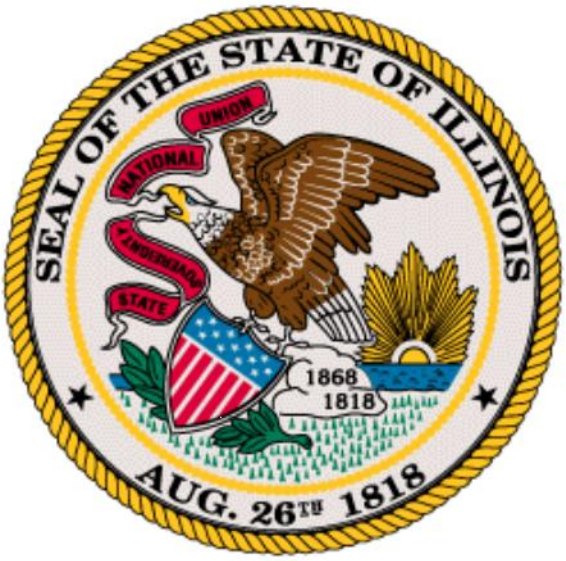
2018 Illinois Natural Hazard Mitigation Plan



Bruce Rauner
GOVERNOR

October 2018

OFFICE OF THE GOVERNOR
207 STATE HOUSE
SPRINGFIELD, ILLINOIS 62706

BRUCE RAUNER
GOVERNOR

October 1, 2018

The Illinois Natural Hazard Mitigation Plan (INHMP) establishes a process for identifying and mitigating the effects of natural hazards in the State of Illinois as required under the Disaster Mitigation Act of 2000. The development and maintenance of the INHMP is a cooperative effort of state agencies, coordinated by the Illinois Emergency Management Agency (IEMA). All grant funding that is provided as a result of this plan will be administered in accordance 2 CFR Part 200.

Hazard mitigation is an important component of emergency management in serving to reduce or eliminate losses to human life and property. The INHMP addresses the history, relative risk and actions that can be taken to mitigate the seven types of natural hazards that can affect Illinois: severe storms, tornadoes, floods, severe winter storms, drought, extreme heat and earthquakes.

The Great Flood of 1993 was one of the greatest natural disasters in Illinois history where more than 24,000 homes were destroyed and more than 884,000 acres of crops were lost. Since 1993, IEMA has played a role in mitigating over 4,000 structures and parcels of land to prevent damage and claims from future floods. In Monroe County, more than 242 properties in the Village of Valmeyer were acquired, allowing the entire village to move three miles to a bluff overlooking the land formerly occupied by the village. Other large-scale mitigation success stories can be found in the Village of Grafton (Jersey County), the City of Rockford (Winnebago County) and the City of Keithsburg (Mercer County).

It is essential that the State of Illinois continue to mitigate losses of human life and property. The INHMP will be continually reviewed, maintained and updated to reflect the changes in federal and state statutes and mitigation opportunities within the State of Illinois. IEMA, pursuant to the Illinois Emergency Management Agency Act (20 ILCS 3305), will coordinate the periodic update and revision of the INHMP.

Sincerely,

Bruce Rauner
Governor, State of Illinois

FORWARD

The Illinois Natural Hazard Mitigation Plan (INHMP) was developed as a cooperative effort of state agencies under the coordination of the Illinois Emergency Management Agency (IEMA). It discusses the process used to identify, profile and assess natural hazards in Illinois and the actions which should be taken to mitigate those hazards.

The INHMP facilitates the delivery of mitigation grant funding to organizations through the Flood Mitigation Assistance (FMA) Program, Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) Program. The INHMP addresses mitigation planning requirements for these programs.

The INHMP will continue to be reviewed and enhanced as new mitigation opportunities become available. Comments and suggestions are welcome and should be forwarded to my attention at the address below.

William Robertson, Acting Director
Illinois Emergency Management Agency
2200 South Dirksen Parkway
Springfield, Illinois 62703

APPENDIX B: STATE MITIGATION PLAN REVIEW TOOL

This section is organized as follows:

B.1 Plan Review Tool Summary
B.2 Standard State Mitigation Plan Regulation Checklist
B.3 Enhanced State Mitigation Plan Regulation Checklist
B.4 Strengths and Opportunities for Improvement

FEMA uses the State Mitigation Plan Review Tool ("**Plan Review Tool**") to document how the state mitigation plan meets the regulation. If plan requirements are not met, FEMA informs the state of the changes it needs to make in each of the Required Revisions sections.

The **"Strengths and Opportunities for Improvement"** summary offers FEMA an opportunity to provide more comprehensive feedback to the state.

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The FEMA Plan Approver must reference the *State Mitigation Plan Review Guide* when completing the *Plan Review Tool*. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.'

The **"Required Revisions"** summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate number, where applicable. Requirements for each Element and sub-element are described in detail in the *State Mitigation Plan Review Guide*.

FEMA will provide a narrative summary of the review findings that includes a discussion of "**Strengths and Opportunities for Improvement"** as a means to offer more comprehensive feedback to the state to acknowledge where the plan exceeds minimum requirements as well as provide suggestions for improvements. FEMA will describe the strengths that are demonstrated and highlight examples of best practices.

FEMA may provide suggestions for improvement as part of the *Plan Review Tool* or in a separate document. FEMA's suggestions for improvement are not required to be made for plan approval.

Required revisions from the Regulation Checklist are not documented in the "**Strengths and Opportunities for Improvement"** section.

B.1 Plan Review Tool Summary

State: Illinois	Title and Date of Plan: 2018 Illinois Natural Hazard Mitigation Plan – 10/2018	Date of Submission: 08.03.2018; 9/11/2018
State Point of Contact (Name / Title): Sam AL-Basha – State Hazard Mitigation Officer Address : 1035 Outer Park, Springfield, IL 62704-4462 Agency : Illinois Emergency Management Agency Phone Number : V: 217/785-9942 F: 217/782-8753 E-Mail : sam.m.al-basha@illinois.gov		

Date Received in FEMA Region:	
FEMA Reviewer (Planning – Name / Title): Steve Greene, HM Community Planner	Date: 8/14/2018; 9/13/2018
FEMA Reviewer (HMA – Name / Title):	Date:
FEMA Reviewer (Name / Title):	Date:
FEMA Reviewer (Name / Title):	Date:
FEMA Approver (Name / Title): Janet M. Odeshoo	Date: 10/4/2018
Plan Status (Not Approved, Approvable Pending Adoption, Approved): Approved Pending Adoption (APA)	Date: 9/26/2018

SUMMARY	YES	NO
STANDARD STATE MITIGATION PLAN		
Does the plan meet the standard state mitigation plan requirements?	✓	
REPETITIVE LOSS STRATEGY		
Does the plan include a Repetitive Loss Strategy? [see S6 / RL1; S8 / RL2; S9 / RL3; S10 / RL4; S13 / RL5; and S15 / RL6]	✓	
ENHANCED STATE MITIGATION PLAN		
Does the plan meet the enhanced state mitigation plan requirements?		N/A

B.2 Standard State Mitigation Plan Regulation Checklist

REGULATION CHECKLIST – STANDARD PLAN *M=Met; NM=Not Met	Location in Plan	M / NM*
STANDARD (S) STATE MITIGATION PLAN		
Planning Process		
S1. Does the plan describe the planning process used to develop the plan? [44 CFR §§201.4(b) and (c)(1)]	Chapter II, INHMP Process, (pp II-1 to II-2)	M
S2. Does the plan describe how the state coordinated with other agencies and stakeholders? [44 CFR §§201.4(b) and (c)(1)]	Chapter II, Illinois Natural Hazard Mitigation Plan Committee, (pp II-3 to II-6)	M
Required Revisions:		
Hazard Identification and Risk Assessment		
S3. Does the risk assessment include an overview of the type and location of all natural hazards that can affect the state? [44 CFR §201.4(c)(2)(i)]	Chapter III, Risk Analysis, (pp III-1 to III-196)	M
S4. Does the risk assessment provide an overview of the probabilities of future hazard events? [44 CFR §201.4(c)(2)(i)]	Chapter III, Illinois Hazard Rating Process (pp III-9 to III-11)	M
S5. Does the risk assessment address the vulnerability of state assets located in hazard areas and estimate the potential dollar losses to these assets? [44 CFR §§201.4(c)(2)(ii) and 201.4(c)(2)(iii)]	Chapter III, State Owned or Operated State Facility Data Methodology (pp III-164 to III-196)	M
S6. Does the risk assessment include an overview and analysis of the vulnerability of jurisdictions to the identified hazards and the potential losses to vulnerable structures? [44 CFR §§201.4(c)(2)(ii) and 201.4(c)(2)(iii)]	Chapter III, Risk Assessment – Jurisdictions (pp III-196)	M
S7. Was the risk assessment revised to reflect changes in development? [44 CFR §201.4(d)]	Chapter III Hazard Analysis and Risk Assessment	M

Required Revisions:		
Mitigation Strategy and Priorities		
S8. Does the mitigation strategy include goals to reduce / avoid long-term vulnerabilities from the identified hazards? [44 CFR §201.4(c)(3)(i)]	Chapter IV (pp 3)	**M**
S9. Does the plan prioritize mitigation actions to reduce vulnerabilities identified in the risk assessment? [44 CFR §§201.4(c)(3)(iii) and (iv)]	Chapter IV (pp 6-68, 84-86)	**M**
S10. Does the plan identify current and potential sources of funding to implement mitigation actions and activities? [44 CFR §201.4(c)(3)(iv)]	Chapter IV (pp 69-75)	**M**
S11. Was the plan updated to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities? [44 CFR §201.4(d)]	Chapter IV (pp 84-94)	**M**
Required Revisions:		
State Mitigation Capabilities		
S12. Does the plan discuss the evaluation of the state's hazard management policies, programs, capabilities, and funding sources to mitigate the hazards identified in the risk assessment? [44 CFR §201.4(c)(3)(ii)]	Chapter IV (pp 85-88), Chapter IV (pp95-138)	**M**
Required Revisions:		

REGULATION CHECKLIST – STANDARD PLAN *M=Met; NM=Not Met	Location in Plan	M / NM*
Local Coordination and Mitigation Capabilities		
S13. Does the plan generally describe and analyze the effectiveness of local and tribal, as applicable, mitigation policies, programs, and capabilities? [44 CFR §201.4(c)(3)(ii)]	Chapter IV (pp 144-145)	**M**
S14. Does the plan describe the process to support the development of approvable local and tribal, as applicable, mitigation plans? [44 CFR §§201.3(c)(5) and 201.4(c)(4)(i)]	Chapter IV (pp 144-145)	**M**
S15. Does the plan describe the criteria for prioritizing funding? [44 CFR §201.4(c)(4)(iii)]	Chapter IV (pp84-86)	**M**
S16. Does the plan describe the process and timeframe to review, coordinate and link local and tribal, as applicable, mitigation plans with the state mitigation plan? [44 CFR §§201.3(c)(6), 201.4(c)(2)(ii), 201.4(c)(3)(iii), and 201.4(c)(4)(ii)]	Chapter IV (pp 139-145)	**M**
Required Revisions:		
Plan Review, Evaluation, and Implementation		
S17. Is there a description of the method and schedule for keeping the plan current? [44 CFR §§201.4(c)(5)(i) and 201.4(d)]	Chapter VI (pp VI -1 to VI -5)	**M**
S18. Does the plan describe the systems for monitoring implementation and reviewing progress? [44 CFR §§201.4(c)(5)(ii) and 201.4(c)(5)(iii)]	Chapter VI (pp VI -1 to VI -5)	**M**
Required Revisions:		
Adoption and Assurances		
S19. Did the state provide documentation that the plan has been formally adopted? [44 CFR §201.4(c)(6)]		**M**
S20. Did the state provide assurances? [44 CFR §201.4(c)(7)]	Chapter I (pp I -2)	**M**
Required Revisions:		
Repetitive Loss (RL) Strategy		
RL1. Did Element S6 (risk assessment) address RL and SRL properties? [44 CFR §§201.4(c)(2)(ii), 201.4(c)(2)(iii), and 201.4(c)(3)(v)]	Chapter III (pp 73-79)	**M**
RL2. Did Element S8 (mitigation goals) address RL and SRL properties? [44 CFR §§201.4(c)(3)(i) and 201.4(c)(3)(v)]	Chapter IV (p 3)	**M**
RL3. Did Element S9 (mitigation actions) address RL and SRL properties? [44 CFR §§201.4(c)(3)(iii) and 201.4(c)(3)(v)]	Chapter IV (pp 20-44)	**M**
RL4. Did Element S10 (funding sources) address RL and SRL properties? [44 CFR §§201.4(c)(3)(iv) and 201.4(c)(3)(v)]	Chapter IV (pp 73-75)	**M**
RL5. Did Element S13 (local and tribal, as applicable, capabilities) address RL and SRL properties? [44 CFR §§201.4(c)(3)(ii) and 201.4(c)(3)(v)]	Chapter IV (pp 106-107)	**M**
RL6. Did Element S15 (prioritizing funding) address RL and SRL properties? [44 CFR §§201.4(c)(4)(iii) and 201.4(c)(3)(v)]	Chapter IV (pp 73-75)	**M**
Required Revisions:		

B.3 Strengths and Opportunities for Improvement

STRENGTHS AND OPPORTUNITIES FOR IMPROVEMENT

INSTRUCTIONS: The purpose of the "**Strengths and Opportunities for Improvement**" section is for FEMA to provide more comprehensive feedback on the state mitigation plan to help the state advance mitigation planning. The intended audience is the state staff responsible for the mitigation plan update. FEMA will address the following topics:

1. Plan strengths, including specific sections in the plan that are above and beyond the minimum requirements; and
2. Suggestions for future improvements.

FEMA will provide feedback and include examples of best practices, when possible, as part of the *Plan Review Tool*, or, if necessary, as a separate document. The state mitigation plan elements are included below in italics for reference but should be deleted as the narrative summary is completed. FEMA is not required to provide feedback for each element.

Required revisions from the **Regulation Checklist** are not documented in the **Strengths and Opportunities for Improvement** section.

Results from the **Strengths and Opportunities for Improvement** section are not required for Plan Approval, but may inform discussions during the Program Consultation.

Describe the mitigation plan strengths, including areas that may exceed minimum requirements, and areas for future improvements to the mitigation plan.

Planning Process

- State Planning Team (Housing Sector) – The planning team encompasses a diverse make up of representatives from various sectors but it is unclear on who the representatives are from the housing sector. The state's planning team can work with the housing sector to identify risks and vulnerabilities within this sector as well as ensure the mitigation strategy addresses these identified risks and vulnerabilities. Housing sector stakeholders benefit from participating in the mitigation planning process by gaining insight into high risk areas, at risk populations, and model building codes and other minimum standards for development that can reduce losses. For the next plan update, the planning team should include representatives from the housing sector.

Mitigation Strategy

- The plan does an excellent job in conveying the state's successes in advancing mitigation, especially for flooding. The discussion provided in the plan showcasing the state's aggressive efforts to mitigate flooding reinforces the state's priorities for hazard mitigation.
- Mitigation Actions – The plan provides a variety of actions to implement but several of these actions appear to be repetitive and administrative actions/duties. Mitigation actions in the plan are specific projects and activities that help achieve the goals. For the next plan update, consider removing actions that are more administrative duties than mitigation actions.
- Objectives & Strategies – For each of the goals there are several strategies and objectives outlined in the plan. In reviewing the strategies and objectives, it's not clear what the difference is between the two statements. Some strategies highlighted in this section of the plan seem they could be added as actions. For the next plan update, the planning team should consider merging them or eliminating one of them to make the mitigation strategy section cleaner and easy to understand.
- Mitigation Action Status (Continuing) – Several of the mitigation actions highlight the status as continuing with a broad definition of what continuing means on page IV-3 of the plan. Even though the plan defines the status of "continuing" there should be more discussion on the progress made for the actions in the plan.

Risk Assessment

- Maps – It appears most of the maps utilized in the risk assessment are for the perceived vulnerability that is included as a result of the local rollup of information from local mitigation plans. There are opportunities within the risk assessment to develop maps that can convey historical occurrences, and/or number of dollars lost for a hazard.
- Tornado/Severe Storms – For the next plan update, tornadoes and severe storms need to be separated and analyzed as separate hazards. While tornadoes form as a result of storms, they have a different mechanism than just an average thunderstorm. The damage they produce is also highly localized, rather than being spread out. Additionally, they are catalogued in the hazard prioritization as two separate hazards.
- Levee Failure – Similar to Tornado/Severe Storms, flooding and levee failure need to be separated and analyzed as separate hazards. While flooding is inherent to a levee breach, it is not the same as a flood and has a different kind of impact. For the next plan update, these two hazards needs to be analyzed separately.
- Extreme Heat – Page III-130 states "This natural disaster 'Heat Wave' has long been overlooked because there is not visible damage like in a tornado and its impact is greatly understated in terms of human toll because not all heat related deaths are recorded." Roadways and railways can suffer damage from prolonged heat as they are not designed to operate under hot conditions for long spans of time. Also, prolonged extreme heat can overtax the electric grid, which would cause black outs or brown outs. These could be considered visible and physical effects.

Describe areas for future improvements to the mitigation plan. (con't from previous page)

- Earthquake – Pages III-133-146 highlights the references in the middle of the Earthquake profile. These should be moved to either the back of the profile or placed with other references in the plan's appendix.
    - The HAZUS runs for Earthquakes appears to be identical to the 2013 run, using 2000 Census data. For the next plan update, these HAZUS runs need to be updated to include more modern information that would account for changes in population and new construction.
- Extreme Heat – Page III-130 states "This natural disaster 'Heat Wave' has long been overlooked because there is not visible damage like in a tornado and its impact is greatly understated in terms of human toll because not all heat related deaths are recorded." Roadways and railways can suffer damage from prolonged heat as they are not designed to operate under hot conditions for long spans of time. Also, prolonged extreme heat can overtax the electric grid, which would cause black outs or brown outs. These could be considered visible and physical effects.
- Influenza Pandemic – This hazard is only two paragraphs. This could be greatly expanded upon to become a full hazard profile. For the next plan update, if this hazard is going to be a part of the plan update there should be more analysis incorporated into the plan.
- Changes in Development – While the plan discusses population changes throughout the plan, there is very little discussion on changes in land use and the built environment. The plan must provide a summary of the changes in development that have occurred (or are projected to occur) in hazard prone areas based on the state, local and tribal, as applicable, risk assessments, specifically:
    - Changes in land use and the built environment;
    - Changes in population demographics, that may affect vulnerability to hazard events; and
    - Changes to the vulnerability of state-owned or operated buildings, infrastructure, and critical facilities.

  For the next plan update, the plan needs to provide more analysis on changes that have occurred since the last plan update.

General Comments

- While the 2018 Illinois Natural Hazard Mitigation Plan has met the standard state mitigation plan requirements, the plan can benefit from additional technical assistance such as further hazard analysis, plan layout, mitigation action development, etc. During the cycle of the plan FEMA Region V Mitigation Planning will continue discussions with IEMA and the state's mitigation planning committee for developing a stronger state mitigation plan. These discussions will occur well before the update of this plan begins and will be in addition to annual state consultations.

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ACRONYMS

APA	Approval Pending Adoption
AIA	American Institute of Architects
ARC	American Red Cross
ARCGC	American Red Cross of Greater Chicago
ATC	Applied Technology Council
B/C	Benefit cost
BOCA	Building Officials Code Association
BOMA	Building Owners and Managers Association
CAP	Community Assistance Program
CAP-SSSE	Community Assistance Program-State Support Services Element
CDAP	Community Development Assistance Program
CDB/DBCR	Capital Development Board/Division of Building Codes and Regulations
CDBG	Community Development Block Grant
CERL	Construction Engineering Research Laboratory (part of USACE)
CFM	Certified Floodplain Manager
CFR	Code of Federal Regulation
CHIP	Capability/Hazard Identification Plan
CMS	Central Management Services
CTP	Cooperating Technical Partners
CUSEC	Central United States Earthquake Consortium
DA&P	Disaster Assistance & Preparedness
DCEO	Department of Commerce and Economic Opportunity
DC&W	Direction, Control and Warning
DHS	Department of Homeland Security
DMA2k	Disaster Mitigation Act of 2000
DOI	Division of Insurance
DRC	Disaster Resistant Community
EOP	Emergency Operations Plan
ESDA	Emergency Services and Disaster Agency (local)
FBFW	Flood Boundary Floodway
FCO	Federal Coordinating Officer
FEMA	Federal Emergency Management Agency
FHMO	Federal Hazard Mitigation Officer
FIRM	Flood Insurance Rate Map
FLASH	Federal Alliance for Safe Housing
FMA	Flood Mitigation Assistance
FRM	Flood Risk Management
FY	Fiscal Year
GAR	Governor's Authorized Representative
GRF	General Revenue Fund
HM	Hazard Mitigation
HMGP	Hazard Mitigation Grant Program
HMST	Hazard Mitigation Survey Team (for non-flood disasters)
HRCQ	Highway Route Controlled Qualities
HUD	Housing and Urban Development

ACRONYMS (continued)

IA	Individual Assistance
IAFSM	Illinois Association of Floodplain and Stormwater Managers
IBA	Illinois Broadcasters Association
IBHS	Institute for Business and Home Safety
IBHS	Institute of Building and Home Safety
ICDB	Illinois Capital Development Board
IDFPR/DOI	Illinois Department of Financial and Professional Regulation/Division of Insurance
IDNDR	International Decade for Natural Disaster Reduction
IDNR-INHS	Illinois Department of Natural Resources - Illinois Natural History Survey
IDNR-OWR	Illinois Department of Natural Resources - Office of Water Resources
IDOA	Illinois Department of Agriculture
IDOT	Illinois Department of Transportation
IDPH	Illinois Department of Public Health
IEA	Illinois Education Association
IEMA	Illinois Emergency Management Agency
IEMMAS	Illinois Emergency Management Mutual Aid System
IEPA	Illinois Environmental Protection Agency
IHMT	Interagency Hazard Mitigation Team
IHPA	Illinois Historic Preservation Agency
ILARC	Illinois Association of Regional Councils
ILEAS	Illinois Law Enforcement Alarm System
IMAG	Interagency Mitigation Advisory Group
INA	Illinois Nurseryman Association
INHMP	Illinois Natural Hazard Mitigation Plan
INHMPC	Illinois Natural Hazard Mitigation Planning Committee
IPAM	Illinois Property Asset Management
IRCC	Illinois River Coordinating Council
ISBE	Illinois State Board of Education
ISGS	Illinois State Geological Survey
ISWS	Illinois State Water Survey (part of IDNR)
JFO	Joint Field Office
LCSMC	Lake County Stormwater Management Commission
LDD	Levee and Drainage District
LIHEAP	Low Income Home Energy Assistance Program
LSAC	Levee Safety Action Classification
MABAS	Mutual Aid Box Alarm System
MCSC	Mitigation Coordination and Strategy Committee
MERSWPC	Metro-East Regional Storm Water Planning Committee
MESD	Metro-East Sanitary District
MICA	Mobile Information Collection Application
MMIS	Modified Mercalli Intensity Scale (I thru XII)
MMMS	Map Modernization Management Support
MSD	Metropolitan Sanitary District - Chicago
MSDGC	Metropolitan Sanitary District of Greater Chicago (Now MWRD)

ACRONYMS (continued)

MWRD	Metropolitan Water Reclamation District - Chicago
NCEI	National Centers for Environmental Information (former NCDC)
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NFIRA	National Flood Insurance Reform Act
NIBS	National Institute of Building Scientists
NIPC	Northeastern Illinois Planning Commission
NLD	National Levee Database
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NSF	National Science Foundation
NTH	Natural and Technological Hazards (part of FEMA)
NWS	National Weather Service
OMB	Office of Management and Budget
OWR	Office of Water Resources (IDNR)
OSLAD	Open Space Acquisition and Development
PA	Public Assistance
PCWD	Prairie Central Watershed District
PDM	PreDisaster Mitigation
PDSI	Palmer Drought Severity Index
PI	Project Impact
PIO	Public Information Officer
PL	Public Law
POC	Point of Contact
PSA	Public Service Announcement
PVC	Polyvinyl Chloride
RACES	Radio Amateur Civil Emergency Service
RECD	Rural Economic and Community Development (former FmHA)
RFC	Repetitive Flood Claims
RR	Railroad
RWIS	Roadway Weather Information System
SBA	Small Business Administration, Department of Commerce
SBE	State Board of Education
SCO	State Coordinating Officer
SCS	Soil Conservation Service (now NRCS)
SHMO	State Hazard Mitigation Officer
SIMAPC	Southwestern Illinois Metropolitan and Regional Planning Commission
SIU	Southern Illinois University
SOP	Standard Operating Procedures
SRL	Severe Repetitive Loss
TARP	Tunnel and Reservoir Project (aka deep tunnel)
TBD	To Be Determined
TWP	Township
UBC	Uniform Building Codes

ACRONYMS (continued)

U/I, U-C	University of Illinois, Urbana-Champaign
USACE U.S.	Army Corps of Engineers
USEPA	U. S. Environmental Protection Agency
USGS	U. S. Geological Survey, Department of Interior

I. INTRODUCTION

Natural disasters have claimed many lives and have caused millions in property damage in the United States. Between 1980 and 2016, the U.S. experienced 203 natural disasters where the total cost for these events exceeded $1.1 trillion (adjusted to 2016 dollars using the Consumer Price Index; NCEI, 2016). Flooding represents 13% of the number of events with 9.4% of the losses, while severe storms made up 41.5% of the number of events, yet only 15.5% of total losses. Tropical cyclones represent the highest in damages with 47.6% of total losses and drought is responsible for 19.1% of damages (NCEI, 2016). (Nationwide, the number of severe storms, droughts, and flood events, has increased over the last 20 years resulting in a surge of property damage, and more frequent interruptions of business and government services (NCEI, 2016). Natural disasters have a tremendous economic impact on governments, businesses and individuals. During 2017, there were 15 weather and climate disaster events with losses exceeding $1 billion each. These events included one drought event, two flooding events, one freeze event, seven severe storm events, three tropical cyclone events, and one wildfire event. Overall, these events resulted in the deaths of 282 people and had significant economic effects on the areas impacted. The costs for Hurricanes Harvey, Irma and Maria are still being assessed (NCEI, 2017).

Illinois received 22 federal disaster declarations (17 major disaster declarations and five emergency declarations) between 2000 and 2017, and 31 gubernatorial disaster proclamations between 2010 and 2018 (IEMA).

Hazard mitigation is a sustained action 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 should 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. Mitigation plans are key to breaking the cycle of disaster damage, reconstruction, and repeated damage (FEMA). A report released by National Institute of Building Sciences in 2017 indicated that mitigation funding can save the nation $6 in future disaster costs, for every $1 spent on hazard mitigation. (http://www.nibs.org/page/mitigationsaves)

A. Purpose and Scope

The Illinois Natural Hazard Mitigation Plan (INHMP) is intended to provide the framework for hazard mitigation not only during the recovery and reconstruction process, but on a year-round basis to identify current and proposed mitigation projects that will reduce the potential for future losses and decrease the costs to taxpayers. The INHMP will be used to increase awareness and initiate development of long-range, interagency, multi-hazard mitigation activities to be administered by the Illinois Emergency Management Agency (IEMA) and the Interagency Mitigation Advisory Group (IMAG) for the State of Illinois. The INHMP shall address those natural hazards that have resulted in claims for Federal assistance, as well as other major natural hazards identified as presenting substantial risk to human life and private and public property. A joint decision was made between the Illinois Natural Hazard Mitigation Planning Committee (INHMPC) and IEMA to keep the plan focused on natural hazards. Separate efforts are in place for man-made hazards.

B. Authority

The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended by (PL) 106-390 (Pre-Disaster Mitigation Program, Hazard Mitigation Grant Program and the Flood Mitigation Assistance Program - 44 CFR Part 78), addresses state mitigation planning, identifies new local mitigation planning requirements, authorizes Hazard Mitigation Grant Program (HMGP) funds for planning activities, and increases the amount of HMGP funds available to states that develop a comprehensive, enhanced mitigation plan. The Disaster Mitigation Act of 2000 (DMA 2000) emphasizes the importance of strong state and local planning processes and comprehensive program management at the state level with a link in the planning process between the state and local mitigation programs. The Federal Emergency Management Agency (FEMA) has promulgated rules for implementation in 44 CFR Parts 201 and 206.

The Illinois Emergency Management Agency Act sets forth IEMA's authority to develop, plan, analyze, conduct, provide, implement and maintain programs for disaster mitigation, preparedness, response and recovery (20 ILCS 3305/5)

C. Assurances

The State of Illinois will comply with all applicable federal statutes and regulations in effect with respect to the periods in which it receives grant funding, including 44 CFR 201.4(c)(7) and 2 CFR Parts 200 and 3002. The Illinois Natural Hazard Mitigation Plan will be amended according to the process described in the Plan Maintenance Section whenever necessary to reflect changes in state and federal statutes.

D. Geographic Characteristics of Illinois

Illinois covers 57,918 square miles, making it the 25th largest of the 50 states in total area. Illinois extends from 36.9540° to 42.4951° North Latitude and from 87.3840° to 91.4244° West Longitude. The State is approximately 385 miles long and 218 miles wide, with its geographic center located in the town of Chestnut. Carlyle Lake (24,580 acres) and Rend Lake (18,900 acres), two of largest lakes in Illinois, make up a substantial amount of the total inland water area. Elevations in the State range from the lowest level at the Mississippi River at Cairo (279 feet above mean sea level) to the highest point Charles Mound (1235 feet above mean sea level). The largest cities in Illinois are: Chicago, Aurora, Rockford, Joliet, Naperville, Springfield and Peoria. The State of Illinois is bordered by the states of: Indiana, Iowa, Kentucky, Missouri, Wisconsin, and Michigan (in Lake Michigan).

E. Climatic Characteristics of Illinois

Illinois lies midway between the Continental Divide and the Atlantic Ocean, and the state's southern tip is 500 miles north of the Gulf of Mexico. Illinois' climate is typically continental with cold winters; warm, humid summers; and frequent short fluctuations in temperature, precipitation, humidity, cloudiness, and winds.

The climate of Illinois has five unique features:

- Four distinct seasons, each with different conditions
- Major north-south temperature contrasts
- An extremely wide variety of types and amounts of precipitation with moderate variations between monthly and seasonal average values

- Extreme variability of weather conditions in different parts of the state and, certainly, between years
- A large number of storms during all seasons

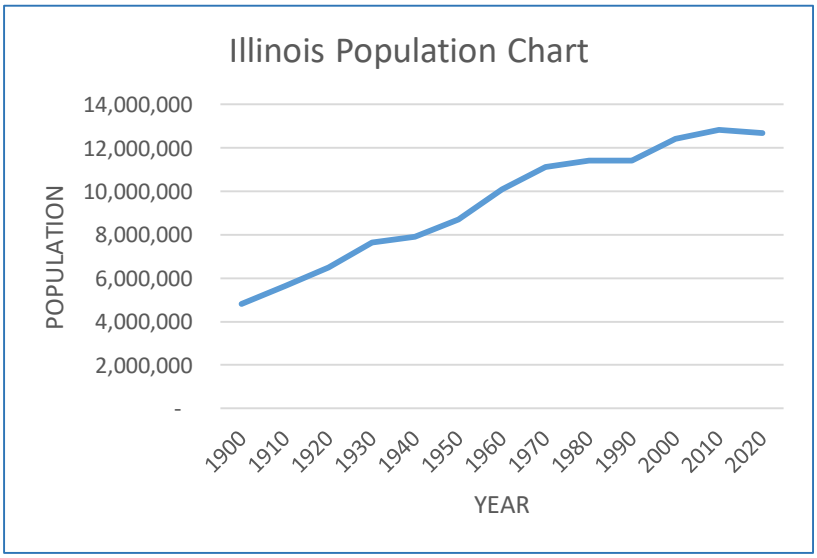
Average annual temperatures range from 48°F in far northern Illinois to 58°F in far southern Illinois. In July, the warmest month of the year, high temperatures range from the low 80s in northern Illinois to the upper 80s in southern Illinois, while low temperatures range from the low 60s in northern Illinois to the upper 60s in southern Illinois. In January, the coldest month of the year, high temperatures range from the upper 20s in northern Illinois to the low to mid 40s in southern Illinois, while low temperatures range from 10 to 12 degrees in northern Illinois to the mid 20s in southern Illinois. In the northern region of Illinois there are on average 10 days a year at or above 90°F while in the southern part of the state the average number of days over 90°F is just over 40 days. Days at or above 100°F are quite rare, occurring about every other year in northern Illinois and one or two days annually in southern Illinois. Days at or below 0°F ranges from 16 days annually in northwestern Illinois to two days in southern Illinois. The highest temperature ever reported in Illinois was 117°F in East St. Louis on July 14, 1954. The lowest temperature ever reported in Illinois was -36°F in Congerville on January 5, 1999.

Average annual precipitation ranges from 36 inches in the northern part of the state to about 48 inches in the south. Average annual snowfall averages are 36 inches a year in the north to less than 12 inches in far southern Illinois. Average annual snowfall is enhanced in northeast Illinois by lake-effect snows from Lake Michigan. Lake County has three stations with over 43 inches of snow on average annually.

The maximum rainfall from a single event was 16.94 inches in Aurora on July 17-18, 1996. The most precipitation in a year was 86.36 inches in Rosiclare (southeastern Illinois) in 2011. The record snowfall in one day was 37.8 inches at Astoria on February 27-28, 1900. The greatest winter snowfall was 105.1 inches at Antioch in 1978-1979. (Source: https://www.isws.illinois.edu/statecli/General/averages.htm#records)

F. Demographic and Economic Characteristics of Illinois

The population of Illinois in 2017 is estimated at 12,801,539 making Illinois the fifth most populous state in the nation. Cook is the largest county with a population of 5,203,499 followed by DuPage (929.368), Lake (703,047), Will (689,529) and Kane (531,715). (US Census Bureau) Illinois is among eight states to lose residents since about 2009. Population first began to drop in 2014, when the state lost 11,961 people. That number more than doubled in 2015, with a loss of 28,497 people, and further multiplied in 2017. Eight counties are expected to have a population increase of 10% or greater based on current population and projected population for the year 2020.



Illinois' $693 billion economy makes it an international center for global commerce. Foreign Direct Investment accounts for nearly 251,000 jobs in the state, making up more than 5 percent of the private-sector workforce and ranking Illinois fifth among the states. Its major industry sectors include clean energy, information technology, advanced manufacturing and financial services. The state is home to 32 Fortune 500 companies and global brands, including Boeing, McDonald's, Allstate, Caterpillar and Kraft Foods. Illinois has a long industrial heritage and has evolved into an advanced, technology-driven enterprise with significant clusters in advanced materials, machine and metal parts fabrication, aerospace and pharmaceuticals. Nearly one-half of the state's 5.6 million workers are professionals, skilled technicians, craftspeople or machine operators, and major manufacturers include Boeing, Caterpillar, John Deere and Navistar.

Illinois plays a lead role in the future of energy such as the Argonne National Laboratory are fueling innovation in clean energy in Illinois. Illinois is experiencing a power surge as an innovator in clean energy technology, which includes emerging as a leader in advanced battery technology and storage thanks in large part to the presence of two major federal laboratories – Fermi and Argonne. Meanwhile, most coal produced in Illinois is exported to other states and countries, and the state is the largest refiner of petroleum in the Midwest. Wind energy is burgeoning industry with big wind farms at EcoGrove (Stephenson County), Mendota Hills (Lee County), Rail Splitter (Logan and Tazewell counties) and Twin Groves (McLean County), and Illinois corn is used to produce more than 40 percent of the ethanol fuel used in the United States.

Illinois feeds the world, with its 75,000 farms covering nearly 76 percent of the state's total land area to produce commodities like soybeans, corns, hogs, beef cattle and dairy products. The state's farms also make it a leader in biofuels, including ethanol and soybean-based biodiesel. In total, the agricultural output is more than $20 billion annually, with corn accounting for nearly 40 percent of that total. Meanwhile, some of the world's most well-known food producers are in Illinois, including Archer Daniels Midland, Cadbury Adams, Del Monte, General Mills, Heinz Kraft and Sara Lee.

Airport, Class I rail carriers and Mississippi River ports make the logistics industry in Illinois a world leader. Business in Illinois, which houses the headquarters of international exchanges CME Group and the Chicago Board Options Exchange as well as major international companies that make the state a global center of financial and business services. The financial services sector employs more than 367,000 workers, and business and professional services another 926,000 workers.

Illinois is a magnet for attracting the best minds, and its educational attainment rates are higher than the national average. The state features two Top 25 engineering schools – University of Illinois and Northwestern University – and other top-flight higher education institutions include the University of Chicago, Loyola, DePaul, Illinois State, Northern Illinois and Southern Illinois.

With a long history of technological breakthroughs in chemistry and physics, Illinois is a breeder reactor of advancement in medicines, medical devices, nutritional products, alternative fuels and environmental solutions. The overall economic output of the biotechnology industry in Illinois is nearly $100 billion, and powerhouse life sciences companies include Abbott Laboratories, Astellas, Baxter Healthcare and Hospira.
Source: https://livability.com/il/business/top-industries-in-illinois

G. Mitigation Success Stories in Illinois

The State of Illinois has been very successful embracing opportunities to reduce and eliminate potential losses to state and local assets though numerous state hazard mitigation planning and project efforts. The combination of federal and state resources has afforded a proactive approach to the common goal of reducing the risk of loss of life and property due to natural hazards in Illinois. While all mitigation efforts must be a continual effort, the State's efforts have shown results. Many community officials, especially those in heavily-mitigated communities, have experienced firsthand the fruits of their mitigation efforts during subsequent flooding events. Properties that previously flooded, resulting in significant damages for residents, have experienced no impacts due to mitigation.

A new report was published in January 2018 by the National Institute of Building Sciences (NIBS) on mitigation. In this new report, NIBS MMC examined 23 years of federal grants data to determine the benefits we derive from avoiding damages through activities funded with federal grants, and examined an expanded set of mitigation actions to determine the Benefit Cost Ratios (BCR) of building new structures beyond code requirements. The hazard categories covered in this report include: Riverine Flood, Hurricane Surge, Wind, Earthquake, and Wildland-Urban Interface Fire (WUI). The new report uses two high-level Benefit Cost Ratios (BCRs) representing the benefits of mitigation.

Below provides a highlight of some of the successful mitigation projects or efforts that have occurred within the State of Illinois. These mitigation actions are vital in the success of reducing or eliminating the impacts of the hazards that affect the State of Illinois and its population.

Current Mitigation Success Stories

Floodplain Mitigation Partnership Between IEMA and IDNR

With flooding causing the greatest financial impacts within the State, it is important to continually attempt to mitigate this hazard and limit these costly impacts. The State of Illinois flood mitigation efforts have and continue to be very proactive and successful. IEMA, with the cooperation of the Illinois Department of Natural Resources (IDNR), has been involved with the mitigation of approximately 4200-4500 structures and parcels of land since 1993 through the following efforts:

- **Property Acquisition and Structure Demolition –** The voluntary acquisition of an existing at-risk structure and, typically, the underlying land, and conversion of the land to open space through the demolition of the structure. The property must be deed-restricted in perpetuity to open space uses to restore and/or conserve the natural floodplain functions.
- **Property Acquisition and Structure Relocation –** The voluntary physical relocation of an existing structure to an area outside of a hazard-prone area, such as the Special Flood Hazard Area (SFHA) or a regulatory erosion zone and, typically, the acquisition of the underlying land. The property must be deed-restricted in perpetuity to open space uses to restore and/or conserve the natural floodplain functions.
- **Structure Elevation –** Physically raising an existing structure to the Base Flood Elevation (BFE) or higher if required by FEMA or local ordinance. Structure elevation may be achieved through a variety of methods, including elevating on continuous foundation walls; elevating on open foundations, such as piles, piers, posts, or columns; and elevating on fill. Foundations must be designed to properly

address all loads and be appropriately connected to the floor structure above, and utilities must be properly elevated as well.

These flood mitigation efforts continue to grow in success with the new addition of the Department of Commerce and Economic Opportunity as a mitigation partner. The success of these efforts is seen with the continual decline of the State's repetitive flood insurance claims. In 1995, Illinois was ranked #5 in the nation for repetitive flood insurance claims. In 2017, Illinois had dropped to #12 in the nation.

Bridge Scour Monitoring System

The Illinois Department of Transportation has implemented a program that has evaluated bridges over waterways for their scour potential. Scouring is the erosion of soil from around the bridge support pillions. This soil erosion can cause structural damage to the bridge supports. On identified bridges, a monitoring system has been installed that will alarm if damaging scouring activity occurs. The system is monitored 24 hours a day with emergency notification to personnel, and it allows for the agency to continually analyze the scouring risk and institute activities to mitigate the impact of the scouring if required.

Illinois Department of Natural Resources/Office of Water Resources Matching Funds

The Illinois Department of Natural Resources/Office of Water Resources (OWR) has a long history of flood mitigation. Starting in the 1970s, the OWR accomplished early flood mitigation buyouts in some of the state's most flood prone areas. Buyouts took place in Thebes, Kampsville, Peoria Heights, and Peoria County. In the subsequent years, dozens of floods have taken place at these mitigation project sites. The program has paid for itself many times over in loss avoidance. These early buyouts set the stage for later programs. After the 1993 flood, the OWR program was used largely as the local cost share match for FEMA's 75%/25% funding. The availability of state matching funds has made the FEMA program much more widely accepted by local communities. More recently, OWR has taken on larger projects (such as Alexander County) to make available "global match" funds to match FEMA mitigation funding.

Community Rating System

The Community Rating System (CRS) is a voluntary program, which provides incentives in the form of premium discounts for communities that go above and beyond minimum floodplain management standards. The State of Illinois is very proud of the way communities have embrace the Community Rating System (CRS). Illinois leads the nation in participation for non-coastal states and is ranked 5th overall in the United States with 64 CRS communities. Illinois also has 13 communities that have achieved a Class 5 rating, resulting in a 25% reduction in flood insurance premiums. This distinction ranks Illinois 4th in the nation and 1st for non-coastal communities. Not only does Illinois have the largest number of CRS communities among inland states, the state is also a national leader when it comes to floodplain management. The citizens of Illinois will realize nearly $1.5 million in annual savings due to CRS. Based strictly on Illinois' state regulations, every community in the state could achieve a 10% reduction in flood premiums simply by joining CRS. (Source: Lou Ann Patellaro – CRS Specialist 2017)

Business Emergency Operation Center

The Business Emergency Operation Center (BEOC) is a private sector emergency operation center the brings representatives from the following sectors into cooperation with State Emergency Management Personnel: agriculture and food; retail; energy; information technology; postal and shipping; bank and finance; communications, transportation systems; chemical; manufacturing; healthcare and public health, water; security; small business; and service industry. The collaboration between the private sector and state emergency management personnel not only improves response and recovery efforts for major disasters, but

has built that connection to develop mitigation strategies to enhance the resiliency of the private sector, ultimately strengthening the State's mitigation efforts.

Illinois Flood Plain Summary

The Illinois Department of Natural Resources Office of Water Resources created an Illinois Flood Plain Summary document to highlight the continuing floodplain efforts including flood mitigation for the State of Illinois. This document provides information for not only state agencies but the general public in regards to floodplain related mitigation efforts in Illinois and the success of its programs. Nearly 4.4 million acres, or 12%, of the entire land area of Illinois is mapped as floodplain. Illinois is ranked 5th in the nation for total number of participating communities in the National Flood Insurance Program.

Illinois State Water Survey (ISWS)

The Prairie Research Institute and the IDNR Office of Water Resources was funded with the conclusion of DCEO IKE funds for three projects including Light Detection and Ranging (LiDAR) Data Acquisition and Processing, Structural Flood Risk Assessment Studies, and a Rainfall Frequency Atlas. The Structure-Based Flood Risk Assessment analyzes flood risk for thousands of properties within Peoria County and the City of Ottawa in LaSalle County. Elevations for at-risk structures were collected by licensed surveyors and include detailed structural information about each property to help estimate flood risk. Elevation data was also collected for thousands of properties in Rock Island County. All of the information collected for this project will be hosted on a web application that with continued support will eventually include flood risk information for the entire State of Illinois. This information will allow for strategic prioritization of building acquisitions and identification appropriate mitigation options. The flood risk assessment provides information for mitigation planners at the local, county, and state level to identify the structures that are likely to experience the mostly costly damages due to flooding and plan accordingly, as well as helping owners to understand the importance and value of flood insurance.

Illinois Drought Preparedness and Response Plan (ISWS)

Adopted by the State Water Plan Task Force (SWPTF), the goal of Illinois' Drought Preparedness and Response Plan is to assist community and state officials and the public with information and tools that promote better decision-making in water supply planning and reduce drought-related impacts, water competition, and conflicts of use. Drought is a common natural phenomenon that can lead to a natural disaster. There are still public health concerns with drought, primarily associated with water quality and proper disinfection as well as the effects of prolonged heat waves that commonly occur during severe drought periods. There are also serious economic impacts of drought with damages to crops or damages resulting from an interruption in available water supply. Every drought is different in its intensity, duration, timing, and impacts.

Illinois Association for Floodplain and Stormwater Management (IAFSM)

The Illinois Association for Floodplain and Stormwater Management (IAFSM) represents over 500 floodplain managers, engineers, local officials, insurance agents, and state and federal agency staff. IAFSM was founded in 1986 and has grown to be one of the largest state floodplain associations in the nation. IAFSM objectives are to:

- Promote the common interest in floodplain and stormwater management
- Enhance cooperation among various local, state, and federal agencies

- Encourage effective and innovative approaches to managing the State's floodplain and stormwater management systems

Throughout the year, IAFSM conducts several training events and publishes a newsletter to inform members on important topics such as current legislation, local activities, hazard mitigation, new state and federal programs, publications, conferences, workshops, and job openings. Each spring, the IAFSM holds an annual conference. Its location varies throughout the State. In recent years, attendance at the annual conference has been 600-700 local floodplain managers. The IAFSM has become one of the best sources to promote flood awareness and provide outreach on flood programs.

HAZUS-MH Reports for Individual Counties (IEMA)
Hazard Mitigation Grant Program funds were utilized to conduct a statewide Level 1.5 HAZUS analysis to develop a risk assessment focused on defining the potential flood exposure throughout the 102 counties in Illinois. This project identified critical and essential facilities located within the 100-year floodplain. A flood vulnerability report for each of the 102 Illinois counties was generated by Southern Illinois University, Carbondale. The report reviewed previous occurrences of flooding in the county, identified the FEMA mapped floodplains, summarized the flood-exposure modeling results and identified any critical facilities susceptible to flooding. Copies of these county reports were distributed to the individual counties to assist with their future mitigation planning efforts.

IDOC Earthquake Response and Preparedness Plan (IDOC)
This plan identifies specific correctional institutions within the State of Illinois that are located near major known fault zones. IDOC has created institution specific plans that assess proper preparation to establish communication links, to provide rapid response, to provide quick assessment of damages, and to provide security to all affected institutions following a significant earthquake. These plans have been developed to limit the impact of an earthquake on those housed and work in these facilities. The 2017 Interim Report released by the National Institute of Building Sciences (NIBS) demonstrates that investing in hazard mitigation measures to exceed select requirements of the 2015 International Codes (I-Codes), the model building codes developed by the International Code Council (ICC), can save the nation $4 for every $1 spent. (Source: https://content.govdelivery.com/accounts/USDHSFEMA/bulletins/1dc5fb1

State Threat Hazard Identification Risk Assessment (IEMA)
The State of Illinois completed a FEMA approved Statewide Threat Hazard Identification Risk Assessment (THIRA) that was consistent with the CPG-201 and expanded on nationally accepted emergency management standards, which have long required using risk assessments, such as HIRAs, as the basis for planning across the mission areas. IEMA's Strategic Planning Cell reviewed the risk of hazards within the State of Illinois. During the THIRA process, numerous plans and studies were reviewed to ensure consistency and accuracy of the information provided in the document. Some of the plans reviewed included the State Natural Hazard Mitigation Plan, State Natural Hazard Risk Assessment, State Technological Hazards Mitigation Plan, State Human Caused Hazards Mitigation Plan, State Emergency Operation Plan, State Recovery Plan, State Mass Fatalities Plan, National Climate Data Center documents, past incident response situation reports and public assistance documents. The continuous cycle of assessing the State's capabilities, plans, and programs while incorporating these results into future THIRAs will allow the State to mitigate the impact to potential identified risks, while providing the means to educate and update individuals, families, businesses, organizations, community leaders, and senior officials on the risks facing a community

in an effort to provide an avenue for building required capabilities and creating a secure and resilient community.

Fire Stopper (ARC)
One of the major functions carried out by the American Red Cross is assisting disaster victims recover after home fires. In an effort to mitigate some of these devastating fires, the ARC has developed the "Team Fire Stopper" program. The program offers simple steps that individuals can take to protect their home and family from fire. This program focuses on previous occurrences within communities that are disproportionately affected by fires, and provides education and hands-on community fire prevention activities to make the communities more resilient by conducting in-home visits and safety fairs. The ARC reaches thousands of households annually and conduct hundreds of household visits to mitigate these house fires.

Keep Cool/Keep Warm Illinois (IDPH and DCEO)
The Illinois Department of Public Health has launched outreach campaigns intended to help residents safely weather severe temperatures. Through the Keep Cool Illinois and Keep Warm Illinois websites and hotlines, IDPH and DCEO have made available tips for keeping temperatures comfortable, guidelines for safe and responsible outdoor activities during extreme temperature events, and resources for assisting individuals with utility bills and finding emergency cooling or heating centers. IDPH continues to supply and update this material on an annual basis. The Department of Commerce and Economic Opportunity, through Low Income Home Energy Assistance Program (LIHEAP), continues to provide financial support to individuals requiring assistance with heating and cooling bills.

Southern Illinois University (SIU) PDM Planning Grant
A Pre-Disaster Mitigation Grant totaling nearly $600,000 was awarded to Southern Illinois University in the development of a Multi-Jurisdictional Hazard Mitigation Plan for 21 counties between 2013 and 2017. These plans use a variety of geographic information system (GIS) modeling programs to accurately portray the risks to the geographic area. The data collected during the planning process has given each participating jurisdiction a wealth of information that will continue to help them prepare for, respond to, and mitigate the effects of natural disasters. The plans developed from this PDM Grant continue to serve these southern counties and have led to a number of mitigation projects and applications, with one of the most significant being the approval of an application for the acquisition of 167 properties and 4 structure elevations in Alexander County.

Public Outreach Campaign (IEMA)
The public awareness campaigns have expanded over the past three years with the addition of monthly campaigns dealing with hazard specific mitigation and preparedness for the general public. These month long campaigns include: Hazard Mitigation, Earthquake Preparedness, Severe Weather Preparedness, Heat Safety and Winter Storm Preparedness. These monthly campaigns are run during the appropriate time periods associated with the specific hazard information on the "Ready Illinois" webpage. http://www.illinois.gov/ready/Preparedness/Pages/default.aspx

City of Rockford Buy-Out
The City of Rockford was experiencing frequent urban residential flooding as a result of decades of shifting land use and development. Ultimately it became clear that a comprehensive flood mitigation plan was needed, which included the acquisition and demolition of the most flood prone structures and major upgrades to drainage systems in the affected areas. The City of Rockford applied for and received $2,603,088 in Hazard Mitigation Grant Program federal funds that were utilized to purchase 38 homes in the Keith Creek

floodplain. The project was successfully closed in January 2016. The benefit/cost for this project was 1.287, using the same methodology as the approved FEMA 1681 project. The 38 homes were demolished with deed restrictions applied to the land.

Lake County Stormwater Management Program

The first County Comprehensive Stormwater Management Plan was adopted in 1990. The Lake County Stormwater Management Commission (SMC) also developed a number of watershed-based plans for four major watersheds in the county. These detailed plans have incorporated a variety zoning ordinances, building codes and watershed regulations to provide successful mitigation efforts. The Lake County Watershed regulations established minimum countywide standards for stormwater management, including floodplains, detention, soil erosion/sediment control, water quality treatment, and wetlands. A number of municipalities in Lake County have incorporated floodplain development restrictions into their zoning ordinances.

City of Streator Stream Bank Stabilization and Property Acquisition

The City of Streator was provided Hazard Mitigation Grant Program federal funds in the amount of $565,600 to be used toward steam bank stabilization work and property acquisition as a result of a 2007 landside. A portion of the Vermilion River bank collapsed causing a massive landslide. The landslide affected two buildings in Streator and caused fear of future landslides. The stabilization work entailed removal of material from the Vermilion River, re-grading of the current river bank and installation of Gabion baskets to provide protection from future erosion. One structure was successfully purchased. Unfortunately, due to environmental concerns, the second structure could not be purchased until clean-up was completed. The project was closed in May 2017.

Creal Springs School District Code Plus Construction

The Marion Community Unit School District No. 2 completed an enhancement of its Pre-Kindergarten through 8th Grade school near the community of Creal Springs utilizing $433,989 in federal funds under the Hazard Mitigation Grant Program. The project included seismic enhancements to the structural, architectural, mechanical, electrical, fire protection, hydronic, and plumbing component of the school as well as the construction of a safe room and addition of an emergency generator. Throughout the school, seismic steel frame columns and beams were installed. The acoustic panel ceilings included addition of galvanized steel support channels and hangers sized and suited for seismic sizing. The electrical system was upgraded to include seismic connections for lights and conduits that included inertia bases, conduit transverse bracing, conduit longitudinal bracing, and seismic fixture clips. The fire protection and hydronic system upgrades included seismic support and flexible connections for piping as well as flexible connections at the fire protection entrance. Additionally, the hydronic system was upgraded to include seismic support and flexible connections for water piping, a flexible connection at the water entrance, and seismic bracing form plumbing equipment.

Rend Lake Water Bypass

Rend Lake Conservancy District received a grant of $1,864,680 toward a total cost of $2,362,005 to build a water bypass. The current water pipe serves the City of Mt. Vernon and several smaller jurisdictions, a total of more than 50,000 people. When Rend Lake was created an error in design allowed the lake to expand past the originally designed location. This resulted in the water pipe being submerged under the lake. The lake is located in between the New Madrid and Wabash Valley fault lines and is very vulnerable to an earthquake. If the line was to be damaged, the quickest solution would be to build a bypass; trying to access and repair the pipe at the bottom of the lake would take even longer. Until the post-earthquake bypass would

be built, the 50,000 customers including several major employers and hospitals would be without water. This project built a bypass to the existing water pipe to provide redundancy in case of an earthquake or another type of break. If the bypass would suffer from a break, because it is not under a lake, the repairs could be made within a day.

Carol Stream Property Acquisitions
The City of Carol Stream applied to IEMA for HMGP mitigation funds to acquire four properties that were classified as repetitive loss properties on the Klein Creek. Four homes were purchased with federal funds in the amount of $758,000. The homes were demolished with deed restrictions applied to the land and the project was closed in May 2016.

Machesney Park Acquisitions
Machesney Park was awarded $2.5 million ~~dollars~~ from the HMGP program and acquired 26 flood-prone structures on the Rock River, and converted the property into open space. Twenty-six homes were demolished with deed restrictions applied to the land. The Village had over 90 homeowners that requested buyouts immediately following a flood event. The project was successfully closed in May 2016.

Keithsburg Acquisitions
Keithsburg was one of the first major buyouts in Illinois after the 1993 flood. Federal funds purchased 111 properties for just over $2 million. In the early 2000s, the City approached IEMA about re-using the acquired properties to build a new manufacturing plant. They were turned down. In 2008 at Keithsburg, the Mississippi River exceeded its previous record in 1993 and there were 111 fewer properties to be impacted. The City also received a grant from FEMA to relocate Central School. If the school was still located in its old location, it would have received several million dollars in damages and several hundred students would have been displaced. Additionally, the City rebuilt its sewer plant five years ago. During the 2013 flood to avoid future damages, City Zoning insisted on elevating the back-up generator. Without this proactive measure, the generator would have been lost and the damages would have been in the millions.

The Illinois Department of Commerce and Economic Opportunity (DCEO) provided funds for buyouts after the 2008 flood, with residents receiving payouts in 2012 through 2014. Losses are estimated by calculating percent damage to each structure based on the depth of flooding. That damage is then estimated in dollars. Two different methods were used to estimate the value of the structures. One option used is the RSMeans construction cost value per square foot; the other method uses pre-flood appraised values of the structures. The return on mitigation investment is calculated as the Total Losses Avoided/Project Investment * 100 = % Return on Investment (ROI). The result is shown in the table below in 2018 U.S. dollars.

City of Keithsburg, IL

Cost Value	Total Losses Avoided	Project Investment	ROI
RSMeans	$7,575,000	$4,640,000	163%
Appraised	$1,773,000	$4,640,000	38%

(Source: City of Keithsburg, Illinois: A Case Study - Prepared by the Illinois State Water Survey May 2018 - Summary of the study included in Appendix A)

Jersey County Army Corps Sites

The U.S. Army Corps of Engineers controls land on the river side of levees and leases sites to private individuals to build structures on them. These structures are extremely vulnerable because of their location and there has always been an issue in enforcing floodplain regulations on the property. The Army Corps said that home owners cannot purchase flood insurance, but that it was FEMA's job to enforce the rule. FEMA disagreed saying the Army Corps had to enforce it. Local jurisdictions did not think it was their responsibility to enforce the National Flood Insurance Program (NFIP) rules because it was Army Corps land. As a result, there were more than 230 structures on Army Corps land that were listed on the State's rep loss list. This was almost 90% of the rep loss properties in the state and the average structure had made six NFIP claims. About two thirds of these properties were located in Jersey County.

The State worked toward a solution for more than 15 years. Attempts to purchase the properties were ruled ineligible because they were on federally-owned land. Finally, through the concerted efforts of the State Floodplain Manager the local floodplain manager, the structures were declared substantially damaged and were either torn down or elevated. At this point virtually all of these repetitive loss properties have been mitigated

Ottawa Acquisitions

The City of Ottawa has a strong program for buying structures that have been flood damaged which has significantly reduced the community's exposure to this natural hazard. A significant number of structures were purchased after the 1996 flood, with the first purchase recorded in 1997. Additional structure buyouts occurred between 1998 and 2001, and again in 2012 and 2013. Funding for these buyouts was provided through grant programs from multiple sources, including the Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR), the Illinois Emergency Management Agency (IEMA managed funds from FEMA) and, from the City of Ottawa itself. Cumulative losses avoided between 1998 and 2018 are estimated to be over $9.5 million, whereas the acquisition cost was just over $4.8 million. Some of these structures would have flooded repeatedly. Losses are estimated by calculating percent damage to each structure based on the depth of flooding. That damage is then estimated in dollars. Two different methods were used to estimate the value of the structures. One option used is the RSMeans construction cost value per square foot; the other method uses pre-flood appraised values of the structures.

The return on mitigation investment can be calculated as the Total Losses Avoided/Project Investment * 100 = % Return on Investment. The total losses avoided between 1998 and 2018 based solely on physical damages are $9,679,000 divided by $4,938,000 = Return on Investment (ROI) of 196%. The result is shown in the table below in 2018 U.S. Dollars.

City of Ottawa, IL

Cost Value	Total Losses Avoided	Project Investment	ROI
RSMeans	$20,898,000	$4,938,000	423%
Appraised	$9,679,000	$4,938,000	196%

(Source: City of Ottawa, Illinois: A Case Study - Prepared by the Illinois State Water Survey May 2018 - Summary of the study included in Appendix A)

The Metropolitan Water Reclamation District of Greater Chicago (MWRD)
MWRD has provided several flood mitigation success stories. The following is a brief description of all the projects:

- **Tunnel and Reservoir Plan:** The Tunnel and Reservoir Plan (TARP), also known as "Deep Tunnel," is a system of deep, large diameter tunnels and vast reservoirs designed to reduce flooding, improve water quality in Chicago area waterways and protect Lake Michigan from pollution caused by combined sewer overflows (CSO). TARP captures and stores combined stormwater and sewage that would otherwise overflow from sewers into waterways in rainy weather. This stored water is pumped from TARP to water reclamation plants (WRPs) after the storm to be cleaned before being released to waterways. The four TARP tunnel systems are designed to flow to three huge reservoirs, and the system will have a capacity of 17.5 billion gallons when completed.

- **Thornton Composite Reservoir:** The Thornton Reservoir was constructed in two stages. The first stage, a temporary flood control reservoir called the Thornton Transitional Reservoir, was completed in March 2003 in the West Lobe of the Thornton Quarry. This reservoir provides overbank flood relief for nine communities, and has captured 37 billion gallons of flood water during 58 fill events. The second stage is a permanent combined NRCS/CUP reservoir, called the Thornton Composite Reservoir, constructed in the North Lobe of the Thornton Quarry. The Thornton Composite Reservoir provides 7.9 billion gallons of storage. In accordance with an agreement executed in 1998, a local mining company completed the Thornton Composite Reservoir excavation in 2013. Construction continued and the composite reservoir became operational at the end of 2015. The transitional reservoir in the West Lobe will continue to be used to hold Thorn Creek water during storms until the end of 2020, when the West Lobe will be returned to an active quarry. At that time, the Thorn Creek flood water will be diverted to the composite reservoir. The Thornton Composite Reservoir was estimated to provide $40 million per year in benefits to 556,000 people in 14 communities. Since it became operational, the Thornton Composite Reservoir has captured more than 17 billion gallons of combined sewage. Construction Cost: $418,000,000.

- **McCook Reservoir:** The MWRD owns the land for the McCook Reservoir, which is being built within the Lawndale Avenue Solids Management Area (LASMA). An agreement was signed with the U.S. Army Corps Engineers (USACE) in 1999. The USACE is responsible for designing and constructing the reservoir features, and the MWRD is responsible for providing the massive hole for the reservoir. The reservoir is planned to be completed in two stages. The first stage provides 3.5 billion gallons of storage and was recently placed in operation. The second stage has been expanded to 6.5 billion gallons and replaces the previously planned third stage. The McCook Reservoir will provide $143 million per year in benefits to 3.1 million people in 37 communities. In October 2003, the MWRD signed an agreement with a local mining company to mine out the limestone to the limits of the McCook Reservoir. The MWRD completed several contracts to connect the quarry to the reservoir site and procure and construct required mining equipment to crush and convey the rock to the quarry for processing. Overburden removal was completed in 2015. Full production mining at the site began in March 2008 and will take approximately twenty years. Mining of Stage 1 was completed in 2016, and Stage 2 is approximately 20% complete. Stage 1 of McCook Reservoir became operational at the end of 2017. Stage 2 is planned to become operational in 2029. Construction Cost: $1,030,000,000.

- **Stormwater Management Phase 1 Projects:** Capital improvement projects that are identified in the Detailed Watershed Plans and designed to address overbank flooding and streambank erosion issues along regional waterways.

- **Heritage Park Flood Control Facility: T**he Heritage Park Flood Control Facility, a partnership between the MWRD, the Village of Wheeling and Wheeling Park District, will provide compensatory floodplain storage for the U.S. Army Corps' Levee 37 project on the Des Plaines River that protects more than 600 homes and businesses in Mount Prospect and Prospect Heights. It also provides Wheeling with increased stormwater detention at Heritage Park. The end product is six stormwater storage areas with a total capacity of more than 49 million gallons, as well as recreational improvements to Heritage Park, including new walkways, a pavilion, a band shell, soccer fields and a baseball complex. The project started in May 2012 and was completed in May 2016. Construction Cost: $29,475,000.

- **Elmwood Park Floodwall and Pump Station**
  The Elmwood Park Floodwall and Pump Station project was a partnership with the Village of Elmwood Park that included an equalization basin, a pump station, a force main, and a floodwall. The equalization basin will take runoff from portions of northwest and southwest Elmwood Park and temporarily store it before a new pump station directs it to the Des Plaines River. The equalization basin and floodwall, averaging 3.5 feet in height, will help address flooding by preventing the Des Plaines River floodwaters from entering Elmwood Park. Funds were awarded in June 2014 and the project was completed in June 2015. Construction Cost: $9,508,000.

- **Streambank Stabilization Project for I&M Canal Tributary D**
  The Streambank Stabilization Project for the Illinois and Michigan Canal Tributary D in Willow Springs stabilized approximately 1,000 linear feet of the I&M Canal Tributary D, north of Archer Avenue and west of Poston Road. The project addressed public safety risks by protecting infrastructure and structures from possible failure due to active streambank erosion and protects more than 20 homes and businesses. A hybrid design of concrete armor units and native plantings were used to stabilize the eroded channel. Funds were awarded in October 2014 and the project was completed in October 2015. Construction Cost: $1,124,000.

- **Streambank Stabilization Project for Higgins Creek and Streambank Stabilization Project for McDonald Creek**
  The Streambank Stabilization Project for Higgins Creek and McDonald Creek addressed critical erosion to buildings, roads and utilities in Des Plaines, Mount Prospect and part of unincorporated Cook County in Elk Grove Township. The project involved the construction of three streambank stabilization projects, which are located in the Lower Des Plaines River Watershed. The work was performed on Higgins Creek in Des Plaines, Higgins Creek in incorporated Elk Grove Township and McDonald Creek in Mount Prospect. Funds were awarded in October 2014 and the project was completed in November 2015. Construction Cost: $2,445,787.

- **Flood Control Project for Upper Salt Creek**
  The Flood Control Project for Upper Salt Creek in Palatine reduces flood damage by bypassing flow from an inundated area south of Dundee Road to an outfall into Upper Salt Creek, which is located south of Cherry Brook Village. The project included approximately 1,100 linear feet of storm sewer,

an engineered berm and backflow preventers. The project alleviates public health and safety concerns by reducing overbank flooding to approximately 18 structures within Palatine. Funds were awarded in September 2015 and the project was completed in September 2016. Construction Cost: $1,349,940.

- **Flood Control/Streambank Stabilization Project on Tinley Creek in Crestwood, IL (TICR- 3, TICR-SE1)**
  The Flood Control/Streambank Stabilization Project on Tinley Creek in Crestwood increased the conveyance capacity of Tinley Creek, downstream of Central Avenue, and stabilized approximately 1,000 linear feet of Tinley Creek, downstream of the conveyance improvements. This project provides protection from the 100-year flood event for approximately 173 structures, and it protects an existing bike path, a commercial building, pedestrian bridges and potable water infrastructure from failure due to erosion of the streambank. Funds were awarded in September 2015. The project is still ongoing. Construction Cost: $7,222,220.

- **Albany Park Diversion Tunnel (MS-07)**
  The Albany Park Diversion Tunnel Project along the North Branch of the Chicago River alleviates overland flooding in the Albany Park neighborhood on the Northwest Side of Chicago. The Chicago Department of Transportation constructed a large-diameter tunnel that would divert a portion of flood flows in the North Branch of the Chicago River from an inlet structure near Foster Avenue and Springfield Avenue to an outlet on the North Shore Channel near Foster Avenue and Virginia Avenue. The project included an inlet shaft with inlet facilities, approximately 5,800 feet of 18-foot diameter rock tunnel and outlet shaft with outlet facilities. The stormwater diversion tunnel addresses public safety concerns and reduce overbank flooding affecting 336 structures in Albany Park. Funds were awarded in April 2016 and project was completed in April 2018. Construction Cost: $62,585,320.

- **Streambank Stabilization Project on Tinley Creek (TICR-5)**
  The Streambank Stabilization Project on Tinley Creek in Orland Hills protects against erosion along a segment of Tinley Creek and reduces the risk of overtopping of the Lake Lorin outlet structure. The project provides naturalized channel stabilization and flood control on Tinley Creek, from Lake Lorin to 88th. Funds were awarded in April 2016 and the project was completed in April 2017. Construction Cost: $664,000.

- **Streambank Stabilization Project for the West Fork of the North Branch of the Chicago River (WF-03)**
  The Streambank Stabilization Project for the West Fork of the North Branch of the Chicago River in Northbrook addresses public safety and protects two residential property structures and utilities in imminent danger of failure due to active streambank erosion. The project stabilized the eastern streambank along the West Fork of the North Branch of the Chicago River through construction of a 155-foot gravity retaining wall. Funds were awarded in April 2016 and the project was completed in April 2017. Construction Cost: $413,000.

- **Glenwood 3 and 6, Glenwood Relief Sewer**
  The Glenwood Flood Control Relief Sewer Project constructed a relief sewer to Thorn Creek and raise the 187th Street roadway. The project alleviated residential and roadway flooding in the area

of 187th Street and Main Street at Thorn Creek. Funds were awarded in April 2016 and the project was completed in November 2016. Construction Cost: $1,589,734.

- **Flood Control Project on the East Branch Cherry Creek in Flossmoor, IL (CHEB-G3)**
  The Flood Control Project on the East Branch Cherry Creek in Flossmoor included the construction of an overflow channel on Homewood-Flossmoor High School's property, west of Governors Highway. It also replaced two collapsed culverts and created shelf storage on Cherry Creek. The project provides flood relief for 16 residential structures. Funds were awarded in March 2017 and the project was completed in March 2018. Construction Cost: $3,304,500.

- **Centerpoint Preserve Riparian Area Restoration (ADCR-7B)**
  The Centerpoint Preserve Riparian Area Restoration Project stabilized Addison Creek between Wolf Road and Palmer Avenue in Northlake. The project alleviates public safety risks by protecting infrastructure from the danger of failure due to active streambank erosion. Work also included habitat restoration. Funds were awarded in May 2017 and the project was completed in June 2018. Construction Cost: $3,813,871.

- **Glenview 1**
  The East of Harms Storm Relief Project benefits an estimated 1,100 single-family homes, indirectly, and 650 homes, directly, east of Harms Road in Glenview that have been stricken by repeated flooding due to the low-lying location in relation to the main stem (middle fork) of the North Branch of the Chicago River, just west of the Cook County Forest Preserve. To prevent the North Branch from backing into neighborhood storm sewers, the project included the installation of two backflow preventers on storm sewer pipes, which lead to the river; two pumping stations with backup generators and new storm sewer piping. One pump station was provided at the Glenview Road and Harms Road area to support the local sewer system, and the other pump station was installed at Cunliff Park. Additionally, new 84-inch storm sewers were constructed under Harms Road to provide for storm water conveyance and detention. The pump station construction also allowed the Glenview Park District to undertake improvements at Cunliff Park, including fieldhouse renovation, new bathrooms and a new playground. Funds were awarded in August 2014 and the project was completed in August 2015. Construction Cost: $10,981,850.

- **Westchester 1**
  The Mayfair Reservoir Expansion Project in Westchester provides direct flood reduction benefits to an estimated 60 residential structures and reduces storm-related impacts for approximately 120 homeowners. Initially placed into service in 1977, the Mayfair Reservoir was designed to accommodate a 100-year storm, but due to the unexpected frequency of these devastating storms, the MWRD chose to designate its property for the expansion and provide additional sewer improvements. Working with the Village of Westchester, MWRD is minimizing the impact of future storms and improving the quality of life for homeowners. Funds were awarded in September 2014 and the project was completed in December 2015. Construction Cost: $2,221,436.

- **Des Plaines 12**
  The Des Plaines Storm Sewer Relief Project along Fargo Avenue, Jarvis Avenue and Des Plaines River Road consists of new 36-inch to 60-inch storm sewers that was connected to an existing outfall on the Des Plaines River. The project provides direct flood reduction benefits to an estimated 56

residential structures in the project area. Funds were awarded in November 2014 and the project was completed in November 2015. Construction Cost: $2,000,000.

- **Winnetka 4**
  The Winnetka Storm Sewers and Berms Project consisted of capacity improvements to storm sewers contributing to an existing detention pond with excess capacity for 100-year protection. The project included collecting runoff from low areas that are subject to frequent flooding. The project provides direct flood reduction benefits to an estimated 27 residential structures in the project area. Funds were awarded in November 2014 and the project was completed in November 2015. Construction Cost: $6,176,615.

- **Hoffman Estates 1**
  The Jones Road/Highland Boulevard Storm Sewer Improvements Project in Hoffman Estates included a new 48-inch storm sewer, asphalt pavement patching and resurfacing, new curb and gutter, sidewalk and driveway removal and replacement, utility structure adjustments, water main adjustment, restoration and related improvements. The project length is 1,830 feet (0.37 miles) commencing at the intersection of Jones Road and Highland Boulevard and ending at the intersection of Heather Lane and Hillcrest Boulevard. The new storm sewers provide direct flood reduction benefits to an estimated seven residential structures and reduce storm related access impacts for approximately 50 home owners in the project area. Funds were awarded in March 2015 and the project was completed in May 2015. Construction Cost: $1,088,016.

- **Lansing 1**
  The Stony Island Ditch and Lansing Manor Detention Basin and Pumping Station Modifications Project involved conveyance improvements along the Stony Island Avenue Ditch along with pump station and basin improvements. The project addressed local flooding caused by the Stony Island ditch exceeding its banks in the vicinity of 181st Street and Stony Island Avenue, where flooding impacted area roadways and the Lansing Manor Subdivision. The Village of Lansing's design provides flood reduction benefits to an estimated 67 residential structures. Funds were awarded in February 2015 and the project was completed in May 2016. Construction Cost: $717,022.

- **Northbrook 2 and 5**
  The Northbrook Storm Sewer Improvements created an overflow sewer, a new relief sewer, additional inlets along Shermer Road and Cherry Lane, and new outlets to the West Fork of the North Branch of the Chicago River, reducing flooding impacts in problem drainage areas. The Shermer Road overflow sewer constructed approximately 1,800 linear feet of 72-inch storm relief sewer that extends from the intersection of Shermer Road and Woodlawn Road and outfall to the West Fork. The project directly benefits 22 properties and 17 structures up to the 50-year frequency storm event and indirectly benefits other properties and structures, as it is interconnected. The Cherry Lane Underpass construction of approximately 700 linear feet of 36-inch and 100 linear feet of 24-inch storm relief sewer that outfall to the West Fork. This project reduces flooding impacts at the Cherry Lane Underpass and for 30 properties and one structure up to the 10-year frequency storm event. Funds were awarded in March 2015 and the project was completed in May 2016. Construction Cost: $2,100,000.

- **CCDTH 2**
  The Roberts Road Trunk Sewer and Drainage Improvements Project extends from 79th to 86th streets in the Villages of Justice and Bridgeview. The Cook County Department of Transportation and Highways installed approximately 1900 feet of new 36" to 60" new storm sewer in Roberts Road to provide in line detention and future corridor improvements. This project provides direct flood reduction benefits to an estimated 30 commercial and residential structures and reduces storm related access impacts along the roadway. Funds were awarded in May 2015 and the project was completed in March 2016. Construction Cost: $2,385,294.

- **Franklin Park 5**
  The Silver Creek Channel Improvements Project alleviates the flooding of approximately 76 structures in Franklin Park, where numerous structures along the creek have flooded during past extreme storms. Channel improvements on Silver Creek occurred from Riverside Drive to Scott Street and included the daylighting of several hundred feed of encapsulated stream channel, four new culverts, water main relocation, sanitary sewer relocation and storm sewer relocation. The village was responsible for the design, construction, operations and maintenance. Funds were awarded in June 2015 and the project was completed in December 2016. Construction Cost: $4,175,771.

- **Willow Springs 1**
  The Willow Springs Stormwater Improvements Project provides a new storm sewer and ditch and outfall improvements to alleviate flooding in the Ravine Avenue Watershed. These improvements provide direct flood reduction benefits to 20 residential structures in the project area. Funds were awarded in August 2015 and the project was completed in December 2015. Construction Cost: $146,455.

- **Niles 1**
  The Cleveland Street Relief Sewer Construction Project in Niles provides capacity to convey surface water away from these areas into the North Branch of the Chicago River in order to minimize surface water flood damages and reduce the amount of surface water discharging to the existing combined sewer system in this area. The project consists of approximately 10,600 feet of new storm sewer to provide relief to roughly 140 residential structures from surface water flooding for the area generally bounded by Main Street to the north, Harlem Avenue to the east, Monroe Street to the south, and Oketo Avenue to the west. The Village of Niles was responsible for the design, construction, operation and maintenance. Funds were awarded in June 2016 and the project was completed in March 2017. Construction Cost: $8,676,309.

- **Brookfield 1**
  The Prairie/Washington Pumping Station Project in Brookfield installed a new pumping station and back-up generator near the Washington Avenue/Forest Avenue intersection, a box culvert under Forest Avenue, a new detention pond west of Forest Avenue and other miscellaneous storm sewer improvements for the public benefit of reducing flooding in the general area. The project addressed roadway and residential flooding that occurred when storm sewers backed up due to Salt Creek water levels. The village was responsible for the design, construction, operation and maintenance. Funds were awarded in June 2016 and the project was completed in December 2016. Construction Cost: $1,853,711.

- **Elk Grove Village 1**
  Construction on the Busse Woods Reservoir South Dam Modification Project in Elk Grove Village, brought Cook and DuPage counties together with the MWRD to bring flood relief to over 1-million people living and working along the Salt Creek watershed. The modification consisted of replacing a fixed concrete barrier with a pair of hinged gates. The gates are used to regulate water levels in the reservoir before and during storm events that affect Salt Creek levels, minimizing the impacts of flooding on nearby roadways and properties. Flooding from Salt Creek has cost the region millions of dollars in property damage, and disruptions from flooding caused closures of critical intersections leaving people unable to access their homes, schools and places of work. Funds were awarded in July 2015 and the project was completed in February 2016. Construction Cost: $2,736,750.

- **IDOT 11**
  The MWRD/IDOT 11 Project provides drainage improvements and storm sewer repair along Illinois Route 62 from west of Arbor Drive to east of magnolia Drive. The project also provides a new 2 acre-feet detention in the infield area of Illinois Route 53 northbound ramp to Illinois 62. The overall project reduces traffic impacts related to flooding at this location. Funds were awarded in June 2016 and the project was completed in November 2016. Construction Cost: $610,386.

- **Lemont 1**
  The Illinois and Michigan Canal Culvert Project in Lemont replaced existing twin culverts between the canal and the Chicago Sanitary and Ship Canal for the public benefit of reducing flooding in the general area. The construction and culvert improvements addressed flooding during heavy rains in industrial areas due to the previous culverts being undersized. The Village of Lemont was responsible for the design, construction, operation and maintenance. Funds were awarded in August 2016 and project completed in February 2017. Construction Cost: $394,889.

- **Glencoe 4 & 6**
  The Glencoe Stormwater Projects includes upgrades at Terrace Court and Skokie Ridge drainage basins that increased the capacity of its storm sewers at critical locations to reduce the frequency of flooding for homes and roadways during moderate and heavy rainfall. The storm sewer upgrade at Terrace Court included 2,200 feet of new storm sewer pipe to address insufficient storm sewer capacity and inadequate overland flow routes and significantly reduced private property structural flooding and blocked street access that impacted 30 homes. The storm sewer upgrades at Skokie Ridge included 3,500 feet of new storm sewer pipe which addressed insufficient storm sewer capacity and the challenges presented by the neighborhood's steep topography. Funds were awarded in April 2016 and the project was completed in February 2017. Construction Cost: $3,041,317.

- **Flood Control Project in the Washington St. Area of Blue Island, IL (Blue Island 1)**
  Installed six rain gardens and two permeable pavement parking lots in the Washington St. area of Blue Island to resolve frequent flooding in low lying area. Funds were awarded in May 2015 and the project was completed in December 2015. Construction Cost: $697,000.

- **Glenview Flood Prone Acquisition**
  The Glenview Flood Prone Acquisition Project involved the acquisition of flood prone property along the West Fork of the North Branch of the Chicago River in Glenview. The Village of Glenview

purchased 17 flood prone homes along the West Fork to reduce the flood hazard risk in the community. This project allowed homeowners from Glenview to voluntarily participate in the buyout of their flood-prone residences through contributions from the MWRD and FEMA. The project was completed in January 2017. Construction Cost: $11,735,000.

- **Des Plaines Flood Prone Acquisition**
  The Des Plaines Flood Prone Acquisition Project involves the acquisition of flood prone property along the Des Plaines River in Des Plaines. The City of Des Plaines is purchasing 13 flood prone homes along the Des Plaines River that will reduce the flood hazard risk in the community. This project allows homeowners from Des Plaines to voluntarily participate in the buyout of their flood-prone residences through contributions from the MWRD and FEMA. The homes in the Big Bend neighborhood of Des Plaines, situated just west of the Des Plaines River, flooded several times since the 1980s, and floods in 2008 and 2013 caused first floor damage and completely destroyed basements and all contents. Executed IGA in February 2016 and the project is in progress. Estimated Construction Cost: $4,000,000.

- **Riverside Lawn Flood Prone Acquisition**
  The Riverside Lawn Flood Prone Acquisition Project involves the acquisition of 39 flood prone properties along the Des Plaines River in unincorporated Cook County in Lyons Township. The Riverside Lawn community is a FEMA designated flood hazard area consisting of approximately 45 homes that have experienced significant flooding in recent years. Riverside Lawn, part of unincorporated Cook County, resembles a peninsula, surrounded by the Des Plaines River to the west, north and east and 39th Street to the south. A rain event in 2013 was so devastating that residents had to be evacuated by boat. To combat this flooding, the MWRD, along with Cook County and Riverside Township, examined several alternative solutions, including a voluntary home acquisition program. This project will allow homeowners from Riverside Lawn to voluntarily participate in the buyout of their flood-prone residences through contributions from the MWRD and HUD. Executed IGA in July 2016 and the status is in progress. Estimated Construction Cost: $12,000,000.

- **Des Plaines Flood Prone Acquisition**
  The Des Plaines Flood Prone Acquisition Project involves the acquisition of flood prone property along the Des Plaines River in Des Plaines. MWRD is providing funding assistance to the City towards purchasing up to 47 flood prone homes along the Des Plaines River that will reduce the flood hazard risk in the community. This project allows homeowners from Des Plaines to voluntarily participate in the buyout of their flood-prone residences through contributions from the MWRD and FEMA. The homes in the Big Bend neighborhood of Des Plaines, situated just west of the Des Plaines River, flooded several times since the 1980s, and floods in 2008 and 2013 caused first floor damage and completely destroyed basements and all contents. Executed IGA in February 2017 and the status is in progress. Estimated Construction Cost: $15,730,281.

- **Northlake Flood Prone Acquisition**
  The Northlake Flood Prone Acquisition Project involves the acquisition of flood prone property along Addison Creek in Northlake. MWRD is providing funding assistance to the village towards 7 flood prone homes along Addison Creek to reduce the flood hazard risk in the community. This project allows homeowners from Northlake to voluntarily participate in the buyout of their flood-prone

residences through contributions from MWRD. Executed IGA in November 2016 and the Status is in progress. Estimated Construction Cost: $1,184,018.

- **Blue Island**
  As part of the Blue Island Green Infrastructure Project, the MWRD installed six rain gardens, two permeable parking lots and bioswales in flood prone areas bound by Western Avenue, 119th Street, Vincennes Avenue and 121st Street. The project captures 150,809 gallons of stormwater per rain event and assists in mitigating flooding damages. Funds were awarded in July 2015 and the project was completed in October 2015. Construction Cost: $697,030.

- **Leland Elementary School, Morrill Math and Science Academy, Schmid Elementary School and Grissom Elementary School**
  In 2014, the MWRD participated in the Space to Grow program to install green infrastructure technologies at playgrounds at four Chicago Public Schools, including Leland Elementary School in the Austin neighborhood on the Far West Side, Morrill Math and Science Academy in the Chicago Lawn neighborhood on the Southwest Side, Schmid Elementary School in the Pullman neighborhood on the Far South Side, and Grissom Elementary School in the Hegewisch neighborhood on the Far Southeast Side. The new infrastructure will reduce flooding and reduce flows to the combined sewer system. These four schools capture 731,004 gallons of stormwater per rain event. Funds were awarded in July 2014 and the project was completed in 2014. Construction Cost: $6,120,299.

- **Orozco Community Academy and Willa Cather Elementary School**
  In 2015, the MWRD participated in the Space to Grow program to install green infrastructure technologies at playgrounds at two Chicago Public Schools, including Orozco Community Academy in the Heart of Chicago neighborhood on the Southwest Side, and Willa Cather Elementary School in the East Garfield Park on the West Side. The new infrastructure will reduce flooding and reduce flows to the combined sewer system. These two schools capture 364,504 gallons of stormwater per rain event. Funds were awarded in April 2015 and the project was completed in October 2015. Construction Cost: $3,000,000.

- **Gunsaulus Scholastic Academy, Corkery Elementary School and Wadsworth Elementary School**
  The MWRD has committed to continue to participate in the Space to Grow program transforming 30 more schools using green infrastructure technologies. In 2016 the MWRD transformed three more playgrounds at Chicago Public Schools, including Wadsworth Elementary School in the Woodlawn neighborhood on the South Side, Gunsaulus Scholastic Academy in the Brighton Park neighborhood on the Southwest Side, Corkery Elementary School in the Little Village neighborhood on the Southwest Side. The new infrastructure will reduce flooding and reduce flows to the combined sewer system. These three schools capture 388,648 gallons of stormwater per rain event.

- **Space to Grow**
  A joint venture operated through the financial support of the MWRD, Space to Grow is managed by the Healthy Schools Campaign and Openlands organizations. Space to Grow transforms Chicago school yards into community spaces for physical activity, outdoor learning, environmental literacy and engagement with art, while addressing neighborhood flooding issues. In addition to providing community members in low-income neighborhoods with safe outdoor spaces to play and stay active,

Space to Grow schoolyards help Chicago Public Schools meet daily recess and physical education requirements for elementary schools. The MWRD, the Chicago Department of Water Management, and the Chicago Public Schools are partnering to design and install the new playgrounds utilizing green infrastructure. The projects will reduce flooding, reduce the load on the combined sewer system, and educate students and neighbors about green infrastructure techniques and purpose. No schools were built in 2017, but six more will be constructed in 2018. Funds were awarded in April 2016 and the project was completed in October 2016. Estimated Construction Cost $4,500,000.

- **Evanston Civic Center Parking Lot**
  The MWRD partnered with the city of Evanston to rehabilitate the Morton Civic Center parking lot. Evanston's first city-owned sustainable public parking lot uses various permeable pavements, rain gardens and native plantings to substantially reduce stormwater runoff. The civic center parking lot features three different porous pavement materials that will be evaluated to determine for stormwater infiltration and durability, and the impact of snow and ice removal. The permeable pavement will improve water quality, ground water recharge and delayed stormwater discharge. The project provides 167,278 gallons of retention. Funds were awarded in June 2015 and project was completed in October 2015. Construction Cost: $1,519,000.

- **Wescott Park Stormwater Reuse**
  The Wescott Park Stormwater Reuse Project in Northbrook called for the construction of a 7.5-million-gallon stormwater storage vault under Wescott Park. The MWRD funded green infrastructure improvements that included an electronic control system and irrigation system to allow the reuse of the stormwater and keep it out of the North Branch of the Chicago River. The project provides 162,926 gallons of retention. Funds were awarded in March 2016, and the project was completed in November 2016. Construction Cost: $10,775,000.

- **Wilmette Green Alleys**
  The Wilmette Green Alleys Project included the installation of five permeable alleys instead of conventional asphalt to reduce flooding and reduce flow to sewer system. The MWRD partnered with Wilmette to enhance urban sustainability by encouraging stormwater to infiltrate into the soil, instead of collecting on hard surfaces and draining into the sewer system. The project provides 74,667 gallons of retention. Funds were awarded in July 2015 and the project was completed in October 2015. Construction Cost: $836,561.

- **Kenilworth**
  The Kenilworth Green Infrastructure Project consisted of installing permeable pavement in streets in flood prone areas of Kenilworth that include Cumberland Avenue, Roslyn Road and Melrose Avenue. The MWRD partnered with the Village to install permeable asphalt pavement and native landscaping to help reduce flooding in the combined sewer area of Kenilworth. The Village identified 105 homes that directly benefit from this project. This number does not include the significant amount of structures downstream of the project that also receive a direct benefit as a result of reduced pressure on the system. The project provides 1,319,827 gallons of stormwater storage. Funds were awarded in May 2016 and the project was completed in August 2016. Construction Cost: $8,100,000.

- **Berwyn**
  The Berwyn Green Infrastructure Project installed green alleys and permeable pavement in local streets. MWRD partnered with Berwyn to construct 20 green alleys and install permeable pavement on Oak Park Avenue from 31st Street to 32nd Street, Stanley Avenue from Clinton Avenue to Wesley Avenue, Windsor Avenue from Harlem Avenue to Wesley Avenue, and Grove Avenue from 32nd Street to 34th Street to help alleviate localized flooding as well as reducing the flow of stormwater into the local combined sewer system. This project captures 679,122 gallons of detention per rain event. Funds were awarded in February 2017 and the project was completed in June 2017. Construction Cost: $2,555,164.

- **Niles**
  The Niles Green Infrastructure Project included bioswale and permeable pavement parking lots. The MWRD partnered with Niles to construct a bioswale and permeable pavement parking lot at Oak Park, which is a park centrally located in Niles. This project reduces localized flooding, reduces the flow of stormwater into the local combines sewer system and provides educational and volunteer opportunities for the community. This project captures 53,811 gallons per rain event. Funds were awarded in August 2016. The project was completed in November 2016. Construction Cost: $400,000.

- **Skokie**
  The Skokie Green Infrastructure Project was a partnership between the MWRD and the Village to construct a 7,800-square-foot rain garden located at Devonshire Park and detention pond improvements at the Skokie police station. This project addressed localized flooding at the intersection of Greenwood Street and Kenneth Terrace. The rain garden's location at a public park serves to further the MWRD's goal of informing the public of the value of green infrastructure. This project captures 46,424 gallons per rain event. Funds were awarded in October 2017 and the project was completed in May 2018. Construction Cost: $500,000.

- **Parjana**
  Parjana is a new technology installed at Chicago Park District softball fields in Mount Greenwood Park. MWRD is currently monitoring the park to determine if the technology is allowing to drain the fields after a rain event better than before. It promotes drainage and reduces runoff by inserting patters of long tubes into the ground. The tubes are said to open up strata layers below the ground, allowing standing water to drain quicker than normal. Funds were awarded in March 2017 and the project was completed in May 2017. Construction Cost: $80,000.

- **Egan Water Reclamation District Parking Lot**
  The MWRD replaced an old parking lot at the Egan Water Reclamation Plant in Schaumburg with a new permeable parking lot with a bioretention area. This project captures 360,855 gallons per rain event. Funds were awarded in the summer of 2017 and the project was completed in 2017. Construction Cost: $1,519,004.

Past Mitigation Success Stories

Whereas current successful mitigation projects are vital to continued reduction or elimination of risk to people and property from natural hazards and their effects, so are the sustained actions of those that have long-term impact. It is important to highlight how past mitigation success stories continue to be successful. Below is a list of past mitigation success stories that continue to provide long-term solutions to the risks to the State's hazards.

Earthquake Resistant Construction

Hazard Mitigation Grant Program (HMGP) funds under Disaster 1633 were provided to the Waterloo School District to ensure the new high school was built to be seismically resistant. The construction of the new school was completed in 2010 which included upgrades meeting FEMA 424 seismic guidelines for structural, architectural, mechanical, electrical, fire protection, hydronic and plumbing standards. The project included the installation of an emergency electric generator for lights, heating/cooling and sewage lift stations. This school is in the heart of the Waterloo community and will provide a safe shelter for a student body of over 1400 students, but it will also act as an emergency shelter for the community if needed during an earthquake or high wind event. Precast concrete panel exterior bearing walls were utilized for the exterior gymnasium-multipurpose room walls. In addition to the wind/earthquake resistant structural system design, a backup generator sized to allow for emergency lighting, food service operations and minimal space power. These mitigation actions were designed with the intent of providing life safety, structure protection, contents protection and continuity of function for the facility.

Critical Bridge Seismic Hardening

The Illinois Department of Transportation is implementing a program to enhance the seismic resistance of high-risk bridges located at key positions in the state's transportation infrastructure. Many bridges have already been retrofitted, while additional bridges are continuing to be retrofitted.

Earthquake Study

IEMA had funded a project by the Mid-America Earthquake Center to conduct a Comprehensive Seismic Loss Assessment for the state. The Assessment is complete and is providing insight into the damages the state can expect in a major earthquake event along the New Madrid or Wabash Valley faults. These insights have been incorporated into the state's efforts to plan and prepare for these disasters, and how to best direct mitigation efforts. Specific portions of this comprehensive report have been added to the 2018 plan update.

Improved Coordination between State and Federal Agencies

The planning process for the initial state mitigation plan improved the relations between the different state agencies and between the state and federal agencies. By working together on the plan, connections were formed that were useful in the past. For example, IEMA worked with the NWS on the lightning awareness issues and when we received a disaster declaration for a winter storm, discussions were held with IDOT on the possibility of living snow fences. The USACE also played an instrumental part in the coordination of the 2008 flooding events. They remain an active member of the Flood Risk Management Team. It should also be mentioned that since the 2007 plan, the State of Illinois uses the National Incident Management System (NIMS) to establish a framework for coordination. With NIMS and the National Response Plan, we address the complete spectrum of incident management and planning among federal, state, local non-governmental and private sector organizations. These relationships continue to grow through planning, response and recovery. The true effectiveness of these relationships during the planning process is continually seen during the response and recovery efforts following a disaster.

Mitigation Projects Currently Under Review or in Progress

To be successful, mitigation must be a continual process that is continually striving to lessen the impact of natural hazards within the state. The following are projects that have been identified as viable projects and are currently in the application phase or are in the infancy of the project.

Mitigation Projects Currently under Review or in Progress 2018

County/Jurisdiction	Disaster Declaration Number	Project	Total Cost	FEMA Share	Local Share	% Complete
Chicago River City	1935	Seawall	$589,000	$441,750	$147,250	10%
Clark County	1935	Acquisitions	$874,862	$656,147	$218,716	10%
Des Plaines	1935	Acquisition	$14,647,256	$14,647,256	$899,508	75%
Des Plaines City	4116	Acquisition/Demolition	$4,266,230	$2,999,810	$1,266,420	50%
East Dundee	1991	storm water - Phase 1/Detention Basin	$547,000	$410,250	$136,750	10%
Gallatin County	1960	Acquisitions/Elevation	$1,864,528	$1,398,396	$466,457	80%
Grundy, County	4116	Acquisition/Demolition	$653,910	$490,433	$163,477	30%
Harrisburg	1991	Detention Basin	$1,212,500	$909,375	$303,125	10%
Hinsdale/Graue Mill	1935	Storm water/Detention	$3,435,300	$2,576,475	$858,825	25%
Kankakee City	1960	Acquisitions	$1,994,000	$1,495,500	$498,500	25%
Lake, County	4116	Acquisition/Demolition	$2,014,589	$1,510,942	$503,647	50%
Lisle, Village	4116	Demolition/Residential	$3,853,152	$2,889,864	$953,288	50%
Massac County	1991	Acquisitions	$275,123	$206,342	$68,781	90%
McHenry County	1991	Acquisitions	$1,291,695	$968,771	$322,924	10%
Pearl City	4116	Acquisitions	$2,191,215	$1,643,411	$547,804	50%
Peoria, County	4116	Acquisition/Demolition and Elevation	$2,012,050	$1,509,038	$503,012	50%
Peoria, County of-Edwards	4116	Acquisition/Demolition	$1,074,388	$805,791	$268,597	50%
Villa Grove	1960	Acquisitions	$468,088	$351,066	$117,022	50%

II. ILLINOIS NATURAL HAZARD MITIGATION PLAN PROCESS

The Illinois Natural Hazard Mitigation Plan (INHMP) was prepared by the Illinois Emergency Management Agency (IEMA), in coordination with other state agencies, partners and stakeholders. The State Hazard Mitigation Officer (SHMO) is responsible for leading and coordinating mitigation and long-term redevelopment efforts. The SHMO organized the Illinois Natural Hazard Mitigation Planning Committee (INHMPC), originally composed of seventeen representatives from federal, state and local governments, the private sector and a non-profit organization, to assist IEMA in preparing the plan. Members of this original committee were also members of the larger Interagency Mitigation Advisory Group (IMAG). The original INHMPC was instrumental in the development of the Illinois Natural Hazard Mitigation Plans (INHMP). Two additional agencies (U.S. Geological Survey and U.S. Army Corps of Engineers) were introduced to the planning process in an effort to provide additional guidance and input into the INHMP. Representatives from twenty state and federal agencies provide IEMA with advice and technical guidance regarding portions of the INHMP. To avoid duplication of mitigation efforts, the INHMPC was consulted in identifying assists in the identifying vulnerabilities to hazards and provides input regarding the development of goals and items to mitigate the hazards. IEMA mitigation staff had a strong framework with the approved plan so we limited the number of meetings to five. We intently worked with the representatives of the agencies by means of frequent phone calls and emails. Ideas and required updates have been noted since the original plan was completed and incorporated in the plan update.

A kick-off meeting was held on February 22, 2017, and a follow-up meeting was held on May 5, 2017, at the Illinois Emergency Management Agency to discuss the plan update process and new regulations and guidance documents in place since the last update. The meeting was attended by the supporting state and federal agencies of the INHMPC. The purpose of these meetings were to:

- Identify steps to protect property and citizens from disaster and speed up the recovery process.
- Analyze cost effective methods for damage reduction.
- Institute policies that can prevent future damages.
- Required by FEMA to access federal funds for mitigation and some public assistance.
- Make each participating agency eligible for mitigation funds by participating in the process.

All sections of the 2013 plan were discussed during these meetings. The SHMO evaluated the comments that had been made. The SHMO also brought new ideas for mitigation projects to the committee and asked them to consider how mitigation might be incorporated into their respected agencies/departments. All agency representatives were given a list of their mitigation strategies prior to the meeting and were asked to provide any updates they saw necessary. While most strategies remain unchanged, contact information was updated, as well as funding sources, timelines, and program names.

In addition to large planning meetings, IEMA mitigation staff conducted individual meetings with each state agency representative to review the plan's mitigation goals and strategies in an effort to streamline the hazard mitigation plan update process. During each meeting, IEMA staff discussed the agency's specific mitigation ideas and concepts regarding the state's mitigation goals and strategies as outlined in the Hazard Mitigation Plan. These meetings were also utilized to review and update in more detail the agency Capability Assessment forms. This approach provided an opportunity to discuss in detail mitigation with all participating agencies and ultimately provide a better finished product. Each individual meeting provided the opportunity

for each agency to speak with IEMA mitigation staff in detail and discuss potential projects, areas where their agency could assist with mitigation efforts and mitigation hindrances they have experienced. After individual meetings were completed, the mitigation strategy section was sent to all planning members with all of the changes highlighted for their review.

Following the individual meetings, updates were completed to the Mitigation Strategy Section of the plan and forwarded to all planning members for review. The planning committee convened as an entire group on January 17, 2018, to review as a whole the mitigation goals and strategies that were developed and updated during these individual meetings.

A final in-house planning meeting was conducted on August 29, 2018, to review all of the changes regarding the 2018 update. The SHMO provided the planning committee members, on an ongoing basis, copies of the updated chapters for review. This time period allowed committee members to review the chapters and document any last revisions or comments for the final plan. The majority of changes were minor. The more extensive changes are identified, as follows:

- The 2018 INHMP has incorporated an updated version of the 2013 flood vulnerability analysis of 1.5 HAZUS-MH completed by Southern Illinois University focused on defining the potential flood exposure throughout the 102 counties in Illinois, including essential state facilities. The analysis generated a flood vulnerability report for each 102 Illinois counties, with a statewide summary report highlighting the major results of the flood-exposure assessment and identifying and quantitatively ranking the 15 most flood-vulnerable communities in Illinois, a list of critical facilities within the 100-year floodplain, and a HAZUS-based flood exposure estimate for flood-prone state critical facilities. The results for both studies are similar but, the analysis in the 2015 paper is more robust.
- The National Weather Service, Illinois State Water Survey, Illinois Emergency Management Agency and the Office of the State Climatologist reviewed the hazard description and historical data portion of Chapter III in the State plan. Most of the descriptions and data for the different hazards were updated in the 2018. No major research findings were added to this area of the plan.
- Because the actions items are very important to the plan, the planning committee reviewed all of the goals, objectives and action items, as appropriate providing comments. The individual agency meetings allowed for in-depth discussion and analysis of new, revised or updated action items. This section of the plan was updated heavily to reflect the changes and cooperative efforts in the state's mitigation efforts.
- The Local Capability Assessment section in Chapter IV was updated to include the recent success with local mitigation plan coverage. The capability has grown and will continue to do so as more plans are approved. The data collected from these local mitigation plans was incorporated into the update of the INHMP.
- During the planning process it was determined that a pandemic was a viable natural hazard that should be added to the "Other Hazards" section of the INHMP. The Illinois Department of Public Health completed a detailed documentation regarding the hazard description and historical data for the portion of Chapter III. It was also determined that each hazard identified in the "Other Hazards" section should be continually reviewed in order to determine if its impact and historic occurrence increase would warrant that hazard to be identified as a primary hazard.

Since the original plan was developed, it has been posted on the IEMA website and comments were invited. For the last five months, the following message was featured on the IEMA Mitigation home page: *"The Illinois*

Emergency Management Agency is currently updating the 2018 Illinois Natural Hazard Mitigation Plan. This is the state's plan to reduce the long term risk to life and property from natural disasters. Comments and input on the plan from the general public are always welcome, especially during updates, and can be submitted to the State Hazard Mitigation Officer at sam.m.al-basha@illinois.gov". This is a public website and all levels of government and the public are able to review the plan and provide comments. The current 2013 plan will subsequently be replaced by the 2018 plan upon its official FEMA approval. Posting the State's Natural Hazard Mitigation Plan online enables viewers to have direct access and provides the greatest access for public comment and input.

In addition, the newly updated Mitigation Strategy Section was posted on the IEMA website from May 30 to June 29, 2018, for public review and with public comments invited. This public involvement and feedback is important to the state's mitigation goals, objectives, strategies and actions.

During this planning process the supporting state and federal agencies coordinated the update of the plan, recognized and incorporated other sources of expertise and resources and established a mitigation strategy to protect the citizens of Illinois including life, property, environment and economic interests. Each participating agency was able to introduce its programs, name, classify and pinpoint mitigation opportunities and subsequently comment on the changes in the plan. Supporting agencies supplied agency capability assessment forms, provided technical guidance to specific portions of the plan and supplied detailed examples of individual agency specific mitigation actions they are currently supporting and/or conducting in Illinois. (Supporting documents such as meeting agenda, minutes and sign-in sheets are included in Appendix H)

Appropriate comments were incorporated into the final version of the plan and the final version will be distributed to the participating agencies.

A. ILLINOIS NATURAL HAZARD MITIGATION PLAN COMMITTEE

American Red Cross	To provide insight into mitigation activities as they relate to response and recovery.
Federal Emergency Management Agency	To provide guidance on the planning process.
Capital Development Board	To provide information on the status of building codes in Illinois.
Central Management Services	To provide data on facilities and mitigation measures used at state facilities.
Illinois Department of Commerce and Economic Opportunity	To identify opportunities to promote economic development through mitigation initiatives. To be a liaison between local economic development agencies and the Illinois Natural Hazard Mitigation Planning Committee. To provide census data.

Illinois Department of Insurance	To provide insight into how reducing damages relates to consumers and the insurance industry.
Illinois Department of Natural Resources	To study the rivers and waterways of the State and identify solutions, both structural and nonstructural, to mitigate flooding. To ensure compliance with the NFIP regulations.
Illinois Department of Public Health	To provide information on preventing and controlling disease and injury which intersects with IEMA's mission.
Illinois Department of Transportation	To help local communities identify mitigation measures for State roads. To identify state resources and infrastructure vulnerable to hazards.
Illinois Emergency Management Agency	To coordinate mitigation planning and project implementation. To serve as a liaison between FEMA's Federal Insurance and Mitigation Administration and the Illinois Natural Hazard Mitigation Planning Committee. To educate local governments (specifically local planning departments) on new hazard mitigation planning requirements and to aid the incorporation of mitigation concerns into local comprehensive planning efforts.
Illinois Emergency Services Managers Association	To be a liaison between the Illinois Natural Hazard Mitigation Planning Committee and the local governments about hazard mitigation planning requirements. To educate local officials about the resources available for mitigation planning assistance and training.
Illinois State Board of Education	To provide information on mitigation activities in the State's public schools including disaster resistant construction and disaster drills.
Illinois State Geological Survey	To provide information on the soil and geology of Illinois and its relation to natural hazards.
Illinois State Water Survey	To provide data on the State's climate as it relates to natural hazards (State Climatologist). Information on FEMA flood hazard mapping and outreach activities (Coordinated Hazard Assessment and Mapping Program).
Illinois Department of Corrections	To identify ways to mitigation hazards that threatens correctional institutions within the State.
National Weather Service	To provide information on weather as it relates to natural disasters.
Illinois Commerce Commission	To provide insight on how to mitigate hazards that threatens public utilities and infrastructure within the State.

Illinois Department of Human Services	To provide data on state hospitals and human service facilities and mitigation measures used at these facilities.
Illinois Environmental Protection Agency	To provide information and data regarding environmental applications with mitigation measures.
U.S. Geological Survey Illinois Water Science Center	To provide hydrologic data to help with flood warning and response, and flood documentation.
US Army Corps of Engineers	To deliver support that responds to, recovers from, and mitigates disaster impacts to Illinois and the nation.

The IMAG is composed of members from agencies involved in emergency management, natural resources, environmental regulations, historic preservation, planning and zoning, community development, construction regulation, public information and insurance, federal, state and local levels of government, private non-profit organizations and academic fields who have expertise in mitigation and who can offer technical assistance. This group meets annually and has the following responsibilities:

- Serves in an advisory role, providing expertise and technical assistance, in regards to policy creation consistent with the State's mitigation goals.
- Advances a comprehensive strategy for the development, integration and implementation of the State's mitigation programs.

The Mitigation Coordination and Strategy Committee (MCSC), which is a sub-committee of IMAG, will continue to meet monthly. This group is comprised of staff from IEMA, IDNR, IDOT, IHPA, DCEO, CMS, FEMA, and ARC. The MCSC has the following responsibilities:

- Review and provide suggestions regarding possibly re-prioritizing mitigation actions/applications for implementation, including measures to be funded.
- Combine funds from various programs to implement a mitigation project and monitor the funding, using all allocations to the extent possible.
- Oversee implementation of approved projects.
- Review plans and reports to identify opportunities to integrate mitigation actions.
- Provide technical assistance to local jurisdictions.
- Prepare status reports, briefings and/or an annual report for the IEMA Director, Governor and General Assembly up on request.
- Monitor and determining, as needed, and no less than annually, if the Illinois Natural Hazard Mitigation Plan needs updating by working with and being a part of the INHMPC.

The Illinois Natural Hazard Mitigation Planning Committee (INHMPC) was instrumental in developing this plan and continues to function, as needed, and no less than annually, as follows:

- Identify the State's vulnerability to hazards.
- Develop and update the Illinois Natural Hazard Mitigation Plan required under 44 CFR Section 201.

The Plan is submitted to FEMA Region V and reviewed. FEMA uses the plan as a reference to understand the risks and potential mitigation activities in Illinois.

B. 2018 UPDATES TO THE 2013 INHMP

Each section was reviewed and the appropriate wording updates were made, *e.g.*, new page numbers, acronyms revised. Specific changes are as follows:

I-Introduction

Section F: Under Demographic Characteristics of Illinois, a population chart was added. Section G: Mitigation Success Stories in Illinois, was updated extensively to include projects that were funded since the approved 2013 INHMP, as well the projects we are looking at funding in the next 3 years. This section was divided into three categories. Current Mitigation Success Stories, which highlights a number of mitigation success stories within the past five years. Past Mitigation Success Stories, this provides a detailed update of how past mitigation projects continue to remain successful in mitigating the hazards in Illinois. Finally, the Current Mitigation Projects Under Review or Progress, provides information regarding what projects are currently being completed in the State.

II-Plan Process

The updating process was described. New planning team members were identified for ARC, CMS, DCEO, IDPH, IEMA and the Illinois Emergency Services Managers Association (IESMA). The U.S. Geological Survey (USGS) Illinois Water Science Center and U.S. Army Corps of Engineers (USACE) were new federal agencies added to the planning team.

III-Hazard Analysis and Risk Assessment

The history of the Illinois natural hazards was updated covering the last five years for both federal declarations and state disaster proclamations. Additional research was done to discover those disasters that were declared prior to 1981 and obtain more comprehensive data regarding the vulnerability of these occurrences. The NWS, ISWS, IEMA and the Office of the State Climatologist reviewed the hazard description and historical data portion of Chapter III in the State plan and utilized any new data since the 2013 plan to update the appropriate sections. The FEMA database, as well as Illinois Public and Individual Assistance records were reviewed to acquire additional information. In addition, a level 1.5 HAZUS analysis was completed in 2015, which focused on defining the potential flood exposure throughout the 102 counties in Illinois, including essential State facilities. This analysis was utilized to assist in determining the impact and loss estimates for flooding within Illinois. A list of Community Rating System (CRS) communities in Illinois for 2017 has been added.

The “Other Hazards” section of the INHMP was updated to add influenza pandemic.

The Risk Analysis was reviewed and updated as necessary, for all natural hazards. Due to a change in the National Climatic Data Center Storm Database, a reanalysis of all the data utilized in the INHMP Risk Assessment was completed and updated, as necessary, for all natural hazards. A variety of data sources were reviewed to obtain additional information regarding past occurrences in order to create the most comprehensive list possible. These data sources include IEMA, FEMA, ISWS, U.S. Geological Survey (USGS), Illinois State Geological Survey (ISGS), IDNR, USACE, the Spatial Hazard Events and Losses Database for the United States (SHELDUS) and the National Centers for Environmental Information (NCEI)

formerly the National Climatic Data Center (NCDC). All of this information has been entered into a spreadsheet database for ease of information analysis and for using GIS mapping capabilities to display and identify Illinois hazard areas. The database was broken down by individual hazard occurrence by county. This database will be continually updated by mitigation staff, in order to maintain an accurate and active collection of previous occurrences. This database will also be an available planning tool for local jurisdictions. A table with Gubernatorial Disaster Proclamations from 2010-2018 and a section on 'Climate Change and Hazard Mitigation' was added.

IV-Mitigation Strategy

All of this section was re-evaluated. The actions items were extensively reviewed and updated, as necessary, by the planning team and the SHMO. The addition of a new capability that will have a significant impact on the State's ability to track projects has been initiated. This will not only have a major impact on this planning process in the future, but also the monitoring of success stories, and the identification of priority projects statewide. The update planning process instituted individual meetings with the agencies involved in the planning process. This approached allowed for a more in-depth review and discussion of the plan and in particular the Mitigation Strategy Section. These focused meetings produced updates of two of the State's mitigation goals, introduction of one new mitigation objective, four new strategies and fifty new mitigation action items.

The current status report for mitigation planning state wide was updated utilizing the most current planning information up to May 31, 2018. A table showing the expiration of current local hazard mitigation plans was added in order to show a true perspective of the State's planning status.

Each individual planning team member was consulted to identify new point of contacts as well as any new strategies they would like to include or update. All existing Illinois Capability Assessment forms were reviewed and updated.

The 2018 strategy includes outreach to rural electrical cooperatives, to special districts such as sewer and water, and to hazard research institutes such as Mid-America Earthquake Center at University of Illinois. IEMA will continue to provide mitigation training and assistance to these organizations upon request.

V-Coordination of Local Mitigation Planning

In updating 2018 INHMP, the 2007 State Hazard Rating Database was revised. Also, a revised version of the 2013 HAZUS-MH analysis for flooding was produced for the 2018 INHMP update, which generated individual county flood vulnerability reports for all 102 counties within Illinois. These vulnerability reports were provided to each prospective county to assist with their mitigation planning efforts.

The 2018 INHMP update includes a more updated version of the flood vulnerability analysis with new general loss estimation tables for Illinois counties for flooding, tornadoes, severe storms, severe winter storms and earthquakes. These loss estimate tables were developed utilizing a variety of data sources, including the 2017 U.S. Census data for total population, total residential units and average residential home value, as well as the NCEI storm data for Illinois. These databases were supplemented with additional information found in loss and demographic information in supplied local hazard mitigation plans.

VI-Plan Maintenance Process

While the process to maintain the plan remain unchanged, contact information and dated document references have all been updated.

III. HAZARD ANALYSIS AND RISK ASSESSMENT

The Illinois Natural Hazard Mitigation Planning Committee performed a technical review and evaluated all of the natural hazards shown in the Federal Emergency Management Agency "State and Local Mitigation Planning how-to-guide." The committee divided the potential natural hazards into three categories: those extremely unlikely to occur in Illinois, those with low probability and minimal impact, and natural hazards that have in the past and in all probability will continue to impact Illinois at various levels of severity and frequency. The following pages extensively discuss the higher risk hazards: severe storms and tornadoes, floods, severe winter storms, drought, extreme heat, and earthquakes. Natural hazards that are less likely to impact Illinois are discussed at the end of this section (Other Natural Hazards). The primary hazards to be reviewed include severe storms, tornadoes, floods, severe winter storms, drought, heat waves and earthquakes.

A. Illinois Federal Disaster Declarations from 1965 to 2017

A complete list and a map of federal disaster declarations dating back to 1965 are included on the following pages. The state's disaster history along with capability assessments and hazard identification surveys confirm that the greatest threats to the citizens of Illinois lie in the natural hazards listed below.

Illinois Major Federal Disasters (1965 – 2017)

Disaster #	Date	Event	Counties Affected
194*	04/25/65	SS, F, T	Jo Daviess, McHenry, Lake, Carroll, Rock Island, Whiteside, Mercer, Henderson, Adams, Pike
227*	04/25/67	T	Winnebago, Boone, McHenry, Lake, Kane, DuPage, Cook, Will, La Salle
242*	06/15/68	SS, F, T	McLean, Logan, Mason, DeWitt, Champaign, Piatt, Vermilion, St. Clair
262*	06/06/69	F	Jo Daviess, Carroll, Whiteside, Rock Island, Mercer, Henderson, Adams, Pike, Calhoun, Jersey
276*	08/30/69	F	Jo Daviess, Stephenson, Henderson, Pike, Jersey, Calhoun, Madison, St., Clair, Clinton, Monroe, Randolph, Jackson, Union, Alexander, Pulaski
351*	09/04/72	SS, F	Cook, DuPage, Grundy
373*	04/26/73	SS, F	Winnebago, Boone, McHenry, Lake, Carroll, Ogle, DeKalb, Kane, Cook, Kendall, La Salle, Lee, Whiteside, Rock Island, Henry, Kankakee, Bureau, Mercer, Peoria, McLean, Tazewell, Mason, Fulton, Hancock, Adams, Brown, Schuyler, Cass, Menard, Logan, Pike, Scott, Morgan, Greene, Jersey, Madison, St. Clair, Monroe, Randolph, Jackson, Franklin, Clinton, Gallatin, Pope, Johnson, Union, Alexander, Pulaski, Massac
427*	04/11/74	T	McLean, Vermilion, Champaign, Macon

Disaster #	Date	Event	Counties Affected
438*	06/10/74	SS, F	Jo Daviess, Stephenson, Winnebago, McHenry, DuPage, Kane, DeKalb, Ogle, Carroll, Whiteside, Rock Island, Lee, Kendall, Will, Grundy, La Salle, Bureau, Henry, Mercer, Henderson, Knox, Peoria, Woodford, Marshall, Livingston, Tazewell, Fulton, Hancock, Mason, Schuyler, Adams, Brown, Cass, Logan, Macon, Edgar, Clark, Cumberland, Coles, Calhoun, Pike, Jersey, Monroe, Randolph, Alexander
478*	07/25/75	T	Fulton
509*	06/18/76	SS, F, T	DuPage, Cook
583*	04/30/79	SS, F	La Salle, Bureau, Marshall, Putnam, Rock Island, Peoria, Woodford, Tazewell, De Witt, Mason, Fulton, Schuyler, Cass, Macon, Morgan, Scott, Pike, Greene, Calhoun, Jersey, Madison, St. Clair, Monroe, Randolph, Jackson, Union, Pulaski, Alexander
643*	06/30/81	SS, F, T	Cook, Carroll
660*	05/31/82	T (Marion, Conant)	Williamson, Perry
674*	12/13/82	T (New Baden), SS, TR, F, SW	Cook, Bureau, Grundy, Will, La Salle, Peoria, Woodford, Marshall, Livingston, Fulton, Mason, Sangamon, Morgan, Scott, Pike, Brown, Schuyler, Cass, Calhoun, Greene, Jersey, Madison, St. Clair, Monroe, Randolph, Williamson, Union, Alexander
684*#	06/06/83	T, TH, FF, UF	Calhoun, Greene, Jersey, Macoupin, Montgomery, Wabash, White, Madison, St. Clair, Monroe, Randolph, Franklin, Jackson, Union, Pulaski, Alexander
735*	03/29/85	SS, ER, IJ, F	Will, Grundy, La Salle, Bureau, Putnam, Rock Island, Peoria, Woodford, Ford, Mason, Fulton, Hancock, Adams, Brown, Cass, Morgan, Scott, Pike, Greene, Jersey, Clark, Crawford, Monroe, White
776*	10/07/86	TR, FF	McHenry, Lake, Cook, Kane, McDonough, Tazewell, Schuyler, Adams, Calhoun, Jersey, St. Clair
798*	08/21/87	TR, FF	Cook, DuPage, Grundy
819*^	01/13/89	T (Allendale)	White, Edwards, Wabash

Disaster #	Date	Event	Counties Affected
860	03/06/90	IS, FR, SW	Iroquois, Ford, Livingston, McLean, Vermilion, Champaign, Piatt, Douglas, Edgar, Moultrie
871	06/22/90	TH, SW, T (Findley, Newton), TR, F	Jo Daviess, Stephenson, Winnebago, Whiteside, Rock Island, Henry, Mercer, Bureau, Woodford, Henderson, Tazewell, McDonough, Hancock, Adams, Cass, Menard, Douglas, Moultrie, Shelby, Macon, Morgan, Scott, Shelby, Calhoun, Jasper, Richland, Edwards, Wabash, Wayne, Marion, Hamilton
878	08/29/90	T	Kane, Kendall, Will
941#	04/15/92	Chicago Tunnel Flood	Cook
997+	07/09/93	Great Midwest Flood	Jo Daviess, Stephenson, Winnebago, Boone, McHenry, Lake, Carroll, Ogle, Cook, Whiteside, rock Island, Henry, Mercer, Peoria, Knox, Warren, Henderson, Hancock, Mason, Brown, Adams, Pike, Scott, Morgan, Jersey, Calhoun, Madison, St. Clair, Monroe, Randolph, Jackson, Union, Pope, Alexander, Pulaski, Massac
1025	04/26/94	TR, TH, FF	Vermilion, Champaign, Piatt, De Witt, Mason, Cass, Sangamon, Douglas, Greene, Calhoun, Jersey, St. Clair, Monroe, Alexander
1053	05/30/95	T, TH, SS, SW, TR, FF	Peoria, Tazewell, Fulton, Cass, Brown, Pike, Scott, Morgan, Greene, Calhoun, Jersey, Madison, St. Clair, Monroe, Randolph, Jackson, Pulaski, Alexander, Union
1110	04/23/96	T, SS	Lake, Henry, Vermilion, Champaign, Macon, Marion
1188=	09/17/97	Chicago Basement Flood	Cook
1278	05/28/99	TR, FF	Jo Daviess
1368	05/09/01	F	Jo Daviess, Carroll, Whiteside, Rock Island, Mercer, Henderson, Adams, Pike, Calhoun
1416	05/21/02	SS, T, F, ER	Woodford, Iroquois, Ford, Fulton, McDonough, Hancock, Brown, Cass, Menard, Logan, De Witt, Piatt, Champaign, Vermilion, Douglas, Edgar, Coles, Moultrie, Macon, Mason, Schuyler, Brown, Adams, Pike, Scott, Morgan, Sangamon, Christian, Calhoun, Greene, Jersey, Macoupin, Montgomery, Fayette, Shelby, Effingham, Jasper, Crawford, Lawrence, Richland, Clay, Marion, Clinton, St. Clair, Washington, Jefferson, Wayne, Edwards, Wabash, White, Hamilton, Franklin, Perry, Randolph, Monroe, Williamson, Saline, Gallatin, Union, Johnson, Pope, Hardin, Alexander, Pulaski, Massac
1469=	05/03/03	SS, T, F	McDonough, Schuyler, Tazewell, Pike, Union, Pope, Pulaski

Disaster #	Date	Event	Counties Affected
1513	04/23/04	SS, T	Will, La Salle, Putnam
4116	05/10/13	SS, F, SW	Winnebago, McHenry, Lake, Carroll, Ogle, DeKalb, Kane, DuPage, Cook, Will, Grundy, Kendall, La Salle, Putnam, Bureau, Henry, Rock Island, Whiteside, Mercer, Knox, Stark, Marshall, Livingston, Henderson, Warren, Peoria, Tazewell, Woodford, Hancock, McDonough, Fulton, Mason, Adams, Brown, Pike, Scott, Cass, Morgan, Douglas,Clark Shelby, Calhoun, Greene, Crawford, Lawrence, Monroe
4157	11/17/13	SS, SW, T	Champaign, Douglas, Fayette, Grundy, Jasper, La Salle, Massac, Pope, Tazewell, Vermilion, Wabash, Washington, Wayne, Will, and Woodford Counties

* Pre-Robert T. Stafford Act	ER Excessive Rainfall	IS Ice Storm
# Public Assistance only	F Flooding	SS Severe Storms
^ HMGP program started	FR Freezing Rains	SW Severe Winds
+ Volkmer Act initiated	FF Flash Floods	T Tornado
= Individual Assistance	TR Torrential Rains	UF Unseasonable Freezing Temperatures
IJ Ice Jam	TH Thunderstorms	

B. Gubernatorial Proclamations between 2010 and February of 2018

Illinois has not had a Federal Disaster Declaration since 2013. There were 31 gubernatorial proclamations between 2010 and January of 2018, which are summarized in the following chart:

Year	Date Governor Declared	Nature of Events	Counties Affected
2010	6/7/2010	Severe Storms & Tornadoes	LaSalle, Livingston, Peoria, Putnam
	6/10/2010	Severe Storms & Tornadoes	Kankakee
	7/26/2010	Severe Storms with High Wind and Torrential Rain	Carroll, Cook, DuPage, Henderson, Jo Daviess, Lee, Mercer, Ogle, Rock Island, Stephenson, Whiteside, Winnebago
	8/31/2010	Severe Storms with High Wind and Torrential Rain	Adams, Pike and Schuyler
	9/16/2010	Severe Storms with High Wind and Torrential Rain	Moultrie
2011	1/31/2011	Extremely Severe Winter Weather	All
	4/25/2011 Reissued 5/25/2011	High Wind, Tornadoes & Torrential Rain	All
	8/10/2011	Severe Storms, High Wind & Torrential Rain	Carroll, Jo Daviess, Stephenson

Year	Date Governor Declared	Nature of Events	Counties Affected
2012	2/29/2012	Severe Storms and Tornadoes	Southern 1/3 of state
2013	4/18/2013 4/20/2013 4/21/2013 4/25/2013 4/30/2013	Severe Storms with Heavy Rainfall; Flooding; Straight-line Winds	Adams, Brown, Bureau, Calhoun, Carroll, Cass, Champaign,Clark, Cook, Crawford, DeKalb, Douglas, DuPage, Fulton, Greene, Grundy, Hancock, Henderson, Henry, Jersey, Jo Daviess, Kane, Kendall, Knox, Lake, LaSalle, Lawrence, Livingston, Marshall, Mason, McDonough, McHenry, Mercer, Monroe, Morgan,Ogle, Peoria, Pike, Putnam, Rock Island, Schuyler, Scott, Stark, Tazewell, Warren, Whiteside, Will, Winnebago, Woodford
2013	4/18/2013 4/20/2013 4/21/2013 4/25/2013 4/30/2013	Severe Storms with Heavy Rainfall; Flooding; Straight-line Winds	Adams, Brown, Bureau, Calhoun, Carroll, Cass, Champaign,Clark, Cook, Crawford, DeKalb, Douglas, DuPage, Fulton, Greene, Grundy, Hancock, Henderson, Henry, Jersey, Jo Daviess, Kane, Kendall, Knox, Lake, LaSalle, Lawrence, Livingston, Marshall, Mason, McDonough, McHenry, Mercer, Monroe, Morgan,Ogle, Peoria, Pike, Putnam, Rock Island, Schuyler, Scott, Stark, Tazewell, Warren, Whiteside, Will, Winnebago, Woodford
	11/17/2013 11/19/2013 11/20/2013	Severe Storms, Straight-line Winds, Tornadoes	Champaign, Douglas, Fayette,Grundy, Jasper, LaSalle, Massac, Pope, Tazewell, Vermilion, Washington, Woodford Wabash, Wayne, Will
2014	1/6/2014	Heavy Snowfall and Frigid Temperatures	All
2015	4/10/2015	Severe Storms and Tornadoes	DeKalb, Ogle
	6/23/2015	Severe Storms, Tornadoes, Straight-line Winds and Heavy Rainfall	Grundy, Lee
	6/30/2015	Severe Storms and Heavy Rainfall	Calhoun, Cass, Fulton, Greene, Jersey, Mason, Morgan, Pike, Schuyler, Scott, Tazewell
	7/31/2015	Severe Storms, Tornadoes, Flooding and Straight-line Winds	Adams, Alexander, Brown, Calhoun, Cass, Coles, Fulton, Greene, Grundy, Iroquois, Jersey, Mason, Monroe, Morgan, Peoria, Pike, Randolph, Richland, Schuyler, Scott, Tazewell, Vermilion, Warren
	12/29/2015	Severe Storms, Heavy Rainfall and Flooding	Calhoun, Jackson, Jersey, Madison, Monroe, Randolph, St. Clair
	12/30/2015	Severe Storms, Heavy Rainfall and Flooding	Alexander, Christian, Clinton, Douglas, and Morgan
2016	1/5/2016 1/28/2016 3/31/2016	Severe Storms, Heavy Rainfall and Flooding	Bureau, Christian, Cass, Clark, Cumberland, Iroquois, Lawrence, Marion, Mason, Menard, Moultrie, Pike, Richland, Sangamon, Vermilion
2017	7/12/2017 7/14/2017	Thunder Storms, Heavy Rainfall and Flooding	McHenry, Kane, Lake and Cook
2018	2/23/2018	Heavy Rainfall and Flooding	Iroquois, Kankakee and Vermilion

Illinois Major Federal Disasters (1965 – 2017)

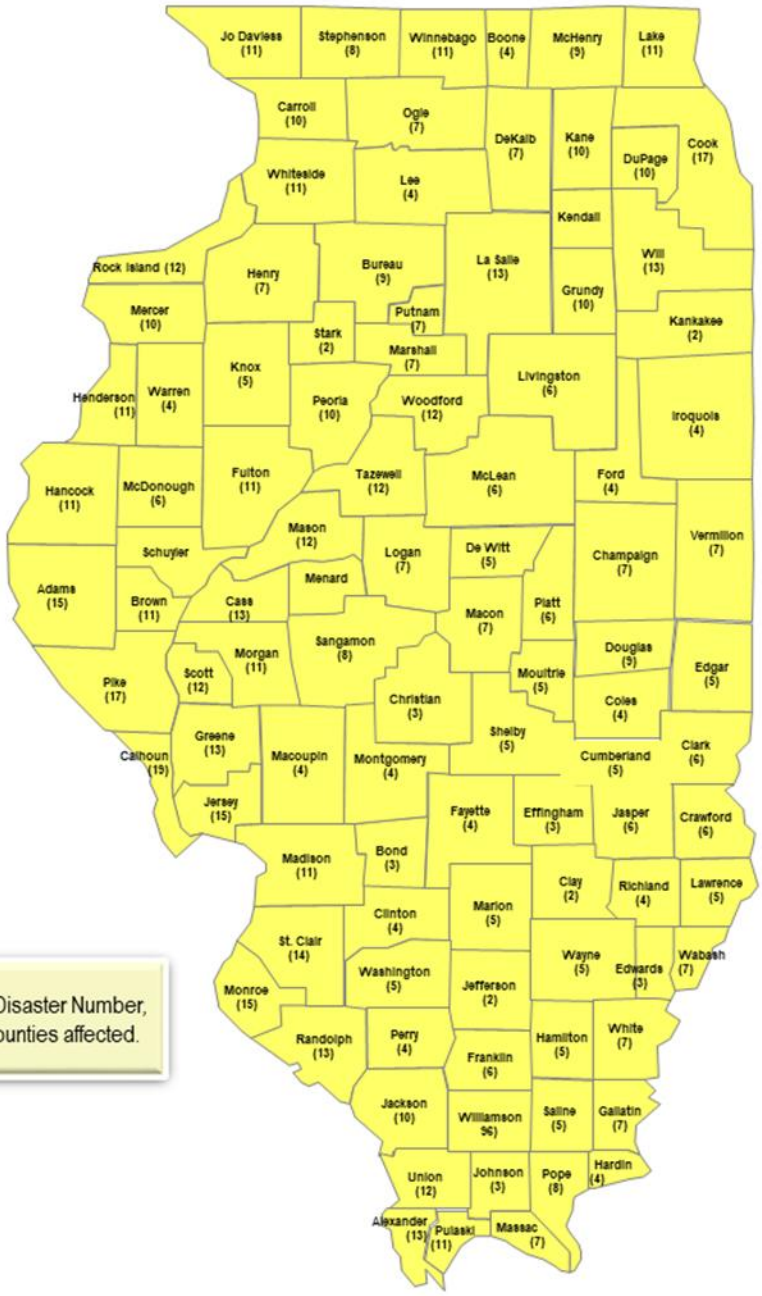


Table below shows details on the Disaster Number, Date, Nature of the events, and Counties affected.

HAZARD WORKSHEET METHODOLOGY

The Illinois Natural Hazard Mitigation Planning Committee developed a methodology for rating natural hazards in Illinois. This process is explained on the next page with the charts beginning on page 12 and maps using this methodology have been prepared and inserted into this document for each natural hazard. The maps that are in this document by hazard were prepared using a table that is in the supporting documentation file.

This system for rating natural hazards in Illinois will be posted on the IEMA Mitigation website for local jurisdictions to use in their mitigation planning process. Local jurisdictions will be encouraged to adopt this process in their mitigation planning activities because the adoption of a standard system will lend itself to the blending of information. As local mitigation plans are received, their risk assessments will be reviewed by the State Hazard Mitigation Officer and incorporated into the State Hazard Mitigation Plan.

Sixty-six years of Illinois hazard data (1951-2017) was obtained from the National Climatic Data Center (NCDC) and Spatial Hazard Events and Losses Database for the United States (SHELDUS) for severe storms (thunderstorms, high wind, lightning and hail) and tornadoes, floods, severe winter storms, drought, and extreme heat. The Illinois State Geological Survey was able to supply an equivalent time frame of data for earthquake activity in Illinois. The INHMP Risk Assessment examines natural disasters on a statewide basis and as well as individual counties. Natural hazards include those caused by climatological, geological, hydrologic, or seismic events. A variety of data sources were reviewed to obtain additional information regarding past occurrences in order to create the most comprehensive list possible. These data sources include: Illinois Emergency Management Agency (IEMA), Federal Emergency Management Agency (FEMA), Illinois State Water Survey (ISWS), US Geological Survey (USGS), Illinois State Geological Survey (ISGS), Illinois Department of Natural Resources (IDNR), US Army Corps of Engineers, and the NCDC. All of this information has been entered into a spreadsheet database for ease of information analysis and for using GIS mapping capabilities to display and identify Illinois hazard areas. The database was broken down by individual hazard occurrence by county. This database will be continually updated by mitigation staff, in order to maintain an accurate and active collection of previous occurrences. This database will also be an available planning tool for local jurisdictions.

Historical/probability– An average of the number of events that have occurred since 1951.

Vulnerability

Severe Storm–All counties are susceptible to severe storms. At any one time, it has been determined that over 25% of the county population might experience severe storms. This determination is supported by Mr. Chris Miller, Warning Coordination Meteorologist, National Weather Service (NWS), Lincoln, Illinois, as follows: "Damage from severe thunderstorms is usually on a much broader spatial scale in the state of Illinois. Illinois averages more than 500 reports of wind damage and nearly 375 reports of large hail annually. Approximately 80% of the severe thunderstorms are multicellular or a supercell hybrid, which are capable of producing damaging wind and/or large hail over approximately a 400 to 500 square mile area. The remainder of severe thunderstorms are squall lines, which can produce damage over 100% of the affected counties. Thus, the vulnerability to severe thunderstorms should be high (greater than 25% of the population affected) in each county across Illinois.

Tornado–While all of Illinois is susceptible to tornadoes (in fact north, south, east and west counties have all been hit by tornadoes) it is estimated less than 10% of a county would be impacted by a tornado at any one time. This estimation is supported by Chris Miller from the NWS as follows: "Based on data of tornadoes in the state of Illinois for the 66-year period from 1951 – 2017, nearly 80% were rated as weak tornadoes (EF0/EF1), 19% were rated as strong tornadoes (EF2/EF3), and 1% were rated as violent tornadoes (EF4/EF5) on the Enhanced Fujita damage assessment scale. The data also suggests that weak tornadoes are typically 60 yards wide with a path length of two miles, strong tornadoes are usually 200 yards wide with a path length around 10 miles, with violent tornadoes around 1/4-mile-wide and path lengths greater than 20 miles. This would mean that with nearly 2,695 tornadoes reported, approximately 925 square miles of Illinois have been affected by tornadoes." "Considering that Illinois is nearly 58,000 square miles in size, with the average county around 569 square miles, the average population affected has been about 1.5%. Thus, every county in Illinois should have a "Low" vulnerability to tornadoes, (low being defined as less than 10% of the total population)."

Flood–History supports the assumption that all counties in Illinois are susceptible to some type of flooding. As stated above in the tornado analysis, it is estimated that 10% of a county would be impacted by flooding at any one time. Illinois Department of Natural Resources provided information on the 100 Year Flood zone in Unincorporated Areas ranging from 52.1% to 2.7% of the county being in the 100-year flood zone with the average being 13.5%. In general, incorporated areas would have a lower average flood zone; therefore, 10% was used for the overall county average.

Drought–Numerous droughts have occurred in Illinois with the most significant occurring in the 1930s, 1950s, 1988, 2007, and in 2012. Following the Drought of 2007, the State Water Plan Task Force developed and published a report entitled "State of Illinois, Drought Preparedness and Response Plan" and includes recommendations for future preparations for drought. These recommendations have been partially implemented. In general, farmers are the first group to feel the impact of a drought. Besides causing stress to crops and livestock, many farmers rely on their own dug wells or wells drilled into shallow aquifers for their water supply. Both types of wells are very vulnerable to drought conditions. Public water supplies are typically more robust against drought, but are not immune from long-term drought conditions. Public water supplies that rely on surface water supplies are historically more vulnerable to drought than those that rely on deep aquifers. The Illinois State Water Survey has produced a document dealing with drought and drought planning. The reference is *The Water Cycle and Water Budgets in Illinois: A Framework for Drought and Water-supply Planning (*Illinois State Water Survey).

Extreme Heat-The most at risk population is the sick~~ly~~ and the elderly. We have arbitrarily identified the elderly population by county and used this as the basis. As stated earlier, young people in poor health are also at risk. The assumption is made that young people in poor health will be offset by the healthy elderly.

Severe Winter Storm–One hundred percent of the population is at risk from a severe winter storm in the State of Illinois.

Earthquake–The Applied Technology Council (ATC) has prepared a publication on rapid visual screening of seismically hazardous buildings. The National Earthquake Hazards Reduction Program Map (FEMA 154, Second Edition, 2002) for Illinois from this publication was used.

Severity of Impact–The various detailed parameters are identified in this table. When evaluating each county based on the 60+ year history, if there is any conflicting data the highest level will be assumed. In keeping with this philosophy, and since the worst known earthquake (1811-1812) occurred outside of the 60+ year period of time, the decision was made to overlay the ATC map with the Modified Mercalli Scale Map (Modified Mercalli Intensities based on a 7.6 Magnitude Earthquake along the New Madrid Seismic Fault) to evaluate Illinois counties.

Population– Population growth by county in Illinois is based on US Census Data 2017.This information was used in supplying information for the fourth and fifth tables. Using the tables in this rating process, the information has been extracted and analyzed in the following manner:

The following pages are the Illinois Hazard Rating by County. These hazard ratings were obtained utilizing the methodology established by the Illinois Natural Hazard Mitigation Planning Committee. Local hazard mitigation plan hazard ratings have been evaluated and translated into the State Hazard Rating System for comparison. This correlation was completed in an effort to improve the level of detail and comprehensiveness of statewide risk assessments and coordination of State hazard mitigation goals and objects with local goals and objectives. Hazard ratings were utilized from Counties with approved LHMPs and were compared to the hazard rating calculated by the State. This correlation can be viewed in detail on page 28 in Section V of the INHMP.

C. Illinois Hazard Rating Process

The overall objective of this process is to devise a method to compare and evaluate natural hazards in Illinois. In order to accomplish this task, a period of time was selected, data was collected on the natural hazards and categories for evaluation were identified. These categories were sub-divided into three divisions and scores for each division were given. The exact procedure is discussed in the next several pages and this section is concluded with a table revealing the results of this process. This Hazard Rating Process was reviewed and updated by Supporting State Agency Hazard Mitigation Planning Members in an effort to ensure that the identified rating process continued to produce an accurate depiction of the hazards associated with the State of Illinois. Three of the four hazard rating categories remained unchanged as their relevance remained consistent. The Historic/Probability (frequency) was subsequently updated to more effectively reflect the increased amount of historic data available.

There are four categories (Historical/Probability, Vulnerability, Severity of Impact and Population) that will identify and define the ratings of each hazard, noted in the five tables on the next three pages. The first table will identify what has occurred in the past as a guide to projecting the probability for future occurrences. The second table identifies the number of citizens who might be impacted based on individual criteria identified in the methodology. The third table estimates the severity by considering health and safety, continuity of operations, property, facilities, infrastructure, environment, economic and financial situation. The fourth category is population with two tables: table 4A is based on the 2017 population and table 4B is based on the projected population growth for 2020.

The first three tables are weighted three times as much as the last two tables combined. Each hazard (for example flood) will have a score from each of the five tables. These tables are displayed and the score to

be used is identified on the following pages by table. This last column under each hazard will be the total overall score of the five tables. This overall score will be evaluated, as shown below:

Very Low – 0 to 12 (green)
Low – 13 to 24 (Pink)
Medium – 25 to 36 (orange)
High – 37 to 48 (blue)
Severe – 49 to 60 (red)

For example, under flood there will be a number from each of the five tables. These five numbers will be totaled to arrive at the overall risk for floods. This rating process is being done by county for all major natural hazards in Illinois. These numbers will be transferred onto a separate spreadsheet by county and colored coded as indicated above to readily indicate the hazard ratings.

1) HISTORICAL/PROBABILITY (frequency)

- The number of times that a disaster has occurred in a county in the past 66 years
- The information is being used to determine and evaluate the likelihood for future disasters

Very Low (6)	0 to 12 occurrences in the last 66 years
Medium (12)	13 to 60 occurrences in the last 66 years
High (18)	More than 60 occurrences in the last 66 years

2) VULNERABILITY (percentage of people)

- The relationship of where people live in or near the hazard area
- The percentage of people that will be adversely affected should the hazard occur

Low (6)	Less than 10% of the total population of the county
Medium (12)	10% to 25% of the total population of the county
High (18)	More than 25% of the total population of the county

3) SEVERITY OF IMPACT (injuries, fatalities, personal property & infrastructure)

- The worst conceivable impact to human life and property which could result from a hazard
- The essential facilities are defined for this purpose as PUBLIC SAFETY (fire, police & local government) and UTILITIES (electric, gas, telephone water & sewer)

Low (6)	Minor injuries (under 50) & property damage (under $1,000,000), or less than 24 hour shutdown of essential facilities
Medium (12)	Serious injury (more than 50), major property damage (structural stability) ($1,000,001 to $15,000,000), or 24 to 72-hour shutdown of essential facilities
High (18)	Multiple deaths (more than five), property destroyed or damaged beyond repair (more than $15,000,000), or more than three days of shutdown for essential facilities

4) POPULATION

The committee included growth as a factor for the risk assessment. After a review of the data, the committee concluded that giving the future growth equal weight with the other factors skewed the risk assessment. Counties range in population from approximately 5,000 to 5,000,000. To conclude that a population growth of 25% in a smaller county (1,250) would have more of an impact than a 10% growth in a larger county (500,000) was not palatable to the committee.

The committee also determined that because of the large population disparity between counties the Vulnerability and Severity of Impact didn't fully distinguish the quantity of people that could be exposed to risk. The committee decided to give the population of the counties equal weight with the growth factor. The planning committee discussed the impact of population on the risk assessment at length. While population is acknowledged to be an important factor to be considered, it is of lesser significance than the first three criteria and has been assigned 1/3 the value. On a scale of 100 the first three tables would receive 30 each and the remaining 10 was allocated to population.

a) POPULATION (number in jurisdiction)

- The actual 2017 population census figure per county
- The quantity will be used to identify a slight increase in risk

Low (1)	0 to 100,000 population in the county
Medium (2)	100,001 to 500,000 population in the county
High (3)	More than 500,000 population in the county

b) POPULATION GROWTH (percentage of increase)

- The projected population growth in a jurisdiction over the next 10 years
- The population growth estimates will be used to identify a potential increase to risk

Low (1)	% of decrease to 10% projected population increase in the county
Medium (2)	11% to 25% projected population increase in the county
High (3)	More than 25% projected population increase in the county

Criteria and Methodology Established by the Illinois Natural Hazard Mitigation Planning Committee

Ratings Updated 1/2/2018

Key	
Very Low=0-12	Low=13-24
Medium=25-36	High=37-48
Severe=49-60	

County Name	Population	Severe Storms	Floods	Severe Winter Storms	Drought	Extreme Heat	Earthquake	Tornado
Adams	66,578	High	Medium	High	Low	High	Low	Medium
Alexander	6,478	Severe	High	High	High	Medium	Severe	Medium
Bond	16,824	High	Low	High	Low	High	Medium	Medium
Boone	53,503	High	Medium	High	Low	Medium	Low	Medium
Brown	6,762	High	Low	High	Low	High	Low	Medium
Bureau	33,359	Severe	Low	High	High	Medium	Low	Medium
Calhoun	4,894	High	Medium	High	Low	High	Medium	Low
Carroll	14,539	Severe	Medium	High	High	Medium	Low	Medium
Cass	12,676	Severe	Low	High	Medium	Medium	Medium	Medium
Champaign	208,419	Severe	Low	High	Medium	Medium	Medium	High
Christian	33,309	Severe	Medium	Severe	Medium	Medium	Medium	Medium
Clark	15,938	High	Low	High	Medium	Medium	Medium	Low
Clay	13,300	Severe	Low	High	Medium	Medium	High	Medium
Clinton	37,729	High	Low	High	Low	High	Medium	High
Coles	54,000	Severe	Low	Severe	Medium	Medium	Medium	High
Cook	5,203,499	Severe	Medium	Severe	Low	High	Low	High
Crawford	19,308	Severe	Medium	High	Medium	Medium	Medium	Medium
Cumberland	10,858	High	Low	Severe	Medium	Medium	Medium	Low
DeKalb	104,528	Severe	Medium	High	Low	Medium	Low	Medium
De Witt	16,226	Severe	Low	High	Medium	Medium	Medium	Medium
Douglas	19,630	Severe	Medium	High	Medium	Medium	Medium	Medium
DuPage	929,368	Severe	Medium	High	Low	Medium	Low	Medium
Edgar	17,566	Severe	Low	High	Medium	Medium	Medium	Medium
Edwards	6,523	Severe	Medium	High	High	High	High	Medium
Effingham	34,386	Severe	Medium	High	Medium	Medium	Medium	Medium
Fayette	21,789	High	Low	High	Low	High	Medium	Medium
Ford	13,575	Severe	Low	High	Low	Medium	Low	Medium

County Name	Population	Severe Storms	Floods	Severe Winter Storms	Drought	Extreme Heat	Earthquake	Tornado
Franklin	39,156	Severe	High	High	Medium	High	High	Medium
Fulton	35,536	Severe	High	High	Medium	Medium	Low	High
Gallatin	5,212	Severe	High	High	Medium	High	High	Medium
Greene	13,093	High	Medium	High	Low	High	Medium	Medium
Grundy	50,437	Severe	Medium	High	Low	Medium	Low	High
Hamilton	8,061	High	Medium	High	Medium	High	High	Medium
Hancock	18,508	Severe	Medium	High	High	Medium	Low	High
Hardin	4,024	High	Medium	High	Medium	High	High	Low
Henderson	6,869	High	Medium	High	High	Medium	Low	Medium
Henry	49,280	Severe	Medium	High	High	Medium	Low	High
Iroquois	28,334	Severe	Medium	High	Low	Medium	Low	Medium
Jackson	58,870	Severe	High	High	Medium	Medium	High	Medium
Jasper	9,536	Severe	Low	High	Medium	Medium	Medium	Medium
Jefferson	38,460	Severe	Low	High	Medium	High	High	Medium
Jersey	22,025	High	Medium	High	Low	High	Medium	Medium
Jo Daviess	21,770	Severe	Medium	High	High	Medium	Low	Medium
Johnson	12,902	Severe	Medium	High	Medium	Medium	High	Medium
Kane	531,715	Severe	Medium	High	Low	Low	Low	Medium
Kankakee	110,008	Severe	Medium	High	Low	Medium	Low	High
Kendall	124,695	High	Medium	High	Low	Low	Low	Medium
Knox	50,938	Severe	Medium	High	Medium	Medium	Low	Medium
Lake	703,047	Severe	Medium	High	Low	Low	Low	High
La Salle	110,642	High	Medium	High	Low	Medium	Low	Medium
Lawrence	16,377	Severe	Medium	High	Medium	Medium	Medium	Medium
Lee	34,251	High	Low	High	Low	Medium	Low	Medium
Livingston	36,526	High	Medium	High	Low	Medium	Medium	Medium
Logan	29,527	Severe	Low	High	Medium	Medium	Medium	High
McDonough	30,996	Severe	Medium	High	High	Medium	Low	Medium
McHenry	307,004	High	Medium	High	Low	Low	Low	High
McLean	172,418	Severe	High	High	Medium	Medium	Low	High
Macon	106,550	Severe	Medium	High	Medium	Medium	Medium	High
Macoupin	45,908	High	Medium	High	Low	High	Medium	Medium
Madison	265,759	Severe	Low	High	Low	High	Medium	High
Marion	38,140	High	Low	High	Low	High	High	Medium
Marshall	11,939	High	Low	High	Medium	Medium	Low	Medium

County Name	Population	Severe Storms	Floods	Severe Winter Storms	Drought	Extreme Heat	Earthquake	Tornado
Mason	13,507	Severe	Medium	High	Medium	Medium	Low	Medium
Massac	14,658	Severe	Low	High	Medium	Medium	High	Medium
Menard	12,516	Severe	Low	High	Medium	Medium	Medium	Medium
Mercer	15,730	Severe	Medium	High	Medium	Medium	Low	Medium
Monroe	34,068	Severe	Medium	High	Low	High	High	Medium
Montgomery	28,952	High	Low	High	Low	High	Medium	Medium
Morgan	34,277	Severe	High	High	Medium	Medium	Medium	Medium
Moultrie	14,827	Severe	Low	High	Medium	Medium	Medium	Medium
Ogle	51,273	Severe	Medium	High	Low	Medium	Low	Medium
Peoria	185,006	Severe	Medium	High	Medium	Medium	Low	High
Perry	21,357	Severe	Medium	High	Medium	High	High	Medium
Piatt	16,560	Severe	Low	High	Medium	Medium	Medium	Medium
Pike	15,950	High	High	High	Low	High	Medium	Medium
Pope	4,157	High	Medium	High	Medium	Medium	High	Medium
Pulaski	5,619	High	High	High	Medium	Medium	Severe	Medium
Putnam	5,611	Severe	Low	High	Medium	Medium	Low	Medium
Randolph	32,621	High	Medium	High	Low	High	High	Medium
Richland	15,930	High	Low	High	Medium	Medium	High	Medium
Rock Island	144,784	Severe	Medium	High	Medium	Medium	Low	Medium
St. Clair	262,759	Severe	Medium	High	Low	High	High	High
Saline	24,307	Severe	Medium	High	Medium	Medium	High	Medium
Sangamon	197,499	Severe	High	High	Medium	Medium	Medium	High
Schuyler	6,923	Severe	Low	High	Medium	Medium	Low	Medium
Scott	5,053	Severe	Medium	High	Medium	High	Medium	Medium
Shelby	21,717	Severe	Medium	High	Medium	Medium	Medium	Medium
Stark	5,776	High	Low	High	Medium	Medium	Low	Medium
Stephenson	45,624	Severe	Medium	High	High	Medium	Low	Medium
Tazewell	134,385	Severe	High	High	Medium	Medium	Low	High
Union	17,212	Severe	Medium	High	Medium	Medium	Severe	Medium
Vermilion	78,111	Severe	Low	High	Medium	Medium	Medium	High
Wabash	11,492	Severe	Medium	High	Medium	Medium	High	High
Warren	17,378	Severe	Medium	High	High	Medium	Low	Medium
Washington	14,154	High	Low	High	Low	High	High	Medium
Wayne	16,396	Severe	Medium	High	Medium	Medium	High	Medium
White	14,292	Severe	High	High	Medium	Medium	High	Medium

County Name	Population	Severe Storms	Floods	Severe Winter Storms	Drought	Extreme Heat	Earthquake	Tornado
Whiteside	56,536	Severe	Medium	High	High	Medium	Low	Medium
Will	689,529	Severe	Medium	High	Low	Low	Low	High
Williamson	67,560	Severe	Medium	High	Medium	Medium	High	High
Winnebago	285,873	Severe	Medium	High	Low	Medium	Low	Medium
Woodford	39,140	Severe	High	High	Medium	Medium	Low	Medium

D. Severe Storms (Wind, Lightning and Hail)

Description

In Illinois, thunderstorms occur when there is a collision of moist, warm air moving north from the Gulf of Mexico with colder fronts moving east from the Rocky Mountains resulting in cold air overriding a layer of warm air causing the warm air to rise rapidly. Thunderstorms may occur singly, in clusters, or in lines. In the course of a few hours, it is possible for several thunderstorms to affect one location or a single thunderstorm to affect one location for an extended time. Thunderstorms typically are 15 miles in diameter and produce heavy rain anywhere from 30 minutes to an hour.

Of the estimated 100,000 thunderstorms each year, pproximately 10 percent are classified severe. Severe storms either produce hail at least one inch in diameter, have winds of 58 miles per hour or higher, or produce a tornado. In Illinois, severe thunderstorms frequently occur in the late afternoon or evening. Thunderstorms can bring heavy rain, strong winds, hail, lightning and tornadoes. Thunderstorms can cause several types of damaging wind. The public is not as familiar with the extent of damage that may accompany a downburst or straight line winds as they are with tornadoes. In thunderstorms, straight-line winds are winds without any rotation. This classification differentiates them from tornadic winds. In severe thunderstorms, downbursts are created by falling rain and associated sinking air, resulting in winds that can reach speeds of 125 mph.

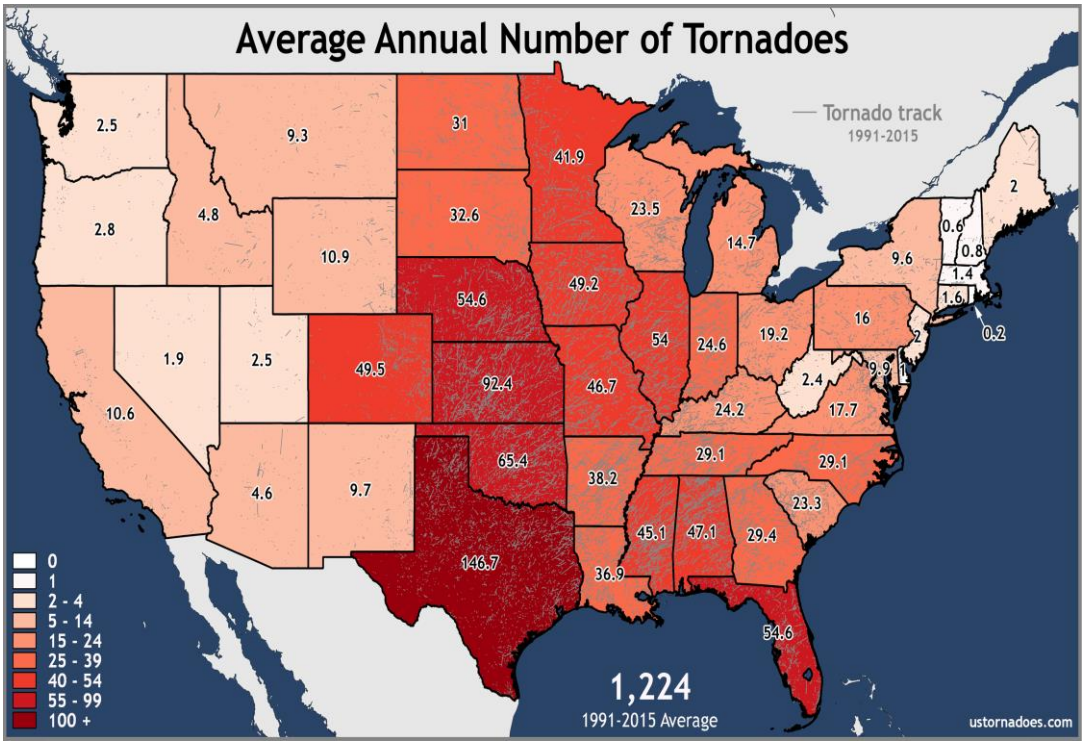
E. Tornadoes

Description

Tornado is almost always spawned from a severe storm. However, there are a few instances that a tornado can develop from a non-severe storm, but it is quite rare. A tornado is a rapidly rotating column of air that is in contact with both the surface of the Earth and a cumulonimbus cloud or, in rare cases, the base of a cumulus cloud.

The top 10 states for tornadoes as of the most recent (1991-2015) average are as follows, in order from high to low: Texas, Kansas, Oklahoma, Florida, Nebraska, Illinois, Colorado, Iowa, Alabama, Missouri, and Mississippi.

The peak tornado season runs March through August, however a tornado can occur in any month in Illinois. Tremendous destruction can occur in paths over a mile wide and 50 miles long with winds in excess of 200 mph. The Enhanced Fujita Scale shown on the next page uses the categories of EF0 through EF5 to rate the strength of tornadoes in the United States estimated by the damage they cause. Implementation of this enhanced scale began February 1, 2007. None of the tornadoes recorded on or before January 31, 2007, will be re-categorized.



Tornado Activity in the United States 1991 – 2015 (Source: ustornadoes.com)

Tornado Tracks for the midwest, individual counties, and by address can be viewed at the Midwestern Regional climage Center web site http://mrcc.isws.illinois.edu/gismaps/cntytorn.htm

Enhanced Fujita Scale

According to the NWS, the Enhanced Fujita Scale or EF Scale, which became operational on February 1, 2007, is used to assign a tornado a "rating" based on estimated wind speeds and related damage. When tornado-related damage is surveyed, it is compared to a list of Damage Indicators (DIs) and Degrees of Damage (DoD), which help better estimate the range of wind speeds the tornado likely produced. From that, a rating (from EF0 to EF5) is assigned.

The EF Scale was revised from the original Fujita Scale to reflect better examinations of tornado damage surveys so as to align wind speeds more closely with associated storm damage. The new scale has to do with how most structures are designed.

The NWS advised that it is important to note that the EF scale still is a set of wind estimates (not measurements) based on damage. It uses three-second gusts estimated at the point of damage based on a judgment of eight levels of damage to the 28 indicators listed below. These estimates vary with height and exposure. Important: The three-second gust is not the same wind as in standard surface observations.

Standard measurements are taken by weather stations in open exposures, using a directly measured, "one-minute mile" speed. http://www.weather.gov

Category EF0	(65-85 mph)	**Minor Damage** - Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
Category EF1	(86-110 mph)	**Moderate Damage** - Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
Category EF2	(111-135 mph)	**Considerable Damage** - Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
Category EF3	(136-165 mph)	**Severe Damage** - Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations are badly damaged.
Category EF4	(166-200 mph)	**Extreme Damage** - Well-constructed and whole frame houses completely leveled; cars and other large objects thrown and small missiles generated.
Category EF5	(>200 mph)	**Total Destruction** - Strong-framed, well-built houses leveled off foundations are swept away; steel-reinforced concrete structures are critically damaged; tall buildings collapse or have severe structural deformations; some cars, trucks, and train cars can be thrown approximately 1 mile (1.6 km).

Source: http://cmc.theenergycoop.com/fujita-scale/

A downward rush of cool descending air from a thunderstorm is a downburst. The air rushing to the ground may look like a cloud or shaft of heavy rain. Once the air strikes the ground at a high speed, the air usually spreads out in all directions. The wind may be 100-150 miles per hour which is as strong as an EF1 or EF2 tornado and exceeds the lower limit of a hurricane. Downburst winds will damage roofs, overturn or push mobile homes off foundations, push autos off the road and may destroy attached garages. A linear group of thunderstorms, typically ahead of a cold front, can produce what is known as “straight-line” winds. High wind from straight-line gusts can reach speeds of 40 to 50 mph up to 110 mph. The width of the damage path can be several miles up to tens of miles. The damage path length can extend from tens of miles to hundreds of miles. Thunderstorm downbursts and straight-line winds are the leading cause of wind related damage.

According to the NWS, some weather patterns can produce what is called a derecho. A derecho is a fast moving windstorm that is made up of thunderstorms that repeatedly develop along the leading edge. These lines or storms can move very quickly and produce widespread straight-line winds over long periods of time.

Derechos can move anywhere from 35-70 mph and last 8 hours or more. Most derechos that produce severe weather move at speeds greater than 50 mph. Warm season events probably move a little slower than cold season events (www.nssl.noaa.gov).

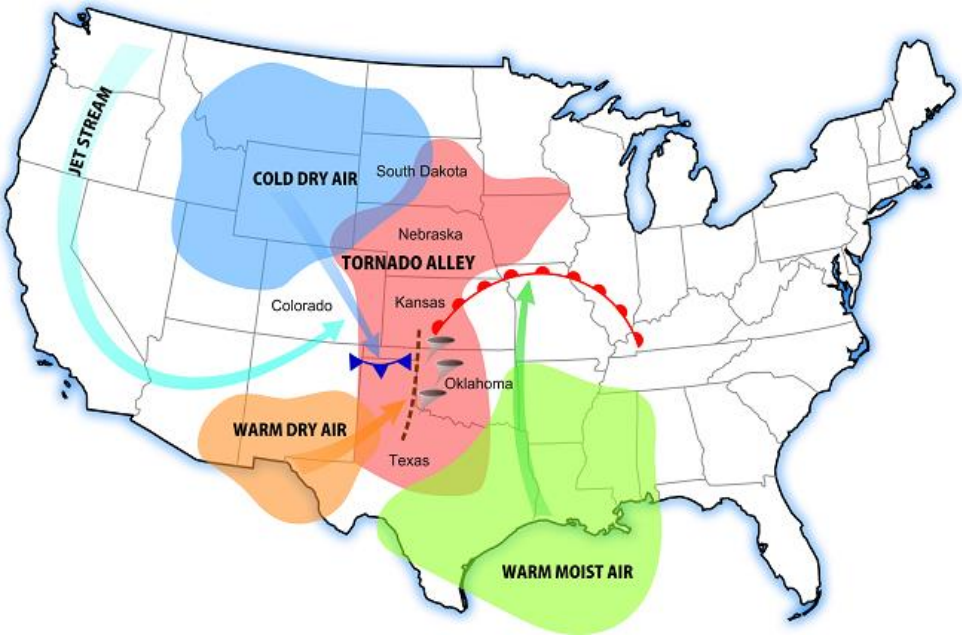
Lightning occurs during all thunderstorms and is an electrical discharge that results from the buildup of positive and negative charges. Lightning appears as a “bolt” when the buildup becomes strong with the flash of light occurring between the clouds and the ground. In a split second the bolt of lightning reaches a temperature approaching 50,000 degrees Fahrenheit. Thunder is the rapid heating and cooling of air near the lightning.

In addition to lightning, a thunderstorm can also produce hail. 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 ice. These balls of ice are a large frozen raindrop. Super cooled water droplets hit ice crystals and freeze instantly. The hailstones grow as more and more droplets hit these ice balls and freeze as they fall through the clouds. As the hailstones reach the bottom of the clouds the wind updrafts may send the hail back up into the cloud to repeat the process and continue to grow. When the weight of the hailstones becomes too heavy to be supported by the updrafts, they fall out of the clouds. Hail can be very destructive to plants/crops, animals and property causing over a billion dollars in damage each year nationally. Hail can be as small as a pea and as large as a softball. Most hail has a diameter smaller than a dime; however, there are records of hailstones weighing more than a pound. The very largest recorded hailstone in Illinois was over 5.6 inches in diameter and weighed 26 ounces; however, usually large hail is less than two inches in diameter and as stated above most is smaller than a dime. Most thunderstorms have hail, but not all thunderstorms produce hail at the ground. Temperatures at the upper levels of a thunderstorm are well below freezing, allowing for the development of hail, but sometimes it melts before reaching the surface of the earth. (www.nssl.noaa.gov)

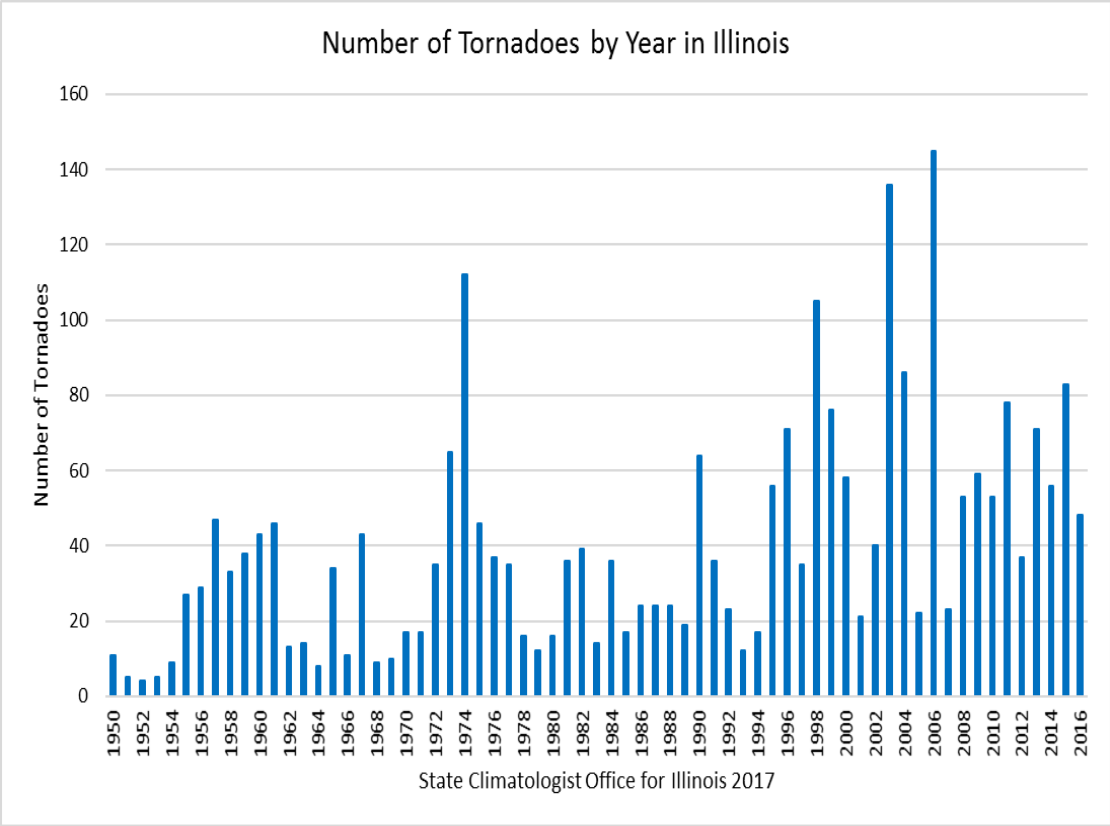
Historical Data

Illinois is situated on the northeast edge of "tornado alley," the tornado-prone area that extends approximately 400 miles on either side of a line from Fort Worth, Texas, to Detroit, Michigan. This area is the battleground of warm, moist air from the Gulf of Mexico and cold air from Canada, resulting in the world's leading breeding area for twisters. The greatest frequency of tornadoes in Illinois occurs in a wide band from Madison and St. Clair counties northeastward to Lake and Cook counties.

Officially, there have been 2,199 tornadoes in Illinois from 1950 through December 31, 2012. Tornadoes can and do occur in any month of the year. Contrary to the belief that there are numerous tornadoes in March, during the last fifty years the primary tornado season in Illinois has been April, May and June. Of the 2,199 tornadoes recorded since 1950, 66 percent (1,457 in number) occurred during the above three months. More than half of all tornadoes occur between the hours of 3:00 PM and 7:00 PM, but they can occur at any time of day or night.



Source: http://www.tornadofacts.net/tornado-alley-facts.php



Source: http://www.isws.illinois.edu/atmos/statecli/Tornado/NewPlots/tornado-year.png

Since 1950, Illinois has averaged 46 tornadoes per year; however, in some years, this average was greatly exceeded. In 1974, 111 tornadoes were reported, and in 1998, 104 were reported. In 1999, 76 tornadoes were reported and in 2003, 136 twisters were reported. The year of 2006 had a record number of tornadoes with 144 tornadoes occurring. According to NOAA, about 1,300 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. Tornado spotting and reporting methods have changed a lot over the last several decades which have increased the accuracy of reporting numbers.

Illinois has one of the higher tornado death tolls of the 50 states due to rare, intense tornadoes that have directly struck towns or cities. Since 1916, the state has recorded 1,129 tornado deaths. Of the 921 deaths prior to 1953, 695 occurred in 1925 in the Great Tri-State Tornado. This is the deadliest tornado in United States history. From 1950 through 2017, there have been 222 deaths in Illinois due to tornadoes. Twenty-nine of these came in the Plainfield-Joliet tornado on August 28, 1990 (FEMA 878-DR). This was the worst tornado to hit Illinois since 1967, when a twister struck Oak Lawn and Belvidere, killing 57.

Tornado outbreaks on May 9, 13, and 18, 1995 brought 54 tornadoes throughout the entire state, five reaching the F3 level and two the F4 level of the Fujita Scale. Even though there were no deaths attributed to these twisters, 87 people were injured, and the F3 and F4 tornadoes alone caused over $37,800,000 in property damage. Tornado outbreaks of this magnitude are not uncommon in Illinois.

Another such outbreak occurred on April 19, 1996, (FEMA-1110-DR) when 41 tornadoes were reported across central and east-central Illinois. In this outbreak, one tornado was reported to have been on the ground for over 3.5 hours and traversed virtually the entire state from eastern Pike County into Indiana. Nearly 90 percent of Ogden, a small town east of Champaign, was impacted when this tornado moved through Champaign County. A path of such incredible length is similar to the devastating tornadoes in Illinois in 1917 and 1925. However, due to the improved warning systems, as well as what lies in the path of tornadoes, only one person was killed in 1996 versus 695 fatalities in 1925. When comparing the 102 counties in Illinois, the five leading tornado counties by square mile are: Will (60 tornadoes), Logan (59), McLean (103), Sangamon (75), and Tazewell (54). April and May 2002 saw an outbreak of tornadoes beginning in Wayne County on April 21st with seven more occurring on April 28th in Clay, Franklin, Johnson, Pope, Saline, St. Clair and Union counties and the last one occurring May 9th in Marion County. These tornadoes resulted in five fatalities, 100 injuries, over 20 homes destroyed and approximately 200 damaged. (FEMA 1416-DR)

Between May 4 and May 10, 2003, tornadoes and damaging winds struck the extreme southern tip and the mid-western portion of the state. This week was unprecedented in American meteorological history. A series of damaging storms that included nearly 400 tornadoes covered seven states including 214 counties. In Illinois, 26 tornadoes struck 13 counties during this time period. One of the 26 tornadoes was a F4 tornado that struck southern Illinois and another of the 26 was a F3 that struck central Illinois. One of these was 1,000 yards wide and traveled for 14 miles and the other one traveled 33 miles in distance. This outbreak of tornadoes resulted in two fatalities that occurred during the storms (one additional death resulting from a heart failure suffered during the cleanup efforts was reported and is attributed to the event) and 75 injuries. Approximately 25 homes were destroyed and approximately 200 homes damaged with property damage exceeding 35 million. Flooding also occurred during this period and a total of 16 counties received the Federal Disaster Declaration. (FEMA 1469-DR)

On April 20, 2004, fifteen tornadoes were spotted across northern Illinois. The core counties with the greatest damage were Kankakee, LaSalle, Putnam and Will. The Village of Utica in LaSalle County was struck by an F3 tornado resulting in eight deaths, four serious injuries and serious impacts to the downtown area (businesses, city hall, elementary school and fire station). The F3 tornado in Utica caused eight deaths when a building collapsed where individuals were seeking safe shelter from the storm. In Granville, in Putnam County, six blocks of modest homes suffered major to minor damage. In addition to the loss of life, these storms caused seven injures and over $4 million in damage (over 660 homes damaged, 20 destroyed and 87 with major damage). (FEMA 1513-DR)

On March 12, 2006, an unusually long-tracked supercell thunderstorm moved across the central United States. The supercell caused significant damage across several central Illinois counties. Although Sangamon County received the most damage, Greene, Logan, Morgan, Randolph and Scott counties also received damage. A significant portion of the storm was caused by straight-line winds as opposed to tornados; however, two F2 tornados also caused much damage, especially in the City of Springfield. More than two dozen people were injured, the damages totaled over $15 million in public (business and government) and private property damage and thousands lost electricity for days. (FEMA 1633-DR)

On February 29, 2012, a severe thunderstorm produced a devastating EF4 tornado in southern Illinois. The tornado had an average width of 275 yards and a track length of over 26 miles. The tornado originally touched

down one mile north of Carrier Mills and tracked to Harrisburg. The deadly tornado resulted in over 100 injuries and eight fatalities and destroyed or heavily damaged over 200 homes and approximately 25 businesses.

On November 17, 2013, two EF4 tornadoes touched down in New Minden and Washington, leaving five dead and 127 injured.

On February 28, 2017, LaSalle, Woodford, Jackson, Franklin and White Counties experienced EF3 tornadoes leaving three dead and 15 injured. Estimated property damage was $10,300,000. Between 2012 and 2017, total damage from EF3 and EF4 tornadoes is estimated at $995,000,000. (Chris Miller, NWS)

The following list of tornadoes, recorded by IEMA, have occurred in Illinois in recent years. In some cases, the FEMA number or predecessor agency number is in parentheses.

March 18, 1925	Tri-State Tornado was the deadliest and most powerful tornado in the United States history. It killed 695 people, injured 2000, destroyed 15,000 homes and 40% of Murphysboro, IL was destroyed. It's 219-mile path began in Missouri and stayed on the ground until it ended in Indiana three and a half hours later. At times it reached one mile in width.
March 4, 1961	Chicago South Side (91st and Western northeast to 67th Street and Lake Michigan), one person killed, with more than 115 people injured and over $7 million in damages
April 21, 1967 (OEP 227-DR)	Cities of Belvidere and Oak Lawn in northern Illinois, 57 killed, close to 1000 injured, and over $100 million in damages.
April 3, 1974 (FDAA 427-DR)	City of Decatur in Macon County, one person killed, 26 injured, and $2 million in damages.
April 3, 1974 (FDAA 438-DR)	City of Morris in Grundy County, two people killed, over 1,000 injured statewide, and $25 million in damages.
May 20, 1975	City of Park Ridge and northeast Chicago area, one person killed, six injured, and $2 million in damages.
July 23, 1975 (FDAA 478-DR)	City of Canton in Fulton County, three people killed, more than 69 injured, and $7 million in damages.
March 12, 1976	Village of Wilmette, a northern Chicago suburb, two people killed, 41 injured, and $14 million in damages.
June 13, 1976 (FDAA 509-DR)	Villages of Downers Grove and Lemont, two people killed, 23 injured, and $3 million in damages.

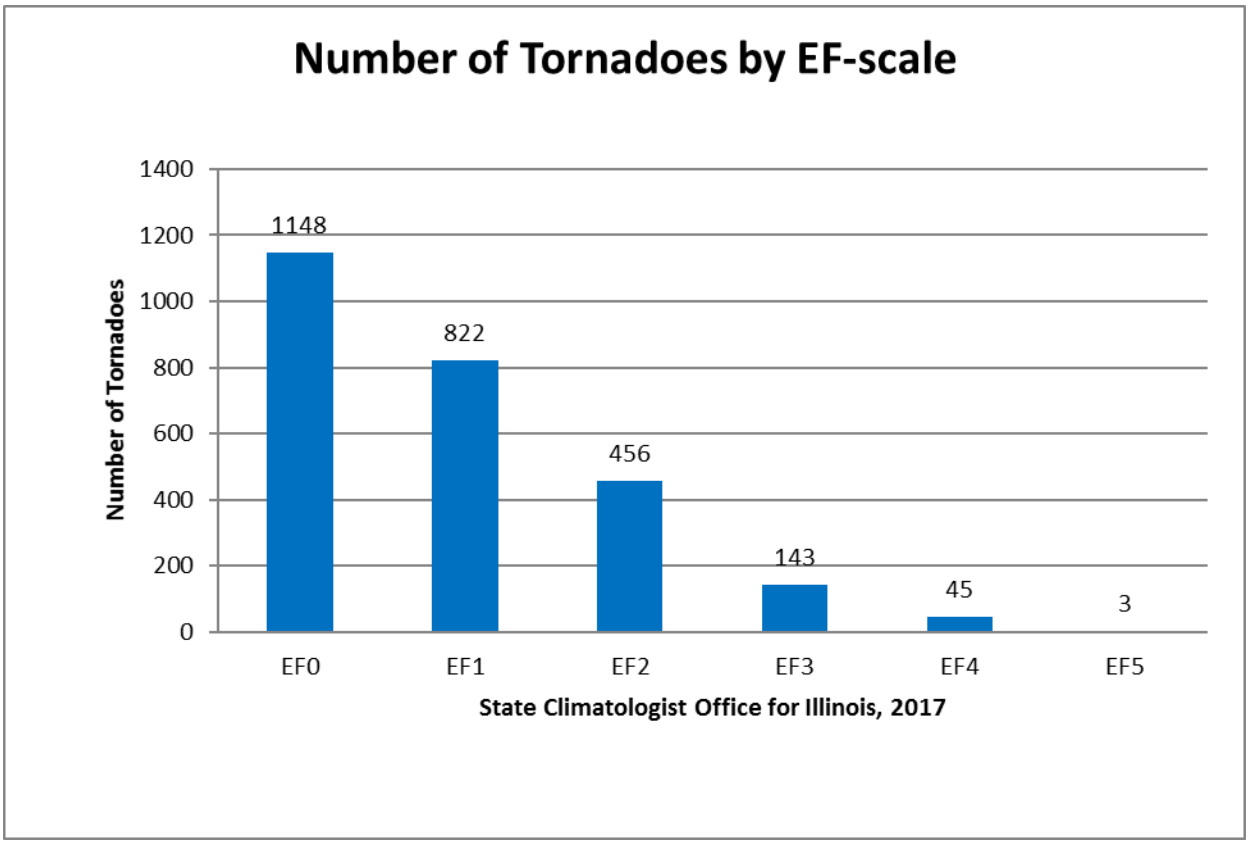
May 29, 1982 (FEMA 660 DR)	City of Marion in Williamson County and unincorporated community of Conant in Perry County, 12 people killed, 188 injured, $100 million in damages.
December 2, 1982 (FEMA 674-DR)	Village of New Baden in Clinton County, two killed, no injuries, but $20 million in damages (27 counties total of which 26 were for flooding).
April 27, 1984	Grundy County and Village of Plainfield in Will County, one killed, five injured, and $3 million in damages.
January 7, 1989 (FEMA 819-DR)	Village of Allendale in Wabash County in southern Illinois, no fatalities, but $1.3 million in damages.
June 20, 1990 (FEMA 871-DR)	Village of Findlay in Shelby County, City of Newton in Jasper County, Wabash County, one killed, 13 injured, $6.4 million in damages.
August 28, 1990 (FEMA 878-DR)	Village of Plainfield and City of Joliet in Will County, 29 killed, 350 injured, $200 million in damages.
November 19, 1991	City of Marion in Williamson County, no fatalities, 24 injured, and $3.6 million in damages, SBA declaration.
April 19, 1996 (FEMA 1110-DR)	Villeage of Ogden in Champaign County and City of Decatur in Macon County, one killed. 41 tornadoes in one day (Illinois record).
April 21-May 9, 2002 (FEMA 1416-DR)	April 21, Wayne County, one death and 42 injuries. April 28, City of Flora in Clay County; City of Sesser in Franklin County; Village of Cypress in Johnson County; City of Golconda in Pope County; Village of Galatia in Saline County; City of Belleville, Villages of Swansea and Shiloh in St. Clair County; and Village of Dongola in Union County; two fatalities and 49 injuries. May 9, City of Centralia in Marion County, two deaths, nine injuries, 22 homes destroyed, 194 damaged.
May 2003 (FEMA 1469-DR)	May 4 and 6, Village of Joppa and the unincorpated community of Hillerman in Massac County May 4 and 6, City of Golconda and the unincoporated communities of Bay City and Temple Hill in Pope County May 6, Village of Grand Chain in Pulaski County, the unincorporated community of Willard in Alexander County May 10, Village of Liberty and the unincorporated community of Meyer in Adams County, the unincorporated community of Tioga in Hancock County; Village of Tennessee in McDonough County, village of Timewell in Brown

	County, City of Rushville in Schuyler County; Village of Ipava and the unincorporated community community of Astoria in Fulton County, City of Havana and Village of Manito in Mason County, Villages of South Pekin and Morton in Tazewell County, City of Eureka in Woodford County, JVillage of Wheeler in asper County, two deaths, 75 injuries, 28 homes destroyed and 194 damaged.
July 4, 2003	Cook, Hancock, Henry, Iroquois, McLean, Stark and Winnebago counties, destruction to homes, businesses, other structures and trees causing broken power lines.
May 30-31, 2003	Logan and DeWitt counties, destruction to homes, businesses, other structures and trees.
April 20, 2004 (FEMA 1513-DR)	Kankakee, LaSalle, Putnam and Will counties, eight deaths, seven injuries, over 660 homes damaged, 20 destroyed, 87 with major damage and over $4 million in damage. All received Individual Assistance and only LaSalle and Putnam Counties received Public Assistance.
May 24 and 26, 2004	Hardin, Morgan, Pike and Scott counties, homes and businesses damaged, topped trees and power lines causing one fatality.
July 13, 2004	City of Danville and Vermilion County, City Champaign and Woodford counties, 500 homes and businesses, industrial buildings and farm operations damaged, downed trees and power lines.
March 11-13, 2006 (FEMA 1633-DR)	City of Springfield in Sangamon County, Greene County, Logan County, Morgan, County, Randolph County, Scott County, more than two dozen injured, over $15 million in damage: public and private property damage, thousands lost electricity for days. All counties received Public Assistance. Greene, Morgan and Sangamon counties received Individual Assistance.
April 2, 2006	Central Illinois (18 counties), one death, dozens of injuries, 564 homes and 91 businesses damaged.
July 19 and 21, 2006	Metro East area continuing through the City of Mt. Vernon in Jefferson County, homes and businesses damaged, power outages intensifying extreme heat
September 26, 2006	A series of tornadoes in Cook, Jackson, Pope, Massac, Washington, and Pike counties, over $1.3M worth of damage.
August 23, 2007	An F1 tornado with a path length of 2.67 miles and a path width of 300 to 500 yards was confirmed in DuPage County. Damage to trees and minor structural damage was reported.

January 7, 2008	An F3 tornado touched down north of the Village of Poplar Grove in Boone County and ended northeast of the City of Harvard in McHenry County, $4 million in property damages were reported.
June 7, 2008	A single thunderstorm that produced eight different tornadoes as it moved east across Illinois caused more than $11.5 million in damage in Livingston, Kankakee, Will, and Cook counties.
May 8, 2009 (FEMA 1850-DR)	A storm, known as a derecho, produced 39 tornadoes in its path including two F3s.
August 19, 2009	A tornado touched down in th Village of Williamsville (Sangamon County). The maximum wind speed at this point was estimated at 140 mph (EF3). The tornado continued through fields, causing extensive crop damage, until crossing into Logan County. Seven tornadoes touched down on August 19, affecting parts of Scott, Morgan, Sangamon, Logan, DeWitt, McLean, and Vermilion counties.
June 5, 2010	Showers and thunderstorms moved east across portions of central and northern Illinois during the overnight and early morning hours. Twelve tornadoes were confirmed by the NWS to have moved across portions of northern Illinois, causing significant damage across portions of LaSalle, Livingston and Kankakee counties. Six of these tornadoes appear to have been associated with particular cyclic supercell storm. The storm produced six EF0, two EF1, two EF2 and two EF3 tornadoes.
April 29, 2011	A severe outbreak of thunderstorms caused two EF2 tornados and one EF3 tornado in Montgomery and Macoupin counties, causing significant damage to homes, outbuildings, farm steads and power poles. The EF2 tornados touched down in the unincorporated community of Honey Bend and the Village of Farmersville, while the EF3 struck the City of Girard.
February 29, 2012	A severe thunderstorm produced a devastating EF4 tornado in Williamson County. The tornado had an average width of 275 yards and a track length of over 26 miles. The tornado originally touched down1 mile north of Carrier Mills and tracked to Harrisburg. Over 200 homes and approximately 25 businesses were heavily damaged or destroyed. The tornado resulted in over 100 injuries and eight fatalities.
November 17, 2013	A total of 10 tornadoes touched down across central Illinois, including an EF4 tornado that severely impacted the community of Washington in Tazewell County. Three people were killed and 142 others were injured as the storms tracked through the area. Total damage was estimated at $1.06 billion across central Illinois.

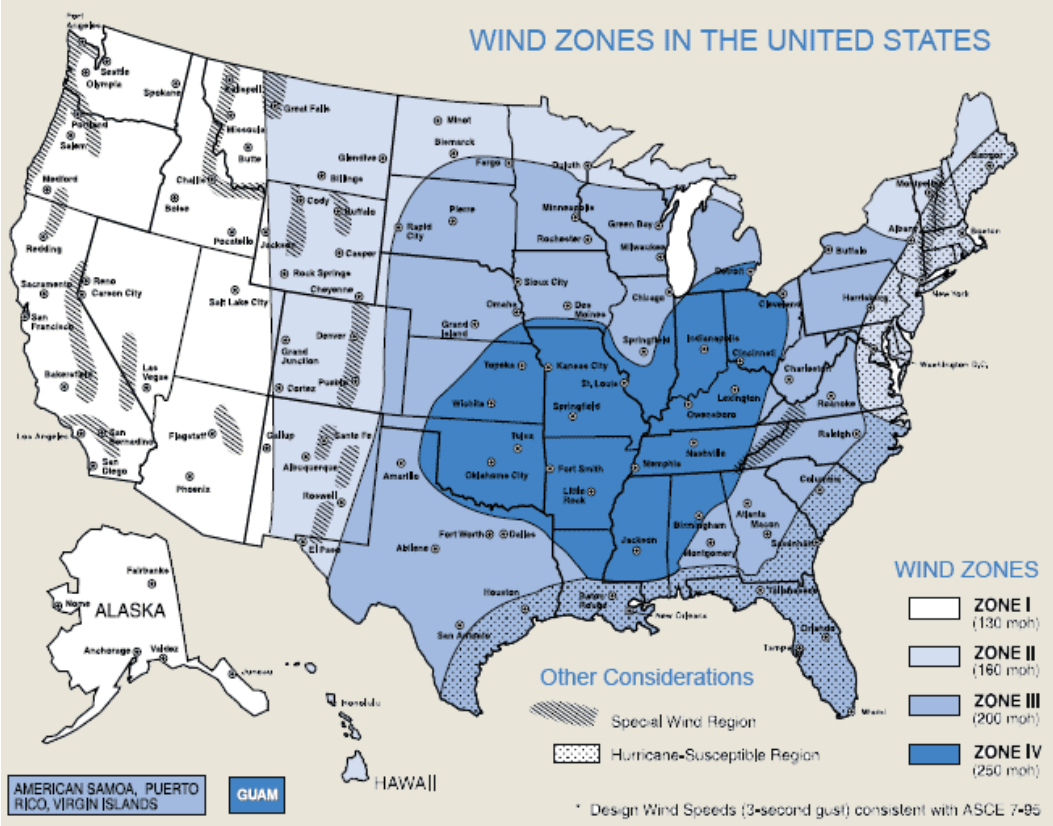
April 9, 2015	Seven tornadoes were confirmed in north central Illinois. A long-track violent tornado destroyed numerous homes and farmsteads along its path across north central Lee, eastern Ogle, northwest DeKalb, and southern Boone counties. This path included the far northwest side of Rochelle, Interstate-39, and a direct hit in the community of Fairdale where two fatalities occurred and 11 injuries occurred. This was the strongest tornado in the NWS Chicago are since the F5 tornado that struck Plainfield on August 28, 1990. At its strongest, peak winds were estimated to be 200 mph. The tornado entered the county just southwest of Fairdale before directly hitting the small community. Peak winds were estimated at 165 mph in DeKalb County, rating this section of the tornado a high end EF3. Approximately 71 homes in the community had been damaged, 17 of which had been completely destroyed with all walls collapsed or removed from the buildings.
March 15, 2016	An EF2 tornado tracked north then curved to the east through upper Rock Island County. An estimated 40 homes were damaged with the most severe damage to a neighborhood in rural East Moline where 10 homes were completely destroyed. Ten people reported minor injuries. The maximum wind with this tornado were estimated at 130 mph.
February 28, 2017	Seven tornadoes were confirmed in the NWS Chicago county warning area. Large hail was reported in numerous areas. The first area of significant damage in the EF2 range was in the area around the LaSalle County Nursing Home and LaSalle County Highway Department, with lighter damage upstream from this location. The tornado continued into the Village of Naplate and produced widespread EF2 damage to numerous homes. EF3 damage also was identified in two locations.

