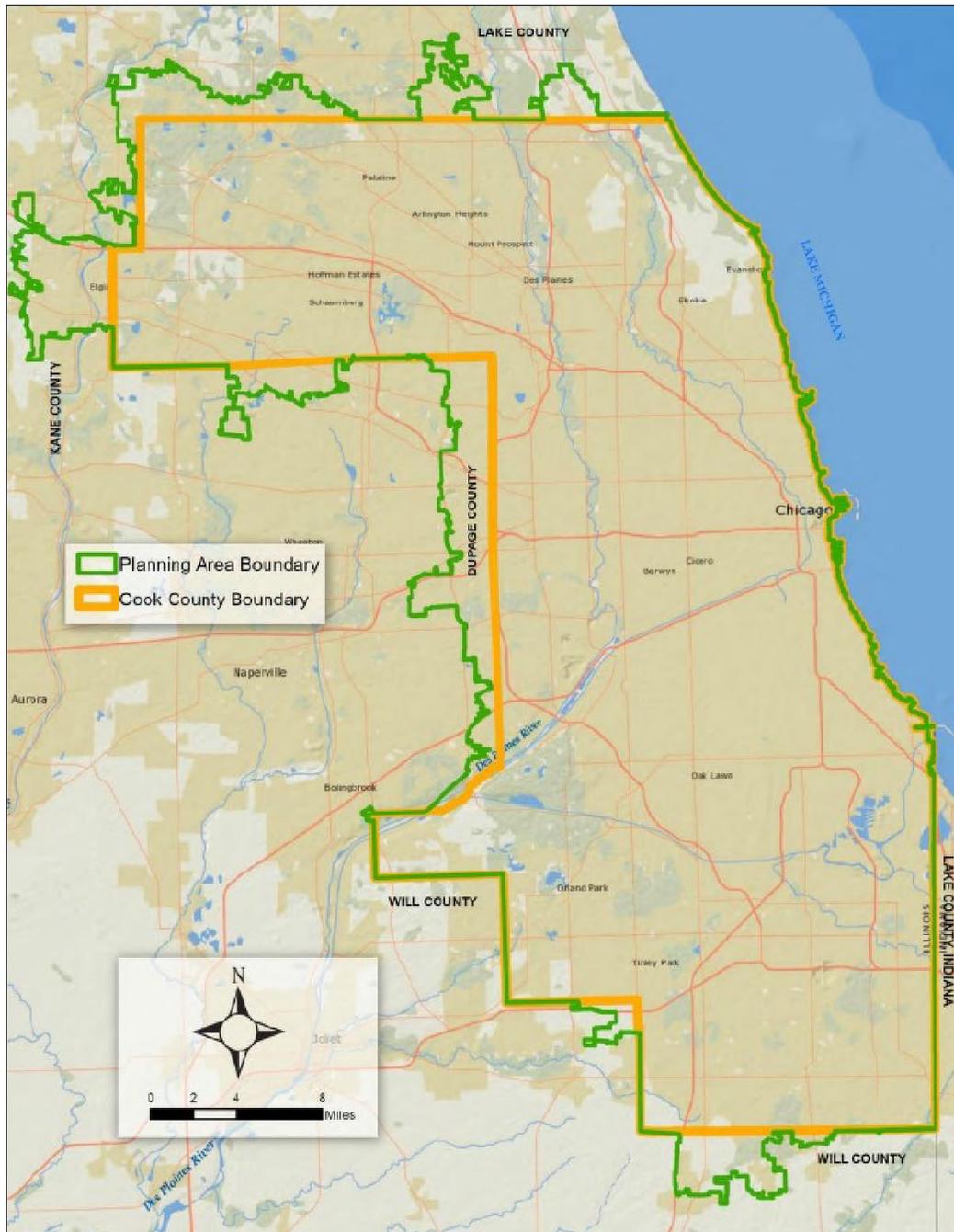
Cook County is the second most populous county in the United States, after Los Angeles County. The county contains 135 municipalities, covering about 85 percent of the area of the county. The remaining unincorporated areas are under the jurisdiction of the Cook County Board of Commissioners, a 17-member board elected by district.

The planning area's economy is strongly based in the educational services, health care, and social assistance industry, followed by the professional, scientific, management, administrative, and waste management industries. Major businesses include, but are not limited to, the U.S. Government, Advocate Health System, JPMorgan Chase, Jewel-Osco, United Airlines, Abbott Laboratories, American Airlines, and Walgreens. Major educational and research institutions in the county include Northwestern University, Loyola University, DePaul University, the University of Chicago, and the University of Illinois at Chicago.