The following is a graph supplied by the Illinois State Water Survey depicting tornadoes by intensity in Illinois. Using tornado statistics provided by the NCDC, Michael Patrick, Department of Atmospheric Science at the University of Illinois, explored the relationship of selected tornado characteristics as part of a Capstone project. This graph below shows the number of tornadoes in each category of the Enhanced Fujita scale. The majority of the tornados in Illinois are at the weaker end of the Fujita scale. These "EF0", tend to cause little if any damage and injuries or deaths are rare. The worst category of tornadoes, an "EF5," are extremely rare. Only three have occurred in the records since 1950.



Source: http://www.isws.illinois.edu/atmos/statecli/Tornado/ilplots.htm

Although they do not receive as much recognition as tornado events, thunderstorm winds cause more damage year-to-year than tornadoes. In 1993 alone, 38 events of thunderstorm winds caused a minimum estimate of well over five million dollars in damage, while the 34 tornadoes caused a maximum of just over 1.5 million dollars. Seven severe thunderstorms traversed the state in June of 1993, creating most of this damage, but significant losses occurred in seven other months. In the 10-year period from 1981 to 1990, damage estimates from severe wind equaled or exceeded damages caused by tornadoes in five of the years. In May of 2009, an extremely progressive storm moved from Southeastern Kansas, into Southern Missouri and ending up in Southwestern Illinois. A storm, known as a derecho, produced 39 tornadoes in its path including two F3s. A derecho is described as a widespread and straight-lined windstorm that often has a band of rapidly moving thunderstorms associated with it. These conditions are ripe for generating multiple tornadoes that can cause severe damage. Southern Illinois suffered damaging winds of above 80 mph, as well as numerous reports of flash flooding. It is estimated that at one point 68,000 people were left without power as a result of the storm. In addition, death tolls from severe winds exceeded tornado deaths for six of these years, and the number of injuries caused by severe wind was greater in three years. (Data from *Storm Data* publication, NOAA/NWS). The damages caused by high winds have been relatively consistent from year-to-year. Cook County reported a damage of $17 million from 784 thunderstorms and strong winds between 1951 -2017.



Source: https://icfresource.com/lg-wndmap.html

Lightning kills more people than tornadoes or hurricanes. Most lightning fatalities and injuries occur outdoors at recreation events and under or near trees. Lightning is most likely to happen in the spring and summer during late afternoon and evening. Nationwide ,it is estimated that 25 million cloud-to-ground lightning flashes occur each year, 1,000 people are injured, and 60 people are killed with about $5 billion in economic impact resulting from lightning. According to Chris Miller, NWS, "Illinois experiences nearly 650,000 lightning strikes each year." Illinois ranks high among the 50 states for lightning fatalities. Over the past 50 years, 99 people

have been killed by lightning in Illinois. As a result, IEMA and NWS have established the Lightning Safety Awareness Week as a public education project.

Hail occurs frequently in Illinois averaging 74 times a year, or 3,951 times since 1950. There have been no deaths, but there have been 23 injuries. Hail does extensive damage: property damage over $73 million and crop damage over $5 million in the last 53 years. The potential size of hail stones illustrates the damage they can cause. On April 23, 1961, several six-inch hail stones were reported in Kankakee, IL. While six inches is very unusual, 46 events had hail stones greater than three inches; in the 2-3 inch range, 281 events occurred causing 15 of the 23 injuries. On, May 21, 2014, the City of Tuscola in Douglas County experienced very large hail up to four inches in size and caused $100 million in damage.

Risk Analysis

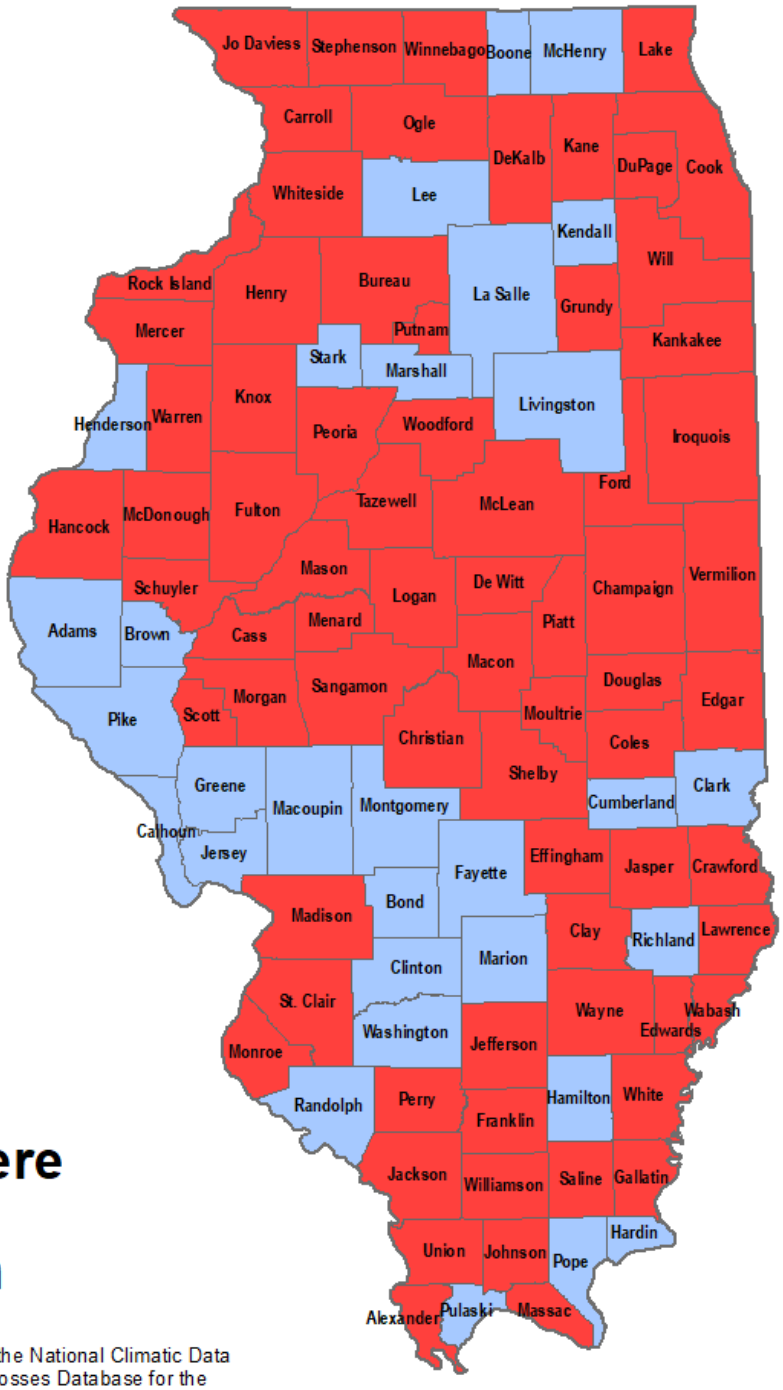
Severe storms, tornadoes, winds, lightning and hail all occur separately and together in various combinations in Illinois. The historical data supports the fact that severe storms and tornadoes can and do happen here frequently. It is impossible to predict when and where one of these storms may occur. Tornadoes are more likely to happen between 3 p.m. and 7 p.m. during April, May and June.

In 25 years, the state has had 10 wind related presidential disaster declarations. This calculation is a wind event every two and one-half years severe enough for a federal declaration. Tornados/high winds are a continuous threat to the state as discussed and indicated on the maps. Pages 35 and 36 have maps indicating risk by county for severe storm and tornado. The Severe Storm Map shows the whole state is in a high to severe category for a severe storm. The Tornado Map indicates an elevated to high pattern from St. Louis to northeastern Illinois. History verifies that tornadoes have and will strike all areas of the state. In 2003, an F4 tornado struck the southern tip of the state, and an F4 struck the northern Belvidere area in 1967. F5 tornadoes, the most severe, have occurred in Illinois. Three are listed here: in December 1957 in Perry County, and August 1990 in Kendall and Will counties. One of these F5 tornadoes was in southern Illinois and the other two were in northern Illinois. On April 9, 2015, th Ogle County community of Fairdale had an EF4 tornado that led to $10 million in property damage.

History proves that at any time of the day, and on any day of the year, an F5 tornado could strike any place in Illinois. This path of destruction could be over a mile wide and as much as 50 miles long.

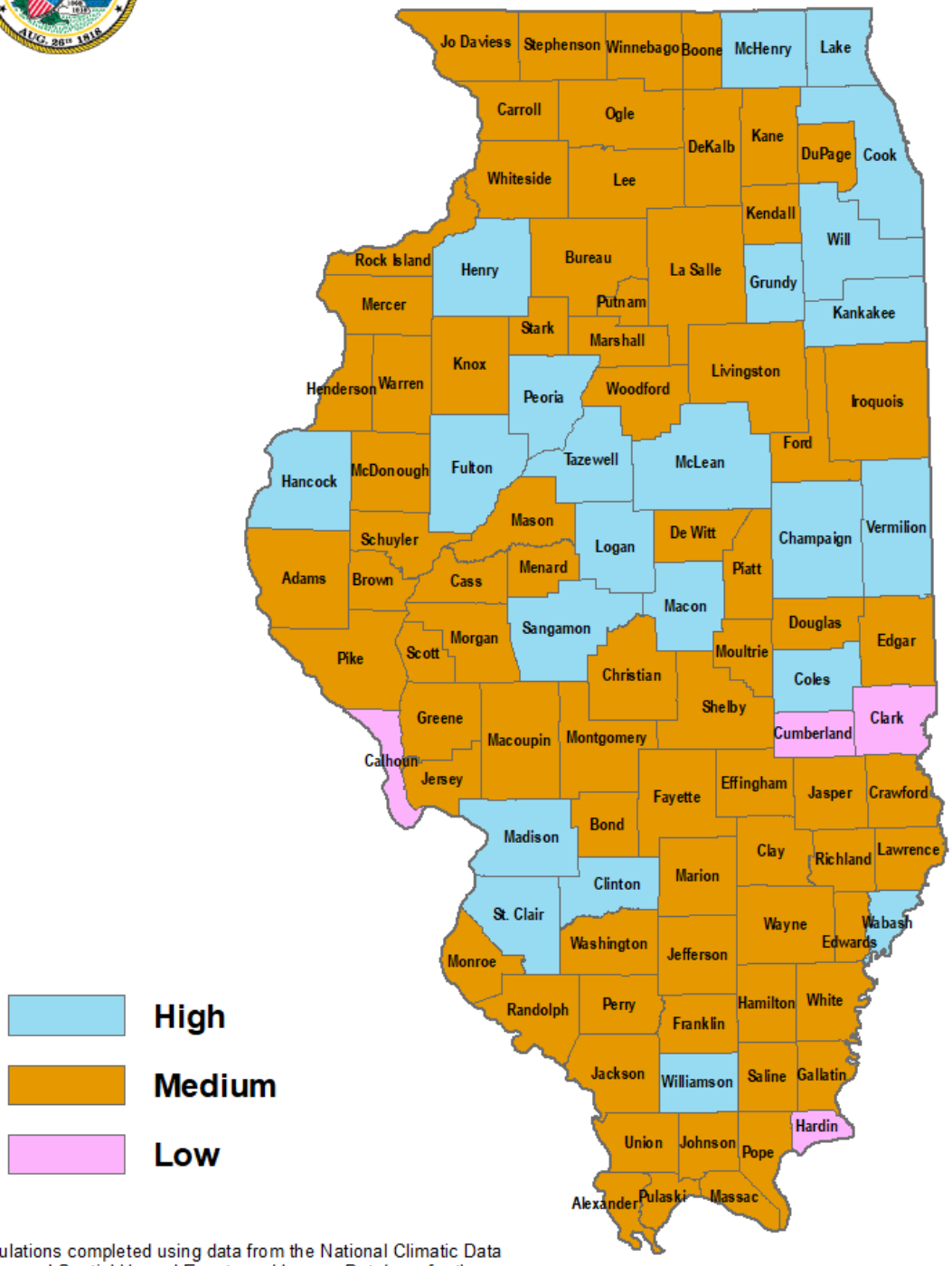
As stated, the entire state is vulnerable to tornadoes and high winds. Unfortunately, the State does not have a uniform standard building code. All areas in the state are at risk and each unit of government adopts and enforces the building codes they chose. The State has no authority in this matter and based on information received from the Capital Development Board, Division of Building Codes and Regulations Planning Team Member there is strong opposition to a statewide uniform building code.

IEMA Illinois Natural Hazard Mitigation Plan
Severe Storms Hazard Rating by County



Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

IEMA Illinois Natural Hazard Mitigation Plan
Tornado Hazard Rating by County



Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

TORNADO RANK BY COUNTY - Normalized by Tornadoes per 100 square miles

Between 1950 and 2017

RANK	COUNTY	Tornadoes per 100 sq. miles	Total Tornadoes	County Area (sq.mi)
1	Will	11.88	69	581
2	Logan	9.55	59	618
3	Sangamon	8.99	78	868
4	Tazewell	8.94	58	649
5	McLean	8.78	104	1184
6	Woodford	7.77	41	528
7	Monroe	7.73	30	388
8	Wabash	7.62	17	223
9	DuPage	7.49	25	334
10	Madison	7.45	54	725
11	Champaign	7.32	73	997
12	Macon	7.29	61	837
13	Piatt	6.82	30	440
14	Alexander	6.78	16	236
15	Randolph	6.75	39	578
16	Douglas	6.71	28	417
17	Kankakee	6.65	45	677
18	Vermilion	6.56	59	899
19	Putnam	6.25	10	160
20	Mason	6.12	33	539
21	Coles	6.10	31	508
22	Rock Island	6.09	26	427
23	St. Clair	6.02	40	664
24	Ford	5.97	29	486
25	Mercer	5.88	33	561
26	DeWitt	5.78	23	398
27	Morgan	5.62	32	569
28	Jackson	5.61	33	588
29	Cook	5.60	53	946
30	Massac	5.44	13	239
31	Warren	5.34	29	543
32	Bond	5.26	20	380
33	Christian	5.22	37	709
34	Johnson	5.22	18	345
35	Washington	5.15	29	563

RANK	COUNTY	Tornadoes per 100 sq. miles	Total Tornadoes	County Area (sq.mi)
36	Henry	4.98	41	823
37	Pulaski	4.98	10	201
38	Montgomery	4.97	35	704
39	Jefferson	4.90	28	571
40	Scott	4.78	12	251
41	McDonough	4.75	28	589
42	Marion	4.72	27	572
43	Edgar	4.65	29	624
44	Boone	4.63	13	281
45	Schuyler	4.58	20	437
46	Union	4.57	19	416
47	Edwards	4.50	10	222
48	Clinton	4.43	21	474
49	Effingham	4.38	21	479
50	Kendall	4.36	14	321
51	Grundy	4.29	18	420
52	Fulton	4.27	37	866
53	Livingston	4.21	44	1044
54	Richland	4.17	15	360
55	Stark	4.17	12	288
56	Perry	4.08	18	441
57	Carroll	4.05	18	444
58	Kane	4.04	21	520
59	Lake	4.02	18	448
60	Lee	4.00	29	725
61	Shelby	3.95	30	759
62	Macoupin	3.94	34	864
63	Bureau	3.91	34	869
64	Franklin	3.88	16	412
65	LaSalle	3.88	44	1135
66	Iroquois	3.85	43	1116
67	Whiteside	3.80	26	685
68	Jersey	3.79	14	369
69	Peoria	3.71	23	620
70	Wayne	3.64	26	714
71	White	3.64	18	495
72	Knox	3.63	26	716
73	Calhoun	3.54	9	254

RANK	COUNTY	Tornadoes per 100 sq. miles	Total Tornadoes	County Area (sq.mi)
74	Pope	3.50	13	371
75	Adams	3.50	30	857
76	Pike	3.49	29	830
77	Cumberland	3.47	12	346
78	Henderson	3.43	13	379
79	Crawford	3.38	15	444
80	Hancock	3.27	26	795
81	Clay	3.20	15	469
82	Menard	3.18	10	314
83	McHenry	3.15	19	604
84	Saline	3.13	12	383
85	Jasper	3.04	15	494
86	Greene	2.95	16	543
87	Fayette	2.93	21	716
88	Marshall	2.85	11	386
89	Ogle	2.77	21	759
90	Winnebago	2.72	14	514
91	Lawrence	2.69	10	372
92	Brown	2.61	8	306
93	Williamson	2.60	11	423
94	Hamilton	2.53	11	435
95	Gallatin	2.47	8	324
96	Cass	2.39	9	376
97	Moultrie	2.38	8	336
98	DeKalb	2.37	15	634
99	Stephenson	2.30	13	564
100	Hardin	2.25	4	178
101	Jo Daviess	2.00	12	601
102	Clark	1.99	10	502

Source: Chris Miller, National Weather Service, Lincoln, Illinois, 2017

Loss Estimation for Tornadoes and Severe Storms

All properties in counties affected by severe storms and tornado-prone were considered at-risk for damages, and the risks for each county were calculated from historic data compiled by the NCDC, most importantly the Storm Events Database. The total number of tornadoes and severe storms reported over a 66-year period were divided by the number of years in the reporting period, to establish the annual number of tornadoes and severe storms that each county would be expected to have, in probabilistic terms. Then, an average dollar amount of property damage (not including crop damages), for each event was compiled from the same data source. The expected number of tornadoes and severe storms per county was then multiplied by the average historic damages reported for each event, to produce an estimate of annual dollar losses. The 66-year period

that produces information for this study is 1951 to 2017. Utilizing the NCDC data for this time period, tornadoes produced a total of $2.9 billion dollars, while severe storms totaled over $738 million dollars statewide in damage. Higher risks are associated to areas with increased populations as well as residential growth. Part of this is due to populations shifting to areas previously uninhabited by humans. The population of Illinois has increased by 13.0% since the 2000 Census. Ten counties have experienced a population increase of 25% or greater since 2000. These counties include: Alexander, Hardin, Henderson, Jersey, Jo Daviess, McHenry, Mason, Pulaski, Warren and Will. The majority of the counties that experienced 25 percent or greater growth were located in the northeastern section of the state. However, the additional counties experiencing growth were located in all portions of the state, providing no correlation to geographical location.

Future plans will continue to keep track of these high growth populations and note that they have the potential for higher vulnerability to climate extremes. Census data will aid in providing this information, and will continue to be updated as future census data is formulated. For an example of how losses were estimated, consider the tornado data for Adams County, which has had 30 reported tornadoes between 1951 and 2017. This translates to an annual probability of 45%. (30/66=.454545) Each tornado event has averaged $110,733 in damage within the county ($3.322,000 million total damages divided by 30 events) and so $110,733 average per event, times a .454545 chance of an event per year, equals $50,333. Some of these figures are rounded off when they appear in the Loss Estimation Table.

It should be noted that certain counties may reflect higher numbers than their neighboring jurisdictions. Examples are losses in areas such as Williamson, Will, Madison and Sangamon counties. Becuase these jurisdictions have had large tornado or severe storm events in the past, the average damage per event is higher in dollar amounts. Our formula looks for the average dollar amount in damages calculated by dividing total previous county damages by the amount of tornadoes. Thus, the higher the damages are for one event, the more skewed the projected losses are. The emphasis here is to say that risks cannot be diminished just because one county has not had a large scale damaging tornado or severe storm.

Once this calculation has been made for all tracts in a county, the results can be totaled to develop an estimate at the county level. The following figure provides the result of this analysis for counties within the state.

Tornado Loss Estimates by County					
County	# of Tornadoes 1951-2017 (NCEI)	Total Recorded Loss (NCEI)	Average $ in crop & prop damage per event	Annual Probability of Event	Estimated Annual Loss
Adams	30	$3,322,000	$110,733	45%	$50,333
Alexander	16	$1,594,000	$99,625	24%	$24,152
Bond	19	$2,950,000	$155,263	29%	$44,697
Boone	14	$2,697,000	$192,643	21%	$40,864
Brown	9	$2,845,000	$316,111	14%	$43,106
Bureau	37	$5,200,000	$140,541	56%	$78,788
Calhoun	9	$425,030	$47,226	14%	$6,440
Carroll	17	$2,618,000	$154,000	26%	$39,667
Cass	8	$2,025,000	$253,125	12%	$30,682
Champaign	67	$103,811,000	$1,549,418	102%	$1,572,894
Christian	37	$2,673,000	$72,243	56%	$40,500
Clark	10	$425,300	$42,530	15%	$6,444
Clay	15	$3,280,000	$218,667	23%	$49,697
Clinton	22	$30,825,000	$1,401,136	33%	$467,045
Coles	31	$19,936,000	$643,097	47%	$302,061
Cook	53	$118,328,000	$2,232,604	80%	$1,792,848
Crawford	17	$1,605,000	$94,412	26%	$24,318
Cumberland	12	$332,500	$27,708	18%	$5,038
DeKalb	14	$8,350,000	$596,429	21%	$126,515
DeWitt	22	$14,908,000	$677,636	33%	$225,879
Douglas	27	$8,075,000	$299,074	41%	$122,348
DuPage	26	$12,463,000	$479,346	39%	$188,833
Edgar	29	$662,560	$22,847	44%	$10,039
Edwards	10	$5,683,000	$568,300	15%	$86,106
Effingham	20	$2,088,000	$104,400	30%	$31,636
Fayette	20	$3,745,250	$187,263	30%	$56,746
Ford	30	$6,389,000	$212,967	45%	$96,803
Franklin	17	$7,167,000	$421,588	26%	$108,591
Fulton	35	$39,234,000	$1,120,971	53%	$594,455
Gallatin	8	$1,323,000	$165,375	12%	$20,045
Greene	17	$3,603,000	$211,941	26%	$54,591
Grundy	19	$61,934,000	$3,259,684	29%	$938,394
Hamilton	11	$9,012,000	$819,273	17%	$136,545
Hancock	27	$34,563,000	$1,280,111	41%	$523,682
Hardin	4	$25,030	$6,258	6%	$379

Tornado Loss Estimates by County					
County	# of Tornadoes 1951-2017 (NCEI)	Total Recorded Loss (NCEI)	Average $ in crop & prop damage per event	Annual Probability of Event	Estimated Annual Loss
Henderson	13	$8,365,000	$643,462	20%	$126,742
Henry	44	$24,700,000	$561,364	67%	$374,242
Iroquois	43	$9,181,000	$213,512	65%	$139,106
Jackson	35	$10,848,000	$309,943	53%	$164,364
Jasper	14	$892,500	$63,750	21%	$13,523
Jefferson	29	$13,029,000	$449,276	44%	$197,409
Jersey	16	$5,577,000	$348,563	24%	$84,500
Jo Daviess	13	$525,250	$40,404	20%	$7,958
Johnson	18	$3,935,000	$218,611	27%	$59,621
Kane	19	$3,728,000	$196,211	29%	$56,485
Kankakee	44	$33,778,000	$767,682	67%	$511,788
Kendall	14	$5,375,000	$383,929	21%	$81,439
Knox	24	$7,127,000	$296,958	36%	$107,985
Lake	17	$15,703,000	$923,706	26%	$237,924
LaSalle	56	$9,493,000	$169,518	85%	$143,833
Lawrence	9	$3,430,000	$381,111	14%	$51,970
Lee	29	$2,993,000	$103,207	44%	$45,348
Livingston	43	$10,245,000	$238,256	65%	$155,227
Logan	59	$41,582,000	$704,780	89%	$630,030
Macon	61	$22,665,000	$371,557	92%	$343,409
Macoupin	35	$1,103,000	$31,514	53%	$16,712
Madison	51	$62,515,000	$1,225,784	77%	$947,197
Marion	27	$7,635,000	$282,778	41%	$115,682
Marshall	10	$3,317,000	$331,700	15%	$50,258
Mason	33	$6,350,000	$192,424	50%	$96,212
Massac	14	$17,140,000	$1,224,286	21%	$259,697
McDonough	29	$1,928,000	$66,483	44%	$29,212
McHenry	19	$32,825,000	$1,727,632	29%	$497,348
McLean	102	$19,996,000	$196,039	155%	$302,970
Menard	9	$12,475,000	$1,386,111	14%	$189,015
Mercer	34	$5,315,000	$156,324	52%	$80,530
Monroe	31	$1,951,000	$62,935	47%	$29,561
Montgomery	36	$1,711,000	$47,528	55%	$25,924
Morgan	30	$6,011,000	$200,367	45%	$91,076
Moultrie	8	$1,010,000	$126,250	12%	$15,303
Ogle	22	$13,575,000	$617,045	33%	$205,682

Tornado Loss Estimates by County					
County	# of Tornadoes 1951-2017 (NCEI)	Total Recorded Loss (NCEI)	Average $ in crop & prop damage per event	Annual Probability of Event	Estimated Annual Loss
Peoria	27	$92,260,000	$3,417,037	41%	$1,397,879
Perry	18	$3,502,000	$194,556	27%	$53,061
Piatt	28	$7,111,000	$253,964	42%	$107,742
Pike	29	$3,255,000	$112,241	44%	$49,318
Pope	13	$4,901,000	$377,000	20%	$74,258
Pulaski	10	$4,000,000	$400,000	15%	$60,606
Putnam	10	$9,303,000	$930,300	15%	$140,955
Randolph	38	$6,737,000	$177,289	58%	$102,076
Richland	13	$5,605,000	$431,154	20%	$84,924
Rock Island	28	$11,559,000	$412,821	42%	$175,136
Saline	12	$6,545,000	$545,417	18%	$99,167
Sangamon	75	$25,647,000	$341,960	114%	$388,591
Schuyler	17	$3,088,000	$181,647	26%	$46,788
Scott	13	$937,000	$72,077	20%	$14,197
Shelby	30	$7,855,000	$261,833	45%	$119,015
St. Clair	40	$11,667,000	$291,675	61%	$176,773
Stark	12	$2,652,000	$221,000	18%	$40,182
Stephenson	15	$2,973,000	$198,200	23%	$45,045
Tazewell	57	$983,461,000	$17,253,702	86%	$14,900,924
Union	19	$5,984,000	$314,947	29%	$90,667
Vermilion	53	$46,771,000	$882,472	80%	$708,652
Wabash	17	$33,239,000	$1,955,235	26%	$503,621
Warren	29	$2,476,000	$85,379	44%	$37,515
Washington	29	$1,050,000	$36,207	44%	$15,909
Wayne	26	$10,931,000	$420,423	39%	$165,621
White	20	$8,597,000	$429,850	30%	$130,258
Whiteside	30	$5,650,000	$188,333	45%	$85,606
Will	67	$350,317,000	$5,228,612	102%	$5,307,833
Williamson	13	$278,091,000	$21,391,615	20%	$4,213,500
Winnebago	16	$5,440,000	$340,000	24%	$82,424
Woodford	42	$27,438,000	$653,286	64%	$415,727

Severe Storms Loss Estimates by County					
County	# of Severe Storms 1951-2017 (NCEI)	Total Recorded Loss (NCEI)	Average $ in crop & prop damage per event	Annual Probability of Event	Estimated Annual Loss
Adams	210	$127,050	$605	318%	$1,925
Alexander	105	$1,279,000	$12,181	159%	$19,379
Bond	106	$33,700	$318	161%	$511
Boone	100	$570,000	$5,700	152%	$8,636
Brown	58	$18,500	$319	88%	$280
Bureau	167	$2,346,500	$14,051	253%	$35,553
Calhoun	69	$30,100	$436	105%	$456
Carroll	165	$2,633,500	$15,961	250%	$39,902
Cass	92	$11,068,000	$120,304	139%	$167,697
Champaign	264	$6,771,500	$25,650	400%	$102,598
Christian	153	$1,131,000	$7,392	232%	$17,136
Clark	94	$573,800	$6,104	142%	$8,694
Clay	135	$2,203,500	$16,322	205%	$33,386
Clinton	176	$316,950	$1,801	267%	$4,802
Coles	155	$2,548,000	$16,439	235%	$38,606
Cook	784	$17,242,000	$21,992	1188%	$261,242
Crawford	123	$2,101,000	$17,081	186%	$31,833
Cumberland	66	$580,200	$8,791	100%	$8,791
DeKalb	198	$1,352,000	$6,828	300%	$20,485
De Witt	118	$1,872,000	$15,864	179%	$28,364
Douglas	93	$1,483,000	$15,946	141%	$22,470
DuPage	308	$5,905,500	$19,174	467%	$89,477
Edgar	109	$1,387,000	$12,725	165%	$21,015
Edwards	71	$2,129,000	$29,986	108%	$32,258
Effingham	135	$1,358,000	$10,059	205%	$20,576
Fayette	134	$78,000	$582	203%	$1,182
Ford	89	$1,014,000	$11,393	135%	$15,364
Franklin	162	$9,306,000	$57,444	245%	$141,000
Fulton	213	$2,207,500	$10,364	323%	$33,447
Gallatin	77	$3,129,000	$40,636	117%	$47,409
Greene	82	$18,000	$220	124%	$273
Grundy	140	$5,926,000	$42,329	212%	$89,788
Hamilton	79	$575,050	$7,279	120%	$8,713
Hancock	152	$5,033,000	$33,112	230%	$76,258
Hardin	55	$300,000	$5,455	83%	$4,545

Severe Storms Loss Estimates by County					
County	# of Severe Storms 1951-2017 (NCEI)	Total Recorded Loss (NCEI)	Average $ in crop & prop damage per event	Annual Probability of Event	Estimated Annual Loss
Henderson	68	$511,000	$7,515	103%	$7,742
Henry	210	$77,082,000	$367,057	318%	$1,167,909
Iroquois	161	$1,742,000	$10,820	244%	$26,394
Jackson	217	$103,485,000	$476,889	329%	$1,567,955
Jasper	94	$2,251,000	$23,947	142%	$34,106
Jefferson	144	$14,488,000	$100,611	218%	$219,515
Jersey	103	$10,000	$97	156%	$152
Jo Daviess	166	$1,701,000	$10,247	252%	$25,773
Johnson	112	$1,038,000	$9,268	170%	$15,727
Kane	287	$1,413,000	$4,923	435%	$21,409
Kankakee	196	$2,123,000	$10,832	297%	$32,167
Kendall	130	$298,500	$2,296	197%	$4,523
Knox	152	$4,204,000	$27,658	230%	$63,697
Lake	182	$5,953,000	$32,709	276%	$90,197
La Salle	298	$617,000	$2,070	452%	$9,348
Lawrence	118	$1,388,000	$11,763	179%	$21,030
Lee	143	$291,500	$2,038	217%	$4,417
Livingston	138	$266,500	$1,931	209%	$4,038
Logan	201	$17,994,000	$89,522	305%	$272,636
McDonough	193	$6,616,050	$34,280	292%	$100,243
McHenry	200	$571,500	$2,858	303%	$8,659
McLean	202	$8,102,000	$40,109	306%	$122,758
Macon	187	$6,401,000	$34,230	283%	$96,985
Macoupin	182	$161,620	$888	276%	$2,449
Madison	344	$2,134,000	$6,203	521%	$32,333
Marion	164	$590,360	$3,600	248%	$8,945
Marshall	15	$2,409,000	$160,600	23%	$36,500
Mason	120	$13,519,000	$112,658	182%	$204,833
Massac	127	$2,372,000	$18,677	192%	$35,939
Menard	120	$6,952,000	$57,933	182%	$105,333
Mercer	101	$13,594,000	$134,594	153%	$205,970
Monroe	101	$1,177,000	$11,653	153%	$17,833
Montgomery	162	$20,500	$127	245%	$311
Morgan	140	$14,012,000	$100,086	212%	$212,303
Moultrie	66	$1,529,000	$23,167	100%	$23,167

Severe Storms Loss Estimates by County					
County	# of Severe Storms 1951-2017 (NCEI)	Total Recorded Loss (NCEI)	Average $ in crop & prop damage per event	Annual Probability of Event	Estimated Annual Loss
Ogle	181	$1,073,000	$5,928	274%	$16,258
Peoria	270	$5,110,500	$18,928	409%	$77,432
Perry	135	$3,393,000	$25,133	205%	$51,409
Piatt	84	$1,895,000	$22,560	127%	$28,712
Pike	147	$59,200	$403	223%	$897
Pope	76	$664,000	$8,737	115%	$10,061
Pulaski	92	$650,000	$7,065	139%	$9,848
Putnam	59	$4,649,000	$78,797	89%	$70,439
Randolph	160	$184,300	$1,152	242%	$2,792
Richland	90	$871,000	$9,678	136%	$13,197
Rock Island	228	$1,535,000	$6,732	345%	$23,258
St. Clair	376	$1,017,200	$2,705	570%	$15,412
Saline	147	$7,512,000	$51,102	223%	$113,818
Sangamon	297	$4,186,000	$14,094	450%	$63,424
Schuyler	79	$3,812,000	$48,253	120%	$57,758
Scott	62	$3,228,600	$52,074	94%	$48,918
Shelby	110	$59,845,000	$544,045	167%	$906,742
Stark	66	$462,000	$7,000	100%	$7,000
Stephenson	208	$4,927,000	$23,688	315%	$74,652
Tazewell	241	$6,255,000	$25,954	365%	$94,773
Union	111	$1,842,000	$16,595	168%	$27,909
Vermilion	242	$17,279,500	$71,403	367%	$261,811
Wabash	101	$913,500	$9,045	153%	$13,841
Warren	125	$1,509,250	$12,074	189%	$22,867
Washington	119	$560,500	$4,710	180%	$8,492
Wayne	109	$2,985,000	$27,385	165%	$45,227
White	122	$2,585,000	$21,189	185%	$39,167
Whiteside	224	$1,035,000	$4,621	339%	$15,682
Will	339	$3,705,500	$10,931	514%	$56,144
Williamson	136	$176,227,000	$1,295,787	206%	$2,670,106
Winnebago	235	$5,591,000	$23,791	356%	$84,712
Woodford	158	$1,444,200	$9,141	239%	$21,882

F. Floods

Description

Except for fire, the most common hazard in the United States is flooding with thousands occurring each year. Flooding occurs along the coast, rivers, lakes, small streams, gullies, creeks, and in typically dry streambeds. Sheet flow can occur when the land is saturated or impervious. Ponding can occur in low lying ground. Street flooding and basement flooding are often associated with overwhelmed storm water systems. The standard definition of a flood is "A general and temporary condition of partial or complete inundation of normally dry land areas from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land." A simpler definition is too much water in the wrong place. Since water circulates from clouds to the soil to streams to rivers to the oceans and returns to the clouds, a scientific definition of a flood is an imbalance in the "hydrological system" with more water flowing through the system than the system can draw off.

Floods are not all alike:

- Riverine Floods: Develop slowly, sometimes over a period of days or weeks.
- Flash Floods: Develop quickly, sometimes in just a few minutes. Usually flash floods are the result of intense storms dropping large amounts of rain within a brief period.
- Overland Floods: Occurs outside a defined river or stream (e.g. sheet flow or ponding in a low lying area)
- Aquifer Flood: Water is expelled from a subterranean geologic formation to the surface causing flooding in the immediate area.
- Subterranean Flood: Water floods into tunnels that are normally dry.

Urban Flooding as defined in PA98-0858, the Urban Flooding Awareness Act (effective August 3, 2014) 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."

Snow melt filling rivers too quickly, heavy rainfall associated with slow-moving, low-pressure or frontal storm systems or storm surge create excess water. This water accumulates and overflows onto adjacent lands not normally covered by water. These floods can occur any time of the year, any time of the day or night and in any part of the country. Flooding can be local, impacting a neighborhood or community, or very large, affecting entire river basins and multiple states. The severity of floods is determined by the amount of rainfall or other water source, duration, topography, ground cover, frozen soil, wet or saturated soil that can't hold any more water, full reservoirs, high river or stream levels, ice-covered rivers or urbanization (lots of buildings, parking lots and roads). The majority of scientists believe that global warming causes extremes in weather that have increased flooding. Human activity influences the frequency and severity of floods.

Flood damage is often exacerbated by snow melt and spring rains which create excessive storm water run-off. The paving over of permeable soils and the fact that most storm water drainage systems are only designed for 10-year storm events increase both rural and urban run-off problems. As with all natural

disasters, it is the presence of humans which creates the problem. In the specific case of floods, the floodplain is a clear visual symbol which tells us that, by nature, a river periodically overflows its banks and that we should expect it. Development of the floodplain without any heed to the flood threat is irrational and costly in both economic and ecological terms. The acquisition/relocation program following the Great Mississippi River Flood of 1993 is a mitigation measure that begins to correct the construction/destruction/reconstruction phenomenon caused by unwise floodplain development, and this remains the priority program for the State of Illinois with which to permanently reduce the effects of riverine flooding.

An aquifer is a subterranean geologic formation composed of permeable layers of rock or sand that hold or transmit groundwater. Aquifer flooding is most often found in areas that have what is termed an "unconfined aquifer" underneath them. An unconfined aquifer is an aquifer that is close to the ground surface, with continuous layers of materials of high intrinsic permeability extending from the land surface to the base of the aquifer. Water is fed into the aquifer through a process called "recharge". Recharge takes place when water seeps downward through the soil layer called the unsaturated zone into the aquifer. Recharge can also occur through lateral ground water flow, or upward seepage from underlying strata. The water in the aquifer is always under pressure. This is normally not a problem, as the amount of water expelled from the aquifer by natural methods is equal to the amount entering the aquifer. If for any reason the amount of water entering the aquifer is greater than the amount expelled (for example seepage into the aquifer from unusually heavy rain causes the amount of water in the aquifer to rise dramatically faster than the water can be naturally expelled) the water in the aquifer, which is already under increased pressure, is placed under even greater pressure until the pressure is greater than the rock and sand of the aquifer can withstand and the water breaks out of the aquifer and rises to the surface where it causes surface flooding in the immediate area. An important thing to remember about aquifer flooding is that the area affected by the flooding may not have any history of flooding and may not even be located near any significant body of water. The only way to be certain that a locality is not susceptible to aquifer flooding is to undertake a systematic geologic study of the area. In Illinois, Mason County has a history of aquifer flooding. The aquifer was mapped by the State Water Survey using HMGP funds following floods in 1994.

Subterranean flooding occurs mainly in urban centers that are adjacent to significant bodies of water (i.e. rivers, lakes, and streams) or in urban centers situated in areas with high water tables. Subterranean flooding occurs when a normally dry tunnel running underneath an urban center such as a train tunnel, is breached. Some examples of a subterranean breach would be malicious action, internal tunnel damage as a result of train derailment, external tunnel damage as a result of sinking vessels, dredging or dropped objects, water main malfunction or structural failure of the tunnel itself. Once the tunnel is breached, water from nearby bodies of water flows into the void. The weight of the water flooding the tunnel can cause extreme pressure on the foundations of nearby buildings, placing those buildings in danger of structural collapse, thus endangering lives and property.

Basement flooding causes significant damage in some urban areas, most commonly in older communities. The damage is exacerbated where there are combined storm water and sanitary sewers. When the capacity of storm sewers and waterways is exceeding water backs up into streets, yards and basements.

Watersheds are an important component in understanding the accumulation and pathway of surface water. A watershed is all of the landscape that drains into a particular lake or river. The Illinois State Water Survey

(ISWS) divided Illinois into 33 major watershed basins. Hydrologic Unit Codes (HUCs) were developed by the US Geological Survey (USGS) to identify watershed boundaries. USGS has mapped Illinois' watersheds at a 10-digit HUC. These smaller watersheds are used by Illinois EPA to group and prioritize impaired waters of the state and for use in Total Maximum Daily Load development. These 10-digit HUCs are delineated in each of the 33 watershed basin maps.

Geographically smaller watersheds are coded as HUC10, and HUC12. Within the watershed, smaller channels or tributaries collect runoff from rain and snowmelt, and convey the water to larger channels and eventually to the main channel which is the lowest body of water in the watershed. A flood, a natural occurrence, happens when the channel capacity is exceeded and water overflows the banks onto the adjacent land (floodplain). The land and the condition of the land affect the rate and quantity of water:

1. If the terrain is steep, water will more rapidly run off the land into streams.
2. If the ground is already saturated from previous rains, from subsequent precipitation events, water will run off the land into streams rather than being intercepted or stored and flooding is more likely.
3. If the depression storage areas are already inundated, flooding is more likely if a significant part of the land area of the watershed has been covered with pavement and other impervious areas; thus, more water will reach the streams and flooding is more likely. Urban watersheds will flood more quickly than rural watersheds because in the country the water can soak into the ground instead of running quickly into the streams and rivers.

Flood Hazard Risk Assessment

Funding is needed to complete Flood Hazard Risk Assessments in the remaining HUC8 watersheds starting with the Rock River and Fox River to prioritize mitigation actions in those watersheds. Structure specific risk assessments are the highest priority for the state for Action Mitigation. Existing structure first floor survey information is available in several watersheds in the state that will allow for detailed structural risk assessments including Rock Island County, Kiswaukee River floodplain, North Branch Chicago River floodplain, Des Plaines River floodplain, DuPage River in Will County and the city of Effingham as funding allows.

The State of Illinois has created a library of Mississippi River flood inundation maps at different stages for the Illinois communities not protected by levees along the Mississippi River. The interpolated flood maps were created so that one-foot increment stage readings at the nearest river gage could be properly mapped at an at-risk community using LiDAR-based topography and the hydraulic river profiles developed by the USACE Flow Frequency Study. It is the intent of the State of Illinois to develop a database (and/or PDF booklet) of structural flood damage assessments for each of these communities to be used by the communities to inform individual property owners of their flood risk, to prioritize flood hazard mitigation activities, and to better predict and prepare for impending flood conditions, resulting in more resilient communities. Long-term floodplain/levee management on the Mississippi River requires this better understanding of existing flood risks along the river in Illinois.

Funding of some of these projects in FFY2018 will provide crucial follow up to the process and demonstrate FEMA's commitment to these communities who have actively participated in the process. Demonstrating to

these communities that participation leads to better risk identification and management will inspire other communities to actively engage in the Risk MAP process as Discovery is initiated in other watersheds.

Risk Mapping, Assessment and Planning (Risk MAP) in Illinois

The Risk MAP is a program is administered through the FEMA Mitigation Division, Risk Analysis Branch. The Risk MAP program outlines a process to identify community needs and conduct outreach and education to community leaders while advancing and updating flood hazard identification for Flood Insurance Rate Maps (FIRMs).

"Risk MAP supports community resilience by providing data, building partnerships, and supporting long-term hazard mitigation planning. In particular, Risk MAP's Flood Risk Products work alongside regulatory products to provide flood risk information and support your community's overall floodplain management and hazard mitigation strategies.

The Flood Risk Products and datasets present information that can enhance hazard mitigation planning activities, especially the risk and vulnerability assessment portion of a hazard mitigation plan, and the development of risk-based mitigation strategies. Flood Risk Products can also help guide land use and development decisions and help you take mitigation action by highlighting areas of highest risk, areas in need of mitigation, and areas of floodplain change."
(https://www.fema.gov/risk-mapping-assessment-and-planning-risk-map).

The Illinois Department of Natural Resources, Office of Water Resources and the Illinois State Water Survey at the Prairie Research Institute, University of Illinois, are Cooperating Technical Partners with FEMA and as such are tasked with conducting Risk MAP projects in Illinois. Information about Risk MAP projects in Illinois can be found at http://www.illinoisfloodmaps.org/.

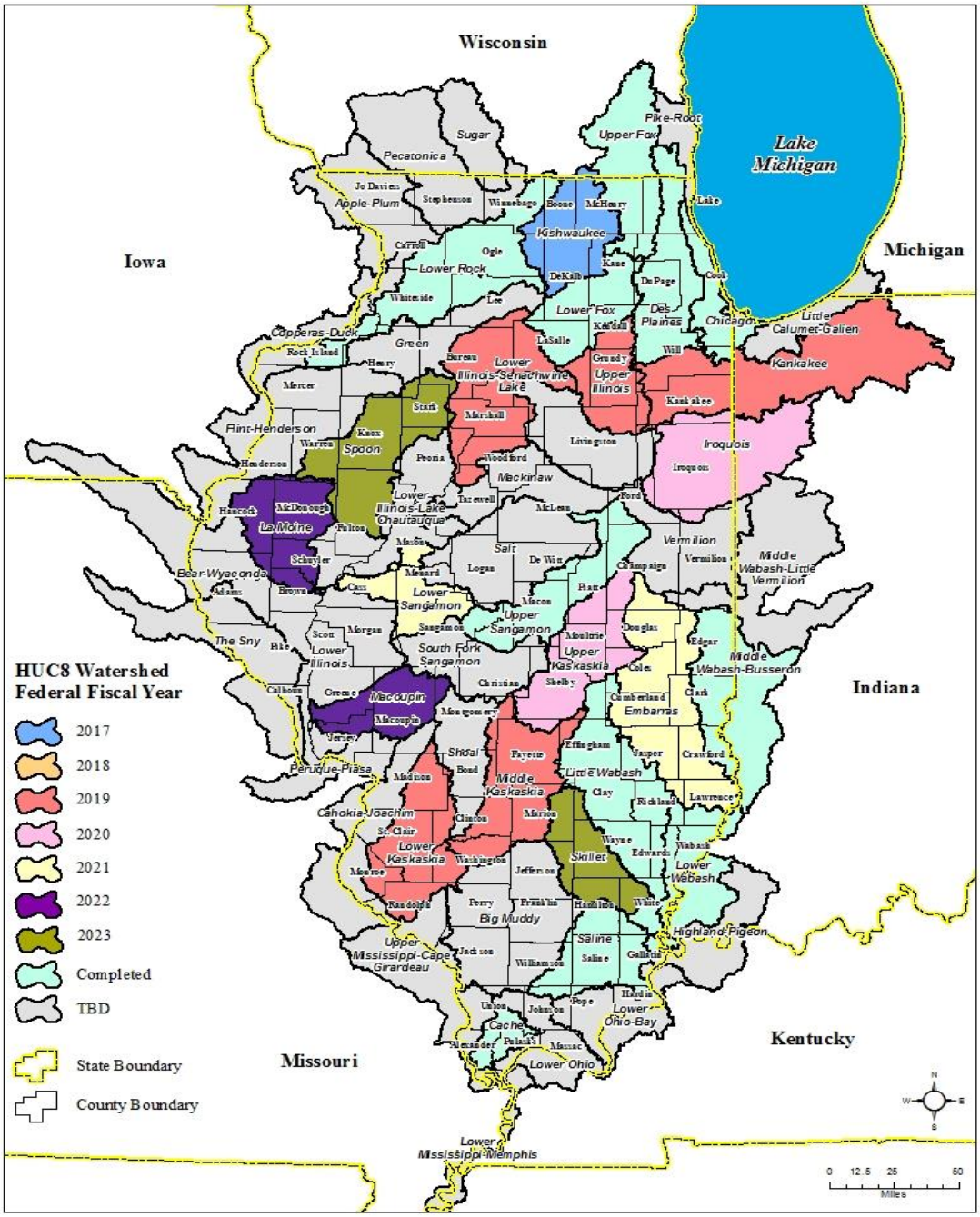
The Risk MAP process begins with Discovery for an entire Hydrologic Unit Code (HUC) 8 watershed, although there have been a few countywide projects where aspects of Risk MAP have been employed. The map shows the HUC8 watersheds that intersect Illinois. The HUC8 watersheds are color-coded based on completed Discovery projects and possible future project funding years. Products developed during Discovery include a map of the watershed, geospatial files including *Areas of Mitigation Interest*, and a report, these can be obtained for completed and in-progress projects at
http://www.illinoisfloodmaps.org/discovery.aspx. Typically these materials are not updated after Discovery is completed.

Flood studies may be initiated as needed based on the findings from Discovery. Often the driver for new flood studies is the status of the effective engineering study that is the basis of the effective FIRM. The status of mapping update needs is presented through FEMA's Community Needs Management Strategy (CNMS) https://www.fema.gov/coordinated-needs-management-strategy. Through this website, communities can submit study data needs in support of identified mitigation actions. The status of new flood studies and updates to FIRMs can be found at http://www.illinoisfloodmaps.org/default.aspx.

As part of the Risk MAP program, new flood studies come with several products in addition to geospatially referenced Digital Flood Insurance Rate Map flood hazard layers. These GIS data layers include depth grids which can be overlaid on base maps such as orthophotos to see the expected depth of flooding at structures for a 1% annual chance event. There are several GIS layers developed with new flood studies including the

percent chance of flooding over a 30 year period. These products are now being provided through the FEMA Map Service Center (https://msc.fema.gov/portal/home).

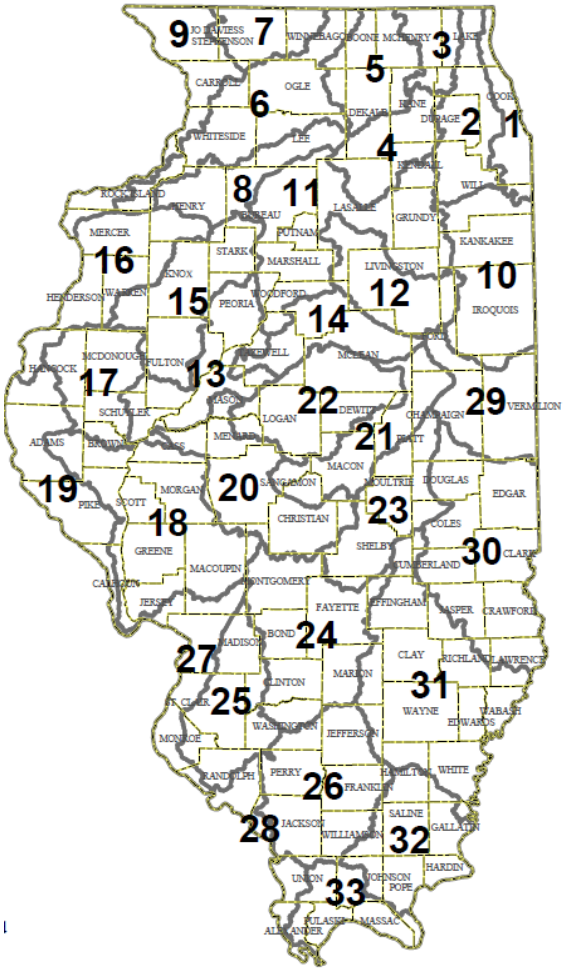
Status of "RiskMAP" in Illinois



Source: 'Cooperating Technical Partner 2018 Business Plan' State of Illinois, Department of Natural Resources, Office of Water Resources, University of Illinois

Major Watersheds in Illinois

1. Great Lakes/Calumet River Watershed
2. Des Plaines River Watershed
3. Upper Fox River Watershed
4. Lower Fox River Watershed
5. Kishwaukee River Watershed
6. Rock River Watersed
7. Pecatonica River Watershed
8. Green River Watershed
9. Mississippi North River Watershed
10. Kankakee/Iroquois River Watershed
11. Upper Illinois/Mazon River Watershed
12. Vermilion (Illinois) River Watershed
13. Middle Illinois River Watershed
14. Mackinaw River Watershed
15. Spoon River Watershed
16. Mississippi Central River Watershed
17. La Moine River Watershed
18. Lower Illinois/Macoupin Creek Watershed
19. Mississippi Central River Watershed
20. Lower Sangamon River Watershed
21. Upper Sangamon River Watershed
22. Salt Creek of Sangamon River Watershed
23. Upper Kaskaskia River Watershed
24. Middle Kaskaskia River Watershed
25. Lower Kaskaskia River Watershed
26. Big Muddy River Watershed
27. Mississippi South Central River Watershed
28. Mississppi South River Watershed
29. Vermilion (Wabash) River Watershed
30. Embarras/Middle Wabash River Watershed
31. Little&LowerWabash/SkilletForkRiver Watershed
32. Saline River/Bay Creek Watershed
33. Cache River Watershed



Source: EPA Illinois

Historical Data

According to the Illinois Department of Natural Resources/Office of Water Resources (IDNR/OWR), Illinois has one of the largest inland systems of rivers, lakes and streams in the United States. Nearly 15% of our total land area (or 7,400 square miles) is subject to flooding. Floods are an inevitable natural event. Floods are by far the most common natural disaster in Illinois, accounting for well over 90% of the declared disasters. It is estimated that over 250,000 buildings are located in floodplains of Illinois.

Since 1965 all but one county in Illinois had been declared at least once by the President as major disaster areas due to flooding. FEMA 4116-DR in 2013 resulted in the sole remaining county becoming declared. Three counties (Cass, St. Clair and Monroe) have been declared in each of the four years from 1993 to 1996. Ten counties were declared in both the 1993 and 1995 floods. Calhoun County, less than ten miles wide and approximately 42 miles from north to south and located between the Mississippi and Illinois rivers, and Cass County which has the Illinois River as its western boundary has had 17 major flood declarations since 1965.

Most of the counties in recent declarations have an extensive history of repetitive flooding. In March 1979, the Illinois River flooded 29 counties (FEMA 583-DR). In June 1981, heavy rains produced flooding in the Cook, Will, Schuyler and Carroll counties (FEMA 643-DR). In February and March of 1982, the Kankakee and Illinois rivers flooded, with Kankakee and Will counties receiving state declarations; however, federal assistance was not requested. In December, the Illinois River flooded again, and 26 counties received federal declarations for flooding and one county (Clinton) received a declaration for a tornado (FEMA 674-DR). In June of 1983, the Mississippi River caused flooding from its confluence with the Illinois River south to its juncture with the Ohio River at Cairo, Illinois, and 13 counties received federal declarations (FEMA 684-DR). In July 1983, flooding occurred in four northern counties for which state declarations were proclaimed. Federal assistance was not requested. Then in February of 1985 flooding again occurred on the Kankakee, Wabash and Illinois rivers, and 28 counties received federal declarations (FEMA 735-DR). Within an eleven-month period (October, 1986 to August, 1987), the Chicago-metro area experienced two major storms that created flash and overland flooding, FEMA 776-DR and 798-DR. In FEMA 776-DR, Cook, Lake, McHenry and Kane counties were declared along with four counties along the Mississippi River (Adams, Calhoun, Jersey and St. Clair counties). In FEMA 798-DR, only Cook and DuPage counties were declared.

Flooding occurred again in May and June 1990, when 30 counties received federal declarations (FEMA 871-DR). A structural failure resulted in underground flooding of the Chicago Loop area in 1992 (FEMA 941-DR).

The Great Flood of 1993 (FEMA 997-DR) did the most damage along the Mississippi River in the recorded history of Illinois. Following a wet winter, continuous and persistently heavy rain fell on most of the Upper Midwest throughout spring and into the summer causing major flooding in nine states. Flood waters began rising in March of 1993 and did not recede until September of that year. Prior to the presidential declaration of this major disaster on July 9, 1993, the State had activated the Emergency Operations Center four times as a result of scattered flooding and gubernatorial proclamations.

Northwest and west-central Illinois (the latter located between the Mississippi and Illinois rivers) were particularly hard-hit. Between July 9 and August 27, 1993, thirty-nine (39) counties in Illinois were declared federal disaster areas as many levees failed along the Mississippi and Illinois rivers. The Great Flood of 1993 brought an increased interest and new attitudes about mitigation. The failure of costly structural flood

control methods changed the emphasis from trying to protect properties located in harm's way to moving people and property from harm's way. Flooding was recognized as a natural process and the wisdom of fighting nature was questioned.

The Great Flood severely impacted the agricultural industry in Illinois. Barge traffic above Cairo, Illinois, was halted for over eight weeks due to the record-high water, causing severe economic loss to their operators, but having only negligible effects on the national transportation costs. Some bridges across the Mississippi and the Illinois rivers were impassable, requiring personal and commercial traffic to reroute well out of their way. In Illinois, the Great Flood of 1993 caused six deaths, displaced 16,000 people, destroyed or severely damaged 6,000 homes; and caused more than 10,000 jobs to be lost (*The Mississippi Flood of 1993*, ISWS).

Less than one year later, the spring flood of 1994 (FEMA 1025-DR) resulted in a federal disaster declaration for 16 counties across Illinois. Extensive rainfall and groundwater flooding were the culprits in this disaster. Hardest hit were the central Illinois counties along the Illinois River, but Monroe, St. Clair, Calhoun, and Alexander counties maintained their reputation for flooding. Six eastern Illinois counties were also declared in this disaster. Excess rainfall and groundwater flooding caused Madison and St. Clair counties to be declared again in the spring of 1995, but this was later amended to include 19 more counties, all along the Illinois and Mississippi Rivers (FEMA 1053-DR). In the Spring of 1996 (FEMA 1112-DR), severe flooding statewide led to a federal disaster declaration for 27 counties mostly in central and southern Illinois.

In late July of 1996, the second highest 24-hour rainfall amount in the nation's history was recorded in northeastern Illinois (FEMA 1129-DR). Seventeen inches fell in southern DuPage and Kane counties with the other nine counties (Cook, DeKalb, Grundy, Kendall, LaSalle, Ogle, Stephenson, Will and Winnebago) ranging from six to 12 inches. Although much of the region witnessed record flooding from this severe rainfall event, which impacted 11 counties, some of the hardest hit areas in the 11 declared counties were the Village of Montgomery in Kane and Kendall counties; the Village of Shorewood in Will County; the City of Ottawa in LaSalle County; the Village of Kirkland in DeKalb County; and the Valley View Subdivision in DuPage County. Hazard mitigation funds made available (15% of the total FEMA assistance for damages) from this disaster represent nearly two-thirds the amount made available from the 1993 flood. However, unlike the 1993 flood (FEMA 997-DR), there was no state funding match for the FEMA 1129-DR disaster. As a result, it was difficult to secure interest from counties and communities to sponsor mitigation projects, specifically acquisitions, when no non-federal match was available. In many instances, counties funded the 25 percent match through Community Development Block Grant (CDBG) funds. Other counties and municipalities agreed to a partial non-federal contribution, and still others requested that homeowners voluntarily contribute their individual 25 percent, which in essence meant the homeowner was only receiving 75 percent of the pre-flood fair market value on their home.

In late March and early April of 1997, six counties along the Ohio River were declared flood disaster areas (FEMA 1170-DR). Torrential rainfall caused record flooding upstream in some portions of Ohio, Indiana, and Kentucky. Naturally, this excess water caused flooding when the crests moved along southern Illinois. This was a relatively small disaster in comparison to the major flood events from previous years. Of particular interest in this disaster is the fact that three of the six counties were not participants in the National Flood Insurance Program, making them ineligible to receive any type of mitigation assistance.

On August 16, 1997, torrential rain fell across Northeastern Illinois producing heavy rainfall in a short period. The NWS reported that over four inches fell in less than two hours on the City of Chicago's west side and several suburban communities, causing flash flooding that severely overloaded the storm water drainage system. As much as 6.1 inches was recorded in some areas. With nowhere else to flow, the rainwater and sewage that accumulated in the combined storm water/sanitary sewer system backed up into over 6,000 basements in the City of Chicago and over 1,000 in suburban Cook County (FEMA 1188-DR). Four fatalities were caused by the flash flooding.

In late May 1999, a severe rain storm over northwestern Illinois resulted in a presidential declaration. Through the days of May 16 and May 17 this storm exceeded ten inches in East Dubuque and western Jo Daviess County. Flash flooding severely impacted the local government's infrastructure damaging a new storm sewer under construction and destroying two police cars. Residences and businesses alike had to evacuate and damage was severe (FEMA 1278-DR).

On April 18, 2001, flooding began as a result of heavy rains and snow melt in the Upper Midwest and continued through the end of the month. On May 9, 2001, the President declared 10 counties a major disaster where near-record flooding occurred on the Mississippi River from the Wisconsin border down to the confluence of the Mississippi and Missouri rivers (FEMA 1368-DR). As mentioned on the previous page, the City of Chicago in August 1997 had torrential rains resulting in a federal declaration (FEMA 1188-DR). As a result of this storm, HMGP funds from FEMA paid $9.7 million towards the $13 million project to install inlet control valves in the city's storm water/sewer system. In August of 2001, Chicago was hit by two torrential rainstorms that were equal to or greater than the August 1997 storm. There was no presidential declaration in 2001 because the damage estimates were only 10% of the 1997 event or $6.7 million. The city also reported much less in overtime costs and debris removal. The impact of these storms clearly illustrated the cost effectiveness of inlet control valves as a mitigation tool.

A series of severe storms began April 21, 2002, and continued through mid-May. These severe storms produced tornadoes, high winds, hail and heavy rains causing flooding. Meanwhile, during the first week of May, Illinois received extraordinary amounts of rain that resulted in both flash and riverine flooding throughout the state. With the ground being saturated from rain for three weeks, flooding occurred in a widespread area. Homes, roads and bridges were damaged. IDOT reported 13 highway closures due to flash flooding including Interstates 55 and 72 near Springfield. May 15th a gubernatorial proclamation was issued for all 102 Illinois counties. On May 21, 2002, the President declared a major disaster (FEMA-1416-DR) resulting in 68 Illinois counties being declared. In addition to flooding the following tornadoes occurred: April 21, Wayne County; April 28, Clay, Franklin, Johnson, Pope, Saline, St. Clair and Union counties and May 9, Marion County.

Between May 4 and May 10, 2003, severe weather including tornadoes, damaging winds and flooding affected the extreme southern-tip and a wide area of the mid-western portion of the state (16 counties).

In northern Illinois (Will County) basements were flooded as a result of torrential rain on July 27, 2003.

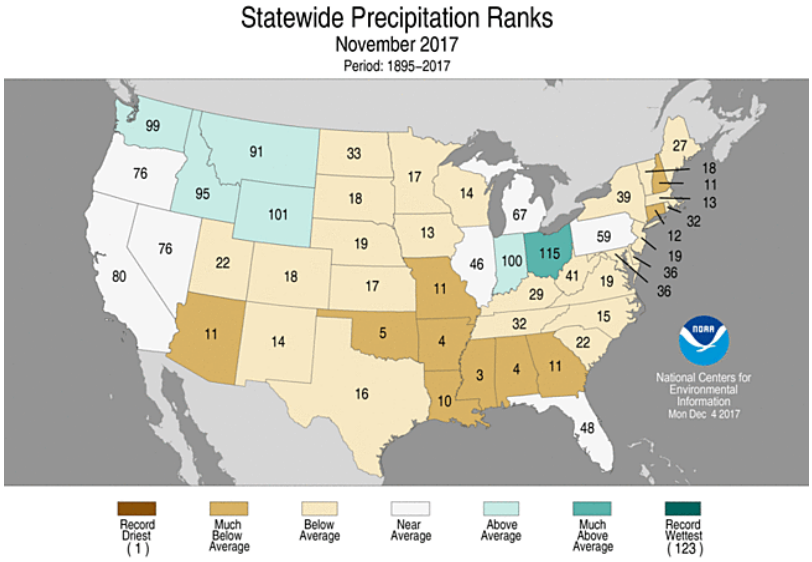
In northeastern Illinois (Lake and parts of Cook counties), as a result of heavy rain the Fox River in Des Plains city flooded and displaced many people from their homes and forced businesses and schools to close in May 2004.

In southeastern Illinois, during the months of December 2004 and January 2005 as a result of historic snowfall and continued heavy rain respectively, nine counties along the Ohio River were flooded and sustained major damages to homes, businesses and roadways.

September 4, 2007, severe storms moved through Winnebago County and the City of Rockford. Because of flash flooding many residents were forced from their homes, with damage to homes, businesses and infrastructure.

August 20-31, 2007, severe storms and flooding moved through most of northeast Illinois removing residents from their homes and affecting businesses and infrastructure in DeKalb, Grundy, Kane, LaSalle, Lake and Will Counties.

Beginning on January 7th, 2008, Livingston and Iroquois Counties began to receive over three inches of rainfall that eventually led to flooding. The ground at the time was still frozen in most areas so the earth could not handle normal saturation. The rain quickly ran off into streams and rivers which then overflowed their banks. Widespread and significant flooding occurred and many areas of the two counties were under water with businesses, schools and homes flooded and damaged.



During March of 2008, the City of Harrisburg experienced extensive flooding in part from interior drainage systems as pumping facilities were not sufficient to discharge accumulated water outside the levee.

After a wet winter and spring, heavy rain fell in June causing moderate to major flooding in much of Illinois. Parts of southern Wisconsin received more than 10 inches of rain which eventually relieved into the Illinois stream network. During the course of the first half of June 2008, much of the Midwestern U.S. received copious amounts of rainfall as one storm system after another traversed the region. Parts of Indiana, Illinois, Iowa and Wisconsin were recipients of over a foot of rainfall with widespread flooding reported along the Mississippi River and its tributaries. Dams and levees were breached across parts of Wisconsin, Iowa, Indiana and along the Mississippi River. By the end of June, many of the communities along the Mississippi River from Rock Island, IL to Cape Girardeau, MO were still experiencing major flooding. (NCEI) The large-scale weather pattern during the first two weeks of June primarily consisted of a high pressure system over the southern Plains and Ohio Valley and abnormally low pressure situated over the northern Plains. The boundary between these two pressure systems was the focal point for the development of the heavy rainfall

and severe storms. (NOAA) During the month of June, over 1,100 daily precipitation records were broken throughout the Midwest. The majority of these records occurred in Iowa, Illinois, Wisconsin and Missouri. For the month, 78 stations reported their wettest day in any June on record and 15 of these stations set a new all-time record for the wettest 24-hour period for any month on record. (NOAA)

Levee breaks on June 10, 2008 flooded portions of Lawrence County near Lawrenceville, inundating a campsite and forcing the evacuations of 200 homes. September 2008 was unfortunately a lot like the month of June. Based on preliminary data from the State Climatologist Office, the state-wide average precipitation for September was 7.98 inches, making this the third wettest September on record (going back to 1895) for Illinois. The all-time record is 1926 with 9.71 inches while second place goes to 1911 with 9.06 inches. Starting on September 12th and continuing through September 15th, the system termed "Hurricane Ike" that was once a category 2 storm in the gulf dropped anywhere from 4-10 inches of rainfall over the state. Considerable flooding was the end result, with the northeastern portion of the state receiving the most damage.

July 2010 saw above normal temperatures and precipitation across Illinois and much of the Midwest. According to the NWS Central Illinois Forecast Office, "Rainfall amounts in extreme northwest Illinois ranged from 13 to 15 inches, which was 11 inches above normal and among the wettest July's on record from Freeport west to Dubuque, Iowa." An article published by the Illinois Association of Floodplain and Storm Water Management, indicated that, up to 7.02 inches of rain fell in one day, and up to 12.10 inches were recorded over two days. Total precipitation records were broken across the affected area, which included Cook, DuPage, Jo Daviess, Stephenson, Winnebago, Carroll, Ogle, Adams, Pike and Schuyler counties. The majority of rivers in the affected area were reported by the NWS to have been at moderate or major flood stage. Many of the rivers reached record breaking heights and remained above flood stage for periods of up to nine days. The majority of damage was concentrated in in Cook and DuPage Counties, caused by sewer backup in basements. The flooding in northwestern counties washed out several critical roads and bridges, while causing major structural damage to a number of homes and businesses.

The 2011 Mississippi River Flood broke numerous stage records and produced the highest flows ever recorded along the waterway from Cairo to the Morganza Floodway (below the Morganza Floodway all record flows date to before floodway construction). River stages and flow rates were comparable to the major floods of 1927 and 1937. Well above-average precipitation fell throughout the Mississippi, Missouri, and Ohio River Valleys from January through early May. Several areas across the Mississippi Valley reached flood stage beginning in late February. In April, two major storm systems deposited record levels of rainfall on the Mississippi River watershed. That rainfall combined with the springtime snowmelt resulted in the river and many of its tributaries swelling to record levels by the beginning of May. On April 28, the Mississippi River at St Louis crested around 34.1 feet. The final round of rain occurred from April 30 to May 2 over the watershed from Greenville to Chester and over the Lower Ohio Valley where two to eight inches fell. The Ohiuo River at Cairo reached about 63.0 feet on May 5.

April of 2013 brought excessive rainfall causing widespread flooding across a large part of northern and central Illinois. Areas from the Chicago metro, southwest along the Illinois River Valley, received 5 to 10 inches over a two-day period from April 17th to April 18th. This caused record flooding along portions of several of Illinois rivers. Federal assistance in Illinois has reached more than $144 million, distributed among more than 58,000 individuals and households, since a major disaster was declared for storms and flooding that

occurred April 16 through May 5. Federal assistance numbers continue to grow as recovery from this disaster continues at the time of the update. (*April 2013 Flood Event, Shauna Urlacher, P.E., CFM, Clark Dietz from IAFSM Current, Summer 2013).* Communities along the Chicago River, Fox River, Des Plaines River, DuPage River, Illinois River, and tributaries experienced riverine flooding, and many rivers recorded record flood stages. Heavy rainfall in these watersheds overwhelmed storm and sanitary sewer systems, causing sewer backups and localized flooding throughout the Chicago area. In addition, many communities, including parts of London Mills (Fulton County), Forest View (Cook County), and Marseilles (LaSalle County) experienced significant riverine flooding outside of mapped Special Flood Hazard Areas.

Reports of flooding from this storm vary by community, even within the same watershed. In northeast Illinois, Bolingbrook reported slightly more than a 10-year event, while upstream Lisle experienced rainfall in excess of the 100-year event. Lisle had levees along the East Branch DuPage River and part of St. Joseph Creek overtop for the first time since they were constructed in the late 1960s. The flooding was so severe that the Village had to evacuate over 1,000 living units (apartments, condominiums, and single-family homes) by boat.

In 2015, a multi-faceted storm system brought several periods of heavy rain to central and southeast Illinois from December 26th through 28th. This storm resulted in 98 flood events with five fatalities and five injuries leaving $7.38 million in property damage and $1.14 million in crop damage.

In January of 2016, flooding along parts of the Mississippi River surpassed the Great Flood of 1993. Along most other rivers, the flooding was relatively minor. The Governor of Illinois declared some counties disaster areas, including the Mississippi River counties of Alexander and Jackson. Mississippi River levels continued their climb from December, and record flooding occurred early in the month. At the Thebes River gauge, the river crested at a new record of 47.74 feet before dawn on the 2nd. The old record was 45.91 feet, which was set in May of 1995. The primary flood-related impact was a large levee break (about one-quarter mile wide) in the Len Small Levee near Miller City, between Thebes and Cairo. This levee break contributed to major flooding in and near the communities of Olive Branch and Miller City. Several dozen residences were flooded, some of them by water up to seven feet deep. 64 events were reported with one death and one injury and $7.32 million in damage.

In January of 2016, the Governor of Illinois added 11 counties to the state disaster declaration for widespread flooding. Those counties include Cass, Cumberland, Iroquois, Lawrence, Marion, Menard, Moultrie, Pike, Richland, Sangamon and Vermilion. (IEMA)

Between January and December of 2017, 147 flood events were reported. Major counties affected were McHenry, Alexander, White and Rock Island. Total damage from these events were estimated at $12.7 million. In July of 2017, the Governor issued a state disaster proclamation for Lake, McHenry and Kane counties. About 6,800 buildings have been affected by "unprecedented" flooding north of Chicago, and about 2,100 structures submerged.

The following is a summary of Federal Flood Declarations in Illinois 1985 – 2017.

Date	FEMA DR#	Nature of Events
Feb.23-Apr.5,1985	FEMA 735-DR	Severe flooding along the Illinois, Kankakee, and Wabash rivers with over $11 million in damages. This was the seventh flooding of these areas since 1979 (28 counties).
Oct.7-28,1986	FEMA 776-DR	McHenry, northern Lake, and parts of Cook and Kane counties. counties were flooded by the Fox and Des Plaines river systems. Continuing rains resulted in later flooding by the Mississippi and Illinois rivers (Adams, Calhoun, Jersey and St. Clair counties). Damage exceeded $50 million with four deaths attributed to the storm (eight counties).
Aug.13-14,1987	FEMA 798-DR	All-time record rains over a 15-hour period caused flooding along the Des Plaines River valley and Salt Creek tributary. (Cook and DuPage counties). Private property damages totaled $77.6 million with at least four deaths attributed to the flooding (two counties).
5/1/1990	FEMA 871-DR	Reoccurring thunderstorms over southeast Illinois created flooding of the Little Wabash and Skillet Fork rivers (30 counties).
6/1/1990	FEMA 871-DR	Similar thunderstorms occurred in Cass and Tazewell counties, producing flash flooding, and $6.4 million in damages which included two tornadoes (included in the above county).
4/13/1992	FEMA 941-DR	Underground flooding of the Chicago Freight Tunnel caused by a breach of the wall between the Chicago River and the Tunnel.

Date	FEMA DR#	Nature of Events
March-Sept.1993	FEMA 997-DR	Major flooding along the entire stretch of the Illinois (280 miles) and Mississippi (581 miles) Rivers, as well as Ohio River. Record rainfalls and river crests were recorded in nine states. There were six deaths in Illinois and 16,000 displaced. Initial loss estimates totaled more than $15 billion (39 counties).
April and May,1994	FEMA 1025-DR	The heavy rain and groundwater flooding in the spring of 1994 resulted in various counties being declared across the State. FEMA disaster costs estimated to be $17.4 million (16 counties).
May and June,1995	FEMA 1053-DR	Heavy rain and some groundwater flooding along the Illinois and Mississippi rivers. FEMA disaster costs estimated to be $24.6 million (19 counties)
5/1/1996	FEMA 1112-DR	Statewide flooding, but most severe in Central and Southeastern Illinois. FEMA disaster costs estimated to be $2.8 million including tornado damage (27 counties).
7/1/1996	FEMA 1129-DR	Near-record national rainfall for a 24-hour period in north-eastern Illinois. Worst flooding seen along Fox and Kishwaukee rivers, and Blackberry and Waubansee creeks. FEMA disaster costs estimated to be $136.4 million (11 counties).
March and April,1997	FEMA 1170-DR	Flooding along the Ohio River in southern Illinois. FEMA disaster costs estimated to be $2.4 million (six counties).
Mid-Sept.,1997	FEMA 1188-DR	Between 4" and 6" of rainfall in 2-hour period on Chicago's west and several suburban communities causing flash flooding in (IA only) more than 7,000 basements. Over 20,260 applied for assistance, however, only 11,739 were eligible. FEMA disaster costs estimated to be $63.0 million.

Date	FEMA DR#	Nature of Events
5/1/1999	FEMA 1278-DR	Jo Daviess County in northwestern Illinois was declared because a storm system caused serious flash flooding in East Dubuque. Major damage to infrastructure, evacuation of 50 people, and damage to nearly 25 homes and businesses. FEMA disaster costs estimated to be nearly $600,000 (one county).
4/1/2001	FEMA 1368-DR	Major flooding along the Mississippi River in extreme northern and central Illinois (10 counties).
4/1/2002	FEMA 1416-DR	Severe storms produced tornadoes, high winds, hail, heavy rains and flash flooding. A gubernatorial proclamation was issued for all 102 counties because of widespread damage to items such as homes, roads and bridges. Fewer counties received the federal declaration (68 counties).
5/1/2003	FEMA 1469-DR	Severe weather causing tornadoes, damaging winds and flooding affected the extreme southern-tip counties and a wide area of the mid-western portion of the state (16 counties).
8/7-8/2007	FEMA 1722-DR	Severe weather causing tornadoes, damaging winds and flooding affected the extreme north of Illinois. (two counties).
8/20-31/2007	FEMA 1729-DR	Severe storms and flooding affected the north-eastern counties and portions of the mid-western portion of the state (nine counties).
1/7/2008	FEMA 1747-DR	Severe storms and flooding affected the mideastern portion of the state. Heavy rains on frozen soil led to a disastrous outcome (two counties)

Date	FEMA DR#	Nature of Events
6/6/2008 – 6/8/2008	FEMA 1771-DR	Record severe storms and flooding affected the entire border of the state with the worst damage on the western portion along the Mississippi. The "Great Flood of 08" affected seven states during its course. (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Wisconsin) (25 counties).
9/13/2008	FEMA 1800-DR	Severe storms and flooding affected16 counties in the state with the worst damage in the northeast. Similar storms occurred one year previously, but this storm was linked directed to Hurricane Ike.
7/2/09	FEMA 1850-DR	In May of 2009, an extremely progressive storm moved from southeastern Kansas, into southern Missouri and ending up in southwestern Illinois. Southern Illinois suffered damaging winds of above 80 mph, as well as numerous reports of flash flooding.
7/19/2010 - 8/7/2010	FEMA 1935-DR	The second costliest flood disaster. Severe storms and flooding affected eight counties in Illinois. Extreme basement flooding and sewer back-up in Cook and DuPage counties, major structural damage in the remaining counties. More than $300 million was approved in assistance grants to individuals and households in Illinois for the severe storms and flooding.

Date	FEMA DR#	Nature of Events
4/19/2011 - 6/14/2011	FEMA 1991-DR	Severe storms and flooding occurred in southern Illinois from mid-April and continued into June, 2011. This severe flooding affected 21 counties and resulted in over $29 million dollars in individual assistance and public assistance combined.
8/20/2007 - 8/31/2007	FEMA 1729-DR	Severe storms and flooding affected the north-eastern counties and portions of the mid-western portion of the state (nine counties).
1/7/2008	FEMA 1747-DR	Severe storms and flooding affected the mid-eastern portion of the state. Heavy rains on frozen soil led to a disastrous outcome (two counties).
6/6/2008 – 6/8/2008	FEMA 1771-DR	Severe storms and flooding affected the entire border of the state with the worst damage on the western portion along the Mississippi. The "Great Flood of 08" affected seven states during its course. (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Wisconsin) (25 counties).
9/13/2008	FEMA 1800-DR	Severe storms and flooding affected16 counties in the state with the worst damage in the northeast. Similar storms occurred the previous year, but this storm was linked directed to Hurricane Ike.
7/2/2009	FEMA 1850-DR	In May of 2009, an extremely progressive storm moved from southeastern Kansas, into southern Missouri and ending up in southwestern Illinois. Southern Illinois suffered damaging winds of above 80 mph, as well as numerous reports of flash flooding.

Date	FEMA DR#	Nature of Events
7/2/2009	FEMA 1850-DR	In May of 2009, an extremely progressive storm moved from southeastern Kansas, into southern Missouri and ending up in southwestern Illinois. Southern Illinois suffered damaging winds of above 80 mph, as well as numerous reports of flash flooding.
7/19/2010 - 8/7/2010	FEMA 1935-DR	The second costliest flood disaster occurred during the months of July and August in 2010. Severe storms and flooding affected eight counties in Illinois. Extreme basement flooding and sewer back up was experienced in Cook and DuPage Counties with major structural damage to homes and businesses in the remaining counties. More than $300 million was approved in assistance grants to individuals and households in Illinois for the severe storms and flooding.
4/19/2011 - 6/14/2011	FEMA 1991-DR	Severe storms and flooding occurred in southern Illinois from mid-April and continued into June, 2011. This severe flooding affected 21 counties and resulted in over $29 million dollars in individual assistance and public assistance combined.
4/16 thru 5/5/2013	FEMA 4116-DR	Severe storms, flooding and straight-line winds affected 40 counties in northern and central Illinois. Federal assistance in Illinois has reached more than $144 million distributed among more than 58,000 individuals and households, since a major disaster was declared for storms and flooding that occurred April 16 through May 5.

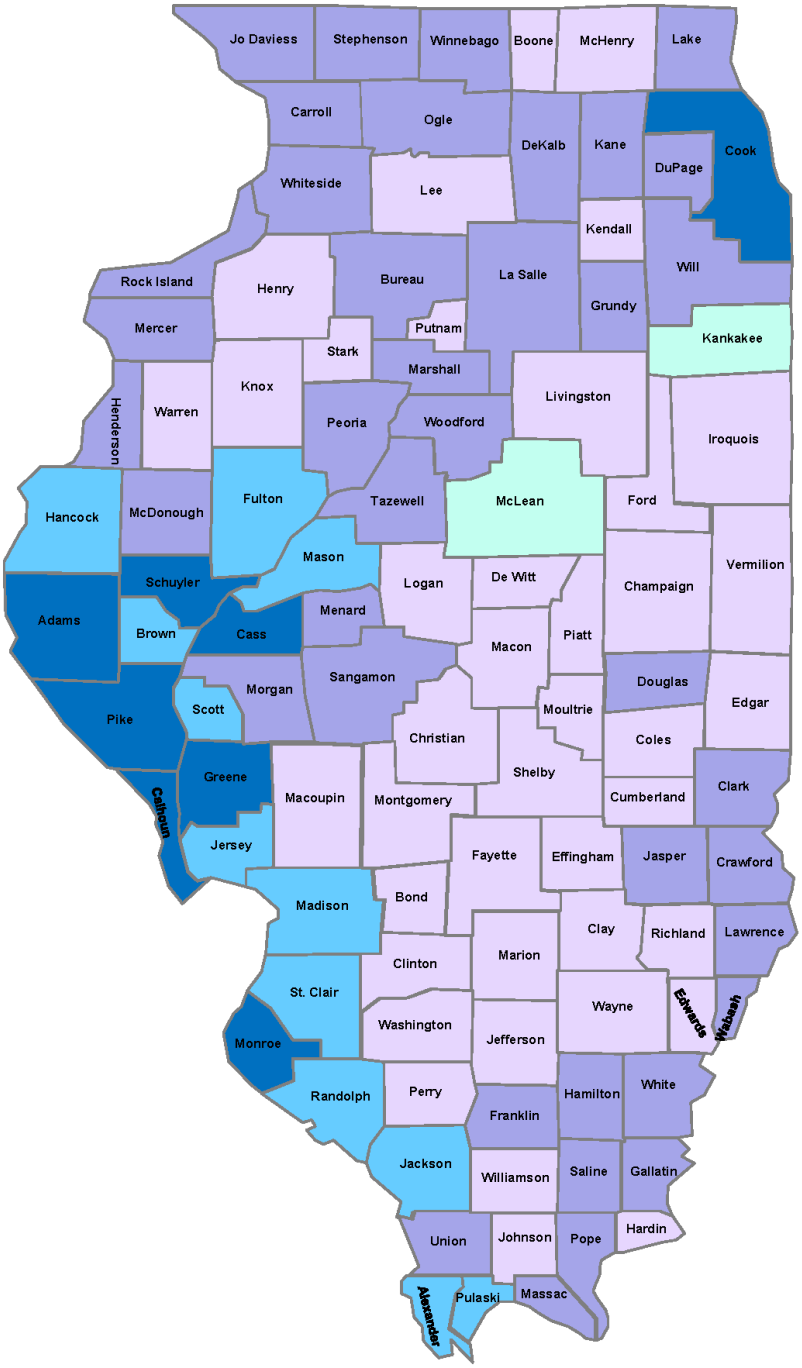
Source: FEMA

Federally Declared Flood Disasters by County
(January, 1981 – December, 2017)

County	# of Declared Floods	County	# of Declared Floods	County	# of Declared Floods
Calhoun	12	Carroll	5	Kendall	3
Adams	11	Crawford	5	Richland	3
Cook	11	DuPage	5	Livingston	3
Greene	11	Henderson	5	McHenry	3
Cass	10	Tazewell	5	Putnam	3
Monroe	10	Mercer	5	Shelby	3
Pike	10	Kane	5	Warren	3
Schuyler	10	Lake	5	Knox	3
Alexander	9	Lawrence	5	Vermillion	3
Jersey	9	Franklin	5	Champaign	2
Hancock	9	Pope	5	Coles	2
Randolph	8	Hamilton	4	DeWitt	2
St. Clair	8	Jasper	4	Edgar	2
Scott	8	Menard	4	Edwards	2
Mason	8	Saline	4	Effingham	2
Brown	8	Sangamon	4	Ford	2
Jackson	7	Stephenson	4	Jefferson	2
Madison	7	Wabash	4	Macon	2
Pulaski	7	White	4	Montgomery	2
Fulton	7	Clark	4	Piatt	2
Douglas	6	DeKalb	4	Washington	2
LaSalle	6	Marshall	4	Wayne	2
Rock Island	6	McDonough	4	Bond	1
Whiteside	6	Ogle	4	Boone	1
Will	6	Peoria	4	Christian	1
Winnebago	6	Cumberland	3	Clay	1
Woodford	6	Hardin	3	Clinton	1
Union	6	Iroquois	3	Fayette	1
Grundy	6	Macoupin	3	Johnson	1
Gallatin	5	Marion	3	Lee	1
Jo Daviess	5	Moultrie	3	Stark	1
Massac	5	Perry	3	Logan	1
Morgan	5	Williamson	3	Kankakee	0
Bureau	5	Henry	3	McLean	0
Source: FEMA					

IEMA Illinois Natural Hazard Mitigation Plan

Federally Declared Flood Disasters by County
(January, 1981 – December, 2017)



- 0
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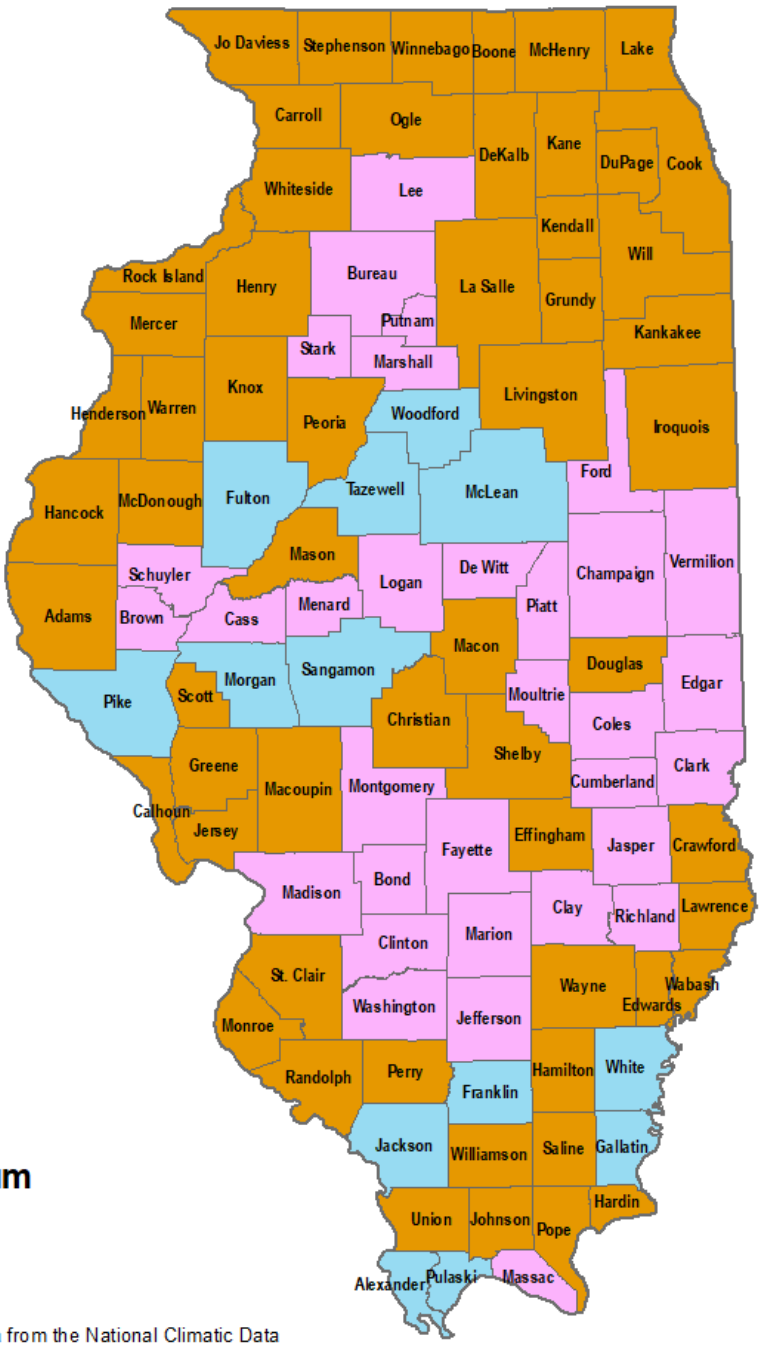
IEMA Illinois Natural Hazard Mitigation Plan
Flood Hazard Rating by County



Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

Risk Analysis

Flooding is a major, recurring problem in Illinois. However, while flooding cannot be prevented, the impacts of flooding can be ameliorated (Remo et al., 2015). Determining total expected dollar losses is extremely hard to estimate in Illinois. In years past, the best source of past damages in dollars was the National Oceanic and Atmospheric Administration's (NOAA), NCDC database, which was combined with data from several other areas to give a well-rounded picture of the flood risk. Flood losses recorded in the NCEI Storm Event Database exceeded $5.6 billion in Illinois between 1993 and 2017. Since 1965, flooding was the either the main or a significant contributing factor for 32 out of the 52 presidential disaster declarations issed in Illinois.

2013 Flood- exposure, loss, and vulnerability assessment

The 2013 Illinois Natural Hazard Mitigation Plan (INHMP) used Hazard Mitigation Grant Program funds to have a state-wide Level 1.5 HAZUS Hazus-MH analysis conducted to develop a risk assessment focused on defining the potential flood exposure throughout the 102 counties in Illinois. This project identified the state's critical and essential facilities located within the 100-year floodplain. A flood vulnerability report for each of the 102 Illinois counties was generated by the Natural Hazard Research and Mitigation Group (NHRMG) at Southern Illinois University, Carbondale (SIUC). The report reviewed previous occurrences of flooding in the county, identified the FEMA mapped floodplains, summarized the flood-exposure modeling results and identified any critical facilities susceptible to flooding. (Remo J.W.F., Pinter N., *Mahgoub M., 2015, Assessing Illinois's Flood Vulnerability Using Hazus-MH. Natural Hazards. 81, 265-287. doi:10.1007/s11069-015-2077-z)

The NHRMG's flood vulnerability assessment used Hazus-MH to estimate potential flood losses and assessed potential damage to critical state facilities within the 100-year floodplain throughout Illinois. Hazus-MH is a Geographic Information System- (GIS-) based risk assessment tool designed by FEMA in collaboration with the National Institute of Building Sciences. The Hazus-MH flood module assesses the impact of flooding based on FEMA and USACE damage relationships. These relationships are applied to Hazus-MH infrastructure inventories or user-defined facilities to estimate losses for a selected flood scenario (Schneider and Schafer, 2006).

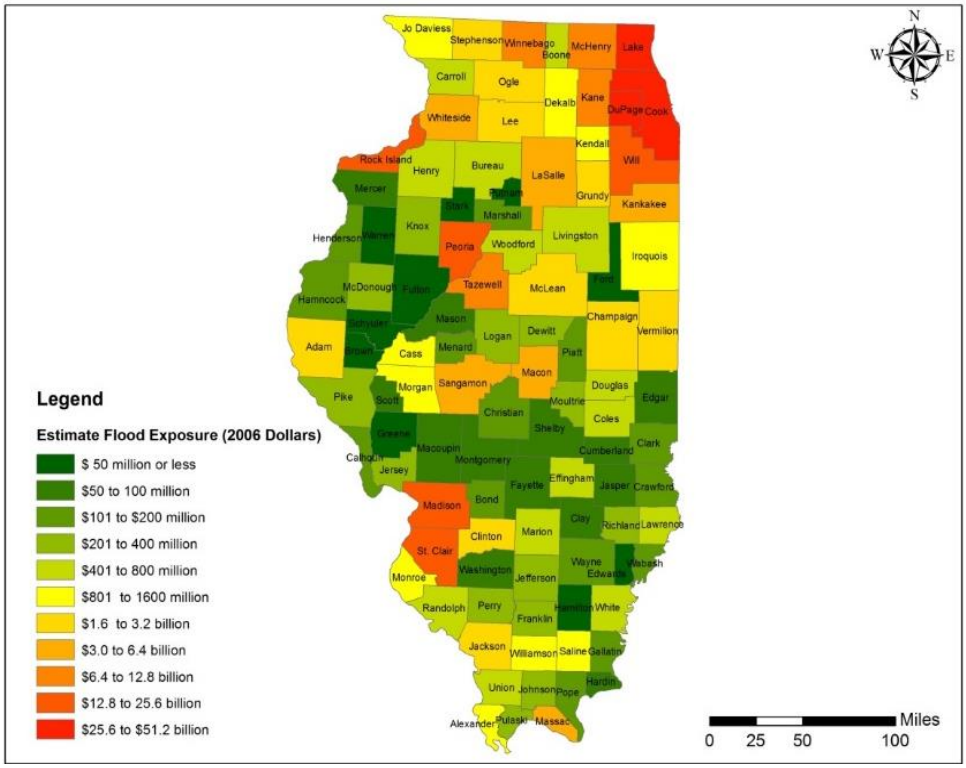
Hazus-MH allows modelers either to choose default settings ("Level 1" analysis) or else to provide increasingly detailed user-supplied data to improve the resolution and accuracy of loss estimates ("Level 2" or "Level 3" analyses). For a Level 1 analysis, the demographic and infrastructure inventories provided with the Hazus-MH package are not significantly updated. The Hazus-provided demographic and infrastructure inventories are compiled from existing national datasets. A Level 2 analysis improves the loss estimates by considering additional data such as improved flood inundation modeling results or significant updates to the demographic and / or infrastructure inventory. A Level 3 analysis generally requires extensive time, resources, and effort in order to modify the Hazus-MH model to fit specific community, location, or geographic region. An example of a Level 3 analysis would be a study in which site-specific building inventory data are used to calculate flood losses for individual building. This type of analysis is referred to as a user defined facility (UDF) analysis.

Level 1 Hazus-MH flood-loss-modeling was utilized to create a flood-hazard assessment report for each of the 102 Illinois counties. Updating building and infrastructure data or performing hydraulic modeling to created detailed depth grids for all counties in Illinois could be done in the future but was beyond the scope

of this project. For each county, the flood exposure and losses were estimate for areas within the 100-year floodplain. However, potential losses to critical state facilities were modeled using a level-2 analysis providing a building-level estimate of potential damage and associated losses. (NHRMG, 2013)

For the Hazus-MH flood-loss assessment of the state's essential facilities, due to the nature of the essential facility data, it is likely that there were some omissions, misidentifications and some of the facilities identified may not currently be in operation. However, all of the 400 essential and critical facilities identified as at-risk were checked to ensure the facility was located within the floodplain. These facilities were not individually checked for flood-proofing measures. (NHRMG, 2013)

Estimated flood exposure on 100-year floodplains aggregated by County

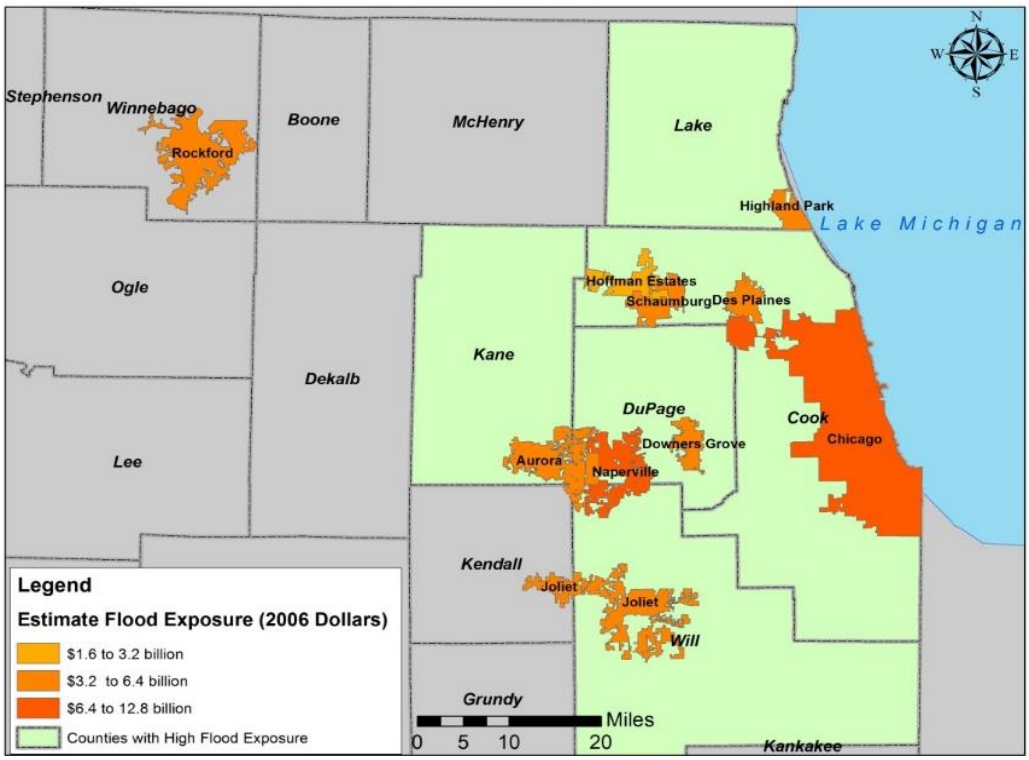


The following text and figures are portions taken directly from the "Illinois Statewide Flood Hazard Assessment" completed by (NHRMG)

The building-related-flood exposure within the 100-year floodplain in Illinois is estimated to be $190.25 billion. The greatest concentration of this flood exposure is located in Cook and adjacent five counties: DuPage, Kane, Lake, McHenry and Will. These counties contain $120.92 billion or nearly 64% of the 100-year flood exposure in Illinois. Correspondingly, the cities within these counties generally had the largest estimate jurisdictional flood exposure. Nine out of the top ten jurisdictions with the largest estimated flood exposure are located within these six counties. The estimated building-related-flood losses within Illinois' 100-year floodplains are $18.03 billion. Aggregated county-level losses ranged from a minimum of $2.4 million in Ford

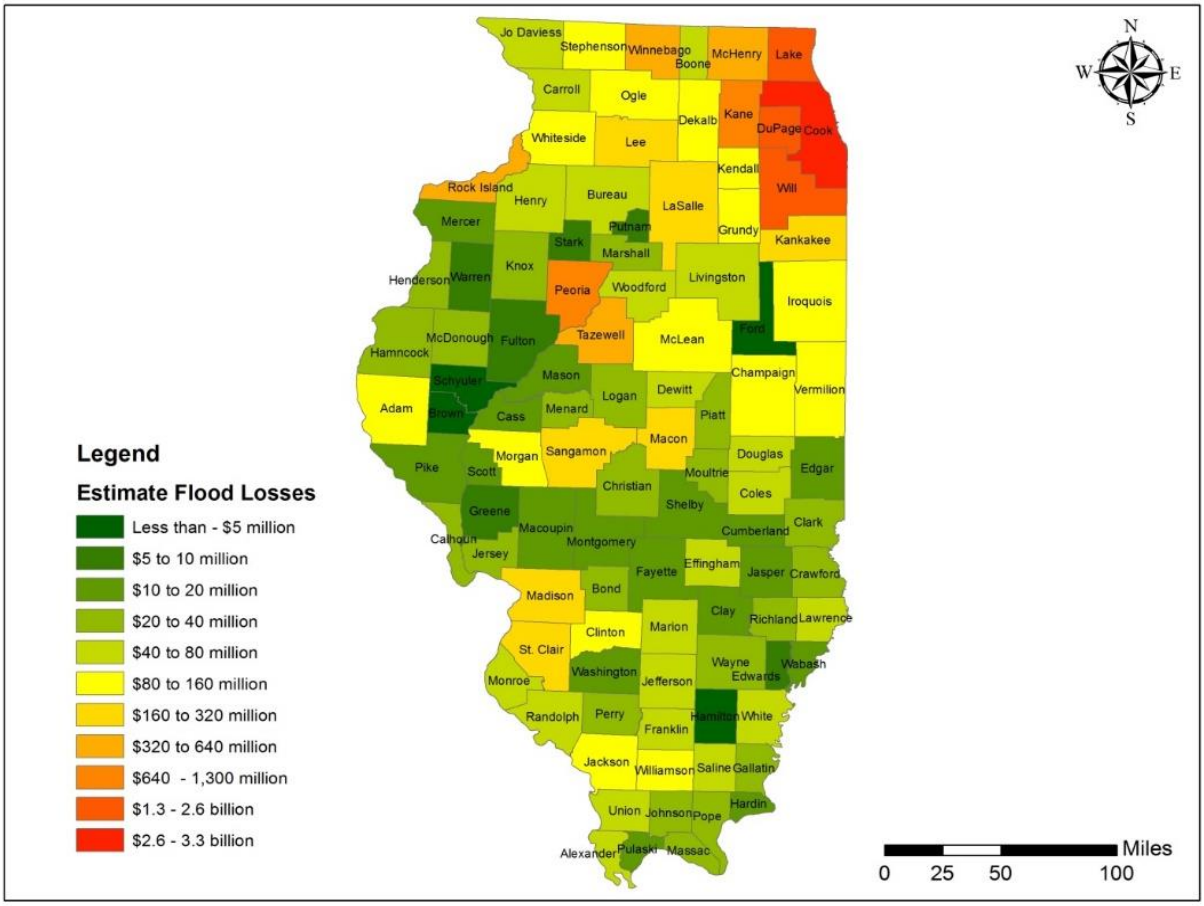
County up to $3.4 billion in Cook County. At the jurisdictional level, flood losses ranged from less than a $1,000 in Bonneville up to $950 million in the City of Chicago. As with the flood exposure estimates, the largest flood losses generally were in and around the City of Chicago.

Top ten jurisdictions in Illinois with highest absolute values of flood exposure on the 100-year floodplains



Flood-loss ratios were calculated in order to normalize losses to total building infrastructure exposure for different jurisdictions. This was done to provide an assessment of the relative impact of flood losses for jurisdictions of different sizes and total quantities of at-risk infrastructure. The average county flood-loss ratio was 0.10, the maximum county flood-loss ratio was 0.3 and the minimum was 0.02. The flood-loss ratio provides a different perspective on flood risk than flood- exposure and -loss maps. When normalized to total exposure, Cook and surrounding counties have average (0.1) to slightly below average ratios. According to Hazus-MH, the counties with the largest flood-loss ratios are Lee, Peoria, Tazewell, White, and Lawrence counties. These counties have large expanses of floodplain along larger rivers such as the Rock, Greene, Illinois and Wabash. Jurisdictions with higher flood-loss ratios tend to be small and relatively less protected river towns such as Gulfport, Naples, Grand Tower, Old Shawneetown and Liverpool. (NHRMG, 2013)

County level estimated of flood losses



2015 Flood Vulnerability Assessment

In the 2013 Illinois Statewide Flood Hazard Assessment, flood vulnerability was quantified as a combined function of potential building-related-economic losses and socioeconomic factors. Differences in socioeconomic factors were incorporated into the analysis because the current social science research suggests that a community's wealth, gender distribution, race, class, and sociopolitical structures can influence the impacts of flood losses, casualties, and the ability the community to recover from a flood disaster. These social factors produce variations in vulnerability among groups of people and geographic locations (Ngo, 2001; Tierney, 2006; Emerson, 2007; Burton and Cutter, 2008, Cutter et al., 2013). To capture both the economic and social aspects of flood vulnerability, Hazus-MH was utilized to quantify potential flood losses within the 100-year floodplain and county-level widely utilized Social Vulnerability Index (SoVI; HVRI, 2012) to quantify the social component of a jurisdiction's flood vulnerability. The flood vulnerability of Illinois counties and incorporated jurisdictions was accomplished in the Illinois Statewide Flood Hazard Assessment, by calculating a Flood Vulnerability Index (FVI) using the Hazus-MH flood-exposure and loss-estimates and SoVI score. Each county's and jurisdiction's FVI score was then used to rank their flood vulnerability (NHRMG, 2013).

In the 2018 INHMP, the Remo et al. (2015) Illinois flood vulnerability study was used to describe flood vulnerability across Illinois. The Remo et al., 2015 study uses the same Hazus-MH estimated flood-losses reported in the 2013 Illinois Statewide Flood Hazard Assessment, but uses a more spatially explicit social vulnerability index than the 2013 assessment (i.e., using a census block level vs. county level SoVI). The purpose of using the Remo et al. (2015) FVI in the 2018 INHMP was to incorporate the most up to date information in this plan. (Complete Study is included in Appendix F)

The FVI values in Remo et al. (2015) were calculated as follows:

1. The flood-exposure ($Flood_{exposure}$) and -loss ($Flood_{loss}$) estimates for the 100-year floodplain were calculated using Hazus-MH (see Flood-Loss Modeling section of the 2013 Illinois Statewide Flood Hazard Assessment for more details).

2. A flood loss ratio ($Loss_{ratio}$) was calculated to normalize flood-loss estimation parameter so that urban jurisdictions with large absolute values of flood exposure could be more easily compared with rural jurisdictions with smaller levels of flood exposure.

$$Loss_{ratio} = \frac{Flood_{loss}}{Flood_{exposure}}$$

(Eq. 1)

3. The census-block-level social vulnerability index calculated in Remo et al. (2015) was aggregated to the respective county and jurisdictions.

4. Hazus-MH does not calculate flood exposure and losses at jurisdictional scales. The minimum spatial scale at which Hazus-MH calculates flood exposure and losses is at the census block level. In order to ascribe the exposure and flood estimates to a particular jurisdiction, we used the spatial join tool within ArcMap. The join tool summed flood -exposure and -loss estimates from the census blocks that were either fully or partly contained within each jurisdiction's boundaries.

5. In order to account for the overlap of census blocks outside a jurisdictional boundary, a floodplain area weighting factor was calculated and then used to weight the jurisdictional flood-loss ratio. This provided a more realistic estimate of a jurisdiction's flood-loss ratio. The floodplain area weighting factor (FP_{wf}) was calculated by dividing the 100-year floodplain area (FP_{area}) within the jurisdiction by the total area of the jurisdiction (JD_{area}).

$$FP_{wf} = \frac{JD_{area}}{FP_{area}}$$

(Eq. 2)

The floodplain area weighting factor was then multiplied by the jurisdiction's loss ratio to calculate the weighted flood loss ratio ($WLoss_{Ratio}$).

$$WLoss_{Ratio} = Loss_{Ratio} \times FP_{wf}$$
(Eq. 3)

6. The county flood-loss ratio, jurisdictional weighted flood-loss ratio and SoVI scores were combined to create a flood-loss index (FLI) and SoVI at the county and jurisdictional levels. The general indexing formula for the FLI and SoVI are as follows. The index (I_i) corresponding to each respective index (FLI and SoVI) indicator for i^{th} county or jurisdiction is calculated using the following equation, which normalizes each index value to a range from 0.0 to 1.0:

$$I_i = \frac{I_i - I_{min}}{I_{max} - I_{min}}$$

(Eq. 4)

where I_{min} *and* I_{max}, are the minimum and maximum values of these indicators for all the counties or jurisdictions, respectively, and I_i is the actual value of the indicator for i^{th} county or jurisdiction.

7. The FLI and SVI were added together to calculate a flood score (*FS*) for each county and jurisdiction.

$$FS = FLI + SVI$$
(Eq. 5)

8. The *FS* were normalized so each county or jurisdiction could be ranked by flood vulnerability relative to other Illinois counties and jurisdictions. The flood score was index (FS_i) was calculated using Equation 4.

9. A z-score (*z*) for the FS_i for each county or jurisdiction was calculated in order to rigorously qualify their relative flood vulnerability.

$$z = \frac{FS_i - \mu}{\sigma}$$
(Eq. 6)

where:
FS_i is the actual flood score for i^{th} county or jurisdiction;
 is the mean of the county or jurisdictional flood scores; and

σ is the standard deviation the flood scores.

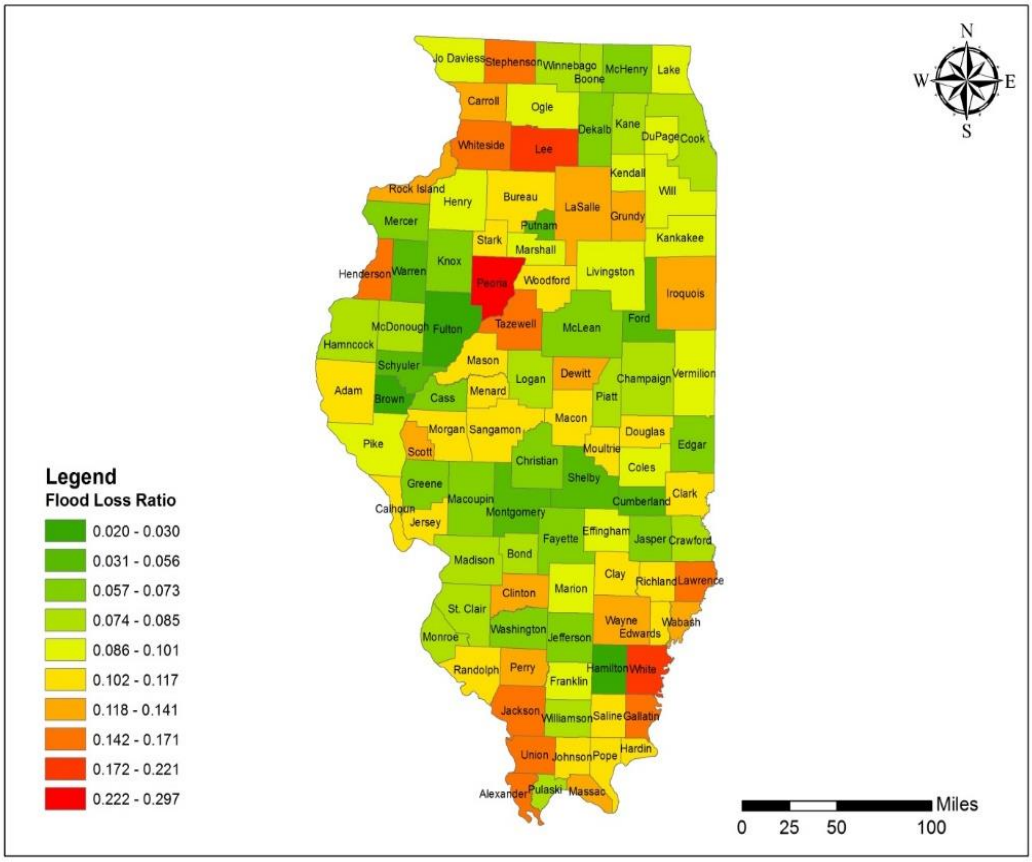
The z-score was used to assign the relative flood vulnerability description to each jurisdiction in the table.

Relative flood vulnerability description for the z or standard score

z – Score Range	Relative Flood Vulnerability Description
5.0 to 1.6	High
1.5 to 0.6	Medium
0.5 to -0.5	Average
-0.6 to -3.0	Low

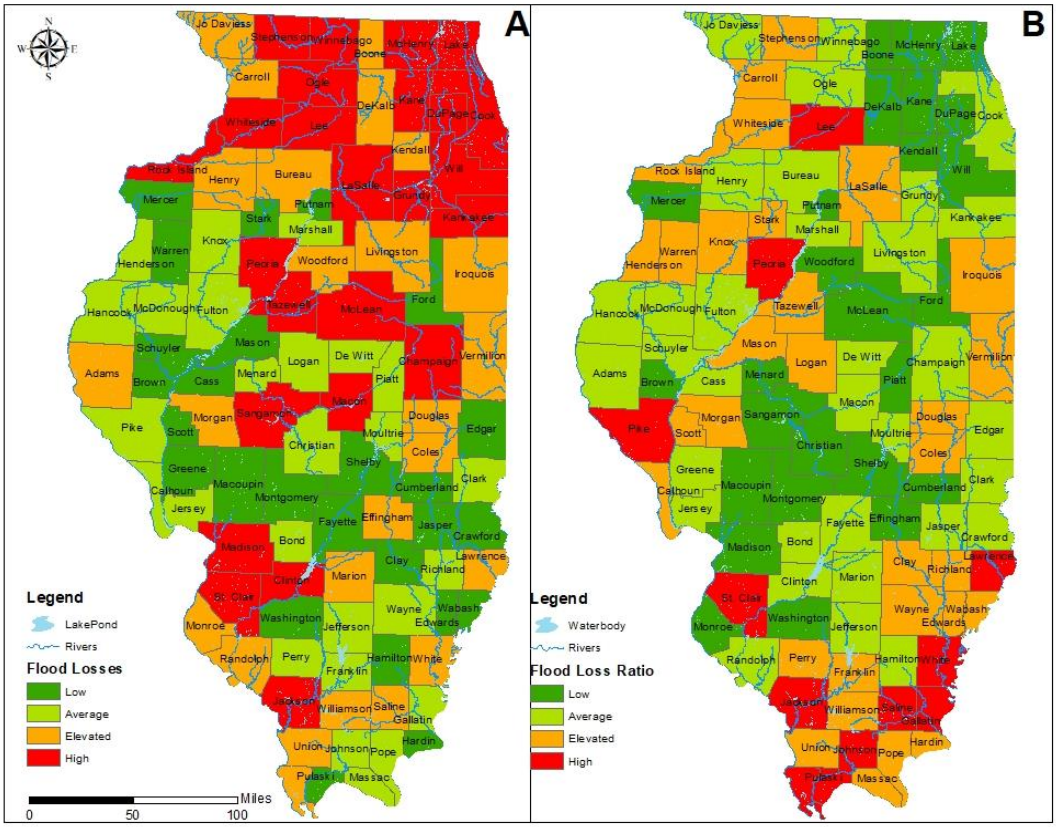
The highest flood vulnerability (FVI) scores are generally in the rural counties and communities located along Illinois's larger rivers. The greatest concentration of jurisdictions with high vulnerability scores are in the portions of southern Illinois bordering the Mississippi and Ohio Rivers. The other jurisdictions with high flood vulnerability ratings were located along other major rivers such as the Greene, Illinois, Kaskaskia, and Rock Rivers.

Relative comparison of flood losses (A) and flood-loss ratios (B) by county

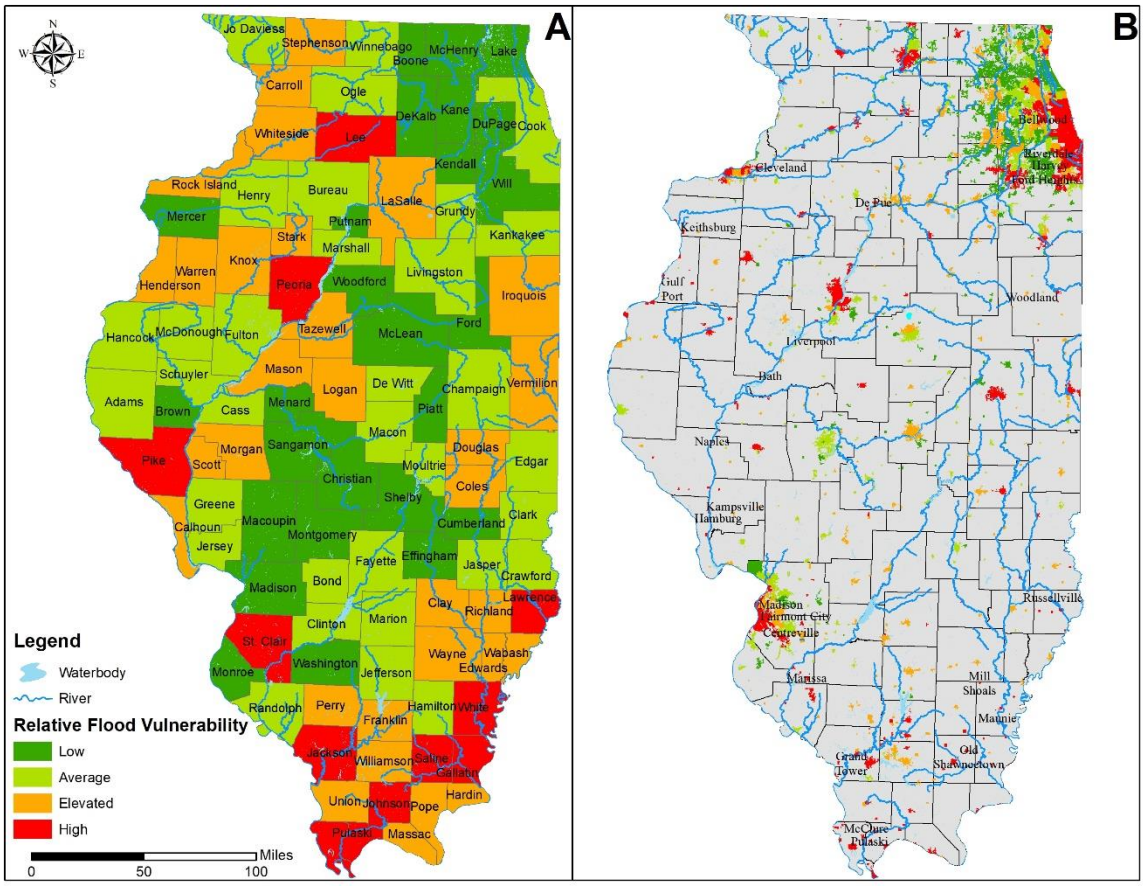


Colors indicate relative rank of parameter by county.

Flood Loss Ratio



Relative flood vulnerability by county and (B) relative flood vulnerability by jurisdiction



The modeling results suggest the least flood vulnerably county is Brown County and the most vulnerable county is Pulaski County. The results also suggest the Village of Hudson is one of the least flood vulnerable jurisdictions in Illinois that contains a FEMA Special Flood Hazard Area (100-year floodplain) and the City of Madison is the most flood-vulnerable jurisdiction. Individual county rankings are identified in the flood loss estimate table of this section.

County Level Flood Vulnerability Assessment

County	Total Exposure ($1000s)	Total Losses ($1000s)	FL Ratio	SV Score	SVI	FL Score	FLI	FV Score	FVI
Pulaski	$142,849	$16,115	0.11	0.08	1.00	0.11	0.68	1.68	1.00
Alexander	$549,571	$55,977	0.10	0.08	1.00	0.10	0.61	1.60	0.94
White	$563,475	$70,881	0.13	-0.06	0.60	0.13	0.78	1.37	0.78
Peoria	$5,622,968	$885,134	0.16	-0.14	0.40	0.16	1.00	1.36	0.77
Pike	$353,342	$35,702	0.10	-0.04	0.70	0.10	0.60	1.26	0.70
Jackson	$1,617,635	$156,074	0.10	-0.04	0.70	0.10	0.57	1.23	0.68
Gallatin	$270,480	$25,321	0.09	-0.03	0.70	0.09	0.55	1.24	0.68
St. Clair	$7,120,882	$549,544	0.08	0.00	0.80	0.08	0.43	1.21	0.66
Saline	$1,294,555	$112,374	0.09	-0.03	0.70	0.09	0.50	1.19	0.65
Lawrence	$544,008	$56,295	0.10	-0.07	0.60	0.10	0.62	1.20	0.65
Lee	$1,193,654	$162,892	0.14	-0.15	0.30	0.14	0.85	1.19	0.64
Johnson	$477,874	$36,426	0.08	-0.01	0.80	0.08	0.43	1.17	0.63
Wayne	$273,602	$24,148	0.09	-0.06	0.60	0.09	0.51	1.10	0.58
Massac	$444,697	$40,478	0.09	-0.08	0.60	0.09	0.53	1.08	0.57
Carroll	$648,059	$58,787	0.09	-0.10	0.50	0.09	0.53	1.01	0.52
Clay	$219,910	$16,878	0.08	-0.07	0.60	0.08	0.43	1.01	0.52
Henderson	$309,593	$32,172	0.10	-0.13	0.40	0.10	0.62	1.02	0.52
Tazewell	$3,456,182	$459,531	0.13	-0.21	0.20	0.13	0.83	1.01	0.51
Iroquois	$1,054,800	$86,851	0.08	-0.09	0.50	0.08	0.47	0.99	0.50

FLratio - Flood Loss Ratio
FVscore - Social Vulnerability Score
SVI - Social Vulnerability Index
FLI - Flood Loss Index
FVscore - Flood Vulnerability Score
FVI - Flood Vulnerability Index

20 most flood vulnerable counties; results present from most flood vulnerable county to least flood vulnerable county (From Remo et al. 2015).

Jurisdictional level Flood Vulnerability Assessment

Jurisdictions	Total Exposure ($1000s)	Total Losses ($1000s)	FL Ratio	SV Score	SVI	FL Score	FLI	FV Score	FVI
Madison city	$86,721	$32,830	0.38	0.29	0.67	0.38	0.88	1.55	1.00
Gulf Port village	$26,378	$7,353	0.28	-0.16	0.24	0.28	1.00	1.24	0.80
Old Shawneetown village	$22,190	$3,897	0.18	0.05	0.44	0.18	0.64	1.09	0.70
Venice city	$968	$71	0.07	0.63	1.00	0.07	0.05	1.05	0.67
Brooklyn village	$16,548	$1,736	0.10	0.55	0.92	0.10	0.10	1.03	0.66
Pulaski village	$2,587	$415	0.16	0.27	0.66	0.16	0.37	1.03	0.66
Grand Tower city	$56,161	$11,172	0.20	-0.04	0.36	0.20	0.66	1.02	0.65
Naples town	$15,753	$3,617	0.23	-0.22	0.19	0.23	0.82	1.01	0.64
Ford Heights village	$176,918	$4,805	0.03	0.51	0.88	0.03	0.02	0.91	0.58
Lenzburg village	$40,467	$9,170	0.23	-0.13	0.27	0.23	0.64	0.91	0.58
East St. Louis city	$952,192	$52,323	0.05	0.50	0.88	0.05	0.04	0.92	0.58
Alorton village	$136,365	$1,129	0.01	0.50	0.88	0.01	0.01	0.89	0.57
Cairo city	$245,163	$27,103	0.11	0.22	0.61	0.11	0.28	0.89	0.57
Washington Park village	$56,292	$2,107	0.04	0.50	0.88	0.04	0.01	0.89	0.57
McClure village	$27,457	$3,811	0.14	-0.01	0.39	0.14	0.51	0.89	0.57
East Cape Girardeau	$45,175	$6,274	0.14	-0.02	0.38	0.14	0.51	0.89	0.56
Gorham village	$20,935	$3,062	0.15	0.01	0.41	0.15	0.45	0.86	0.55
Russellville village	$146,337	$20,210	0.14	-0.06	0.34	0.14	0.51	0.85	0.54
Liverpool village	$21,226	$3,571	0.17	-0.16	0.24	0.17	0.62	0.85	0.54
Maunie village	$13,841	$1,920	0.14	-0.06	0.33	0.14	0.51	0.84	0.53

FLratio - Flood Loss Ratio
FVscore - Social Vulnerability Score
SVI - Social Vulnerability Index
FLI - Flood Loss Index
FVscore - Flood Vulnerability Score
FVI - Flood Vulnerability Index

Top 20 most flood vulnerable jurisdictions; results present from most flood vulnerable jurisdiction to least flood vulnerable jurisdiction (from Remo et al., 2015).

National Flood Insurance Program (NFIP)

In 1968, Congress created the National Flood Insurance Program (NFIP) to help provide a means for property owners to financially protect themselves. The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the NFIP. Participating communities agree to adopt and enforce ordinances that meet or exceed FEMA requirements to reduce the risk of flooding (FEMA Flood Smart) The NFIP is a voluntary program based on a mutual agreement between the federal government and the local community. The Illinois Department of Natural Resources/Office of Water Resources (IDNR/OWR) is the state coordinating agency for the NFIP and is a leader in the nation for NFIP coordination. Currently in Illinois, there are 885 jurisdictions participating in the NFIP. 122 are not in the Program, of which 12 are suspended and 3 have withdrawn. Both FEMA and the Illinois Office of Water Resources have established floodplain management standards for communities to follow. These regulations prevent future flood losses from occurring. The area of the state with the greatest growth (northeastern Illinois) has adopted floodplain regulations that go beyond the requirements of the NFIP. These areas only allow appropriate open space uses in the floodway and any development in the floodway requires compensatory storage. This area also has the largest and best trained staff in code and zoning enforcement. As a result, very few new structures in Illinois are out of compliance with the NFIP. Following data is from NFIP Insurance Report, Federal Emergency Management Agency, Illinois (01.02.2018)

Total communities in the NFIP: 885
Communities not in the NFIP: 122
Total polices: 42,190
Average premium: $1,024
Total coverage: $ 8,181,932,300
Total claims (since 1978): 49,157
Total paid damages: $512,201,790

Illinois also encourages jurisdictions to participate in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) which is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. The Community Rating System (CRS) is a voluntary program which provides incentives in the form of premium discounts for communities which go above-and-beyond minimum floodplain management standards. The State of Illinois is very proud of the way communities have embrace the Community Rating System (CRS).

Illinois leads the nation in participation for non-coastal states and is ranked (tied for 5th with Texas) 6th overall in the United States with 69 CRS communities. Illinois also has 13 communities that have achieved a Class 5 rating which results in a 25% reduction in flood insurance premiums. This distinction ranks us 4th nation-wide (FL, NJ, WA and IL- Washington has less Class 5 but they have classes better than 5 (4 and 3)) and 1st for non-coastal communities. Not only do we have the largest number of CRS communities among inland states, we are also national leaders when it comes to floodplain management. The citizens of Illinois will realize nearly $1.5 million in savings due to CRS. Based strictly on Illinois' state regulations, every community in the state could be achieving a 10% reduction in flood premiums simply by joining CRS. This speaks loudly of everyone who works with floodplain management in Illinois.

Illinois currently has over 69 communities participating in the CRS program, ranking it (tied for 5th) 6th in the nation in CRS communities. Of these communities, 13 are rated as a Class 5 community which results in a 25% reduction in flood insurance premiums. This distinction ranks Illinois 4th nation-wide and 1st for non-coastal communities. DuPage County is pending review which will bring the count up to 65 once approved.

2018 Illinois CRS Communities

Community	ST	NFIP #	CRS Class	Points	Notes
ADAMS COUNTY	IL	170001	8	1,444	
ADDISON, VILLAGE OF	IL	170198	6	2,283	
AURORA	IL	170320	New Visit 4/2018		Pending Verification Results
BARTLETT, VILLAGE OF	IL	170059	6	2,323	Improved
CALUMET CITY, CITY OF	IL	170072	6	2,491	
CARPENTERSVILLE, VILLAGE OF	IL	170322	6	2,293	
CHAMPAIGN, CITY OF	IL	170026	5	2,869	
COUNTRY CLUB HILLS, CITY OF	IL	170078	8	1,088	
CRYSTAL LAKE, CITY OF	IL	170476	6	2,094	
DEERFIELD, VILLAGE OF	IL	170361	6	2,464	
DEKALB, CITY OF	IL	170182	7	1,722	
DES PLAINES, CITY OF	IL	170081	7	2,178	
DOWNERS GROVE, VILLAGE OF	IL	170204	6	2,181	
DU PAGE COUNTY	IL	170197	6	2,456	NEW Community
FLOSSMOOR, VILLAGE OF	IL	170091	7	1,754	
GLEN ELLYN, VILLAGE OF	IL	170207	7	2,054	Needs Building Code for Class 6
GLENDALE HEIGHTS, VILLAGE OF	IL	170206	7	1,785	
GLENVIEW, VILLAGE OF	IL	170096	5	2,544	Improved
GURNEE, VILLAGE OF	IL	170365	6	2,225	
HAMPSHIRE, VILLAGE OF	IL	170327	7	1,761	
HIGHLAND PARK, CITY OF	IL	170367	8	1,384	
HOFFMAN ESTATES, VILLAGE OF	IL	170107	6	2,370	Improved
HUNTLEY, VILLAGE OF	IL	170480	New Visit 7/2018		Pending Verification Visit in July
JERSEY COUNTY	IL	170312	5	2,746	
LAKE COUNTY	IL	170357	6	2,048	
LAKE FOREST, CITY OF	IL	170374	7	1,623	
LAKE-IN-THE-HILLS, VILLAGE OF	IL	170481	6	2,133	
LANSING, VILLAGE OF	IL	170116	7	1,538	
LASALLE COUNTY	IL	170400	8	1,380	
LIBERTYVILLE	IL	170377	New Visit 2/2018		Pending Verification Results
LINCOLNSHIRE, VILLAGE OF	IL	170378	5	2,686	
LISLE, VILLAGE OF	IL	170211	5	2,835	
MCHENRY COUNTY	IL	170732	7	1,682	Improved

Community	ST	NFIP #	CRS Class	Points	Notes
MELROSE PARK, VILLAGE OF	IL	170125	8	1,057	
METROPOLIS, CITY OF	IL	170469	8	1,291	New
MIDLOTHIAN, CITY OF	IL	170127	7	1,849	NEW Community
MOLINE, CITY OF	IL	170591	8	1,420	
MONTGOMERY, VILLAGE OF	IL	170328	5	2,657	
MOUNT PROSPECT, VILLAGE OF	IL	170129	6	2,415	Improved
NILES, VILLAGE OF	IL	170130	6	2,003	
NORTHBROOK, VILLAGE OF	IL	170132	7	1,593	New
NORTHFIELD, VILLAGE OF	IL	170133	7	2,183	Needs Building Code for Class 6
OAK BROOK, VILLAGE OF	IL	170214	7	1,638	
OGLE COUNTY	IL	170525	7	1,741	
ORLAND HILLS, VILLAGE OF	IL	170172	5	2,674	
OTTAWA, CITY OF	IL	170405	5	4,012	Needs Class 4 or better prerequisites
PALATINE, VILLAGE OF	IL	175170	7	1,803	
PEORIA COUNTY	IL	170533	5	2,780	
PROSPECT HEIGHTS, CITY OF	IL	170919	7	2,017	
RIVER FOREST, VILLAGE OF	IL	170151	7	2,125	Needs Building Code for Class 6
RIVERWOODS, VILLAGE OF	IL	170387	8	1,654	
ROCK ISLAND COUNTY	IL	170582	7	1,620	
ROXANA, VILLAGE OF	IL	170448	8	1,390	
SANGAMON COUNTY	IL	170912	7	1,600	
SOUTH ELGIN, VILLAGE OF	IL	170332	5	3,061	Needs Class 4 or better prerequisites
SOUTH HOLLAND, VILLAGE OF	IL	170163	5	2,876	
ST. CHARLES, CITY OF	IL	170330	5	2,589	
ST. CLAIR COUNTY	IL	170616	6	2,048	Improved
SUGAR GROVE, VILLAGE OF	IL	170333	6	2,103	
SWANSEA, Village of	IL	170637	New Visit 4/2018		Pending Verification Results
SYCAMORE, CITY OF	IL	170191	7	1,709	
TINLEY PARK, VILLAGE OF	IL	170169	7	1,519	
WESTCHESTER, VILLAGE OF	IL	170170	8	1,386	
WHEATON, CIT OF	IL	170221	6	2,157	NEW Community
WHEELING, VILLAGE OF	IL	170173	6	2,210	Community on Hold per IDNR
WHITESIDE COUNTY	IL	170687	8	1,037	
WILLOWBROOK, VILLAGE OF	IL	170222	6	2,185	
WINNETKA, VILLAGE OF	IL	170176	6	2,008	
WOOD DALE, CITY OF	IL	170224	5	3,660	Needs Class 4 or better prerequisites
IL Class 5 (13) Class 6 (20) Class 7 (21) Class 8 (11) NEW Pending Results (4) **Total 69**					

The tables below provide a listing of the top 15 jurisidictions and top 15 counties with the highest insurance payouts to repetitive loss properties. The information was supplied by IDNR, from a repetitive loss dataset. The table includes information related to the number repetitive loss properties including the number of losses and insurance payment amounts. The repetitive loss list excludes those structures that have already been mitigated. The county listing is for repetitive loss properties located in unincorporated areas within said county. The previous table represents the total repetitive loss numbers for the county.

Community Repetitive Loss Listing

Community Name	Number of Losses	Number of Repetitive Loss Properties	Total Insurance Claims Paid	Average Insurance Claim Paid
Des Plaines	630	244	$22,920,609.31	$36,381.92
Bellwood	549	236	$5,622,864.03	$10,242.01
Cook County*	377	125	$7,277,890.95	$19,304.75
Peoria County*	533	125	$6,064,568.12	$11,378.18
Will County*	355	111	$4,757,040.85	$13,400.12
Westchester	231	101	$3,072,823.62	$13,302.27
Rockford	194	92	$5,800,328.41	$29,898.60
Stone Park	283	91	$5,567,359.45	$19,672.65
Rock Island	338	82	$3,395,448.46	$10,045.71
Melrose Park	168	69	$3,241,085.39	$19,292.17
Watseka	156	61	$2,019,604.00	$12,946.18
Chicago	133	60	$1,719,640.37	$12,929.63
Lake County*	160	59	$2,417,595.24	$15,109.97
Kankakee County*	193	56	$2,754,273.91	$14,270.85
McHenry County*	156	50	$2,176,698.12	$13,953.19

County Repetitive Loss Listing

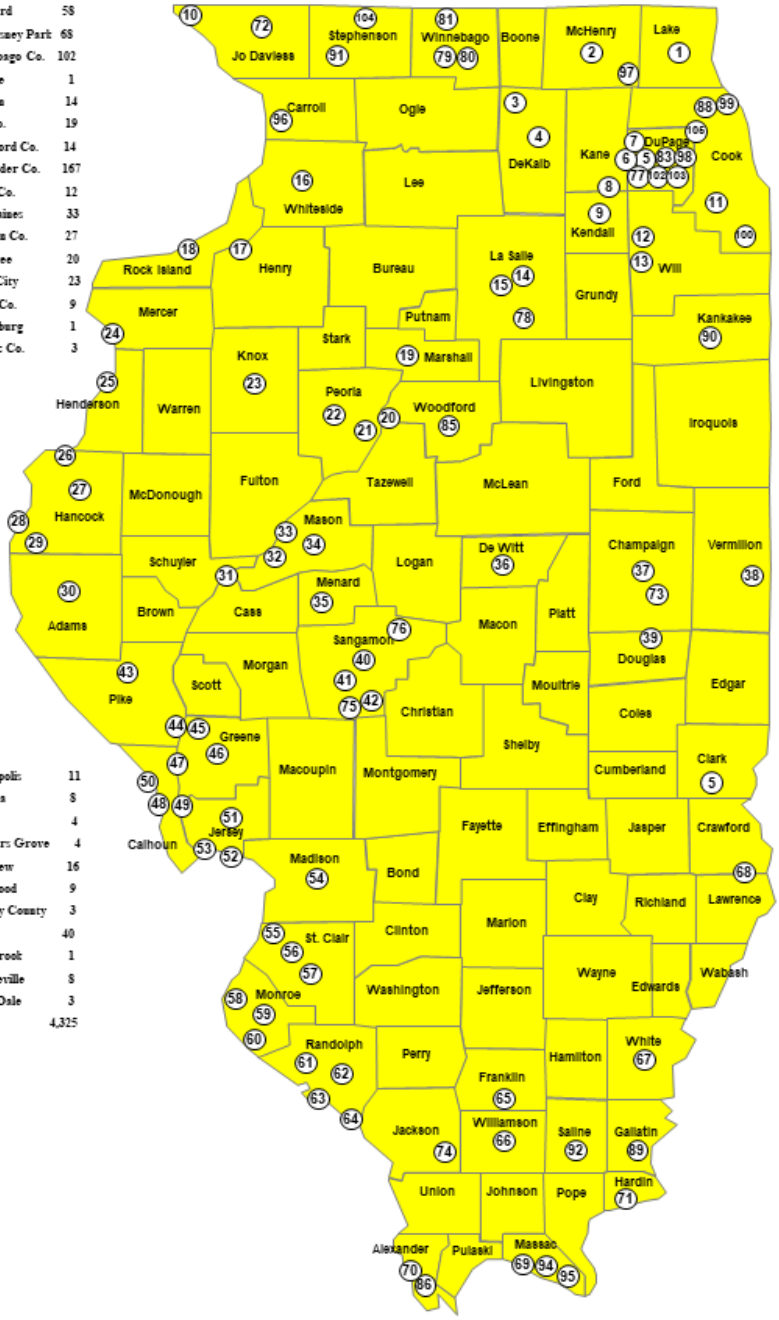
County Name	Number of Losses	Number of Repetitive Loss Properties	Total Insurance Claims Paid	Average Insurance Claim Paid
Cook	4539	1775	$92,838,524.01	$1,673,616.85
Peoria	1515	362	$16,680,792.67	$94,176.58
Jersey	1271	329	$13,837,007.35	$39,622.80
Calhoun	1120	288	$11,206,096.21	$45,134.55
DuPage	804	283	$15,321,215.03	$392,354.67
Winnebago	501	201	$11,324,072.45	$70,537.19
Lake	492	181	$9,793,836.88	$409,799.21
Rock Island	633	178	$8,523,959.74	$131,520.57
Will	522	167	$7,177,678.95	$137,370.94
La Salle	253	88	$5,603,697.09	$155,452.24
Iroquois	207	83	$3,043,965.00	$47,964.10
Kankakee	261	80	$3,662,644.00	$61,917.89
McHenry	228	77	$2,856,664.02	$104,030.71
Fulton	251	71	$2,546,813.05	$38,021.14
Woodford	223	63	$2,664,962.68	$20,334.38

A detailed list of Severe Repetitive Loss and Non-Mitigated Loss properties are given in Appendix C

IEMA Bureau of Preparedness and Grant Administration

MAP SHOWING FLOODPLAIN MITIGATION ACQUISITION BUY-OUT PROJECTS 1993 – December 2015

Index	Jurisdiction	Parcels
1	Lake Co.	73
2	McHenry Co.	16
3	Kirtland	65
4	DeKalb	138
5	DuPage Co.	70
6	Aurora	25
7	Aurora Twp.	22
8	Montgomery	39
9	Kendall Co.	7
10	East Dubuque	35
11	Palos Hills	3
12	Shorewood	47
13	Birds Bridge	15
14	Ottawa	65
15	LaSalle Co.	14
16	Whiteside Co.	7
17	Cleveland	34
18	Rock Island Co.	111
19	Sparland	19
20	Peoria	3
21	Peoria Hts.	20
22	Peoria Co.	61
23	Knox Co.	14
24	Keithsburg	110
25	Oquawka	34
26	Pontoosuc	25
27	Hancock Co.	49
28	Warsaw	5
29	Rocky Run Twp.	13
30	Adams Co.	20
31	Browning	54
32	Bath	9
33	Havana	49
34	Mason Co.	28
35	Petersburg	43
36	Clinton	57
37	Champaign Co.	1
38	Danville	23
39	Villa Grove	24
40	Sangamon Co.	20
41	Chatham	9
42	Pawnee	3
43	Pike Co.	33
44	Pearl	4
45	Hillview	15
46	Greene Co.	57
47	Kampsville	14
48	Calhoun Co.	75
49	Hardin	43
50	Hamburg	9
51	Jersey Co.	94
52	Elsah	2
53	Grafton	111
54	Madison Co.	39
55	East St. Louis	612
56	Belleville	54
57	St. Clair Co.	259
58	Valmeyer	244
59	Monroe Co.	136
60	Fults	25
61	Evansville	18
62	Randolph Co.	24
63	Kaskaskia	6
64	Rockwood	11
65	West Frankfort	31
66	Marion	46
67	Cami	66
68	Birds	50
69	Joppa	6
70	Thebes	1
71	Elizabethtown	2
72	Jo Daviess Co.	2
73	Sidney	10
74	Jackson Co.	49
75	Diverson	8
76	Riverton	6
77	Carol Stream	3
78	Streator	2
79	Rockford	58
80	Machesney Park	68
81	Winnebago Co.	102
82	Gurnee	1
83	Addison	14
84	Will Co.	19
85	Woodford Co.	14
86	Alexander Co.	167
87	Clark Co.	12
88	Des Plaines	33
89	Gallatin Co.	27
90	Kankakee	20
91	Pearl City	23
92	Saline Co.	9
93	Harrisburg	1
94	Massac Co.	3
95	Metropolis	11
96	Savanna	8
97	Cary	4
98	Downers Grove	4
99	Glenview	16
100	Glenwood	9
101	Grundy County	3
102	Lisle	40
103	Oak Brook	1
104	Orangeville	8
105	Wood Dale	3
Total:		4,325



Updated
12.01.15

Loss Estimation according to Hazus-MH For Floods 2015

County Name	Total Exposure ($1,000s)	Total Loss ($1,000s)	Flood Loss Ratio	SV Score	SV Index	FL Score	FL Index	FV Score	FV Index	Z Score	Flood Vulnerability Rating
Pulaski	$142,849	$16,115	0.11	0.08	1.00	0.11	0.68	1.68	1.00	3.33	High
Alexander	$549,571	$55,977	0.10	0.08	0.99	0.10	0.61	1.60	0.94	3.00	High
White	$563,475	$70,881	0.13	-0.06	0.59	0.13	0.78	1.37	0.78	2.18	High
Peoria	$5,622,968	$885,134	0.16	-0.14	0.36	0.16	1.00	1.36	0.77	2.14	High
Pike	$353,342	$35,702	0.10	-0.04	0.66	0.10	0.60	1.26	0.70	1.79	High
Gallatin	$270,480	$25,321	0.09	-0.03	0.69	0.09	0.55	1.24	0.68	1.71	High
Jackson	$1,617,635	$156,074	0.10	-0.04	0.66	0.10	0.57	1.23	0.68	1.68	High
St. Clair	$7,120,882	$549,544	0.08	0.00	0.78	0.08	0.43	1.21	0.66	1.60	High
Lawrence	$544,008	$56,295	0.10	-0.07	0.58	0.10	0.62	1.20	0.65	1.54	High
Saline	$1,294,555	$112,374	0.09	-0.03	0.69	0.09	0.50	1.19	0.65	1.54	High
Lee	$1,193,654	$162,892	0.14	-0.15	0.33	0.14	0.85	1.19	0.64	1.51	High
Johnson	$477,874	$36,426	0.08	-0.01	0.75	0.08	0.43	1.17	0.63	1.46	High
Wayne	$273,602	$24,148	0.09	-0.06	0.59	0.09	0.51	1.10	0.58	1.20	High
Massac	$444,697	$40,478	0.09	-0.08	0.55	0.09	0.53	1.08	0.57	1.12	High
Union	$786,178	$71,345	0.09	-0.09	0.52	0.09	0.53	1.05	0.55	1.02	High
Henderson	$309,593	$32,172	0.10	-0.13	0.39	0.10	0.62	1.02	0.52	0.88	Elevated
Clay	$219,910	$16,878	0.08	-0.07	0.58	0.08	0.43	1.01	0.52	0.87	Elevated
Carroll	$648,059	$58,787	0.09	-0.10	0.48	0.09	0.53	1.01	0.52	0.86	Elevated
Tazewell	$3,456,182	$459,531	0.13	-0.21	0.18	0.13	0.83	1.01	0.51	0.85	Elevated
Iroquois	$1,054,800	$86,851	0.08	-0.09	0.52	0.08	0.47	0.99	0.50	0.78	Elevated
Whiteside	$1,518,869	$160,450	0.11	-0.16	0.32	0.11	0.63	0.96	0.48	0.67	Elevated
Pope	$324,502	$22,406	0.07	-0.07	0.58	0.07	0.38	0.96	0.48	0.67	Elevated

County Name	Total Exposure ($1,000s)	Total Loss ($1,000s)	Flood Loss Ratio	Social Vulnerability Score	Social Vulnerability Index	Flood Loss Score	Flood Loss Index	FV Score	FV Index	Z Score	Flood Vulnerability Rating
Hardin	$211,629	$10,714	0.05	-0.02	0.70	0.05	0.24	0.94	0.47	0.62	Elevated
Edwards	$92,902	$7,297	0.08	-0.10	0.49	0.08	0.44	0.93	0.46	0.57	Elevated
Wabash	$223,544	$20,548	0.09	-0.14	0.38	0.09	0.54	0.92	0.45	0.52	Elevated
LaSalle	$3,277,029	$283,313	0.09	-0.12	0.42	0.09	0.50	0.91	0.45	0.51	Elevated
Morgan	$1,184,533	$87,282	0.07	-0.09	0.50	0.07	0.41	0.91	0.45	0.50	Elevated
Stephenson	$1,429,500	$130,399	0.09	-0.14	0.38	0.09	0.53	0.91	0.44	0.49	Average
Warren	$442,978	$21,018	0.05	-0.03	0.68	0.05	0.22	0.91	0.44	0.49	Average
Knox	$798,855	$39,148	0.05	-0.03	0.67	0.05	0.23	0.91	0.44	0.49	Average
Calhoun	$381,603	$27,802	0.07	-0.10	0.49	0.07	0.40	0.90	0.43	0.45	Average
Rock Island	$4,267,069	$322,760	0.08	-0.11	0.46	0.08	0.42	0.88	0.42	0.39	Average
Perry	$496,773	$36,586	0.07	-0.11	0.46	0.07	0.41	0.87	0.41	0.34	Average
Franklin	$698,286	$43,055	0.06	-0.08	0.54	0.06	0.32	0.87	0.41	0.34	Average
Coles	$900,576	$64,729	0.07	-0.11	0.46	0.07	0.40	0.85	0.40	0.29	Average
Douglas	$647,908	$56,647	0.09	-0.15	0.34	0.09	0.51	0.85	0.40	0.27	Average
Stark	$122,676	$9,004	0.07	-0.12	0.44	0.07	0.41	0.84	0.40	0.26	Average
Richland	$496,028	$33,082	0.07	-0.10	0.48	0.07	0.36	0.84	0.40	0.25	Average
Mason	$280,911	$20,485	0.07	-0.12	0.43	0.07	0.40	0.84	0.39	0.23	Average
Williamson	$1,757,244	$99,932	0.06	-0.08	0.54	0.06	0.29	0.83	0.39	0.20	Average
Scott	$167,185	$14,537	0.09	-0.16	0.32	0.09	0.50	0.82	0.38	0.18	Average
Logan	$641,279	$34,228	0.05	-0.08	0.55	0.05	0.26	0.82	0.38	0.16	Average
Vermilion	$1,930,631	$123,219	0.06	-0.10	0.48	0.06	0.34	0.81	0.38	0.15	Average
Cook	$65,830,820	$3,311,723	0.05	-0.08	0.55	0.05	0.24	0.79	0.36	0.07	Average
Bureau	$957,405	$68,100	0.07	-0.13	0.40	0.07	0.39	0.79	0.36	0.05	Average

County Name	Total Exposure ($1,000s)	Total Loss ($1,000s)	Flood Loss Ratio	Social Vulnerability Score	Social Vulnerability Index	Flood Loss Score	Flood Loss Index	FV Score	FV Index	Z Score	Flood Vulnerability Rating
Clinton	$1,539,535	$128,931	0.08	-0.17	0.30	0.08	0.48	0.78	0.35	0.01	Average
Crawford	$417,870	$21,469	0.05	-0.09	0.52	0.05	0.25	0.77	0.34	-0.02	Average
Livingston	$1,207,106	$77,113	0.06	-0.12	0.42	0.06	0.34	0.76	0.34	-0.06	Average
Marion	$884,614	$55,058	0.06	-0.12	0.42	0.06	0.33	0.74	0.33	-0.10	Average
Champaign	$2,804,797	$152,183	0.05	-0.11	0.47	0.05	0.27	0.74	0.32	-0.14	Average
Adams	$1,511,682	$110,536	0.07	-0.16	0.32	0.07	0.40	0.72	0.31	-0.17	Average
Greene	$214,723	$11,182	0.05	-0.10	0.47	0.05	0.25	0.72	0.31	-0.18	Average
Clark	$324,430	$21,680	0.07	-0.14	0.36	0.07	0.36	0.72	0.31	-0.20	Average
Fayette	$372,794	$17,894	0.05	-0.10	0.49	0.05	0.23	0.71	0.31	-0.21	Average
De Witt	$510,457	$41,365	0.08	-0.18	0.25	0.08	0.46	0.71	0.30	-0.22	Average
McDonough	$673,306	$35,004	0.05	-0.11	0.46	0.05	0.25	0.71	0.30	-0.22	Average
Macon	$2,919,870	$213,068	0.07	-0.16	0.31	0.07	0.40	0.71	0.30	-0.22	Average
Jo Daviess	$1,200,227	$83,399	0.07	-0.16	0.32	0.07	0.38	0.70	0.30	-0.26	Average
Hamilton	$156,359	$5,395	0.03	-0.08	0.55	0.03	0.13	0.68	0.28	-0.34	Average
Randolph	$1,007,719	$64,459	0.06	-0.15	0.34	0.06	0.34	0.67	0.28	-0.36	Average
Marshall	$442,352	$29,758	0.07	-0.16	0.31	0.07	0.36	0.67	0.27	-0.38	Average
Jasper	$286,802	$13,741	0.05	-0.11	0.44	0.05	0.23	0.67	0.27	-0.38	Average
Henry	$921,216	$58,225	0.06	-0.15	0.33	0.06	0.33	0.67	0.27	-0.38	Average
Kankakee	$3,595,442	$199,175	0.06	-0.14	0.38	0.06	0.28	0.65	0.26	-0.43	Average
Ogle	$2,017,976	$127,109	0.06	-0.16	0.32	0.06	0.33	0.65	0.26	-0.44	Average
Fulton	$700,881	$35,865	0.05	-0.13	0.39	0.05	0.25	0.64	0.25	-0.48	Average
Hancock	$588,693	$30,182	0.05	-0.13	0.39	0.05	0.25	0.64	0.25	-0.49	Average
Cass	$231,921	$10,871	0.05	-0.12	0.42	0.05	0.22	0.63	0.25	-0.50	Average

County Name	Total Exposure ($1,000s)	Total Loss ($1,000s)	Flood Loss Ratio	Social Vulnerability Score	Social Vulnerability Index	Flood Loss Score	Flood Loss Index	FV Score	FV Index	Z Score	Flood Vulnerability Rating
Jefferson	$893,671	$40,884	0.05	-0.12	0.42	0.05	0.21	0.63	0.25	-0.50	Average
Jersey	$527,028	$37,740	0.07	-0.19	0.24	0.07	0.39	0.63	0.24	-0.52	Average
Moultrie	$533,496	$37,365	0.07	-0.18	0.24	0.07	0.38	0.63	0.24	-0.53	Average
Grundy	$1,664,047	$126,972	0.08	-0.20	0.20	0.08	0.43	0.63	0.24	-0.53	Average
Winnebago	$9,165,487	$469,060	0.05	-0.14	0.37	0.05	0.25	0.62	0.24	-0.55	Average
Edgar	$269,281	$11,754	0.04	-0.13	0.41	0.04	0.20	0.61	0.23	-0.61	Low
Bond	$437,437	$23,440	0.05	-0.15	0.33	0.05	0.27	0.59	0.22	-0.65	Low
Schuyler	$98,772	$4,080	0.04	-0.13	0.41	0.04	0.18	0.59	0.21	-0.68	Low
Effingham	$979,611	$55,735	0.06	-0.17	0.28	0.06	0.29	0.57	0.20	-0.74	Low
Washington	$374,966	$17,739	0.05	-0.15	0.33	0.05	0.22	0.55	0.19	-0.81	Low
Cumberland	$327,348	$11,458	0.04	-0.13	0.41	0.04	0.13	0.54	0.18	-0.84	Low
DuPage	$38,819,352	$2,227,470	0.06	-0.18	0.25	0.06	0.29	0.54	0.18	-0.85	Low
Sangamon	$4,199,163	$311,161	0.07	-0.23	0.12	0.07	0.41	0.53	0.17	-0.88	Low
Woodford	$966,859	$66,559	0.07	-0.22	0.16	0.07	0.37	0.53	0.17	-0.89	Low
Will	$23,655,568	$1,448,957	0.06	-0.20	0.21	0.06	0.32	0.53	0.17	-0.90	Low
McLean	$3,086,097	$134,424	0.04	-0.16	0.33	0.04	0.19	0.52	0.17	-0.92	Low
Menard	$352,948	$24,418	0.07	-0.22	0.14	0.07	0.38	0.52	0.16	-0.94	Low
Montgomery	$389,029	$12,479	0.03	-0.13	0.40	0.03	0.11	0.51	0.16	-0.96	Low
Kane	$14,288,209	$731,564	0.05	-0.18	0.26	0.05	0.25	0.51	0.16	-0.96	Low
Christian	$599,562	$32,638	0.05	-0.19	0.23	0.05	0.27	0.50	0.15	-0.99	Low
Piatt	$511,235	$32,145	0.06	-0.22	0.15	0.06	0.33	0.49	0.14	-1.05	Low
Shelby	$371,840	$14,373	0.04	-0.16	0.32	0.04	0.16	0.48	0.14	-1.05	Low
Madison	$4,410,928	$235,883	0.05	-0.20	0.21	0.05	0.26	0.48	0.13	-1.09	Low
Macoupin	$395,831	$17,115	0.04	-0.17	0.28	0.04	0.19	0.47	0.13	-1.11	Low

County Name	Total Exposure ($1,000s)	Total Loss ($1,000s)	Flood Loss Ratio	Social Vulnerability Score	Social Vulnerability Index	Flood Loss Score	Flood Loss Index	FV Score	FV Index	Z Score	Flood Vulnerability Rating
DeKalb	$2,186,071	$103,538	0.05	-0.18	0.25	0.05	0.22	0.47	0.13	-1.11	Low
Lake	$37,102,854	$2,142,158	0.06	-0.22	0.14	0.06	0.30	0.44	0.11	-1.22	Low
Mercer	$345,123	$15,993	0.05	-0.19	0.22	0.05	0.21	0.43	0.10	-1.24	Low
Putnam	$184,789	$7,930	0.04	-0.19	0.23	0.04	0.19	0.42	0.09	-1.29	Low
Monroe	$885,884	$50,496	0.06	-0.24	0.08	0.06	0.29	0.37	0.06	-1.47	Low
Ford	$77,032	$2,649	0.03	-0.19	0.24	0.03	0.13	0.37	0.06	-1.47	Low
Boone	$1,388,336	$65,162	0.05	-0.22	0.14	0.05	0.22	0.36	0.05	-1.52	Low
Kendall	$1,974,161	$119,578	0.06	-0.27	0.00	0.06	0.32	0.32	0.02	-1.66	Low
McHenry	$11,711,743	$548,194	0.05	-0.24	0.08	0.05	0.22	0.30	0.01	-1.73	Low
Brown	$205,193	$3,288	0.02	-0.17	0.29	0.02	0.00	0.29	0.00	-1.77	Low

Levee Failure

Description

Levee failure fits into the second definition of flooding " the unusual and rapid accumulation or runoff of surface waters from any source." There are several areas in Illinois that utilize levees to protect land:

a) from peak flood levels, and/or
b) to protect land that is below river level.

What is a Levee?

National Flood Insurance Program defines a levee **"**a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to reduce risk from temporary flooding." The NFIP regulations define a levee system as "a flood protection system which consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices." For the purposes of this document, levees and levee systems are referred to as "levees."
(The National Flood Insurance Program (NFIP) defines a levee in Title 44, Chapter 1, Section 59.1 of the Code of Federal Regulations (44 CFR 59.1 Revised 2016)

Nature of Hazard

Levees are designed to provide a specific level of protection. They can be overtopped or fail in larger flood events. Levees also decay over time. They require regular maintenance and periodic upgrades to retain their level of protection. When levees do fail, they fail catastrophically. The damage may be more significant than if the levee was not there. For all these reasons, FEMA urges people to understand their flood risk. (FEMA Fact Sheet 2016)

Failure can be grouped into six main failure mechanisms: bearing failure, sliding failure, slump or spreading failure, seepage failure, erosion failure, and over topping (Moss and Eller, 2007). Although, when the water level exceed the design standard for the level, it is not strictly a failure. Many levees have been constructed to meet the criteria for a 1% annual chance flood (a.k.a. 100-year flood). These levees are not designed to withstand a greater event, which may occur less frequently, but is expected to occur.

A bearing failure in levees is typically deep-seated and is most likely induced by seismic ground shaking. Failure is commonly triggered by a seismic event that either causes a loss of soil strength or produces destabilizing inertial loading conditions.

A sliding failure may occur if the foundation soil has a weak or brittle zone resulting in a preferred failure plane. Both seismic induced inertial loading and high water levels can cause sliding failures.
Slumping and spreading can be generated by two loading conditions. Cyclic loading from earthquakes may generate increased pore pressures and reduced soil strength, leading to volumetric and/or deviatoric strains in the foundation. The same results can also occur due to increased pore pressures from high water levels and increased seepage.

Seepage is one of the most common failure mechanisms in levees. Levees are built in fluvial depositional environments and it is common to find levees with an existing sandy layer beneath the foundation. The sandy layer can be a conduit for flow underneath the levee, resulting in critical conditions at the inboard) or landside) toe. This leads to erosion of the foundation during high water or a consistent weakening of the foundation over a long period of time, both eventually leading to failure. Biogenic agents can also lead to destabilizing seepage. This can include rodent holes, tree roots, or other biological activity that create conduits for seepage.

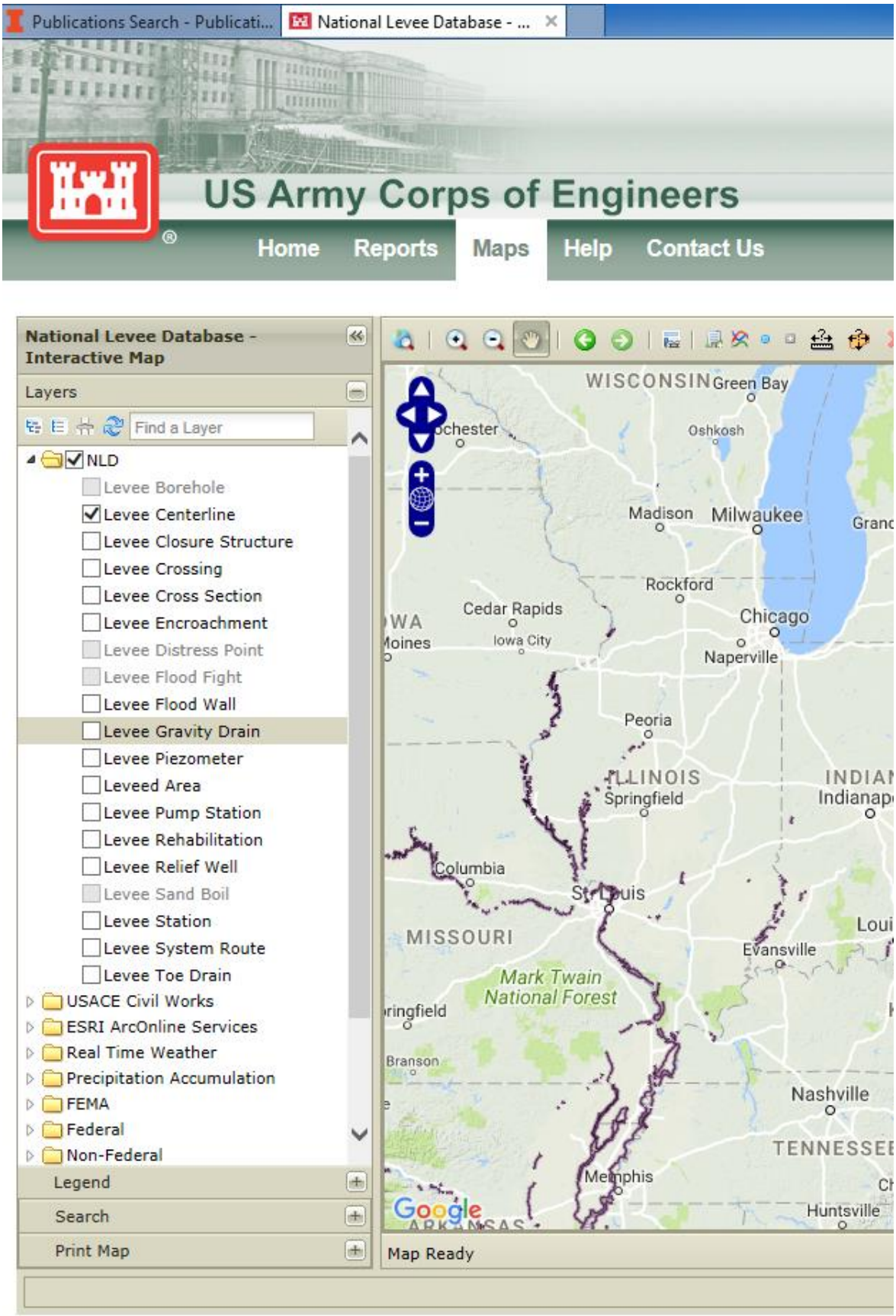
High velocity flows can erode material from the outboard or waterside of the levee, which may lead to instability and failure. Erosion can occur at once or over time as a function of the storm cycle and scale of the peak storms. The failure mechanism of overtopping occurs when high water exceeds the elevation of the levee crest. The water energy is then concentrated at the inboard toe of the levee leading to soil erosion and decreased levee stability. Overtopping failure can be exacerbated by decreased levee crest height due to land subsidence. (Source:INHMP 2013)

According to the "Illinois Statewide Flood Hazard Assessment" conducted by the Natural Hazard Research and Mitigation Group (NHRMC) at Southern Illinois University, Carbondale; FEMA-mapped 100-year floodplains in Illinois encompass approximately 7,140 mi^2 or 13% of the state. Within the total Illinois floodplain area, 146 levees, together protecting 1,500 mi^2 of floodplain have been identified. Protection levels of Illinois's levees range from 5- to 10-year flood which are generally privately owned and constructed levees up to 100- and 500-year flood protection level for federally constructed levees which usually protect developed or urban areas.

Of the 146 levee systems identified in Illinois there are three levees with an acceptable rating (2%), 80 with minimally acceptable rating (55%), 45 levees with an unacceptable rating (31%) and 18 levees with no rating information (12%) (Source: Dr. Jon Remo, SIU Carbondale)

The Illinois State Water Survey report Illinois River Levees: *Sizing Up their Impact on Flooding and Risk* (Byard, Gregory J., Ryan Meekma, Brad McVay, Sally McConkey, 2014 Illinois State Water Survey, Champaign, IL ISWS CR 2014-0. 2014.) provides information on the expected frequency of levees along the Illinois River being overtopped, the area inundated as well as data on risk exposure in terms of buildings and crops.