Cook County has experienced 19 hazard events since 1967 for which federal disaster declarations were issued. The Spatial Hazard Events and Losses Database for the United States (SHELDUS), maintained by the University of South Carolina, includes many more hazard events. For Cook County, SHELDUS lists 851 instances of direct property, crop, monetary, or human loss due to a hazard event from 1960 through 2017 - an average of approximately 15 various direct loss events per year.

2. Participating Partners and the Planning Area

The responsibility for hazard mitigation lies with many, including private property owners; business and industry; and local, state, and the federal government. Through multi-jurisdictional partnerships, local jurisdictions within an area that has uniform risk exposure can pool resources and eliminate redundant planning activities. Cook County opened this planning effort to all municipalities within the County. The table, *Planning Partners*, lists the planning partners that participated in the planning process and are covered under this plan. The planning area was defined as all incorporated and unincorporated areas of Cook County as well as the incorporated areas of cities that cross county boundaries. The planning area boundary is shown in the figure below (*Figure: Planning Area*).



Municipalities that are partially in Cook County and are participating in the mitigation planning efforts of adjacent counties are also included in the table below. Future efforts are already underway to include these jurisdictions in future updates of the plan. Six jurisdictions that had not previously participated in the 2014 Cook County MJ-HMP are now part of the 2019 Cook County MJ-HMP.

TABLE: PLANNING PARTNERS		
PLANNING PARTNERS COVERED BY THIS HAZARD MITIGATION PLAN		
North	Central	South
Arlington Heights	Bellwood	Alsip
Barrington	Berkeley	Bedford Park
Bartlett	Berwyn	Blue Island
Des Plaines	Broadview	Bridgeview
Elk Grove Village	Brookfield	Burbank
Evanston	City of Chicago	Burnham
Glencoe	Cicero	Calumet City
Glenview	Countryside	Calumet Park
Golf	Elmwood Park	Chicago Heights
Hanover Park	Forest Park	Chicago Ridge
Hoffman Estates	Forest View	Country Club Hills
Inverness	Franklin Park	Crestwood
Kenilworth	Harwood Heights	Dixmoor
Lincolnwood	Hillside	Dolton
Morton Grove	Hodgkins	East Hazel Crest
Mount Prospect	Indian Head Park	Evergreen Park
Niles	LaGrange	Flossmoor
Northbrook	LaGrange Park	Ford Heights
Northfield	Lyons	Glenwood
Palatine	Maywood	Harvey
Park Ridge	McCook	Hazel Crest
Prospect Heights	Melrose Park	Hickory Hills
Rolling Meadows	Norridge	Hometown
Schaumburg	Northlake	Homewood
Skokie	North Riverside	Justice
South Barrington	Oak Park	Lansing
Streamwood	River Forest	Lemont
Wheeling	River Grove	Lynwood
Wilmette	Riverside	Markham
Winnetka	Rosemont	Matteson
	Schiller Park	Merrionette Park

	Stickney	Midlothian
	Stone Park	Oak Forest
	Summit	Oak Lawn
	Westchester	Olympia Fields
	Western Springs	Orland Hills
		Orland Park
		Palos Heights
		Palos Hills
		Palos Park
		Park Forest
		Phoenix
		Posen
		Richton Park
		Riverdale
		Robbins
		Sauk Village
		South Chicago Heights
		South Holland
		Steger
		Thornton
		Tinley Park
		University Park
		Willow Springs
		Worth
<i>Not Participating in 2019 Cook County MJ-HMP</i>	<i>Not Participating in 2019 Cook County MJ-HMP</i>	<i>Not Participating in 2019 Cook County MJ-HMP</i>
Barrington Hills	Bensenville	Frankfort
Buffalo Grove	Burr Ridge	Woodridge
Deerfield	Elmhurst	
Deer Park	Hinsdale	
East Dundee	Oak Brook	
Elgin		
Roselle		

3. Plan Development and Organization

The 2019 Cook County MJ-HMP was updated by a planning team of Cook County Department of Homeland Security and Emergency Management staff and expert consultants, with guidance from a steering committee representing the planning partners and other local stakeholders. The key steps in updating the plan were as follows:

1. Determine the Planning Area and Resources
2. Build and Reconvene the Planning Team
3. Outreach Strategy
4. Review and Update Community Capabilities
5. Update and Conduct the Risk Assessment
6. Update the Mitigation Strategy
7. Keep the Plan Current
8. Review and Adopt the Plan
9. Create a Safe and Resilient Community

4. Mission Goals and Objectives

The defined mission for the 2019 Cook County MJ-HMP is to “Identify risks and sustainable, cost-effective actions to mitigate the impact of natural hazards to protect the life, health, safety, welfare, and economy of the communities of Cook County.” Mitigation **goals** were established as follows:

1. Develop and implement sustainable, cost-effective, and environmentally sound risk-reduction (mitigation) projects.
2. Protect the lives, health, safety, and property of the citizens of Cook County from the impacts of natural hazards.
3. Protect public services and critical facilities, including infrastructure, from loss of use during natural hazard events and potential damage from such activities.
4. Involve stakeholders to enhance the local capacity to mitigate, prepare for, and respond to the impacts of natural hazards.
5. Develop, promote, and integrate mitigation action plans.
6. Promote public understanding of and support for hazard mitigation.

Thirteen **objectives** were established for the plan that meets multiple goals, serving as stand-alone measurements of the effectiveness of the mitigation action. Proposed mitigation actions were evaluated in part based on how many goals and objectives they would help to fulfill.

1. Eliminate or minimize disruption of local government operations caused by natural hazards through all phases of emergency management.
2. Increase the resilience of (or protect and maintain) infrastructure and critical facilities.
3. Consider the impacts of natural hazards on future land uses in the planning area, including possible impacts from climate change.
4. Integrate hazard mitigation policies into land use plans in the planning area.
5. Develop, improve, and protect systems that provide early warnings, emergency response communications, and evacuation procedures.
6. Use the best available data, science and technologies to educate the public and to improve understanding of the location and potential impacts of natural hazards, the vulnerability of building types and community development patterns, and the measures needed to protect life safety.
7. Retrofit, purchase, or relocate structures in high hazard areas, including those known to be repetitively damaged.
8. Establish partnerships among all levels of local government, the private sector, and/or nongovernmental organizations to improve and implement methods to protect people and property.
9. Provide or improve flood protection on a watershed basis with flood control structures and drainage maintenance plans.
10. Strengthen codes and land use planning and their enforcement, so that new construction or redevelopment can avoid or withstand the impacts of natural hazards.
11. Encourage mitigation through incentive-based programs, such as the Community Rating System, Firewise, and StormReady programs.
12. Reduce natural hazard-related risks and vulnerability to potentially isolated populations within the planning area.
13. Encourage hazard mitigation measures that result in the least adverse effect on the natural environment and that use natural processes.

5. Hazards Addressed

The steering committee considered the full range of natural hazards that could impact the planning area and identified the following hazards as presenting the most significant concern:

- Dam or levee failure
- Drought
- Earthquake
- Flood
- Severe weather
- Severe winter weather

- Tornado

Detailed risk assessments were performed for each of these hazards of concern. Also, a brief qualitative review was conducted of technological and human-caused hazards of interest, which included the following: epidemic or pandemic, nuclear power plant incident, secondary impacts from incoming evacuees, widespread power outage, hazardous material incident, and coastal erosion. Climate Change was addressed for each hazard, as applicable.

6. Risk Assessment Methodology

The risk assessments of the identified hazards of concern describe the risks associated with each hazard. The following steps were used to define the risk of each hazard:

- Profile and update each hazard, describing the geographic area it affects, its frequency and severity, and the warning time provided before a hazard event occurs.
- Use maps of hazard impact areas, as appropriate, to determine and update how many structures, facilities, and systems are exposed to each hazard.
- Assess the vulnerability of exposed structures and infrastructure based on exposure and the probability of occurrence of a hazard event. Tools such as the Federal Emergency Management Agency's (FEMA's) hazard modeling program called Hazus-MH were used to perform this assessment for flood, dam failure, earthquake hazards, and tornado. Outputs similar to those from Hazus-MH were generated for other hazards, using maps generated by the Hazus-MH program.

A detailed inventory of critical facilities and infrastructure were reevaluated for this plan using GIS applications. Over 6,000 facilities were inventoried and uploaded into the Hazus-MH model to support the risk assessment.

7. Profiles of Cook County Hazards of Concern

The following hazards are addressed in the 2019 Cook County MJ-HMP. A brief description of each hazard is included in this section of the Executive Summary.