The USACE National Levee Database (http://nld.usace.army.mil/egis/f?p=471:1:0:: accessed April 30, 2018) provides information on the majority of levees within the USACE program. It is expected to be expanded to include all levees in the future. Levee centerlines and areas of possible inundation may be viewed at the website.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Levee Closure Structure
Levee Crossing
Levee Cross Section
Levee Encroachment
Levee Distress Point
Levee Flood Fight
Levee Flood Wall
Levee Gravity Drain
Levee Piezometer
Leveed Area
Levee Pump Station
Levee Rehabilitation
Levee Relief Well
Levee Sand Boil
Levee Station
Levee System Route
Levee Toe Drain
USACE Civil Works
ESRI ArcOnline Services
Real Time Weather
Precipitation Accumulation
FEMA
Federal
Non-Federal
Legend
Search
Print Map
WISCONSIN
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MISSOURI
Evansville
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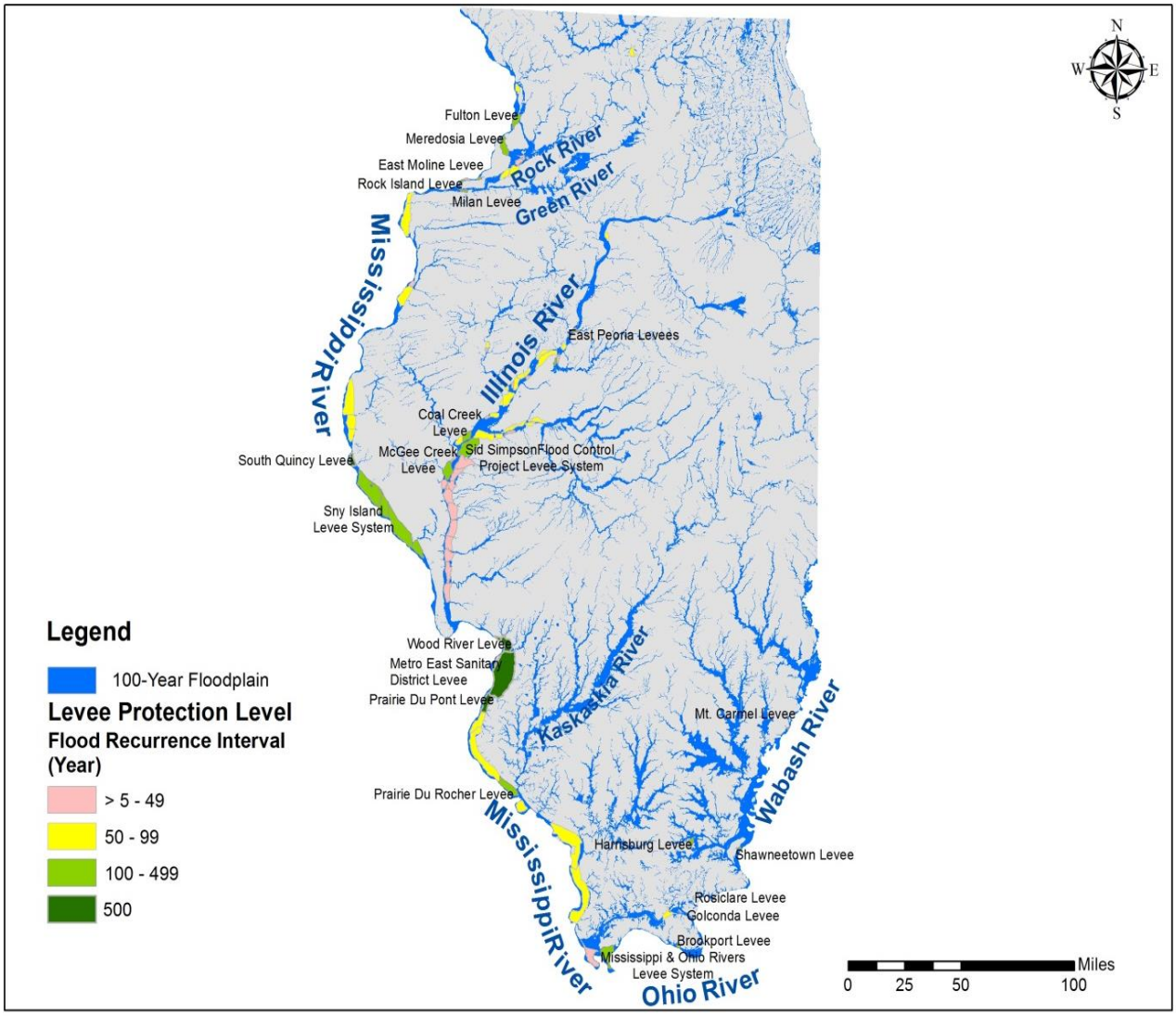
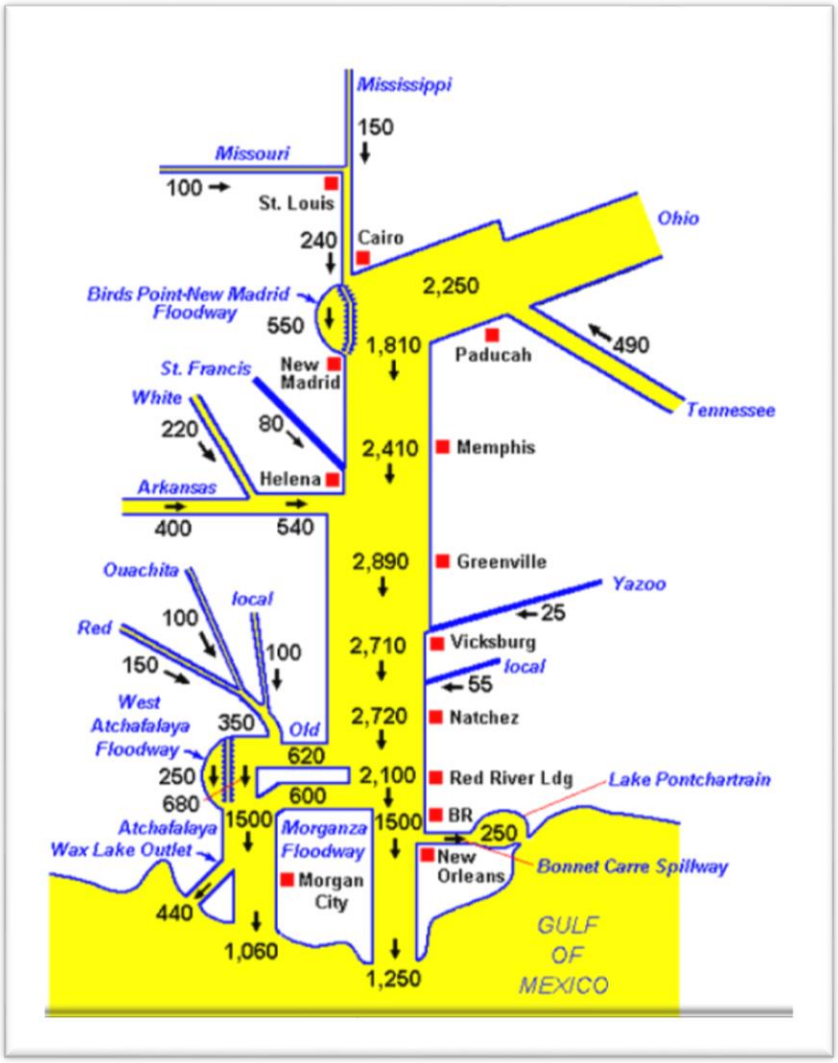
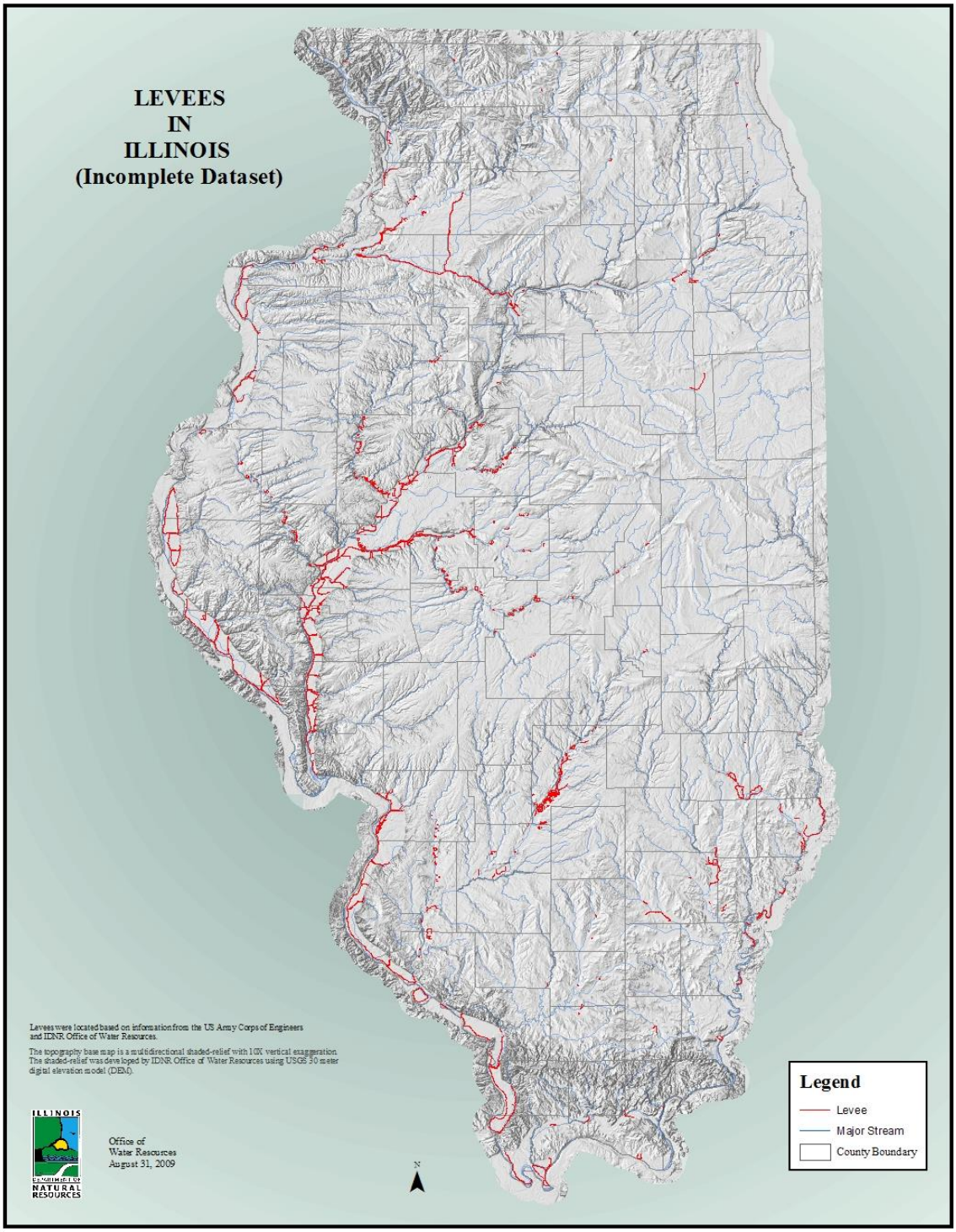
100-year floodplain extent and levees in Illinois. Levees with a protection level of ≥100-year flood are labeled

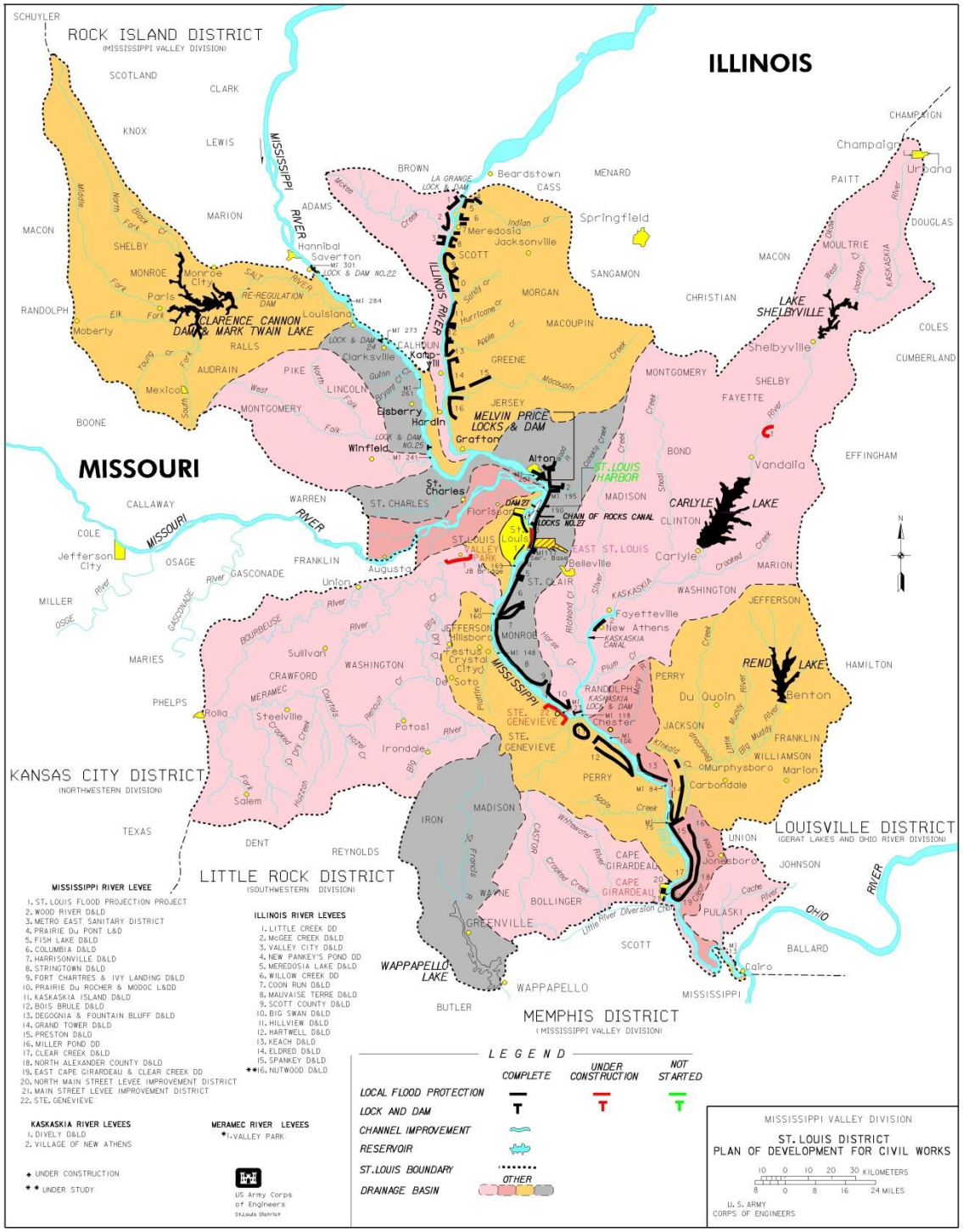


Schematic of the Mississippi River and Tributary system



Levees in Illinois




ROCK ISLAND DISTRICT
(MISSISSIPPI VALLEY DIVISION)
ILLINOIS
MISSOURI
KANSAS CITY DISTRICT
(NORTHWESTERN DIVISION)
LITTLE ROCK DISTRICT
(SOUTHWESTERN DIVISION)
LOUISVILLE DISTRICT
(GREAT LAKES AND OHIO RIVER DIVISION)
MEMPHIS DISTRICT
(MISSISSIPPI VALLEY DIVISION)
MISSISSIPPI RIVER
ILLINOIS RIVER
MISSOURI RIVER
OHIO RIVER
CLARENCE CANNON DAM & MARK TWAIN LAKE
MELVIN PRICE LOCKS & DAM
ST. LOUIS HARBOR
CHAIN OF ROCKS CANAL
LOCKS NO.27
CARLYLE LAKE
LAKE SHELBYVILLE
REND LAKE
WAPPAPELLO LAKE
MISSISSIPPI RIVER LEVEE
1. ST. LOUIS FLOOD PROJECTION PROJECT
2. WOOD RIVER D&LD
3. METRO EAST SANITARY DISTRICT
4. PRAIRIE Du PONT L&D
5. FISH LAKE D&LD
6. COLUMBIA D&LD
7. HARRISONVILLE D&LD
8. STRINGTOWN D&LD
9. FORT CHARTRES & IVY LANDING D&LD
10. PRAIRIE Du ROCHER & MODOC L&DD
11. KASKASKIA ISLAND D&LD
12. BOIS BRULE D&LD
13. DEGOGNIA & FOUNTAIN BLUFF D&LD
14. GRAND TOWER D&LD
15. PRESTON D&LD
16. MILLER POND DD
17. CLEAR CREEK D&LD
18. NORTH ALEXANDER COUNTY D&LD
19. EAST CAPE GIRARDEAU & CLEAR CREEK DD
20. NORTH MAIN STREET LEVEE IMPROVEMENT DISTRICT
21. MAIN STREET LEVEE IMPROVEMENT DISTRICT
22. STE. GENEVIEVE
ILLINOIS RIVER LEVEES
1. LITTLE CREEK DD
2. McGEE CREEK D&LD
3. VALLEY CITY D&LD
4. NEW PANKEY'S POND DD
5. MEREDOSIA LAKE D&LD
6. WILLOW CREEK DD
7. COON RUN D&LD
8. MAUVAISE TERRE D&LD
9. SCOTT COUNTY D&LD
10. BIG SWAN D&LD
11. HILLVIEW D&LD
12. HARTWELL D&LD
13. KEACH D&LD
14. ELDRED D&LD
15. SPANKEY D&LD
16. NUTWOOD D&LD
KASKASKIA RIVER LEVEES
1. DIVELY D&LD
2. VILLAGE OF NEW ATHENS
MERAMEC RIVER LEVEES
1. VALLEY PARK
UNDER CONSTRUCTION
UNDER STUDY
US Army Corps of Engineers
St.Louis District
LEGEND
COMPLETE
UNDER CONSTRUCTION
NOT STARTED
LOCAL FLOOD PROTECTION
LOCK AND DAM
CHANNEL IMPROVEMENT
RESERVOIR
ST.LOUIS BOUNDARY
DRAINAGE BASIN
OTHER
MISSISSIPPI VALLEY DIVISION
ST. LOUIS DISTRICT
PLAN OF DEVELOPMENT FOR CIVIL WORKS
KILOMETERS
MILES
U. S. ARMY
CORPS OF ENGINEERS

Levee Database for Illinois November/December 2017

County Name	Levee Name	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Accredited Levee	Inspection Rating	Inspection Date	Inspection Type
Adams	Indian Grave: LDB Rock	Mississippi River	1971	29	12638	50	Yes	No	Minimally Acceptable	10/27/2014	Routine
Adams	Indian Grave: RDB Rock	Mississippi River	1971	29	6859	50	Yes	No	Minimally Acceptable	10/27/2014	Routine
Adams	South Quincy Drainage District	Mississippi River	Not Available	8.8	5515	500	Yes	Yes	Minimally Acceptable	11/3/2014	Routine
Alexander	Len Small Levee System	Mississippi River	Not Available	Not Available	16605	15	Yes	No	Minimally Acceptable	9/23/2015	Routine
Alexander	Mississippi & Ohio Rivers LS	Mississippi and Ohio	Not Available	Not Available	16584	100	Yes	Yes	Unacceptable	10/6/2016	Routine
Brown	Little Creek Drainage and Levee District	Illinois River	Not Available	5.8	1646	12	Yes	No	Unacceptable	11/16/2010	Periodic
Brown	McGee Creek	Illinois River	Not Available	14.6	12254	100	Yes	Yes	Unacceptable	10/8/2015	Routine
Calhoun	Sny Island Levee Drainage District	Mississippi River	1971		14037	100	Yes	Yes	Minimally Acceptable	8/5/2014	Periodic
Carroll	Spring Lake Wildlife Area	Mississippi River	1993	7.8	3300	50	No	No	Not Applicable	Not Applicable	Not Applicable
Cass	South Sangamon Drainage & Levee District West	Sangamon River	1975	6.1	3811	50	Yes	No	Unacceptable	3/31/2010	Routine
Cass	Chandlerville, IL	Sangamon River	1895	8	2561	20	Yes	No	Minimally Acceptable	12/11/2013	Routine
Cass	South Sangamon Drainage & Levee District East	Sangamon River	1975	Not Available	Not Available	20	Yes	No	Unacceptable	3/24/2010	Routine
Cass	Clear Lake Special & Hager Slough	Sangamon River	1948	8.5	13954	50	Yes	No	Unacceptable	7/9/2014	Periodic
Cass	S. Sangamon D&LD, East	Sangamon River	Not Available	Not Available	4082	Not Available	Yes	No	Inactive	Not Available	Not Applicable
Cass	Sid Simpson Flood Control Project	Illinois River	1967	11.1	21923	100	Yes	Yes	Minimally Acceptable	10/16/2014	Routine
Clinton	Germantown Levee System	Kaskaskia River	Not Available	Not Available	1277	Not Available	Yes	No	Minimally Acceptable	8/25/2015	Routine

County Name	Levee Name	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Accredited Levee	Inspection Rating	Inspection Date	Inspection Type
Clinton	Hanover Levee System	Kaskaskia River	Not Available	Not Available	3443	Not Available	Yes	No	Minimally Acceptable	6/7/2017	Routine
Clinton	Heimann Levee System	Shoal Creek	Not Available	Not Available	1403	Not Available	Yes	No	Minimally Acceptable	9/16/2015	Routine
Clinton	Santa Fe Levee System	Kaskaskia River	Not Available	Not Available	2932	Not Available	Yes	No	Unacceptable	9/16/2015	Routine
Cook	Levee 37	Des Plaines River	Not Available	Not Available	Not Available	Not Available	Yes	No	Minimally Acceptable	8/1/2017	Routine
Cook	Levee50	Des Plaines River	Not Available	Not Available	Not Available	Not Available	Yes	No	Minimally Acceptable	8/2/2017	Routine
DeKalb	Dekalb LFP: LDB South Branch	Kishwaukee	1958	3.2	183	100	Yes	Yes	Unacceptable	5/29/2014	Periodic
DeKalb	Dekalb LFP: RDB South Branch	Kishwaukee	1958	3.2	92	100	Yes	Yes	Unacceptable	3/11/2011	Periodic
Fayette	Dively D&LD System	Kaskaskia River	Not Available	Not Available	1398	Not Available	Yes	No	Minimally Acceptable	10/8/2015	Routine
Fayette	Vandalia Levee System	Kaskaskia River	Not Available	Not Available	11978	Not Available	Yes	No	Not Available	Not Available	Not Available
Fulton	East Liverpool Levee and Drainage District	Illinois River	1941	8.7	2961	50	Yes	No	Minimally Acceptable	1/30/2015	Routine
Fulton	Effland D&LD	Spoon River	1960	2.4	290	10	Yes	No	Minimally Acceptable	11/14/2014	Routine
Fulton	Globe Drainage and Levee District N/S	Illinois and Spoon River	1930	5.5	1233	20	Yes	No	Unacceptable	11/26/2001	Routine
Fulton	L L Langellier W Matanzas K Valley	Illinois River	1949	4.5	10553	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Fulton	Liverpool Drainage and Levee District	Illinois River	1941	7	3174	50	Yes	No	Minimally Acceptable	1/30/2015	Routine
Fulton	Lower Pleasant Valley Levee District	Spoon River	1954	3.7	980	10	Yes	No	Minimally Acceptable	11/24/2014	Routine
Fulton	Seahorn Drainage and Levee District	Illinois River	1939	4.7	1782	50	Yes	No	Minimally Acceptable	6/3/2014	Periodic
Fulton	Spoon River Project No. 1	Spoon River	1955	6.1	2213	50	Yes	No	Minimally Acceptable	11/14/2014	Routine
Fulton	Spoon River Ranch and Roddis D & L	Spoon River	Not Available	Not Available	422	Not Available	Yes	No	Unacceptable	3/5/2009	Routine

County Name	Levee Name	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Accredited Levee	Inspection Rating	Inspection Date	Inspection Type
Fulton	West Mantanzas DD and LD	Illinois River	1920	12.3	5911	50	Yes	No	Acceptable	Not Available	Not Available
Fulton	Zempel Mutual Drainage District	Spoon River	1983	3.2	1290	50	Yes	No	Acceptable	3/24/2011	Routine
Gallatin	Shawneetown LFPP	Ohio River	Not Available	Not Available	945	100	Yes	No	Unacceptable	12/13/2005	Routine
Greene	Bluffdale Levee System	Illinois	Not Available	Not Available	725	Not Available	Yes	No	Minimally Acceptable	10/6/2015	Routine
Greene	Eldred Drainage and Levee District	Illinois River	Not Available	11.8	9455	20	Yes	No	Unacceptable	5/4/2015	Routine
Greene	Hartwell Drainage and Levee District	Illinois River	Not Available	12.2	9795	20	Yes	No	Minimally Acceptable	10/6/2015	Routine
Greene	Hillview Drainage and Levee District	Illinois River	Not Available	12.8	13446	20	Yes	No	Minimally Acceptable	10/7/2015	Routine
Greene	Keach Drainage and Levee District	Illinois River	Not Available	12.4	9362	25	Yes	No	Minimally Acceptable	10/6/2015	Routine
Greene	Schafer Levee	Illinois	Not Available	Not Available	275	Not Available	Yes	No	Minimally Acceptable	10/6/2015	Routine
Hancock	Hunt Lima Lake Drainage District	Mississippi River	1972	30.3	31406	50	Yes	No	Minimally Acceptable	5/12/2014	Periodic
Hardin	Rosiclare LFPP	Ohio River	Not Available	Not Available	263	100	Yes	Yes	Unacceptable	3/8/2017	Routine
Henderson	Henderson County Drainage District No. 1	Mississippi River	1968	11.3	17998	50	Yes	No	Unacceptable	4/23/2012	Periodic
Henderson	Henderson County Drainage District No. 2	Mississippi	Not Available	Not Available	686	Not Available	Yes	No	Unacceptable	4/23/2012	Periodic
Henderson	Henderson County Drainage District No. 3	Mississippi River	1968	6.6	6163	Not Available	No	No	Unacceptable	8/22/2012	Periodic
Henderson	Niota, IL LEVEE	Mississippi River	Not Available	Not Available	458	Not Available	No	No	Not Applicable	Not Applicable	Not Applicable
Henderson	Oquawka Illinois Levee	Mississippi River	Not Available	Not Available	77	Not Available	No	No	Not Applicable	Not Applicable	Not Applicable
Jackson	Degognia \ Grand Tower	Mississippi River	Not Available	19.4	56777	50	Yes	No	Unacceptable	7/14/2010	Periodic
Jasper	Saint Marie Levee	Embarrass River	Not Available	Not Available	2078	Not Available	Yes	No	Minimally Acceptable	10/29/2013	Routine

County Name	Levee Name	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Accredited Levee	Inspection Rating	Inspection Date	Inspection Type
Jersey	Nutwood Drainage and Levee District	Illinois River	Not Available	12.3	11048	20	Yes	No	Unacceptable	12/11/2013	Routine
Jersey	Spanky D&LD System	Illinois River	Not Available	Not Available	931	Not Available	Yes	No	Minimally Acceptable	5/5/2015	Routine
Jo Daviess	East Dubuque, IL	Mississippi River	Not Available	Not Available	40	Not Available	No	No	Minimally Acceptable	11/14/2014	Routine
Joe Daviess	Galena LFPP LDB	Galena River	1951	1.6	30	100	Yes	Yes	Minimally Acceptable	6/17/2014	Periodic
Joe Daviess	Galena LFPP RDB	Galena River	1951	Not Available	39	100	Yes	Yes	Minimally Acceptable	11/14/2014	Routine
La Salle	Ottawa Township High school Levee, IL	Illinois River	Not Available	Not Available	63	Not Available	Yes	No	Minimally Acceptable	12/23/2014	Routine
La Salle	Streator, IL Levee	Vermilion River	Not Available	0.4	27	50	Yes	No	Unacceptable	10/21/2008	Routine
Lake	North Libertyville Estates	Des Plaines River	Not Available	Not Available	65	Not Available	Yes	No	Minimally Acceptable	8/3/2017	Routine
Lawrence	England Pond Levee	Wabash River	Not Available	Not Available	6157	Not Available	Yes	No	Minimally Acceptable	3/27/2017	Routine
Lawrence	Russell-Allison-Ambraw Levee	Wabash River	Not Available	Not Available	41385	Not Available	Yes	No	Minimally Acceptable	10/29/2013	Routine
Madison	Chouteau Island Drainage and Levee District	Mississippi River	Not Available	11.3	1999	10	Yes	No	Minimally Acceptable	7/15/2011	Routine
Madison	Gabaret and Cabrolet Island Drainage and Levee District	Mississippi River	Not Available	2.4	800	10	No	No	Not Applicable	Not Applicable	Not Applicable
Madison	Metro East Levee and Drainage District	Mississippi River	Not Available	19.8	85977	500	Yes	Yes	Unacceptable	1/26/2015	Periodic
Madison	Wood River East	Mississippi River	Not Available	20.8	428	500	Yes	Yes	Minimally Acceptable	8/30/2011	Periodic
Madison	Wood River North	Mississippi River	Not Available	20.8	10688	500	Yes	Yes	Minimally Acceptable	8/28/2015	Routine
Madison	Wood River West	Mississippi River	Not Available	20.8	1640	500	Yes	Yes	Minimally Acceptable	8/27/215	Routine
Mason	Farmers L&DD and Hergbert D&LD	Sangamon River	1941	8.3	7448	50	Yes	No	Minimally Acceptable	12/17/2014	Routine

County Name		River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Accredited Levee	Inspection Rating	Inspection Date	Inspection Type
Mason	Lake Chautaqua Wildlife Areas	Illinois River	1993	3.8	1192	10	No	No	Not Applicable	Not Available	Not Applicable
Mason	Mason and Menard D&LD	Sangamon River	1939	14.5	5885	50	Yes	No	Minimally Acceptable	8/8/2014	Periodic
Massac	Brookport	Ohio River	Not Available	Not Available	1185	100	Yes	Yes	Unacceptable	9/21/2016	Periodic
Massac	Reevesville LFPP	Bay Creek Ditch	Not Available	Not Available	6655	50	Yes	No	Minimally Acceptable	9/22/2016	Routine
Menard	North Sangamon-Lattimore Creek Mutual DD	Sangamon River	Not Available	Not Available	563	Not Available	Yes	No	Minimally Acceptable	1/13/2010	Routine
Menard	Oakford Special DD	Sangamon River	1939	7.4	2729	50	Yes	No	Unacceptable	8/8/2014	Periodic
Mercer	Bay Island Drainage and Levee District No. 1	Mississippi River	1966	19.9	24989	50	Yes	No	Minimally Acceptable	12/2/2014	Routine
Mercer	Keithsburg Levee	Mississippi River	1969	0.9	115	Not Available	No	No	Not Applicable	Not Applicable	Not Applicable
Monroe	Columbia D&LD No.3	Mississippi River	Not Available	20.1	13806	50	Yes	No	Unacceptable	8/17/2015	Periodic
Monroe	Harrisonville / Ft Chartres	Mississippi River	Not Available	21.4	45938	50	Yes	No	Minimally Acceptable	8/20/2015	Periodic
Morgan	Coon Run D&LD SE System	Illinois	Not Available	Not Available	1600	Not Available	Yes	No	Minimally Acceptable	8/23/2012	Routine
Morgan	Meredosia Lake-Willow Creek	Illinois River	Not Available	10.8	16119	30	Yes	No	Minimally Acceptable	10/8/2015	Routine
Morgan	Willow Creek	Illinois River	Not Available	7	9062	10	Yes	No	Minimally Acceptable	8/24/2015	Periodic
Peoria	Banner Special Levee and Drainage District	Illinois River	1941	10.8	4866	50	Yes	No	Inactive	Not Available	Not Applicable
Peoria	East Peoria Sanitary District	Illinois River	Not Available	9.5	81	100	Yes	Yes	Unacceptable	6/14/2012	Periodic
Peoria	Greater Peoria Sanitary District	Illinois River	Not Available	1.2	57	100	Yes	No	Minimally Acceptable	12/3/2013	Routine
Peoria	Keystone Levee	Illinois River	Not Available	2.6	245	10	No	No	Not Applicable	Not Applicable	Not Applicable
Peoria	Komatsu-Dresser Levee	Illinois River	Not Available	1	125	10	No	No	Not Applicable	Not Applicable	Not Applicable

County Name	Levee Name	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Accredited Levee	Inspection Rating	Inspection Date	Inspection Type
Peoria	Pekin and LA Marsh Levee and Drainage District	Illinois River	1954	7.1	2843	50	Yes	No	Unacceptable	3/19/2012	Periodic
Pike	Sny Island Levee Drainage District	Mississippi River	1971	Not Available	45261	100	Yes	Yes	Minimally Acceptable	10/16/2014	Routine
Pike	Sny Island Levee Drainage District	Mississippi River	1971	Not Available	896	100	Yes	Yes	Minimally Acceptable	12/10/2014	Routine
Pike	Sny Island Levee Drainage District	Mississippi River	1971	Not Available	17264	100	Yes	Yes	Minimally Acceptable	11/20/2013	Routine
Pike	Sny Island Levee Drainage District	Mississippi River	1971	Not Available	43296	100	Yes	Yes	Minimally Acceptable	12/8/2014	Routine
Pike	Sny Island Pleasant Hill V	Mississippi	Not Available	Not Available	2461	Not Available	Yes	No	Minimally Acceptable	11/20/2013	Routine
Pike	Valley City Drainage and Levee District	Illinois River	Not Available	8.2	4772	40	Yes	No	Minimally Acceptable	3/14/2016	Periodic
Pope	Golconda, LFPP	Ohio River	Not Available	Not Available	74	100	Yes	Yes	Unacceptable	2/24/2016	Routine
Pulaski	Cache River Levee	Cache River	Not Available	Not Available	2147	Not Available	Yes	No	Unacceptable	9/22/2016	Routine
Putnam	Hennepin Drainage and Levee District	Illinois River	1940	5.9	2612	50	Yes	No	Unacceptable	11/19/2001	Routine
Randolph	Kaskaskia	Mississippi River	Not Available	14.8	9241	50	Yes	No	Unacceptable	5/22/2014	Routine
Randolph	Prairie Du Rocher	Mississippi River	Not Available	16.5	16151	100	Yes	Yes	Unacceptable	4/13/2016	Periodic
Rock Island	Andalusia Refuge Levee	Mississippi River	1989	1.6	130	2	Yes	No	Minimally Acceptable	6/5/2014	Periodic
Rock Island	Drury Drainage District	Mississippi River	1963	9.6	5110	50	Yes	No	Minimally Acceptable	11/20/2014	Routine
Rock Island	East Moline LFPP	Mississippi River	1984	2.5	1193	200	Yes	Yes	Minimally Acceptable	12/3/2014	Periodic
Rock Island	Milan, IL LFPP - Mill Creek / LBD Rock	Rock River	1988	10.8	811	200	Yes	Yes	Acceptable	11/20/2014	Routine
Rock Island	Milan, IL LFPP & Big Island Cons. District	Rock River	1988	10.8	1147	200	Yes	Yes	Minimally Acceptable	11/20/2014	Routine

County Name	Levee Name	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Accredited Levee	Inspection Rating	Inspection Date	Inspection Type
Rock Island	Milan/Big Island RDB South	Slough Mill Creek	Not Available	Not Available	85	100	Yes	Yes	Minimally Acceptable	11/20/2014	Routine
Rock Island	ROCK ISLAND ARSENAL (FED GOVT)	Mississippi River	Not Available	0.9	822	Not Available	No	No	Not Applicable	Not Applicable	Not Applicable
Rock Island	Rock Island LFPP	Mississippi River	1973	3.8	863	200	Yes	Yes	Minimally Acceptable	11/5/2014	Routine
Rock Island	Village of Andalusia Levee	Mississippi River	1969	1.6	63	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Rock Island	Village of Andalusia Levee	Mississippi River	1969	1.6	113	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Rock Island	Zuma CaNoe Special Service Area	Rock River	Not Available	7.6	5007	50	Yes	No	Minimally Acceptable	11/11/2015	Routine
Saline	Harrisburg LFPP	Saline River	Not Available	Not Available	3903	100	Yes	Yes	Minimally Acceptable	3/8/2017	Routine
Schuyler	Big Lake Drainage and Levee District	Illinois River	1943	6.8	3921	50	Yes	No	Unacceptable	5/12/2012	Periodic
Schuyler	Coal Creek Levee and Drainage District	Illinois River	1954	13.1	6318	100	Yes	Yes	Minimally Acceptable	5/8/2012	Periodic
Schuyler	Crane Creek Levee and Drainage District	Illinois River	1941	8.6	5559	50	Yes	No	Minimally Acceptable	7/8/2014	Periodic
Schuyler	Kelly Lake Drainage and Levee District	Illinois River	Not Available	4.8	1200	Not Available	No	No	Not Applicable	Not Applicable	Not Applicable
Scott	Big Swan Drainage and Levee District	Illinois River	Not Available	11.3	13607	20	Yes	No	Minimally Acceptable	8/26/2011	Routine
Scott	Mauvaise Terre D&LD	Illinois River	Not Available	6.4	5481	40	Yes	No	Minimally Acceptable	1/4/2011	Periodic
Scott	Robertson Mutual Levee	Illinois River	Not Available	1.9	693	40	YES	No	Not Available	Not Available	Not Available
Scott	Scott County	Illinois River	Not Available	17	11125	40	Yes	No	Minimally Acceptable	2/11/2011	Periodic
St. Clair	Prairie Du Pont & Fish Lake	Mississippi River	Not Available	10.3	12903	500	Yes	Yes	Unacceptable	9/8/2015	Periodic
St. Clair	Village of New Athens System	Kaskaskia River	Not Available	Not Available	146	100	Yes	Yes	Minimally Acceptable	8/25/2015	Routine
Stark	Don Morrissey Levee	Spoon River	Not Available	0.7	152	10	Yes	No	Minimally Acceptable	10/31/2007	Routine

County Name	Levee Name	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Accredited Levee	Inspection Rating	Inspection Date	Inspection Type
Tazewell	Cincinnati L&DD	Mackinaw	Not Available	4.6	2004	10	Yes	No	Unacceptable	7/15/2011	Initial Eligibility
Tazewell	East Peoria Levee & Drainage District	Illinois River	1945	3.2	17	100	Yes	No	Unacceptable	3/9/2015	Routine
Tazewell	East Peoria Levee & Drainage District	Illinois River	1945	Not Available	1049	100	Yes	No	Unacceptable	3/9/2015	Routine
Tazewell	East Peoria Sanitary District	Illinois River	1945	9.5	20	100	Yes	No	Unacceptable	4/11/2012	Periodic
Tazewell	East Peoria Sanitary District	Illinois River	1945	9.5	355	100	Yes	No	Unacceptable	4/11/2012	Periodic
Tazewell	East Peoria Sanitary District	Illinois River	1945	9.5	37	100	Yes	No	Unacceptable	4/11/2012	Periodic
Tazewell	East Peoria Sanitary District	Illinois River	1945	9.5	93	100	Yes	No	Unacceptable	4/11/2012	Periodic
Tazewell	East Peoria Sanitary District	Illinois River	1945	9.5	94	100	Yes	No	Unacceptable	6/13/2012	Periodic
Tazewell	Mackinaw River L&DD No.1	Mackinaw	Not Available	3.4	1639	100	Yes	Yes	Minimally Acceptable	12/7/2010	Routine
Tazewell	Spring Lake Levee and Drainage District	Illinois River	1941	16	13010	50	Yes	No	Minimally Acceptable	12/11/2014	Routine
Union	Big Five Levee System	Mississippi River	Not Available	14.6	16200	50	Yes	No	Minimally Acceptable	1/19/2011	Periodic
Wabash	Mt. Carmel Protected Area	Wabash River	Not Available	Not Available	550	100	Yes	Yes	Unacceptable	8/22/2016	Routine
Wabash	Rochester-McCleary's Bluff Levee	Wabash River	Not Available	Not Available	4823	Not Available	Yes	No	Minimally Acceptable	8/23/2016	Routine
Whiteside	Anderson Weaver- Erie Township Levee	Rock River	Not Available	7.6	5800	10	No	No	Not Applicable	Not Applicable	Not Applicable
Whiteside	Charles Brown Levee	Rock River	Not Available	1.7	770	5	No	No	Not Applicable	Not Applicable	Not Applicable
Whiteside	Fulton Flood Control District	Mississippi River	1984	12	9586	200	Yes	Yes	Minimally Acceptable	11/21/2014	Routine
Whiteside	Meredosia D&LD	Mississippi River	1977	3.4	10044	100	Yes	Yes	Unacceptable	10/8/2015	Routine
Whiteside	Paul Young Levee	Rock River	Not Available	0.4	100	20	No	No	Not Applicable	Not Applicable	Not Applicable

County Name	Levee Name	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Accredited Levee	Inspection Rating	Inspection Date	Inspection Type
Whiteside	Penny Slough Drainage and Levee District	Rock River	1940	9.2	9495	50	Yes	No	Unacceptable	4/3/2012	Periodic
Winnebago	Rockford, IL Alpine Dry Reservoir	Keith Creek	Not Available	Not Available	210	Not Available	Yes	No	Unacceptable	11/19/2003	Routine
Winnebago	Levings Lake Dam	South Branch Kent Creek	1988	Not Available	3605	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Winnebago	Page Park Dam North Branch	Kent Creek	Not Available	Not Available	751	50	Yes	No	Minimally Acceptable	11/19/2014	Routine
Winnebago	Rockford, IL South Branch Ken Creek Diversion Channel	Kent Creek	Not Available	Not Available	637	50	Yes	No	Minimally Acceptable	11/19/2014	Routine
Woodford	Herman Drainage and Levee District	Illinois River	Not Available	1.6	420	10	No	No	Not Applicable	Not Applicable	Not Applicable

Source: (Dr. Jonathan William Remo, Southern Illinois University, Carbondale)

Loss Estimation according to Hazus – MH for Levee Failure

County	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Loss Index	SVI Score	SVI Index	Flood Score	z-score	Flood Vulnerability Ratting
Alexander	1	106710	473539	0.23	0.74	4.75	1.00	1.74	3.38	High
Peoria	2	1007400	3391926	0.30	1.00	-1.56	0.47	1.47	2.32	High
White	3	70270	355209	0.20	0.64	2.19	0.78	1.42	2.14	High
Rock Island	4	920790	3607772	0.26	0.85	-0.63	0.55	1.40	2.05	High
Lee	5	161510	730949	0.22	0.73	-0.53	0.56	1.29	1.61	High
Hardin	6	12680	113683	0.11	0.33	3.91	0.93	1.26	1.51	High
Pulaski	7	45770	278678	0.16	0.52	1.59	0.73	1.25	1.47	Elevated
Pope	8	28030	274439	0.10	0.30	4.11	0.95	1.25	1.45	Elevated
Jackson	9	154400	998106	0.15	0.49	1.69	0.74	1.23	1.38	Elevated
Massac	10	59880	353205	0.17	0.54	0.87	0.67	1.21	1.31	Elevated
Cass	11	111560	551835	0.20	0.66	-0.63	0.55	1.21	1.30	Elevated
Whiteside	12	211780	1107594	0.19	0.62	-0.40	0.57	1.19	1.23	Elevated
LaSalle	13	281280	2060057	0.14	0.42	1.92	0.76	1.18	1.20	Elevated
Gallatin	14	24840	169928	0.15	0.46	1.44	0.72	1.18	1.18	Elevated
Saline	15	110930	833748	0.13	0.41	1.68	0.74	1.15	1.07	Elevated
Pike	16	32140	231988	0.14	0.43	1.43	0.72	1.15	1.07	Elevated
Johnson	17	32240	275579	0.12	0.35	2.26	0.79	1.14	1.04	Elevated
Henderson	18	30510	184335	0.17	0.53	0.06	0.61	1.14	1.02	Elevated
Lawrence	19	56700	336329	0.17	0.54	-0.23	0.58	1.12	0.95	Elevated
Union	20	70000	474138	0.15	0.46	0.53	0.65	1.11	0.93	Elevated
Perry	21	35330	272062	0.13	0.40	1.32	0.71	1.11	0.91	Elevated
Wabash	22	26040	169552	0.15	0.48	-0.14	0.59	1.07	0.78	Elevated
Carroll	23	57950	409575	0.14	0.44	0.32	0.63	1.07	0.76	Elevated
Stephenson	24	129770	851978	0.15	0.48	-0.17	0.59	1.07	0.76	Elevated

County	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Loss Index	SVI Score	SVI Index	Flood Score	z-score	Flood Vulnerability Ratting
Franklin	25	40530	441770	0.09	0.26	2.24	0.79	1.05	0.69	Elevated
Adam	26	145230	993649	0.15	0.46	-0.13	0.59	1.05	0.67	Elevated
Randolph	27	76190	631635	0.12	0.36	0.88	0.67	1.03	0.63	Elevated
Wayne	28	23770	170222	0.14	0.43	-0.07	0.59	1.02	0.58	Elevated
Morgan	29	85850	792258	0.11	0.32	0.87	0.67	0.99	0.45	Average
St. Clair	30	1184080	7511279	0.16	0.50	-1.36	0.49	0.99	0.45	Average
Marion	31	53940	572355	0.09	0.27	1.15	0.70	0.97	0.37	Average
Tazewell	32	454300	2661830	0.17	0.54	-2.25	0.41	0.95	0.32	Average
Vermilion	33	123700	1243312	0.10	0.29	0.65	0.66	0.95	0.29	Average
Calhoun	34	27730	252997	0.11	0.32	0.09	0.61	0.93	0.24	Average
Dewitt	35	41170	302236	0.14	0.42	-1.07	0.51	0.93	0.22	Average
Mason	36	18420	166071	0.11	0.33	-0.02	0.60	0.93	0.22	Average
Richland	37	32620	302456	0.11	0.32	0.11	0.61	0.93	0.21	Average
Iroquois	38	87070	700991	0.12	0.38	-0.65	0.55	0.93	0.21	Average
Knox	39	37840	515381	0.07	0.19	1.54	0.73	0.92	0.20	Average
Madison	40	1327770	8271525	0.16	0.51	-2.23	0.41	0.92	0.17	Average
Clay	41	15870	141698	0.11	0.33	-0.25	0.58	0.91	0.15	Average
Macon	42	212940	1925620	0.11	0.33	-0.24	0.58	0.91	0.13	Average
Bureau	43	63980	574753	0.11	0.33	-0.40	0.57	0.90	0.11	Average
Moultrie	44	34240	327897	0.10	0.30	-0.12	0.59	0.89	0.09	Average
Brown	45	2620	113197	0.02	0.01	3.35	0.88	0.89	0.07	Average
Clark	46	21010	198880	0.11	0.31	-0.29	0.58	0.89	0.06	Average
Jo Daviess	47	106020	868841	0.12	0.37	-0.93	0.52	0.89	0.06	Average
Kendall	102	104850	1199314	0.09	0.24	-7.15	0.00	0.24	-2.45	Low
Williamson	48	97300	1142675	0.09	0.23	0.33	0.63	0.86	-0.03	Average
Marshall	49	27760	273602	0.10	0.29	-0.34	0.57	0.86	-0.03	Average

County	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Loss Index	SVI Score	SVI Index	Flood Score	z-score	Flood Vulnerability Ratting
Schuyler	50	3830	61423	0.06	0.15	1.29	0.71	0.86	-0.04	Average
Clinton	51	125260	962267	0.13	0.40	-1.64	0.46	0.86	-0.06	Average
Edwards	52	5670	49066	0.12	0.34	-1.09	0.51	0.85	-0.07	Average
McDonough	53	33700	429648	0.08	0.21	0.44	0.64	0.85	-0.08	Average
Scott	54	13410	104179	0.13	0.39	-1.81	0.45	0.84	-0.12	Average
Coles	55	63890	648722	0.10	0.28	-0.60	0.55	0.83	-0.15	Average
Greene	56	9120	136790	0.07	0.17	0.75	0.66	0.83	-0.17	Average
Jefferson	57	40080	580847	0.07	0.18	0.61	0.65	0.83	-0.18	Average
Stark	58	8350	80955	0.10	0.30	-0.92	0.52	0.82	-0.20	Average
Logan	59	33330	413402	0.08	0.22	-0.06	0.60	0.82	-0.21	Average
Fayette	60	16670	253200	0.07	0.17	0.53	0.65	0.82	-0.22	Average
Livingston	61	74040	819864	0.09	0.25	-0.53	0.56	0.81	-0.23	Average
Christian	62	26400	375896	0.07	0.18	0.35	0.63	0.81	-0.24	Average
Crawford	63	21050	284808	0.07	0.19	0.09	0.61	0.80	-0.26	Average
Douglas	64	50080	470359	0.11	0.31	-1.27	0.49	0.80	-0.27	Average
Montgomery	65	11950	252162	0.05	0.10	1.23	0.70	0.80	-0.29	Average
Jersey	66	36090	328308	0.11	0.32	-1.71	0.46	0.78	-0.34	Average
Kankakee	67	198930	2071666	0.10	0.27	-1.23	0.50	0.77	-0.38	Average
Hancock	68	28950	379773	0.08	0.20	-0.38	0.57	0.77	-0.39	Average
Edgar	69	11570	184342	0.06	0.15	0.09	0.61	0.76	-0.42	Average
Sangamon	70	309090	2685773	0.12	0.34	-2.12	0.42	0.76	-0.42	Average
Hamilton	71	4030	135221	0.03	0.03	1.32	0.71	0.74	-0.49	Average
Henry	72	57330	614438	0.09	0.26	-1.59	0.47	0.73	-0.54	Average
Menard	73	22730	215605	0.11	0.31	-2.12	0.42	0.73	-0.56	Average
Bond	74	20510	267956	0.08	0.20	-0.95	0.52	0.72	-0.58	Average
Jasper	75	12540	173289	0.07	0.19	-0.90	0.53	0.72	-0.60	Low

County	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Loss Index	SVI Score	SVI Index	Flood Score	z-score	Flood Vulnerability Ratting
Cook	76	3273790	43728088	0.07	0.20	-1.01	0.52	0.72	-0.60	Low
Shelby	77	13180	242679	0.05	0.12	-0.17	0.59	0.71	-0.62	Low
Winnebago	78	467060	5588832	0.08	0.23	-1.45	0.48	0.71	-0.63	Low
Ogle	79	126530	1252250	0.10	0.29	-2.26	0.41	0.70	-0.66	Low
Monroe	80	95220	701150	0.14	0.42	-3.83	0.28	0.70	-0.68	Low
Ford	81	2390	50666	0.05	0.10	-0.02	0.60	0.70	-0.68	Low
Warren	82	6680	141830	0.05	0.10	-0.04	0.60	0.70	-0.68	Low
Macoupin	83	13700	215085	0.06	0.16	-0.72	0.54	0.70	-0.68	Low
Effingham	84	55360	622949	0.09	0.25	-1.97	0.44	0.69	-0.72	Low
Washington	85	14610	214510	0.07	0.17	-1.13	0.51	0.68	-0.73	Low
Fulton	86	9250	459592	0.02	0.00	0.96	0.68	0.68	-0.75	Low
Champaign	87	151490	1960497	0.08	0.21	-1.70	0.46	0.67	-0.80	Low
Mercer	88	15760	238450	0.07	0.17	-1.56	0.47	0.64	-0.92	Low
Grundy	89	121980	1008513	0.12	0.36	-3.96	0.27	0.63	-0.93	Low
Cumberland	90	10390	205235	0.05	0.11	-1.05	0.51	0.62	-0.98	Low
Woodford	91	61660	579495	0.11	0.31	-3.65	0.29	0.60	-1.05	Low
Piatt	92	30900	368835	0.08	0.23	-2.70	0.37	0.60	-1.06	Low
Putnam	93	7350	136742	0.05	0.12	-2.23	0.41	0.53	-1.32	Low
DeKalb	94	103050	1494590	0.07	0.18	-3.01	0.35	0.53	-1.34	Low
McLean	95	131850	2137957	0.06	0.15	-3.70	0.29	0.44	-1.68	Low
Boone	96	61430	780967	0.08	0.21	-4.51	0.22	0.43	-1.71	Low
Kane	97	702320	8717526	0.08	0.22	-5.06	0.18	0.40	-1.84	Low
Will	98	1399440	15129593	0.09	0.26	-5.73	0.12	0.38	-1.91	Low
Lake	99	2090820	22539796	0.09	0.26	-6.00	0.10	0.36	-1.98	Low
DuPage	100	2199620	23666320	0.09	0.26	-6.36	0.07	0.33	-2.10	Low
McHenry	101	517800	7140216	0.07	0.19	-6.16	0.08	0.27	-2.34	Low

G. Severe Winter Storms

Description

A winter storm is an event in which varieties of precipitation are formed that only occur at low temperatures, such as snow or sleet, or a rainstorm where ground temperatures are low enough to allow ice to form. There are three categories of winter storms:

Blizzard: This is the most dangerous of all winter storms. A blizzard is defined as falling or blowing snow with winds of at least 35 miles per hour, reducing visibility to less than one-quarter mile.

Heavy Snow Storm: Will produce six inches or more of snow in 12 hours or less, or eight inches or more of snow in 24 hours in all of northern and central Illinois. In southern Illinois, generally south of Interstate 64 where heavy snow is less common, a heavy snow storm is defined as amounts of four inches or more of snow in 12 hours or less, or six inches of snow in 24 hours.

Ice Storm: Occurs when moisture falls and freezes immediately upon impact, and accumulating to a thickness of one-quarter inch or more, causing damage to trees and power lines, usually resulting in widespread and extended power outages.The amount and extent of snow or ice, air temperature, wind speed and event duration are characteristics of a severe winter storm. All of these combine to determine the severity of the storm.

Snow Storm: If melted, an inch of snow falling at 32 degrees contains twice the amount of water as an inch of snow falling at 10 degrees. This relationship translates into when snow will blow and drift with high winds that make conditions hazardous for hours or perhaps days. If the temperature is near freezing when snow falls, it rarely drifts. As the temperature falls farther from the freezing mark, then snow is lighter and more prone to blow and drift.

Ice Storm: Factors in how much damage will occur are the amount of rain and thus icing taking place, the strength of the wind and if the storm strikes an urban or rural area.

Extreme Cold: Very cold temperatures, usually in the single digits or below zero, which combined with the wind can cause frostbite or a potentially deadly condition known as hypothermia. The wind chill chart below indicates that frostbite will occur within 30 minutes when temperatures are below zero and wind speeds are 15 mph or greater. Rapid frostbite will occur in 10 minutes or less with temperatures of -20 degrees or colder and wind speeds of 15 mph or higher.

The NWS will issue a wind chill advisory or warning in Illinois for the following wind chill conditions:
North of I-80: Advisory for -20 to -30 degrees; Warning for colder than -30 degrees
Between I-80 and I-64: Advisory for -15 to -25 degrees; Warning for colder than -25 degrees
South of I-64: Advisory for -10 to -25 degrees; Warning for colder than -25 degrees

Wind Chill Chart

Wind (mph)	Temperature (°F)																	
Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	29	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Freezing Rain	Rain that freezes when it falls onto ground based objects, creating a coating of ice on roads, walkways, trees and power lines.
Sleet	Rain that turns to ice pellets before reaching the ground. Sleet also causes roads to freeze and become slippery.
Winter Storm Watch	**Potentially significant** winter weather, including heavy snow, ice, sleet, and/or blowing snow is expected within the next day or two.
Winter Storm Warning	Heavy snow, blowing snow, sleet or a combination of winter weather hazards are expected to cause a **significant impact to life or property**.
Ice Storm Warning	Heavy accumulations of ice, usually greater than ¼" in thickness, are expected to cause a **significant impact to life or property**, resulting in hazardous travel conditions, tree damage and extended power outages.
Blizzard Warning	Strong winds (35 mph or greater) will produce blinding snow and near zero visibility, resulting in **potentially life-threatening conditions** – particularly for travelers. Blizzards can occur with minimal accumulations of snow.
Freeze Warning	Below freezing temperatures are expected during the growing season, which will cause damage to local vegetation.
Winter Weather Advisory	Snow, blowing snow, ice and/or sleet is expected to produce **potentially dangerous travel conditions** within the next 12 to 36 hours.

Source: Winter Weather Preparedness Guide, IEMA, November 2017

Different types of precipitation can fall in the same area. As an example, sometimes sleet precedes snow or initially falls at the same time as snow. Also, it is not uncommon to have freezing rain and sleet together.

A major winter storm can immobilize an entire region for a prolonged period of time causing widespread damage and disruption, injury and death. Areas that experience mild winters can be hit by extreme cold or a major snow or ice storm. A severe winter storm's impact can include hypothermia, closed highways, blocked roads, downed power lines and flooding.

Historical Data

An Illinois winter does not pass without a severe winter storm somewhere in the State. On average, five severe storms strike each year. As few as two and as many as 18 have occurred in some years.

The NWS definition of an Illinois severe winter storm is:

Snowfall: Six inches or more of snow in 12 hours or less, or eight inches or more of snow in 24 hours in all of northern and central Illinois. In southern Illinois, generally south of Interstate 64 where heavy snow is less common, a heavy snow storm is defined as amounts of four inches or more of snow in 12 hours or less, or six inches of snow in 24 hours.

Freezing Rain: An ice accumulation of 1/4 inch or more in thickness

Sleet: A sleet (ice pellet) accumulation of ½ inch or more in depth

Severe winters are characterized by either extremely cold periods one to two months in duration, or by severe ice storms or heavy snowfalls occurring repeatedly over a period of six to twelve weeks. Ice storms tend to fill a 50-80 mile band between heavy snows to the north and rain to the south.

One of the worst winter storms to impact the state was on January 26-27, 1967, when as much as 23 inches of snow fell on Moline (Rock Island County) and the Chicago area, paralyzing the O'Hare International Airport. Travel throughout northern Illinois was curtailed and areas to the south experienced a glaze of ice which made travel virtually impossible until January 29, 1967. Fifty deaths were directly attributed to this storm.

Four of six winters between 1977 and 1982 were regarded as severe. The March 24-27, 1978, Good Friday ice storm was also accompanied by strong winds and rainfall of up to two inches. A television transmitting tower in Decatur (Macon County) collapsed under the weight of the accumulated ice. In 1977-1978, eighteen severe winter storms occurred, making it the worst winter on record.

The following year, 1979, a federal snow emergency was declared (FDAA 3068-EM) when the northern third of the state received six inches or more of snowfall between January 12 and 14. The heaviest snowfall, between 12 and 20 inches, was recorded in the northeast quarter of the state, where traffic was paralyzed and transportation corridors closed. Midway and O'Hare airports recorded maximum amounts of 20 and 19.8

inches of snow, respectively. Walnut (northwest Bureau County) recorded 22 inches; Paw Paw (southeast Lee County) had 12 inches; and Rockford (Winnebago County) had 15.5 inches.

The winter of 1981-82 saw 18 storms and is regarded as the second most severe winter in Illinois history. The extreme cold, blizzard-like conditions, and ice-associated storms stranded travelers, caused extended power outages and record energy consumption, and resulted in numerous injuries and deaths. In response to hazard identification surveys in the mid-eighties (FEMA's CHIP), 174 of the 182 local ESDA respondents ranked winter storms to be their most frequent, destructive, and over-taxing hazard for their jurisdiction.

The Valentine's Day storm of 1990 (FEMA 860-DR) was identified among the 2 or 3 worst ice storms in the last 30 years because (1) its area of impact stretched across central Illinois from Jacksonville (Morgan County) to Danville (Vermilion County); (2) the thickness of accumulated ice on wires and trees measured between one-half to three-fourths inches in and around the Champaign-Urbana area; (3) the duration of freezing precipitation lasted 10-12 hours; (4) the duration of time without electrical services (30 hours) was common and some homes and businesses were without power for 5 to 7 days; and, (5) the amount of damage to trees was much more extensive than the 1979 ice storm. This was the first time in the last twenty years that a severe winter storm without associated tornadoes or flooding resulted in a federal declaration, so lessons were learned and procedures written as the response progressed. Ten east-central counties received federal disaster declarations.

The 1999 New Year's Day storm which intensified over the next two days (January 1-3, 1999) resulted in record snowfall across the northern half of the state. High winds and frigid temperatures caused blizzard conditions behind the snowfall which left 21.6 inches in Chicago, second only to the 1967 January storm. On January 8, 1999, an all-time low temperature, -36 degrees F., was recorded in Congerville (Woodford County). During the first week of the year, the American Red Cross and other organizations sheltered more than 1,600 people. Eventually, 51 counties sought and received federal public assistance as a result of the magnitude of the storm which severely overtaxed the personnel, equipment and budgets of both state and local governments (FEMA 3134-EM declared January 8, 1999). FEMA approved nearly $40 million in federal assistance. IEMA reimbursed these funds to local applicants in the 51 counties included in the declaration.

From December 10 through December 31, 2000, the cumulative effects of severe winter storms caused extensive road closures, school closings and hazardous road conditions and severely taxed snow removal resources. During this time period, the Chicago area received a record 41.3 inches of snow. Twenty-seven counties either had a record or near-record snowfall or were contiguous to a county which did. This was the first emergency in Illinois to allow contiguous counties to be approved in the federal emergency declaration (11 counties had record snowfall, 3 near record and 14 contiguous). This extensive snowfall combined with blowing snow, record low temperatures, freezing rain and ice led to a request for a federal emergency in January, 2001. As of March 2004, FEMA 3161-EM approved nearly $23 million in federal assistance to the 27 counties for reimbursement for snow removal, de-icing, salting and sanding roads. These 27 counties were scattered throughout the top three-fourths of the state from Winnebago south to St. Clair and from McDonough on the western side to Cook, Clark and Will on the eastern state line.

On December 21-25, 2004, a severe winter storm struck the 17 southern counties. In several counties in southern Illinois, the storm produced record or near-record snowfall, blowing and drifting snow and frigid

temperatures. The cumulative effects of the storm included road closures, school closings, hazardous road conditions, and the snow removal resources of state and local governments being severely taxed. Over a million dollars was spent on emergency protective measures (FEMA 3199-EM).

On November 30, 2006, through December 1, 2006, a severe winter storm passed through central and northern Illinois. This storm resulted in heavy snowfall, ice accumulation, frigid temperatures, power outages, strong winds and downed trees and branches. The governor declared 49 counties disaster areas due to record snowfall and/or extraordinary ice formations. A presidential emergency declaration (FEMA 3269-EM) was received for the record or near-record snowfall in 26 northern and west-central Illinois counties. A presidential declaration (FEMA 1681-DR) was received for the ice storm that occurred in 18 central to mid-southwestern counties. Refer to the Illinois Federal Disaster Declaration History for details on the location.

On January 26-28, 2009 a severe winter storm consisting of heavy snow, sleet, and freezing rain impacted southern Illinois. The highest snowfall totals from this 2-day event were 12.5 inches while most affected counties reported up to 10 inches. Nearly a half inch of ice accumulation in southern Illinois caused numerous downed trees and power lines.

On February 13, 2009, Governor Pat Quinn requested a federal Major Disaster Declaration for nine affected counties within the State of Illinois. On March 2, 2009, President Obama designated the following counties eligible for Public Assistance (PA) under FEMA-1826-DR-IL and statewide eligibility for the Hazard Mitigation Grant Program (HMGP): Alexander, Gallatin, Hardin, Johnson, Massac, Pope, Pulaski, Saline and Union Counties.

On January 31st thru February 2nd, 2011 a wide spread severe winter storm passed over the majority of Illinois resulting in large accumulations of heavy snow. The overall strength of the system produced widespread 1 to 2 inch per hour snowfall rates, with thundersnow only serving to enhance those rates further. Three day snowfall totals ranged from as much as 19 to 20 inches in parts of western Illinois and northeast Missouri, with significant blowing and drifting widespread. Moline, Illinois observed 16.7 inches of snow from the evening of February 1st to the morning of February 2nd, setting a new 24 hour snowfall record by topping January 3, 1971 by 0.3 inches. The Moline three day totals of 18.4 inches also tied the record for a single storm that was set back in January of 1979. This severe winter storm resulted in a federal major disaster declaration (DR-1960) approving approximately $10.5 million dollars in federal assistance to 65 counties for reimbursement for snow removal, de-icing, salting and sanding roads.

A major snowstorm struck central Illinois on March 24th, 2013 bringing significant snow accumulations to much of the area. Due to the convective nature of this event, impressive snowfall rates of 2-3 inches per hour were observed at times. While all of central and southeast Illinois picked up significant snowfall, the highest totals of 10 to 18 inches were concentrated between the I-72 and I-70 corridors. The top amounts were observed across portions of Sangamon and Christian counties. Further north and south, snowfall amounts steadily decreased, with 4 to 5 inches across Stark and Marshall counties, and only 1 to 3 inches across Richland and Lawrence counties in southeast Illinois.

With respect to extreme cold, there have only been five winters since 1900 when temperatures in Illinois have NOT fallen below zero. (INHMP2013). Springfield observed the coldest temperature on Jan 1 and 2 of 2018 which was 13 degrees below zero. These were the coldest temperatures observed since February 27, 2015

(14 below Zero). The low for January 1st tied the record for the date, set in 1974. (NWS 2018). Chicago's third-coldest winter contributed to the deaths of 26 people by the end of January of 2018. According to separate data from the Illinois Department of Public Health and the National Oceanic and Atmospheric Administration, Cook County saw the highest number of cold-related deaths in the state. Slightly more than half of the county's cold-related deaths this year were in Chicago. (IDPH and NOAA)

Risk Analysis

Historically, one might say the northern half of the state has severe winter storms. In twenty-four years there have been three federal emergency declarations which included Illinois counties in this area. The last federal emergency stretched as far south as St. Clair County reaching into the bottom third of the state.

The Illinois Hazard Rating Map for Severe Winter Storms summarizes Illinois winters. Severe winter storms can and do occur in Illinois as identified in the paragraph above. The probability of a severe winter storm may be slightly higher for the northern half of the state (occurring more severely and more often), but all of Illinois has a high probability of a severe winter storm.

Since 1979, there has been seven declared disasters/emergencies for winter storms. If you base your calculations on federal declared disasters/emergencies over the last 28 years, the state could expect one severe winter storm every four years. In the last eight years there has been four declarations, for an average of one every two years. Using the declarations to judge the frequency of severe storms is misleading because an emergency declaration is determined by record setting amounts of snow; therefore, a jurisdiction could have a major event but not receive a declaration. Since the records are based on local data a jurisdiction in the more snow prone northern part of the state could regularly get more snowfall than a declared emergency in the southern part of the state. The northern part of the state is also much better prepared for large snowfalls.

Over the last 30 years, Illinois has had a minimum of two winter storms a year and a high of 18 severe winter storms in 1977-78 and 1981-82. While it is impossible to predict with any accuracy the probability of a severe winter storms, it is a near certainty that each winter will have at least a couple.

Since 1900, there has only been five years in which the state did not record a temperature below zero. This further identifies extreme cold as a common occurrence statewide. The most vulnerable groups are mainly in urban areas, mostly middle aged or elderly, and often homeless.

Loss Estimation for Severe Winter Storms

Loss estimations for severe winter storms were calculated using the same approach as tornados and severe storms. All counties within the state are affected by severe winter storms and were considered at-risk for damages. The risks for each county were calculated from historic data compiled by the NCDC, most importantly the Storm Events Database. The total numbers of severe winter storms reported over a 52-year period were divided by the number of years in the reporting period, to establish the annual number of severe winter storms that each county would be expected to have, in probabilistic terms. Then an average dollar amount of property damage for each event was compiled from the same data source. The expected number of severe winter storms per county was then multiplied by the average historic damages reported for each

event, to produce an estimate of annual dollar losses. The 66 year period that produces information for this study is 1957 to 2017.

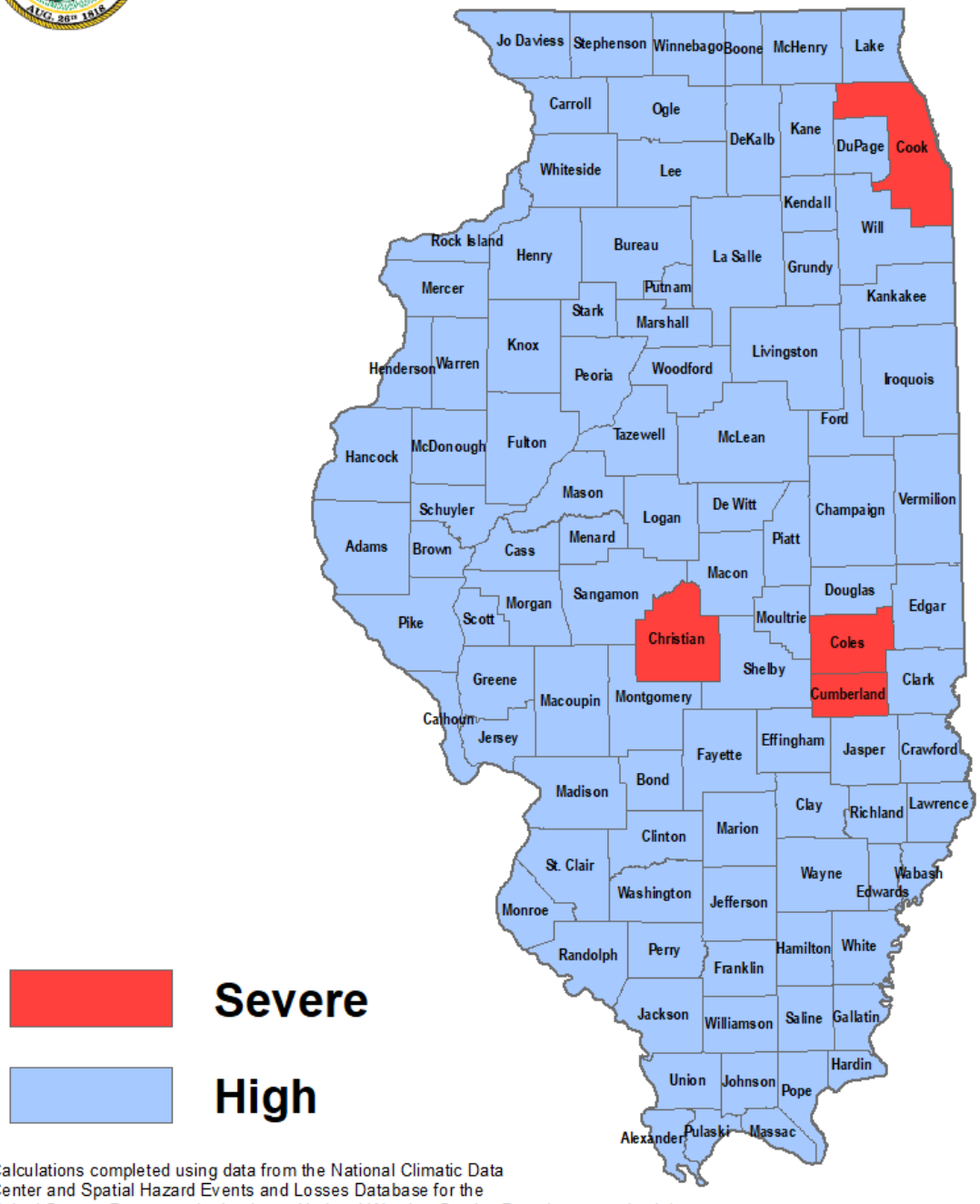
Higher risks are associated to areas with increased populations as well as residential growth. It should be noted that the NCEI calculates severe winter storms losses and occurrences by region and not on a county by county basis. The NCEI calculates that total losses for each event including: property damage, crop damage, fatalities and injuries and divides the total number by the number of counties in the reporting region. This style of reporting results in certain counties reflecting similar numbers of loss for the same event. Once this calculation has been made for all tracts in a county, the results can be totaled to develop an estimate at the county level. The following table and figure provides the result of this analysis for counties within the state.

Severe Winter Storm Loss Estimates by County					
County	# of Severe Winter Storms 1951-2017 (NCEI)	Total Recorded Loss (NCEI)	Average $ in crop & prop damage per event (NCCEI)	Annual Probability of Event	Estimated Annual Loss
Adams	27	$0	$0	41%	$0
Alexander	20	$11,050,000	$552,500	30%	$167,424
Bond	28	$0	$0	42%	$0
Boone	20	$0	$0	30%	$0
Brown	27	$0	$0	41%	$0
Bureau	45	$5,000	$111	68%	$76
Calhoun	26	$0	$0	39%	$0
Carroll	51	$0	$0	77%	$0
Cass	13	$0	$0	20%	$0
Champaign	16	$50,000	$3,125	24%	$758
Christian	14	$1,500,000	$107,143	21%	$22,727
Clark	12	$700,000	$58,333	18%	$10,606
Clay	11	$0	$0	17%	$0
Clinton	25	$0	$0	38%	$0
Coles	13	$600,000	$46,154	20%	$9,091
Cook	27	$0	$0	41%	$0
Crawford	12	$0	$0	18%	$0
Cumberland	11	$1,000,000	$90,909	17%	$15,152
DeKalb	20	$0	$0	30%	$0
DeWitt	15	$450,000	$30,000	23%	$6,818
Douglas	12	$350,000	$29,167	18%	$5,303
DuPage	25	$0	$0	38%	$0
Edgar	14	$850,000	$60,714	21%	$12,879
Edwards	21	$50,000	$2,381	32%	$758
Effingham	9	$900,000	$100,000	14%	$13,636
Fayette	27	$0	$0	41%	$0
Ford	13	$0	$0	20%	$0
Franklin	24	$300,000	$12,500	36%	$4,545
Fulton	17	$0	$0	26%	$0
Gallatin	22	$600,000	$27,273	33%	$9,091
Greene	25	$0	$0	38%	$0
Grundy	14	$100,000	$7,143	21%	$1,515
Hamilton	23	$100,000	$4,348	35%	$1,515
Hancock	39	$0	$0	59%	$0

Severe Winter Storm Loss Estimates by County					
County	# of Severe Winter Storms 1951-2017 (NCEI)	Total Recorded Loss (NCEI)	Average $ in crop & prop damage per event (NCEI)	Annual Probability of Event	Estimated Annual Loss
Hardin	21	$9,000,000	$428,571	32%	$136,364
Henderson	37	$0	$0	56%	$0
Henry	45	$0	$0	68%	$0
Iroquois	12	$0	$0	18%	$0
Jackson	27	$1,050,000	$38,889	41%	$15,909
Jasper	11	$0	$0	17%	$0
Jefferson	25	$80,000	$3,200	38%	$1,212
Jersey	29	$0	$0	44%	$0
Jo Daviess	46	$0	$0	70%	$0
Johnson	21	$1,150,000	$54,762	32%	$17,424
Kane	24	$0	$0	36%	$0
Kankakee	16	$0	$0	24%	$0
Kendall	18	$0	$0	27%	$0
Knox	19	$0	$0	29%	$0
Lake	24	$0	$0	36%	$0
LaSalle	21	$0	$0	32%	$0
Lawrence	11	$1,000	$91	17%	$15
Lee	17	$0	$0	26%	$0
Livingston	21	$0	$0	32%	$0
Logan	14	$550,000	$39,286	21%	$8,333
Macon	15	$1,500,000	$100,000	23%	$22,727
Macoupin	26	$2,000,000	$76,923	39%	$30,303
Madison	32	$1,700,000	$53,125	48%	$25,758
Marion	26	$0	$0	39%	$0
Marshall	18	$0	$0	27%	$0
Mason	13	$1,583,126	$121,779	20%	$23,987
Massac	21	$13,000,000	$619,048	32%	$196,970
McDonough	42	$0	$0	64%	$0
McHenry	26	$0	$0	39%	$0
McLean	17	$400,000	$23,529	26%	$6,061
Menard	11	$0	$0	17%	$0
Mercer	39	$0	$0	59%	$0
Monroe	26	$750,000	$28,846	39%	$11,364
Montgomery	26	$0	$0	39%	$0

Severe Winter Storm Loss Estimates by County					
County	# of Severe Winter Storms 1951-2017 (NCEI)	Total Recorded Loss (NCEI)	Average $ in crop & prop damage per event (NCEI)	Annual Probability of Event	Estimated Annual Loss
Morgan	11	$0	$0	17%	$0
Moultrie	14	$200,000	$14,286	21%	$3,030
Ogle	17	$0	$0	26%	$0
Peoria	18	$0	$0	27%	$0
Perry	26	$145,000	$5,577	39%	$2,197
Piatt	15	$410,000	$27,333	23%	$6,212
Pike	27	$0	$0	41%	$0
Pope	22	$10,500,000	$477,273	33%	$159,091
Pulaski	19	$11,040,000	$581,053	29%	$167,273
Putnam	41	$0	$0	62%	$0
Randolph	26	$0	$0	39%	$0
Richland	11	$0	$0	17%	$0
Rock Island	47	$0	$0	71%	$0
Saline	23	$750,000	$32,609	35%	$11,364
Sangamon	13	$4,000,000	$307,692	20%	$60,606
Schuyler	13	$0	$0	20%	$0
Scott	11	$0	$0	17%	$0
Shelby	13	$1,200,000	$92,308	20%	$18,182
St. Clair	29	$0	$0	44%	$0
Stark	18	$0	$0	27%	$0
Stephenson	48	$0	$0	73%	$0
Tazewell	14	$0	$0	21%	$0
Union	24	$1,340,000	$55,833	36%	$20,303
Vermilion	14	$10,000	$714	21%	$152
Wabash	20	$50,000	$2,500	30%	$758
Warren	41	$5,000	$122	62%	$76
Washington	28	$0	$0	42%	$0
Wayne	21	$500,000	$23,810	32%	$7,576
White	21	$100,000	$4,762	32%	$1,515
Whiteside	46	$0	$0	70%	$0
Will	23	$0	$0	35%	$0
Williamson	23	$1,030,000	$44,783	35%	$15,606
Winnebago	20	$0	$0	30%	$0
Woodford	13	$500,000	$38,462	20%	$7,576

IEMA Illinois Natural Hazard Mitigation Plan
Severe Winter Storms Hazard Rating by County



Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

H. Drought

Description

Drought is a normal and a recurrent feature of climate; however, it is only a temporary feature of climate. Drought characteristics vary from one region to another, but drought occurs almost everywhere. All societies are vulnerable to this natural hazard and it can affect vast territorial regions and large population numbers. A drought may not have a distinct start and its termination may be difficult to recognize. Weather conditions, soil moisture, runoff, water table conditions, water quality and stream flow are all natural factors that are important in determining drought. High temperature, high wind and low relative humidity can significantly aggravate its severity.

This hazard is difficult to define and yet it has scores of definitions. It originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group or environmental sector. Operational definitions help people identify the beginning, end and degree of severity of a drought. There are four commonly used operational definitions:

> Meteorological Drought: A period of well-below-average precipitation that spans from a few months to a few years.
> Agricultural Drought: A period when soil moisture is inadequate to meet the demands for crops to initiate and sustain plant growth.
> Hydrological Drought: A period of below-average stream flow and/or depleted reservoir storage (i.e., stream flow, reservoir and lake levels, ground water).
> Economic Drought: This definition deals with the supply and demand of water. Some years there is an ample supply of water and in other years there is not enough to meet human and environmental needs.

Generally, drought is associated with a sustained period (which differs for each drought impact) of significant below average water or moisture supply. The degree of precipitation deficiency, the duration and the size of the affected area determines the severity of the drought. A drought can ruin agricultural- and tourism- based local economies and increase the risk of fire, flash flood and possible landslides/debris flow.

Drought Impacts:

- Damaged/diminished crop harvests
- Loss of Electricity generation
- Poor surface water quality
- Scarce drinking water supplies/rationing
- Recreation opportunities lost
- Transportation problems

Historical Data

Droughts are differentiated on the basis of use and need for water into three categories:

1. Meteorological = precipitation shortfall
2. Agricultural = soil moisture deficit
3. Hydrological = surface and groundwater deficit

Statewide meteorological droughts are also further subdivided into specific lengths of occurrence:

- A 3-month drought exists if the state average for rainfall is less than or equal to 60 percent of the mean;
- A 6-month drought exists if the state average for rainfall is less than or equal to 70 percent of the mean;
- A 12-month drought exists if the state average for rainfall is less than or equal to 80 percent of the mean.

One-month precipitation deficits on a statewide or regional basis do not usually constitute droughts, although there may be significant impacts on agriculture depending on the time in the growing season and on soil moisture conditions. Agricultural and hydrologic droughts have different lag times in relation to the timing of precipitation, and their intensities do not correlate exactly with one another. Agricultural droughts typically trigger the availability of several USDA emergency assistance programs.

In September 1983, all 102 counties were proclaimed state disaster areas because of high temperatures and insufficient precipitation beginning in mid-June. More recently 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, but no state proclamations.

Hydrologic droughts reduce run-off and river, lake and groundwater levels. Normally, such droughts are preceded by several months of below-normal precipitation and develop more slowly than a meteorological or agricultural drought. Noticeably reduced water levels may occur within one or two months, but sometimes as much as three to twelve months after a precipitation deficit begins. Low river levels result in navigation blockages and emergency dredging. In 1988, a plan was put in place to divert water from Lake Michigan into the Mississippi River during the 1988 drought to aid in riverine navigation. This plan was never followed through; however, emergency dredging was carried out successfully.

The Palmer Drought Severity Index (PDSI) is an attempt to compare weekly temperature and precipitation readings over a defined climatic region in order to identify periods of abnormally dry (or wet) weather. These PDSI readings reflect the relative disparity between moisture supply (precipitation and soil moisture) and demand (evapotranspiration, soil recharge and runoff needs) for a particular region based upon what is considered normal for the area. The index is used to evaluate scope, severity, and duration of abnormal weather.

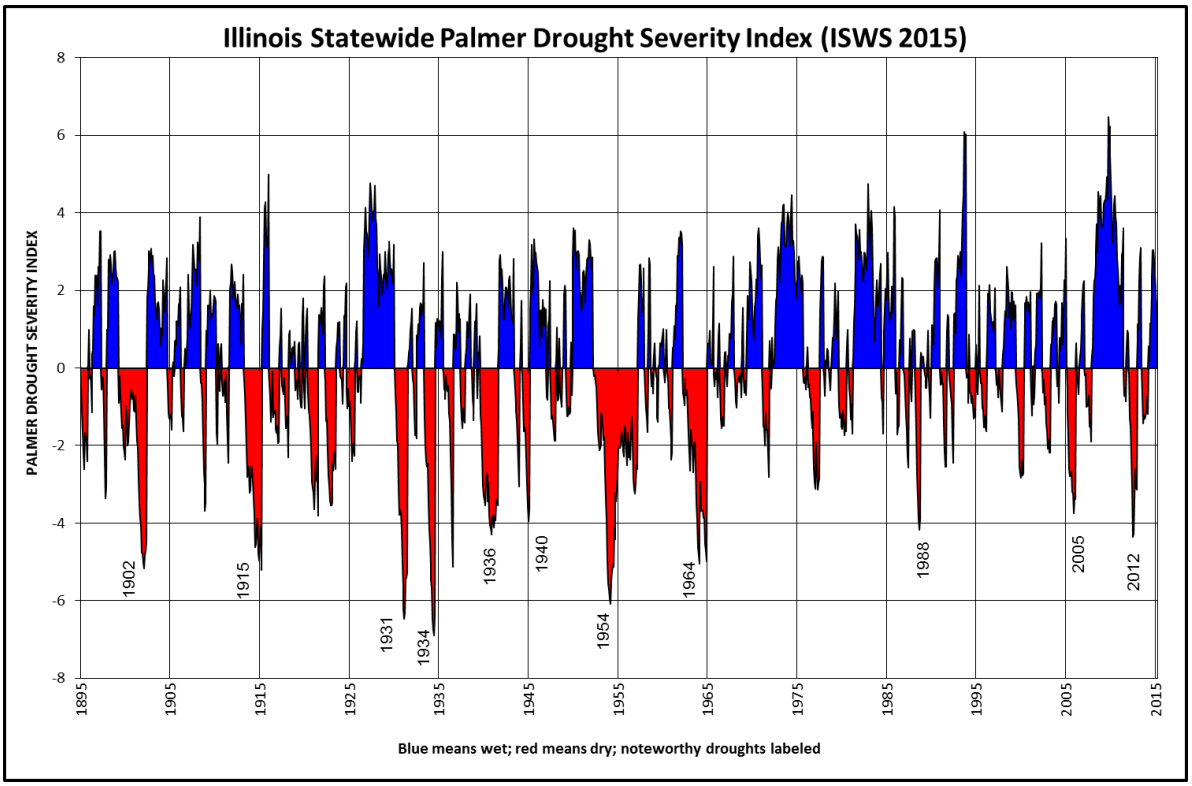


Figure: Time series of the state-wide monthly Palmer Drought Severity Index for Illinois from 1895 to 2015. Areas in blue represent wet periods while areas in red represent dry periods.

Both the timing and amount of precipitation are responsible for the occurrence of a drought. Average yearly precipitation for Illinois varies from just over 48 inches (1,200 mm) at the southern tip to just under 32 inches (810 mm) in the northern portion of the state. Annual amounts fluctuate primarily within a 10-inch range of the median. Numerous droughts have occurred in Illinois with the most significant occurring in the 1930's, 1950's, 1988, 2007, and in 2012. The most severe drought in recent years was 1988, when rainfall was 88 percent of normal. The timing or distribution was also abnormal because 1988 saw less than 50 percent of the April through August normal rainfall. Droughts of this magnitude occur about once every 21 years.

A smaller drought occurred in the northern two-thirds of the state (NWS zones 1-10). Although it only lasted through the month of May 1992, Chicago, Moline and Rockford recorded the driest May on record, and Springfield and Peoria their second driest.

Precipitation of less than 88 percent of normal also occurred in all of Illinois in September of 1994, northwestern Illinois in December of 1994, the northern half of the state in February of 1995, all of the state in March, and the northern half again in June of 1995. However, even though precipitation values were below average, none of these were considered drought-like conditions officially.

Precipitation values from 54 to 65 percent of normal for the months of February and April of 1996 in northwest and central portions of the state would technically put those areas into the 3-month or 6-month precipitation drought categories. However, above average precipitation in May reversed all drought impacts.

Precipitation values from 54 to 65 percent of normal for the months of February and April of 1996 in northwest and central portions of the state would technically put those areas into the three-month or six-month precipitation drought categories. However, above average precipitation in May reversed all drought impacts.

A severe drought struck Illinois in 2005-06, especially in the northern half of the state. Dry conditions in 2005 reached a historic level of severity in some parts of Illinois and ranked as one of the three most severe droughts in Illinois in 112 years of record. The timing of the dryness during the spring and summer, when water demand and use are high, ensured substantial impacts on agriculture and other sectors. The drought also had several unusual characteristics. The drought area was long and narrow, extending from south Texas to the Great Lakes, but within the Midwest, the drought had relatively minor impacts on states other than Illinois. A record number of remnants of hurricanes and tropical storms passed through Illinois during July, August and September, substantially ameliorating drought conditions in portions of central and southern Illinois. Crop yields were surprisingly high in parts of the state, perhaps providing evidence of increased drought resistance in modern varieties and the benefits of timely rains.

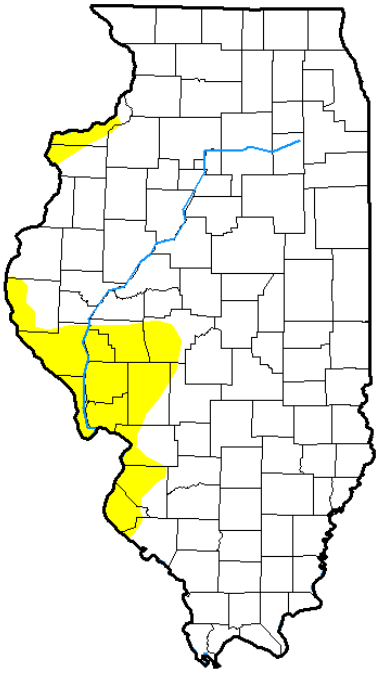
In 2012 another severe drought occurred in Illinois, affecting a large majority of the state. The drought conditions intensified throughout the summer months and into early fall. Agricultural impacts became evident in late July as hydrologic conditions continued to deteriorate. The statewide average precipitation total from June 21 to July 3 was 0.5 inches, only 28 percent of normal. The statewide average temperature during this time was 78.0 degrees, 3.8 degrees above normal. Extremely hot weather occurred during the second half of this period with highs in the 90s and low 100s common across the state. At least 56 sites in Illinois broke their daily high temperature records on June 28 and 29. The statewide average precipitation for June was 1.8 inches, which is 2.3 inches below normal and 43 percent of normal. It was the eighth driest June on record. June 1988 was the driest on record at 1.1 inches. The statewide average precipitation for the first half of 2012 was 12.6 inches, making it the sixth driest on record.

The Governor's Drought Response Task Force was activated with the Governor's approval when drought conditions warrant a unified statewide approach. This task force was activated on June 19, 2012, by the State Water Plan Task Force with the approval of the Governor's Office. A copy of the "Drought of 2012 – A Report of the Governor's Drought Response Task Force," is attached as an appendix to the INHMP. The State's Drought Response Task Force continues to hold telephone conference calls when necessary; however, except for a few isolated areas there have been no statewide drought problems since 1988. The U.S. Drought Monitor is the standard for determining drought in the U.S.

Multiple waves of rain and storms moved through the Midwest during the 3rd week of February 2018, with 7-day accumulations of more than five inches across the southern portion of the region. The rainfall helped to fill ponds and increase streamflow, and caused minor to moderate flooding. As a result, broad cat-1 and 2 improvements were made to drought areas, including the removal of severe drought in south-central and eastern Missouri and reductions in moderate drought in southern and eastern Missouri and in the border regions of southwest Illinois.

U.S. Drought Monitor

Illinois



February 27, 2018

(Released Thursday, Mar. 1, 2018)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	89.54	10.46	0.00	0.00	0.00	0.00
Last Week *02-20-2018*	61.91	38.09	18.03	3.66	0.00	0.00
3 Months Ago *11-28-2017*	76.51	23.49	4.06	0.65	0.00	0.00
Start of Calendar Year *01-02-2018*	51.40	48.60	16.19	1.18	0.00	0.00
Start of Water Year *09-26-2017*	7.40	92.60	12.84	0.00	0.00	0.00
One Year Ago *02-28-2017*	48.87	51.13	2.89	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Risk Analysis

One of the obstacles to an objective and reasoned reaction to drought in Illinois is uncertainty over its definition. One way of measuring drought is through the Palmer Drought Severity Index (PDSI), which takes into account both temperature and precipitation in determining the severity of drought. Historically, the 1930s and 1950s were periods when drought was most frequent and troublesome in Illinois. More recently, the 1988 drought was severe but short-lived, lasting from June to October of that year. Based on the PDSI, the risk of drought has historically been evenly distributed across the state. This is not surprising since drought is partially the result of changes in the large-scale circulation patterns of the atmosphere, for example, the location of a high-pressure dome over the Midwest in summer. 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. (Dr. Jim Angel, State Climatologist)

Loss Estimation For Drought

Loss estimations for drought were calculated using the same approach as severe winter storms. All counties within the state are affected by drought to some degree and were considered at-risk for damages. The risks for each county were calculated from historic data compiled by the NCDC, most importantly the Storm Events Database. The total numbers of severe winter storms reported over a 22-year period were divided by the number of years in the reporting period, to establish the annual number of severe winter storms that each

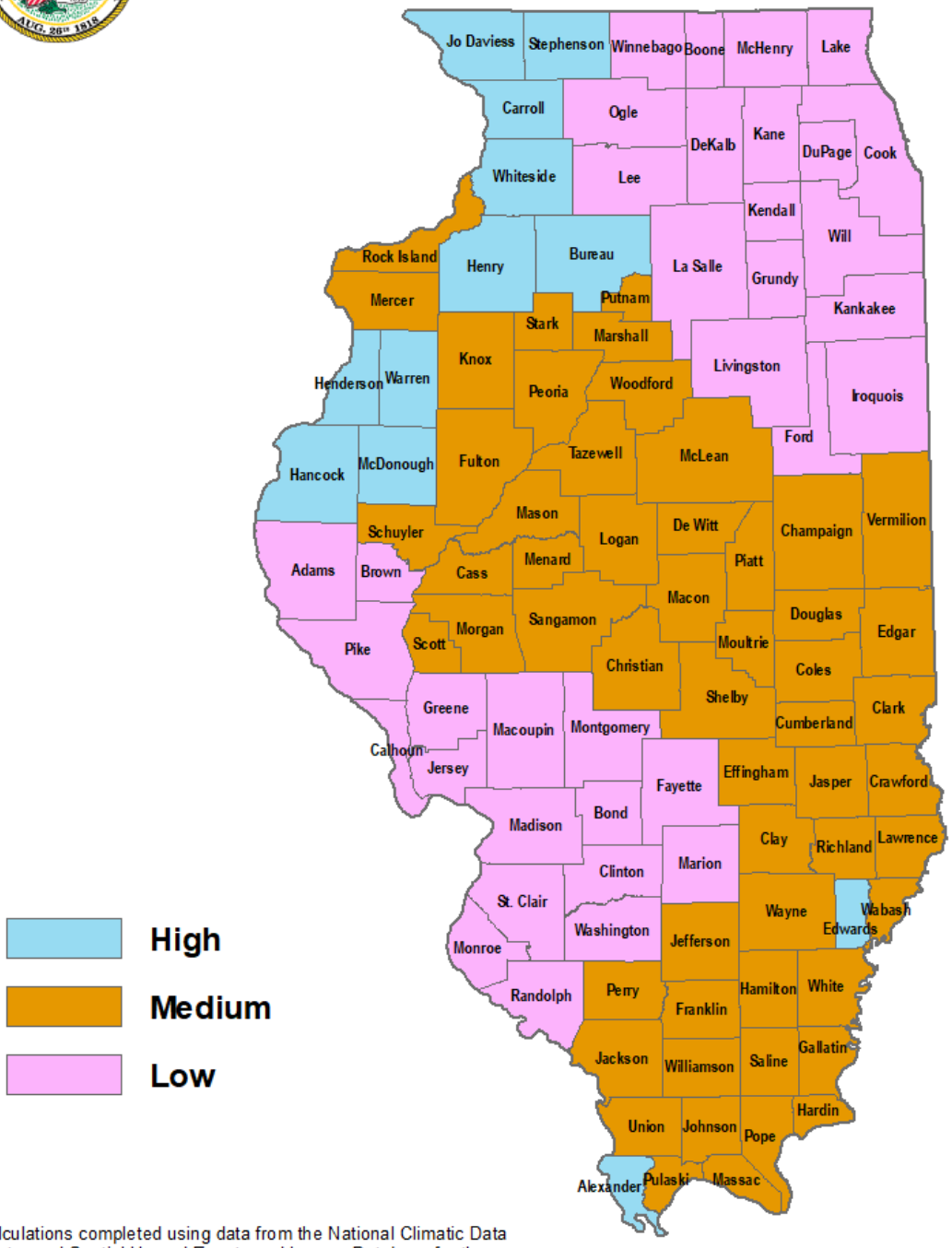
county would be expected to have, in probabilistic terms. Then, an average dollar amount of crop damage for each event was compiled from the same data source. Droughts historically, do not produce large amounts of property damage as other hazards. However, crop damage is utilized to depict that loss estimates as related to drought events. The expected number of drought per county was then multiplied by the average historic damages reported for each event, to produce an estimate of annual dollar losses, which totaled approximately $72 million dollars statewide. The 27-year period that produces information for this study is 1990 to 2017. Higher risks are associated to areas with increased populations as well as residential growth. It should be noted that the NCEI calculates drought losses and occurrences by region and not on a county by county basis. The NCEI calculates that total losses for each event including: property damage, crop damage, fatalities and injuries and divides the total number by the number of counties in the reporting region. This style of reporting results in certain counties reflecting similar numbers of loss for the same event. Once this calculation has been made for all tracts in a county, the results can be totaled to develop an estimate at the county level. The following figure provides the result of this analysis for counties within the state.

Drought Loss Estimates by County					
County	**# of Droughts 1951-2017 (NCEI)**	**Total Recorded Loss (NCEI)**	**Average $ in crop & prop damage per event (NCEI)**	**Annual Probability of Event**	**Estimated Annual Loss**
Adams	6	$0.00	$0	9%	$0
Alexander	29	$3,450,000	$118,966	44%	$52,273
Bond	4	$0	$0	6%	$0
Boone	9	$0	$0	14%	$0
Brown	5	$0	$0	8%	$0
Bureau	15	$34,380,000	$2,292,000	23%	$520,909
Calhoun	6	$0	$0	9%	$0
Carroll	14	$15,800,000	$1,128,571	21%	$239,394
Cass	5	$28,600,000	$5,720,000	8%	$433,333
Champaign	3	$7,260,000	$2,420,000	5%	$110,000
Christian	3	$53,800,000	$17,933,333	5%	$815,152
Clark	4	$34,400,000	$8,600,000	6%	$521,212
Clay	6	$32,200,000	$5,366,667	9%	$487,879
Clinton	3	$0	$0	5%	$0
Coles	3	$34,800,000	$11,600,000	5%	$527,273
Cook	9	$0	$0	14%	$0
Crawford	6	$30,400,000	$5,066,667	9%	$460,606
Cumberland	4	$23,700,000	$5,925,000	6%	$359,091
DeKalb	9	$0	$0	14%	$0
DeWitt	6	$22,000,000	$3,666,667	9%	$333,333
Douglas	3	$28,600,000	$9,533,333	5%	$433,333
DuPage	9	$0	$0	14%	$0
Edgar	3	$42,800,000	$14,266,667	5%	$648,485
Edwards	21	$56,450,000	$2,688,095	32%	$855,303
Effingham	4	$32,800,000	$8,200,000	6%	$496,970
Fayette	4	$0	$0	6%	$0
Ford	2	$0	$0	3%	$0
Franklin	23	$3,450,000	$150,000	35%	$52,273
Fulton	4	$3,300,000	$825,000	6%	$50,000
Gallatin	25	$3,450,000	$138,000	38%	$52,273
Greene	6	$0	$0	9%	$0
Grundy	9	$0	$0	14%	$0
Hamilton	24	$3,450,000	$143,750	36%	$52,273

Drought Loss Estimates by County					
County	**# of Droughts 1951-2017 (NCEI)**	**Total Recorded Loss (NCEI)**	**Average $ in crop & prop damage per event (NCEI)**	**Annual Probability of Event**	**Estimated Annual Loss**
Hancock	16	$13,000,000	$812,500	24%	$196,970
Henderson	17	$11,560,000	$680,000	26%	$175,152
Henry	15	$35,010,000	$2,334,000	23%	$530,455
Iroquois	1	$0	$0	2%	$0
Jackson	21	$3,450,000	$164,286	32%	$52,273
Jasper	6	$33,900,000	$5,650,000	9%	$513,636
Jefferson	19	$3,450,000	$181,579	29%	$52,273
Jersey	6	$0	$0	9%	$0
Jo Daviess	13	$8,560,000	$658,462	20%	$129,697
Johnson	27	$3,450,000	$127,778	41%	$52,273
Kane	9	$0	$0	14%	$0
Kankakee	4	$0	$0	6%	$0
Kendall	9	$0	$0	14%	$0
Knox	4	$2,700,000	$675,000	6%	$40,909
Lake	9	$0	$0	14%	$0
LaSalle	9	$0	$0	14%	$0
Lawrence	6	$25,500,000	$4,250,000	9%	$386,364
Lee	10	$0	$0	15%	$0
Livingston	10	$0	$0	15%	$0
Logan	8	$34,200,000	$4,275,000	12%	$518,182
Macon	7	$46,300,000	$6,614,286	11%	$701,515
Macoupin	6	$0	$0	9%	$0
Madison	4	$0	$0	6%	$0
Marion	3	$0	$0	5%	$0
Marshall	7	$21,400,000	$3,057,143	11%	$324,242
Mason	5	$29,800,000	$5,960,000	8%	$451,515
Massac	29	$3,450,000	$118,966	44%	$52,273
McDonough	15	$16,110,000	$1,074,000	23%	$244,091
McHenry	9	$0	$0	14%	$0
McLean	7	$65,500,000	$9,357,143	11%	$992,424
Menard	4	$17,400,000	$4,350,000	6%	$263,636
Mercer	15	$14,860,000	$990,667	23%	$225,152
Monroe	4	$0	$0	6%	$0
Montgomery	5	$0	$0	8%	$0
Morgan	3	$43,200,000	$14,400,000	5%	$654,545
Moultrie	3	$23,000,000	$7,666,667	5%	$348,485

Drought Loss Estimates by County					
County	**# of Droughts 1951-2017 (NCEI)**	**Total Recorded Loss (NCEI)**	**Average $ in crop & prop damage per event (NCEI)**	**Annual Probability of Event**	**Estimated Annual Loss**
Ogle	10	$0	$0	15%	$0
Peoria	7	$34,300,000	$4,900,000	11%	$519,697
Perry	21	$3,450,000	$164,286	32%	$52,273
Pike	6	$0	$0	9%	$0
Pope	29	$3,450,000	$118,966	44%	$52,273
Pulaski	29	$3,450,000	$118,966	44%	$52,273
Putnam	15	$6,025,000	$401,667	23%	$91,288
Randolph	4	$0	$0	6%	$0
Richland	6	$24,700,000	$4,116,667	9%	$374,242
Rock Island	15	$9,210,000	$614,000	23%	$139,545
Saline	24	$3,450,000	$143,750	36%	$52,273
Sangamon	3	$65,900,000	$21,966,667	5%	$998,485
Schuyler	3	$1,600,000	$533,333	5%	$24,242
Scott	3	$19,100,000	$6,366,667	5%	$289,394
Shelby	3	$52,100,000	$17,366,667	5%	$789,394
St. Clair	4	$0	$0	6%	$0
Stark	7	$15,900,000	$2,271,429	11%	$240,909
Stephenson	13	$21,060,000	$1,620,000	20%	$319,091
Tazewell	8	$35,900,000	$4,487,500	12%	$543,939
Union	27	$3,450,000	$127,778	41%	$52,273
Vermilion	3	$65,400,000	$21,800,000	5%	$990,909
Wabash	21	$3,450,000	$164,286	32%	$52,273
Warren	17	$21,130,000	$1,242,941	26%	$320,152
Washington	4	$0	$0	6%	$0
Wayne	19	$3,450,000	$181,579	29%	$52,273
White	24	$3,450,000	$143,750	36%	$52,273
Whiteside	15	$21,860,000	$1,457,333	23%	$331,212
Will	9	$0	$0	14%	$0
Williamson	24	$3,450,000	$143,750	36%	$52,273
Winnebago	10	$0	$0	15%	$0
Woodford	7	$29,200,000	$4,171,429	11%	$442,424

IEMA Illinois Natural Hazard Mitigation Plan
Drought Hazard Rating by County



Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

(Calculations completed using data from the National Centers for Environmental Information for the United States. Data was obtained on a county by county basis)

I. Extreme Heat

Description

Extreme heat for a region is temperatures that hover 10 degrees or more above the average high temperature for several days to several weeks. The definitions do vary by region; however, a heat wave is usually defined as a period of at least three consecutive days above 90 degrees.

Heat kills by pushing the human body beyond its limits. Normally the body's internal thermostat produces perspiration that evaporates to cool and regulate the body's temperature to 98.6 degrees. Sweating does nothing to cool the body unless the water is removed by evaporation. High humidity retards this process. Because the body has been robbed of its ability to cool itself, the body must work much harder to maintain a normal temperature in extreme heat and high humidity. A sunburn will slow the skin's ability to release excess heat.

Young children, the elderly, those who are sick, overweight or have alcohol problems and men in general, (because they sweat more and become more quickly dehydrated) are more susceptible to extreme heat.

The chronically ill and elderly are often taking prescription medications (e.g., diuretics, anticholinergic, antipsychotics and antihypertensive) that interfere with the body's ability to dissipate heat. Usually the victims have been overexposed to heat or have over-exercised for their age and physical condition.

Stagnant atmospheric (humid and muggy) conditions and poor air quality can induce heat-related illnesses. In addition to air quality, concrete and asphalt store heat longer and gradually release the heat at night which produces higher nighttime temperatures. Therefore, people living in urban areas may be at a greater risk than people in rural regions. The heat index chart helps to identify the apparent temperature. Find where the temperature across the top of the chart and the relative humidity down the left side of the chart intersect for the apparent temperature.

NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Below are relevant terms:

EXTREME HEAT TERMS

Heat Wave	Prolonged period of excessive heat often combined with excessive humidity.
Heat Index	A number in degrees Fahrenheit (F) that tells how hot it feels when relative humidity is added to the air temperature. The Heat Index assumes an average-sized adult, with clothing, in the shade, with a 5-mph wind. Exposure to full sunshine can increase the heat index by 15 degrees.
Heat Cramps	Muscular pains and spasms due to heavy exertion. Although heat cramps are the least severe of heat related medical problems, they are often the first signal that the body is having trouble with the heat.
Heat Exhaustion	Typically occurs when people exercise heavily or work in a hot, humid place where body fluids are lost through heavy sweating. Blood flow to the skin increases, causing blood flow to decrease to the vital organs. This results in a form of mild shock. If not treated, the victim's condition will worsen. Body temperature will keep rising and the victim may suffer heat stroke.
Heat Stroke	Heat stroke is life-threatening. The victim's temperature control system, which produces sweating to cool the body, stops working. The body temperature can rise so high that brain damage and death may result if the body is not cooled quickly.
Sun Stroke	Another term for heat stroke.

Source: https://www.ready.gov/heat

The chart below indicates the heat index at which the high risk group might experience medical problems described on the previous page:

HEAT INDEX/HEAT DISORDERS

Classification	Heat Index	Possible Heat Disorders for People in Higher Risk Groups
Extreme Danger	125º or higher	Heat stroke highly likely.
Danger	103º - 124º	Sun stroke/heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity.
Extreme Caution	90 º -103º	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity.
Caution	80 º - 90º	Fatigue possible with prolonged exposure and/or physical activity.

Source:https://www.weather.gov/ama/heatindex

Historical Data

Severe heat waves have caused catastrophic crop failures, thousands of deaths and widespread power outages due to increased use of air conditioning.

The heat waves of the summer of 1995 caused deaths and injuries previously unseen in the State of Illinois from such a phenomenon. Throughout the entire State, the combination of record or near-record high temperatures and high dew point temperatures led to heat indices routinely above the 120-degree mark from July 12-17. The heat index peaked at 125 degrees on July 14 when the air temperature was 98 degrees and the relative humidity was 63 percent. Conditions such as these create hardships for respiratory and cardiovascular systems of every person, but especially in toddlers and the elderly. Scattered power outages compounded the problem when Commonwealth Edison, the supplier of electricity to virtually the entire Chicago metropolitan area, and other electric utilities could not keep up with the record demand. Of the 583 fatalities associated with the 1995 heat waves, 75 death certificates listed heat as the primary cause, and 508 as the secondary cause. In a sampling of 134 of the heat victims, 61% were over the age of 65, but only 2 of the 134 fatalities (1.5%) were toddlers. 504 of the deaths were in Chicago. At the time there was a perception that the numbers were inflated, later studies indicated the opposite was true and the heat victims were significantly undercounted. Local officials believed that many of the elderly were scared to come out of their apartments because of high amounts of crime in their neighborhoods. Many were found in their rooms with air temperatures in excess of 120 degrees. The City of Chicago has taken a number of steps to mitigate the health hazards in the event of future heat waves, including a program for home visits to check the condition of people indicated as vulnerable.

In 1999, the entire Midwest was above normal in temperature for the month of July, with the last ten days consisting of a major heat wave. As a ten-day average, both maximum and minimum temperatures were 7 to 11 degrees above normal. The peak of the heat struck on July 29th and 30th in most of the Midwest. Minimums exceeded 78 degrees in cities like Chicago, St. Louis and Cincinnati, where many heat related deaths occurred. The maximum temperature exceeded 100 degrees in many of these same cities, with most of the Midwest recording maximums 10 to 20 degrees above normal.

The Illinois Department of Public Health (IDPH), as well as the NWS has provided information on heat related deaths. Identifying the exact number of deaths due to heat is very difficult. Usually heat is not the primary cause listed on the death certificate but an “underlying cause”.

The following table shows heat related fatalities in Illinois between 2008 and 2017, cause of death literals and the ICD10 codes are used as the determining factors.

Illinois Heat Related Fatalities 2008 through 2017				
	Immediate Cause of Death	Contributing Factor 1	Contributing Factor 2	Other Significant Conditions
2008	4	2	2	0
2009	19	3	0	3
2010	8	4	1	5
2011	11	4	3	36
2012	15	6	2	20
2013	8	1	1	11
2014	4	0	1	2
2015	5	2	2	4
2016	2	1	0	8
2017	10	2	1	0
NOTE: These figures were determined from the cause of death literals and heat related ICD10 codes. Source: IDPH				

Risk Analysis

This natural disaster 'Heat Wave' has long been overlooked because there is not visible damage like in a tornado and its impact is greatly understated in terms of human toll because not all heat related deaths are recorded. The current mitigation planning process encourages the State to look at such factors as urbanization, the elderly and low income. It is impossible to ignore these factors when analyzing heat waves. According to historical discussion and the above referenced article, when the Chicago heat wave of July 1995, occurred "the poor, the old, residents of abandoned and violent neighborhoods that lived alone, lacked access to transportation and lacked air-conditioning" were the victims.

The Extreme Heat Map based on the Illinois Hazard Rating Process predicts what one would expect based on general knowledge and the previous discussion. Especially southern and central Illinois can be extremely hot and humid which is indicated by the high category. Taking into account the urbanization effect will add Cook County and the collar counties, which is also indicated on the map as a high category.

Chicago had previously experienced deadly heat waves in 1955 when "large numbers of deaths" occurred and in 1916 with 535 deaths. In the 1990s, two significant heat waves impacted Chicago. In the 1995 heat wave, the number of estimated fatalities varies, but most sources agree that the number exceeded 700. Then in 1999, Chicago experienced another heat wave that closely matched the 1995 event, but the death toll was reduced to approximately 100 people. A paper written by Michael Palace and Stanley Chagnon, of the State Water Survey, attribute much of the reduction in deaths to mitigation efforts. The efforts included education by the news media and care monitoring procedures for the urban elderly. The September 2005, Chicago All-Hazard Risk Assessment also states the 1999 deaths were lower than 1995 and believed to be the result of the implementation of Chicago's Extreme Weather Operations Plan.

The conditions in Chicago during the heat wave of 1999 were similar to those of the 1995 heat wave, both in temperatures and duration. It is unlikely that the reduction of deaths in Chicago in 1999 is due solely to meteorological differences between the two heat waves.

The NWS offices with responsibility for counties in the state of Illinois will initiate alert procedures to warn people of the impending danger due to excessive heat. When the heat index is forecast to exceed 105 - 110 degrees for at least two consecutive days, NWS procedures are:

I. Heat Index values will be included in all NWS forecasts.

II. "Hazardous Weather Outlook" products will highlight any threat of excessive heat for the following 1 to 7 day period.

III. "Excessive Heat Warning" products will present a detail discussion of:
   a) The extent and expected duration of the hazard, including forecast temperatures and heat index values.
   b) Who is most at risk.
   c) Safety rules for reducing the risk.

IV. Assist state and local health officials to prepare emergency messages prior to and during excessive heat events. Meteorological information from "Excessive Heat Warnings" will be included, as well as more detailed medical information, advice, and names and telephone numbers of health officials.

V. Forecasts, outlooks and warnings will be released by the NWS to the media, over NOAA's All Hazards Weather Alert Radio system, and via NEWS web sites.

Each NWS Forecast Office issues the following heat related products as conditions warrant.

- Excessive Heat Outlooks – Issued when the potential exists for an excessive heat event in the next 3-7 days.

- Excessive Heat Watches – Issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours.

- Excessive Heat Warnings/Advisories – Issued when an excessive heat event is expected in the next 36 hours.

This warning action by NWS, coupled along with the action now being taken by some of the larger cities initiating a system to contact and check on the elderly, will not prevent a heat wave but will significantly reduce the number of fatalities resulting from a heat wave.

IEMA Illinois Natural Hazard Mitigation Plan
Extreme Heat Hazard Rating by County

Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

J. Earthquake

Introduction

Over 600 earthquakes have been reported or recorded in Illinois since 1795 through 2017. Four hundred and six have been estimated or recorded at magnitude 2 and greater; with magnitudes in the 2s being the level at which people start to feel earthquakes. Of these, 43 were magnitude 4 and higher, which is at the level to possibly cause some damage. Figure 1 shows the locations of earthquakes within the state and Table 2 (end of earthquake section) lists magnitude 2 and greater earthquakes by county.

Earthquakes occur when rocks forming the Earth's crust slip past each other along a fault. This slippage occurs when the buildup of stresses reach the point that they are greater than the strength of the locked up section of rocks along the fault plane. When faulting takes place, the sudden release of energy produces vibrations or seismic (shock) waves that radiate from the main fault movements. These waves cause the shaking or "quaking" that lasts tens of seconds to a few minutes, depending on the magnitude (energy released) of the event and what kinds of rocks the waves travel through and the stiffness or lack of stiffness of the soils at a site. Where the faulting starts, at some depth below the Earth's surface, is the hypocenter (focus) of an earthquake. The point on the surface directly above the hypocenter is the epicenter.

Earthquake measurement and observation

Magnitude and *intensity* are terms used to describe the severity of an earthquake, but they do not mean the same thing. *Magnitude* is a measure of the seismic energy released from the earthquake. It is calculated from measurements of the ground vibrations recorded by seismographs. Earthquake magnitudes are reported in logarithmic increments which means that a magnitude 7 earthquake has about 32 times greater energy than a 6 and an increase of 0.2 means twice as much energy is released. The Richter Scale is one of several magnitude scales that is used for reporting the size of an earthquake. Each scale uses a different formula/method to calculate the magnitude from the recorded vibrations (Bolt, 1993).

Earthquakes in Illinois originate within the crystalline basement rocks at depths of one to 25 miles, which is below the layers of sedimentary rock where coal, oil, and aggregate (gravel) are mined. They occur in the granitic rocks far below the sedimentary layers of rock where known faults are mapped. The earthquake vibrations move out away from the point of origin (hypocenter or focus) through the bedrock and then up though the overlying soils on top of the bedrock. In the central part of the U.S., the bedrock is flat-lying, old, intact, and strong. Earthquake vibrations travel very far through material such as this in comparison to the young, broken, weak bedrock of the west coast. Because of this difference, central U. S. earthquakes are felt and cause damage over, an area 15 to 20 times larger than California earthquakes with similar magnitudes.

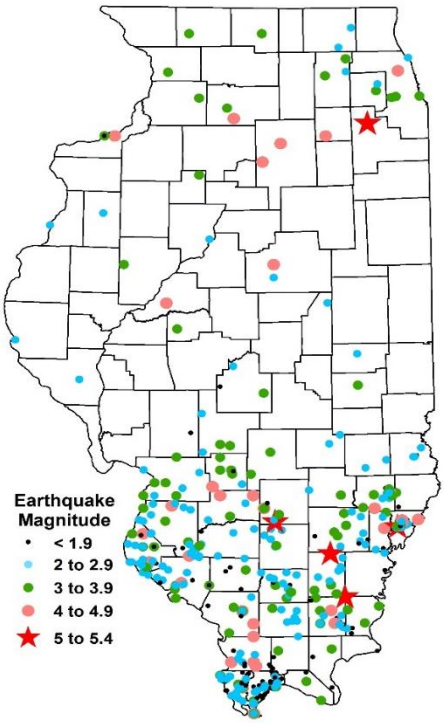


Figure 1. Earthquakes in Illinois from 1795 through 2017.

Intensity is another measurement of the effects brought about by an earthquake; using observations of people in the area affected. Intensities are based on descriptive reports, rather than calculations from instrument readings. In general, intensities decrease at greater distances from an epicenter, but are also influenced by the soils resting on bedrock. Thick, loose, saturated soils such as in river valleys may amplify earthquake ground motions and thus have higher intensities reported than just outside of the valley. Several formal intensity scales are used in different parts of the world. In the U.S., earthquake intensities are reported using the twelve-point Modified Mercalli Intensity Scale (Wood and Neumann, 1931; Table 1), increasing from barely detectable to catastrophic. For any earthquake, there will be many intensities, depending on the location of observers and their site conditions - but only one magnitude.

MODIFIED MERCALLI INTENSITY SCALE

(abbreviated with corresponding estimates of ground motion as a percent of acceleration of gravity (g) and typical magnitude of earthquakes that might cause these intensities)

I. Not felt except by a very few under especially favorable conditions.

II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects swing.

III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Vibrations are similar to the passing of a truck.

IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, rattled but not broken doors swing, walls make cracking sound. Sensation like heavy truck striking building. 1.5% to 4% *g* M~3.5

V. Felt by nearly everyone; many awakened. Some dishes, windows broken, plaster cracked. Unstable objects overturned. 4% to 9% g

VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster and cracked chimneys. Damage slight. 9% to 18% *g*; M~4

VII. Difficult to stand. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. 18% to 34% *g*

VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. 34% to 65 % *g*; M~6

IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. 65% to 124% *g*

X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent slightly. >124% *g*; M~8

XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.

XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

(Table 1. Modified Mercalli Intensity Scale, magnitude estimates from Heigold and Larson, 1990 and acceleration estimates from Wald et al., 1999).

Many of the 406 Illinois earthquakes have small magnitudes of 2 to 4 that do not cause damage, but are felt over large areas. Larson (2001) documented the effects of one of these small earthquakes in north-central Illinois. Over 500 people responded to a questionnaire published in local newspapers. Their recollections of the earthquake (magnitude 3.5, centered near Amboy, south*ea*st of Dixon) fit surprisingly well into the Modified Mercalli Scale. Those criteria on Table 1 most helpful in distinguishing between intensity levels are shown in bold typeface (see also Stover and Coffman, 1993). Many people throughout the area that felt the earthquake did not recognize it as such, but attributed the sharp vibrations to an errant quarry blast or the passing of a particularly loud vehicle (Intensity III). Closer to the epicenter, many people reported the sensation of something striking the house, or falling onto it (Intensity IV). Others reported dishes and windows rattling, but not breaking (Intensity IV). Today when one feels an earthquake, they can report what they felt on the U.S. Geological Survey's (USGS) Did You Feel It? website that produces an Intensity map for the event from the reported experiences.

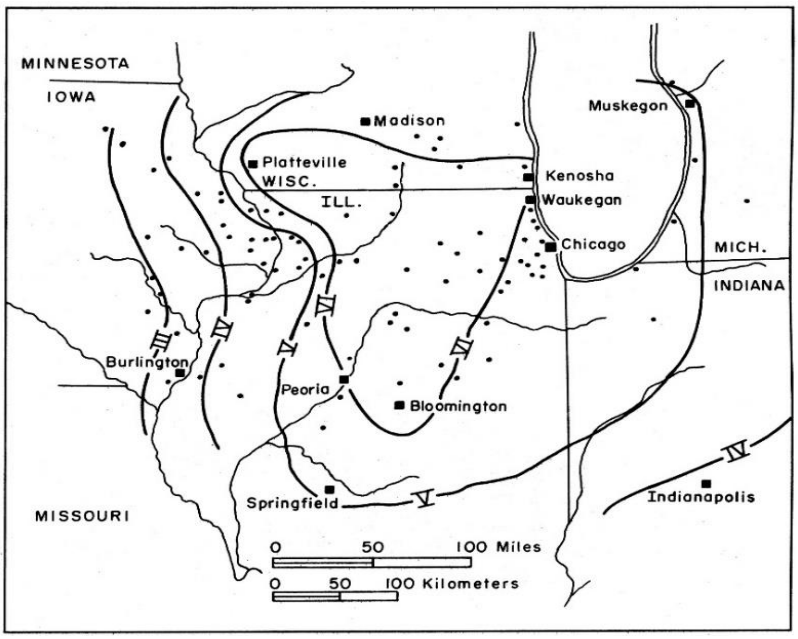
The first modern seismograph network was established in the Central U.S. in the 1960's (Heigold and Larson, 1990). Prior to that time, most of the records of earthquakes are based on newspaper accounts and personal journals. Magnitudes of these older earthquakes can be estimated by comparing their intensities with the intensities from recent earthquakes that have known magnitudes. Magnitude estimates can be based on the maximum intensity of the earthquake (Nuttli and Herrmann, 1978) or by the size of area over which the earthquake was felt (Sibol et al., 1987).

Damage to buildings, highways, power lines, pipelines and other structures only partly depend on the amount of energy released during the earthquake. Certain kinds of earth materials resting on the bedrock amplify the earthquake ground motions. In Illinois, structures built on thick, loose sediments of river flood plains are more likely to be damaged than structures on glacial till (stiff, pebbly clay) or bedrock. In fact, seismic intensity may increase one or more units on the Modified Mercalli Intensity Scale, if loose sediments are present. Also, loose sandy sediments with high moisture content can turn to liquid – a quick sand type state - (liquefaction) when shaken enough.

Figure 2. Intensity distribution from the 1909 earthquake in northern Illinois. Modified from Udden, 1910.

Historical Data Earthquakes in Illinois

Of the 605 earthquakes shown on figure 1, 90 percent occur in the southern third of the state, south of latitude 39° N. Four percent of the earthquakes (27) occur in the central part of the state between latitudes 39°N and 41° N and another five percent (32) are located in the northern part of the state, north of latitude 41°N.

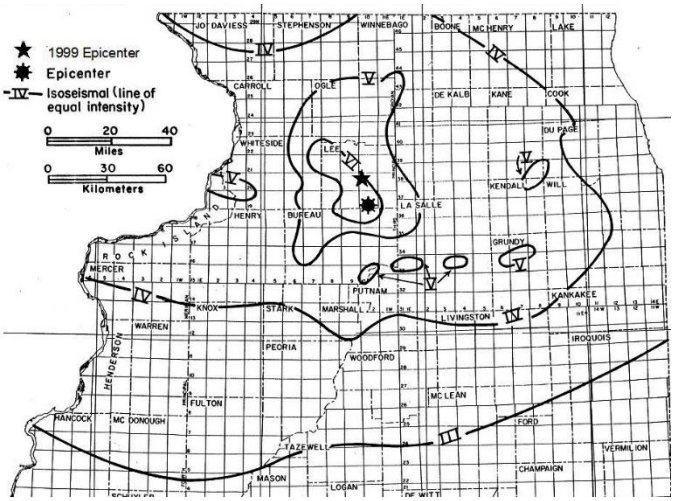


Northern Illinois: Fire at Aurora

One of the largest historical earthquakes in Illinois occurred in northern Illinois on May 26, 1909. The exact location of the magnitude 5.1 (estimated) earthquake isn't known, but the largest intensities occurred in and near Aurora where many chimneys fell, a stove overturned, gas lines broke, and a fire started. Although considerable excitement ensued, the Aurora Fire was quickly extinguished and soon forgotten. Elsewhere, houses were jostled out of plumb in Beloit, Wisconsin and brick walls cracked as far away as Bloomington. The area encompassed by minor damage is shown in Figure 2. This map is modified from one originally constructed by Prof. J. A. Udden of Augustana College, Rock Island, who based it on a compilation of newspaper reports (Udden, 1910; Heigold, 1972). A somewhat smaller earthquake occurred nearby in 1912.

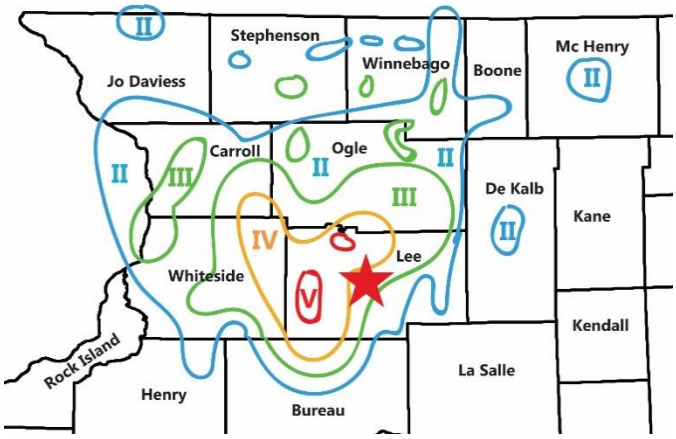
A magnitude 4.0 earthquake centered in north-central Illinois south of Rockford, near the village of Amboy woke many Chicago area residents when it struck late at night on September 15, 1972 (figure 3, Heigold, 1972). Although felt over a very large area, the intensity VI area is much smaller than the 1909 earthquake.

Figure 3. Intensity distribution from the 1972 earthquake in northern Illinois, from Heigold, 1972.



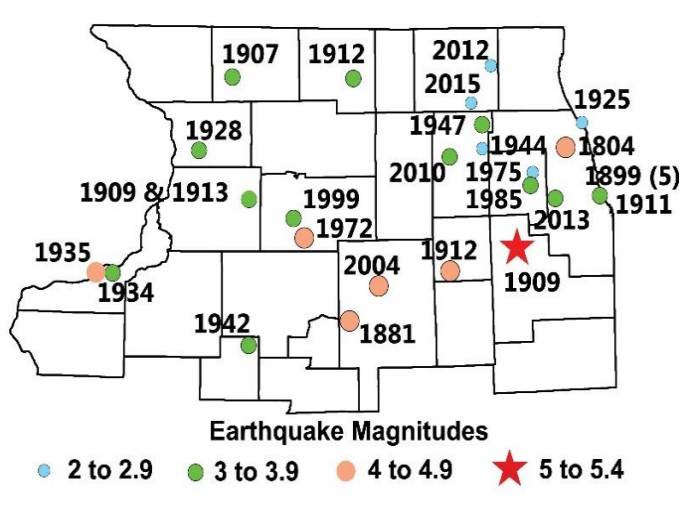
Twenty-seven years later on September 2, 1999, a magnitude 3.5 earthquake occurred at nearly the same location as the 1972 earthquake. An isoseismic map (figure 4) prepared from responses to questionnaires distributed to Post Offices and published in local papers indicated that the greatest intensities were several miles northwest of the epicenter as located by regional seismographs (Larson, 2001). This area also experienced a 4.2 magnitude event on June 28, 2004, which was felt in six states. Several small earthquakes occurred in the Rock Island area in the 1930's (Fryxell, 1940; Heigold, 1972). Two that were located in Illinois are shown in Figure 1 & 5 and the others occurred in Iowa.

Figure 4. Intensity distribution from the 1999 earthquake in northern Illinois. Modified from Larson, 2001.



Chicago area: Earthquakes occur throughout the state with most in the southern third of the state but 16 events have been recorded in Cook, DuPage, Kane, Kendall, and Will Counties since 1804 (figure 5). A 3.8 magnitude earthquake struck on February 10, 2010, about 2 miles northwest of Lily Lake in Kane County. This earthquake was located about 6 miles below ground in the crystalline basement rock.

Figure 5. Historical earthquakes and their location in Northern Illinois from 1804 through 2017.

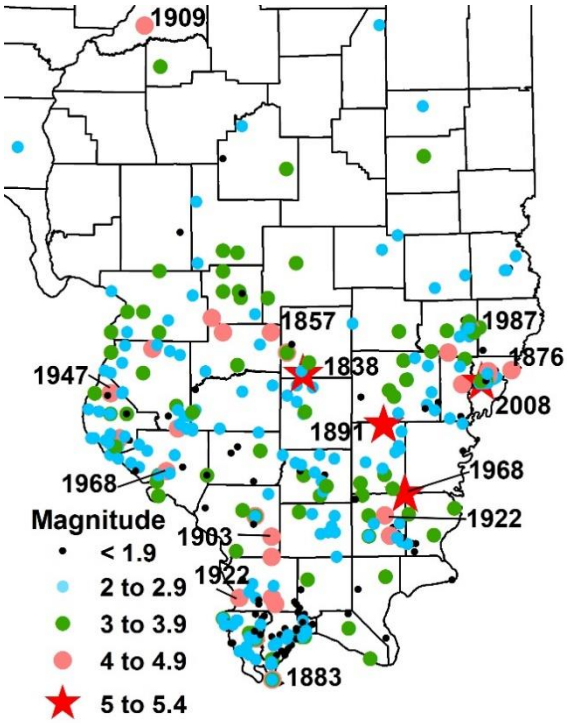


Central Illinois: Burglars in the basement For the most part, central Illinois is characterized by a lack of earthquakes. The largest known earthquake in central Illinois occurred about 11:00 p.m. on July 19, 1909, estimated to be located between Petersburg and Havana. With an estimated magnitude of 4.8, this earthquake damaged chimneys and broke windows. Many residents were awakened and congregated outside after the unusual event. The St. Louis Post Dispatch reported "several who had gone to bed before the tremor arrived report that they experienced a vague Pullman train car type berth sensation."

Figure 6. Earthquake epicenters in southern Illinois. Years indicated for larger events.

Southern Illinois: Minor damage

Nearly two dozen damaging earthquakes have been reported in southern Illinois (figure 6), although seldom is the damage more severe than fallen chimneys, broken windows or cracked masonry walls. The second largest earthquake in the Central U.S. since 1895 occurred in southeast Illinois on April 18, 2008. The magnitude 5.23 event caused damage to 240 structures in Illinois, with three condemned according to the county emergency managers (figure 7). Damage in Illinois and Indiana covered a 20 to 30 mile radius from the epicenter located about four miles northwest of Mt. Carmel, Illinois. Several buildings in Indiana were also condemned.

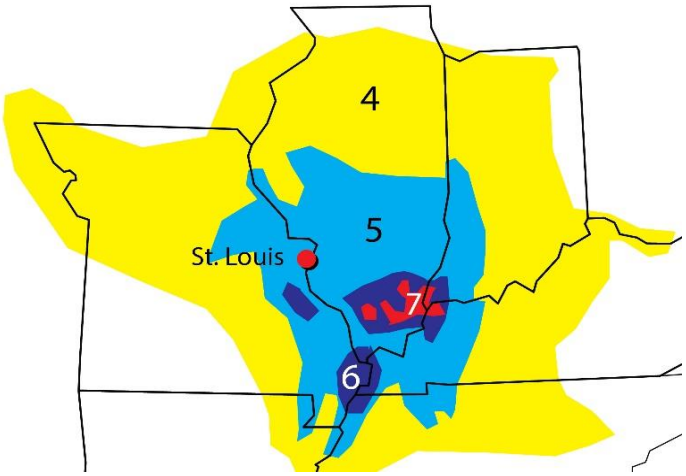


Fgure 7. Mt. Carmel, Illinois magnitude 5.23 earthquake damage to 1904 school building that was converted to apartments. Building condemned on day of earthquake and razed 1.5 years later. ISGS photo.

Southern Illinois: Minor damage

Nearly two dozen damaging earthquakes have been reported in southern Illinois (figure 6), although seldom is the damage more severe than fallen chimneys, broken windows or cracked masonry walls. The second largest earthquake in the Central U.S. since 1895 occurred in southeast Illinois on April 18, 2008. The magnitude 5.23 event caused damage to 240 structures in Illinois, with three condemned according to the county emergency managers (figure 7). Damage in Illinois and Indiana covered a 20 to 30 mile radius from the epicenter located about four miles northwest of Mt. Carmel, Illinois. Several buildings in Indiana were also condemned.

Figure 8. Reported Intensities from the 1968 earthquake in southern Illinois, from Gordon (et al., 1970).



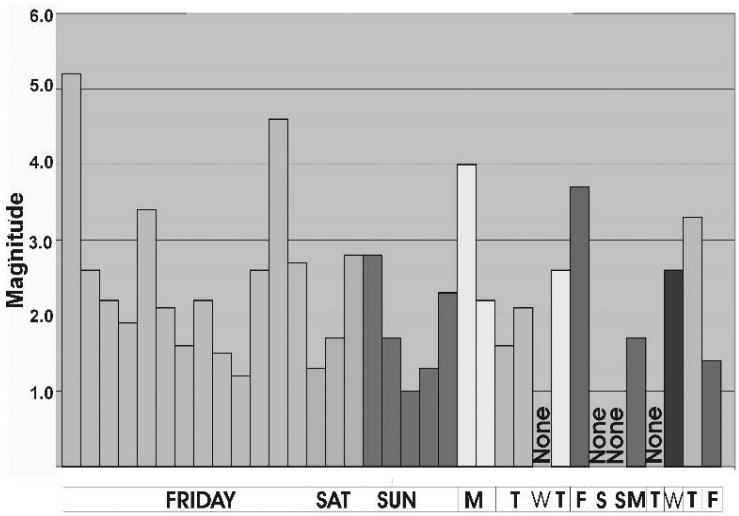
The largest earthquake during the 20th Century occurred in southeast Illinois on November 9, 1968. This magnitude 5.3 earthquake caused Intensity VII damage in the epicentral area northeast of Harrisburg. Fifteen percent of the chimneys in a 25-mile radius of the epicenter were damaged, foundations cracked and bricks were thrown from masonry parapets. The earthquake was felt by people in multi-story buildings as far away as Boston, Massachusetts. Also walls and chimneys fell in St. Louis 110 miles away.

A magnitude 4.9 earthquake near Lawrenceville in 1987 is typical of the 35 other magnitude 4 or greater earthquakes in southern Illinois. It caused minor damage in the area and was felt throughout the Midwest. Diagonal cracks in masonry walls and loosened bricks shown in Figure 9 are common examples of the minor damage that can occur in these earthquakes.

Figure 9. Typical minor damage (Modified Mercalli Intensity VI to VII) from Illinois earthquakes. Left: diagonal masonry cracks in church tower, Lawrenceville M 4.9 earthquake 1987. Below: bricks thrown from chimney in Lawrenceville by M 4.9 earthquake, 1987. ISGS photos

Short descriptions of the effects from the larger earthquakes in Illinois can be found in Stover and Coffman, (1993). The USGS maintains a catalog of earthquakes in the Eastern, Central and Mountain States of the U S from 1530 to1986 (modified from Stover et al.,1984). A combination of listings was used to compile Figure 1.

Figure 10. Diagram shows the magnitude and number of aftershocks following the main shock (first event on diagram) recorded within the first 2 weeks by nearby seismograph stations for the Mt. Carmel, Illinois April 18, 2008 earthquake.



The April 18, 2008 Mt. Carmel earthquake reminds us that larger earthquakes often have aftershocks for many months following the main shock. Portable recorders placed near the Mt. Carmel event recorded 121 aftershocks within the first 5 days following the day of the earthquake. Figure 10 shows the larger aftershocks recorded during the first two weeks by permanent seismograph stations near Mt. Carmel. These aftershocks follow the typical sequence of fewer and fewer aftershocks per day with lower magnitudes than the main shock. A magnitude 2.4 and 3.6 occurred in 2009 and 2012 respectively within the hypocenters of all the aftershocks. Two more aftershocks of 3.1 and 3.8 occurred in Sept. of 2017. Several earthquake

swarms have been recorded in Illinois. The most notable was a series of 150 small earthquakes of magnitude 0.2 to 3.6 centered near Olmsted in Pulaski County during the winter of 1983-1984.

Regional earthquakes

During the winter of 1811-1812 a series of four very large (magnitude greater than 7.0) earthquakes occurred along the three separate faults in the New Madrid Seismic Zone. Within the three months of these large main shock earthquakes, over 1,900 aftershocks were recorded with five estimated at magnitude 6.7, ten similar in magnitude to the Charleston, Missouri 1895 magnitude 6.0 event, and 65 similar to the Mt. Carmel 5.23 magnitude event. These earthquakes were centered in the New Madrid area of Missouri, south and southwest of Illinois, where they caused severe damage. In 1811-1812, frightened settlers living along the Ohio, Wabash and Mississippi Rivers reported various types of liquefaction, such as sand blows, fissures, bank collapse, in the bottomlands of these river valleys. Evidence of liquefaction from several pre-historic earthquakes from New Madrid faults have shown that the 1811-1812 sequence of earthquake events also occurred about 1450 A.D, 900 A.D. and 300 A.D. The shortest interval between these events is about 350 years and the longest about 600 years (Tuttle & Schweig 1995 and Tuttle 2001) with magnitudes from 7 to 7.6. Liquefaction features along the Wabash Valley Fault Zone demonstrates that large earthquakes have occurred from about 2,000 to 12,000 years ago (Obermeier et al., 1992 and Munson and Munson, 1996). Some of these recent investigations, estimated several of the earthquake magnitudes to be 6.2 to 7.3 based on aerial extent of liquefaction features of similar age (Olson et al., 2005).

Other moderately large earthquakes have occurred in surrounding states. The most notable was one that struck in Missouri, just west of Cairo, Illinois on Halloween morning October 31, 1895. This earthquake, with an estimated magnitude 6.0, broke hundreds of chimneys and plate glass windows in Cairo. This is the same event that caused many central Illinois residents to check for burglars in their basements. The Intensity in the Chicago area varied from IV to V and no severe damage was reported and many people did not feel the earthquake. The area damaged by this earthquake is shown in Figure 11. As expected, the areas of higher shaking tend to follow the major river valleys that are filled with thick, loose, sediments.

Figure 11. Intensities reported per town from the "Halloween Earthquake" of 1895. From Bakun et al., 2002.

Magnitude 6.8 anywhere - Intensity VIII - IX A study of earthquakes around the world within stable interior parts of continents show that earthquakes with magnitudes up to 6.8 can occur anywhere in these settings. A magnitude 6.8 event would produce intensities of VIII to IX.

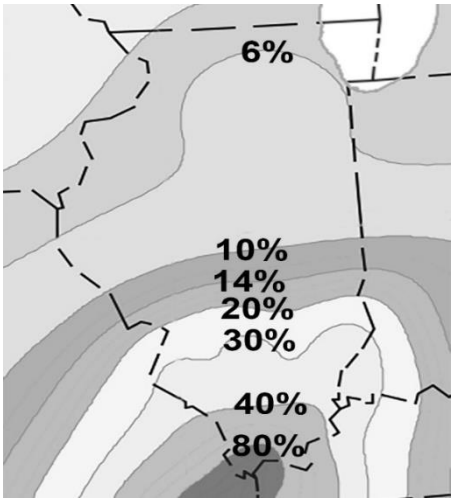
Earthquake Risk and Hazards

Although there have been over 600 earthquakes in Illinois reported during the last two+ centuries, very few of them have caused any damage (Modified Mercalli Intensity of VI or higher) or injuries. Larger earthquakes in the New Madrid region have caused more damage in Illinois than earthquakes originating in Illinois. The risk of probable damage from future earthquakes can be estimated based on the historical record of past earthquakes. Petersen et al., 2014 and colleagues at the USGS create the maps for building codes of the largest probable ground shaking that have a low probability of being exceeded over a 50 year period (figure 12). They have plotted intensity information as numerical values of ground shaking, or accelerations, which can be converted to Modified Mercalli Intensities using the conversion values in Table 1. These USGS maps only show the estimate of shaking on the top of bedrock. Shaking will be modified and usually increased by the overlying soils.

Figure 12. Earthquake risk for Illinois given as maximum accelerations with a 2% probability of being exceeded within a 50 year window (represents a 1 chance in 2,475 of it being exceeded in any year). From Petersen et al., 2014 and the USGS National Seismic Hazards Mapping Project Web page

For most of Illinois, the risk is dominated by the possibility of large earthquakes recurring in the New Madrid Seismic Zone, south of Illinois. In this scenario, the maximum accelerations in the southern-most counties of Illinois exceed 80 percent of gravity, or Modified Mercalli Intensity IX. Although the risk decreases to the north, there is a two percent probability during the next 50 years that an acceleration greater than 6 percent of gravity (Modified Mercalli Intensity V) could be exceeded in most of Illinois. Because of the record of minor to moderate earthquakes in northern Illinois, west of Chicago, the risk of damaging earthquake motions increases in the western suburbs of Chicago. But if magnitude 4 to 5 earthquakes occur near or under Chicago as early events have been located, damage could occur to weak, old structures through other parts of the city.

Earthquakes create numerous risks in people's homes. People can lessen the severity of earthquake damage by identifying hazards that exist in their homes, schools, or places of business and then systematically removing or correcting each hazard. This is especially important in the southernmost counties of Illinois where the earthquake risks are the greatest. Some common hazards include: free standing water heaters, stoves, and other gas or electric appliances which could move or fall during an earthquake; bookshelves, filing cabinets or chest of drawers which are free standing or bookshelves with objects stored above head level; water or gas pipes which are not fastened well to walls or ceiling.



Some other things that people can do to make their homes more earthquake ready include: keeping a few days supply of food and water available; being sure each home has a fire extinguisher and smoke alarm; maintaining a properly equipped first aid kit complete with any necessary prescription medication in sufficient quantities to last a few days to a few weeks; organizing and testing a family emergency plan which would help ensure each family member's survival; and having residents know how to turn off gas supply to building.

Should you be involved in an earthquake, remembering a few simple facts can greatly increase your chance of survival and can help to reduce possibility of serious injury. If inside a building: stay inside and **duck** under some furniture, **cover** the back of your head, and **hold on** to the furniture. Protection inside a building is found next to or under heavy furniture. Do not run outside of a building during the shaking. Falling parts (bricks and glass) from buildings can kill or injure you. Rooms with lots of fixtures (hanging lights within a dropped ceiling) can be dangerous if they fall. Large windows or groups of windows can shatter and shards of glass can fly inward. These areas should be avoided. Large rooms with open-span ceilings or roofs are the most vulnerable to collapse and should be avoided. Many suggested actions and checklists to be used to secure your home and be prepared can be found at state and federal websites www.ready.illinois.gov or www.ready.gov and the Red Cross.

The following table provides the number of past earthquakes from 1795 to the end of 2017, by county, that were of a magnitude that could be felt or cause possible damage. These numbers do not represent the total recorded earthquakes per county since some counties have had large numbers of small events that were not detected by people, below magnitude 2.0. In addition, aftershocks and swarms are not included in the table. Earthquakes recorded prior to about 1955 utilized estimated magnitudes and locations for the events based on damage amounts, aerial extent and location. Damage from earthquakes would become evident in magnitudes in the mid-4s and higher. The larger magnitude events listed in this table would also influence neighboring counties. As seen in the table, 62 out of the 102 counties in Illinois (61%) have experienced earthquakes of a magnitude that could be felt by the public and 23 out of 102 (23%) counties had possible damaging earthquakes.

Induced Seismicity

Arkansas, Ohio, Kansas, and Oklahoma are experiencing an increase in seismic activity from induced seismicity from wastewater disposal. Illinois has not seen an increase in earthquake activity nor has it had a felt or seismic network recorded earthquake associated with wastewater disposal wells, even though during the past several years USGS has nearly doubled the seismic stations in Illinois. The states experiencing induced seismic activity have been disposing of water associated with hydraulic fracturing (Arkansas and Ohio) or produced waters (water brought to the surface along with oil production) (Oklahoma and Kansas) into a sandstone formation resting on the crystalline basement rocks. The deep crystalline basement rock is the location of the vast majority of our natural earthquakes. Increased water pressures exerted into the basement rock from this wastewater disposal is inducing earthquakes on unknown, critically stressed faults in the crystalline basement. The practices in Illinois are very different for handling produced waters. First, not as much waters are produced in Illinois per barrel of oil as compared to Oklahoma and Kansas. Secondly, in Illinois, much of the waters are pumped back into the formation from which they were extracted to help drive the oil to the production wells. Thirdly, other disposal wells in Illinois are typically not using the sandstone layer right above the crystalline basement but are using highly porous sedimentary rock layers from 1 to >2 miles above the crystalline basement. This normal operating procedure in Illinois is the technique proposed by Walsh and Zoback (2015) to eliminate the induced earthquakes in Oklahoma from wastewater disposal.

All of these wells are Class II regulated wells, associated with disposal of waters from the oil and gas industry. These wells have been operating for many decades without seismic issues and are regulated for maximum allowable pressures and volumes injected. Other regulated disposal wells are also using these same high porosity formations. One industrial complex has been disposing of fluids since 1966

with a total disposal of over 20 billion gallons with rates as high as 700,000 gallons a day, without recorded or felt seismic events.

Table 2. Lists magnitude 2 and greater earthquakes by county from 1795 through 2017excluding aftershocks and swarms.

	FELT			SOME POSSIBLE DAMAGE			FELT			SOME POSSIBLE DAMAGE	
	Magnitudes			Magnitudes			Magnitudes			Magnitudes	
COUNTY	2 to 2.9	3 to 3.9		4 to 4.9	5 to 5.4	**COUNTY**	2 to 2.9	3 to 3.9		4 to 4.9	5 to 5.4
Adams	1					Marion	1	5		1	1
Alexander	30	21		5		Mason				1	
Bond	2	6		1		Massac	1	2			
Carroll		1				McHenry	2				
Christian	1	1				McLean	1			1	
Clay	1	1				Menard		1			
Clinton	2	1		2		Monroe	11	6		2	
Coles		1				Montgomery	2	2			
Cook	1	3		1		Peoria	1				
Crawford	3					Perry	2	2			
Douglas	1					Piatt	1				
Du Page	2	1				Pike	1				
Edwards	2	1		1		Pope		1		1	
Effingham	2					Pulaski	35	5			
Fayette		3				Randolph	10	5		1	
Franklin	7	3				Richland	19	5		2	
Fulton		1				Rock Island		1		1	
Gallatin	1	3				Saline	6	5		2	
Hamilton	6	5			2	St. Clair	18	7		2	
Henderson	1					Stark		1			
Jackson	2	3		2		Stephenson		1			
Jasper	2					Union	4			4	
Jefferson	5	1				Wabash	16	6		4	1
Johnson	1	1				Warren	1				
Kane	1	2				Washington	6	1			
Kendall				1		Wayne	7	5			
LaSalle				2		White	2				
Lawrence		1				Whiteside		2			
Lee		1		1		Will					1
Macoupin		1				Williamson	7	1			
Madison	5	4				Winnebago		1			

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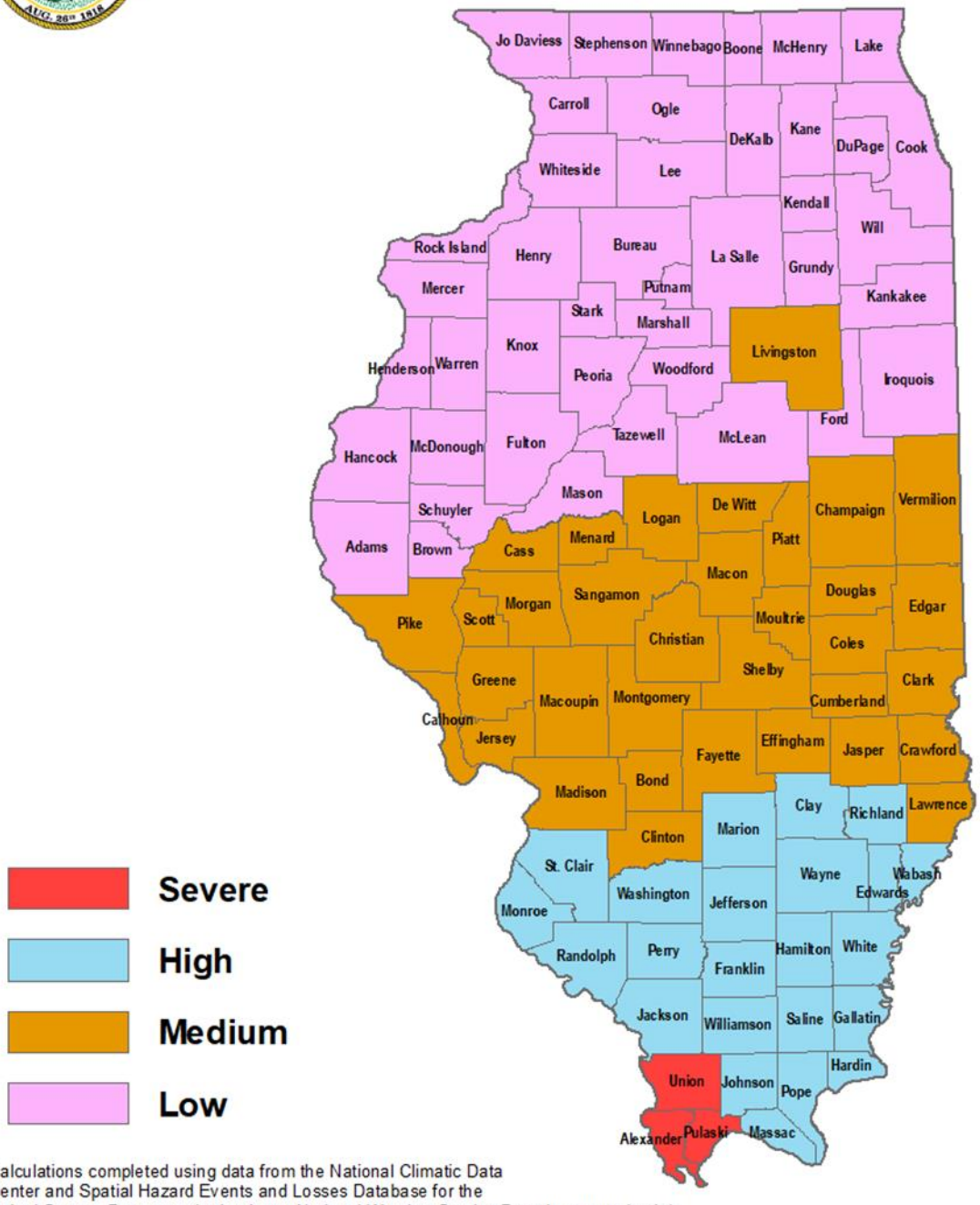
IEMA Illinois Natural Hazard Mitigation Plan
Earthquake Hazard Rating by County



Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

Comprehensive Seismic Loss Modeling for the State of Illinois

This is a summary of only a few highlights from an earthquake loss estimation that was performed for the entire state of Illinois using HAZUS and its accompanying default data and also performed for the southernmost 32 counties of Illinois using HAZUS and updated, detailed inventories, a soil site class map and liquefaction susceptibility map (Elnashai 2007). This estimate was performed by the Mid-America Earthquake Center (MAE-Center) located at the University of Illinois with assistance from staff at Georgia Institute of Technology, Illinois State Geological Survey and the Illinois Emergency Management Agency. These estimates were run using three different earthquake scenarios of a moment magnitude 7.7 and 6.3 near the northern end of the New Madrid seismic zone and a magnitude 7.1 for the Wabash Valley seismic zone, all analyzed for damage inflicted from Peak Ground Acceleration (PGA)and spectral accelerations at 0.2 and 1.0 seconds. The ground shaking at different "frequencies" of 0.2 and 1.0 seconds impacts structures of different heights, lengths and type of construction.

STATEWIDE ESTIMATE WITH DEFAULT DATA:

The FEMA-sponsored HAZUS (Hazards US) computer loss estimation program comes with default data of building and some infrastructure inventory from various sources including the 2000 census. It uses one type of soil for the entire area. Soils modify the earthquake ground motions that travel through the bedrock and typically amplify the ground motions, increasing shaking at the ground surface as compared to the shaking on the bedrock. The default building inventory contains numbers of structures by construction type per census track and replacement costs for structures are based on an average cost per square foot for 2002. It contains an inventory of essential facilities such as: hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities and high potential loss facilities such as: dams, levees, military installations, nuclear power plants and hazardous material sites.

- State-Wide Damage for Magnitude 6.3 New Madrid Event
  HAZUS estimates that 4,453 buildings will sustain at least moderate damage and of those 1,689 will be completely damaged. No essential facilities are expected to be completely damaged and a large percentage will be functional on the day of the event. It is estimated 6,321 households will be without potable water and 3,964 without electricity on the day of the event. Eight of the 22,854 bridges in Illinois are expected to be completely damaged along with two ferry facilities. Debris generated is estimated to be 219,000 tons. Displaced households are 1,882 with 556 requiring shelter. There are 540 casualties and a total direct economic impact of about $920 million.

- State-Wide Damage for Magnitude 7.7 New Madrid Event
  HAZUS estimates that 75,272 buildings will sustain at least moderate damage and of those 19,044 will be completely damaged. Forty-two essential facilities are expected to be completely damaged including two hospitals and many facilities will need a few days to a month to recover to functionality. It is estimated 100,483 households will be without potable water and 25,191 without electricity on the day of the event. Sixty-two of the 22,854 bridges in Illinois are expected to be completely damaged along with two ferry facilities and one airport. Debris generated is estimated to be 3,377,000 tons. Displaced households are 22,468 with 6,556 requiring shelter. There are 7,629 casualties and a total direct economic impact of about $9 billion.

- State-Wide Damage for Magnitude 7.1 Wabash Valley Event
  HAZUS estimates that 32,036 buildings will sustain at least moderate damage and of those 6,428 will be completely damaged. Thirty-one essential facilities are expected to be completely damaged including one hospital and many facilities will need a few days to a month to recover to functionality. It is estimated 19,137 households will be without potable water and 20,233 without electricity on the day of the event. Ninety-eight of the 22,854 bridges in Illinois are expected to be completely damaged along with two ferry and two airport facilities. Debris generated is estimated to be 1,279,000 tons. Displaced households are 6,927 with 1,755 requiring shelter. There are 2,389 casualties and a total direct economic impact of about $4.6 billion.

DETAILED ANALYSIS FOR SOUTHERN 32 ILLINOIS COUNTIES:
HAZUS was also used to estimate losses for the southernmost 32 counties in Illinois using updated, detailed information wherever possible. HAZUS default inventory data was improved using a previous MAE-Center essential facility inventory and computerized tax parcel data from cooperating counties in the 32 county area. Building replacement costs were modified to reflect current replacement costs. HAZUS uses damage functions (fragility curves) that estimate the level of damage per structure type per the level of shaking. The HAZUS default functions are meant to be used across the entire country. This project developed and used specific fragility curves for the Midwest for the different building and bridge types located in this part of the country. Also detailed soil site class and liquefaction susceptibility maps were developed and used for this project. These maps are used to estimate how much soils will amplify earthquake ground motions. For essential/critical facilities with known latitude and longitude locations, the HAZUS program will use the specific soils information below the structure for the analysis.

- 32 County Damage for Magnitude 6.3 New Madrid Event
  HAZUS estimates that 4,303 buildings will sustain at least moderate damage and of those 1,858 will be completely damaged. A few essential facilities show moderate damage and none are expected to be completely damaged. It is estimated 6,321 households will be without potable water and 3,964 without electricity on the day of the event. Four bridges in the 32 counties are expected to be completely damaged. Displaced households are 1,884 with 555 requiring shelter. There are 540 casualties and a total direct economic impact of about $930 million.

- 32 County Damage for Magnitude 7.7 New Madrid Event
  HAZUS estimates that 71,263 buildings will sustain at least moderate damage and of those 20,386 will be completely damaged. Twenty-nine essential facilities are expected to be completely damaged including one hospital. It is estimated 100,483 households will be without potable water and 25,191 without electricity on the day of the event. Eighty of the 5,197 bridges in the 32 counties are expected to be completely damaged along with 1 airport. Debris generated is estimated to be 3,332,000 tons. Displaced households are 22,454 with 6,552 requiring shelter. There are 7,591 casualties and a total direct economic impact of about $8.5 billion.

- 32 County Damage for Magnitude 7.1 Wabash Valley Event
  HAZUS estimates that 29,369 buildings will sustain at least moderate damage and of those 6,663 will be completely damaged. No essential facilities are expected to be completely damaged. It is estimated 19,137 households will be without potable water and 20,233 without electricity on the

day of the event. One hundred and four of the 5,197 bridges in the 32 counties are expected to be completely damaged along with two airport facilities. Debris generated is estimated to be 1,211,000 tons. Displaced households are 7,016 with 1,752 requiring shelter. There are 2,344 casualties and a total direct economic impact of about $4.3 billion.

Some of the impact numbers are the same for the state-wide assessment and the detailed 32 county analysis because the 32 counties are the closest to the earthquake epicenter and damage levels north of these counties for the state-wide assessment were small for some magnitude scenarios. The detailed report also contains information on estimates of how soon functions would be restored to various utilities and facilities and also information on many more infrastructure systems.

Loss Estimation for Earthquakes

The more detailed county by county analysis can be viewed in the 2007 Plan Update supporting documentation CD. This document is attached for the reason that it is very lengthy and extremely detailed. This detailed loss estimation data was reviewed during the update process. No further information of additional data would be able to equal or surpass the detailed estimates that were obtained from the HAZUS analysis in 2007.

Reference: Elnashai, Amr, 2007, Comprehensive Seismic Loss Modeling for the State of Illinois: Mid-America Earthquake Center Report for the Illinois Emergency Management Agency.

Figure 1: "Comprehensive Seismic Loss Modeling of the State of Illinois" Mid-America Earthquake Center, University of Illinois Urbana-Champaign

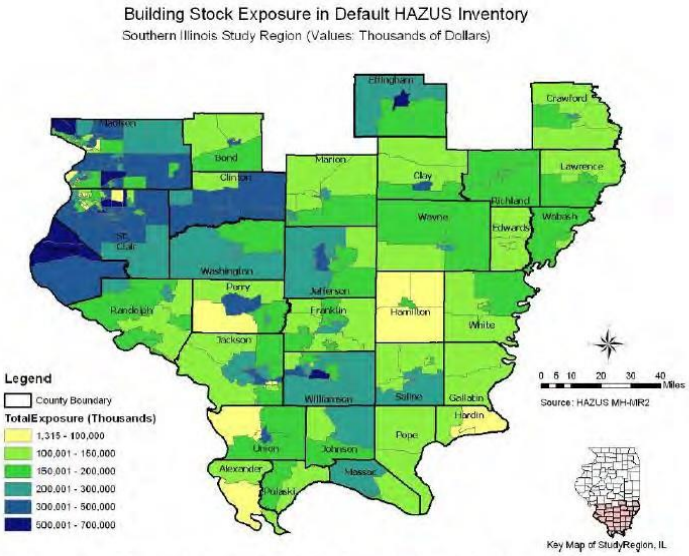


Figure II-13 – Building stock Exposure in Southern Illinois Regions (Thousands of $)

K. Other Natural Hazards

As stated in the opening paragraph of this section, the Illinois Natural Hazard Mitigation Planning Committee divided potential natural hazards into three categories: those extremely unlikely to occur in Illinois, those with low probability and minimal impact, or natural hazards that have in the past and in all probability will continue to impact Illinois at various levels of severity and frequency. The preceding pages have dealt with disasters that will most definitely occur in Illinois. This portion of the plan will discuss the remaining two categories.

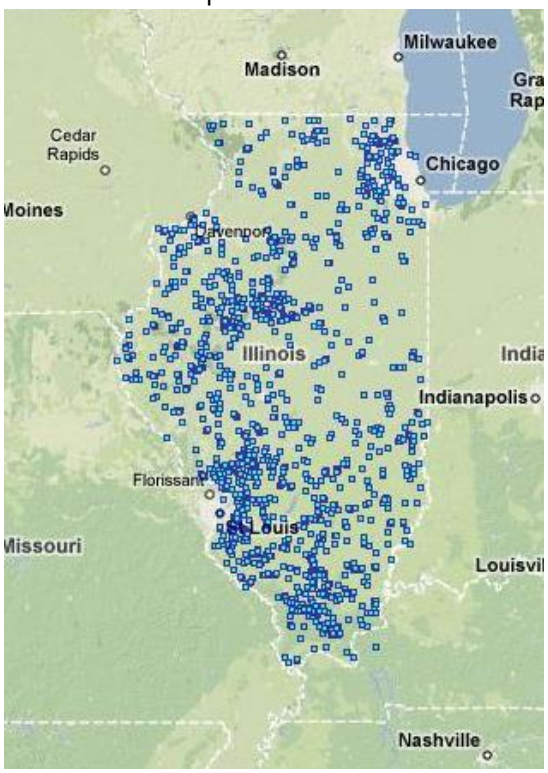
The first category is natural hazards that are extremely unlikely to happen in Illinois: avalanche, coastal storm, hurricane, tsunami and volcano. No mitigation actions or hazard profiles will be discussed regarding these hazards.

The second category is natural hazards that have a low probability of occurring or minimal impact. These secondary hazards to be discussed include: Dam failure, Mine Subsidence, and Pandemic.

The intent for future plan updates is to include a loss estimation model for the "Other Natural Hazards." Currently, data is not available to provide accurate estimates. No mitigation efforts have been discussed as these hazards are very difficult to predict where the next event could take place. However, with recent occurrences and the potential of risk, the planning committee determined that these hazards should be identified in the INHMP and evaluated utilizing the plans monitoring and update cycle. New to the 2018 Hazard Mitigation Plan is the addition of Pandemic to the "Other Natural Hazards." Recent occurrences, combined with increased losses have made this hazard worth noting. Currently, no mitigation efforts have been discussed as it is very difficult to predict where the next event could take place.

Dam Failure:

Dam failure is an accidental or unintentional collapse or other failure of an impoundment structure that results in downstream flooding. Dams are man-made structures and dam failures are usually considered technological hazards, however, these failures are usually caused by prolonged periods of rainfall and flooding.



A dam is a barrier constructed across a watercourse in order to store, control, or divert water. Dams are usually constructed of earth, rock, concrete, or mine tailings. The water impounded behind a dam is referred to as the reservoir and is measured in acre-feet, with one acre-foot being the volume of water that covers one acre of land to a depth of one foot. Due to topography, even a small dam may have a reservoir containing many acre-feet of water. A dam failure is the collapse, breach, or other failure of a dam that causes downstream flooding. Dam failures may result from natural events, human-caused events, or a combination thereof. Due to the lack of advance warning,

failures resulting from natural events, such as hurricanes, earthquakes, or landslides, may be particularly severe. Prolonged rainfall that produces flooding is the most common cause of dam failure [FEMA, 1997].

HAZARD POTENTIAL CLASSIFICATION:
A system that categorizes dams according to the degree of adverse incremental consequences of a failure or mis-operation of a dam. The hazard potential classification does not reflect in any way on the current condition of the dam (e.g., safety, structural integrity, flood routing capacity). This system categorizes dams into Low, Significant and High Hazard Potential based on the probable loss of human life and the impacts on economic, environmental, and lifeline interests. Improbable loss of life exists where persons are only temporarily in the potential inundation area. (FEMA)

1. LOW HAZARD POTENTIAL
Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

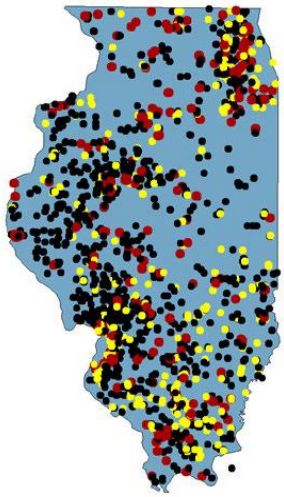
2. SIGNIFICANT HAZARD POTENTIAL
Dams assigned the significant hazard potential classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.

3. HIGH HAZARD POTENTIAL
Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life.

High-Hazard Potential Dam

Significant-Hazard Potential Dam

Low-Hazard Potential Dam



Source:https://damsafety.org/sites/default/files/IL_PerfomanceReport_v3.pdf

NATURE OF THE HAZARD

Dam failures usually occur when the spillway capacity is inadequate and water overtops the dam or when internal erosion through the dam foundation occurs [also known as piping]. If internal erosion or overtopping cause a full structural breach, a high-velocity, debris-laden wall of water is released and rushes downstream, damaging or destroying whatever is in its path. Dam failures may result from one or more the following:

- Prolonged periods of rainfall and flooding [the cause of most failures];
- Inadequate spillway capacity which causes excess overtopping flows;
- Internal erosion due to embankment or foundation leakage or piping;
- Improper maintenance;
- Improper design;
- Negligent operation;
- Failure of upstream dams;
- Landslides into reservoirs;
- High winds; and
- Earthquakes.

For emergency planning purposes, dam failures are categorized as either *rainy day* or *sunny day failures. Rainy day failures* involve periods of excessive precipitation leading to an unusually high runoff. This high runoff increases the reservoir of the dam and if not controlled, the overtopping of the dam or excessive water pressure can lead to dam failure. Normal storm events can also lead to rainy day failures if water outlets are plugged with debris or otherwise made inoperable. *Sunny day failures* occur due to poor dam maintenance, damage/obstruction of outlet systems, or vandalism. This is the worst type of failure and can be catastrophic because the breach is unexpected and there may be insufficient time to properly warn downstream residents.

PREVIOUS HISTORY OF DAM FAILURES

A request for Dam information was made for failure events prior to 1990. The official collection of this data began post 1990 so no accurate records exist today. Another request was made to discover what dam failures resulted from the historic 1993 and 2008 flood events. It was determined that no regulated dams failed during these events.

According to the National Inventory of Dams, the State of Illinois has 1,516 Dams. More than 60% of those Dams are considered very low in terms of Hazard Potential. In fact, less than 15% are considered to represent a high risk to the population they protect. The following images define this more clearly.

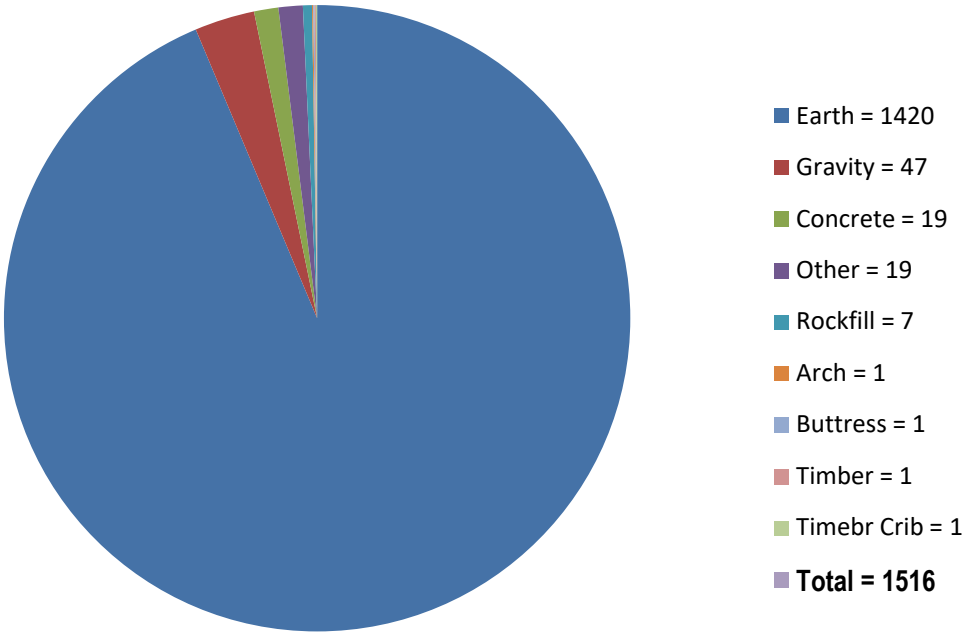
For more information and current analysis, please refer to the following websites,

http://geo.usace.army.mil/pgis/f?p=397:3:1577842890320650::NO::P3_STATES:IL

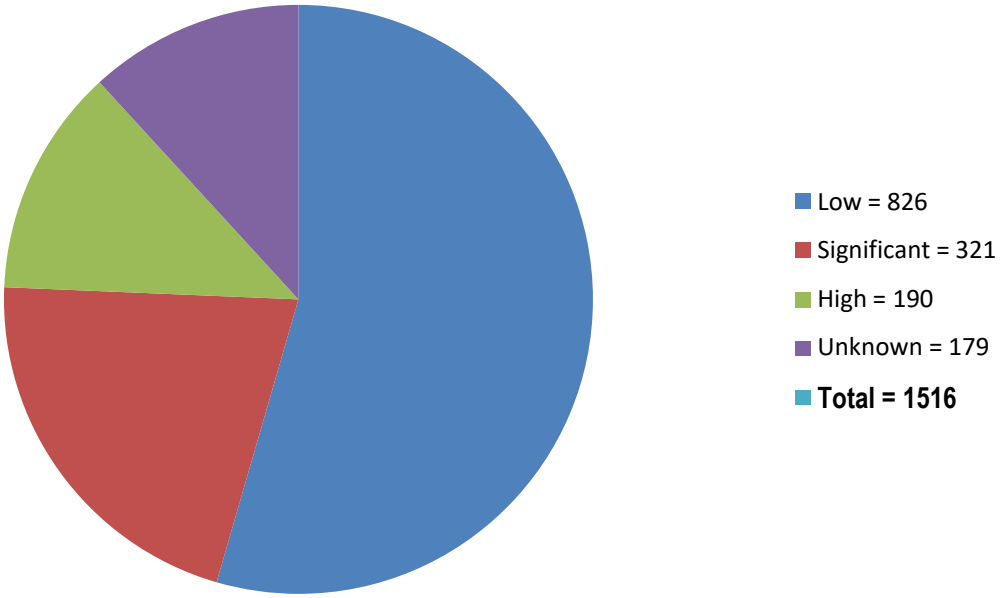
Federal Emergency Management Agency.1997. "Multi-Hazard Identification and Risk Assessment:: A Cornerstone of the National Mitigation Strategy."
http://www.fema.gov/fhm/dl_mhira.shtm.

National Inventory of Dams, USACE
http://geo.usace.army.mil/pgis/f?p=397:3:1577842890320650::NO::P3_STATES:IL

Dams by Primary Type

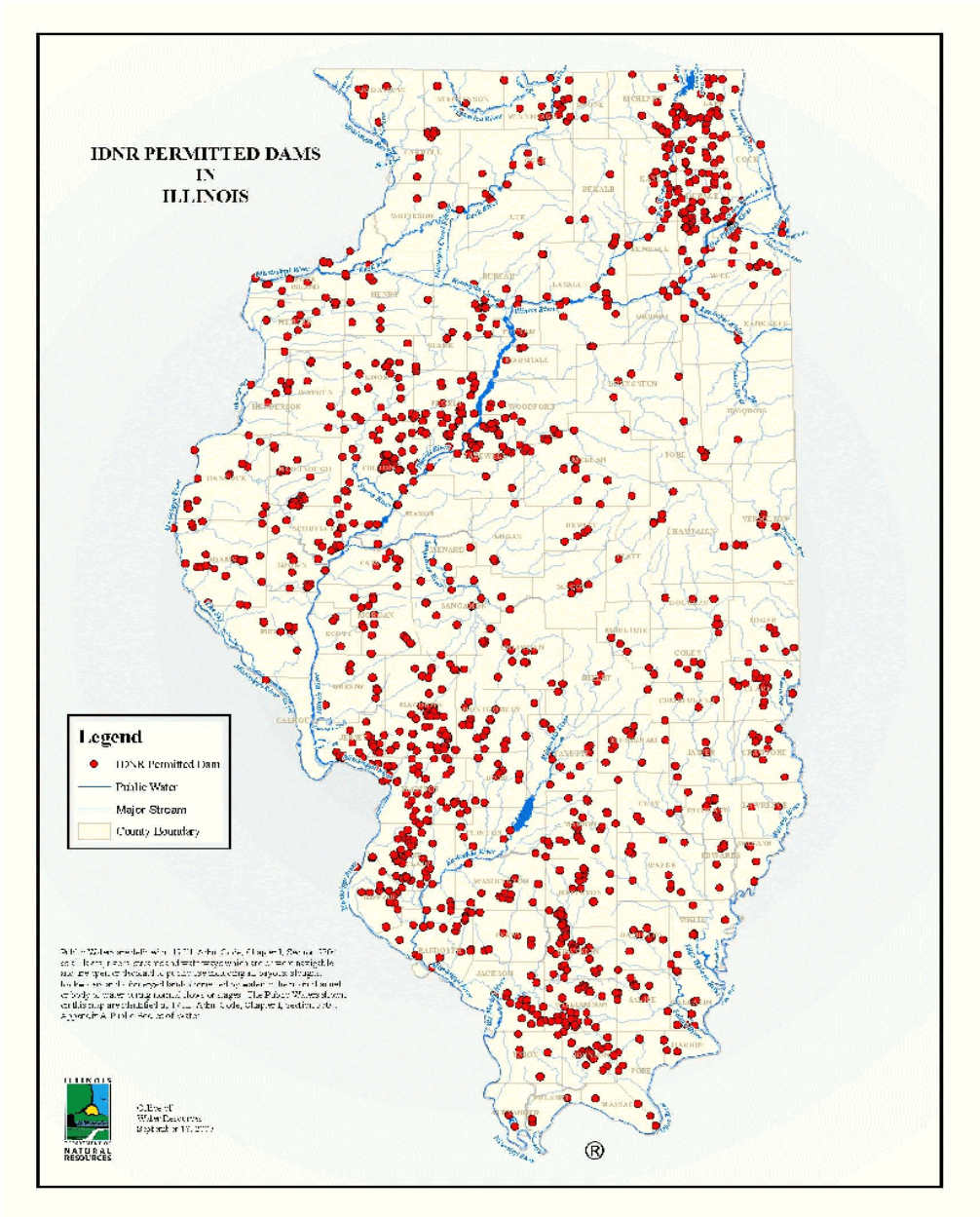


Dams by Hazard Potential



http://npdp.stanford.edu/data_library

IDNR Permitted Dams in Illinois



Sources: Federal Emergency Management Agency.1997. "Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy." http://www.fema.gov/fhm/dl_mhira.shtm.

Mine Subsidence:

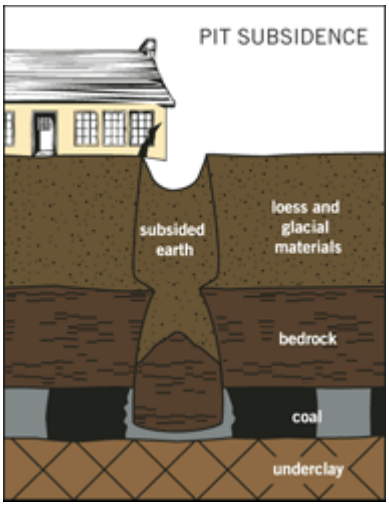
"Mine Subsidence" is a lateral or vertical ground movement caused by a failure initiated at the mine level, of man-made underground mines, including, but not limited to coal, clay, limestone, lead-zinc and fluorspar mines. In simpler terms, when the roof of a subsurface mine collapses, it causes the ground above to sink or subside. Most experts agree that room and pillar mines will eventually experience some degree of collapse, but currently there is no way to know when or exactly where mine subsidence will occur. *Illinois Mine Subsidence Insurance Fund 8/7/12* https://www.imsif.com/definition (The largest subsidence event in Illinois was over a lead-zinc mine, and subsidence also happens where buildings are not located.)

NATURE OF THE HAZARD

Generally speaking, Illinois has two forms of subsidence; pit and sag. According to the Illinois Department of Natural Resources Office of Mines and Minerals it is currently not possible to predict precisely how long a mine subsidence event will last. It is known, based on experience, that 60 to 90 percent of the total ground movement occurs within the first few weeks of an event. The remaining ground movement continues to develop at a continually decreasing rate and may take three to five years, or sometimes decades, to reach completion.

Pit subsidence:

- bell-shaped hole,
- usually 6-8 feet deep and 2-40 feet across.
- The mine will most likely be shallow, less than 100 feet deep,
- The bedrock over the mine is usually less than 50 feet thick and consists of weak rock materials such as shale.
- Ground movement will be swift and sudden.

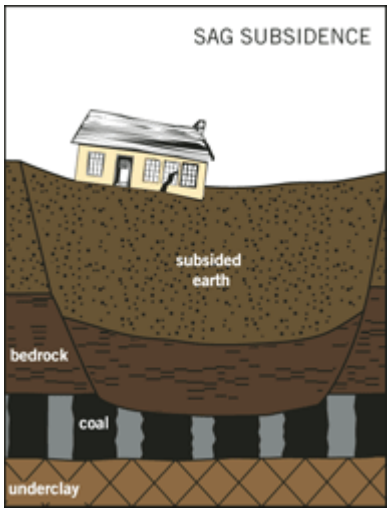


Diagrams Provided by the Illinois Mine Subsidence Insurance Fund

Illinois Mine Subsidence Insurance Fund Confirmed Claims Distributed by County 1999 - 2017	
St. Clair	538
Sangamon	261
Madison	193
Christian	87
LaSalle	41
Saline	26
Macoupin	57
Tazewell	22
Perry	16
Williamson	16
Grundy	13
Franklin	18
Fulton	10
Vermilion	7
Clinton	6
Randolph	3
Bond	1
Jackson	1
Jefferson	1
Knox	1
JoDavies	1
Livingston	1
McDonough	1
Montgomery	5
Peoria	2
Rock Island	1
White	1
Williamson	16
TOTAL	**1346**

Sag subsidence:

- the most common type of mine subsidence,
- appears as a gentle depression in the ground and can spread over an area as large as several acres.
- First signs may appear suddenly within a few hours or days, with gradual movement continuing anywhere from a couple of years to more than a decade.
- Damage is usually subtle, and perhaps dismissed as normal wear and tear until multiple signs appear.
- Sag subsidence can develop over mines of any depth and are usually caused when coal pillars, left intact by miners to support the mine roof, disintegrate or collapse or are pushed into a soft layer below the pillars. *(ISGS, 13)*



Diagrams Provided by the Illinois Mine Subsidence Insurance Fund

HISTORY

While past generations were using mined coal as a fuel source, not much thought went into how this mining would impact future generations. The miners' goal was to get the coal and get out of the mine. Because there was no urbanization above the mines, they weren't concerned about the long term stability of the rooms. When the miners were done, they left. But the abandoned mines left behind were not necessarily stable. In fact, mines can fail in many different ways.(IMSIF, 13)

About 840,000 acres of Illinois land have been undermined for coal and other minerals. The Illinois State Geological Survey estimates that approximately 201,000 acres of urban and built up lands in Illinois are in close proximity to mines. Within that area, there are an estimated 330,000 housing units with possible exposure to mine subsidence. Statewide, this number is likely to increase as urban sprawl continues. The number of underground coal mines in Illinois has been estimated at 5,500. Maps exist for about 2,600.(ISGS, 06)

In 1979, the Mine Subsidence Insurance Act was passed to provide subsidence insurance for homeowners in mining areas. The risk of damage was high enough that the law mandated that private insurance carriers include coverage as a part of their homeowner policies. Homeowners in counties where 1% or more of the land has been undermined (fig. 1 below) will automatically have subsidence insurance added to their policies when issued. Those individuals refusing coverage will be asked to sign a waiver. (ISGS, 06) Figure 2 below identifies land that has been mined in Illinois. Later Amendments to this Act have increased coverage for insured structures from $50,000 (1979) to $350,000 (1990). Mine subsidence insurance in Illinois covers damage caused by underground mining of any solid mineral resource. (ISGS, 13)

If there are life safety concerns associated with past mining activity, a property owner should contact the Illinois Department of Natural Resources, Office of Mines and Minerals, Abandoned Mined Lands Division. If desired by a property owner, a team can be promptly dispatched to investigate the concerns. If conditions prove to be (1) life threatening and (2) mine related, Abandoned Mined Lands staff will seek federal funds to abate the hazardous conditions. These funds appropriated by the U.S. Congress can be made available through the Office of Surface Mining Reclamation and Enforcement to be used in abating life-threatening conditions associated with abandoned coal mines. These funds cannot be used for damage repair but are readily available for life protection measures. Often the work associated with hazard abatement serves to reduce or control future damages. (ISGS, 06)

Illinois Mine Subsidence Insurance Fund Mine Subsidence Claim Payments 1999 – 2017

1999	$3,651,278
2000	$6,141,826
2001	$5,708,849
2002	$4,527,670
2003	$4,021,325
2004	$10,025,654
2005	$5,561,257
2006	$5,444,497
2007	$7,605,006
2008	$15,270,358
2009	$13,432,750
2010	$12,289,510
2011	$9,760,583
2012	$5,596,288
2013	$10,172,246
2014	$9,651,678
2015	$8,653,192
2016	$10,151,135
2017	$10,374,625
TOTAL	**$158,039,727**

Illinois Mine Subsidence Insurance Fund

Number of Confirmed Mine Subsidence Claims 1999 - 2017

1999	73
2000	77
2001	71
2002	70
2003	62
2004	44
2005	35
2006	64
2007	117
2008	88
2009	106
2010	98
2011	52
2012	65
2013	47
2014	57
2015	94
2016	54
2017	56
TOTAL	**1330**

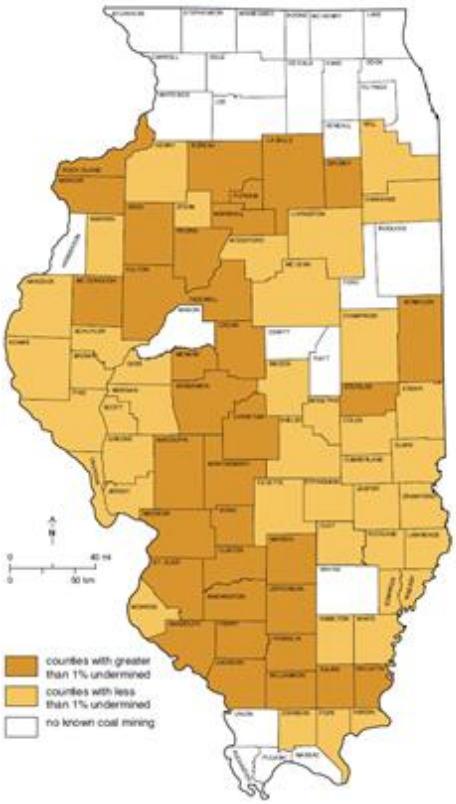


Figure 1

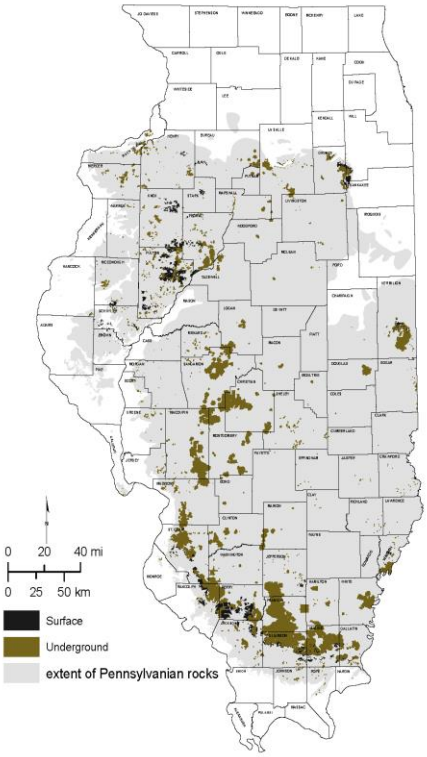


Figure 2

Source: Mine Subsidence in IL: Facts for Homeowners 2013 second Edition (Robert A Bauer)

Influenza Pandemic

According to the Centers for Disease Control and Prevention (CDC), an influenza pandemic is caused by a new influenza virus that is very different from current and recently circulating seasonal influenza viruses, and is able to infect people easily and spread from person to person in an efficient and sustained way. Most people will have little or no immunity because they have no previous exposure to the virus. While typically not addressed as natural hazard, an influenza pandemic has the potential to cause major impact on the general public. The rate of medical visits, complications, hospitalizations and death can range from moderate to high.

IDPH has developed the Illinois Pandemic Influenza Preparedness and Response Plan in an effort to address the potential for a pandemic influenza outbreak in Illinois. It is a dynamic document that will be updated to reflect new developments in the understanding of the influenza virus, including virus transmission, treatment and prevention. The purpose of the Plan is to provide a framework for federal, state, local, private sector and nongovernmental entities to work together to reduce morbidity, mortality, and social disruption that would result from a pandemic influenza outbreak. The Plan provides guidance on activities to aid in prevention and mitigation, such as vaccination and education on infection control measures.

Landslides in Illinois

Illinois does not have a state-wide reporting system for landslides. The Illinois State Geological Survey (ISGS) received some reports from individuals in the Illinois Department of Transportation (IDOT), Illinois Division of Highways (Bureau of Materials 1954), Natural Resource Conservation Service, Universities and ISGS staff. An inventory based on this type of submitted information was published in 1985 (Killey et al., 1985). The ISGS has also performed a few systematic landslide inventories along rivers; part of the Illinois River by LaSalle/Peru (DuMontelle et al., 1971), and part of the Ohio and Mississippi Rivers in southern Illinois by aerial studies (Su and Stohr, 1992).

The ISGS maintains a database which is being updated using the original forms, archived site reports performed by ISGS staff, ISGS picture and slide collection and new events added through review of imagery and field observations. To date, there are about 390 individual landslides reported in 49 counties with some details and 221 additional landslides located by aerial studies (Su and Stohr, 1992). Nearly 60 percent are classified as related to human activity, most associated with cutting into slopes for roadways. In Illinois, there have been two known deaths associated with landslides in 1928 and 1995.

Only about 9% of the case histories have some financial information such as cost reported for repair, for injuries and compensation for loss or disruption. These typically aren't total costs combined for an event. The total in 2016 dollars for these cases is $29.4 million with a minimum of $9,900 to a maximum of $5.9 million.

References:

Bureau of Materials, Illinois Division of Highways, Department of Public Works and Buildings, 1954, Landslide data prepared for Landslide Committee of the Highway Research Board.

DuMontelle, P.B., N.C. Hester and R.E. Cole, 1971, Landslides Along the Illinois River Valley South and West of LaSalle and Peru, Illinois, Illinois State Geological Survey Environmental Geology Notes No. 48, 16 pp.

Killey, M.M., J.K. Hines and P.B. DuMontelle, 1985, Landslide Inventory of Illinois, Illinois State Geological Survey Circular 534, 28 pp.

Su, W.J. and C.J. Stohr, 1992, Landslides in the New Madrid Seismic Zone: Landslide Inventory and Risk Assessment in Illinois, Along the Ohio and the Mississippi Rivers from Olmsted to Chester, Illinois: Final Technical Report to the U.S. Geological Survey, 147 pp.

Other Hazards

The following hazards have been previously discussed by the INHMP planning team as other possible hazards impacting Illinois. These hazards currently do not have the frequency of occurrences or impact that would constitute an in-depth analysis and coverage in the INHMP. However, these hazards will continue to be monitored by the INHMP planning team to ensure that if their occurrences and impact increases to a level that warrants further analysis, they will be analyzed in further detail in the INHMP.

- Expansive soils are generally clay soil. As clay soil absorbs water it will expand or increase in volume and as the water leaves the soil it will shrink or lessen in volume. This may result in damage to foundations after decades of wetting and drying.

- Karst often manifests itself with sinkholes in areas with carbonate bedrock (limestone and dolomite with low clay content). Karst areas also contain underground streams and caverns. The appearance of sinkholes depends on how fast the carbonate landscape erodes. According to the U.S. Geological Survey, "Karst is a terrain with distinctive landforms and hydrology created from the dissolution of soluble rocks, principally limestone and dolomite. Karst terrain is characterized by springs, caves, sinkholes, and a unique hydrogeology that results in aquifers that are highly productive but extremely vulnerable to contamination. In the United States, about 40% of the groundwater used for drinking comes from karst aquifers." Illinois is located in Midwest Paleozoic Carbonate Aquifer Region, which includes the majority of the Midwest including: Iowa, Illinois, Indiana, Ohio, Wisconsin, Michigan and Tennessee. Information on Karst in Illinois can be found in these publications: Panno, S.V., Weibel, C.P. and Li, W.B., 1997. Karst regions of Illinois. Illinois State Geological Survey Open File Series 1997-2, and Weibel, C.P. and Panno, S.V., 1997. Karst terrains and carbonate bedrock of Illinois. Illinois State Geological Survey, Illinois Map Series 8, 1:500,000 Scale.

- Wildfire is a fire occurring in relatively untouched wild land areas or in wilderness areas. The Shawnee National Forest located in southern Illinois primarily is primarily the main location in Illinois

that could be impacted by a wildfire. Shawnee National Forest consists of approximately 280,000 acres of federally managed lands. The majority of the forest is located in parts of Pope, Jackson, Union, Hardin, Alexander, Saline, Gallatin, Johnson, and Massac counties.

- Lake Michigan Storm Surge is an abnormal rise and onshore surge of lake water due to intense winds within a storm, or the surface barometric pressure drop near the storm center. The effects of a strong storm surge will be high winds and waves, lakeshore flooding, beach erosion and damage to unprotected vessels and structures in the lake or near the lakeshore. Storm surge and seiche were discussed at length during a planning meeting. A NWS represnetative said that with storm surges, the biggest problem has been beach erosion. However, these are not very frequent occurrences, and it has been awhile (more than 10 years) since this has been a problem.

- Seiche. According to the NWS, about once per year, Chicago experiences a seiche.This occurs when a line of severe thunderstorms with strong winds moves from NW to SE across the southern part of Lake Michigan. Because of the shape of the lake, the results are high waves which cause the lake level to rise rapidly. He said that they get a minor seiche about once per year where the water levels rise about two to three feet along the piers on Lake Michigan. In 1954, a 10-foot seiche wave caused eight deaths in Chicago and lakeshore damage along the Illinois Lake Michigan shoreline (Ewing, et al., 1954).

  Lake County approved mitigation plan looked at coastal erosion for their county. Currently, it is estimated that 4% of the county/communities (Highland Park, Highwood, Lake Bluff, Lake Forest and North Chicago) in Lake County has the potential to be affected. Because the structures (roads, homes and associated structures) have been constructed with a significant setback from the area vulnerable to failure, no significant damage is expected from this natural hazard. By their five-year update, the County plans to evaluate the area and structures in more detail. IEMA will continue to monitor the information provided by professional staff, the Lake County plan update and information received from the other State potential coastal erosion area in Cook County.

L. Local Risk Assessment

1) **Worksheet #3a** is from the "State and Local Mitigation Planning how-to guide", FEMA 386Whenthis document is received from a local jurisdiction and after the local mitigation plan has received FEMA approval, it will be compiled in an Illinois Natural Hazard Mitigation Plan supporting documentation notebook.
2) **Potential Structure Losses for Floods** is a form which was prepared to capture local jurisdiction information. If flooding is a hazard, the information from this form will be entered in the Illinois Natural Hazard Mitigation Plan when the local jurisdiction receives FEMA approval. Refer to the next page for a copy of this form.
3) **Potential Structure Losses for Earthquakes**, is a form which was prepared to capture local jurisdiction information. If earthquakes are a hazard, the information from this form will be entered in the Illinois Natural Hazard Mitigation Plan when the local jurisdiction receives FEMA approval. Refer to the next page immediately after the potential structure losses for floods form.

This section will be expanded to capture local information on structures as local jurisdiction plans receive FEMA approval.

POTENTIAL STRUCTURE LOSSES FOR FLOODS

City County or Multi-Jurisdictional	County	Assessed Vulnerability	Estimated # of People	% of Structures in Floodplain	# Estimated Residential Losses	$ Estimated Residential Losses	# Estimated Commercial Losses	$ Estimated Commercial Losses	# Estimated Industrial Losses	$ Estimated Industrial Losses	# of Critical Facilities	Relative Losses

POTENTIAL STRUCTURE LOSSES FOR EARTHQUAKES

City County or Multi-Jurisdictional	County	Assessed Vulnerability	Estimated # of People	# Estimated Residential Losses	$ Estimated Residential Losses	# Estimated Commercial Losses	$ Estimated Commercial Losses	# Estimated Industrial Losses	$ Estimated Industrial Losses	# of Critical Facilities (CF)	$ Estimated Loss to Critical Facilities (CF)	Type of CF Structure	Relative Losses

M. State Owned or Operated State Facility Data Methodology

The 2004 INHMP established an initial list of State owned or operated facilities. This data was obtained from the Department of Central Management Services (CMS) in order to comply with the requirement, regarding State owned or operated facilities, established in Title 44 Code of Federal Regulations part 201.4(c)(2)(ii). At that time, the SHMO thought that additional information would be available from CMS, specifically latitude/longitude of state facilities to enhance this section. In 2004, CMS contracted with Illinois Property Asset Management (IPAM), to compile an all-encompassing list of state owned and operated facilities. At the time in 2004, IPAM supplied a preliminary list, in electronic format. The list provided by IPAM contained 7,345 buildings. Of the buildings on that list, approximately 300 are listed as "Demolished", leaving 7,095 buildings in the inventory. The inventory ranges from a privy at a state park to the State Capitol building and everything in between. This list was utilized to develop the loss estimates identified in the 2004 plan update. The process regarding the calculation of loss estimates is described later in this section.

IEMA contacted CMS regarding updated information for state owned or operated facilities for the 2018 plan. CMS provided the 'Annual Real Property Utilization Report' for 2017 for both 'Sites and Buildings'. Based on the report there are 6360 sites and 8466 buildings listed as state owned or operated.

These agencies include: Secretary of State, Department of Agriculture, Department of Veterans Affairs, Department of Military Affairs, Department of Human Services, State University System, Attorney General, Treasure's Office, Comptroller's Office, Department of Transportation, Department of Corrections, Toll Highway, Department of Natural Resources and Student Assistance Commission.

Neither the Illinois Emergency Management Agency nor the INHMPC have the statutory authority or the resources to develop or maintain such a detailed database; however they do concur that such a database would be a strong asset to all phases for emergency management. This type of all-encompassing dataset could create a shared resource for all levels of government. The property data managed through CMS, joined with the data collected and maintained from cooperating state agencies could create a basis for significant future analysis impacting functions such as:

- Preparedness
- Response
- Recovery
- Mitigation
- Economic Development
- Homeland Security and Public Safety
- Land Management
- Planning Efforts

In an attempt, to achieve the creation of an all-encompassing database, the IHHMPC unanimously created a mitigation action item addressing this issue. The 2013 INHMP has incorporated an action item that will coordinate with State Agencies to develop an all-encompassing database of state controlled buildings and facilities, which may include latitude/longitude, square footage and estimated facility cost. Preliminary steps, including funding exploration, have already begun in an effort to make this database available for future updates. When checked with CMS on the status of the database for 2018 plan, we were notified that it is still ongoing and couldn't complete due to budget issues.

The development and maintenance of this anticipated database is dependent on a number of uncontrollable variables including the voluntary participation by all State entities. Initial development would include state facilities with the greatest life safety and financial impact on the state; including facilities with a total cost over $8 million and those with occupancy of 150 or more.

- Meet with State Agencies and obtain buy-in for the development of database, by discussing potential benefits of a singular database. Initial steps have begun during the 2013 INHMP update; all agency representatives support the development of said database.
- Work with the IEMA Director's Office, to engage agency head level involvement with state agency entities to solicit participation in gathering facility information.
- Explore possible funding avenues for capturing the required information and compilation of data into a singular dataset.
- CMS will remain the main point of contact for State facility information. As defined in the Illinois Blue Book, published by the Illinois Secretary of State, "The mission of Central Management Services (CMS) is to free Illinois state agencies and governmental entities to focus their resources on their core missions." CMS is a member of the planning committee and has been working with the planning committee to provide the latest available information. This is a team effort: CMS has been sharing the facility data and IEMA and the planning committee members have been sharing mitigation ideas with CMS. This as an ongoing process.

- Expand CMS's current state facility database to include new categories for coordinates and building replacement cost, while maintaining and updating the existing dataset of all CMS managed facilities.
- Engage facility building managers to capture coordinates and square footage of CMS managed facilities.
- Explore CMS capturing building information supplied by non-CMS facilities managers, in a singular database. CMS has advised that agencies not under the Governor's Office, submit facility information annually for the "General Annual Real Property Report" which is supplied to the Illinois General Assembly. CMS currently does not vet, maintain, track nor update these submissions.
- Engage agencies with facilities currently not under CMS control, to capture building specific information including coordinates, square footage and replacement costs. Include these representatives from said agencies into the INHMPC planning process, to ensure a throughout understanding of the process. These agencies include: Secretary of State, Department of Agriculture, Department of Veterans Affairs, Department of Military Affairs, Department of Human Services, State University System, Attorney General, Treasure's Office, Comptroller's Office, Department of Transportation, Department of Corrections, Toll Highway, Department of Natural Resources and Student Assistance Commission.
- Explore the possibility of the development of a committee comprised of state agency GIS specialist to development and maintain agency specific base maps for individual agency controlled facilities. These layers could then be added into an all-encompassing state map, showing all state owned and operated facilities as agency specific layers.

The following narrative describes how the data for the State of Illinois owned or operated facilities was collected and the methodology used for analysis of the data, in the 2004 Illinois Natural Hazard Mitigation Plan and subsequently utilized in the 2013 and 2018 update. In order to comply with the requirement, regarding State owned or operated facilities, established in Title 44 Code of Federal Regulations part 201.4(c)(2)(ii), the Illinois Emergency Management Agency (IEMA) set about the process of collecting the data necessary to be included in the INHMP04.

On December 5, 2003, representatives of IEMA and the Federal Emergency Management Agency (FEMA) came together via a teleconference to establish the minimum allowable state owned critical or operated facilities data which must be included. Out of that meeting came a consensus on which facilities should be included in the INHMP04. The following list is those minimum critical facilities:

Illinois State Police (ISP) facilities
Illinois Department of Transportation (IDOT) facilities
State of Illinois owned hospitals
State of Illinois owned mental health and developmental disability facilities
Infrastructure map (showing highways, bridges and waterways)
Lifelines Map (showing power, gas/oil pipelines and communications)
Public recreation areas map

As mentioned above, the list provided by CMS contains 8466 buildings. The inventory ranges from a privy at a state park to the State Capitol building and everything in between. A total of 7,095 were evaluated for loss estimations in the 2004 plan. The 2018 update focused on 8466 critical/essential State owned/operated

facilities that were obtained from the Central Management Services database. The loss of any State facility will have an effect on the State's operations. However, it was determined that the loss or disruption of services from these identified 230 facilities would have the largest impact on the operation of State essential services as a whole. The following tables provides a list of state facilities by county and the replacement cost in the event of a disaster. Replacement cost on these 8,466 buildings is based on a conservative estimate of 10% increase in cost from 2013 to 2017.

State Facilities by County

County Name	Administrative	Correctional	Education	Emergency	Health	Recreation	Transportation	Total Buildings	Replacement Cost
Adams	56	0	0	0	0	11	6	73	$77,304,680
Alexander	0	22	0	0	0	10	8	40	$43,694,664
Bond	0	0	0	0	0	0	4	4	$1,883,050
Boone	0	0	1	0	0	0	2	3	$1,810,499
Brown	0	25	0	0	0	0	3	28	$40,462,603
Bureau	0	0	0	0	0	58	14	72	$17,645,619
Calhoun	0	0	0	0	0	0	0	0	$0
Carroll	0	0	0	0	0	55	4	59	$52,065,283
Cass	2	0	0	0	0	66	4	72	$9,541,980
Champaign	10	0	544	4	0	0	10	568	$937,642,199
Christian	0	30	0	0	0	0	3	33	$23,537,188
Clark	0	0	0	0	0	25	10	35	$3,565,823
Clay	0	0	0	0	0	0	5	5	$3,808,596
Clinton	0	48	0	0	18	73	5	144	$49,367,423
Coles	4	0	89	0	0	105	7	205	$32,742,124
Cook	124	0	166	3	95	29	67	484	$946,748,848
Crawford	0	27	0	0	0	8	5	40	$22,843,705
Cumberland	0	0	0	0	0	0	5	5	$2,164,061
Dekalb	1	0	81	0	0	28	5	115	$9,048,769
DeWitt	0	0	0	0	0	81	5	86	$20,902,142
Douglas	0	0	0	0	0	0	7	7	$2,471,110
DuPage	1	17	4	0	0	0	14	36	$19,687,660
Edgar	6	0	0	0	0	0	6	12	$17,361,382
Edwards	0	0	0	0	0	0	4	4	$957,942
Effingham	3	0	0	6	0	0	18	27	$19,639,768
Fayette	0	116	5	0	0	12	5	138	$56,742,743

County Name	Administrative	Correctional	Education	Emergency	Health	Recreation	Transportation	Total Buildings	Replacement Cost
Ford	0	0	0	0	0	0	4	4	$1,709,294
Franklin	1	0	1	0	0	50	12	64	$14,697,754
Fulton	0	29	1	0	0	43	4	77	$65,174,565
Gallatin	0	0	0	0	0	28	4	32	$9,337,356
Greene	0	4	0	0	0	0	5	9	$5,054,697
Grundy	0	0	0	0	0	29	10	39	$7,456,177
Hamilton	0	0	0	0	0	44	0	44	$2,310,944
Hancock	0	0	6	0	0	27	6	39	$2,942,184
Hardin	0	10	1	0	0	1	3	15	$3,074,973
Henderson	0	0	0	0	0	7	4	11	$2,702,995
Henry	4	11	0	1	0	30	25	71	$31,639,675
Iroquois	1	0	0	1	0	19	15	36	$9,851,329
Jackson	3	5	393	0	0	127	19	547	$149,892,856
Jasper	0	0	0	0	0	38	8	46	$3,334,926
Jefferson	3	24	1	0	0	35	7	70	$63,057,400
Jersey	0	9	0	0	0	210	7	226	$25,598,475
Jo Daviess	0	0	0	0	0	50	8	58	$6,783,268
Johnson	0	74	0	0	0	38	10	122	$86,423,674
Kane	5	54	11	3	24	0	11	108	$196,297,814
Kankakee	35	12	0	0	58	38	7	150	$175,269,868
Kendall	0	0	0	0	0	25	3	28	$4,849,516
Knox	3	29	0	0	0	7	8	47	$58,301,493
La Salle	58	71	0	2	0	126	18	275	$126,124,386
Lake	0	0	0	0	66	57	13	136	$41,111,494
Lawrence	1	27	0	0	0	25	7	60	$57,709,149
Lee	3	87	0	0	28	24	18	160	$126,646,356
Livingston	6	120	0	1	7	0	20	154	$146,138,919
Logan	27	83	1	0	0	12	5	128	$148,348,645

County Name	Administrative	Correctional	Education	Emergency	Health	Recreation	Transportation	Total Buildings	Replacement Cost
Macon	10	19	0	0	0	16	12	57	$48,845,517
Macoupin	0	0	0	0	0	20	4	24	$2,146,615
Madison	0	0	79	0	28	26	38	171	$126,695,742
Marion	1	0	0	0	0	38	8	47	$31,764,433
Marshall	0	0	0	0	0	22	4	26	$4,063,423
Mason	0	0	0	0	0	55	3	58	$13,826,843
Massac	0	0	0	0	0	32	7	39	$3,542,240
McDonough	3	0	100	5	0	8	3	119	$28,308,949
McHenry	3	0	0	0	0	80	8	91	$18,986,664
McLean	6	0	192	0	0	58	17	273	$72,524,613
Menard	0	0	0	0	0	90	2	92	$10,645,206
Mercer	0	0	0	0	0	0	5	5	$1,006,881
Monroe	0	0	0	0	0	0	10	10	$3,238,686
Montgomery	1	51	0	3	0	8	8	71	$41,942,421
Morgan	21	29	0	0	32	0	5	87	$143,163,500
Moultrie	1	0	1	0	0	5	4	11	$4,059,289
Ogle	0	0	17	0	0	93	12	122	$10,635,741
Peoria	12	0	2	0	0	42	15	71	$30,223,844
Perry	0	28	1	4	0	80	4	117	$91,820,336
Piatt	0	0	40	0	0	2	4	46	$15,260,488
Pike	0	7	7	4	0	4	7	29	$17,402,570
Pope	0	6	8	0	0	36	0	50	$0
Pulaski	0	0	0	4	0	0	0	4	$1,405,547
Putnam	0	0	0	0	0	0	0	0	$0
Randolph	8	107	0	0	28	105	5	253	$135,947,671
Richland	0	0	1	0	0	0	5	6	$1,266,144
Rock Island	4	29	2	1	0	13	18	67	$70,261,096
Saline	0	15	0	0	0	0	7	22	$23,530,835

County Name	Administrative	Correctional	Education	Emergency	Health	Recreation	Transportation	Total Buildings	Replacement Cost
Sangamon	103	0	80	28	10	219	52	492	$885,281,288
Schuyler	1	11	0	0	0	0	4	16	$28,620,771
Scott	0	0	0	0	0	0	4	4	$1,445,030
Shelby	0	0	0	0	0	68	4	72	$4,283,376
St. Clair	9	17	13	0	0	30	35	104	$63,522,546
Stark	0	0	0	0	0	9	7	16	$3,019,470
Stephenson	2	0	0	0	0	28	5	35	$6,542,704
Tazewell	1	0	0	0	0	6	18	25	$15,034,100
Union	2	0	0	0	44	15	12	73	$62,326,994
Vermilion	1	27	2	0	0	58	10	98	$45,747,663
Wabash	0	0	0	0	0	10	3	13	$798,632
Warren	1	0	1	0	0	0	4	6	$8,639,841
Washington	0	0	0	0	0	30	5	35	$2,273,993
Wayne	1	0	0	0	0	0	4	5	$593,849
White	0	0	1	6	0	0	5	12	$27,516,174
Whiteside	4	0	0	9	0	50	11	74	$17,447,528
Will	5	185	17	4	0	47	26	284	$302,482,779
Williamson	5	0	4	0	0	8	8	25	$23,977,834
Winnebago	18	0	7	4	0	8	7	44	$65,489,311
Woodford	0	0	0	5	0	2	7	14	$2,787,823
Total	**580**	**1465**	**1880**	**98**	**438**	**3072**	**933**	**8466**	**$6,505,827,042**

N. Vulnerability of State Facilities

State owned and operated facilities are important centers that link the government of the State of Illinois to the public it serves. These facilities can range from the Illinois State Capitol building in Springfield to one of the many Secretary of State's Driver Services Facilities throughout the state. These facilities are hubs for everything from administrative activities to public safety functions and every conceivable role in between. Should these facilities be rendered inoperable by a natural hazard, the public will lose a vital link between them and their government and the services the government provides. The following set of hazard maps for Illinois' 102 counties show the nature, extent, scope and magnitude of identified hazard areas, as well as the locations of state owned or occupied facilities. A more in-depth analysis of the State's critical and essential facilities was utilized in the HAZUS analysis for flooding. This analysis included 230 State operated facilities and over 14,250 local critical or essential facilities. Due to Illinois' effective use of mutual aid, a number of the State's critical facilities are not state owned or operated. However, these facilities are just as vital to the State's operation as a state owned facility. Due to this reasoning, these locally and privately owned essential facilities were incorporated into the flood HAZUS analysis. It is anticipate that these initial facilities will be the foundation of building an all-encompassing database with latitude/longitude and building cost to create a more accurate loss estimate in future updates. The facilities found in this analysis remained consistent with the types of facilities agreed upon between FEMA and IEMA in the 2013 plan.

All state owned/operated facilities are potentially vulnerable to damage and impacts caused by the hazards found below. These hazards have the potential to affect facilities statewide. Although, the effect of these hazards on the facilities may not be location specific, their location does have an impact on the frequency that these facilities may be exposed to these hazards.

Severe Storms and Tornadoes: Storms and tornadoes can damage or destroy state facilities in a jurisdiction, thus cutting off vital state government services to the citizens in that area. State facilities would have comparable vulnerability to severe storms and tornadoes as all facilities located within a said county. As indicated in the Hazard Worksheet Methodology, "At any one time, it has been determined that over 25% of the county population might experience severe storms.

Floods: Floods can inundate the facility rendering it inoperable. A Hazus-MH UDF flood-loss analysis was performed on State owned essential and critical facilities identified within the 100-year floodplain. This analysis included 230 State operated facilities and over 14,250 local critical or essential facilities. Due to Illinois' effective use of mutual aid, a number of the State's critical facilities are not state owned or operated. However, these facilities are just as vital to the State's operation as a state owned facility. Due to this reasoning, these locally and privately owned essential facilities were incorporated into the flood HAZUS analysis. Using IEMA's statewide essential and critical facility database, five state-owned essential or critical facilities were identified within FEMA-mapped 100-year floodplains. A Hazus-MH user defined flood loss analysis was performed on each of these facilities to assess the flood exposure and potential flood losses if each of these facilities were to experience a 100-year flood. According to Hazus-MH, the estimated flood exposure for these five

facilities (total estimated replacement value of structure and content) is $44.75 million. The total estimated flood loss if these structures were inundated to the 100-year flood level is $24.26 million. The exposure and losses estimates for each of these five facilities in listed below.

In addition, the Hazus-MH study showed four hundred non-state owned essential or critical facilities that were identified on 100-year floodplains. Of these 400 facilities, eight were medical care facilities (hospitals, nursing homes and clinics), 48 were fire stations, 26 were police stations, 95 were schools, 25 were communication facilities, 10 were power facilities, three were natural gas facilities, six were oil facilities, 33 were potable water treatment facilities and 146 were waste water facilities. These 400 essential or critical facilities were located in 78 of the 102 Illinois counties. The top five counties with the greatest number of at risk essential or critical facilities were Madison (31 facilities), Cook (30), La Salle (18), Will (17), and Jackson (15).

A UDF flood-loss analysis is a structure-by-structure analysis in which flood losses are calculated for specific building or buildings using depth-damage functions within Hazus-MH. UDF analysis requires certain building parameters which were not available from the IEMA essential and critical facility database. This missing data was replaced with default values, based on occupancy type, from FEMA's Hazus-MH Flood Model Technical Manual (FEMA, 2012). The missing parameters included square footage, building material, foundation type, and number of stories (see Table 2 for values used). As with the county-level-flood-loss modeling, a flood-depth grid was constructed using Hazus-MH's EQL tool employing either a DFIRM or digitized FIRM map for the floodplain boundary and a 1/3-arc-second DEM (10 m) for floodplain topography.

The following list of building parameters were used in the UDF flood-loss analysis for State-owned essential and critical facilities.

Facility Type	Occupancy Class	Average Square Footage (ft^2)	Estimated Replacement Cost ($Millions)	Building Material	Foundation Type	Number of Stories
Armory	IND2	30,000	$2.27	Masonry	Concrete Slab	1
Correctional Center	RES3F	60,000	$7.92	Masonry	Concrete Slab	1
Government Building	GOV1	11,000	$1.18	Wood	Concrete Slab	1
Regional Headquarters	COM4	80,000	$10.67	Masonry	Concrete Slab	1
Barracks	GOV2	11,000	$1.83	Masonry	Concrete Slab	1

Using IEMA's statewide essential and critical facility database, five state-owned essential or critical facilities were identified within FEMA-mapped 100-year floodplains. A Hazus-MH user defined flood loss analysis was performed on each of these facilities to assess the flood exposure and potential flood losses if each of these facilities were to experience a 100-year flood. The estimated flood exposure for these five facilities (total estimated replacement value of structure and content) is $44.75 million. The total estimated flood loss if these structures were inundated to the 100-year flood level is $24.26 million. The exposure and losses estimates for each of these five facilities are as follows:

County	Facility Name	Replacement Cost ($1000s)	Estimated Content ($1000s)	Full Replacement Cost ($1000)	Total Losses ($1000)
Madison	District Headquarters	$ 10,674	$ 10,674	$ 21,349	$ 9,814
Madison	District Headquarters	$ 1,832	$ 2,749	$ 4,581	$ 2,984
Madison	Office Building	$ 1,832	$ 2,749	$ 4,581	$ 2,201
Saline	Office Building	$ 1,180	$ 1,180	$ 2,360	$ 2,223
Jersey	Correction Center	$ 7,916	$ 3,958	$ 11,874	$ 7,045
	Total			**$ 44,745**	**$ 24,268**

Flood exposures and estimated flood losses for Illinois state-owned essential and critical facilities within the 100-year floodplain. Source: "Illinois Statewide Flood Hazard Assessment" 2013 conducted by: Natural Hazard Research and Mitigation Group (NHRMC) at Southern Illinois University, Carbondale

Severe Winter Storms: Severe winter storms can cut off access to facilities by blocking roads. This not only prevents the public from traveling to the facility to access the services provided there, it can also degrade the emergency response capabilities emanating from that facility. Similar to severe storms and tornados, state facilities would have comparable vulnerability to severe winter storms as other structures within said counties. The INHMP Hazard Methodology indicates that 100% of the population is at risk from a severe winter storm. This was evident on February 1st, 2011 when over 39,000 state workers were ordered not to come into work due to the severe winter weather.

Drought: The effects on state facilities from this hazard are minimal.

Extreme Heat: The effects on state facilities from this hazard are minimal.

Earthquake: Earthquakes as mentioned above can destroy buildings, cut power and block access to the facility, rendering it inoperable to the detriment of the community.

Two Executive Branch documents have had an important impact on improving the natural hazard vulnerability of state facilities from floods and earthquakes. This first document was identified in the development of the 2004 INHMP as an action item. The 1979 version needed to be updated which was accomplished and signed by the Governor on March 7, 2006:

Executive Order Number 5 (2006) - Construction Activities in Special Flood Hazard Areas
All State Agencies engaged in any development within a Special Flood Hazard Area shall undertake such development in accordance with the following:

All development shall comply with all requirements of the National Flood Insurance Program (44 C.F.R. 59-79) and with all requirements of 92 Illinois Administrative Code Part 700 or 92 Illinois Administrative Code Part 708, whichever is applicable.

A. In additional to the requirements set forth in preceding Section A, the following additional requirements shall apply where applicable:

1. All new critical facilities shall be located outside of the floodplain. Where this is not practicable, critical facilities shall be developed with the lowest floor elevation equal to or greater than the 500-year frequency flood elevation or structurally dry floodproofed to at least the 500-year frequency flood elevation.

2. All new buildings shall be developed with the lowest floor elevation equal to or greater than the Flood Protection Elevation or structurally dry floodproofed to at least the Flood Protection Elevation.

3. Modifications, additions, repairs or replacement of existing structures may be allowed so long as the new development does not increase the floor area of the existing structure by more than twenty (20) percent or increase the market value of

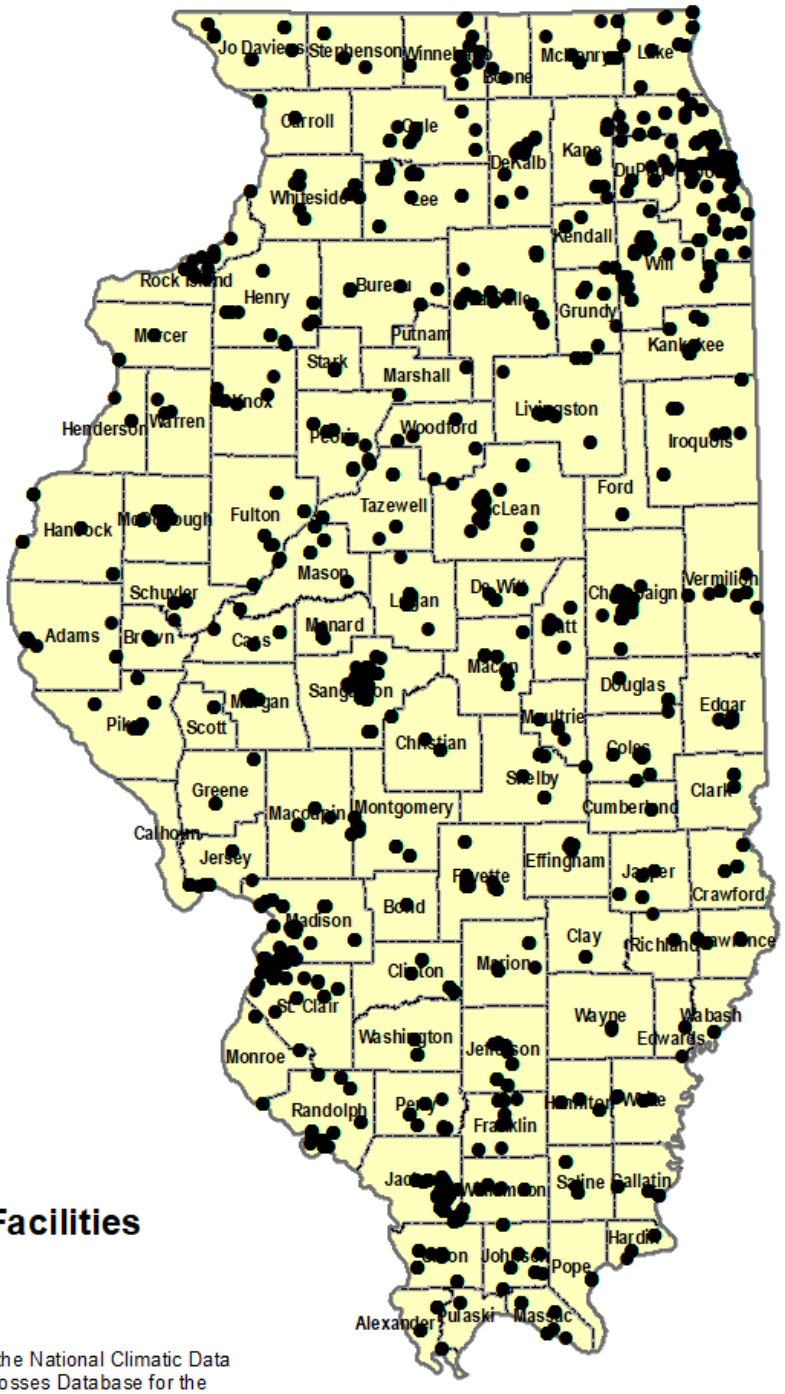
   the structure by fifty (50) percent, and does not obstruct flood flows. Floodproofing activities are permitted and encouraged, but must comply with the requirements noted above.

Executive Order Number 2 (1990) - Executive Order for the Reduction of Earthquake Hazards
Each State Agency responsible for the design and construction of each new state building shall ensure that the building is designed and constructed in accord with appropriate seismic design and construction standards.

State Facilities Attachments:

1) Base Map
2) Severe Storm Map
3) Tornado Map
4) Flood Map
5) Severe Winter Storm Map
6) Drought Map
7) Extreme Heat Map

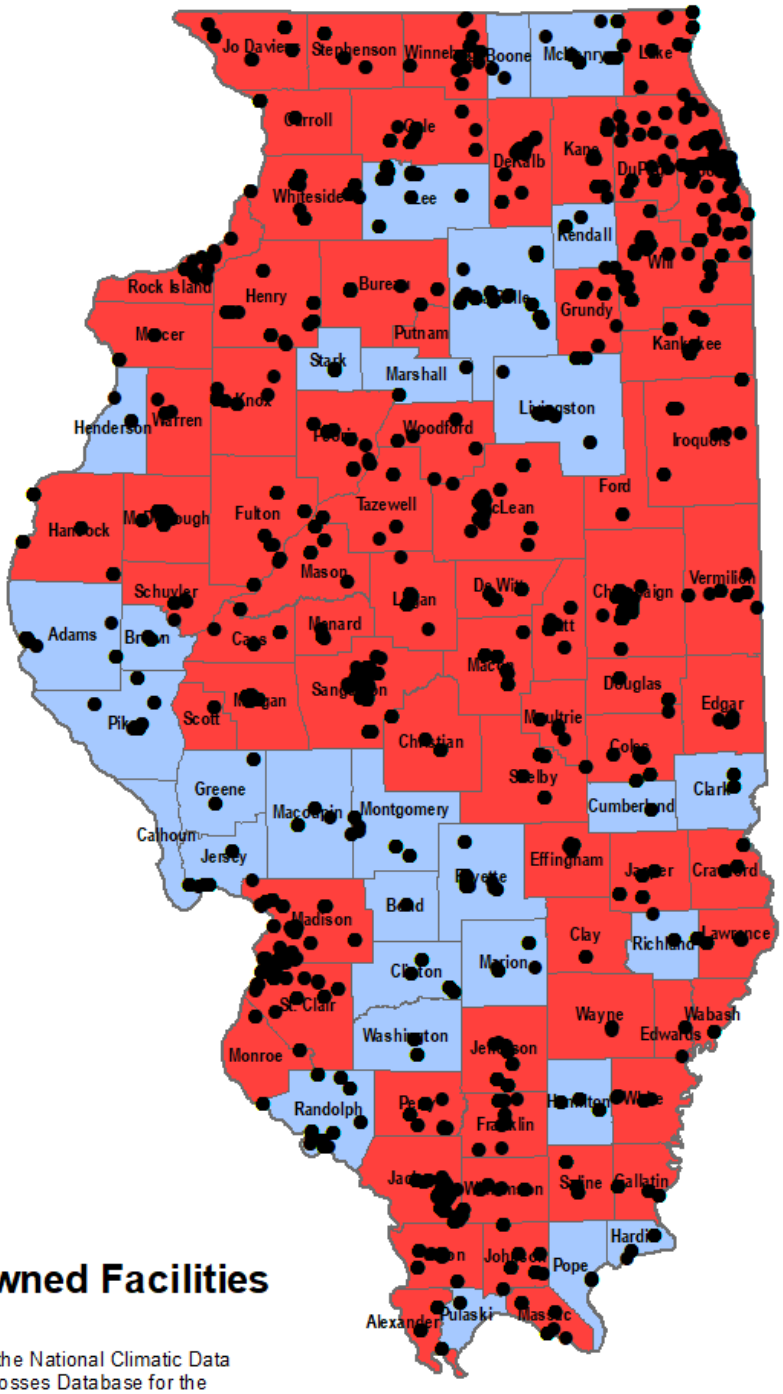
IEMA Illinois Natural Hazard Mitigation Plan
State Owned Facilities by County



● **State Owned Facilities**

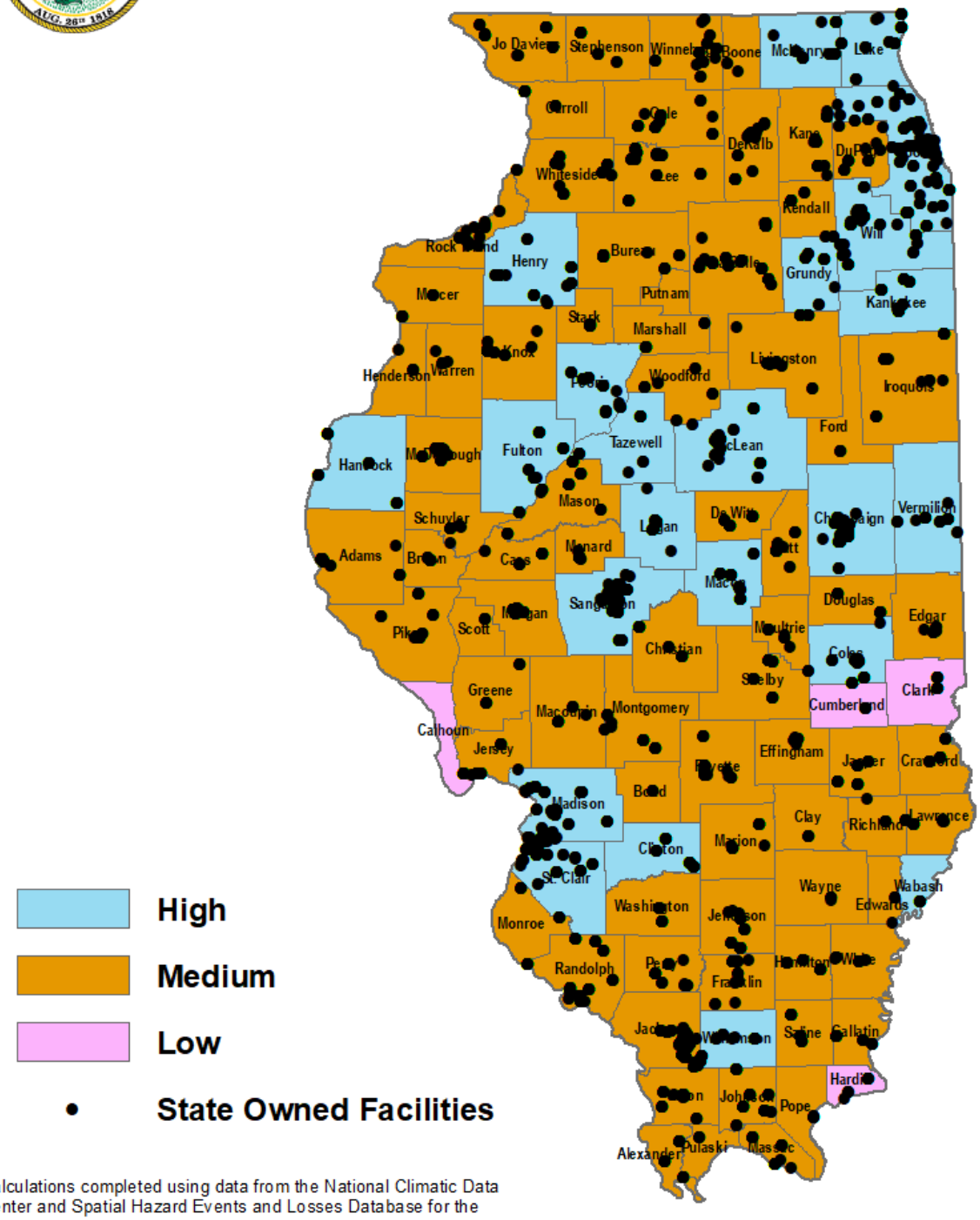
Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

IEMA Illinois Natural Hazard Mitigation Plan
Severe Storms Hazard Rating by County



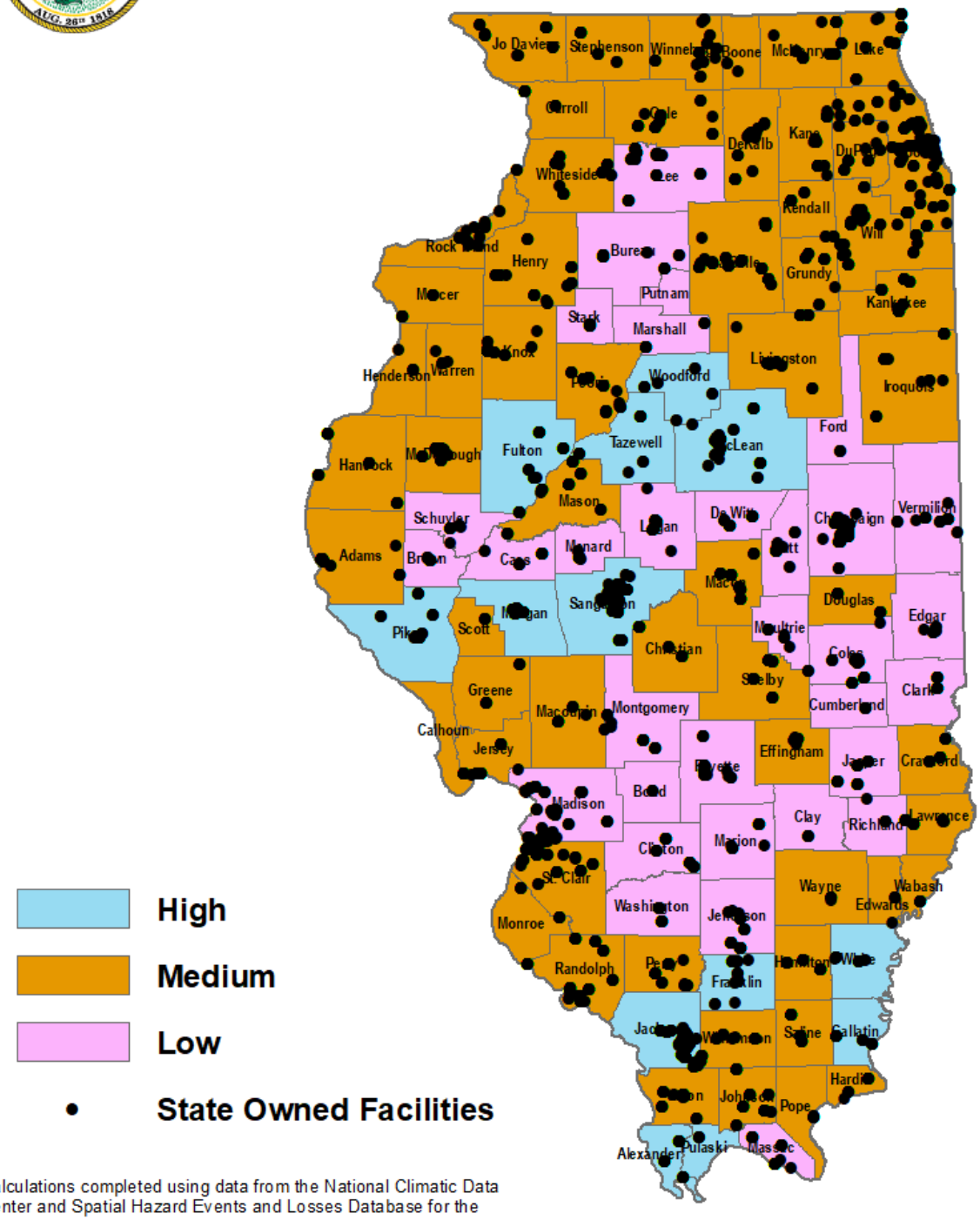
Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

IEMA Illinois Natural Hazard Mitigation Plan
Tornado Hazard Rating by County



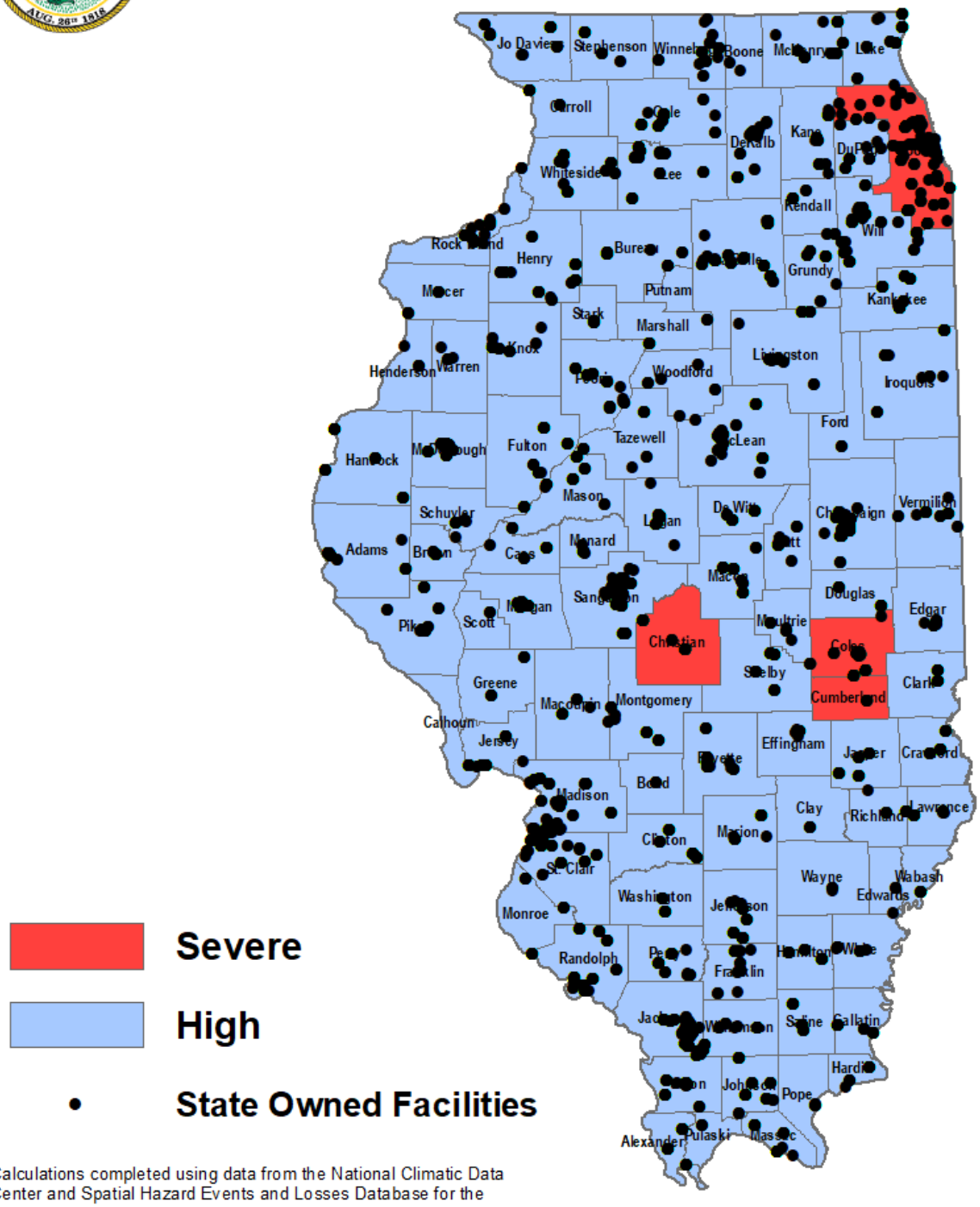
Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

IEMA Illinois Natural Hazard Mitigation Plan
Flood Hazard Rating by County



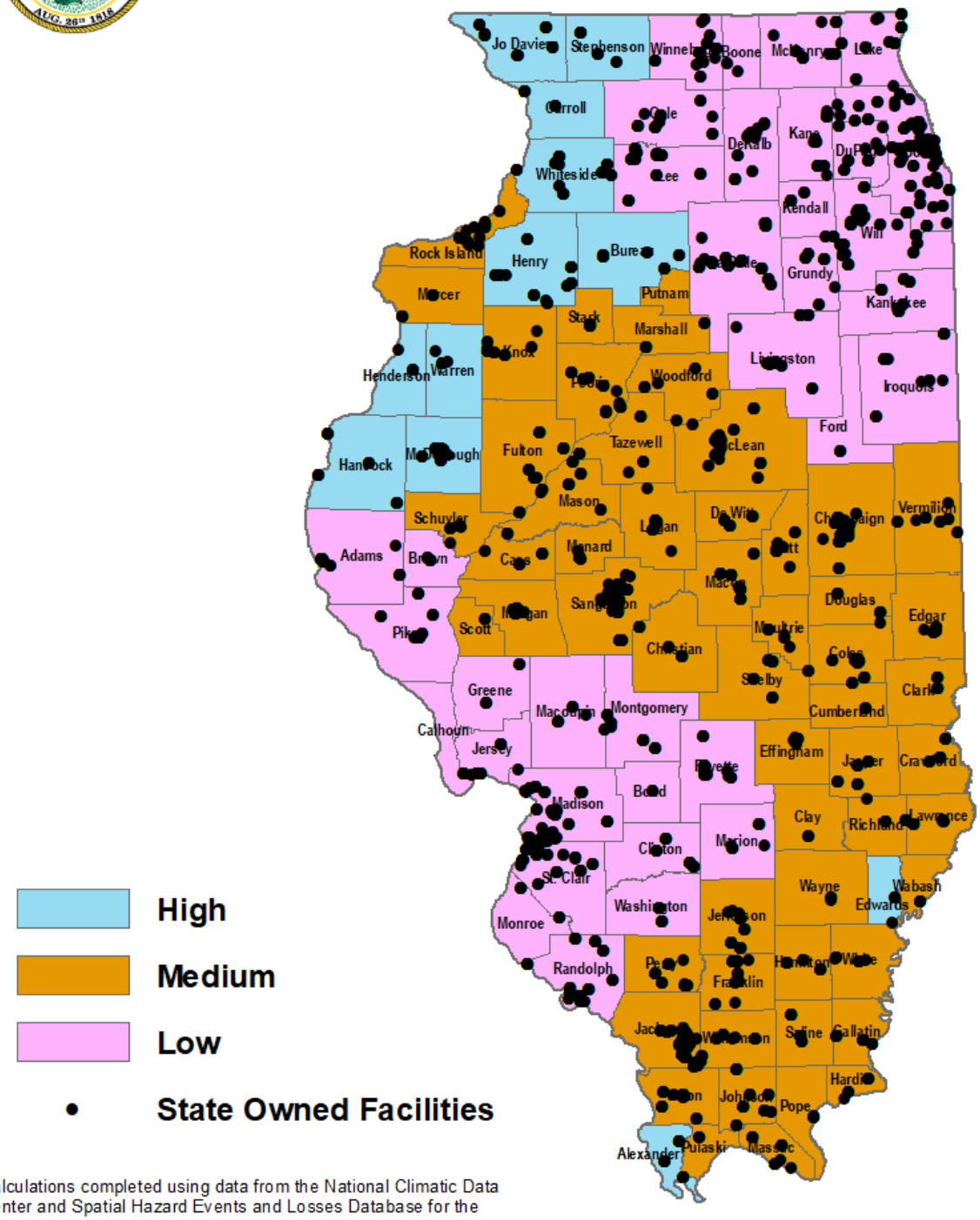
Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

IEMA Illinois Natural Hazard Mitigation Plan
Severe Winter Storms Hazard Rating by County



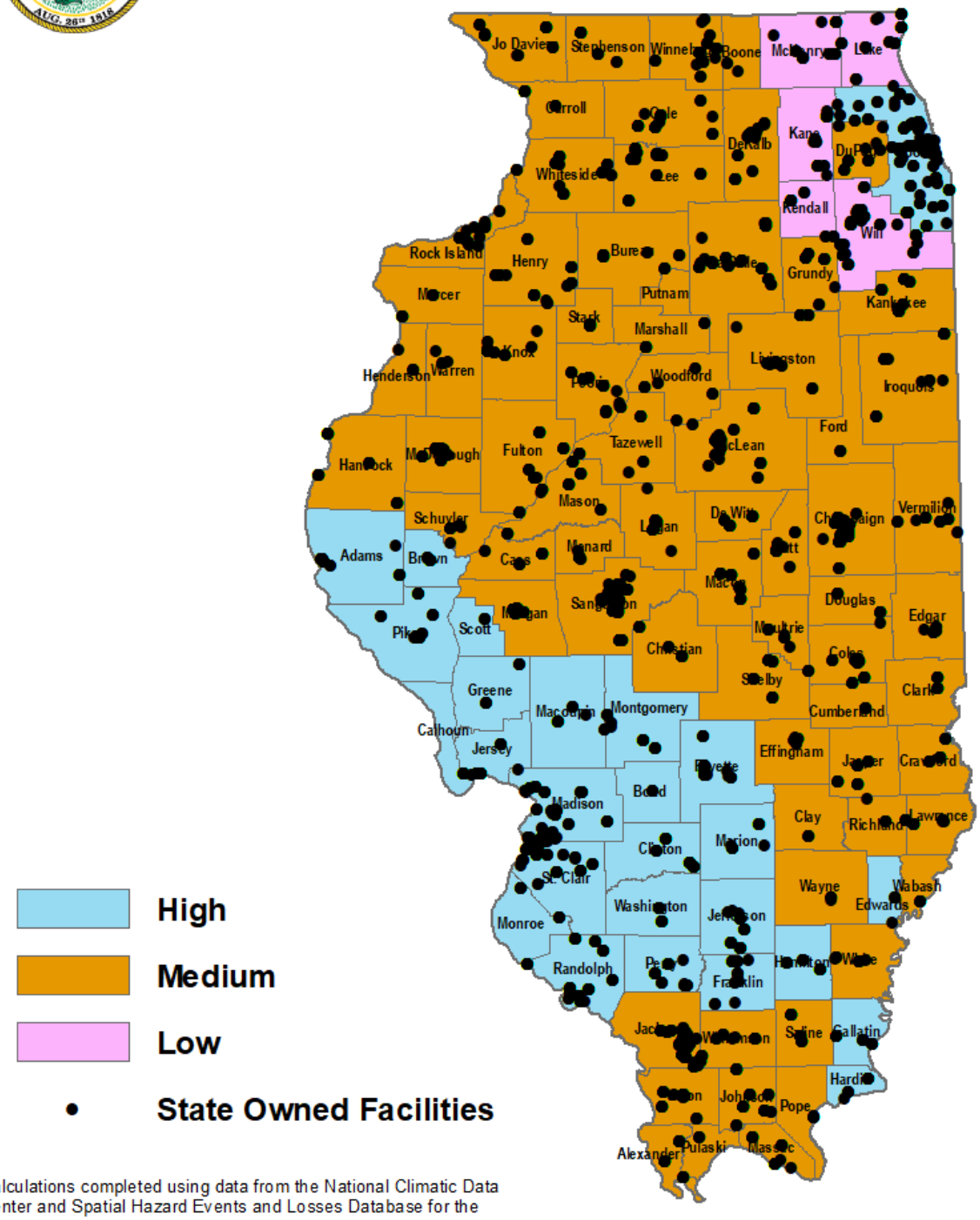
Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

IEMA Illinois Natural Hazard Mitigation Plan
Drought Hazard Rating by County



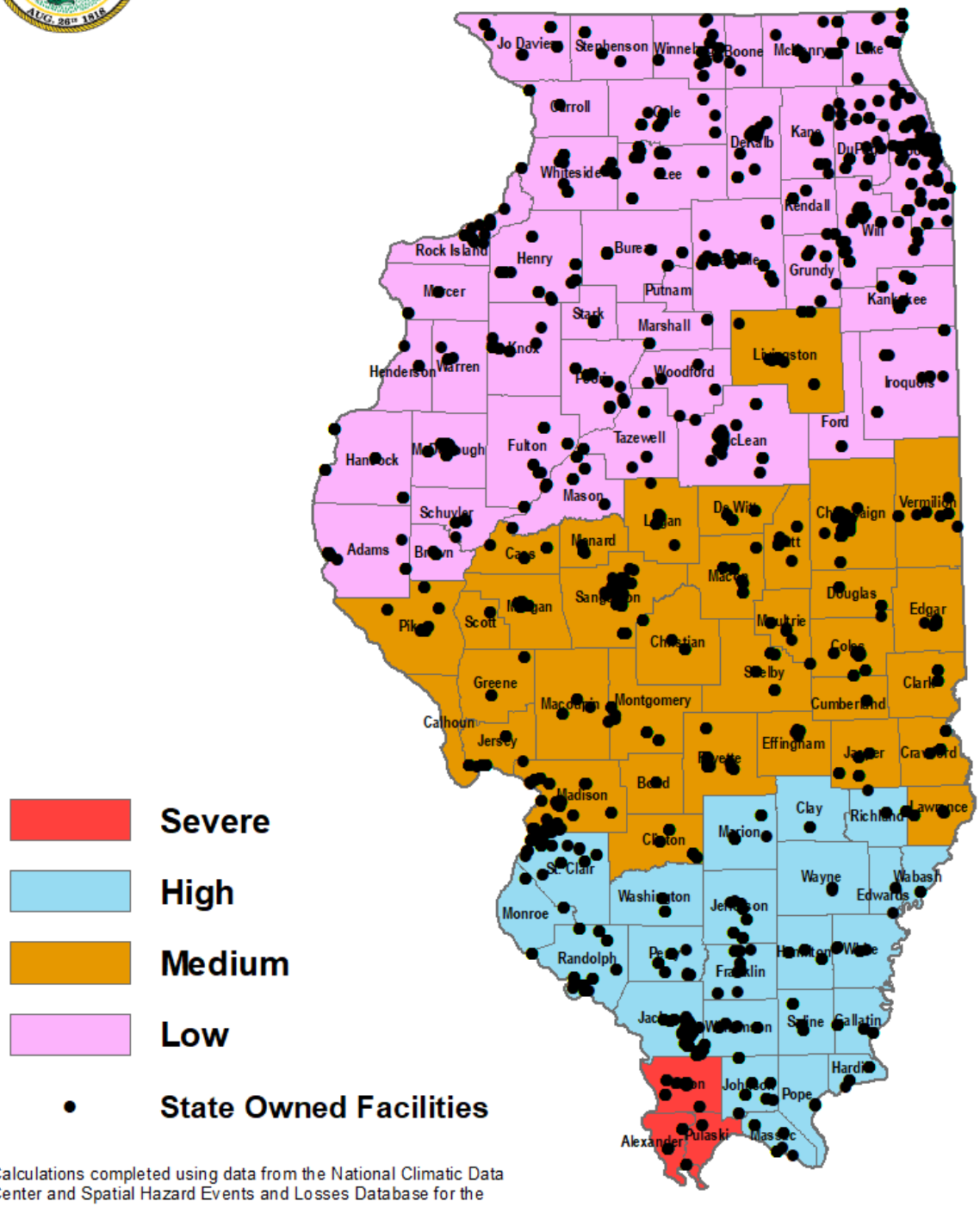
Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

IEMA Illinois Natural Hazard Mitigation Plan
Extreme Heat Hazard Rating by County



Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

IEMA Illinois Natural Hazard Mitigation Plan
Earthquake Hazard Rating by County



Calculations completed using data from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States. Data was obtained on a National Weather Service Zone by county basis*

O. Critical Infrastructure

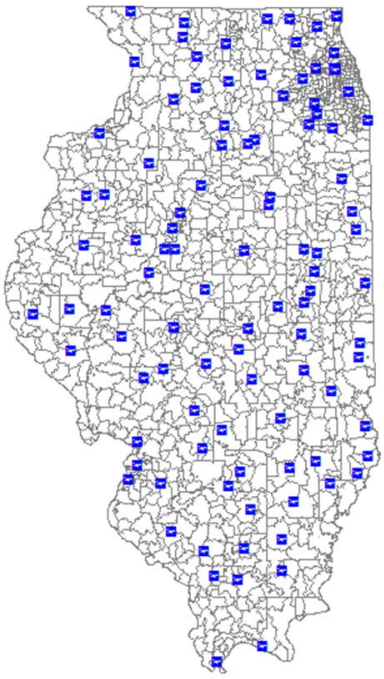
This section discusses the critical infrastructure of the State of Illinois and the threat posed to it by the six previously defined natural hazards (Severe Storms and Tornadoes, Floods, Severe Winter Storms, Drought, Extreme Heat, and Earthquake). The Illinois Natural Hazard Mitigation Planning Committee (INHMPC), in compliance with the guidance provided by the Federal Emergency Management Agency (FEMA), has defined eight components that make the state's critical infrastructure. The components are: Airports, State Parks and Recreation Areas, the State's Communications Infrastructure, Major Highway Bridges Over Waterways, Major Natural Gas Transmission Lines, Interstate, U.S. and State Highways, Major Electrical Transmission Lines Generating and Relay Stations, Ports and Landings along Waterways. The following paragraphs will describe each component of the State's Critical Infrastructure and the function it serves. We will also catalog the threat posed to each component by each of the six natural hazards. Maps are also available upon request from the IEMA mitigation staff for specific critical infrastructure and the hazards that they face. Because the Illinois Natural Hazard Mitigation Plan is a publically-accessible document, specific critical infrastructure information regarding exact location has been omitted from both the public distribution version and the federal review to ensure security integrity. Specific data and material is maintained by IEMA and is available for inspection by appropriate and approved emergency management officials only. Illinois has passed specific legislation protecting certain types of homeland security information from release under the Freedom of Information Act.

Airports

Air transportation plays a vital role in the economy of the State of Illinois and the United States of America as a whole. Aeronautical industry experts surmise that as we move through the twenty-first century the role of air travel will only increase. According to statistics from the United States Department of Transportation, Division of Federal Aviation Administration, some 49,891,027 people flew into or out of Illinois airports in 2016. (Source:https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/). The safety of passengers is the number one priority of the aeronautics industry and the Federal Aviation Administration. This has led to numerous rules to protect passengers and minimize the impact of hazards on airport facilities. Weather delays are primarily caused by low visibility, but other natural hazards can create delays.

> **Severe Storms and Tornadoes**: Severe storms and tornadoes reduce visibility and create dangerous air currents called "wind shear" that can pose a major hazard to navigation. The effects can cause flights to be delayed creating an inconvenience to passengers. Once the weather has passed the airlines focus on getting the flight schedule back to normal. Airports work closely with the NWS to ensure flights do not encounter dangerous conditions.

Floods: All of the publicly owned airports in Illinois are elevated above the base flood elevation with the exception of the Palwaukee Airport, the third busiest in the state, which was recently elevated to a 50-year level of protection. Flash flooding of runways is possible if more rain is deposited on an airport's tarmac than can be handled by the airport drainage system. This is a rare event and results in short term delays.



Severe Winter Storms: Severe winter storms can decrease visibility and block runways, closing the airport to navigation. According to the Illinois Department of Transportation, Division of Aeronautics, this creates some delays but it is rare for an airport to be completely closed. The reason is that the airports most threatened by severe winter storms have taken steps to be prepared for these events with snow removal equipment and design considerations.

Drought: According to the Illinois Department of Transportation, Division of Aeronautics, this has no negative impact on aeronautics.

Extreme Heat: In the rare event of extreme heat causing runways of the airport to buckle and crack, it is quickly repaired by the airport maintenance staff.

Earthquake: Earthquakes can buckle runways and cut power, rendering the airport unsafe for use.

State Parks and Recreation Areas

State Parks and Recreation Areas are important social resources for the State of Illinois. Tourism dollars generated by State Parks and Recreation Areas are also an important source of revenue for the State of Illinois and local units of government. Every year thousands of visitors flock to the parks and recreation areas spending their money at the parks themselves and in the communities that surround the parks. Many of the defined natural hazards have posed a threat to these parks and recreation areas. Should these resources be forced to close it could have an extremely detrimental effect on the local community and the State as a whole.

Severe Storms and Tornadoes: Storms and tornadoes can fell trees, cut power, and deposit debris in the park area, rendering the park unsafe and thus forcing it to close.

Floods: Floods can inundate the park area and force the park to close, costing the State and the local community large amounts of revenue.

Severe Winter Storms: Severe winter storms can block the roads that provide access to the park, closing the park to visitors.

Drought: A severe, prolonged drought's effect on a park can be extremely subtle but no less severe than the other listed natural hazards. In many State Parks visitors flock to see the scenic natural wonders that the park provides. If a drought degrades the vegetation and the landscape to a great enough extent, tourists will spend their holiday dollars at other parks, possibly in other states.

Extreme Heat: During extreme heat events, holidaymakers are less likely to spend time in parks and recreation area (especially those that do not provide water recreation opportunities) thus costing the State and the local community revenue.

Earthquake: Earthquakes can fell trees and buildings and destroy access roads, making the park not a viable recreation option for tourist.

State Communications Infrastructure

The State of Illinois maintains a complex communications system which includes: land-based telecommunications capability, wireless telephone communications, a satellite telephone communications system and low and high frequency radio and paging systems. In order to mitigate against damage to any segment of the state of Illinois communications system, the State has developed a series of redundant emergency backup systems. Should any of the state facilities, which provide a critical communications capability in any region of the state, be rendered inoperable by a natural hazard, emergency backup systems can fill in the communications gap. Detailed plans for when and how the emergency communications backup systems should be employed can be found in the "Communications Annex (ESF2)" of the State of Illinois Emergency Operations Plan.

Severe Storms and Tornadoes: Lightning from severe storms can disrupt radio and telephone communications. High winds from severe storms can fell telecommunications lines and radio towers.

Floods: Floods can inundate communications centers, telecommunications lines and radio towers rendering them inoperable.

Severe Winter Storms: Severe winter storms can also sever land-based telecommunications lines when the lines are covered with more snow and ice than the line can support.

Drought: The effects on the State communications infrastructure from this hazard are minimal.

Extreme Heat: Extreme heat can cause power outages that may have a detrimental effect on the communications infrastructure.

Earthquake: Earthquakes can bring down radio towers, telephone lines and/or the communications centers themselves.

Major Highway Bridges over Waterways

Major highway bridges over waterways are a transportation link vital to interstate commerce. If a bridge should be rendered inoperable by a natural hazard, whole regions of the state may be cut off from the rest of the state and have significant large scale economic consequences. During the Great Flood of 1993, all of the bridges on the Mississippi River from the Interstate 270 bridge at St. Louis to Interstate 74 at Rock Island were inoperable because of flooded approaches. The Illinois River was impassable south of Interstate 36.

Severe Storms and Tornadoes: Storms and tornadoes can deposit debris on the bridge deck and approaches, closing the bridge to traffic.

Flood: Floods can inundate the approaches to the bridge causing the bridge to be closed to traffic.

Severe Winter Storms: Severe winter storms can also block traffic with large amounts of snow.

Drought: The effects on major highway bridges from this hazard are minimal.

Extreme Heat: The effects on major highway bridges from this hazard are minimal.

Earthquake: Earthquakes can destroy bridges and their approaches.

Major Natrual Gas Transmission Lines

Major natural gas transmission lines perform a vital role for the State of Illinois and the United States of America as a whole. They deliver needed fuel to heat homes during harsh northern winters. They also help deliver fuel to natural gas-fired power plants. Should these lines be damaged or destroyed, especially in the winter, the gravest of consequences could result. According to the U.S. Energy Information Administration, twenty-six interstate and at least eight intrastate natural gas pipeline companies operate within the Midwest Region (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin). The principal sources of natural gas supply for the region are production areas in the Southwest, although Canadian natural gas pipelines now account for about one-fourth of natural gas pipeline capacity entering the region. Regional natural gas

production, principally from Ohio and Michigan, accounts for little more than eight percent of the gas consumed in the region.
http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/midwest.html

Severe Storms and Tornadoes: Where natural gas lines are exposed above ground they are vulnerable to the high winds of severe storms and tornadoes.

Floods: The effects on major natural gas transmission lines from this hazard are minimal.

Severe Winter Storms: The effects on major natural gas transmission lines from this hazard are minimal.

Drought: The effects on major natural gas transmission lines from this hazard are minimal.

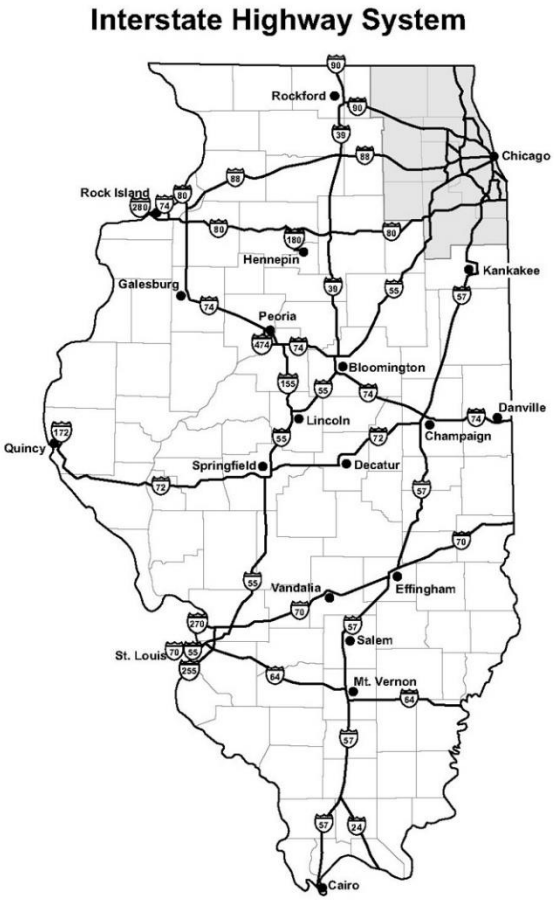
Extreme Heat: The effects on major natural gas transmission lines from this hazard are minimal.

Earthquake: Earthquakes can rupture natural gas transmission lines, resulting in a loss of service and a potential fire hazard.

Diagram of major pipelines in Illinois
Supplied by U.S. Energy Information

Interstate, U.S. and State Highways

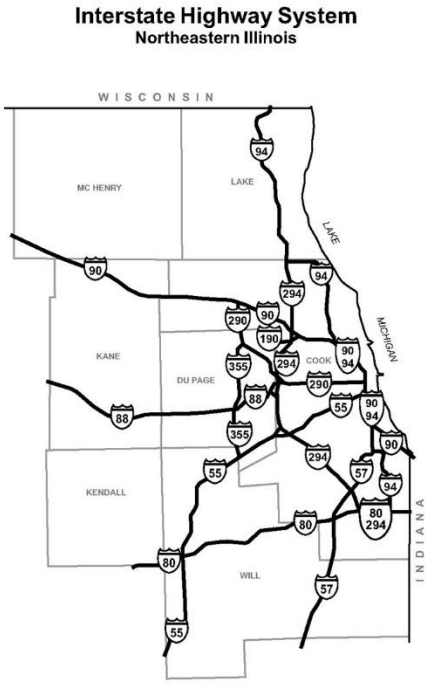
Highway systems are a vital component of intestate commerce. According to statistics from the U.S. Trucking Association, every year 15.5 million trucks operate on U.S. roadways. If these transportation arteries were to be cut, the economic consequences would be in the tens of millions of dollars. The Illinois Department of Transportation advises that Illinois has 2,169.53 miles of interstate highways and ranks third in the nation in interstate miles; only Texas (3,233.45 miles) and California (2,455.74 miles) rank ahead of the Land of Lincoln. In Illinois, over 29 percent of all public travel is done via the interstates and over 60 percent of all truck travel. The busiest segment of the Illinois interstate system in 2004 was along Interstate 90/94 (the John F. Kennedy Expressway in Chicago) just north of Chicago Avenue, where an average of 332,400 vehicles use the highway daily. The least traveled Illinois interstate was Interstate 180 in Bureau County, which carries an average of 2,000 vehicles daily.



Severe Storms and Tornadoes: Can deposit debris on roadways closing them to traffic.

Floods: Floods can inundate or washout roadways rendering them impassable to traffic. The number one cause of death from flooding is drowning caused by people trying to drive cars through moving water.

Maps Supplied by the Illinois Department of Transportation



Severe Winter Storms: Severe winter storms can block roadways with large amounts of snow and ice.

Drought: The effects on roadways from this hazard are minimal.

Extreme Heat: Extreme heat can cause roadways to buckle, posing a hazard to traffic.

Earthquake: Earthquakes can sever roadways and stop the flow of traffic.

Major Electrical Transmission Lines, Generating and Relay Stations

Electricity is the fuel that powers our society. Power outages can severely disrupt everyday activities, create large losses of refrigerated products, and have even been known to cause riots. Lack of power for heat or air conditioning can endanger lives.

Severe Storms and Tornadoes: Can knock down power lines and disrupt service.

Floods: Floods can inundate Relay Stations and render them inoperable.

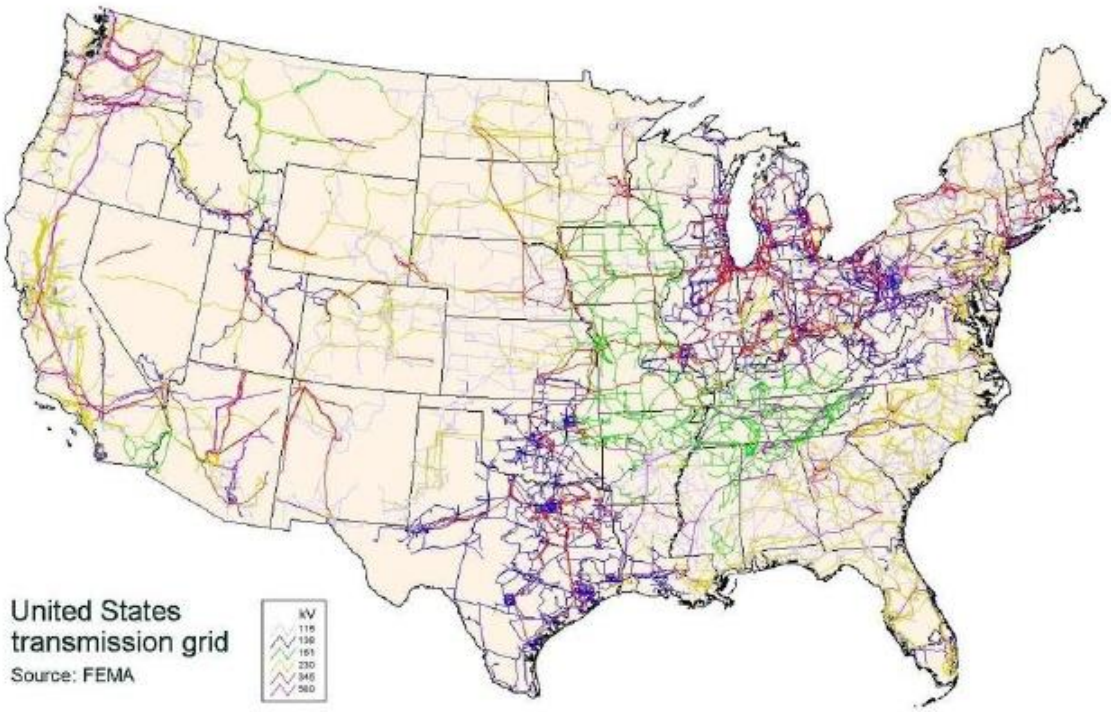
Severe Winter Storms: Severe winter storms can bring down power lines, when they deposit large amounts of snow and ice on them.

Drought: Drought has no significant impact on power stations. Less than one-tenth of one percent of Illinois's power comes from hydroelectric dams.

Extreme Heat: Extreme heat can cause power outages when increased public demand for power outpaces the generating station's ability to produce power.

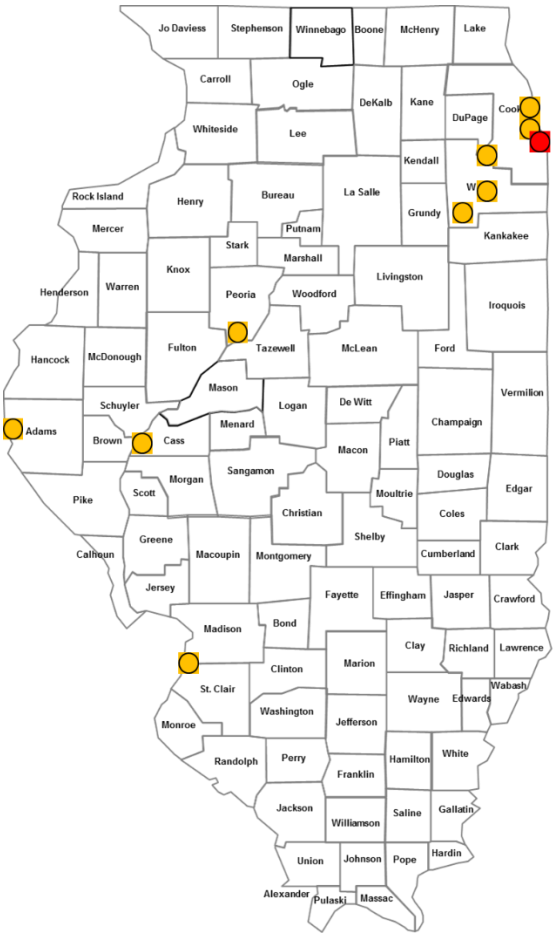
Earthquake: Earthquakes can sever transmission lines and destroy generation and relay stations.

The Continental U.S. power transmission grid consists of about 300,000 km of lines operated by approximately 500 companies.



Ports and Landings Along Waterways

Ports and Landings are vital to the economy of Illinois. Ports along Lake Michigan provide raw materials and finished goods for sale in markets around the world. Landings along the rivers of Illinois provide the agricultural industry important links to markets around the world. According to 'World Port Source", Illinois has 11 major ports; including the Port of Chicago with consists of several port facilities within the City of Chicago. Illinois ranks 7th largest in U.S. Customs Districts for export and imports. Ports and landings are threatened by several of the previously defined natural hazards.



Severe Storms and Tornadoes: Can cause turbulent waters that make navigation impossible, closing the port or landing to navigation costing operators and consumers thousands of dollars a day.

Floods: Floods can inundate the port or landing, once again closing it to navigation, and subjecting citizens to substantial monetary loss.

Severe Winter Storms: Severe winter storms can block waterways with large amounts of snow and ice.

Drought: Droughts can lower the water levels at ports and landings making it impossible to land boats and carry out commerce.

Extreme Heat: The effects of extreme heat on ports and landings are minimal.

Earthquake: Earthquakes cause waves that could swamp and destroy ports and landings and can also destroy the port or landing itself through violent ground motion.

P. Climate Change and Hazard Mitigation

Tornado and Thunderstorm Winds

Examining the climatology from 1950 to 2016 and including all tornadoes reveals is a noticeable increase in tornadoes from year to year. The increase is especially noticeable after the 1990s with wider variations from year to year. There is an upward trend in the number of the weakest F0 (EF0) tornadoes. These weakest tornadoes rarely caused any damage and traditionally under reported. The upward trend in recent years is likely the result of better radar systems, better spotter networks, and increased awareness and interest by the public. Combined, these factors have allowed for a better documentation of the weaker events over time. Ignoring this tornado from the event in the climatology, a small increase in tornado damage from year to year is still observed with an average tornado damage per year of approximately $28 million. Looking at injuries from 1950 to 2016 the frequency of reported injuries is steadily decreasing over time. This is likely a result of increased awareness and preparedness for tornadoes by the public.

Thunderstorm wind costs about $4 million more than tornadoes per year on average. It should be noted that anomalous events such as the 2009 Super Derecho event and the Washington, Illinois tornado event cost can greatly exceed the yearly average. It was found that injuries and fatalities from both tornadoes and thunderstorms decreased steadily over time, hopefully reflecting increased preparedness and awareness. Thunderstorm wind accounts for approximately one fourth of injuries compared to tornadoes. Thunderstorm winds only accounts for approximately half as many fatalities as tornadoes on average.

Little research is available to address potential future changes in tornadoes and severe thunderstorms over Illinois. Besides the limitations of the historical database described here, climate models do not have the time and space resolution to successfully model tornado activity.

Droughts

The most recent drought in Illinois was the 2012 drought. As described in Knapp et al. (2017), the primary impact of the 2012 drought in Illinois was to agriculture. Significant precipitation deficits led to much-reduced soil moisture and made worse by extreme high temperatures, stressed crops, pasture, and livestock. Corn yields were noticeably reduced throughout large portions of the state, and some of that crop was tainted with aflatoxins. The drought also posed concerns about water resources and water supply that may have developed into greater specific threats had the drought lasted longer. The developing potential for water supply shortages was lessened, and in some cases removed entirely, after abundant precipitation produced by the remnants of Hurricane Isaac occurred over Labor Day weekend. Fish kills associated with low stream levels, high water temperatures, or algal blooms were reported in numerous streams and rivers. In a few cases in northeastern Illinois, water quality treatment problems emerged related to excessively high amounts of algae in rivers. Although the drought also diminished rural groundwater supplies and caused navigation concerns on some major rivers, ultimately the overall impacts to these resources were limited by the relative brevity of the drought.

Illinois has experienced an increase in annual precipitation of 4.1 inches over the last century. That translates into about an extra month's worth of precipitation. The 1981-2010 average, or normal, for the state now stands as 39.96 inches. Because of these increases, large-scale droughts have become less frequent and less intense over time in Illinois. Moderate drought is expected once every five to six years, while severe droughts are expected every once in every 10 to 11 years.

Heat Waves

Overall, Illinois temperatures have warmed by about 1.2°F over the last century. However, much of that warming has occurred in winter and spring. The pattern for summer is more complex. Daytime high temperatures for summer (June, July, and August) in Illinois have decreased by 1 degree over the last century. Summer daytime temperatures were especially high in the 1930s with its combination of widespread heat and drought during several summers. Unfortunately, records for heat index are less common and do not extend back as far as daily temperature records. Their analysis is further handicapped by a decision at the national archive to archive only one out of every three hourly observations in the historical record for a period before 1978, resulting in an incomplete record.

There is high confidence that the temperatures in the U.S. and Illinois will increase throughout the 21st century. The latest estimate for Illinois for the period 2016-2045 is about 2.5 degrees of warming, much faster than the 1.2 degrees warming of the last 100 years. As noted in the Climate Science Special Report (CSSR), temperature extremes are projected to increase even faster. For example, in Chicago the average number of days per year greater than 95 degrees is about two. For the period, 2016-2045 the expected average frequency increased to 10 for the low emission scenario and 12 days per year for the high emission scenario. It is expected that the heat wave hazard is highly likely in any given year somewhere in Illinois.

Heavy Precipitation

Increases in precipitation in general and heavy precipitation in particular have been a concern in Illinois for several decades. In 2015, the Illinois Department of Natural Resources in cooperation with the Illinois State Water Survey produced a report for the Urban Flooding Awareness Act outlining the impacts of increased precipitation on Illinois (Winters et al. 2015). Over a 10-year period, they documented $2.3 billion in costs in urban areas. Some $1.6 billion came from five damaging storms. Over 90 percent of these damages occurred outside the mapped floodplain. Based on a linear trend, Illinois precipitation has increased from 36 to 40 inches, about 10% over the last century. Illinois has become more likely to experience exceptionally wet years in recent decades. The year 1993 was the wettest on record with 51.18 inches. The next two wettest years were 2009 with 50.96 inches and 2008 with 50.18 inches. All of those years were noted for widespread flooding across Illinois.

In summary, annual and seasonal precipitation in Illinois has increased with time and is likely to continue. More importantly, heavy rain events have increased with time and are very likely to continue in the future. It is very likely that heavy rains and flooding hazards will continue to occur every year in Illinois.

Winter Storms

Average snowfall in Illinois ranges from about 10 inches in far southern Illinois to 40 inches in the Chicago area. Illinois can feel major impacts from large winter storms. A famous example is the February 1-3, 2011, "Groundhog Day" storm that dropped up to 27 inches of snow in northeastern Illinois. More than 9.8 million. Ilinois residents were in areas with 12 or more inches of snow. The Illinois State Water Survey has conducted a number of studies on winter storms over the years. In general, those studies found that the late 1970s marked an unusual period of increased winter storms not found before or since in the historical records. These studies have also found that events producing six inches or more of snow would reliably cause impacts in Illinois. Snowfall amounts dropped steeply with less year-to-year variability for much of the 1980s and into the early 2000s. However, snowfall amounts in the last six winters have been more variable with the winter of 2014 being about as snowy as the winters of late 1970s. On the other hand, the two lowest snowfall totals were from the winter of 2011-12 with 9.2 inches and the winter of 2016-17 with 9.6 inches.

In summary, no significant historical trend could be detected in snowfall totals or the frequency of days with six, nine, and 12-inch of snow. Potential future changes remain highly uncertain due to low confidence in the projections. For planning purposes, it is recommended that the risk of winter storms will remain the same winter storms likely to occur somewhere in Illinois every year. (Climate Change and Hazard Mitigation Study included in the Appendix E)

Risk Assessment – Jurisdictions

2018 plan is not in a position to include information on the risk assessment on those jurisdictions that faces the most risk from these identified hazards like Severe Storms, Floods, Severe Winter Storms, Drought, Extreme Heat , Earthquake and Tornado . Reason being, no data readily available. To further investigate, the State Mitigation Staff reached out to the State Climatologist where he confirmed that no studies were completed to obtain the data and nearly all future climate change work has been done at a global or national scale. There is no capability to distinguish between the relative risks for one jurisdiction vs other.

IV. MITIGATION STRATEGY

MISSION STATEMENT

The mission of the Illinois Natural Hazard Mitigation Plan is to identify natural hazards which affect Illinois, assess the vulnerability of Illinois to each hazard and implement a strategy for mitigating the effects of the hazards.

VISION STATEMENT

The State of Illinois will implement a comprehensive mitigation program to reduce the effects of natural hazards within the State. This program will educate the public on mitigation methods they can use in their homes and businesses, promote local mitigation planning and assist eligible organizations with the development of mitigation projects. Federal, State and local government resources, along with private resources, will be used to support cost-effective mitigation measures.

The Illinois Natural Hazard Mitigation Planning Committee (INHMPC) met to review and update the risk assessment and to discuss the goals and objectives for the State Hazard Mitigation Plan. During the update process, individual meetings between IEMA mitigation staff and individual state agency representatives were conducted to provide a more focused look at cooperating State Agency involvement in the mitigation goals and actions. These focused meetings resulted in an accumulation of additional action items, which will help to further the mitigation efforts within the state. The state's goals are long-term general guidelines to establish and serve as the State's vision and direction for hazard mitigation and loss reduction measures. The overriding goal is to reduce the damages to people and property from natural hazards. Consistent with Illinois' all-hazard philosophy, we have chosen not to make separate goals for each hazard, since most of the activities apply to all hazards. Instead we have chosen to break the goals down by the groups that are affected by disasters and who play a role in mitigating them. Goal one was updated to show the enhancement of the State's capacity to continuously protect lives, health, and safety of the citizens in Illinois form the impact of natural hazards. This was updated from the original goal identifying IEMA's capacity to meet these needs. It was discussed that the capacity should be the State's versus a single agency. This goal is supplemented with objectives and actions that support mitigation through the state in a variety of manners. The second goal is for local jurisdictions and how the mitigation partners can work with them to strengthen mitigation. The third goal is the interaction among agencies for the purpose of mitigation. The final goal was updated to focus on individuals and how we can educate and involve them in mitigating their hazards. Under each objective is a list of specific mitigation actions to accomplish or support the objectives and ultimately the goals.

While in draft form, a thorough evaluation of each mitigation action item identified in the Mitigation Strategy was conducted by the INHMPC or the State Hazard Mitigation Officer (SHMO). The action items were prioritization utilizing the Social, Technical, Administrative, Political, Legal, Economic, and Environmental

(STAPLEE) method. A detailed description of the method maybe found in Section V of the INHMP. Factors in the prioritization of the action items included: cost-effectiveness, environmental consideration, technically feasibility, legality, political support, social acceptability and administrative elements such as funding and staffing availability. A traditional ranking approach was not utilized as the INHMP Mitigation Strategy is viewed as an all-encompassing process which utilizes each identified action item to accomplish the strategy's goals.

The mitigation action items were divided into four categories of prioritization: ongoing, annually, within three years, and in the event of a disaster. These prioritization categories were left unchanged in the update process as they remained an accurate depiction of the prioritization. The ongoing category is the largest group and covers the activities that are necessary to maintain a quality state-run hazard mitigation program. These activities take priority as they are the activities that need to be done on a regular basis, which are done as requested, or are ongoing projects that are worked on as time allows. Most of these projects have no cost beyond staff time.

The actions that are labeled "annually" are projects that should be completed once a year. Most of these are associated with events, such as conferences, that only occur once a year. The rest are projects that are not worked on a regular basis but need to be updated or redone once a year. Some of these actions are associated with funding that is available through an annual grant cycle. The third category is items to be completed within three years. These actions involve the gathering of data that is to be completed by the time of the next State Hazard Mitigation Plan update.

The final category covers actions that occur in the event of a disaster. Some of these involve providing information in the aftermath of a disaster; others are associated with funding that becomes available in the event of a disaster.

There are several common themes to the action items. Building a team of people from agencies outside IEMA which support and promote mitigation is essential. The mitigation staff is limited and for mitigation to take root and grow it must do so by forming partnerships with groups outside of IEMA. To maximize the mitigation resources, it is important to run the program as efficiently as possible with as little wasted effort as possible and with an emphasis on minimizing expenditures.

Another major theme is that developing a positive view of mitigation is vital to its growth. People that work with mitigation projects need to come away with a positive experience and the successes of the program must be promoted. One of the ironies of a successful mitigation program is that when a disaster occurs nothing happens. Implementation of the projects must be made as trouble free as possible to provide the programs with a positive reputation. Successful projects which are difficult to administer limit the number of jurisdictions willing to attempt projects. Efforts must be made to promote the success stories so the public, policy makers, and elected officials view mitigation as a worthwhile and cost beneficial program.

Lastly, a major theme is the role of education in promoting mitigation. We have to make people understand what mitigation is and how they can use it to lessen the impact of hazards in their lives. Funds are finite and not sufficient for mitigating hazards that affect millions of people. The most effective tool we have is to educate people on the risks they face and the proper techniques to mitigate their risks. We are trying to reach a wide variety of people with the mitigation message, so we need to use a variety of methods. To ensure that the public absorbs the message the mitigation message must be repeated again and again. We must expose the public to mitigation concepts as many different ways and as many times as possible. This

is how businesses promote products and how we must promote mitigation. We cannot demand that people mitigate so we must educate people to demand mitigation.

The 2018 plan was updated to identify specific lead agencies and supporting agencies for each of the identified actions. In addition, an update status section was added to the mitigation action items header category to identify what the current status is of the identified action item. The status of action items has been denoted with the follow title(s):

- Updated, indicates that the original action items were updated with current information and/or supporting agencies were identified to assist with the action.
- Complete; denotes that the action has been completed since the update of the previous plan.
- Unchanged; identifies that the action has been reviewed and remains a viable and accurate action item for the State of Illinois, but due to specific challenges the actions has not been completed or initiated.
- Continuing; indicates that the action item has been reviewed and remains a viable action within the plan and that the action is continually being completed or that initial steps have begun regarding the actions completion.
- New, designates that that particular action was created new in the update. These "New" action items were prioritized utilizing the same approaches as utilized with past actions.

SUMMARY OF UPDATED MITIGATION STRATEGY ITEMS

Throughout the update process the planning committee reviewed all mitigation goals, objectives, strategies and actions to evaluate their effectiveness and determine if additional actions were required in order to reach the identified mitigation goals. In additional, support agencies were added to many of the actions in order to assist in the facilitation of the actions. Listed below are those items which have been updated, deleted or are new to the Mitigation Strategy Section. Mitigation strategies are organized under the Goals they support; the four goals are:

Goal 1: Maintain and enhance the State of Illinois capacity to continuously protect the lives, health, and safety of the public in Illinois from the impact and effects of natural hazards.

Goal 2: Build and support local capacity and commitment to continuously become less vulnerable to natural hazards with a focus on Repetitive and Severe Repetitive Loss Properties.

Goal 3: Improve coordination and communication with other relevant entities.

Goal 4: Increase public understanding, support, education and demand for hazard mitigation planning and projects to protect public services, utilities and critical facilities from potential damage from natural hazard events.

The INHMPC prepared the goals, mitigation actions, and mitigation strategies included in the State Hazard Mitigation Plan. The goals and mitigation actions were developed based on the experience of committee members, presentations and discussions about the natural hazards that impact the State, information from the State Risk Assessment, review and discussion of previous mitigation planning and activities, and review and discussion of the mitigation goals of the state's local mitigation plans. Through the planning process, the mitigation strategies below were developed for the Plan. The goals guided the development of mitigation

actions and strategies and the Mitigation Action Plan, and will foster a vision for hazard mitigation and disaster resistance throughout the state.

Strategy 1.1.4. Maintain and implement a State Mitigation Plan that fosters innovation, advances public support, and gains long-term commitments for pre-disaster mitigation from the State of Illinois.

- Added Action 1.1.4.7 Evaluate climate adaptation strategies adopted by other states for applicability to Illinois to reduce future risk.

Strategy 1.3.2. Cooperate and coordinate with partners at all government levels in planning and use of best technology.

- Added Action 1.3.2.4. Work with USACE to ensure the National Levee Database has complete coverage of all levees in Illinois including areas at risk of flooding if they are overtopped or fail.

Strategy 2.1.3. Provide information on mitigation for publications with a target audience of public officials (Illinois Issues, IL Municipal Review).

- Added Action 2.1.3.5. Conduct Community Disaster Education programs throughout Illinois.
- Added Action 2.1.3.6. Install smoke detectors in residences throughout Illinois.

Strategy 2.2.2. Publicize and provide risk assessment products and planning services to assist local officials throughout the local mitigation planning process.

- Added Action 2.2.2.5 Continue to build a database of individual structure risk assessments.

Strategy 2.4.4. Use new technologies such as GIS with high resolution, current topography, lidar, orthophotography and digital floodplain mapping (DFIRM) as a tool to increase flood hazard awareness and risk reduction. ISGS added as a supporting agency.

- Action 2.4.4. 7. ISGS coordinates the acquisition, quality assurance review, and on-line distribution of airborne LiDAR data collections for counties within the State. (ongoing)

Strategy 4.2.2. Launch or participate in awareness campaigns and special events.

- Added Action 4.2.2.8. Promote the National Weather Service (NWS) Weather Ready Nation (WRN) Ambassador Program.

Deleted Items from 2013 Plan

Strategy 2.4.6. Ensure that all State funded or State promoted activities are consistent with sound floodplain management principles.

- Action 2.4.6.3. Develop Executive Order workshops for state agencies.
- Action 2.4.6.4 Create Executive Order instructional book for guidance.

Strategy 4.3.3. Increase the public's exposure to hazard mitigation issues.

- Added Action 4.3.3.3. Develop and distribute a calendar with mitigation information. (Not cost effective)

Strategy 4.3.4. Execute delivery.

- Action 4.3.4.1. Develop and utilize all available partnerships.
  Action 4.3.4.4. Provide grant funds to the American Red Cross to hire staff to promote disaster resistant construction. (Staffing Limitations)

Objective 4.4. Educate the public on the benefits of mitigation measures

- Added Action 4.4.1.3. Distribute mitigation materials to all of the libraries in the State. (Duplicate Item - Action 4.3.3.5)

A. GOALS, OBJECTIVES, ACTIONS AND FUNDING

GOAL 1. Maintain and enhance the State of Illinois's capacity to continuously protect the lives, health, and safety of the public in Illinois from the impact and effects of natural hazards, while lessening the State's vulnerability to natural hazards.

Objective 1.1. Institutionalize Hazard Mitigation.
Strategy 1.1.1. Attract and retain qualified, professional and experienced Hazard Mitigation staff.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.1.1.1. Provide high quality in-house training.	IEMA Staff (Mitigation)	Training will increase the skills of the mitigation staff.	A well-trained staff can more effectively manage mitigation programs.	Continuing
Action 1.1.1.2. Encourage professional development and certification through outside continuing education courses.	General Revenue Funds	Continuing education increases the skills of the mitigation staff.	Professional development improves the execution of mitigation programs.	Continuing Training opportunities listed on IEMA webpage
Action 1.1.1.3. Allow staff members to travel and attend relevant conferences.	General Revenue Funds	Conferences increase the knowledge base of the mitigation staff and provide networking that can form relationships and provide ideas.	Conferences provide opportunities to spread mitigation ideas and to get ideas that make the staff more effective.	Continuing
Action 1.1.1.4. When appropriate, provide membership fees for professional organizations.	General Revenue Funds	It is important for staff members to be involved with their professional organizations.	Professional organizations provide training, information, and connections that improve the abilities of the staff to execute the programs.	Continuing

Strategy 1.1.2. Educate and assist the Illinois General Assembly in developing state legislation that will further hazard mitigation efforts.

Lead Agency: IEMA
Supporting Agency: IDNR

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.1.2.1. Notify elected officials of grants and success stories in their jurisdictions.	General Revenue Funds	For virtually no cost, mitigation can be promoted by giving positive information about areas the officials are concerned about.	By understanding the positive ramifications of mitigation, elected officials are more likely to support it.	Continuing
Action 1.1.2.2. Support IDNR/OWR's Flood Mitigation Program.	Available HMA Funds	IDNR's program is an important partner and we need to inform all the elected officials we work with of this.	Without the IDNR Flood Mitigation Program, many jurisdictions would be unable to provide the local match.	Continuing

Strategy 1.1.3. Expand Mitigation Opportunities.

Lead Agency: IEMA
Supporting Agencies: IDNR, IESMA, DCEO

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.1.3.1. Publicize program successes through news media or on the web.	General Revenue Funds	By promoting positive mitigation stories to the media and promoting them on our website we can educate the public on how mitigation works. The biggest obstacle to promoting mitigation is that when it works, nothing happens.	By understanding the positive ramifications of mitigation, the public is more likely to support it.	Continuing Added Supporting Agencies

Strategy 1.1.4. Maintain and implement a State Mitigation Plan that fosters innovation, advances public support, and gains long-term commitments for pre-disaster mitigation from the State of Illinois.

Lead Agency: IEMA
Supporting Agencies: IDNR/OWR, ISWS

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.1.4.1. Closely follow FEMA's development of the new rules and regulations for implementing Section 322 of the Disaster Mitigation Act of 2000.	Available HMA Funds	By following FEMA's guidance, the State can develop a DMA2k approved plan. The process of developing a plan strengthens mitigation in the State by forming connections with numerous agencies.	An approved DMA2k plan is required for future mitigation funds. The plan and the process guides the mitigation programs of the State.	Continuing List all updates and revision on the IEMA webpage
Action 1.1.4.2. Using FEMA's criteria for State Mitigation Plans," work with the planning committee to develop and maintain a State Mitigation Plan that remains a functional document to guide all Mitigation Section activities.	General Revenue Funds	The mitigation planning process allows for a variety of interested parties to work together to develop the most effective strategies to guide the State's mitigation policies.	A functional plan is necessary to guide State's mitigation activities.	Continuing All portions of the plan reviewed / updated in 2018
Action 1.1.4.3. Review, update, and incorporate the information on state owned facilities into the INHMP.	General Revenue Funds	It is important to identify all of the State facilities to be aware of their risk factors.	When the risk factors of State facilities are known, the proper mitigation steps can be taken.	Continuing New action item 1.3.1.7. created to assist with Action

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.1.4.4. When local jurisdiction's mitigation plans are approved, incorporate the hazards, risk assessments and projects into the INHMP.	General Revenue Funds	The locals are doing the most detailed analysis of the risks they face.	The more detailed analysis of risks improves the ability of the State to mitigate those risks.	Continuing
Action 1.1.4.5. When local jurisdiction's mitigation plans are approved, review their mitigation policies, programs and capabilities.	General Revenue Funds	When the plans are approved it provides IEMA with the information on what locals are doing to mitigate and how they are doing it.	Best practices can be learned from local governments and shared with others. It can also guide the assistance the State provides.	Continuing
Action 1.1.4.6. Establish evaluation criteria to guide the approval of planning and projects. **(IHMPC) (complete)**	General Revenue Funds	By establishing criteria it assists in making logical determinations and minimizes personal preferences.	To determine the priorities for spending is one of the cornerstones of a mitigation strategy.	Continuing
Action 1.1.4.7 Evaluate climate adaptation strategies adopted by other states for applicability to Illinois to reduce future risk (new)	IDNR (initial study funds) Environmental Protection Trust Funds (EPTF)	Evaluating climate adaption actions adopted by other states is an efficient approach to assessing potential Illinois adaptation strategies (initial study funded by IDNR/OWR to be completed Dec 2018)	To determine forward looking mitigation actions that would contribute to adaptation to changing climate and reduce future risk.	Continuing

Objective 1.2. Improve organizational efficiency.
Strategy 1.2.1. Coordinate and communicate with other IEMA programs to support mitigation efforts.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.2.1.1. Jointly develop procedures with the Public Assistance Program to maximize the use of Section 406 Mitigation Funding following a declared disaster event.	General Revenue Funds	Infrastructure should be mitigated to prevent future damages, so procedures should be developed to maximize available mitigation resources.	It is in the interests of mitigation to protect the State's infrastructure and maximize the dollars spent on mitigation in the State.	Continuing
Action 1.2.1.2. Coordinate with the Public Information Officer (PIO) to publicize success stories.	General Revenue Funds	The PIO has the skills and resources to publicize success stories.	Success stories build support for mitigation among the public, policy makers, and elected officials.	Continuing
Action 1.2.1.3. Support the IEMA Earthquake Program's efforts to mitigate earthquake damages.	General Revenue Funds	It is important to encourage and assist promoting earthquake mitigation.	Earthquakes are potentially the most damaging hazard Illinois faces. There is a definite need to put more resources into mitigating the hazard.	Continuing
Action 1.2.1.4. Improve coordination and communication with IEMA Regional Coordinators by consulting them in the application process and notifying them of grant approval.	General Revenue Funds	Regional Coordinators are links to local governments. Consulting them in the process and notifying them of the results keeps them involved with mitigation.	By involving Regional Coordinators it builds the team that is working on mitigation and increases the chance of mitigation ideas being applied as a solution.	Continuing

Strategy 1.2.2. Improve Communication with HMGP, FMA and PDM applicants and subgrantees.

Lead Agency: IEMA
Supporting Agency: IESMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.2.2.1. Make regular phone calls and emails to subrecipients to disseminate policies and provide training.	General Revenue Funds	Correct actions come from the people implementing projects being well informed and trained.	If we expect locals to follow the policies we must keep them updated on what they are.	Continuing
Action 1.2.2.2. Maintain consistency between policies and procedures, and create an e-mail group to allow for routine dissemination of policies and procedures.	General Revenue Funds	Disseminating information through email groups is the cheapest most effective method. Everyone is told the same thing and it is in writing for future reference.	If we expect locals to follow the policies we must keep them updated on what they are.	Continuing
Action 1.2.2.3. Maintain the same Project Manager for consistency.	No resources required	By maintaining the same project manager it enables IEMA to have a better understanding of the project and assists the local by developing a relationship with the project manager.	Consistency in the guidance of projects minimizes dissatisfaction with the process. Knowledge of projects can take a while and it helps ensure that the correct policies are implemented.	Continuing
Action 1.2.2.4. Maintain a contact log.	General Revenue Funds	This serves to document that information was conveyed to the local government.	This helps ensure an informed subrecipient.	Continuing

Strategy 1.2.3. Streamline Grant Management Process and Procedures.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.2.3.1. Maintain a uniform standardized filing system.	General Revenue Funds	Filing must occur and by having a standardized system it prevents information from being lost.	Efficient management of mitigation requires that the documents are easily found.	Continuing Since 2013, hired a new office coordinator to ensure consistency in filing.
Action 1.2.3.2. Assure staff documents all contact, visits, etc. with community in a contact log.	General Revenue Funds	This serves to document that information was conveyed to the local government.	This helps ensure an informed subrecipient.	Continuing Since 2013, maintained electronically.
Action 1.2.3.3. A POC group will be set up on the e-mail system to facilitate POC's receiving policies promptly. POC's who do not have e-mail will be set up as a group on the fax system and information faxed to them.	General Revenue Funds	Disseminating information through email groups is the cheapest most effective method. Everyone is told the same thing and it is in writing for future reference.	If we expect locals to follow the policies we must keep them updated on what they are.	Continuing
Action 1.2.3.4. Minimize paperwork and reporting requirements where possible.	General Revenue Funds	Unnecessary paperwork is a burden, creates dissatisfaction, and takes time away from other areas.	A positive experience in implementing projects improves the image of the mitigation program.	Continuing Since 2013, all subgrantees are required to submit quarterly reports and payment requests electronically.

Strategy 1.2.4. Improve Management.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.2.4.1. Task assignment-use a weekly task assignment sheet and help staff prioritize assignments.	General Revenue Funds	Weekly prioritization of tasks ensures that the priorities get accomplished and limited resources are used correctly.	The mitigation staff has limited resources and decisions must be made on priorities to ensure the most important work is completed.	Continuing Since 2013, mitigation staff are required to submit weekly report.
Action 1.2.4.2. Hire additional mitigation staff to assist with mitigation planning and projects.	HMA Management Costs	Mitigation grant funds, projects and plans all have a deadline for completion associated with them. In order to meet these deadlines proper staffing is required.	A properly staffed mitigation section will provide timely and accurate assistance to mitigation projects, plans and grants.	Continuing Since 2013, Hired two Disaster Services Planners and a Hazard Mitigation Specialist.

Strategy 1.2.5. Ensure Timely Process.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.2.5.1. Complete Local Mitigation Plan reviews within two months.	General Revenue Funds	If reviews are not timely it hinders the efforts of locals to make the necessary changes.	Timely review improves satisfaction and prevents the plans from stagnating.	Continuing Since 2013, the Planner reviewed approximately 20 Plans in a timely manner.
Action 1.2.5.2. Have Local Mitigation Project applications ready for submittal within 12 months from the disaster declaration date.	General Revenue Funds	If applications are not submitted in a timely manner, potential mitigation projects may be denied.	Timely submission of applications allows for a quicker turn around in approvals for grants.	Continuing

Objective 1.3. Maximize the utilization of best technology.
Strategy 1.3.1. Incorporate geographic information system (GIS) as a tool in decision making.

Lead Agency: IEMA
Supporting Agencies: CMS, IDOT, IDNR/OWR, ICC, DCEO, INHMPC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.3.1.1. Continually upgrade statewide spatial data maintained in-house through multiple data sources.	General Revenue Funds	Current data improves the use of technology. Technology is only as good as the data put into it.	Using the best data leads to making the best decisions.	Continuing
Action 1.3.1.2. Evaluate emerging technologies and upgrade through hardware/software acquisition and training where appropriate and feasible.	General Revenue Funds	Improved technologies can assist in risk assessment which enables us to better understand the risk factors.	Upgraded technology improves the ability to assess risks and to maximize the resources of the mitigation section.	Continuing
Action 1.3.1.3. Keep GIS staff positions filled with capable personnel.	General Revenue Funds	Turnover results in the loss of institutional knowledge and hinders the use of GIS for mitigation purposes.	A well-trained staff can more effectively assist with mitigation programs.	Continuing
Action 1.3.1.4. Maintain capability of GIS specialists and technicians through classroom education and distance learning.	General Revenue Funds	Continuing education increases the skills of the GIS staff. It is especially important for them to learn how to apply their skills for mitigation purposes.	A well-trained staff can more effectively assist with mitigation programs.	Continuing

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.3.1.5. Make spatial data with viewing and mapping capability available to all staff in hazard mitigation section, creating a scaled section-wide geographic information system.	General Revenue Funds	The more effectively IEMA can use available data, the more effectively we can implement the programs.	Using the best data leads to making the best decisions.	Continuing
Action 1.3.1.6. Training current mitigation staff positions in GIS software and application.	General Revenue Funds	GIS data is utilized in many mitigation planning initiatives and projects, having mitigation staff training in GIS, will allow for a more effective exchange.	Properly trained staff will provide the accessibility to more accurate and updated GIS information for mitigation studies and analysis.	Continuing
Action 1.3.1.7. Coordinate with State agencies to develop and maintain a specific agency database with GPS latitude and longitude coordinates to develop an all-encompassing database of state controlled buildings and facilities.	General Revenue Funds Department of Energy Grant Funds	Accurate latitude and longitude coordinates for all state occupied and operated buildings will assist in determining risk to specific hazards	Risk assessments require the best data available to ensure an accurate product is produced.	Continuing
Action 1.3.1.8. Coordinate with the Illinois Commerce Commission and other state agencies to explore grant funding opportunities to develop a comprehensive state facility database.	Department of Energy Grant Funds	Having an all-encompassing data base of state facilities will assist in all phases of emergency management.	An in depth database with latitude and longitude of state buildings and facilities will provide for more accurate future risk analysis.	Continuing

Strategy 1.3.2. Cooperate and coordinate with partners at all government levels in planning and use of best technology.

Lead Agency: IEMA
Supporting Agency: INHMPC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.3.2.1. Develop working relationships with other state agencies for mutual assistance in technologies.	General Revenue Funds	Other agencies are already gathering information that can be useful to IEMA.	Limited mitigation resources make building partnerships and using existing data essential.	Added Supporting Agency
Action 1.3.2.2. Work with State and federal agencies to ensure all current risk data bases are utilized (i.e., weather studies and rainfall data).	General Revenue Funds	Other agencies are already gathering information that can be useful to IEMA. We need to ensure we are using the best data possible.	Limited mitigation resources make building partnerships and using existing data essential. Using the best data leads to making the best decisions.	Continuing Updated the database utilizing NCEI and SHELDUS
Action 1.3.2.3. Develop working relationship with federal agencies with interests related to emergency management and hazard mitigation, with technologies from which we can benefit.	General Revenue Funds	Other agencies are already gathering information that can be useful to IEMA. We need to ensure we are using the best data possible	Limited mitigation resources make building partnerships and using existing data essential. Using the best data leads to making the best decisions.	Continuing
Action 1.3.2.4. Work with USACE to ensure the National Levee Database has complete coverage of all levees in Illinois including areas at risk of flooding if they are overtopped or fail.	CAP Funds USACE Funds	Provides basis for communicating risk to those protected by levees; supports planning for mitigation and emergency management.	Comprehensive data on the areas protected by levees will provide information to inform agencies and individuals of flood risk and identify possible mitigation actions.	Funds requested by USACE to develop database

Strategy 1.3.3. Increase the use of best technology in Grants Management.

Lead Agency: IEMA
Support Agencies: IDNR, DCEO

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.3.3.1. Use GIS for project identification, application development and project implementation.	General Revenue Funds	Improved technologies can assist in risk assessment which enables us to better understand the risk factors.	Using the best data leads to making the best decisions.	Continuing
Action 1.3.3.2. Develop a standardized grants management tracking system.	EMPG Funds	Proper tracking of grant funds is essential in managing state and federal funds.	Standardized tracking of grant funds will enable more accurate projection of future fund availability in disaster funds.	Continuing Since 2013, IEMA is in the discussion phase to develop grant management tracking system.

Strategy 1.3.4. Utilize HAZUS MH for risk assessment.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 1.3.4.1. Use HAZUS MH to determine the dollar amount of potential losses for future updates to the INHMP.	General Revenue Funds	HAZUS MH assists in risk assessment which enables us to better understand the risk factors.	The INHMP should use the best data possible. Using the best data leads to making the best decisions.	Continuing
Action 1.3.4.2. Coordinate the earthquake HAZUS MH risk assessments with the IEMA Earthquake Program and continue to coordinate local data collection to include in the INHMP.	General Revenue Funds	HAZUS MH assists in risk assessment which enables us to better understand the risk factors. This information can make the Earthquake Coordinator more effective.	Using the best data leads to making the best decisions. The Earthquake Coordinator is a valuable partner and we should ensure we are working with the same information.	Continuing
Action 1.3.4.3. Encourage and provide training to local jurisdictions to use HAZUS MH for risk assessment.	General Revenue Funds	HAZUS MH is a valuable tool and its widespread use should be encouraged. It also provides consistency in the risk assessments.	Local jurisdictions using HAZUS MH provides consistent quality risk assessments.	Continuing
Action 1.3.4.4. Provide training to IEMA Planning Staff on HAZUS MH.	General Revenue Funds	HAZUS MH is a valuable tool and its widespread use should be encouraged. It also provides consistency in the risk assessments.	The INHMP should use the best data possible. Using the best data leads to making the best decisions.	Continuing

GOAL 2. Build and support local capacity and commitment to continuously become less vulnerable to natural hazards with a focus on Repetitive and Severe Repetitive Loss Properties

Objective 2.1. Increase awareness and knowledge of hazard mitigation principles and practice among local public officials.
Strategy 2.1.1. Conduct mitigation presentations for local public officials.

Lead Agency: IEMA
Supporting Agency: INHMPC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.1.1.1. Develop and maintain a variety of adaptable mitigation Power Point presentations for local officials upon request.	General Revenue Funds	Previously developed presentations allow for a minimum of preparation time for speaking engagements and helps ensure everything is covered.	Prepared presentations optimize the opportunity to educate officials.	Continuing
Action 2.1.1.2. Contact associations for zoning officials to present mitigation ideas to their membership.	General Revenue Funds	Zoning officials are an important ally in mitigation and we need to form a better relationship with them.	This builds partnerships and provides support for the mission of zoning officials.	Continuing
Action 2.1.1.3. Contact township and County Highway associations to present mitigation ideas to their membership.	General Revenue Funds	Township and highway officials are an important ally in mitigation and we need to form a better relationship with them.	This builds partnerships and provides support for the mission of highway officials.	Continuing
Action 2.1.1.4. Include information regarding mitigation activities for natural hazards on the Ready.Illinois.gov website.	General Revenue Funds	Ready.Illinois.gov is a well know resource for citizens to reference for disaster assistance.	Providing mitigation activities and ideas on a readily accessible website will educate a larger population.	Continuing

Strategy 2.1.2. Conduct training courses for local public officials.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.1.2.1. Conduct interactive "Mitigation Planning Workshops" and mitigation training classes.	General Revenue Funds	Locals must be educated on why and how to do mitigation plans.	Local mitigation plans will form the foundation for future state plans.	Continuing
Action 2.1.2.2. Educate IEMA Regional Coordinators and local coordinators in coordination with the Training Officer.	General Revenue Funds	Regional Coordinators are links to local governments. We need to educate them on all of the mitigation tools available.	By involving Regional Coordinators it builds the team that is working on mitigation and increases the chance of mitigation ideas being applied as a solution.	Continuing Since 2013, agency held quarterly webinars for Emergency Regional Coordinators.

Strategy 2.1.3. Provide information on mitigation for publications with a target audience of public officials.

Lead Agency: IEMA
Supporting Agencies: IDNR, DCEO, ARC, CDB, IDOT, IESMA, IDPH, IEPA, CMS, DOI, DHS

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.1.3.1. Work with State Agency PIOs on writing and distributing articles.	General Revenue Funds	These magazines provide opportunities to do a more in-depth analysis of mitigation and target people interested in public policy.	By understanding the positive ramifications of mitigation, public officials are more likely to support it.	Continuing
Action 2.1.3.2. Explore using 5% funds to pay for a professional writer to create articles promoting mitigation.	HMGP 5% funds	The PIO might not have the time to commit to in-depth analysis. A professional writer can provide a quality product and potentially increase the chance of getting it published.	By understanding the positive ramifications of mitigation, the public and public officials are more likely to support it.	Continuing
Action 2.1.3.3. Create publications to distribute regarding agency coordinated or funded mitigation projects.	General Revenue Funds	Publication of agency specific mitigation actions or agency funded projects will promote local mitigation efforts.	By understanding the positive ramifications of mitigation, the public and public officials are more likely to support it.	Continuing
Action 2.1.3.4. Distribute hazard mitigation material to insurance companies, agents, and consumers to assist in the development, establishment and implementing of statewide mitigation programs.	General Revenue Funds	The DOI acts as the regulator agency for insurance and carriers. The DOI encourages loss prevention and enhancing through education.	Engaging insurance companies and carriers will help educate the public regarding private mitigation actions.	Continuing Since 2013, mitigation materials are send Electronically.

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.1.3.5. Conduct Community Disaster Education programs throughout Illinois.	American Red Cross or its partner agencies	Public can be better prepared for disasters and emergencies and reduce the impact of disasters through appropriate mitigation strategies.	The program aims to increase awareness and understanding of natural hazards and teaches safety, emotional coping skills, and personal preparedness and mitigation efforts.	New
Action 2.1.3.6. Install smoke detectors in residences throughout Illinois.	American Red Cross or its partner agencies	Reduce fire related deaths of elderly and disabled individuals.	A concentrated effort will be to install detectors in high risk neighborhoods (those with the highest numbers of fires, in homes where elderly and disabled live and those that are unable to install detectors themselves). The installation of detectors and providing fire safety mitigation information is free of charge.	New

Strategy 2.1.4. Provide jurisdictions with the necessary resources to evaluate their community building codes highlighting the impact of safe buildings on local residents.

Lead Agency: CDB
Supporting Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.1.4.1. Publication of the "Directory of Illinois Building Related Requirements." In electronic format via the internet **(completed)**	General Revenue Funds	Educates individuals and contractors on building codes in force in their jurisdiction.	Ensures that construction complies with the existing laws and regulations.	Continuing (Maintenance of the directory)
Action 2.1.4.2. Maintain a website to provide informational resources regarding building codes administered in Illinois among the more than 25 state agencies. **(completed)**	General Revenue Funds	Educates individuals and contractors on building codes in force in their jurisdiction.	Ensures that construction complies with the existing laws and regulations.	Continuing (Maintenance of the site)
Action 2.1.4.3. Explore possibilities for the creation of a mobile support team and legislation to provide technical engineering and architectural staff capable of assessing the structural safety of facilities for disaster resilience.	General Revenue Funds	Providing technical assessments of facilities to determine disaster resilience and identify potential risks to existing facilities, while providing legal authority and limiting liability to mobile support team.	Pre-Disaster assessment of facilities will determine disaster resilience and identify potential risks to existing facilities.	Continuing
Action 2.1.4.4. Provide instructional and training opportunities for local code officials to enable them to conduct pre-disaster assessments of structural safety of facilities for disaster resilience.	General Revenue Funds	Providing training to allow local officials to conduct assessments of their own facilities to determine disaster resilience and identify potential risks to existing facilities.	Pre-Disaster assessment of facilities will determine disaster resilience and identify potential risks to existing facilities.	Continuing

Objective 2.2. Provide direct technical assistance to local public officials and help communities obtain funding for mitigation planning and project activities.
Strategy 2.2.1. Provide information on available mitigation funds to jurisdictions.

Lead Agency: IEMA
Supporting Agencies: IDNR, DCEO

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.2.1.1. Improve the IEMA mitigation website to provide the latest mitigation information on funding sources and planning instructions to the local jurisdictions.	General Revenue Funds	This is the most efficient method of making information available to all interested jurisdictions.	It provides information to local jurisdictions.	Continuing
Action 2.2.1.2. Following any major disaster, send a letter to the local jurisdictions explaining the mitigation assistance that is available.	General Revenue Funds	This targets the affected jurisdictions to let them know about potential mitigation assistance.	This educates the jurisdictions with potentially the highest level of interest in mitigation about available programs.	Continuing Via IEMA Press Releases.
Action 2.2.1.3. Provide presentations to local jurisdictions explaining all types of mitigation funding sources that are or might become available.	General Revenue Funds	Mitigation is not an area familiar to many people. Local jurisdictions might not be aware of the potential funds for projects that would serve their interests.	This educates jurisdictions on what tools might be available to them to minimize the risks their jurisdiction faces.	Continuing IEMA mitigation staff participate in local planning meetings upon request.

Strategy 2.2.2. Publicize and provide risk assessment products and planning services to assist local officials throughout the local mitigation planning process.

Lead Agency: IEMA
Supporting Agencies: IESMA, ISWS, ISGS, NWS, IDPH

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.2.2.1. Distribute FEMA's mitigation planning documents (State and Local Mitigation Planning how-to guides) to interested jurisdictions.	General Revenue Funds	Following FEMA guidance increases the chance of approval.	Local mitigation plans will form the foundation for future State Plans.	Continuing Since 2013, planning documents are send Electronically.
Action 2.2.2.2. Distribute IEMA's forms (Illinois Hazard Rating Process, Local Risk Assessment and Local Mitigation Projects) to any jurisdiction starting a mitigation plan.	General Revenue Funds	In order to integrate local plans into the INHMP it is important that they follow the same guidance.	Local mitigation plans will form the foundation for future State Plans.	Continuing Since 2013, IEMA's forms are send Electronically.
Action 2.2.2.3. Create an all-encompassing source of past natural hazard occurrences including impact data in Illinois for future planning efforts. **(annually)**	General Revenue Funds	A singular source of past natural hazard occurrences in Illinois will provide for a more in-depth and through risk assessment process for local jurisdictions.	A thorough and in-depth examination of past occurrences including impact data of all natural hazards will produce a more accurate risk assessment.	Continuing
Action 2.2.2.4. Conduct public health hazard risk assessments at all local health departments throughout the state.	Public Health Emergency Preparedness Grant	Public Health Departments were required to conduct a risk assessment by the end of 2012.	Conducting more in depth risk assessments at the local level will provide better insight to a wider range of hazards.	Continuing

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.2.2.5 Continue to build a database of individual structure risk assessments.	General Revenue Funds	A singular source of risk assessments for structures throughout Illinois will provide for a more in-depth and thorough risk assessment process for the state and local jurisdictions.	Individual structure risk assessments provide specific and detailed information for prioritizing buyouts and/or mitigation actions.	New

Objective 2.3. Encourage communities to develop, adopt, and implement local hazard mitigation plans.
Strategy 2.3.1. Continuously demonstrate the importance of pre-disaster mitigation planning to local public officials and promote the availability of PDM resources.

Lead Agency: IEMA
Supporting Agencies: IESMA, MCSC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.3.1.1. Send updated information on the PDM initiative to all eligible municipal and county managers, along with local planners and floodplain administrators. **(annually)**	General Revenue Funds	Local jurisdictions need to be made aware of this program. PDM is a competitive program. It is in the State's interest to attract as many applications as possible.	Any projects approved provide funds for mitigation activities in the State.	Continuing Since 2013,updated information on the PDM initiative send Electronically.
Action 2.3.1.2. Publicize Section 322 of the Disaster Mitigation Act of 2000 to local public officials in all outreach activities.	General Revenue Funds	Local public officials need to be aware of the Mitigation planning requirements to encourage them to begin work on a plan.	The local plans serve as the foundation for the State plan and make the locals eligible for mitigation funds.	Continuing
Action 2.3.1.3. Make HMGP planning grant funds available to Non-NFIP compliant counties for the development of a natural hazard mitigation plan.	Hazard Mitigation Grant Program	The availability to obtain a planning grant to develop a HMP is important for all counties in order to identify their associated risks and items to lessen their risk.	This type of planning effort will enable counties to seek assistance in the development of a HMP, which could identify their need or benefit of participating in the NFIP.	Continuing

Objective 2.4. Improve compliance with State floodplain regulations and encourage participation in the National Flood Insurance Program (NFIP).
Strategy 2.4.1. Promote NFIP compliance as a prerequisite for all communities considering hazard mitigation projects.

Lead Agency: IDNR/OWR
Supporting Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.4.1.1. Ensure that Mitigation section staff routinely identify and communicate potential compliance issues.	General Revenue Funds	The mitigation staff travels to many flood prone locations. This provides the opportunity to refer potential violations to IDNR/OWR as we work together to ensure jurisdictions are compliant with NFIP regulations.	Preventing structures from being built in harm's way is the first step in mitigation.	Continuing
Action 2.4.1.2. Ensure communities not in good standing with the NFIP understand that they will remain ineligible for any mitigation funding.	No resources required	Requiring good standing in the NFIP for mitigation funds serves as an incentive for jurisdictions to come into compliance.	Preventing structures from being built in harm's way is the first step in mitigation.	Continuing
Action 2.4.1.3 Continue to promote Flood Insurance and the NFIP Program as the cornerstone of mitigation.	No resources required	The NFIP program and flood insurance policies provide tools for homeowners and communities to mitigate their flood risks.	Preventing structures from being built in harm's way is the first step in mitigation. This educates jurisdictions on tools available to minimize the flood risk.	Continuing

Strategy 2.4.2. Encourage communities to adopt strong local floodplain regulations to reduce future flood losses.

Lead Agency: IDNR/OWR
Supporting Agencies: IEMA, IDPH, IEPA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.4.2.1. Work with IDNR/OWR to identify flood prone areas and incorporated municipalities where stronger regulations would be appropriate. **(IEMA)**	General Revenue Funds	The mitigation staff travels to many flood prone locations. This provides the opportunity to identify areas where stronger floodplain regulations can serve as an effective tool.	Preventing structures from being built in harm's way is the first step in mitigation.	Continuing
Action 2.4.2.2. Maintain awareness of new incorporations and encourage participation in the NFIP. **(IDNR/OWR)**	General Revenue Funds	Jurisdictions complying with the NFIP rules prevent structures from being built in harm's way.	Preventing structures from being built in harm's way is the first step in mitigation.	Continuing
Action 2.4.2.3. Continue to work with IDNR/OWR to conduct floodplain management and flood mitigation workshops. **(IEMA)**	General Revenue Funds	This is a long standing partnership that benefits both partners by educating the locals on flood mitigation.	Preventing structures from being built in harm's way is the first step in mitigation. This educates jurisdictions on tools available to minimize the flood risk.	Continuing
Action 2.4.2.3. Provide public education and continued enforcement of septic and sewer regulations to locations in floodplains	General Revenue Funds	Continued education and enforcement of current regulations will help to ensure continued compliance.	Public knowledge and compliance regarding septic and sewer in the flood plain will mitigation future issues.	Continuing
Action 2.4.2.4. Identify public water supply sources repeatedly affected by flooding and encourage mitigation efforts to limit losses associated with water quality.	General Revenue Funds	Water supply contamination is a continual risk during flooding events.	Identification of continually flood threatened water supply sources will assist in mitigating this risk.	Continuing

Strategy 2.4.3. Encourage participation in Community Rating System (CRS) and improve ratings of communities.

Lead Agency: IDNR/OWR
Supporting Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.4.3.1. Identify potential CRS communities and notify IDNR/OWR to encourage enrollment.	General Revenue Funds	CRS communities go beyond the minimum standards required by the NFIP. Many of these activities are mitigation based.	CRS is a mitigation tool that rewards mitigation activities.	Continuing

Strategy 2.4.4. Use new technologies such as GIS with high resolution, current topography, lidar, orthophotography and digital floodplain mapping (DFIRM) as a tool to increase flood hazard awareness and risk reduction.

Lead Agency: IDNR/OWR
Support Agencies: ISWS, ISGS, IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.4.4.1. Continue to develop digital Countywide floodplain mapping for the entire State.	CAP and CTP funds	Digital maps will improve the quality and usability of flood maps. Illinois is the only state that is doing this without consultants.	Using the best data leads to making the best decisions and digital maps will greatly increase the ease of use with GIS and HAZUS.	Continuing
Action 2.4.4.2. Use DFIRM data to identify newly mapped flood hazard areas. **(annually)**	CAP and CTP funds	Improved technologies can assist in risk assessment which enables us to better understand the risk factors.	Using the best data leads to making the best decisions.	Continuing
Action 2.4.4.3. Notify communities with new flood risks and encourage them to adopt local floodplain regulations and seek mitigation alternatives.	CAP and CTP funds	NFIP regulations are the first step in mitigating flooding.	Mitigation begins prior to construction with appropriate land use.	Continuing
Action 2.4.4.4. Encourage and assist communities to develop GIS parcel maps and DFIRMs to identify at-risk properties in flood hazard areas.	CAP and CTP funds	Improved technologies can assist in risk assessment which enables us to better understand the risk factors.	Using the best data leads to making the best decisions.	Continuing
Action 2.4.4.5. Work with communities with identified flood risks to establish flood gauging and early warning systems.	CAP and CTP funds	Improved data can assist in risk assessment which enables a better response.	Using the best data leads to making the best decisions.	Continuing
Action 2.4.4.6. Incorporate the RiskMAP program into mitigation project and planning efforts.	CTP	The use of RiskMAP's products together with local knowledge will provide for increased identification of possible mitigation efforts at the local level.	The information provided through the RiskMAP program will highlight specific hazard areas within a jurisdiction, prompting mitigation efforts to limit or eliminate the impact.	Continuing

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.4.4.7. ISGS coordinates the acquisition, quality assurance review, and on-line distribution of airborne LiDAR data collections for counties within the State.	Illinois Height Modernization Program (ILHMP); project-driven state and federal projects.	Current, high-resolution airborne LiDAR data is important for flood simulation models and flood hazard mapping.	Provides detailed topographic data for ISWS and IDRN/OWR flood hazard mapping.	New

Strategy 2.4.5. S**upport the Illinois Association for Floodplain and Stormwater Managers (IAFSM) programs, including education and communication.**

Lead Agency: IDNR/OWR
Supporting Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.4.5.1. Support IAFSM administration of the Certified Floodplain Manager (CFM) program. **(IDNR/OWR)**	General Revenue Funds	This is a method of professionalizing floodplain management.	Professional development improves the execution of floodplain management.	Continuing
Action 2.4.5.2. Support and submit information to the IAFSM newsletter for communication.	General Revenue Funds	The IAFSM newsletter reaches a target audience of people interested in floodplain issues. This is a free way to educate people that execute policies.	This provides information on mitigation to interested parties.	Continuing
Action 2.4.5.3. Coordinate education activities with IAFSM.	General Revenue Funds	IAFSM is a valuable partner for reaching a target audience interested in floodplain issues.	This provides information on mitigation to interested parties.	Continuing

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.4.5.4. Support annual IAFSM conference. **(annually)**	General Revenue Funds	The conference provides an opportunity to convey best practices and network.	This provides information on mitigation to interested parties.	Continuing
Action 2.4.5.5. Ensure IAFSM Board membership participation in the States Hazard Mitigation Planning Meetings.**(annually)**	No Funds Required	IAFSM representation is required at the State Hazard Mitigation Plan meetings to ensure consistency with planning efforts.	IAFSM board membership representation will ensure that no duplication of services or planning is taking place.	Continuing

Strategy 2.4.6. Ensure that all State funded or State promoted activities are consistent with sound floodplain management principles.

Lead Agency: IDNR/OWR
Supporting Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.4.6.1. Encourage compliance with the new Executive Order on Floodplain Management (EO4). **(IDNR/OWR)**	General Revenue Funds /CAP	The new Executive Order reflects the current floodplain laws, but is only worthwhile if it is enforced.	As an Executive Order it provides a law that all the State agencies must follow on floodplain management.	Continuing
Action 2.4.6.2. Work with other state agencies to identify flood risks and develop a method that minimizes potential flood losses.	General Revenue Funds	EO4 has prohibited State construction in the floodplain for 25 years. There might be some existing State structures in the floodplain. We must identify them and then decide the appropriate mitigation action.	State facilities serve the public; therefore, to ensure continuity of service we need to minimize the risks from hazards.	Continuing

Strategy 2.4.7. Assure minimum flood protection standards are met and promote higher floodplain management standards in all jurisdictions.

Lead Agency: IDNR/OWR
Supporting Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.4.7.1. Update and distribute model Flood Damage Prevention Ordinance. **(IDNR/OWR)**	CAP funds	This assists jurisdictions in utilizing the best ordinance possible.	Mitigation begins prior to construction with appropriate land use.	Continuing
Action 2.4.7.2. Develop and maintain community floodplain management information database. **(IDNR/OWR)**	CAP funds	This assists the State in identifying jurisdictions that need assistance in managing the floodplain.	Mitigation begins prior to construction with appropriate land use.	Continuing
Action 2.4.7.3 Create a database of all levees in the State. Updated annually	General Revenue Funds	The State is currently developing this database to provide a better understanding of what areas are protected by levees in the State.	Identifying levees improves the State's understanding of flood control and potential flood damage.	Completed
Action 2.4.7.4. Identify areas of residual risk from flooding	General Revenue Funds	Areas behind levees and dams give people a false sense of security. Many are not identified on flood maps.	Citizens located in areas of residual risk may be unaware of their real risk and not take proper precautions or mitigation steps.	Continuing
Action 2.4.7.5. Develop state incentives for minimum compliance and for higher floodplain management standards.	CAP funds	The model ordinance provides a minimum standard; mitigation can be furthered by adopting more stringent regulations.	Incentives would cause greater compliance by giving locals a reason to make mitigation a higher priority.	Continuing

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.4.7.6. Develop and conduct workshops for local officials regarding flood protection standards.	CAP funds	Workshops will provide local officials in-depth information regarding minimum flood protection standards.	Understanding flood protection standards will facility compliance by participating local jurisdictions.	New
Action 2.4.7.7. Conduct community audits to ensure compliance with minimum flood standards.	CAP Funds	Audits ensure that proper standards are being met regarding the flood standards.	Jurisdictions will attempt to remain compliant with current flood standards if audits will be complete to review compliance.	New

Objective 2.5. To assist jurisdictions in developing mitigation projects and identifying funding for cost-beneficial mitigation projects.
Strategy 2.5.1. Identify and assess repetitive loss properties for possible projects.

Lead Agency: IDNR
Supporting Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.5.1.1. Verify repetitive loss database.	CAP funds potentially HMGP funds	The repetitive loss database has errors. We need to work with correct data.	Acquiring repetitive loss properties is one of the State's highest priorities.	Continuing
Action 2.5.1.2. Collect digital pictures of rep loss properties.	CAP funds potentially HMGP funds	This is part of the process of building a data base on repetitive loss properties. They can also be used for future success stories.	Acquiring repetitive loss properties is one of the State's highest priorities.	Continuing
Action 2.5.1.3. Gather GPS latitude/longitude coordinates and first floor elevations of repetitive loss properties.	CAP funds potentially HMGP funds	This is the most important part of the process of building a data base on repetitive loss properties. They can be used for B/C's and success stories.	Acquiring repetitive loss properties is one of the State's highest priorities. The best data leads to the best decisions.	Continuing
Action 2.5.1.4. Take field inspection comments on repetitive loss properties.	CAP funds potentially HMGP funds	This is part of the process of building a data base on repetitive loss properties. They can also be used for future success stories.	Acquiring repetitive loss properties is one of the State's highest priorities.	Continuing

Strategy 2.5.2. When available, allocate federal and state grant funding to local governments (or other eligible recipient) for the purposes of developing local mitigation plans.

Lead Agency: IEMA
Supporting Agencies: IDNR, DCEO

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.5.2.1. Provide federal HMA Planning Grants to communities willing to provide a 25% local match, and based upon established criteria.	HMA Funds	Many jurisdictions do not have the resources available to develop a plan. The State wants as many local jurisdictions as possible to be covered by mitigation plans.	The local plans serve as the foundation for the INHMP and make the locals eligible for mitigation funds.	Continuing
Action 2.5.2.2. Coordinate with other State and Federal Agencies to assist communities with obtaining assistance for the 25% local match, when available and meets regulations.	State and Federal Grant Funds	Many jurisdictions do not have the local resources available to provide a 25% local cost match.	If cost match assistance is available, local resources will not be over taxed, resulting in more mitigation actions.	Continuing Since 2013, global match was part of DR 1935.
Action 2.5.2.3. Facilitate partnerships between benevolent/faith based groups and local jurisdictions to provide assistance for 25% local match, when available and meets regulations.	General Revenue Funds	Many benevolent/faith based groups provide funding opportunities for community assistance.	Assisting local jurisdictions become engaged with these organizations may provide funding assistance, not previously explored.	Continuing Since 2013, Local Regional Planning Commissions implemented reach out programs.

Strategy 2.5.3. When available, allocate federal and state grant funding to local governments (or other eligible recipient) for the purposes of implementing eligible hazard mitigation projects using adopted plans as guides.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.5.3.1. Provide federal Flood Mitigation Assistance (FMA), Pre-Disaster Mitigation (PDM), and Project Grants to communities willing to contribute the non-federal cost match and with an adopted and federally approved local mitigation plan, and based upon criteria established through a competitive grant cycle. **(annually)**	FMA, PDM	The State wants to maximize the Federal dollars available to assist local jurisdictions in implementing hazard mitigation projects. Very few jurisdictions have the funds to finance mitigation projects on their own.	The highest priority mitigation projects for the State are the acquisition of substantially damaged structures and repetitive loss properties. These are expensive projects and Federal funds greatly expand the amount of work that can be accomplished.	Continuing Since 2013, $3,725,839.14 was awarded for PDM and $7,400,665.82 for FMA projects.
Action 2.5.3.2. Provide federal Hazard Mitigation Grant Program (HMGP) Project Grants to communities, who are completing within one year an adopted and federally approved local mitigation plan or currently have such an existing plan, based upon established criteria. **(In the event of a Federal Disaster)**	HMGP	The State wants to maximize the Federal dollars available to assist local jurisdictions in implementing hazard mitigation projects. Very few jurisdictions have the funds to finance mitigation projects on their own.	The highest priority mitigation projects for the State are the acquisition of substantially damaged structures and repetitive loss properties. These are expensive projects and Federal funds greatly expand the amount of work that can be accomplished.	Continuing Since 2013, 37 HMGP grants were awarded.

Objective 2.6. Continuously demonstrate and capitalize upon the connection between hazard mitigation and sustainable development.
Strategy 2.6.1. Actively participate in all State-level sustainable development initiatives.

Lead Agency: MCSC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.6.1.1. Establish two-way links between the Mitigation Section's website and those of other State agencies or other groups that promote sustainable development.	General Revenue Funds	This is a free way to promote the ideas of sustainable development, which overlap with the ideas of mitigation.	This distributes mitigation ideas and reinforces them with the concept of sustainable development.	Continuing

Strategy 2.6.2. Coordinate with non-profit organizations that are responsible for promoting and/or implementing sustainable development or "smart growth" initiatives.

Lead Agency: MCSC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.6.2.1. Identify all non-profit organizations that are responsible for promoting and/or implementing sustainable development or "smart growth" initiatives.	General Revenue Funds	The mitigation staff is always looking for other entities that share our mission to develop partnerships.	Limited mitigation resources make building partnerships essential.	Continuing
Action 2.6.2.2. Identify specific opportunities for future collaboration and/or partnerships and develop methods to ensure continued coordination.	General Revenue Funds	The potential partnerships can be strengthened by sharing projects that serve our common interests.	Limited mitigation resources make building partnerships essential.	Continuing

Strategy 2.6.3. Ensure that hazard mitigation is recognized in any state-level programs or proposed legislation packages that target "smart growth" or sustainable development practices.

Lead Agency: MCSC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.6.3.1. Work to amend the "smart growth" legislation to include hazard mitigation.	General Revenue Funds	There is "smart growth" legislation that has been approved but that did not include mitigation as a factor.	Inclusion would help institutionalize mitigation as a factor in smart growth.	Continuing

Strategy 2.6.4. Work in coordination with other organizations to acquire and connect hazard-prone or environmentally sensitive lands throughout the State.

Lead Agency: IDNR/OWR
Supporting Agencies: MCSC, IEPA, IDOT, IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 2.6.4.1. Work in developing and maintaining a database on all protected lands, identifying possible partners in the acquisition and maintenance of hazard prone lands contiguous to protected lands. **(MCSC)**	General Revenue Funds	Partnerships can be developed that serve common interests. Identifying the protected lands will help to identify organizations with common interests and put acquired properties to the best use.	The acquisition of substantially damaged and repetitive loss properties is a State priority. The State is always looking for organizations that can contribute matching funds and potentially maintain acquired properties. Assistance in maintenance makes projects more attractive to locals.	Continuing
Action 2.6.4.2. Use IDNR/OWR Flood Mitigation Assistance Program funds to acquire flood prone property.	Illinois Flood Mitigation Program	The State allocates funds to acquire flood prone properties. These funds are frequently used to provide the local match.	The acquisition of substantially damaged and repetitive loss properties is a State priority. Many jurisdictions would be unable to participate without using these funds for matching funds.	Continuing

Objective 2.7. Improve the disaster resistance of buildings, structures, and infrastructure whether new construction, expansion or renovation.
Strategy 2.7.1. Utilize disaster related impact and response information, to determine potential mitigation project locations.

Lead Agency: IEMA
Supporting Agencies: IDOT, IDOC, IDNR, ARC

Actions	Projected Resources	Rationale for Action	How Action Contribute to Mitigation Strategy	Update Status (2018)
Action 2.7.1.1. Use Public Assistance (PA) costs to identify locations which experience continual infrastructural damage.	General Revenue Funds	Identifying locations within the State that continually experience infrastructural damage will assist in finding possible mitigation projects.	Mitigating locations that continually experience infrastructural damage will lessen the amount of public assistance funding required.	Continuing Since 2013, $570,609.24 awarded under PA.
Action 2.7.1.2. Provide hazard mitigation presentations regarding application process and grant funding requirements for local officials directly following a Disaster (DR).	General Revenue Funds	Providing hazard mitigation support directly following a disaster will develop increased interested and support from the local jurisdiction.	Directly following a disaster, officials will be more likely and eager to conduct mitigation actions in their jurisdiction to limit the impact of future disasters.	Continuing Standard IEMA operating procedure to reach out following a DR.

Strategy 2.7.2. Develop partnerships with private and public sector organizations to promote and implement mitigation planning efforts and improvement of disaster resistance of buildings.

Lead Agency: IEMA
Supporting Agencies: CDB, ICC, ISBE, IDHS, DCEO, IHPA

Actions	Projected Resources	Rationale for Action	How Action Contribute to Mitigation Strategy	Update Status (2018)
Action 2.7.2.1. Involve the Association of Illinois Electrical Cooperatives (AIEC) and Illinois Municipal Electric Association (IMEA) in mitigation planning efforts and studies.	General Revenue Funds	Electrical Cooperatives in Illinois may be a large portion of Public Assistance funds claimed.	Assisting electrical cooperatives in identifying potential hazards and possible solutions could help mitigate future losses.	Continuing Since 2013, AIEC and IMEA participate in the LHMP development.
Action 2.7.2.2. Engage private sector business to promote disaster resistant building and retro fitting of existing buildings in Illinois.	Private Sector Funds	Private sector business provides many vital services to the citizens of Illinois.	Obtaining buy in from private sector businesses could ensure vital services remain functional following a disaster.	Continuing Since 2013, IEMA and CDB encourage adopting new building codes.
Action 2.7.2.3. Coordinate with Non-profit groups that provide services of a governmental nature, to address mitigation efforts with in their organization.	General Revenue Funds	Non-profit groups provide vital services to Illinois and constitute an additional portion of Public Assistance claims.	Obtaining buy in from private non-profit groups could ensure vital services remain functional following a disaster.	Continuing Since 2013, more efforts by county officials to work with non – profit groups to develop LHMP.
Action 2.7.2.4. Encourage higher education institutions to complete campus specific mitigation plans and risk assessments.	General Revenue Funds	Higher education institutions have a number of buildings on their campuses that house a number of students.	These institutions incorporate a large population of students. Proper planning is necessary to mitigation potential hazards.	Continuing Since 2013, ISU was awarded the planning grant.
Action 2.7.2.5. Encourage private or parochial schools to complete campus specific mitigation plans and risk assessments.	General Revenue Funds	Private or parochial schools have the same risk to hazards as the public counter parts.	Proper planning and risk assessment knowledge is necessary to mitigation hazards	Continuing

Actions	Projected Resources	Rationale for Action	How Action Contribute to Mitigation Strategy	Update Status (2018)
Action 2.7.2.6. Attempt to incorporate Code Plus construction into state facility, future historic site, and future school facility construction of new or existing structures.	General Funds HMGP Funds	New construction or renovation projects of state facilities provide for a good opportunity to improve the resiliency of the structure.	Code Plus construction on state facilities will assist in mitigating future loss of life and property.	Continuing Since 2013, IEMA and CDB encourage adopting new building codes.

Strategy 2.7.3. Continue to evaluation mitigation measures and projects for state agencies and facilities.

Lead Agency: IEMA
Supporting Agency: INHMPC

Actions	Projected Resources	Rationale for Action	How Action Contribute to Mitigation Strategy	Update Status (2018)
Action 2.7.3.1. Review the risk assessment to determine potential mitigation projects for state facilities. **(annually)**	General Revenue	Identifying mitigation projects for state facilities will decrease the impact of natural disasters on the state.	Lower the impact of natural disasters on state facilities and agencies.	Continuing Since 2013, CMS is updating a database on state critical facilities.
Action 2.7.3.2. Develop a prioritized mitigation project list for state facilities, focusing on critical facilities. **(annually)**	General Revenue	A prioritized mitigation project list will assist with identifying projects when funding becomes available.	A list will provide a continuing focus on state mitigation projects.	Continuing Since 2013, CMS is updating a database on state critical facilities.
Action 2.7.3.3. Utilize past disaster intelligence information to identify possible mitigation projects for state critical and essential facilities. **(annually)**	General Revenue	Identifying past state facilities that have been affected by natural hazards will assist with identifying mitigation projects to limit future impact.	Lower the impact of natural disasters on state facilities and agencies.	Continuing Since 2013, CMS is updating a database on state critical facilities.

GOAL 3. Improve coordination and communication with other relevant entities.

Objective 3.1. Establish and maintain lasting partnerships.
Strategy 3.1.1. Develop a partnership and coordinate mitigation ideas and policies with Illinois Mitigation Advisory Group (IMAG) and its subcommittee.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 3.1.1.1. Plan and host an annual IMAG meeting. **(annually)**	General Revenue Funds	An annual meeting keeps agencies with a peripheral interest in mitigation involved.	Mitigation needs to be reinforced as a tool available to other State agencies. Limited mitigation resources make building partnerships essential.	Continuing Since 2013, IEMA, DNR and ISWS meet on regular basis. Last meeting was on June 5, 2018.
Action 3.1.1.2. Participate with and use resources such as the Central United States Earthquake Consortium (CUSEC), the Federal Alliance Safe Housing (FLASH), and Institute of Building and Home Safety (IBHS).	General Revenue Funds	These are organizations with a mission of mitigating hazards. We can use their expertise to further our mission of promoting mitigation.	Working with other organizations makes additional resources available.	Continuing Since 2013, SIU awarded a 2015 grant on earth quake studies.

Strategy 3.1.2. Distribute Illinois publications to State Hazard Mitigation Officers and State Emergency Management Directors.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 3.1.2.1. IEMA mitigation staff will share new publications with others.	General Revenue Funds	The states work together to further mitigation. We share our publications with them and they share their publications with us.	Limited mitigation resources make building partnerships essential.	Continuing Since 2013, IEMA maintains a website and share mitigation resources.

Objective 3.2. Streamline policies to eliminate conflicts and duplication of effort.
Strategy 3.2.1. Develop knowledge of other State programs.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 3.2.1.1. Continue with IMAG and MCSC.	General Revenue Funds	IMAG and IMAG-SC provide opportunities for representatives of State agencies to coordinate efforts and maximize resources.	Limited mitigation resources make building partnerships essential.	Continuing

Strategy 3.2.2. Coordinate efforts with other agencies to ensure National Environmental Policy Act (NEPA) compliance.

Lead Agency: IEMA
Supporting Agencies: IEPA, IDNR

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 3.2.2.1. Prior to submission of application to FEMA, according to Notice of Funding Opportunity, advising letters will be sent to the consulting agencies.	General Revenue Funds	Letters advising consulting agencies on potential projects is the first step in the required NEPA process.	NEPA compliance is a prerequisite for FEMA approval and the process produces better projects.	Continuing SHMO reaches out to local profit/non-profit organizations before and after FEMA NOFO.
Action 3.2.2.2. All of the consulting agencies will be called to review all active projects to ensure that they are still in compliance. **(annually)**	General Revenue Funds	FEMA has advised us that the consulting agencies need to be consulted once a year to ensure projects remain in compliance.	NEPA compliance is a prerequisite for FEMA approval and the process produces better projects.	Continuing

Objective 3.3. Incorporate hazard mitigation into the activities of other organizations.
Strategy 3.3.1. Educate organizations on the theory and practice of hazard mitigation and help them to identify how mitigation can become incorporated into their own routine functions or activities.

Lead Agency: IEMA
Supporting Agency: INHMPC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 3.3.1.1. Provide mitigation programs for interested groups.	General Revenue Funds ARC funds HMGP project funds	Each Red Cross chapter has a mitigation requirement. HMGP funds are being provided to the Red Cross for disaster resistant construction outreach.	Limited mitigation resources make building partnerships essential. This educates the public on tools available to them to minimize the risks to which they are exposed.	Completed
Action 3.3.1.2. Survey state facilities to determine the presence of a NOAA weather alert radio and severe weather response plans. Provide information about NOAA radios and seek funding sources to obtain weather radios for facilities lacking them.	HMGP Funding	Weather radios area cost-effective ways of alerting facilities of dangerous weather conditions.	Response plans and early dangerous weather alerts will safeguard state employees working in these facilities.	Continuing
Action 3.3.1.3. Develop an Economic Recovery Framework to help businesses recover following a disaster.	CDBG Funding	An increased understanding of how significantly job loss and business failure impacts community recovery.	Increasing disaster preparedness and limiting business failure following a disaster will provide economic stability.	Continuing
Action 3.3.1.4. Target business –related mitigation materials to vulnerable areas.	CDBG Funding	Businesses are excellent and important partners in community mitigation efforts.	Business participation in mitigation activities will reduce future loss and build strong partnerships.	Continuing

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 3.3.1.5. Share instructions for mitigation techniques for storage of historic artifacts and documents being stored in below grade locations such as basements.	General Revenue Funds	The State Historical Society and the Illinois State Archives have technical expertise in proper storage of historical artifacts and documents. Their guidance will assist not only state agencies, but could be passed to local jurisdictions.	Many historic artifacts and documents are irreplaceable or extremely costly to repair. Developing proper storage techniques will limit potential loss of these items.	Continuing

Strategy 3.3.2. Assist other state agencies in identifying structures located in hazardous areas.

Lead Agency: IEMA
Supporting Agencies: IDNR/OWR, CMS, IDOT, IDOC, IDPH, IEPA, ICC, DCEO

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 3.3.2.1. Work with IHPA to identify elevations of historic structures in the floodplain or Mercalli zone 8 or above and evaluate and fund mitigation activities.	General Revenue Funds	GIS and HAZUS-MH allow us to efficiently identify at risk properties and we can then decide the appropriate mitigation action.	Historic structures are important to the fabric of life. Part of preservation is minimizing the risks from hazards. This will be part of the updated INHMP.	Continuing
Action 3.3.2.2. Work with CMS to identify the elevations of state owned/operated facilities in the floodplain or Mercalli zone 8 or above and evaluate and fund mitigation activities.	General Revenue Funds	GIS and HAZUS-MH allow us to efficiently identify at risk properties and we can then decide the appropriate mitigation action.	State facilities serve the public and to ensure continuity of service we need to minimize the risks from hazards. This will be part of the updated INHMP.	Continuing
Action 3.3.2.3. Provide workshops on wind refuge areas for local ESDA/EMA staff, CMS building managers and university safety officers.	General Revenue Funds	In the course of developing the Plan we discovered that no one is providing this training. The risk of tornadoes makes this important for public safety. The ESDAs/EMAs could advise anyone interested at a local level.	This is an educational program that works with partners to educate them on appropriate mitigation measures.	Unchanged Staffing and Funding
Action 3.3.2.4. Make presentations on the importance of and available funding for hazard resistant construction to Park District Associations.	General Revenue Funds	The lack of structures makes people in parks especially vulnerable to natural hazards. We need to ensure that the available shelters are disaster resistant.	This is an educational program that works with partners to educate them on methods to protect vulnerable populations.	Continuing
Action 3.3.2.5. Create and maintain a tracking system for all Privately Owned Wastewater Treatment Systems.	General Revenue Funds	This ensures that information on all existing systems is collected and all future maintenance actions are tracked.	This will aid in determining the status of these systems following a flood event.	Continuing

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 3.3.2.6. Perform hazard mitigation reviews for electric, natural gas, and water utility construction projects.	General Revenue Funds Department of Energy Funds	Reviews and approvals of electric, natural gas, and water utility construction projects should include a determination of floodplain impacts and mitigation.	Conducting hazard mitigation reviews prior to construction will assist in limiting future impacts from hazards.	Continuing
Action 3.3.2.7. Survey State Historic Sites to determine shelter locations and availability for visitors and staff.	HMGP Funds General Revenue Funds	Proper shelter locations should be located in the event of a natural hazard for all visitors at a State Historic site. If one is not available, possible funding should be explored to construct a suitable shelter.	State Historic Sites attract thousands of visitors annually. In order to ensure life and property safety; shelters should be located on said locations.	Continuing

Objective 3.4. Leverage resources and expertise that will further hazard mitigation efforts.
Strategy 3.4.1. Develop and track joint mitigation/conservation projects with IDNR, DCEO, DOA, land trusts and environmental groups.

Lead Agency: IEMA
Supporting Agencies: IDNR/OWR, DCEO

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 3.4.1.1. Develop an online resource guide that identifies other sources for funds or advice on mitigation.	General Revenue Funds	Mitigation resources need to be compiled in one location so no resources are overlooked.	This educates local jurisdictions on mitigation partners and their resources. By identifying other resources it increases the possibility of mitigation projects.	Continuing
Action 3.4.1.2. Keep data on acquired properties up to date.	General Revenue Funds	To ensure deed restrictions are being enforced, we need to know where every property is located. GIS coding is required in applications	Lack of enforcement of deed restrictions would undermine the acquisition program.	Continuing
Action 3.4.1.3. Maintain and improve the "Local Mitigation Action Item Database" to track local mitigation plan actions and associated projects.	General Revenue Funds HMGP Funds	Provides basis for a continued review and update of local mitigation plans. It also will assist with the coordination between the State HMP is in line with local mitigation actions.	Identification of mitigation action items that are successfully implemented will provide better examples of how to implement.	Continuing

GOAL 4. Increase public understanding, support, education and demand for hazard mitigation planning and projects; to protect public services, utilities and critical facilities from potential damage from natural hazard events.

Objective 4.1. Identify hazard-specific issues and needs.
Strategy 4.1.1. Coordinate with key local officials to determine local issues and concerns as well as local, state and federal actions previously taken.

Lead Agency: IEMA
Supporting Agency: INHMPC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.1.1.1. Attend and make presentations at the annual IEMA and IESMA conferences.	General Revenue Funds	This is a free way to present mitigation ideas to an audience interested in mitigation.	By involving local coordinators it builds the team that is working on mitigation and increases the chance of mitigation ideas being applied as a solution.	Continuing Since 2013, IEMA holds annual training summit.
Action 4.1.1.2. Hold meetings with Key Elected Officials, as requested.	General Revenue Funds	This is a method to explain in detail the benefits of mitigation to people in a position to promote projects.	This educates people on the risks they face and the proper techniques to mitigate the risks.	Continuing
Action 4.1.1.3. Attend additional professional conferences to make presentations regarding mitigation and funding availability.	General Revenue Funds	Attending a variety of different professional conferences will provide mitigation information to a broader base of individuals.	Dependent on the type of mitigation project, different local agencies may take the lead regarding the project. By involving a broader base of individuals will increase the awareness of local officials.	Continuing

Objective 4.2. Heighten public awareness of natural hazards.
Strategy 4.2.1. Use the IEMA website to inform the public about natural hazards.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.2.1.1. Develop "History of Natural Disasters in Illinois" page for website.	General Revenue Funds	This can serve as a resource for jurisdictions working on their plan, for students working on papers, and for interested members of the public.	This assists in the development of plans and provides a tool for educating the public. It also saves mitigation resources by making the information easily accessible.	Continuing
Action 4.2.1.2. Post hazard maps, including the Mercalli index on the website.	General Revenue Funds	This can serve as a resource for jurisdictions working on their plan, for students working on papers, and for interested members of the public.	This assists in the development of plans and provides a tool for educating the public. It also saves mitigation resources by making the information easily accessible.	Continuing Staffing Limitations
Action 4.2.1.3. Continue to improve and update the website.	General Revenue Funds	This can serve as a resource for jurisdictions working on their plan, for students working on papers, and for interested members of the public. It publicizes success stories.	This assists in the development of plans and provides a tool for educating the public. It also saves mitigation resources by making the information easily accessible.	Continuing
Action 4.2.1.4. Use the IEMA website to draw attention to the potential problem of using basements for storage in homes and public facilities.	General Revenue Funds	This is a method of educating the public on a widespread hazard.	This advises the public on mitigation tools to minimize risk.	Continuing Staffing Limitations

Strategy 4.2.2. Launch or participate in awareness campaigns and special events.

Lead Agency: IEMA
Supporting Agency: NWS

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.2.2.1. Participate in Severe Winter Storms Awareness Week. **(annually)**	General Revenue Funds	This is a method to partner with media outlets to educate the public on risks and how to mitigate them.	This educates the public on risks and the tools to mitigate the risks.	Continuing
Action 4.2.2.2. Participate in Tornado Awareness Week. **(annually)**	General Revenue Funds	This is a method to partner with media outlets to educate the public on risks and how to mitigate them.	This educates the public on risks and the tools to mitigate the risks.	Continuing
Action 4.2.2.3. Participate in Earthquake Awareness Week. **(annually)**	General Revenue Funds	This is a method to partner with media outlets to educate the public on risks and how to mitigate them.	This educates the public on risks and the tools to mitigate the risks.	Continuing
Action 4.2.2.4. Participate in Lightning Safety Awareness Week. **(annually)**	General Revenue Funds	This is a method to partner with media outlets to educate the public on risks and how to mitigate them.	This educates the public on risks and the tools to mitigate the risks.	Continuing
Action 4.2.2.5. Work with the IEMA PIO to maintain other natural disaster Awareness Weeks.	General Revenue Funds	Not all hazards have awareness weeks. In order educate the public on risks not highlighted by other groups.	This educates the public on risks and the tools to mitigate the risks.	Continuing
Action 4.2.2.6. Work with libraries and/or bookstores to develop and promote a list of recommended books.	General Revenue Funds	This could work in conjunction with the awareness weeks to draw attention to natural hazards. In libraries it could be linked with mitigation information.	This educates the public on risks and the tools to mitigate the risks.	Continuing
Action 4.2.2.7. Promote the National Weather Service (NWS) Storm Ready Program**.**	General Revenue Funds	This program promotes safety from severe weather. It is essentially a mitigation program.	This educates the public on risks and the tools to mitigate the risks. This is a worthwhile program that needs promotion.	Continuing

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.2.2.8. Promote the National Weather Service (NWS) Weather Ready Nation (WRN) Ambassador Program	General Revenue Funds	WRN Ambassadors help to strengthen national resilience against extreme weather. The program helps to unify the efforts across government, non-profits, academia, and private industry toward making the nation more ready, responsive, and resilient against extreme environmental hazards.	This program uses many NWS partners in government and private sectors to educate the public about environmental hazards and which tools are available to mitigate the risks.	New

Strategy 4.2.3. Publicize and encourage the use of warning systems.

Lead Agency: IEMA
Supporting Agency: NWS

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.3.1.1. Attend public meetings to discuss mitigation programs.	General Revenue Funds	This is an opportunity to explain in detail the benefits of mitigation to people in a position to participate in projects.	This educates people on the risks they face and the proper techniques to mitigate the risks.	Continuing
Action 4.3.1.2. Ensure mitigation is represented in the Joint Field Offices (JFOs).	General Revenue Funds	People affected by disaster are the most likely to take steps to ensure they avoid future losses.	This educates people on the risks they face and the proper techniques to mitigate the risks.	Continuing
Action 4.3.1.3. Organize wind-resistant construction and/or safe room workshops in the aftermath of tornadoes.	General Revenue Funds	People affected by disaster are the most likely to take steps to ensure they avoid future losses.	This educates people on the risks they face and the proper techniques to mitigate the risks.	Unchanged Staffing and Funding Limitations

Strategy 4.3.2. Establish methods for outreach.

Lead Agency: MCSC
Supporting Agencies: IEMA, ARC, IAFSM

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.3.2.1. Assemble a comprehensive list of potential methods for outreach.	General Revenue Funds	A list of outreach methods will make certain we maximize our outreach efforts.	To reach the largest audience and to repeat the message, we need to utilize as many outreach methods as possible.	Continuing
Action 4.3.2.2. Determine appropriateness, cost-effectiveness and timeliness of each option.	General Revenue Funds	Limited resources increase the importance of finding the most cost effective outreach methods.	To reach the largest audience and to repeat the message, we need to utilize as many outreach methods as possible.	Unchanged Staffing and Funding Limitations
Action 4.3.2.3. Consider appropriate media usage (print media, electronic media, direct mail, outdoor media, supplementary media and news media).	General Revenue Funds	Limited resources increase the importance of finding the most cost effective outreach methods.	To reach the largest audience and to repeat the message, we need to utilize as many outreach methods as possible.	Unchanged Staffing and Funding Limitations
Action 4.3.2.4. Utilize public access channels to show mitigation videos.	General Revenue Funds	By using mitigation videos already created, this is a free way to reach the public with extended messages.	To reach the largest audience and to repeat the message, we need to utilize as many outreach methods as possible.	Unchanged Staffing and Funding limitations
Action 4.3.2.5. Provide grant funds to the Illinois Association for Floodplain and Stormwater Management to develop and maintain an interactive flood mitigation website that identifies mitigation activities to minimize flood damage.	HMGP 5% funds IASFM matching	The web is increasingly where people go to find information. This would use IASFM expertise to make sure the information is correct.	This educates people on the risks they face and the proper techniques to mitigate the risks.	Continuing

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.3.2.6. Present information and techniques at home improvement retail stores (Lowe's, Home Depot, Menards, etc.). (**American Red Cross)**	HMGP 5% funds American Red Cross matching	People go to home improvement stores to learn how to upgrade their homes. They benefit by selling mitigation products, we benefit by making them easily accessible to the public.	This educates people on the risks they face and the proper techniques to mitigate the risks. This increases the audience size.	Unchanged Staffing and Funding Limitations
Action 4.3.2.7. Provide focused hazard mitigation information to counties and municipalities based on the greatest identified risks.	General Revenue Funds	Providing a focused approach to the dissemination of hazard mitigation information will provide for a more direct approach to identifying potential mitigation projects.	Educating local jurisdictions regarding their greatest risks will assist in providing a focused approach to identifying potential mitigation techniques and increase accountability.	Continuing

Strategy 4.3.3. Increase the public's exposure to hazard mitigation issues.

Lead Agency: IEMA
Supporting Agency: ARC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.3.3.1. Develop a magazine style publication for distribution that provides information on mitigating natural hazards.	HMGP 5% funds	Mitigation needs to be put into different packages to attract different audiences. This publication could be sent to libraries or given away at the State Fair.	This educates people on the risks they face and the proper techniques to mitigate the risks.	Unchanged Staffing and Funding Limitations
Action 4.3.3.2. Develop mitigation public service announcements (PSAs) for distribution.	General Revenue Funds	This is a relatively low cost way of presenting the mitigation message to the public.	This educates people on the risks they face and the proper techniques to mitigate the risks.	Continuing
Action 4.3.3.3. Ensure mitigation is represented in the Illinois tent at the State Fair. **(annually)**	General Revenue Funds	This is a low cost way of promoting mitigation to a new audience and questions can be answered in an informal setting.	This educates people on the risks they face and the proper techniques to mitigate the risks.	Continuing Dependent on staff availability
Action 4.3.3.4. Provide materials to the State Library to ensure information on mitigation is available to the public.	General Revenue Funds HMGP 5% funds	It is important to make mitigation information available to the public. Many people prefer libraries to the internet.	This educates people on the risks they face and the proper techniques to mitigate the risks. It increases the mitigation audience.	Continuing

Strategy 4.3.4. Execute delivery.

Lead Agency: IEMA
Supporting Agencies: IDPH, DCEO

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.3.4.1. Provide low income citizens with energy assistance for extreme heat and extreme cold. **(DCEO)**	General Revenue Funds	Low income citizens lack the financial resources to pay for the utilities needed to prevent the weather from aggravating health conditions.	Heat waves are the deadliest natural disaster and can be mitigated by providing relief from the heat.	Continuing
Action 4.3.4.2. Provide information to the public on methods to minimize effects of extreme heat or cold. The programs are "Keep Cool Illinois" and "Keep Warm Illinois". **(IDPH)**	General Revenue Funds	The public needs to be aware of options they have to avoid the dangers of extreme temperatures.	Heat waves are the deadliest natural disaster and can be mitigated by providing relief from the heat. Cold weather can also be extremely dangerous.	Complete
Action 4.3.4.3. Develop web based publications regarding mitigation methods, utilizing an all hazards approach.	General Revenue & HMGP funds	The public needs to be aware of options they have to avoid the dangers of all identified hazards.	To reach the largest audience and to repeat the message, we need to utilize as many outreach methods as possible.	Continuing

Objective 4.4. Educate the public on the benefits of mitigation measures.
Strategy 4.4.1. To utilize different methods to deliver the mitigation message to the public.

Lead Agency: IEMA
Support Agencies: ISWS, IFSM

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.4.1.1. Continue to develop success stories for the FEMA website. Provide a link from the IEMA website.	General Revenue Funds	By promoting positive mitigation on the FEMA web site we can educate the public on how mitigation works.	By understanding the positive ramifications of mitigation, the public and public officials are more likely to support it.	Continuing
Action 4.4.1.2. Provide information to any media reporting on past disasters and mitigation in the aftermath of a disaster. **(in the event of a disaster)**	General Revenue Funds	Interest is highest in mitigation following a disaster and on the anniversaries of disasters. This is an opportunity to reach the public with a mitigation message.	By understanding the positive ramifications of mitigation, the public and public officials are more likely to support it.	Continuing
Action 4.4.1.3. Work with IAFSM to conduct flood proofing workshops. **(annually)**	CAP funds	These are proven tools for meeting the public and discussing their individual situations with them.	This educates people on the risks they face and the proper techniques to mitigate the risks. It increases the mitigation audience.	Continuing
Action 4.4.1.4. Earthquake Coordinator will conduct outreach and education.	General Revenue Funds	The mitigation staff has not had the resources to work on earthquake issues. This is a method of educating the public on a serious risk.	This educates people on the risks they face and the proper techniques to mitigate the risks. It increases the mitigation audience.	Continuing

Objective 4.5. Help educate the public on the benefits of hazard-resistant construction and site planning.
Strategy 4.5.1. To increase the demand by the public for hazard-resistant construction.

Lead Agency: IEMA
Supporting Agency: ARC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.5.1.1. Work with the American Red Cross to promote hazard resistant construction by having representatives at home shows and at other public presentations.	HMGP 5% funds	This allows us to educate the public with a respected partner, who is viewed as looking out for the best interests of the public and not as a product salesman. This target an audience interested in improving their homes.	To reach the largest audience and to repeat the message, we need to utilize as many outreach methods as possible.	Continuing

Strategy 4.5.2. To provide the public with information on building codes to enable them to make informed decisions.

Lead Agency: CDB
Supporting Agencies: IEMA, DOI

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.5.2.1. Require 3 hours of flood insurance training for all licensed insurance agents. **(Dept. of Insurance)**	General Revenue Funds	This is required by Federal law and increases knowledge of how the NFIP works.	Insurance agents with better training in the NFIP can promote flood insurance which decreases uninsured losses.	Continuing
Action 4.5.2.2. Provide the public and construction industry with a one-stop shop for code information. **(CDB)**	General Revenue Funds	Providing a one-stop shop for code information aides in the implementation of building codes by reducing the burden and making sure all the laws are followed.	This educates people on the risks they face and the proper techniques to mitigate the risks.	Continuing
Action 4.5.2.3. Provide links on the IEMA mitigation website to sites where individuals can learn more about building codes. **(IEMA)**	General Revenue Funds	Correct building techniques are an important mitigation tool. The codes are the best source for these techniques.	To reach the largest audience and to repeat the message, we need to utilize as many outreach methods as possible.	Continuing

Objective 4.6. Help create a workforce trained in hazard resistant construction techniques.
Strategy 4.6.1. To make mitigation a factor in training the building tradesmen.

Lead Agency: IEMA
Supporting Agency: ISBE

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.6.1.1. Work with the State Board of Education (SBE) to provide hazard resistant construction information to vocational school teachers.	General Revenue Funds	Vocational school teachers are an important audience because of the training they provide to young people. We need to provide them with the information they need to provide proper instruction.	To reach the largest audience and to repeat the message, we need to utilize as many outreach methods as possible.	Unchanged Staffing/Funding Limitations
Action 4.6.1.2. Work with SBE to provide workshops for vocational school teachers.	General Revenue Funds	Workshops will allow us to promote mitigation to educators and improve the training of the future workforce.	To reach the largest audience and to repeat the message, we need to utilize as many outreach methods as possible.	Unchanged Staffing/Funding Limitations
Action 4.6.1.3. Provide workshops for construction workers on hazard resistant construction. Work with construction unions and building associations to organize these workshops.	General Revenue Funds HMGP 5%	Workshops will allow us to provide training and improve the skills of the current workforce. These skills make the workers more employable and provide a workforce trained in mitigation techniques.	To reach the largest audience and to repeat the message, we need to utilize as many outreach methods as possible.	Unchanged Staffing/Funding Limitations

Objective 4.7. Maximize available post-disaster "windows of opportunity" to implement major mitigation outreach initiatives.
Strategy 4.7.1. Participate in PDA activities immediately following a disaster.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.7.1.1. Assign staff to mitigation outreach teams. **(in the event of a disaster)**	General Revenue Funds	Personally seeing the hazard and its effects educates the mitigation staff on effective mitigation solutions.	The better the understanding of the hazards the better the choice of solutions.	Continuing Since 2013, staff development team reaches out to locals.

Strategy 4.7.2. Document and disseminate information on losses avoided.

Lead Agency: IEMA

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.7.2.1. Coordinate with local officials to collect digital pictures and field reports.	General Revenue Funds	The locals are on the scene and can tell us when losses are avoided and can provide us with the information at no cost.	It provides us with information to inform people of mitigation successes and reinforces the success of the program for the locals.	Continuing
Action 4.7.2.2. Incorporate findings into future volumes of success story documents.	General Revenue Funds	This provides a source for best practices and is used to promote mitigation.	Success stories are often used to sell other jurisdictions on the need for mitigation.	Continuing
Action 4.7.2.3. Post success story articles on the mitigation website.	General Revenue Funds	By promoting positive mitigation on our website we can educate the public on how mitigation works.	By understanding the positive ramifications of mitigation, the public is more likely to support it.	Continuing
Action 4.7.2.4. Present information to the policy makers.	General Revenue Funds	It is important for the policy makers to understand how mitigation works.	By understanding the positive ramifications of mitigation, policy makers are more likely to support it.	Continuing

Strategy 4.7.3. Maximize available Federal resources.

Lead Agency: IEMA
Supporting Agency: INHMPC

Actions	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy	Update Status (2018)
Action 4.7.3.1. Work toward an enhanced state mitigation plan. **(INHMPC)**	General Revenue Funds	Enhanced plans improve the delivery of mitigation services and increase the HMGP allocations.	It is in the interest of mitigation to run the programs as effectively as possible and to maximize the dollars spent on mitigation in the State.	Unchanged Staffing and Funding Limitations

Illinois Hazard Mitigation Funding Sources

The State of Illinois works in partnership with the Federal Emergency Management Agency to provide funding for hazard mitigation in the State of Illinois. The State provides the funding for the hazard mitigation staff and the Illinois Department of Natural Resources' Flood Hazard Mitigation Program; FEMA provides funding for mitigation projects through the HMGP, FMA, and PDM programs. The State of Illinois promotes the participation in these FEMA grant programs in an effort to maximize the mitigation efforts throughout the State. The use of these federal grant funds has been extremely successful throughout the years.
All of the Federal program funds require a non-federal match. When there are not adequate state funds through the IDNR program to provide the matching funds, local jurisdictions have provided the match. In rare situations, the homeowners have been required to provide the match in order to participate in the project.

STATE FUNDING SOURCES

General Revenue Funds (GRF)

The General Revenue Fund finances some activities associated with State government. These are funds that are raised by taxes and allocated by the legislature. For mitigation activities, IEMA uses a small percentage of GRF funds,

Flood Hazard Mitigation Program

The Illinois Department of Natural Resource's Flood Hazard Mitigation Program is administered through the Office of Water Resources' Resource Management Division. The Program is most frequently used to provide the matching funds for the HMGP or FMA funded acquisition projects, but it also fully funds its own mitigation projects. Funding for the Program comes from the sale of General Obligation Capital Bonds. Authority to sell the bonds is obtained through the legislative process on an annual basis. If funds are approved, they become part of the Governor's annual budget. The amount of funds varies from year to year, but the average expenditure is approximately one million dollars a year. The program operates on a reimbursement basis and cannot furnish funds for local jurisdiction's administrative costs or the purchase of personal property such as mobile homes.

FEDERAL FUNDING SOURCES

CDBG Disaster Recovery Program

The U.S. Department of Housing and Urban Development (HUD) provides flexible grants to help cities, counties, and States recover from Presidentially declared disasters, especially in low-income areas, subject to availability of supplemental appropriations. In response to Presidentially declared disasters, Congress may appropriate additional funding for the Community Development Block Grant (CDBG) program as Disaster Recovery grants to rebuild the affected areas and provide crucial seed money to start the recovery process.

The Illinois Department of Commerce and Economic Opportunity (DCEO), working closely with the Illinois Emergency Management Agency (IEMA), the Illinois Housing Development Agency (IHDA) and inviting input by communities, individuals and other interested parties, have developed an action plan that outlines the eligible activities available to assist counties to address these mitigation and critical restoration needs.

Community Assistance Program (CAP)

For more than 20 years, the State of Illinois has participated in FEMA's Community Assistance Program-State Support Services Element (CAP-SSSE). CAP-SSSE is a State grant mechanism which is effectively used to support the National Flood Insurance Program and State floodplain management objectives. This includes providing technical assistance to NFIP communities, evaluating community performance, monitoring floodplain development activities, and building community floodplain management expertise and capability. CAP also plays a critical role in the success of FEMA and State floodplain mapping priorities. In FY 2017, FEMA awarded $420,000 in funding under the Community Assistance Program, State Support Services Element (CAP-SSSE) to the Illinois Department of Natural Resources. Expected funding for FY 2018, will be $393,383. (Source: FEMA)

Public Assistance

The Federal Emergency Management Agency (FEMA)'s Public Assistance grant program provides federal assistance to state and local governments and certain types of private nonprofit organizations following a presidential disaster declaration. Public Assistance provides grants to communities to quickly respond and recover from major disasters or emergencies. Through the program, FEMA provides supplemental federal disaster grant assistance for debris removal, life-saving emergency protective measures and the repair, replacement or restoration of disaster-damaged publicly owned facilities and the facilities of certain private nonprofit organizations. The Public Assistance program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process. The federal share of assistance is not less than 75 percent of the eligible cost.

Hazard Mitigation Grant Program (HMGP)

The HMGP has been the primary funding source for mitigation projects in Illinois. All areas within the State of Illinois are eligible for assistance under the Hazard Mitigation Grant Program. It is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Act. It provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Since 1989, there have been 1,485 major disaster declarations resulting in the availability of $13.8 billion HMGP funds. FEMA provides up to 75 percent of the funds for mitigation projects. The remaining 25 percent can come from a variety of sources. A cash payment from the state, local government or in some cases directly from the individual is the most direct option. Other sources may include donated resources, such as construction labor; Increased Cost of Compliance (ICC) funds from a flood insurance policy; or loans from other government agencies, such as the Small Business Administration. (Source: FEMA Fact Sheet 2017)

The following table shows the list of grants released by FEMA under the HMPG program in 2014 and 2015

Year and Date	Counties/Jurisdictions	Grant Amount	Project
January 24, 2014	Village of Glenview	$2,784,000	For storm water management system improvements. The project includes the installation of 3,160 linear feet of new storm sewers and one new storm water detention basin. These storm water improvements will help reduce the impacts of heavy rain and flooding in the village.
February 3, 2014	City of Chicago	$441,750	For the proposed structural retrofits to the River City Condominium building. The project includes the elevation of an existing marina wall and the installation of a sewer backflow preventer.
February 13, 2014	Villa Grove	$351,066	Acquisition and demolition of 8 residential structures and one public building located in the floodplains of the West Ditch and Embarras River.
February 14, 2014	Hinsdale	$2,576,475	For the proposed Graue Mill Condominium Complex storm water improvement project.
February 25, 2014	Pearl City	$1,643,411	Acquisition and demolition of 19 residential and four commercial structures located in the floodplain of Yellow Creek.
March 5, 2014	City of Carmi	$707,507	Acquisition and demolition of 22 residential structures and the purchase of seven flood prone vacant lots located in the Little Wabash River floodplain
March 7, 2014	Clark County	$656,147	Acquisition and demolition of 12 residential structures located in the floodplain of the Wabash River and its tributaries.
March 13, 2014	Gallatin County	$1,398,396	Acquire and demolish 19 residential structures as well as raise seven homes above the base flood elevation in the Ohio River floodplain.
March 21, 2014	City of Des Plaines	$2,698,523	Acquisition and demolition of 21 residential structures in the Big Bend subdivision located in the Des Plaines River floodplain

Year and Date	Counties/Jurisdictions	Grant Amount	Project
March 24, 2014	City of West Frankfort	$6,415,688	A proposed sewer treatment plant improvement project.
May 7, 2014	Saline County	$676,740	Acquisition and demolition of 8 residential structures and 1 commercial structure located in the floodplain.
May 28, 2014	Savanna	$238,219	Acquisition and demolition of 8 residential structures in the Plum River floodplain.
June 20, 2014	McHenry County	$914,519	Acquisition and demolition of 10 residential structures in the Nippersink Creek floodplain.
June 20, 2014	Village of Hamburg	$307,275	Acquisition and demolition of 6 residential structures in the Mississippi River floodplain.
October 14, 2014	Lake County	$1,510,942	Acquisition and demolition of 9 residential structures in the floodplain.
October 14, 2014	Village of Cary	$971,295	Acquisition and demolition of 4 residential structures in the floodplain
October 14, 2014	Downers Grove	$820,211	Acquisition and demolition of 4 residential structures in the floodplain.
November 14, 2014	Glenview	$2,999,992	Acquisition and demolition of 16 residential structures in the Chicago River floodplain.
November 14, 2014	Village of Lisle	$2,889,864	Acquisition and demolition of 13 residential structures in the floodplain. In addition, six structures will be elevated three feet above the base flood elevation along the east branch of the DuPage River.
March 5, 2015	Machesney Park	$2,952,257	Acquisition and demolition of 24 residential structures in the Rock River floodplain.
March 19, 2015	DuPage County	$2,781,435	The acquisition and demolition of 13 residential structures in the Winfield Creek, Salt Creek and East Branch DuPage River floodplains.
March 20, 2015	Village of Glenwood	$1,050,990	The acquisition and demolition of nine residential structures in the Thorn Creek floodplain.
April 24, 2015	City of Des Plaines	$2,999,810	Acquisition and demolition of 13 residential structures in the Des Plaines River floodplain.

Flood Mitigation Assistance Program (FMA)

As appropriated by the Consolidated Appropriations Act, 2017 (Public Law 114-113); the Fiscal Year (FY) 2017 Flood Mitigation Assistance (FMA) Grant Program provides resources to assist states, tribal governments, territories and local communities in their efforts to reduce or eliminate the risk of repetitive flood damage to buildings and structures insurable under the National Flood Insurance Program (NFIP) as authorized by the National Flood Insurance Act of 1968, as amended. FMA was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP. The funding, which is provided through the National Flood Insurance Fund, is calculated on the basis of flood insurance policies in the state and varies each year.

For FY 2015, $150 million was appropriated for FMA. On May 29, 2015, FEMA opened the FMA application period through August 28, 2015. IEMA submitted 6 applications totaling $4,367,844.20. The FMA selection committee chose 2 of our applications for further review. These 2 applications for project grants total $2,347,694.00. The first of these projects is in DuPage County and resulted in the purchase and demolition of 15 floodprone properties in unincorporated areas of the County. The second project is the purchase and demolition of 8 floodprone properties in unincorporated Cook County. 6 of the 8 homes appear on the Severe Repetitive Loss (SRL) structure list.

The FMA program provides annual funding for the development of comprehensive flood mitigation plans and implementation of cost effective mitigation measures on NFIP-insured properties. The former Repetitive Flood Claims and Severe Repetitive Loss programs have been rolled into the FMA program. Mitigation of repetitive loss and severe repetitive loss properties as defined by FEMA is the highest priority for the program.

There are three types of grants available under FMA: Planning, Project, and Technical Assistance Grants. FMA Planning Grants are available to States and communities to prepare Flood Mitigation Plans. NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project Grants. FMA Project Grants are available to States and NFIP participating communities to implement measures to reduce flood losses. Ten percent of the Project Grant is made available to States as a Technical Assistance Grant. These funds may be used by the State to help administer the program, but the State of Illinois has always used these funds as part of the project grant.

On July 26, 2016, Federal Emergency Management Agency (FEMA) has released $1,677,592 in FMA funds to Cook County for the acquisition and demolition of eight flood-prone homes. On July 11, 2017, FEMA released $271,992 in FMA funds to Macon County, Illinois, for the acquisition of three flood-prone homes. The removal of these structures will create a permanent open space that reduce damages, financial impacts on individuals and lessen the impacts of flooding on the local community.

In Fiscal Year 2017, $160,000,000 in FMA is available to assist states, tribal, territorial and local governments in reducing or eliminating claims under the National Flood Insurance Program (NFIP). (FEMA Fact Sheet 2017) FMA provides funding to assist States and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program (NFIP). The State of Illinois has only used these funds for acquisition and planning.

Flood Mitigation Assistance Program (FMA) 2010 – 2017

Fiscal Year	Planning	Total Project Cost
FY2010	$0	$0
FY2011	$0	$0
FY2012	$0	$0
FY2013	$0	$0
FY2014	$0	$693,286 (Lake County Storm Water Management)
FY2015	$0	$2,526,187 (Cook County and DuPage Acquisitions)
FY2016	$0	$505,911 (Kankakee and Mason Acquisitions)
FY2017		$6,661,473 (Machesney Park (4 acquisition/demolition), Village of Villa Park Sugar Creek Watershed Drainage Improvements
Total	**$0**	**$10,386,857**

Pre-Disaster Mitigation Grant Program (PDM)

As appropriated by the Consolidated Appropriations Act, 2017 (Public Law 115-31); the Fiscal Year (FY) 2017 Pre-Disaster Mitigation (PDM) Grant Program provides resources to assist states, tribal governments, territories and local communities in their efforts to implement a sustained pre-disaster natural hazard mitigation program, as authorized by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended (42 U.S.C. 5133).

For FY 2015, $25 million was appropriated nationally for PDM. FEMA added $5 million made available from de-obligations of other program funds for a total of $30 million available for grants. IEMA submitted 10 applications totaling $943,952.52. The PDM selection committee chose nine of our applications for further review. These nine applications for planning grants total $381,455.52. The one application that was not selected for further consideration was a $562,500.00 Flood Mitigation Project in Lincolnwood, Illinois. (IEMA) In Fiscal Year 2017, $90,000,000 is available to assist state, tribal, territorial and local governments in reducing overall risk to the population and structures from future hazard events, while also reducing reliance on federal funding from future disasters. (FEMA Fact Sheet 2017)

Pre-Disaster Mitigation Grant Program (PDM) 2010 – 2017

Fiscal Year	Planning	Project
FY 2010 PDM	$54,750	$0
FY 2011 PDM	$0	$656,625
FY 2012 PDM	$0	$0
FY 2013 PDM	$0	$553,600
FY 2014 PDM	$175,655.37	$0
FY 2015 PDM	$359,166.79	$0
FY 2016 PDM	$698,087.79	$3,436,740.07
FY 2017 PDM	$388,774	$1,508,655
Total	**$1,676,433.95**	**$6,155,620.07**

Repetitive Loss (RL) A RL property is a structure that has incurred flood-related damage on two occasions. Funding for the Repetitive Loss (RL) structures is available on an annual basis through FEMA FMA. The purpose of funding is to reduce or eliminate the long-term risk of flood damage to structures insured by the NFIP and identified by FEMA as RL structures. RL will operate under a 75% Federal/25% Local cost share.

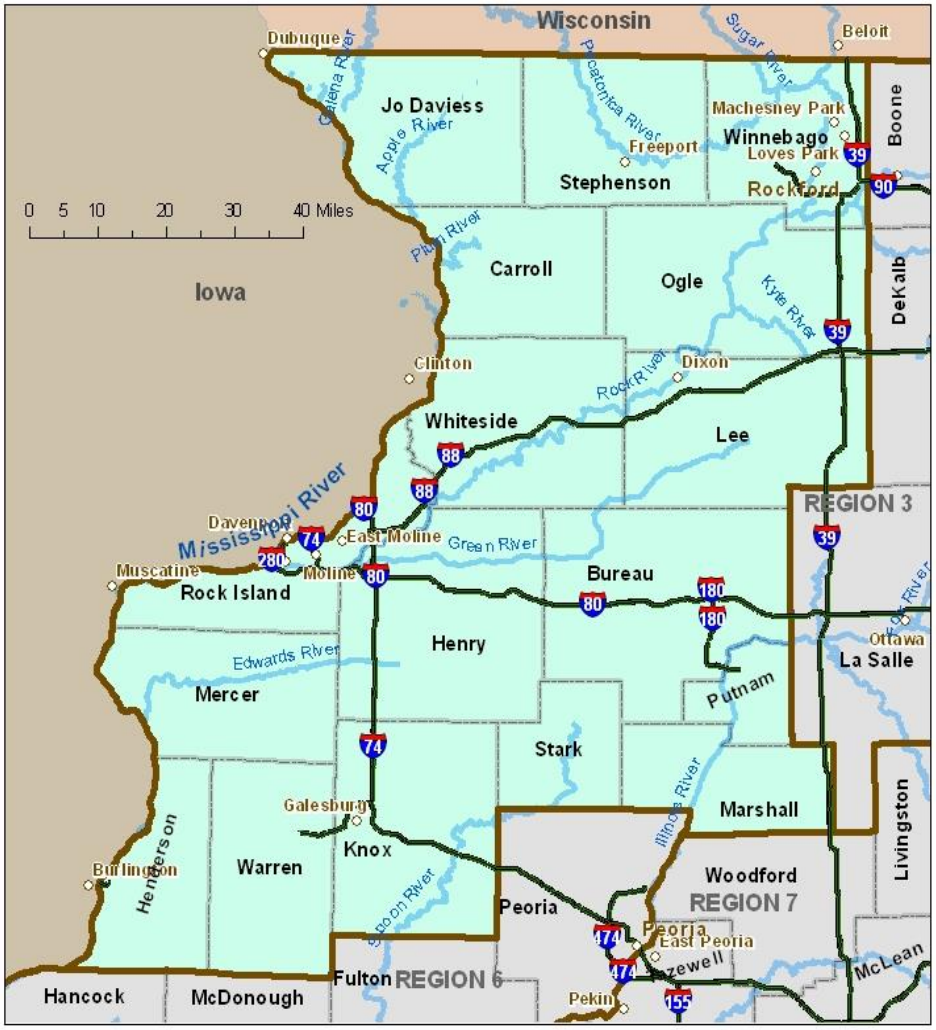
Severe Repetitive Loss (SRL) Funding for the Severe Repetitive Loss (SRL) structures is available on an annual basis through FEMA FMA. The purpose of funding is to reduce or eliminate the long-term risk of flood damage to structures insured by the NFIP and identified by FEMA as SRL structures. Specifically, SRL structures are residential properties that have at least four NFIP claims over $5,000 each, at least two of which occur within ten years of each other, or that have had at least two structural claims within ten years of each other that cumulatively exceed the value of the structure. SRL will operate under a 75% Federal/25% Local cost share and FEMA may contribute up to 100% Federal Cost Share. Typical activities would be acquisition and demolition of properties, or elevation.

Cooperating Technical Partners (CTP) There is a significant challenge keeping flood hazard maps current. This program is an innovative approach to creating partnerships between FEMA and participating NFIP communities, regional agencies, and State agencies that have the interest and capability to become more active participants in the in the FEMA Flood Hazard mapping program.

The maps on pages 76 – 83, show the locations (counties and jurisdictions) of floodplain mitigation projects with disaster numbers since the 1993 flood (FEMA 997).

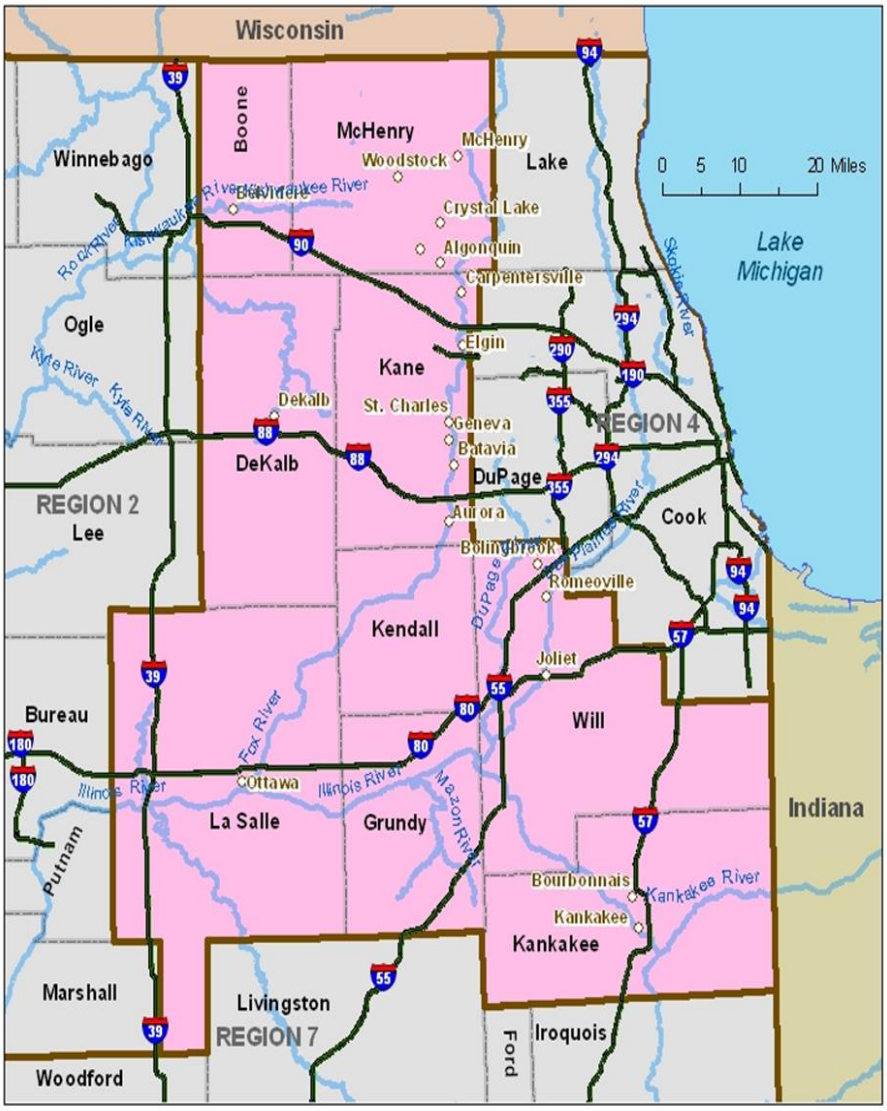
Illinois Floodplain Mitigation Projects

(Northwest Illinois) IEMA Region 2



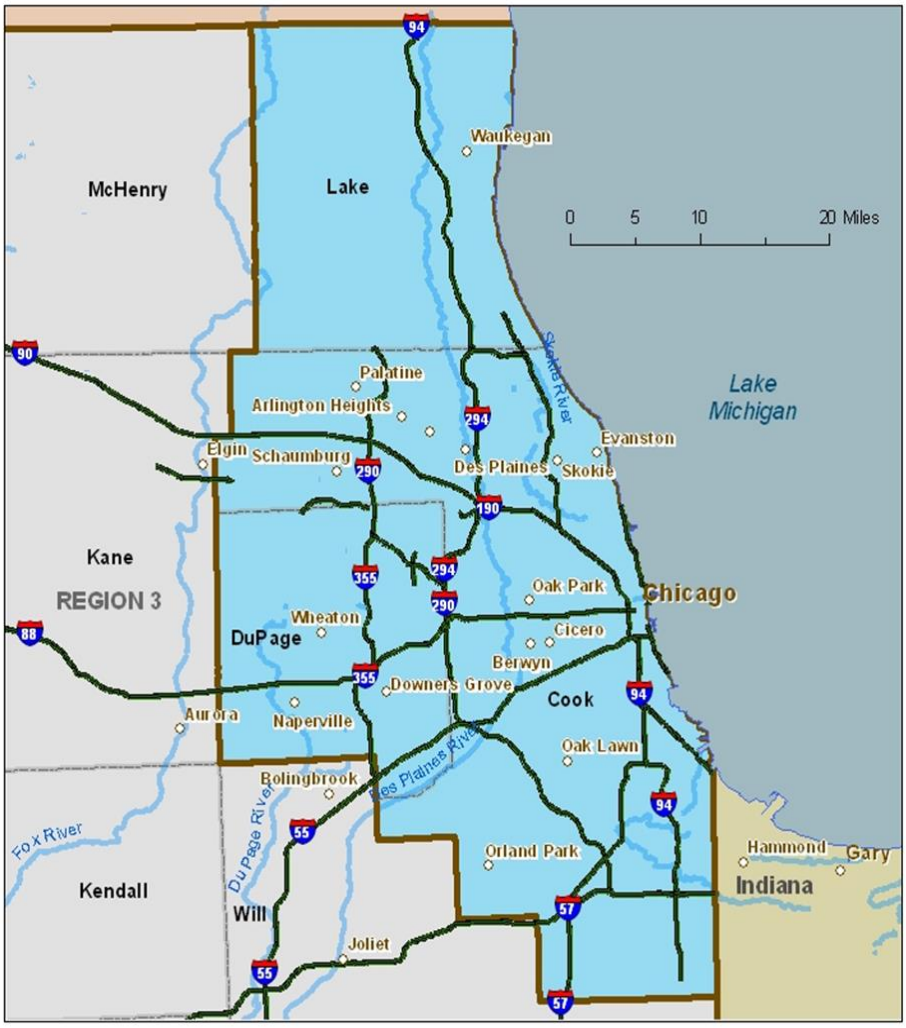
Jurisdiction	# of Acquisitions
1- East Dubuque - 1188,1278,1416, FMA	35
2- Jo Daviess County - 1188	2
3- Whiteside County - 1188	7
4- Rock Island County– 997,1188,1368,1416, FMA	67
5- Cleveland – 1188, FMA	34
6-Keithsburg – 997	110
7- Oquawka – 997	34
8-Knox County - 997	14
9-Sparland – 1188	19
10-Rockford – 1681, 1771	80
11-Machesney Park- 1729, 1826, 4116	52
12-Blackhawk Island – 1771	90
13- Edgemere Terrace – 1771	12
Total	**556**

Illinois Floodplain Mitigation Projects
(North Central Illinois) IEMA Region 3



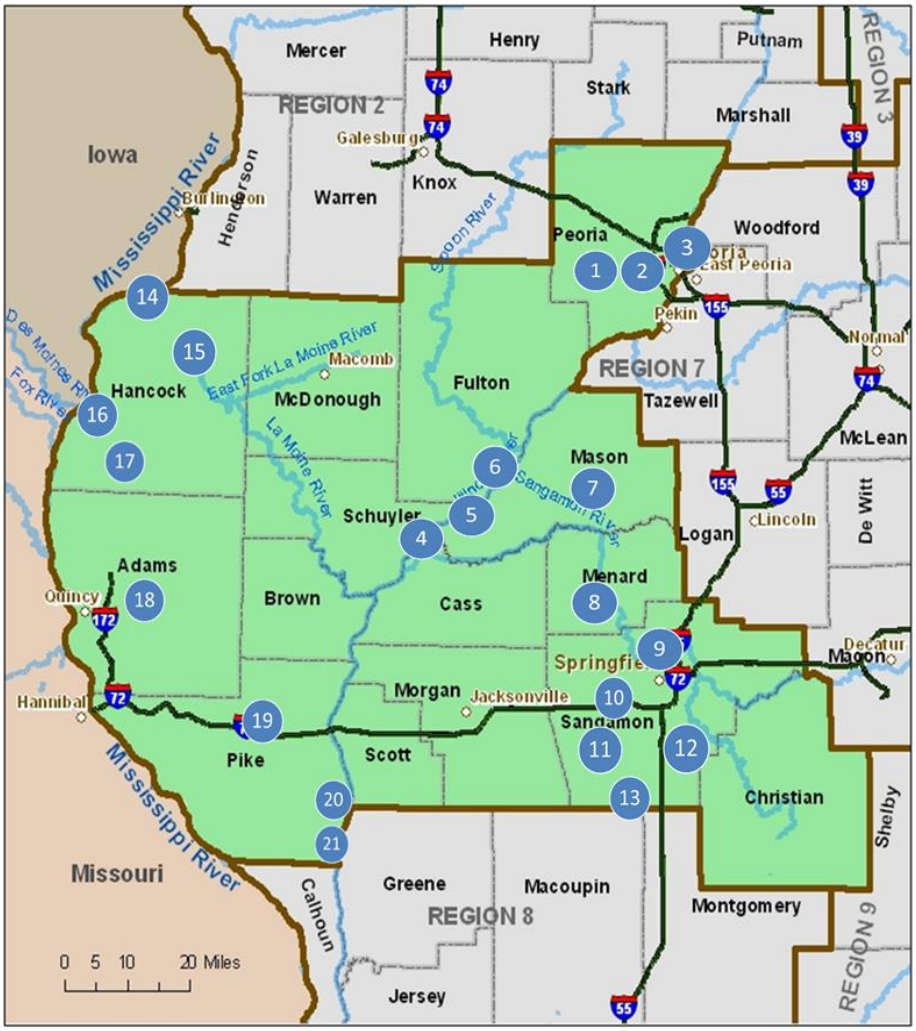
Jurisdiction	# of Acquisitions
1- McHenry County – 977	1
2-Kirkland – 1129	65
3-DeKalb County – 1188	6
4- Montgomery – 1129	39
5-Kendall County – 1188, FMA	9
6- Ottawa – 1129, 1771	65
7-LaSalle – 1129	14
8-Aurora – 1722	1
9-Streator – 1771	1
10-Will County – 1800	19
11-Evergreen Village - 1800	129
12-Shorewood – 1129	47
13- Bird's Bridge – 1129	15
14-Glenview – 4116	17
Total	**428**

Illinois Floodplain Mitigation Projects
(Northeast Illinois) IEMA Region 3



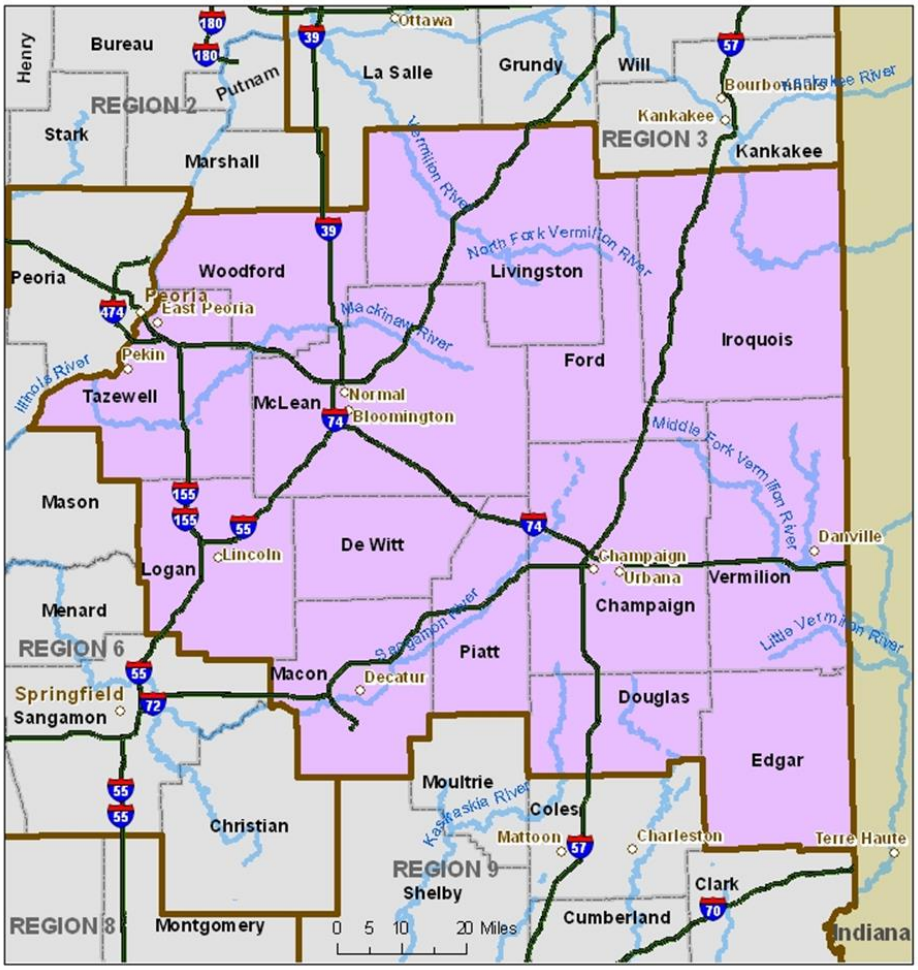
Jurisdiction	# of Acquisitions
1-Lake County – 1110,1112,1129,1850, 4116	79
2-Aurora – 1129	25
3-Aurora Township – 1129	22
4-DuPage County – 1129	49
5-Palos Hills – 1129	3
6-Gurnee – 1771	1
7-Oak Brook – 1935	1
8-Addison – 1800	14
9-Carol Stream – 1747	4
10-Downers Grove – 4116	3
Total	**201**

Illinois Floodplain Mitigation Projects
(West Central Illinois) IEMA Region 6



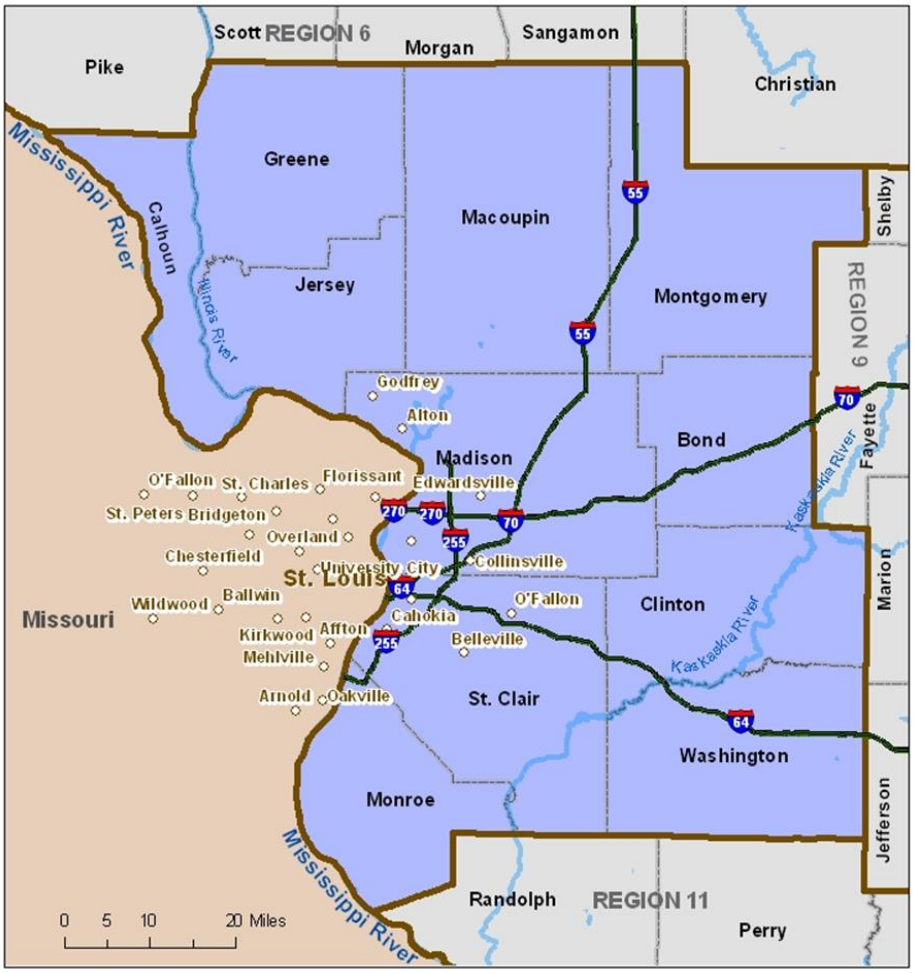
Jurisdiction	# of Acquisitions
1- Peoria County 1188, FMA	14
2- Peoria Heights FMA	20
3-Peoria/East Peoria 1188, FEMA,4116	10
4-Browning - 997	54
5-Bath - 997	9
6-Hawana – 1771	49
7-Mason County – 997	28
8-Petersburg - 1025, 1112	43
9-Riverton - 1416	6
10-Sangamon County – 1025, 1112	20
11- Chatham- 1025,1053,1129	9
12-Pawnee- 1112	3
13-Divernon – 1416	8
14- Pontoosuc – 997	25
15- Hancock County – 997	49
16-Warsaw – 997	5
17- Rocky Run Township- 997	13
18-Adams County – 997	20
19-Pike County – 997	33
20-Pearl – 997, 1469	11
Total	**429**

Illinois Floodplain Mitigation Projects
(East Central Illinois) IEMA Region 7



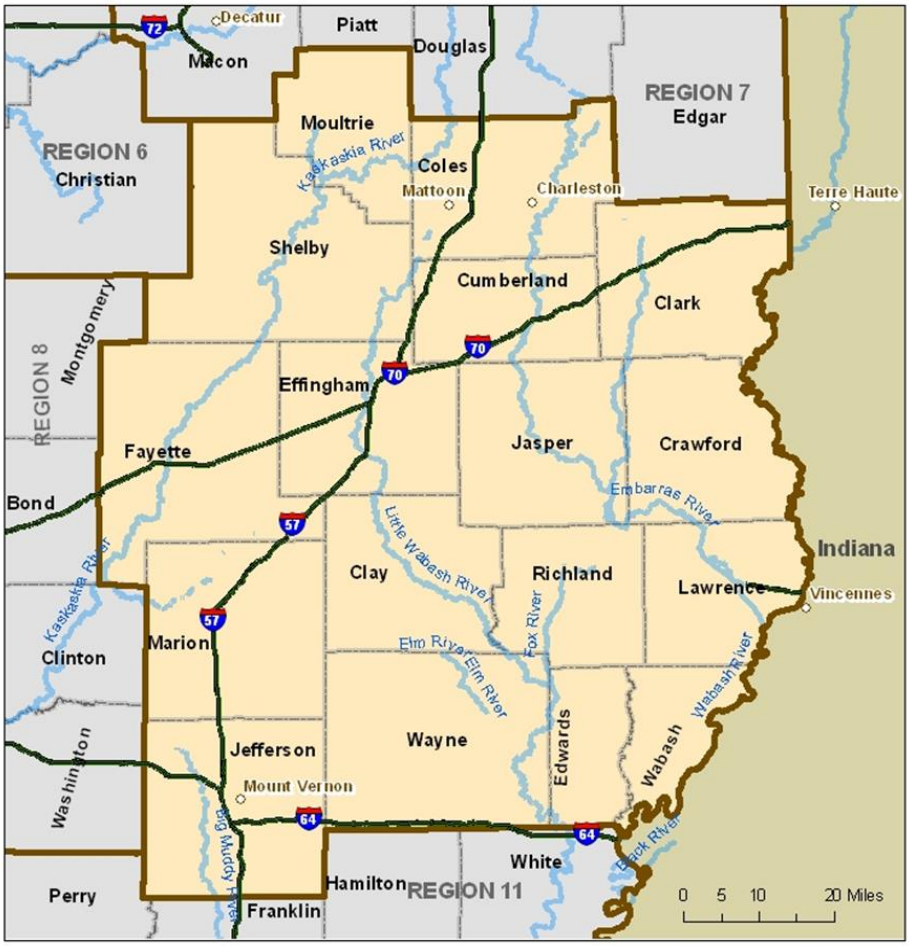
Jurisdiction	# of Acquisitions
1- Clinton – 1025, 1188	57
2- Champaign County - 1025	1
3-Sidney – 1188	10
4-Villa Grove – 1025, 1112	15
5-Danville – 1025	23
6-Woodford County – 1800	14
Total	**120**

Illinois Floodplain Mitigation Projects
(Southwest Illinois) IEMA Region 8



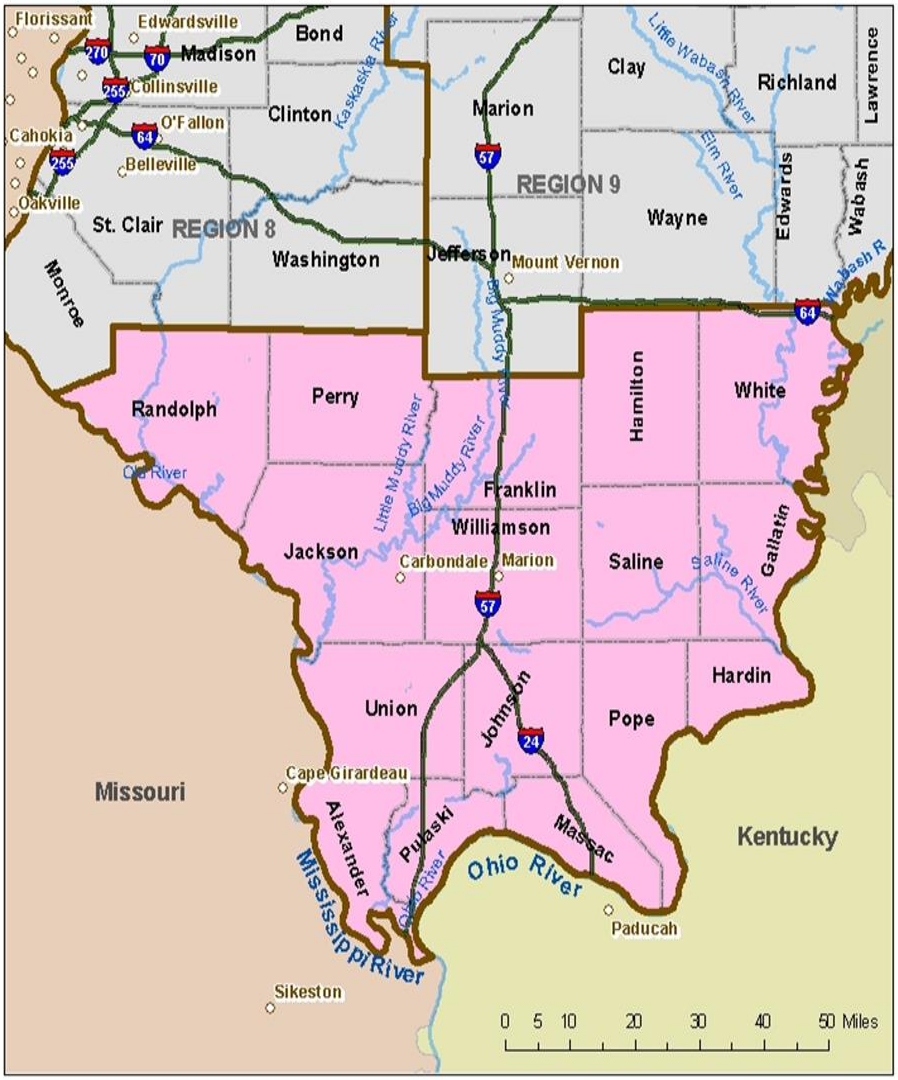
Jurisdiction	# of Acquisitions
1- Hillview – 997	15
2-Green County - 997	57
3-Kampsville – 997	14
4-Hamburg – 997	3
5-Calhoun County – 997	75
6-Hardin – 997	43
7-Jersey County – 997	94
8- Grafton – 997	111
9-Elsah – 997	2
10-East Alton – 1513	2
11-Madison County – 997	39
12-East St. Louis – 997, 1053	612
13-Belleville – 1053, 1112, 1188	54
14-St. Clair County – 1025, 1053	259
15-Valmeyer – 997	244
16-Monroe County – 997	136
17- Fults – 997	25
Total	**1785**

Illinois Floodplain Mitigation Projects
(South East Illinois) IEMA Region 9



Jurisdiction	# of Acquisitions
1- Birds – 1112	50
Total	**50**

Illinois Floodplain Mitigation Projects
(South Central Illinois) IEMA Region 11



Jurisdiction	# of Acquisitions
1-Evansville – 997	18
2-Randolph County - 997	24
3-Kaskaskia – 997	6
4-Rockwood – 997	3
5-Reed Station – 1935	48
6-Carbondale – PI	1
7-West Frankfort – 1112	31
8-Marion – 1112	46
9-Carmi – 1112, 1188	37
10-Elizabeth Town – 1170	2
11-Thebes – 997	1
12-Alexander County – 1935	150
13-Joppa – 1170	6
14-Metropolis – 1935, 1991	14
Total	**387**

Prioritization of Mitigation Actions

The INHMP contains mitigation action items that were evaluated and prioritized by the Illinois Natural Hazard Mitigation Planning Committee or the State Hazard Mitigation Officer in order to identify actions to conduct over the life of the plan and beyond. These mitigation actions were developed by assessing the State's existing authorities, policies, programs, and resources while examining our capability to utilize existing programs and resources to reduce losses and vulnerability from the summarized hazards in the plan. The action items were prioritization utilizing the STAPLEE method. A detailed description of the method maybe found in Section V of the INHMP. Factors in the prioritization of the action items included: cost-effectiveness, environmental considerations, technical feasibility, legality, political support, social acceptability and administrative elements such as funding and staffing availability.