7.1 Dam and Levee Failure

There are 40 dams in Cook County, all regulated by the Water Resources Division of the Illinois Department of Natural Resources (IDNR). Importantly, 24 of these dams are classified as "high" (10) or "significant" (14) hazard, which means they have significant downstream populations at risk if the dam should fail. Flooding as a result of a dam and levee failure would significantly impact properties and communities in the inundation zones. No records of dam failures in the planning area are available, however.

There are also nine levee systems in Cook County. Although there is no history of levee failures in the planning area, it should be noted that the State of Illinois experienced levee failures in 1993 and 2008. In 1993, 17 levee systems breached along the Mississippi River and the Illinois River just north of where it meets the Mississippi River. Over 237,000 acres along the rivers were flooded.

Warning time for dam or levee failure varies depending on the cause of the failure. In events of extreme precipitation or massive snowmelt, evacuations can be planned with sufficient time. In the event of a

structural failure due to an earthquake, there may be no warning time. Cook County and its planning partners have established protocols for flood warning and response for dam failure in the flood warning portion of its adopted emergency operations plan. These protocols are tied to the emergency action plans created by the dam owners.

Important issues associated with dam and levee failure include the following:

- Federally regulated dams have an adequate level of oversight and sophistication in their emergency action plans. However, the protocol for notifying downstream citizens of imminent failure needs to be tied to local emergency response planning.
- Mapping that estimates inundation depths is needed for non-federal-regulated dams to better assess the risk associated with dam failure from these facilities.
- Most dam failure mapping required at federal levels requires determination of the probable maximum flood, which is a worst-case scenario and generally the event with the lowest probability of occurrence. For non-federal-regulated dams, mapping of dam failure scenarios that are less extreme than the probable maximum flood but have a higher probability of occurrence could better illustrate areas potentially impacted by more frequent events to support emergency response and preparedness.
- The concept of residual risk associated with structural flood control projects should be considered in the design of capital projects and the application of land use regulations.
- Addressing security concerns and the need to inform the public of the risk associated with dam failure is a challenge for public officials. Not all levees are reflected in the current flood mapping, which makes complete delineation of the hazard area difficult.

7.2 Drought

Droughts originate from a deficiency of precipitation resulting from an unusual weather pattern. If the weather pattern lasts a short time (a few weeks or a couple of months), the drought is considered short-term. If the weather pattern becomes entrenched and the precipitation deficits last for several months or years, the drought is considered to be long-term. Drought generally affects large geographic areas, so drought descriptions in the hazard mitigation plan are usually for the entire State of Illinois rather than the immediate planning area of Cook County.

The most severe droughts in Illinois occurred in the summer of 1934, the summer of 1931 and 1954. All three of these events were categorized as extreme droughts. More recently, in September 1983, all 102 counties were declared state disaster areas because of high temperatures and insufficient precipitation. In 1988, 54 percent of the state was impacted by drought-like conditions, resulting in disaster relief payments to landowners and farmers exceeding \$382 million. Historical drought data for the planning area indicate there have been at least seven (7) significant droughts in the last 115 years, which equates to a drought every 16 years on average, or a minimum of a 6.25-percent chance of a drought in any given year.

Drought can have a widespread impact on the environment and the economy, although it typically does not result in loss of life or damage to property, as do other natural disasters. The National Drought Mitigation Center describes likely drought impacts as those affecting agriculture, water supplies, and the risk of fire.

Scientists at this time do not know how to predict drought more than a month in advance for most locations. How long a drought lasts depends on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on the global scale.

Crucial issues associated with drought include the following:

- Identification and development of alternative water supplies
- Use of groundwater recharge techniques to stabilize the groundwater supply
- The probability of increased drought frequencies and durations due to climate change
- The promotion of active water conservation even during non-drought periods.

7.3. Earthquake

An earthquake is the vibration of the earth's surface following a release of energy in the earth's crust. Earthquakes tend to occur along faults, which are zones of weakness in the crust. Earthquakes occur throughout Illinois, with most in the southern third of the state. Over 360 earthquakes have occurred in Illinois during the past 20 years, with 32 resulting in damage. Fifteen events have been recorded in Cook, DuPage, Kane, Kendall, and Will Counties since 1704. Cook County has experienced three earthquakes ranging from a magnitude of 3 (categorized as "minor") to 4.9 (categorized as "light").

The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties generally result from falling objects and debris, because the shocks shake, damage or demolish buildings and other structures. Disruption of communications, electrical power supplies and gas, sewer and water lines should be expected. Earthquakes may trigger fires, dam failures, or releases of hazardous material, compounding their effects. Any seismic activity of 6.0 or greater on faults within the planning area would have significant impacts throughout the county. Earthquakes of this magnitude or higher would lead to a massive failure of structures built on loose soils. Levees and revetments constructed on such soils would likely fail, representing a loss of critical infrastructure. These events could cause secondary hazards, including mudslides, that would further damage structures.

There is currently no reliable way to predict an earthquake at any given location with any significant warning time. Research is being done with warning systems that use the low energy waves that precede major earthquakes to give approximately 40 seconds notice that a major earthquake is about to occur. The warning time is very short but it could allow for someone to get under a desk, step away from a hazardous material they are working with or shut down a computer system.

Important issues associated with earthquakes include the following:

- The public perception of the earthquake risk within the planning area is low. It can be difficult to get the public to think about earthquake mitigation with little or no perceived risk.
- Most of the planning area's building stock was built prior to 1975 when seismic provisions became uniformly applied through building code applications. A building stock analysis that looks at the potential fragility of the older building stock constructed without building code influence would be beneficial in the identification of seismic mitigation projects.
- More earthquake mapping is needed for the planning area.

- Critical facility owners/operators should be encouraged to create or enhance continuity of operations plans using the information on risk and vulnerability contained in the Cook County hazard mitigation plan.
- Geotechnical standards should be established that take into account the probable impacts of earthquakes in the design and construction of new or enhanced facilities.
- The County has over 6 miles of earthen levees and revetments on soft, unstable soil. These soils are prone to liquefaction, which would severely undermine the integrity of these facilities.
- There are a large number of earthen dams within the planning area. Dam failure warning and evacuation plans and procedures should be reviewed and updated to reflect the dams' risk potential associated with earthquake activity in the region.

7.4 Flood

Flood Types and History

Two types of flooding are typical in Cook County: riverine flooding when water overflows the banks of a stream; and stormwater/urban drainage flooding, when storm runoff exceeds the capacity of local drainage systems in place to convey stormwater to a receiving body. 231 flooding events (including flood, flash flood, coastal flood, and heavy rains) have occurred in Cook County from 1996 to 2019. Flood events of historical significance occurred in the Cook County region in 1849, 1855, 1885, 1938, 1952, 1954, 1957, 1961, 1973, 1979, 1986, 1987, 1996, 2001, 2004, 2010, 2011, and 2013. Since 1972, 13 presidential-declared flood events in the County have caused over \$628.5 million in property damage.

In the past 20 years, stormwater/urban drainage flooding has become the principal cause of flood losses in the Cook County planning area. Urban portions of the county annually experience nuisance flooding related to drainage issues. After flooding in August 2010, FEMA provided more than

\$435 million in disaster recovery, response, and mitigation in Cook and DuPage Counties, and more than 75 percent of this went to individual homeowners, most of whom suffered sewer back-ups and basement flooding caused by stormwater/urban drainage flooding. The frequency and the magnitude of stormwater/urban drainage flooding in Cook County dictated the assignment of stormwater management within the County to a single entity—the Metropolitan Water Reclamation District of Greater Chicago (MWRD).

Cook County experiences numerous episodes of the river and urban flooding every year; massive floods that can cause significant property damage typically occur every three to seven years.

Flood Mapping

Flood studies use historical records to determine the probability of occurrence for different river discharge (flow) levels. The flood frequency equals 100 divided by the discharge probability. For example, the 100-year discharge has a 1-percent chance of being equaled or exceeded in any given year. The extent of flooding associated with a 1-percent annual probability of occurrence (the base flood or 100-year flood) is used as a regulatory boundary by many agencies. This boundary is a convenient tool for assessing risk in flood-prone communities. For most communities participating in the National Flood Insurance Program (NFIP), FEMA has prepared a detailed Flood Insurance Study that presents water surface elevations for the 1- percent annual chance flood and the 0.2-percent annual chance flood (the 500-year flood). The boundaries of the 100- and 500-year floodplains are shown on Flood Insurance Rate Maps.

FEMA has mapped over 78 square miles of the 100-year floodplain and 99 square miles of 500-year floodplain along 172 watercourses in the Cook County planning area. Approximately 8 percent of the County is located within mapped 100-year floodplains. As is the case for many communities, there is a need for updated maps that better reflect the actual flood risk. MWRD has created inundation maps, which may be a good resource for some communities.