The INHMP has incorporated the local mitigation actions and goals into the planning process to ensure that the IHMHP Mitigation Strategy remains consistent and supports the mitigation efforts of the State's local entities. The INHMP does not identify nor prioritize site-specific mitigation projects, but engages a strategic approach that incorporates goals, strategies and actions that support the specific mitigation actions identified by the local hazard mitigation plans.

In 2010, IEMA began work on a project and mitigation action tracking database. The development of this database was suspended for approximately 2 ½ years due to funding and staffing limitations. However, in 2013 the construction of this database was re-instituted. IEMA will partner with the Illinois State Water Survey in an effort to populate and update the structure buyouts information. In accordance with the State mitigation strategy, IEMA has continued to monitor approved local plans. This section of the State Hazard Mitigation Plan will address the issue of identification and evaluation of cost-effective and technically feasible hazard mitigation projects and initiatives. All hazard mitigation projects within the State are designed to mitigate the effects of disasters in reference to one or more of the following six categories:

- Prevention: Actions intended to keep a hazard risk problem from getting worse.
- Property Protection: Actions used to modify buildings subject to a hazard risk, or their surroundings, rather than to prevent the hazard from occurring.
- Public Education and Awareness: Actions that inform and remind people about hazardous areas and the actions necessary to avoid potential damage and injury.
- Natural Resource Protection: Actions intended to reduce the intensity of hazard effects as well as to improve the quality of the environment and wildlife habitats.
- Critical Facilities Protection: Effort to protect buildings that are vital to the public safety needs within jurisdictions.
- Structural Projects: Actions that involve construction of manmade structures to control hazards; i.e. dams, levees, dikes, and seawalls.

This mitigation action tracking database has been completed and entry of approved mitigation action items for all jurisdictions with FEMA approved mitigation plans are continuing. This database was created by the university and after 2013 it was not updated. IEMA is using spreadsheets now for tracking the project status and payment history.

When mitigation projects are proposed, an initial review of the project application is conducted by the IMAG-

SC to ensure that the project is eligible and meets the federal requirements for the requested grant program. The project applications are then evaluated utilizing a set of criteria that reflect the State's priorities, so non-structural projects such as acquisitions, demolition, relocation, and policy enforcement receive the most consideration for funding.

1) **Enforcement of State planning and regulatory efforts**
Continued enforcement of State regulatory efforts is one of the top priorities of the State of Illinois as related to mitigation. Enforcement and creation of strong regulations including floodplain ordinances, zoning and building codes are a cost effective approach to mitigating the future impact of hazards. All can be adopted, developed, maintained and enforced at the local level, with little to no cost. The State continues to promote compliance with state planning and regulatory efforts such as: National Flood Insurance Program (NFIP) regulations, Executive Order Number 5, Executive Order Number 2, CDB Act and various acts outlined in the Illinois Compiles Statutes. On-going hazard mitigation programs are coordinated with the State's efforts to coordinate and promote compliance with these regulations and planning efforts. The State has been very successful in past years regarding the enforcement of such regulations. The IDNR/OWR ensures that jurisdictions participating in the NFIP enforce the regulations. By preventing new structures from being built in the floodplain it greatly reduces the people and property at risk. Illinois is ranked #5 in the nation for total number of participating communities. 885 of approximately 1,000 communities in Illinois have adopted local floodplain regulations and joined the NFIP. (DNR 2017)

2) **Acquisition of substantially damaged structures.**
Acquisition of substantially damage structures remain a top priority of the State of Illinois. Structures that are located in the floodplain of jurisdictions participating in the NFIP that receive damages that exceed 50% of the value of the structure are considered "substantially damaged". The structure must either be demolished or built above the base flood elevation. This degree of loss and the potential additional expense of coming into compliance make it an economic disaster for the flood victims. By acquiring the property for pre-flood fair market value we can ease the economic suffering of the disaster victims and eliminate the impact of future flooding hazards regarding those structures. Illinois has purchased nearly 3,547 flood prone properties since 1993. More than $97 million in Federal mitigation funds and $25 million in state matching funds have been utilized to achieve this accomplishment.

3) **Acquisition of repetitive loss properties**.
This works hand in hand with enforcement of the NFIP rules and the acquisition of substantially damaged properties to break the cycle of construction/destruction/reconstruction. Those homes or businesses, which have had two or more claim payments of more than $1,000 from the National Flood Insurance Program within any rolling 10-year period are considered a Repetitive Loss (RL) structure. Acquiring repetitive loss structures provides an opportunity to mitigate future losses to these properties. Priority will be given to those projects requesting acquisition of Severe Repetitive Loss Properties. A SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- That has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or
- For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
- For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.

Illinois has been very successful in reducing the number of repetitive loss properties. As of December 31, 2017, there were a total of 5324 properties in Illinois that had experienced repetitive loss (two or more claims of $1000 or more under an NFIP flood insurance policy paid within any ten-year period since 1978). According to NFIP records, 1530 of those properties have been reported to have been mitigated and 3794 of those properties remain unmitigated. Among the states, Illinois is 11th in terms of the total number of unmitigated repetitive loss properties and 12th in terms of the total number of losses that have occurred at repetitive loss properties.

4) **Small Structural Projects**
Small structural projects have recently become a priority to reduce flood risks in Illinois. These small structural projects may include: storm water detention projects, reservoirs, floodwalls and channel improvements.

5) **Construction and Retrofitting**
Projects directly related to the retrofitting of critical/essential facilities or Code Plus construction projects related to wind-resistant and seismic mitigation remain one of the State's priorities. Shelter construction is a relevant mitigation project, with priority being given to projects proposed for critical or essential facilities such as schools, hospitals, and nursing homes.

6) **Education and Public Outreach**
Education and Public Outreach are essential to the mitigation process. With limited funding not all mitigation projects such as a variety of construction projects, acquisitions or warning systems can be funded through federal or state grants. Educating the public of mitigation techniques and low cost projects allows for additional avenues to help limit the impact of specific hazards. The State of Illinois continues to place education and public outreach as a top priority in relation to the mitigating the hazards in Illinois. The unique mitigation opportunity that education and public outreach provides is that it can address a larger number of the identified hazards and impact a larger population base then other mitigation projects. These efforts continue to be a collective effort by all State agencies represented on the INHMPC. Educational opportunities have been provided in recent years regarding wind-resistance construction, earthquakes, flooding and severe weather. Manuals and videos have been developed to explain mitigation construction techniques. These materials were distributed to public libraries in the State and to interested people around the country; these manuals and videos continue to be distributed to interested parties. In addition, wind-resistant construction workshops and seismic mitigation courses have been held.

B. Illinois Mitigation Capability Assessment
The State of Illinois has the legal authority to engage in pre- and post- disaster mitigation activities. The State of Illinois has put together a group of agencies known as IMAG, Illinois Mitigation Advisory Group. This group is comprised of state agencies, federal departments, academia, business and industry and private nonprofit organizations. The task of this group is to provide suggestions and provide technical guidance regarding mitigation policies, best methods and procedures to their respective and related organizations in the State. In Illinois, this group is the primary mitigation resource. In the pre-disaster setting all of the strategy and policy decision making occurs. Depending on the scenario, in the post-disaster setting IMAG functions as a response group on an as needed basis. This group functions not in the initial sense of first responders, but nevertheless in a planned deliberate response to solve the post-disaster mitigation concerns. The integration of mitigation with recovery efforts has always been and is a priority in Illinois. This allows for maximum flexibility to provide whatever resources are currently required.

The State has several funding programs in place which are available to local jurisdictions. These funds are primarily from various Federal grant programs. Currently, the State uses the FEMA programs of HMGP, FMA, PDM and the HUD program of Community Development Block Grants (CDBG) funds to promote mitigation activities. The State supplements these sources with funding from the Flood Hazard Mitigation Program from the Illinois Department of Natural Resources/Office of Water Resources. This program is funded with Capital Bond Funds and the amount varies from year-to-year depending on the appropriation of the legislature. The Program occasionally receives special appropriations from the legislature (Build Illinois, Illinois First). These funds must be used for the purchase of real property (not mobile homes) in the floodplain. The State of Illinois has invested a significant commitment to emergency management and public safety. Representatives from a variety of State agencies are involved in numerous planning efforts regarding all phases of emergency management including: Prevention, Mitigation, Response and Recover. This integration and commitment has resulted in the development of a number of fundamental programs, regulations, plans and policies that strengthen the State's hazard management capabilities. These plans, regulations, programs and policies were reviewed during the INHMP update process in an effort to identify their effectiveness and potential for further mitigation initiatives. The State's mitigation planning efforts have been integrated into the following State planning programs and initiatives.

Planning Efforts	Description
Illinois Emergency Operation Plan (IEOP)	The IEOP was developed in cooperation with the Office of the Governor, executive departments and agencies, the Illinois Terrorism Task Force and the American Red Cross. The IEOP describes the Illinois Disaster Management System (IDMS), which conforms to the national incident Management System (NIMS). The IDMS will be used by all State of Illinois government agencies when the IEOP is implemented for response or recovery operation in any part of the state affected by a major emergency or disaster.
Illinois Recovery Plan	The Recovery Plan facilitates the delivery of state assistance to support citizens and local governments and private industry as they deal with the recovery from a major disaster. It is designed to supplement and support local recovery efforts and it describes how state agencies coordinate and facilitate the delivery of federal disaster assistance programs. The plan includes annexes such as: Damage Assessment, Supplemental Federal Disaster Assistance, Individual Assistance, Public Assistance and Mitigation Assistance.
Catastrophic Earthquake Annex	The Earthquake Annex outlines operational command, coordination, communication, and control for counties and responsible agencies/organizations following a catastrophic earthquake. It is used in conjunction with a jurisdiction's Emergency Operations Plan.
Food and Water Distribution Plan	This document provides operational guidance and serves as a concept of operations for jurisdictions undertaking missions for the distribution of food and water to the public following a disaster where public facilities for potable water and/or food preparation and supply are inoperable or incapable of meeting the public's essential needs.
Resource Management Planning	Resource management is the cornerstone of effective response and recovery. A comprehensive resource management system provides jurisdictions with a pre-identified structure for assigning resources and carrying out critical missions that support life safety and life essential services.

Strategic Operations Planning	Strategic Operations of Emergency Management provides executive and senior level local emergency management staff with practices designed to outline efficiencies and priorities prior to, during, and after disaster strikes. Strategic Operations of Emergency Management explores and expands on interlocking strategies for emergency operations centers and incident command structures; development and implementation of straight-line information pathways; lateral and vertical coupling of critical sectors and emergency response roles; analysis of critical and priority information requirements; determination of centers of gravity for objectives driven task assignment; execution of strategic priorities against defined resourcing elements; and the incorporation of deliberate decision and/or trigger points for strategic emergency management.
Continuity of Operations Plan (COOP)	COOP ensures continuity of essential department or agency functions/services in spite of an emergency or disaster. The COOP is implemented when a building or facility is rendered inoperable for a period greater than 30 days, during which time services to public and private stakeholders must be continued.
Illinois Threat Hazard Identification Assessment (THIRA)	The Threat and Hazard Identification and Risk Assessment (THIRA) process standardizes the risk analysis process that emergency managers and homeland security professionals use every day through the normal course of their work. The THIRA process builds on existing local, state, tribal, territorial Hazard Identification and Risk Assessments (HIRAs) by: • Broadening the threats and hazards considered to include human-caused threats and technological hazards. • Incorporating the whole community into the planning process, including: individuals, families, businesses, faith-based and community organizations, nonprofit groups, schools and academia, media outlets and all levels of government, including local, state, tribal, territorial and federal partners. • Providing increased flexibility to account for community-specific factors. The THIRA process helps communities identify capability targets and resource requirements necessary to address anticipated and unanticipated risks.
Illinois Drought Preparedness and Response Plan	The goal of the plan is to assist community and state officials and the public with information and tools that promote better decision-making in water supply planning and reduce drought-related impacts, water completion, and conflict of use. The drought plan provides state agencies, communities, and the public with a resource to stay updated on water supply issues, drought actions, and key consideration communities should make for drought preparedness.

Laws and Regulations

The mitigation strategies outlined in the INHMP continue to be integrated into State planning and regulatory efforts in a continued effort to improve the mitigation process in Illinois. The State of Illinois has enacted a number of laws, regulations and acts impacting local governments that have an impact on mitigation. The majority of these legislative actions have been enacted to provide legal authority and guidance for both state and local governments. The primary laws, regulations, programs and policies that have an impact on mitigation programs in Illinois are listed below.

Illinois Constitution Section 6 of Article XVII of the Illinois Constitution designates Illinois as a home-rule state. This amendment to the state constitution grants cities, municipalities, and counties the ability to pass laws to govern themselves as they see fit, as long as implemented laws obey the state and federal constitutions.

The Illinois Administrative Code is a codification of the rules of the administrative agencies of the state. These rules are reviewed by the Joint Committee on Administrative Rules (JCAR), which is a bipartisan legislative oversight committee created by the General Assembly in 1977. Pursuant to the Illinois Administrative Procedure Act, the committee is authorized to conduct systematic reviews of administrative rules promulgated by State agencies. JCAR conducts several integrated review programs, including a review program for proposed, emergency and peremptory rulemaking, a review of new Public Acts and a complaint review program.

JCAR is composed of 12 legislators who are appointed by the legislative leadership, with the membership apportioned equally between the two houses and the two political parties. It is co-chaired by 2 members representing each party and each legislative house. Support services for the committee are provided by the JCAR staff. Two purposes of JCAR are to ensure that the General Assembly is adequately informed of how laws are implemented through agency rulemaking and to facilitate public understanding of rules and regulations.

(20 ILCS 3305) Illinois Emergency Management Agency Act: This act not only outlines the responsibilities and actions performed by the State of Illinois during, before and after a disaster but also provides legal authority and guidance to "local political subdivisions" i.e. Local governments on emergency management issues. In chapter 127 paragraph 1060, the IEMA Act authorizes and guides local governments to establish "Emergency Service and Disaster Agencies (ESDA)" in their perspective jurisdictions. Paragraph 1061, provides the legal authority for local governments regarding local disaster declarations. Mutual Aid requirements and guidelines are discussing in Chapter 127 paragraph 1063 for local governments.

(50 ILCS 752) Illinois Public Safety Agency Network Act: This act promotes intergovernmental cooperation between public safety agencies of local government, i.e. Sheriff, Fire, and Police. It also promotes interoperability among all public safety disciplines.

(50 ILCS 805 Section 4) Land Resource Management Planning Act: It is the purpose of this Act to encourage municipalities and counties to protect the land, air, water, natural resources and environment of the State and to encourage the use of such resources in a manner which is socially and economically desirable through the adoption of joint or compatible Local Land Resource Management Plans. Such plans may include goals and procedures to identify, document, publicize, and establish the best safe usage for land subject to natural disasters and hazards, including flooding. In addition, the act also allows for the develop and maintenance of data on existing social, economic and physical conditions including analysis of municipal needs, and demographic projections to provide current information for decisions and action. (Source: P.A. 84-865.)

(765 ILCS 77/) Residential Real Property Disclosure Act
This Act requires a seller to tell a potential to advise the potential buyer, if they are aware of any basement flooding, if the property is in the floodplain, or if the seller has flood insurance.

(425 ILCS 25/9 Section 9) Fire Investigation Act
This Act enables the State Fire Marshal to make, or cause to be made, inspections of buildings, structures and premises to determine their conformity with the provisions in this Act and their safety to life and property from fire or other emergency requiring evacuation of the building (such as presence of explosive or flammable gasses, fume hazard, and power failure).

(50 ILCS 815 Section 2) Flood Damage Prevention Act: This act enables local governments to issue building permits in the relation to infrastructure for runoff water. Any county or municipality may, by ordinance, adopt requirements that all applications for building permits contain a statement that such buildings and appurtenances connected therewith include facilities for the orderly runoff or retention of rain and melting snow. Such facilities may include, but not be limited to: retention ponds, retention tanks, pools located on and a part of the roof of buildings, permeable pavements and such other facilities as may be suitable. Such plans shall include a signed statement issued by a licensed civil engineer that the plans include facilities adequate to prevent harmful runoff. The governing body of the county or municipality shall determine rain and snowfalls taking into consideration such factors as the permeability and water absorbing quality of the soil and adequacy of existing water-ways. (Source: P. A. 78-400.)

(210 ILCS 120/) Illinois Mobile Home Tie down Act (from Ch. 111 1/2, par. 4405) Section 5 of the Illinois Mobile Home Tie down Act indicates that the owner of each mobile home installed in Illinois on or after January 1, 1980, or which is moved from one lot to another after that date, shall be responsible to insure that approved tied own equipment is obtained and used to secure the mobile home to the surface upon which it is to rest when occupied. After January 1, 1990, the owner of each mobile home park shall make available to the owner of any mobile home moved within or into their mobile home park with a copy of the Mobile Home Owner's Tie down Guide pamphlet prepared by the Department. This pamphlet shall be made available to the homeowner prior to the installation of the home. The Department shall be responsible for providing these pamphlets to each mobile home park owner. The installer of such equipment shall secure the mobile home in accordance with this Act and all rules and regulations promulgated under the authority of this Act. (Source: P.A. 86-595.)

Coastal Management Program

The Illinois Department of Natural Resources/Office of Coastal Management was officially approved as a program of NOAA in January 2012, as part of the Coastal Zone Management Act. The goals of the program are to preserve, protect, restore, and where possible, enhance coastal resources in Illinois for this and succeeding generations. The program will also work to support and coordinate partnerships among local, state and federal agencies and organizations for coastal planning and management and strengthen local stakeholder capacity to initiate and continue effective coastal management consistent with identified state standards and criteria.

The program intends to work with Federal, state and local partners to identify coastal hazards, including erosion, water level changes, storm surges, flooding and potential climate change issues with the goal of increasing long-term coastal resilience to mitigate those hazards. The Illinois Coastal Management Program can offer technical support, coordination, data and monitoring, and funding for projects that help mitigate coastal natural hazards.

State Policy Regarding Development
In Illinois much of the legal enforcement powers are decentralized and lie within the local jurisdictions. Illinois is a "home-rule" State. This results in the lack of uniformity from one jurisdiction to the next.

Examples are as follows:

1) Each jurisdiction must enforce its own zoning rules and regulations which includes floodplain management. The State cannot enforce these regulations; it is up to the local jurisdiction.

2) Each jurisdiction chooses whether or not to adopt building codes and is responsible for enforcing building codes. Generally, the State of Illinois has not adopted a statewide building code. The exception is that for Illinois public school districts, excluding Chicago Public Schools, Illinois has adopted a statewide building code.

The Illinois Department of Natural Resources/Office of Water Resources coordinates the NFIP and works with communities to adopt and enforce local floodplain regulations. In Illinois, 101 counties and 885 jurisdictions have adopted local floodplain management ordinances and participate in the National Flood Insurance Program. Virtually all communities in Illinois have adopted the state model floodplain ordinance. The state model ordinance has several regulations which go above-and-beyond NFIP minimum standards. Communities in the six counties of Northeastern Illinois go even further. These communities require compensatory storage for any floodplain development and enforce strict "appropriate use" regulations within the floodway. Many Illinois local officials are Certified Floodplain Managers (CFMs). As a result, Illinois has the fewest number of flood claims on new buildings. Few (if any) states in the nation regulate floodplain development as ardently as Illinois. The Illinois Department of Natural Resources/Office of Water Resources has developed a model ordinance for floodplain management, which provides the minimum requirements an NFIP participating jurisdiction must enforce. This model encourages community development outside of the floodplain and assists in managing the current floodplain. It requires a State permit for any construction in the floodway. Some jurisdictions have chosen to exceed the requirements of the model ordinance and have adopted more restrictive ordinances. This is most common in the Chicago metro area.

Rivers, Lakes and Streams Act, 615 ILCS 5 (Dam Safety Program)
Pursuant to the Rivers, Lakes and Streams Act, the Illinois Department of Natural Resources, Division of Resource Management regulates the construction, operation and maintenance of new dams and the modification, operation and maintenance of existing dams. Dams are classified by the Division based on hazard potential into one of three hazard classifications. All dams in the two higher classifications are required to have a permit under Dam Safety rules promulgated by the Department. Dams in the lower hazard classification require a permit for construction or modification if they meet certain size criteria. Dams in the lower classification may qualify for authorization under General Permit 98-01 or General Permit 02-01.

The Capital Development Board Act establishes a model building code for all areas throughout the State that currently have no code. The bill provides minimum code(s) for commercial construction. The bill provides for a qualified inspection of construction. Allows inspectors to be qualified by several different venues other than certification by a national code organization. Local jurisdictions may charge fees as local governments do now for building permits, etc. and they may enter into agreements with other local governments for these services and with third party providers for inspection services. The Capital Development Board's Division of Building Codes and Regulations (formerly the Illinois Building Commission)

acts as an advisory body assigned the responsibility to assist in streamlining building requirements in Illinois. The Division primarily acts as an informational resource to be used by the various building industry elements, the general public and various governmental units.

(815 ILCS 670/) Illinois Residential Building Code Act
The purpose of this Act is to provide minimum requirements for safety and to safeguard property and the public welfare by regulating and controlling the design, construction, installation, and quality of materials of new residential construction as regulated by this Act.

State Agency Programs & Policies
The State of Illinois has also enacted a variety of State agency policies and programs to assist in carrying out the mitigation actions pre and post disaster in an effort to achieve the State's mitigation goals. A variety of existing and emerging policies and programs were reviewed and evaluated as related to the mitigation program in Illinois. Members of the planning team have provided a capability assessment form to indicate their area of expertise. The following agency capability assessment forms are new to the 2018 INHMP Update: United States Army Corps of Engineers and US Geological Survey, IL Water Science Center. Illinois Historical preservation Agency is merged with DNR. So, their capability assessment form is not incorporated in the 2018 Plan.

Illinois' mitigation capabilities continue to increase year to year, as the benefits of strong mitigation measures are seen and new agencies are added to the mitigation planning efforts. Representatives from the following disciplines will be engaged in the future in an effort to strengthen updates and provide additional capabilities in areas currently not represented on the planning committee: University System, Electrical Cooperatives, Illinois Floodplain and Stormwater Management, Metropolitan Water Reclamation Districts, and Hazard Research Institutes (Mid-America Earthquake Center). Mitigation is a shared responsibility by all levels of government. All members of the INHMPC have essential roles that help the State achieve its mitigation efforts and reduce risk and impact as a whole from the identified natural hazards. The identified capabilities have been reviewed and determined to remain effective capabilities in assisting the State's mitigation program. The previously outlined regulations and policies incorporated with the State agency specific programs provide the final aspect of integration of the State's mitigation planning process. Each of these elements; regulations, policies and programs when combined together, provide the state with strong hazard management capabilities both pre and post disaster.

INHMPC members have provided Capability Assessment forms that provided greater detail related to the programs, plans, policies, regulations, funding and practices that their agencies have as related to mitigation in Illinois. These forms provide the agencies the availability to provide a brief description of each element and provide the opportunity to explore additional mitigation efforts that they may be able to engage in future years. The following capability assessment forms have been reviewed and updated to ensure that the most current capabilities are listed.

Capital Development Board/Division of Building Codes and Regulations - CDB/DBCR has retained all of the capabilities listed in previous plans. They have continued to update and revise the State's building code website available to all local agencies. In addition, initial discussions have begun to incorporate School Construction Grant administered by CDB with Code Plus Construction grants through HMGP, in order to maximize the construction of safe room's in schools.

Central Management Services - CMS current capabilities have not changed since the last update of the INHMP. Initial steps and discussions have begun to allow CMS to develop an all-encompassing GIS database for state owned or occupied facilities. CMS has agreed to manage and operate such a database when developed.

Department of Insurance - IDOI capabilities remain consistent providing strong partnerships in the mitigation field with public outreach and education.

Department of Natural Resources - IDNR continues to be an essential partner in the mitigation efforts in Illinois. The agencies mitigation capabilities continue to become enhanced. Continued enforcement of the National Flood Insurance Program and local outreach regarding floodplain management continues to be an essential capability. In addition, IDNR continues to update the State's floodplain maps and studies, while completing watershed and flood risk studies to develop structural and non-structural measures to reduce flooding impacts.

Department of Public Health - IDPH capabilities remain consistent providing an emphasis on public outreach and education for mitigation measures.

Department of Transportation - IDOT continues to provide a strong partnership with mitigation efforts in Illinois, focusing on structural projects related to mitigation. IDOT provides a unique capability of outreach to local highway departments or public works to identify potential mitigation projects. In addition, they have added the capability of a bridge scouring program, to identify and monitor high risk bridge locations, noted for scouring potential.

State Board of Education - ISBE provides the unique opportunity to assist Illinois school districts and policymakers with mitigation efforts for the safety of our children. ISBE continues to work with IEMA to establish mitigation opportunities for Code Plus construction and public educational opportunities for mitigation.

State Geological Survey - ISGS provides the technical expertise capability regarding earthquake hazards and estimated impacts the State of Illinois.

State Water Survey - ISWS provides a variety of mitigation capabilities for Illinois. The State Climatologist provides technical expertise in climate conditions such as winter storms, heat, and drought. ISWS also provides technical expertise related to flooding research and information. ISWS as a Cooperating Technical Partner with FEMA provides the capability of a direct link to the ever expanding RiskMap research being conducted on specific watersheds in Illinois.

Department of Human Services - IDHS provides a unique capability of providing assistance programs following a disaster potentially mitigating further impact on jurisdictions.

Department of Corrections - IDOC was incorporated to deliver the unique capability of providing technical guidance regarding mitigation measures directly related to correctional facilities.

Commerce Commission - ICC provides the capability of coordination and technical guidance regarding mitigation efforts for the State's critical infrastructure.

Environmental Protection Agency - IEPA provides the capability of safeguarding environmental quality, consistent with the social and economic needs of the State, so as to protect health, welfare, property and the quality of life, through a number of regulations and policies.

Department of Commerce and Economic Opportunity- DCEO continues to increase it's involvement with mitigation activities in Illinois. Their capability of assisting in providing a global match utilizing "IKE funds" has been a true asset allowing many jurisdictions' to further their mitigation projects.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **ILLINOIS EMERGENCY MANAGEMENT AGENCY (IEMA)**

POINT OF CONTACT: **Sam Al-Basha, State Hazard Mitigation Officer**

1035 Outer Park Drive, Springfield, Illinois 62704

Phone Number: **(217) 785-9942** E-mail Address **Sam.M.Al-Basha@illinois.gov**

AGENCY MISSION/FUNCTION:

AGENCY MISSION

To protect the State through integrated approaches of Emergency Management and Homeland Security that mitigate, prepare for, respond to and recover from all hazards, disasters and terrorist attacks.

SUMMARY OF AGENCY OPERATIONS

The primary responsibility of the Illinois Emergency Management Agency (IEMA) is to better prepare the State of Illinois in emergency management and Homeland security from any natural, manmade or technological disasters, hazards, or acts of terrorism. Through comprehensive emergency management, IEMA provides mitigation, preparedness, response and recovery. The Illinois Terrorism Task Force was established as a working partner within IEMA covering all disciplines and regions of the State, to facilitate the coordination of resources and the communication of information essential to combat terrorism. IEMA also provides monitoring of nuclear power plants; inspection and escorts of spent nuclear fuel shipments and all Highway Route Controlled Quantities (HRCQ) of radioactive materials; regulation of radon contractors, x-ray machines and technicians; licensing and inspection of radioactive materials.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Manages a hazard mitigation program	X			The mitigation staff's purpose is to promote mitigation statewide and to manage the FEMA mitigation programs for Illinois.
Participates in all Federal mitigation programs for which it is eligible	X			IEMA makes all attempts to use every mitigation dollar on eligible activities.
Encourages jurisdiction participation in NFIP	X			IEMA requires good standing as a prerequisite to mitigation funding. Joining the NFIP is viewed as the first step in mitigation.
Capability to track areas of repetitive flood loss and has developed a strategy to correct the problem	X			Illinois is a leader nationwide in identifying repetitive loss properties and has made their acquisition a top priority.
Develops a mitigation strategy based on the results of the hazard identification and risk assessment, program assessment, and operational experience to eliminate or mitigate the effects of hazards	X			The State's first priority is assisting the victims of disasters. The State Mitigation Plan is compiling local mitigation plans to identify the best projects.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Encourages and supports communities in becoming disaster resistant by providing them disaster prevention guidance, training, public education materials, technical assistance, and access to available Statewide resources	X			Mitigation projects are implemented by the local governments. All efforts are made to educate the local jurisdictions on mitigation options. IMA has focused on providing mitigation workshops following disasters while the interest is high.
Provides incentives that encourage mitigation activities sponsored by public and private sector partnerships	X			The mitigation staff has provided funding when possible to public/private sector partnerships. We have initiated a disaster resistant construction education program with the American Red Cross.
Considers but is not limited to use of appropriate building construction standards; hazard avoidance through appropriate land use practices; relocation, retrofitting, or removal of structures at risk; and removal or elimination of the hazard	X			IMA promotes mitigation prior to construction through proper land use planning. When structures are in harm's way we will work to remove them when it is cost-effective. We have provided funds for code-plus construction in schools and critical facilities.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Implements mitigation projects and/or initiatives with or without Federal grant assistance, according to a plan that sets priorities based on the highest potential for damage	X			IEMA's first priority is assisting the victims of disasters. Potential projects are analyzed to give priority to the avoidance of the greatest damage.
Provides policy leadership and coordination that promotes hazard mitigation programs and initiatives		X		The mitigation staff coordinates the IMAG, the INHMPC and the MCSC (formerly A&R).
Provides technical assistance to local governments in developing, adopting, and implementing state of the art building codes with all hazards mitigation components		X		Jurisdictions are directed to IBC for specific information on building codes. Manuals on wind resistant construction available on the IEMA website. Disaster Resistant construction materials are distributed to all interested parties.
Provides technical assistance to local governments in developing, adopting, and implementing land use ordinances for the purpose of reducing risks from all hazards	X			Jurisdictions are directed to IDNR/OWR for information on joining the NFIP. Mitigation staff answers basic questions on the NFIP but directs the complex questions to IDNR/OWR.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Provides technical assistance to local governments conducting hazard identification, vulnerability, and risk assessments	X			Mitigation staff is receiving train-the-trainer instruction in this area. HAZUS-MH is promoted as the tool of choice.
Provides technical assistance to local governments in developing and implementing mitigation plans	X			Local governments are provided with the FEMA planning guidance, IMA planning guidance and directed to the IMA website for information
Identifies mitigation opportunities during the development of the Disaster Survey Report/Project Worksheet	X			Mitigation staff accompanies PDA teams and looks for areas where future damages can be avoided.
Provides support to local jurisdictions that are building Disaster Resistant communities (e.g., Project Impact)	X			The mitigation staff provides technical assistance to any jurisdiction striving to be disaster resistant.
Tracks dollar savings due to mitigation efforts	X			When a disaster affects an area that has taken mitigation actions, an attempt is made to research and document the savings.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **American Red Cross (ARC)**

POINT OF CONTACT: **Scott D. Clarke**
1045 Outer Park Drive
Springfield, IL 62704

Phone Number**: (217) 299-7431** E-mail Address: **Scott.Clarke@redcross.org**

AGENCY MISSION/ FUNCTION:

The American Red Cross prevents and alleviates human suffering in the face of emergencies by mobilizing the power of volunteers and the generosity of donors. The American Red Cross helps people plan for, respond to and recover from disasters.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Smoke detector installation.	X			The American Red Cross and its partner organizations installed 10,661 smoke detectors in Illinois residences in 2016 and 13,689 in 2017. These resulted in a documented 16 lives being saved.
Disaster education in schools on all hazards risks.(pillowcase project)	X			2016: 26,257 students 2017: 12,322 students

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **CAPITAL DEVELOPMENT BOARD, DIVISION OF BUILDING CODES AND REGULATIONS (CDB/DBCR)**

POINT OF CONTACT: **Lisa Mattingly**

Stratton Office Building 401 South Spring Street, 3rd Floor
Springfield, Illinois 62706

Phone Number: **(217) 524-6408** E-mail Address: **lisa.mattingly@illinois.gov**

AGENCY MISSION/ FUNCTION:

The Capital Development Board (CDB) oversees the construction of new state facilities, such as prisons, college and university classroom buildings, mental health hospitals and state parks. In addition, CDB is responsible for renovation and rehabilitation projects at the State's 8,441 state-owned buildings containing more than 96 million square-feet of floor space.

The Capital Development Board's Division of Building Codes and Regulations (formerly the Illinois Building Commission) acts as an advisory body assigned to assist with streamlining building requirements in Illinois. The Division is an informational resource to governmental entities, designers, contractors and the general public. The Division has created a database of municipal and county adopted codes as required by statute.

They also publish the Directory of Illinois Building Related Requirements. This Directory provides contact information for all agencies involved in design and construction. The Directory and all services provided by the Division are available on the Commission's website, www.cdb.state.il.us.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Monitor Legislative and Regulatory issues related to Building Codes enforced in Illinois	X			Provide Administrative Rule and Legislative tracking and analysis specific to State construction requirements. Provide information on administrative rule process utilized by Illinois.
Support website that provides informational resources on building regulations in Illinois	X			Online access to reference documents regarding agency administrative rules related to building requirements. Legislative/administrative rule updates. Construction related resources.
Track new and amended building codes adopted by local municipalities and counties	X			Implemented program in 2000. Post new code adoptions or amendments to existing codes submitted by counties and municipalities. They are required to notify the division 30 days prior to adopting or amending an existing building code. Access by public for 60 days prior to being archived.
County/Municipality Code Identification	X			Division has established a database to identify codes and contact information for counties and municipalities in Illinois.
Designers for CDB projects are required to design new or reconstructed structures to meet IBC seismic requirements.	X			This helps limit damage in a seismic event.
CDB has adopted policies to coincide with Executive Order 2006-05.	X			This includes but is not limited to the requirement that all critical facilities shall be located outside of floodplains. Where this is not practicable, the lowest floor elevation will be equal to or greater than the 500 yr. frequency or structurally dry flood proofed to that frequency. This can limit damages by avoiding areas where flooding may be present.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **CENTRAL MANAGEMENT SERVICES (CMS)**

POINT OF CONTACT: **Diane Hoots**

Room 715, Stratton Office Building
Springfield, IL 62706

Phone Number**: (217) 299-6039** E-mail Address: **diane.hoots@illinois.gov**

AGENCY MISSION/ FUNCTION:

CMS Mission Statement: "Our mission is to ensure the accountable, efficient, transparent and effective delivery of a broad range of programs and services to state agencies, the Illinois business community, local governments, and the citizens of Illinois, while maintaining the lowest impact on taxpayer dollars."

CMS is divided into several business units, each providing a variety of services to Illinois government and citizens. Those services include maintenance and management of the state's vehicle fleet; operation of a state mail and messenger service; warehousing and management of state surplus property; oversight of the state's recycling program; administration of group insurance and deferred compensation programs for state government and university employees, retirees, and their dependents; promotion of state business opportunities for minority-owned Illinois businesses; providing media (radio, video, graphic design) services to state agencies, boards, and commissions; administering the state Personnel Code, Personnel Rules, Pay Plan, and Position Classification Plan; management and maintenance for state-owned and leased facilities; management of state facility access control systems such as badges and badge readers; development of procurement documents and establishment of state contracts for goods and services, which establishes contracts that can be utilized by local governments in Illinois.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Property Management has policy that tenant agencies may not store documents in basements of facilities – to prevent flood loss.		X		After several instances in which important paper documents were lost or damaged and/or significant expenses were incurred in order to recover water damaged papers, CMS implemented this policy to prevent future losses.
When and where possible, CMS Property Management encourages landlords of lease facilities to maintain proper drainage and grading on properties to prevent flood damage to the offices within the facilities we lease.	X			One example is an IDHS office in Benton. Over time, the parking lot pavement settled enough that significant rain events caused water to run toward the building instead of away from it. At one point, water actually ran into the building under the front door. BoPM worked with the landlord to resurface the parking lot to force rain drainage away from the building.
It is also CMS Bureau of Property Management practice that no facility will be leased that is located in a floodplain.	X			

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **Department of Insurance (IDOI)**

POINT OF CONTACT: **Robert Rapp**
320 W. Washington
Springfield IL 62707

Phone Number: **(217) 785-1680** E-mail Address: **Robert.rapp@illinois.gov**

AGENCY MISSION/ FUNCTION:

To protect consumers by providing assistance and information, by efficiently regulating the insurance industry's market behavior and financial solvency, and by fostering a competitive insurance marketplace.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X)			Comments
	Support	Facilitate	Hinder	
Attend monthly IEMA briefings	X			Allows DOI to maintain situational awareness and assistance when required
Participate in MARC sites when required	X			Provide short term assistance for Illinois residents affected by natural disasters.
Ongoing development and evaluation of Department disaster response procedures		X		Provides direction and allows DOI staff and insurers to be prepared for actions taken following an event.
Outreach engagements		X		The DOI provides public presentations to community interest groups addressing insurance and disaster preparations.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **ILLINOIS DEPARTMENT OF NATURAL RESOURCES (IDNR)**

POINT OF CONTACT: **Ron Davis**
One Natural Resources Way, Springfield, Illinois 62702-1271

Phone Number: **(217) 524-7200** E-mail Address: **ron.davis@illinois.gov**

AGENCY MISSION/FUNCTION:

IDNR's mission is to manage, protect, and sustain Illinois' natural & cultural resources; provide resource-compatible recreational opportunities; and promote natural resource-related public safety, education, and science.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Flood Hazard Mitigation Program		X		Provides funding and planning assistance for the purchase of floodprone properties. Land purchased must remain in open space in perpetuity. Program can act alone or in conjunction with IEMA/FEMA. (POC = Ron Davis, (217) 7524-7200).
Local Floodplain Management	X			Oversees compliance with local floodplain regulations. Works with communities to prepares and adopt local floodplain ordinances. Investigates and resolves floodplain violations. Provides technical floodplain management assistance. (POC = Paul Osman (217) 782-4428).
National Flood Insurance Program (NFIP)	X			Coordinates the National Flood Insurance Program in Illinois. Provide assistance and training to insurance agents and lenders. Tracks repetitive loss properties. Resolve flood insurance complaints. Coordinate CRS & ICC Projects (POC = Paul Osman (217- 782-4428).
State Floodway Permitting Program	X			Program is responsible for review of proposed development and issuing/denying permits for construction in the floodway of streams. Also regulates development activities in and along public bodies of water. (POC= Mark McCauley

				(217) 524-1047).
Dam Safety	X			Oversees the construction, operation, & maintenance of dams which existed prior to 9-2-80. Dams are classified by size and hazard potential. (POC = Paul Mauer (217) 782-4427)
OSLAD	X			Open Space Lands Acquisition and Development Program provides funding assistance to local governments for the acquisition and/or development of land for public parks and open space. (POC = Jan Nation, (217) 782-7607).
Mines & Minerals	X			Program provides information on location of underground mines in 73 IL counties. This information could be useful in determining risk as it relates to earthquakes.
Law Enforcement	X	X		Provides Law Enforcement activities in emergency situations related to natural disasters. (POC = Joe Morelock)
Flood Surveillance Program		X		Monitor flood stages throughout state and provide technical assistance to IMA concerning flood stages, flood forecasting and damages to urban & rural areas. (POC = Bill Milner (217) 524-1458)
Planning Studies (Flood-Control) Flood Control Act of 1945	X			Complete watershed and flood risk studies to develop structural & non-structural measures to reduce flooding and reduce or eliminate the number of damaged structures. (POC = Rick Pohlman
Floodplain Mapping	X			Coordinate State's floodplain maps and studies. (POC = Sally McConkey.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **ILLINOIS DEPARTMENT OF PUBLIC HEALTH (IDPH)**

POINT OF CONTACT: **Winfred Rawls**
422 South 5th Street, Springfield, IL 62701

Phone Number: **(217) 557-3699** E-mail Address: **Winfred.Rawls@illinois.gov**

AGENCY MISSION/FUNCTION:

IDPH's mission is to promote the health of the people of Illinois through the prevention and control of disease and injury.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Office of Preparedness and Response	X			Collaborates with Local Health Departments, Hospitals and Emergency Medical Services to assess their disaster preparedness capabilities and assist with planning and training.
	X			Coordinates Emergency Medical Services (EMS) Assets to support any potential evacuations of Hospitals and Long Term Care Facilities.
		X		Assist with procurement of potable water and portable toilets for local jurisdictions, upon request.
		X		Developed "Surviving Disasters A Citizen's Emergency Handbook".
Office of Health Care Regulation	X			Collaborates with IEMA at the Regional and State level to assist Hospitals and Long Term Care Facilities and their local EMA in providing relief supplies and any potential evacuations.
	X			Advises Hospitals and Long Term Care Facilities to coordinate with their local EMA for any supplies needed to assist response efforts.

	X			Hospitals and Long Term Care Facilities are advised to coordinate with their local EMA if evacuation of their facilities is required.
Office of Health Protection	X			Monitors operations of and resources from the Divisions of Infectious Diseases, Environmental Health, Food, Drugs and Dairies, and Laboratories collaborating with Local Health Departments as necessary and appropriate.
		X		Assist with procurement of potable water and portable toilets for local jurisdictions, upon request.
		X		Developed “Surviving Disasters A Citizen’s Emergency Handbook”.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **ILLINOIS DEPARTMENT OF TRANSPORTATION (IDOT)**

POINT OF CONTACT: **Thomas E. Korty**
2300 South Dirksen Parkway, Springfield, Illinois

Phone Number: **(217) 524-0151** E-mail Address: **Thomas.Korty@illinois.gov**

AGENCY MISSION/FUNCTION:

The mission of the Illinois Department of Transportation is to provide safe, cost effective, transportation for Illinois road ways that enhance quality of life, promote economic prosperity and demonstrate respect for our environment.

Bureau of Bridge and Structures

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Bridges over waterways are evaluated for their scour potential.		X		
Bridges with Critical Scour ratings are inspected after large storm events that produce high water condition.	X			
Bridges in seismically sensitive areas are inspected immediately after a significant earthquake event in accordance with the Earthquake Preparedness Plan.	X			
Bridges in seismically sensitive areas have been prioritized by their susceptibility to damage or collapse from seismic		X		

forces.				
Bridges with substructure elements in navigable waterways have been assessed for their susceptibility to barge collision and the condition of their protection devices.		X		This process identifies bridges with critical scour potential and initiates mitigation through installation of countermeasures or justification for structure replacement. Provides inspectors and structural engineers with necessary data to determine if a structure is suitable to remain open to traffic. Provides inspectors and structural engineers with necessary data to determine if a structure is suitable to remain open to traffic. Provides Department planners with justification data in order to budget for repair, rehabilitation, or replacement of structures in seismic areas. Provides the Department with assurances that bridges with substructure elements in navigation channels are adequately protected from barge collision and justification for repair or replacement of damaged protection devices.

Bureau of Design and Environment

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Roadway crowns are required to be 3 feet over 50-year flood event highwater elevation.	X			This can reduce damage by preventing a design flood event from overtopping roadways.
Low beams of structures are required to be 2 feet above 50 year flood event highwater elevation.	X			This helps limit damage by preventing accumulation of debris which exacerbates flooding during design flood events.
Establishment of compensatory storage is required when regulatory floodplains are filled during the course of a project.	X			This helps prevent exacerbation of damage during flood events.
A Hydraulic Report is required for every structure rehabilitation or replacement project.	X			This helps to prevent damage by assuring adequate bridge opening to minimize flooding.
Drainage studies are required on all but the simplest projects, and explicitly address any flood hazards to users and adjoining properties.	X			This helps prevent damage by identifying and correcting any potential drainage problems during design.
Existing structures in seismically sensitive areas are studied for possible retrofits if the replacement is not indicated.	X			This helps limit damage in a seismic event.

Bureau of Design and Environment (Continued)

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
New or reconstructed structures in seismi-cally sensitive areas are analyzed and designed to withstand seismic design loadings.	X			This helps limit damage in a seismic event.
Designers are required to coordinate with emergency services entities to assure accommodation throughout the project duration and beyond.	X			This will help limit damage by assuring the best practicable emergency response in the case of an event.
Interstate projects are coordinated with Department of Defense for the Strategic Highway Network(STRAH-NET) needs, particularly with respect to vertical clearances to structures.		X		This will help facilitate response in instances of domestic or foreign terrorism or other events requiring military capabilities.
The potential for geologic hazards such as mine subsidence, landslides and seismic activity is investigated and addressed on projects.	X			This can help to limit damages by identifying and avoiding or mitigating such hazards.

Bureau of Design and Environment (Continued)

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Crossing a flood plain with a new highway alignment is avoided unless there is no practical alternative, as directed by the U.S. Army Corps of Engineers	X			This can limit damages by avoiding areas where flooding may be prevalent.
Policy against crossing floodplains	X			Army Corps of Engineers to prevent flooding.
Minimize induced head for structures	X			Prevents structures from backing up streams and rivers.
Three feet freeboard on structures	X			Prevents accumulation of debris to help prevent flooding.
Pier placement in streams and rivers		X		Try to not place piers in the center of streams to hinder the flow of the streams.
Drainage studies	X			To make sure adequate drainage is on the project.

Bureau of Operations-Infrastructure Security Section

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Information Systems	X			Unit experienced in processing "Emergency Affidavits", Public Assistance Grants and Federal Highway Administration Grants to pay for emergency/disaster related response.
Communication Center Operations	X			Participation in user groups to study all types of operations to include winter operations (Multi-state runs meeting) and National /International Research Organization-Aurora
Bridge Recovery Program	X			Continue to implement the Bridge Recovery Program. This is the first in the nation. It established plans for structural evaluations and emergency response contracts to restore bridges to service as soon as possible following a natural or manmade disaster.
Bridge Security Program		X		Installation of over $12 million in surveillance equipment in Chicago, East St. Louis, LaSalle/Peru and other major Interstates. This equipment is used to secure bridges and highways from unauthorized access to critical infrastructure. Lighting, cameras, CCTV, fiber optics and fencing have been installed on 45 critical bridges in the State of Illinois.
		X		Installation completed on 42 manual gate systems on the inbound ramps on the Chicago expressway system. The gate system is to allow uninterrupted flow of emergency response vehicles into the City of Chicago while easing the burden of inbound traffic. Eighty locations have been selected for this program.

Bureau of Operations-Infrastructure Security Section (Continued)

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Evacuation Planning	X			The ITTF Transportation Committee in conjunction with the Illinois Terrorism Task Force prepared and tested evacuation plans for Chicago, Rockford, Peoria, Springfield and East St. Louis. Approximately $8 million in traffic management equipment has been provided to install traffic management equipment along streets and highways to insure free traffic flow from danger zones.
	X			The Transportation Committee Evacuation Implementation Group developed a Traffic Management Evacuation Plan for the City of Chicago Expressway. Priority routes have been selected to assist the evacuation planning of the Chicago Central Business District. Developing a Traffic Management Evacuation plan for the East St. Louis Metro area in coordination with SIU-E.

Bureau of Operations-Infrastructure Security Section

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Communication Center Operations		X		Staffed 24-hours a day to receive calls from Law Enforcement and other responder agencies to coordinate IDOT involvement and assistance for #1 safety events on IDOT highways -Incident reports -Maintain IDOT 800# for travelers alerting them of severe road conditions and closures on interstates.
		X		Communication Center "Liaisons" on call 24-hour, to respond to emergency disasters and SEOC activities.
	X			Communication center updates - winter road conditions map and road closure list as displayed on IDOT web page.
	X	X		Provide 800# for Motorist to report events and complaints.
	X			Contract funding for statewide weather forecasting provides warnings and forecasts to IDOT areas as well as selected pavement temperature forecasts.
	X			Refined study of equipment and their evaluation; yields enhanced equipment, better to respond in severe weather events. Experienced staff have pressed for more current fleet (truck) additions to ensure effective response to adverse events.
				Statewide radio systems and towers provide links between districts, trucks individually and control communications center.

Bureau of Operations-Maintenance Section

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Information Systems		X		Computer system support staff maintains road condition map as displayed on the internet.
		X		The MMIS Coordinator's for the Information System tracks dollars associated w/storm clean up.
	X			Roadway Weather Information System provides real-time pavement and atmosphere data at 53 locations statewide. (RWIS)
	X			A variety of performance and cost reports and salt reports to assist managers and budget staff.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **Illinois Emergency Services Management Association (IESMA)**

POINT OF CONTACT: **Dawn Cook, IESMA President (April 2018-2020)**
Director Tazewell County EMA
21304 State Route 9, Tremont, IL 61568

Phone Number**: (309) 925-2271** E-mail Address: **dcook@tazewell.com**

AGENCY MISSION/ FUNCTION:

The Illinois Emergency Services Management Association broad objectives are to assist State and Local government to maintain an effective emergency services and disaster management program locally and statewide; to be a vital and effective element of our National Defense Program; and through research, educational and information programs, to advance the professional standards of individuals so engaged. Within these broad objectives, the Association has as its purposes:

- To coordinate the efforts of its members in a common cause, to protect the lives and property of all persons within its territorial limits from enemy action or natural disaster, and to preserve our national security.

- To evaluate and disseminate the common experiences and collective judgment of the Local Emergency Management/ESDA organization and those other specialists trained in and responsible for Emergency Management activities.

- To serve as a clearing house for the collective experiences for Emergency Management activities, ideas and/or suggestions as well as successful course of action among our members and to make this material available to our members and agencies, both private and governmental.

- To provide opportunities for the members to keep abreast of the new developments and approved principles relating to Emergency Management and to encourage members to take advantage of these services.

- To act in concert with and in a professional advisory capacity to other organizations regarding Emergency Management/Preparedness matters.

Through the Illinois Emergency Management Mutual Aid System (IEMMAS), we will provide qualified and educated personnel, upon request through the State Emergency Operations Center, to any stricken or afflicted body of government, be it local county state or federal. We currently have three regionally structured teams – Red (North), White (Central) and Blue (South) ready for deployment.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Illinois Professional Standards and Accreditation Program	X			Education of the emergency manager's role in disaster planning to support mitigation.
Emergency Mobile Support Team (IEMMAS)	X			State resource of Emergency Management.
Incident Management Teams	X			State resource of Incident Management Teams in concert with MABAS, ILEAS and other agencies.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **Illinois State Board of Education (ISBE)**

POINT OF CONTACT: **Jeffrey Aranowski**
100 W. Randolph Street, Suite 14-300
Chicago, Illinois 60601

Phone Number**: (217) 782-8535** E-mail Address: **jaranows@isbe.net**

AGENCY MISSION/ FUNCTION:

The vision of the Illinois State Board of Education (ISBE) is that Illinois is a state of whole, healthy children nested in whole, healthy systems supporting communities wherein all people are socially and economically secure. The mission of ISBE is to provide leadership and resources to achieve excellence across all Illinois districts by engaging legislators, school administrators, teachers, students, parents, families, and other stakeholders in formulating and advocating for policies that enhance education, empower districts, and ensure equitable outcomes for all students.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Health Life Safety Code for Public Schools	X			Develop, maintain and administer the minimum standards for the maintenance and construction of public school facilities for 850 Illinois public school districts (excludes Chicago Public Schools and the Department of Juvenile Justice), the minimum standards and guidelines for regional superintendents to use for ensuring compliance, the standards for qualifying individuals who conduct plan reviews and inspections of schools, and the standards for obtaining authorization to use and raise fire prevention and safety financing.
School Safety Drill Act PA 094-0600	X			Develop, maintain and administer the minimum standards for 852 Illinois public school districts (includes Chicago Public Schools) to follow when conducting school safety drills and the minimum standards for reviewing school emergency and crisis response plans, and the standards and procedures for ensuring compliance with the minimum standards.

School Construction Program	X			Develop, maintain and administer the standards for determining capacity need for 852 Illinois public school district (includes Chicago Public Schools), the standards for issuing entitlements to eligible school districts for school construction project grants, and the standards for determining the order of priority for projects based on the School Construction Law.
Non-public Recognition		X		Conduct health safety reviews as part of the Recognition Process.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
School Safety Drill Act Administration Title 29 Part 1500	X			Joint Rules of the Office of the State Fire Marshal and the Illinois State Board of Education: School Emergency and Crisis Response. Establishes the requirements for the annual review and updating of the protocols and procedures in each school's emergency and crisis response plan.
Superintendent's Weekly Message	X			Reminders and announcements for the agency are sent to school districts and regional superintendents through the "Superintendents Weekly Message". Recent topics regarding safety include the announcement of the Seventh Annual Safe School Symposium, Lightening Safety Awareness Week, availability of the online Incident Command System course, and Severe Weather Preparedness Week, etc. The weekly messages are then archived on our website at: www.isbe.net.
School Security Training Program	X			A one-day course on "Forming Critical Incident Response Teams" and a two-day "Train the Trainer" Multi-Hazard Emergency Planning for Illinois Schools" are offered free of charge to local law enforcement officers, firefighters, emergency management and public and private school districts. The training is provided by contract with Western Illinois University through IEMA.
Hazardous Material Training	X			Regional offices of education with Hazmat training. (105 ILCS 5/10-20.17a) (from ch. 122, par. 10-20.17a) Sec. 10-20.17a Hazardous Materials Training. To enhance the safety of pupils and staff by providing in-service training programs on the safe handling and use of hazardous or toxic materials for personnel in the district who work with such materials on a regular basis. Such programs shall be approved by the State board of Education in consultation with the Illinois Dept. Of Public Health. (Source: P.A. 84-1294)

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **ILLINOIS STATE GEOLOGICAL SURVEY(ISGS)**

POINT OF CONTACT: **Robert A. Bauer, Engineering Geologist**
615 E. Peabody Drive, Champaign, Illinois 61820

Phone Number: **(217) 244-2394** E-mail Address: **rabauer@illinois.edu**

AGENCY MISSION/FUNCTION:

Providing the citizens and institutions of Illinois with a geoscience basis for environmental and economic decision making through relevant research, modern geologic mapping, targeted technical assistance, expanded education and outreach, and extensive databases and collections.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
CUSEC State Geologists' soil amplification and liquefaction susceptibility maps of 8 central U.S. States and some towns.	X	X		Maps that are produced for inclusion into HAZUS earthquake loss estimation. Eight states and Carbondale, Illinois
Detailed mapping of geology in 3 dimensions in multiple higher populated areas of state – quadrangle mapping.	X	X		Mapping results used a base for other derived maps: earthquake amplification, liquefaction, and groundwater availability and contamination potential
Groundwater contamination potential maps	X	X		Maps showing degrees of potential to contaminate groundwater in the State. State wide map and various areas where quadrangle mapping is occurring.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **ILLINOIS STATE WATER SURVEY (ISWS)**

POINT OF CONTACT: **Kevin Obrien, Acting Director**
2204 Griffith Drive, Champaign, Illinois 61820-7495

Phone Number: **(217) 244-5449** E-mail Address: **kcobrien@illinois.edu**

AGENCY MISSION/FUNCTION:

The Illinois State Water Survey is the primary agency in Illinois for research and information on surface water, groundwater, and the atmosphere. Its mission is to characterize and evaluate the quality, quantity, and use of these resources. The mission is achieved through basic and applied research; by collecting, analyzing, archiving, and disseminating objective scientific and engineering data and information; and through service, education, and outreach programs. This information provides a sound technical basis for the citizens and policymakers of Illinois and the nation to make wise social, economic, and environmental decisions.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X)			Comments
	Support	Facilitate	Hinder	
State Climatologist Office	X	X		Monitor current climate conditions within the state and provides data and research on current and potential future climate hazards such as heavy rains, heat waves, winter storms and drought.
Coordinated Hazard Identification and Mapping Program Groundwater contamination potential maps	X	X		FEMA Cooperating Technical Partner, conduct flood studies, prepare Digital Flood Insurance Rate Maps; and conduct HAZUS-MH analyses for mitigation planning; prepare Risk MAP non-regulatory products and outreach.
Water Supply Planning Program	X	X		Water supply planning research identifies areas that are at risk of potable water shortages.
Illinois Water Inventory Program	X	X		Locations of public water supply withdrawals, annual quantities, and contact information for water suppliers.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **NATIONAL WEATHER SERVICE (NWS)**

POINT OF CONTACT: **Chris Miller, Warning Coordination Meteorologist**
1362 State Route 10, Lincoln, IL 62656

Phone Number: **(217) 732-4029 ext 726** E-mail Address: **chris.miller@noaa.gov**

AGENCY MISSION/FUNCTION:

The mission of the National Weather Service (NWS) is to provide weather and flood warnings, public forecasts, and advisories for all of the United States, its Territories, adjacent waters, and ocean areas, primarily for the protection of life and property.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X)			Comments
	Support	Facilitate	Hinder	
Storm Ready Program	X			The NWS Storm Ready program recognizes those communities that are prepared for natural disasters. The inspection process, prior to recognition, verifies that communities have the resources to receive weather information and warnings, the means to disseminate warnings to critical facilities, and that community preparedness activities have been accomplished and are on-going. StormReady recognition rewards local hazardous weather mitigation programs, helps emergency managers justify costs to support mitigation programs, provides a means of acquiring 25 Community Rating System points assigned by the National Flood Insurance Program (NFIP), and provides an "image incentive" to communities.
Public Outreach		X		The NWS offices across the state of Illinois conduct numerous public outreach presentations at home shows, fairs, and for civic, religious, school and business groups. The main topics highlighted during this outreach are:

Weather Ready Nation Ambassador Program	X			- Hazardous weather safety & preparedness campaigns - The importance of NOAA Weather Radio and other weather sources - Hazard mitigation projects for home owners, such as wind resistant construction and tornado safe rooms Seasonal preparedness campaigns are held across the state, in conjunction with the IEMA's Ready Illinois program. The Weather-Ready Nation (WRN) Ambassador™ initiative is the NWS' effort to formally recognize partners who are improving the nation's readiness, responsiveness, and overall resilience against extreme weather, water, and climate events. As a WRN Ambassador, partners commit to working with the NWS and other Ambassadors to strengthen national resilience against extreme weather. In effect, the WRN Ambassador initiative helps unify the efforts across government, non-profits, academia, and private industry toward making the nation more ready, responsive, and resilient against extreme environmental hazards. WRN Ambassadors must commit to: ▪ Promoting Weather-Ready Nation messages and themes to their stakeholders; ▪ Engaging with NWS personnel on potential collaboration opportunities; ▪ Sharing their success stories of preparedness and resiliency; ▪ Serving as an example by educating employees on workplace preparedness

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **ILLINOIS DEPARTMENT OF HUMAN SERVICES (IDHS)**

POINT OF CONTACT: **AMY DICKENSON-FERGUSON**
100 SOUTH GRAND AVENUE, EAST, HARRIS BUILDING II,
SPRINGFIELD, IL 62762

Phone Number**: (217) 557-9354** E-mail Address: **Amy.dickenson-ferguson@illinois.gov**

AGENCY MISSION/ FUNCTION:

IDHS's mission is to assist Illinois customers to achieve maximum self-sufficiency, independence and health through the provision of seamless, integrated services for individuals, families and communities. Illinois created DHS in 1997, to provide Illinois residents with streamlined access to integrated services, especially those who are striving to move from welfare to work and economic independence, and others who face multiple challenges to self-sufficiency. Programs are provided based upon income eligibility.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X)			Comments
	Support	Facilitate	Hinder	
Disaster Supplemental Nutritional Assistance Program (D-SNAP)	X			The United States' Department of Agriculture (USDA) Food and Nutrition Service (FNS) authorizes disaster SNAP (formally food stamps) programs based upon federal and state disaster declarations and D-SNAP state application to the USDA. SNAP helps low-income people and families buy the food they need for good health. Benefits are provided on the Illinois Link Card - an electronic card that is accepted at most grocery stores.
Temporary Assistance for Needy Families (TANF)	X			The Temporary Assistance for Needy Families (TANF) program helps pregnant women and families with one or more dependent children with temporary cash and other benefits. TANF can help pay for food, shelter, utilities, and expenses other than medical.
Emergency Food	X			The Emergency Food Program (EFP) provides food at no cost to help supplement the diets of

Program (EFP)				needy low-income households. The EFP is a Federal program, administered by the Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA).
Woman, Infants, and Children (WIC	X			WIC is a food assistance program for Women, Infants, and Children. It helps pregnant women, new mothers and young children eat well and stay healthy.
Supplemental Nutrition Assistance Program (SNAP)	X			The Supplemental Nutrition Assistance Program (SNAP) (formerly Food Stamps) helps low-income people and families buy the food they need for good health. Benefits are provided on the Illinois Link Card - an electronic card that is accepted at most grocery stores.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **Illinois Department of Corrections (IDOC)**

POINT OF CONTACT: **Mike Chappell**
1301 Concordia Court
Springfield, IL 62794-9277

Phone Number**: (217) 558-2200 ext 7845** E-mail Address: **Mike.Chappell@illinois.gov**

AGENCY MISSION/ FUNCTION:

The mission of the Illinois Department of Corrections is to protect the public from criminal offenders through a system of incarceration and supervision which securely segregates offenders from society, assures offenders of their constitutional rights and maintains programs to enhance the success of offenders' re-entry into society. Safety is at the forefront of agency operations with an emphasis on frontline staff to protect and control inmates. Additionally, the agency has work camp and boot camp crews which provide thousands of hours each year toward community service projects and disaster relief efforts.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X)			Comments
	Support	Facilitate	Hinder	
IDOC Mass Evacuation Plans	X			IDOC operates 27 adult correctional centers, 2 Impact Incarceration Programs (boot camps), 4 adult transition centers and 3 work camps. Each of these Facilities is required to maintain a Mass Evacuation Plan in the event their Facility is affected by a Natural Disaster (i.e. flood, tornado, wind storm, ice storm, earthquake, etc.), Terrorist Incident, Hazardous Material Spill, Fire, Pandemic Influenza, etc.
IDOC Pandemic Influenza Plan	X			Correctional institutions pose special risks and considerations due to the nature of their unique environment. Inmates are in mandatory custody and options are limited for isolation and removal of ill persons from the environment. The workforce must be maintained and options are limited for work alternatives (e.g., work from home, reduced or alternate schedules, etc.). In addition, many inmates and the workforce may have medical conditions that increase their risk of influenza-related complications. The focus of the Pandemic Influenza Plan is on general

				preventive measures for institutions, risk reduction of introduction of the virus into institutions, rapid detection of persons with novel influenza A (H1N1) infections, and management and isolation of identified cases. This Plan provides guidance specific for correctional facilities to ensure continuation of essential public services and protection of the health and safety of inmates, staff and visitors.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **Illinois Commerce Commission (ICC)**

POINT OF CONTACT: **Jim Zolnierek**
527 E. Capitol Avenue
Springfield, Illinois 62701

Phone Number**: (217) 785-5278** E-mail Address: **jim.zolnierek@illinois.gov**

AGENCY MISSION/ FUNCTION:

The ICC's mission is to pursue an appropriate balance between the interests of consumers and existing and emerging service providers to ensure the provision of adequate, efficient, reliable, safe and least-cost public utility services.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
(220 ILCS 30/) Electric Supplier Act	X			This Act declared it to be in the public interest that, in order to avoid duplication of facilities and to minimize disputes between electric suppliers which may result in inconvenience and diminished efficiency in electric service to the public, any 2 or more electric suppliers may contract, subject to the approval of the Illinois Commerce Commission, as to the respective areas in which each supplier is to provide service.
Energy Engineering	X			Reviews: utility plant additions and "used and useful" issues in electric and gas rate cases; infrastructure construction certificates including electric transmission lines (need and route); ARES, ABC, MSP and AGS certification applications; ESA complaints; PGA and FAC reconciliations; electric distribution reliability reports; electric and gas meter calibration facilities; technical issues in consumer complaints; electric and gas accident reports;

				liquid petroleum pipeline facility certifications (need and route); and mercury rules compliance verifications.
Natural Gas Pipeline Safety	X			Inspects natural gas pipeline facilities to assure compliance with all Federal and State safety rules and regulations pertaining to the design, construction, operation and maintenance of those facilities, and incidents involving natural gas resulting in injury requiring hospitalization, fatalities or significant property damage.
Reliability Assessment	X			Provides analysis and policy advice regarding electric utility reliability reviews, power delivery infrastructure and distributed and renewable generation. Monitors investigations of power delivery infrastructure and environmental disclosure requirements. Provides representation on state and regional industry entities; and summaries and analyses as required on other issues as requested by the Division Director, the Executive Director and the Commission.
Water Engineering	X			Reviews tariffs and other filings by public water and sewer utilities; provides expert testimony in litigated cases; performs field reviews and inspections of plant, facilities and operations; and reviews and recommends Commission policies on state and national-level water and sewer issues. IEPA addresses water safety.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **Illinois Environmental Protection Agency (IEPA)**

POINT OF CONTACT: **Blaine Kinsley**
1021 North Grand Ave. East, Springfield, Illinois 62794

Phone Number**: (217) 558-1673** E-mail Address: **Blaine.Kinsley@illinois.gov**

AGENCY MISSION/ FUNCTION:

The mission of the Illinois Environmental Protection Agency (IEPA) is to safeguard environmental quality, consistent with the social and economic needs of the State, so as to protect health, welfare, property and the quality of life.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X)			Comments
	Support	Facilitate	Hinder	
Green Infrastructure for Clean Water Act	X			Public Act 96-26, the Green Infrastructure for Clean Water Act, requires the Illinois EPA to assess and evaluate using green infrastructure to help manage stormwater in Illinois. Illinois EPA is currently working with the University of Illinois – Chicago to undertake research to assess effective best management practices, green infrastructure standards and institutional and policy frameworks to support the development of a Green Infrastructure Plan for Illinois.
Clean Water Act Amendments of 1987	X			The Act established the NPDES storm water program. The act called for implementation in two phases; Phase I addressed the most significant sources of pollution in storm water runoff. Phase II addresses other sources to protect water quality, including modernizing wastewater treatment plants to meet water quality standards, replacing aging water mains and sewers and updating drinking water treatment facilities.
Emergency Operations Unit (EOU)	X			Protect the health and safety of the citizens of Illinois during emergency incidents involving the release of oil, hazardous materials or other

Hazardous Waste Program Title 35 Ill. Adm. Code, Parts 700-739	X			contaminants, while stabilizing, minimizing or eliminating the environmental consequences to the land, air or waters of the state. The intent of the hazardous waste program is to provide a cradle-to-grave management scheme for hazardous wastes to ensure that these wastes are not mismanaged in a manner that will impact human health or the environment. At Illinois EPA, the Bureau of Land Permit Section is responsible for implementing the hazardous waste program.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **ILLINOIS DEPARTMENT OF COMMERCE AND ECONOMIC OPPORTUNITY (DCEO)**

POINT OF CONTACT: **David Wortman, P.E.**
Deputy Director of Community Development
Illinois Department of Commerce & Economic Opportunity

Phone Number: **(217) 558-4200** **E-mail Address: David.Wortman@illinois.gov**

AGENCY MISSION/FUNCTION:

The Department of Commerce and Economic Opportunity is the lead state agency responsible for improving the competitiveness of Illinois in the global economy resulting in prosperous, growing industries, rising real income and high quality jobs. We, the DCEO Team provide information, assistance, and advocacy to facilitate and advance the economic development process in partnership with Illinois communities, business, and our network of public and private service providers.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (x)			Comments
	Support	Facilitate	Hinder	
Community Development Block Grant Program	X	X		Requires 8-Step Flood Plain Review for all funded projects
Dislocated Worker Program		X		Assists workers when major job loss occurs in a community.
Federal Grant Coordination	X	X		Assists communities in obtaining federal grants.
Public Infrastructure Program	X	X		Grants to communities to make infrastructure improvements.
Disaster Response Program	X	X		Grants to communities for disaster response in counties with a Governor-declared disaster.

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **United States Army Corps of Engineers (USACE)**

POINT OF CONTACT: **Mr. Scott Whitney**
1500 Rock Island Drive
Clock Tower Building
Rock Island, IL 61201

Phone Number: **(309) 794-5386** E-mail Address: **Scott.D.Whitney@usace.army.mil**

AGENCY MISSION/ FUNCTION:

The U.S. Army Corps of Engineers, Rock Island District, delivers vital engineering and water resource solutions in collaboration with our partners to secure our Nation, reduce disaster risk and enhance quality of life, providing value to the region and the Nation.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) Support	Facilitate	Hinder	Comments
Emergency Management	X	X		http://www.mvr.usace.army.mil/About/Offices/Emergency-Management/Emergency-Operations/
Flood Risk Management	X	X		http://www.mvr.usace.army.mil/Business-With-Us/Outreach-Customer-Service/Flood-Risk-Management/Continuing-Authorities-Program/
Planning Assistance to States	X	X		http://www.mvr.usace.army.mil/Business-With-Us/Outreach-Customer-Service/Planning-Assitance-to-States-and-Tribes/
Floodplain Management Services	X	X		http://www.mvr.usace.army.mil/Business-With-Us/Outreach-Customer-Service/Floodplain-Management-Services/

ILLINOIS CAPABILITY ASSESSMENT

NAME OF AGENCY: **US Geological Survey, IL Water Science Center**

POINT OF CONTACT: **Gary P. Johnson**
405 N. Goodwin Ave
Urbana, IL 61801

Phone Number**: (217) 328-8747** E-mail Address: **gjohnson@usgs.gov**

AGENCY MISSION/ FUNCTION:

The USGS Illinois Water Science Center primarily addresses water issues. These include flooding and surface- and ground-water quality. The USGS, Illinois Water Science Center investigates the occurrence, distribution, quantity, movement, and chemical and biological quality of Illinois' surface and ground water. Specific water resources activities of the Illinois Water Science Center include maintenance and analysis of long-term (prior to the turn of the Century) quantitative and qualitative data for streams, reservoirs, estuaries, and ground water; and short-term interpretive investigations of specific water-resources issues on a local, State, regional, and national level. Such investigations include the study of urbanization and flooding, water quality of the Illinois's major river basins, sedimentation of rivers and lakes, and contamination of surface water and ground water by hazardous waste. The USGS in Illinois primarily carries out its activities from three offices in Urbana, Mt. Vernon, and DeKalb, with a highly trained staff of scientists, technicians, and support personnel committed to providing accurate and timely natural resource information.

Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X)			Comments
	Support	Facilitate	Hinder	
Stream gages	X			Used in floodplain delineation Used extensively in flood warning and response Documents flood magnitude and duration

C. Local Government Mitigation Capability Assessment

IEMA and its partner State agencies promote local government mitigation capability by providing technical and educational assistance to identify actions which will be effective for hazard mitigation planning. Existing capability with local units of government varies depending on geographic location, available funding, and the interest of the local government leadership. Local interest in mitigation is usually directly tied to the history of disasters in the jurisdiction; with the jurisdictions most recently impacted having the most interest in mitigation. In general, larger jurisdictions have been more willing and able to build local mitigation capability than their smaller counterparts. Federal laws, such as the Disaster Mitigation Act of 2000 (DMA2K), have specified that in order to receive funds to complete a mitigation project within your jurisdiction, it is necessary for you to have a FEMA/IEMA approved Mitigation Plan. As of May 31st, 2018, 54.9% of the State's counties have an approved mitigation plan. It is projected that by the end of 2018 approximately 95% of the State's population will be covered by an approved Hazard Mitigation Plan. The summary of the table and map show us that areas with an approved mitigation plan will become less vulnerable to natural disasters and climate anomalies. In Illinois, the concept of putting together a mitigation plan is spreading as more jurisdictions wish to complete buyouts, elevations, and other mitigation projects that they are currently unable to do as a result of the Disaster Mitigation Act of 2000. This puts those jurisdictions at a greater risk than those with compliant plans already in place. Although, with the help of FEMA funded disaster planning, more jurisdictions are able to acquire contractors for help in achieving a mitigation plan compliant plan for their jurisdiction. This assessment of capability and project tracking is expected to develop into more detail when additional mitigation plans are FEMA approved.

2010-2018 Mitigation Plan Statistics		
Counties Covered by Mitigation Plans	56	54.9%
Counties with Mitigation Plans in Progress	25	23.5%
Counties that have not started a Mitigation Plan	10	9.8%
Counties with Expired Plan	12	11.8%

Local Hazard Mitigation Plan Status Map

IEMA
Illinois Emergency Management Agency

State of Illinois
Local Mitigation Plan (LMP) Status
5/31/2018

Counties with an approved/adopted LMP 56/102 = 54.9%
Population covered by LMP: 11,218,095 = 87.6%

1. Boone - 6-18-2014 (53,503)
2. Bureau - 10-30-2015 (33,359)
3. Carroll – 7-17-2017 (14,539)
4. Champaign - 10-30-2015 (208,419)
5. Clark - 5-2-2018 (15,938)
6. Clinton - 3-26-2018 (37,729)
7. Coles - 3-26-2018 (54,000)
8. Cook - 9-26-2014 (5,203,499)
9. Crawford - 8-18-17 (19,308)
10. Cumberland - 6-15-15 (10,858)
11. DeKalb - 8-29-2013 (104,528)
12. DuPage - 5-24-2018 (929,368)
13. Edgar - 8-22-2014 (17,566)
14. Edwards - 7-03-2017 (6,523)
15. Franklin - 4-28-17 (39,156)
16. Grundy - 8-2-2013 (50,437)
17. Hancock - 1-31-2018 (18,508)
18. Henry - 1-30-2014 (49,280)
19. Jackson - 9-16-2016 (58,870)
20. Jefferson – 11-9-2016 (38,460)
21. Jersey - 12-12-2016 (22,025)
22. Jo Daviess - 10-18-2013 (21,770)
23. Kane - 12-23-2015 (531,715)
24. Kankakee - 11-20-2013 (110,008)
25. Lake - 11-8-2017 (703,047)
26. LaSalle - 10-30-2015 (110,642)
27. Lawrence - 11-7-2017 (16,377)
28. Logan - 3-18-2014 (29,527)
29. Macon - 3-14-2014 (106,550)
30. Madison 3-17-2015 (265,759)
31. Marshall - 10-30-15 (11,939)
32. Mason - 1-15-16 (13,507)
33. McHenry - 9-25-2017 (307,004)
34. Mercer - 4-17-17 (15,730)
35. Monroe - 5-28-2014 (34,068)
36. Montgomery - 2-24-2017 (28,952)
37. Morgan - 5-28-2014 (34,277)
38. Moultrie - 5-22-17 (14,827)
39. Peoria - 3-13-2018 (185,006)
40. Perry - 9-29-2017 (21,357)
41. Putnam - 10-30-15 (5,611)
42. Rock Island - 9-16-16 (144,784)
43. Saline - 6-11-13 (24,307)
44. Sangamon - 5-12-17 (197,499)
45. Scott - 6-30-2014 (5,053)
46. Shelby - 3-26-2018 (21,717)
47. Stark - 10-30-15 (5,776)
48. Stephenson - 4-14-2017 (45,624)
49. Vermilion - 12-12-2014 (78,111)
50. Wabash - 12-20-2017 (11,492)
51. Wayne - 1-5-2018 (16,396)
52. White - 7-31-2017 (14,292)
53. Whiteside - 8-24-16 (56,536)
54. Will - 3-17-2015 (689,529)
55. Williamson - 11-5-2015 (67,560)
56. Winnebago - 12-12-2014 (285,873)

Counties with Planning in Progress

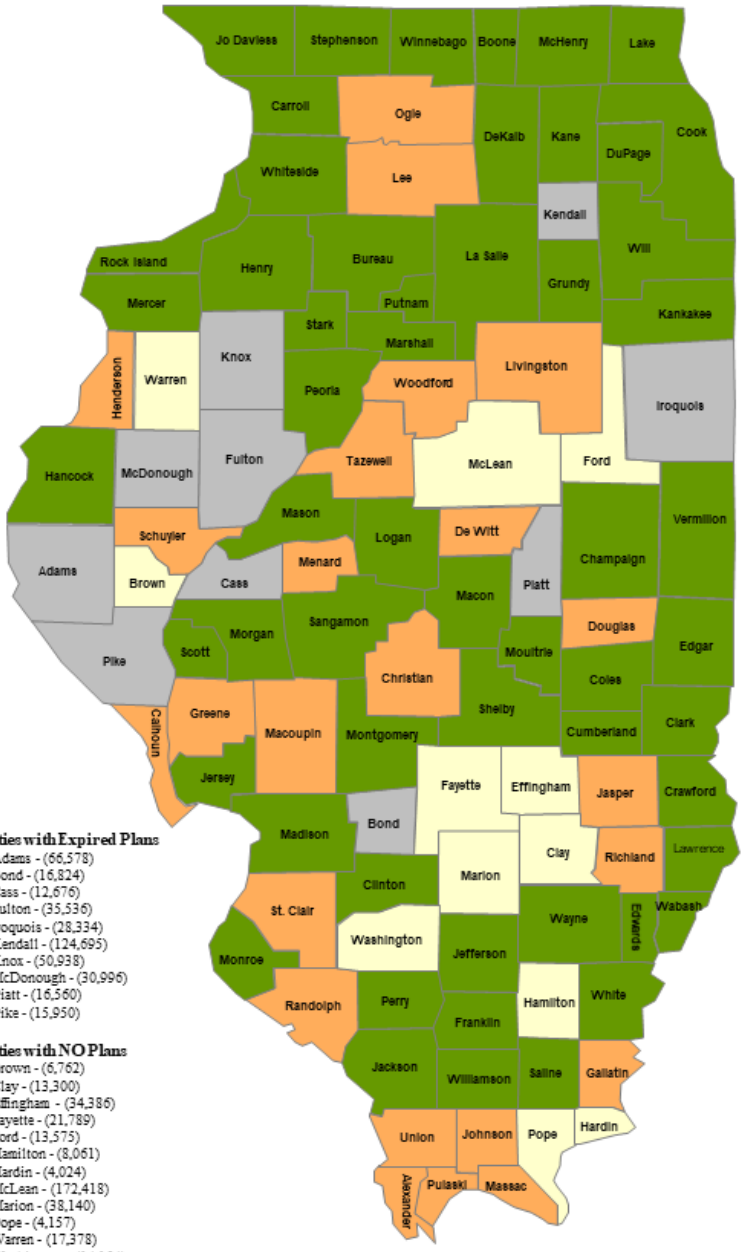
1. Alexander - (6,478)
2. Calhoun - (4,894)
3. Christian - (33,309)
4. Douglas - (19,630)
5. DeWitt - (16,226)
6. Gallatin - (5,212)
7. Greene - (13,093)
8. Henderson - (6,869)
9. Jasper - (9,536)
10. Johnson - (12,902)
11. Lee - (34,251)
12. Livingston - (36,526)
13. Macoupin - (45,908)
14. Massac - (14,658)
15. Menard - (12,516)
16. Ogle - (51,273)
17. Pulaski - (5,619)
18. Randolph - (32,621)
19. Richland - (15,930)
20. St. Clair - (262,759)
21. Schuyler - (6,923)
22. Tazewell - (134,385)
23. Union - (17,212)
24. Woodford - (39,140)

Counties with Expired Plans

1. Adams - (66,578)
2. Bond - (16,824)
3. Cass - (12,676)
4. Fulton - (35,536)
5. Iroquois - (28,334)
6. Kendall - (124,695)
7. Knox - (50,938)
8. McDonough - (30,996)
9. Piatt - (16,560)
10. Pike - (15,950)

Counties with NO Plans

1. Brown - (6,762)
2. Clay - (13,300)
3. Effingham - (34,386)
4. Fayette - (21,789)
5. Ford - (13,575)
6. Hamilton - (8,061)
7. Hardin - (4,024)
8. McLean - (172,418)
9. Marion - (38,140)
10. Pope - (4,157)
11. Warren - (17,378)
12. Washington - (14,154)



Counties with plans expiring between May 31, 2018 – 2022

2018		2019		2020		2021		2022	
County Name	Date of Expiration	County Name	Date of Expiration	County Name	Date of Expiration	County Name	Date of Expiration	County Name	Date of Expiration
Carroll	7/17/2018	Boone	6/18/2019	Bureau	10/30/2020	Jackson	9/16/2021	Franklin	4/28/2022
DeKalb	8/29/2018	Cook	9/26/2019	LaSalle	10/30/2020	Jefferson	11/9/2021	Lake	11/8/2022
Grundy	8/2/2018	Des Plaines	1/9/2019	Marshall	10/30/2020	Jersey	12/12/2021	Lawrence	11/7/2022
Jo Daviess	10/18/2018	Edgar	8/22/2019	Putnam	10/30/2020	Mason	1/15/2021	McHenry	9/25/2022
Kankakee	11/20/2018	Henry	1/30/2019	Stark	10/30/2020	Rock Island	9/16/2021	Mercer	4/17/2022
Saline	6/11/2018	Logan	3/18/2019	Champaign	12/30/2020	Whiteside	8/24/2021	Montgomery	2/24/2022
		Macon	3/14/2019	Cumberland	6/15/2020			Moultrie	5/22/2022
		Monroe	5/28/2019	Kane	12/23/2020			Perry	9/29/2022
		Morgan	5/28/2019	Madison	3/17/2020			Sangamon	5/12/2022
		Scott	6/30/2019	Will	3/17/2020			Stephenson	4/14/2022
		Vermillion	12/12/2019	Williamson	11/5/2020			Wabash	12/19/2022
		Winnebago	12/12/2019					White	7/30/2022

Local hazard mitigation policies, programs, and capabilities are reviewed with the submission of each local hazard mitigation plan. Policies, programs and capabilities such as building codes, zoning regulations, stormwater management programs, comprehensive plans, and land use polices were evaluated to determine effectiveness. With the number of State agencies represented on the INHMPC, the committee has the resources to provide guidance to local jurisdictions for model ordinances and examples of plans. In addition that State has a variety of possible funding avenues available to local jurisdictions interested in adopting hazard mitigation actions. The State attempts to maximize participation by local governments in FEMA's grant programs such as: PDM, HMGP and FMA. The State supplements these sources with funding from: General Revenue Funds, Flood Hazard Mitigation Program and CDBG Disaster Recovery Program.

The State has been actively working with the local jurisdictions to identify those actions most effective for hazard mitigation planning. In recent years, local governments have adopted and demonstrated capabilities to administer flood planning regulations, and even more have tried to participate in hazard mitigation grant programs. Support is continuing to grow for policies that will help with hazard mitigation. Funding has become increasingly restricted at all levels of government, making implementation of cost effective projects and mitigation friendly policies/regulation essential. The costs of implementing the following measures are relatively low, compared to mitigating future hazards. Many jurisdictions within the State have adopted or incorporate an element of the following items into mitigation efforts. A list of mitigation success stories can be found in Section I of the INHMP, highlighting these efforts. An increase in coordination between counties and local jurisdictions regarding mitigation priorities and planning efforts could also provide an outlet regarding financial burdens. Just as identified with the State capabilities, these policies, regulations and programs should be continually reviewed to determine their effectiveness and subsequently updated to continue to provide the most effective capabilities available.

The following is a list of existing and planned policies, programs and capabilities that are expected to improve the effectiveness of local mitigation.

Mitigation Training and Outreach Programs

State conducts hazard mitigation sessions at the IEMA Training Summit every year, along with other miscellaneous training on HM planning and project formulation. A lot of training was done informally by the mitigation staff in person or by phone with local officials as part of other events (damage assessment, public meetings for projects, general phone discussions on application preparation or project implementation). Mitigation has also been covered in a couple of the Operations Training classes. State is planning to start revising some of the operations training materials soon. Since 2013, agency held quarterly webinars for Emergency Regional Coordinators**.** IEMA mitigation staff participate in local planning meetings upon request. Local Regional Planning Commissions implemented reach out programs to provide assistance to jurisdictions on Mitigation plans.

Since 2013, due to staffing, the outreach program to profit and non-profit organizations was very minimal. For the 2018 update, the SHMO understands that a statewide outreach program is critical and an integral part to the success of mitigation programs offered by the IEAM. As a result, the SHMO directed mitigation staff to reaching out to local jurisdictions through IEMA webinars to regional EMA coordinators and attending local planning meetings to promote the PDM and FMA programs. SHMO requested from the Planner to reach out to counties with expired and no adopted local Hazard Mitigation on file. In addition, SHMO forwarded the preliminary dates for FEMA NOFO for the availability of federals, to the current sub-grantees asking to start planning their PDM and FMA application. The SHMO conducted a mitigation training session at the IEMA Annual Training Summit on September 5, 2018.

Building Codes

Building codes protect provide the ability to regulate and enforce the design and construction of structures to an established set of standards. Building codes protect new structures from damage by tornados, high winds, snow storms, and earthquakes. Building codes can be implemented in relation to improvements or repairs to ensure mitigation actions are being transposed to mitigate hazard impacts of current structures. Jurisdictions may adopt codes if approved by the State as providing “adequate minimum standards.” Local regulations cannot be less restrictive than the State code. The majority of county jurisdictions utilize the Illinois State Building Code **(815 ILCS 670/) Illinois Residential Building Code Act** as their guide for local building standards. The purpose of this Act is to provide minimum requirements for safety and to safeguard property and the public welfare by regulating and controlling the design, construction, installation, and quality of materials of new residential construction as regulated by this Act.

Zoning Ordinances

Zoning ordinances and laws regulate development by dividing the community into zones and by setting development criteria for each zone. Zoning can keep inappropriate development out of hazard-prone areas, such as identified floodplain and can designate certain areas for such thing as conservation, public use, or agriculture. When utilized in conjunction with land use planning, zoning ordinances and laws can effectively mitigate future construction in known hazard-prove locations. Local zoning ordinances can work in conjunction with State statutes that provide the authority for such actions.

Land Use Planning

All local hazard mitigation plans in Illinois have addressed land use planning. Land use planning allows for local governments to manage current and future development of land within their jurisdiction, while preventing development in hazardous areas or strategically alters the development to minimize damage from hazards. Land use planning is often a portion of a comprehensive planning effort and is a strong tool, when utilized in conjunction with mitigation planning.

Subdivision Regulations

Subdivision regulations govern construction and location criteria regarding layout and infrastructure including roads, sidewalks, utilities, storm sewers and drainage ways. Utilizing subdivision regulations allows jurisdictions to ensure developments of new subdivisions are done in non-flood hazard areas. Many of the local hazard mitigation plans address subdivision regulations as a portion of the counties overall zoning regulations.

Floodplain Management Programs

The NFIP provides many of the regulatory requirements associated with local floodplain management. A Local floodplain management program, provides that avenue to institute, regulate and monitor these regulatory requirements. Local floodplain management programs assist in the control of development in floodplains and the implementation of local regulations to floodplain protection. 100% of all of the counties with approved FEMA hazard mitigation plans, participate in the National Flood Insurance Programs (NFIP). In addition, the local hazard mitigation plans had identified floodplain ordinances that regulate development in the floodplain. The majority require existing buildings impacted by a flood to be re-built in such a way to minimize future damages. Many prohibit the development in the floodplain without a permit from the Zoning or Floodplain Administrator.

Stormwater Management/Watershed Development Regulations

Jurisdiction taking part in Watershed Discovery Projects in association with FEMA's "Risk Map" process, utilized the discovery process to collect and analyze data, involve watershed stakeholders and develop recommendations for future projects based on the analysis of the data. In addition, Watershed Development Regulations have the ability to ensure that new development does not increase existing stormwater issues or create additional problems. Provisions regarding development projects should review and regulate how runoff will effect both development and how excess water should be managed. The regulations establish a minimum standard for stormwater management, including floodplains, detention, soil erosion, sediment control, water quality treatment and wetlands.

Emergency Operations Plan

Emergency Operation Plans are a source for hazard identification and emergency operations procedures. These procedures include lists of roles and responsibilities of persons/departments in charge of dispatching support during a natural hazard. Annexes are used to address specific areas of the plan that are not specific enough for particular hazards and functions.

Local Hazard Plan Review

Plans must be submitted to the SHMO for initial review and coordination. The State will then send the Plan to the appropriate FEMA Regional Office for formal review and approval. FEMA will work with State to establish mutually agreeable methods of communication for Local Mitigation Plan (LMP) reviews to ensure plans are reviewed in a timely manner and to prioritize the order of the review of all plans submitted. Plans can be submitted electronically or in paper copy, or both.

All LMPs submitted will be reviewed by FEMA using the Local Mitigation Plan Review Guide and the Local Mitigation Plan Review Tool (LMPRT). The State is responsible for forwarding the LMPRT to the local community. The local community may work with the State, jointly with the State and FEMA, or directly with FEMA to make revisions. All LMP will be reviewed within 45 days. Upon completion of a Plan review, FEMA will prepare and forward a notification in the form of a" Requires Revisions", "Approval Pending Adoption (APA)" or "Approval" to the state letter. LMPs that do not meet all of the FEMA requirements in 44 CFR 201.6 are returned with a "Requires Revisions." The required revisions are indicated on the Regulation Checklist (in the LMPRT) and sent to the State. When a plan is not approved upon the first review, FEMA will complete subsequent plan reviews within the 45-day period upon receipt from the State, whenever possible.

The Approval Pending Adoption (APA) is a recommended and potentially time-saving process by which jurisdictions submit the final draft Local Mitigation Plan for a review prior to formal jurisdictional adoption by the appropriate officials, agencies, or organizations. If FEMA determines the plan is not approvable, the responsible local agency or office will be able to address deficiencies before taking the plan through adoption, therefore avoiding unnecessary delays in plan approval.

If all Elements are met except adoption, FEMA determines that the Local Mitigation Plan is APA. The FEMA Region sends an APA letter to the State who, in turn, forwards the determination to the local community. The jurisdiction can then proceed with the adoption process, knowing the adopted plan will be approved. When the APA plan is adopted by the jurisdiction, and FEMA has received the documentation of adoption, then it will be formally approved through a signed FEMA approval letter. If the LMP adopted after FEMA review, adoption must take place within one calendar year of receipt of FEMA's APA letter. If the plan is not adopted within one calendar year of FEMA's APA letter, the jurisdiction must update the entire plan and resubmit it for FEMA review. The plan approval date begins the five-year approval period and sets the expiration date for the plan. The official approval date is indicated on the signed FEMA approval letter. In addition to providing the approval date, it also indicates the expiration date of the plan.

Once all Elements are 'Met' and the adoption resolution is received by the FEMA Regional office, FEMA will send an "Approved" letter signed by the Regional Administrator or his/her designee to the State. Correspondence for "Approved" plans will identify, at a minimum, the name of the approved plan, jurisdiction(s) that have adopted the plan, date(s) of plan adoption, date of plan approval, and the expiration date of FEMA's approval of the plan. For multi-jurisdictional plans, this information may be included in the Local Mitigation Plan Review Tool or other attachment. As with single jurisdictional plans, in order for FEMA to approve a multi-jurisdictional plan, at least one participating jurisdiction must formally adopt the plan within one calendar year of FEMA's designation of the plan as APA. Participants of a multi-jurisdictional plan will assume the expiration date five years from the first jurisdiction's approval date regardless of the other participant's subsequent adoption date(s). The five-year approval period does not get the "re-set" each time another participating jurisdiction adopts the plan. FEMA recommends that all participating jurisdictions

coordinate the adoption process as soon as the plan has received APA status to ensure that all participants are covered by a plan for the full five years.

Approval letter(s) for multi-jurisdictional plans will clearly read that the expiration date of FEMA's approval of the plan applies for all participating jurisdictions, regardless of different adoption dates. If the plan is multi-jurisdictional and all participating jurisdiction's adoptions are not received by FEMA at the same time, more than one approval letter will be sent to the State as additional adoptions are received by FEMA. A completed Local Mitigation Plan Review Tool will accompany correspondence for all approved Local Mitigation Plans. All APA and approval letters from FEMA are sent to the State. The State is responsible for communicating the status of the Plan with the local community.

V. LOCAL MITIGATION PLANNING PROCESS

A. Local Funding and Technical Assistance

Planning Grants

The Illinois Emergency Management Agency hazard mitigation staff provides technical assistance to local jurisdictions upon request for plan development. Grants may be available to local units of government to assist for hazard mitigation planning.

Since the original 2004 FEMA-approved INHMP plan was developed, it has been a priority of both IEMA and FEMA to ensure that the citizens of Illinois are covered by approved hazard mitigation plans. It was determined that the best method to coordinate a planning initiative within the state was to provide planning workshops and utilize state staff to provide technical assistance to individual jurisdictions to promote plan development. This initiative is pursued utilizing a variety of different methods.

1. Planning Workshops:

Specialized planning workshops or meetings have been held with jurisdictions following declared disasters in order to provide guidance and promote the need for Local Hazard Mitigation Plans. In addition, these specialized workshops allow specific jurisdictional questions to be addressed regarding mitigation planning and potential projects. IEMA mitigation staff meets with the local Emergency Management Coordinator to discuss the planning process as well as resolve any issues related to funding the plan development. This initiative has been and continues to be an effective approach to promote mitigation efforts.

2. Participating in Conferences, Workshops, and Meetings:

In addition to specialized planning workshops, IEMA mitigation staff regularly attends and in many cases, speaks at numerous conferences, workshops, and meetings. These events allow for the broad dissemination of information to a wide variety of groups, in an effort to heighten the awareness and interest in mitigation planning and projects. This initiative provides the ability to expose a greater percentage of individuals to the positive benefits of mitigation. Some of these conferences host over 1,000 registrants, with the majority of attendees having local mitigation responsibilities. Examples of these events regularly attended IEMA mitigation staff are:

- Illinois Association of State Floodplain Managers (IASFM) Conference
- Illinois Emergency Management Agency Training Summit
- Grants Workshops
- City Council Meetings
- Illinois Mitigation Advisory Group (IMAG) Meetings

3. Technical Assistance:
The IEMA mitigation staff has responded to the increasingly paperless demand for mitigation material. Since April 2004, the agency website has a mitigation section which provides mitigation information, including the latest planning guides, maps, Illinois Hazard Rating Process, Local Risk Assessment tools, approved local plans, local mitigation projects, and hazard specific data for the county planners to utilize. The educational guides and approved plan resources on the IEMA website have not only increased the website traffic, but have also provided planning groups with all the materials they need to complete a plan.

Despite IEMA's outreach activities across the state, some of the counties in Illinois were slow to respond in developing mitigation plans. Several large counties initially approached the agency and decided not to pursue a plan at that particular time. The common reasons expressed for the lack of interest were: the focus of resources on terrorism planning; the view that they had participated in enough mitigation projects and that they did not anticipate participating in any in the near future; and the assumption they would not receive any grant funding for planning. The mitigation planning initiative has continued, however the emphasis is now being placed on developing multi-jurisdiction plans. Over the past ten years the planning initiative has steadily continued to increase. The promotion of this planning initiative is evident in areas with a high number of repetitive loss properties, as the state has made it a priority to work with local governments willing to act on the issue of repetitive loss properties. The success of the state's acquisition of flood prone properties has required the development of local plans that support the acquisition of such properties, which is consistent with the state planning strategies.

In 2004 when the original FEMA Approved INHMP plan was developed, four counties and 26 jurisdictions within those counties received FEMA approval for their mitigation plans. Kane County provided their own funds to supplement FMA funds to develop a plan that was the first in the nation to qualify under DMA2K act, FMA, and CRS. Twenty-four jurisdictions in Kane County participated in the planning process and are covered by the plan. The other three counties, Peoria, Tazewell, and Woodford, developed a plan as part of their Project Impact project. Peoria and Pekin, the two largest cities in these counties, participated in the planning process and are covered by the plan.

In 2018, 56 of the 102 counties in Illinois have an approved mitigation plan. This accounts for 54% of the counties in Illinois and over 87% of the population. Twenty-six counties are currently receiving funds for developing mitigation plans.

Mitigation planning efforts have continued to be a priority over the last five years (2013-2018), with 56 counties obtaining an approved mitigation plan and 24 counties receiving funds to develop a plan. In addition, we have seen an influx of single jurisdictions seeking approval for a mitigation plan. Over the past 11 years, Illinois has had over ten single jurisdictions (municipalities) submit multi-hazard mitigation plans for FEMA review. Two of these plans have subsequently been approved, with the others making revisions and are projected to be approved following the requested changes. It is projected within the next five years, an additional 30 counties will have their plans completed and approved, bringing the total of counties with plans to over 90% and covering approximately 95% of the state's population

The major obstacle to IEMA is that the first wave of local mitigation plans are expiring. Some of the counties have successfully updated their plans, where the rest are facing challenges. Lack of funds and increasing complexity of planning has led to questions and concerns regarding the need for updating the plan every five years. Additionally, lack of manpower and technical expertise has resulted in local governments utilizing contractors to complete their plans. Again, this results in additional fiscal impacts to already restricted local budgets.

The following page includes a map illustrating the status of local Hazard Mitigation Plans in the State of Illinois.

IEMA
Illinois Emergency Management Agency

State of Illinois
Local Mitigation Plan (LMP) Status
5/31/2018

Counties with an approved/adopted LMP 56/102 = 54.9%
Population covered by LMP: 12,803,196 = 87.6%

1. Boone - 6-18-2014 (53,503)
2. Bureau - 10-30-2015 (33,359)
3. Carroll – 7-17-2017 (14,539)
4. Champaign - 10-30-2015 (208,419)
5. Clark - 5-2-2018 (15,938)
6. Clinton - 3-26-2018 (37,729)
7. Coles - 3-26-2018 (54,000)
8. Cook - 9-26-2014 (5,203,499)
9. Crawford - 8-18-17 (19,308)
10. Cumberland - 6-15-15 (10,858)
11. DeKalb - 8-29-2013 (104,528)
12. DuPage - 5-24-2018 (929,368)
13. Edgar - 8-22-2014 (17,566)
14. Edwards - 7-03-2017 (6,523)
15. Franklin - 4-28-17 (39,156)
16. Grundy - 8-2-2013 (50,437)
17. Hancock - 1-31-2018 (18,508)
18. Henry - 1-30-2014 (49,280)
19. Jackson - 9-16-2016 (58,870)
20. Jefferson – 11-9-2016 (38,460)
21. Jersey - 12-12-2016 (22,025)
22. Jo Daviess - 10-18-2013 (21,770)
23. Kane - 12-23-2015 (531,715)
24. Kankakee - 11-20-2013 (110,008)
25. Lake - 11-8-2017 (703,047)
26. LaSalle - 10-30-2015 (110,642)
27. Lawrence - 11-7-2017 (16,377)
28. Logan - 3-18-2014 (29,527)
29. Macon - 3-14-2014 (106,550)
30. Madison 3-17-2015 (265,759)
31. Marshall - 10-30-15 (11,939)
32. Mason - 1-15-16 (13,507)
33. McHenry - 9-25-2017 (307,004)
34. Mercer - 4-17-17 (15,730)
35. Monroe - 5-28-2014 (34,068)
36. Montgomery - 2-24-2017 (28,952)
37. Morgan - 5-28-2014 (34,277)
38. Moultrie - 5-22-17 (14,827)
39. Peoria - 3-13-2018 (185,006)
40. Perry - 9-29-2017 (21,357)
41. Putnam - 10-30-15 (5,611)
42. Rock Island - 9-16-16 (144,784)
43. Saline - 6-11-13 (24,307)
44. Sangamon - 5-12-17 (197,499)
45. Scott - 6-30-2014 (5,053)
46. Shelby - 3-26-2018 (21,717)
47. Stark - 10-30-15 (5,776)
48. Stephenson - 4-14-2017 (45,624)
49. Vermilion - 12-12-2014 (78,111)
50. Wabash - 12-20-2017 (11,492)
51. Wayne - 1-5-2018 (16,396)
52. White - 7-31-2017 (14,292)
53. Whiteside - 8-24-16 (56,536)
54. Will - 3-17-2015 (689,529)
55. Williamson - 11-5-2015 (67,560)
56. Winnebago - 12-12-2014 (285,873)

Counties with Planning in Progress

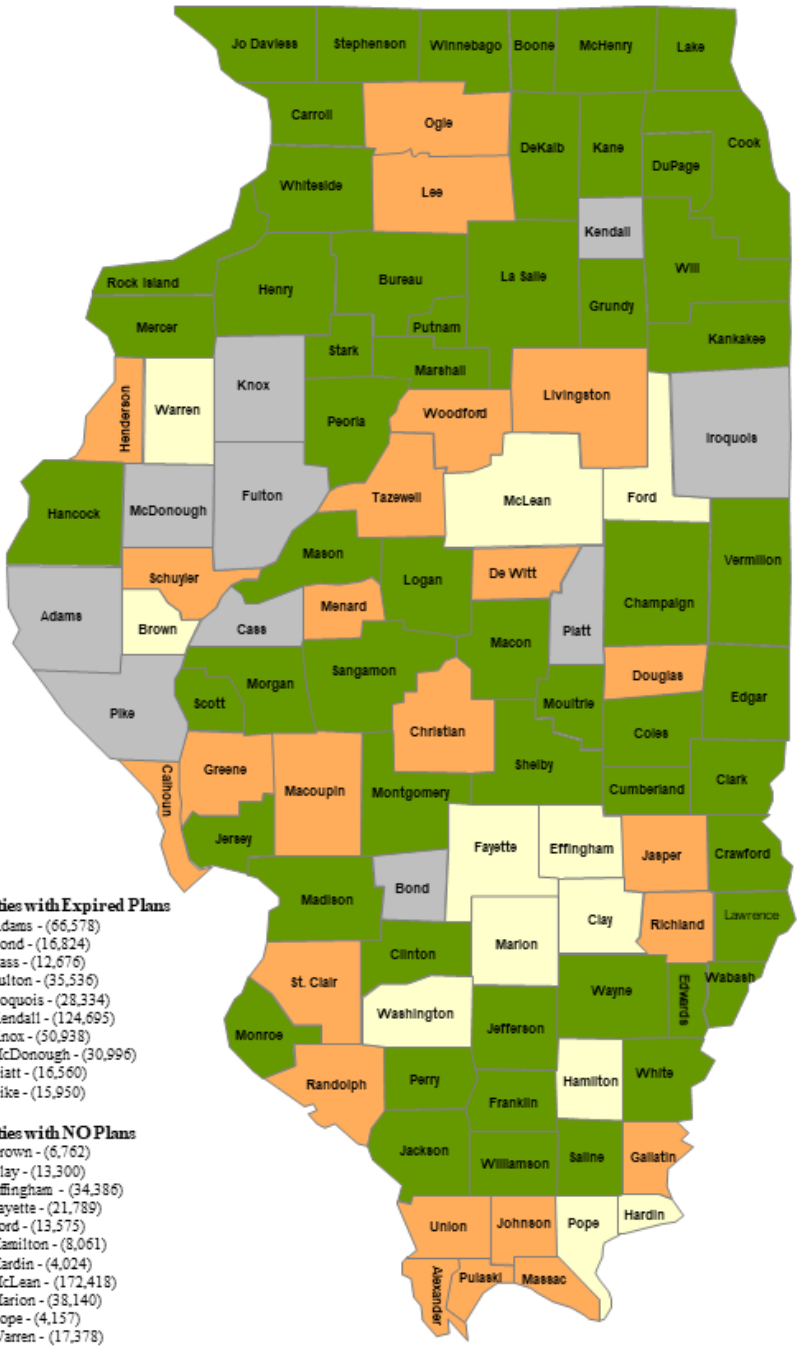
1. Alexander - (6,478)
2. Calhoun - (4,894)
3. Christian - (33,309)
4. Douglas - (19,630)
5. DeWitt - (16,226)
6. Gallatin - (5,212)
7. Greene - (13,093)
8. Henderson - (6,869)
9. Jasper - (9,536)
10. Johnson - (12,902)
11. Lee - (34,251)
12. Livingston - (36,526)
13. Macoupin - (45,908)
14. Massac - (14,658)
15. Menard - (12,516)
16. Ogle - (51,273)
17. Pulaski - (5,619)
18. Randolph - (32,621)
19. Richland - (15,930)
20. St. Clair - (262,759)
21. Schuyler - (6,923)
22. Tazewell - (134,385)
23. Union - (17,212)
24. Woodford - (39,140)

Counties with Expired Plans

1. Adams - (66,578)
2. Bond - (16,824)
3. Cass - (12,676)
4. Fulton - (35,536)
5. Iroquois - (28,334)
6. Kendall - (124,695)
7. Knox - (50,938)
8. McDonough - (30,996)
9. Piatt - (16,560)
10. Pike - (15,950)

Counties with NO Plans

1. Brown - (6,762)
2. Clay - (13,300)
3. Effingham - (34,386)
4. Fayette - (21,789)
5. Ford - (13,575)
6. Hamilton - (8,061)
7. Hardin - (4,024)
8. McLean - (172,418)
9. Marion - (38,140)
10. Pope - (4,157)
11. Warren - (17,378)
12. Washington - (14,154)



Funds for planning assistance come from four Federal sources:

(1) Hazard Mitigation Grant Program (HMGP) funds

Up to 7% of HMGP funds can be used for planning assistance.

FEMA-1771: A total of $689,213 was allocated to Hazard Mitigation Planning for the following jurisdictions:

- Clark County, Cook County, Douglas County, Fulton County, Menard County and Schuyler County.
- An additional $9,846,470 was also allocated for the following mitigation projects throughout the State of Illinois as a result of successfully approved local mitigation plans:
    - Acquisition of 109 flood prone structures
    - Stream bank stabilization
    - Removal of fill from floodway
    - Educational outreach

FEMA 1800: A total of $667,344.25 was allocated to Hazard Mitigation Planning for the following jurisdictions:

- Ogle County, Calhoun County, Christian County, Green County, Jasper County, Kendall County, Knox County, Lee County, Macoupin County, Piatt County, and Richland County.
- An additional $12,672,451.75 was also allocated for the following mitigation projects throughout the State of Illinois as a result of successfully approved local mitigation plans:
    - Acquisition of 258 flood prone structures
    - Code plus construction

FEMA 1826: A total of $107,250 was allocated to Hazard Mitigation Planning for the following jurisdictions:

- Lake County (Plan update) & Saline County

FEMA 1850: A total of $42,189 was allocated to develop a Hazard Mitigation Planning for the following jurisdictions:

- Grundy County
- An additional $2,114,620 was also allocated for the following mitigation projects throughout the State of Illinois as a result of successfully approved local mitigation plans:
    - Acquisition of 5 flood prone structures
    - Construction of detention basins
    - Culvert improvements

FEMA 1935: A total of $642,450.25 was allocated for planning applications in the following counties:

- Boone County, Carroll County, Edgar County, Henry County, Jo Daviess County, Logan County, Macon County, Madison County, Monroe County, Morgan County, Scott County and Vermillion County
- A total of $52,379,973.00 was requested for the following mitigation projects throughout the State of Illinois as a result of successfully approved local mitigation plans:
    - Acquisition of 316 flood prone structures
    - Elevations of flood prone structures
    - Construction of storm water detention ponds and storage basins
    - Food proofing of a variety of structures
    - Stream bank stabilization
    - Roadway elevation to critical facility
    - Water main bypass to ensure sufficient water supply
    - Construction and retro-filling of safe rooms
    - Seismic analysis
    - Educational programs including: websites development and educational displays

FEMA 1960: A total of $301,493 has been requested for planning applications for the following counties:

- Cumberland County, Jersey County, Mason County, Moultrie County and Winnebago County
- A total of $6,711,384 was requested to complete the following mitigation projects throughout the State of Illinois as a result of successfully approved local mitigation plans:
    - Acquisition of 158 flood prone structures and lots

FEMA 1991: $134,396 was awarded to the Illinois Emergency Management Agency for the completion of a level 1.5 HAZUS analysis for flooding, which will analyze the critical/essential facilities within the 100-year floodplain of all 102 counties.

- A total of $4,422,107 was requested to complete the following mitigation projects throughout the State of Illinois as a result of successfully approved local mitigation plans:
    - Acquisition of 30 flood prone structures and lots
    - Construction of storm water detention ponds
    - Development of mitigation educational material, including videos
    - Hardening critical infrastructure

FEMA 4116: A total of $24,579,302.00 is the federal share obligated for the following acquisitions:

- Cary Acquisition
- Lake County acquisition
- Downers Grove acquisition
- Lisle Acquisition
- Machesney Park Acquisitions
- Glenview Acquisition
- Des Plaines Acquisition
- Peoria County Acquisition
- Peoria County Edwards Acquisitions
- DuPage Acquisition
- Glenwood Acquisition
- Grundy County Acquisitions
- East Peoria Landslide Acquisition

FEMA 4157: A total of $299,997 is the federal share obligated for Lisle Acquisition.

(2) Pre-Disaster Mitigation (PDM) Program funds

FY2009 PDM Funds: No planning funds were allocated in the 2009 PDM funding. A total of $484,365 was allocated for property acquisitions in Villa Park.

FY2010 PDM Funds: A total of $54,750 was allocated for planning efforts in the following jurisdictions:

- Cass County

FY2011 PDM Funds: No planning funds were allocated in 2011.
A total of $656,625 was allocated for property acquisition in Addison.

FY2012 PDM Funds: No awards were received in 2012.

FY2013 PDM Funds: No awards were received in 2013.

FY2014 PDM Funds: A total of $175,655.37 was allocated for planning efforts in the following counties:

- Shelby County
- McHenry County
- Coles County
- Montgomery County
- Clinton County

FY2015 PDM Funds: A total of $359,166.79 was allocated for planning efforts in the following counties:

- DeWitt County
- Menard County
- Douglas County
- Gallatin County
- Hancock County
- Greene County
- Illinois State University HM Plan
- St. Clair County
- Tri-County

FY2016 PDM Funds: A total of $ 646,793.79 was allocated for planning efforts in the following counties:

- Randolph County
- Southern Five County
- Macoupin County
- Ogle County
- State Multi-Hazard Mitigation Plan
- Schuyler County
- Lee County

A total of $3,436,740.07 was allocated for projects:

- Village of DePue Flood Wall
- City of Peru Flood Wall
- City of Marseilles Flood Wall

FY2017 PDM Funds: A total of $388,774.40 was proposed for planning efforts in the following counties:

- Cook County
- Christian County
- Carroll County
- Livingston County
- Calhoun County
- Henderson County
- A total of $1,508,655 was proposed to City of Des Plaines Fire Station.

(3) Flood Mitigation Assistance (FMA) Program funds

FMA funds can only be used by local communities for the flood portion of the mitigation plan.

FY2014 FMA Funds: Lake county received a grant amount of $693,285.60 for Stormwater Management.

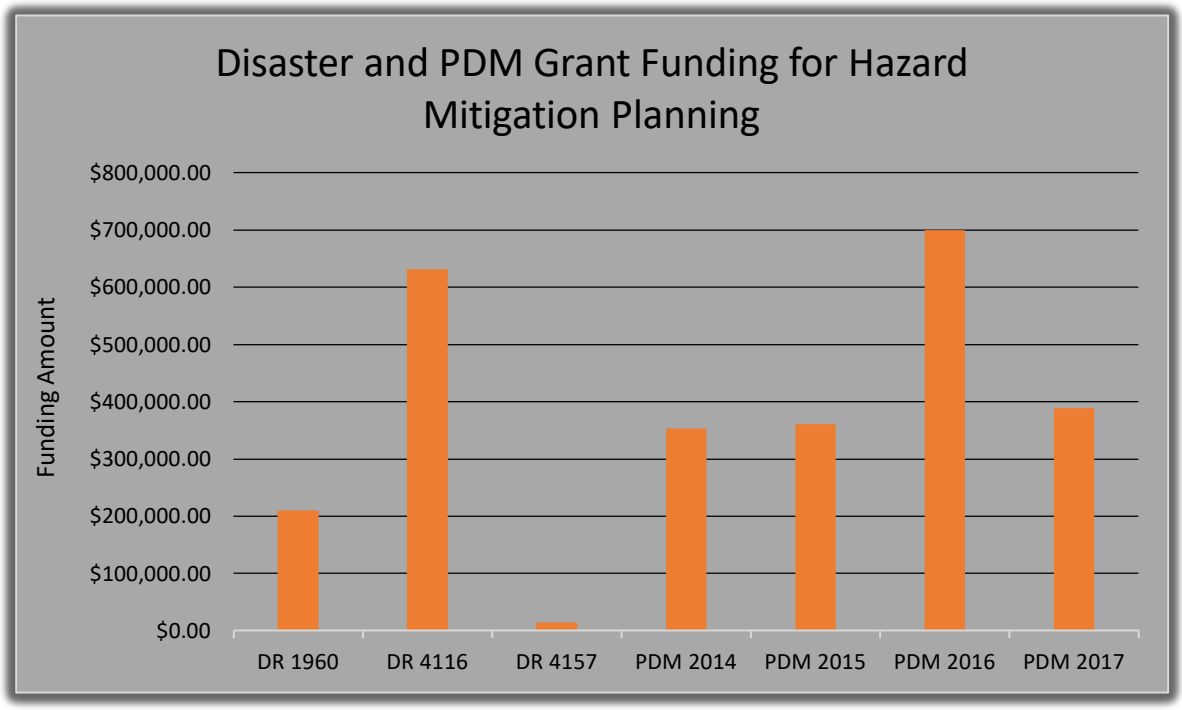
FY2015 FMA Funds: DuPage and Cook Counties were granted $2,308,731.19 for acquisition/demolition.

FY2016 FMA Funds: Macon and Kankakee counties were granted $455,250.78 for Acquisition projects.

FY2017 FMA Funds: A total of $3,943,398.25 is proposed under FMA grant to Machesney Park FMA 2017 (4 acquisition/demolition) and Village of Villa Park Sugar Creek Watershed Drainage Improvements.

The following graph shows a depiction of federal funding utilized for planning for 3 recent Federal Disasters and Pre Disaster Mitigation grants in the State of Illinois between 2014 – 2017. These federal grant funds have been provided to or offered to all 102 counties within Illinois.

Disaster # and PDM /Year	Funding
DR 1960	$210,557.00
DR 4116	$631,289.00
DR 4157	$14,000.00
PDM 2014	$353,324.74
PDM 2015	$361,181.79
PDM 2016	$700,103.79
PDM 2017	$388,774.40



(4) Public Assistance (PA)

The Federal Emergency Management Agency (FEMA)'s Public Assistance grant program provides federal assistance to state and local governments and certain types of private nonprofit organizations following a presidential disaster declaration. Public Assistance provides grants to communities to quickly respond and recover from major disasters or emergencies. Through the program, FEMA provides supplemental federal disaster grant assistance for debris removal, life-saving emergency protective measures and the repair, replacement or restoration of disaster-damaged publicly owned facilities and the facilities of certain private nonprofit organizations. The Public Assistance program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process. PA is a cost-sharing program with FEMA paying 75 percent. The remainder is the responsibility of the state and local governments. The federal share of assistance is not less than 75 percent of the eligible cost.

FEMA

REGION V
HMGP Lock-In

ILLINOIS	HMGP
819	$0
880 - PA only	
871	$424,143
878	$63,245
841	$311,708
897 - Volkmer	$33,859,205
1026	$2,607,000
1063	$3,690,441
1110	$421,005
1112	$3,542,964
1129	$20,419,462
1170	$369,013
1188 - IA & MT only	$9,444,166
1278 - MNMA	$116,847
1388	$1,007,808
1416	$2,797,158
1489 - 7.5%, IA & MT only	$202,306
1613	$229,725
1633	$912,416
1681 - 15%, PA & MT only	$3,280,745
1722 - IA & MT only	$273,823
1729	$3,186,416
1747 - IA & MT only	$918,936
1771	$10,929,736
1800	$13,339,796
1828	$1,762,064
1860 - PA & MT only	$2,354,500
1935	$53,010,484
1960 - PA & MT only	$7,159,924
1991	$4,624,853
4116	$29,481,608
4167 - IA & MT only	$369,304
	$211,110,821

INDIANA	HMGP
889	$384,615
886	$854,390
891	$260,833
898 - PA & MT only	$1,583,836
863	$216,386
862 - PA & MT only	$161,915
1002 - Volkmer, IA & MT only	$469,962
1109 - PA only	
1126	$937,133
1166	$2,018,361
1217 - PA & MT only	$697,209
1234 - PA & MT only	$743,291
1418 - MNMA	$861,968
1433	$733,140
1476 - 7.5%	$1,493,752
1487 - IA & MT only	$711,325
1620	$743,549
1642 - PA & MT only	$209,109
1673	$2,476,257
1612	$312,215
1682 - 15%, IA & MT only	$1,911,972
1732 - IA & MT only	$863,944
1740	$1,890,055
1768	$25,531,906
1786	$8,597,584
1828	$1,676,481
1832 - IA & MT only	$467,384
1987 - PA & MT only	$2,212,313
4068	$1,057,305
4173 - PA & MT only	$1,398,794
	$61,276,904

MICHIGAN	HMGP
1028 - Volkmer, PA & MT only	$688,746
1128	$2,668,751
1181	$5,192,887
1228 - PA & MT only	$3,653,589
1237 - PA & MT only	$949,106
1348 - MNMA, IA & MT only	$33,020,506
1413 - PA & MT only	$756,962
1627 - 7.5%, IA & MT only	$3,125,321
1777 - 15%, PA & MT only	$2,248,593
4121 - PA & MT only	$762,282
4195	$23,855,334
4328 - IA & MT only	$766,373 #
	$77,686,432

MINNESOTA	HMGP
824	$320,484
829 - PA & MT only	$725,943
848	$0
883 - Volkmer	$12,804,763
1084 - PA & MT only	$768,969
1078 - PA & MT only	$669,718
1116 - PA & MT only	$1,204,423
1161 - PA & MT only	$1,870,010
1168 - PA only	
1176	$30,063,750
1187	$1,841,385
1212	$4,986,531
1226 - PA & MT only	$4,016,116
1283 - MNMA	$2,857,945
1288 - PA & MT only	$1,422,187
1333	$4,784,611
1370	$5,525,419
1419	$5,889,732
1688 - 7.5%	$607,510
1622 - PA & MT only	$624,188
1648 - PA & MT only	$514,228
1717 - 15%	$10,186,020
1772 - PA & MT only	$938,765
1830	$6,204,157
1800 - PA & MT only	$1,915,501
1821 - PA & MT only	$4,229,516
1841 - PA & MT only	$4,222,540
1882 - PA & MT only	$3,104,513
1890 - PA & MT only	$1,400,977
4008 - PA & MT only	$2,164,873
4089 - PA & MT only	$6,576,851
4113 - PA & MT only	$1,212,635
4131 - PA & MT only	$2,039,516
4182 - PA & MT only	$6,232,862
4290	$1,412,188
	$133,400,716

OHIO	HMGP
831 - IA only	
870	$663,441
951	$373,789
1065 - Volkmer	$721,500
1087	$1,721,655
1122 - PA & MT only	$1,137,951
1184	$9,821,524
1227	$5,866,125
1321 - MNMA, IA & MT only	$297,310
1338 - IA & MT only	$1,132,279
1343 - IA & MT only	$558,025
1390 - PA & MT only	$876,439
1444 - IA & MT only	$139,068
1453 - 7.5%	$2,415,899
1478 - IA & MT only	$145,762
1484	$6,016,468
1607	$875,265
1619 - IA & MT only	$2,305,560
1658	$3,948,349
1680	$7,534,746
1661 - 15%, IA & MT only	$1,798,019
1668 - 15%	$3,411,736
1720 - 15%	$6,630,799
1806 - 15%	$6,507,249
4002 - PA & MT only	$5,046,137
4077 - 15% - PA & MT only	$3,353,199
4088 - 15% - PA & MT only	$3,704,581
	$77,002,896

WISCONSIN	HMGP
874	$360,366
877 - IA only	
912	$54,342
958	$19,434
963	$188,187
964	$196,537
984 - Volkmer	$10,503,366
1131 - PA & MT only	$258,386
1180	$4,686,762
1236 - PA & MT only	$1,471,849
1238	$3,337,816
1284 - MNMA, PA & MT only	$609,044
1332	$3,318,014
1369	$3,292,586
1429 - PA & MT only	$496,962
1432	$817,188
1526 - 7.5%	$1,362,737
1719 - 15%	$4,164,069
1768 - 15%	$23,186,913
1933 - 15%	$16,003,899
1844 - 15% - PA & MT only	$793,713
1866 - 15% - PA & MT only	$1,627,060
4076 - 15% - PA & MT only	$1,578,803
4141 - 15% - PA & MT only	$1,143,561
4276 - 15% - PA & MT only	$2,108,980
4288 - 15% - PA & MT only	$1,746,397
4343 - 15% - PA & MT only	$1,516,262 *
	$64,613,181

* 30-Day Estimated Amount
\# 6-Month Estimated Amount
NO HMGP

GRAND TOTAL $645,290,050

11/23/88 Robert T. Stafford Act authorized the Hazard Mitigation Grant Program (HMGP)

Application deadline is 12 months from date of declaration (w/ up to two 90-day extensions allowed - both coming from the Region).

Volkmer Amendment changed HMGP ceiling from 5% to 15% calculation (DR# 893 - 1444)

Policy memo: Statewide Availability of HMGP dated 7/23/97 (DR# 1187 - ____)

DMA2K changed HMGP ceiling from 15% to 7.5% calculation (DR# 1448 - 1681)

Post-Katrina Emergency Management Reform Act of 2006 changed HMGP ceiling from 7.5% to 15% calculation (DR# 1863 - ____)

For disasters declared after 11/13/07 - Section 324 100% State Management Cost (SMC) policy established MC as "additional" to HMGP ceiling amount (DR# 1732 - ____)

Property Acquisition and Relocation for Open Space regulations promulgated in Oct 1, 2005 44 CFR Part 80 - projects for open space pursuant to a major disaster declared on or after Dec 3, 2007 (DR# 1748-IN) must be implemented in accordance

Note that ALL projects (incl those approved prior to Part 80 issuance) MUST adhere to 80.19 "Land Use and Oversight" as this section applies to all future actions on property that was acquired w/ FEMA funding (regardless of original project date) for the purpose of open space.

The National disaster sequence slips from DR-1500 to DR-4500 in Jul 2011 (as the 2000 series are Fire Suppression Authorizations and the 3000 series are Emergency Declarations)

The 9/1/13 Miller-Johnson HMGP Ceiling memo instituted a "1-yr only" Lock-In Ceiling for new declarations (DR# 4113 - ____) and also rescinded the 6-month "Floor" lockin which impacted DR# 4088, as the 6-month est had not yet been issued.

Note that 4089-MN, 4075-WI, 4077-OH all got a "pass" since they DID have a 6-mo est issued at time of this procedure change.

Policy memos: Sandy Recovery and Improvement Act (SRIA) of 2013 - Program Administration by State (PAS) Pilot 6/1; HMGP Streamlining 9/1; Advance Assistance (AA) 9/24

For HMA grants issued on or after 12/26/14 - 2 CFR Part 200 applies (OMB Super Circular)

	Date Range	Source Document	DR#
For disasters declared:	between Nov 1988 and Sep 1999	HMGP Policy Compendium	819 - 1298
	after Oct 1999	HMGP Desk Reference	1321 - 1833
	after 8/1/09	FY2009 Unified HMA Guidance	1866 - 1960
	after 6/1/10	FY2010 Unified HMA Guidance	1821 - 4121
	after 7/12/13	FY2013 Unified HMA Guidance & Addendum	4121 - 4195
	after 2/27/15	FY2015 Unified HMA Guidance & Addendum	42__ - ____

Page 5: DR# 4113 is being implemented under 2013 UHMA Guidance per HMGP Admin Plan (at State's risk)

disasters 1-22-15 - multiple tabs.xls

Source: FEMA

When planning funds are available IEMA will review, evaluate and rank sub-applicants according to the following criteria established by the planning committee and forward to FEMA to award.

1) The Illinois Natural Hazards Mitigation Planning Committee has developed the following priorities for planning assistance for local jurisdictions:

   A) the lack of an approved Mitigation Plan.
   B) participation in the NFIP. Priority is given to unsanctioned (not on probation or suspension) jurisdictions, counties not participating in the may apply for planning funds however, priority will remain with those participating in the event that multiple counties apply.
   C) vulnerability to hazards based on the Illinois Hazard Rating Process (all points (A, B, C, D, F and G) being equal, the jurisdiction(s) with the highest vulnerability to hazards will receive funding).
   D) multi-jurisdictional planning effort.
   E) previously approved mitigation plan (HMGP, FMA or CRS).
   F) their access to geographic information systems and planning resources.
   G) the capability of the jurisdiction to conduct a planning process.

2) Should a jurisdiction experience a disaster and not have an approved Mitigation Plan, they will automatically move to the top of the priority list providing they participates in the NFIP. This will occur even if the jurisdiction does not receive a Presidential declaration. Jurisdictions receiving Presidential Declarations take priority, but jurisdictions that receive a State Declaration will also move up in the list.

When jurisdictions apply for planning funds to develop a Mitigation Plan and a disaster has not occurred in that particular jurisdiction, the Plan Development Assistance Prioritization Matrix below will be used to evaluate applications from local jurisdiction(s) and forward to FEMA to determine if the sub-applicant should be awarded:

- First column is a list of Illinois counties.
- Second column is an overall summary of hazards based on the Illinois Hazard Rating Process (refer to the key for the score to be received in this column).
- Third column indicates if it is a multi-jurisdictional plan (15 points).
- Fourth column indicates if a previously approved mitigation plan exists (15 points),
- Fifth column will be used to indicate if a geographic information system exists (15 points).
- Sixth column will be used to indicate if there are planning resources (if a planning team or planning department exists add 15 points).
- Seventh column will be used to indicate if local matching funds are available (add 15 points if funds are available).
- Eighth column will be used to identify their ranking (add the score of the five columns together).

If several jurisdictions have an equal score and sufficient funds are not available If several jurisdictions have equal scores and sufficient funds are not available for all sub-applicants, then the below criteria will be utilized by the Mitigation Strategy and Coordination Committee to evaluate applications from jurisdictions to be forwarded to FEMA to consider awarding:

1) Number of repetitive loss properties (the community with the most will receive the planning grant),
2) If the above factor does not clearly identify who should receive the funding, the second criteria to be considered is most intense development pressures (jurisdiction with the largest projected growth rate as identified by the Department of Commerce and Economic Opportunities) for the next five to ten year period.

   NOTE: The table has already considered the criteria of highest risk

PLAN DEVELOPMENT ASSISTANCE PRIORITIZATION MATRIX

Key	
Very Low=1	Low=2
Medium=3	High=4
Severe=5	

County Name	Overall Hazard Rating	Approval DMA 2000 Plan	Access GIS	Planning Dept. or Team	Local funds available	Overall rating
Adams	Medium					
Alexander	High					
Bond	Medium					
Boone	Medium					
Brown	Medium					
Bureau	Medium					
Calhoun	Medium					
Carroll	Medium					
Cass	Medium					
Champaign	High					
Christian	High					
Clark	Medium					
Clay	Medium					
Clinton	Medium					
Coles	Medium					
Cook	High					
Crawford	Elevated					
Cumberland	Elevated					
DeKalb	Elevated					
De Witt	High					
Douglas	High					
DuPage	High					
Edgar	Medium					
Edwards	Medium					
Effingham	High					
Fayette	Medium					
Ford	Medium					
Franklin	High					
Fulton	Medium					
Gallatin	Medium					
Greene	Medium					
Grundy	Medium					
Hamilton	Medium					
Hancock	Medium					
Hardin	High					
Henderson	Medium					
Henry	Medium					

County Name	Overall Hazard Rating	Approval DMA 2000 Plan	Access GIS	Planning Dept. or Team	Local funds available	Overall rating
Iroquois	Medium					
Jackson	High					
Jasper	Medium					
Jefferson	Medium					
Jersey	Medium					
Jo Daviess	Medium					
Johnson	High					
Kane	Medium					
Kankakee	Medium					
Kendall	Medium					
Knox	Medium					
Lake	High					
La Salle	Medium					
Lawrence	Medium					
Lee	Medium					
Livingston	Medium					
Logan	High					
McDonough	Medium					
McHenry	Medium					
McLean	High					
Macon	High					
Macoupin	Medium					
Madison	High					
Marion	Medium					
Marshall	Medium					
Mason	Medium					
Massac	High					
Menard	Medium					
Mercer	Medium					
Monroe	Medium					
Montgomery	Medium					
Morgan	Medium					
Moultrie	Medium					
Ogle	Medium					
Peoria	Medium					
Perry	Medium					
Piatt	Medium					
Pike	Medium					
Pope	Medium					
Pulaski	High					
Putnam	Medium					
Randolph	Medium					
Richland	Medium					
Rock Island	Medium					
St. Clair	High					

County Name	Overall Hazard Rating	Approval DMA 2000 Plan	Access GIS	Planning Dept. or Team	Local funds available	Overall rating
Saline	Medium					
Sangamon	High					
Schuyler	Medium					
Scott	Medium					
Shelby	Medium					
Stark	Medium					
Stephenson	Medium					
Tazewell	Medium					
Union	High					
Vermilion	High					
Wabash	High					
Warren	Medium					
Washington	Medium					
Wayne	Medium					
White	High					
Whiteside	Medium					
Will	High					
Williamson	High					
Winnebago	Medium					
Woodford	Medium					

Non-Planning Grants

The INHMPC established the following priorities for project funds:

1. As of November 2004, jurisdictions will be required to either have an approved mitigation plan or be developing a mitigation plan.
2. A jurisdiction must be participating in the NFIP, and priority is given to unsanctioned jurisdictions.
3. Structures that are substantially damaged (50% or more of the property value) due to a disaster.
4. Projects that mitigate against the loss of human life will take priority over mitigating property loss.
5. Critical facilities in which a retrofit will substantially reduce the risk.
6. Repetitive loss properties with priority given to the target list,
7. Highest benefit/cost ratio.
8. Acquisitions will receive priority over elevations.
9. Minor structural projects that will relieve widespread minor damage (inlet control valves).
10. Project will solve the problem independently or is part of another solution with assurance that the project will be completed.
11. Projects with multiple properties to purchase or retrofit.
12. Jurisdiction contributes funds for the project.
13. Jurisdiction has a history of supporting mitigation principles.
14. The jurisdiction with the highest risk.
15. 7% of HMGP funds will be used for planning purposes when possible.
16. The jurisdiction with intense development pressures.
17. 5% of HMGP funds for educational outreach when possible.
18. STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) review process will be used.

The STAPLEE review process considers the following factors:

STAPLEE

SOCIAL
- Community Acceptance
- Effect on Segment of Population

TECHNICAL
- Technical Feasibility
- Long-term Solution
- Secondary Impacts

ADMINISTRATIVE
- Staffing
- Funding Allocated
- Maintenance/Operations

POLITICAL
- Political Support
- Local Champion
- Public Support

LEGAL
- State Authority
- Existing Local Authority
- Potential Local Challenge

ECONOMIC
- Benefit of Action
- Cost of Action
- Contributes to Economic Goals
- Outside Funding Required

ENVIRONMENTAL
- Effect on Land/Water
- Effect on Endangered Species
- Effect on HAZMIT/Waste Sites
- Consistent with Community Environmental Goals
- Consistent with Federal Laws

This chart does not contain all of the information necessary to make funding decisions, but serves to provide a summary of the most important factors in the decision making process. We will make a note whether the Benefit Cost (B/C) is provided by the local jurisdiction (L) or the State (S). A correct Benefit Cost analysis requires some technical skill and experience, and prior to project recommendation the state will either confirm the accuracy of the B/C or re-analyze the B/C.

MITIGATION PROJECTS from LOCAL PLANS

Jurisdiction sorted by County	Hazard	Project Description	Properties Total / in floodplain / Repetitive Loss	Total Cost	Source of Local Match	Environ-mental Impact + or -	Social Impact + or -	B/C ratio Local (L) State (S)	Rank

NOTE TO JURISDICTION

This form should be completed after a complete review of the proposed actions, prioritization and the final ranking has been determined. This chart does not contain all of the information necessary to make funding decisions, but serves to provide a summary of the most important factors in the decision making process. Most of the columns are self-explanatory. Place the mean (total benefits divided by the total costs) B/C into the B/C ratio column. We will note whether the Benefit Cost (B/C) is provided by the local jurisdiction (L) or the state (S). A correct Benefit Cost analysis requires some technical skill and experience, and prior to project recommendation the State will either confirm the accuracy of the B/C or re-analyze the B/C. You should put a plus sign if there is a positive impact and a minus sign if there is a negative impact in the environmental and social impacts columns. If there is a negative impact, it is recommended that you attach a description on why the benefits of the project outweigh the negative impact.

There are not columns to indicate if your jurisdiction is a NFIP participating jurisdiction or if the plan has FEMA approval as these are prerequisites for project approval.

LOCAL MITIGATION PROJECTS

_____COUNTY

Jurisdiction	Hazard	Lead Implementer/Contact	Project Description	Properties Total / in floodplain / Repetitive Loss	Total Cost	Source of Local Match	Environ-mental Impact + or -	Social Impact + or -	B/C ratio Local (L) State (S)	Rank

For non-planning grants the IMAG and/or its sub-committees will use benefit cost (B/C) reviews to determine which projects maximize benefits relative to their costs. Since benefit cost analysis requires technical expertise and experience, B/C's submitted by local governments will be confirmed or re-analyzed prior to recommendation. The INHMPC discussed using a point scale to determine project funding. It was determined that a point scale for non-planning projects was not necessary and that the current policy of the MCSC (formerly A&R) committee reviewing and recommending projects has worked without problems or controversies for more than 20 years and should be continued. The MCSC takes into consideration development pressures on the jurisdiction. It is important to note that the IMAG and its subcommittees are advisory groups. IEMA makes the final decision on all grants they administer.

B. Local Plan Integration

The State of Illinois has the unique opportunity in having a large diversity regarding the development of local hazard mitigation plans (LHMP) and risk assessments. The LHMPs were developed utilizing the resources of a number of independent contractors, planning commissions and in-house local jurisdictional participation by a responsible agency. Due to this diversity, Illinois' LHMPs were created using different planning tools, strategies and perspectives. This has resulted in a number of different approaches to meeting the Local Multi-Hazard Mitigation Planning Guidance Requirements such as; hazard risk assessment, jurisdictional specific mitigation strategies, and public involvement. Whereas the majority of these planning efforts were successful and resulted in a FEMA approved hazard mitigation plan, some plans proved to be a greater resource then others. The following pages provide a review and correlation regarding Illinois' LHMPs.

The Illinois Emergency Management Agency, Bureau of Disaster Assistance and Preparedness, Hazard Mitigation Staff, will be responsible for reviewing, coordinating and linking the local mitigation plans to the State Mitigation Plan. IEMA agrees that in the past these procedures have not been followed. In May of 2018 a Mitigation Planner was added to the IEMA staff. Since that addition, IEMA is now capable of reviewing local plans in house before the submission to FEMA. Technical assistance is able to be provided to the jurisdictions and the most important part of all is that local plan integration into the state plan is finally taking place. Since January 1, 2008, IEMA has increased its local hazard mitigation plan initiatives significantly.

The table below represents the success the State of Illinois has had regarding the development of LHMPs:

LHMP Status Comparison – (2013 thru 2018)

May 30, 2018		
Counties Covered by Mitigation Plans	56	54.9%
Counties with Mitigation Plans in Progress	24	23.5%
Counties with Expired Plans	10	9.8%
Counties that have not started a Mitigation Plan	12	11.8%

Local Hazard Mitigation Plan Adoption Status

As of May 31, 2018, 54.9% of the State's counties have an approved mitigation plan. Currently, 23.5% of the counties are writing plans or have a plan submitted for review. Over 87.6% of the State's population is covered by a FEMA approved LHMP. It is projected that by the end of 2023 approximately 95% of the state's population will be eligible to be covered by an approved Hazard Mitigation Plan. 92% of the LHMPs in Illinois are multi-jurisdictional, with the county being the coordinating entity during the plan development. This approached has allowed Illinois to utilize the Hazard Mitigation Grant Program funds in a fiscally appropriate manner to more effectively cover the state's population with a LHMP. Illinois has seen an increase in single jurisdiction plan development over the last eleven years, with ten single jurisdiction plans being developed and/or updated. These single jurisdiction plans were focused within large metropolitan areas, where the county did not have a FEMA approved LHMP.

Local Hazard Mitigation Plan Adoption Status - Municipalities

County	County LHMP Status	# of Municipalities within the county	# of Municipalities participating in LHMP	# of Municipalities Adopted LHMP	% of participating Municipalities adopted
Adams	No*	14	0	0	0%
Alexander	Yes*	4	0	0	0%
Bond	No*	8	0	0	0%
Boone	Yes	5	5	3	60%
Brown	No**	4	0	0	0%
Bureau	Yes	23	16	13	81%
Calhoun	Yes*	5	0	0	0%
Carroll	Yes	7	7	7	100%
Cass	No*	5	0	0	0%
Champaign	Yes	23	23	23	100%
Christian	Yes*	13	0	0	0%
Clark	Yes	4	4	4	100%
Clay	No**	6	0	0	0%
Clinton	Yes	13	13	13	100%
Coles	Yes	6	6	6	100%
Cook	Yes	127	124	124	100%
Crawford	Yes	6	5	5	100%
Cumberland	Yes	4	4	4	100%
DeKalb	Yes	13	10	10	100%
De Witt	Yes*	7	0	0	0%
Douglas	Yes*	9	0	0	0%
DuPage	Yes	30	30	30	100%
Edgar	Yes	8	8	8	100%
Edwards	Yes	5	5	5	100%
Effingham	No**	10	0	0	0%
Fayette	No**	7	0	0	0%
Ford	No**	9	0	0	0%
Franklin	Yes	16	16	7	44%
Fulton	No*	20	0	0	0%
Gallatin	Yes*	7	0	0	0%
Greene	Yes*	10	0	0	0%
Grundy	Yes	13	12	12	100%
Hamilton	No**	4	0	0	0%
Hancock	Yes	15	14	12	86%
Hardin	No**	3	0	0	0%
Henderson	Yes*	8	0	0	0%
Henry	Yes	16	15	15	100%
Iroquois	No*	21	0	0	0%
Jackson	Yes	11	11	11	100%
Jasper	Yes*	7	0	0	0%
Jefferson	Yes	9	9	9	100%

County	County LHMP	# of Municipalities within the county	# of Municipalities participating in LHMP	# of Municipalities Adopted LHMP	% of participating Municipalities adopted
Jersey	Yes	6	6	6	100%
Jo Daviess	Yes	10	10	10	100%
Johnson	Yes*	7	0	0	0%
Kane	Yes	23	21	21	100%
Kankakee	Yes	20	15	15	100%
Kendall	No*	8	0	0	0%
Knox	No*	14	0	0	0%
Lake	Yes	48	40	40	100%
La Salle	Yes	22	20	20	100%
Lawrence	Yes	5	5	5	100%
Lee	Yes*	11	0	0	0%
Livingston	Yes*	14	0	0	0%
Logan	Yes	11	6	6	100%
McDonough	No*	10	0	0	0%
McHenry	Yes	22	22	18	82%
McLean	No**	21	0	0	0%
Macon	Yes	12	11	11	100%
Macoupin	Yes*	27	0	0	0%
Madison	Yes	27	27	27	100%
Marion	No**	13	0	0	0%
Marshall	Yes	8	5	5	100%
Mason	Yes	8	5	5	100%
Massac	Yes*	3	0	0	0%
Menard	Yes*	5	0	0	0%
Mercer	Yes	11	11	11	100%
Monroe	Yes	6	6	6	100%
Montgomery	Yes	19	7	7	100%
Morgan	Yes	10	6	6	100%
Moultrie	Yes	6	6	6	100%
Ogle	Yes*	13	0	0	0%
Peoria	Yes	16	3	2	67%
Perry	Yes	6	6	5	83%
Piatt	No*	7	0	0	0%
Pike	No*	18	0	0	0%
Pope	No**	2	0	0	0%
Pulaski	Yes*	7	0	0	0%
Putnam	Yes	6	3	3	100%
Randolph	Yes*	14	0	0	0%
Richland	Yes*	5	0	0	0%
Rock Island	Yes	14	15	15	100%
St. Clair	Yes*	27	0	0	0%
Saline	Yes	7	7	5	71%
Sangamon	Yes	27	18	18	100%

County	County LHMP	# of Municipalities within the county	# of Municipalities participating in LHMP	# of Municipalities Adopted LHMP	% of participating Municipalities adopted
Schuyler	Yes*	4	0	0	0%
Scott	Yes	7	4	4	100%
Shelby	Yes	11	8	8	10%
Stark	Yes	4	4	4	100%
Stephenson	Yes	11	5	5	100%
Tazewell	Yes*	15	0	0	0%
Union	Yes*	6	0	0	0%
Vermilion	Yes	21	10	10	100%
Wabash	Yes	4	4	4	100%
Warren	No**	5	0	0	0%
Washington	No**	13	0	0	0%
Wayne	Yes	9	6	6	100%
White	Yes	8	8	8	100%
Whiteside	Yes	13	10	10	100%
Will	Yes	20	20	20	100%
Williamson	Yes	16	16	15	94%
Winnebago	Yes	11	11	11	100%
Woodford	Yes*	15	0	0	0%
Totals:		1304	724	699	96.5%

(Source: https://intranet.iema.state.il.us/policy/Directories/IllinoisCountiesIncorporatedMunicipalities.pdf
CDPs not included

Yes- Counties with Approved/Adopted Plan	No* - Plan Expired
Yes* - Counties Currently Developing Plan	No** - No Plan

Although 56 counties have approved LHMPs, a large number of jurisdictions within these areas are still ineligible to received HMGP funding due to the lack of a formal adoption of the LHMP. It should be a goal of all local jurisdictional planning efforts to ensure that all participating jurisdictions adopted the LHMP. Additionally, only 50% of the state's municipalities participated in the planning process regarding the development of a LHMP. Efforts should be made to increase the participation levels in future development and updating of all LHMPs.

Hazard Analysis and Risk Assessment

Hazard Analysis

When the initial planning process began the Illinois Hazard Rating Process that is described on the following pages of this plan were provided to the local jurisdiction. They can also be obtained on the IEMA website. This tool is necessary in developing the hazard analysis section for the jurisdiction.

When local jurisdiction plans are received this information will be required. When local plans receive FEMA approval this information will be incorporated into the Hazard Analysis and Risk Assessment section of the State Mitigation Plan. If the local assessment does not match the State's risk assessment, the State mitigation staff will analyze the data and determine what should be entered into the State Plan. In most cases the County uses a format similar to the States to analyze and assess risk. In the case that they do not, the data gathered by the county for each hazard is used by the State planner to fit into the risk assessment model the State uses as described on Chapter III, page 8. Utilizing a consistent ranking method, allows for a more accurate correlation between the local hazard mitigation plans and the INHMP. It is the State's objective that local jurisdictions use the risk assessment worksheets that follow on V 48 thru V 50, in an effort to identify potential losses and identify vulnerabilities to critical facilities. In most cases, we find that the localized data is better and we can gain a more accurate picture of the risk. By doing this, the State uses a uniform model for each county in Illinois.

Risk Assessment

In order for the local jurisdictions to identify inventory assets and to make loss projections, they need to refer to the "State and Local Mitigation Planning how-to guide" (FEMA-386-2, August, 2001) for instructions and forms (Worksheet #3a, Worksheet #3b and Worksheet #3c) pages 38 thru 50 of the INHMP. This planning guide may be obtained from the IEMA Mitigation website or the SHMO. Every jurisdiction is encouraged to complete Worksheet #3a, make an extra copy to provide when submitting the plan for approval. In addition to Worksheet #3a, if the hazards exist for any floods and/or earthquakes with an elevated, high or severe rating, then the form for Potential Structure Losses for Floods and/or the Potential Structure Losses for Earthquakes shall be completed. The coordination between the INHMP and local HMP is vital. The INHMP is reliant on the detailed information found in local HMPs and worksheets submitted. Due to this reliance, the State places priority on providing a variety of tools, data and resources to assist local jurisdictions with the development of their hazard mitigation plans. In 2013 a statewide HAZUS-MH analysis was completed for flooding. The analysis resulted in a flood assessment report for each of the 102 counties. In addition, the State has compiled and compressed the storm loss data from the National Climate Data Center utilized in the State Risk Assessment. Each of these specific planning tools is available to each jurisdiction to provide consistency during the planning phase and can be directly incorporated into their risk assessments. The majority of these tools are located on the Illinois Emergency Management website or by contacting the State Mitigation Planner.

Highlighted on the next page are the Illinois counties that have submitted a mitigation plan. Some have used the States Hazard Rating methodology whereas others have used their own method. These systems have been evaluated and translated into the State Hazard Rating System for comparison. This correlation was completed in an effort to improve the level of detail and comprehensiveness of statewide risk assessments and coordination of State hazard mitigation goals and objects with local goals and objectives. The following chart is utilized as a checks and balance to ensure the State plan more effectively reflects the analysis of the local hazard mitigation plans. The first column for each county is the State evaluation and the second white column is from the county plan.

Illinois Hazard Rating by County based off of the Illinois Hazard Rating Process in Chapter III
Updated 5/30/2018

Key	
Very Low=0-12	Low=13-24
Medium=25-36	High=37-48
Severe=49-60	

County Name	Population	Severe Storms		Floods		Severe Winter Storms		Drought		Extreme Heat		Earthquake		Tornado	
		State	County	State	County	State	County	State	County	State	County	State	County	State	County
Adams**	66,578	High		Medium		High		Low		High		Low		Medium	
Alexander*	6,478	Severe		High		High		High		Medium		Severe		Medium	
Bond*	16,824	High		Low		High		Low		High		Medium		Medium	
Boone	53,503	High	High	Medium	Medium	High	High	Low	Low	Medium	Medium	Low	Low	Medium	Medium
Brown***	6,762	High		Low		High		Low		High		Low		Medium	
Bureau	33,359	Severe	Severe	Low	Low	High	High	High	Medium	Medium	Medium	Low	Low	Medium	Medium
Calhoun*	4,894	High		Medium		High		Low		High		Medium		Low	
Carroll	14,539	Severe	Severe	Medium	High	High	High	High	Medium	Medium	Medium	Low	Low	Medium	Medium
Cass**	12,676	Severe		Low		High		Medium		Medium		Medium		Medium	
Champaign	208,419	Severe	Severe	Low	Low	High	High	Medium	Low	Medium	Medium	Medium	Low	High	High
Christian*	33,309	Severe		Medium		Severe		Medium		Medium		Medium		Medium	
Clark	15,938	High	High	Low	Medium	High	High	Medium	Low	Medium	Low	Medium	Medium	Low	High
Clay***	13,300	Severe		Low		High		Medium		Medium		High		Medium	
Clinton	37,729	High	High	Low	Low	High	High	Low	Low	High	High	Medium	High	High	Medium
Coles	54,000	Severe	Severe	Low	Medium	Severe	High	Medium	Low	Medium	High	Medium	High	High	Severe
Cook	5,203,499	Severe	Severe	Medium	High	Severe	High	Low	Low	High	High	Low	Medium	High	High
Crawford	19,308	Severe	Severe	Medium	Medium	High	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Severe

County Name	Population	Severe Storms		Floods		Severe Winter Storms		Drought		Extreme Heat		Earthquake		Tornado	
		State	County	State	County	State	County	State	County	State	County	State	County	State	County
Cumberland	10,858	High	High	Low	Low	Severe	Severe	Medium	Low	Medium	Medium	Medium	Low	Low	Low
DeKalb	104,528	Severe	Severe	Medium	Medium	High	Severe	Low	Low	Medium	Medium	Low	Low	Medium	Low
De Witt*	16,226	Severe		Low		High		Medium		Medium		Medium		Medium	
Douglas*	19,630	Severe		Medium		High		Medium		Medium		Medium		Medium	
DuPage	929,368	Severe	Severe	Medium	Medium	High	Severe	Low	Low	Medium	High	Low	Low	Medium	Medium
Edgar	17,566	Severe	Severe	Low	Low	High	High	Medium	Medium	Medium	Low	Medium	Medium	Medium	Medium
Edwards	6,523	Severe	Severe	Medium	Medium	High	Medium	High	Low	High	Medium	High	High	Medium	Severe
Effingham***	34,386	Severe		Medium		High		Medium		Medium		Medium		Medium	
Fayette***	21,789	High		Low		High		Low		High		Medium		Medium	
Ford***	13,575	Severe		Low		High		Low		Medium		Low		Medium	
Franklin	39,156	Severe	Severe	High	Medium	High	Medium	Medium	Medium	High	Medium	High	High	Medium	High
Fulton**	35,536	Severe		High		High		Medium		Medium		Low		High	
Gallatin*	5,212	Severe		High		High		Medium		High		High		Medium	
Greene*	13,093	High		Medium		High		Low		High		Medium		Medium	
Grundy	50,437	Severe	Severe	Medium	Medium	High	Medium	Low	Low	Medium	Medium	Low	Medium	High	Severe
Hamilton***	8,061	High		Medium		High		Medium		High		High		Medium	
Hancock	18,508	Severe	Severe	Medium	High	High	Medium	High	Medium	Medium	Medium	Low	Medium	High	Severe
Hardin***	4,024	High		Medium		High		Medium		High		High		Low	
Henderson*	6,869	High		Medium		High		High		Medium		Low		Medium	
Henry	49,280	Severe	Severe	Medium	Medium	High	High	High	Medium	Medium	Medium	Low	Low	High	High
Iroquois**	28,334	Severe		Medium		High		Low		Medium		Low		Medium	
Jackson	58,870	Severe	High	High	High	High	High	Medium	Medium	Medium	Medium	High	High	Medium	High
Jasper*	9,536	Severe		Low		High		Medium		Medium		Medium		Medium	

County Name	Population	Severe Storms		Floods		Severe Winter Storms		Drought		Extreme Heat		Earthquake		Tornado	
		State	County	State	County	State	County	State	County	State	County	State	County	State	County
Jefferson	38,460	Severe	High	Low	Medium	High	Medium	Medium	Medium	High	High	High	Severe	Medium	Severe
Jersey	22,025	High	High	Medium	Medium	High	High	Low	Low	High	High	Medium	Medium	Medium	Medium
Jo Daviess	21,770	Severe	Severe	Medium	High	High	High	High	Medium	Medium	Medium	Low	Low	Medium	Low
Johnson*	12,902	Severe		Medium		High		Medium		Medium		High		Medium	
Kane	531,715	Severe	Severe	Medium	Medium	High	Severe	Low	Low	Low	Low	Low	Low	Medium	Medium
Kankakee	110,008	Severe	Severe	Medium	Low	High	Severe	Low	Medium	Medium	Medium	Low	Low	High	High
Kendall*	124,695	High		Medium		High		Low		Low		Low		Medium	
Knox*	50,938	Severe		Medium		High		Medium		Medium		Low		Medium	
Lake	703,047	Severe	Severe	Medium	High	High	Severe	Low	Low	Low	Medium	Low	Low	High	High
La Salle	110,642	High	Severe	Medium	Medium	High	High	Low	Medium	Medium	Medium	Low	Low	Medium	Medium
Lawrence	16,377	Severe	Severe	Medium	Medium	High	High	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Lee*	34,251	High		Low		High		Low		Medium		Low		Medium	
Livingston*	36,526	High		Medium		High		Low		Medium		Medium		Medium	
Logan	29,527	Severe	Severe	Low	Low	High	High	Medium	Low	Medium	Medium	Medium	Medium	High	High
McDonough**	30,996	Severe		Medium		High		High		Medium		Low		Medium	
McHenry	307,004	High	High	Medium	Medium	High	High	Low	Low	Low	Low	Low	Low	High	Medium
McLean***	172,418	Severe		High		High		Medium		Medium		Low		High	
Macon	106,550	Severe	Severe	Medium	Medium	High	High	Medium	Medium	Medium	Medium	Medium	Medium	High	High
Macoupin*	45,908	High		Medium		High		Low		High		Medium		Medium	
Madison	265,759	Severe	Severe	Low	High	High	High	Low	Low	High	High	Medium	Medium	High	High
Marion***	38,140	High		Low		High		Low		High		High		Medium	
Marshall	11,939	High	Severe	Low	Medium	High	High	Medium	Medium	Medium	Medium	Low	Low	Medium	Low
Mason	13,507	Severe	Severe	Medium	Medium	High	Medium	Medium	Medium	Medium	Medium	Low	Low	Medium	Medium

County Name	Population	Severe Storms		Floods		Severe Winter Storms		Drought		Extreme Heat		Earthquake		Tornado	
		State	County	State	County	State	County	State	County	State	County	State	County	State	County
Massac*	14,658	Severe		Low		High		Medium		Medium		High		Medium	
Menard*	12,516	Severe		Low		High		Medium		Medium		Medium		Medium	
Mercer	15,730	Severe	High	Medium	Severe	High	High	Medium	Low	Medium	Low	Low	Low	Medium	Medium
Monroe	34,068	Severe	Severe	Medium	High	High	High	Low	Medium	High	High	High	Medium	Medium	Medium
Montgomery	28,952	High	Severe	Low	Low	High	High	Low	Low	High	Medium	Medium	Low	Medium	High
Morgan	34,277	Severe	Severe	High	High	High	High	Medium	Medium	Medium	Medium	Medium	Low	Medium	Medium
Moultrie	14,827	Severe	Severe	Low	Low	High	High	Medium	Medium	Medium	Low	Medium	Medium	Medium	Medium
Ogle*	51,273	Severe		Medium		High		Low		Medium		Low		Medium	
Peoria	185,006	Severe	High	Medium	High	High	Medium	Medium	Medium	Medium	Medium	Low	Medium	High	High
Perry	21,357	Severe	High	Medium	High	High	Medium	Medium	Medium	High	High	High	High	Medium	Severe
Piatt**	16,560	Severe		Low		High		Medium		Medium		Medium		Medium	
Pike**	15,950	High		High		High		Low		High		High		Medium	
Pope***	4,157	High		Medium		High		Medium		Medium		High		Medium	
Pulaski*	5,619	High		High		High		Medium		Medium		Severe		Medium	
Putnam	5,611	Severe	Severe	Low	Low	High	High	Medium	Medium	Medium	Medium	Low	Low	Medium	Low
Randolph*	32,621	High		Medium		High		Low		High		High		Medium	
Richland*	15,930	High		Low		High		Medium		Medium		High		Medium	
Rock Island	144,784	Severe	Severe	Medium	High	High	High	Medium	Medium	Medium	High	Low	Medium	Medium	High
St. Clair*	262,759	Severe		Medium		High		Low		High		High		High	
Saline	24,307	Severe	High	Medium	Severe	High	Severe	Medium	High	Medium	Medium	High	High	Medium	Severe
Sangamon	197,499	Severe	Severe	High	Medium	High	Severe	Medium	Medium	Medium	Medium	Medium	Medium	High	High
Schuyler*	6,923	Severe		Low		High		Medium		Medium		Low		Medium	

County Name	Population	Severe Storms		Floods		Severe Winter Storms		Drought		Extreme Heat		Earthquake		Tornado	
		State	County	State	County	State	County	State	County	State	County	State	County	State	County
Scott	5,053	Severe	Severe	Medium	Medium	High	High	Medium	Medium	High	High	Medium	Medium	Medium	Medium
Shelby	21,717	Severe	High	Medium	Medium	High	High	Medium	Medium	Medium	Medium	Medium	Low	Medium	Low
Stark	5,776	High	Severe	Low	Medium	High	High	Medium	Medium	Medium	Medium	Low	Low	Medium	Low
Stephenson	45,624	Severe	Severe	Medium	Medium	High	High	High	Low	Medium	Medium	Low	Low	Medium	Medium
Tazewell*	134,385	Severe		High		High		Medium		Medium		Low		High	
Union*	17,212	Severe		Medium		High		Medium		Medium		Severe		Medium	
Vermilion	78,111	Severe	Severe	Low	Low	High	High	Medium	Medium	Medium	Medium	Medium	Medium	High	High
Wabash	11,947	Severe	Severe	Medium	Medium	High	High	Medium	Medium	Medium	Medium	High	High	High	High
Warren***	17,378	Severe		Medium		High		High		Medium		Low		Medium	
Washington***	14,154	High		Low		High		Low		High		High		Medium	
Wayne	16,396	Severe	Severe	Medium	Medium	High	High	Medium	Medium	Medium	Medium	High	High	Medium	Medium
White	14,292	Severe	High	High	High	High	Medium	Medium	Low	Medium	Medium	High	High	Medium	Severe
Whiteside	56,536	Severe	High	Medium	Medium	High	High	High	High	Medium	Medium	Low	Low	Medium	Medium
Will	689,529	Severe	Severe	Medium	High	High	Severe	Low	Medium	Low	Low	Low	Low	High	High
Williamson	67,560	Severe	Severe	Medium	High	High	High	Medium	Medium	Medium	Low	High	Severe	High	Severe
Winnebago	285,873	Severe	High	Medium	Medium	High	Medium	Low	Medium	Medium	Medium	Low	Low	Medium	Medium
Woodford*	39,140	Severe		High		High		Medium		Medium		Low		Medium	

Counties with Approved/Adopted Plan * Counties with Planning in Progress ** Counties with Expired Plans *** Counties with No Plans Source: Hazard Rating Database – IEMA

C. Disaster Mitigation Act of 2000 Local Plan Guidance

NOTE TO LOCAL JURISDICTIONS

The State of Illinois has developed and is using the following Hazard Rating Process in the State Mitigation Plan. This process is being shared as a guide for local jurisdiction review and use. You may be required to supply jurisdiction-specific data for your local plan. A local jurisdiction can use this general process and supply detailed hazard specific data. Currently the State has a broad general picture and will use this specific information to develop more detail in future revisions. By using this format, the efforts of the local governments can be easily integrated into the State's Hazard Analysis. Supplying this process is meant to start your thinking and data collection. Information available on the IEMA Mitigation website may not provide information that is detailed enough for a local plan.

HAZARD WORKSHEET METHODOLOGY

Sixty-six years of Illinois hazard data (1951-2017) was obtained from the National Climatic Data Center and Spatial Hazard Events and Losses Database for the United States (SHELDUS) for severe storms (thunderstorms, high wind, lightning and hail) and tornadoes, floods, severe winter storms, drought, and extreme heat. The Illinois State Geological Survey was able to supply an equivalent time frame of data for earthquake activity in Illinois. The INHMP Risk Assessment examines natural disasters on a statewide basis and as well as individual counties. Natural hazards include those caused by climatological, geological, hydrologic, or seismic events. A variety of data sources were reviewed to obtain additional information regarding past occurrences in order to create the most comprehensive list possible. These data sources include: Illinois Emergency Management Agency (IEMA), Federal Emergency Management Agency (FEMA), Illinois State Water Survey (ISWS), US Geological Atmospheric Administration (USGS), Illinois State Geological Survey (ISGS), Illinois Department of Natural Resources (IDNR), US Army Corps of Engineers, the Spatial Hazard Events and Losses Database for the United States (SHELDUS) and the National Climatic Data Center (NCDC/NCEI). All of this information has been entered into a spreadsheet database for ease of information analysis and for using GIS mapping capabilities to display and identify Illinois hazard areas. The database was broken down by individual hazard occurrence by county. This database will be continually updated by mitigation staff, in order to maintain an accurate and active collection of previous occurrences. This database will also be an available planning tool for local jurisdictions.

Historical/probability– An average of the number of events that have occurred since 1950.

- **Vulnerability**– Severe Storm–All counties are susceptible to severe storms. At any one time, it has been determined that over 25% of the county population might experience severe storms. This determination is supported by Mr. Chris Miller, WCM, National Weather Service, Lincoln, IL, as follows: "Damage from severe thunderstorms is usually on a much broader spatial scale in the state of Illinois. Illinois averages more than 500 reports of wind damage and nearly 375 reports of large hail annually. Approximately 80% of the severe thunderstorms are multicellular or a supercell hybrid, which are capable of producing damaging wind and/or large hail over approximately a 400 to 500 square mile area. The remainder of severe thunderstorms are squall lines, which can produce damage over 100% of the

affected counties. Thus, the vulnerability to severe thunderstorms should be high (greater than 25% of the population affected) in each county across Illinois. This is reinforced by a study done by Stanley Chagnon of Chagnon Climatologist, in his publication *"Thunderstorms Across the Nation - An Atlas of Storms, Hail, and Their Damages in the 20th Century"*. This study indicated that in an analysis of thunderstorm caused catastrophes, Illinois ranked 4th in the United States in total thunderstorm catastrophes between 1949 and 1998."

- Tornado–While all of Illinois is susceptible to tornadoes (in fact north, south, east and west counties have all been hit by tornadoes) it is estimated less than 10% of a county would be impacted by a tornado at any one time. This estimation is supported by Mr. Chris Miller, WCM, National Weather Service, Lincoln, IL, as follows: "Based on data of tornadoes in the state of Illinois for the -66-year period from 1951 – 2017, nearly 80% were rated as weak tornadoes (EF0/EF1), 19% were rated as strong tornadoes (EF2/EF3), and 1% were rated as violent tornadoes (EF4/EF5) on the Enhanced Fujita damage assessment scale. The data also suggests that weak tornadoes are typically 60 yards wide with a path length of 2 miles, strong tornadoes are usually 200 yards wide with a path length around 10 miles, with violent tornadoes around 1/4-mile-wide and path lengths greater than 20 miles. This would mean that with nearly 2695 tornadoes reported, approximately 925 square miles of Illinois have been affected by tornadoes." "Considering that Illinois is nearly 58,000 square miles in size, with the average county around 925 square miles, the average population affected has been about 1.5%. Thus, every county in Illinois should have a "Low" vulnerability to tornadoes, (low being defined as less than 10% of the total population)."

- Flood–History supports the assumption that all counties in Illinois are susceptible to some type of flooding. As stated above in the tornado analysis, it is estimated that 10% of a county would be impacted by flooding at any one time. Illinois Department of Natural Resources provided information on the 100 Year Floodzone in Unincorporated Areas ranging from 52.1% to 2.7% of the county being in the 100 year floodzone with the average being 13.5%. In general, incorporated areas would have a lower average floodzone; therefore, 10% was used for the overall county average.

- Drought–In general, farmers are the first group to feel the impact of a drought. Besides causing stress to crops and livestock, many farmers rely on their own dug wells or wells drilled into shallow aquifers for their water supply. Both types of wells are very vulnerable to drought conditions. Public water supplies are typically more robust against drought but are not immune from long-term drought conditions. Public water supplies that rely on surface water supplies are historically more vulnerable to drought than those that rely on deep aquifers. The Illinois State Water Survey has produced a document dealing with drought and drought planning. The reference is *The Water Cycle and Water Budgets in Illinois: A Framework for Drought and Water-supply Planning (*Illinois State Water Survey, 2006, ISWS IEM 2006-02).

- Extreme Heat-The most at risk population is the sickly and the elderly. We have arbitrarily identified the elderly population by county and used this as the basis. As stated earlier the young people in poor health are also at risk. The assumption is made that the young people in poor health will be offset by the healthy elderly.

- Severe Winter Storm–One hundred percent of the population is at risk from a severe winter storm in the State of Illinois.

- Earthquake–The Applied Technology Council (ATC) has prepared a publication on rapid visual screening of seismically hazardous buildings. The National Earthquake Hazards Reduction Program Map (FEMA 154, Second Edition, 2002) for Illinois from this publication was used.

Severity of Impact–The various detailed parameters are identified in this table. When evaluating each county based on the 60+ year history, if there is any conflicting data the highest level will be assumed. In keeping with this philosophy and since the worst known earthquake (1811-1812) occurred outside of the 60+ year period of time, the decision was made to overlay the ATC map with the Modified Mercalli Scale Map (Modified Mercalli Intensities based on a 7.6 Magnitude Earthquake along the New Madrid Seismic Fault) to evaluate Illinois counties.

Population–The Illinois Department of Commerce and Economic Opportunity provided the 2010 census population and the projected population growth by county through 2017 from US Census bureau's website. This information was used in supplying information for the fourth and fifth tables. Using the tables in this rating process, the information has been extracted and analyzed in the following manner:

ILLINOIS HAZARD RATING PROCESS

There are four categories (Historical/Probability, Vulnerability, Severity of Impact and Population) that will identify and define the ratings of each hazard, noted in the five tables on the next three pages. The first table will identify what has occurred in the past as a guide to projecting the probability for future occurrences. The second table will identify the number of citizens who might be impacted based on individual criteria identified in the methodology. The third table will estimate the severity by considering health and safety, continuity of operations, property, facilities, infrastructure, environment, economic and financial situation. The fourth category is population with two tables: table 4A is based on the 2017 census population and table 4B is based on the projected population growth for the next ten years.

The first three tables are weighted three times as much as the last two tables combined. Each hazard (for example flood) will have a score from each of the five tables. The score to be used for low, medium and high is identified in each table. This last column under each hazard will be the total overall score of the five tables, as shown on the next page:

Very Low – 0 to 12 (green)

Low – 13 to 24 (pink)

Medium – 25 to 36 (orange)

High – 37 to 48 (blue)

Severe – 49 to 60 (red)

For example, under flood there will be a number from each of the five tables. These five numbers will be totaled to arrive at the overall risk for floods. This rating process is being done by county for all major natural hazards in Illinois. These numbers will be transferred onto a separate spreadsheet by county and colored coded as indicated above to readily indicate the hazard ratings.

1) HISTORICAL/PROBABILITY (frequency)

-The number of times that a disaster has occurred in a county in the past 66 years

-The information is being used to determine and evaluate the likelihood for future disasters

Low (6)	0 to 12 occurrences in the last 66 years
Medium (12)	12 to 60 occurrences in the last 66 years
High (18)	More than 60 occurrences in the last 66 years

2) VULNERABILITY (percentage of people)

-The relationship of where people live in or near the hazard area

-The percentage of people that will be adversely affected should the hazard occur

Low (6)	Less than 10% of the total population of the county
Medium (12)	10% to 25% of the total population of the county
High (18)	More than 25% of the total population of the county

3) SEVERITY OF IMPACT (injuries, fatalities, personal property & infrastructure)

-The worst conceivable impact to human life and property which could result from a hazard

-The essential facilities are defined for this purpose as PUBLIC SAFETY (fire, police & local government) and UTILITIES (electric, gas, telephone water & sewer)

Low (6)	Minor injuries (under 50) & property damage (under $1,000,000), or less than 24 hour shutdown of essential facilities
Medium (12)	Serious injury (more than 50), major property damage (structural stability) ($1,000,001 to $15,000,000), or 24 to 72-hour shutdown of essential facilities
High (18)	Multiple deaths (more than 5), property destroyed or damaged beyond repair (More than $15,000,000), or more than 3 days of shutdown for essential facilities

4) POPULATION–COMBINED FOURTH CRITERIA based on 1/3 the value of the above tables. The committee was instructed to include growth as a factor for the risk assessment. After a review of the data the committee concluded that giving the future growth equal weight with the other factors skewed the risk assessment. Counties range in population from approximately 5,000 to 5,000,000. To say a population growth of 25% in a smaller county (1, 250) would have more of an impact than a larger county with 10% growth (500,000) was not acceptable to the committee.

The committee also determined that because of the large population disparity among counties the Vulnerability and Severity of Impact didn't fully distinguish the quantity of people that could be exposed to risk. The committee decided to give the population of the counties equal weight with the growth factor.

The planning committee discussed the impact of population on the risk assessment at length. While population is acknowledged to be an important factor to be considered, it is of lesser significance than the first three criteria and has been assigned 1/3 the value. On a scale of 100 the first three tables would receive 30 each and the remaining 10 was allocated to population.

4A) POPULATION (number in jurisdiction)

-The actual 2000 population census figure per jurisdiction

-The quantity will be used to identify a slight increase in risk

Low (1)	0 to 100,000 population in the county
Medium (2)	100,001 to 500,000 population in the county
High (3)	More than 500,000 population in the county

4B) POPULATION GROWTH (percentage of increase)

-The projected population growth in a jurisdiction over the next 10 years

-The population growth estimates will be used to identify a potential increase to risk

Low (1)	% of decrease to 10% projected population increase in the county
Medium (2)	11% to 25% projected population increase in the county
High (3)	More than 25% projected population increase in the county

HAZARD RATING - COUNTY

City, County or Multi-Jurisdictional	Population	Severe Storms	Floods	Severe Winter Storms	Drought	Extreme Heat	Earthquake	Tornado

NOTE TO LOCAL JURISDICTIONS

LOCAL RISK ASSESSMENT

Three forms dealing with risk assessment shall be submitted with the mitigation plan to the State for approval. The State will compile this information from the local jurisdictions into the State Hazard Mitigation Plan. The assumption will be made that since the locals are doing a more detailed analysis of the local risk that their risk assessment is the more accurate. The State reserves the right to re-analyze the risk assessment data to determine the most accurate level of risk.

1) Worksheet #3a – In preparing the risk assessment for the jurisdiction it is necessary for this worksheet to be completed. Make an extra copy of this worksheet to be submitted to the State when the local mitigation plan is submitted for approval. This worksheet and the instructions for completing this worksheet may be found in "State and Local Mitigation Planning how-to guide", FEMA 386-2. This document is on the IEMA Mitigation website and may be obtained from the State Hazard Mitigation Officer (SHMO).

2) Potential Structure Losses for Floods–This form will be required if flooding is a hazard for the jurisdiction. Much of this information can be taken from Worksheet #3a, Worksheet #3b and Worksheet #4 that are found in "State and Local Mitigation Planning how-to guide", FEMA 386-2.

   The definition for a critical facility is Emergency Operations Center (EOC), Courthouses, Police and Fire Stations, Rescue/Ambulance Service, Medical Facilities (hospital, nursing home and medical clinic), Transportation Facilities (critical roads, bridges, airport, and port), and local Utilities such as telco central offices, cell towers, and power plants.

3) Potential Structure Losses for Earthquakes–This form will be required if the earthquake hazard rating for the jurisdiction is elevated, high or severe. Much of this information can be taken from Worksheet #3a, Worksheet #3b and Worksheet #4 that are found in "State and Local Mitigation Planning how-to guide", FEMA 386-2.

Critical Facilities for the jurisdiction should be listed on this form. The information for these critical facilities shall include the name, most accurate physical address and, if possible, latitude and longitude for mapping purposes (i.e. no post office boxes, etc.). A critical facility is defined as Emergency Operations Center (EOC), Courthouses, Police and Fire Stations, Rescue/Ambulance Service, Medical Facilities (hospital, nursing home and medical clinic), Utilities (water, sewer, electric and gas), Transportation Facilities (critical roads, bridges, airport and port) and local Utilities such as telco central offices, cell towers, and power plants.

Type of Structure code for the critical facilities shall be taken from the table on the next page. This table has been developed from the "Second Edition Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook", FEMA 154/March 2002, publication.

TYPE OF STRUCTURE

CODE	BUILDING IDENTIFIER	CHARACTERISTICS
1	Wood Buildings	• Light wood frame residential and commercial buildings equal to or smaller than 5,000 sq. ft. (W1): Wood stud walls are typically constructed of 2-inch by 4-inch vertical wood members set about 16 inches apart (2-inch by 6-inch for multiple stories). Most common exterior finish materials are wood siding, metal siding or stucco. • Light wood frame buildings greater than 5,000 sq. ft. (W2) These are large apartment buildings, commercial buildings or industrial structures usually of one to three stories and rarely, as tall as six stories.
2	Steel Buildings	• Steel moment-resisting frame (S1) Typical steel moment-resisting frame structures usually have similar bay widths in both the transverse and longitudinal directions, around 20-30 ft. The floor diaphragms are usually concrete, sometimes over steel decking. This structural type is used for commercial, institutional and public buildings. • Braced steel frame (S2) These buildings are braced with diagonal members, which usually cannot be detected from the building exterior. Braced frames are sometimes used for long and narrow buildings because of their stiffness. • Light metal building (S3) The structural system usually consists of moment frames in the transverse direction and braced frames in the longitudinal direction, with corrugated sheet-metal siding. In some regions, light metal buildings may have partial-height masonry walls. The interiors of most of these buildings do not have interior finishes and their structural skeleton can be seen easily.

CODE	BUILDING IDENTIFIER	CHARACTERISTICS
2	Steel Buildings Continued	• Steel frames with cast-in-place concrete shear walls (S4) Lateral loads are resisted by shear walls, which usually surround elevator cores and stairwells, and are covered by finish materials. An interior investigation will permit a wall thickness check. More than six inches in thickness usually indicates a concrete wall. • Steel frames with unreinforced masonry infill walls (S5) Steel columns are relatively thin and may be hidden in walls. Usually masonry is exposed on exterior with narrow piers (less than 4 ft. wide) between windows. Portions of solid walls will align vertically. Infill walls are usually two to three wythes thick. Veneer masonry around columns or beams is usually poorly anchored and detaches easily.
3	Concrete Buildings	• Concrete moment-resisting frames (C1) All exposed concrete frames are reinforced concrete (not steel frames encased in concrete). • Concrete shear wall buildings (C2) Concrete shear-wall buildings are usually cast in place, and show typical signs of cast-in-place concrete. Shear-wall thickness ranges from 6 to 10 inches. • Concrete frames with unreinforced masonry infill walls (C3) Concrete columns and beams may be full wall thickness and may be exposed for viewing on the sides and rear of the building. Usually masonry is exposed on the exterior with narrow piers (less than 4 ft. wide) between windows. Portions of solid walls will align vertically. This type of construction was generally built before 1940 in high-seismicity regions but continues to be built in other regions.

CODE	BUILDING IDENTIFIER	CHARACTERISTICS
4	Precast Concrete Buildings	• Tilt-up Buildings (PC1) Tilt-ups are typically one or two stories high and are basically rectangular in plan. Exterior walls were traditionally formed and cast on the ground adjacent to their final position, and then "tilted-up" and attached to the floor slab. The roof can be a plywood diaphragm carried on wood purlins and glulam beams or a light steel deck and joist system, supported in the interior of the building on steel pipe columns. • Precast concrete frame buildings (PC2) Precast concrete frames are, in essence, post and beam construction in concrete. Structures often employ concrete or reinforced masonry (brick or block) shear walls.
5	Masonry Buildings	• Reinforced masonry buildings with flexible diaphragms (RM1) • Reinforced masonry buildings with rigid diaphragms (RM2) Walls are either brick or concrete block. Wall thickness is usually 8 inches to 12 inches. Interior inspection is required to determine if diaphragms are flexible or rigid. The most common floor and roof systems are wood, light steel, or precast concrete. • Unreinforced masonry buildings (URM) These buildings often used weak lime mortar to bond the masonry units together. Arches are often an architectural characteristic of older brick bearing wall buildings. Other methods of spanning are also used, including steel and stone lintels. Unreinforced masonry usually shows header bricks in the wall surface.

Worksheet #3a — Inventory Assets — step 3

Date: *What will be affected by the hazard event?*

Task A. Determine the proportion of buildings, the value of buildings, and the population in your community or state that are located in hazard areas.

Hazard _____

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community or State	# in Hazard Area	% in Hazard Area	$ in Community or State	$ in Hazard Area	% in Hazard Area	# in Community or State	# in Hazard Area	% in Hazard Area
Residential									
Commercial									
Industrial									
Agricultural									
Religious/ Non-profit									
Government									
Education									
Utilities									
Total									

Task B. Determine whether (and where) you want to collect additional inventory data.

	Y	N
1. Do you know where your greatest damages may occur in your hazard areas?	____	____
2. Do you know whether your critical facilities will be operational after a hazard event?	____	____
3. Is there enough data to determine which assets are subject to the greatest potential damages?	____	____
4. Is there enough data to determine whether significant elements of the community are vulnerable to potential hazards?	____	____
5. Is there enough data to determine whether certain areas of historic, environmental, political, or cultural significance are vulnerable to potential hazards?	____	____
6. Is there concern about a particular hazard because of its severity, repetitiveness, or likelihood of occurrence?	____	____
7. Is additional data needed to justify the expenditure of community or state funds for mitigation initiatives?	____	____

POTENTIAL STRUCTURE LOSSES FOR FLOODS

_____COUNTY

Worksheet #3b

City, County or Multi-Jurisdictional	Assessed Vulnerability	Estimated # of People	% of Structures in Floodplain	# of Repetitive Loss Properties	# Estimated Residential Losses	$ Estimated Residential Losses	# Estimated Commercial Losses	$ Estimated Commercial Losses	# Estimated Industrial Losses	$ Estimated Industrial Losses	# of Critical Facilities	Relative Losses (High, Med., Low)

POTENTIAL STRUCTURE LOSSES FOR EARTHQUAKES

_____COUNTY

Worksheet #3c

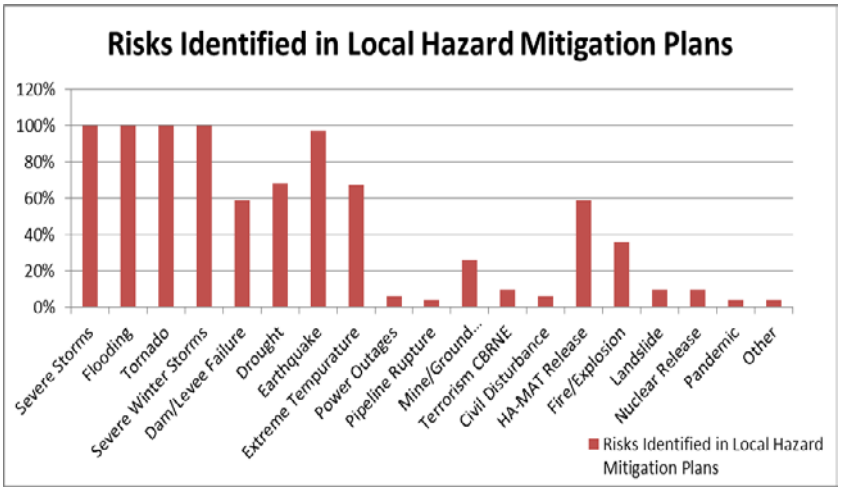
City, County or Multi-Jurisdictional	Assessed Vulnerability	Estimated # of People	# of Estimated Residential Losses	$ Estimated Residential Losses	# of Estimated Commercial Losses	$ Estimated Commercial Losses	# of Estimated Industrial Losses	$ Estimated Industrial Losses	# of Critical Facilities (CF)	# of Critical Facilities (CF) out-of-service	$ Estimated Losses to Critical Facilities (CF)	Type of CF Structure	Relative Losses (High, Med., Low)

D. Local Hazard Mitigation Plan Risk Assessments

Local jurisdictional hazard risk assessments were conducted utilizing a variety of different methods. Assessments conducted at the local level tend to provide a unique and detailed approach to the assessment that the INHMP cannot emulate. Following are correlations that have been identified utilizing LHMPs that have been provided from each jurisdiction. All counties that were covered by plans have been considered in this list, in terms of their top hazards and any areas of significant development pressure. This section however, is not intended to definitively prioritize the jurisdictions with regards to one another, but represents concerns from these local jurisdictions. This list provides that opportunity to incorporate and correlate the in depth assessments from the local plans into the INHMP. To research individual county information in detail, all FEMA approved hazard mitigation plans are listed on our IEMA website. The State analyzes information from local risk assessments for use in an effort to supplement the risk assessment in the INHMP. A detailed description of this analysis and correlation can be found in Section III of the INHMP. The following pages provide highlights of best practices from local hazard mitigation plans that do a good job of risk assessments for specific hazards, while analyzing the hazards and risks identified in Illinois' local hazard mitigation plans.

The majority of hazards identified in LHMP mirror those identified in the INHMP. The most commonly identified hazards include: severe storms (thunderstorms), tornados, floods and severe winter storms which are represented as potential hazards in 100% of the LHMPs. Over 97% of Illinois LHMPs have identified earthquakes in their rankings. Drought and extreme temperatures were moderately addressed in the LHMPs at approximately 67%, while dam/levee failure was addressed in approximately 59% of the plans.

There are 28 hazards identified in the LHMPs reviewed. Although LHMP guidance does not require human-caused hazards or technological hazards to be identified, over 58% of the LHMP included such hazards. The most popular non-natural hazard addressed in the LHMP was hazardous materials (HAZ-MAT) release. HAZ-MAT releases were listed as a hazard for the local jurisdictions in 59% of the LHMPs.



The following table represents the hazards identified in Illinois' LHMPs.

Hazards Identified in LHMPs

Tornado	Earthquake
Severe Storms	Pipeline Ruptures
Drought	Transportation Accidents
Fire/Explosions	Hazardous Material Spill
Black Outs/Power Outages	Dam/Levee Failure
Structure/Building Collapse	Flooding
Storm/Wastewater Infrastructure Flooding	Terrorism (CBRNE)
Cyber Incident	Civil Disturbance
Extreme Temperatures	Sewer Back-ups
Severe Winter Storms	Wastewater Flooding
Mine Subsidence	Nuclear Release
Erosion	Waste Remediation
Ground Subsidence	Pandemics
Landslide	Wildfire

As identified in the FEMA Local Multi- Hazard Mitigation Guidance, "The overall intent of the hazard identification or risk assessment is to provide the factual basis for activities proposed in the strategy that will reduce losses from identified hazards. A quality assessment makes a clear connection between the community's vulnerability and the hazard mitigation actions. In other words, it provides sufficient information to enable the jurisdiction(s) to identify and prioritize appropriate hazard mitigation actions. Local risk assessments do not need to be based on the most sophisticated technology, but do need to be accurate, current, and relevant." LHMPs in Illinois provide a detailed description of the type, location and extent of all the natural hazards that affect the jurisdiction, while including information on previous occurrences. Multi-jurisdictional LHMPs have the unique task of providing detailed information regarding each individual jurisdiction's risks where they vary from the risks facing the entire planning area. In addition, future land use descriptions and development trends within the communities are difficult incorporate into LHMPs with sufficient detail. However, this type of forward thinking is imperative in planning efforts, so that mitigation options can be considered in future land use decisions. Below are examples, of detailed risk assessments and strong descriptions of land uses and development trends, that are specific to each jurisdiction participating in the plan development. This detailed jurisdictional assessment allows for each jurisdiction to truly rank and assess the risk impacting them individually, while providing a strong foundation for developing mitigation actions to reduce or limit the impact of these hazards.

Examples of Local Hazard Mitigation Plans

Montgomery County – Plan Approved: February 24, 2017

INTRODUCTION

Each year natural hazards (i.e., severe thunderstorms, tornadoes, severe winter storms, flooding, etc.) cause damage to property and threaten the lives and health of the residents of Montgomery County. Since 1965, Montgomery County has had three federally-declared disasters. Figure 1 identifies each declaration including the year the disaster was declared and the type of natural hazard that triggered the declaration.

Figure 1
Federal Disaster Declarations: Montgomery County

Declaration #	Year	Natural Hazard(s) Covered by Declaration
1416	2002	flooding; excessive rainfall; severe storms and tornadoes
1681	2006	severe winter storm
1800	2008	severe storms and flooding

In addition, in the past decade alone, there have been 41 thunderstorms with damaging winds, 30 severe storms with hail one inch in diameter or greater, 19 extreme heat events, 18 severe winter storms, ten tornadoes, nine recorded flash flood events, three recorded lightning strike events, three droughts, two recorded extreme cold events, and one earthquake felt by residents in the County.

While natural hazards cannot be avoided, their impacts can be reduced through effective hazard mitigation planning. This prevention-related concept of emergency management often receives the least amount of attention, yet it is one of the most important steps in creating a hazard resistant community.

How is this plan different from other emergency plans?

A natural hazards mitigation plan is aimed at identifying projects and activities that can be conducted prior to a natural disaster, unlike other emergency plans which provide direction on how to respond to a disaster after it occurs. This is the first time that Montgomery County has updated its hazard mitigation plan since the original plan was prepared in 2010. This update that describes in detail the actions that can be taken to help reduce or eliminate damages caused by specific types of natural hazards.

1.1 PARTICIPATING JURISDICTIONS

Recognizing the benefits of having an updated natural hazards mitigation plan, the Montgomery County Board Chairman signed a Statement of Intent on July 17, 2014 authorizing the update of the Montgomery County Multi-Jurisdictional Natural Hazards Mitigation Plan (hereto referred to as the Plan). Appendix A contains a copy of the Statement of Intent. The County then invited all the local government entities within Montgomery County to participate. Figure 2 identifies the participating jurisdictions that are represented in the Plan.

Figure 2 Participating Jurisdictions Represented in the Plan	
❖ Coffeen, City of	❖ Panama, Village of
❖ Donnellson, Village of	❖ Raymond, Village of
❖ Farmersville, Village of	❖ Regional Office of Education #3
❖ Hillsboro, City of	❖ Schram City, Village of
❖ Hillsboro Area Hospital	❖ St. Francis Hospital
❖ Litchfield, City of	❖ Taylor Springs, Village of
❖ Nokomis, City of	❖ Waggoner, Village of
	❖ Witt, City of

1.2 DEMOGRAPHICS

Montgomery County is located in central Illinois and covers approximately 710 square miles. Figure 3 provides a location map of Montgomery County and the participating municipalities. The topography is generally flat to gently sloping. The County is bounded to the north by Sangamon and Christian Counties, to the east by Shelby and Fayette Counties, to the south by Bond and Madison Counties and to the west by Macoupin County. The County seat is located in Hillsboro.

Agriculture is an important enterprise in Montgomery County. According to the 2012 Census of Agriculture, there were 1,021 farms in Montgomery County occupying approximately 84% (382,388 acres) of the total acreage in the County. The major crops include soybeans, wheat and corn while the major livestock includes pheasants, hogs and sheep. The County ranks 13th in the State for soybeans, 21st for wheat and winter wheat, and 22nd for corn. In terms of livestock, the County ranks 9th for pheasants, 10th for hogs and pigs and 18th for sheep and lambs. The County also ranks in the top 20 Illinois counties for livestock cash receipts and in the top 30 for crop cash receipts.

Manufacturing in the County is primarily located in Litchfield, where such items as PVC pipe, marine engine parts, steel grating, construction components, farm equipment, and athletic equipment are produced. In the southern portion of the county, a coal-fired power plant near Coffeen supplies much of the surrounding area with power. Other important industries located in the County include coal mining, healthcare, retail trade and corrections.

Figure 4 provides demographic data on the County and each of the participating municipalities along with information on housing units and assessed values. The assessed values are for all residential structures and associated buildings (including farm homes and buildings associated with the main residence.) The assessed value of a residence in Montgomery County is approximately one-third of the market value.

Figure 4 Demographic Data by Participating Jurisdiction						
Participating Jurisdiction	Population (2010)	Projected Population (2030)	Land Area (Sq. Miles) (2010)	Number of Housing Units (2010)	Housing Unit Density (Units/ Sq. Mile) (Rounded Up)	Total Assessed Value of Housing Units (2014)
Montgomery County (unincorporated)	7,521	8,275	676.047	3,432	6	$48,639,001
Coffeen	685	754	1.191	315	265	$4,283,870
Donnellson	210	231	0.325	106	---	$982,363
Farmersville	724	797	0.903	342	---	$7,936,042
Hillsboro	6,207	6,830	6.552	2,029	310	$45,558,654
Litchfield	6,939	7,635	6.448	3,158	490	$68,091,218
Nokomis	2,256	2,482	1.304	1,070	821	$18,299,600
Panama	343	377	0.359	177	---	$1,312,385
Raymond	1,006	1,107	1.321	457	346	$11,331,074
Schram City	586	645	0.733	295	---	$4,348,673
Taylor Springs	690	759	1.004	282	281	$4,603,074
Waggoner	266	293	0.263	115	---	$1,203,150
Witt	903	994	1.400	471	337	$5,344,398

Sources: Durston, Ray, Montgomery County Supervisor of Assessments.
Illinois Department of Commerce and Economic Opportunity, Projection Summary by County.
U.S. Census Bureau, 2010 Census U.S. Gazetteer Files
U.S. Census Bureau, American Fact Finder

3.0 RISK ASSESSMENT

Risk assessment is the process of evaluating the vulnerability of people, buildings and infrastructure to natural hazards in order to estimate the potential loss of life, personal injury, economic injury and property damage resulting from natural hazards. This section summarizes the results of the risk assessment conducted on the natural hazards that pose a threat to Montgomery County. The information contained in this section was gathered by evaluating local, state and federal records from the last 60 years.

This risk assessment identifies the natural hazards that pose a threat to the County and includes a profile of each which identifies past occurrences, the severity or extent of the hazard, and the likelihood of future occurrences. It also provides a vulnerability assessment which identifies the impacts to public health and property, evaluates the assets of the participating jurisdictions (i.e., residential buildings, critical facilities and infrastructure) and estimates the potential impacts each natural hazard would have on the health and safety of the residents as well as the buildings, critical facilities and infrastructure located within the County. Where applicable, the differences in vulnerability between participating jurisdictions are described.

One of the responsibilities of the Planning Committee was to decide if additional natural hazards should be included in the updated Plan. Therefore, over the course of the first two meetings, the Planning Committee members discussed their experiences with natural hazard events and reviewed information about various natural hazards. After discussing their options, the Committee

chose not to add any additional natural hazards to those included in the original Plan. The following identifies the natural hazards included in this updated Plan:

- severe storms (thunderstorms, hail, lighting & heavy rain)
- severe winter storms (snow, ice & extreme cold)
- extreme heat
- tornadoes
- floods
- drought
- earthquakes
- dams

The subsequent sections provide detailed information on each of the selected natural hazards. The sections are color coded and ordered by the frequency with which the natural hazard has previously occurred within the County, starting with severe storms (thunderstorms, hail, lightning and heavy rain). Each natural hazard section contains three subsections: identifying the hazard, profiling the hazard and assessing vulnerability.

While problems related to land subsidence and sinkholes have occurred in counties west and south of Montgomery County, neither of these hazards has been reported to the Montgomery County Emergency Management Agency. In addition, discussions with the Planning Committee did not reveal any isolated problems not reported to county officials. Interstate 55 south of Farmersville shows evidence of land subsidence in the undulating pavement surface. This "ripple effect" in the pavement does not pose a safety problem for travelers nor have these undulations shown any movement or changes.

Sinkholes commonly occur in areas where carbonate rock formations characteristic of karst geology are present. Mapping prepared by the Illinois State Geological Survey show that these geologic characteristics are not present in Montgomery County. Sinkholes can also occur in areas where coal mining has been conducted. Although coal mining has and still does occur in Montgomery County, problems with sinkholes have not been reported.

The relatively flat topography of Montgomery County is not conducive to experiencing landslide problems. The closest areas to Montgomery County where landslide problems have been identified are along steeper sloped river valleys to the west. Montgomery County has no major river valleys, only minor streams.

3.1 SEVERE STORMS (THUNDERSTORMS, HAIL, LIGHTNING & HEAVY RAIN)

IDENTIFYING THE HAZARD

What is the definition of a severe storm?

The National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) defines a "severe storm" as any thunderstorm that produces one or more of the following:

- winds with gust of 50 knots (58 mph) or greater;
- hail that is at least one inch in diameter (quarter size) or larger; and/or
- a tornado.

While severe storms are capable of producing deadly lightning and excessive rainfall that may lead to flash flooding, the NWS does not use either to define a severe storm. However, a discussion of both lightning and heavy rain is included in this section because they are both capable of causing extensive damage. For the purposes of this report, tornadoes and flooding are categorized as separate hazards and are not discussed under severe storms.

What is a thunderstorm?

A thunderstorm is a rain shower accompanied by lightning and thunder. An average thunderstorm is approximately 15 miles in diameter, affecting a relatively small area when compared to winter storms or hurricanes, and lasts an average of 30 minutes. Thunderstorms can bring heavy rain, damaging winds, hail, lightning and tornadoes.

There are four basic types of thunderstorms: single-cell, multi-cell, squall line, and supercell. The following provides a brief description of each.

Single-cell Thunderstorm

Single cell storms are small, weak storms that only last about ½ hour to an hour and are not usually considered severe. They are typically driven by heating on a summer afternoon. Occasionally a single cell storm will become severe, but only briefly. When this happens, it is called a pulse severe storm.

Multi-cell Thunderstorm

Multi-cell storms are the most common type of thunderstorms. A multi-cell storm is organized in clusters of at least two to four short-lived cells. Each cell usually lasts 30 to 60 minutes while the system as whole may persist for many hours. Multi-cell storms may produce hail, strong winds, brief tornadoes, and/or flooding.

Squall Line

A Squall line is a group of storms arranged in a line, often accompanied by “squalls” of high wind and heavy rain. The line of storms can be continuous or there can be gaps and breaks in the line. Squall lines tend to pass quickly and can be hundreds of miles long but are typically only 10 to 20 miles wide. A “bow echo” is a radar signature of a squall line that “bows out” as winds fall behind the line and circulation develops on either end.

Supercell Thunderstorm

Supercell storms are long-lived (greater than one hour) and highly organized storms that feed off a rising current of air (an updraft). The main characteristic that sets a supercell storm apart from other thunderstorm types is the presence of rotation in the updraft. The rotating updraft of a supercell (called a mesocyclone when visible on radar) helps a supercell storm produce extreme weather events. Supercell storms are potentially the most dangerous storm type and have been observed to generate the vast majority of large and violet tornadoes, as well as downburst winds and large hail.

Despite their size, all thunderstorms are dangerous and capable of threatening life and property. Of the estimated 100,000 thunderstorms that occur each year in the United States, roughly 10% are classified as severe.

What kinds of damaging winds are produced by a thunderstorm?

Aside from tornadoes, thunderstorms can produce straight-line winds. A straight-line wind is defined as any wind produced by a thunderstorm that is not associated with rotation. There are several types of straight-line winds including downdrafts, downbursts, microbursts, gust fronts and derechos.

Damage from straight-line winds is more common than damage from tornadoes and accounts for most thunderstorm wind damage. Straight-line wind speeds can exceed 87 knots (100 mph), produce a damage pathway extending for hundreds of miles and can cause damage equivalent to a strong tornado.

The NWS measures a storm's wind speed in knots or nautical miles. A wind speed of one knot is equal to approximately 1.15 miles per hour. Figure 8 shows conversions from knots to miles per hour for various wind speeds.

Figure 8
Wind Speed Conversions

Knots	Miles Per Hour	Knots	Miles Per Hour
50 kts	58 mph	60 kts	69 mph
52 kts	60 mph	65 kts	75 mph
55 kts	63 mph	70 kts	81 mph
58 kts	67 mph	80 kts	92 mph

What is hail?

Hail is precipitation in the form of spherical or irregular-shaped pellets of ice that occur within a thunderstorm when strong rising currents of air (updrafts) carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice.

Hailstones grow by colliding with supercooled water drops. The supercooled water drops freeze on contact with ice crystals, frozen rain drops, dust, etc. Thunderstorms with strong updrafts continue lifting the hailstones to the top of the cloud where it would encounter more supercooled water and continue to grow. Eventually the hail becomes too heavy to be supported by the updraft and falls to the ground.

In the United States, hail causes more than $1 billion in damages to property and crops annually. Hail has been known to cause injuries, although it rarely causes fatalities or serious injury.

How is the severity of a hail event measured?

The severity or magnitude of a hail event is measured in terms of the size (diameter) of the hailstones. The hail size is estimated by comparing it to known objects. Figure 9 provides descriptions for various hail sizes.

Figure 9
Hail Size Descriptions

Hail Diameter	Description	Hail Diameter	Description
0.25 in.	pea	1.75 in.	golf ball
0.50 in.	marble/mothball	2.50 in.	tennis ball
0.75 in.	penny	2.75 in.	baseball
0.88 in.	nickel	3.00 in.	tea cup
1.00 in.	quarter	4.00 in.	grapefruit
1.50 in.	ping pong ball	4.50 in.	softball

Source: NOAA, National Severe Storm Laboratory.

Hail size can vary widely. Hailstones may be as small as 0.25 inches in diameter (pea-sized) or, under extreme circumstances, as large as 4.50 inches in diameter (softball-sized). Typically hail that is one (1) inch in diameter (quarter-sized) or larger is considered severe.

The severity of a hail event can also be measured or rated using the TORRO Hailstorm Intensity Scale. This scale was developed in 1986 by the Tornado and Storm Research Organization of the United Kingdom. It measures the intensity or damage potential of a hail event based on several factors including: maximum hailstone size, distribution, shape and texture, numbers, fall speed and strength of the accompanying winds.

The Hailstorm Intensity Scale identifies ten different categories of hail intensity, H0 through H10. Figure 10 gives a brief description of each category. This scale is unique because it recognizes that, while the maximum hailstone size is the most important parameter relating to structural damage, size alone is insufficient to accurately categorize the intensity and damage potential of a hail event.

It should be noted that the typical damage impacts associated with each intensity category reflect the building materials predominately used in the United Kingdom. These descriptions may need to be modified for use in other countries to take into account the differences in building materials typically used (i.e., whether roofing materials are predominately shingle, slate or concrete, etc.

Figure 10
TORRO Hailstorm Intensity Scale

Intensity Category		Typical Hail Diameter		Description	Typical Damage Impacts
		millimeters (approx.)*	inches (approx.)*		
H0	Hard Hail	5 mm	0.2”	pea	no damage
H1	Potentially Damaging	5-15 mm	0.2” – 0.6”	pea / mothball	slight general damage to plants, crops
H2	Significant	10-20 mm	0.4” – 0.8”	dime / penny	significant damage to fruit, crops, vegetation
H3	Severe	20-30 mm	0.8” – 1.2”	nickel / quarter	severe damage to fruit and crops, damage to glass and plastic structures, paint and
H4	Severe	25-40 mm	1.0” – 1.6”	half dollar / ping pong ball	widespread glass damage, vehicle bodywork damage

H5	Destructive	30-50 mm	1.2” – 2.0”	golf ball	wholesale destruction of glass, damage to tiled roofs,
H6	Destructive	40-60 mm	1.6” – 2.4”	golf ball / egg	bodywork of grounded aircraft dented, brick walls
H7	Destructive	50-75 mm	2.0” – 3.0”	egg / tennis ball	severe roof damage, risk of serious injuries
H8	Destructive	60-90 mm	2.4” – 3.5”	tennis ball / tea cup	severe damage to aircraft
H9	Super Hailstorms	75-100 mm	3.0” – 4.0”	tea cup / grapefruit	extensive structural damage, risk of severe or even fatal injuries to persons caught in
H10	Super Hailstorms	> 100 mm	> 4.0”	softball	extensive structural damage, risk of severe or even fatal injuries to persons caught in

* Approximate range since other factors (i.e., number and density of hailstones, hail fall speed and surface wind speed) affect severity.

Source: Tornado and Storm Research Organization, TORRO Hailstorm Intensity Scale Table.

What is lightning?

Lightning, a component of all thunderstorms, is a visible electrical discharge that results from the buildup of charged particles within storm clouds. It can occur from cloud-to-ground, cloud-to-cloud, within a cloud or cloud-to-air. The air near a lightning strike is heated to approximately 50,000°F (hotter than the surface of the sun). The rapid heating and cooling of the air near the lightning strike causes a shock wave that produces thunder.

Lightning on average causes 60 fatalities and 300 injuries annually in the United States. Most fatalities and injuries occur when people are caught outdoors in the summer months. In addition, lightning can cause structure and forest fires. Many of the wildfires in the western United States and Alaska are started by lightning. According to the NWS lightning strikes cost more than $1 billion in insured losses each year.

Are alerts issued for severe storms?

Yes. The NWS Weather Forecast Office in St. Louis, Missouri is responsible for issuing *severe thunderstorm watches* and *warnings* for Montgomery County depending on the weather conditions. The following provides a brief description of each type of alert.

- Watch. A severe thunderstorm watch is issued when conditions are favorable for a severe thunderstorm to develop. The watch will tell individuals when and where a severe thunderstorm is likely to occur.
- Warning. A severe thunderstorm warning is issued when severe weather (i.e., hail 1 inch in diameter or greater and/or damaging winds of 58 miles or greater) has been reported by spotters or indicated on radar. Warnings indicate imminent danger to life and property for those who are in the path of the storm.

PROFILING THE HAZARD

When have severe storms occurred previously? What is the extent of these previous severe storms?

Figures 11, 12, 13, and 14, located at the end of this section, summarize the previous occurrences as well as the extent or magnitude of severe storm events recorded in Montgomery County. The severe storm events are separated into four categories: thunderstorms with damaging winds, hail, lightning and heavy rain. Severe storms are the most frequently occurring natural hazard in Montgomery County.

Thunderstorms with Damaging Winds

NOAA's Storm Events Database and Planning Committee member records were used to document 114 reported occurrences of thunderstorms with damaging winds in Montgomery County between 1956 and 2014. Of the 114 occurrences, 75 had reported wind speeds of 50 knots or greater. There were 39 occurrences, however, where the wind speed was not recorded.

Severe Storms Fast Facts – Occurrences
Number of Thunderstorms with Damaging Winds (1956 – 2014): 114
Number of Severe Hail Events (1968 – 2014): 56
Number of Lightning Strike Events (1996 – 2014): 5
Number of Heavy Rain Events (2003 – 2014): 2
Highest Recorded Wind Speed: 70 knots (May 30, 2004 & May 31, 2013)
Largest Hail Recorded: 4.50 inches (May 28, 2011)
Most Likely Month for Thunderstorms with Damaging Winds to Occur: May
Most Likely Month for Severe Hail to Occur: May
Most Likely Time for Thunderstorms with Damaging Winds to Occur: Early Evening
Most Likely Time for Severe Hail to Occur: Afternoon

The highest wind speed recorded in Montgomery County occurred in Litchfield on May 30, 2004, and again near Farmersville on May 31, 2013, when winds reached 70 knots (81 mph) during a thunderstorm event. Thunderstorms with damaging winds have been recorded in every participating municipality within the County on multiple occasions, with exception of Panama. This does not indicate that thunderstorms with damaging winds have never occurred within Panama, it simply means that the events were not recorded.

Figure 15 charts the reported occurrences of thunderstorms with damaging winds in Montgomery County by month. Of the 114 events, 69 (61%) took place in May, June and July making this the peak period for thunderstorms with damaging winds in Montgomery County. Of those 69 events, 29 (42%) occurred during May, making this the peak month for thunderstorms with damaging winds.

Figure 15
Thunderstorms with Damaging Winds by Month
1956 – 2014

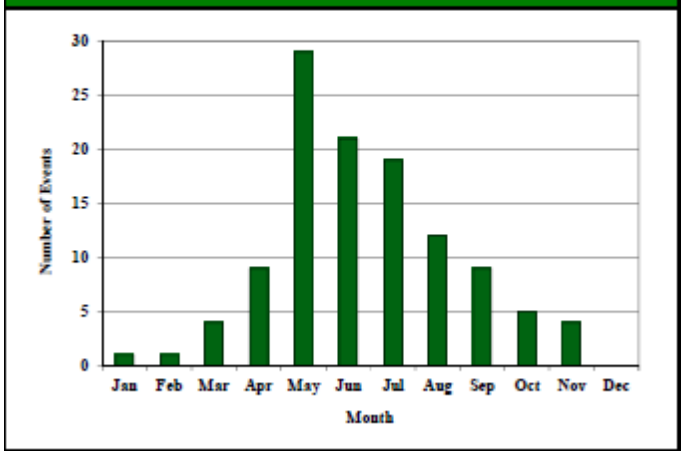
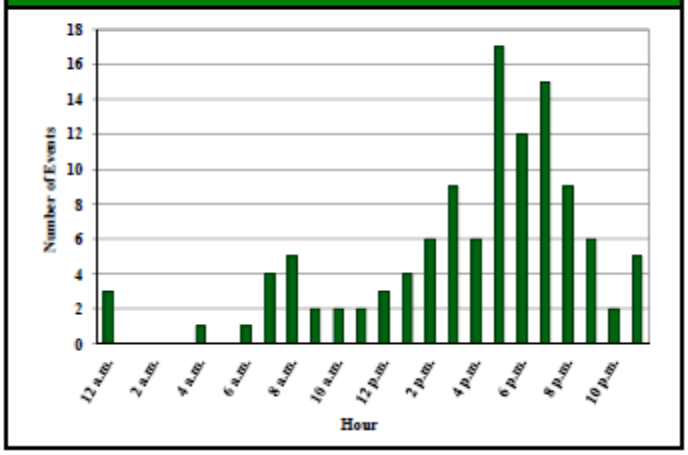


Figure 16 charts the reported occurrences of thunderstorms with damaging winds by hour. Approximately 82% of all thunderstorms with damaging winds occurred during the p.m. hours, with 68 of the events (72%) taking place between 3 p.m. and 9 p.m.

Figure 16
Thunderstorms with Damaging Winds by Hour
1956 – 2014



Hail

NOAA's Storm Events Database and Planning Committee member records were used to document 56 reported occurrences of severe storms with hail one inch in diameter or greater in Montgomery County between 1968 and 2014. Of the 56 occurrences, 26 produced hailstones 1.50 inches or larger in diameter.

The largest hail documented in Montgomery County measured 4.50 inches in diameter (slightly softball-sized) and fell on May 28, 2011, at Irving and Lake Lou Yaeger. Hail one inch in diameter or greater has been *recorded* at least once in every participating municipality, with the exception of Panama, Schram City, Waggoner and Witt. This does not indicate that hail of this diameter has never fallen within these communities, it simply means that it has not been recorded.

Figure 17 charts the reported occurrences of hail by month. Of the 56 occurrences, 35 (63%) took place in April, May and June making this the peak period for hail in Montgomery County. Of the 35 events, 23 (66%) occurred during May, making this the peak month for hail events.

Figure 17
Hail Events by Month 1968 – 2014

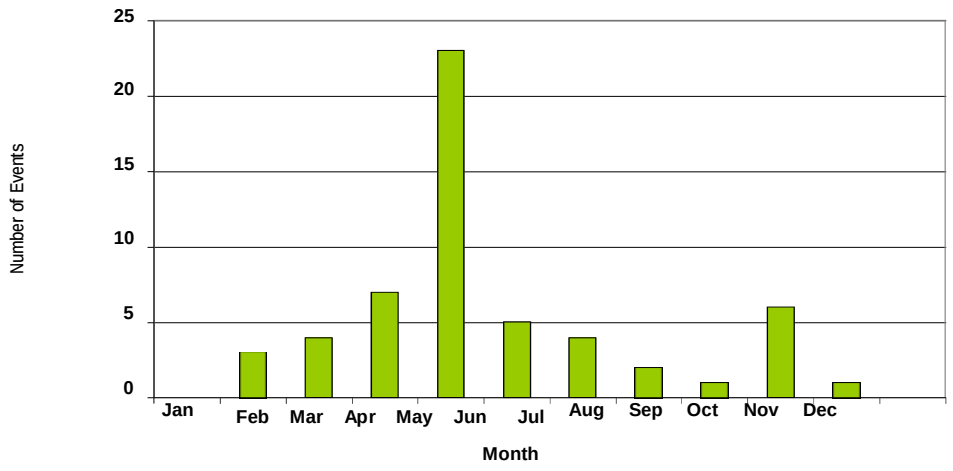
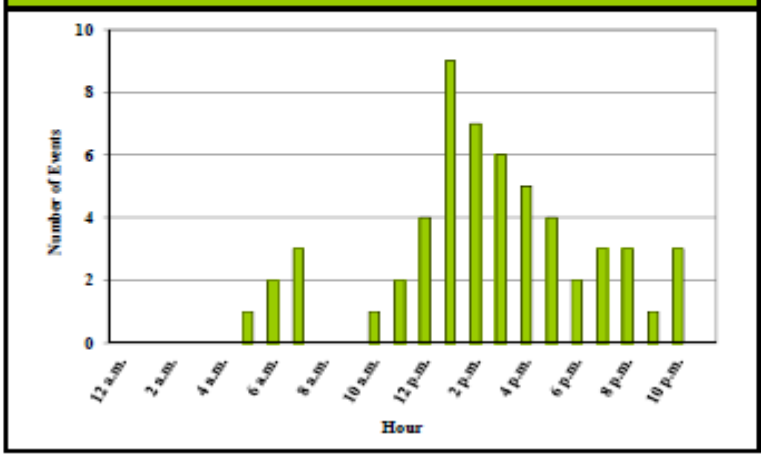


Figure 18 charts the reported occurrences of hail by hour. Approximately 84% of all the hail events occurred during the p.m. hours, with 35 of the events (63%) taking place between 12 p.m. and 6 p.m.

Lightning

While lightning strike events occur regularly across central Illinois, NOAA's Storm Events Database has only five *recorded* occurrences of lightning strikes in Montgomery County between 1996 and 2014. This is almost certainly due to the rural nature of the County. Each of the five events took place in a different month from January through August. All of the events with recorded times occurred during the p.m. hours.

Figure 18
Hail Events by Hour
1968 – 2014



Heavy Rain

While heavy rain events occur on a fairly regular basis across central Illinois, NOAA's Storm Events Database has only two *recorded* occurrences of heavy rain in Montgomery County between 2003 and 2014. This may be due in part to a lack of uniform reporting guidelines for heavy rain events. One of the events occurred in November and other occurred in January. Both events started in the a.m. hours and caused widespread flooding and property damage.

V. What locations are affected by severe storms?

Severe storms affect the entire County. A single severe storm event will generally extend across the entire County and affect multiple locations. The *2013 Illinois Natural Hazard Mitigation Plan* prepared by the Illinois Emergency Management Agency (IEMA) classifies Montgomery County's hazard rating for severe storms as "severe." (IEMA's hazard rating system has five levels: low, guarded, elevated, high and severe.)

VI. What is the probability of future severe storm events occurring?

Thunderstorms with Damaging Winds

Montgomery County has had 114 verified occurrences of thunderstorms with damaging winds between 1956 and 2014. With 114 occurrences over the past 59 years, Montgomery County should expect to experience approximately two thunderstorms with damaging winds each year. There were 16 years over the last 59 years where multiple (three or more) thunderstorms with damaging winds occurred. This indicates that the probability that multiple thunderstorms with damaging winds may occur during any given year within the County is 27%.

Hail

There have been 56 verified occurrences of hail one (1) inch in diameter or greater between 1968 and 2014. With 56 occurrences over the past 47 years, Montgomery County should expect to experience at least one severe hail event each year. There were eight years over the last 47 years where two or more hail events occurred. This indicates that the probability that more than one severe storm with hail may occur during any given year within the County is 17%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to severe storms?

Yes. All of Montgomery County is vulnerable to the dangers presented by severe storms due to the topography of the region and its location in relation to the movement of weather fronts across northwestern Illinois. Since 2005, Montgomery County has recorded 41 thunderstorms with damaging winds, 30 severe storms with hail one (1) inch in diameter or greater, three lightning strikes, and one heavy rain event producing at least 1.50 inches of rain.

Figure 19 details the number thunderstorms with damaging winds and hail events that were recorded in or near each participating municipality. Of the five lightning strikes recorded, four occurred in Hillsboro while the remaining event occurred near Waggoner.

Figure 19
Verified Severe Storm Events by Participating Municipality

Participating Municipality	Number of Events	
	Thunderstorm & High Wind	Severe Hail
Coffeen	6	3
Donnellson	3	2
Farmersville	9	1
Hillsboro	19	6
Litchfield	27	22
Nokomis	14	6
Panama	0*	0†
Raymond	13	2
Schram City	1	0†
Taylor Springs	4	2
Waggoner	4	0†
Witt	5	0†

Figure 20
Verified Severe Storm Events in Unincorporated Montgomery County

Participating Municipality	Number of Events	
	Thunderstorm & High Wind	Severe Hail
Chapman	0	1
Honey Bend	2	1
Lake Lou Yaeger	0	2
Van Burensburg	0	1

While no verified thunderstorms with damaging winds were recorded for Panama, there have been multiple verified events in the area that almost certainly impacted the Village.

† While no verified occurrences of hail one inch in diameter or greater were recorded for Panama, Schram City, Waggoner or Witt, there have been multiple verified events in the area that almost certainly impacted these municipalities.

Of the participating municipalities, Litchfield, Hillsboro and Nokomis have had more recorded occurrences of thunderstorms with damaging winds and the greatest number of recorded hail events than any of the other municipalities. The difference in the number of recorded events may be due in part to the size of the municipalities in addition to the fact that the only active COOP observer for the NWS in Montgomery County is located in Hillsboro.

Figure 20 details the number of thunderstorms with damaging winds and hail events that were recorded in or near unincorporated areas of Montgomery County. No data was available on lightning strikes in the unincorporated areas.

What impacts resulted from the recorded severe storms?

Severe storms as a whole have caused an estimated $1,101,465 in recorded property damages and $50,000 in recorded crop damages. The following provides a breakdown of impacts by category.

While severe summer storms frequently occur in Montgomery County, the number of injuries and fatalities is very low. The hospitals in Hillsboro and Litchfield, as well as hospitals in Springfield (Sangamon County), Taylorville, (Christian County), Carlinville (Macoupin County),

Greenville (Bond County), Vandalia (Fayette County), and the Metro East St. Louis area (Madison County), are equipped to provide care to persons injured during a severe storm. Consequently, the risk or vulnerability to public health and safety from severe storms is low.

Thunderstorms with Damaging Winds Data obtained from NOAA's Storm Events Database and Planning Committee member records indicates that between 1968 and 2014, six of the 114 thunderstorms with damaging winds caused $374,040 in property damage. Damage information was either unavailable or none was recorded for the remaining 98 reported occurrences.

NOAA's Storm Events Database documented one injury as a result of a November 27, 1994 thunderstorm event in Witt. Detailed information on the type and severity of the injuries was unavailable.

Severe Storms Fast Facts – Impacts/Risk

Thunderstorms with Damaging Winds Impacts
- Total Property Damage: *$374,040*
- Infrastructure/Critical Facilities Damage*: *n/a*
- Total Crop Damage: *n/a*
- Injuries: *1*
- Fatalities: *0*

Severe Hail Impacts
- Total Property Damage: *$25,000*
- Infrastructure/Critical Facilities Damage*: *$25,000*
- Total Crop Damage: *$50,000*

Lightning Strike Impacts
- Total Property Damage: *$502,425*
- Infrastructure/Critical Facilities Damage*: *$272,425*
- Total Crop Damage: *n/a*
- Injuries: *1*
- Fatalities: *0*

Heavy Rain Impacts
- Total Property Damage: *$200,000*
- Infrastructure/Critical Facilities Damage*: *n/a*
- Total Crop Damage: *n/a*

Severe Storms Risk/Vulnerability to:
- Public Health & Safety: *Low*
- Buildings/Infrastructure/Critical Facilities: *Medium/High*

* Infrastructure/Critical Facilities Damage totals are included in the Total Property Damage amounts.

Hail

Data obtained from NOAA's Storm Events Database and Planning Committee member records indicates that between 1968 and 2014, two of the 56 hail events caused $25,000 in property damage and $25,000 in crop damage. Damage information was either unavailable or none was recorded for the remaining 54 reported occurrences. The property damage figure provided above is composed entirely of infrastructure and critical facilities damage sustained in Donnellson. Hail caused $25,000 in roof damage to the Community Center on May 13, 2009. No injuries or fatalities were reported as a result of any of the hail events.

Lightning

Data obtained from NOAA's Storm Events Database and Planning Committee member records indicates that between 1996 and 2014, five lightning strike events caused $502,425 in property damage. Included in the property damage figure provided above is $272,425 in verified infrastructure and critical facilities damage sustained in Hillsboro. The following provides a brief description of the damages.

- A lightning strike on July 9, 2002 caused $260,000 in damage to the communication tower at the Montgomery County Sheriff's Office base station.
- On August 5, 2008 lightning struck the City's Fire Department damaging computers, security equipment and radios causing $3,195 in damages.
- A lightning strike on June 19, 2009 caused $9,230 in damage to computers, security equipment and radios at the City's Fire Department.

NOAA's Storm Events Database documented one injury as a result of a July 9, 2002 lightning strike event in Hillsboro. A man was treated for burns at a local hospital after being struck by lightning.

Heavy Rain

Information obtained from Planning Committee member records indicates that each of the heavy rain events caused approximately $100,000 in property damage. No injuries or fatalities were reported as a result of either event.

What other impacts can result from severe storms?

In Montgomery County, the greatest risk to health and safety from severe storms is vehicle accidents. Hazardous driving conditions resulting from severe storms (i.e., wet pavement, poor visibility, high winds, etc.) can contribute to accidents that result in injuries and fatalities. Traffic accident data assembled by the Illinois Department of Transportation from 2009 through 2013 indicates that wet road surface conditions were present for 10.9% to 16.5% of all crashes recorded annually in the County.

While other circumstances cause wet road surface conditions (i.e., melting snow, condensation, light showers, etc.), law enforcement officials agree that hazardous driving conditions caused by severe storms add to the number of crashes. Figure 21 provides a breakdown by year of the number of crashes and corresponding injuries and fatalities that occurred when wet road surface conditions were present.

Figure 21
Severe Weather Crash Data for Montgomery County

Year	Total # of	Presence of Wet Road Surface		
		# of	# of	# of
2009	674	99	24	0
2010	664	89	31	0
2011	561	85	22	1
2012	641	70	25	0
2013	551	91	26	0
Total:	**3,091**	**434**	**128**	**1**

Source: Illinois Department of Transportation.

Are existing buildings, infrastructure and critical facilities vulnerable to severe storms?

Yes. All existing buildings, infrastructure and critical facilities located in Montgomery County and the participating municipalities are vulnerable to damage from severe storms. Structural damage to buildings is a relatively common occurrence with severe storms. Damage to roofs, siding, awnings and windows can occur from hail, flying and falling debris and high winds. Lightning strikes can damage electrical components and equipment (i.e., appliances, computers etc.) and can cause fires that consume buildings. If the roof is compromised or windows are broken, rain can cause additional damage to the structure and contents of a building.

Infrastructure and critical facilities tend to be just as vulnerable to severe storm damage as buildings. The infrastructure and critical facilities that are the most vulnerable to severe storms are related to power distribution and communications. High winds, lightning and flying and falling debris have the potential to cause damage to communication and power lines; power substations; transformers and poles; and communication antennas and towers.

The damage inflicted by severe storms often leads to disruptions in communication and creates power outages. Depending on the damage, it can take anywhere from several hours to several days to restore service. Power outages and disruptions in communications can impair vital services, particularly when backup power generators are not available. Most of the participating municipalities acknowledged the need for emergency backup generators to allow continued operation of critical facilities such as municipal buildings, police and fire stations, heating and cooling centers, storm shelters and lift stations.

In addition to affecting power distribution and communications, debris and flooding from severe storms can block state and local roads hampering travel. When transportation is disrupted, emergency and medical services are delayed, rescue efforts are hindered and government services can be affected.

Based on the frequency with which severe storms occur in Montgomery County, the amount of property damage previously reported and the potential for disruptions to power distribution and communication; the risk or vulnerability to buildings, infrastructure and critical facilities from severe storms is medium to high.

Are future buildings, infrastructure and critical facilities vulnerable to severe storms?

Yes, and No. While four of the participating municipalities have building codes in place that will likely help lessen the vulnerability of new buildings and critical facilities to damage from severe storms, the County and the other eight municipalities do not. In addition, infrastructure such as new communication and power lines will continue to be vulnerable to severe storms as long as they are located above ground. High winds, lightning and flying and falling debris can disrupt power and communication. Steps to bury all new lines would eliminate the vulnerability, but this action would be cost prohibitive in most areas.

What are the potential dollar losses to vulnerable structures from severe storms?

Unlike other natural hazards, such as tornadoes, there are no standard loss estimation models or methodologies for severe storms. With only 15 of the 177 recorded events listing property damage numbers for all categories of severe storms, there is no way to accurately estimate future potential dollar losses. Since all existing structures within Montgomery County are vulnerable to damage, it is highly probable that there will be future dollar losses from severe storms,.

3.2 SEVERE WINTER STORMS & EXTREME COLD

IDENTIFYING THE HAZARD

Severe Winter Storms

NOAA's Storm Events Database, NWS's COOP Data records, the Illinois State Water Survey, and Planning Committee member records were used to document 77 reported occurrences of severe winter storms (snow, ice and/or a combination of both) in Montgomery County between 1950 and 2014. Of the 77 recorded occurrences there were:

Severe Winter Storm Fast Facts – Occurrences

Number of Severe Winter Storm Events Reported (1950 – 2014): *77*

Number of Extreme Cold Events Reported (2000 – 2014): *3*

Maximum One-Day Snow Accumulation: *14.3 inches (Mar. 25, 2013)*

Coldest Temperature Recorded in the County: *-22°F (Feb. 14, 1905)*

Most Likely Month for Severe Winter Storms to Occur: *January*

Most Likely Time for Severe Winter Storms to Occur: *Morning*

- 55 heavy snow storms or blizzards;
- 13 combination events (freezing rain, sleet, ice and/or snow); and
- 9 ice storms.

Figure 25 charts the reported occurrences of severe winter storms by month. Of the 77 events, 45 (58%) took place in January and February. Of these 45 events, 28 (62%) occurred during January, making this the peak month for severe winter storms. There were three events that spanned two months; however, for illustration purposes only the month when the event started is graphed.

Extreme Cold

NOAA's Storm Events Database was used to document three occurrences of extreme cold (dangerously low temperatures and wind chill values) in Montgomery County between 2000 and 2014. Of the three occurrences, two preceded recorded severe storms while one followed a recorded severe winter storm. Two of the three events (66%) took place in January and the remaining event took place in December. All of the events began during the a.m. hours.

According to the Midwestern Regional Climate Center records from 1895 through 2015, the coldest temperature recorded in Montgomery County was -22°F at Hillsboro on February 14, 1905.

What locations are affected by severe winter storms and extreme cold?

Severe winter storms and extreme cold affect the entire County. All communities in Montgomery County have been affected by severe winter storms and extreme cold. Severe winter storms and extreme cold generally extend across the entire County and affect multiple locations. The 2013 Illinois Natural Hazard Mitigation Plan prepared by IEMA classifies Montgomery County's hazard rating for severe winter storms as "high."

Do any of the participating municipalities have designated warming centers?

Yes. Eight of the twelve participating municipalities have designated warming centers. A "designated" warming center is identified as any facility that has been formally identified by the municipality (through emergency planning, resolution, Memorandum of Agreement, etc.) as a location available for use by residents during severe winter storms and extreme cold events. Figure 27 identifies the location of each warming center by jurisdiction. The County is also served by one state-designated warming center located at the Illinois Department of Human Services office, 210 East Fairground Avenue in Hillsboro.

Are existing buildings, infrastructure and critical facilities vulnerable to severe winter storms and extreme cold?

Yes. All existing buildings, infrastructure and critical facilities located in Montgomery County and the participating municipalities are vulnerable to damage from severe winter storms and extreme cold. The following summarize the vulnerabilities by severe winter storms and extreme cold events.

Based on the frequency with which severe winter storms and extreme cold events occur in Montgomery County, the amount of property damage previously reported and the potential for disruptions to power distribution and communication; the risk or vulnerability to buildings, infrastructure and critical facilities from severe winter storms is medium.

3.3 EXTREME HEAT

Extreme heat is characterized by temperatures that hover 10 degrees or more above the average high temperature of a region for a prolonged period of time (several days to several weeks) and is often accompanied by high humidity. In comparison, a heat wave is generally defined as a prolonged period of excessive heat and humidity. While there is no universally agreed upon definition of a heat wave, for most the United States the "standard" definition is a period of three or more consecutive days of highs reaching at least 90°F.

NOAA's Storm Events Database has documented 34 occurrences of extreme heat in Montgomery County between 1995 and 2014.

Extreme Heat Fast Facts – Occurrences
Number of Extreme Heat Events Reported (1995 – 2014): 34
Hottest Temperature Recorded in the County: 114°F (July 14, 1954)
Most Likely Month for Extreme Heat Events to Occur: July

Extreme heat affects the entire County. All communities in Montgomery County have been affected by extreme heat. Extreme heat events generally extend across an entire region and affect multiple counties. The 2013 Illinois Natural Hazard Mitigation Plan classifies Montgomery County's hazard rating for extreme heat as "elevated."

Montgomery County has experienced 34 verified occurrences of extreme heat between 1995 and 2014. With 34 occurrences over the past 20 years, Montgomery County should expect to experience at least one extreme heat event a year. There were eight years over the past 20 years where two or

more extreme heat events occurred. This indicates that the probability that more than one extreme heat event may occur during any given year within the County is 40%.

ASSESSING VULNERABILITY

Since 2005, Montgomery County has experienced 19 extreme heat events. NOAA's Storm Events Database documented a total of eight fatalities and 341 heat-related injuries as a result of four extreme heat events. The fatality and heat-related injury totals represent losses sustained over a multi-county area (including Montgomery County). A breakdown by county was unavailable.

Extreme Heat Fast Facts – Impacts/Risk

Extreme Heat Events

- Total Property Damage: *$55,000^*
- Infrastructure/Critical Facilities Damage: *n/a*
- Total Crop Damage: *$410,000^*
- Fatalities: *8**
- Injuries: *341**

Extreme Heat Risk/Vulnerability to:

- Public Health & Safety – General Population: *Low/Medium*
- Public Health & Safety – Sensitive Populations: *Medium/High*
- Buildings/Infrastructure/Critical Facilities: *Low*

^ The property and crop damage totals represent losses sustained during three separate events over a 21-county area (including Montgomery County). A detailed breakdown by county was not available.

* The fatality and injury totals represent losses sustained during five separate events over at least a 17-county area (including Montgomery County). A detailed breakdown by county was unavailable.

Are future buildings, infrastructure and critical facilities vulnerable to extreme heat?

No. Future buildings, infrastructure and critical facilities within the County and participating municipalities are no more vulnerable to extreme heat events than the existing building, infrastructure and critical facilities. As discussed above, buildings do not typically sustain damage from extreme heat. Infrastructure and critical facilities may, in rare cases, be damaged by extreme heat, but very little can be done to prevent this.

What are the potential dollar losses to vulnerable structures from extreme heat?

Unlike other natural hazards there are no standard loss estimation models or methodologies for extreme heat. With only two of the 34 recorded events listing property damage numbers for extreme heat, there is no way to accurately estimate future potential dollar losses. Since extreme heat typically does not cause structure damage, it is unlikely that future dollar losses will be excessive. The primary concern associated with extreme heat is the health and safety of those living in the County and municipalities, especially sensitive populations such as the elderly, infants, young children and those with medical conditions.

3.4 TORNADOES

NOAA's Storm Events Database have documented 34 occurrences of tornadoes in Montgomery County between 1950 and 2014. In comparison, there have been 2,199 tornadoes statewide between 1950 and 2012.

For Montgomery County the level of risk or vulnerability posed by tornadoes to public health and safety is considered to be low to medium. This assessment is based on the fact that despite their relative frequency, a large majority of the tornadoes that have impacted the County have touched down in rural areas away from concentrated populations. This has contributed to a relatively low number of injuries and fatalities. In addition, the County is not densely populated and there is not a large number of high risk living accommodations present.

Tornado Fast Facts – Impacts/Risk

Tornado Impacts

- Total Property Damage: *$1,995,700*^
- Infrastructure/Critical Facilities Damage*: *$10,000*
- Total Crop Damage: *n/a*
- Injuries: *15*
- Fatalities: *3*

Tornado Risk/Vulnerability to:

- Public Health & Safety – Rural Areas: *Low to Medium*
- Public Health & Safety – Municipalities: *High*
- Buildings/Infrastructure/Critical Facilities – Rural Areas: *Low*
- Buildings/Infrastructure/Critical Facilities – Municipalities/Populated Unincorp. Areas: *High*

^ Included in the property damage total is $525,000 in damages sustained as the result of three separate events and represents losses incurred in two or more counties (including Montgomery County). A breakdown by county was not available.

* Infrastructure/Critical Facilities Damage totals are included in the Total Property Damage amounts.

In terms of adequate access to health care, both St. Francis Hospital in Litchfield and Hillsboro Area Hospital in Hillsboro are equipped to provide continuous care to persons injured by a tornado assuming that they are not directly impacted. In addition, there are hospitals in Springfield (Sangamon County), Taylorville, (Christian County), Carlinville (Macoupin County), Greenville (Bond County), Vandalia (Fayette County), and the Metro East St. Louis area (Madison County) which are equipped to provide care.

Are existing buildings, infrastructure and critical facilities vulnerable to tornadoes?

Yes. All existing buildings, infrastructure and critical facilities located within the County and the participating municipalities are vulnerable to damage from tornadoes. Buildings, infrastructure and critical facilities located in the path of a tornado usually suffer extensive damage, if not complete destruction.

Estimating the Number of Potentially-Damaged Housing Units

With the average housing unit densities calculated it is relatively simple to provide an estimate of the number of existing potentially-damaged housing units. This can be done by taking the average housing unit density and multiplying that by the average-sized tornado.

To calculate the number of potentially-damaged housing units for these municipalities, take the average area impacted by the tornado and divide that by the land area within the municipality to get

the impacted land area. The impacted land area is then multiplied by the total number of housing units within the municipality to get the number of potentially-damaged housing units.

For Montgomery County the level of risk or vulnerability posed by tornadoes to existing buildings, infrastructure and critical facilities is considering to be medium to low. This assessment is based on the frequency with which tornadoes have occurred in the County as well as the amount of damage that has been sustained tempered by the low population density throughout most the County as well as the relative absence of high risk living accommodations. While previously recorded tornadoes have followed largely rural pathways they have caused significant damage on several occasions.

Are future buildings, infrastructure and critical facilities vulnerable to tornadoes?

Yes, and No. While four of the participating jurisdictions have building codes in place that will likely lessen the vulnerability of new buildings and critical facilities to damage from tornadoes, others do not. However, even new buildings and critical facilities built to code are vulnerable to the risks posed by a high rated tornado.

Infrastructure such as new communication and power lines will continue to be vulnerable to tornadoes as long as they are located above ground. Flying debris can disrupt power and communication lines even if they are not directly in the path of the tornado. Steps to bury all new lines would eliminate the vulnerability, but this action would be cost prohibitive in most areas.

3.5 FLOODS

Flood events are usually separated and discussed as two categories, general floods (riverine and shallow/overland) and flash floods; however, in Montgomery County there were no general flood events recorded by NOAA's Storm Events Database for the reported time period from 1994 through 2014.

Flood Fast Facts – Occurrences

Number of General Floods Reported (1994 – 2014): *0*

Number of Flash Floods Reported (1994 – 2014): *15*

Most Likely Month for Flash Floods to Occur: *May*

Most Likely Time for Flash Floods to Occur: *Afternoon/ Early Evening*

Flash Floods

NOAA's Storm Events Database and NWS's COOP data records documented 15 reported occurrences of flash flooding in Montgomery County between 1994 and 2014. Seven (47%) of the 15 flash flood events took place in May and June. Of the seven events, four (57%) occurred in May, making this the peak month for flash flooding.

While specific locations are affected by general flooding, most areas of the County can be impacted by overland and flash flooding because of the topography and seasonally high water table of the area. Only 2.8% of the area in Montgomery County is designated as being within the base floodplain and susceptible to riverine floods.

What is the probability of future flood events occurring?

General Floods

Since there have been no recorded occurrences of general flooding between 1994 and 2014, it is difficult to specifically establish the probability of a future occurrences. It is highly likely that general flooding occurred during this time period but was either not recorded due to the rural nature of the County or was initially reported as flash flooding and a second record was not created to report subsequent riverine/overland flooding. Since general flooding has occurred in the past, it is most likely to occur again in the future.

Flash Floods

There have been 15 verified occurrences of flash flooding between 1994 and 2014. With 15 occurrences over the past 21 years, the probability or likelihood of a flash flood event occurring in Montgomery County in any given year is 71%. There was three years over the past 21 years where two or more flash flood events occurred. This indicates that the probability that more than one flash flood event may occur during any given year within the County is 14%.

Montgomery County's vulnerability to flooding was greatly reduced following a series of construction projects that began in the 1950s. Federal funds were used to help construct Lake Lou Yeager in Litchfield, Glenn Shoals Lake in Hillsboro and several dams along the Middle and West Forks of Shoal Creek. These projects helped reduce the number and severity of flood events within the County, especially in Litchfield and Hillsboro.

While the number of injuries and fatalities associated with flash flooding are very low, there is very little warning associated with each event. As a result, the risk to public health and safety from flash floods is seen as medium. In terms of the risk or vulnerability to public health and safety from general floods, the risk is seen as low due to the lack of recorded events and the nature of riverine/overland floods.

Flood Fast Facts – Impacts/Risk

Flash Flood Impacts
- Total Property Damage: *$51,101,800*^
- Infrastructure/Critical Facilities Damage*: *$1,100,000*
- Total Crop Damage: *n/a*
- Injuries: *0*
- Fatalities: *1*

Flood Risk/Vulnerability to:
- Public Health & Safety – General Flooding: *Low*
- Public Health & Safety – Flash Flooding: *Medium*
- Buildings/Infrastructure/Critical Facilities: *Medium/High*

^ Included in the property damage total is $50 million for the April 1994 flash flood event which represents losses sustained by 8 counties (including Montgomery County). A detailed breakdown by county was not available.

* Infrastructure/Critical Facilities Damage totals are included in the Total Property Damage amounts.

Are future buildings, infrastructure and critical facilities vulnerable to flooding?

The answer to this question depends on the type of flooding being discussed.

Riverine Flooding

In terms of riverine flooding, the vulnerability of future buildings, infrastructure and critical facilities located within NFIP-participating jurisdictions is low as long as the existing floodplain ordinances are enforced. Enforcement of the floodplain ordinance is the mechanism that ensures that new structures either are not built in flood-prone areas or are elevated or protected to the base flood elevation.

Flash Flooding

In terms of flash flooding, all future buildings, infrastructure and critical facilities are still vulnerable depending on the amount of precipitation that is received, the topography and any land use changes undertaken within the participating jurisdictions.

What are the potential dollar losses to vulnerable structures from flooding?

An estimate of the potential dollar losses to vulnerable residential structures located within the participating municipalities can be calculated if several assumptions are made. These assumptions represent a probable scenario based on the reported occurrences of flooding in Montgomery County.

The purpose of providing an estimate is to help residents and municipal officials make informed decisions about how they can better protect themselves and their communities. These estimates are meant to provide a general idea of the magnitude of the potential damage that could occur from a flood event in each of the municipalities.

Calculation of Average Assessed Value

Total Assessed Value of Residential Buildings ÷ Total Housing Units = Average Assessed Value (Rounded to the Nearest Penny)

Hillsboro: $45,558,654 ÷ 3,158 housing units = $17,102.430

Structure – Potential Dollar Loss Calculations

Average Market Value Per Housing Unit x Percent Damage = Average Structural Damage Hillsboro: $67,361 x 20% = $13,472.20 per unit

Average Structural Damage x Number of Potentially-Damaged Housing Units = Potential Dollar Losses – Structure (Rounded to the Nearest Penny)

Hillsboro: $13,472.20 per unit x 25 housing units = $336,805.00

Content – Potential Dollar Loss Calculations

½ (Average Market Value Per Housing Unit) x Percent Damage = Average Content Damage Hillsboro: ½ ($67,361) x 30% = $10,104.15 per unit

Average Content Damage x Number of Potentially-Damaged Housing Units = Potential Dollar Losses – Content (Rounded to the Nearest Penny)

3.6 DROUGHTS

Drought events affect the entire County. Droughts, like extreme heat and severe winter storms, tend to impact large areas, extending across an entire region and affecting multiple counties. The 2013 Illinois Natural Hazard Mitigation Plan classifies Montgomery County's hazard rating for drought as "guarded."

What is the probability of future drought events occurring?

Montgomery County has experienced four droughts between 1983 and 2014. With four occurrences over 32 years, the probability or likelihood that the County may experience a drought in any given year is 12.5%. However, if earlier recorded droughts are factored in, then the probability that Montgomery County may experience a drought in any given year decreases to 9.5%.

Are the participating jurisdictions vulnerable to drought?

Yes. All of Montgomery County is vulnerable to drought. Neither the amount nor the distribution of precipitation; soil types; topography; or water table conditions provides protection for any area within the County. Since 2005 Montgomery County has experienced two droughts.

What impacts resulted from the recorded drought events?

Damage information was only available for one of the four drought events experienced between 1983 and 2014. According to an estimate developed by the Montgomery County Farm Bureau, the University of Illinois Extension Service serving Christian, Jersey, Macoupin & Montgomery Counties, and the Montgomery County Soil and Water Conservation District in conjunction with the Consultant, the 2012 drought caused $72.3 million in crop damage to corn. Damage information was either unavailable or none was recorded for the remaining three reported occurrences.

Of the four drought events, disaster relief payment information was only available for one of the events. In 1988, landowners and farmers in Illinois were paid in excess of $382 million in relief payments; however, a breakdown by county was unavailable.

No injuries or fatalities were reported as a result of any of the recorded drought events in Montgomery County. Unlike other natural hazards that affect the County, drought events do not typically cause injuries or fatalities. The primary concern centers on the financial impacts that result from loss of crop yields and livestock and potential drinking water shortages. Even taking into consideration the potential impacts that a water shortage may have on the general public, the risk or vulnerability to public health and safety from drought is low.

Drought Fast Facts – Impacts/Risk

Drought Impacts
- Total Property Damage: *n/a*
- Infrastructure/Critical Facilities Damage*: *n/a*
- Total Crop Damage: *$72.3 million*

Drought Risk/Vulnerability to:
- Public Health & Safety: *Low*
- Buildings/Infrastructure/Critical Facilities: *Low*

* Infrastructure/Critical Facilities Damage totals are included in the Total Property Damage amounts.

Are existing buildings, infrastructure and critical facilities vulnerable to drought?

No. In general, existing buildings, infrastructure and critical facilities located in Montgomery County and the participating municipalities are not vulnerable to drought. The primary concern centers on the financial impacts that result from loss of crop yields and livestock.

Are future buildings, infrastructure and critical facilities vulnerable to drought?

No. Future buildings, infrastructure and critical facilities within the County are no more vulnerable to drought than the existing building, infrastructure and critical facilities.

What are the potential dollar losses to vulnerable structures from drought?

Unlike other natural hazards there are no standard loss estimation models or methodologies for drought. Since drought typically does not cause structure damage, it is unlikely that future dollar losses will be excessive

3.7 EARTHQUAKES

According to the Illinois State Geological Survey (ISGS) Earthquakes of Illinois: 1795 – 2013 map, four earthquakes have originated in Montgomery County during the last 200 years.

Earthquake Fast Facts – Occurrences

Earthquakes Originating in the County (1795 – 2013): *4*

Fault Zones Located within the County: *None*

Earthquakes Originating in nearby Counties (1795-2013): *24*

Fault Zones Located in Nearby Counties: *6*

What locations are affected by earthquakes?

Earthquake events can affect the entire County. Earthquakes, like drought and extreme heat, impact large areas extending across an entire region and affecting multiple counties. Montgomery County's proximity to multiple fault zones, both large and small, makes the entire area likely to be affected by an earthquake if these faults become seismically active.

Are the participating jurisdictions vulnerable to earthquakes?

Yes. All of Montgomery County is vulnerable to earthquakes. The unique geological formations topped with glacial drift soils found in the central United States conduct an earthquake's energy farther than in other parts of the Nation.

Are existing buildings, infrastructure and critical facilities vulnerable to earthquakes?

Yes. All existing buildings, infrastructure and critical facilities located in Montgomery County and the participating municipalities are vulnerable to damage from earthquakes.

Are future buildings, infrastructure and critical facilities vulnerable to earthquakes?

Yes. All future buildings, infrastructure and critical facilities located in Montgomery County and the participating municipalities are vulnerable to damage from earthquakes.

What are the potential dollar losses to vulnerable structures from earthquakes?

Since property damage information was either unavailable or none was recorded for the documented earthquakes in Montgomery County there is no way to accurately estimate future potential dollar losses to vulnerable structures in the County.

3.8 DAMS

There has been one recorded dam failure in Montgomery County. On September 8, 2008 the Walton Park Lake Dam in Litchfield experienced a partial dam failure as a result of approximately six inches of rain within a two-hour period. The excess precipitation and runoff caused overtopping of the dam. While the incident did not cause any structural breaks in the dam, it did cause cracks to form, impairing the dam's integrity.

Dam Failure Fast Facts – Occurrences

Number of Dam Failures Reported: *1*

What locations are affected by dam failure?
Dam failures have the potential to impact Hillsboro, Litchfield, Schram City and unincorporated areas of Montgomery County. In addition, if the Coffeen Lake Dam were to experience a dam failure, portions of Bond and Clinton Counties may also be affected due to the dam's location near the southern border of the County.

What is the probability of future dam failure events occurring?
Montgomery County has only experienced one dam failure (Walton Park Lake Dam) during the life of all 48 of its classified dams. Based on the age of the Walton Park Lake Dam and the fact that is has only experienced one recorded failure during its life, the probability it will experience another dam failure is considered to be low to medium, depending on proper maintenance, including maintain the reservoir's capacity.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to dam failures?
Yes. Hillsboro, Litchfield, Schram City and portions or unincorporated Montgomery County are vulnerable to the dangers presented by dam failures. However, none of the rest of the County or participating municipalities are considered vulnerable.

Dam Failure Fast Facts – Risk

Dam Failure Risk/Vulnerability to:
- Public Health & Safety: Class I & II Dams – *Medium/ High*
- Public Health & Safety: Class III Dams – *Low*
- Buildings/Infrastructure/Critical Facilities: Class I & II Dams – *Medium/High*
- Buildings/Infrastructure/Critical Facilities: Class III Dams – *Low*

Are existing buildings, infrastructure and critical facilities vulnerable to dam failures? Yes.

Are future buildings, infrastructure and critical facilities vulnerable to dam failures?
Yes. Any future buildings, infrastructure and critical facilities located within the flood path of a classified dam are vulnerable to damage from a dam failure.

What are the potential dollar losses to vulnerable structures from dam failures?
Unlike other hazards, there are no standard loss estimation models or methodologies for dam failures. Given that there have been only one recorded dam failures in Montgomery County, sufficient information was not available to prepare a reasonable estimate of future potential dollar losses to vulnerable structure from dam failures.

DuPage County – Plan Approved: May 18, 2018

(Repetitive Loss Information and Flood Hazard Profile)

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

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	Extreme Heat	Tornado	Drought	Earthquake
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*

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 Years	Last 10 Years	Last 30
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 Winter Storms)
(-- No Data Available)

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

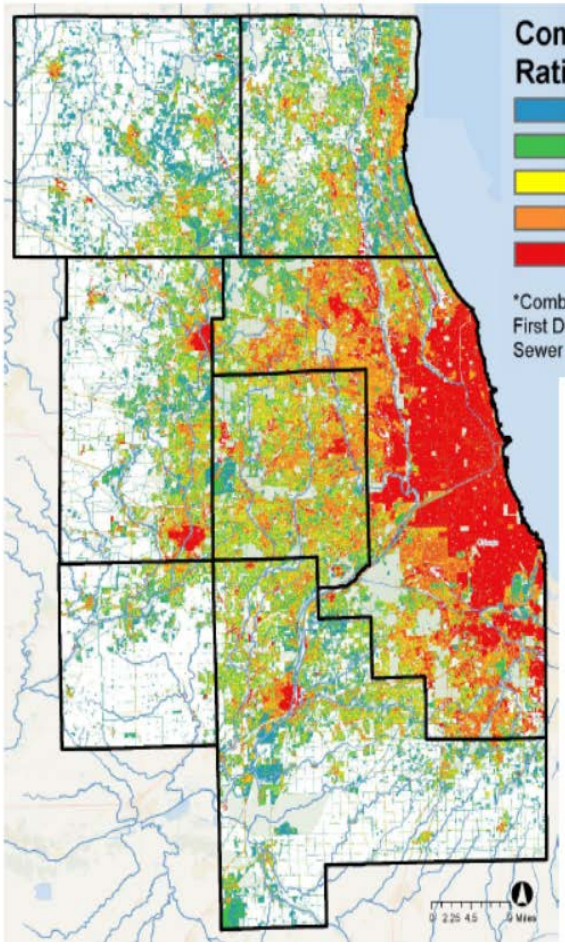
most notable events where overbank flooding has occurred and damages have been documented to be the following flood events which all were declared state and/or federal disasters: August 1987, July 1996, September 2008, and April 2013. Overbank flooding occurs when water rises overflows over the edges 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 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.

Exhibit 2-4
Chicago Metro Area Urban Flooding Susceptibility Index

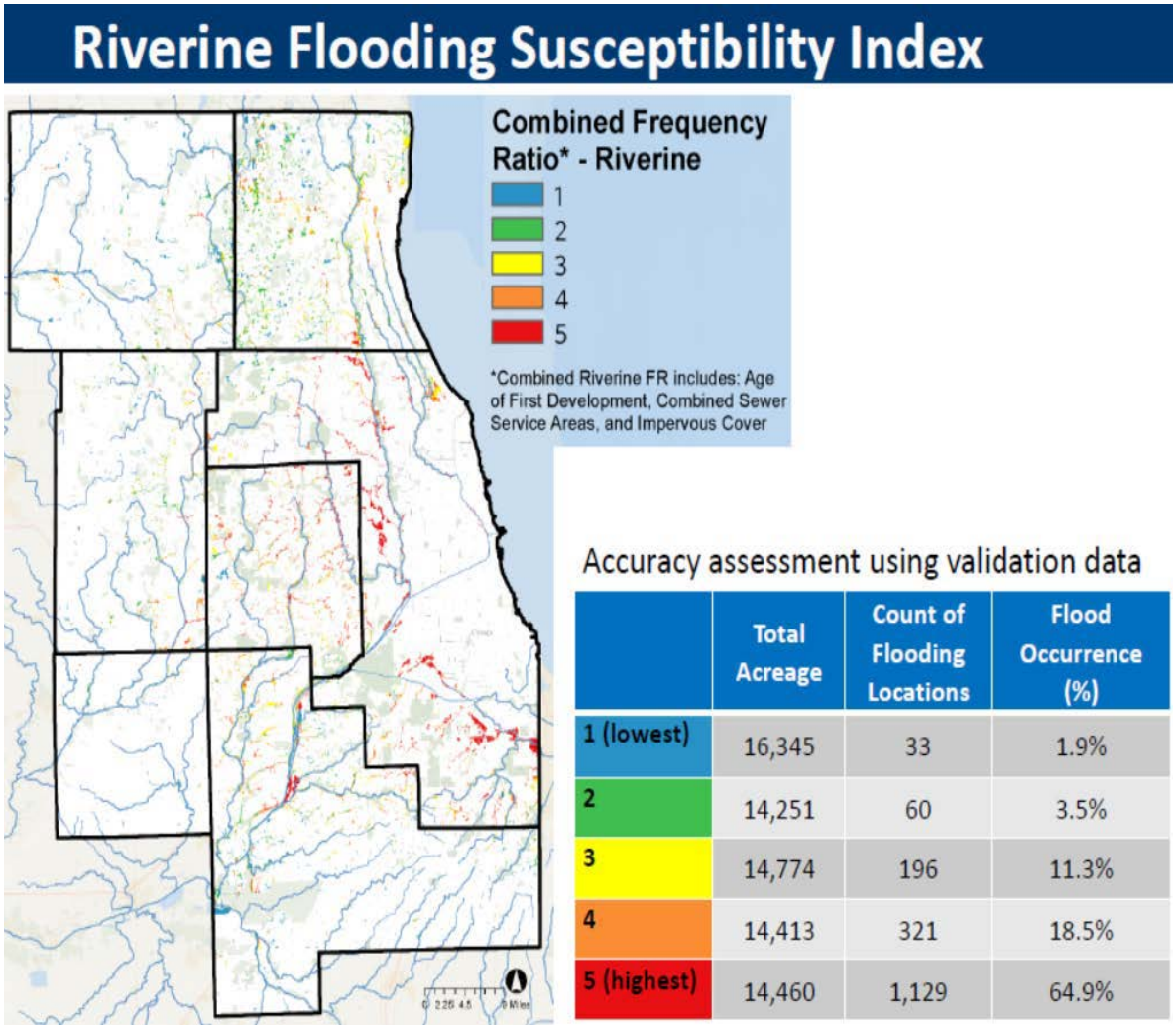
Urban Flooding Susceptibility Index



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

Flood Prone Areas Along Waterways in DuPage County

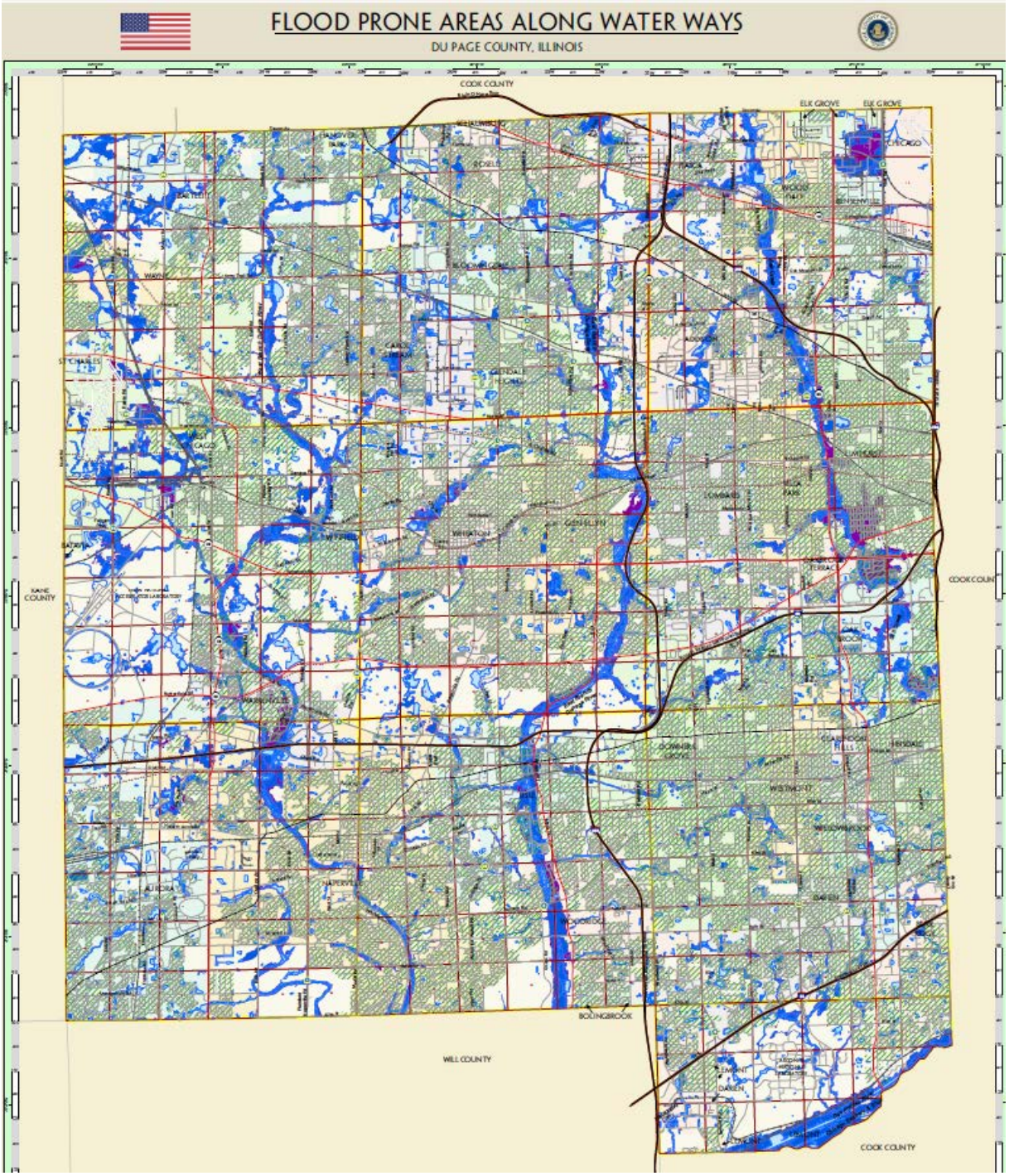


Table 2-7
DuPage County 2010 Flood Federal Reimbursement Totals

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

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.

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.

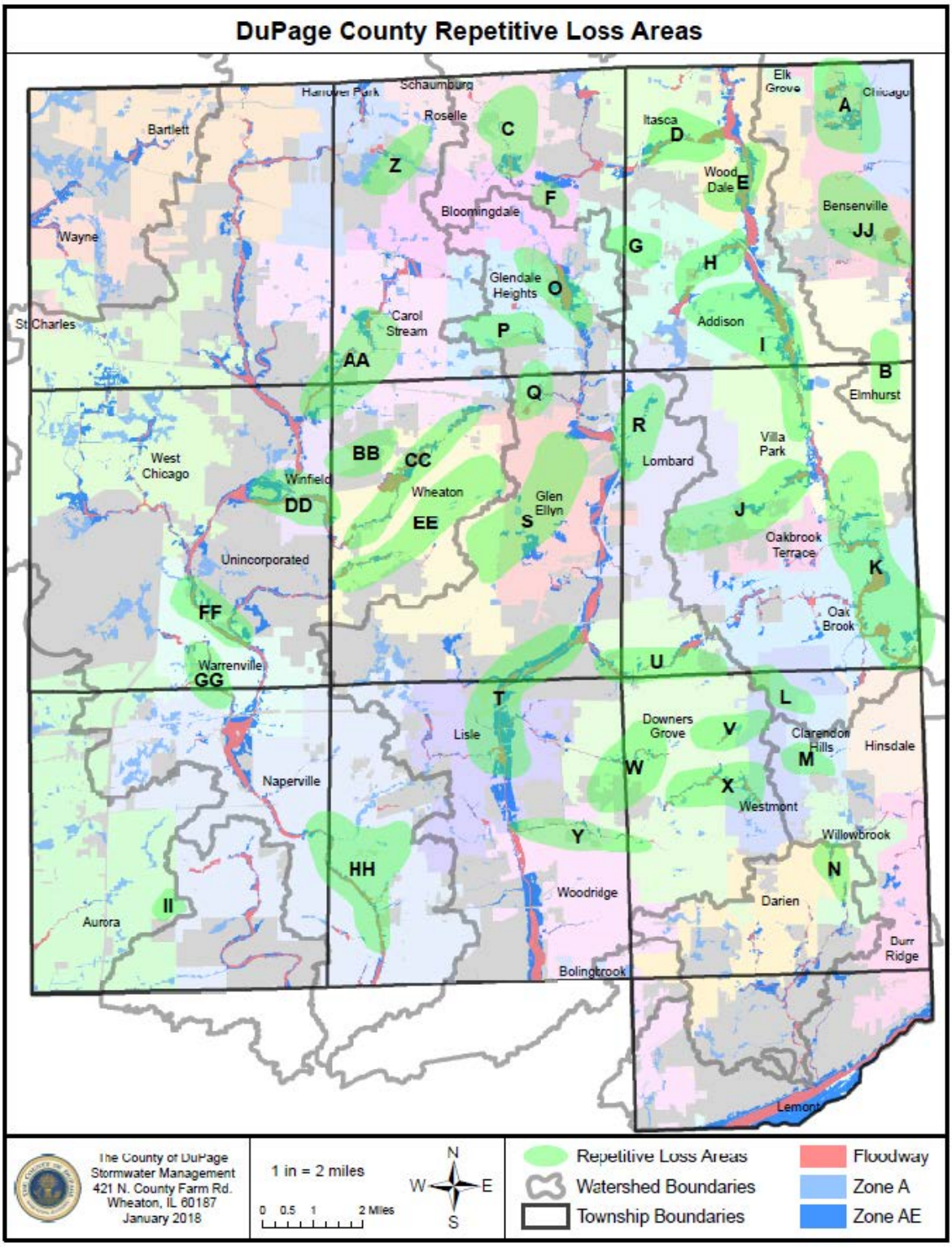
Table 2-8
Estimate of Vulnerable Structures within the DuPage County 100-Year Floodplain

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

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
	10y	50yr	100y	500y	(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 Branch	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 Branch	Overbank	0-6"
30	430	585	665	935	1.5	713.7	Winfield Creek Trib 2 to West Branch	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



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.

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. Natural Hazard Mitigation Plan Property Protection 5–17 2018

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.

Peoria County – Plan Approved: March 13, 2018

Peoria County is located in the heart of Illinois on the west bank of the Illinois River midway between Chicago and St. Louis, approximately 180 miles from each. Peoria County is situated within the Illinois River drainage basin. The County has a substantial floodplain area of varying widths both along the Illinois River and along a number of smaller tributaries throughout the County. Kickapoo Creek and Dry Run Creek drain most of the central portion of the County landscape. Other watersheds involved in County drainage include LaMarsh Creek (southeastern), Copperas Creek (southwestern), Senachwine Cree(northeastern), and the Spoon River (northwestern). The 2010 U.S. Census population for the County was 186,494 persons (density of 301.2 sq. mi) with a predicted population of 186,221 persons in 2015.

The polar jet stream is a major factor in the climate of Peoria County. The jet stream moves masses of air in and out of Canada, strengthens storms and steers low and high pressure centers. Generally, when the jet stream is to the south, cold air pushes southwards, and when the jet stream is to the north, dominant weather in the US Pacific or Gulf south dictates weather in the County. Average annual climate statistics include:

Table 2.1 Peoria IL – Annual Climate Averages, 2017

Climate	Peoria, IL	United States
Rainfall (Inches)	38.3	39.2
Snowfall (Inches)	24.6	25.8
Precipitation Days	97	102
Sunny Days	194	205
Average July High	85.6	86.1
Average January Low	17	22.6
Comfort Index (Higher=Better)	41	54
Ultra-Violet Light Index	3.8	4.3
Elevation (Feet)	633	1,443

The 100-year flood, which is the minimum standard used by most federal and state agencies, is used by the NFIP as the standard for floodplain management and to determine the need for flood insurance. Participation in the NFIP requires adoption and enforcement of a local floodplain management ordinance which is intended to prevent unsafe development in the floodplain, thereby reducing future flood damages. Within Peoria County, the local floodplain management ordinance includes requirements beyond the NFIP minimum requirements including the finished first floor of residential construction to be two feet above the 100-year flood elevation and construction of critical facilities outside the 500-year floodplain.

The major sources of flooding in Peoria are the Illinois River, Dry Creek and Kickapoo Creek. The floodplains of these waterways vary in width. The main flood prone areas in Peoria County are along the Illinois River from the southern border of Chillicothe to the southern Peoria County boundary and the Kickapoo Creek watershed.

Peoria County has an extremely proactive history in regards to floodplain management as well as identifying and prioritizing potential vulnerable areas. As a part of the National Flood Insurance Program (NFIP), floodplains and floodways on the Illinois River, and many local streams have been established and are regulated by the local floodplain management ordinance.

Figures 3.15 and 3.16 reflect the mapped flood insurance zones for Peoria County. Of the 87,508 parcels within Peoria County, 13,034 parcels are located within the identified special flood hazard area (SFHA). With approximately 15% of parcels within the SFHA, the geographic location was assigned a rank of medium:
Medium – Between 10% to 25% of the total population adversely affected should the hazard occur.

Figure 3.15 Flood Hazard Northern Peoria County

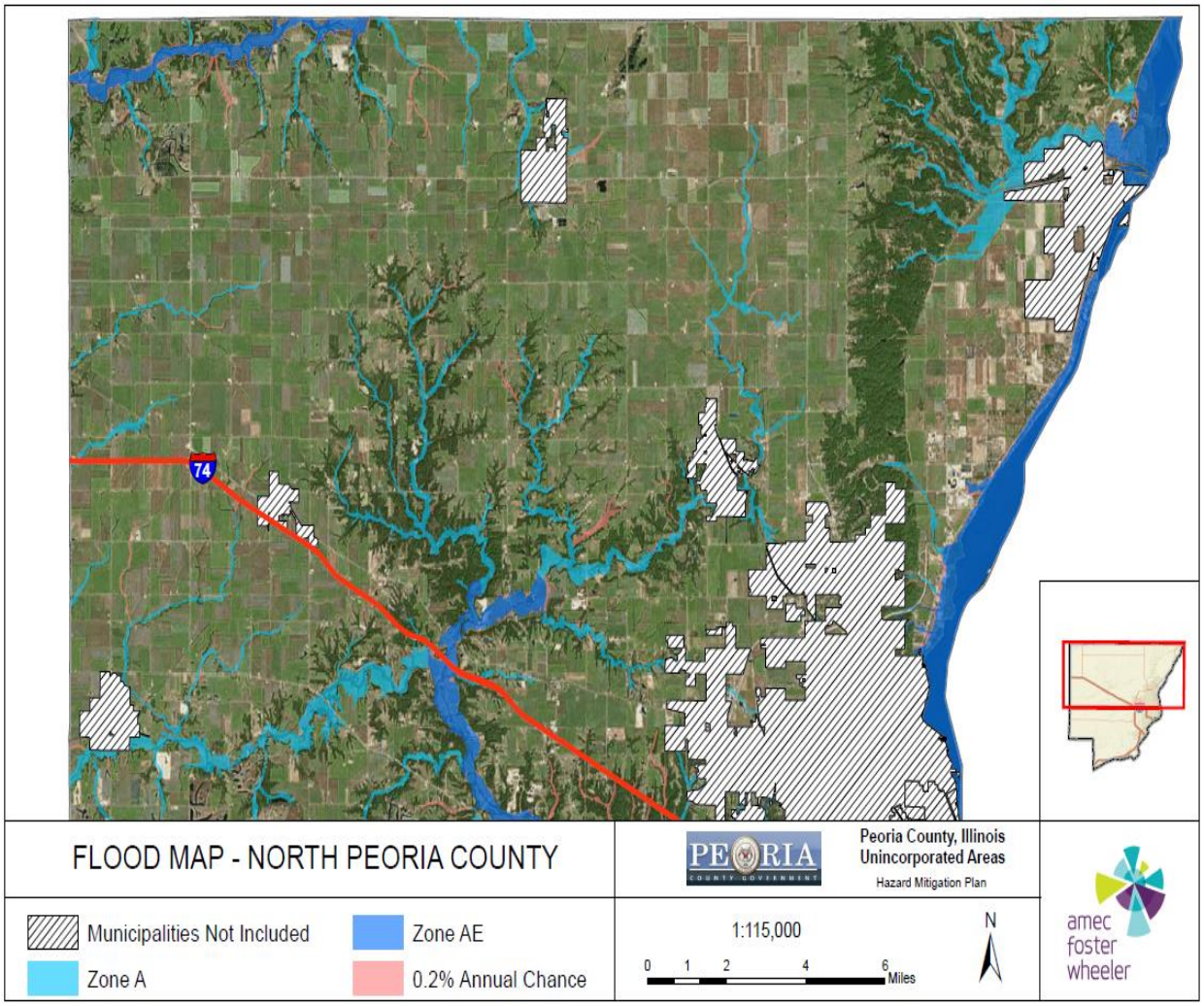
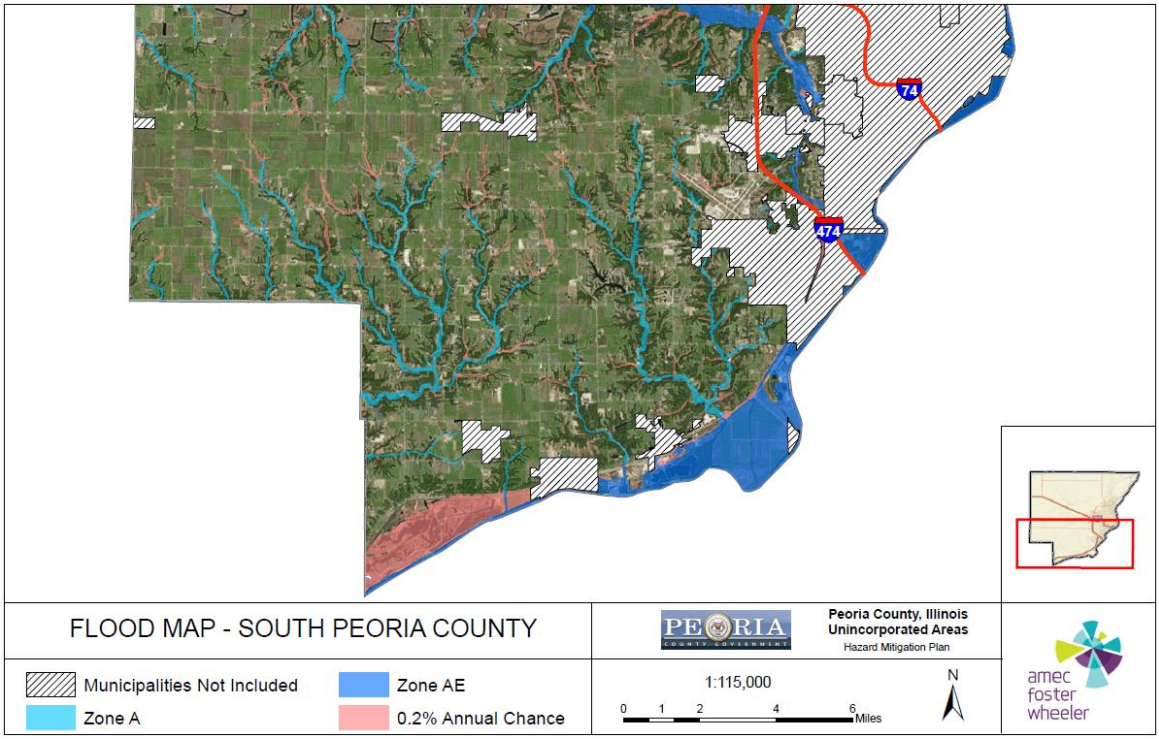


Figure 3.16 Flood Hazard Southern Peoria County



All streams within Peoria County, as previously identified, are subject to flooding and backwater flooding. Backwater flooding is defined as upstream flooding caused by downstream conditions such as channel restriction and/ or high flow in a downstream confluence stream. The primary effect of flooding on these streams appears to be inundation, although velocities will become significant to persons and structures under more extreme flooding situations.

National Flood Insurance Program (NFIP) Participation

Peoria County currently participates in the National Flood Insurance Program (NFIP) and is rated Class 5 in the Community Rating System. This class rating results in a 25% reduction in flood insurance premiums for NFIP policy holders. Tables 3.14 through 3.18 provides additional details on NFIP participation as well as flood insurance policies and claims for the County categorized by occupancy type, flood zone, Pre-FIRM and Post-FIRM. Source: FEMA Community Information System (CIS)

Table 3.14 NFIP Policy and Claims Data Overview

Jurisdiction	Status/Date	Effective FIRM Date	Policies in Force (6/6/2016)	Insurance in Force ($)	Number of Paid Losses Since 1978	Total Losses Paid($)	Substantial Damage Claims Since 1978
Unincorporated Peoria County		June 1, 1983	311	$42,919,100	1,542	$15,563,826.00	156

Table 3.15 NFIP Policy and Claims Data Overview

Structure Type	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Number Total of Closed Paid Loses
Single Family	284	$203,378	$38,688,900	1,380	$13,171,161.27
2-4 Family	6	$4,115	$955,500	28	$341,955.27
All Other Residential	0	$0	$0	15	$173,271.33
Non-Residential	21	$30,005	$3,274,700	119	$1,877,439.77
TOTAL	311	$237,498	$42,919,100	1,542	$15,563,827.64

Table 3.16 NFIP Policy and Claims Data by Flood Zone

Structure Type	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Number Total of Closed Paid Loses
A01-30 & AE Zones	220	$180,755	$25,086,100	1,091	$10,369,138.23
A Zones	22	$21,819	$2,626,500	167	$1,371,312.30
B, C, & X Zones					
- Standard	10	$12,109	$1,879,500	36	$556,959.19
- Preferred	54	$19,815	$13,162,000	10	$88,064.16
TOTAL	306	$234,498	$42,754,100	1,304	$12,331,473.00

Table 3.17 NFIP Policy and Claims Data by Flood Zone, Pre-FIRM

Structure Type	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Number Total of Closed Paid Loses
A01-30 & AE Zones	191	$169,755	$19,393,600	1,075	$10,269,281.37
A Zones	15	$9,124	$1,127,200	164	$1,148,294.46
B, C, & X Zones					
- Standard	8	$10,740	$1,529,500	36	$556,959.19
- Preferred	14	$6,044	$3,572,000	6	$46,280.44
TOTAL	228	$195,663	$25,622,300	1,281	$12,020,814.00

Table 3.18 NFIP Policy and Claims Data by Flood Zone, Post-FIRM

Structure Type	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Number Total of Closed Paid Loses
A01-30 & AE Zones	29	$11,000	$$5,692,500	16	$99,856.86
A Zones	7	$12,695	$1,499,300	3	$169,017.84
B, C, & X Zones					
- Standard	2	$1,369	$350,000	0	$0
- Preferred	40	$13,771	$9,590,000	4	$41,783.72
TOTAL	78	$38,835	$17,131,800	23	$310,656.00

Repetitive Loss Structures

A repetitive loss property is a property for which two or more flood insurance claims of more than $1,000 have been paid by the NFIP within any 10-year period since 1978. An analysis of repetitive loss was completed by the County to examine repetitive loss properties against FEMA flood zones.

Methodology

According to 2016 NFIP records, there are a total of 123 mitigated and 126 unmitigated repetitive loss properties within Peoria County. Fifteen properties are classified as severe repetitive loss. Of the fifteen severe repetitive loss properties, five remain unmitigated. The unmitigated repetitive loss properties are located within seven repetitive loss areas. Repetitive loss areas include the individual repetitive loss properties and all nearby properties with the same or similar flooding conditions.

Figures 3.17 through present the individual repetitive loss areas as well as an overview map of the County.

Figure 3.17 Overview of Repetitive Loss Areas

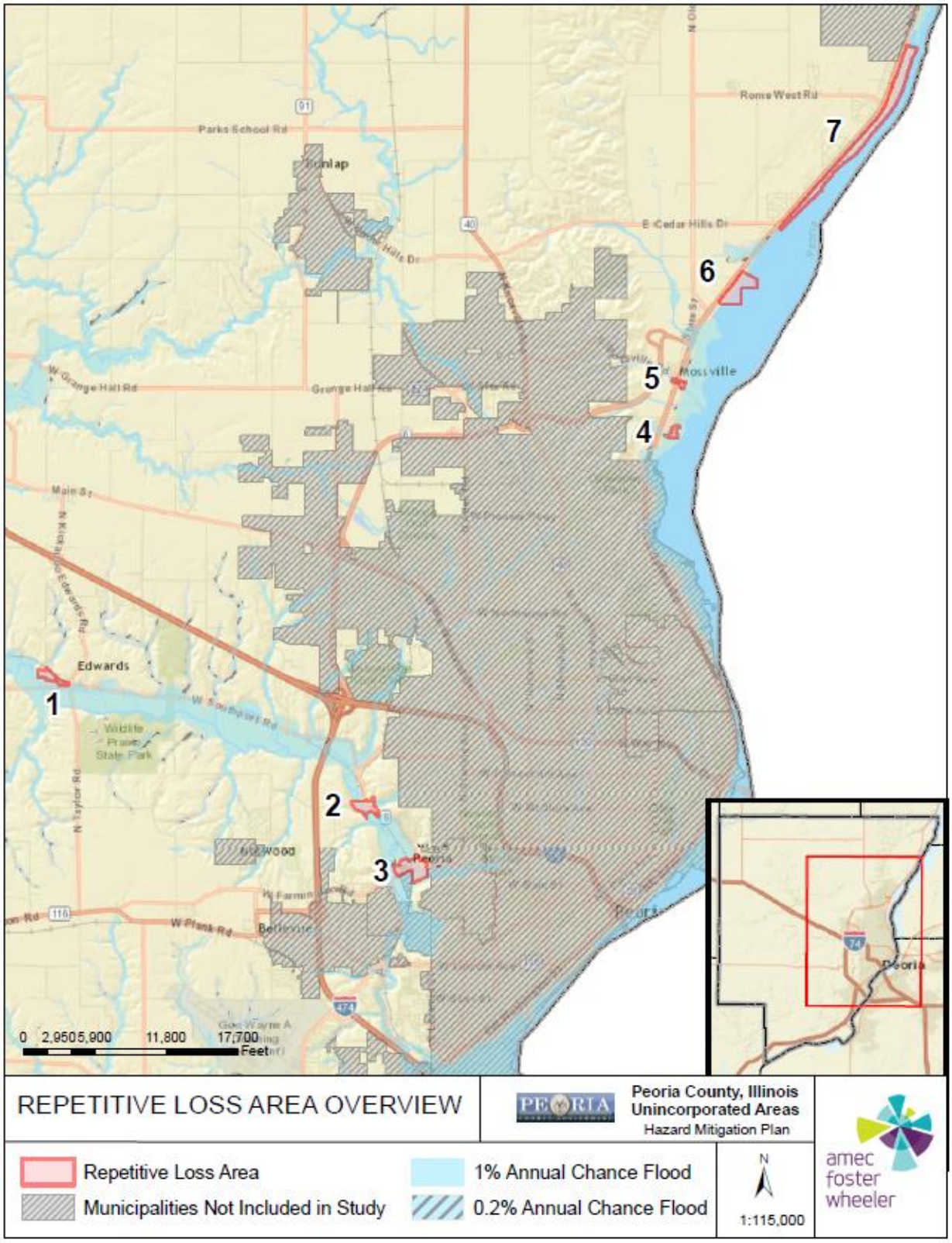


Table 3.19 NFIP Policy and Claims Data by Flood Zone

Repetitive Loss Area	Number of Repetitive Loss Properties	Number of Neighboring Properties	Total Assessed Value	Total Land Value	Total Improvement Value
1	1	38	$280,426	$93,486	$186,940
2	3	44	$451,620	$134,430	$317,190
3	4	83	$1,914,720	$515,090	$1,399,630
4	8	64	$1,569,260	$189,960	$1,379,300
5	2	17	$352,378	$101,128	$251,250
6	11	78	$1,761,550	$295,820	$1,465,730
7	140	279	$8,568,700	$1,273,640	$7,295,060
TOTAL	174	598	$14,898,654	$2,603,554	$12,295,100

Table 3.45 shows the total population, number of structures, and value of structure and contents by jurisdiction. Land values have been purposely excluded because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Additionally, state and federal disaster assistance programs generally do not address loss of land or its associated value.

Table 3.45 Maximum Population and Building exposure

Community	2014 Population	Number of Parcels	Number of Structures	Total Structure and Contents Value
Peoria County Unincorporated Areas	36,564	21,941	41,697	$915,388,034

Flood Mitigation Efforts

In response to these previous flood events and the potential for future flood events, Peoria County has established a robust mitigation program to acquire and/or elevate flood prone and repetitively flooded structures. Mitigation projects have included:

Ongoing Voluntary and/or Required Elevation of Structures – Elevation of 36 floodprone homes to 2-feet above the determined base flood elevation for each site. The complete list of elevated structures since 2000 is presented in Table 3.21. Illinois River Acquisition Program – Acquisition and demolition of 117 flood-prone properties along the Illinois River. Completed in 2003. Table 3.22 presents the mitigated properties. In-Progress Edwards Acquisition Project - Acquisition and demolition of 20 flood-prone properties within the community of Edwards, also identified as Repetitive Loss Area #1. Table 3.23 presents the properties identified for this mitigation project utilizing funding from disaster declaration DR-4116, May 10, 2013. In-Progress Unincorporated Peoria County

Acquisition Project - Acquisition and demolition of 21 flood-prone properties and elevation of one structure. Table 3.23 presents the properties identified for this mitigation project utilizing funding from disaster declaration DR-4116, May 10, 2013. (Source: Andrew Braun, Peoria County Planning & Zoning).

Additional flood vulnerability analysis was conducted for Peoria County to determine the number and values of buildings at risk to the 1% annual chance flood. GIS was used to create a centroid or point representing the center of the parcel polygon. Preliminary DFIRM flood data was then overlaid on the parcel centroids. For the purposes of this analysis, the flood zone that intersected a parcel centroid was assigned the flood zone for the entire parcel. The model assumes that every parcel with a structure value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building on it. It is important to note that there could be more than one structure or building on an improved parcel (i.e. condo complex occupies one parcel but might have several structures). Only improved parcels and the value of their improvements were analyzed. The end result is an inventory of the number and types of parcels and buildings subject to flood hazard at the designated frequency. Detailed tables show counts of parcels and land use type (Agriculture, Commercial, Industrial and Residential).

Table 3.53 Peoria County Improved Parcels within the 1% Annual Chance Flood Plain

Agriculture	Commercial	Industrial	Residential	Other	Total
2,177	79	112	952	443	3,763

Source: HAZUS; Peoria County Assessor's Office - Note: Other includes tax exempt; state assessed railroad, and railroad parcels

Table 3.54 Peoria County Improvement Values within the 1% Annual Chance Flood Plain

Agriculture	Commercial	Industrial	Residential	Other	Total
$45,308,794	$4,006,429	$45,263,190	$46,856,650	$1,210	$141,436,273

Source: HAZUS; Peoria County Assessor's Office

Note: Other includes wooded transition parcels, vacant lots-land; tax exempt; state assessed railroad, and railroad parcels

Potential losses from flooding are related to a variety of factors including flood depth, flood velocity, building type and construction. Based on FEMA Flood Insurance Administration (FIA) flood depth-damage curves, the percent of damage is directly related to the flood depth. FEMA's HAZUS flood loss estimation tool and the flood benefit/cost module both use this simplified approach to model flood damage based on building type and flood depth. A damage estimation of 20 percent of the total value was used based on FIA depth-damage curves for a onestory structure with no basement flooded to two feet. While there are several limitations to this model, it does present a methodology to estimate potential damages. This model may include structures within the 1-percent annual chance floodplain that may be elevated above the level of the base flood elevation, according to local floodplain development requirements, and thus mitigate the risk. Additionally, structures with finished basements and commercial properties would likely sustain a higher percentage of damage.

To determine the population that would be impacted and potentially displaced by a 1-percent annual chance flood event, the average household size, as determined by the 2010 census, was multiplied by the number of residential improved parcels in the 1-percent annual chance floodplain. The population impacted is somewhat underestimated since some of the residential structures could be multi-family structures. However, data was not available to determine the number of households in any multi-family structures.

Table 3.55 Potential Flood Loss Estimates, 1% Annual Chance Flood

Total Improved Value	Improved Value in Floodplain	Estimated Losses	Loss Ratio	Residential Properties in Floodplain	Average Household Size	Est. Impacted Population (#)
$915,388,034	$141,436,273	$45,259,607	0.20	952	2.39	2,275

Source: HAZUS; Peoria County Assessor's Office; Average Household Size from U.S. Census Bureau, 2011-2015 estimate

Lake County – Plan Approved: November 8, 2017

Lake County is the most northeastern County in Illinois. The total area of Lake County is approximately 1,368 square miles with a land area of approximately 448 square miles and the rest water. There are four major watersheds in Lake County: Des Plaines River, Fox River, North Branch of the Chicago River, and Lake Michigan.

3.3.2 Flood Hazard Profile

Exhibit 9 shows mapped regulatory floodplains and floodways in Lake County, which cover 57,168 acres. Mapped regulatory floodplains are defined as the area of land, which is inundated with water during 100-year flood events. For a historical comparison of flooding in Lake County, the USGS Hydrologic Atlas (1963, 1968) places 52,898 acres within areas inundated as part of today's regulatory floodplains and floodways. Lake County has also identified 428 areas that cover 7,956 acres of land with local drainage and flooding problems. Over half of these areas reside outside of regulatory floodways and floodplains. Table 17 shows the percent of area land use in the Lake County 100-year floodplain, and a summary of the floodplain land area is shown in Table 18.

Exhibit 9: Lake County 100 Year Floodplain and Floodway

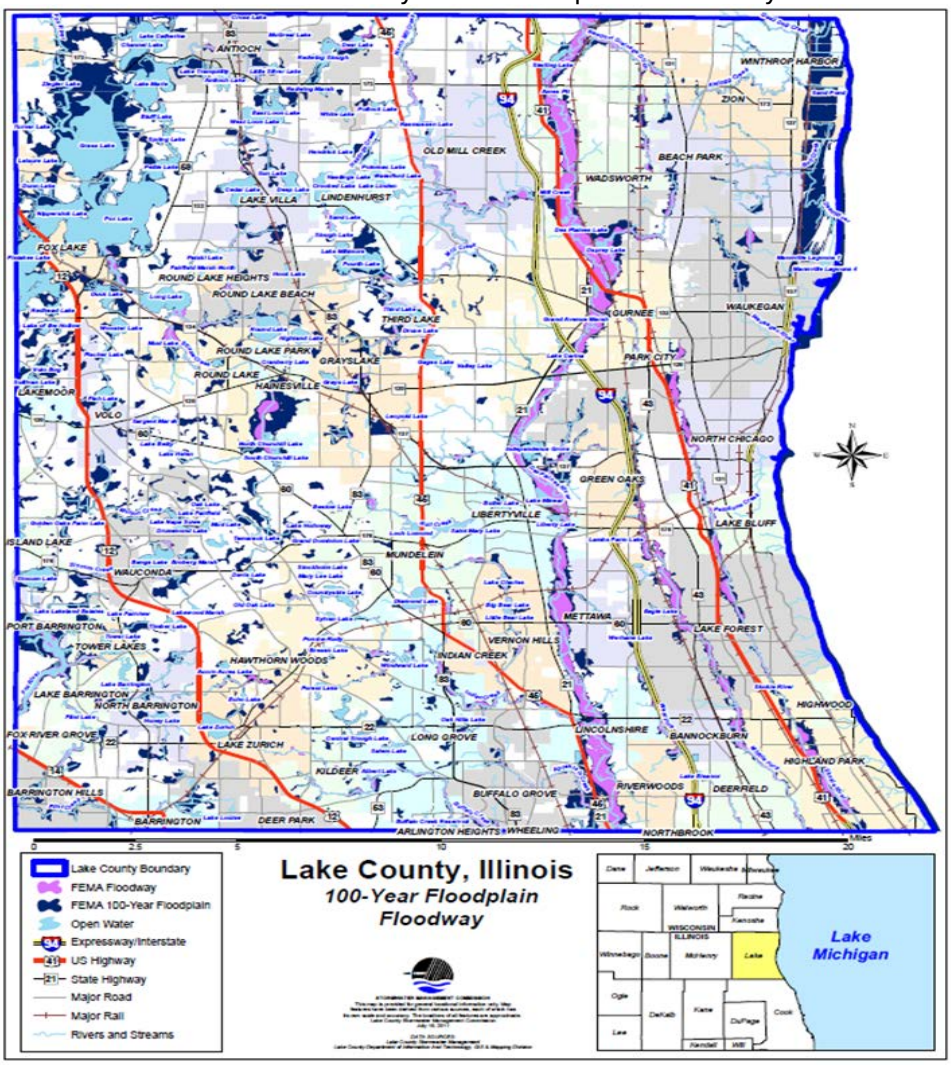


Table 17: Lake County Floodplain Land Use

Floodplain Land Use	Acres	Percent of Floodplain
Agricultural	1,990	3.5%
Disturbed Land	179	0.3%
Forest/Grassland/Beach	2,284	4.0%
Government/Institutional	336	0.6%
Industrial	237	0.4%
Office/Research	56	0.1%
Other	30	0.1%
Public/Private Open Space	17,760	31.1%
Residential	2,767	4.8%
Retail/Commercial	450	0.8%
Transportation	1,240	2.2%
Utilities/Waste Facilities	836	1.5%
Water (excluding Lake Michigan)	20,242	35.4%
Wetlands	8,763	15.3%
TOTAL	57,138	100.0%

Table 18: Lake County Estimate of Flood Prone Land

Flood Areas	Acres	Square Miles	% of County Area
Floodplains and Floodways	57,168	89.33	19%
Flood of Record	52,903	82.66	18%

SMC Flood Problem Areas Inventory: In 1995 – 1996, the SMC conducted a flood damage inventory to identify flood problem areas. This was done with contacts and personal interviews with cities, villages, townships, home owner associations, county agencies, county board members, private organizations and individuals. Problem sites were identified by sub-watersheds and numbered. A standardized "Flood Problem Areas" information worksheet was developed for each site and pertinent information was added as it was obtained. A resident input questionnaire was also developed to gather additional information on local flooding problems. The problem areas were included on the County's GIS. Over 300 identified flood problem sites were field inspected to verify problem area boundaries, assess the flood problem, and identify suitable mitigation solutions for the flood hazard area. The inventory only identifies areas experiencing historic flood damage to property and infrastructure. Flooding of open space and vacant land were not inventoried or mapped.

A summary of the problems area inventory is provided in Table 19 for the major Lake County watersheds and Exhibit 10 shows the mapped flood problem areas. The inventory is updated as watershed plans are developed or updated. Note that a flood problem site may include multiple buildings, roads or other infrastructure, and more than one type of flooding may occur at a problem site.

Table 19: Lake County Flood Problem Area Inventory Summary - 2016

Type of Flooding and Number of Sites:	Fox River	Des Plaines River	Lake Michigan	North Branch Chicago River	Total:
Overbank Flooding	87	46	3	17	153
Local Drainage Problems	58	65	27	22	172
Depressional Flooding	68	39	4	5	116
Sanitary Sewer / Septic Failure	7	11	4	3	25
Associated Erosion	1	2	3	0	6
Total:	221	163	41	47	472
Flood Problem Site Locations:					
Floodplain	133	72	6	25	236
(Floodway:)	(27)	(44)	(4)	(18)	(93)
Outside Floodplain	88	91	35	22	236
Critical Facilities Subject to Flooding or Closure:	19	9	6	4	38
Roads and Bridges Threatened by Flooding:	170	93	34	41	338

* Sites reported multiple problems in these categories

An examination of National Flood Insurance Policies and Flood Insurance claims highlights the number of communities that have been impacted by past flooding. Table 20 shows Lake County community flood insurance coverage and flood insurance claims from 1978 to 2015. Note that policies are show for an entire community, including the portions of communities that are in other counties. The policy coverage in Lake County is about the same as it was in the 2012 ANHMP, but the total claims paid amount increase by $6 million, and are most likely due to the April 2013 flood. Since several Lake County municipalities are within other counties, it is difficult to separate claims for properties in Lake County verses other counties. More information is available about the Lake County flooding at:: http://www.lakecountyil.gov/3510/Flood-Information

Exhibit 10 Lake County Flood Problem Areas

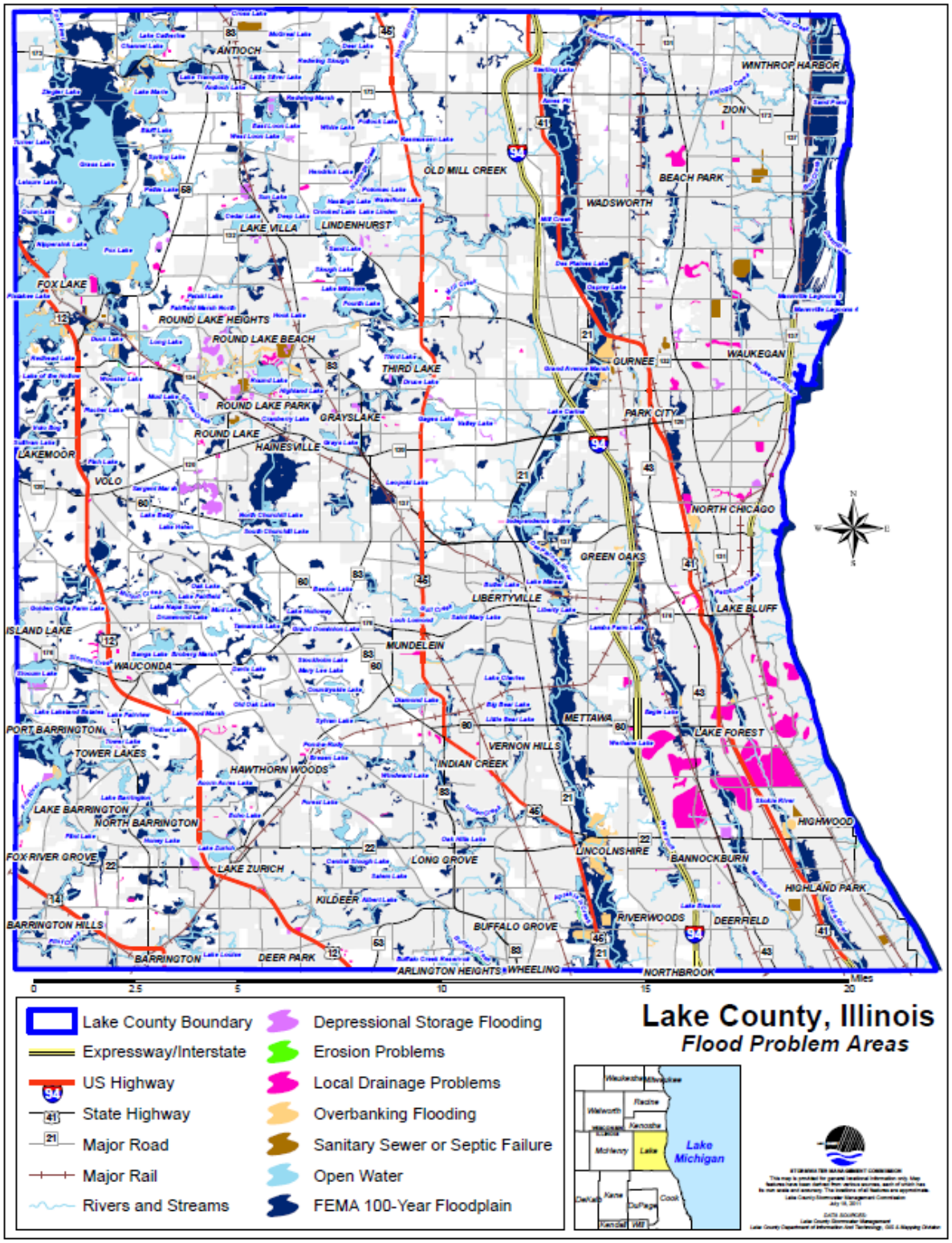


Table 20: Lake County NFIP Flood Insurance Active Policies & Claims (1978 - 2015)

Community	NFIP CID	Number of Active Policies	Total Premium	Total Coverage	Number of Claims*	Total Paid
Village of Antioch	170358	79	$80,203	$16,801,200	71	$ 788,569
Village of Bannockburn	170359	3	$1,195	$ 1,050,000	0	$ -
Village of Barrington*	170057	36	$18,330	$ 8,713,600	20	$ 320,931
Village of Barrington Hills*	170058	13	$13,823	$ 3,680,700	4	$53,648
Village of Beach Park	171022	31	$31,584	$ 6,158,300	10	$96,438
Village of Buffalo Grove*	170068	63	$46,324	$15,664,300	3	$ 3,149
Village of Deer Park*	171028	5	$4,183	$ 1,725,000	4	$26,319
Village of Deerfield*	170361	144	$108,783	$39,742,600	124	$ 1,304,698
Village of Fox Lake*	170362	303	$323,156	$60,926,500	200	$ 2,068,425
Village of Fox River Grove*	170477	31	$38,051	$ 6,966,100	1	$ 3,712
Village of Grayslake	170363	61	$56,852	$13,419,800	4	$14,412
Village of Green Oaks	170364	14	$16,936	$ 3,317,000	2	$ 3,689
Village of Gurnee	170365	119	$188,636	$34,587,300	68	$ 2,372,380
Village of Hainesville		1	333	$ 280,000		
Village of Hawthorn Woods	170366	14	16433	$ 3,795,000	1	$ 4,309
City of Highland Park	170367	161	$167,868	$45,566,100	61	$ 217,120
City of Highwood	171033	0	$ -	$ -	0	$ -
Village of Indian Creek	170369	0	$ -	$ -	0	$ -
Village of Island Lake*	170370	35	$24,526	$ 7,955,700	1	$ 743
Village of Kildeer	170371	19	$22,694	$ 5,520,000	1	$27,352
Village of Lake Barrington	170372	17	$12,504	$ 4,568,400	3	20,807
Village of Lake Bluff	170373	10	$3,660	$ 2,871,800	0	$ -
City of Lake Forest	170374	68	$63,553	$18,716,100	18	$85,980
Village of Lake Villa	170375	14	$10,270	$ 3,239,600	10	$25,827
Village of Lake Zurich	170376	15	$6,291	$ 3,980,000	6	$54,425
Village of Lakemoor*	170915	31	$24,331	$ 4,368,300	0	$ -
Village of Libertyville	170377	149	$199,286	$35,587,000	45	$ 488,974
Village of Lincolnshire	170378	113	$113,929	$32,609,800	27	$ 1,167,991
Village of Lindenhurst	170379	10	$4,910	$ 2,599,000	7	$78,790
Village of Long Grove	170380	39	$38,345	$12,166,200	3	$13,267
Village of Mettawa	170381	5	5059	$ 1,530,000	1	$ 8,558
Village of Mundelein	170382	48	$49,580	$11,808,700	11	$59,544
Village of North Barrington	170383	19	$14,713	$ 5,395,900	2	$25,381
City of North Chicago	170384	10	$4,540	$ 1,641,500	7	$31,161
Village of Old Mill Creek	170385	0	$ -	$ -	1	$ 7,433
City of Park City	170386	30	$13,835	$ 4,973,300	0	$ -
Village of Port Barrington*	170478	44	$47,485	$ 9,757,600	38	$ 390,094
Village of Riverwoods	170387	90	$86,894	$28,749,100	20	$ 218,401

Community	NFIP CID	Number of Active Policies	Total Premium	Total Coverage	Number of Claims*	Total Paid
Village of Round Lake	170388	15	$14,672	$ 2,548,700	10	$22,465
Village of Round Lake Beach	170389	218	$201,300	$32,868,600	67	$417,458
Village of Round Lake Heights	170390	6	$9,751	$ 1,323,500	8	$63,899
Village of Round Lake Park	170391	17	$9,991	$ 4,024,900	1	$11,642
Village of Third Lake	170392	4	$3,849	$ 1,090,000	0	$ -
Village of Tower Lakes	170393	5	$7,507	$ 1,305,000	0	$ -
Village of Vernon Hills	170394	24	$10,135	$ 4,360,900	1	$ 245
Village of Volo	171042	1	$1,440	$ 500,000	0	$ -
Village of Wadsworth	170395	8	$7,412	$ 1,986,400	1	$ 3,699
Village of Wauconda	170396	36	34052	$ 7,705,600	21	$ 156,817
City of Waukegan	170397	77	$83,218	$17,610,200	10	$ 410,921
Village of Wheeling	170173	813	$921,455	$ 172,221,300	126	$ 1,174,048
Village of Winthrop Harbor	170398	10	$4,219	$ 2,596,000	2	$21,534
City of Zion	170399	9	$10,253	$ 1,851,600	11	$94,665
Unincorporated Lake County	170357	964	$901,931	$ 197,120,500	412	$ 4,412,615
Naval Station Great Lakes	n/a					
TOTALS		4051	$4,080,280	$ 909,544,700	1444	$ 16,772,535

3.3.3 Repetitive Flood Loss Properties

FEMA uses several definitions for repetitive loss structures. Since Lake County and many Lake County municipalities participate in the CRS, the CRS definition of repetitive loss is used in the plan. A "repetitive loss structure" is a flood-insured structure that has received two or more flood insurance claim payments of more than 25% of the market value within any 10-year period. Repetitive loss data was provided to Lake County through the CRS program in 2015. A summary repetitive loss in provided in Table 21. The repetitive loss areas are shown in Exhibit 11. Repetitive flood loss areas include 1 or more repetitive loss properties and the neighboring or nearby properties subject to similar flood damage. The repetitive loss areas numbers and names are shown in Table 22.

Table 21: Lake County Repetitive Loss Structures

Community	Number of Repetitive Loss Properties as of 6/30/2015	Mitigated	Mitigation Status	Remaining Repetitive Losses
Village of Antioch	1	0		1
Village of Beach Park	3	0		3
Village of Fox Lake*	27	4	1 Non-FEMA, 2 FMA, 1 HMGP	23
Village of Fox River Grove*	2	0		2
Village of Gurnee	10	4	1-PDM, 2-HMGP, 1-GGS	6
City of Highland Park	6	0		6
City of Lake Forest	4	1	1-Non FEMA	3
Village of Lakemoor*	1	0		1
Village of Libertyville	3	1	1-Non-FEMA	2

Community	Number of Repetitive Loss Properties as of 6/30/2015	Mitigated	Mitigation Status	Remaining Repetitive Losses
Village of Lincolnshire	1	0		1
Village of Lindenhurst	2	1	1-HMGP	1
Village of Port Barrington*	5	0		5
Village of Riverwoods	1	1	1-Non FEMA	0
Village of Round Lake	1	0		1
Village of Round Lake Beach	5	1	1-HMGP	4
Village of Round Lake Heights	1	1	1-HMGP	0
Village of Wauconda	1	0		1
City of Waukegan	1	0		1
Unincorporated Lake County	47	0		47
TOTALS	122	14		108

Since 2000, Lake County has been conducting "flood audits" in repetitive loss areas. Table 23 shows the number of repetitive loss properties that have received a flood audit in each community. Many of the properties included in the 108 properties in Table 23 that are shown as "To Be Audited" are within areas that did have other flood audits conducted between 2000 and 2006. Mitigation of repetitive flood loss structures are discussed further in Chapter 5.

A notable number of unmitigated repetitive loss properties are located on or near major Lake County lakes. When flooding occurs on the Fox Chain of Lakes, the flooding lasts for weeks. Long flood periods can also be experienced for properties along the Des Plaines River.

Exhibit 11: Lake County Repetitive Flood Loss Areas

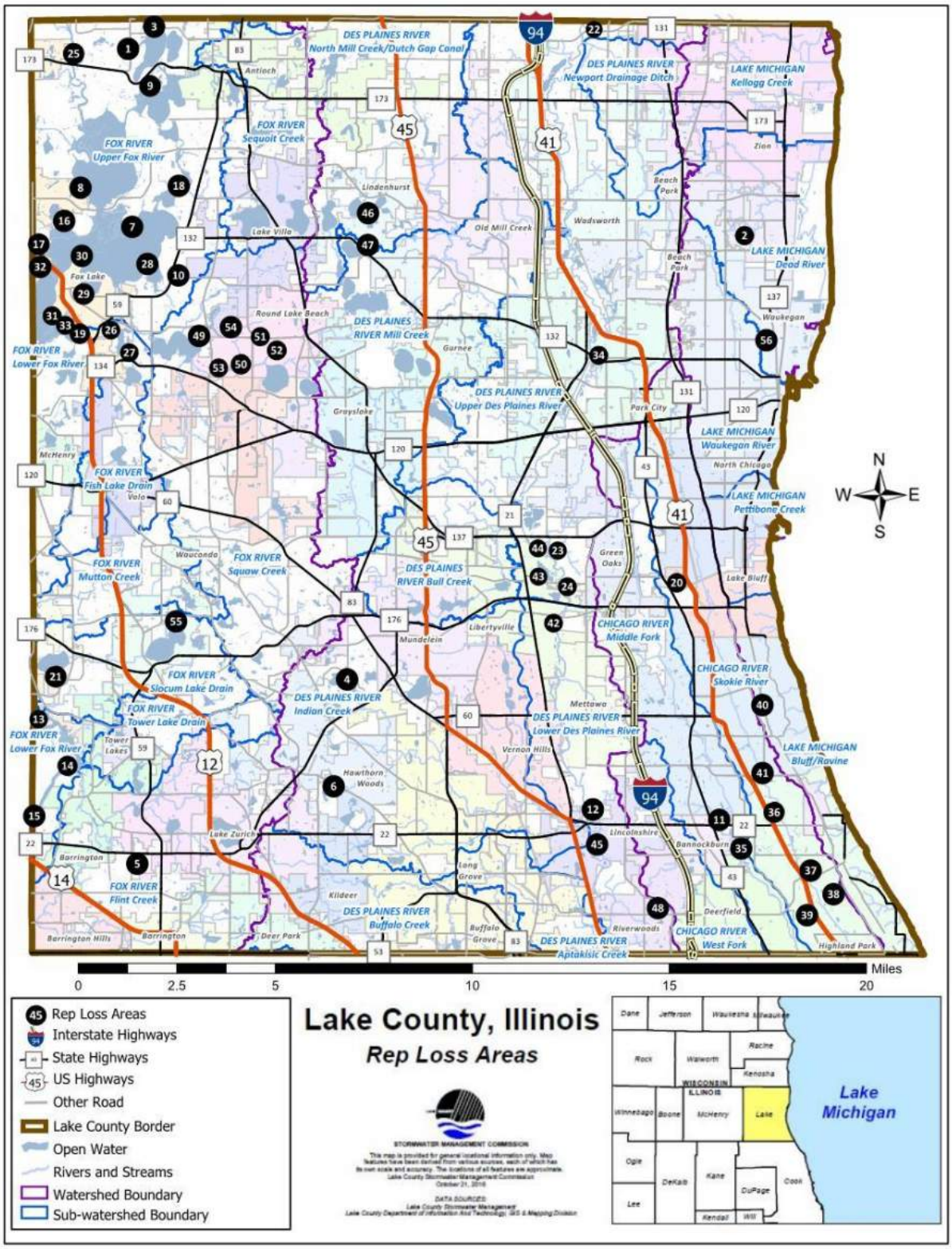


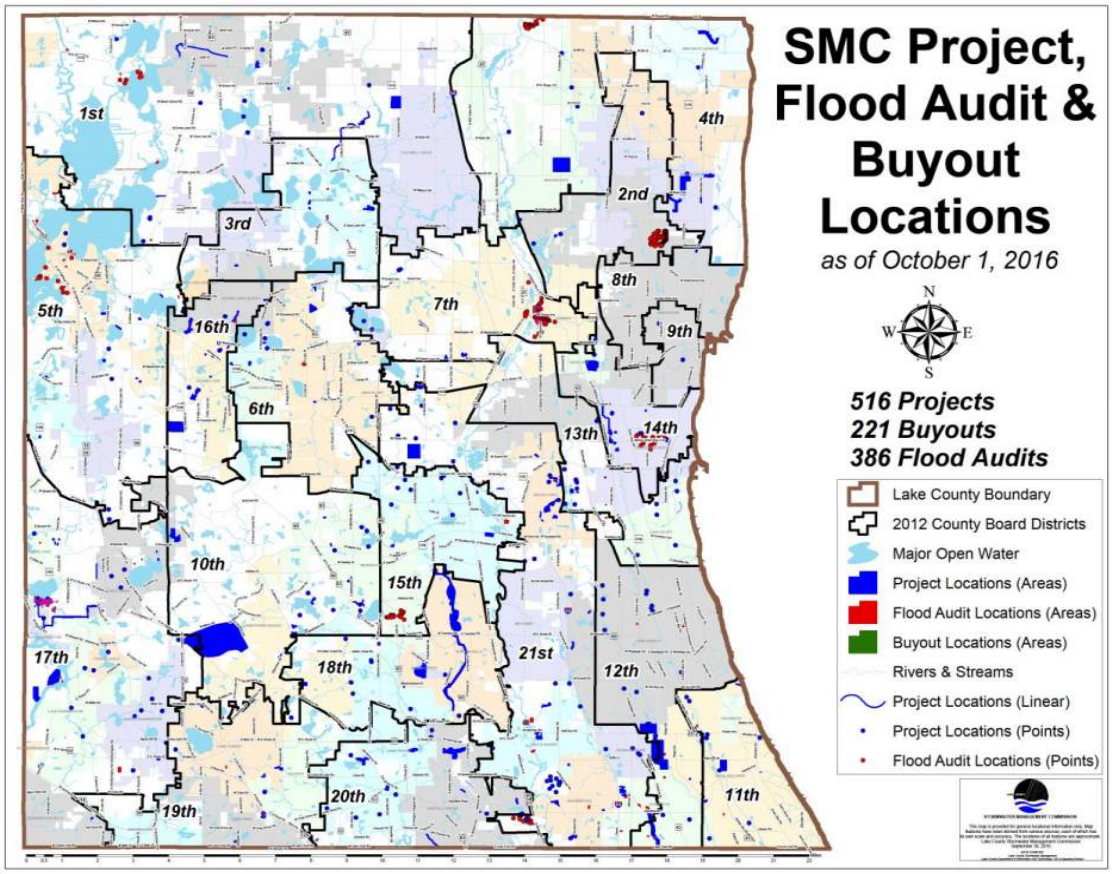
Table 22: Lake County Repetitive Flood Loss Area Numbers and Names

Rep. Loss Area Number	Rep. Loss Area Name	Number of Rep. Loss Properties in Area	Rep. Loss Area Number	Rep. Loss Area Name	Number of Rep. Loss Properties in Area
1	Antioch - Channel Lake	1	29	Fox Lake - Fox Lake 3	9
2	Beach Park - Dead River	3	30	Fox Lake - Fox Lake 4	1
3	County - Channel Lake	3	31	Fox Lake - Pistakee Lake 1	8
4	County - Countryside Lake	1	32	Fox Lake - Pistakee Lake 2	2
5	County - Flint Creek	1	34	Gurnee - Des Plaines River	9
6	County - Forest Lake	1	35	Highland Park - Middle Fork	1
7	County - Fox Lake 1	1	36	Highland Park - Skokie River 1	1
8	County - Grass Lake	1	37	Highland Park - Skokie River 2	1
9	County - Lake Marie	10	38	Highland Park - Skokie River 3	1
10	County - Local 1	1	39	Highland Park - Skokie River 4	1
11	County - Local 2	1	40	Lake Forest - Bluff/Ravine	1
12	County - Lower Des Plaines 2	2	41	Lake Forest - Skokie River	1
13	County - Lower Fox River 1	3	42	Libertyville - Lower Des Plaines	1
14	County - Lower Fox River 2	2	43	Libertyville - Minear Lake	1
15	County - Lower Fox River 3	1	44	Libertyville -Des Plaines River	3
16	County - Nippersink Lake 1	1	45	Lincolnshire - Des Plaines River	1
17	County - Nippersink Lake 2	1	46	Lindenhurst - Local 1	1
18	County - Petite Lake	1	47	Lindenhurst - Local 2	1
20	County - Skokie River	1	48	Riverwoods - Local	1
21	County - Slocum Lake	4	49	Round Lake - Local	1
22	County - Upper Des Plaines 1	2	50	Round Lake - Round Lake Drain	2
23	County - Upper Des Plaines 2	1	51	Round Lake Beach - Local	1
24	County - Upper Des Plaines 3	1	52	Round Lake Beach - Round Lake Drain 1	1
25	County - Upper Fox River	2	53	Round Lake Beach - Round Lake Drain 2	1
26	Fox Lake - Duck Lake 1	5	54	Round Lake Heights - Round Lake Drain	1
27	Fox Lake - Duck Lake 2	2	55	Wauconda - Bangs Lake	1
28	Fox Lake - Fox Lake 2	1	56	Waukegan - Dead River	1

Table 23: "Flood Audited" Repetitive Loss Properties in Lake County

Community	Audited Repetitive Loss Properties	Repetitive Loss Properties to Be Audited
Village of Antioch	0	1
Village of Beach Park	0	3
Village of Fox Lake	7	21
Village of Gurnee	1	8
City of Highland Park	3	2
City of Lake Forest	2	0
Village of Libertyville	0	5
Village of Lincolnshire	1	0
Village of Lindenhurst	1	1
Village of Riverwoods	1	0
Village of Round Lake	1	2
Village of Round Lake Beach	1	2
Village of Round Lake Heights	0	1
Village of Wauconda	0	1
City of Waukegan	1	0
Lake County (Unincorporated Areas)	12	30
Totals:	31	77

Exhibit 16: Lake County SMC Flood Audit and Floodplain Buyout Locations



The Lake County government arrangement allows communities to take individual mitigation projects or to participate with the county. For example, communities can pursue their own buyouts, or they can participate with the SMC to address environmental and demolition/restoration needs. Municipalities have the choice of relying on the county for watershed development issues or making their own determinations through the WDO Certified Community approach. Communities have numerous mutual aid agreements, and LCEMA is working to reduce overall vulnerability.

The constraints facing Lake County and the communities include both limited staff resources and funds that can be directed toward implementing hazard mitigation actions. To a great extent, communities will need to rely on technical and financial assistance from regional, state and federal resources to effectively implement hazard mitigation actions over the next five years. The current economy has severely limited funding throughout Lake County.

After reviewing recent planning initiatives, it is readily apparent that the municipalities have the capability to bring together citizens, government representatives, and local officials to work closely together in crafting a better future for their communities. That same cooperative effort, if joined with the appropriate technical and financial assistance from regional, state and federal resources, can be harnessed to implement the priority hazard mitigation actions described in Section 6 on this plan. A sustained effort by the citizens, staff, and local officials can create a more sustainable and disaster resistant future for Lake County.

Clinton County – Plan Approved: March 26, 2018

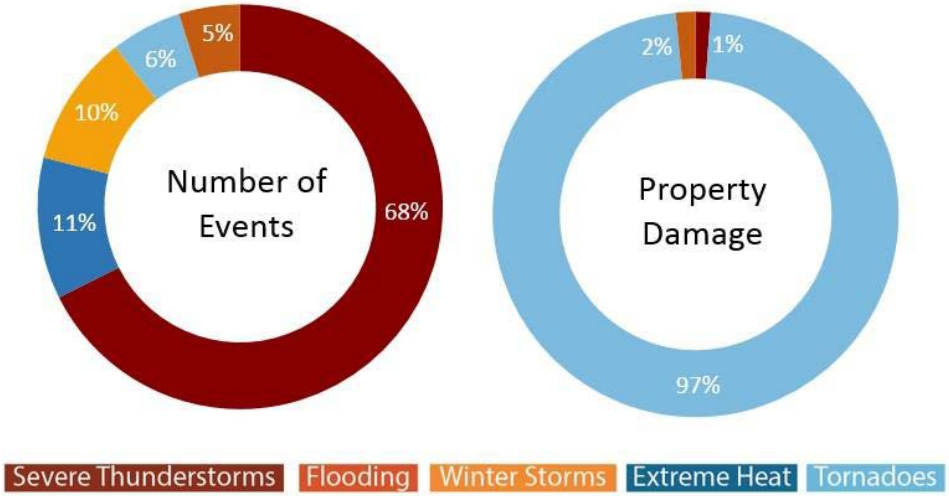
Clinton County is located in the southwestern region of Illinois about 30 miles east of St. Louis metropolitan areas. It is bordered on the North by Bond County and Fayette Counties, on the Northwest by Madison County, on the South by the Kaskaskia River and Crooked Creek which separates Clinton County from Washington County, on the West by Saint Clair County, and on the East by Marion County. The Kaskaskia River Valley Project was formed in 1933 as a result of frequent flooding of the Kaskaskia River, which later led to the Kaskaskia Valley Association in 1952, whose efforts resulted in the authorization for the US Army Corps of Engineers authorized by the Federal Flood Control Act of 1958 to construct the dam at Carlyle and the impoundment of a major 26,000-acre reservoir. In 1967 work was completed on the dam and lake, resulting in Carlyle Lake, the largest man-made lake in Illinois.

Clinton County's climate is typical of southwestern Illinois. The variables of temperature, precipitation, and snowfall can vary greatly from one year to the next. As early as October and extending as late as April, winter temperatures can fall below freezing. According to the National Climatic Data Center (NCDC), the average lowest winter temperature, occurring in January is 20°F. In the summer, the average high is around 88°F. Average annual precipitation is 40 inches per year.

Table 4-1. Summary of Meteorological Hazards Reported by the NCDC for Clinton County

Hazards	Time Period		Number of Events	Property Damage	Deaths	Injuries
	Start	End				
Flooding	1950	Feb 2017	19	$501,000	1	0
Severe Thunderstorms	1950	Feb 2017	217	$310,000	0	0
Tornadoes	1950	Feb 2017	20	$30,825,000	2	0
Winter Storms	1950	Feb 2017	43	$0	0	0
Extreme Heat	1950	Feb 2017	48	$0	0	4

Figure 4-1. Distribution of NCDC Meteorological Hazards for Clinton County



The product of hazard probability and magnitude is the RPI. After evaluating the calculated RPI, the Planning Team adjusted the ranking to better suit the county. Table 4-5 identifies the RPI and adjusted ranking for each hazard specified by the Planning Team.

Table 4-5. Clinton County Hazard Priority Index and Ranking

Hazard	Probability	Magnitude/Severity	Risk Priority Index	Rank
Flooding	4	7	28	1
Tornadoes	3	6	18	2
Levee/Dam Failure	2	8	16	3
Extreme Heat/Drought	3	5	15	4
Earthquakes	2	6	12	5
Winter Storms	3	3	9	6
Severe Thunderstorms	4	2	8	7
Sinkholes & Collapse	3	2	6	8
Hazardous Materials Release	4	1	4	9

4.1.6 Jurisdictional Hazard Ranking

Each jurisdiction created its own RPI because hazard susceptibility may differ by jurisdiction. Table 4-6 lists the jurisdictions and their respective hazard rankings (Ranking 1 being the highest concern).

Table 4-6. Hazard Ranking by Jurisdiction

Jurisdiction	Flooding	Tornado	Levee / Dam Failure	Heat / Drought	Earthquakes	Winter Storms	Severe Storms	Sinkholes & Collapse	HAZMAT	Subsidence
Albers	6	2	-	5	-	3	1	-	-	4
Aviston	2	1	9	3	6	5	4	7	-	8
Bartelso	2	3	-	-	5	4	1	-	-	6
Beckemeyer	6	1	10	5	2	4	3	8	7	9
Breese	8	1	9	4	6	3	2	7	5	-
Carlyle	6	1	8	-	5	3	2	-	4	-
Damiansville	2	1	7	6	3	5	4	8	10	9
Germantown	5	2	9	6	4	3	1	8	7	-
Hoffman	4	1	7	6	9	3	2	8	5	9
New Baden	1	2	3	4	5	6	7	8	9	-
Saint Rose	8	1	-	4	6	3	2	7	5	-
Trenton	1	2	3	4	5	6	7	8	9	-
Clinton County Animal Control	1	2	3	4	5	6	7	8	9	-

4.2 Vulnerability Assessment

4.2.1 Asset Inventory

Processes and Sources for Identifying Assets

Local GIS data was used to verify the locations of all critical facilities. SIU GIS analysts incorporated these updates and corrections to the Hazus-MH data tables prior to performing the risk assessment. The updated Hazus-MH inventory contributed to a Level 2 analysis, which improved the accuracy of the risk assessment. Clinton County also provided local assessment and parcel data to estimate the actual number of buildings susceptible to damage for the risk assessment.

Essential Facilities List

Table 4-7 identifies the number of essential facilities identified in Clinton County. Essential facilities are a subset of critical facilities. Appendix E include a comprehensive list of the essential facilities in Clinton County.

Table 4-7. Clinton County's Essential Facilities

Facility	Number of Facilities
EOC	1
Fire Stations	13
Police Stations	6
Medical Care	13
Schools	23

Facility Replacement Costs

Table 4-8 identifies facility replacement costs and total building exposure. Clinton County provided local assessment data for updates to replacement costs. Tax-exempt properties such as government buildings, schools, religious and non-profit structures were excluded from this study because they do not have an assessed value. Table 4-8 also includes the estimated number of buildings within each occupancy class.

Table 4-8. Clinton County 's Building Exposure

General Occupancy	Estimated Total Buildings	Total Building Exposure
Residential	17631	$2,517,233,424
Commercial	1036	$3,336,688,707
Industrial	141	$317,092,320
Total:	18808	$6,171,014,451

4.3.2 Flooding Hazard

Previous Occurrences of Flooding

The NCDC database reported 19 flooding events in Clinton County. The most significant flood event occurred in June 1996. Up to five inches of rain fell on Clinton County from a nearby stationary thunderstorm, causing widespread flash flooding. Most of the damage occurred in Germantown, where residents had to be evacuated from flooded neighborhoods. At least 40 homes suffered water damage. The county was declared a state disaster area. Table 4-10 identifies NCDC-recorded flooding events that caused damage, death, or injury in Clinton County.

Table 4-10. NCDC-recorded Flooding Events that caused Death, Damage or Injury in Clinton County

Location or County*	Date	Deaths	Injuries	Property Damage
Clinton County	6/10/1996	0	0	$500,000
Trenton	6/6/2008	0	0	$1,000
Damiansville	5/11/2015	1	0	$0
Total:		1	0	$501,000

*NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event.

Records indicate that there is one repetitive loss structure within the county. The total amount paid for building replacement and building contents for damage to this repetitive loss structures is $7597.30. Table 4-11 describes the repetitive loss structures for each jurisdiction.

Table 4-11. Repetitive Loss Structures for each Jurisdiction in Clinton County

Jurisdiction	Number of Properties	Number of Losses	Total Paid
Breese	1	2	$7597.30
Total:	1	2	$7597.30

The primary sources of river flooding in Clinton County is the Kaskaskia River and its tributaries. On April 28, 2002, Clinton County was one of the six counties (Washington, St. Clair, Fayette, Monroe, and Randolph) in southwestern Illinois impacted by flooding. The NCDC reported heavy rains during the last week in April pushed the Kaskaskia River out of its banks. The flooding was initially relatively minor, but continued and worsened in May.

All floodplains are susceptible to flooding in Clinton County. The floodplain of concern is for the 100-year flood event which is defined as areas that have a 1% chance of flooding in any given year. However, flooding is dependent on various local factors including, but not limited to, impervious surfaces, amount of precipitation, river-training structures, etc. The 100-year flood plain covers approximately 32% of Clinton County. The vulnerability ratings are categorically representations (low, average, elevated, or high) of the flood vulnerability index. Clinton County has an Average Flood Vulnerability Rating and ranks 46 out of the 102 counties in Illinois in terms of loss estimation according to Hazus-MH for floods. Table 4-12 lists the jurisdictional Flood Vulnerability Ratings for Clinton County.

Table 4-12. Jurisdictional Flood Vulnerability Ranking for Clinton County

Jurisdiction	State Ranking	Flood Vulnerability Rating
Albers	453	Average
Aviston	626	Average
Bartelso	581	Average
Beckemeyer	632	Average
Breese	614	Average
Carlyle	533	Average
Centralia	355	Average
Damiansville	609	Average
Germantown	613	Average

Hoffman	710	Low
Keyesport	285	Average
New Baden	304	Average
Trenton	610	Average

All critical facilities within the floodplain are vulnerable to floods. An essential facility will encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., a damaged police station cannot serve the community).

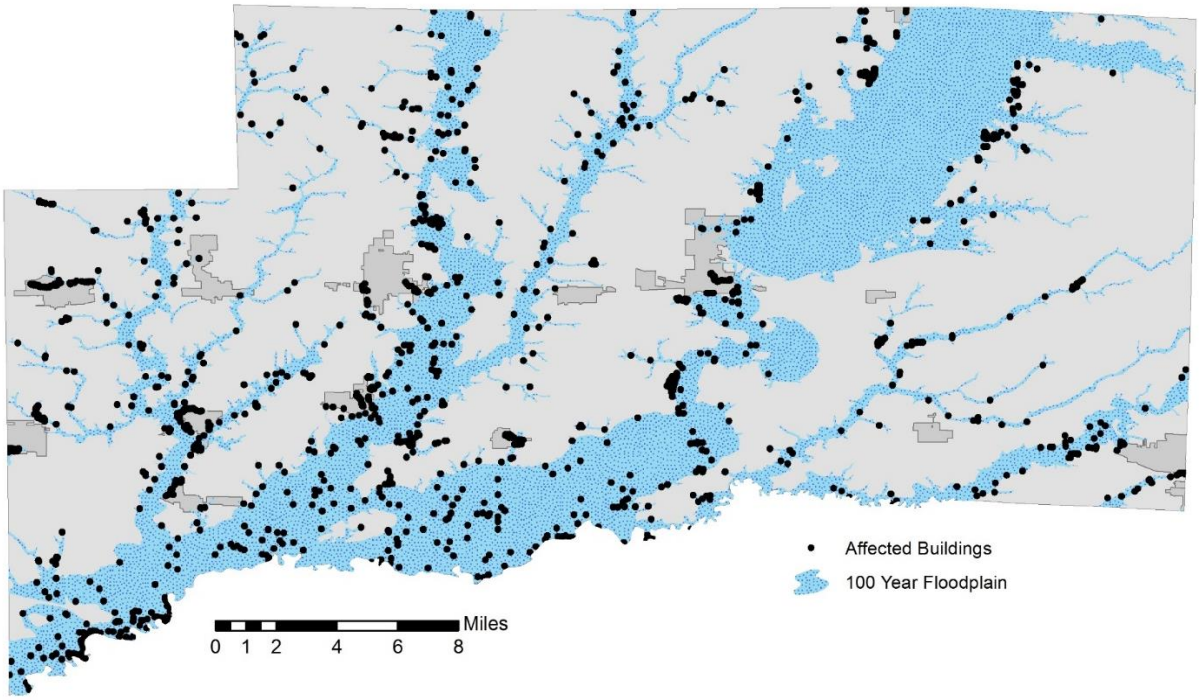
Hazus-MH was utilized to generate the flood depth grid for a 100-year return period and made calculations by clipping the USGS one-third-arc-second DEM (~10 m) to the flood boundary. Next, Hazus-MH was used to estimate the damages for Clinton County by utilizing a detailed building inventory database created from assessor and parcel data.

According to this analysis, there are 1,571 buildings located in the Clinton County 100-year floodplain. The estimated damage to these structures is $418 million. It should be noted that the results should be interpreted as degrees of loss rather than exact number of buildings exposed to flooding. Figure 4-4 depicts the building inventory within the 100-year floodplain and Table 4-13 shows the loss estimates by occupancy class.

Table 4-13. Estimated Flood Losses within the 100-year Floodplain

Occupancy Class	Number of Structures	Estimated Building Related Losses
Residential	1,516	$259,985,469
Commercial	51	$144,656,481
Industrial	4	$13,693,014
Total:	1,571	$418,334,964

Figure 4-4. Building Inventory Located within the 100-year Floodplain in Clinton County



The analysis identified one essential facilities that are subject to flooding. Table 4-14 identified the essential facilities within the 100-year floodplain.

Table 4-14. Essential Facilities within the 100-year Floodplain

Essential Facility	Facility Name
Fire Department	Breese Fire Protection District

Tornadoes

There have been several occurrences of tornadoes in Clinton County during recent decades. The National Climatic Data Center (NCDC) database reported 22 tornadoes/funnel clouds in Clinton County since 1950. Table 4-16 identifies NCDC-recorded tornadoes that caused damage, death, or injury in Clinton County. Additional details of individual hazard events are on the NCDC website. The most damaging tornado event occurred in December 2, 1982 when an EF3 tornado running 10.5 miles touched down in Clinton County killing two people and causing $25 million in property damages.

Table 4-16. NCDC-Recorded Tornadoes That Caused Damage, Death, or Injury in Clinton County

Location or County*	Date	Scale	Deaths	Injuries	Property Damage
Clinton Co	2/25/1956	F4	0	0	2,500,000
Clinton Co	4/5/1958	F3	0	0	250,000
Clinton Co	3/8/1964	F2	0	0	25,000
Clinton Co	12/21/1967	F2	0	0	2,500,000
Clinton Co	4/3/1968	F1	0	0	250,000
Clinton Co	4/18/1975	F1	0	0	250,000
Clinton Co	10/22/1979	F1	0	0	25,000
Clinton Co	12/2/1982	F3	2	0	25,000,000
Clinton Co	11/26/1990	F0	0	0	25,000
		Total:	2	0	30,825,000

*NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event.

The GIS analysis estimates that the modeled EF4 tornado would damage 5,583 buildings in Path 1 and 3,784 buildings in Path 2. The estimated building losses are approximately $ 2.4 billion for Path 1 and approximately $ 1.5 billion for Path 2. The building losses are an estimate of building replacement costs multiplied by the damage percent combined with estimated content costs. Table 4-19 and 4-20. shows the results of the EF4 tornado analysis.

Figure 4-6. Modeled Tornado Tracks for Clinton County

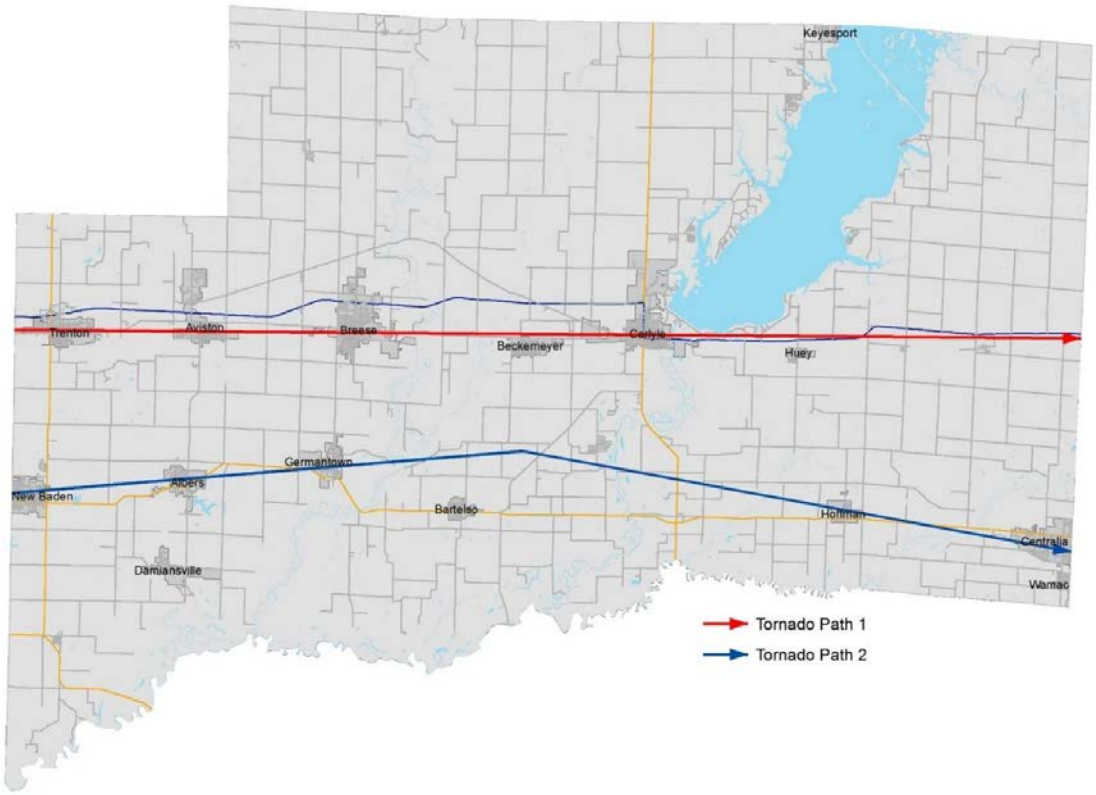


Table 4-19. Estimated Building Loss by Occupancy Type of Path 1

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$221,765,693	$170,652,866	$185,220,533	$19,566,298
Commercial	$888,613,320	$378,346,997	$341,538,834	$102,362,378
Industrial	$5,834,753	$0	$53,750,966	$5,681,940
Total:	$1,116,213,766	$548,999,863	$580,510,333	$127,610,616

Table 4-20. Estimated Building Loss by Occupancy Type of Path 2

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$145,898,937	$118,206,479	$109,009,330	$11,289,449
Commercial	$453,405,948	$190,926,730	$341,131,950	$51,094,395
Industrial	$5,325	$27,768,720	$35,155,459	$7,140,944
Total:	$599,310,210	$336,901,929	$485,296,739	$69,524,788

Suggestions for Community Development Trends

Preparing for severe storms will be enhanced if local officials sponsor a wide range of programs and initiative to address severe storm preparedness. It is suggested that the county should build new structures with more sturdy construction, and harden existing structures to lessen the potential impacts of severe weather. This is particularly important where the future economic expansion is expected to take place in Carlyle, Breese, and Centralia. Additional warning sirens can warn the community of approaching storms to ensure the safety of Clinton County residents and minimize property damage.

Winter Storm Hazard

The NCDC database reported 39 winter storm and extreme cold events for Clinton County since 1950. The most recent reported event occurred in March of 2015. The county received six to eight inches of snow over the course of the afternoon of February 28 to the afternoon of March 1. NCDC-recorded no winter storm events that caused damage, death, or injury in Clinton County. Clinton County has incurred approximately $310,000 in damages relating to thunderstorms, including hail, lightning, and high winds since 1950. NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources.

Breese Ammonia

An estimate of property exposed to the ammonia spill was calculated by using the building inventory and intersecting these data with each of the AEGL levels. The Clinton County assessment and parcel data was utilized for this analysis. There are 984 buildings within the ammonia plume. It should be noted that the results should be interpreted as potential degrees of impact rather than exact number of buildings affected by the ammonia release. Table 4-34 lists the total amount of building exposure to each AEGL zone. Figure 4-18 depicts the ammonia spill footprint and location of the buildings exposed.

Table 4-34. Estimated Building Exposure as a Result of Ammonia Release

Occupancy	Number of Buildings		
	AEGL 1	AEGL 2	AEGL3
Residential	210	327	295
Commercial	12	29	102
Industrial	3	0	6
Total:	225	356	403

The major transportation routes and the industries located in Clinton County pose a threat of dangerous chemicals and hazardous materials release.

NFIP Status

In Clinton County, 11 incorporated communities participate in the NFIP. Participating jurisdictions will continue to comply with the NFIP through the implementation of mitigation strategies that enforce a flood damage prevention ordinance to reduce future flood risks to new construction within the SFHA. At this time, no new construction is planned within the 100-year floodplain.

As of June 30, 2016, 28 households paid flood insurance, insuring $2,499,000 in property value. The total premiums collected for the policies amounted to $22,188. Since the establishment of the NFIP in 1978, nine flood insurance claims were filed in Clinton County, totaling in $66,456.96 in payments. Table 5-2 summarizes the claims since 1978.

Table 5-2: Policy and Claim Statistics for Flood Insurance in Clinton County

Community	Total Losses	Closed Losses	Open Losses	CWOP Losses	Payments
Carlyle	3	2	0	1	$5,273.93
Centralia	6	6	0	0	$35,416.58
Clinton County	16	13	0	3	$494,752.03
New Baden	5	4	0	1	$16,573.11

*NFIP policy and claim statistics since 1978 until the most recently updated date of 03/31/2017. Closed Losses refer to losses that are paid; open losses are losses that are not paid in full; CWOP losses are losses that are closed without payment; and total losses refers to all losses submitted regardless of status. Lastly, total payments refer to the total amount paid on losses.

Records indicate that there is 1 repetitive loss structures within the county. The total amount paid for building replacement and building contents for damage to these repetitive loss structures is $7597.30. Table 5-3 describes the repetitive loss structures for each jurisdiction.

Table 5-3. Repetitive Loss Structures for each Jurisdiction in Clinton County

Jurisdiction	Number of Properties	Number of Losses	Total Paid
Breese	1	2	$7597.30
Total:	1	2	$7597.30

Implementation of the mitigation strategies is critical to the overall success of the mitigation plan. It is important to decide, based upon many factors, which action will be undertaken first. In order to

pursue the top priority first, an analysis and prioritization of the actions is vital. It is important to note that some actions may occur before the top priority due to financial, engineering, environmental, permitting, and site control issues. Public awareness and input of these mitigation actions can increase knowledge to capitalize on funding opportunities and monitoring the progress of an action. It is also critical to take into account the amount of time it will take the community to complete the mitigation project.

E. Local Hazard Mitigation Strategy

As indicated in the Stafford Act Section 322(b), Local Hazard Mitigation Plans shall describe hazard mitigation actions and establish a strategy to implement those actions. It is this mitigation strategy that serves as the long-term blueprint for reducing the potential losses identified in the plans risk assessment. The Hazard Mitigation Strategy Sections for each LHMP will be reviewed upon submission to ensure that the section identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard. Goals will be reviewed to determine if they reflect the State's mitigation goals. Objectives and projects/actions will be reviewed only to the extent necessary to determine if their implementation will achieve their goals. The Local Mitigation Projects form will be provided when the planning process begins by the SHMO and will be required by IEMA when the local mitigation plan is submitted for FEMA approval.

The information listed above that is required from the local mitigation plans will be incorporated into a work copy of the State Natural Hazard Mitigation Plan as plans receive approval. This will be an ongoing process so the information will be readily available for plan updating.

As identified in the Local Multi-Hazard Mitigation Planning Guidance, a critical step in the development of specific hazard mitigation actions and projects is assessing the community's existing authorities, policies, programs and resources. Fiscal constraints are increasingly becoming an issue in the implementation of many mitigation projects, placing an increasing emphasis on different mechanisms such as: involving staff in additional local planning activities explore funding through taxing authorities or annual budgets and establishing/maintaining regulatory authorities for comprehensive planning, building codes, and ordinances. Multi-jurisdictional hazard mitigation plans, must provide identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

Illinois' LHMPs provide a wide variety of mitigation action items in their mitigation strategy. Overall many of mitigation strategies were developed in an overarching approach, which results in an uncertainty of prioritization of the actions identified. Without specific action prioritization, it is difficult to document funding sources, responsible staff/agency to coordinate the project and identify projects with the highest mitigation benefit. As seen in the Local Mitigation Action Items Graph, the leading mitigation action group is emergency. Unfortunately, the mitigation actions identified in this group are typically non-mitigation activities related to response activities. The remaining top three groups include: policy, infrastructure and education.

Mitigation Strategy Example - Montgomery County

As stated in the Local Multi-Hazard Mitigation Planning Guidance, the mitigation strategy serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. For multi-

jurisdictional plans, each participating jurisdiction identifies the specific actions they will undertake for each hazard profiled. Some actions may apply to more than one jurisdiction, but specific mitigation actions are identified for each jurisdiction as their risk to specific hazards differs. The Montgomery County LHMP provides a good example of identifying specific mitigation actions for each participating jurisdictions within the plan. The plan identified specific mitigation actions for both the countywide and for each of the jurisdictions participating in the planning process. Below are potions of the mitigation strategy section explaining how the strategy was developed and examples of action items from the county and three participating jurisdictions.

MITIGATION STRATEGY - The mitigation strategy identifies how participating jurisdictions are going to reduce or eliminate the potential loss of life and property damage that results from the natural hazards identified in the Risk Assessment section of this Plan. The strategy includes:

- Developing mitigation goals. Mitigation goals describe the objective(s) or desired outcome(s) that the participants would like to accomplish in terms of hazard and loss prevention. These goals are intended to reduce or eliminate long-term vulnerabilities to natural hazards.
- Identifying a comprehensive range of jurisdiction-specific mitigation actions including those related to continued compliance with the National Flood Insurance Program. Mitigation actions are projects, plans, activities or programs that achieve at least one of the mitigation goals identified.
- Analyzing and prioritizing mitigation actions.
- Implementing and administering mitigation actions.
- As part of the Plan update, the mitigation strategy was reviewed and revised. A detailed discussion of each aspect of the mitigation strategy and any updates that were made is provided below.

MITIGATION GOALS - As part of the Plan update process, the mitigation goals developed in the original Plan were reviewed and re-evaluated. Planning Committee members were provided a list of the hazard mitigation goals developed for the original Plan at the first meeting held on May 14, 2015. Members were asked to review the list before the second meeting and consider whether any changes needed to be made or if additional goals should be included. At the Planning Committee's July 23, 2015 meeting, the group discussed the original list of goals and approved them with one minor language addition to Goal 3. Figure 87 lists the approved mitigation goals.

REVIEW & EVALUATION OF EXISTING MITIGATION ACTIONS - The Plan update included a review and evaluation of the *existing* hazard mitigation actions listed in the original Plan. Each of the jurisdictions who originally participated were provided a list of their existing mitigation actions at the second meeting held on July 23, 2015. They were asked to identify those actions that were either in progress or that had been completed since the original Plan was adopted in 2010. Figure 88 through Figure 95 located at the end of this section, summarize the results of this evaluation by jurisdiction.

IDENTIFICATION OF NEW MITIGATION ACTIONS - Following the review and evaluation of the existing mitigation actions, all of the Planning Committee members were asked to consult with their respective jurisdictions to identify *new* mitigation actions. The five jurisdictions new to the Plan update (Donnellson, Panama, Schram City, Taylor Springs and Waggoner) were encouraged to identify a comprehensive range of mitigation actions that would meet the specific needs and risks associated with their jurisdiction.

Figure 87 Mitigation Goals	
Goal 1	Educate people about the natural hazards they face and the ways they can protect themselves, their homes, and their businesses from those hazards.
Goal 2	Protect the lives, health, and safety of the people and animals in the County from the dangers of natural hazards.
Goal 3	Protect existing infrastructure and design new infrastructure (roads, bridges, utilities, water supplies, sanitary sewer systems, stormwater retention and elimination systems, etc.) to be resilient to the impacts of natural hazards.
Goal 4	Incorporate natural hazard mitigation into community plans and regulations.
Goal 5	Place a priority on protecting public services, including critical facilities, utilities, roads and schools.
Goal 6	Preserve and protect the rivers and floodplains in our County.
Goal 7	Ensure that new developments do not create new exposures to damage from natural hazards.
Goal 8	Protect historic, cultural, and natural resources from the effects of natural hazards.
Goal 9	Ensure proper communication between emergency services and government organizations that comply with NIMS regulations.

Representatives of the following jurisdictions were also asked to identify mitigation actions that would ensure their continued compliance with the National Flood Insurance Program. Hillsboro, Litchfield, Montgomery County, Nokomis and Witt. The compiled lists of new mitigation actions were reviewed to assure the appropriateness and suitability of each action. Those actions that were not deemed appropriate and/or suitable were either reworded or eliminated.

ANALYSIS OF MITIGATION ACTIONS

Next, those existing mitigation actions retained and all of the new mitigation actions identified were assigned to one of six broad mitigation activity categories which allowed Committee members to compare and consolidate similar actions. Figure 96 identifies each mitigation activity category and provides a brief description. Each mitigation action was then analyzed to determine:

- the hazard or hazards being mitigated;
- the degree to which the impacts associated with a particular hazard(s) would be mitigated (i.e., reduced or eliminated);
- the general size of the population affected (i.e., small, medium or large);
- the goal or goals fulfilled;
- whether the action would reduce the effects on new or existing buildings and infrastructure; and
- whether the action would ensure continued compliance with the NFIP.

Figure 96 Types of Mitigation Activities	
Category	Description
Regulatory Activities (RA)	Regulatory activities are designed to reduce a jurisdiction's vulnerability to specific hazard events. These activities are especially effective in hazard prone areas where development has yet to occur. Examples include: planning and zoning, floodplain regulations and local ordinances (i.e., building codes, etc.).
Structural Projects (SP)	Structural projects lessen the impact that a hazard has on a particular structure through design and engineering. Examples include: storm sewers, road and bridge projects, storm/tornado shelters, flood walls and seismic retrofits.
Public Information & Awareness (PI)	Public information and awareness activities are used to educate individuals about the potential hazards that affect their community and the mitigation strategies that they can take part in to protect themselves and their property. Examples include: outreach programs, school programs, brochures and handout materials, evacuation planning and drills, volunteer activities (i.e., culvert cleanout days, initiatives to check on the elderly/disabled during hazard events, etc.).
Studies (S)	Studies are used to identify activities that can be undertaken to reduce the impacts associated with certain hazards. Examples include: hydraulic and drainage studies.
Miscellaneous Projects (MP)	Miscellaneous projects is a catchall for those activities or projects that help to reduce or lessen the impact that a hazard may have on a critical facility or community service. Examples include: snow fences, generators, warning sirens, etc.
Property Protection (PP)	Property protection activities are designed to retrofit existing structures to withstand natural hazards or to remove structures from hazard prone areas. In Illinois, this category of activities primarily pertains to flood protection. Examples include: acquisition, relocation, elevation, insurance (i.e., flood, homeowners, etc.) and retrofitting (i.e., impact resistant windows, etc.).

REVIEW OF PRIORITIZATION METHODOLOGY

Also included in the Plan update process was a review of the methodology developed in the original Plan to prioritize each action. This original prioritization methodology was presented to the Planning Committee members at the third meeting held on October 22, 2015. The group reviewed and discussed the methodology and chose to approve it with no changes.

Figure 97 identifies and describes the four-tiered prioritization methodology re-adopted by the Committee. The methodology developed provides a means of objectively determining which actions have a greater likelihood of eliminating or reducing the long-term vulnerabilities associated with the most frequently-occurring natural hazards.

While prioritizing the actions is useful and provides participants with additional information, it is important to keep in mind that implementing all the mitigation actions is desirable regardless of which prioritization category an action falls under.

IMPLEMENTATION & ADMINISTRATION OF MITIGATION ACTIONS

Finally, each participating jurisdiction was asked to identify how the mitigation actions will be implemented and administered. This included:

- Identifying the party or parties responsible for oversight and administration.
- Determining what funding source(s) are available or will be pursued.
- Describing the time frame for completion.

Figure 97
Mitigation Action Prioritization Methodology

		Hazard	
		Most Significant Hazard (M) (i.e., severe storms, severe winter storms, extreme heat, tornadoes)	Less Significant Hazard (L) (i.e., floods, drought, earthquakes, dam failures)
Mitigation Action	Mitigation Action with the Potential to Virtually Eliminate or Significantly Reduce Impacts (H)	HM mitigation action will virtually eliminate damages and/or significantly reduce the probability of fatalities and injuries from the most significant hazards	HL mitigation action will virtually eliminate damages and/or significantly reduce the probability of fatalities and injuries from less significant hazards
	Mitigation Action with the Potential to Reduce Impacts (L)	LM mitigation action has the potential to reduce damages, fatalities and/or injuries from the most significant hazards	LL mitigation action has the potential to reduce damages, fatalities and/or injuries from less significant hazards

In addition, a preliminary qualitative cost/benefit analysis was conducted on each mitigation action. The costs and benefits were analyzed in terms of the general overall cost to complete an action as well as the action's likelihood of permanently eliminating or reducing the risk associated with a specific hazard. The general descriptors of high, medium and low were used. These terms are not meant to translate into a specific dollar amount, but rather to provide a relative comparison between the actions identified by each jurisdiction.

This analysis is only meant to give the participants a starting point to compare which actions are likely to provide the greatest benefit based on the financial cost and staffing effort needed. It was repeatedly communicated to the Planning Committee members that when a grant application is submitted to IEMA/FEMA for a specific action, a detailed cost/benefit analysis will be required to receive funding.

RESULTS OF MITIGATION STRATEGY

The following Table summarizes the results of the Montgomery County mitigation strategy.

Acronyms –

Figure 98
(Sheet 1 of 9)
Montgomery County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis	Status
							New	Existing					
County Board													
LM	Scan Montgomery County records from all County offices for easier public access and secure archival of paper originals or paper copies of same.	EQ, F, SS, SWS, T	MP	Eliminates	Large	5, 8	n/a	n/a	County Board / Individual Departments	3 years	TBD	Medium/High	New
LL	Better binding and archiving of paper originals or paper copies of same of Montgomery County records from all County offices to preserve these valuable records.	EH	MP	Reduces	Large	5, 8	n/a	n/a	County Board / Individual Departments	3 years	TBD	Medium/High	New
HM	Design and construct a community safe room (tornado shelter) at the Recycling Center that is equipped with automatic emergency backup generator and heating/air conditioning units that can also serve as an emergency shelter/heating and cooling center for staff and area residents.	EH, EQ, F, SS, SWS, T	SP	Reduces	Small	2	Yes	n/a	County Board	TBD	75% Federal 25% Local	High/High	New
HM	Purchase and install R95 grounding system at all Montgomery County facilities to protect critical systems and improve the building's ability to survive a lightning strike/ electromagnetic pulse event.	SS	MP	Reduces	Small	2, 3, 5	n/a	Yes	County Board	TBD	TBD	Medium/High	New

Hazard(s) to be Mitigated: DF-Dam Failure F-Flood DR-Drought SS-Severe Storms (Thunderstorms, etc.) EH-Extreme Heat SWS-Severe Winter Storms (Snow, etc.) EQ-Earthquake T-Tornado

Type of Mitigation Activity: RA-Regulatory Activities S-Studies SP-Structural Projects MP-Miscellaneous Projects PI-Public Involvement PP-Property Protection

Figure 98
(Sheet 2 of 9)
Montgomery County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis	Status
							New	Existing					
County Board Continued…													
HM	Replace all the windows in the County buildings with shatter-resistant/shatter-proof glass to make the buildings resistant to natural hazards.	EQ, SS, T	SP	Reduces	Medium	2, 3, 5	n/a	Yes	County Board	TBD	75% Federal 25% Local	Medium/Medium	New
HM	Retrofit the Montgomery County Courthouse to include a community safe room (tornado sheltet) with automatic emergency backup generator for use by staff and area residents. The shelter would also serve as a heating/cooling center and emergency services shelter and contact center.	EH, EQ, F, SS, SWS, T	SP	Reduces	Small	2, 3, 5	n/a	Yes	County Board	TBD	75% Federal 25% Local	High/High	New
HM	Purchase and install automatic emergency backup generator at the County Courthouse to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	County Board	TBD	TBD	Low/High	New
HM	Purchase and install automatic emergency backup generator at the County Highway Department to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	County Board	TBD	TBD	Low/High	New
HM	Purchase and install automatic emergency backup generator at the County Health Department to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	County Board	TBD	TBD	Low/High	New

Figure 98
(Sheet 3 of 9)
Montgomery County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis	Status
							New	Existing					
County Board Continued…													
HM	Purchase and install automatic emergency backup generator at the Historic Courthouse to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	County Board	TBD	TBD	Low/High	New
HM	Purchase and install automatic emergency backup generator at the Montgomery County Jail to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	County Board	TBD	TBD	Low/High	New
Animal Control													
HM	Design and construct a community safe room (tornado shelter) at the Animal Control Facility that is equipped with automatic emergency backup generator and heating/air conditioning units that can also serve as an emergency shelter for staff, volunteers, visitors and area residents.	EQ, F, SS, T	SP	Reduces	Small	2	Yes	n/a	County Board	TBD	75% Federal 25% Local	High/High	New
LM	Develop and distribute educational materials to the general public on emergency preparedness and evacuation plans for companion animals & farm animals in the event of a natural hazard occurrence.	DF, EH, EQ, F, SS, SWS, T	PI	Reduces	Medium	1, 2	n/a	n/a	County Board	TBD	TBD	Low/High	New

Figure 98
(Sheet 4 of 9)
Montgomery County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis	Status
							New	Existing					
Animal Control Continued…													
HM	Purchase and install grounding system at Animal Control Facility to protect critical systems and improve each facility's ability to survive a lightning strike.	SS	MP	Reduces	Small	2, 3, 5	n/a	Yes	County Board	TBD	TBD	Medium/High	New
HM	Install landscape (living snow fences)/man-made barriers along 9th Ave. in Hillsboro in the low areas to maintain access to the Animal Control Facility and ease hazardous driving conditions.	SWS	MP	Reduces	Small	2, 3, 5	n/a	Yes	County Board	TBD	TBD	Low/Medium	New
LM	Instruct staff on Emergency Operations Plan for companion animals.	DF, EH, EQ, F, SS, SWS, T	PI	Reduces	Medium	2	n/a	n/a	County Board	TBD	County	Low/High	New
HM	Purchase and install a water storage tank to serve as an auxiliary water supply source during natural hazard events.	EQ, F, SS, SWS, T	MP	Reduces	Small	2, 5	n/a	n/a	County Board	TBD	TBD	Medium/Medium	New
LM	Develop small animal rescue strike tem per FEMA 508-1 Typed Resource Definitions Animal Health Resources guidance.	DF, EH, EQ, F, SS, SWS, T	PI	Reduces	Medium	2	n/a	n/a	County Board	TBD	County	Low/High	New
LM	Develop small animal sheltering team per FEMA 508-1 Typed Resource Definitions Animal Health Resources guidance.	DF, EH, EQ, F, SS, SWS, T	PI	Reduces	Medium	2	n/a	n/a	County Board	TBD	County	Low/High	New

Figure 98
(Sheet 5 of 9)
Montgomery County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis	Status
							New	Existing					
Clerk/Recorder													
LM	Scan Montgomery County Land Records (deeds, mortgages, surveys, easements, misc.) from 1822 – 1991 for easier public access and secure archival of paper originals or paper copies of same housed in Land Records Vault.	EQ, F, SS, SWS, T	MP	Eliminates	Large	5, 8	n/a	n/a	Clerk/Recorder	1 year	TBD	Medium/High	Existing (2010)
LL	Better binding and archiving of paper originals or paper copies of same housed in Land Records Vault, Historic Courthouse, Hillsboro, IL.	EH	MP	Reduces	Large	5, 8	n/a	n/a	Clerk/Recorder	1 year	TBD	Medium/High	Existing (2010)
911													
LM	Purchase and install a grounding system for file repeater and store forward radio sites to improve their ability to survive lightning strikes.	SS	MP	Reduces	Medium	2, 3, 5, 9	n/a	n/a	911	2 years	TBD	Medium/High	Existing (2010)
HM	Purchase stand alone generators for each repeater/store forward tower site in the County (seven total).	EH, EQ, F,SS, SWS, T	MP	Reduces	Medium	2, 3, 5, 9	n/a	n/a	911	3 years	TBD	Medium/High	Existing (2010)
HM	Purchase a repeater system for backup needs in case of main system failure during emergencies.	EQ, F, SS, SWS, T	MP	Reduces	Large	2, 5, 9	n/a	n/a	911	4 years	TBD	Medium/High	Existing (2010)
LM	Evaluate existing 911 facilities/tower sites for potential natural hazard vulnerabilities.	DF, EQ, EH, F, SS, SWS, T	S	Reduces	Large	2, 3, 5, 9	Yes	Yes	911	4 years	TBD	Low/High	Existing (2010)
HM	Alternate tower site for primary communications systems during primary system failure.	EH, EQ, F, SS, SWS, T	SP	Eliminates	Large	2, 3, 5, 9	n/a	n/a	911	5 years	TBD	High/High	Existing (2010)

Figure 98
(Sheet 6 of 9)
Montgomery County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis	Status
							New	Existing					
911 Continued…													
LM	Alternate paging system for public safety agencies to enhance the ability to page agencies during reduced operations during an emergency.	DF, EH, EQ, F, SS, SWS, T	MP	Reduces	Large	2, 3, 5, 9	n/a	n/a	911	6 years	TBD	Medium/High	Existing (2010)
HM	Evaluate the need and design of an enhanced trunked radio system for public safety agencies to improve crisis/emergency communications and meet narrow banding requirements.	DF, EH, EQ, F, SS, SWS, T	MP	Reduces	Large	2, 3, 5, 9	Yes	Yes	911	6 years	TBD	High/High	Existing (2010)
EMA													
HM	Purchase and install storm warning siren systems in unincorporated communities and subdivisions within the County.	SS, T	MP	Reduces	Small	2	n/a	n/a	EMA	TBD	TBD	Medium/High	New
HM	Purchase and install storm warning sirens in communities that do not have any sirens or do not have adequate coverage with existing sirens.	SS, T	MP	Reduces	Small	2	n/a	n/a	EMA	TBD	TBD	Medium/High	New
LL	Review and present for adoption the revised Flood Insurance Rate Maps when they become available.*	F	RA	Reduces	Small	6, 7	Yes	Yes	EMA	TBD	County	Low/Medium	Existing (2010)

Figure 98
(Sheet 7 of 9)
Montgomery County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis	Status
							New	Existing					
EMA Continued…													
LL	Make the most recent Flood Insurance Rate Maps available at the County Clerk/Recorder's office to assist the public in considering where to construct new buildings and make county officials aware of the maps and issues related to construction in a floodplain.*	F	RA	Reduces	Small	1, 6, 7	Yes	Yes	EMA	TBD	County	Low/Medium	Existing (2010)
LL	Make information materials available to the public about the National Flood Insurance Program's voluntary Community Rating System.*	F	PP	Reduces	Small	1, 6, 7	Yes	Yes	EMA	TBD	County	Low/Medium	Existing (2010)
Highway Department													
LM	Remove and dispose of trees and brush adjacent to highways.	F, SS, SWS	MP	Reduces	Medium	2, 3, 5	n/a	Yes	Highway Department	Ongoing	County	Medium/Medium	Existing (2010)
LM	Evaluate existing road, bridge, culvert and storm sewer infrastructure to identify natural hazard vulnerabilities.	EQ, F, SS, SWS	S	Reduces	Large	2, 3, 5	Yes	Yes	Highway Department	1 year	TBD	Medium/Medium	Existing (2010)
HM	Perform preliminary engineering and construct, retrofit or completely replace road, bridge, culvert and storm sewer infrastructure as recommended to mitigate natural hazard vulnerabilities.	EQ, F, SS, SWS	SP	Reduces	Large	2, 3, 5	n/a	Yes	Highway Department	Ongoing	TBD	High/High	Existing (2010)

Figure 98
(Sheet 8 of 9)
Montgomery County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis	Status
							New	Existing					
Highway Department Continued…													
LM	Evaluate existing Highway Department administrative, maintenance, equipment storage buildings and radio transmitter to identify natural hazard vulnerabilities	EH, EQ, F, SS, SWS, T	S	Reduces	Large	2, 3, 5	Yes	Yes	Highway Department	1 year	TBD	Low/Medium	Existing (2010)
HM	Perform preliminary engineering and architecture work to construct, retrofit or completely replace the Highway Department's administrative, maintenance, equipment storage buildings and radio transmitter to mitigate identified natural hazard vulnerabilities.	EH, EQ, F, SS, SWS, T	SP	Reduces	Large	2, 3, 5	n/a	Yes	Highway Department	2 years	TBD	High/High	Existing (2010)
LM	Prepare public information, including long range plans, maps, policies, and procedures and make them available online along with an area for the public to make comments.	DF, DR, EQ, EH, F, SS, SWS, T	PI	Reduces	Large	1, 2	Yes	Yes	Highway Department	2 years	TBD	Low/High	Existing (2010)
LM	Protect historical Highway Department documents including plans, specifications, construction records and agreements by scanning, inventorying and storing off site.	EQ, F, SS, SWS, T	MP	Eliminates	Large	5, 8	n/a	n/a	Highway Department	3 years	TBD	Medium/High	Existing (2010)
LM	Purchase road signage and barricades to warn and detour traffic in the event a natural disaster causes dangerous or impassable conditions.	DF, EH, EQ, F, SS, SWS, T	MP	Reduces	Large	2	NA	NA	Highway Department	1 year	TBD	Low/High	Existing (2010)
HL	Retrofit the Simpson Bridge against seismic and flood damage.	EQ, F	SP	Reduces	Small	2, 3, 5	n/a	Yes	Highway Department	2 years	75% Federal 25% Local	High/Medium	Existing (2010)

Figure 98
(Sheet 9 of 9)
Montgomery County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis	Status
							New	Existing					
Sheriff's Office													
HM	Establish a Montgomery County Sheriff's Office (MCSO) Building/Jail Emergency Operating Center (EOC) in the event that the main facility is destroyed or inoperable.	EQ, F, SS, SWS, T	SP	Reduces	Large	2, 5	Yes	Yes	Sheriff's Office	1 year	75% Federal 25% Local	High/High	Existing (2010)
HM	Training for Montgomery County Sheriff's Office personnel on County Emergency Operating Procedures.	DF, EH, EQ, F, SS, SWS, T	MP	Reduces	Large	2, 9	n/a	n/a	Sheriff's Office	Ongoing	County	Low/High	Existing (2010)
Supervisor of Assessments													
LL	Obtain new high resolution orthographic photography of Montgomery County with LIDAR topographic Digital Elevation Model (1 ft. contours) for flood analysis.	F, SS, SWS	MP	Reduces	Large	2, 3, 5, 7	Yes	Yes	Supervisor of Assessments	TBD	TBD	Medium/Medium	New
LL	Upon obtaining new LIDAR data, perform floodway delineation analysis of selected waterways and streams in the County to identify areas where flood mitigation measures need to be implemented.	F, SS, SWS	S	Reduces	Medium	2, 3, 5, 7	Yes	Yes	Supervisor of Assessments	TBD	75% Federal 25% Local	Medium/Medium	New

F. Local Hazard Mitigation Plan Development

44 CFR Part 201 requires a narrative description of the process used to develop the mitigation plan. A systematic account about how the mitigation plan evolved from the moment the planning team was created and the public participated, to how it will be implemented. This description of the planning process serves as a permanent record that explains how decisions were reached and who was involved.

Illinois' LHMPs were developed utilizing the resources of a number of independent contractors, planning commissions and in-house local jurisdictional participation by a responsible agency. Twelve different consultants and regional planning commissions have been utilized in the development of Illinois LHMPs. This diversity has resulted in a variety of different planning methods and techniques. All LHMPs have incorporated public involvement at different levels. LHMPs have utilized a variety of different methods to gather public comment and input including: open meetings, interactive websites, questionnaires and surveys.

In addition, a wide variety of stakeholders have been involved in the LHMPs planning process. Illinois LHMPs have been successful in engaging stakeholders that have the data and expertise needed to develop the plan, while also having the authority or responsibility to implement the hazard mitigation activities identified in the plan. This has been accomplished by involving stakeholders from emergency service agencies (emergency management, police, fire, ems), public works, public health, academia, state agencies, federal agencies, levee districts, township officials, GIS, school districts, zoning, storm water management, engineering, elected officials, private business (electrical co-operatives, insurance companies, local industry) and public residence. This diverse foundation of stakeholders provides for a planning process that integrates local knowledge into the hazard analysis and risk assessment, while developing specific actions to eliminate or reduce these risks.

All LHMPs have identified a plan maintenance section within the plan that addresses the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle. However, many of the approved LHMPs fail to compile with this schedule, resulting in difficulty in the update and implementation of the plan.

In over 95% of all of the LHMPs developed, the emergency management agency was utilized as the lead responsible agency during the planning process. Approximately 80% of all LHMPs were developed by an independent contractor, followed by Regional Planning Commissions at 15%. The remaining 5% of the LHMPs were the result of in-house development. It is expected that, over the coming years, there will be an increase in the LHMP updates being conducted by local agencies with little to no consultant involvement.

The State of Illinois will require the local jurisdictions to complete the Local Hazard Mitigation Plan Review Tool. This review tool is available on the IEMA Mitigation website and through the State

Hazard Mitigation Officer (SHMO) or the State Hazard Mitigation Planner. However, local jurisdictions are encouraged not to adopt the plan until it has FEMA approval.
Each local jurisdiction shall complete the following sections:

- Appendix A: Jurisdiction specific information (Contact Information) Page A-1
- Section 1: Regulation Checklist- The location of where each requirement is met in the plan is required to be entered into the Location in Plan section. Page A-2 thru A-5
- Section 3: Multi-Jurisdiction Summary Sheet (If applicable) –The multi-jurisdiction summary should be completed in the event of a multi-jurisdictional plan. Page A-10

The plan will be reviewed by State mitigation staff within two months of receipt of the plan. If the plan is acceptable, it will be sent to FEMA for a final review. Should a plan be unacceptable, it will be returned to the local jurisdiction with the appropriate comments provided on the Local Hazard Mitigation Plan Review Tool. When the State is notified that a local plan is acceptable pending the adoption of the plan, the SHMO or State Mitigation Planner will notify the local jurisdiction. When the adoption process is complete at the local level, the documentation will be forwarded to FEMA from IEMA.

The following three sections from local plans have to be incorporated into the Illinois Natural Hazards Mitigation Plan as they are approved by FEMA: Hazard Analysis and Risk Assessments, Inventory Assets/Loss Estimations and Mitigation Projects. When the initial local planning process for DMA2k begins (and whenever the local planning update process begins) these forms will be sent to the local jurisdiction to be completed during the planning process. These forms will be provided by the SHMO and required when the local jurisdiction's plan is submitted to IEMA for approval. When they are returned the information will be incorporated into the sections of the State plan as indicated below.

Information to complete these forms except for type of structure on the earthquake form can be found in the how-to guide mentioned above. These forms were provided when the local planning process began. When local plans receive FEMA approval this information will be incorporated into the Hazard Analysis and Risk assessment section of the State Mitigation Plan.

VI. PLAN MAINTENANCE PROCESS

A. Monitoring, Evaluating, Updating and Distributing the Plan

To accomplish the monitoring and evaluation tasks, the State will make use of the FEMA planning guide series, "State and Local Mitigation Planning how-to-guide: Bringing the Plan to Life." The associated worksheets of this guide, or similar data collection format, will be used for strategy progress reporting, evaluating the planning team, evaluating project results, revising the risk assessment, and updating the general plan itself.

Public participation strategies such as website postings and outreach through conferences and workshops will continue throughout the life of the plan. In addition to these types of outreach strategies, IEMA have also included the post disaster mitigation briefings to explain the benefits of the program to the general public as well as potential planning bodies. Opportunities for public review will be made possible through local contacts throughout the state via local emergency managers, planners and State Regional Coordinators.

The State recognizes that the Illinois Natural Hazard Mitigation Plan is a living document and requires regular monitoring, review and evaluation. Also, the Federal hazard mitigation planning regulations require the State plan to be updated and submitted for approval to the Regional Administrator of FEMA every five years. Monitoring of the Plan as a whole will occur during the Plan review, which will begin approximately 12 months before FEMA approval is required. The Illinois Natural Hazard Mitigation Planning Committee (INHMPC) and the Mitigation Coordination and Strategy Committee (MCSC) will meet and be responsible for reviewing and evaluating the Mitigation Plan. These committees have previously been identified in the planning process section. These combined committees will meet once a year. If political or hazard events change and dictate an earlier review, then the members will be solicited via telephone or e-mail contact for their input to these changes. All members will be asked to analyze the overall success and progress in implementing the Plan.

- Review the goals and action items to determine their relevance to changing situations in the State as well as changes in policy and to ensure they are addressing current and expected conditions.
- Review the Risk Assessment and Capabilities portion, as necessary, to incorporate current information, including updated hazard profiles and any new data on vulnerable state facilities.
- Monitor progress on mitigation actions and projects in the Plan by reviewing quarterly progress reports. The database of all local plans and local action items will be reviewed as part of the process.
- Evaluate mitigation actions and projects in the Plan by reviewing the final quarterly progress report. When possible the actions will be reported on by the party responsible for its implementation, and will include which implementation processes worked well, any difficulties encountered, how coordination efforts were proceeding and which strategies or processes need to be revised or strengthened.
- Identify implementation problems (technical, political, legal and financial) based on quarterly progress reports and input by the public and partners.
- Evaluate the effectiveness of the planning effort by using Worksheet #2. Evaluate Your Planning Team.
- Consider recommendations by the INHMPC members to increase hazard mitigation involvement by state agencies and local jurisdictions.

- Discuss changes in policies, priorities, programs and funding that alter the Plan's goals and objectives, projects and time lines.

Should the INHMPC or the MCSC determine during the annual meeting that the Plan should be updated, a meeting will be scheduled for updating the Plan. Review and update will involve all of the original participants in the planning process and others identified as important for the Plan update (i.e., the INHMPC comprised of the MCSC, other State and federal agencies, various associations from the State, business and public sectors). A list of recommendations or enhancements compiled during the annual INHMPC meeting will be used to update the Plan. The State will update its plan as necessary to reflect:

- Hazards addressed in the Plan – All of the natural hazards that have been identified as posing a threat to the State of Illinois have been included in the Plan. As situations change or new information becomes available 1) the hazards currently included in the Plan will be updated and 2) new hazards identified as a threat will be added to the Plan.
- State owned structures – A State owned and other Critical Facilities Database is included. This database inventories all state owned structures and will be maintained, as necessary. This list is projected to be replaced with a more comprehensive GIS database for future plan updates.
- HAZUS Analysis – HAZUS, the risk assessment software program, was attempted in previous editions of the Plan. The capability of the IEMA mitigation staff to perform the work is unmanageable. IEMA has and continues to plan on utilizing grant funds to contract the work for future plan update. IEMA continues to refer to the local mitigation plan HAZUS runs as they are completed in order to acquire the needed data. Grant funding was successfully secured for the 2013 update to conduct a HAZUS analysis regarding the flooding risks in Illinois. An individual report for each county was compiled, with county specific reports being supplied to each county's emergency management agency. These documents are available upon request; however, because of the length of each HAZUS run for individual counties they are not included in this plan. The overall state report has been added to the 2018 INHMP update as an appendix.
- New mitigation actions and projects – Additional actions and projects may be identified during the Plan evaluation.
- Problem identification and resolution – Recommendations developed to overcome problems (technical, political, legal and financial) may affect the mitigation strategy.
- Incorporation of Local Plan Action Items – the Action Items listing will be updated after the final approval of the local hazard mitigation plan. The Action Items section of the State plan will be updated to reflect local plan information. As local action items are completed based on information provided by the PDM and HMGP program coordinators and county emergency managers, the mitigation planner will compile a list and insert it into the five-year update as an appendix.
- Incorporation of Local Plan Hazard Ratings- Upon the completion or update of local hazard mitigation plans, the mitigation planner will re-evaluate and incorporate the results of the local hazard ratings into the hazard ratings of the State's plan to ensure consistency and accuracy between the plans. These changes and correlations will be incorporated into the five-year update as part of the State's Hazard Rating System.

This process will occur as needed, but at least every five years. The Illinois Emergency Management Agency (IEMA) will be responsible for making the necessary changes to the Plan. The State Hazard Mitigation Officer (SHMO) has the overall authority and responsibility for maintenance of the plan. The revised Plan will be submitted for approval to the INHMPC no later than three months after the conclusion of the committee

meeting. FEMA will be notified of any changes to the Plan or will be given a justification of why no changes were deemed necessary. When revised, the Plan will be resubmitted to FEMA for their review as required by the federal Mitigation planning guidelines. Once FEMA has determined the Plan is approval pending adoption, the updated Plan will be submitted for approval by the Governor and the INHMPC no later than three months after the conclusion of the plan update meeting.

Disasters provide an opportunity to evaluate the effects of the disaster, to improve resistance to the hazard, review the accuracy of hazard specific sections and to determine if the planning efforts affected damage reduction. In the case of a disaster declaration in the State, the Plan can be updated if IEMA or the INHMPC believes this is necessary. A post-disaster review may replace an annual review depending upon the severity of the disaster event.

The mitigation staff is responsible for reviewing all Local Mitigation Plans based on the criteria established in 44 CFR 201.6 within 30 days of the arrival date and either certifying the plan or supplying comments, as needed. Upon the certification or approval of the Local Mitigation Plan, the mitigation staff has 180 days to update the Local Hazard Assessment, Local Capability Assessment, Actions Items section and the database of the Action Item Listing sections of the Illinois Natural Hazard Mitigation Plan with the new material from the Local Mitigation Plans.

The Plan, and any changes to it, will be available in an electronic format on the IEMA website. Hard copies of the Plan will be distributed to State and Federal agencies as requested and required. IEMA will maintain a distribution list for hard copies provided to such agencies to facilitate the distribution of plan revisions.

Inquiries about the Plan should be directed to:

State Hazard Mitigation Officer
1035 Outer Park Drive
Springfield, IL 62704-4462
Phone: (217) 785-9942
E-mail: sam.m.al-basha@illinois.gov
www.state.il.us/iema/

B. Monitoring Progress of Mitigation Activities

IEMA is responsible for the monitoring and tracking of the progress of mitigation actions. The SHMO has been assigned to monitor and track the progress of mitigation measures by following-up with other agencies. In addition to the SHMO, the MCSC has been identified in the planning process section as the committee who will monitor the progress of mitigation actions and will meet on a monthly basis for the review.

The SHMO collects quarterly reports on measurable outcomes, which are then input into a database which will be distributed to all participating agencies. These reports are reviewed by the SHMO to evaluate the measurable outcomes. Once a year MCSC committee reviews the overall progress on achieving the Plan's goals. This group verifies project closeouts and reviews the level of coordination among agencies, which is a key to the success in implementing the Plan.

IEMA mitigation staff tracks progress through quarterly reports from sub-grantees. Once a project is approved, it is added to the IMAG list of projects to be discussed at the monthly meeting. Also, at the end of each quarter, a progress report is submitted to FEMA listing each project.

Once a year the MCSC will meet jointly with the INHMPC to report on the overall progress on achieving the Plan's goals, review any new information and make recommendations to the SHMO for updating the baseline data used in the risk analysis. This information is used to reassess project prioritization, as necessary.

- Project outcomes (successes/difficulties/what could have been done better) using the last Quarterly Report as the final evaluation;
- Relevance of goals to changing situations;
- New information learned from disasters, studies or reports;
- Changes in State or federal policy;
- Risk assessment updates; and
- Level of coordination among agencies in the State

Goals, objectives and projects will be reviewed in the event of a disaster to determine whether they need to be modified to reflect the new conditions and the findings appended to the existing Plan. Based on the current conditions, the goals and projects will be reevaluated to determine if there is a need to modify the Plan. If necessary, the SHMO will update the Plan based on the recommendations of the INHMPC. Each action will be reviewed by members of the planning committee, and updates such as contacts, prioritization, and fund names will be updated.