It should be noted that mapping showing areas of urban flooding is limited in the County.

Flood Severity

The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the more damage they can cause. Shallow flooding with high velocities can cause as much damage as deep flooding with slow velocity, is especially true when a channel migrates over a broad floodplain, redirecting high-velocity flows and transporting debris and sediment.

The worst-case scenario for flooding in the Cook County planning area has happened numerous times in the past. It involves intense rainstorms that stall over the planning area, dropping rainfall totals in excess 6 inches over 48 hours (this scenario is significantly exacerbated by the presence of snowpack on the ground), which leads to both riverine and stormwater/urban drainage flooding that can overwhelm flood response capabilities in the planning area. Significant roads can be blocked, preventing critical access for many residents and critical functions. High in-channel flows can cause water courses to scour, possibly washing out roads and creating more isolation problems.

Flood Warning

The Cook County flood threat system consists of a network of precipitation gages throughout the watershed and stream gages at strategic locations that continuously monitor and report stream levels. All of this information is analyzed by agencies such as the Cook County Department of Homeland Security and Emergency Management (DHSEM) and Metropolitan Water Reclamation District to evaluate the flood threat and possible evacuation needs.

Floods are generally classed as either slow-rise or flash floods. Due to the sequential pattern of meteorological conditions needed to cause serious slow-rise flooding, it is unusual for a slow-rise flood to occur without warning. Slow-rise floods may be preceded by a warning time from several hours, to days, to possibly weeks. Evacuation and sandbagging for a slow-rise flood may lessen flood damage. Flash floods are more difficult to prepare for, due to the extremely short warning time given, if any. Flash flood warnings usually require evacuation within an hour. However, potential hazard areas can be warned in advance of potential flash flooding danger.

Participation in Federal Flood Programs

The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. Cook County entered the NFIP on April 15, 1981. The effective date for the current countywide Flood Insurance Rate Map is August 19, 2008. In addition to the County, most Cook County municipalities participate in the NFIP. As of October 2018, Cook County had 14,790 flood insurance policies providing \$3.092 billion in insurance coverage. According to FEMA statistics, in the State of Illinois, there were 51,246 total losses (claims) between January 1, 1978, and January 31, 2019, for a total of approximately \$545.36 million, an average of roughly \$10,642 per claim.

Twenty-four communities in the planning area also participate in the Community Rating System (CRS) a voluntary program that encourages floodplain management activities that exceed the NFIP requirements. The CRS requires participating communities to identify repetitive loss areas, where flood insurance claims have been paid multiple times for individual properties. There are 1,775 such properties in Cook County as of October 2018.

Issues

Important issues associated with flooding include the following:

- The 2-D, unsteady-state modeling performed by the Metropolitan Water Reclamation District is considered to be the best available flood risk data for the planning area, but it is not the basis of FEMA's current effective Flood Insurance Rate Map. The District's flood hazard data should be formatted so that can be used to support risk assessment and thus validate best available data.
- The planning area has a large percentage of policies and losses outside a mapped hazard area. Basement flooding is a common problem.
- The stormwater/urban drainage flooding risk is not mapped, which makes it difficult to assess this hazard, other than looking at historical loss data.
- The risk associated with the flood hazard overlaps the risk associated with other hazards such as an earthquake. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce the risk for multiple hazards.
- There is no consistency of land-use practices and regulatory floodplain management within the planning area. It is unclear how potential climate change may impact flood conditions in the planning area.
- The concept of residual risk should be considered in the design of future capital flood control projects and should be communicated with residents living in the floodplain.
- More information is needed on flood risk to support the concept of risk-based analysis of capital projects.
- There needs to be a sustained effort to gather historical damage data, such as high water marks on structures and damage reports, to measure the cost-effectiveness of future mitigation projects.
- Ongoing flood hazard mitigation will require funding from multiple sources.
- There needs to be a coordinated hazard mitigation effort between jurisdictions affected by flood hazards in the county.
- Floodplain residents need to continue to be educated about flood preparedness and the resources available during and after floods.
- The promotion of flood insurance as a means of protecting private property owners from the economic impacts of frequent flood events should continue.
- The economy affects a jurisdiction's ability to manage its floodplains. Budget cuts and personnel losses can strain the resources needed to support floodplain management.