FEMA requires that all disasters be closed and project activity terminated within five years of a disaster declaration. The SHMO will ensure that all grant projects are closed after all approved work has been completed or within two years of the date of project approval, whichever comes first. The SHMO will monitor all project files and fiscal issues and perform an annual site visit to ensure the community's compliance. The Project Manager is responsible for notifying the SHMO within 10 days of completion of the project. The SHMO will schedule a final site visit to review all program and fiscal records related to the project, and all unspent funds being held by the community must be returned.

A programmatic and fiscal closeout ensures that all claims and costs are eligible and in compliance with the Project Application and program requirements. At the time of the closeout, all files not previously reviewed or completed will be reviewed to ensure all necessary documents are included. If a file does not contain all required documentation, the Project Manager will be required to provide the information within 30 days of closeout. When all files are complete, the SHMO prepares a spreadsheet providing the total project costs and appropriate cost shares. IEMA and community will comply with the Single Audit Act, as amended, and maintain all project documentation for a period of three years following project or disaster closeouts.

The State mitigation staff will monitor, review and evaluate the deadlines for each project and assess the status of the goals and activities throughout the year. Any recommendations regarding actions necessary to ensure a project's completion will be reported to the SHMO. The SHMO in coordination with the INHMPC and MCSC are responsible for monitoring and updating the plan.

The State continues to make progress and improvements with the INHMP. Collaboration and partnerships between state agencies continues to be the catalyst that helps creating a successful mitigation plan. This

collaboration is seen with the continued growth of adding additional state agencies to planning committee in an effort to obtain a better planning foundation. In addition, these partnerships assist in providing increased educational opportunities, grant funding and specialized programs specific to achieving the mitigation goals in Illinois. In addition, partnerships with private, non-profit and academia organizations continue to expand, creating additional mitigation opportunities. IEMA will continue these relationships and anticipate further growth in these partnerships.

In addition, improvements to IEMA's website (http://www.state.il.us/iema/planning/planning.htm) were achieved to provide additional mitigation information. The State Plan, planning guides and success stories were posted on IEMA's website. Furthermore, the site update provides local jurisdictions with step-by-step instructions on how to apply for PDM and FMA grants. A "Hazard Mitigation Tool Box" was also added to the IEMA website. This "toolbox" provides templates and examples for developing successful applications for HMGP grant funds and planning documents, as well as examples of budgets, budget narratives, scope of work, cost match letters and procurement documentation. This has proved to be a valuable asset to many of Illinois' jurisdictions seeking grant funding.

The website update was also very successful in getting local jurisdictions interested in preparing mitigation plans to be in compliance with the Disaster Act of 2000 and as a result, fifty-six county and four municipality plans were approved. Twenty-four counties are currently developing hazard mitigation plans with the goal of completing them all by the end of 2018. Planning interest has increased significantly over the last five years. Over 80% of Illinois' counties have had or are currently developing a hazard mitigation plan. IEMA will continue to solicit counties to update their hazard mitigation plan. There are many mitigation actions that can be completed by local jurisdictions with little to no funding required from the State or Federal governments, larger projects, which historically have the biggest impact on reducing the risks, are still required to maintain interest in mitigation planning. The SHMO suggested that by extending the number of years a local hazard mitigation plan is active would be beneficial, by allowing for a greater opportunity to utilize existing or future mitigation funds for projects. The State mitigation staff coordinates the review of these plans in the form of technical assistance and direct review before the plan is officially submitted to FEMA.

VII. APPENDICES

Appendix A: City of Ottawa, Illinois and City of Keithsburg, Illinois Case Studies

Loss Avoidance through Property Buyouts:
Case Studies for the City of Ottawa, IL and City of Keithsburg, IL

Prepared for:
Illinois Emergency Management Agency
2018 State of Illinois Natural Hazard Mitigation Plan

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ILLINOIS
Illinois State Water Survey
PRAIRIE RESEARCH INSTITUTE

City of Ottawa, Illinois: A Case Study

Prepared by the Illinois State Water Survey

May 2018

Located at the confluence of the Illinois and Fox Rivers, the City of Ottawa, Illinois has a history of dealing with flooding. With an estimated population of 18,289 in 2016 (U.S. Census, 2018) it is the most populous city in LaSalle County and serves as the county seat. In July of 1996, north central and north eastern Illinois experienced a period of heavy rainfall. This event caused extensive flooding in the area and even prompted a federal disaster declaration (DR1129). Ottawa was one of the communities that was impacted, with flooding from the Fox River and Illinois River damaging several properties. Using funds made available from DR1129, Ottawa began buying many of the properties that were damaged in this flood event with the intent to remove them from the floodplain. Since these buyouts began, there have been several more flood events in this area, some of which have been at well above flood stage. This case study looks at some of the economic impacts of these buyouts by estimating the losses avoided through removing these properties from the floodplain. By comparing these losses avoided to the initial investment of the buyouts, a return on investment for this program can be estimated.

1996 - DR1129 Flooding

Incident Period:
July 17, 1996 - August 07, 1996

Major Disaster Declaration:
July 25, 1996

Cook, DeKalb, DuPage, Grundy, Kane, Kendall, LaSalle, Ogle, Stephenson, Will

"The rainstorm on July 17-18, 1996, produced several rainfall records and (at the time) was the second most costly weather disaster in Illinois behind the 1993 flood. The 16.94 inches recorded at Aurora still stands as the statewide record for the most rain from a single 24-hour period. The 10.99 inches on the west side of the Chicago metro area was the most recorded in the Chicago urban area." Jim Angel, https://www.weather.gov/lot/1996Jul1718_rain

Loss Avoidance

The purchase of residences and other structures that have flooded unburdens the owners, the community, and the National Flood Insurance Program (NFIP). The buyout program eligibility is based on a cost-benefit ratio calculation using the probability of future flooding and resulting expected damages. In the long run, it is less costly to purchase the damaged home than to repeatedly pay to repair flood damages. After purchase and removal, the actual flood damage losses avoided can be calculated by considering the cumulative damages that would likely have resulted were the structure still in place during subsequent actual flood events. A simplistic, but widely accepted approach considers the expected cost to repair damage to the structure each time it would likely have been damaged by floodwaters. The distribution of the cost to the owner and the NFIP would depend on the level of insured value. There are other costs avoided by removing a structure from a flood hazard area including, but not limited to,

displacement/loss of use, debris removal, service utility repair, and emergency action. However, some of these considerations are significant only if several structures in a contiguous area are removed.

The Federal Emergency Management Agency (FEMA) Hazus program (FEMA, 2017) is a nationally recognized method to estimate potential losses from natural hazards. Estimates of flood losses can be performed with user inputs of specific structure information and flood depth. In a loss avoidance assessment, the structure information for the purchase and removal of structures and flood data for events occurring after the purchase are input into Hazus for the assessment. The Hazus program has a number of modules to estimate other types of losses such as those noted above; however, unless local data are available to calibrate or validate estimates, the default values may or may not represent a particular area if these other costs savings have not yet been evaluated.

The City of Ottawa has a strong program for buying structures that have been flood damaged and has effectively reduced the community's exposure to this natural hazard. A significant number of structures were purchased after the 1996 flood, with the first purchase recorded in 1997. Additional structure buyouts occurred between 1998 and 2001, and again in 2012 and 2013. Funding for these buyouts was provided through grant programs from multiple sources, including the Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR), the Illinois Emergency Management Agency (IEMA managed funds from FEMA) and, of course, from the City of Ottawa itself. Many of the structures removed from the floodplain were in an area called the "Flats" shown in Figure 1. Keeping in mind that while damage caused by local flooding may not warrant a disaster declaration, between 1998 and 2018 there were thirteen events that had the potential to damage structures had they not been purchased and removed. *Table* 1 lists the thirteen flood events analyzed, losses avoided, and the return on investment for purchased structures, excluding Central Elementary School. **Error! Reference source not found.** shows the losses avoided during the 2013 flood event for Central Elementary School.

Figure 1 The Flats, Flood of April 2013

Using the data collected from records provided by the City of Ottawa, an inventory of purchased structures was created that incorporated each of the buyout structures included in this study. A Hazus User Defined Facility (UDF) analysis was then performed. For a UDF analysis to be run, it is important to have an accurate portrayal of the characteristics of each individual structure. Examples are: occupancy class, (residential, commercial, etc.), building value, number of stories, square footage, foundation type,

building material, and year built. With the information provided by the City of Ottawa, these characteristics could be accurately represented for this analysis.

Two of the most crucial pieces of information for a UDF analysis are the value of the structure and the height of the first finished floor above grade. Two different methods were used to estimate the value of the structures. One method used the RSMeans construction cost value per square foot taken from the Hazus 4.2 database. The other method uses pre-flood appraised values of the structures. The appraised values were converted to 2018 U.S. dollars using the Bureau of Labor Statistics Consumer Price Index (DOL, 2018). Both of these methods give us valuable information with RSMeans estimating how much new construction would cost, and the appraised value indicating the actual condition and value of the structure being bought out. The first-floor height of each structure was estimated since these values were not available. This was done using photos of each structure that were provided by the city in combination with suggested heights provided by Hazus based on the foundation types. Once the inventory was complete, an analysis was run using the inventory in conjunction with flood depth grids created from each modeled, historical event.

The total losses avoided shown in Table 1 represent estimated physical losses to the structure, the contents of the structure, and inventory losses if the property was commercially used. Figure 2 shows the locations of structures removed. It should be noted that the 2006 flood event was included in this analysis, but it was not shown to add to the losses avoided and was omitted from the table. The cumulative project investment includes the purchase cost of the property and other costs associated with it such as appraisals, asbestos removal, and demolition, all of which were converted to 2018 U.S. dollars. The results described below are separated into two sections, one using the appraised value of the structures, and the other using the RSMeans.

Appraised Structure Values:

Cumulative losses avoided between 1998 and 2018 are estimated to be over $9.6 million, whereas the acquisition cost was just over $4.9 million (total 2018 dollars not adjusted for opportunity cost). Some of these structures would have flooded repeatedly. The return on mitigation investment can be calculated as the Total Losses Avoided / Project Investment * 100 = % Return on Investment. The total losses avoided between 1998 and 2018 based solely on physical damages are $9,679,000 divided by $4,938,000 = Return on Investment (ROI) of 196%.

RSMeans Structure Values:

The RSMeans values generally skew higher than the appraisals, so cumulative losses avoided between 1998 and 2018 were estimated to be over $20.8 million. The total losses avoided between 1998 and 2018 based solely on physical damages are $20,898,000 divided by the project investment of $4,938,000 = Return on Investment (ROI) of 423%.

Table 1. Flood Damage Losses Avoided, City of Ottawa

Year of Flood Event	Removed Structures with Losses Avoided[2]	Cumulative Total Losses Avoided (Appraised)[1]	Cumulative Total Losses Avoided (RSMeans)[1]	Cumulative Project Investment[1]	ROI (Appraised)	ROI (RSMeans)
1998	6	$176,000	$101,000	$1,938,000	9%	5%
1999	1	$179,000	$102,000	$2,946,000	6%	3%
2001	3	$187,000	$110,000	$4,099,000	5%	3%
2002	12	$392,000	$621,000	$4,099,000	10%	15%
2004	1	$396,000	$622,000	$4,099,000	10%	15%
2005	18	$669,000	$1,298,000	$4,099,000	16%	32%
2007	46	$1,551,000	$3,296,000	$4,099,000	38%	80%
2008	54	$3,852,000	$8,331,000	$4,099,000	94%	203%
2009	47	$4,940,000	$10,809,000	$4,099,000	121%	264%
2013[3]	58	$7,553,000	$16,287,000	$4,938,000	153%	330%
2015[3]	20	$7,839,000	$16,971,000	$4,938,000	159%	344%
2017[3]	4	$7,900,000	$17,096,000	$4,938,000	160%	346%
2018[3]	61	$9,679,000	$20,898,000	$4,938,000	196%	423%
Total[3]		**$9,679,000**	**$20,898,000**	**$4,938,000**	**196%**	**423%**

1) 2018 U.S. dollars

2) Only buildings that were acquired prior to the event were included in the analysis. Only buildings with potential losses avoided are reported; thus, the number in this column does not represent all buyouts, only those potentially damaged by the analyzed flood events.
3) Excludes Central Elementary School

Central Elementary School was analyzed separately from the other buyout properties (McConkey, 2017). The school suffered damage during the 2008 flood and was declared substantially damaged. The decision was made to demolish the old structure and rebuild in an area outside of the floodplain. The original structure was demolished in 2013. Table 2 lists the results from two separate scenarios used to show potential losses avoided during the 2013 flood event.

Scenario 1 represents the situation in which the original school remains in the same location. To determine the replacement cost of the structure, an estimate was created by using the R.S. Means *Square Footage Costs* (2014) taken from the Hazus 4.0 building inventory database. This value of $173.88 per square foot was multiplied by 70,000, the square footage of the original structure. This value was then multiplied by a location factor of 1.10 and adjusted to 2018 U.S. dollars using the Bureau of Labor Statistics Consumer Price Index (DOL, 2018).

Scenario 2 represents the losses avoided if the new elementary school was constructed in the same location as the original. This uses the replacement cost of the new school adjusted to 2018 U.S. dollars. Only one recorded flood event would have caused damage at the original site of the Central Elementary School since its demolition. The return on investment will continue to increase over time when flooding along the Illinois River occurs.

Table 0. Losses Avoided During the 2013 Flood Event for Central Elementary School

Scenario	Structure	Building Replacement Cost	Square Footage	Total Losses Avoided to Date (Estimated)[1]	Project Investment[1]	Projected ROI
1	Original Building	$13,925,000	70,000	**$4,646,000**	**$23,407,000**	**20%**
2	New Construction Building	$23,407,000	103,000	**$10,952,000**	**$23,407,000**	**47%**

1) 2018 U.S. dollars

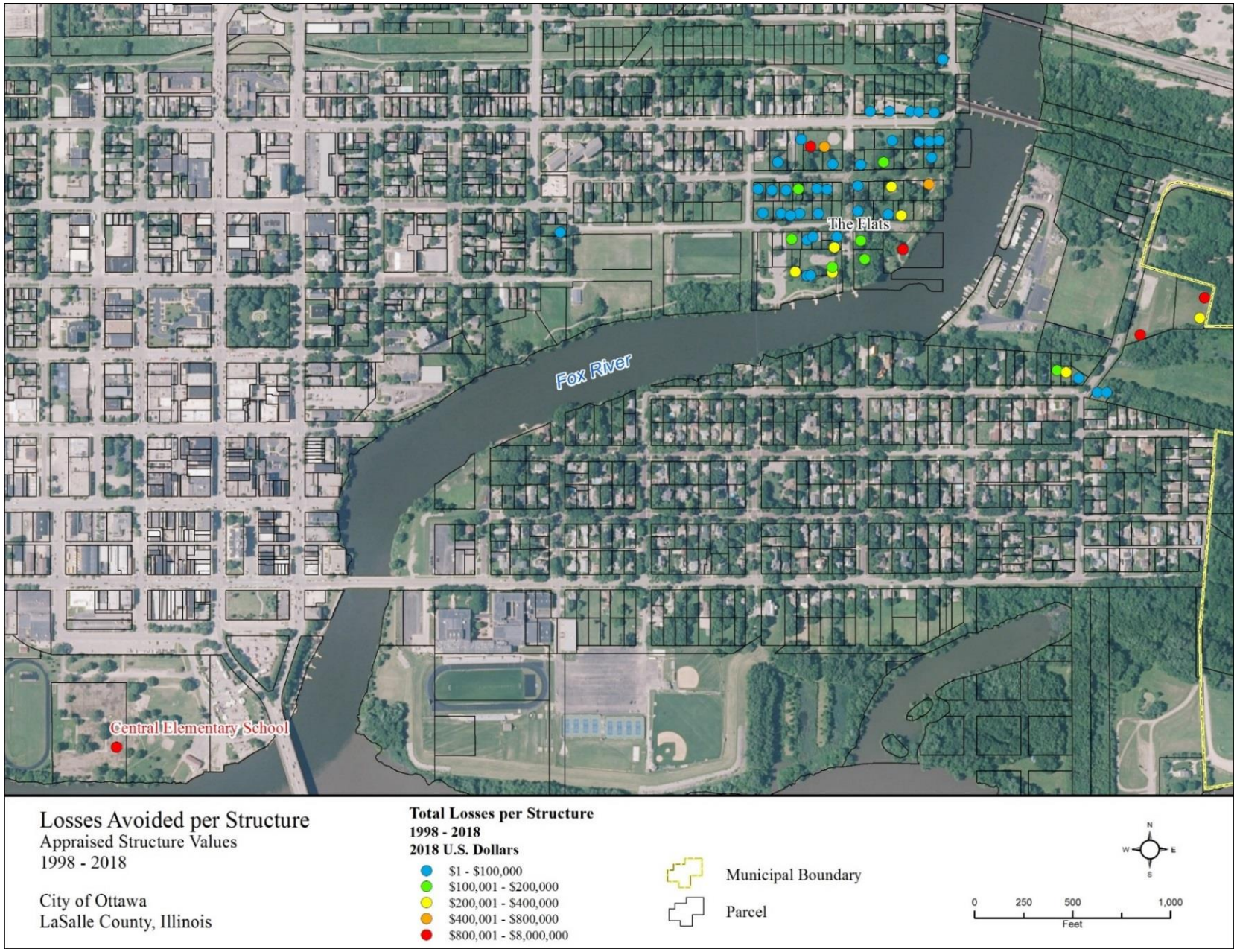

Figure 0. City of Ottawa Loss Avoidance

Losses can be avoided by community adoption of standards that reduce flooding risk. The City of Ottawa has adopted a standard that new construction must be two feet higher than the 100-year flood elevation compared to the minimum standard, which allows new construction to be built at the 100-year flood elevation. The development of Heritage Harbor in Ottawa illustrates the losses avoided by adoption of higher standards. Figure 3 shows that the higher elevation kept these structures from being flooded in 2013. Table 3 lists expected losses avoided for the 1% and 0.2% annual chance flood events (100- and 500-year).

Figure 3. Heritage Harbor Structures Built to Higher Standard of Two Feet above the 100-year Flood Elevation

Table 3. Expected Losses Avoided, Heritage Harbor

Event Type	Projected Structures Impacted without 2' Higher Elevation Requirement	Total Loss without 2' Higher Elevation Requirement (Estimated)[1]	Total Loss with Current Construction (Estimated)[1]	Total Losses Avoided (Estimated)[1]
1% Annual Chance Flood (100-year)	33	$2,396,000	$0	**$2,396,000**
0.2% Annual Chance Flood (500-year)	63	$7,603,000	$3,888,000	**$3,715,000**
Totals		**$9,999,000**	**$3,888,000**	**$6,111,000**

1) All loss values have been converted to 2018 U.S. Dollars

Conclusion

The City of Ottawa has experienced multiple flood events over time. Because of this, they have taken actions that would reduce their exposure to flood risk. Adoption of floodplain standards that exceed minimum requirements and coordinated community planning are examples of actions taken that reduce risk at relative low investment cost to the community. Actively pursuing mitigation grant funding and execution of multiple property acquisition projects requires a significant investment of time and energy. Obtaining public assistance funds and special grants to purchase Central Elementary School in Ottawa is an example that indicates an awareness of funding opportunities. The return on investment of federal, state, and local funds to remove structures from the floodplain clearly demonstrates the benefit of these actions to reduce federal disaster costs and individual hardship. There are savings for the community as well with reduced emergency services although the actual savings are not computed for this study. These successes indicate a high level of risk awareness, willingness to learn and pursue mitigation opportunities, and potentially reflect a high level of trust in the community leaders.

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City of Keithsburg, Illinois: A Case Study

Prepared by the Illinois State Water Survey

July 2018

The City of Keithsburg, with an estimated 2017 population of 579 (U.S. Census, 2018), is small community located on the western edge of Mercer County, Illinois. Positioned along the shore of the Mississippi River, the city faces a high risk for flooding and is partially located in the 1% annual chance floodplain as per the Flood Insurance Rate Maps (FIRMs) published by FEMA (FEMA, 2010). This flood risk was realized in 1993. Extensive and prolonged rainfall in the Upper Midwest caused major flooding along the Mississippi River which would later be dubbed "The Great Flood of 1993". Keithsburg was one of many communities that were impacted by this historic event with a significant number of structures being damaged or destroyed by flooding. A Major Disaster Declaration (DR-997) was issued for Illinois on July 9th, 1993 as a result of the flooding on the Mississippi and Illinois Rivers. A buyout program was initiated using funds from DR-997 to purchase and remove many of the properties that were impacted by the flooding.

1993 – DR997 Flooding

Incident Period:
April 13, 1993 - October 22, 1993

Major Disaster Declaration:
July 09, 1993

Adams, Alexander, Boone, Brown, Calhoun, Carroll, Cass, Cook, Fulton, Greene, Hancock, Henderson, Henry, Jackson, Jersey, Jo Daviess, Knox, Lake, Madison, Mason, Massac, McHenry, Mercer, Monroe, Morgan, Ogle, Pike, Pope, Pulaski, Randolph, Rock Island, Schuyler, Scott, St. Clair, Stephenson, Union, Warren, Whiteside, Winnebago

The Great Flood of 1993 wasn't the first time Keithsburg was flooded and would not be the last as the city continued to be at high risk for flooding. In 2008 the failure of two levees caused heavy flooding in the city. At this time the Illinois Department of Commerce and Economic Opportunity (DCEO) stepped in to provide funding and facilitate more buyouts of flooded properties. DCEO provided funds for the buyouts, with residents receiving payouts in 2012 and 2013.

The Keithsburg levee is a man-made earthen structure built to protect from flooding of unspecified magnitude. The levee is locally constructed, operated, and maintained; it is not owned or maintained by the United States Army Corps of Engineers (USACE), and is not part of the USACE PL 84-99 Levee Rehabilitation program. The levee is also not accredited by FEMA to protect from the 1% annual chance flood, but the levee does provide a level of protection from flooding. According to the USACE National Levee Database, there are still approximately 82 people and 49 structures at risk behind this levee.

Loss Avoidance

The purchase of residences and other structures that have flooded unburdens the owners, the community, and the National Flood Insurance Program (NFIP). The buyout program eligibility is based on a cost-benefit ratio calculation using the probability of future flooding and resulting expected damages. In the long run, it is less costly to purchase the damaged home than to repeatedly pay to repair flood damages. After purchase and removal, the actual flood damage losses avoided can be calculated by considering the cumulative damages that would likely have resulted were the structure still in place

during subsequent actual flood events. A simplistic, but widely accepted approach considers the expected cost to repair damage to the structure each time it would likely have been damaged by floodwaters. The distribution of the cost to the owner and the NFIP would depend on the level of insured value. There are other costs avoided by removing a structure from a flood hazard area including, but not limited to, displacement/loss of use, debris removal, service utility repair, and emergency action. However, some of these considerations are significant only if several structures in a contiguous area are removed.

The Federal Emergency Management Agency (FEMA) Hazus program (FEMA, 2017) is a nationally recognized method to estimate potential losses from natural hazards. Estimates of flood losses can be performed with user inputs of specific structure information and flood depth. In a loss avoidance assessment, the structure information for the purchase and removal of structures and flood data for events occurring after the purchase are input into Hazus for the assessment. The Hazus program has a number of modules to estimate other types of losses such as those noted above; however, unless local data are available to calibrate or validate estimates, the default values may or may not represent a particular area if these other costs savings have not yet been evaluated.

The flood elevations for historic events were derived using the annual peak stages at the Mississippi River gage at Keithsburg. The annual peak stage were converted to peak elevations based on the gage datum. Several Mississippi River valley cross sections were drawn to extend across the river and through Keithsburg. The historic flood elevations at each cross section were estimated based on a flood profile slope of 0.000076 (ft./ft.) and the distance from each cross section to the river gage.

Figure 1 Keithsburg, Illinois, Flood of June 2008

An ArcGIS script was used to generate a depth grid for each historic flood event based on the flood elevations at the drawn cross sections and the 2012 Mercer County LiDAR derived terrain dataset. The script creates depth grids by subtracting the terrain elevations from the historic flood elevations based on the cross section orientation. Negative results indicate no flooding depth from the historic event and are filtered out from the positive results which indicate flooding of a certain depth did occur. The resulting grid displays the spatially varying flood depths for a historic flood event. This process was repeated for each year's peak flood event to create a series of depth grids representing the maximum annual flood depths for Keithsburg.

Since the flood protection elevation of the Keithsburg Levee is unknown, local observations were used to determine whether the historic flood events overtopped or breached the levee. Local sources reported that the levee was compromised by floods in 1993 and in 2008. There was a significant flood event in

2014, however it was confirmed that the levee provided protection from the flood waters that year.

Using records provided by IEMA and DCEO, a GIS building inventory was created for the buyout properties. This involved generating a point for each structure based on its address and parcel identification number. These points were then adjusted to the original location of the since removed structure using historical orthophotography provided in Google Earth. Once the points were in the correct location, building characteristics necessary for a Hazus User Defined Facilities (UDF) analysis had to be determined or estimated for each structure. This was done by data mining the records provided by IEMA and DCEO for information on each of the relevant structures. Example characteristics are: occupancy class, (residential, commercial, etc.), building value, number of stories, square footage, foundation type, building material, and year built. Information from IEMA for the buyouts that stemmed from the 1993 flood was limited, unfortunately, so many of the building characteristics had to be estimated using a combination of Google Earth historical orthophotography and default values taken from Hazus (FEMA,2017). For the buyouts resulting from the 2008 flood event, DCEO was able to provide pre-demolition appraisals for each structure so all of the characteristics were populated with a high degree of accuracy.

Two of the most crucial pieces of information for a UDF analysis are the value of the structure and the height of the first finished floor above grade. Two different methods were used to estimate the value of the structures. One method used the RSMeans construction cost value per square foot taken from the Hazus 4.2 database. The other method used pre-flood appraised values of the structures which were available for all of the buyouts. The appraised values were converted to 2018 U.S. dollars using the Bureau of Labor Statistics Consumer Price Index (DOL, 2018). Both of these methods give us valuable information. The RSMeans estimates how much new construction would cost, and the appraised value gives an indication of the actual condition and value of the structure prior to the buyout.

The first-floor height of each structure had to be estimated since these values were not available. For the 2008 buyouts, this was done using pre-demolition photos of each structure that were included with the appraisals. For the 1993 buyouts, estimates were created using suggested heights provided by Hazus based on the foundation type of each structure.

Once the building inventory was complete, an analysis was run using the inventory in conjunction with flood depth grids created from 20 historical events that took place between 1995 and 2017. The total losses avoided shown in Table 1 represent estimated physical losses to the structure, the contents of the structure, and inventory losses if the property was commercially used. Figure 2 shows the locations of structures removed. The cumulative project investment includes the purchase cost of the property and other costs associated with it such as appraisals, asbestos removal, and demolition, all of which were converted to 2018 U.S. dollars. The results described below are separated into two sections, one using the appraised value of the structures, and the other using the RSMeans values.

Appraised Structure Values:

Cumulative losses avoided between 1995 and 2017 are estimated to be over $1.7 million, whereas the acquisition cost was just over $4.6 million (total 2018 dollars not adjusted for opportunity cost). Some of these structures would have flooded repeatedly. The return on mitigation investment can be calculated as the Total Losses Avoided / Project Investment * 100 = % Return on Investment. The total losses avoided

between 1995 and 2017 based solely on physical damages are $1,773,000 divided by $4,640,000 = Return on Investment (ROI) of 38%.

RSMeans Structure Values:

The RSMeans values generally skew higher than the appraisals, so cumulative losses avoided between 1995 and 2017 were estimated to be over $7.5 million. The total losses avoided between 1995 and 2017 based solely on physical damages are $7,575,000 divided by the project investment of $4,640,000 = Return on Investment (ROI) of 163%.

Table 1. Flood Damage Losses Avoided, City of Keithsburg

Year of Flood Event	Removed Structures with Losses Avoided[2]	Cumulative Total Losses Avoided (Appraised)[1]	Cumulative Total Losses Avoided (RSMeans)[1]	Cumulative Project Investment[1]	ROI (Appraised)	ROI (RSMeans)
1997	1	$3,000	$8,000	$3,363,000	0%	0%
1998	1	$10,000	$32,000	$3,363,000	0%	1%
2001	1	$23,000	$71,000	$3,363,000	1%	2%
2008	84	$1,727,000	$7,427,000	$3,363,000	51%	221%
2011	1	$1,736,000	$7,453,000	$3,363,000	52%	222%
2013	1	$1,748,000	$7,491,000	$4,640,000	38%	161%
2014	2	$1,772,000	$7,572,000	$4,640,000	38%	163%
2016	1	$1,773,000	$7,575,000	$4,640,000	38%	163%
Total		**$1,773,000**	**$7,575,000**	**$4,640,000**	**38%**	**163%**

1) 2018 U.S. dollars

2) Only buildings that were acquired prior to the event were included in the analysis. Only buildings with potential losses avoided are reported; thus, the number in this column does not represent all buyouts, only those potentially damaged by the analyzed flood events.

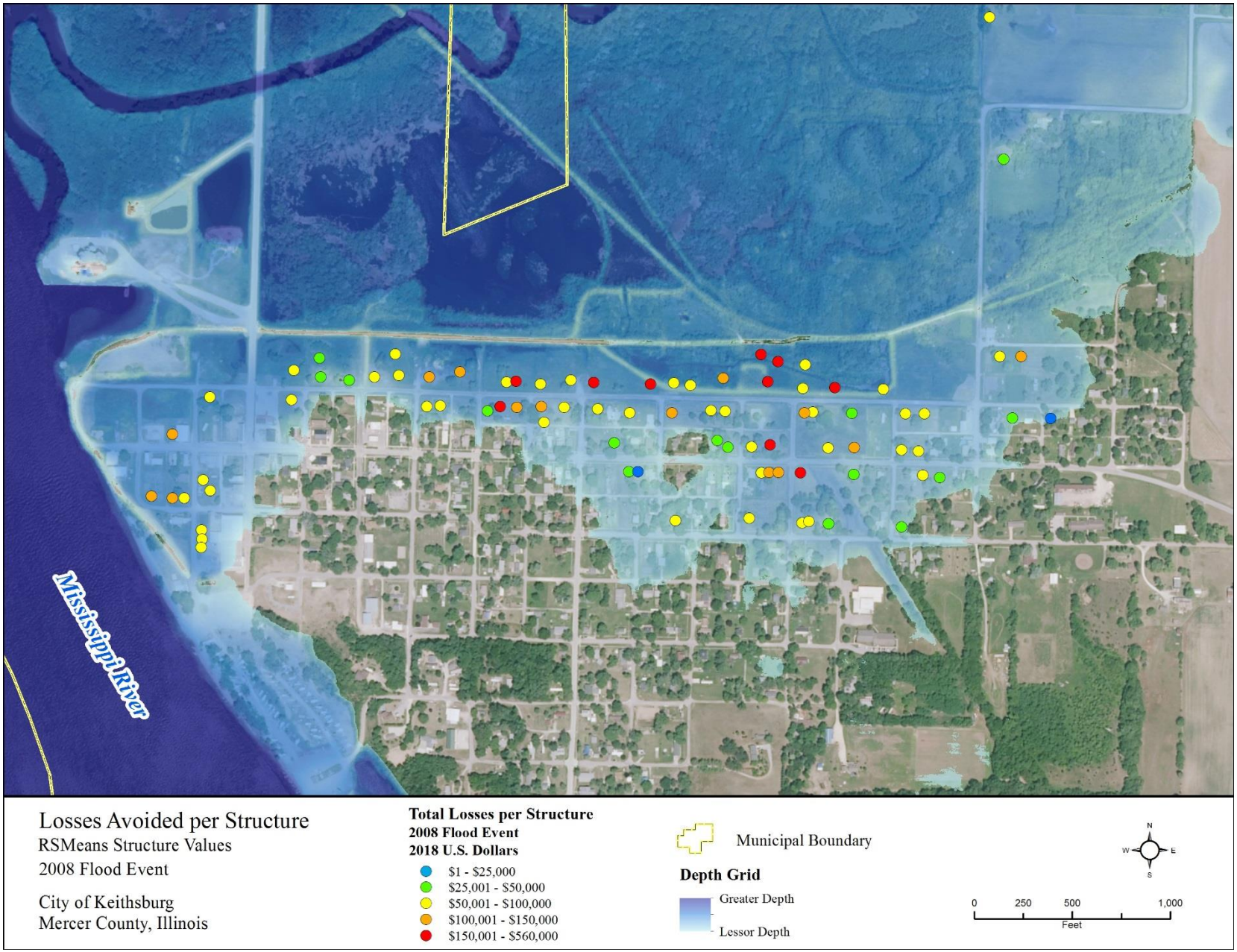

Figure 0. City of Keithsburg Loss Avoidance

Conclusion

Due to its proximity to the Mississippi River, the City of Keithsburg is a community at high risk of flooding. Though the Keithsburg levee does provide some level of protection, the flood events of 1993 and 2008 show that this risk is not completely eliminated. Indeed, a danger of relying on a levee for protection is that in the case of a breach, there may be little or no warning before flooding strikes the community. Because of this, it was important to take further measures to reduce their exposure to flooding. Utilizing mitigation grant funding and the execution of multiple property acquisition projects requires a significant investment of time and energy. The return on investment of federal, state, and local funds to remove structures from the floodplain demonstrates the benefit of these actions to reduce federal disaster costs and individual hardship. Taking a long term view on the return on investment is recommended as it may take several years to recoup the initial investment. As the 2008 event shows, however, one flood event can go a long way toward justifying that investment. There are potential savings for the community as well with reduced emergency services, although the actual savings are not computed for this study. There is also more to consider then just the economic return on investment. Flooding and the stress that comes with it can cause great mental and physical strain to the individuals who are impacted. It is a benefit to public health to reduce a community's exposure to this threat. Reducing flood risk is an important goal, and through mitigation actions such as structure buyouts we can reduce the long term financial burden to government at all levels, and increase the safety and health of the community as a whole.

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Appendix B: Illinois Statewide Flood Hazard Assessment

County Name	Population 2017	Projected Population for the year 2020	Percentage Change In Population	Severe Storms and Wind						Hazard Rating	Floods						Hazard Rating	Severe Winter Storms						Hazard Rating	Drought						Hazard Rating	Extreme Heat						Hazard Rating	Earthquake						Hazard Rating	Tornado						Hazard Rating
				HP	Gro	V	P	$ol	O		HP	Gro	V	P	$ol	O		HP	Gro	V	P	$ol	O		HP	Gro	V	P	$ol	O		HP	Gro	V	P	$ol	O		HP	Gro	V	P	$ol	O		HP	Gro	V	P	$ol	O	
Adams	66,578	64,741	-2.8%	18	1	18	1	6	44	High	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Alexander	6,478	7,606	17.4%	18	2	18	1	12	51	Severe	18	2	6	1	18	45	High	12	2	18	1	12	45	High	12	2	12	1	12	39	High	12	2	6	1	6	27	Medium	18	2	18	1	18	57	Severe	12	2	6	1	12	33	Medium
Bond	16,824	18,357	9.1%	18	1	18	1	6	44	High	6	1	6	1	6	20	Low	12	1	18	1	6	38	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Boone	53,503	61,503	15.0%	18	2	18	1	6	45	High	12	2	6	1	6	27	Medium	12	2	18	1	12	45	High	6	2	6	1	6	21	Low	6	2	12	1	6	27	Medium	6	2	6	1	6	21	Low	12	2	6	1	12	33	Medium
Brown	6,762	7,576	12.0%	18	2	18	1	6	45	High	6	2	6	1	6	21	Low	12	2	18	1	12	45	High	6	2	6	1	6	21	Low	12	2	12	1	18	45	High	6	2	6	1	6	21	Low	6	2	6	1	12	27	Medium
Bureau	33,359	33,682	1.0%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	12	1	6	1	18	38	High	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Calhoun	4,894	4,920	0.5%	18	1	18	1	6	44	High	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low
Carroll	14,539	14,169	-2.5%	18	1	18	1	12	50	Severe	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	12	1	6	1	18	38	High	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Cass	12,676	13,019	2.7%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	6	26	Medium	6	1	6	1	12	26	Medium
Champaign	208,419	217,735	4.5%	18	1	18	2	12	51	Severe	6	1	6	2	6	21	Low	12	1	18	2	12	45	High	6	1	6	2	18	33	Medium	6	1	12	2	6	27	Medium	6	1	12	2	6	27	Medium	18	1	6	2	18	45	High
Christian	33,309	33,152	-0.5%	18	1	18	1	12	50	Severe	6	1	6	1	12	26	Medium	12	1	18	1	18	50	Severe	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Clark	15,938	15,396	-3.4%	18	1	18	1	6	44	High	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	12	32	Medium	6	1	6	1	6	20	Low
Clay	13,300	13,172	-1.0%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	6	38	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	18	1	12	38	High	12	1	6	1	12	32	Medium
Clinton	37,729	38,696	2.6%	18	1	18	1	6	44	High	6	1	6	1	6	20	Low	12	1	18	1	6	38	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	6	1	6	1	12	26	Medium	12	1	6	1	18	38	High
Coles	54,000	56,851	5.3%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	18	50	Severe	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	12	32	Medium	12	1	6	1	18	38	High
Cook	5,203,499	5,132,412	-1.4%	18	1	18	3	18	58	Severe	18	1	6	3	6	34	Medium	18	1	18	3	18	58	Severe	6	1	6	3	6	22	Low	12	1	12	3	12	40	High	6	1	6	3	6	22	Low	12	1	6	3	18	40	High
Crawford	19,308	19,185	-0.6%	18	1	18	1	12	50	Severe	12	1	6	1	6	26	Medium	12	1	18	1	6	38	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Cumberland	10,858	10,782	-0.7%	18	1	18	1	6	44	High	6	1	6	1	6	20	Low	12	1	18	1	18	50	Severe	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	12	32	Medium	6	1	6	1	6	20	Low
DeKalb	104,528	119,701	14.5%	18	2	18	1	12	51	Severe	12	2	6	1	12	33	Medium	12	2	18	1	12	45	High	6	2	6	1	6	21	Low	6	2	12	1	6	27	Medium	6	2	6	1	6	21	Low	12	2	6	1	12	33	Medium
De Witt	16,226	15,832	-2.4%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	6	26	Medium	12	1	6	1	12	32	Medium
Douglas	19,630	19,767	0.7%	18	1	18	1	12	50	Severe	6	1	6	1	12	26	Medium	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
DuPage	929,368	939,015	1.0%	18	1	18	3	12	52	Severe	12	1	6	3	6	28	Medium	12	1	18	3	12	46	High	6	1	6	3	6	22	Low	6	1	12	3	6	28	Medium	6	1	6	3	6	22	Low	12	1	6	3	12	34	Medium
Edgar	17,566	16,904	-3.8%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Edwards	6,523	6,390	-2.0%	18	1	18	1	12	50	Severe	12	1	6	1	6	26	Medium	12	1	18	1	6	38	High	12	1	6	1	18	38	High	12	1	12	1	12	38	High	6	1	18	1	12	38	High	6	1	6	1	12	26	Medium
Effingham	34,386	33,463	-2.7%	18	1	18	1	12	50	Severe	12	1	6	1	6	26	Medium	6	1	18	1	12	38	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Fayette	21,789	22,840	4.8%	18	1	18	1	6	44	High	6	1	6	1	6	20	Low	12	1	18	1	6	38	High	6	1	6	1	6	20	Low	12	1	12	1	12	38	High	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Ford	13,575	13,450	-0.9%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Franklin	39,156	38,470	-1.8%	18	1	18	1	12	50	Severe	18	1	6	1	12	38	High	12	1	18	1	6	38	High	12	1	6	1	12	32	Medium	12	1	12	1	12	38	High	6	1	18	1	12	38	High	12	1	6	1	12	32	Medium
Fulton	35,536	35,761	0.6%	18	1	18	1	12	50	Severe	12	1	6	1	18	38	High	12	1	18	1	12	44	High	6	1	6	1	12	26	Medium	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	18	38	High
Gallatin	5,212	4,953	-5.0%	18	1	18	1	12	50	Severe	18	1	6	1	12	38	High	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	12	1	12	1	12	38	High	6	1	18	1	18	44	High	6	1	6	1	12	26	Medium
Greene	13,093	12,881	-1.6%	18	1	18	1	6	44	High	6	1	6	1	12	26	Medium	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	12	1	12	1	12	38	High	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Grundy	50,437	55,970	11.0%	18	2	18	1	12	51	Severe	12	2	6	1	12	33	Medium	12	2	18	1	12	45	High	6	2	6	1	6	21	Low	6	2	12	1	6	27	Medium	6	2	6	1	6	21	Low	12	2	6	1	18	39	High
Hamilton	8,061	8,361	3.7%	18	1	18	1	6	44	High	12	1	6	1	6	26	Medium	12	1	18	1	6	38	High	12	1	6	1	12	32	Medium	12	1	12	1	12	38	High	6	1	18	1	12	38	High	6	1	6	1	12	26	Medium
Hancock	18,508	17,353	-6.2%	18	1	18	1	12	50	Severe	12	1	6	1	12	32	Medium	12	1	18	1	12	44	High	12	1	6	1	18	38	High	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	18	38	High
Hardin	4,024	3,948	-1.9%	12	1	18	1	6	38	High	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	12	1	12	1	18	44	High	6	1	18	1	18	44	High	6	1	6	1	6	20	Low
Henderson	6,869	6,792	-1.1%	18	1	18	1	6	44	High	12	1	6	1	12	32	Medium	12	1	18	1	12	44	High	12	1	6	1	18	38	High	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Henry	49,280	48,234	-2.1%	18	1	18	1	18	56	Severe	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	12	1	6	1	18	38	High	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	18	38	High
Iroquois	28,334	27,687	-2.3%	18	1	18	1	12	50	Severe	12	1	6	1	12	32	Medium	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Jackson	58,870	62,031	5.4%	18	1	18	1	18	56	Severe	18	1	6	1	12	38	High	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	12	1	12	1	6	32	Medium	6	1	18	1	12	38	High	12	1	6	1	12	32	Medium
Jasper	9,536	8,698	-8.8%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	6	38	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Jefferson	38,460	39,227	2.0%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	6	38	High	12	1	6	1	12	32	Medium	12	1	12	1	18	44	High	6	1	18	1	12	38	High	12	1	6	1	12	32	Medium
Jersey	22,025	23,578	7.1%	18	1	18	1	6	44	High	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Jo Daviess	21,770	22,138	1.7%	18	1	18	1	12	50	Severe	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	12	1	6	1	18	38	High	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	6	26	Medium

County Name	Population	Projected Population for the year 2020	Percentage Change In Population	Severe Storms and Wind						Hazard Rating	Floods						Hazard Rating	Severe Winter Storms						Hazard Rating	Drought						Hazard Rating	Extreme Heat						Hazard Rating	Earthquake						Hazard Rating	Tornado						Hazard Rating
				HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O	
Johnson	12,902	13,489	4.5%	18	1	18	1	12	50	Severe	6	1	6	1	12	26	Medium	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	12	1	12	1	6	32	Medium	6	1	18	1	12	38	High	12	1	6	1	12	32	Medium
Kane	531,715	583,386	9.7%	18	1	18	3	12	52	Severe	12	1	6	3	12	34	Medium	12	1	18	3	12	46	High	6	1	6	3	6	22	Low	6	1	6	3	6	22	Low	6	1	6	3	6	22	Low	12	1	6	3	12	34	Medium
Kankakee	110,008	117,167	6.5%	18	1	18	2	12	51	Severe	12	1	6	2	6	27	Medium	12	1	18	2	12	45	High	6	1	6	2	6	21	Low	6	1	12	2	6	27	Medium	6	1	6	2	6	21	Low	12	1	6	2	18	39	High
Kendall	124,695	142,818	14.5%	18	2	18	2	6	46	High	12	2	6	2	6	28	Medium	12	2	18	2	12	46	High	6	2	6	2	6	22	Low	6	2	6	2	6	22	Low	6	2	6	2	6	22	Low	12	2	6	2	12	34	Medium
Knox	50,938	50,492	-0.9%	18	1	18	1	12	50	Severe	12	1	6	1	12	32	Medium	12	1	18	1	12	44	High	6	1	6	1	12	26	Medium	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Lake	703,047	764,397	8.7%	18	1	18	3	12	52	Severe	12	1	6	3	6	28	Medium	12	1	18	3	12	46	High	6	1	6	3	6	22	Low	6	1	6	3	6	22	Low	6	1	6	3	6	22	Low	12	1	6	3	18	40	High
La Salle	110,642	112,417	1.6%	18	1	18	2	6	45	High	12	1	6	2	12	33	Medium	12	1	18	2	12	45	High	6	1	6	2	6	21	Low	6	1	12	2	6	27	Medium	6	1	6	2	6	21	Low	12	1	6	2	12	33	Medium
Lawrence	16,377	16,493	0.7%	18	1	18	1	12	50	Severe	6	1	6	1	18	32	Medium	12	1	18	1	6	38	High	6	1	6	1	18	32	Medium	6	1	12	1	12	32	Medium	6	1	12	1	12	32	Medium	6	1	6	1	12	26	Medium
Lee	34,251	36,065	5.3%	18	1	18	1	6	44	High	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Livingston	36,526	39,390	7.8%	18	1	18	1	6	44	High	12	1	6	1	12	32	Medium	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	6	1	12	1	6	26	Medium	6	1	6	1	12	26	Medium	12	1	6	1	12	32	Medium
Logan	29,527	30,380	2.9%	18	1	18	1	18	56	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	6	26	Medium	12	1	6	1	18	38	High
McDonough	30,996	33,824	9.1%	18	1	18	1	12	50	Severe	12	1	6	1	12	32	Medium	12	1	18	1	12	44	High	12	1	6	1	18	38	High	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
McHenry	307,004	345,056	12.4%	18	2	18	2	6	46	High	6	2	6	2	12	28	Medium	12	2	18	2	12	46	High	6	2	6	2	6	22	Low	6	2	6	2	6	22	Low	6	2	6	2	6	22	Low	12	2	6	2	18	40	High
McLean	172,418	188,341	9.2%	18	1	18	2	12	51	Severe	18	1	6	2	12	39	High	12	1	18	2	12	45	High	6	1	6	2	18	33	Medium	6	1	12	2	6	27	Medium	6	1	6	2	6	21	Low	18	1	6	2	18	45	High
Macon	106,550	105,401	-1.1%	18	1	18	2	12	51	Severe	12	1	6	2	12	33	Medium	12	1	18	2	12	45	High	6	1	6	2	18	33	Medium	6	1	12	2	6	27	Medium	6	1	12	2	6	27	Medium	18	1	6	2	18	45	High
Macoupin	45,908	45,987	0.2%	18	1	18	1	6	44	High	12	1	6	1	12	32	Medium	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Madison	265,759	271,688	2.2%	18	1	18	2	12	51	Severe	6	1	6	2	6	21	Low	12	1	18	2	6	39	High	6	1	6	2	6	21	Low	12	1	12	2	18	45	High	6	1	12	2	12	33	Medium	12	1	6	2	18	39	High
Marion	38,140	37,323	-2.1%	18	1	18	1	6	44	High	6	1	6	1	6	20	Low	12	1	18	1	6	38	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	6	1	18	1	12	38	High	12	1	6	1	12	32	Medium
Marshall	11,939	11,908	-0.3%	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	6	1	6	1	12	26	Medium
Mason	13,507	12,841	-4.9%	18	1	18	1	12	50	Severe	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Massac	14,658	15,432	5.3%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	12	1	12	1	6	32	Medium	6	1	18	1	18	44	High	12	1	6	1	12	32	Medium
Menard	12,516	12,867	2.8%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	6	26	Medium	6	1	6	1	12	26	Medium
Mercer	15,730	15,897	1.1%	18	1	18	1	12	50	Severe	12	1	6	1	12	32	Medium	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Monroe	34,068	36,390	6.8%	18	1	18	1	12	50	Severe	12	1	6	1	6	26	Medium	12	1	18	1	6	38	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	12	1	12	1	12	38	High	12	1	6	1	12	32	Medium
Montgomery	28,952	29,578	2.2%	18	1	18	1	6	44	High	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Morgan	34,277	35,266	2.9%	18	1	18	1	12	50	Severe	12	1	6	1	18	38	High	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	6	26	Medium	12	1	6	1	12	32	Medium
Moultrie	14,827	14,715	-0.8%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	12	32	Medium	6	1	6	1	12	26	Medium
Ogle	51,273	54,317	5.9%	18	1	18	1	12	50	Severe	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Peoria	185,006	183,593	-0.8%	18	1	18	2	12	51	Severe	6	1	6	2	18	33	Medium	12	1	18	2	12	45	High	6	1	6	2	18	33	Medium	6	1	12	2	6	27	Medium	6	1	6	2	6	21	Low	12	1	6	2	18	39	High
Perry	21,357	22,496	5.3%	18	1	18	1	12	50	Severe	12	1	6	1	6	26	Medium	12	1	18	1	6	38	High	12	1	6	1	12	32	Medium	12	1	12	1	18	44	High	6	1	18	1	12	38	High	12	1	6	1	12	32	Medium
Piatt	16,560	16,205	-2.1%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	6	26	Medium	12	1	6	1	12	32	Medium
Pike	15,950	15,630	-2.0%	18	1	18	1	6	44	High	12	1	6	1	18	38	High	12	1	18	1	12	44	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	6	1	12	1	6	26	Medium	12	1	6	1	12	32	Medium
Pope	4,157	4,367	5.1%	18	1	18	1	6	44	High	12	1	6	1	12	32	Medium	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	12	1	12	1	6	32	Medium	6	1	18	1	18	44	High	12	1	6	1	12	32	Medium
Pulaski	5,619	5,435	-3.3%	18	1	18	1	6	44	High	18	1	6	1	12	38	High	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	12	1	12	1	6	32	Medium	18	1	18	1	18	56	Severe	6	1	6	1	12	26	Medium
Putnam	5,611	5,998	6.9%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	6	1	6	1	12	26	Medium
Randolph	32,621	32,518	-0.3%	18	1	18	1	6	44	High	12	1	6	1	6	26	Medium	12	1	18	1	6	38	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium
Richland	15,930	15,068	-5.4%	18	1	18	1	6	44	High	6	1	6	1	6	20	Low	12	1	18	1	6	38	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium
Rock Island	144,784	143,037	-1.2%	18	1	18	2	12	51	Severe	12	1	6	2	12	33	Medium	12	1	18	2	12	45	High	12	1	6	2	12	33	Medium	6	1	12	2	6	27	Medium	6	1	6	2	6	21	Low	12	1	6	2	12	33	Medium
St. Clair	262,759	267,263	1.7%	18	1	18	2	12	51	Severe	12	1	6	2	12	33	Medium	12	1	18	2	12	45	High	6	1	6	2	6	21	Low	12	1	12	2	18	45	High	12	1	18	2	12	45	High	12	1	6	2	18	39	High
Saline	24,307	23,894	-1.7%	18	1	18	1	12	50	Severe	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	12	1	12	1	6	32	Medium	12	1	18	1	12	44	High	6	1	6	1	12	26	Medium
Sangamon	197,499	203,501	3.0%	18	1	18	2	12	51	Severe	12	1	6	2	18	39	High	12	1	18	2	12	45	High	6	1	6	2	18	33	Medium	6	1	12	2	6	27	Medium	6	1	12	2	6	27	Medium	18	1	6	2	18	45	High
Schuyler	6,923	7,201	4.0%	18	1	18	1	12	50	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	12	26	Medium	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Scott	5,053	5,157	2.3%	18	1	18	1	12	50	Severe	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	18	38	High	6	1	12	1	6	26	Medium	12	1	6	1	6	26	Medium
Shelby	21,717	21,496	-1.0%	18	1	18	1	18	56	Severe	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	12	32	Medium	12	1	6	1	12	32	Medium
Stark	5,776	5,586	-3.3%	18	1	18	1	6	44	High	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	6	1	6	1	12	26	Medium
Stephenson	45,624	46,243	1.4%	18	1	18	1	12	50	Severe	12	1	6	1	12	32	Medium	12	1	18	1	12	44	High	12	1	6	1	18	38	High	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Tazewell	134,385	136,051	1.2%	18	1	18	2	12	51	Severe	12	1	6	2	18	39	High	12	1	18	2	12	45	High	6	1	6	2	18	33	Medium	6	1	12	2	6	27	Medium	6	1	6	2	6	21	Low	12	1	6	2	18	39	High
Union	17,212	17,357	0.8%	18	1	18	1	12	50	Severe	6	1	6	1	12	26	Medium	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	12	1	12	1	6	32	Medium	12	1	18	1	18	50	Severe	12	1	6	1	12	32	Medium
Vermilion	78,111	77,965	-0.2%	18	1	18	1	18	56	Severe	6	1	6	1	6	20	Low	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	6	1	12	1	6	26	Medium	6	1	12	1	6	26	Medium	12	1	6	1	18	38	High
Wabash	11,492	11,257	-2.0%	18	1	18	1	12	50	Severe	18	1	6	1	6	32	Medium	12	1	18	1	6	38	High	12	1	6	1	12	32	Medium	12	1	12	1	6	32	Medium	12	1	18	1	12	44	High	12	1	6	1	18	38	High
Warren	17,378	17,218	-0.9%	18	1	18	1	12	50	Severe	6	1	6	1	12	26	Medium	12	1	18	1	12	44	High	12	1	6	1	18	38	High	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium
Washington	14,154	14,329	1.2%	18	1	18	1	6	44	High	6	1	6	1	6	20	Low	12	1	18	1	6	38	High	6	1	6	1	6	20	Low	12	1	12	1	18	44	High	6	1	18	1	12	38	High	12	1	6	1	12	32	Medium
Wayne	16,396	15,827	-3.5%	18	1	18	1	12	50	Severe	18	1	6	1	6	32	Medium	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	12	1	12	1	6	32	Medium	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium
White	14,292	13,416	-6.1%	18	1	18	1	12	50	Severe	18	1	6	1	12	38	High	12	1	18	1	6	38	High	12	1	6	1	12	32	Medium	12	1	12	1	6	32	Medium	6	1	18	1	12	38	High	12	1	6	1	12	32	Medium
Whiteside	56,536	55,267	-2.2%	18	1	18	1	12	50	Severe	12	1	6	1	12	32	Medium	12	1	18	1	12	44	High	12	1	6	1	18	38	High	6	1	12	1	6	26	Medium	6	1	6	1	6	20	Low	12	1	6	1	12	32	Medium

County Name	Population	Projected Population for the year 2010	Percentage Change In Population	Severe Storms and Wind						Hazard Rating	Floods						Hazard Rating	Severe Winter Storms						Hazard Rating	Drought						Hazard Rating	Extreme Heat						Hazard Rating	Earthquake						Hazard Rating	Tornado						Hazard Rating
				HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O		HP	Gro	V	P	Sol	O	
Will	689,529	795,161	15.3%	18	2	18	3	12	53	Severe	18	2	6	3	6	35	Medium	12	2	18	3	12	47	High	6	2	6	3	6	23	Low	2	3	6	3	6	20	Low	6	2	6	3	6	23	Low	18	2	6	3	18	47	High
Williamson	67,560	68,355	1.2%	18	1	18	1	18	56	Severe	12	1	6	1	6	26	Medium	12	1	18	1	12	44	High	12	1	6	1	12	32	Medium	1	1	12	1	6	21	Medium	6	1	18	1	12	38	High	12	1	6	1	18	38	High
Winnebago	285,873	302,259	5.7%	18	1	18	2	12	51	Severe	12	1	6	2	12	33	Medium	12	1	18	2	12	45	High	6	1	6	2	6	21	Low	1	2	12	2	12	29	Medium	6	1	6	2	6	21	Low	12	1	6	2	12	33	Medium
Woodford	39,140	40,350	3.1%	18	1	18	1	12	50	Severe	12	1	6	1	18	38	High	12	1	18	1	12	44	High	6	1	6	1	18	32	Medium	1	2	12	1	6	22	Medium	6	1	6	1	6	20	Low	12	1	6	1	18	38	Medium

KEY			
HP=Historical Probability		**Sol= Severity of Impact**	
Gro= Growth		**O= Overall Rating**	
V=Vulnerability		**P= Population**	
Hazard Rating Color Code			
Very Low = 0-12	**Low = 13-24**	**Medium = 25-36**	**High= 37-48**
	Severe = 49-60		

Source: 2017 Population - US Census Bureau
Source: 2020 Projected Population - IDPH Population Projections for Illinoi

Appendix C: Severe Repetitive Loss and Unmitigated Properties – Illinois 2018

List of all Severe Repetitive Loss Properties – Illinois 2018

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
ADAMS COUNTY	Adams County*	245,516.56	30,689.57	8	2
CALHOUN COUNTY	Kampsville, Village Of	130,752.45	14,528.05	9	2
CHAMPAIGN COUNTY	Champaign County *	118,268.54	23,653.71	5	1
CHAMPAIGN COUNTY	St. Joseph, Village Of	89,537.45	22,384.36	4	1
CHRISTIAN COUNTY	Christian County *	64,185.26	21,395.09	3	1
CLARK COUNTY	Clark County*	81,676.71	11,668.10	7	1
COOK COUNTY	Bellwood, Village Of	254,567.41	13,398.28	19	4
COOK COUNTY	Bensenville, Village Of	86,686.49	14,447.75	6	1
COOK COUNTY	Broadview, Village Of	36,449.14	9,112.29	4	1
COOK COUNTY	Cook County *	1,983,252.00	47,220.29	42	8
COOK COUNTY	Des Plaines, City Of	1,626,025.95	43,946.65	37	7
COOK COUNTY	Dolton, Village Of	65,063.58	16,265.90	4	1
COOK COUNTY	Elgin, City Of	226,930.45	22,693.05	10	2
COOK COUNTY	Glenview, Village Of	75,565.80	18,891.45	4	1
COOK COUNTY	Lyons, Village Of	113,811.46	28,452.87	4	1
COOK COUNTY	Melrose Park, Village Of	290,645.97	32,294.00	9	2
COOK COUNTY	Mount Prospect, Village Of	39,899.03	9,974.76	4	1
COOK COUNTY	Northbrook, Village Of	171,729.62	42,932.41	4	1
COOK COUNTY	Northlake, City Of	57,830.99	11,566.20	5	1
COOK COUNTY	River Grove, Village Of	141,846.90	17,730.86	8	1
COOK COUNTY	Schaumburg, Village Of	64,470.55	16,117.64	4	1
COOK COUNTY	Schiller Park, Village Of	171,378.10	11,425.21	15	3
COOK COUNTY	Stone Park, Village Of	2,185,860.40	29,943.29	73	15
COOK COUNTY	Wheeling, Village Of	101,779.45	16,963.24	6	1
DOUGLAS COUNTY	Douglas County*	96,561.33	10,729.04	9	1
DU PAGE COUNTY	Addison, Village Of	238,881.36	9,953.39	24	4
DU PAGE COUNTY	Aurora, City Of	62,047.02	7,755.88	8	1
DU PAGE COUNTY	Downers Grove, Village Of	349,029.54	49,861.36	7	1
DU PAGE COUNTY	Lisle, Village Of	912,253.55	76,021.13	12	3
DU PAGE COUNTY	Oak Brook, Village Of	357,751.89	89,437.97	4	1
DU PAGE COUNTY	Westmont, Village Of	108,616.58	21,723.32	5	1
DU PAGE COUNTY	Wheaton, City Of	184,833.86	12,322.26	15	3
DU PAGE COUNTY	Wood Dale, City Of	65,965.43	9,423.63	7	1
GRUNDY COUNTY	Grundy County *	411,700.12	29,407.15	14	2
GRUNDY COUNTY	Seneca, Village Of	280,203.57	40,029.08	7	1
HENDERSON COUNTY	Henderson County *	423,588.18	32,583.71	13	2
HENDERSON COUNTY	Oquawka, Village Of	206,778.73	22,975.41	9	2

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
HENRY COUNTY	Henry County *	83,741.18	16,748.24	5	1
IROQUOIS COUNTY	Watseka, City Of	675,864.89	23,305.69	29	6
IROQUOIS COUNTY	Woodland, Village Of	38,493.17	7,698.63	5	1
JERSEY COUNTY	Elsah, Village Of	166,527.84	13,877.32	12	1
JERSEY COUNTY	Grafton, City Of	85,660.87	10,707.61	8	1
JERSEY COUNTY	Jersey County *	98,144.81	19,628.96	5	1
KANE COUNTY	Algonquin, Village Of	129,861.80	32,465.45	4	1
KANE COUNTY	Montgomery, Village Of	82,956.13	16,591.23	5	1
KANKAKEE COUNTY	Aroma Park, Village Of	74,829.67	18,707.42	4	1
KANKAKEE COUNTY	Kankakee County *	1,292,636.26	24,858.39	52	8
LA SALLE COUNTY	North Utica, Village Of	84,581.53	21,145.38	4	1
LA SALLE COUNTY	Peru, City Of	96,757.93	10,750.88	9	1
LAKE COUNTY	Fox Lake, Village Of	315,882.70	19,742.67	16	3
LAKE COUNTY	Lake County *	319,512.26	15,214.87	21	3
LAKE COUNTY	Round Lake Beach, Village Of	50,038.20	12,509.55	4	1
LAWRENCE COUNTY	Lawrenceville, City Of	58,544.87	14,636.22	4	1
MARSHALL COUNTY	Marshall County *	57,086.68	14,271.67	4	1
MCHENRY COUNTY	Holiday Hills, Village Of	52,470.40	13,117.60	4	1
MCHENRY COUNTY	Mchenry County*	437,134.74	23,007.09	19	3
MCHENRY COUNTY	Mchenry, City Of	115,893.80	28,973.45	4	1
OGLE COUNTY	Ogle County*	55,981.85	9,330.31	6	1
PEORIA COUNTY	Peoria County *	1,215,060.12	12,526.39	97	13
PEORIA COUNTY	Peoria Heights, Village Of	438,832.65	16,878.18	26	3
PEORIA COUNTY	Peoria, City Of	137,178.59	8,573.66	16	1
PIKE COUNTY	Pike County*	74,776.24	10,682.32	7	1
ROCK ISLAND COUNTY	Carbon Cliff, Village Of	133,886.09	16,735.76	8	1
ROCK ISLAND COUNTY	East Moline, City Of	100,998.41	25,249.60	4	1
ROCK ISLAND COUNTY	Rock Island County*	739,474.36	10,270.48	72	10
WILL COUNTY	New Lenox, Village Of	165,608.29	20,701.04	8	1
WILL COUNTY	Will County *	531,769.92	12,366.74	43	6
WILLIAMSON COUNTY	Marion, City Of	42,683.87	10,670.97	4	1
WINNEBAGO COUNTY	Machesney Park, Village Of	161,945.88	17,993.99	9	2
WINNEBAGO COUNTY	Rockford, City Of	107,430.54	13,428.82	8	2
WINNEBAGO COUNTY	Winnebago County *	253,581.88	19,506.30	13	2
WOODFORD COUNTY	Woodford County *	334,238.69	33,423.87	10	2

List of Unmitigated Repetitive Loss Properties – Illinois 2018

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
ADAMS COUNTY	Adams County*	15,172.73	7,586.37	2	1
ADAMS COUNTY	Adams County*	1,276,113.76	32,720.87	39	12
ADAMS COUNTY	Quincy, City Of	439,846.72	36,653.89	12	4
ALEXANDER COUNTY	Alexander County*	333,714.68	16,685.73	20	10
ALEXANDER COUNTY	Cairo, City Of	30,145.57	3,768.20	8	3
ALEXANDER COUNTY	East Cape Girardeau, Village Of	27,991.86	6,997.97	4	2
ALEXANDER COUNTY	Tamms, Village Of	44,515.76	11,128.94	4	2
ALEXANDER COUNTY	Thebes, Village Of	33,153.99	4,736.28	7	1
BOONE COUNTY	Belvidere, City Of	15,378.00	7,689.00	2	1
BOONE COUNTY	Boone County *	118,131.30	16,875.90	7	2
BOONE COUNTY	Loves Park, City Of	214,002.16	71,334.05	3	1
BROWN COUNTY	Brown County *	237,888.78	11,328.04	21	6
BUREAU COUNTY	Bureau County *	20,289.49	6,763.16	3	1
BUREAU COUNTY	Cherry, Village Of	10,130.58	5,065.29	2	1
BUREAU COUNTY	De Pue, Village Of	26,215.90	8,738.63	3	1
BUREAU COUNTY	Princeton, City Of	26,179.79	5,235.96	5	1
CALHOUN COUNTY	Calhoun County *	2,414,812.02	11,077.12	218	48
CALHOUN COUNTY	Hamburg, Village Of	141,388.84	11,782.40	12	4
CALHOUN COUNTY	Hardin, Village Of	408,341.47	11,342.82	36	7
CALHOUN COUNTY	Kampsville, Village Of	1,784,343.73	20,509.70	87	20
CARROLL COUNTY	Carroll County *	161,458.31	13,454.86	12	4
CARROLL COUNTY	Mt. Carroll, City Of	43,413.47	21,706.74	2	1
CARROLL COUNTY	Savanna, City Of	11,261.48	5,630.74	2	1
CASS COUNTY	Ashland, Village Of	10,118.45	5,059.23	2	1
CASS COUNTY	Cass County *	137,520.04	15,280.00	9	2
CHAMPAIGN COUNTY	Champaign County *	153,082.65	21,868.95	7	2
CHAMPAIGN COUNTY	Champaign, City Of	116,203.66	7,746.91	15	6
CHAMPAIGN COUNTY	Fisher, Village Of	34,377.63	17,188.82	2	1
CHAMPAIGN COUNTY	Sidney, Village Of	43,849.60	21,924.80	2	1
CHAMPAIGN COUNTY	St. Joseph, Village Of	229,143.64	19,095.30	12	5
CHRISTIAN COUNTY	Christian County *	64,185.26	21,395.09	3	1
CHRISTIAN COUNTY	Stonington, Village Of	4,893.32	2,446.66	2	1
CLARK COUNTY	Clark County*	177,116.25	16,101.48	11	3
CLINTON COUNTY	Clinton County*	17,468.85	8,734.43	2	1
COLES COUNTY	Charleston, City Of	56,507.46	14,126.87	4	2
COLES COUNTY	Coles County *	48,907.27	24,453.64	2	1

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
COOK COUNTY	Arlington Heights, Village Of	24,057.30	4,009.55	6	3
COOK COUNTY	Bellwood, Village Of	5,622,864.03	10,242.01	549	236
COOK COUNTY	Bensenville, Village Of	2,271,720.73	46,361.65	49	15
COOK COUNTY	Bridgeview, Village Of	149,057.51	49,685.84	3	1
COOK COUNTY	Broadview, Village Of	133,236.47	16,654.56	8	3
COOK COUNTY	Brookfield, Village Of	616,245.10	15,801.16	39	13
COOK COUNTY	Buffalo Grove, Village Of	20,160.30	6,720.10	3	1
COOK COUNTY	Burbank, City Of	111,274.32	11,127.43	10	4
COOK COUNTY	Burr Ridge, Village Of	141,091.01	28,218.20	5	1
COOK COUNTY	Calumet City, City Of	481,939.18	8,309.30	58	25
COOK COUNTY	Chicago Heights, City Of	48,226.89	6,889.56	7	3
COOK COUNTY	Chicago, City Of	1,723,675.60	12,767.97	135	61
COOK COUNTY	Cicero, Town Of	24,894.93	12,447.47	2	1
COOK COUNTY	Cook County *	7,348,301.06	19,286.88	381	126
COOK COUNTY	Country Club Hills, City Of	16,074.24	8,037.12	2	1
COOK COUNTY	Crestwood, Village Of	15,577.30	7,788.65	2	1
COOK COUNTY	Deerfield, Village Of	311,962.62	16,419.09	19	9
COOK COUNTY	Des Plaines, City Of	22,950,139.12	36,313.51	632	245
COOK COUNTY	Dixmoor, Village Of	41,907.31	3,809.76	11	4
COOK COUNTY	Dolton, Village Of	511,156.23	6,907.52	74	31
COOK COUNTY	East Dundee, Village Of	15,370.83	7,685.42	2	1
COOK COUNTY	Elgin, City Of	1,030,851.63	20,617.03	50	18
COOK COUNTY	Elk Grove Village, Village Of	917,317.51	57,332.34	16	6
COOK COUNTY	Elmhurst, City Of	1,081,276.18	27,031.90	40	17
COOK COUNTY	Elmwood Park, Village Of	341,392.63	11,379.75	30	13
COOK COUNTY	Flossmoor, Village Of	215,060.52	7,680.73	28	9
COOK COUNTY	Ford Heights, Village Of	91,675.75	3,819.82	24	8
COOK COUNTY	Franklin Park, Village Of	4,366,880.29	66,164.85	66	29
COOK COUNTY	Glencoe, Village Of	15,125.09	3,781.27	4	2
COOK COUNTY	Glenview, Village Of	1,579,013.48	29,240.99	54	23
COOK COUNTY	Glenwood, Village Of	68,590.77	6,235.52	11	3
COOK COUNTY	Hanover Park, Village Of	6,923.99	3,462.00	2	1
COOK COUNTY	Harvey, City Of	255,492.14	3,992.06	64	28
COOK COUNTY	Hazel Crest, Village Of	13,462.31	2,692.46	5	2
COOK COUNTY	Hickory Hills, City Of	59,098.36	29,549.18	2	1
COOK COUNTY	Hinsdale, Village Of	5,399,803.63	269,990.18	20	10
COOK COUNTY	Homewood, Village Of	54,287.32	3,877.67	14	5
COOK COUNTY	Inverness, Village Of	71,283.52	7,128.35	10	5
COOK COUNTY	Justice, Village Of	37,680.03	9,420.01	4	1

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
COOK COUNTY	La Grange, Village Of	10,659.86	5,329.93	2	1
COOK COUNTY	Lansing, Village Of	211,618.44	6,826.40	31	12
COOK COUNTY	Lincolnwood, Village Of	19,108.59	4,777.15	4	2
COOK COUNTY	Lynwood, Village Of	22,347.84	7,449.28	3	1
COOK COUNTY	Lyons, Village Of	878,775.46	24,410.43	36	12
COOK COUNTY	Markham, City Of	419,380.17	8,223.14	51	21
COOK COUNTY	Matteson, Village Of	4,684.09	2,342.05	2	1
COOK COUNTY	Maywood, Village Of	69,228.78	5,769.07	12	6
COOK COUNTY	Mccook, Village Of	144,772.91	72,386.46	2	1
COOK COUNTY	Melrose Park, Village Of	3,267,044.38	19,331.62	169	69
COOK COUNTY	Midlothian, Village Of	50,061.14	4,551.01	11	5
COOK COUNTY	Morton Grove, Village Of	30,789.18	4,398.45	7	3
COOK COUNTY	Mount Prospect, Village Of	196,034.67	13,068.98	15	6
COOK COUNTY	Niles, Village Of	917,601.77	28,675.06	32	14
COOK COUNTY	North Riverside, Village Of	87,654.27	14,609.05	6	2
COOK COUNTY	Northbrook, Village Of	492,839.10	27,379.95	18	7
COOK COUNTY	Northfield, Village Of	838,157.52	16,763.15	50	18
COOK COUNTY	Northlake, City Of	1,447,625.16	13,160.23	110	42
COOK COUNTY	Oak Forest, City Of	398,375.00	11,716.91	34	9
COOK COUNTY	Oak Lawn, Village Of	166,297.58	16,629.76	10	4
COOK COUNTY	Olympia Fields, Village Of	20,585.68	10,292.84	2	1
COOK COUNTY	Orland Park, Village Of	186,252.60	15,521.05	12	5
COOK COUNTY	Palatine, Village Of	15,923.76	7,961.88	2	1
COOK COUNTY	Palos Hills, City Of	119,767.91	11,976.79	10	3
COOK COUNTY	Palos Park, Village Of	32,602.00	10,867.33	3	1
COOK COUNTY	Park Ridge, City Of	358,145.58	12,349.85	29	12
COOK COUNTY	Posen, Village Of	39,451.46	4,383.50	9	4
COOK COUNTY	Prospect Heights, City Of	464,745.88	58,093.24	8	3
COOK COUNTY	Richton Park, Village Of	4,761.58	2,380.79	2	1
COOK COUNTY	River Grove, Village Of	1,544,535.09	25,320.25	61	25
COOK COUNTY	Riverside, Village Of	2,426,262.24	27,888.07	87	35
COOK COUNTY	Robbins, Village Of	76,204.98	7,620.50	10	4
COOK COUNTY	Rolling Meadows, City Of	5,452.63	2,726.32	2	1
COOK COUNTY	Roselle, Village Of	13,270.36	6,635.18	2	1
COOK COUNTY	Rosemont, Village Of	876,886.34	125,269.48	7	3
COOK COUNTY	Schaumburg, Village Of	88,008.18	11,001.02	8	3
COOK COUNTY	Schiller Park, Village Of	769,909.94	11,665.30	66	23
COOK COUNTY	Skokie, Village Of	659,901.90	11,184.78	59	22
COOK COUNTY	South Holland, Village Of	221,327.11	6,147.98	36	14

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
COOK COUNTY	Steger, Village Of	59,390.49	29,695.25	2	1
COOK COUNTY	Stone Park, Village Of	5,567,359.45	19,672.65	283	91
COOK COUNTY	Summit, Village Of	6,825.13	3,412.57	2	1
COOK COUNTY	Westchester, Village Of	3,072,823.62	13,302.27	231	101
COOK COUNTY	Western Springs, Village Of	8,417.02	2,805.67	3	1
COOK COUNTY	Wheeling, Village Of	480,444.58	11,173.13	43	16
COOK COUNTY	Wilmette, Village Of	276,928.33	7,287.59	38	17
COOK COUNTY	Winnetka, Village Of	879,789.68	16,919.03	52	23
COOK COUNTY	Woodridge, Village Of	71,653.68	35,826.84	2	1
COOK COUNTY	Frankfort, Village Of	375,871.04	41,763.45	9	3
CRAWFORD COUNTY	Crawford County*	86,433.75	14,405.63	6	3
CRAWFORD COUNTY	Hutsonville, Village Of	240,399.72	30,049.97	8	3
DE KALB COUNTY	De Kalb County *	783,609.36	20,621.30	38	14
DE KALB COUNTY	De Kalb, City Of	208,598.55	8,343.94	25	7
DE KALB COUNTY	Hinckley, Village Of	71,183.41	35,591.71	2	1
DE KALB COUNTY	Sycamore, City Of	214,505.16	17,875.43	12	6
DOUGLAS COUNTY	Douglas County*	134,402.95	12,218.45	11	2
DOUGLAS COUNTY	Tuscola, City Of	102,591.99	6,412.00	16	3
DOUGLAS COUNTY	Villa Grove, City Of	334,621.84	9,560.62	35	12
DU PAGE COUNTY	Addison, Village Of	2,133,027.12	22,219.03	96	31
DU PAGE COUNTY	Aurora, City Of	435,645.77	12,101.27	36	9
DU PAGE COUNTY	Bloomingdale, Village Of	29,153.82	5,830.76	5	2
DU PAGE COUNTY	Bolingbrook, Village Of	503,031.42	41,919.29	12	4
DU PAGE COUNTY	Carol Stream, Village Of	1,026,405.51	20,947.05	49	21
DU PAGE COUNTY	Clarendon Hills, Village Of	44,645.95	11,161.49	4	2
DU PAGE COUNTY	Darien, City Of	11,780.96	2,945.24	4	2
DU PAGE COUNTY	Downers Grove, Village Of	570,701.47	22,828.06	25	7
DU PAGE COUNTY	Du Page County*	1,018,150.06	18,511.82	55	22
DU PAGE COUNTY	Glen Ellyn, Village Of	106,963.91	7,130.93	15	7
DU PAGE COUNTY	Glendale Heights, Village Of	56,691.46	5,669.15	10	5
DU PAGE COUNTY	Itasca, Village Of	284,603.96	21,892.61	13	5
DU PAGE COUNTY	Lisle, Village Of	1,733,993.83	27,967.64	62	23
DU PAGE COUNTY	Lombard, Village Of	175,033.10	12,502.36	14	4
DU PAGE COUNTY	Naperville, City Of	119,540.25	11,954.03	10	5
DU PAGE COUNTY	Oak Brook, Village Of	2,679,086.49	76,545.33	35	11
DU PAGE COUNTY	St. Charles, City Of	16,684.31	4,171.08	4	2
DU PAGE COUNTY	Villa Park, Village Of	585,039.21	45,003.02	13	6
DU PAGE COUNTY	Warrenville, City Of	197,697.46	21,966.38	9	4
DU PAGE COUNTY	Westmont, Village Of	670,440.79	35,286.36	19	7

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
DU PAGE COUNTY	Wheaton, City Of	611,958.30	11,332.56	54	18
DU PAGE COUNTY	Winfield, Village Of	440,286.93	16,306.92	27	9
DU PAGE COUNTY	Wood Dale, City Of	447,562.89	17,213.96	26	7
FRANKLIN COUNTY	West Frankfort, City Of	132,266.22	18,895.17	7	3
FULTON COUNTY	Fulton County*	574,072.46	18,518.47	31	9
FULTON COUNTY	Liverpool, Village Of	153,246.46	9,014.50	17	4
FULTON COUNTY	London Mills, Village Of	118,333.76	16,904.82	7	2
GALLATIN COUNTY	Gallatin County *	83,265.06	27,755.02	3	1
GREENE COUNTY	Greene County *	34,712.59	11,570.86	3	1
GRUNDY COUNTY	Braceville, Village Of	61,466.37	30,733.19	2	1
GRUNDY COUNTY	Channahon, Village Of	140,680.44	23,446.74	6	2
GRUNDY COUNTY	Diamond, Village Of	33,846.95	16,923.48	2	1
GRUNDY COUNTY	Dwight, Village Of	12,178.56	3,044.64	4	2
GRUNDY COUNTY	Grundy County *	2,066,360.46	22,218.93	93	34
GRUNDY COUNTY	Morris, City Of	403,471.12	21,235.32	19	9
GRUNDY COUNTY	Seneca, Village Of	280,203.57	40,029.08	7	1
HANCOCK COUNTY	Dallas City, City Of	204,139.84	12,758.74	16	6
HANCOCK COUNTY	Hancock County *	57,573.84	11,514.77	5	2
HANCOCK COUNTY	Pontoosuc, Village Of	230,440.83	10,973.37	21	9
HARDIN COUNTY	Elizabethtown, Village Of	96,175.91	10,686.21	9	2
HENDERSON COUNTY	Gulfport, Village Of	125,816.76	25,163.35	5	2
HENDERSON COUNTY	Henderson County *	1,333,913.74	21,867.44	61	20
HENDERSON COUNTY	Oquawka, Village Of	415,487.00	24,440.41	17	5
HENRY COUNTY	Coal Valley, Village Of	66,792.43	11,132.07	6	3
HENRY COUNTY	Colona, City Of	4,920.71	2,460.36	2	1
HENRY COUNTY	Henry County *	411,117.89	11,111.29	37	9
IROQUOIS COUNTY	Cissna Park, Village Of	34,288.25	8,572.06	4	2
IROQUOIS COUNTY	Iroquois County*	850,073.01	40,479.67	21	8
IROQUOIS COUNTY	Milford, Village Of	71,139.14	35,569.57	2	1
IROQUOIS COUNTY	Watseka, City Of	3,447,488.98	16,185.39	213	72
IROQUOIS COUNTY	Woodland, Village Of	38,493.17	7,698.63	5	1
JACKSON COUNTY	Carbondale, City Of	859,998.59	95,555.40	9	3
JACKSON COUNTY	Dowell, Village Of	24,880.81	12,440.41	2	1
JACKSON COUNTY	Makanda, Village Of	23,350.28	7,783.43	3	1
JACKSON COUNTY	Murphysboro, City Of	21,606.64	10,803.32	2	1
JASPER COUNTY	Newton, City Of	110,273.55	27,568.39	4	2
JERSEY COUNTY	Elsah, Village Of	324,920.92	17,101.10	19	3
JERSEY COUNTY	Grafton, City Of	2,344,984.31	16,061.54	146	32
JERSEY COUNTY	Jersey County *	973,245.61	9,541.62	102	28

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
JO DAVIESS COUNTY	East Dubuque, City Of	582,540.63	10,991.33	53	13
JO DAVIESS COUNTY	Galena, City Of	113,737.81	37,912.60	3	1
JO DAVIESS COUNTY	Jo Daviess County *	391,895.57	35,626.87	11	3
KANE COUNTY	Algonquin, Village Of	221,344.96	14,756.33	15	6
KANE COUNTY	Gilberts, Village Of	9,787.70	4,893.85	2	1
KANE COUNTY	Hampshire, Village Of	6,475.89	3,237.95	2	1
KANE COUNTY	Kane County *	958,425.34	19,559.70	49	19
KANE COUNTY	Montgomery, Village Of	239,251.58	14,953.22	16	4
KANE COUNTY	North Aurora, Village Of	9,286.00	4,643.00	2	1
KANE COUNTY	South Elgin, Village Of	182,234.46	9,591.29	19	8
KANKAKEE COUNTY	Aroma Park, Village Of	364,319.04	19,174.69	19	7
KANKAKEE COUNTY	Kankakee County *	4,093,423.65	18,112.49	226	63
KANKAKEE COUNTY	Kankakee, City Of	160,392.09	10,692.81	15	6
KANKAKEE COUNTY	Momence, City Of	171,154.26	15,559.48	11	5
KENDALL COUNTY	Joliet, City Of	338,908.03	8,472.70	40	17
KENDALL COUNTY	Kendall County *	342,611.56	13,704.46	25	10
KENDALL COUNTY	Lisbon, Village Of	33,885.62	16,942.81	2	1
KENDALL COUNTY	Millington, Village Of	82,673.00	16,534.60	5	2
KENDALL COUNTY	Plainfield, Village Of	604,303.50	31,805.45	19	8
KENDALL COUNTY	Plano, City Of	90,050.09	12,864.30	7	2
KENDALL COUNTY	Yorkville, City Of	16,041.74	8,020.87	2	1
LA SALLE COUNTY	La Salle County *	1,716,667.83	32,389.96	53	18
LA SALLE COUNTY	Mendota, City Of	38,943.62	4,867.95	8	3
LA SALLE COUNTY	North Utica, Village Of	544,623.09	28,664.37	19	7
LA SALLE COUNTY	Ottawa, City Of	428,715.16	30,622.51	14	4
LA SALLE COUNTY	Peru, City Of	386,101.71	13,789.35	28	6
LA SALLE COUNTY	Sheridan, Village Of	123,848.92	30,962.23	4	2
LA SALLE COUNTY	Streator, City Of	7,908.47	1,977.12	4	1
LAKE COUNTY	Antioch, Village Of	25,722.14	12,861.07	2	1
LAKE COUNTY	Beach Park, Village Of	134,867.90	13,486.79	10	4
LAKE COUNTY	Fox Lake, Village Of	1,842,156.99	18,060.36	102	34
LAKE COUNTY	Fox River Grove, Village Of	98,192.59	14,027.51	7	3
LAKE COUNTY	Gurnee, Village Of	1,670,253.90	64,240.53	26	9
LAKE COUNTY	Highland Park, City Of	95,970.53	5,998.16	16	8
LAKE COUNTY	Lake County *	2,698,881.69	15,334.56	176	66
LAKE COUNTY	Lake Forest, City Of	18,359.29	4,589.82	4	2
LAKE COUNTY	Lakemoor, Village Of	3,540.45	1,770.23	2	1
LAKE COUNTY	Libertyville, Village Of	80,728.87	16,145.77	5	2
LAKE COUNTY	Lincolnshire, Village Of	1,915,928.77	91,234.70	21	8

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
LAKE COUNTY	Lindenhurst, Village Of	71,638.93	17,909.73	4	2
LAKE COUNTY	North Barrington, Village Of	23,279.05	11,639.53	2	1
LAKE COUNTY	Port Barrington, Village Of	344,641.31	16,411.49	21	9
LAKE COUNTY	Riverwoods, Village Of	226,399.61	56,599.90	4	2
LAKE COUNTY	Round Lake Beach, Village Of	89,564.13	7,463.68	12	5
LAKE COUNTY	Round Lake Heights, Village Of	27,740.34	9,246.78	3	1
LAKE COUNTY	Round Lake, Village Of	3,331.60	1,665.80	2	1
LAKE COUNTY	Wauconda, Village Of	51,007.66	17,002.55	3	1
LAKE COUNTY	Waukegan, City Of	8,141.73	4,070.87	2	1
LAWRENCE COUNTY	Lawrenceville, City Of	58,544.87	14,636.22	4	1
LEE COUNTY	Amboy, City Of	32,813.93	6,562.79	5	2
LEE COUNTY	Dixon, City Of	13,865.22	6,932.61	2	1
LEE COUNTY	Lee County*	412,664.79	10,316.62	40	15
LEE COUNTY	Rochelle, City Of	82,181.12	9,131.24	9	4
LIVINGSTON COUNTY	Livingston County*	67,558.84	33,779.42	2	1
LIVINGSTON COUNTY	Pontiac, City Of	131,416.79	6,257.94	21	10
LOGAN COUNTY	Elkhart, Village Of	66,969.94	33,484.97	2	1
LOGAN COUNTY	Lincoln, City Of	8,768.64	2,192.16	4	2
LOGAN COUNTY	Logan County *	9,710.25	4,855.13	2	1
MACON COUNTY	Decatur, City Of	435,905.51	16,765.60	26	10
MACON COUNTY	Forsyth, Village Of	35,249.80	17,624.90	2	1
MACON COUNTY	Macon County *	82,332.04	20,583.01	4	2
MACOUPIN COUNTY	Gillespie,City Of	13,126.00	4,375.33	3	1
MADISON COUNTY	Alton, City Of	274,610.22	9,469.32	29	9
MADISON COUNTY	Collinsville, City Of	63,400.21	10,566.70	6	2
MADISON COUNTY	East Alton, Village Of	26,776.00	13,388.00	2	1
MADISON COUNTY	Granite City, City Of	7,248.53	3,624.27	2	1
MADISON COUNTY	Livingston, Village Of	23,586.78	11,793.39	2	1
MADISON COUNTY	Madison County *	530,973.56	21,238.94	25	10
MADISON COUNTY	Madison, City Of	23,607.73	11,803.87	2	1
MADISON COUNTY	Pontoon Beach, Village Of	115,265.50	19,210.92	6	2
MADISON COUNTY	Wood River, City Of	69,784.60	34,892.30	2	1
MARSHALL COUNTY	Henry, City Of	217,438.52	18,119.88	12	3
MARSHALL COUNTY	Marshall County *	107,413.39	10,741.34	10	4
MARSHALL COUNTY	Sparland, Village Of	42,797.01	6,113.86	7	3
MASON COUNTY	Bath, Village Of	45,170.68	5,018.96	9	2
MASON COUNTY	Mason County *	1,008,486.91	12,150.44	83	23
MASSAC COUNTY	Metropolis, City Of	11,801.32	5,900.66	2	1
MCDONOUGH COUNTY	Mcdonough County *	57,956.52	19,318.84	3	1

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
MCHENRY COUNTY	Crystal Lake, City Of	26,738.64	4,456.44	6	2
MCHENRY COUNTY	Harvard, City Of	12,577.13	3,144.28	4	1
MCHENRY COUNTY	Holiday Hills, Village Of	212,611.39	11,811.74	18	7
MCHENRY COUNTY	Johnsburg, Village Of	30,489.91	7,622.48	4	2
MCHENRY COUNTY	Lake-In-The-Hills, Village Of	57,548.28	5,754.83	10	4
MCHENRY COUNTY	Marengo, City Of	9,507.68	3,169.23	3	1
MCHENRY COUNTY	Mchenry County*	2,177,416.78	13,868.90	157	49
MCHENRY COUNTY	Mchenry, City Of	199,651.59	33,275.27	6	2
MCHENRY COUNTY	Spring Grove, Village Of	119,630.87	9,202.37	13	6
MCHENRY COUNTY	Woodstock, City Of	44,282.41	8,856.48	5	2
MCLEAN COUNTY	Bloomington, City Of	181,546.00	18,154.60	10	5
MCLEAN COUNTY	Heyworth, Village Of	81,896.31	27,298.77	3	1
MCLEAN COUNTY	Leroy, City Of	14,782.03	7,391.02	2	1
MCLEAN COUNTY	Mclean County *	143,396.25	71,698.13	2	1
MCLEAN COUNTY	Mclean, Village Of	11,539.61	5,769.81	2	1
MCLEAN COUNTY	Normal, Town Of	5,189.28	1,729.76	3	1
MCLEAN COUNTY	Towanda, Village Of	9,243.64	4,621.82	2	1
MENARD COUNTY	Menard County *	41,423.51	10,355.88	4	2
MERCER COUNTY	Keithsburg, City Of	184,659.99	30,776.67	6	2
MONROE COUNTY	Monroe County*	961,367.21	41,798.57	23	8
MONROE COUNTY	Waterloo, City Of	16,830.75	8,415.38	2	1
MONTGOMERY COUNTY	Montgomery County *	94,153.02	31,384.34	3	1
MORGAN COUNTY	Jacksonville, City Of	8,533.96	2,133.49	4	2
MORGAN COUNTY	Meredosia, Village Of	3,652.91	1,826.46	2	1
MORGAN COUNTY	Morgan County*	44,821.79	4,482.18	10	4
MOULTRIE COUNTY	Lovington, Village Of	31,337.97	7,834.49	4	1
OGLE COUNTY	Ogle County*	817,008.50	16,340.17	50	15
PEORIA COUNTY	Bartonville, Village Of	25,671.52	6,417.88	4	2
PEORIA COUNTY	Chillicothe, City Of	568,907.27	12,367.55	46	12
PEORIA COUNTY	Pekin, City Of	70,457.99	3,355.14	21	6
PEORIA COUNTY	Peoria County *	6,085,834.90	11,333.03	537	125
PEORIA COUNTY	Peoria Heights, Village Of	1,991,280.87	11,510.29	173	30
PEORIA COUNTY	Peoria, City Of	1,017,895.76	9,253.60	110	26
PEORIA COUNTY	West Peoria, City Of	869,405.42	41,400.26	21	2
PERRY COUNTY	Perry County *	17,994.61	5,998.20	3	1
PIKE COUNTY	Pike County*	1,130,723.49	15,925.68	71	21
PIKE COUNTY	Valley City, Village Of	14,633.14	4,877.71	3	1
PULASKI COUNTY	Karnak, Village Of	13,012.44	6,506.22	2	1
PUTNAM COUNTY	Putnam County *	246,800.95	8,226.70	30	9

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
RANDOLPH COUNTY	Kaskaskia, Village Of	58,866.59	8,409.51	7	2
RANDOLPH COUNTY	Randolph County *	274,851.30	9,816.12	28	9
RANDOLPH COUNTY	Rockwood, Village Of	52,960.13	8,826.69	6	2
ROCK ISLAND COUNTY	Andalusia, Village Of	150,065.80	9,379.11	16	7
ROCK ISLAND COUNTY	Carbon Cliff, Village Of	380,469.29	18,117.59	21	5
ROCK ISLAND COUNTY	Cordova, Village Of	43,044.51	6,149.22	7	2
ROCK ISLAND COUNTY	East Moline, City Of	187,492.22	10,416.23	18	7
ROCK ISLAND COUNTY	Hampton, Village Of	75,930.09	6,902.74	11	4
ROCK ISLAND COUNTY	Hillsdale, Village Of	9,423.86	4,711.93	2	1
ROCK ISLAND COUNTY	Milan, Village Of	126,089.91	7,417.05	17	6
ROCK ISLAND COUNTY	Moline, City Of	1,255,488.44	50,219.54	25	7
ROCK ISLAND COUNTY	Port Byron, Village Of	13,340.79	1,905.83	7	2
ROCK ISLAND COUNTY	Rock Island County*	3,051,779.05	9,844.45	310	74
ROCK ISLAND COUNTY	Rock Island, City Of	33,028.82	6,605.76	5	1
SANGAMON COUNTY	Leland Grove,City Of	215,552.72	30,793.25	7	2
SANGAMON COUNTY	Pawnee, Village Of	5,054.22	2,527.11	2	1
SANGAMON COUNTY	Pleasant Plains, Village Of	7,994.81	3,997.41	2	1
SANGAMON COUNTY	Riverton, Village Of	20,430.66	10,215.33	2	1
SANGAMON COUNTY	Sangamon County *	243,662.94	15,228.93	16	7
SANGAMON COUNTY	Springfield, City Of	465,166.67	33,226.19	14	6
SCHUYLER COUNTY	Browning, Village Of	65,824.28	8,228.04	8	4
SCHUYLER COUNTY	Schuyler County *	13,616.52	2,723.30	5	1
SCOTT COUNTY	Bluffs, Village Of	7,019.58	3,509.79	2	1
SCOTT COUNTY	Scott County*	55,775.36	13,943.84	4	2
ST. CLAIR COUNTY	Belleville, City Of	17,358.84	3,471.77	5	2
ST. CLAIR COUNTY	Cahokia, Village Of	36,927.98	7,385.60	5	2
ST. CLAIR COUNTY	Caseyville, Village Of	4,128.23	2,064.12	2	1
ST. CLAIR COUNTY	Centreville, City Of	15,174.29	5,058.10	3	1
ST. CLAIR COUNTY	Dupo, Village Of	21,875.23	10,937.62	2	1
ST. CLAIR COUNTY	East Carondelet, Village Of	41,872.03	6,978.67	6	3
ST. CLAIR COUNTY	East St. Louis, City Of	431,428.68	7,072.60	61	23
ST. CLAIR COUNTY	O'Fallon, City Of	296,528.37	74,132.09	4	2
ST. CLAIR COUNTY	St. Clair County *	419,347.35	19,968.92	21	8
ST. CLAIR COUNTY	Swansea, Village Of	14,571.11	7,285.56	2	1
STEPHENSON COUNTY	Freeport, City Of	142,797.90	7,515.68	19	9
STEPHENSON COUNTY	Stephenson County *	121,554.83	9,350.37	13	5
TAZEWELL COUNTY	Creve Coeur, Village Of	16,957.20	3,391.44	5	2
TAZEWELL COUNTY	East Peoria, City Of	371,338.31	12,804.77	29	9
TAZEWELL COUNTY	North Pekin, Village Of	316,560.32	24,350.79	13	3

County Name	Community Name	Total Payments	Average Payment	Losses	Properties
TAZEWELL COUNTY	Tazewell County *	475,771.05	10,122.79	47	15
UNION COUNTY	Mill Creek, Village Of	6,164.12	3,082.06	2	1
UNION COUNTY	Union County*	14,172.91	3,543.23	4	2
VERMILION COUNTY	Danville, City Of	141,150.94	23,525.16	6	2
VERMILION COUNTY	Vermilion County*	834,636.39	34,776.52	24	10
WABASH COUNTY	Mount Carmel, City Of	3,840.00	1,280.00	3	1
WAYNE COUNTY	Fairfield, City Of	51,117.90	12,779.48	4	2
WHITE COUNTY	Carmi, City Of	29,580.41	4,930.07	6	3
WHITE COUNTY	White County *	58,654.50	29,327.25	2	1
WHITESIDE COUNTY	Albany, Village Of	134,263.54	10,327.96	13	4
WHITESIDE COUNTY	Morrison, City Of	116,030.72	16,575.82	7	2
WHITESIDE COUNTY	Whiteside County*	189,716.41	9,485.82	20	8
WILL COUNTY	Beecher, Village Of	12,703.36	6,351.68	2	1
WILL COUNTY	Crest Hill, City Of	13,686.38	3,421.60	4	1
WILL COUNTY	Crete, Village Of	75,255.06	12,542.51	6	2
WILL COUNTY	Elwood, Village Of	36,510.76	4,563.85	8	3
WILL COUNTY	Lockport, City Of	112,948.71	8,067.77	14	5
WILL COUNTY	New Lenox, Village Of	460,191.91	18,407.68	25	7
WILL COUNTY	Romeoville, Village Of	10,282.03	5,141.02	2	1
WILL COUNTY	Shorewood,Village Of	148,314.64	16,479.40	9	3
WILL COUNTY	Will County *	5,215,815.56	13,983.42	373	117
WILL COUNTY	Wilmington, City Of	287,274.69	14,363.73	20	8
WILLIAMSON COUNTY	Marion, City Of	552,075.99	12,001.65	46	12
WILLIAMSON COUNTY	Williamson County *	26,315.12	8,771.71	3	1
WINNEBAGO COUNTY	Machesney Park, Village Of	1,665,550.95	17,532.12	95	35
WINNEBAGO COUNTY	Rockford, City Of	4,092,401.42	24,359.53	168	78
WINNEBAGO COUNTY	Roscoe, Village Of	30,188.89	3,773.61	8	3
WINNEBAGO COUNTY	South Beloit, City Of	8,521.40	4,260.70	2	1
WINNEBAGO COUNTY	Winnebago County *	1,484,190.05	14,409.61	103	28
WOODFORD COUNTY	Spring Bay, Village Of	247,909.15	8,548.59	29	10
WOODFORD COUNTY	Woodford County *	2,188,850.44	13,265.76	165	43

Appendix D: Hazard Identification in Local Hazard Mitigation Plans

County Name:	Severe Storms	Flooding	Tornado	Winter Storms	Dam/ Levee Failure	Drought	Earthquake	Extreme Temp	Power Outages	Pipeline Rupture	Mine/ Ground Sub.	Terrorism CBRNE	Civil Disturbance	HAZ-MAT Release	Fire/ Explosion	Other Hazards
Adams																
Alexander	x	x	x	x	x		x							x	x	Trans.
Bond																
Boone																
Brown																
Bureau	x	x	x	x		x	x	x							x	Land Slide
Calhoun																
Carroll	x	x	x	x	x	x	x	x								
Cass	x	x	x	x	x									x	x	
Champaign	x	x	x	x		x	x	x						x	x	
Christian														x		
Clark	x	x	x	x	x	x	x							x	x	
Clay																
Clinton	x	x	x	x			x				x			x	x	
Coles	x	x	x	x	x	x	x		x	x		x	x	x	x	Epidemics Nuclear, Trans.
Cook																
Crawford	x	x	x	x	x	x	x	x						x		
Cumberland	x	x	x	x		x	x	x								
DeKalb	x	x	x	x		x	x	x								
DeWitt	x	x	x	x		x	x	x								
Douglas	x	x	x	x	x	x	x	x				x		x		Nuclear

County Name:	Severe Storms	Flooding	Tornado	Winter Storms	Dam/ Levee Failure	Drought	Earthquake	Extreme Temp	Power Outages	Pipeline Rupture	Mine/ Ground Sub.	Terrorism CBRNE	Civil Disturbance	HAZ-MAT Release	Fire/ Explosion	Other Hazards
DuPage	x	x	x	x	x	x	x	x								
Edgar																
Edwards	x	x	x	x		x	x				x			x		
Effingham																
Fayette																
Ford																
Franklin	x	x	x	x	x		x				x			x		
Fulton	x	x	x	x	x		x							x		
Gallatin	x	x	x	x	x	x	x	x			x			x		
Greene	x	x	x	x	x	x	x	x								
Grundy																
Hamilton																
Hancock	x	x	x	x		x	x	x			x					
Hardin																
Henderson																
Henry	x	x	x	x	x	x	x	x								
Iroquois	x	x	x	x			x	x								Railroad Incident
Jackson	x	x	x	x	x		x				x					
Jasper																
Jefferson	x	x	x	x			x							x		
Jersey																
Jo Daviess	x	x	x	x	x	x	x	x				x		x		Waste Remediati on
Johnson	x	x	x	x		x	x	x						x	x	
Kane	x	x	x	x	x		x									
Kankakee																

County Name	Severe Storms	Flooding	Tornado	Winter Storms	Dam/ Levee Failure	Drought	Earthquake	Extreme Temp	Power Outages	Pipeline Rupture	Mine/ Ground Sub.	Terrorism CBRNE	Civil Disturbance	HAZ-MAT Release	Fire/ Explosion	Other Hazards
Kendall																
Knox																
Lake	x	x	x	x		x	x	x								Erosion
LaSalle	x	x	x	x		x	x	x								
Lawrence	x	x	x	x		x	x	x								
Lee																
Livingston																
Logan	x	x	x	x		x	x	x								
McDonough																
McHenry	x	x	x	x	x	x	x	x								
McLean																
Macon	x	x	x	x	x	x	x	x						x		Nuclear
Macoupin	x	x	x	x	x		x							x		
Madison	x	x	x	x		x	x	x								
Marion																
Marshall	x	x	x	x	x	x	x								x	Land Slide, Trans.
Mason	x	x	x	x		x	x	x								
Massac	x	x	x	x	x		x							x	x	
Menard	x	x	x	x	x		x							x		
Mercer	x	x	x	x		x	x	x			x					
Monroe	x	x	x	x			x	x						x	x	
Montgomery	x	x	x	x	x	x	x	x								
Morgan	x	x	x	x		x	x	x								
Moultrie	x	x	x	x		x	x	x								
Ogle	x	x	x	x	x	x	x	x				x		x		Nuclear

County Name:	Severe Storms	Flooding	Tornado	Winter Storms	Dam/ Levee Failure	Drought	Earthquake	Extreme Temp	Power Outages	Pipeline Rupture	Mine/ Ground Sub.	Terrorism CBRNE	Civil Disturbance	HAZ-MAT Release	Fire/ Explosion	Other Hazards
Peoria	x	x	x	x		x	x	x			x					Landslide, Wildfire
Perry	x	x	x	x			x				x			x		
Piatt	x	x	x	x		x	x	x						x	x	
Pike																
Pope																
Pulaski	x	x	x	x		x	x	x								
Putnam	x	x	x	x		x	x	x								
Randolph																
Richland	x	x	x	x	x	x	x	x						x	x	
Rock Island	x	x	x	x	x	x	x	x						x		
St. Clair	x	x	x	x	x		x	x			x			x	x	
Saline	x	x	x	x	x	x	x	x			x			x	x	
Sangamon	x	x	x	x	x	x	x	x			x					
Schuyler	x	x	x	x	x	x	x	x						x	x	
Scott	x	x	x	x		x	x	x								
Shelby	x	x	x	x		x	x	x								
Stark	x	x	x	x		x	x	x							x	Land Slide
Stephenson	x	x	x	x		x	x	x	x			x	x	x	x	Pandemic, Nuclear, Trans.
Tazewell																
Union	x	x	x	x	x		x	x						x	x	
Vermilion	x	x	x	x	x		x	x								
Wabash	x	x	x	x	x		x	x								
Warren																
Washington																
Wayne	x	x	x	x		x	x	x								

County Name:	Severe Storms	Flooding	Tornado	Winter Storms	Dam/ Levee Failure	Drought	Earthquake	Extreme Temp	Power Outages	Pipeline Rupture	Mine/ Ground Sub.	Terrorism CBRNE	Civil Disturbance	HAZ-MAT Release	Fire/ Explosion	Other Hazards
White	x	x	x	x	x	x	x	x						x		
Whiteside	x	x	x	x		x	x	x								
Will	x	x	x	x	x	x	x	x		x	x	x	x		x	Public Heath, Trans.
Williamson	x	x	x	x		x	x	x			x			x		Landslide
Winnebago	x	x	x	x		x	x	x								
Woodford																

Appendix E: Climate Change and Hazard Mitigation Study

Climate Change and Hazard Mitigation

This chapter addresses the impacts of climate change on natural hazards in Illinois. The five natural hazards identified for study include severe weather, extreme heat, drought, floods, and winter storms. For each topic, both historical data and future climate projections were examined to determine the change in risk. In November 2017, The U.S. Global Change Research Program (USGCRP) released the first volume of their two-part Fourth National Climate Assessment, a report to Congress mandated by the Global Change Research Act of 1990. This first volume is referred to as the Climate Science Special Report (CSSR) (USGCRP 2017). Authors of the report consisted of scientists from Federal agencies, national laboratories, universities, and the private sector. The report is based on a large body of scientific, peer-reviewed research as well as publicly available datasets. Furthermore, multiple Federal agencies, university experts, and the National Academy of Science reviewed the report. As such, this report reflects the current state of the science on climate change in the US and assigns levels of confidence in the findings. While their results address the entire US, this chapter will identify factors relevant to Illinois.

The data used in this study were collected from the National Oceanic and Atmospheric Administration (NOAA). Most of the historical data on temperatures, drought, snowfall, and precipitation came from the NOAA National Centers for Environmental Information (NCEI). Historical data on tornadoes came from the NOAA Storm Prediction Center.

Severe Weather

Introduction

Tornadoes in the state of Illinois are a year-round hazard that affects all parts of the state. Illinois is ranked high in terms of the number of tornadoes and tornado impacts (damages, deaths, and injuries). In fact, Illinois has experienced the worst tornadoes in U.S. history. The infamous Tri-State tornado occurred on March 18, 1925, passing through southern Missouri, Illinois, and Indiana, leaving 695 dead and 2000 injured.

To analyze the trends in frequency, damage, injuries, and fatalities a climatology was built using archived storm event data from the Storm Prediction Center (SPC 2017). This data when organized into specific fields like tornado occurrence per year can show overall climatological trends in the data for Illinois.

Historical Trends

Tornadoes

Examining the climatology from 1950 to 2016 and including all tornadoes reveals is a noticeable increase in tornadoes from year to year (Figure 1). The increase is especially noticeable after the 1990s with wider variations from year to year. Figure 2 shows the upward trend in the number of the weakest F0 (EF0) tornadoes. These weakest tornadoes rarely caused any damage and traditionally under reported. The upward trend in recent years is likely the result of better radar systems, better spotter networks, and increased

awareness and interest by the public. Combined, these factors have allowed for a better documentation of the weaker events over time. Figure 3 shows the time series for stronger F1-F5 (EF1-EF5) events. Up until 2000, there was little evidence of a trend. However, since 2000 there has been an increase in both the number of stronger tornadoes and the year-to-year variability. The average number of stronger tornadoes from 1950 to 1999 was 18.7 per year, and increased to 27.1 per year after 2000.

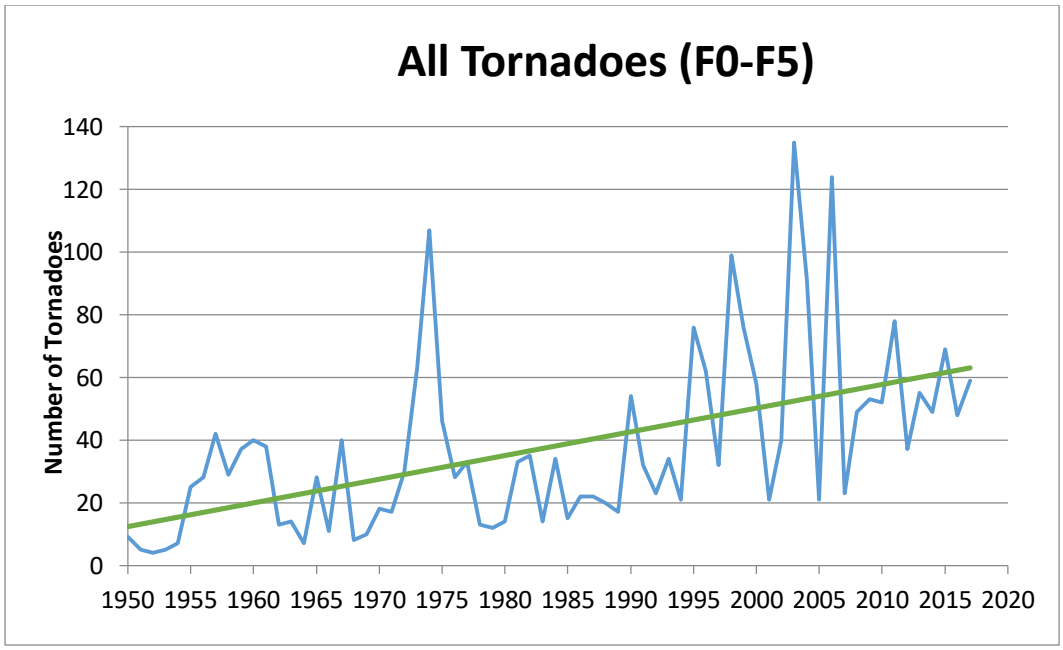


Figure 1. All tornadoes 1950-2017. Source: NOAA SPC 2018.

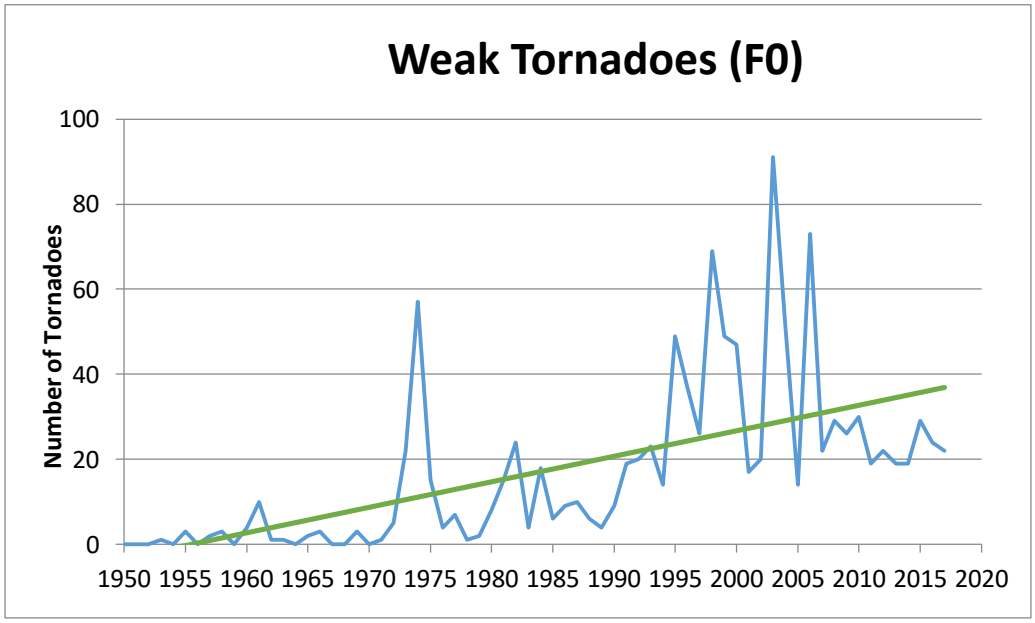


Figure 2. Weak tornadoes (E)F0, 1950-2017. Source: NOAA SPC 2018.

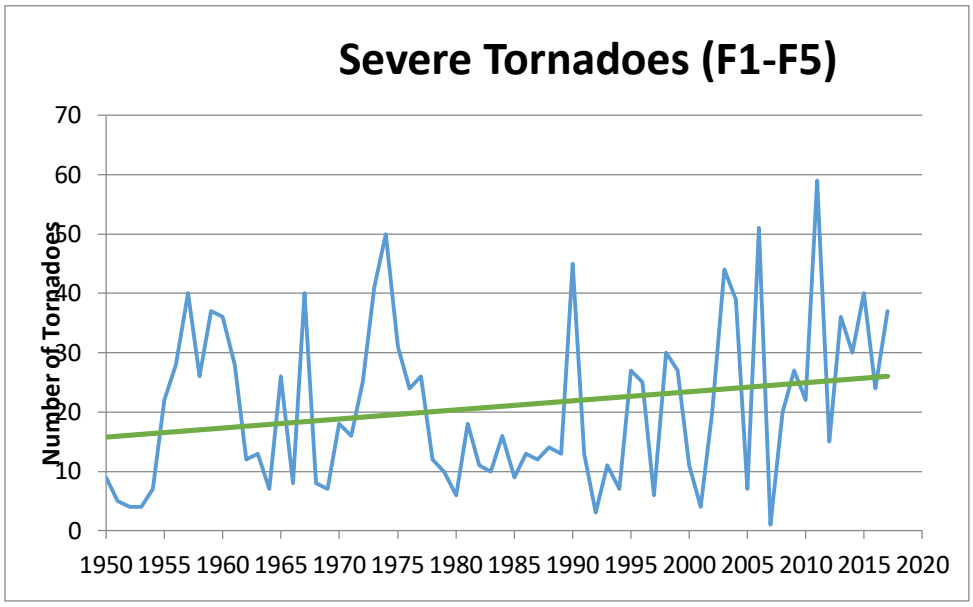


Figure 3. Severe Tornadoes (E)F1-(E)F5, 1950-2017. Source: NOAA SPC 2018.

Looking at monthly and seasonal trends of tornadoes within the state of Illinois between the years 1950 and 2016 (Figure 4), most tornadoes occur during meteorological spring (MAM) and summer (JJA) with substantially less during fall (SON) and winter (JJA). This is typical of the rest of the country where tornadoes are most common during the spring and summer months, though summer sees slightly less than spring. While not shown, an examination of monthly trends for the period 1950 to 2016 shows an increase in tornado events during the months of March, April, May and June. This coincides with the yearly uptick and peak of tornadoes for Illinois.

Tornadoes result often in damage, injuries, and even fatalities and it is important to observe the impact to life and property. Tornado damage is hard to observe accurately before 1996 due to the use of numbers signifying wide ranging damage values for property damage. After 1996 whole dollar amounts were used and using this more modern range will give a representative climatology for tornado damage. For 2000-2016, Figure 5, there exists a clear upward trend in damage from year to year, but this is partially the result of the November 17th, 2013 tornado outbreak. The Washington, Illinois tornado, as part of that outbreak, skewed the results greatly as this one tornado was close to a $1 billion disaster. Ignoring this tornado from the event in the climatology, a small increase in tornado damage from year to year is still observed with an average tornado damage per year of approximately $28 million. Looking at injuries from 1950 to 2016 the frequency of reported injuries is steadily decreasing over time. This is likely a result of increased awareness and preparedness for tornadoes by the public. A similar result is observed with fatalities from 1950-2016 from tornadoes.

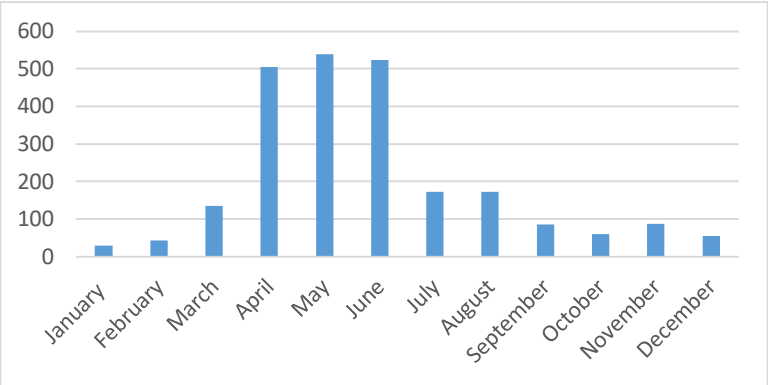


Figure 4. Tornado frequency by month from 1950-2016. Source: NOAA SPC 2018.

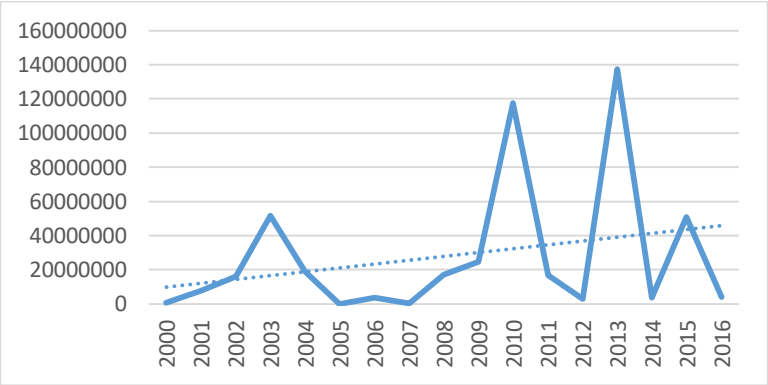


Figure 5. Property damage form tornadoes from 2000-2016, minus the Washington IL tornado. See text. Source NOAA SPC 2018.

Thunderstorm Winds

Thunderstorm wind additionally poses a hazard year-round and in all parts of the state, causing both loss of life and property damage. Thunderstorm wind reports in the state of Illinois for the years of 1955 to 2016 were examined. Year to year trends beginning in 1955 and ending in 2016 show a substantial increase in thunderstorm wind reports (not shown). This is most likely a result of factors such as increased awareness, better reporting systems, etc., as was discussed with the tornado reporting. Thunderstorm wind reports remain constant when looking at a more modern period of 2000-2016, Figure 6. Looking at monthly frequency between 1955 and 2016, Figure 7, thunderstorm wind damage reports are most frequent in the spring and summer months and similar to the patterns found for tornadoes. During the summer months, it is noted that there is as many thunderstorm wind reports as all other seasons put together, but spring still contains a substantial amount of severe wind reports.

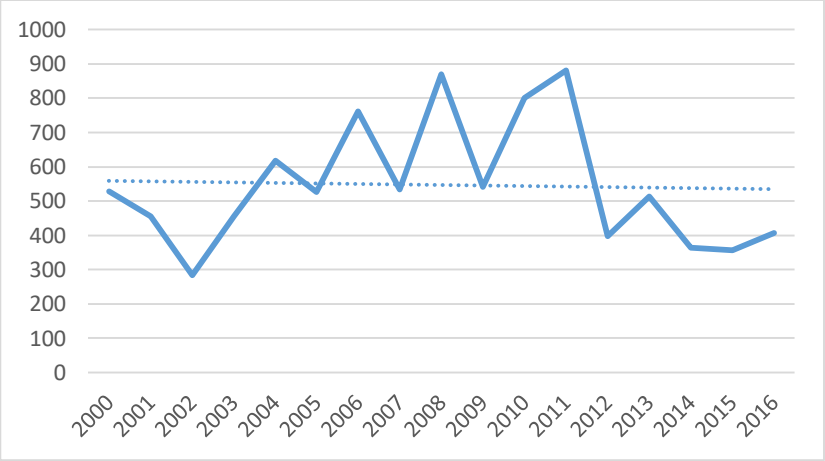


Figure 6.Thunderstorm wind damage reports for 2000-2016. Source: NOAA SPC 2018.

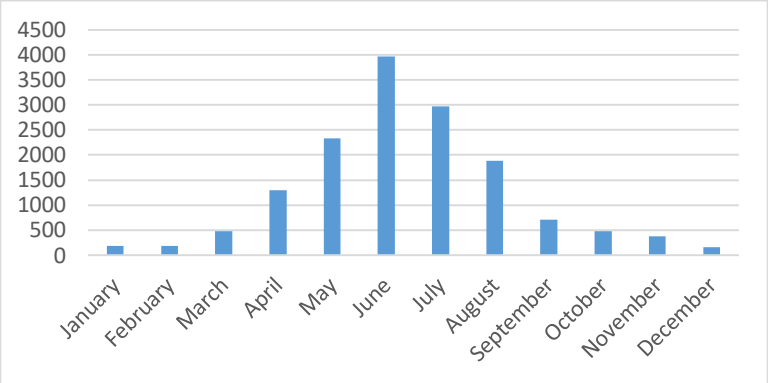


Figure 7. Thunderstorm wind damage reports by month for 2000-2016. Source: NOAA SPC 2018.

Thunderstorm wind also results in damage, injuries, and fatalities and is important to consider alongside tornadoes. Thunderstorm wind has the same problem as tornadoes of whole dollar amounts not being available until 1996, so the year range will focus on 2000-2016 for a modern climatology. During this period there was a nearly steady amount a damage caused per year with a yearly average of approximately $31 million. Of note is that the Super Derecho that occurred on May 8th, 2009 that affected parts of Southern Illinois was outstanding in damages, costing approximately 10 times the average. The examination of both injuries and fatalities was limited to the modern range of 2000-2016 as older data is not readily available. These data reveal that there was steady decrease in injuries and fatalities. This is likely a result of increased awareness and preparedness of the public for thunderstorm wind events.

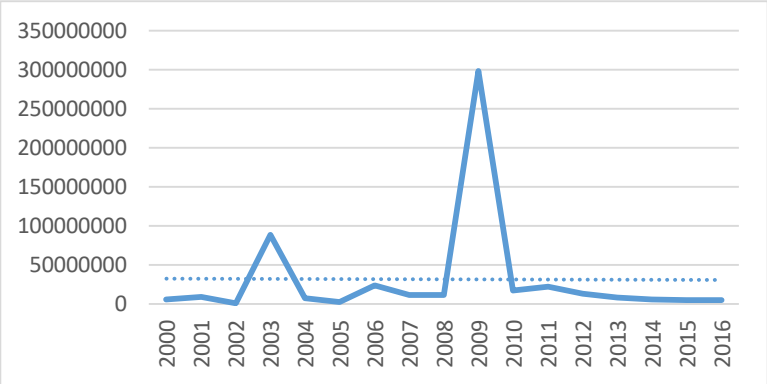


Figure 8. Thunderstorm wind damage dollar amounts by year from 2000-2016. Source: NOAA SPC 2018.

This study found that thunderstorm wind costs about $4 million more than tornadoes per year on average. It should be noted that anomalous events such as the 2009 Super Derecho event and the Washington, Illinois tornado event cost can greatly exceed the yearly average. It was found that injuries and fatalities from both tornadoes and thunderstorms decreased steadily over time, hopefully reflecting increased preparedness and awareness. Thunderstorm wind accounts for approximately one fourth of injuries compared to tornadoes. Thunderstorm winds only accounts for approximately half as many fatalities as tornadoes on average.

Potential Future Changes

Little research is available to address potential future changes in tornadoes and severe thunderstorms over Illinois. Besides the limitations of the historical database described here, climate models do not have the time and space resolution to successfully model tornado activity. The Climate Science Special Report (CSSR) has some key findings (Chapter 9, Kossin et al., 2017) on severe weather for the United States including:

- "Tornado activity in the United States has become more variable, particularly over the 2000s, with a decrease in the number of days per year with tornadoes and an increase in the number of tornadoes on these days (*medium confidence*). Confidence in past trends for hail and severe thunderstorm winds, however, is *low*. Climate models consistently project environmental changes that would putatively support an increase in the frequency and intensity of severe thunderstorms (a category that combines tornadoes, hail, and winds), especially over regions that are currently prone to these hazards, but confidence in the details of this projected increase is *low*."
- Despite the database limits, the careful use of the tornado report database has revealed other important information about tornado trends. Since the 1970s, the United States has experienced a decrease in the number of days per year on which tornadoes occur, but an increase in the number of tornadoes that form on such days. One important implication is that the frequency of days with large numbers of tornadoes—tornado outbreaks—appears to be increasing (Figure 10). This has implications for Illinois in that a shift towards more tornado outbreaks could hamper mutual aid if multiple communities are impacts, such as in the November 2013 outbreak.
- The extent of the season over which such tornado activity occurs is increasing as well: although tornadoes in the United States are observed in all months of the year, an earlier calendar-day start to the season of high activity is emerging at the national level. While not strongly evident yet in Illinois, it could be a concern for tornado preparedness in what is typically considered the "off season". They also noted more year-to-year variability in tornado occurrence at the national level, as was found here for Illinois.

In summary, the information about future trends in tornado activity is limited. Unfortunately, it is not clear if the intensity or frequency of tornadoes will increase or decrease in Illinois in the future. Therefore, it is recommended to assume that the frequency of tornadoes and severe weather will remain the same, occurring often somewhere in Illinois every year. However, for planning purposes it may be wise to consider how a possible increase in large tornado outbreaks could affect mutual aid resources.

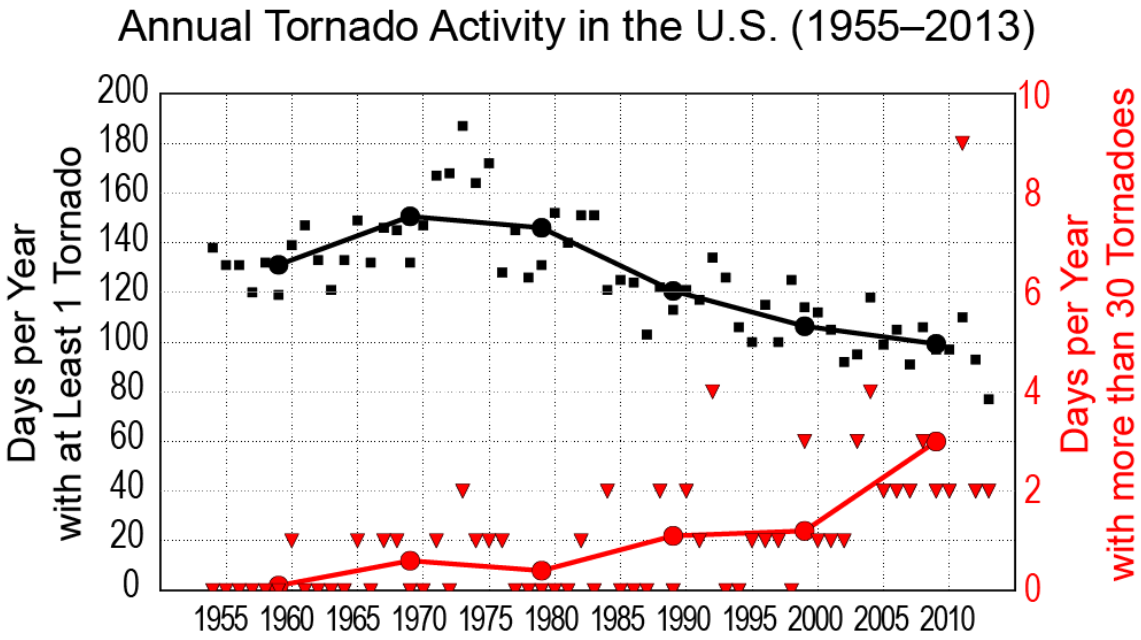


Figure 9. Annual tornado activity in the United States over the period 1955–2013. The black squares indicate the number of days per year with at least one tornado rated (E)F1 or greater, and the black circles and line show the decadal mean line of such tornado days. The red triangles indicate the number of days per year with more than 30 tornadoes rated (E)F1 or greater, and the red circles and line show the decadal mean of these tornado outbreaks (Figure 9.3, NCA4 2017)

Droughts

Introduction

The Illinois State Water Survey has done extensive work on droughts in Illinois. One of the challenges in any drought is the uncertainty over its definition. Changnon (1987) described drought as "a complex physical and social phenomenon of widespread significance, and despite all the problems droughts have caused, drought has proven difficult to define. There is no universally accepted definition because: 1) drought, unlike flood, is not a distinct event, and 2) drought is often the result of many complex factors acting on and interacting within the environment. Complicating the problem of drought definition is the fact that drought often has neither a distinct start nor end. It is usually recognizable only after a period and because a drought may be interrupted by short spells of one or more wet months, its termination is difficult to recognize. Drought is also a temporary feature of the climate of Illinois, and we know it occurs only when less than adequate precipitation exists for an extended period. Because of the complex nature of droughts, there are many definitions, often reflecting a specific area of concern of an individual, a city, or a region."

In general, the two types of drought of concern in Illinois are agricultural and hydrologic droughts. Agricultural droughts occur when soil moisture is not sufficient to support crops during the growing season. These droughts can delay or stunt the development of crops, resulting in reduced yields and sometime even loss of yields entirely. Agricultural drought may mean shortages in water for livestock, poor pasture, and shortages of hay. In general, agricultural droughts are largely confined to one growing season (late spring to early fall).

Hydrologic drought refers to periods of below-normal streamflow, depleted reservoir storage, or shortages in groundwater supplies. Hydrologic droughts usually cause severe impacts to water supplies, as well as impede river navigation and reduce water quality. In general, hydrological droughts last longer than agricultural droughts. In Illinois, it usually requires below-normal precipitation for 6 or more months for development and could last 1 to 2 years, or more.

Despite these distinctions, most droughts may exhibit characteristics of both types of drought. For example, the 2012 drought was an agriculture drought in spring and summer. However, by August the lack of rainfall had begun to negatively impact surface and groundwater supplies. While the rains in late August and September provided some relief to agriculture, water supplies continued to struggle through the fall and winter. A similar pattern was observed in the 1988-89 drought (Angel et al. 1992).

Historical trends in drought

The Palmer Drought Severity Index (PDSI), a widely used index of drought severity, is based on temperature, precipitation, and soil characteristics. The time series of monthly PDSI values averaged for the entire state is shown (Figure 11). An index of -4 or less represents extreme drought, -3 to -3.9, severe drought, and -2 to -2.9, moderate drought. Values between -2 and +2 are considered near normal. Larger positive values indicate anomalously wet conditions. There is considerable variability in the PDSI for Illinois at different time scales, a few months to a few years. As measured by the PDSI, the most extreme drought statewide in Illinois occurred in 1934, reaching peak intensity in July (PDSI of -6.9). This was part of a multiyear period of dry and hot conditions, with extreme drought also in 1931 (PDSI of -6.5) and in 1936 (PDSI of -5.1). Crop yields, essential for the agriculturally-based economy of that era, were cut drastically. As shown in the figure, historical drought events occurred in 1901-1902, 1914-1915, 1930-31, 1933-34, 1936, 1940-41, 1954,1954, 1963-1964, 1988, and 2012, with PDSI values of less than -4 and considered as extreme droughts. Such droughts may be expected to occur roughly once in 10 to 11 years on average, based on the historical record.

When the PDSI values are examined for individual climate divisions in Illinois for the 1900–2015 period, the PDSI's extreme classification is shown to occur for 10 additional drought events, giving a total of 21 events (Table 1.1). However, this list is irrespective of which region of Illinois was affected by an event. Whereas an extreme PDSI drought might be expected to occur once in 10 to 11 years on average for any specific region of Illinois, the list in Table 1.4 indicates that an extreme PDSI drought might be expected to occur somewhere in Illinois roughly once in five to six years.

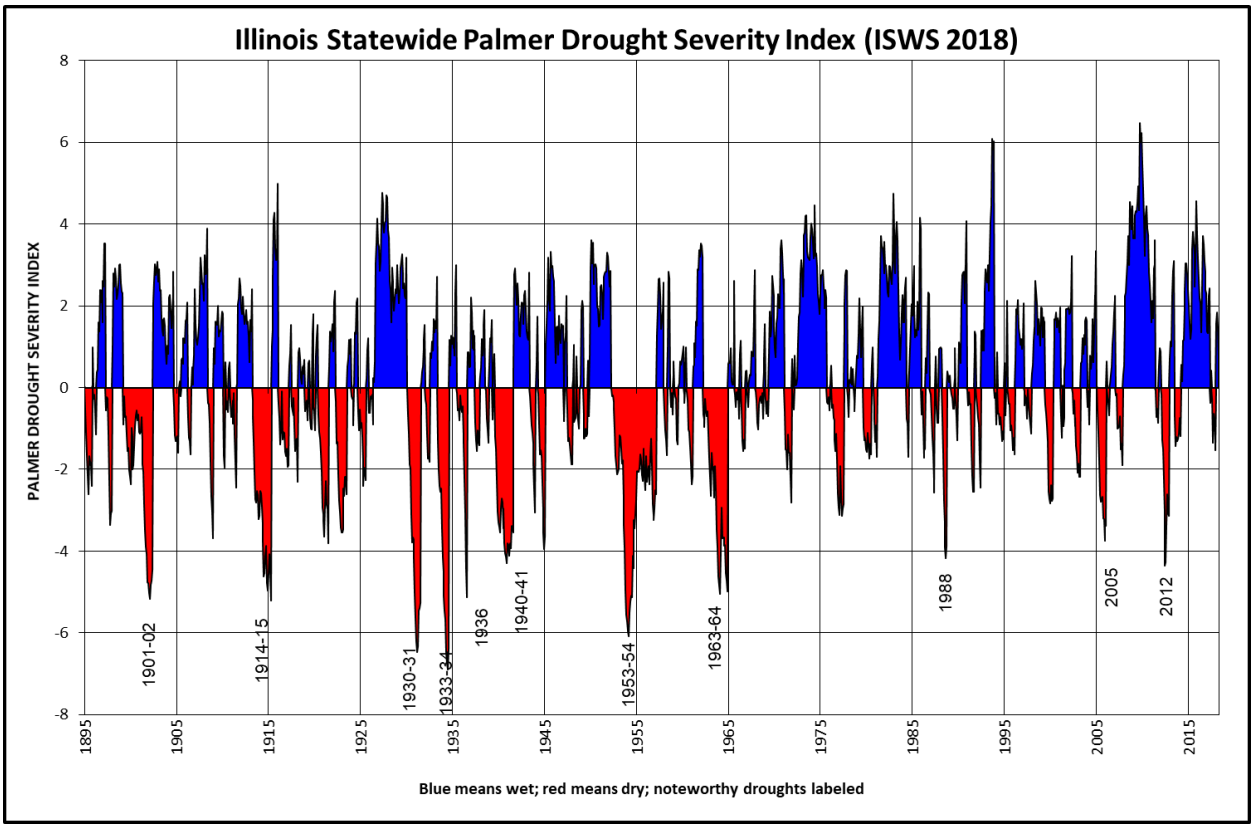


Figure 10. Statewide Palmer Drought Severity Index for Illinois from 1895 to 2017. Data source: NOAA NCEI, 2018.

Table 1.1 Drought Events Classified as Extreme by the PDSI for One or More Climate Divisions in Illinois, 1900-2015.	
Drought Event	Climate Divisions with Extreme Classification
1901-1902	7
1908-1909	5
1910-1911	3
1914-1915	8
1920-1921	3
1923	2
1930-1931	9
1933-1934	9
1936	7
1940-1941	5
1944-1945	5
1953-1954	6
1956-1957	3
1963-1964	8
1977	2
1981	1
1988-1989	5
2000	1
2003	1
2005-2006	4
2012	8

A drought of note in Illinois during the early 1950s reached its peak in March 1954 (PDSI of -6.1). What is most notable about that drought is its duration; the PDSI remained negative, indicating drought conditions, from April 1952 through March 1957, the longest such period in Illinois' recorded history. Other notable long-term droughts occurred in 1901-1902, 1914-1915, 1940-1941, and 1963-1964.

Another significant drought in Illinois history was the 1988-1989 drought. A PDSI of -4.2 in September 1988 indicated a drought of lesser intensity than those in the 1930s. However, timing of the 1988 drought caused serious impacts. April-June 1988 was the driest spring on record. Continuing dryness in July and August resulted in sharp reductions in crop yields and very low flows in streams and

rivers. Many municipalities faced water shortages, and low water levels disrupted barge traffic on the Illinois and Mississippi Rivers. Angel et al. (1992) provide a detailed account of this drought.

The most recent drought in Illinois was the 2012 drought. As described in Knapp et al. (2017), the primary impact of the 2012 drought in Illinois was to agriculture. Significant precipitation deficits led to much-reduced soil moisture and made worse by extreme high temperatures, stressed crops, pasture, and livestock. Corn yields were noticeably reduced throughout large portions of the state, and some of that crop was tainted with aflatoxins. The drought also posed concerns about water resources and water supply that may have developed into greater specific threats had the drought lasted longer. The developing potential for water supply shortages was lessened, and in some cases removed entirely, after abundant precipitation produced by the remnants of Hurricane Isaac occurred over Labor Day weekend. Fish kills associated with low stream levels, high water temperatures, or algal blooms were reported in numerous streams and rivers. In a few cases in northeastern Illinois, water quality treatment problems emerged related to excessively high amounts of algae in rivers. Although the drought also diminished rural groundwater supplies and caused navigation concerns on some major rivers, ultimately the overall impacts to these resources were limited by the relative brevity of the drought.

Potential Future Changes

The Climate Science Special Report has some key findings (Chapter 8, Wehner et al., 2017) on drought including:

- Recent droughts and associated heat waves have reached record intensity in some regions of the United States; however, by geographical scale and duration, the Dust Bowl era of the 1930s remains the benchmark drought and extreme heat event in the historical record (very high confidence). While by some measures drought has decreased over much of the continental United States in association with long-term increases in precipitation, neither the precipitation increases, nor inferred drought decreases have been confidently attributed to anthropogenic forcing.
- The human effect on recent major U.S. droughts is complicated. Little evidence is found for a human influence on observed precipitation deficits, but much evidence is found for a human influence on surface soil moisture deficits due to increased evapotranspiration caused by higher temperatures. (High confidence)
- Future decreases in surface (top 4 inches) soil moisture from anthropogenic forcing over most of the United States are likely as the climate warms under higher scenarios. (Medium confidence)

As noted later in this chapter, Illinois has experienced an increase in annual precipitation of 4.1 inches over the last century over the last century. That translates into about an extra month's worth of precipitation. The 1981-2010 average, or normal, for the state now stands as 39.96 inches. Because of these increases, large-scale droughts have become less frequent and less intense over time in Illinois. That is not to say that large-scale droughts cannot occur in Illinois – witness the 2012 drought. As the CSSR noted, it is possible that future warmer conditions could lead to increased drying of soils by mid to late 21st century. However, for now it is recommended that the historical drought of record for specific locations in Illinois be used for planning purposes. Moderate drought is expected once every 5 to 6 years, while severe droughts are expected every once in every 10 to 11 years.

Heat Waves

Introduction

Illinois has experienced several severe heatwaves in the past. Probably the most well-known was the 1995 Chicago Heat Wave that took over 740 lives. A second, less severe heat wave occurred in Chicago in 1999, taking the lives of 80 people. Other heat waves have affected Illinois as well, including the 1954 heat wave that resulted in the record warmest temperature for Illinois, 117°F in East St. Louis on July 14, 1954.

Historical Trends in Heat Waves

Overall, Illinois temperatures have warmed by about 1.2°F over the last century. However, much of that warming has occurred in winter and spring. The pattern for summer is more complex. Daytime high temperatures for summer (June, July, and August) in Illinois have decreased by 1 degree over the last century. Summer daytime temperatures were especially high in the 1930s with its combination of widespread heat and drought during several summers (Figure 12).

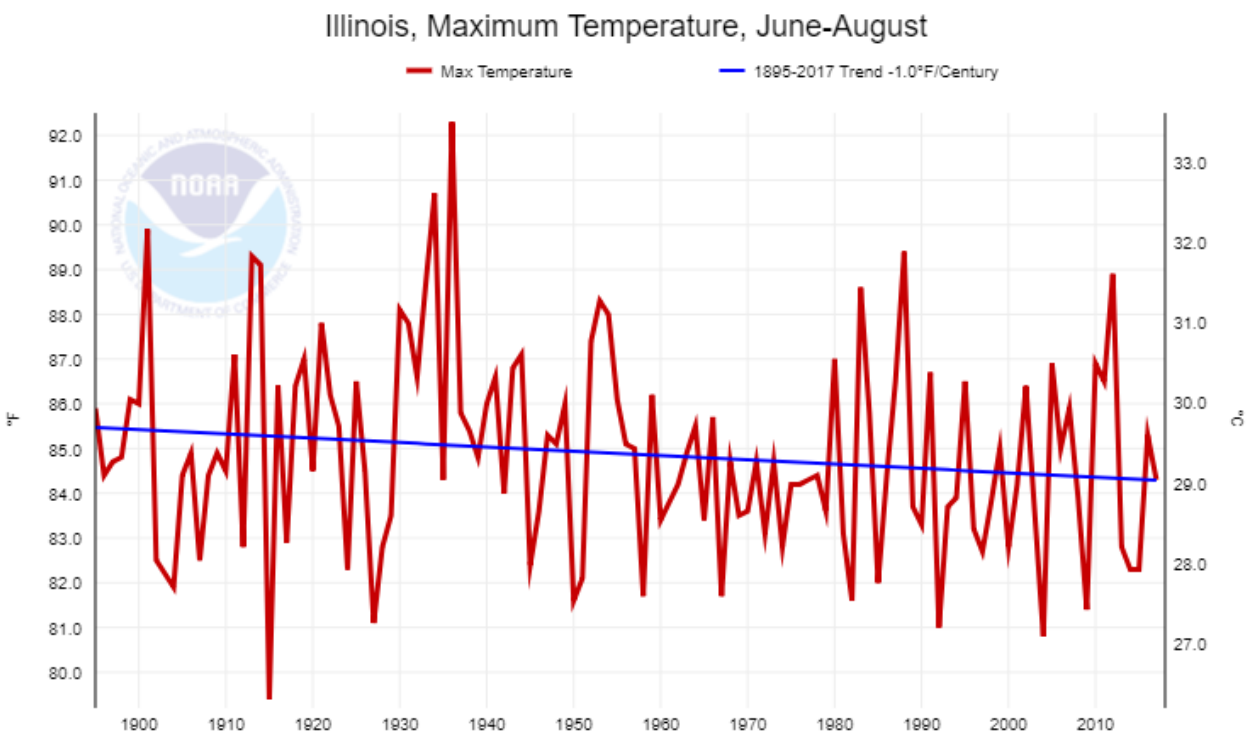


Figure 11. Average maximum temperature in summer for Illinois, 1895-2017. Source: NCEI, 2018.

Frankson et al. 2017 used data from 36 stations in Illinois to calculate the average number of days above 95°F by half-decade, referred to as very hot days (Figure 13). This shows a clear pattern of frequent very hot days in the early part of record from 1900 to the early 1950s. The half-decade of 1930-34 saw the most with an average of 28 days across the state. Starting in the late 1950s, the number of very hot days dropped below the long-term average for nearly every half-decade through 2014.

The historical evidence points toward a higher risk of heat in the early part of the 20th century and in particular the 1930s. However, other important components of heat waves are 1) warmer nights that prevent recovery from the daytime heat and 2) higher humidity levels. While the daytime temperatures have decreased over time, the average summertime nighttime temperatures have increased over time by 1.5 degrees over the last century (Figure 14). This increase in nighttime temperatures may be the result of increased humidity levels due to both increases in precipitation in spring and summer and increased plant density and more aggressive root systems for corn and soybeans in Illinois. Higher humidity levels are reflected in higher dew point temperatures. The dew point temperature is defined as the temperature to which the air would have to cool to reach saturation or 100 percent relative humidity. At that point, dew and/or fog may form. In general, nighttime temperatures in summer will drop down to the dew point temperature before stopping. Therefore, higher dew point temperatures result in higher nighttime temperatures. Higher humidity levels during the day will translate into higher values of the heat index scale, which takes into account both temperature and humidity.

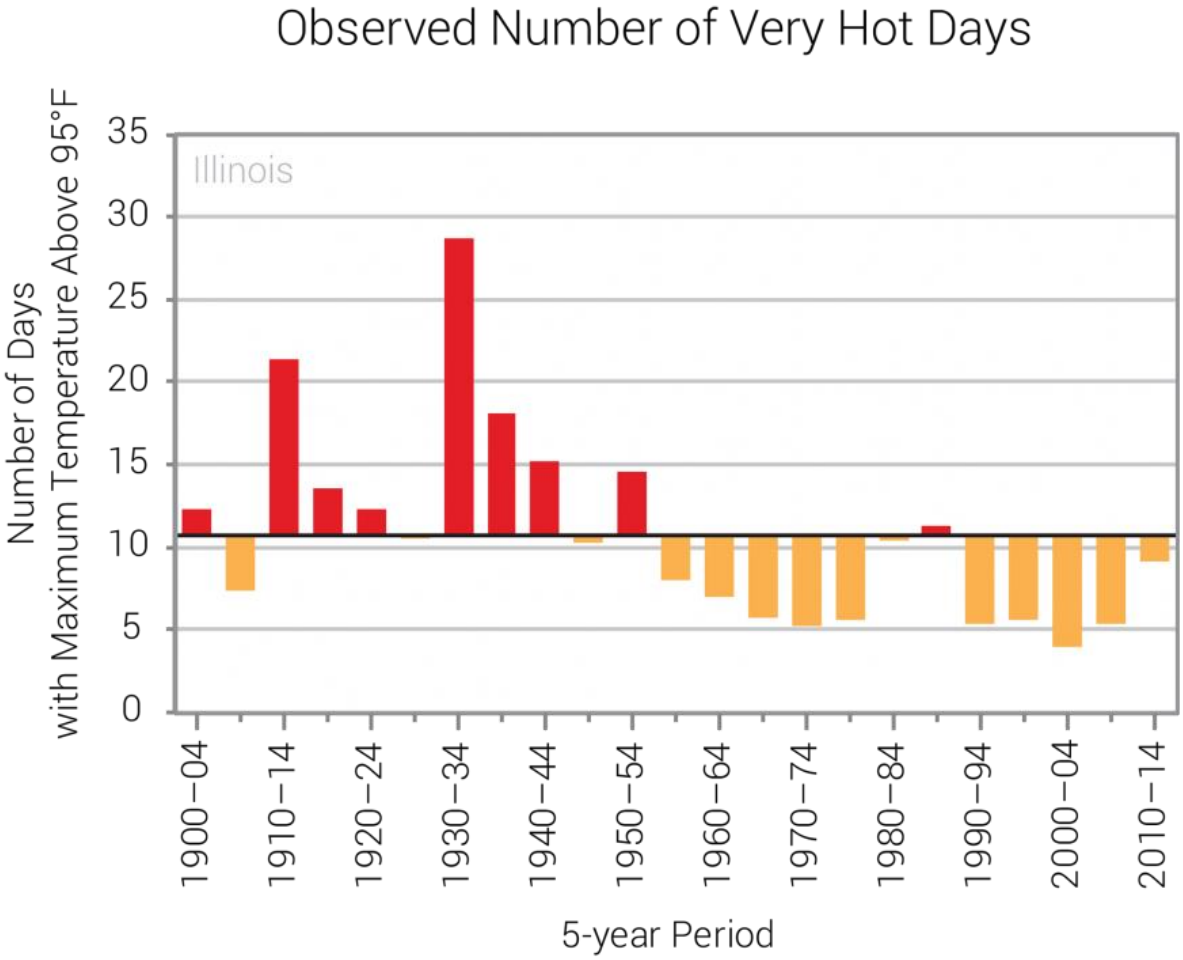


Figure 12. Observed number of days above 95°F averaged over 36 long-term stations in Illinois. Source: Frankson et al. 2017.

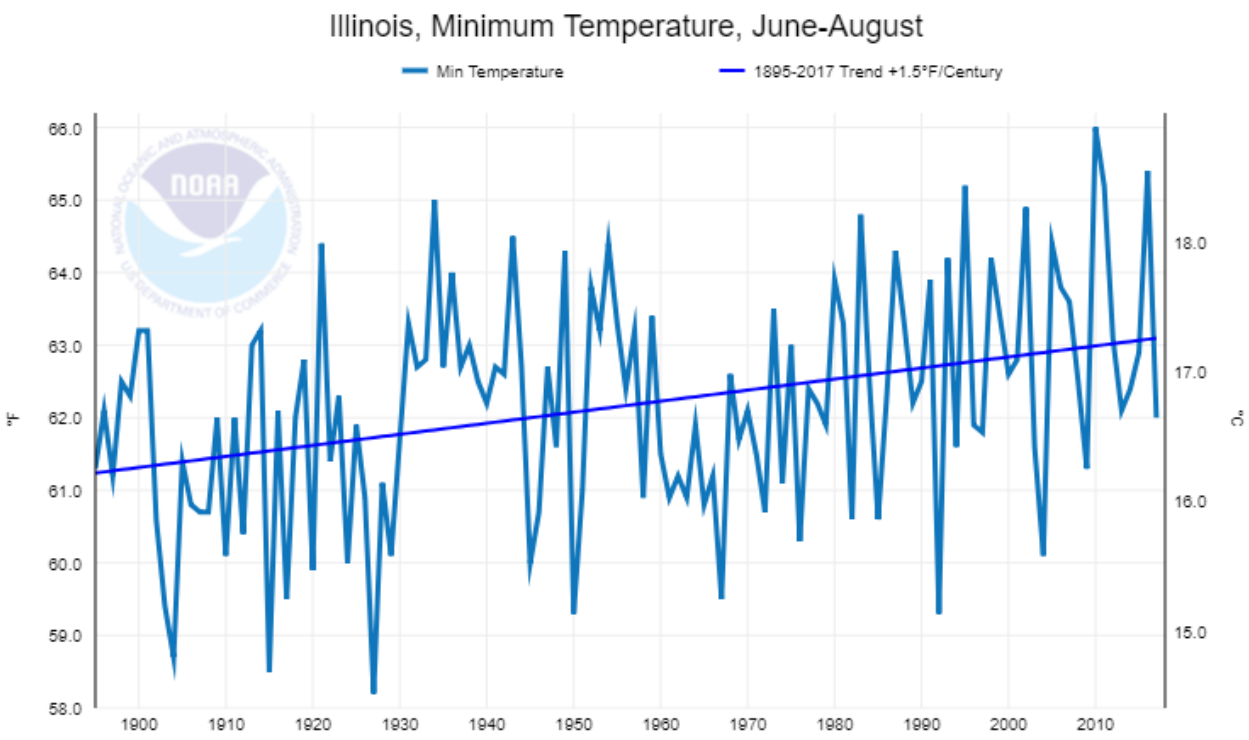


Figure 13. Trend in nighttime minimum temperatures in summer in Illinois. Source: NOAA NCEI 2018.

Unfortunately, records for heat index are less common and do not extend back as far as daily temperature records. Their analysis is further handicapped by a decision at the national archive to archive only one out of every three hourly observations in the historical record for a period before 1978, resulting in an incomplete record. Even so, dew point temperature thresholds of 70, 75, and 80 degrees, as well as heat index values of 100, 105, and 110 were examined here for major Illinois and nearby cities including Chicago, Rockford, Moline, Peoria, Springfield, St. Louis, and Paducah. The last two were included to represent southern Illinois. The results showed little evidence of consistent upward or downward trends across the region in the last 39 years. There were some indications that dew point temperatures above 75 degrees, and heat index values above 105 degrees were less frequent in the last decade at Chicago O'Hare. However, the year-to-year variability is too large to make any determination on trends.

Potential Future Changes

The Climate Science Special Report has some key findings (Chapter 6, Vose et al., 2017) on heat waves including:

- Annual average temperature over the contiguous United States is projected to rise (very high confidence). Increases of about 2.5°F are projected for the period 2021–2050 relative to 1976–2005 in all RCP scenarios, implying recent record-setting years may be "common" in the next few decades (high confidence). Much larger rises are projected by late century (2071–2100): 2.8°–7.3°F in a lower scenario (RCP4.5) and 5.8°–11.9°F in the higher scenario (RCP8.5) (high confidence).

- Extreme temperatures in the contiguous United States are projected to increase even more than average temperatures. The temperatures of extremely cold days and extremely warm days are both expected to increase. Cold waves are projected to become less intense while heat waves will become more intense. The number of days below freezing is projected to decline while the number above 90°F will rise. (Very high confidence)

This is one of those cases where the historical pattern of heat waves in Illinois suggest a decreased risk of heat waves compared to the 1930s and 1950s. However, there is high confidence that the temperatures in the US and Illinois will increase throughout the 21st century. The latest estimate for Illinois for the period 2016-2045 is about 2.5 degrees of warming, much faster than the 1.2 degrees warming of the last 100 years. As noted in the CSSR, temperature extremes are projected to increase even faster. For example, in Chicago the average number of days per year greater than 95 degrees is about 2. For the period, 2016-2045 the expected average frequency increased to 10 for the low emission scenario and 12 days per year for the high emission scenario. It is expected that the heat wave hazard is highly likely in any given year somewhere in Illinois.

Heavy Precipitation

Introduction

The average annual precipitation for Illinois ranges from 48 inches in far southern Illinois to 36 inches in far northern Illinois. About half of the precipitation in Illinois comes from thunderstorms during the warmer months of the year. This can be short and intense rainfall events. The rest is produced by passing warm and cold fronts as well as slow-moving, low-pressure systems. Surprisingly, while infrequent, Illinois has received large amounts of rain from tropical systems as they move up from the Gulf of Mexico. Examples of this include Hurricanes Ike and Gustav in 2004 and Isaac in 2012. While no longer at hurricane strength, they can produce 3 to 6 inches of rain over very wide areas in 1 to 3 days.

Observed increases in precipitation in general and heavy precipitation in particular have been a concern in Illinois for several decades. In 2015, the Illinois Department of Natural Resources in cooperation with the Illinois State Water Survey produced a report for the Urban Flooding Awareness Act outlining the impacts of increased precipitation on Illinois (Winters et al. 2015). Over a 10-year period, they documented $2.3 billion dollars in costs in urban areas. Some $1.6 billion came from five damaging storms. Over 90 percent of these damages occurred outside the mapped floodplain.

Historical Precipitation Trends

The CSSR produced maps of historical changes in precipitation over the US for each season and the year as a whole (Figure 15). Changes are the average for 1986-2015 minus the average of the first part of the 20th century, 1901-1960, and divided by that same average to get a percent change over time. Nearly all of the central US and the northeast have experienced increases in precipitation since 1900. Illinois and surrounding states have experienced increases of 5 to 15 percent, depending on the location. Furthermore, Illinois has experienced increases in precipitation for all four seasons.

Historical records for the statewide average annual precipitation for Illinois from 1895 to 2017 are shown in Figure 16. Based on a linear trend, Illinois precipitation has increased from 36 to 40 inches, about 10% over the last century. Illinois has become more likely to experience exceptionally wet years in recent decades. The year 1993 was the wettest on record with 51.18 inches. The next two wettest years were 2009 with 50.96 inches and 2008 with 50.18 inches. All of those years were noted for widespread flooding across Illinois.

Winters et al. (2015) discussed the factors going into the observed increases in precipitation and heavy rainfall. First is that temperatures in the U.S. have warmed by about 1.5 to 1.9 degrees (depending on the calculation used) over the last century. Meanwhile, temperatures in Illinois have warmed by about 1.2 degrees over the last century. Warmer air has the ability to contain more water vapor. This ability increases by almost 4% with each degree increase in air temperature. This means that on average storms have more water available for precipitation. It is also possible that the characteristics of storms are changing as the U.S. gets warmer. For example, a longer warm season has increased the opportunity for thunderstorms. Additional work in Illinois suggests that the increasingly intense agricultural practices of the Midwest (more acreage and more plants per acre) have elevated summer humidity levels as well (Changnon, Sandstrom, & Bentley, 2006).

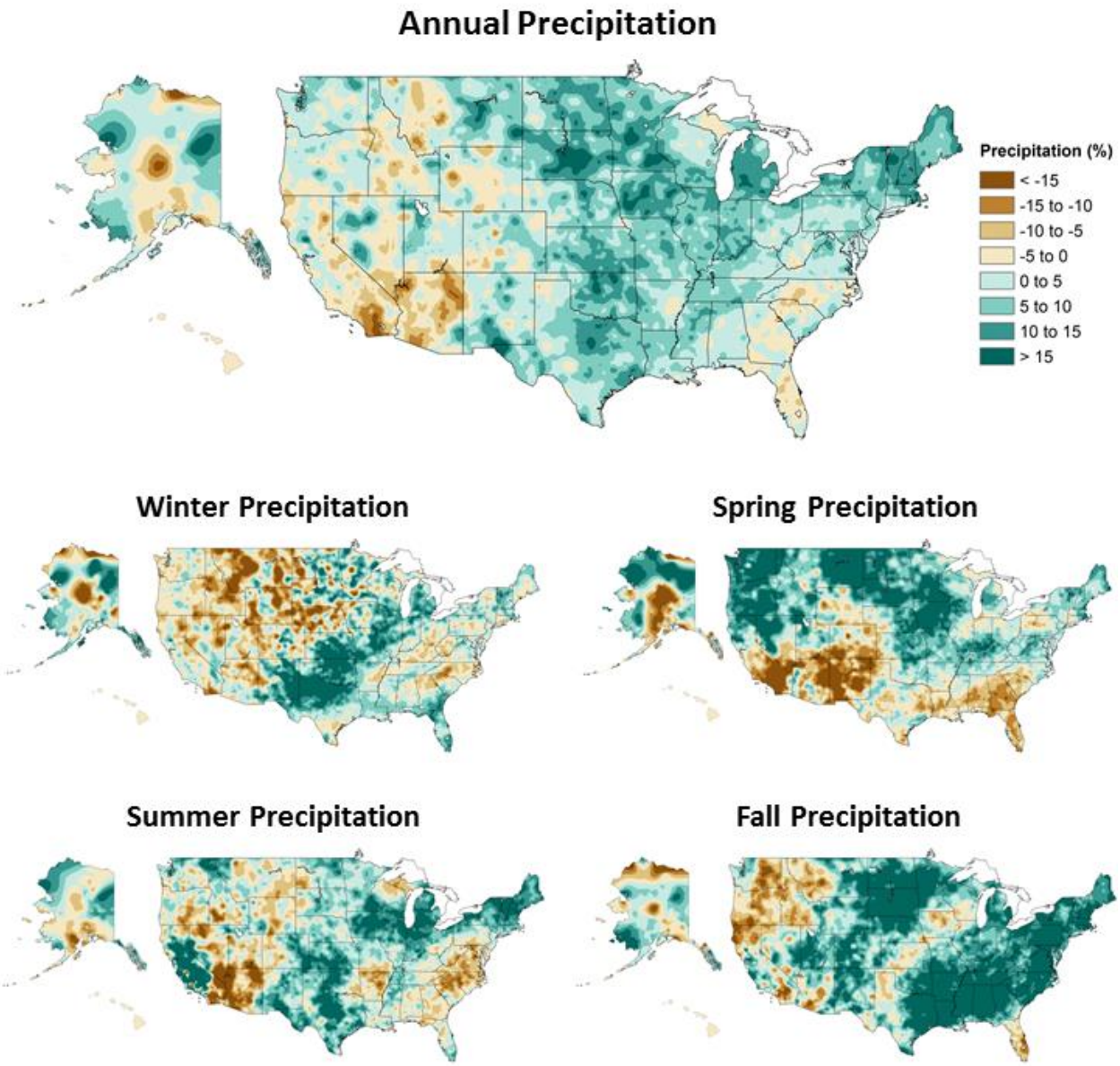


Figure 14. Annual and seasonal changes in precipitation for the period 1986-2015 minus the 1901-1960 average, and divided by the 1901-1960 average to get a percent change over time. Source: CSSR: Figure 7.1.

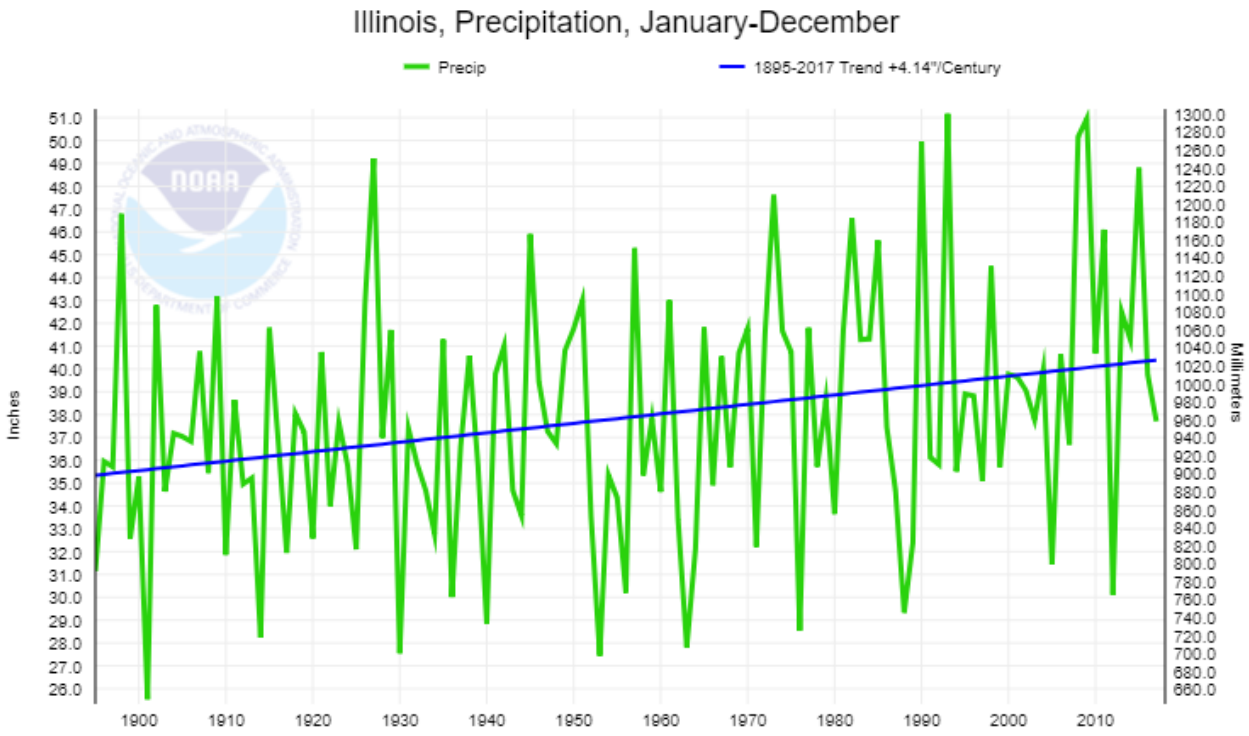


Figure 15. Statewide average annual precipitation for Illinois from 1895 to 2017. The green line shows the year to year variability. The blue line is a linear trend showing an increase of 4.14" over the last century. Source: NOAA NCEI 2018.

Not only has annual and seasonal precipitation increased but also so has the extreme precipitation events. Figure 17 shows the observed annual number of days with precipitation greater than 2 inches per station for 1900-2014, average over 5-year periods. These values are averaged over 43 available long-term stations in Illinois. The average number of annual events has been above the long-term average for most 5-year periods since the 1960s. During the most recent 5-year period (2010-2014), Illinois experienced a record number of events when stations averaged more than 2 events annually. More heavy rains have fallen in the last 3 years including widespread heavy rains in southern Illinois in late February 2018 and in northern and eastern Illinois in June.

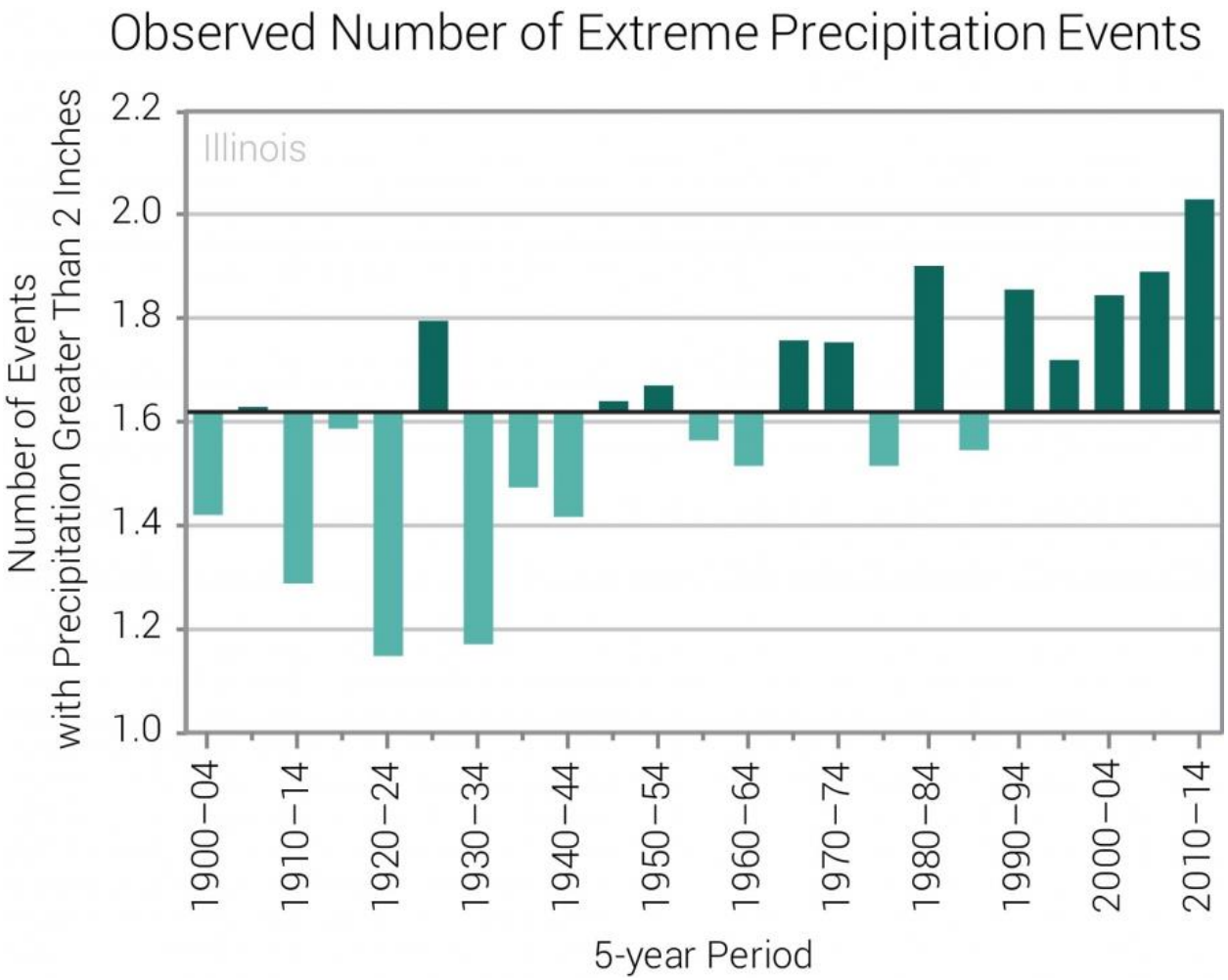


Figure 16. The observed annual number of days with precipitation greater than 2 inches for 1900-2014, average over 5-year periods. These values are averaged over 43 available long-term stations. The average number of annual events has been above the long-term average for most 5-year periods since the 1960s. During the most recent 5-year period, Illinois experienced a record number of events when stations averaged more than 2 events annually. The dark horizontal line is the 1900-2014 average of 1.6 days per year. Source: Frankson et al., 2017.

Potential Future Changes

The Climate Science Special Report has some key findings (Chapter 7 Easterling et al., 2017) on precipitation and heavy rainfall events including:

- Heavy precipitation events in most parts of the United States have increased in both intensity and frequency since 1901 (*high confidence*). There are important regional differences in trends, with the largest increases occurring in the northeastern United States (*high confidence*). In particular, mesoscale convective systems (organized clusters of thunderstorms)—the main mechanism for warm season precipitation in the central part of the United States—have increased in occurrence and precipitation amounts since 1979 (*medium confidence*).
- The frequency and intensity of heavy precipitation events are projected to continue to increase over the 21st century (*high confidence*). Mesoscale convective systems in the central United States are expected to continue to increase in number and intensity in the future (*medium confidence*). There are, however, important regional and seasonal

differences in projected changes in total precipitation: the northern United States, including Alaska, is projected to receive more precipitation in the winter and spring … (*medium confidence*).

In summary, annual and seasonal precipitation in Illinois has increased with time and is likely to continue. More importantly, heavy rain events have increased with time and are very likely to continue in the future. It is very likely that heavy rains and flooding hazards will continue to occur every year in Illinois.

Winter Storms

Introduction

Average snowfall in Illinois ranges from about 10 inches in far southern Illinois to 40 inches in the Chicago area. Illinois can feel major impacts from large winter storms. A famous example is the February 1-3, 2011, "Groundhog Day" storm that dropped up to 27 inches of snow in northeastern Illinois. More than 9.8 million Illinois residents were in areas with 12 or more inches of snow. The Illinois State Water Survey has conducted a number of studies on winter storms over the years. In general, those studies found that the late 1970s marked an unusual period of increased winter storms not found before or since in the historical records. These studies have also found that events producing six inches or more of snow would reliably cause impacts in Illinois. That threshold was used here as well.

The statewide average snowfall since 1902 (Figure 18) shows no long-term trends. However, some decades were snowier than others, such as the 1910s, 1960s, and 1970s. In fact, the 1970s were the snowiest decade on record with an average snowfall of 27.2 inches.

Snowfall amounts dropped steeply with less year-to-year variability for much of the 1980s and into the early 2000s. However, snowfall amounts in the last 6 winters have been more variable with the winter of 2014 being about as snowy as the winters of late 1970s. On the other hand, the two lowest snowfall totals were from the winter of 2011-12 with 9.2 inches and the winter of 2016-17 with 9.6 inches.

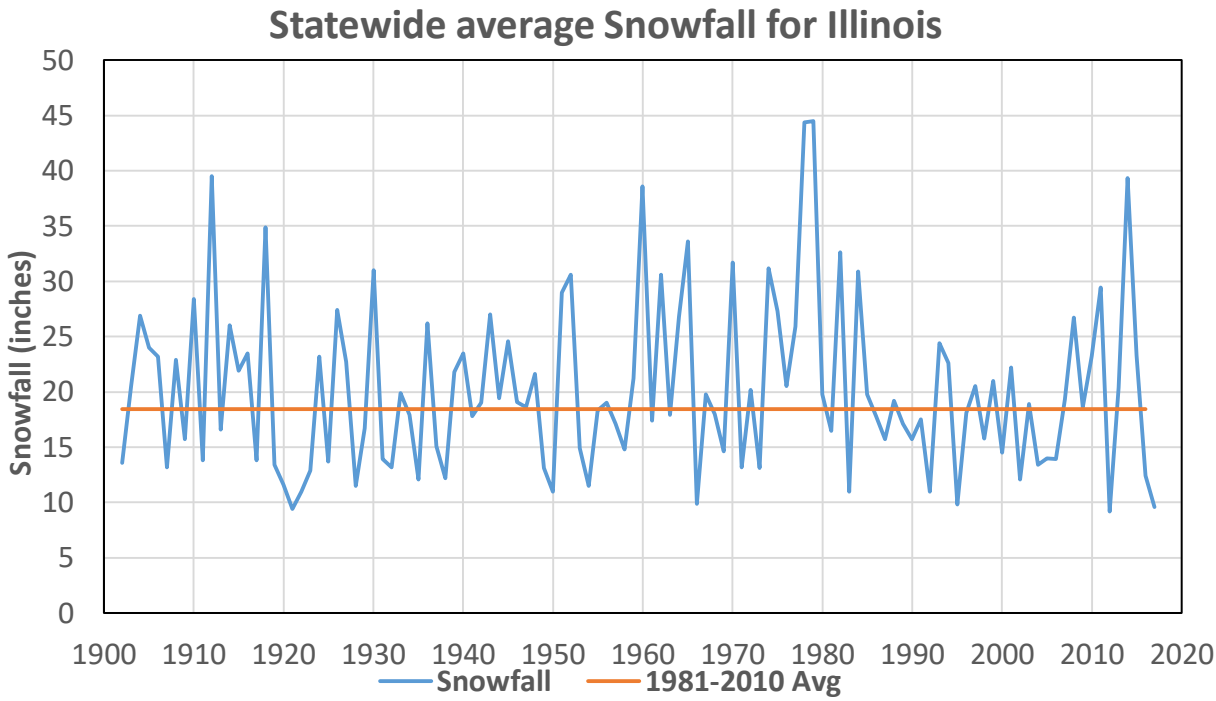
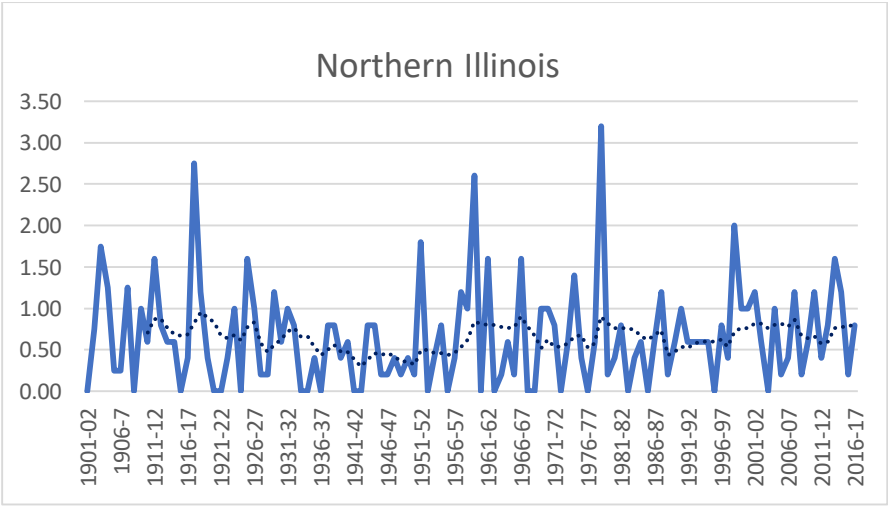


Figure 17. Statewide average snowfall for Illinois, 1902-2017.

Dividing the state into three zones – north, central and south – helped to identify the appropriate level of risk across the state. Figure 19 shows that days with 6 inches or more of snow are most frequent in northern Illinois and least frequent in southern Illinois. However, none of the regions show any indications of consistent changes over time. Similar results were achieved for days with 9 and 12 inches or more of snow. The only trend found in the snowfall data was that the snowfall season has decreased by about two weeks since the 1970s.



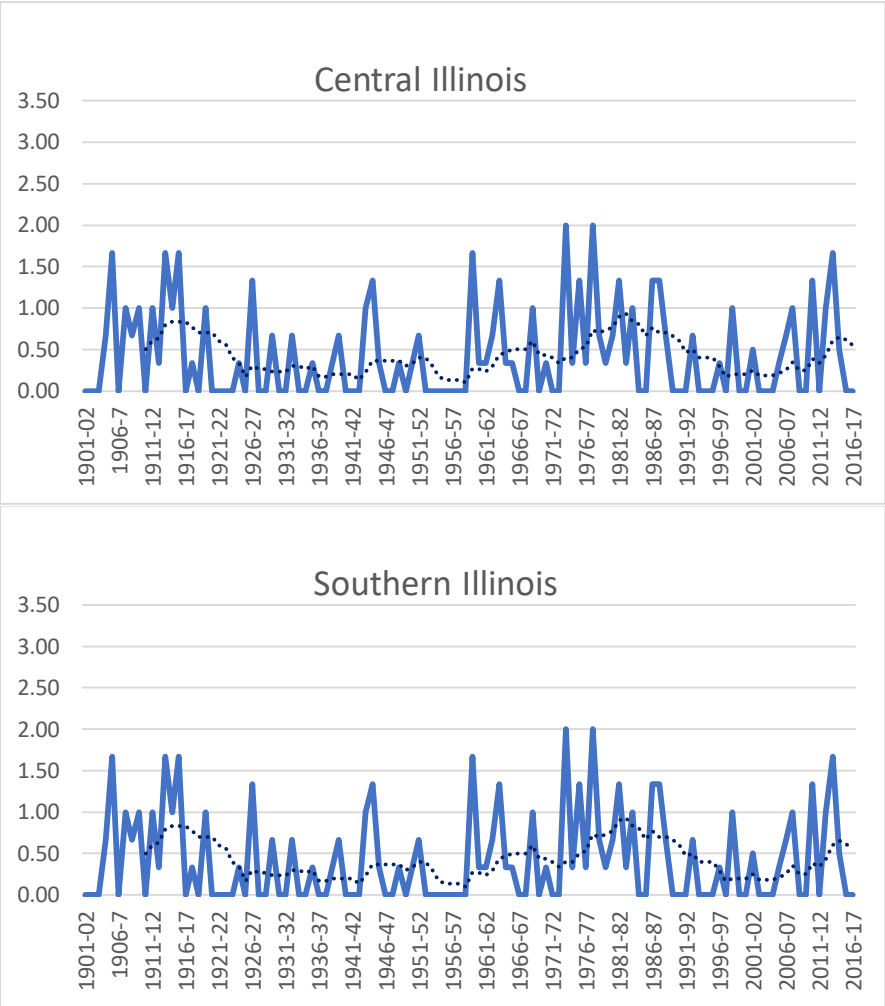


Figure 18. Frequency of daily snowfall exceeding 6 inches for northern, central, and southern Illinois.

Potential Future Changes

The Climate Science Special Report has some key findings (Chapter 9, Kossin et al., 2017) on winter storms and snowfall including:

- There has been a trend toward earlier snowmelt and a decrease in snowstorm frequency on the southern margins of climatologically snowy areas (medium confidence). Winter storm tracks have shifted northward since 1950 over the Northern Hemisphere (medium confidence). Projections of winter storm frequency and intensity over the United States vary from increasing to decreasing depending on region, but model agreement is poor and confidence is low. Potential linkages between the frequency and intensity of severe winter storms in the United States and accelerated warming in the Arctic have been postulated, but they are complex, and, to some extent contested, and confidence in the connection is currently low.

In summary, no significant historical trend could be detected in snowfall totals or the frequency of days with 6, 9, and 12-inch of snow. Potential future changes remain highly uncertain due to low confidence in the projections. For planning purposes, it is recommended that the risk of winter storms will remain the same winter storms likely to occur somewhere in Illinois every year.

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Appendix F: Illinois Statewide Flood Hazard Assessment – 2013

ILLINOIS STATEWIDE FLOODHAZARD ASSESSMENT

July 22, 2013

Submitted to:
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Submitted by:
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Executive Summary

The Illinois Emergency Management Agency contracted with the Natural Hazard Research and Mitigation Group at Southern Illinois University, Carbondale to perform a statewide flood-hazard and vulnerability assessment. For this assessment, flood risk was assessed using the Federal Emergency Management Agency's (FEMA's) Hazus-MH software to estimate building related floor exposure and losses. The flood vulnerabilities of Illinois jurisdiction were quantified and ranked using flood-loss and social-vulnerability parameters to develop a flood vulnerability index. Other products from this study included county-level flood-hazard assessment for each of the State's 102 counties and a flood-risk analysis of State-owned facilities. The intent of the State, county, and jurisdictional flood hazard assessment was to help inform planners and decision makers at all levels about flood hazards and flood vulnerability in their respective jurisdictions in order to augment community resilience through appropriate flood mitigation strategies.

The 100-year floodplain in Illinois encompasses approximately 7,140 mi^2 in Illinois or 13% of the State. Within the 100-year floodplain, we have identified $190.25 billion in building-related-flood exposure and the corresponding building-related-flood losses are estimated to be $18.39 billion dollars (2006 dollars). The major of these building-related-flood exposures and losses ($120.91 billion and $10.18 billion, respectively) are located within the City of the Chicago, in greater Cook County, and in the surrounding counties.

Unlike flood exposure and losses, which are concentrated in the urban and suburban areas surrounding Chicago, the most flood-vulnerable communities in Illinois are the rural jurisdictions located along the State's larger rivers. Flood vulnerability analysis suggests the urban and suburban communities within the Chicago metropolitan region would, in general, be more resilient (possess greater resources for recovery) than rural river communities. This difference in flood vulnerability is despite the smaller flood losses in rural areas, in absolute terms, compared to the urban and suburban areas. The greatest concentration of jurisdictions with high flood vulnerability ratings is in the southern Illinois counties bordering the Mississippi and Ohio Rivers.

Levee protection is an issue of concern in Illinois, presently. Recent inspections by the U.S. Army Corps of Engineers (USACE) have found significant deficiencies in 108 of the participating 123 levee systems in Illinois (88%). Thirty-four of these levee systems are of particular concern because they have been rated unacceptable by the USACE, which means these levees may not perform as designed during a major flood. We estimate that the levee systems in Illinois provide flood protection at varying levels to $25.01 billion in building-related infrastructure.

We identified 405 essential or critical facilities located on 100-year floodplains in Illinois. Of these 405 facilities, 5 were Stated-owned, comprising $44.75 million in flood exposure and $24.27 million in estimated damages (modeled for a 100-year flood). The remaining 400 essential or critical facilities were owned by local governments, private companies or not-for-profit groups. The majority of at-risk essential facilities were schools (95 statewide), fire stations (48), and police stations (26). The majority of at-risk critical facilities were waste-water treatment (146), potable-water treatment (33), and communication facilities (25).

Introduction

The Illinois Emergency Management Agency (IEMA) is responsible for supporting activities that can reduce losses which result from natural hazards. Successful mitigation activities require realistic and quantitative assessment of the probability and impact of a particular hazard on a given community or region. Assessment of risk and potential economic impacts informs mitigation planning and allows prioritization of activities to ameliorate disasters impacts.

Flooding is one of the most costly hazards facing the citizens of Illinois. Flood losses recorded in the National Oceanic and Atmospheric Administration's (NOAA) Nation Climatic Data Center (NCDC) database exceeded $5.5 billion in Illinois between 1993 and 2012. Since 1965, flooding was the either the main or a significant contributing factor for 32 out of the 52 Presidential Disaster Declarations declared in Illinois.

IEMA contracted with the Natural Hazard Research and Mitigation Group (NHRMG), at Southern Illinois University at Carbondale (SIUC) to perform a state-wide flood hazard and vulnerability assessment. Flood risk was assessed using the Federal Emergency Management Agency's (FEMA's) Hazus-MH flood software to estimate building-related flood exposure and losses. Using the flood-exposure and -loss estimates, a flood loss index (FLI) was generated. The social vulnerability index (SoVI) of Cutter (2013) was used to assess each community's ability to cope with/recover from flood losses. The social vulnerability index attempts to quantify the characteristics of a population that determine relative levels of resilience to the impacts of natural hazards (Cutter, 2013). The FLI and SoVI were combined to create a flood vulnerability index (FVI) which was used to quantify and relative rank each Illinois' jurisdictions in terms of relative flood vulnerability. This ranking system was intended to help quantify and/or prioritizing mitigation planning efforts and projects.

Other products from this study include: 1) an individual flood-hazard assessment for each of the 102 Illinois counties; 2) a flood-risk assessment of State-owned facilities; and 3) updates to the State's essential and critical facility database. The purpose of the county flood-hazard assessment is to help inform regional, county, and local planners and decision-makers about the flood hazard in their communities in order to guide mitigation strategies that will decrease vulnerability and increase resilience to flood disasters. The flood-risk assessment of State-owned facilities is intended to help the state identify at-risk facilities and quantify their potential flood losses.

Methods

Data Sources

This section outlines thee geospatial, hydrologic, historic flood losses, and social vulnerability data sources used to generate the Illinois Statewide flood-hazard-assessment and the county-level flood-hazard assessment.

Geospatial Data Sources

Floodplain Maps

We compiled a 100-year floodplain data layer for the State of Illinois. This layer was compiled from two primary sources: 1) the FEMA digital flood rate insurance rate maps (DFIRMS) where available and 2) digitized versions of FEMA's flood insurance (FIRM) rate maps where DFIRMs were not available. The DFIRMs were obtained from the FEMA Map Service Center, and the digitized FIRMs were compiled and edited from the Illinois State Water Survey's (ISWS's) "One-Hundred and Five-Hundred Flood-zones for Unincorporated Areas in Illinois" (ISWS, 1996). In Massac and Warren counties, DFIRMs were available for certain communities. In order to incorporate the most updated floodplain delineations we merged the DFIRM with the FIRM to create a hybrid layer that defined the 100-year floodplain in these counties. In Madison, Monroe, and St. Clair Counties, preliminary DFIRMs we obtained from the local jurisdictions were used to define the 100-year floodplain boundary. Figure 1 shows which map types were used to delineate the 100-year floodplain statewide.

Digital Elevation Model

Digital Elevation Models (DEMs) for the Hazus-MH flood-loss analysis were downloaded from the United States Geologic Survey's National Map. We used 1/3-arc-second (~10 m resolution) DEMs for the flood-loss analyses performed in this study.

Essential and Critical Facilities, Locally Owned

For this study we created a database of essential and critical facilities for the State of Illinois. Essential facilities are defined as those that provide vital emergency response and recovery following a disaster. These facilities include emergency operation centers, hospitals, fire stations, police stations and schools. Critical facilities are defined as facilities that provide vital services or resources to a community. These facilities include water treatment, waste water treatment, power, communication, liquid fuels (oil and gas), and other user-defined critical facilities. SIUC has compiled essential and critical facility database from the best publicly available state and federal sources. For the 43 Illinois counties which SIUC has previously prepared county pre-disaster mitigation plans, the state and federal data were replaced here with local essential and critical facility data, or else the available federal and state data were reviewed and updated by local subject-matter experts.

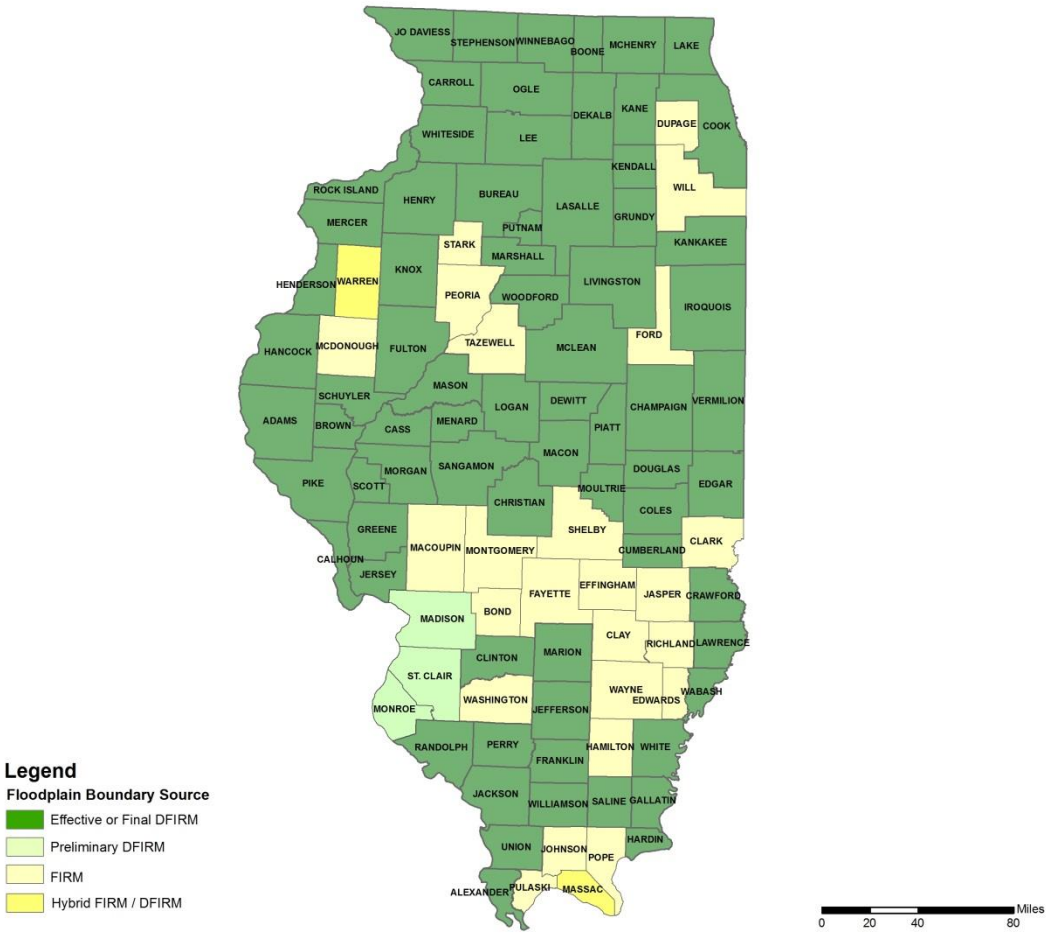

Figure 1 – Data sources for the 100-year floodplain boundaries used in this study.