7.5 Severe Weather

Severe weather refers to any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. It includes hail, heat, excessive heat, lightning, hail, fog, and high, strong, and thunderstorm winds. Severe-weather events can happen anywhere in the planning area. Severe local storms are probably the most common widespread hazard. They affect large numbers of people throughout Cook County and the surrounding region when they occur. The heat

wave of July 1995 was one of the worst disasters in Illinois history, with over 700 deaths statewide over five-days.

Records from the National Climatic Data Center indicate approximately 1,386 severe weather events (not including heat and excessive heat events) in the planning area between 1950 and 2018 occurring between 503 separate days. NCDC data from 1996 to 2018 also records 57 heat or excessive heat events. This means that Cook County can expect approximately 9 days every year where at least one severe weather event is occurring. More specifically, this represents an average of approximately 11 thunderstorm wind, 7 hail, 3 heat or excessive heat, 1 lightning, and 1 high or strong wind event every year. According to the 2018 Illinois Natural Hazard Mitigation Plan, the planning area is designated as severely vulnerable to severe storms, with a high vulnerability to extreme heat as well. There were no significant fog events recorded for Cook County in the NCDC - NOAA data.

The most common problems associated with severe storms are immobility and loss of utilities. Roads may become impassable due to flooding, downed trees, or a landslide. Power lines may be downed due to high winds, and services such as water or phone may not be able to operate without power. Lightning can cause severe damage and injury. A worst-case severe-weather event would involve prolonged high winds during a thunderstorm. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to power outages caused by high winds and downed tree obstructions. In more rural areas, some subdivisions could experience limited ingress and egress. Prolonged rain could produce flooding and overtopped culverts with ponded water on roads. Flooding could further obstruct roads and bridges, further isolating residents.

Meteorologists can often predict the likelihood of a severe storm or other severe weather events, which can give several days of warning time. The Chicago Office of the National Weather Service issues severe storm watches and warnings when appropriate to alert government agencies and the public of possible or impending weather events. The watches and warnings are broadcast over NOAA weather radio and are forwarded to the local media for re-transmission using the Emergency Alert System.

Important issues associated with severe weather include the following:

- Redundancy of power supply throughout the planning area must be evaluated. The capacity for backup power generation is limited.
- Public education on dealing with the impacts of severe weather needs to be provided and debris management (downed trees, etc.) must be addressed.
- The effects of climate change may result in an increase in the frequency of extreme heat events.

7.6 Severe Winter Weather

The severe winter weather hazard encompasses heavy snow, lake-effect snow, blizzards, ice storms, sleet, cold/windchill, extreme cold temperatures and wind chill, frost/freeze, general winter weather, and winter storms. Severe winter weather events can happen anywhere in the planning area. NOAA identifies 178 of these severe winter weather events in the planning area from 1950 - 2018, excluding snowstorms classified as less than major snowstorms. The planning area typically receives 34 inches of snow each year and can expect to experience exposure to a severe winter weather event at least annually.

178 severe winter weather events were reported between 01/01/1950 and 06/01/2019, although Cold/Windchill and Extreme Cold/Windchill were not recorded in available data sets until 1997 and

2006, respectively. There have likely been many more of these events before those dates that were not recorded by the NCDL data. All events totaled \$700,000 in property damage, 156 direct deaths and 8 indirect deaths, and 5 direct injuries and 3 indirect injuries.

Severe winter weather impacts can be significant. Roads may become impassable due to ice or snow. Power lines may be downed due to high winds or ice accumulation, and services such as water or phone may not be able to operate without power. Physical damage to homes and facilities can occur from wind damage or accumulation of snow or ice. Freezing rain can cause the most dangerous conditions. Ice buildup can bring down trees, communication towers, and wires, creating hazards for property owners, motorists, and pedestrians alike. Many severe winter weather events in the planning area have resulted in the loss of life.

Meteorologists can often predict likely severe winter weather, giving several days of warning time. The National Weather Service provides public warnings on storm, snow and ice events as appropriate to alert government agencies and the public of possible or impending weather events. Watches and warnings are broadcast over NOAA weather radio and are forwarded to local media for re-transmission using the Emergency Alert System.

Important issues associated with severe winter weather in the planning area include the following:

- The older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to severe winter weather events such as windstorms.
- Redundancy of power supply must be evaluated.
- The capacity for backup power generation is limited.
- Isolated population centers are at significant risk.

7.7 Tornado

Tornadoes are the most violent of all atmospheric storms, and all of Illinois is susceptible to them, including Cook County. The tornado season runs March through August, although a tornado can occur in the state at any time. Many tornadoes have struck Cook County, including several within the Chicago city limits. According to NCDL data, there were 54 tornado and three funnel cloud events from 1954 to 2018, which totaled \$118,337,750 in property damage, 39 deaths, and 770 injuries. The F4-rated Oak Lawn tornado in April 1967 was the deadliest tornado in the planning area, with 33 fatalities. The only F5 tornado to ever strike the Chicago area was on August 28, 1990, which additionally impacted Will and Kendall Counties. In total, 29 direct deaths, 350 injuries, and 250 million in property damage was recorded.

Tornadoes can cause fatalities and devastate a neighborhood in seconds. Winds can reach 300 mph, and damage paths can be more than a mile wide and 50 miles long. If a major tornado were to strike within the populated areas of Cook County, the damage could be widespread. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted. Buildings can be damaged or destroyed.

The local NWS office issues a tornado watch when tornadoes are possible in an area and a tornado warning when a tornado has been sighted or indicated by weather radar. The current average lead time for tornado warnings is 13 minutes. The National Weather Service has established a goal of 15 minutes

in its strategic plan. Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible.

Important issues associated with tornadoes in the planning area include the following:

- The older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to tornadoes.
- Redundancy of power supply must be evaluated. The capacity for backup power generation is limited.
- The amount of the tornado zone that contains vacant, developable land is not known and would be valuable information for gauging the future development potential of the tornado zone.
- Declining growth rate makes it difficult for code standards to have impacts on new development. The planning area has insufficient suitable tornado shelters.
- Public awareness of tornado response protocols is a concern, given the area’s many visitors.

8. Planning Area Risk Ranking

Risk rankings were performed by each planning partner to compare the probable impacts of the hazards of concern. For each community, the rankings assessed the probability of each hazard’s occurrence as well as its likely impact on people, property, and the economy. The results of the countywide ranking, which were used in establishing mitigation action and priorities, are summarized below.

TABLE: HAZARD RISK RANKING		
Hazard Ranking	Hazard Event	Category
1	Severe Winter Weather	High
2	Severe Weather	High
3	Flood (including urban flooding)	High
4	Earthquake	Medium
5	Tornado	Medium
6	Drought	Low
7	Dam Failure	Low

9. Mitigation Strategies

The heart of the mitigation plan is the mitigation strategy, which serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy describes how Cook County and the participating jurisdictions will accomplish the overall purpose, or mission, of the planning process. As part of the update process, mitigation goals and objectives were reevaluated; and mitigation actions/projects were updated/amended, identified, evaluated, and prioritized. A total of 367 new mitigation projects were identified by the County and participating jurisdictions.

10. Plan Maintenance Strategy

The hazard mitigation plan includes a formal process to ensure that the 2019 Cook County MJ-HMP remains an active and relevant document and that the planning partners maintain their eligibility for relevant funding sources. The plan's format allows sections to be reviewed and updated when new data become available, resulting in a plan that will remain current and relevant. The strategy for ongoing maintenance of the plan includes the following components:

Plan Implementation—Plan implementation and evaluation will be a shared responsibility among all planning partners and agencies identified as lead agencies in the mitigation action plans. Cook County DHSEM will assume lead responsibility for implementing the plan maintenance strategy.

Steering Committee—It is recommended that a steering committee remain a viable body involved in key elements of the plan maintenance strategy. The steering committee will strive to include representation from the planning partners, as well as other stakeholders in the planning area.

Annual Progress Report—The steering committee will convene to perform annual reviews. DHSEM will then prepare a formal annual report on the progress of the plan.

Plan Update—The planning partnership intends to update the hazard mitigation plan on a five-year cycle from the date of initial plan adoption.

Continuing Public Involvement—The public will continue to be apprised of the plan's progress through the Cook County hazard mitigation website and by copies of annual progress reports provided to the media. DHSEM has agreed to maintain the hazard mitigation plan website, and each planning partner has agreed to provide links to the website on their jurisdictional websites.

Incorporation into Other Planning Mechanisms—All municipal planning partners are committed to creating a linkage between the hazard mitigation plan and their comprehensive plans by identifying a mitigation action as such and giving that action a high priority. As information becomes available from other planning mechanisms that can enhance this plan, that information will be incorporated via the update process.

11. Plan Adoption

The 2019 Cook County MJ-HMP will be submitted for a pre-adoption review to the Illinois Emergency Management Agency and FEMA before adoption by Cook County. Once pre-adoption approval has been provided, all planning partners will formally adopt the plan.