Essential and Critical Facilities State Owned

A geodatabase and an Excel worksheet containing non-georeferenced State critical and essential facilities were provided by IEMA to the NHRMG. This facility information was provided to SIUC in order to assess the flood risk to the State-owned essential and critical facilities. The non-georeferenced State facilities were georeferenced and added to the State's existing essential and critical facility database. To georeference these facilities, we used the street addresses and/or facility names provide to us to locate the geographic position of these facilities using Google Maps or MapQuest. Once the facility was located, the geographic position (latitude and longitude) was entered into the corresponding state facility geodatabase using ArcMap. Once entered, the location of each of these facilities was visually inspected on the most recently available aerial photographs (circa 2011-2012) in ArcMap to ensure the facility was in its proper geographic location.

Levees

For this study, we compiled a levee database for the State of Illinois. Information in this database was collected largely from two main sources: 1) The Scientific Assessment and Strategy Team's (SAST) levee database (SAST, 1995) and 2) the USACE's National Levee Database (USACE, 2013). The locations of the levees in this database were checked for accuracy and corrected if necessary against high-resolution geo-referenced aerial photography and DEMs.

Cartographic Data Sources

The sources of cartographic data, such as road, political boundaries, water bodies, etc., used in creation of the statewide and county reports are presented in Table 1.

Table 1 –Cartographic data sources

Data Type	Source
Political Boundaries	US Census (2010)
Roads and Highways	IL Department of Transport (2010)
Rail Roads	IL Department of Transport (2010)
Dams	USACE National Dam Database (FEMA, 1993)
Hydrologic Features	USGS National Hydrographic Data Set (2012)

Social Vulnerability Index

Social vulnerability was incorporated into the flood vulnerability assessment undertaken here. Social vulnerability describes characteristics of a population that determine relative levels of resilience to the impact of natural disasters. Social vulnerability can help to explain why some communities' experience greater hardship and/or recover more slowly than others, for similar magnitudes of floods ore other events (Cutter, 2010). For this study, we employed the widely cited social vulnerability index (SoVI) for each of Illinois' county. Values of SoVI were calculated by the Hazards and Vulnerability Research Institute (HVRI) at the University of South Carolina (HVRI, 2012). SoVI was developed using principal component analysis (PCA) that assessed an array of socio-economic variables derived primarily from the U.S. Census data. The socio-economic variables in the PCA were selected based on the social science research identifying factors that influence a community's ability to prepare for, respond to, and recover from a natural disaster, such as flooding (Cutter et al., 2013).

Historic Hydrologic and Flood Loss Data Sources

Stream gage information for this study was compiled from two sources. Stream gage locations and information were from the U.S. Geological Survey's (USGS's) National Water Information System (USGS, 2013). Flood stage categories, flood impacts, and historical flood levels/crest information were compiled from the National Ocean and Atmospheric Administration's (NOAA's) National Weather Service (NWS) Advanced Hydrologic Prediction Service's (ADHPS) gage information database (NWS, 2013a). Flood casualty, damage, and loss data were obtained from NOAA's National Climate Data Center (NCDC) storm event database (NOAA, 2013b)

Flood-Hazard Assessment

The county-level flood-hazard assessment for all 102 Illinois counties consisted of three main components: 1) a review of each county's historical occurrences of flooding; 2) flood -exposure and -loss modeling; and 3) a flood-risk screening for at-risk essential and critical facilities. To describe, qualify, and quantify occurrences of flooding in each county we reviewed and compiled information from: USGS hydrological records, Flood Insurance Study (FIS) reports, ADHPS gage information database, and from NCDC's storm event database.

Flood-Loss Modeling

The flood-loss modeling in this study was performed using Hazus-MH. Hazus-MH is a Geographic Information System-(GIS-) based risk assessment tool designed by FEMA in collaboration with the National Institute of Building Sciences. The Hazus-MH flood module assesses the impact of flooding based on FEMA and USACE damage relationships. These relationships are applied to Hazus-MH infrastructure inventories or user-defined facilities to estimate losses for a selected flood scenario (Schneider and Schauer, 2006).

Hazus-MH allows modelers either to choose default settings ("Level 1" analysis) or else to provide increasingly detailed user-supplied data to improve the resolution and accuracy of loss estimates ("Level 2" or "Level 3" analyses). For a Level 1 analysis, the demographic and infrastructure inventories provided with the Hazus-MH package are not significantly updated. The Hazus-provided demographic and infrastructure inventories are compiled from existing national datasets. A Level 2 analysis improves the loss estimates by considering additional data such as improved flood inundation modeling results or significant updates to the demographic and / or infrastructure inventory. A Level 3 analysis generally requires extensive time, resources, and effort in order to modify the Hazus-MH model to fit specific community, location, or geographic region. An example of a Level 3 analysis would be a study in which site-specific building inventory data are used to calculate flood losses for individual building. This type of analysis is referred to as a user defined facility (UDF) analysis.

We performed Level 1 Hazus-MH flood-loss-modeling for each Illinois County's flood-hazard assessment report. Updating building and infrastructure data or performing hydraulic modeling to created detailed depth grids for all counties in Illinois could be done in the future but was beyond the scope of this project. For each county, we estimated the potential flood losses within the 100-year floodplain. In counties with FEMA-accredited levees we performed a levee fails "scenario" in which in addition to the inundation of the unprotected 100-year floodplain, we modeled flooding of areas protected by the levee(s) up to the 100-year flood level. It is important to note these flood scenarios do not represent a realistic flood. It is highly unlikely that all rivers and streams in a given jurisdiction, let alone the whole state of Illinois, would experience a 100-year event at the same time. Hence, the flood losses presented here should be viewed as a standardized estimate of building-related-flood losses which allows for a comparison of flood risk between Illinois's jurisdictions.

Hazus-MH requires the construction of a flood-depth grid to define the area of potential flood inundation. To construct the flood-depth grids here, we employed Hazus-MH's Enhanced Quick Look (EQL) tool. The data required to generate a flood-depth grid using the EQL tool are a polygon layer representing the extent of the flood, in this case the 100-year floodplain, and a DEM representing floodplain topography. In each county we used the DFIRM or digitized FIRM map when a DFIRM was not available to delineate the 100-year flood boundary (Figure 1). A 1/3-arc-second (10 m) DEM was

used to depict floodplain topography. Hazus-MH default aggregate General Building Stock (GBS) data were used for the loss estimation. The aggregated general building stock uses building valuations from Dunn and Bradstreet's 2006 R.S. Means Values. Consequently, the flood-loss and flood-exposure estimations presented in this report are in 2006 dollars.

Hazus-MH flood-losses reported in this study are for building-related losses only. Building-related losses include building damages, building-inventory damages, and commercial-inventory damages. These building-related flood-loss estimates do not include damage to infrastructure (i.e., roads, bridges, utilities, etc.), agricultural losses, or indirect economic losses (secondary losses). In addition, these flood-loss and the exposure estimates are based on full replacement cost (i.e., the estimated cost to replace the damaged portion of a building). Hence, the resulting flood losses estimates may be significantly higher than insured losses or loss estimates calculated using property assessment data. Insured losses and loss estimates using assessor's data commonly use the fair-market value, which include depreciation of building values after initial construction.

Flood Risk Analysis for Locally Owned Essential and Critical Facilities

Our essential and critical facility database was used to screen for at-risk facilities. This was accomplished by over-laying in a GIS each county's mapped essential and critical facilities with the county's DFIRM or FIRM map and identifying the facilities located within the 100-year floodplain. Facilities identified within the floodplain were listed in the statewide flood-hazard assessment report and listed and mapped in the county's flood hazard assessment report.

Flood Risk Analysis for State Owned Facilities

A Hazus-MH UDF flood-loss analysis was performed on State owned essential and critical facilities identified within the 100-year floodplain. A UDF flood-loss analysis is a structure-by-structure analysis in which flood losses are calculated for specific building or buildings using depth-damage functions within Hazus-MH. UDF analysis requires certain building parameters which were not available from the IEMA essential and critical facility database. These missing data were replaced with default values, based on occupancy type, from FEMA's Hazus-MH Flood Model Technical Manual (FEMA, 2012). The missing parameters included square footage, building material, foundation type, and number of stories (see Table 2 for values used). As with the county-level-flood-loss modeling, a flood-depth grid was constructed using Hazus-MH's EQL tool employing either a DFIRM or digitized FIRM map for the floodplain boundary and a 1/3-arc-second DEM (10 m) for floodplain topography.

Table 2 - List of building parameters used in the UDF flood-loss analysis for State-owned essential and critical facilities.

Facility Type	Occupancy Class	Average Square Footage (ft^2)	Estimated Replacement Cost ($Millions)	Building Material	Foundation Type	Number of Stories
Armory	IND2	30,000	$2.27	Masonry	Concrete Slab	1
Correctional Center	RES3F	60,000	$7.92	Masonry	Concrete Slab	1
Government Building	GOV1	11,000	$1.18	Wood	Concrete Slab	1
Illinois Department of	COM4	80,000	$10.67	Masonry	Concrete Slab	1

Transportation Regional Headquarters Illinois State Police Barracks	GOV2	11,000	$1.83	Masonry	Concrete Slab	1

Flood Vulnerability Screening

For this study we quantified flood vulnerability as a combined function of potential building-related-economic losses and socioeconomic factors. We incorporated differences in socioeconomic factors into our analysis because the current social science research suggests that a community's wealth, gender distribution, race, class, and sociopolitical structures can influence the impacts of flood losses, casualties, and the ability the community to recover from a flood disaster. These social factors produce variations in vulnerability among groups of people and geographic locations (Ngo, 2001; Tierney, 2006; Enarson, 2007; Burton and Cutter, 2008, Cutter et al., 2013). To capture both the economic and social aspects of flood vulnerability, we used Hazus-MH to quantify potential flood losses within the 100-year floodplain and county-level SoVI scores to quantify the social component of a jurisdiction's flood vulnerability.

Screening of the flood vulnerability of Illinois counties and incorporated jurisdictions was accomplished by calculating a Flood Vulnerability Index (FVI) using the Hazus-MH flood-exposure and loss-estimates and SoVI score. Each county's and jurisdiction's FVI score was then used to rank their flood vulnerability. The FVI values were calculated as follows:

1. The flood-exposure ($Flood_{exposure}$) and -loss ($Flood_{loss}$) estimates for the 100-year floodplain were calculated using Hazus-MH (see Flood-Loss Modeling section above for details).

2. A flood loss ratio ($Loss_{ratio}$) was calculated to normalize flood-loss estimation parameter so that urban jurisdictions with large absolute values of flood exposure could be more easily compared with rural jurisdictions with smaller levels of flood exposure.

$$Loss_{ratio} = \frac{Flood_{loss}}{Flood_{exposure}} \quad \text{(Eq. 1)}$$

3. The SoVI (HVRI, 2012) was assigned to its respective county and jurisdictions.

4. Hazus-MH does not calculate flood exposure and losses at jurisdictional scales. The minimum spatial scale at which Hazus-MH calculates flood exposure and losses is at the census block level. In order to ascribe the exposure and flood estimates to a particular jurisdiction, we used the spatial join tool within ArcMap. The join tool summed flood -exposure and -loss estimates from the census blocks that were either fully or partly contained within each jurisdiction's boundaries.

5. In order to account for the overlap of census blocks outside a jurisdictional boundary, a floodplain area weighting factor was calculated and then used to weight the jurisdictional flood-loss ratio. This provided a

more realistic estimate of a jurisdiction's flood-loss ratio. The floodplain area weighting factor (FP_{wf}) was calculated by dividing the 100-year floodplain area (FP_{area}) within the jurisdiction by the total area of the jurisdiction (JD_{area}).

$$FP_{wf} = \frac{JD_{area}}{FP_{area}}$$

(Eq. 2)

The floodplain area weighting factor was then multiplied by the jurisdiction's loss ratio to calculate the weighted flood loss ratio ($WLoss_{Ratio}$).

$$WLoss_{Ratio} = Loss_{Ratio} \times FP_{wf}$$

(Eq. 3)

6. The county flood-loss ratio, jurisdictional weighted flood-loss ratio and SoVI scores were combined to create a flood-loss index (FLI) and SoVI at the county and jurisdictional levels. The general indexing formula for the FLI and SoVI are as follows. The index (I_i) corresponding to each respective index (FLI and SoVI) indicator for i^{th} county or jurisdiction is calculated using the following equation, which normalizes each index value to a range from 0.0 to 1.0:

$$I_i = \frac{I_i - I_{min}}{I_{max} - I_{min}}$$

(Eq. 4)

where I_{min} *and* I_{max}, are the minimum and maximum values of these indicators for all the counties or jurisdictions, respectively, and I_i is the actual value of the indicator for i^{th} county or jurisdiction.

7. The FLI and SoVI were added together to calculate a flood score (*FS*) for each county and jurisdiction.

$$FS = FLI + SoVI$$

(Eq. 5)

8. The *FS* were normalized so each county or jurisdiction could be ranked by flood vulnerability relative to other Illinois counties and jurisdictions. The flood score was index (FS_i) was calculated using Equation 4.

9. A z-score (*z*) for the FS_i for each county or jurisdiction was calculated in order to rigorously qualify their relative flood vulnerability.

$$z = \frac{FS_i - \mu}{\sigma}$$

(Eq. 6)

where:

FS_i is the actual flood score for i th county or jurisdiction;

□ is the mean of the county or jurisdictional flood scores; and

σ is the standard deviation the flood scores.

The z-score was used to assign the relative flood vulnerability description to each jurisdiction (Table 3).

Table 3 – Relative flood vulnerability description for the z or standard score

z – Score Range	Relative Flood Vulnerability Description
5.0 to 1.6	High
1.9 to 0.6	Elevated
0.5 to -0.5	Average
-0.6 to -3.0	Low

Results

Illinois' Floodplains and Levees

FEMA-mapped 100-year floodplains in Illinois encompass approximately 7,140 mi^2 or 13% of the State. Within the total Illinois floodplain area, we have identified 143 levees, together protecting 1,500 mi^2 of floodplain. Protection levels of Illinois's levees range from 5- to 10-year flood which are generally privately owned and constructed levees up to 100- and 500-year flood protection level for federally constructed levees which usually protect developed or urban areas (Figure 2).

Of the 143 levees identified, the National Levee Database indicates 124 of these participate in or are eligible for the USACE's Public Law 84-99 program (PL-84-99). Enrollment in the PL-84-99 program provides reimbursement for some-flood related damages for levees that are actively maintained and pass regular inspections. Maintenance and proper operation of the levee are intended to prevent routine damage and reduce the possibility of levee failure. In the case of severe flood-related damage to a participating levee, the USACE will provide post-damage assistance.

USACE's levee inspection records showed that 10 of the levee systems in Illinois were rated as "acceptable", 84 levee systems were rated as "minimally acceptable", 28 levees were rated as "unacceptable" or inactive, and 2 were not rated. An acceptable rating indicates no "unacceptable" rating on any inspection criteria, and significantly more "acceptable" criteria ratings than "minimally acceptable" ratings. Minimally acceptable indicates no "unacceptable" rating on any inspection criteria, and generally fewer "acceptable" criteria than "minimally acceptable" ratings. An "unacceptable" levee rating indicated one or more "unacceptable" results on any of the inspection criteria. Unacceptable ratings are generally interpreted to mean that a levee has one or more structural or operational deficiency that could result in it not performing to design specification during a large flood. Levees with an overall unacceptable rating are often moved from active to inactive status within the PL-84-99 program until the necessary repairs to the levee system are made. See the Non-Federal Flood Control Works Inspection Guide (ER 500-1-1; Appendix E) for further details on the USACE levee rating system. Table 4 lists unacceptable and inactive levees in Illinois; Appendix A lists and tabulates details for all 143 levees identified in Illinois.

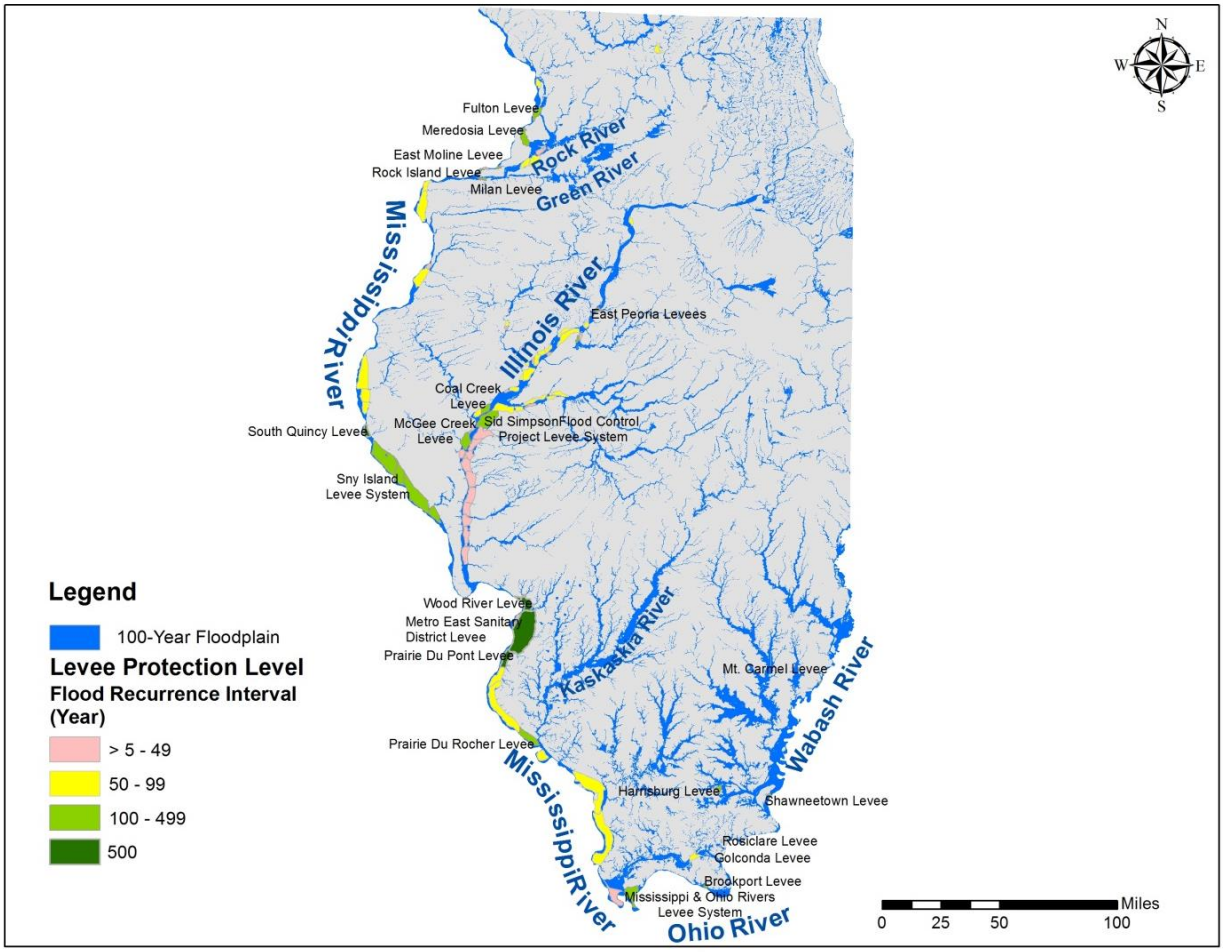

Figure 2 – 100-year floodplain extent and levees in Illinois. Levees with a protection level of ≥100-year flood are labeled.

Table 4 –PL-84-99 levees in Illinois that have an unacceptable or inactive rating

Levee District Name	County	River or Stream	Protected Area (Acres)	Protection Level (Years)	Recent Inspection Rating	Inspection Date
Metro East D&LD	Madison	Mississippi River	85,977	500	Unacceptable	5/22/2010
East Peoria Sanitary District	Tazewell	Illinois River	20	100	Unacceptable	4/11/2012
East Peoria Sanitary District	Tazewell	Illinois River	355	100	Unacceptable	4/11/2012
East Peoria D&LD	Tazewell	Illinois River	17	100	Unacceptable	4/11/2012
East Peoria D&LD	Tazewell	Illinois River	1,049	100	Unacceptable	4/11/2012
East Peoria Sanitary District	Tazewell	Illinois River	37	100	Unacceptable	4/11/2012
East Peoria Sanitary District	Tazewell	Illinois River	93	100	Unacceptable	4/11/2012

Levee District Name	County	River or Stream	Protected Area (Acres)	Protection Level (Years)	Recent Inspection Rating	Inspection Date
East Peoria Sanitary District	Tazewell	Illinois River	94	100	Unacceptable	4/11/2012
Shawneetown LFPP	Gallatin	Ohio River	9,45	100	Unacceptable	12/13/2005
Brookport	Massac	Ohio River	1,185	100	Unacceptable	6/3/2010
Mississippi & Ohio Rivers LS	Alexander	Mississippi and Ohio	16,584	100	Unacceptable	4/16/2012
DeKalb LFP: LDB South Branch	DeKalb	Kishwaukee	183	100	Inactive	Not Available
East Peoria Sanitary District	Peoria	Illinois River	81	100	Unacceptable	4/11/2012
Penny Slough D&LD	Whiteside	Rock River	9,495	50	Unacceptable	4/3/2012
Hennepin D&LD	Putnam	Illinois River	2,612	50	Unacceptable	11/19/2001
Pekin and La Marsch D&LD	Peoria	Illinois River	2,843	50	Inactive	Not Available
Degognia \ Grand Tower	Jackson	Mississippi River	56,777	50	Unacceptable	7/14/2010
Mason and Menard D&LD	Mason	Sangamon River	5,885	50	Inactive	Not Available
Streator, IL Levee	La Salle	Vermilion River	27	50	Unacceptable	10/21/2008
Page Park Dam North Branch	Winnebago	Kent Creek	751	50	Inactive	Not Available
Cincinnati L&DD	Tazewell	Mackinaw	2,004	10	Inactive	Not Available

Estimation of Flood Exposure, Losses, and Vulnerability

For this study, we evaluated the flood exposure, losses, and vulnerability for the State of Illinois at county and jurisdictional scales in order to inform mitigation activities. The estimates of flood exposure and losses presented here are in 2006 dollars.

Exposure

The building-related-flood exposure within the 100-year floodplain in Illinois is estimated to be $190.25 billion. The greatest concentration of this flood exposure is located in Cook and adjacent five counties: Dupage, Kane, Lake, McHenry and Will. These counties contain $120.92 billion or nearly 64% of the 100-year flood exposure in Illinois (Figure 3; Appendix B and C). Correspondingly, the cities within these counties generally had the largest estimate jurisdictional flood exposure. Nine out of the top ten jurisdictions with the largest estimate flood exposure are located within these six counties (Figure 4; Appendix D).

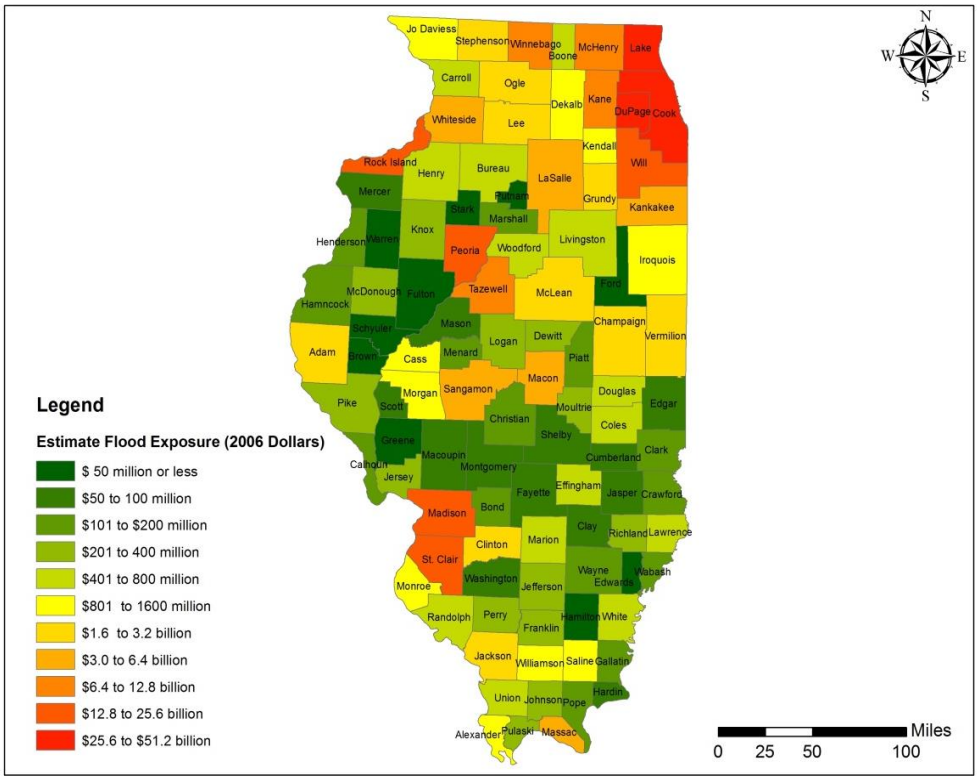

Figure 3 - Estimated flood exposure on 100-year floodplains aggregated by county

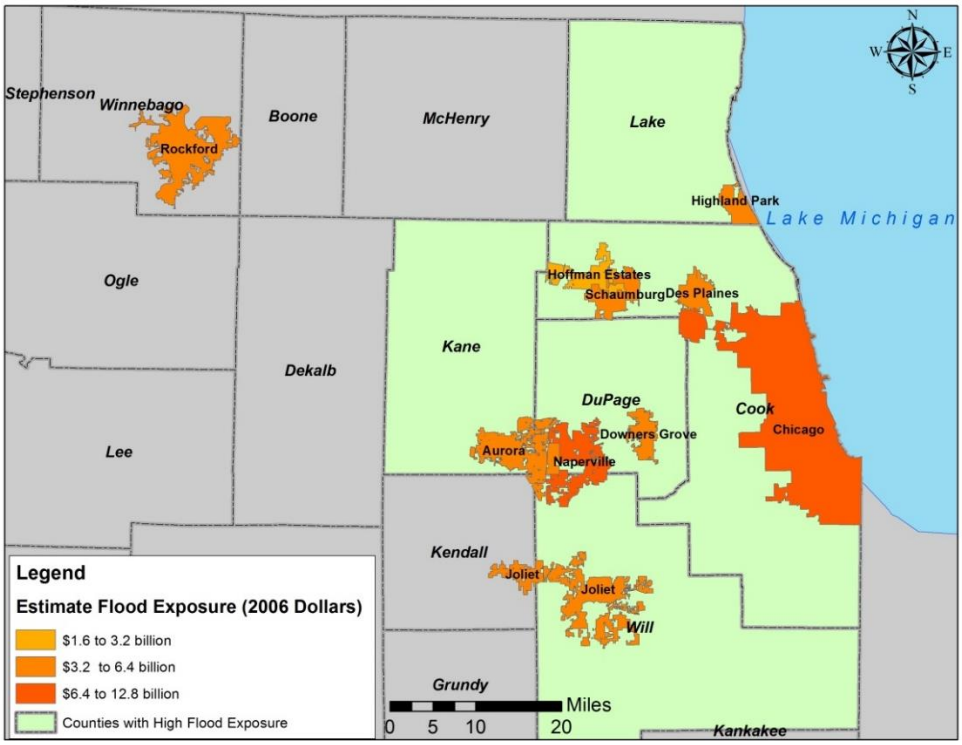

Figure 4 - Top ten jurisdictions in Illinois with highest absolute values of flood exposure on the 100-year floodplains.

This analysis estimated there to be $22.3 billion in building-related infrastructure in Illinois behind levees accredited by FEMA as protecting the 100-year level or higher. The majority of this exposure (85%) is located within three counties along the Mississippi River: Madison County ($13.42 billion in exposure), Rock Island County ($3.84 billion), and St. Clair ($1.71 billion; Figure 5; Appendices C, D, and E).

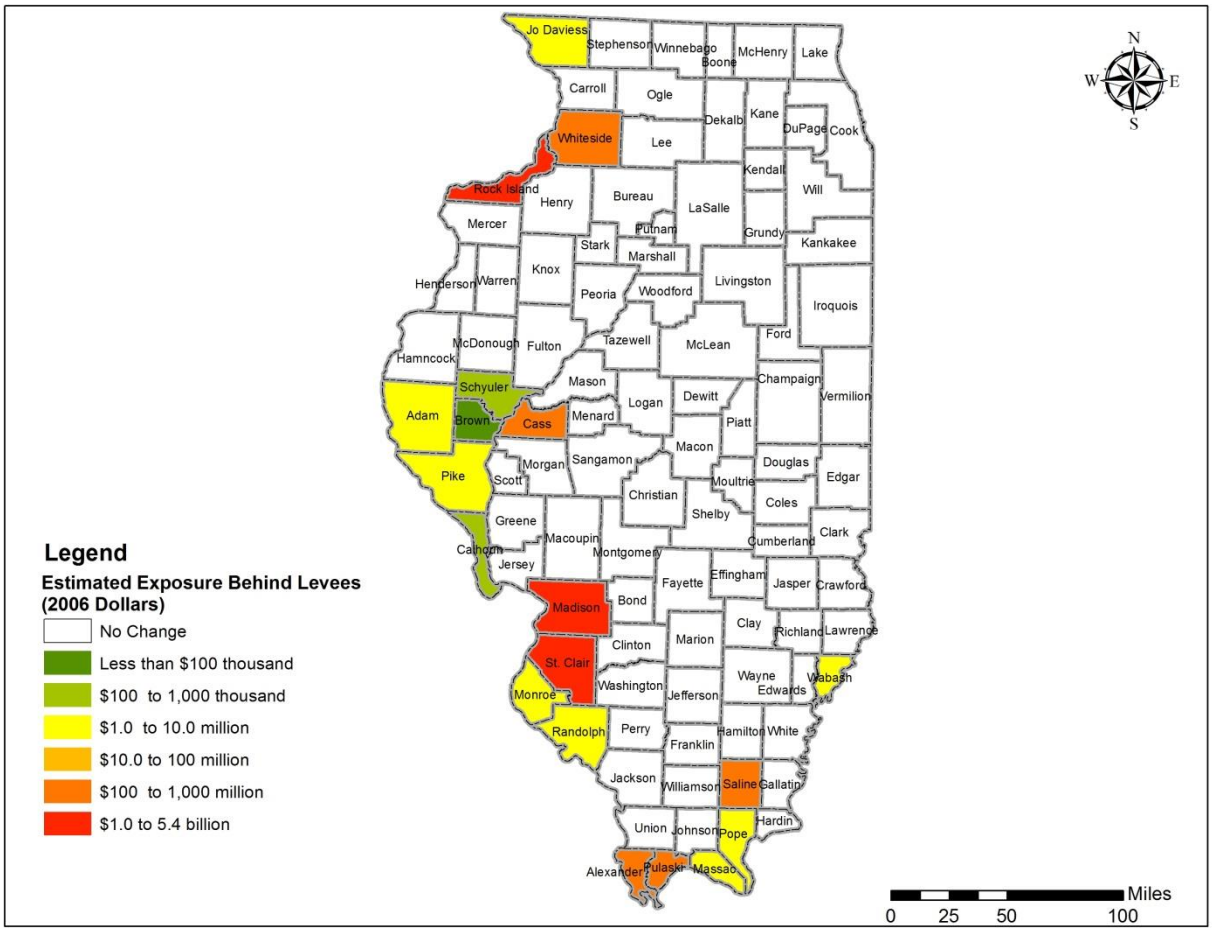

Figure 5 - Estimated flood exposure in levee-protected areas by county.

Flood Losses

Flood losses were estimated for 100-year floodplains throughout the State of Illinois. For counties and jurisdictions which had FEMA-accredited levees (≥ 100-year protection level), we also estimated losses for a "levee fails scenario" in which, in addition to floodwaters inundation of unprotected floodplain, inundation and damages were also modeled for levee-protected areas.

Assuming the all the FEMA-accredited levees perform as designed (i.e., no levee failure[s]) the estimated building-related-flood losses on 100-year Illinois floodplains of are $18.03 billion. Aggregated county-level losses ranged from a minimum of $2.39 million in Ford County up to $3.27 billion in Cook County (Figure 6). At the jurisdictional level, flood

losses ranged from less than a $1,000 in Bondville up to $950 million in the City of Chicago (Appendix D). As with the flood exposure estimates, the largest flood losses generally were in and around the City of Chicago.

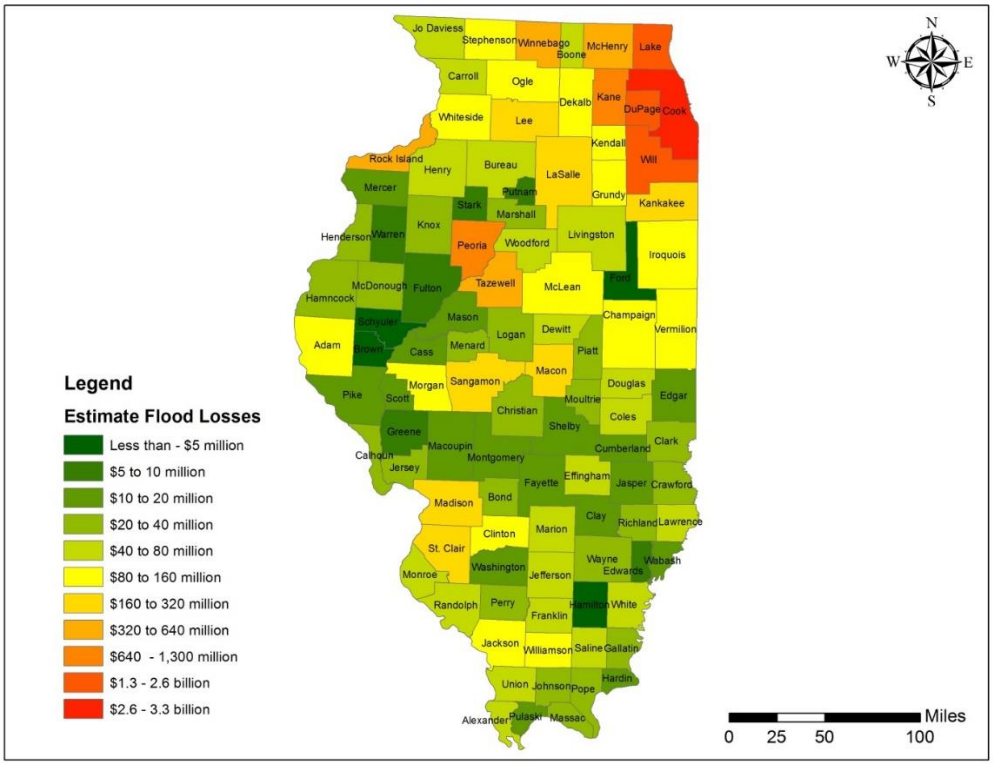

Figure 6- Estimated flood loss on the 100-year floodplain by county.

For the "levee fails scenario" the estimated building-related-flood losses on 100-year Illinois floodplains would increase from $18.03 billion to $21.44 billion (19%). The majority of the increase in flood losses (77%) is located in within three counties along the Mississippi River: Madison County ($1.1 billion increase in losses from $0.23 billion to $1.33 billion), St. Clair ($0.98 billion increase in losses from $0.20 billion to $1.18 billion), and Rock Island County ($0.58 billion increase from $0.34 billion to $0.92 billion; Appendices C, D, and E).

Flood-Loss Ratio

Flood-loss ratios were calculated in order to normalize losses to total building infrastructure exposure for different jurisdictions. This was done to provide an assessment of the relative impact of flood losses for jurisdictions of different sizes and total quantities of at-risk infrastructure. The average county flood-loss ratio was 0.10, the maximum county flood-loss ratio was 0.3 and the minimum was 0.02 (Figure 7; Appendix B). The average floodplain area weighted jurisdictional flood-loss ratio is 0.01, the maximum is 0.25, and the minimum is 0.00 (Figure 8; Appendix D). Flood-loss ratios for the jurisdictional analysis were weighted according to amount of floodplain area within the jurisdiction to correct for the overlap of census block outside of a jurisdiction's boundary (see Flood Vulnerability in the methods).

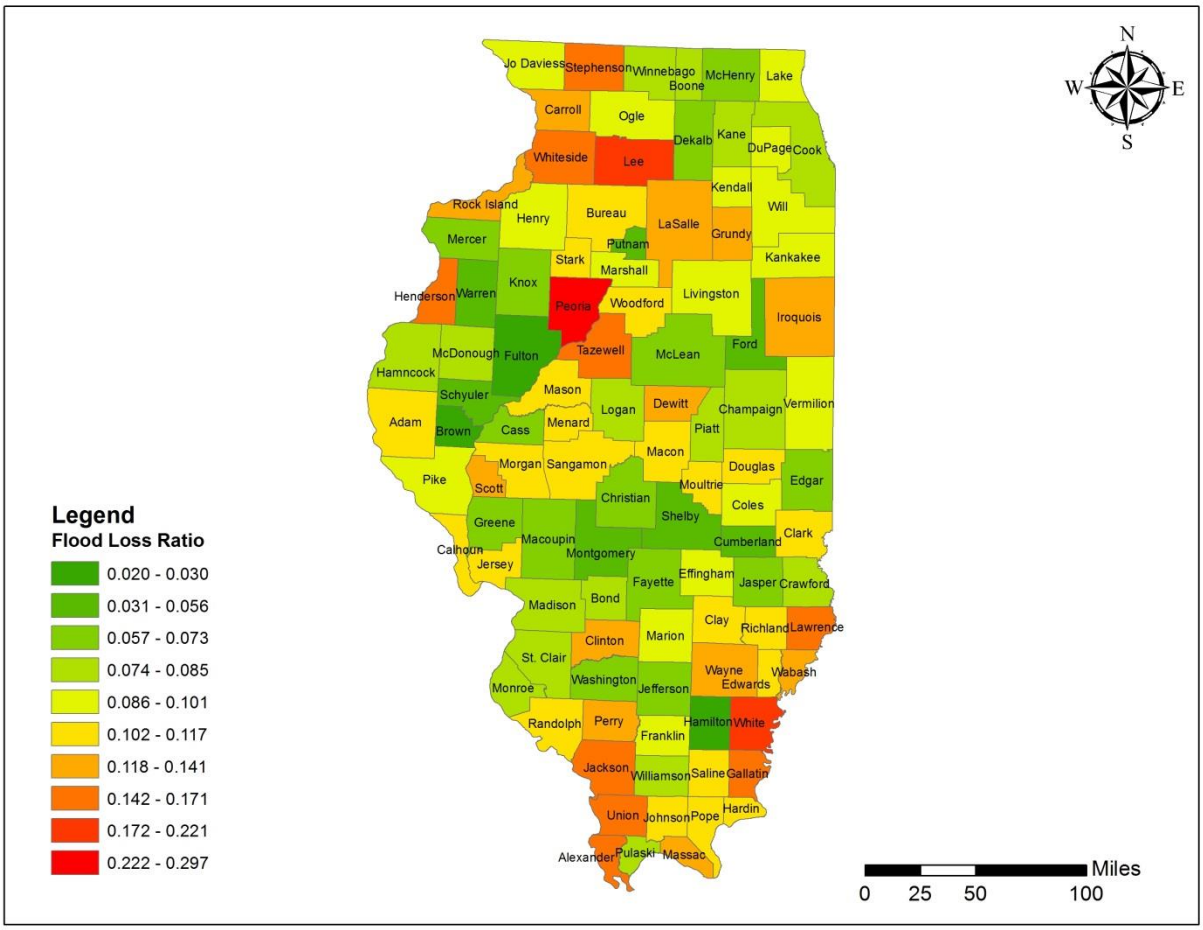

Figure 7 – County flood-loss ratios; values shown are a ratio estimated flood losses in each county's 100-year floodplain relative to total building-related exposure in the floodplain.

As Figures 7 and 8 show, the flood-loss ratio provides a different perspective on flood risk than flood- exposure and -loss maps. When normalized to total exposure, Cook and surrounding counties have average (0.1) to slightly below average ratios. The counties with the largest flood-loss ratios are Lee, Peoria, Tazewell, White, and Lawrence Counties (Figure 7). These counties have large expanses of floodplain along larger rivers such as the Rock, Green, Illinois and Wabash. Jurisdictions with higher flood-loss ratios tend to be small and relatively less protected river towns such as Gulfport, Naples, Grand Tower, Old Shawneetown and Liverpool (Figure 8; Appendix D).

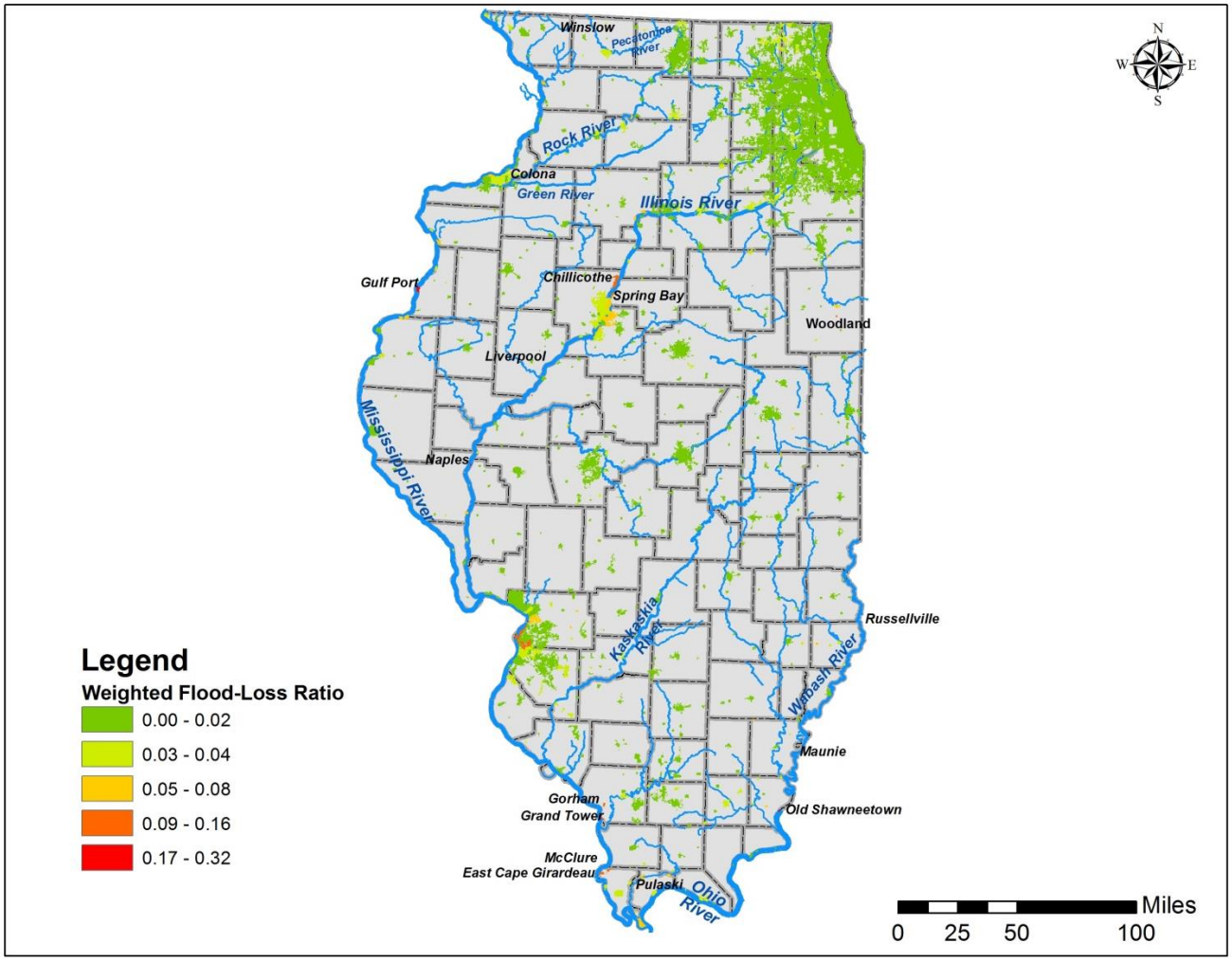

Figure 8 – Jurisdictional floodplain area weighted flood-loss ratios; jurisdictions with a loss ratio greater than 0.09 are labeled. Values shown are a ratio estimated flood losses in each jurisdiction's 100-year floodplain relative to total building-related exposure in the floodplain.

Flood Vulnerability

Vulnerability to flooding was assessed in this study by calculating a Flood Vulnerability Index (FVI) that combines Hazus-based estimates of flood exposure and loss with the widely utilized Social Vulnerability Index (SoVI; HVRI, 2012). The county-level FVI scores ranged from 0.00 to 1.49 with an average of 0.48 (Figure 9; Appendix B). The modeling results suggest the least flood vulnerably county is Kendall County and the most vulnerable county is Alexander County. By individual jurisdictions, the FVI scores ranged from 0.00 to 1.60 with a mean of 0.54. These results suggest that Boulder Hill is one of the least flood vulnerable jurisdictions in Illinois that contains a FEMA Special Flood Hazard Area (100-year floodplain) and Gulfport, IL is the most flood-vulnerable jurisdiction (Figure 10; Appendix D). The ten most vulnerable jurisdictions in Illinois are listed in Table 5.

The highest vulnerability scores (FVI) and vulnerability ratings are generally in the rural counties and communities located along Illinois's larger rivers. The greatest concentration of jurisdictions with high

vulnerability rating is in the portions of southern Illinois bordering the Mississippi and Ohio Rivers. The other jurisdictions with high flood vulnerability ratings were located along other major rivers such as the Green, Illinois, Kaskaskia, and Rock Rivers (Figures 9 and 10).

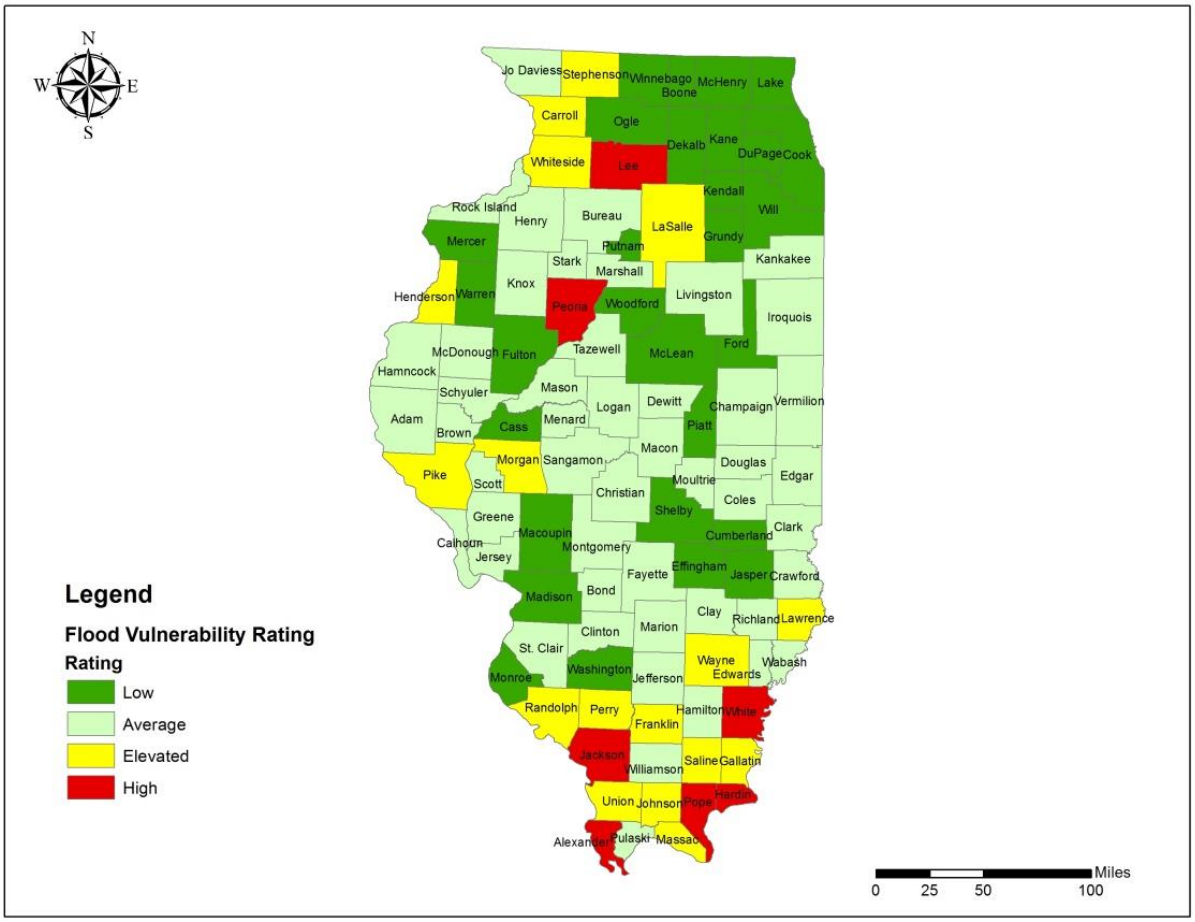

Figure 9 - Flood vulnerability ratings for the 102 counties in Illinois. These vulnerability ratings are categorical representations (low, average, elevated, or high) of the flood vulnerability index (FVI; see text).

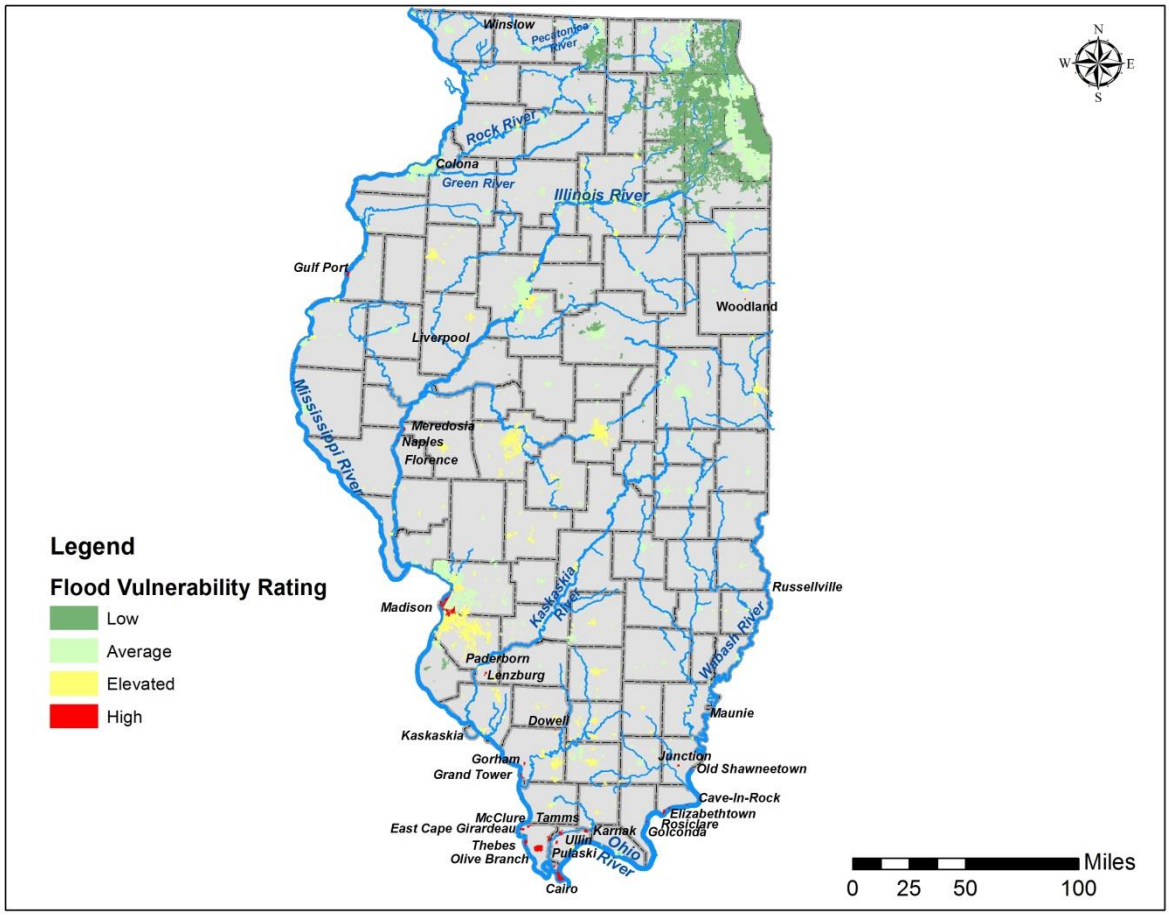

Figure 10 – The flood vulnerability rating for the 891 Illinois jurisdictions with a FEMA Special Flood Hazard Area (100-year floodplain). The high flood vulnerability jurisdictions are labeled.

Table 5 - The ten jurisdictions in Illinois most vulnerable to flooding

Town/City	Rank	Total Losses ($1000)	Total Exposure ($1000)	Loss Index	SoVI Index	Flood Score	Flood Vulnerability Index	Flood Vulnerability Rating
Gulf Port	1	6,135	23,775	1.000	0.606	1.606	1.000	High
East Cape Girardeau	2	6,213	43,849	0.560	1.000	1.560	0.971	High
Naples	3	3,618	15,753	0.886	0.587	1.472	0.917	High
Grand Tower	4	11,332	56,161	0.722	0.743	1.465	0.912	High
Old Shawneetown	5	3,913	22,190	0.697	0.722	1.419	0.883	High
McClure	6	3,820	27,457	0.550	0.823	1.372	0.854	High
Liverpool	7	3,593	21,226	0.669	0.682	1.350	0.841	High
Maunie	8	1,696	11,862	0.565	0.785	1.350	0.840	High
Gorham	9	3,098	20,789	0.499	0.743	1.242	0.773	High
Cairo	10	27,391	243,913	0.307	0.867	1.174	0.731	High

State Essential and Critical Facilities Flood Loss Assessment

Using IEMA's statewide essential and critical facility database, five state-owned essential or critical facilities were identified within FEMA-mapped 100-year floodplains. A Hazus-MH user defined flood loss analysis was performed on each of these facilities to assess the flood exposure and potential flood losses if each of these facilities were to experience a 100-year flood. The estimated flood exposure for these five facilities (total estimated replacement value of structure and content) is $44.75 million. The total estimated flood losses if these structures were inundated to the 100-year flood level is $24.26 million. Table 6 shows the exposure and losses estimates for each of these five facilities.

Table 6 – Flood exposures and estimated flood losses for Illinois state-owned essential and critical facilities within the 100-year floodplain.

County	Facility Name	Replacement Cost ($1000s)	Estimated Content ($1000s)	Full Replacement Cost ($1000)	Total Losses ($1000)
Madison	Illinois Department of Transportation District 8 Headquarters	$ 10,674	$ 10,674	$ 21,349	$ 9,814
Madison	Illinois State Police - District 11	$ 1,832	$ 2,749	$ 4,581	$ 2,984
Madison	Illinois State Police / Office Building	$ 1,832	$ 2,749	$ 4,581	$ 2,201
Saline	Saline USDA Office	$ 1,180	$ 1,180	$ 2,360	$ 2,223
Jersey	Grafton Juvenile Correction Center	$ 7,916	$ 3,958	$ 11,874	$ 7,045
	Total			**$ 44,745**	**$ 24,268**

Other Critical and Essential Facilities

We used our statewide essential and critical facility to identify additional non-state-owned at-risk facilities. Four hundred essential or critical facilities were identified on 100-year floodplains. Of these 400 facilities, 8 were medical care facilities (hospitals, nursing homes and clinics), 48 were fire stations, 26 were police stations, 95 were schools, 25 were communication facilities, 10 were power facilities, 3 were natural gas facilities, 6 were oil facilities, 33 were potable water treatment facilities and 146 were waste water facilities. These 400 essential or critical facilities were located in 78 of the 102 Illinois counties. The top five counties with the greatest number of at risk essential or critical facilities were Madison County (31 facilities), Cook (30), La Salle (18), Will (17), and Jackson County (15). Appendix F lists all the essential and critical facilities on Illinois 100-year floodplains.

Discussion and Conclusions

Sources of Uncertainty

Rigorous and quantitative analysis requires identification of methodological assumptions and sources of uncertainty. In this study, sources of uncertainty were associated with the flood-exposure methods, with the loss estimation, with the social vulnerability parameters, and with the essential and critical facilities data. In addition, the results here should be interpreted in the context of the methods by which they were generated.

Uncertainty in Flood Exposure and Loss Estimates

The primary sources of uncertainty in the Hazus-MH flood -exposure and -loss estimates are (1) the use of the national-level infrastructure data for the building inventory and (2) the assumption of an even distribution of inventory across each census block. National-level infrastructure data provided with Hazus-MH are coarse approximations of structure, contents, and inventory values for a specific county or jurisdiction. The Hazus-MH infrastructure data inventory is provided at the census-block level instead of actual locations of individual buildings. The aggregate analysis in Hazus-MH involves the assumption that buildings are evenly distributed throughout each census block. In Illinois, previous research has shown that building-related loss estimates can average up to 50% greater than loss estimates using individual structure data with assessed values (Remo et al., 2012). Hence, the flood- exposure and -loss values presented here should be viewed as coarse estimates useful for comparative purposes.

Uncertainty in Social Vulnerability Parameters

The SoVI scores used in the flood vulnerability analysis here were estimated for each county. We used the county-level SoVI scores in the jurisdictional analysis because they were the highest resolution SoVI data available. The use of county-level SoVI data limits the resolution of the vulnerability results presented in this study, however these SoVI score were useful for assessing relative differences in flood vulnerability across Illinois, in particular comparisons between counties.

Uncertainty in Essential and Critical Facilities Data

Flood-vulnerable essential and critical facilities was screened using the best publicly available data. Due to the nature of these data, it is likely that there were some omissions, misidentifications and some of the facilities identified may not currently be in operation. However, all of the 400 essential and critical facilities identified as at-risk were checked to ensure the facility was located within the floodplain. These facilities were not individually checked for flood-proofing measures.

Major Findings

FEMA-mapped 100-year floodplains in Illinois encompass 7,140 mi^2, or 13% of the State. Within these floodplains, the estimated building-related flood exposure is $190 billion. Sixty-four percent ($121 billion) of Illinois's building-related-flood exposure is contained within the six counties which include and surround the city of Chicago (Figure 2). The building related-flood losses within the 100-year floodplain are estimated to be $18.39 billion dollars. Again the majority of these losses (~$10.18 billion of 55%) are located in and around Chicago. We underscore here again these exposure and loss estimates represent building-related exposure and losses only. These estimates do not take in

account damage to infrastructure (i.e., roads, bridges, utilities, etc.), agriculture (i.e., crop damage) or secondary losses. In addition, all exposure and loss estimates are presented in $2006 dollars which is the unit currently used in the Hazus-MH infrastructure database.

Unlike flood exposure and losses, which are concentrated in the urban and suburban areas around Chicago, the most flood-vulnerable communities in Illinois are rural jurisdictions located along Illinois's larger rivers. The vulnerability analysis suggests that urban and suburban communities would tend to be more resilient (i.e., more resources available for recovery from significant flood losses) then rural river communities, despite the larger absolute flood losses in the urban areas. The greatest concentration of jurisdictions with high flood vulnerability indices were in southern Illinois counties bordering the Mississippi and Ohio Rivers (Figures 9 and10).

We identified 405 essential or critical facilities located on the 100-year floodplains in Illinois. Of these, only 5 were state-owned facilities (Table 6), together they comprised $44.75 million in flood exposure and $24.27 million in estimated flood losses. The remaining 400 essential or critical facilities were owned by local governments, private companies, or not-for-profit groups. The majority of at-risk essential facilities were schools (95 facilities statewide), fire stations (48), and police stations (26). The majority of the critical facilities at risk were waste-water treatment (146), potable-water treatment (33), and communication facilities (25).

Flood risk on levee-protected floodplains, in Illinois and elsewhere, is a distinct hazard with distinct issues and concerns. Of the 143 levee systems we identified in Illinois, the majority (124) participate or are eligible for the USACE's Public Law 84-99 program, involving regular levee inspections and resources for levee repair following flood damage. We estimate that the 143 levee systems provide flood protection to $25.01 billion in building infrastructure on Illinois 100-year floodplains. It should be noted, however, that recent levee inspections by the USACE have found significant deficiencies in 108 (87%) of these levee systems and 28 (23%) of these levees were rated by the USACE as "unacceptable" or "inactive" (see Floodplains and Levees section of this report).

Three levee-protected areas in Illinois are of particular concern: 1) Metro East, 2) East Peoria, and 3) Rock Island. Failure of any of the levees which protect these areas would likely result is a significant loss of property and, potentially, life. Of greatest concern is the Metro East Sanitary District levee system. This is an urban levee constructed to the 500-year protection level which protects 20 communities with a total population of ~120,000 people against inundation from the Mississippi River. This levee system has been rated unacceptable by the USACE, which means that the levee may not perform to its designed level during a major flood. The analysis here identified $15.13 billion of dollars building-related infrastructure protected by the Metro East levee system. This study estimated that there would be nearly $3.0 billion of building-related-flood losses if the levee was to fail and flood waters inundate the levee cell to the 100-year level.

In East Peoria there are seven levee systems along the Illinois River, protecting ~2,000 people, which were originally designed to protect up to 100-year flood level. These levees have been rated as unacceptable by the USACE, which means they may not perform to their design level during a major flood. These levees are estimated to contain $792 million in building-related infrastructure. This study estimated that there would be $207 million in building-related-flood losses if the levees were to fail and flood waters inundate the levee cell to the 100-year level.

In Rock Island County there are five levee systems, protecting approximately 11,200 people in portions of Rock Island, Moline, East Moline, and Milan from inundation by the Mississippi and/or Rock Rivers up to the 200-year flood level.

These levees have been rated as “minimally acceptable” by the USACE during their last inspection, which means they would likely perform to their design level during a large flood. However, these levees protect the second largest concentration of floodplain infrastructure in Illinois. The estimated building-related infrastructure (i.e., exposure) protected by these levees is $2.62 billion. This study estimated that there would be $625 million in building-related-flood losses if these levees were to fail and flood waters inundate the levee cell to the 100-year level.

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Illinois Statewide Flood Hazard Assessment

(Appendix A – Levee Information)

County	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Certified Levee	Inspection Rating	Inspection Date	Inspection Type
Carroll	Mississippi River	1993	7.8	3300	50	No	No	Not Applicable	Not Applicable	N/A
Whiteside	Mississippi River	1984	12.0	9586	200	Yes	Yes	Minimally Acceptable	4/22/2010	Periodic
Whiteside	Mississippi River	1977	3.4	10044	100	Yes	Yes	Minimally Acceptable	3/12/2012	Periodic
Whiteside	Rock River	Not Available	0.4	100	20	No	No	Not Applicable	Not Applicable	N/A
Whiteside	Rock River	Not Available	7.6	5800	10	No	No	Not Applicable	Not Applicable	N/A
Whiteside	Rock River	Not Available	1.7	770	5	No	No	Not Applicable	Not Applicable	N/A
Whiteside	Rock River	1940	9.2	9495	50	Yes	No	Unacceptable	4/3/2012	Routine
Rock Island	Rock River	Not Available	7.6	5007	50	Yes	No	Inactive	4/21/2011	Routine
Rock Island	Mississippi River	1984	2.5	1193	200	Yes	Yes	Minimally Acceptable	5/13/2010	Periodic
Rock Island	Mississippi River	Not Available	0.9	822	Not Available	No	No	Not Applicable	Not Applicable	N/A
Rock Island	Mississippi River	1973	3.8	863	200	Yes	Yes	Minimally Acceptable	5/11/2010	Periodic
Rock Island	Rock River	1988	10.8	1147	200	Yes	Yes	Minimally Acceptable	4/2/2012	Periodic
Rock Island	Rock River	1988	10.8	811	200	Yes	Yes	Minimally Acceptable	4/2/2012	Periodic
Rock Island	Mississippi River	1969	1.6	63	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Rock Island	Mississippi River	1969	1.6	113	50	Yes	No	Minimally Acceptable	Not Available	Not Available

County	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Certified Levee	Inspection Rating	Inspection Date	Inspection Type
Rock Island	Mississippi River	1963	9.6	5110	50	Yes	No	Minimally Acceptable	5/10/2012	Periodic
Rock Island	Mississippi River	1989	1.6	130	2	Yes	No	Minimally Acceptable	Not Available	Not Available
Putnam	Illinois River	1940	5.9	2612	50	Yes	No	Unacceptable	11/19/2001	Routine
Mercer	Mississippi River	1966	19.9	24989	50	Yes	No	Minimally Acceptable	5/13/2010	Routine
Mercer	Mississippi River	1969	0.9	115	Not Available	No	No	Not Applicable	Not Applicable	N/A
Henderson	Mississippi River	Not Available	0.0	77	Not Available	No	No	Not Applicable	Not Applicable	N/A
WOODFORD	Illinois River	Not Available	1.6	420	10	No	No	Not Applicable	Not Applicable	N/A
Henderson	Mississippi River	1968	6.6	6163	Not Available	No	No	Not Applicable	Not Applicable	N/A
Henderson	Mississippi River	1968	11.3	17998	50	Yes	No	Not Available	Not Available	Not Available
Peoria	Illinois River	Not Available	1.0	125	10	No	No	Not Applicable	Not Applicable	N/A
Tazewell	Illinois River	1945	9.5	20	100	Yes	No	Unacceptable	4/11/2012	Periodic
Tazewell	Illinois River	1945	9.5	355	100	Yes	No	Unacceptable	4/11/2012	Periodic
Tazewell	Illinois River	1945	3.2	17	100	Yes	No	Unacceptable	4/11/2012	Periodic
Tazewell	Illinois River	1945	0.0	1049	100	Yes	No	Unacceptable	4/11/2012	Periodic
Tazewell	Illinois River	1945	9.5	37	100	Yes	No	Unacceptable	4/11/2012	Periodic

County	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Certified Levee	Inspection Rating	Inspection Date	Inspection Type
Tazewell	Illinois River	1945	9.5	93	100	Yes	No	Unacceptable	4/11/2012	Periodic
Tazewell	Illinois River	1945	9.5	94	100	Yes	No	Unacceptable	4/11/2012	Periodic
Peoria	Illinois River	Not Available	1.2	57	100	Yes	No	Minimally Acceptable	10/5/2007	Routine
Peoria	Illinois River	Not Available	2.6	245	10	No	No	Not Applicable	Not Applicable	N/A
Peoria	Illinois River	1954	7.1	2843	50	Yes	No	Inactive	Not Available	Not Available
Henderson	Mississippi River	Not Available	0.0	458	Not Available	No	No	Not Applicable	Not Applicable	N/A
Tazewell	Illinois River	1941	16.0	13010	50	Yes	No	Acceptable	Not Available	Not Available
Peoria	Illinois River	1941	10.8	4866	50	Yes	No	Inactive	Not Available	N/A
Fulton	Illinois River	1941	8.7	2961	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Fulton	Illinois River	1941	7.0	3174	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Mason	Illinois River	1993	3.8	1192	10	No	No	Not Applicable	Not Available	N/A
Fulton	Illinois River	1920	12.3	5911	50	Yes	No	Acceptable	Not Available	Not Available
Fulton	Illinois River	1949	4.5	10553	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Hancock	Mississippi River	1972	30.3	31406	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Fulton	Illinois River	1939	4.7	1782	50	Yes	No	Minimally Acceptable	Not Available	Not Available

County	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Certified Levee	Inspection Rating	Inspection Date	Inspection Type
Schuyler	Illinois River	1943	6.8	3921	50	Yes	No	Unacceptable	5/12/2012	Periodic
Schuyler	Illinois River	Not Available	4.8	1200	Not Available	No	No	Not Applicable	Not Applicable	N/A
Adams	Mississippi River	1971	29.0	12638	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Schuyler	Illinois River	1954	13.1	6318	100	Yes	Yes	Minimally Acceptable	5/8/2012	Periodic
Schuyler	Illinois River	1941	8.6	5559	50	Yes	No	Acceptable	12/15/2010	Routine
Cass	Illinois River	1967	11.1	21923	100	Yes	Yes	Minimally Acceptable	7/22/2010	Periodic
Adams	Mississippi River	1971	29.0	6859	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Morgan	Illinois River	Not Available	10.8	16119	30	Yes	No	Minimally Acceptable	6/15/2010	Periodic
Brown	Illinois River	Not Available	5.8	1646	12	Yes	No	Minimally Acceptable	12/1/2007	Not Available
Brown	Illinois River	Not Available	14.6	12254	100	Yes	Yes	Minimally Acceptable	12/1/2007	Periodic
Adams	Mississippi River	Not Available	8.8	5515	500	Yes	Yes	Acceptable	Not Available	Not Available
Morgan	Illinois River	Not Available	7.0	9062	10	Yes	No	Minimally Acceptable	10/9/2010	Periodic
Pike	Mississippi River	1971	0.0	45261	100	Yes	Yes	Minimally Acceptable	Not Available	Not Available
Scott	Illinois River	Not Available	6.4	5481	40	Yes	No	Minimally Acceptable	1/4/2011	Periodic
Pike	Illinois River	Not Available	8.2	4772	40	Yes	No	Minimally Acceptable	1/5/2011	Periodic

County	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Certified Levee	Inspection Rating	Inspection Date	Inspection Type
Scott	Illinois River	Not Available	1.9	693	40	YES	No	Minimally Acceptable	8/25/2011	Routine
Scott	Illinois River	Not Available	17.0	11125	40	Yes	No	Minimally Acceptable	2/11/2011	Periodic
Pike	Mississippi River	1971		896	100	Yes	Yes	Minimally Acceptable	Not Available	Not Available
Pike	Mississippi River	1971		17264	100	Yes	Yes	Minimally Acceptable	Not Available	Not Available
Scott	Illinois River	Not Available	11.3	13607	20	Yes	No	Minimally Acceptable	8/26/2011	Routine
Pike	Mississippi River	1971		43296	100	Yes	Yes	Minimally Acceptable	Not Available	Not Available
Greene	Illinois River	Not Available	12.8	13446	20	Yes	No	Minimally Acceptable	8/24/2011	Routine
Greene	Illinois River	Not Available	12.2	9795	20	Yes	No	Minimally Acceptable	10/2/2010	Periodic
CALHOUN	Mississippi River	1971		14037	100	Yes	Yes	Minimally Acceptable	Not Available	Not Available
Greene	Illinois River	Not Available	12.4	9362	25	Yes	No	Minimally Acceptable	10/9/2010	Periodic
Greene	Illinois River	Not Available	11.8	9455	20	Yes	No	Minimally Acceptable	12/9/2010	Periodic
JERSEY	Illinois River	Not Available	12.3	11048	20	Yes	No	Minimally Acceptable	12/1/2007	Not Available
Madison	Mississippi River	Not Available	20.8	428	500	Yes	Yes	Minimally Acceptable	8/30/2011	Periodic
Madison	Mississippi River	Not Available	20.8	10688	500	Yes	Yes	Minimally Acceptable	8/30/2011	Periodic
Madison	Mississippi River	Not Available	20.8	1640	500	Yes	Yes	Minimally Acceptable	8/30/2011	Periodic

County	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Certified Levee	Inspection Rating	Inspection Date	Inspection Type
Madison	Mississippi River	Not Available	19.8	85977	500	Yes	Yes	Unacceptable	5/22/2010	Periodic
Madison	Mississippi River	Not Available	11.3	1999	10	Yes	No	Minimally Acceptable	12/1/2007	Not Available
Madison	Mississippi River	Not Available	2.4	800	10	No	No	Not Applicable	Not Applicable	N/A
St. Clair	Mississippi River	Not Available	10.3	12903	500	Yes	Yes	Minimally Acceptable	10/9/2009	Periodic
Monroe	Mississippi River	Not Available	20.1	13806	50	Yes	No	Minimally Acceptable	1/30/2011	Periodic
Monroe	Mississippi River	Not Available	21.4	45938	50	Yes	No	Minimally Acceptable	11/2/2010	Periodic
Randolph	Mississippi River	Not Available	16.5	16151	100	Yes	Yes	Minimally Acceptable	11/3/2010	Periodic
Randolph	Mississippi River	Not Available	14.8	9241	50	Yes	No	Minimally Acceptable	8/12/2011	Routine
Jackson	Mississippi River	Not Available	19.4	56777	50	Yes	No	Unacceptable	7/14/2010	Periodic
Union	Mississippi River	Not Available	14.6	16200	50	Yes	No	Minimally Acceptable	12/1/2007	Not Available
Fulton	Spoon River	1983	3.2	1290	50	Yes	No	Acceptable	3/24/2012	Routine
Fulton	Illinois and Spoon R	1930	5.5	1233	20	Yes	No	Minimally Acceptable	Not Available	Not Available
Fulton	Spoon River	Not Available	0.0	422	Not Available	Yes	No	Unacceptable	3/5/2009	Routine
Fulton	Spoon River	1955	6.1	2213	50	Yes	No	Minimally Acceptable	3/1/2011	Routine
Fulton	Spoon River	1954	3.7	980	10	Yes	No	Acceptable	3/7/2011	Routine

County	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Certified Levee	Inspection Rating	Inspection Date	Inspection Type
Mason	Sangamon River	1939	14.5	5885	50	Yes	No	Inactive	Not Available	Not Available
Menard	Sangamon River	1939	7.4	2729	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Menard	Sangamon River	Not Available	0.0	563	Not Available	Yes	No	Minimally Acceptable	1/13/2010	Routine
Mason	Sangamon River	1941	8.3	7448	50	Yes	No	Acceptable	Not Available	Not Available
Cass	Sangamon River	Not Available	0.0	4082	Not Available	Yes	No	Inactive	Not Available	N/A
Cass	Sangamon River	1895	8.0	2561	20	Yes	No	Minimally Acceptable	10/29/2009	Routine
Cass	Sangamon River	1975	6.1	3811	50	Yes	No	Minimally Acceptable	5/22/2009	Routine
Cass	Sangamon River	1948	8.5	13954	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Fulton	Spoon River	1960	2.4	290	10	Yes	No	Minimally Acceptable	3/14/2011	Routine
Stark	Spoon River	Not Available	0.7	152	10	Yes	No	Minimally Acceptable	10/31/2007	Routine
Fayette	Kaskaskia River	Not Available	0.0	1398	Not Available	Yes	No	Minimally Acceptable	5/26/2010	Periodic
Fayette	Kaskaskia River	Not Available	0.0	11978	Not Available	Yes	No	Not Available	Not Available	Not Available
Clinton	Kaskaskia River	Not Available	0.0	2932	Not Available	Yes	No	Minimally Acceptable	9/22/2011	Routine
Clinton	Kaskaskia River	Not Available	0.0	1277	Not Available	Yes	No	Minimally Acceptable	9/22/2011	Routine
Clinton	Kaskaskia River	Not Available	0.0	3443	Not Available	Yes	No	Minimally Acceptable	9/22/2011	Routine

County	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Certified Levee	Inspection Rating	Inspection Date	Inspection Type
Clinton	Shoal Creek	Not Available	0.0	1403	Not Available	Yes	No	Minimally Acceptable	9/22/2011	Routine
St. Clair	Kaskaskia River	Not Available	0.0	146	100	Yes	Yes	Minimally Acceptable	9/14/2011	Periodic
Jasper	Embarrass River	Not Available	0.0	2078	Not Available	Yes	No	Minimally Acceptable	9/18/2007	Routine
Lawrence	Wabash River	Not Available	0.0	41385	Not Available	Yes	No	Minimally Acceptable	9/18/2007	Routine
Lawrence	Wabash River	Not Available	0.0	6157	Not Available	Yes	No	Minimally Acceptable	4/5/2012	Periodic
Wabash	Wabash River	Not Available	0.0	550	100	Yes	Yes	Minimally Acceptable	7/11/2012	Periodic
Wabash	Wabash River	Not Available	0.0	4823	Not Available	Yes	No	Minimally Acceptable	4/6/2012	Periodic
Gallatin	Ohio River	Not Available	0.0	945	100	Yes	No	Unacceptable	12/13/2005	Routine
Saline	Saline River	Not Available	0.0	3903	100	Yes	Yes	Minimally Acceptable	9/12/2012	Routine
Hardin	Ohio River	Not Available	0.0	263	100	Yes	Yes	Minimally Acceptable	2/6/2012	Periodic
Massac	Ohio River	Not Available	0.0	1185	100	Yes	Yes	Unacceptable	6/3/2010	Periodic
Massac	Bay Creek Ditch	Not Available	0.0	6655	50	Yes	No	Minimally Acceptable	2/7/2012	Routine
Pulaski	Cache River	Not Available	0.0	2147	Not Available	Yes	No	Unacceptable	4/22/2010	Periodic
Alexander	Mississippi River	Not Available	0.0	16605	15	Yes	No	Minimally Acceptable	12/1/2007	Not Available
Alexander	Mississippi and Ohio	Not Available	0.0	16584	100	Yes	Yes	Unacceptable	4/16/2012	Routine

County	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Certified Levee	Inspection Rating	Inspection Date	Inspection Type
La Salle	Illinois River	Not Available	0.0	63	Not Available	Yes	No	Acceptable	Not Available	Not Available
La Salle	Vermilion River	Not Available	0.4	27	50	Yes	No	Unacceptable	10/21/2008	Routine
Winnebago	Kent Creek	Not Available	0.0	751	50	Yes	No	Inactive	Not Available	Not Available
Winnebago	South Branch Kent Creek	1988	0.0	3605	50	Yes	No	Minimally Acceptable	Not Available	Not Available
Winnebago	Kent Creek	Not Available	0.0	637	50	Yes	No	Acceptable	Not Available	Not Available
Winnebago	Keith Creek	Not Available	0.0	210	Not Available	Yes	No	Unacceptable	11/19/2003	Routine
Lake	Des Plaines River	Not Available	0.0	65	Not Available	Yes	No	Minimally Acceptable	4/26/2010	Periodic
DeKalb	Kishwaukee	1958	3.2	92	100	Yes	Yes	Minimally Acceptable	Not Available	Not Available
DeKalb	Kishwaukee	1958	3.2	183	100	Yes	Yes	Inactive	Not Available	Not Available
Peoria	Illinois River	Not Available	9.5	81	100	Yes	Yes	Unacceptable	4/11/2012	Periodic
Jo Daviess	Mississippi River	Not Available	0.0	40	Not Available	No	No	Not Applicable	Not Applicable	N/A
Joe Daviess	Galena River	1951	1.6	30	100	Yes	Yes	Minimally Acceptable	Not Available	Not Available
Joe Daviess	Galena River	1951	0.0	39	100	Yes	Yes	Not Available	Not Available	Not Available
Rock Island	Slough Mill Creek	Not Available	0.0	85	100	Yes	Yes	Not Available	Not Available	Not Available
Henderson	Mississippi	Not Available	0.0	686	Not Available	Yes	No	Not Available	Not Available	Not Available

County	River or Stream	Year Completed	Length (Miles)	Protected Area (Acres)	Protection Level (Years)	PL 84-99 Participation	FEMA Certified Levee	Inspection Rating	Inspection Date	Inspection Type
Pike	Mississippi	Not Available	0.0	2461	Not Available	Yes	No	Minimally Acceptable	3/17/2011	Periodic
Jersey	Illinois River	Not Available	0.0	931	Not Available	Yes	No	Minimally Acceptable	12/17/2010	Periodic
Greene	Illinois	Not Available	0.0	725	Not Available	Yes	No	Minimally Acceptable	12/1/2007	Not Available
Greene	Illinois	Not Available	0.0	275	Not Available	Yes	No	Acceptable	12/1/2007	Not Available
Morgan	Illinois	Not Available	0.0	1600	Not Available	Yes	No	Minimally Acceptable	11/2/2010	Periodic
Tazewell	Mackinaw	Not Available	4.6	2004	10	Yes	No	Inactive	Not Available	Routine
Tazewell	Mackinaw	Not Available	3.4	1639	100	Yes	Yes	Minimally Acceptable	12/7/2010	Routine
Pope	Ohio River	Not Available	0.0	74	100	Yes	Yes	Minimally Acceptable	2/8/2012	Routine

Illinois Statewide Flood Hazard Assessment

(Appendix B – County Flood -Exposure, -Loss, and -Vulnerability Results)

County	Rank	Total Losses ($Thousand)	Total Exposure ($Thousand)	Loss Ratio	Loss Index	SVI Score	SVI Index	Flood Score	Flood Vulnerability Index	Z Score	Flood Vulnerability Rating
Alexander	1	54730	350565	0.16	0.49	4.75	1.00	1.49	1.00	2.7	High
Peoria	2	1007400	3391926	0.30	1.00	-1.56	0.47	1.47	0.98	2.6	High
White	3	70270	355209	0.20	0.64	2.19	0.78	1.43	0.95	2.4	High
Pope	4	21750	185248	0.12	0.35	4.11	0.95	1.30	0.84	1.9	High
Lee	5	161510	730949	0.22	0.73	-0.53	0.56	1.28	0.83	1.8	High
Hardin	6	12680	113683	0.11	0.33	3.91	0.93	1.26	0.81	1.7	High
Jackson	7	154400	998106	0.15	0.49	1.69	0.74	1.23	0.79	1.6	High
LaSalle	8	281280	2060057	0.14	0.42	1.92	0.76	1.18	0.75	1.4	Elevated
Gallatin	9	24840	169928	0.15	0.46	1.44	0.72	1.18	0.75	1.4	Elevated
Johnson	10	32240	275579	0.12	0.35	2.26	0.79	1.14	0.72	1.2	Elevated
Henderson	11	30510	184335	0.17	0.53	0.06	0.61	1.13	0.71	1.2	Elevated
Lawrence	12	56700	336329	0.17	0.54	-0.23	0.58	1.12	0.70	1.1	Elevated
Perry	13	35330	272062	0.13	0.40	1.32	0.71	1.11	0.69	1.1	Elevated
Union	14	70000	474138	0.15	0.46	0.53	0.65	1.11	0.69	1.1	Elevated
Whiteside	15	154200	947245	0.16	0.52	-0.4	0.57	1.08	0.67	1.0	Elevated
Saline	16	75220	673263	0.11	0.33	1.68	0.74	1.07	0.66	1.0	Elevated
Carroll	17	57950	409575	0.14	0.44	0.32	0.63	1.07	0.66	0.9	Elevated
Stephenson	18	129770	851978	0.15	0.48	-0.17	0.59	1.06	0.66	0.9	Elevated
Massac	19	38920	312129	0.12	0.38	0.87	0.67	1.05	0.65	0.9	Elevated
Franklin	20	40530	441770	0.09	0.26	2.24	0.79	1.05	0.64	0.8	Elevated
Wayne	21	23770	170222	0.14	0.43	-0.07	0.59	1.03	0.63	0.8	Elevated
Morgan	22	85850	792258	0.11	0.32	0.87	0.67	0.99	0.60	0.6	Elevated
Randolph	23	63950	597776	0.11	0.31	0.88	0.67	0.99	0.60	0.6	Elevated
Pike	24	14370	152930	0.09	0.27	1.43	0.72	0.99	0.60	0.6	Elevated
Rock Island	25	342530	2505693	0.14	0.42	-0.63	0.55	0.97	0.58	0.5	Average
Pulaski	26	14340	169434	0.08	0.23	1.59	0.73	0.97	0.58	0.5	Average
Marion	27	53940	572355	0.09	0.27	1.15	0.70	0.97	0.58	0.5	Average
Tazewell	28	454300	2661830	0.17	0.54	-2.25	0.41	0.96	0.57	0.5	Average

County	Rank	Total Losses ($Thousand)	Total Exposure ($Thousand)	Loss Ratio	Loss Index	SVI Score	SVI Index	Flood Score	Flood Vulnerability Index	Z Score	Flood Vulnerability Rating
Wabash	29	15850	130800	0.12	0.36	-0.14	0.59	0.95	0.57	0.5	Average
Vermilion	30	123600	1243312	0.10	0.29	0.65	0.66	0.94	0.56	0.4	Average
Adam	31	110210	947578	0.12	0.35	-0.13	0.59	0.94	0.56	0.4	Average
Calhoun	32	27620	250702	0.11	0.33	0.09	0.61	0.93	0.55	0.4	Average
Dewitt	33	41170	302236	0.14	0.42	-1.07	0.51	0.93	0.55	0.4	Average
Mason	34	18420	166071	0.11	0.33	-0.02	0.60	0.93	0.55	0.4	Average
Richland	35	32620	302456	0.11	0.32	0.11	0.61	0.93	0.55	0.4	Average
Knox	36	37840	515381	0.07	0.19	1.54	0.73	0.92	0.54	0.3	Average
Iroquois	37	87070	700991	0.12	0.38	-0.65	0.55	0.92	0.54	0.3	Average
Clay	38	15870	141698	0.11	0.33	-0.25	0.58	0.91	0.54	0.3	Average
Macon	39	212940	1925620	0.11	0.33	-0.24	0.58	0.91	0.53	0.3	Average
Bureau	40	63980	574753	0.11	0.33	-0.4	0.57	0.90	0.52	0.2	Average
Moultrie	41	34240	327897	0.10	0.30	-0.12	0.59	0.90	0.52	0.2	Average
Brown	42	2600	112709	0.02	0.01	3.35	0.88	0.89	0.52	0.2	Average
Clark	43	21010	198880	0.11	0.31	-0.29	0.58	0.89	0.51	0.2	Average
Marshall	44	27760	273602	0.10	0.29	-0.34	0.57	0.87	0.50	0.1	Average
Williamson	45	97300	1142675	0.09	0.23	0.33	0.63	0.86	0.50	0.1	Average
Clinton	46	125260	962267	0.13	0.40	-1.64	0.46	0.86	0.49	0.1	Average
Edwards	47	5670	49066	0.12	0.34	-1.09	0.51	0.85	0.49	0.1	Average
McDonough	48	33700	429648	0.08	0.21	0.44	0.64	0.85	0.49	0.0	Average
Scott	49	13410	104179	0.13	0.39	-1.81	0.45	0.84	0.48	0.0	Average
Schuyler	50	3070	54524	0.06	0.13	1.29	0.71	0.84	0.48	0.0	Average
Coles	51	63890	648722	0.10	0.28	-0.6	0.55	0.83	0.47	0.0	Average
Greene	52	9120	136790	0.07	0.17	0.75	0.66	0.83	0.47	0.0	Average
Jefferson	53	40080	580847	0.07	0.18	0.61	0.65	0.83	0.47	-0.1	Average
Stark	54	8350	80955	0.10	0.30	-0.92	0.52	0.82	0.46	-0.1	Average
Logan	55	33330	413402	0.08	0.22	-0.06	0.60	0.81	0.46	-0.1	Average
Christian	56	26400	375896	0.07	0.18	0.35	0.63	0.81	0.46	-0.1	Average

County	Rank	Total Losses ($Thousand)	Total Exposure ($Thousand)	Loss Ratio	Loss Index	SVI Score	SVI Index	Flood Score	Flood Vulnerability Index	Z Score	Flood Vulnerability Rating
Fayette	57	16670	253200	0.07	0.17	0.53	0.65	0.81	0.45	-0.1	Average
Livingston	58	74040	819864	0.09	0.25	-0.53	0.56	0.81	0.45	-0.1	Average
Douglas	59	50080	470359	0.11	0.31	-1.27	0.49	0.81	0.45	-0.1	Average
Montgomery	60	11950	252162	0.05	0.10	1.23	0.70	0.80	0.45	-0.2	Average
Crawford	61	21050	284808	0.07	0.19	0.09	0.61	0.80	0.45	-0.2	Average
Jo Daviess	62	75040	795935	0.09	0.27	-0.93	0.52	0.79	0.44	-0.2	Average
Jersey	63	36090	328308	0.11	0.32	-1.71	0.46	0.78	0.43	-0.2	Average
Kankakee	64	198930	2071666	0.10	0.27	-1.23	0.50	0.77	0.42	-0.3	Average
Hamncock	65	28950	379773	0.08	0.20	-0.38	0.57	0.77	0.42	-0.3	Average
Sangamon	66	309090	2685773	0.12	0.34	-2.12	0.42	0.77	0.42	-0.3	Average
Edgar	67	11570	184342	0.06	0.15	0.09	0.61	0.76	0.42	-0.3	Average
Hamilton	68	4030	135221	0.03	0.03	1.32	0.71	0.75	0.40	-0.4	Average
Henry	69	57330	614438	0.09	0.26	-1.59	0.47	0.73	0.39	-0.5	Average
Menard	70	22730	215605	0.11	0.31	-2.12	0.42	0.73	0.39	-0.5	Average
Bond	71	20510	267956	0.08	0.20	-0.95	0.52	0.72	0.39	-0.5	Average
Jasper	72	12540	173289	0.07	0.19	-0.9	0.53	0.71	0.38	-0.5	Average
Cook	73	3273790	43728088	0.07	0.20	-1.01	0.52	0.71	0.38	-0.5	Average
Shelby	74	13180	242679	0.05	0.12	-0.17	0.59	0.71	0.37	-0.5	Average
Winnebago	75	467060	5588832	0.08	0.23	-1.45	0.48	0.71	0.37	-0.5	Average
St.Clair	76	202020	2509109	0.08	0.22	-1.36	0.49	0.70	0.37	-0.6	Low
Cass	77	10230	162022	0.06	0.16	-0.63	0.55	0.70	0.37	-0.6	Low
Ogle	78	126530	1252250	0.10	0.29	-2.26	0.41	0.70	0.37	-0.6	Low
Macoupin	79	13700	215085	0.06	0.16	-0.72	0.54	0.70	0.36	-0.6	Low
Ford	80	2390	50666	0.05	0.10	-0.02	0.60	0.70	0.36	-0.6	Low
Warren	81	6680	141830	0.05	0.10	-0.04	0.60	0.69	0.36	-0.6	Low
Effingham	82	55360	622949	0.09	0.25	-1.97	0.44	0.68	0.35	-0.7	Low
Fulton	83	9250	459592	0.02	0.00	0.96	0.68	0.68	0.35	-0.7	Low
Washington	84	14610	214510	0.07	0.17	-1.13	0.51	0.68	0.35	-0.7	Low

County	Rank	Total Losses ($Thousand)	Total Exposure ($Thousand)	Loss Ratio	Loss Index	SVI Score	SVI Index	Flood Score	Flood Vulnerability Index	Z Score	Flood Vulnerability Rating
Champaign	85	151490	1960497	0.08	0.21	-1.7	0.46	0.66	0.34	-0.7	High
Mercer	86	15760	238450	0.07	0.17	-1.56	0.47	0.64	0.31	-0.8	Low
Grundy	87	121980	1008513	0.12	0.36	-3.96	0.27	0.63	0.31	-0.9	Low
Cumberland	88	10390	205235	0.05	0.11	-1.05	0.51	0.62	0.30	-0.9	Low
Madison	89	225880	2960648	0.08	0.20	-2.23	0.41	0.62	0.30	-0.9	Low
Woodford	90	61660	579495	0.11	0.31	-3.65	0.29	0.61	0.29	-1.0	Low
Piatt	91	30900	368835	0.08	0.23	-2.7	0.37	0.60	0.29	-1.0	Low
Putnam	92	7350	136742	0.05	0.12	-2.23	0.41	0.53	0.23	-1.3	Low
Dekalb	93	103050	1494590	0.07	0.18	-3.01	0.35	0.52	0.23	-1.3	Low
Monroe	94	49310	612245	0.08	0.22	-3.83	0.28	0.50	0.20	-1.4	Low
McLean	95	131850	2137957	0.06	0.15	-3.7	0.29	0.44	0.16	-1.7	Low
Boone	96	61430	780967	0.08	0.21	-4.51	0.22	0.43	0.15	-1.7	Low
Kane	97	702320	8717526	0.08	0.22	-5.06	0.18	0.39	0.12	-1.8	Low
Will	98	1399440	15129593	0.09	0.26	-5.73	0.12	0.38	0.11	-1.9	Low
Lake	99	2090820	22539796	0.09	0.26	-6	0.10	0.36	0.09	-2.0	Low
DuPage	100	2199620	23666320	0.09	0.26	-6.36	0.07	0.33	0.07	-2.1	Low
McHenry	101	517800	7140216	0.07	0.19	-6.16	0.08	0.27	0.02	-2.3	Low
Kendall	102	104850	1199314	0.09	0.24	-7.15	0.00	0.24	0.00	-2.5	Low

Illinois Statewide Flood Hazard Assessment

(Appendix C – County Flood -Exposure, -Loss, and -Vulnerability Results for the Levees Fail Scenarios)

County	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Loss Index	SVI Score	SVI Index	Flood Score	z-score	Flood Vulnerability Ratting
Alexander	1	106710	473539	0.23	0.74	4.75	1.00	1.74	3.38	High
Peoria	2	1007400	3391926	0.30	1.00	-1.56	0.47	1.47	2.32	High
White	3	70270	355209	0.20	0.64	2.19	0.78	1.42	2.14	High
Rock Island	4	920790	3607772	0.26	0.85	-0.63	0.55	1.40	2.05	High
Lee	5	161510	730949	0.22	0.73	-0.53	0.56	1.29	1.61	High
Hardin	6	12680	113683	0.11	0.33	3.91	0.93	1.26	1.51	High
Pulaski	7	45770	278678	0.16	0.52	1.59	0.73	1.25	1.47	Elevated
Pope	8	28030	274439	0.10	0.30	4.11	0.95	1.25	1.45	Elevated
Jackson	9	154400	998106	0.15	0.49	1.69	0.74	1.23	1.38	Elevated
Massac	10	59880	353205	0.17	0.54	0.87	0.67	1.21	1.31	Elevated
Cass	11	111560	551835	0.20	0.66	-0.63	0.55	1.21	1.30	Elevated
Whiteside	12	211780	1107594	0.19	0.62	-0.40	0.57	1.19	1.23	Elevated
LaSalle	13	281280	2060057	0.14	0.42	1.92	0.76	1.18	1.20	Elevated
Gallatin	14	24840	169928	0.15	0.46	1.44	0.72	1.18	1.18	Elevated
Saline	15	110930	833748	0.13	0.41	1.68	0.74	1.15	1.07	Elevated
Pike	16	32140	231988	0.14	0.43	1.43	0.72	1.15	1.07	Elevated
Johnson	17	32240	275579	0.12	0.35	2.26	0.79	1.14	1.04	Elevated
Henderson	18	30510	184335	0.17	0.53	0.06	0.61	1.14	1.02	Elevated
Lawrence	19	56700	336329	0.17	0.54	-0.23	0.58	1.12	0.95	Elevated
Union	20	70000	474138	0.15	0.46	0.53	0.65	1.11	0.93	Elevated
Perry	21	35330	272062	0.13	0.40	1.32	0.71	1.11	0.91	Elevated
Wabash	22	26040	169552	0.15	0.48	-0.14	0.59	1.07	0.78	Elevated
Carroll	23	57950	409575	0.14	0.44	0.32	0.63	1.07	0.76	Elevated
Stephenson	24	129770	851978	0.15	0.48	-0.17	0.59	1.07	0.76	Elevated
Franklin	25	40530	441770	0.09	0.26	2.24	0.79	1.05	0.69	Elevated
Adam	26	145230	993649	0.15	0.46	-0.13	0.59	1.05	0.67	Elevated
Randolph	27	76190	631635	0.12	0.36	0.88	0.67	1.03	0.63	Elevated
Wayne	28	23770	170222	0.14	0.43	-0.07	0.59	1.02	0.58	Elevated
Morgan	29	85850	792258	0.11	0.32	0.87	0.67	0.99	0.45	Average
St.Clair	30	1184080	7511279	0.16	0.50	-1.36	0.49	0.99	0.45	Average
Marion	31	53940	572355	0.09	0.27	1.15	0.70	0.97	0.37	Average
Tazewell	32	454300	2661830	0.17	0.54	-2.25	0.41	0.95	0.32	Average
Vermilion	33	123700	1243312	0.10	0.29	0.65	0.66	0.95	0.29	Average
Calhoun	34	27730	252997	0.11	0.32	0.09	0.61	0.93	0.24	Average
Dewitt	35	41170	302236	0.14	0.42	-1.07	0.51	0.93	0.22	Average
Mason	36	18420	166071	0.11	0.33	-0.02	0.60	0.93	0.22	Average
Richland	37	32620	302456	0.11	0.32	0.11	0.61	0.93	0.21	Average
Iroquois	38	87070	700991	0.12	0.38	-0.65	0.55	0.93	0.21	Average
Knox	39	37840	515381	0.07	0.19	1.54	0.73	0.92	0.20	Average
Madison	40	1327770	8271525	0.16	0.51	-2.23	0.41	0.92	0.17	Average
Clay	41	15870	141698	0.11	0.33	-0.25	0.58	0.91	0.15	Average

County	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Loss Index	SVI Score	SVI Index	Flood Score	z-score	Flood Vulnerability Ratting
Macon	42	212940	1925620	0.11	0.33	-0.24	0.58	0.91	0.13	Average
Bureau	43	63980	574753	0.11	0.33	-0.40	0.57	0.90	0.11	Average
Moultrie	44	34240	327897	0.10	0.30	-0.12	0.59	0.89	0.09	Average
Brown	45	2620	113197	0.02	0.01	3.35	0.88	0.89	0.07	Average
Clark	46	21010	198880	0.11	0.31	-0.29	0.58	0.89	0.06	Average
Jo Daviess	47	106020	868841	0.12	0.37	-0.93	0.52	0.89	0.06	Average
Kendall	102	104850	1199314	0.09	0.24	-7.15	0.00	0.24	-2.45	Low
Williamson	48	97300	1142675	0.09	0.23	0.33	0.63	0.86	-0.03	Average
Marshall	49	27760	273602	0.10	0.29	-0.34	0.57	0.86	-0.03	Average
Schuyler	50	3830	61423	0.06	0.15	1.29	0.71	0.86	-0.04	Average
Clinton	51	125260	962267	0.13	0.40	-1.64	0.46	0.86	-0.06	Average
Edwards	52	5670	49066	0.12	0.34	-1.09	0.51	0.85	-0.07	Average
McDonough	53	33700	429648	0.08	0.21	0.44	0.64	0.85	-0.08	Average
Scott	54	13410	104179	0.13	0.39	-1.81	0.45	0.84	-0.12	Average
Coles	55	63890	648722	0.10	0.28	-0.60	0.55	0.83	-0.15	Average
Greene	56	9120	136790	0.07	0.17	0.75	0.66	0.83	-0.17	Average
Jefferson	57	40080	580847	0.07	0.18	0.61	0.65	0.83	-0.18	Average
Stark	58	8350	80955	0.10	0.30	-0.92	0.52	0.82	-0.20	Average
Logan	59	33330	413402	0.08	0.22	-0.06	0.60	0.82	-0.21	Average
Fayette	60	16670	253200	0.07	0.17	0.53	0.65	0.82	-0.22	Average
Livingston	61	74040	819864	0.09	0.25	-0.53	0.56	0.81	-0.23	Average
Christian	62	26400	375896	0.07	0.18	0.35	0.63	0.81	-0.24	Average
Crawford	63	21050	284808	0.07	0.19	0.09	0.61	0.80	-0.26	Average
Douglas	64	50080	470359	0.11	0.31	-1.27	0.49	0.80	-0.27	Average
Montgomery	65	11950	252162	0.05	0.10	1.23	0.70	0.80	-0.29	Average
Jersey	66	36090	328308	0.11	0.32	-1.71	0.46	0.78	-0.34	Average
Kankakee	67	198930	2071666	0.10	0.27	-1.23	0.50	0.77	-0.38	Average
Hamncock	68	28950	379773	0.08	0.20	-0.38	0.57	0.77	-0.39	Average
Edgar	69	11570	184342	0.06	0.15	0.09	0.61	0.76	-0.42	Average
Sangamon	70	309090	2685773	0.12	0.34	-2.12	0.42	0.76	-0.42	Average
Hamilton	71	4030	135221	0.03	0.03	1.32	0.71	0.74	-0.49	Average
Henry	72	57330	614438	0.09	0.26	-1.59	0.47	0.73	-0.54	Average
Menard	73	22730	215605	0.11	0.31	-2.12	0.42	0.73	-0.56	Average
Bond	74	20510	267956	0.08	0.20	-0.95	0.52	0.72	-0.58	Average
Jasper	75	12540	173289	0.07	0.19	-0.90	0.53	0.72	-0.60	Low
Cook	76	3273790	43728088	0.07	0.20	-1.01	0.52	0.72	-0.60	Low
Shelby	77	13180	242679	0.05	0.12	-0.17	0.59	0.71	-0.62	Low
Winnebago	78	467060	5588832	0.08	0.23	-1.45	0.48	0.71	-0.63	Low
Ogle	79	126530	1252250	0.10	0.29	-2.26	0.41	0.70	-0.66	Low
Monroe	80	95220	701150	0.14	0.42	-3.83	0.28	0.70	-0.68	Low
Ford	81	2390	50666	0.05	0.10	-0.02	0.60	0.70	-0.68	Low

County	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Loss Index	SVI Score	SVI Index	Flood Score	z-score	Flood Vulnerability Ratting
Warren	82	6680	141830	0.05	0.10	-0.04	0.60	0.70	-0.68	Low
Macoupin	83	13700	215085	0.06	0.16	-0.72	0.54	0.70	-0.68	Low
Effingham	84	55360	622949	0.09	0.25	-1.97	0.44	0.69	-0.72	Low
Washington	85	14610	214510	0.07	0.17	-1.13	0.51	0.68	-0.73	Low
Fulton	86	9250	459592	0.02	0.00	0.96	0.68	0.68	-0.75	Low
Champaign	87	151490	1960497	0.08	0.21	-1.70	0.46	0.67	-0.80	Low
Mercer	88	15760	238450	0.07	0.17	-1.56	0.47	0.64	-0.92	Low
Grundy	89	121980	1008513	0.12	0.36	-3.96	0.27	0.63	-0.93	Low
Cumberland	90	10390	205235	0.05	0.11	-1.05	0.51	0.62	-0.98	Low
Woodford	91	61660	579495	0.11	0.31	-3.65	0.29	0.60	-1.05	Low
Piatt	92	30900	368835	0.08	0.23	-2.70	0.37	0.60	-1.06	Low
Putnam	93	7350	136742	0.05	0.12	-2.23	0.41	0.53	-1.32	Low
Dekalb	94	103050	1494590	0.07	0.18	-3.01	0.35	0.53	-1.34	Low
McLean	95	131850	2137957	0.06	0.15	-3.70	0.29	0.44	-1.68	Low
Boone	96	61430	780967	0.08	0.21	-4.51	0.22	0.43	-1.71	Low
Kane	97	702320	8717526	0.08	0.22	-5.06	0.18	0.40	-1.84	Low
Will	98	1399440	15129593	0.09	0.26	-5.73	0.12	0.38	-1.91	Low
Lake	99	2090820	22539796	0.09	0.26	-6.00	0.10	0.36	-1.98	Low
DuPage	100	2199620	23666320	0.09	0.26	-6.36	0.07	0.33	-2.10	Low
McHenry	101	517800	7140216	0.07	0.19	-6.16	0.08	0.27	-2.34	Low

Illinois Statewide Flood Hazard Assessment

(Appendix D – Jurisdictional Flood -Exposure, -Loss, and -Vulnerability Results)

Town/City	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Floodplain Area Weighting Factor	Weighted Flood Loss Ratio	Loss Index	SoVI Score	SoVI Index	Flood Score	Flood Vulnerability Index	z-score	Flood Vulnerability Rating
Gulf Port	1	6135	23775	0.26	0.98	0.25	1.00	0.06	0.61	1.61	1.00	4.52	High
East Cape Girardeau	2	6213	43849	0.14	1.00	0.14	0.56	4.75	1.00	1.56	0.97	4.33	High
Naples	3	3618	15753	0.23	0.98	0.22	0.89	-0.17	0.59	1.47	0.92	3.96	High
Grand Tower	4	11332	56161	0.20	0.91	0.18	0.72	1.69	0.74	1.46	0.91	3.92	High
Old Shawneetown	5	3913	22190	0.18	1.00	0.18	0.70	1.44	0.72	1.42	0.88	3.73	High
McClure	6	3820	27457	0.14	1.00	0.14	0.55	2.64	0.82	1.37	0.85	3.53	High
Liverpool	7	3593	21226	0.17	1.00	0.17	0.67	0.96	0.68	1.35	0.84	3.44	High
Maunie	8	1696	11862	0.14	1.00	0.14	0.56	2.19	0.78	1.35	0.84	3.44	High
Gorham	9	3098	20789	0.15	0.85	0.13	0.50	1.69	0.74	1.24	0.77	2.98	High
Cairo	10	27391	243913	0.11	0.69	0.08	0.31	3.17	0.87	1.17	0.73	2.69	High
Pulaski	11	420	2587	0.16	0.63	0.10	0.41	1.59	0.73	1.14	0.71	2.55	High
Thebes	12	771	8033	0.10	0.36	0.03	0.14	4.75	1.00	1.14	0.71	2.53	High
Russellville	13	20470	146337	0.14	1.00	0.14	0.55	-0.23	0.58	1.13	0.71	2.52	High
Olive Branch	14	4211	57562	0.07	0.44	0.03	0.13	4.75	1.00	1.13	0.70	2.49	High
Tamms	15	4171	57130	0.07	0.32	0.02	0.09	4.75	1.00	1.09	0.68	2.35	High
Cleveland	16	11139	51684	0.22	0.67	0.15	0.57	-1.59	0.47	1.04	0.65	2.13	High
Florence	17	991	7369	0.13	0.57	0.08	0.30	1.43	0.72	1.02	0.64	2.06	High
Ullin	18	4175	32265	0.13	0.55	0.07	0.28	1.59	0.73	1.01	0.63	2.02	High
Meredosia	19	17859	143985	0.12	0.62	0.08	0.30	1.15	0.70	1.00	0.62	1.96	High
Woodland	20	6067	40743	0.15	0.77	0.11	0.45	-0.65	0.55	1.00	0.62	1.95	High
Dowell	21	2471	28515	0.09	0.74	0.06	0.25	1.69	0.74	0.99	0.62	1.93	High
Karnak	22	1191	15278	0.08	0.75	0.06	0.23	1.93	0.76	0.99	0.62	1.93	High
Madison	23	3339	26490	0.13	0.63	0.08	0.32	0.83	0.67	0.99	0.61	1.90	High
Winslow	24	9958	51870	0.19	0.50	0.10	0.38	-0.17	0.59	0.97	0.60	1.83	High
Cave-In-Rock	25	429	8232	0.05	0.19	0.01	0.04	3.91	0.93	0.97	0.60	1.82	High
Elizabethtown	26	747	20027	0.04	0.21	0.01	0.03	3.91	0.93	0.96	0.60	1.79	High
Golconda	27	2507	29026	0.09	0.04	0.00	0.01	4.11	0.95	0.96	0.60	1.78	High
Rosiclare	28	1568	34550	0.05	0.16	0.01	0.03	3.91	0.93	0.96	0.60	1.77	High

Town/City	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Floodplain Area Weighting Factor	Weighted Flood Loss Ratio	Loss Index	SoVI Score	SoVI Index	Flood Score	Flood Vulnerability Index	z-score	Flood Vulnerability Rating
Paderborn	29	1289	10483	0.12	0.37	0.05	0.18	1.68	0.74	0.92	0.57	1.63	High
Kaskaskia	30	121	1965	0.06	1.00	0.06	0.24	0.88	0.67	0.92	0.57	1.61	High
Junction	31	645	13116	0.05	0.97	0.05	0.19	1.44	0.72	0.91	0.57	1.57	Elevated
Lenzburg	32	303	5979	0.05	0.77	0.04	0.15	1.68	0.74	0.90	0.56	1.52	Elevated
Freeman Spur	33	1369	8439	0.16	0.29	0.05	0.18	1.29	0.71	0.89	0.56	1.50	Elevated
Mill Shoals	34	1112	10863	0.10	0.50	0.05	0.20	1.06	0.69	0.89	0.55	1.49	Elevated
New Haven	35	3122	27697	0.11	0.31	0.03	0.14	1.82	0.75	0.89	0.55	1.49	Elevated
Hamburg	36	6418	29396	0.22	0.32	0.07	0.27	0.09	0.61	0.88	0.55	1.45	Elevated
Kampsville	37	3993	27608	0.14	0.42	0.06	0.24	0.42	0.64	0.88	0.55	1.43	Elevated
Alhambra	38	451	5775	0.08	0.90	0.07	0.28	-0.02	0.60	0.88	0.55	1.43	Elevated
London Mills	39	2453	22097	0.11	0.38	0.04	0.17	1.25	0.71	0.87	0.54	1.42	Elevated
Murphysboro	40	50187	287549	0.17	0.18	0.03	0.12	1.69	0.74	0.87	0.54	1.39	Elevated
Belknap	41	193	6714	0.03	0.66	0.02	0.07	2.26	0.79	0.87	0.54	1.38	Elevated
North Utica	42	19198	138357	0.14	0.19	0.03	0.10	1.92	0.76	0.86	0.54	1.38	Elevated
Pearl	43	888	7680	0.12	0.37	0.04	0.17	1.09	0.69	0.86	0.54	1.37	Elevated
Omaha	44	795	7875	0.10	0.33	0.03	0.13	1.44	0.72	0.85	0.53	1.33	Elevated
Crossville	45	3157	50402	0.06	0.25	0.02	0.06	2.19	0.78	0.85	0.53	1.31	Elevated
Marine	46	408	6300	0.06	0.97	0.06	0.25	-0.02	0.60	0.85	0.53	1.30	Elevated
Orient	47	586	7259	0.08	0.18	0.01	0.06	2.24	0.79	0.85	0.53	1.30	Elevated
Evansville	48	3779	15645	0.24	0.18	0.04	0.17	0.88	0.67	0.85	0.53	1.30	Elevated
Lake Holiday	49	20805	194458	0.11	0.20	0.02	0.08	1.92	0.76	0.85	0.53	1.30	Elevated
Chillicothe	50	91798	370349	0.25	0.38	0.09	0.37	-1.56	0.47	0.84	0.52	1.29	Elevated
Scott AFB	51	14156	130321	0.11	0.24	0.03	0.10	1.68	0.74	0.84	0.52	1.29	Elevated
Mascoutah	52	19061	182499	0.10	0.23	0.02	0.10	1.68	0.74	0.84	0.52	1.27	Elevated
Simpson	53	1617	32054	0.05	0.22	0.01	0.04	2.26	0.79	0.83	0.52	1.25	Elevated
Vienna	54	10688	94366	0.11	0.09	0.01	0.04	2.26	0.79	0.83	0.52	1.24	Elevated
Valley City	55	150	3369	0.04	0.63	0.03	0.11	1.43	0.72	0.83	0.52	1.24	Elevated
Rock Island Arsenal	56	13115	103193	0.13	0.56	0.07	0.28	-0.63	0.55	0.83	0.52	1.24	Elevated

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West Frankfort	57	8497	129212	0.07	0.15	0.01	0.04	2.24	0.79	0.83	0.51	1.22	Elevated
Carmi	58	17456	213231	0.08	0.13	0.01	0.04	2.19	0.78	0.83	0.51	1.22	Elevated
Zeigler	59	3833	38619	0.10	0.09	0.01	0.04	2.24	0.79	0.83	0.51	1.21	Elevated
Royalton	60	723	13266	0.05	0.15	0.01	0.03	2.24	0.79	0.82	0.51	1.20	Elevated
Ottawa	61	50501	430556	0.12	0.13	0.02	0.06	1.92	0.76	0.82	0.51	1.20	Elevated
Hartford	62	4366	34617	0.13	0.44	0.05	0.22	-0.02	0.60	0.82	0.51	1.18	Elevated
Savanna	63	24637	170148	0.14	0.33	0.05	0.19	0.32	0.63	0.82	0.51	1.18	Elevated
Olmsted	64	917	7771	0.12	0.17	0.02	0.08	1.59	0.73	0.81	0.51	1.17	Elevated
Marissa	65	531	21501	0.02	0.74	0.02	0.07	1.68	0.74	0.81	0.51	1.17	Elevated
Pawnee	66	18248	81615	0.22	0.12	0.03	0.10	1.29	0.71	0.81	0.51	1.16	Elevated
Smithton	67	8217	81220	0.10	0.17	0.02	0.07	1.68	0.74	0.81	0.50	1.15	Elevated
New Athens	68	1610	36250	0.04	0.38	0.02	0.07	1.68	0.74	0.81	0.50	1.14	Elevated
North City	69	2450	12023	0.20	0.02	0.00	0.02	2.24	0.79	0.81	0.50	1.14	Elevated
Hurst	70	2060	18954	0.11	0.28	0.03	0.12	1.01	0.69	0.81	0.50	1.13	Elevated
East St. Louis	71	1451	18420	0.08	0.20	0.02	0.06	1.68	0.74	0.80	0.50	1.13	Elevated
Caseyville	72	13741	279658	0.05	0.32	0.02	0.06	1.68	0.74	0.80	0.50	1.12	Elevated
Tonica	73	4033	50075	0.08	0.13	0.01	0.04	1.92	0.76	0.80	0.50	1.12	Elevated
Biggsville	74	4267	24365	0.18	0.28	0.05	0.20	0.06	0.61	0.80	0.50	1.12	Elevated
Valier	75	329	6711	0.05	0.07	0.00	0.01	2.24	0.79	0.80	0.50	1.12	Elevated
Marseilles	76	13502	111509	0.12	0.08	0.01	0.04	1.92	0.76	0.80	0.50	1.11	Elevated
Buckner	77	379	10103	0.04	0.07	0.00	0.01	2.24	0.79	0.80	0.50	1.11	Elevated
Riverton	78	7068	68425	0.10	0.22	0.02	0.09	1.29	0.71	0.80	0.50	1.10	Elevated
Bureau Junction	79	909	10200	0.09	0.66	0.06	0.23	-0.40	0.57	0.80	0.50	1.10	Elevated
Central City	80	3188	21386	0.15	0.21	0.03	0.12	0.87	0.67	0.79	0.49	1.09	Elevated
Benton	81	2843	51717	0.05	0.02	0.00	0.00	2.24	0.79	0.79	0.49	1.08	Elevated
West City	82	193	4125	0.05	0.02	0.00	0.00	2.24	0.79	0.79	0.49	1.08	Elevated
Christopher	83	957	22770	0.04	0.02	0.00	0.00	2.24	0.79	0.79	0.49	1.08	Elevated
Cahokia	84	4629	158830	0.03	0.42	0.01	0.05	1.68	0.74	0.79	0.49	1.07	Elevated
Springerton	85	13	2080	0.01	0.18	0.00	0.00	2.19	0.78	0.79	0.49	1.06	Elevated

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Thompsonville	86	251	6716	0.04	0.00	0.00	0.00	2.24	0.79	0.79	0.49	1.06	Elevated
East Carondelet	87	64	4028	0.02	0.74	0.01	0.05	1.68	0.74	0.79	0.49	1.06	Elevated
Equality	88	2639	31360	0.08	0.20	0.02	0.07	1.44	0.72	0.79	0.49	1.06	Elevated
Kangley	89	857	8289	0.10	0.06	0.01	0.03	1.92	0.76	0.79	0.49	1.06	Elevated
Nebo	90	522	14602	0.04	0.46	0.02	0.07	1.43	0.72	0.79	0.49	1.05	Elevated
Mendota	91	21235	438837	0.05	0.11	0.01	0.02	1.92	0.76	0.78	0.49	1.04	Elevated
LaSalle	92	7193	96407	0.07	0.07	0.01	0.02	1.92	0.76	0.78	0.49	1.03	Elevated
Sheridan	93	3018	55486	0.05	0.09	0.00	0.02	1.92	0.76	0.78	0.49	1.03	Elevated
Wataga	94	2494	22536	0.11	0.12	0.01	0.05	1.54	0.73	0.78	0.49	1.03	Elevated
Earlville	95	21343	201079	0.11	0.04	0.00	0.02	1.92	0.76	0.78	0.49	1.02	Elevated
Washington Park	96	1152	12467	0.09	0.10	0.01	0.04	1.68	0.74	0.78	0.48	1.01	Elevated
Spring Bay	97	10248	81113	0.13	0.79	0.10	0.40	-2.61	0.38	0.78	0.48	1.01	Elevated
Brooklyn	98	137	1344	0.10	0.26	0.03	0.11	0.83	0.67	0.78	0.48	1.01	Elevated
Oglesby	99	4623	59311	0.08	0.04	0.00	0.01	1.92	0.76	0.77	0.48	1.00	Elevated
De Soto	100	4165	45165	0.09	0.08	0.01	0.03	1.69	0.74	0.77	0.48	0.99	Elevated
Rockwood	101	691	12777	0.05	0.45	0.02	0.10	0.88	0.67	0.77	0.48	0.99	Elevated
Shiloh	102	12841	206303	0.06	0.12	0.01	0.03	1.68	0.74	0.77	0.48	0.98	Elevated
Troy Grove	103	183	7113	0.03	0.08	0.00	0.01	1.92	0.76	0.77	0.48	0.98	Elevated
Broughton	104	132	1779	0.07	0.20	0.01	0.06	1.32	0.71	0.77	0.48	0.98	Elevated
Thayer	105	3306	26534	0.12	0.12	0.02	0.06	1.29	0.71	0.77	0.48	0.97	Elevated
Dupo	106	5144	140304	0.04	0.18	0.01	0.03	1.68	0.74	0.77	0.48	0.97	Elevated
Dayton	107	718	20930	0.03	0.04	0.00	0.01	1.92	0.76	0.77	0.48	0.97	Elevated
Freeburg	108	8774	96866	0.09	0.07	0.01	0.03	1.68	0.74	0.77	0.48	0.97	Elevated
Sparland	109	2994	31168	0.10	0.34	0.03	0.13	0.44	0.64	0.77	0.48	0.96	Elevated
Divernon	110	4605	37491	0.12	0.12	0.01	0.06	1.29	0.71	0.77	0.48	0.96	Elevated
Roxana	111	7082	55686	0.13	0.33	0.04	0.17	-0.02	0.60	0.77	0.48	0.96	Elevated
Lebanon	112	2222	49593	0.04	0.13	0.01	0.02	1.68	0.74	0.76	0.48	0.96	Elevated
Keithsburg	113	3553	25423	0.14	0.53	0.07	0.29	-1.56	0.47	0.76	0.48	0.96	Elevated

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Fayetteville	114	899	8752	0.10	0.05	0.01	0.02	1.68	0.74	0.76	0.48	0.95	Elevated
Elkville	115	1448	25431	0.06	0.09	0.01	0.02	1.69	0.74	0.76	0.47	0.95	Elevated
Leland	116	315	23642	0.01	0.02	0.00	0.00	1.92	0.76	0.76	0.47	0.95	Elevated
Swansea	117	26250	450423	0.06	0.09	0.01	0.02	1.68	0.74	0.76	0.47	0.95	Elevated
Sauget	118	717	49742	0.01	0.36	0.01	0.02	1.68	0.74	0.76	0.47	0.95	Elevated
Pinckneyville	119	19534	136996	0.14	0.09	0.01	0.05	1.32	0.71	0.76	0.47	0.95	Elevated
Dallas City	120	1761	13539	0.13	0.34	0.04	0.17	-0.16	0.59	0.76	0.47	0.94	Elevated
Springfield	121	141308	1868422	0.08	0.16	0.01	0.05	1.29	0.71	0.76	0.47	0.93	Elevated
Belleville	122	25976	463300	0.06	0.07	0.00	0.02	1.68	0.74	0.76	0.47	0.93	Elevated
Villa Grove	123	18354	111338	0.16	0.41	0.07	0.26	-1.27	0.49	0.76	0.47	0.93	Elevated
Pontoosuc	124	1658	17831	0.09	0.51	0.05	0.19	-0.38	0.57	0.76	0.47	0.92	Elevated
Ridgway	125	801	9882	0.08	0.10	0.01	0.03	1.44	0.72	0.76	0.47	0.92	Elevated
Sumner	126	3625	37506	0.10	0.45	0.04	0.17	-0.23	0.58	0.75	0.47	0.91	Elevated
Decatur	127	175726	2232688	0.08	0.18	0.01	0.06	1.15	0.70	0.75	0.47	0.91	Elevated
Centreville	128	195	17170	0.01	0.23	0.00	0.01	1.68	0.74	0.75	0.47	0.91	Elevated
Vergennes	129	175	1733	0.10	0.02	0.00	0.01	1.69	0.74	0.75	0.47	0.90	Elevated
O'Fallon	130	40173	813755	0.05	0.05	0.00	0.01	1.68	0.74	0.75	0.47	0.90	Elevated
Rochester	131	10222	141867	0.07	0.15	0.01	0.04	1.29	0.71	0.75	0.47	0.90	Elevated
Spaulding	132	3656	58706	0.06	0.17	0.01	0.04	1.29	0.71	0.75	0.47	0.90	Elevated
Ellisville	133	358	4018	0.09	0.19	0.02	0.07	0.96	0.68	0.75	0.47	0.89	Elevated
Harrison	134	547	26238	0.02	0.03	0.00	0.00	1.69	0.74	0.75	0.46	0.88	Elevated
Leland Grove	135	6768	97453	0.07	0.13	0.01	0.04	1.29	0.71	0.75	0.46	0.87	Elevated
Altona	136	765	26729	0.03	0.13	0.00	0.01	1.54	0.73	0.74	0.46	0.87	Elevated
Millstadt	137	2993	81287	0.04	0.01	0.00	0.00	1.68	0.74	0.74	0.46	0.87	Elevated
Fairview Heights	138	1559	102354	0.02	0.00	0.00	0.00	1.68	0.74	0.74	0.46	0.86	Elevated
Mechanicsburg	139	619	13724	0.05	0.18	0.01	0.03	1.29	0.71	0.74	0.46	0.86	Elevated
Hutsonville	140	6120	54847	0.11	0.30	0.03	0.13	0.09	0.61	0.74	0.46	0.86	Elevated
Knoxville	141	1262	19383	0.07	0.03	0.00	0.01	1.54	0.73	0.74	0.46	0.85	Elevated

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Prairie du Rocher	142	2441	29624	0.08	0.19	0.02	0.06	0.88	0.67	0.74	0.46	0.84	Elevated
Holiday Shores	143	17876	183937	0.10	0.36	0.03	0.14	-0.02	0.60	0.74	0.46	0.83	Elevated
Marion	144	49830	876776	0.06	0.12	0.01	0.03	1.30	0.71	0.74	0.46	0.83	Elevated
Dongola	145	5547	43947	0.13	0.18	0.02	0.09	0.53	0.65	0.74	0.46	0.83	Elevated
Abingdon	146	890	14101	0.06	0.02	0.00	0.00	1.54	0.73	0.73	0.46	0.83	Elevated
Williamsfield	147	834	21802	0.04	0.02	0.00	0.00	1.54	0.73	0.73	0.46	0.83	Elevated
Oneida	148	144	16132	0.01	0.05	0.00	0.00	1.54	0.73	0.73	0.46	0.82	Elevated
Fairmont City	149	2349	53537	0.04	0.35	0.02	0.06	0.83	0.67	0.73	0.46	0.82	Elevated
Eldred	150	477	12464	0.04	0.44	0.02	0.07	0.75	0.66	0.73	0.45	0.81	Elevated
Sherman	151	3833	59902	0.06	0.08	0.01	0.02	1.29	0.71	0.73	0.45	0.81	Elevated
Auburn	152	4499	50193	0.09	0.06	0.01	0.02	1.29	0.71	0.73	0.45	0.81	Elevated
Como	153	3094	27269	0.11	0.36	0.04	0.16	-0.40	0.57	0.73	0.45	0.81	Elevated
Banner	154	543	10807	0.05	0.24	0.01	0.05	0.96	0.68	0.73	0.45	0.81	Elevated
Orangeville	155	3367	30788	0.11	0.33	0.04	0.14	-0.17	0.59	0.73	0.45	0.80	Elevated
Grantfork	156	1600	30622	0.05	0.63	0.03	0.13	-0.02	0.60	0.73	0.45	0.80	Elevated
Du Quoin	157	8083	103210	0.08	0.05	0.00	0.02	1.32	0.71	0.73	0.45	0.80	Elevated
New Canton	158	2658	33106	0.08	0.02	0.00	0.01	1.43	0.72	0.73	0.45	0.80	Elevated
Pleasant Plains	159	1713	54676	0.03	0.13	0.00	0.02	1.29	0.71	0.73	0.45	0.79	Elevated
Collinsville	160	41998	591194	0.07	0.19	0.01	0.05	0.83	0.67	0.73	0.45	0.79	Elevated
Chatham	161	14575	307680	0.05	0.07	0.00	0.01	1.29	0.71	0.72	0.45	0.78	Elevated
Loami	162	1323	24890	0.05	0.06	0.00	0.01	1.29	0.71	0.72	0.45	0.78	Elevated
Pleasant Hill	163	7054	78689	0.09	0.00	0.00	0.00	1.43	0.72	0.72	0.45	0.78	Elevated
Hull	164	1912	33260	0.06	0.00	0.00	0.00	1.43	0.72	0.72	0.45	0.78	Elevated
Hillsboro	165	840	40857	0.02	0.20	0.00	0.02	1.23	0.70	0.72	0.45	0.77	Elevated
Sparta	166	9897	86352	0.11	0.10	0.01	0.04	0.88	0.67	0.72	0.45	0.77	Elevated
Lacon	167	8688	67160	0.13	0.16	0.02	0.08	0.44	0.64	0.72	0.45	0.76	Elevated
Forsyth	168	8601	188273	0.05	0.11	0.01	0.02	1.15	0.70	0.72	0.45	0.76	Elevated
Raymond	169	1065	15762	0.07	0.05	0.00	0.01	1.23	0.70	0.72	0.45	0.76	Elevated
Carbondale	170	34987	525710	0.07	0.12	0.01	0.03	1.01	0.69	0.72	0.45	0.75	Elevated

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Junction City	171	955	12529	0.08	0.14	0.01	0.04	0.87	0.67	0.72	0.45	0.75	Elevated
Nokomis	172	1845	30811	0.06	0.05	0.00	0.01	1.23	0.70	0.72	0.44	0.75	Elevated
Jerome	173	5708	93423	0.06	0.02	0.00	0.00	1.29	0.71	0.71	0.44	0.74	Elevated
McLeansboro	174	41	3557	0.01	0.01	0.00	0.00	1.32	0.71	0.71	0.44	0.74	Elevated
Jacksonville	175	40433	591435	0.07	0.14	0.01	0.04	0.87	0.67	0.71	0.44	0.73	Elevated
Williamsville	176	1095	46948	0.02	0.02	0.00	0.00	1.29	0.71	0.71	0.44	0.73	Elevated
Streator	177	46474	434920	0.11	0.12	0.01	0.05	0.70	0.66	0.71	0.44	0.73	Elevated
Muncie	178	478	8629	0.06	0.25	0.01	0.06	0.65	0.66	0.71	0.44	0.73	Elevated
Oquawka	179	1617	20135	0.08	0.33	0.03	0.10	0.06	0.61	0.71	0.44	0.73	Elevated
Watseka	180	49490	546127	0.09	0.46	0.04	0.16	-0.65	0.55	0.71	0.44	0.72	Elevated
Mount Zion	181	10716	220782	0.05	0.06	0.00	0.01	1.15	0.70	0.71	0.44	0.72	Elevated
Wenona	182	428	15299	0.03	0.08	0.00	0.01	1.18	0.70	0.71	0.44	0.72	Elevated
Makanda	183	4181	42344	0.10	0.03	0.00	0.01	1.11	0.69	0.71	0.44	0.71	Elevated
Salem	184	30709	370807	0.08	0.10	0.01	0.03	0.87	0.67	0.71	0.44	0.71	Elevated
Wenonah	185	45	3826	0.01	0.04	0.00	0.00	1.23	0.70	0.71	0.44	0.71	Elevated
Long Creek	186	8408	214765	0.04	0.05	0.00	0.01	1.15	0.70	0.71	0.44	0.71	Elevated
Farmersville	187	144	4859	0.03	0.01	0.00	0.00	1.23	0.70	0.71	0.44	0.71	Elevated
Litchfield	188	223	49313	0.00	0.05	0.00	0.00	1.23	0.70	0.71	0.44	0.71	Elevated
Mill Creek	189	393	6848	0.06	0.26	0.01	0.06	0.53	0.65	0.70	0.44	0.70	Elevated
Ripley	190	485	7164	0.07	0.14	0.01	0.04	0.77	0.67	0.70	0.44	0.70	Elevated
Rome	191	25931	156883	0.17	0.49	0.08	0.32	-2.61	0.38	0.70	0.44	0.70	Elevated
Belgium	192	2238	32244	0.07	0.17	0.01	0.05	0.65	0.66	0.70	0.44	0.69	Elevated
Argenta	193	637	13397	0.05	0.02	0.00	0.00	1.15	0.70	0.70	0.44	0.69	Elevated
Hillview	194	695	20382	0.03	0.27	0.01	0.04	0.75	0.66	0.70	0.44	0.69	Elevated
Blue Mound	195	387	26542	0.01	0.04	0.00	0.00	1.15	0.70	0.70	0.44	0.68	Elevated
Aroma Park	196	21632	205067	0.11	0.48	0.05	0.20	-1.23	0.50	0.70	0.43	0.67	Elevated
Niantic	197	7	195	0.04	0.00	0.00	0.00	1.15	0.70	0.70	0.43	0.67	Elevated
St. David	198	1058	14209	0.07	0.05	0.00	0.02	0.96	0.68	0.70	0.43	0.67	Elevated

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Steeleville	199	2192	61847	0.04	0.14	0.00	0.02	0.88	0.67	0.69	0.43	0.66	Elevated
Vandalia	200	2532	44643	0.06	0.22	0.01	0.05	0.53	0.65	0.69	0.43	0.66	Elevated
Canton	201	8595	116120	0.07	0.04	0.00	0.01	0.96	0.68	0.69	0.43	0.66	Elevated
St. Jacob	202	802	16193	0.05	0.48	0.02	0.09	-0.02	0.60	0.69	0.43	0.65	Elevated
Ruma	203	1478	25620	0.06	0.08	0.00	0.02	0.88	0.67	0.69	0.43	0.65	Elevated
Potomac	204	1670	22118	0.08	0.12	0.01	0.04	0.65	0.66	0.69	0.43	0.65	Elevated
Johnston City	205	4160	48282	0.09	0.18	0.02	0.06	0.33	0.63	0.69	0.43	0.65	Elevated
Peru	206	28127	375698	0.07	0.09	0.01	0.03	0.76	0.66	0.69	0.43	0.64	Elevated
Taylorville	207	6697	97976	0.07	0.21	0.01	0.06	0.35	0.63	0.69	0.43	0.63	Elevated
Bryant	208	400	13802	0.03	0.05	0.00	0.01	0.96	0.68	0.69	0.43	0.63	Elevated
Hardin	209	5039	81397	0.06	0.21	0.01	0.05	0.42	0.64	0.69	0.43	0.63	Elevated
Chandlerville	210	2485	41563	0.06	0.59	0.04	0.14	-0.63	0.55	0.69	0.43	0.63	Elevated
Rossville	211	1450	24070	0.06	0.13	0.01	0.03	0.65	0.66	0.69	0.43	0.63	Elevated
Cambria	212	496	10522	0.05	0.00	0.00	0.00	1.01	0.69	0.69	0.43	0.62	Elevated
South Jacksonville	213	4089	75616	0.05	0.05	0.00	0.01	0.87	0.67	0.69	0.43	0.62	Elevated
Rankin	214	574	7514	0.08	0.10	0.01	0.03	0.65	0.66	0.69	0.43	0.62	Elevated
Browns	215	550	9823	0.06	0.62	0.03	0.14	-0.62	0.55	0.69	0.43	0.62	Elevated
Greenfield	216	943	15735	0.06	0.09	0.01	0.02	0.75	0.66	0.68	0.43	0.62	Elevated
Carrollton	217	2116	25127	0.08	0.06	0.01	0.02	0.75	0.66	0.68	0.43	0.61	Elevated
Lewistown	218	762	46997	0.02	0.01	0.00	0.00	0.96	0.68	0.68	0.42	0.61	Elevated
Hamilton	219	4271	82167	0.05	0.55	0.03	0.11	-0.38	0.57	0.68	0.42	0.61	Elevated
East Peoria	220	262340	1355192	0.19	0.31	0.06	0.24	-1.91	0.44	0.68	0.42	0.60	Elevated
Nelson	221	1478	22745	0.06	0.49	0.03	0.12	-0.53	0.56	0.68	0.42	0.60	Elevated
Sterling	222	58156	187475	0.31	0.09	0.03	0.11	-0.40	0.57	0.68	0.42	0.60	Elevated
Edinburg	223	5017	53498	0.09	0.13	0.01	0.05	0.35	0.63	0.68	0.42	0.60	Elevated
Indianola	224	454	5507	0.08	0.07	0.01	0.02	0.65	0.66	0.68	0.42	0.60	Elevated
Lawrenceville	225	7593	58045	0.13	0.19	0.02	0.10	-0.23	0.58	0.68	0.42	0.59	Elevated
Andalusia	226	13793	104227	0.13	0.25	0.03	0.13	-0.63	0.55	0.68	0.42	0.59	Elevated

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Claremont	227	1083	13459	0.08	0.22	0.02	0.07	0.11	0.61	0.68	0.42	0.59	Elevated
Chester	228	4676	108581	0.04	0.02	0.00	0.00	0.88	0.67	0.68	0.42	0.59	Elevated
Alvan	229	649	10737	0.06	0.08	0.01	0.02	0.65	0.66	0.68	0.42	0.58	Elevated
Sandoval	230	280	9514	0.03	0.01	0.00	0.00	0.87	0.67	0.68	0.42	0.58	Elevated
Iuka	231	88	3258	0.03	0.00	0.00	0.00	0.87	0.67	0.67	0.42	0.57	Elevated
Danville	232	63671	1038856	0.06	0.08	0.00	0.02	0.65	0.66	0.67	0.42	0.57	Elevated
Mount Carroll	233	12358	119412	0.10	0.11	0.01	0.04	0.32	0.63	0.67	0.42	0.56	Elevated
Tovey	234	355	1596	0.22	0.05	0.01	0.04	0.35	0.63	0.67	0.42	0.56	Elevated
Galesburg	235	21313	449447	0.05	0.04	0.00	0.01	0.75	0.66	0.67	0.42	0.56	Elevated
St. Francisville	236	931	8944	0.10	0.22	0.02	0.09	-0.23	0.58	0.67	0.42	0.56	Elevated
Hoopeston	237	2429	56657	0.04	0.08	0.00	0.01	0.65	0.66	0.67	0.42	0.55	Elevated
Mount Vernon	238	14105	312997	0.05	0.10	0.00	0.02	0.61	0.65	0.67	0.42	0.55	Elevated
Dalzell	239	180	10262	0.02	0.05	0.00	0.00	0.76	0.66	0.67	0.42	0.55	Elevated
North Pekin	240	10963	74805	0.15	0.44	0.06	0.26	-2.25	0.41	0.67	0.42	0.55	Elevated
Bonnie	241	167	5265	0.03	0.12	0.00	0.02	0.61	0.65	0.67	0.41	0.54	Elevated
East Alton	242	6704	42773	0.16	0.11	0.02	0.07	-0.02	0.60	0.67	0.41	0.54	Elevated
Palestine	243	2656	39235	0.07	0.22	0.01	0.06	0.09	0.61	0.67	0.41	0.54	Elevated
Manlius	244	2920	25245	0.12	0.22	0.03	0.10	-0.40	0.57	0.67	0.41	0.54	Elevated
Toluca	245	673	20919	0.03	0.22	0.01	0.03	0.44	0.64	0.67	0.41	0.54	Elevated
Holiday Hills	246	5316	91482	0.06	0.54	0.03	0.12	-0.72	0.54	0.66	0.41	0.53	Elevated
Grand Detour	247	3280	30714	0.11	0.43	0.05	0.18	-1.40	0.48	0.66	0.41	0.53	Elevated
Prophetstown	248	6470	53933	0.12	0.20	0.02	0.10	-0.40	0.57	0.66	0.41	0.53	Elevated
Jonesboro	249	13428	78452	0.17	0.03	0.00	0.02	0.53	0.65	0.66	0.41	0.53	Elevated
South Roxana	250	795	23799	0.03	0.45	0.02	0.06	-0.02	0.60	0.66	0.41	0.51	Elevated
De Pue	251	3049	25655	0.12	0.36	0.04	0.17	-1.32	0.49	0.66	0.41	0.50	Elevated
Westville	252	1221	35527	0.03	0.01	0.00	0.00	0.65	0.66	0.66	0.41	0.50	Elevated
Catlin	253	762	62425	0.01	0.02	0.00	0.00	0.65	0.66	0.66	0.41	0.50	Average
Tilton	254	2728	43067	0.06	0.00	0.00	0.00	0.65	0.66	0.66	0.41	0.50	Average
Hillsdale	255	1893	60835	0.03	0.80	0.02	0.10	-0.52	0.56	0.66	0.41	0.50	Average

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Olivet	256	228	10854	0.02	0.00	0.00	0.00	0.65	0.66	0.66	0.41	0.50	Average
Georgetown	257	734	10437	0.07	0.00	0.00	0.00	0.65	0.66	0.66	0.41	0.49	Average
Ashland	258	2370	40145	0.06	0.11	0.01	0.03	0.33	0.63	0.66	0.41	0.49	Average
Waltonville	259	26	878	0.03	0.02	0.00	0.00	0.61	0.65	0.65	0.41	0.49	Average
Maroa	260	4028	16086	0.25	0.05	0.01	0.05	0.04	0.60	0.65	0.41	0.49	Average
Deer Grove	261	510	6390	0.08	0.28	0.02	0.09	-0.40	0.57	0.65	0.41	0.49	Average
Ina	262	432	40230	0.01	0.04	0.00	0.00	0.61	0.65	0.65	0.41	0.49	Average
Bluford	263	116	3478	0.03	0.01	0.00	0.00	0.61	0.65	0.65	0.41	0.49	Average
Pearl City	264	3676	57057	0.06	0.26	0.02	0.07	-0.17	0.59	0.65	0.41	0.48	Average
Nason	265	26	1819	0.01	0.00	0.00	0.00	0.61	0.65	0.65	0.41	0.48	Average
Freeport	266	40703	342931	0.12	0.14	0.02	0.06	-0.17	0.59	0.65	0.40	0.48	Average
Bush	267	333	4584	0.07	0.08	0.01	0.02	0.33	0.63	0.65	0.40	0.47	Average
Anna	268	10789	230855	0.05	0.02	0.00	0.00	0.53	0.65	0.65	0.40	0.47	Average
Bridgeport	269	3338	55592	0.06	0.29	0.02	0.07	-0.23	0.58	0.65	0.40	0.47	Average
Wonder Lake	270	26731	222606	0.12	0.23	0.03	0.11	-0.72	0.54	0.65	0.40	0.47	Average
Grayville	271	672	6252	0.11	0.05	0.01	0.02	0.32	0.63	0.65	0.40	0.46	Average
Dixon	272	132059	602977	0.22	0.11	0.02	0.09	-0.53	0.56	0.65	0.40	0.46	Average
Avon	273	704	14124	0.05	0.04	0.00	0.01	0.46	0.64	0.65	0.40	0.46	Average
Colp	274	411	8343	0.05	0.08	0.00	0.02	0.33	0.63	0.64	0.40	0.45	Average
Allenville	275	456	6268	0.07	0.18	0.01	0.05	-0.12	0.59	0.64	0.40	0.44	Average
Herrin	276	16681	244371	0.07	0.05	0.00	0.01	0.33	0.63	0.64	0.40	0.44	Average
Pontoon Beach	277	9023	376002	0.02	0.44	0.01	0.04	-0.02	0.60	0.64	0.40	0.43	Average
La Rose	278	40	614	0.07	0.01	0.00	0.00	0.44	0.64	0.64	0.40	0.43	Average
Alton	279	8838	111913	0.08	0.13	0.01	0.04	-0.02	0.60	0.64	0.40	0.43	Average
Bluffs	280	1708	28176	0.06	0.22	0.01	0.05	-0.17	0.59	0.64	0.40	0.42	Average
Hamel	281	36	3099	0.01	0.84	0.01	0.04	-0.02	0.60	0.64	0.40	0.42	Average
Milledgeville	282	4067	31794	0.13	0.02	0.00	0.01	0.32	0.63	0.64	0.40	0.42	Average
Brussels	283	717	12739	0.06	0.13	0.01	0.03	0.09	0.61	0.64	0.40	0.41	Average

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Kincaid	284	603	9006	0.07	0.02	0.00	0.01	0.35	0.63	0.64	0.40	0.41	Average
Keyesport	285	2518	23699	0.11	0.34	0.04	0.14	-1.30	0.49	0.63	0.39	0.41	Average
Walnut	286	7229	65957	0.11	0.16	0.02	0.07	-0.40	0.57	0.63	0.39	0.41	Average
Palmer	287	173	5365	0.03	0.03	0.00	0.00	0.35	0.63	0.63	0.39	0.40	Average
East Moline	288	26346	429079	0.06	0.35	0.02	0.09	-0.63	0.55	0.63	0.39	0.40	Average
Venice	289	186	4491	0.04	0.20	0.01	0.03	-0.02	0.60	0.63	0.39	0.40	Average
Winchester	290	1603	9057	0.18	0.06	0.01	0.05	-0.17	0.59	0.63	0.39	0.40	Average
Thomson	291	350	6820	0.05	0.02	0.00	0.00	0.32	0.63	0.63	0.39	0.39	Average
Stonington	292	41	4806	0.01	0.05	0.00	0.00	0.35	0.63	0.63	0.39	0.39	Average
Langleyville	293	292	5660	0.05	0.00	0.00	0.00	0.35	0.63	0.63	0.39	0.39	Average
Energy	294	2399	43653	0.05	0.01	0.00	0.00	0.33	0.63	0.63	0.39	0.39	Average
Mount Carmel	295	10854	116603	0.09	0.11	0.01	0.04	-0.14	0.59	0.63	0.39	0.39	Average
Carterville	296	1979	94713	0.02	0.01	0.00	0.00	0.33	0.63	0.63	0.39	0.38	Average
East Dubuque	297	17687	127351	0.14	0.19	0.03	0.11	-0.93	0.52	0.63	0.39	0.38	Average
Arthur	298	22385	218076	0.10	0.21	0.02	0.09	-0.70	0.54	0.63	0.39	0.38	Average
Erie	299	4831	87997	0.05	0.28	0.02	0.06	-0.40	0.57	0.63	0.39	0.38	Average
Pittsburg	300	42	2229	0.02	0.00	0.00	0.00	0.33	0.63	0.63	0.39	0.38	Average
St. Libory	301	363	19612	0.02	0.05	0.00	0.00	0.28	0.62	0.63	0.39	0.38	Average
Sidney	302	12175	91038	0.13	0.32	0.04	0.17	-1.70	0.46	0.63	0.39	0.38	Average
Lomax	303	65	3127	0.02	0.26	0.01	0.02	0.06	0.61	0.63	0.39	0.38	Average
New Baden	304	3958	40492	0.10	0.06	0.01	0.02	0.02	0.60	0.63	0.39	0.37	Average
Gladstone	305	580	8405	0.07	0.08	0.01	0.02	0.06	0.61	0.63	0.39	0.37	Average
Cissna Park	306	3666	49625	0.07	0.27	0.02	0.08	-0.65	0.55	0.63	0.39	0.37	Average
Albany	307	2312	19877	0.12	0.13	0.01	0.06	-0.40	0.57	0.63	0.39	0.37	Average
Chrisman	308	1989	28349	0.07	0.06	0.00	0.02	0.09	0.61	0.63	0.39	0.37	Average
New Bedford	309	1089	11907	0.09	0.16	0.01	0.06	-0.40	0.57	0.62	0.39	0.36	Average
Carbon Cliff	310	8239	127148	0.06	0.30	0.02	0.08	-0.63	0.55	0.62	0.39	0.36	Average
New Boston	311	1510	17762	0.09	0.46	0.04	0.15	-1.56	0.47	0.62	0.39	0.36	Average
Ridott	312	387	10746	0.04	0.27	0.01	0.04	-0.17	0.59	0.62	0.39	0.36	Average

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Stoy	313	109	2652	0.04	0.10	0.00	0.02	0.09	0.61	0.62	0.39	0.36	Average
Morrison	314	12813	164196	0.08	0.18	0.01	0.06	-0.40	0.57	0.62	0.39	0.36	Average
Paris	315	2590	63664	0.04	0.09	0.00	0.01	0.09	0.61	0.62	0.39	0.36	Average
Wood River	316	8593	162044	0.05	0.11	0.01	0.02	-0.02	0.60	0.62	0.39	0.35	Average
Maryville	317	2525	81026	0.03	0.18	0.01	0.02	-0.02	0.60	0.62	0.39	0.35	Average
Arenzville	318	311	10156	0.03	0.09	0.00	0.01	0.12	0.61	0.62	0.39	0.35	Average
Edwardsville	319	10104	334774	0.03	0.18	0.01	0.02	-0.02	0.60	0.62	0.39	0.35	Average
Cordova	320	3385	30439	0.11	0.16	0.02	0.07	-0.63	0.55	0.62	0.39	0.34	Average
Highland	321	4012	166694	0.02	0.20	0.00	0.02	-0.02	0.60	0.62	0.38	0.34	Average
Iroquois	322	1969	16900	0.12	0.16	0.02	0.07	-0.65	0.55	0.62	0.38	0.33	Average
Lyndon	323	1238	10976	0.11	0.11	0.01	0.05	-0.40	0.57	0.62	0.38	0.33	Average
Peoria Heights	324	31439	367853	0.09	0.66	0.06	0.22	-2.49	0.39	0.62	0.38	0.33	Average
Glen Carbon	325	82	2806	0.03	0.15	0.00	0.02	-0.02	0.60	0.62	0.38	0.33	Average
Moline	326	151089	1582437	0.10	0.18	0.02	0.07	-0.63	0.55	0.62	0.38	0.33	Average
Golden Gate	327	118	1482	0.08	0.06	0.00	0.02	-0.07	0.59	0.61	0.38	0.32	Average
Olney	328	6143	113024	0.05	0.02	0.00	0.00	0.11	0.61	0.61	0.38	0.32	Average
Parkersburg	329	263	4541	0.06	0.01	0.00	0.00	0.11	0.61	0.61	0.38	0.31	Average
Hume	330	147	12573	0.01	0.05	0.00	0.00	0.09	0.61	0.61	0.38	0.30	Average
Granite City	331	4586	258157	0.02	0.14	0.00	0.01	-0.02	0.60	0.61	0.38	0.30	Average
Robinson	332	3587	180883	0.02	0.01	0.00	0.00	0.09	0.61	0.61	0.38	0.30	Average
Flat Rock	333	13	1038	0.01	0.01	0.00	0.00	0.09	0.61	0.61	0.38	0.30	Average
Bethalto	334	5879	199530	0.03	0.08	0.00	0.01	-0.02	0.60	0.61	0.38	0.30	Average
Martinsville	335	2659	29017	0.09	0.09	0.01	0.03	-0.29	0.58	0.61	0.38	0.30	Average
Troy	336	1387	132605	0.01	0.21	0.00	0.01	-0.02	0.60	0.61	0.38	0.29	Average
Quincy	337	65005	1045083	0.06	0.07	0.00	0.02	-0.13	0.59	0.61	0.38	0.29	Average
Elkhart	338	501	19792	0.03	0.12	0.00	0.01	-0.06	0.60	0.61	0.38	0.29	Average
Louisville	339	1141	7110	0.16	0.04	0.01	0.03	-0.25	0.58	0.61	0.38	0.29	Average
Milan	340	23372	369522	0.06	0.24	0.01	0.06	-0.63	0.55	0.61	0.38	0.29	Average

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Fulton	341	9991	116422	0.09	0.12	0.01	0.04	-0.40	0.57	0.61	0.38	0.29	Average
Media	342	25	735	0.03	0.00	0.00	0.00	0.06	0.61	0.61	0.38	0.29	Average
Nauvoo	343	188	6293	0.03	0.31	0.01	0.04	-0.38	0.57	0.61	0.38	0.28	Average
Seatonville	344	1061	13120	0.08	0.12	0.01	0.04	-0.40	0.57	0.61	0.38	0.28	Average
Williamson	345	11	1794	0.01	0.82	0.01	0.02	-0.18	0.59	0.61	0.38	0.28	Average
Warsaw	346	822	23755	0.03	0.27	0.01	0.04	-0.38	0.57	0.61	0.38	0.28	Average
Exeter	347	297	4980	0.06	0.08	0.00	0.02	-0.17	0.59	0.60	0.38	0.28	Average
Mitchell	348	430	27856	0.02	0.08	0.00	0.01	-0.02	0.60	0.60	0.38	0.28	Average
Bradford	349	2627	22827	0.12	0.18	0.02	0.08	-0.92	0.52	0.60	0.38	0.28	Average
Dalton City	350	566	38524	0.01	0.22	0.00	0.01	-0.12	0.59	0.60	0.38	0.28	Average
Johnsburg	351	38616	481638	0.08	0.20	0.02	0.06	-0.72	0.54	0.60	0.37	0.27	Average
Livingston	352	50	2196	0.02	0.03	0.00	0.00	-0.02	0.60	0.60	0.37	0.27	Average
Lincoln	353	11328	300659	0.04	0.04	0.00	0.01	-0.06	0.60	0.60	0.37	0.27	Average
Henry	354	5057	31555	0.16	0.12	0.02	0.08	-0.90	0.53	0.60	0.37	0.27	Average
Centralia	355	6469	116276	0.06	0.13	0.01	0.03	-0.32	0.57	0.60	0.37	0.27	Average
Rosewood Heights	356	3354	92645	0.04	0.02	0.00	0.00	-0.02	0.60	0.60	0.37	0.27	Average
Gibson City	357	46	3423	0.01	0.02	0.00	0.00	-0.02	0.60	0.60	0.37	0.26	Average
Macomb	358	22639	362237	0.06	0.08	0.00	0.02	-0.24	0.58	0.60	0.37	0.26	Average
Ste. Marie	359	394	3074	0.13	0.15	0.02	0.07	-0.90	0.53	0.60	0.37	0.26	Average
Clay City	360	1407	27939	0.05	0.10	0.00	0.02	-0.25	0.58	0.60	0.37	0.26	Average
Roseville	361	74	21184	0.00	0.05	0.00	0.00	-0.04	0.60	0.60	0.37	0.25	Average
Charleston	362	28262	329518	0.09	0.14	0.01	0.05	-0.60	0.55	0.60	0.37	0.25	Average
Little York	363	70	4150	0.02	0.01	0.00	0.00	-0.04	0.60	0.60	0.37	0.25	Average
Wamac	364	2746	28929	0.09	0.13	0.01	0.05	-0.63	0.55	0.60	0.37	0.25	Average
Hampton	365	2879	31008	0.09	0.13	0.01	0.05	-0.63	0.55	0.60	0.37	0.25	Average
Wyanet	366	655	7639	0.09	0.09	0.01	0.03	-0.40	0.57	0.60	0.37	0.25	Average
Fairfield	367	870	15132	0.06	0.01	0.00	0.00	-0.07	0.59	0.60	0.37	0.24	Average
Bethany	368	714	20237	0.04	0.04	0.00	0.01	-0.12	0.59	0.60	0.37	0.24	Average

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Wayne City	369	186	13244	0.01	0.02	0.00	0.00	-0.07	0.59	0.60	0.37	0.24	Average
Sims	370	195	3814	0.05	0.00	0.00	0.00	-0.07	0.59	0.60	0.37	0.24	Average
La Moille	371	634	12037	0.05	0.13	0.01	0.03	-0.40	0.57	0.59	0.37	0.24	Average
Rock Island	372	56122	966299	0.06	0.20	0.01	0.05	-0.63	0.55	0.59	0.37	0.24	Average
Galena	373	31418	213166	0.15	0.12	0.02	0.07	-0.93	0.52	0.59	0.37	0.23	Average
Sullivan	374	1104	52102	0.02	0.03	0.00	0.00	-0.12	0.59	0.59	0.37	0.23	Average
Cedarville	375	1420	49582	0.03	0.05	0.00	0.01	-0.17	0.59	0.59	0.37	0.23	Average
Lovington	376	201	23447	0.01	0.04	0.00	0.00	-0.12	0.59	0.59	0.37	0.23	Average
Loraine	377	416	5197	0.08	0.00	0.00	0.00	-0.13	0.59	0.59	0.37	0.22	Average
Stonefort	378	385	6812	0.06	0.29	0.02	0.06	-0.90	0.53	0.59	0.37	0.22	Average
Stone Park	379	23466	543040	0.04	0.43	0.02	0.07	-1.01	0.52	0.59	0.37	0.22	Average
Bellwood	380	58199	611790	0.10	0.20	0.02	0.07	-1.01	0.52	0.59	0.37	0.21	Average
Mulberry Grove	381	924	15883	0.06	0.02	0.00	0.00	-0.21	0.58	0.59	0.37	0.21	Average
Milford	382	2051	26617	0.08	0.14	0.01	0.04	-0.65	0.55	0.59	0.37	0.21	Average
Lena	383	316	31625	0.01	0.00	0.00	0.00	-0.17	0.59	0.59	0.36	0.20	Average
South Beloit	384	69304	475998	0.15	0.19	0.03	0.11	-1.45	0.48	0.59	0.36	0.20	Average
Dixmoor	385	8443	79705	0.11	0.17	0.02	0.07	-1.01	0.52	0.59	0.36	0.20	Average
Cherry	386	676	13223	0.05	0.09	0.00	0.02	-0.40	0.57	0.59	0.36	0.20	Average
Columbia	387	9039	185294	0.05	0.39	0.02	0.08	-1.08	0.51	0.59	0.36	0.20	Average
Pontiac	388	21858	334348	0.07	0.11	0.01	0.03	-0.53	0.56	0.59	0.36	0.20	Average
Sheffield	389	595	7590	0.08	0.06	0.00	0.02	-0.40	0.57	0.58	0.36	0.19	Average
Richmond	390	13887	177422	0.08	0.14	0.01	0.04	-0.72	0.54	0.58	0.36	0.19	Average
Bushnell	391	57	1447	0.04	0.01	0.00	0.00	-0.24	0.58	0.58	0.36	0.19	Average
Kingston Mines	392	1338	14824	0.09	0.40	0.04	0.14	-1.91	0.44	0.58	0.36	0.19	Average
Carlinville	393	5405	56696	0.10	0.03	0.00	0.01	-0.34	0.57	0.58	0.36	0.18	Average
Farmington	394	596	14829	0.04	0.04	0.00	0.01	-0.30	0.58	0.58	0.36	0.18	Average
Rock Falls	395	8102	152069	0.05	0.07	0.00	0.01	-0.40	0.57	0.58	0.36	0.18	Average

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Forrest	396	2748	53635	0.05	0.11	0.01	0.02	-0.53	0.56	0.58	0.36	0.17	Average
Oakland	397	2046	35460	0.06	0.12	0.01	0.03	-0.60	0.55	0.58	0.36	0.17	Average
Hollowayville	398	273	7387	0.04	0.08	0.00	0.01	-0.40	0.57	0.58	0.36	0.17	Average
La Harpe	399	852	17887	0.05	0.05	0.00	0.01	-0.38	0.57	0.58	0.36	0.17	Average
Marshall	400	908	23953	0.04	0.00	0.00	0.00	-0.29	0.58	0.58	0.36	0.16	Average
Reynolds	401	4114	27784	0.15	0.12	0.02	0.07	-1.10	0.51	0.58	0.36	0.16	Average
Ashmore	402	2307	26132	0.09	0.07	0.01	0.03	-0.60	0.55	0.58	0.36	0.16	Average
Mineral	403	108	3091	0.03	0.06	0.00	0.01	-0.40	0.57	0.58	0.36	0.16	Average
Carthage	404	5138	96976	0.05	0.03	0.00	0.01	-0.38	0.57	0.58	0.36	0.16	Average
Hettick	405	205	8808	0.02	0.03	0.00	0.00	-0.34	0.57	0.58	0.36	0.15	Average
Elvaston	406	146	4039	0.04	0.04	0.00	0.01	-0.38	0.57	0.57	0.36	0.15	Average
Pierron	407	353	7224	0.05	0.07	0.00	0.01	-0.49	0.56	0.57	0.36	0.15	Average
Pana	408	1974	27716	0.07	0.05	0.00	0.01	-0.51	0.56	0.57	0.36	0.14	Average
Staunton	409	562	17027	0.03	0.00	0.00	0.00	-0.34	0.57	0.57	0.36	0.14	Average
Princeton	410	6808	160744	0.04	0.03	0.00	0.00	-0.40	0.57	0.57	0.36	0.14	Average
Summit	411	5325	43319	0.12	0.11	0.01	0.05	-1.01	0.52	0.57	0.35	0.13	Average
Greenwood	412	2305	35290	0.07	0.12	0.01	0.03	-0.72	0.54	0.57	0.35	0.13	Average
River Forest	413	18915	183398	0.10	0.13	0.01	0.05	-1.01	0.52	0.57	0.35	0.13	Average
Burnham	414	2276	40094	0.06	0.24	0.01	0.05	-1.01	0.52	0.57	0.35	0.13	Average
Eldorado	415	18956	157099	0.12	0.31	0.04	0.15	-2.12	0.42	0.57	0.35	0.13	Average
Buda	416	55	1975	0.03	0.01	0.00	0.00	-0.40	0.57	0.57	0.35	0.13	Average
Crescent City	417	1371	20588	0.07	0.08	0.01	0.02	-0.65	0.55	0.57	0.35	0.13	Average
Amboy	418	7475	100909	0.07	0.04	0.00	0.01	-0.53	0.56	0.57	0.35	0.12	Average
Tiskilwa	419	109	5683	0.02	0.01	0.00	0.00	-0.40	0.57	0.57	0.35	0.12	Average
Ladd	420	55	7255	0.01	0.00	0.00	0.00	-0.40	0.57	0.57	0.35	0.12	Average
Farmer City	421	4068	41877	0.10	0.14	0.01	0.05	-1.07	0.51	0.57	0.35	0.11	Average
Melrose Park	422	132604	1385203	0.10	0.13	0.01	0.05	-1.01	0.52	0.57	0.35	0.11	Average
Rapids City	423	5159	43260	0.12	0.04	0.00	0.02	-0.63	0.55	0.57	0.35	0.11	Average
Lakewood	424	10786	272564	0.04	0.15	0.01	0.02	-0.72	0.54	0.56	0.35	0.11	Average

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Moweaqua	425	311	11752	0.03	0.05	0.00	0.01	-0.51	0.56	0.56	0.35	0.10	Average
Northfield	426	34829	608313	0.06	0.21	0.01	0.05	-1.01	0.52	0.56	0.35	0.10	Average
River Grove	427	12674	231814	0.05	0.22	0.01	0.05	-1.01	0.52	0.56	0.35	0.10	Average
Rochelle	428	43608	585585	0.07	0.27	0.02	0.08	-1.40	0.48	0.56	0.35	0.10	Average
Fairbury	429	1729	29969	0.06	0.02	0.00	0.00	-0.53	0.56	0.56	0.35	0.09	Average
Riverside	430	20190	317717	0.06	0.18	0.01	0.04	-1.01	0.52	0.56	0.35	0.09	Average
Oakwood Hills	431	10289	239523	0.04	0.11	0.00	0.02	-0.72	0.54	0.56	0.35	0.09	Average
Somonauk	432	1598	44842	0.04	0.03	0.00	0.00	-0.55	0.56	0.56	0.35	0.09	Average
Lake Summerset	433	2819	86562	0.03	0.20	0.01	0.03	-0.81	0.53	0.56	0.35	0.09	Average
Hanover	434	3772	46240	0.08	0.11	0.01	0.04	-0.93	0.52	0.56	0.35	0.09	Average
Port Byron	435	1862	26176	0.07	0.04	0.00	0.01	-0.63	0.55	0.56	0.35	0.09	Average
Long Point	436	86	2742	0.03	0.02	0.00	0.00	-0.53	0.56	0.56	0.35	0.08	Average
Bartonville	437	22283	346669	0.06	0.35	0.02	0.09	-1.56	0.47	0.56	0.35	0.08	Average
Virginia	438	1435	37747	0.04	0.06	0.00	0.01	-0.63	0.55	0.56	0.35	0.08	Average
Steward	439	50	5733	0.01	0.02	0.00	0.00	-0.53	0.56	0.56	0.35	0.08	Average
Ashton	440	52	3042	0.02	0.01	0.00	0.00	-0.53	0.56	0.56	0.35	0.08	Average
Saunemin	441	49	4349	0.01	0.01	0.00	0.00	-0.53	0.56	0.56	0.35	0.08	Average
Chatsworth	442	2	506	0.00	0.00	0.00	0.00	-0.53	0.56	0.56	0.35	0.07	Average
Leaf River	443	3975	23134	0.17	0.21	0.04	0.15	-2.26	0.41	0.56	0.35	0.07	Average
Ashkum	444	247	10913	0.02	0.10	0.00	0.01	-0.65	0.55	0.56	0.35	0.07	Average
Lake in the Hills	445	39217	1095386	0.04	0.11	0.00	0.01	-0.72	0.54	0.56	0.35	0.07	Average
Westchester	446	61812	749831	0.08	0.12	0.01	0.04	-1.01	0.52	0.55	0.35	0.07	Average
Seneca	447	6210	96181	0.06	0.15	0.01	0.04	-1.02	0.52	0.55	0.34	0.07	Average
McHenry	448	29818	535864	0.06	0.06	0.00	0.01	-0.72	0.54	0.55	0.34	0.06	Average
Gilman	449	877	29924	0.03	0.06	0.00	0.01	-0.65	0.55	0.55	0.34	0.06	Average
Mattoon	450	3767	150422	0.03	0.02	0.00	0.00	-0.60	0.55	0.55	0.34	0.06	Average
Lyons	451	11799	151951	0.08	0.12	0.01	0.04	-1.01	0.52	0.55	0.34	0.06	Average

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Thawville	452	189	4075	0.05	0.03	0.00	0.01	-0.65	0.55	0.55	0.34	0.06	Average
Albers	453	3837	45220	0.08	0.26	0.02	0.09	-1.64	0.46	0.55	0.34	0.05	Average
Sun River Terrace	454	1612	23676	0.07	0.20	0.01	0.05	-1.23	0.50	0.55	0.34	0.05	Average
Marengo	455	7972	386530	0.02	0.13	0.00	0.01	-0.72	0.54	0.55	0.34	0.05	Average
Beardstown	456	277	7865	0.04	0.02	0.00	0.00	-0.63	0.55	0.55	0.34	0.05	Average
Union	457	5564	167002	0.03	0.08	0.00	0.01	-0.72	0.54	0.55	0.34	0.05	Average
Humboldt	458	339	12968	0.03	0.00	0.00	0.00	-0.60	0.55	0.55	0.34	0.05	Average
North Riverside	459	15895	221842	0.07	0.12	0.01	0.03	-1.01	0.52	0.55	0.34	0.05	Average
Spring Grove	460	34864	471489	0.07	0.03	0.00	0.01	-0.72	0.54	0.55	0.34	0.05	Average
Golf	461	2194	27900	0.08	0.11	0.01	0.03	-1.01	0.52	0.55	0.34	0.04	Average
Silvis	462	2146	52824	0.04	0.01	0.00	0.00	-0.63	0.55	0.55	0.34	0.04	Average
Lynwood	463	5337	199434	0.03	0.30	0.01	0.03	-1.01	0.52	0.55	0.34	0.04	Average
Franklin Park	464	118529	1744238	0.07	0.12	0.01	0.03	-1.01	0.52	0.55	0.34	0.04	Average
Prairie Grove	465	8776	253741	0.03	0.05	0.00	0.01	-0.72	0.54	0.55	0.34	0.04	Average
Clinton	466	16441	114187	0.14	0.06	0.01	0.04	-1.07	0.51	0.55	0.34	0.04	Average
Crystal Lake	467	35615	843276	0.04	0.04	0.00	0.01	-0.72	0.54	0.55	0.34	0.03	Average
South Holland	468	56527	749828	0.08	0.10	0.01	0.03	-1.01	0.52	0.55	0.34	0.03	Average
Robbins	469	10905	269639	0.04	0.19	0.01	0.03	-1.01	0.52	0.55	0.34	0.03	Average
Des Plaines	470	206126	3538235	0.06	0.13	0.01	0.03	-1.01	0.52	0.55	0.34	0.03	Average
Cary	471	27754	644760	0.04	0.03	0.00	0.01	-0.72	0.54	0.55	0.34	0.03	Average
Harvard	472	4439	180698	0.02	0.05	0.00	0.01	-0.72	0.54	0.55	0.34	0.03	Average
Woodstock	473	29290	1433845	0.02	0.06	0.00	0.00	-0.72	0.54	0.55	0.34	0.03	Average
Chemung	474	333	8788	0.04	0.03	0.00	0.00	-0.72	0.54	0.55	0.34	0.03	Average
Prospect Heights	475	54827	1211728	0.05	0.16	0.01	0.03	-1.01	0.52	0.54	0.34	0.03	Average
Bull Valley	476	3377	226092	0.01	0.06	0.00	0.00	-0.72	0.54	0.54	0.34	0.02	Average
Ringwood	477	2000	77083	0.03	0.02	0.00	0.00	-0.72	0.54	0.54	0.34	0.02	Average
Washburn	478	8142	78014	0.10	0.18	0.02	0.08	-1.61	0.47	0.54	0.34	0.01	Average

Town/City	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Floodplain Area Weighting Factor	Weighted Flood Loss Ratio	Loss Index	SoVI Score	SoVI Index	Flood Score	Flood Vulnerability Index	z-score	Flood Vulnerability Rating
Godfrey	479	15537	447821	0.03	0.10	0.00	0.01	-0.87	0.53	0.54	0.34	0.01	Average
Browning	480	322	10632	0.03	0.78	0.02	0.09	-1.81	0.45	0.54	0.34	0.01	Average
East Hazel Crest	481	4825	22026	0.22	0.03	0.01	0.03	-1.01	0.52	0.54	0.34	0.01	Average
Glenwood	482	6260	128879	0.05	0.13	0.01	0.03	-1.01	0.52	0.54	0.34	0.01	Average
Durand	483	5446	77598	0.07	0.22	0.02	0.06	-1.45	0.48	0.54	0.34	0.01	Average
Forest View	484	1028	22656	0.05	0.14	0.01	0.02	-1.01	0.52	0.54	0.34	0.01	Average
Hebron	485	439	51001	0.01	0.01	0.00	0.00	-0.72	0.54	0.54	0.34	0.01	Average
McCullom Lake	486	302	20116	0.02	0.01	0.00	0.00	-0.72	0.54	0.54	0.34	0.01	Average
Winnetka	487	16143	677525	0.02	0.26	0.01	0.02	-1.01	0.52	0.54	0.34	0.01	Average
Schiller Park	488	30178	890553	0.03	0.18	0.01	0.02	-1.01	0.52	0.54	0.34	0.01	Average
Trout Valley	489	37	44618	0.00	0.01	0.00	0.00	-0.72	0.54	0.54	0.34	0.01	Average
Spring Valley	490	26221	234702	0.11	0.11	0.01	0.05	-1.32	0.49	0.54	0.34	0.01	Average
Ford Heights	491	4834	176918	0.03	0.22	0.01	0.02	-1.01	0.52	0.54	0.34	0.00	Average
Pekin	492	75584	432837	0.17	0.14	0.02	0.10	-1.91	0.44	0.54	0.34	0.00	Average
La Grange Park	493	8225	93788	0.09	0.07	0.01	0.02	-1.01	0.52	0.54	0.34	0.00	Average
Harvey	494	19273	482983	0.04	0.14	0.01	0.02	-1.01	0.52	0.54	0.33	0.00	Average
Toulon	495	754	16442	0.05	0.08	0.00	0.01	-0.92	0.52	0.54	0.33	0.00	Average
Olympia Fields	496	27497	393791	0.07	0.08	0.01	0.02	-1.01	0.52	0.54	0.33	0.00	Average
Brookfield	497	21503	305180	0.07	0.07	0.01	0.02	-1.01	0.52	0.54	0.33	-0.01	Average
Oak Forest	498	43651	779163	0.06	0.09	0.00	0.02	-1.01	0.52	0.54	0.33	-0.01	Average
Rosemont	499	99770	1294230	0.08	0.06	0.00	0.02	-1.01	0.52	0.54	0.33	-0.01	Average
McCook	500	8987	117996	0.08	0.06	0.00	0.02	-1.01	0.52	0.54	0.33	-0.01	Average
Posen	501	8890	228827	0.04	0.12	0.00	0.02	-1.01	0.52	0.53	0.33	-0.02	Average
Calumet City	502	53596	791342	0.07	0.07	0.00	0.02	-1.01	0.52	0.53	0.33	-0.02	Average
Forest Park	503	14984	187233	0.08	0.06	0.00	0.02	-1.01	0.52	0.53	0.33	-0.02	Average
Lansing	504	49743	893897	0.06	0.08	0.00	0.02	-1.01	0.52	0.53	0.33	-0.02	Average
Newman	505	2100	25910	0.08	0.12	0.01	0.04	-1.27	0.49	0.53	0.33	-0.02	Average
Midlothian	506	21575	547511	0.04	0.11	0.00	0.02	-1.01	0.52	0.53	0.33	-0.02	Average
Greenup	507	3447	25802	0.13	0.04	0.01	0.02	-1.05	0.51	0.53	0.33	-0.02	Average

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Crestwood	508	24893	454940	0.05	0.08	0.00	0.02	-1.01	0.52	0.53	0.33	-0.02	Average
Wheeler	509	70	3649	0.02	0.10	0.00	0.01	-0.90	0.53	0.53	0.33	-0.03	Average
Hazel Crest	510	28607	566564	0.05	0.08	0.00	0.02	-1.01	0.52	0.53	0.33	-0.03	Average
Newton	511	3454	36071	0.10	0.02	0.00	0.01	-0.90	0.53	0.53	0.33	-0.03	Average
Flossmoor	512	22648	466812	0.05	0.08	0.00	0.02	-1.01	0.52	0.53	0.33	-0.03	Average
Chicago Ridge	513	34402	601886	0.06	0.07	0.00	0.02	-1.01	0.52	0.53	0.33	-0.03	Average
Indian Head Park	514	10415	246489	0.04	0.09	0.00	0.02	-1.01	0.52	0.53	0.33	-0.03	Average
Morton Grove	515	14834	209315	0.07	0.05	0.00	0.02	-1.01	0.52	0.53	0.33	-0.03	Average
Palos Heights	516	33851	675171	0.05	0.07	0.00	0.01	-1.01	0.52	0.53	0.33	-0.04	Average
Greenville	517	3680	49648	0.07	0.03	0.00	0.01	-0.95	0.52	0.53	0.33	-0.04	Average
Park Ridge	518	86352	986190	0.09	0.04	0.00	0.01	-1.01	0.52	0.53	0.33	-0.04	Average
Menominee	519	882	36749	0.02	0.07	0.00	0.01	-0.93	0.52	0.53	0.33	-0.04	Average
Glencoe	520	10357	253494	0.04	0.08	0.00	0.01	-1.01	0.52	0.53	0.33	-0.04	Average
Oak Lawn	521	43821	895881	0.05	0.06	0.00	0.01	-1.01	0.52	0.53	0.33	-0.04	Average
Orland Hills	522	8837	277007	0.03	0.09	0.00	0.01	-1.01	0.52	0.53	0.33	-0.05	Average
Hennepin	523	960	18312	0.05	0.18	0.01	0.04	-1.32	0.49	0.53	0.33	-0.05	Average
Chicago Heights	524	32273	723649	0.04	0.07	0.00	0.01	-1.01	0.52	0.53	0.33	-0.05	Average
Rolling Meadows	525	65653	1379199	0.05	0.06	0.00	0.01	-1.01	0.52	0.53	0.33	-0.05	Average
Apple Canyon Lake	526	813	136818	0.01	0.17	0.00	0.00	-0.93	0.52	0.53	0.33	-0.05	Average
Justice	527	7859	275612	0.03	0.09	0.00	0.01	-1.01	0.52	0.53	0.33	-0.05	Average
Elmwood Park	528	7068	137751	0.05	0.05	0.00	0.01	-1.01	0.52	0.53	0.33	-0.05	Average
Coal Valley	529	10915	248879	0.04	0.11	0.00	0.02	-1.11	0.51	0.53	0.33	-0.05	Average
The Galena Territory	530	4936	231733	0.02	0.04	0.00	0.00	-0.93	0.52	0.53	0.33	-0.05	Average
Muddy	531	970	16843	0.06	0.46	0.03	0.10	-2.12	0.42	0.53	0.33	-0.05	Average
Tuscola	532	9342	192891	0.05	0.17	0.01	0.03	-1.27	0.49	0.53	0.33	-0.05	Average

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Carlyle	533	12201	118404	0.10	0.15	0.02	0.06	-1.64	0.46	0.53	0.33	-0.05	Average
Homewood	534	25361	344740	0.07	0.03	0.00	0.01	-1.01	0.52	0.53	0.33	-0.05	Average
Broadlands	535	546	6922	0.08	0.22	0.02	0.07	-1.70	0.46	0.53	0.33	-0.05	Average
Hodgkins	536	2658	60648	0.04	0.05	0.00	0.01	-1.01	0.52	0.53	0.33	-0.06	Average
Broadview	537	29077	686263	0.04	0.05	0.00	0.01	-1.01	0.52	0.52	0.33	-0.06	Average
Maywood	538	22800	290553	0.08	0.03	0.00	0.01	-1.01	0.52	0.52	0.33	-0.06	Average
Dolton	539	7049	165509	0.04	0.05	0.00	0.01	-1.01	0.52	0.52	0.33	-0.06	Average
Glenview	540	54493	1109365	0.05	0.04	0.00	0.01	-1.01	0.52	0.52	0.33	-0.06	Average
Riverdale	541	2938	84863	0.03	0.06	0.00	0.01	-1.01	0.52	0.52	0.33	-0.06	Average
Palos Hills	542	24483	964377	0.03	0.08	0.00	0.01	-1.01	0.52	0.52	0.33	-0.06	Average
Inverness	543	16157	819119	0.02	0.10	0.00	0.01	-1.01	0.52	0.52	0.33	-0.06	Average
Markham	544	5491	235628	0.02	0.09	0.00	0.01	-1.01	0.52	0.52	0.33	-0.06	Average
Kankakee	545	115770	1346321	0.09	0.08	0.01	0.03	-1.23	0.50	0.52	0.33	-0.07	Average
Colona	546	11065	175592	0.06	0.23	0.01	0.06	-1.59	0.47	0.52	0.33	-0.07	Average
Camargo	547	797	13092	0.06	0.12	0.01	0.03	-1.27	0.49	0.52	0.33	-0.07	Average
Petersburg	548	9163	60662	0.15	0.17	0.03	0.10	-2.12	0.42	0.52	0.33	-0.07	Average
Northbrook	549	61192	1565153	0.04	0.04	0.00	0.01	-1.01	0.52	0.52	0.32	-0.07	Average
Niles	550	32819	524394	0.06	0.03	0.00	0.01	-1.01	0.52	0.52	0.32	-0.07	Average
Palos Park	551	14115	424300	0.03	0.04	0.00	0.01	-1.01	0.52	0.52	0.32	-0.07	Average
South Barrington	552	8875	461404	0.02	0.08	0.00	0.01	-1.01	0.52	0.52	0.32	-0.07	Average
Thornton	553	2213	27922	0.08	0.02	0.00	0.01	-1.01	0.52	0.52	0.32	-0.07	Average
Alsip	554	22673	650083	0.03	0.04	0.00	0.01	-1.01	0.52	0.52	0.32	-0.07	Average
Wilmette	555	18762	502307	0.04	0.04	0.00	0.01	-1.01	0.52	0.52	0.32	-0.07	Average
Streamwood	556	22820	416238	0.05	0.02	0.00	0.01	-1.01	0.52	0.52	0.32	-0.07	Average
Jewett	557	72	2119	0.03	0.06	0.00	0.01	-1.05	0.51	0.52	0.32	-0.07	Average
Worth	558	5002	64753	0.08	0.02	0.00	0.01	-1.01	0.52	0.52	0.32	-0.08	Average
Country Club Hills	559	10988	471739	0.02	0.05	0.00	0.00	-1.01	0.52	0.52	0.32	-0.08	Average

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Blue Island	560	7277	467984	0.02	0.07	0.00	0.00	-1.01	0.52	0.52	0.32	-0.08	Average
Stickney	561	82	1966	0.04	0.02	0.00	0.00	-1.01	0.52	0.52	0.32	-0.08	Average
Western Springs	562	4949	136017	0.04	0.03	0.00	0.00	-1.01	0.52	0.52	0.32	-0.08	Average
Lincolnwood	563	3862	41030	0.09	0.01	0.00	0.00	-1.01	0.52	0.52	0.32	-0.08	Average
Mount Prospect	564	44048	1711503	0.03	0.04	0.00	0.00	-1.01	0.52	0.52	0.32	-0.08	Average
Bedford Park	565	3725	122943	0.03	0.03	0.00	0.00	-1.01	0.52	0.52	0.32	-0.08	Average
Merrionette Park	566	1689	100272	0.02	0.05	0.00	0.00	-1.01	0.52	0.52	0.32	-0.08	Average
South Chicago Heights	567	2515	104635	0.02	0.04	0.00	0.00	-1.01	0.52	0.52	0.32	-0.08	Average
Downs	568	12529	50560	0.25	0.11	0.03	0.10	-2.23	0.41	0.52	0.32	-0.09	Average
Calumet Park	569	651	46404	0.01	0.04	0.00	0.00	-1.01	0.52	0.52	0.32	-0.09	Average
Evanston	570	11052	362847	0.03	0.02	0.00	0.00	-1.01	0.52	0.52	0.32	-0.09	Average
Hillside	571	1442	13841	0.10	0.00	0.00	0.00	-1.01	0.52	0.52	0.32	-0.09	Average
Hickory Hills	572	6274	363975	0.02	0.02	0.00	0.00	-1.01	0.52	0.52	0.32	-0.09	Average
Skokie	573	5730	97209	0.06	0.01	0.00	0.00	-1.01	0.52	0.52	0.32	-0.09	Average
Kenilworth	574	8898	202106	0.04	0.01	0.00	0.00	-1.01	0.52	0.52	0.32	-0.09	Average
Countryside	575	3634	211773	0.02	0.01	0.00	0.00	-1.01	0.52	0.52	0.32	-0.09	Average
Bridgeview	576	1796	145195	0.01	0.01	0.00	0.00	-1.01	0.52	0.52	0.32	-0.10	Average
Kenney	577	84	544	0.15	0.01	0.00	0.01	-1.07	0.51	0.52	0.32	-0.10	Average
La Grange	578	154	14449	0.01	0.00	0.00	0.00	-1.01	0.52	0.52	0.32	-0.10	Average
Okawville	579	1867	69490	0.03	0.09	0.00	0.01	-1.13	0.51	0.52	0.32	-0.10	Average
Neoga	580	120	16645	0.01	0.06	0.00	0.00	-1.05	0.51	0.51	0.32	-0.10	Average
Bartelso	581	1898	21835	0.09	0.15	0.01	0.05	-1.64	0.46	0.51	0.32	-0.10	Average
Nashville	582	1828	42148	0.04	0.05	0.00	0.01	-1.13	0.51	0.51	0.32	-0.11	Average
New Milford	583	8235	94236	0.09	0.10	0.01	0.03	-1.45	0.48	0.51	0.32	-0.11	Average
St. Joseph	584	8452	94451	0.09	0.15	0.01	0.05	-1.70	0.46	0.51	0.32	-0.11	Average

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Shelbyville	585	1413	23977	0.06	0.11	0.01	0.02	-1.36	0.49	0.51	0.32	-0.12	Average
Rockton	586	5041	94188	0.05	0.15	0.01	0.03	-1.45	0.48	0.51	0.32	-0.12	Average
Sammons Point	587	1390	25570	0.05	0.06	0.00	0.01	-1.23	0.50	0.51	0.32	-0.12	Average
Momence	588	3414	95934	0.04	0.09	0.00	0.01	-1.23	0.50	0.51	0.32	-0.12	Average
Peoria	589	657847	2936813	0.22	0.13	0.03	0.12	-2.49	0.39	0.51	0.32	-0.12	Average
Bradley	590	26551	432577	0.06	0.05	0.00	0.01	-1.23	0.50	0.51	0.32	-0.12	Average
Geneseo	591	13844	126095	0.11	0.10	0.01	0.04	-1.59	0.47	0.51	0.32	-0.13	Average
Saybrook	592	2351	17099	0.14	0.17	0.02	0.09	-2.23	0.41	0.51	0.32	-0.13	Average
Mahomet	593	27092	280756	0.10	0.13	0.01	0.05	-1.70	0.46	0.51	0.32	-0.13	Average
Radom	594	33	1318	0.03	0.00	0.00	0.00	-1.13	0.51	0.51	0.31	-0.14	Average
Harrisburg	595	66699	648510	0.10	0.20	0.02	0.08	-2.12	0.42	0.50	0.31	-0.14	Average
Grafton	596	14112	96212	0.15	0.08	0.01	0.05	-1.71	0.46	0.50	0.31	-0.15	Average
Manteno	597	4223	234865	0.02	0.08	0.00	0.01	-1.23	0.50	0.50	0.31	-0.15	Average
Machesney Park	598	41821	915059	0.05	0.13	0.01	0.02	-1.45	0.48	0.50	0.31	-0.16	Average
Millington	599	4515	49842	0.09	0.34	0.03	0.12	-2.62	0.38	0.50	0.31	-0.16	Average
West Peoria	600	10794	97777	0.11	0.07	0.01	0.03	-1.56	0.47	0.50	0.31	-0.16	Average
Limestone	601	2369	41501	0.06	0.02	0.00	0.00	-1.23	0.50	0.50	0.31	-0.16	Average
Roscoe	602	16145	422971	0.04	0.14	0.01	0.02	-1.45	0.48	0.50	0.31	-0.16	Average
Grant Park	603	479	21928	0.02	0.01	0.00	0.00	-1.23	0.50	0.50	0.31	-0.17	Average
Bourbonnais	604	8514	773059	0.01	0.02	0.00	0.00	-1.23	0.50	0.50	0.31	-0.17	Average
Pecatonica	605	3210	79432	0.04	0.11	0.00	0.02	-1.45	0.48	0.50	0.31	-0.18	Average
Penfield	606	90	1295	0.07	0.14	0.01	0.04	-1.70	0.46	0.50	0.31	-0.18	Average
Lake of the Woods	607	4713	65429	0.07	0.13	0.01	0.04	-1.70	0.46	0.49	0.31	-0.19	Average
Seaton	608	421	9064	0.05	0.13	0.01	0.02	-1.56	0.47	0.49	0.31	-0.19	Average
Damiansville	609	991	17284	0.06	0.13	0.01	0.03	-1.64	0.46	0.49	0.31	-0.20	Average
Trenton	610	6655	64583	0.10	0.06	0.01	0.02	-1.64	0.46	0.49	0.30	-0.22	Average
Mapleton	611	488	6260	0.08	0.05	0.00	0.02	-1.56	0.47	0.49	0.30	-0.22	Average

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Lost Nation	612	1172	16361	0.07	0.00	0.00	0.00	-1.40	0.48	0.48	0.30	-0.23	Average
Germantown	613	2423	57147	0.04	0.13	0.01	0.02	-1.64	0.46	0.48	0.30	-0.23	Average
Breese	614	5482	131445	0.04	0.13	0.01	0.02	-1.64	0.46	0.48	0.30	-0.23	Average
Bellevue	615	12029	199002	0.06	0.04	0.00	0.01	-1.56	0.47	0.48	0.30	-0.25	Average
Elmwood	616	268	9446	0.03	0.08	0.00	0.01	-1.56	0.47	0.48	0.30	-0.26	Average
Sherrard	617	502	53176	0.01	0.22	0.00	0.01	-1.56	0.47	0.48	0.30	-0.26	Average
Princeville	618	1885	64024	0.03	0.07	0.00	0.01	-1.56	0.47	0.48	0.30	-0.26	Average
Sadorus	619	393	8289	0.05	0.10	0.00	0.02	-1.70	0.46	0.48	0.30	-0.26	Average
Creve Coeur	620	882	17533	0.05	0.18	0.01	0.04	-1.91	0.44	0.48	0.30	-0.26	Average
Galatia	621	3446	53548	0.06	0.21	0.01	0.05	-2.12	0.42	0.47	0.30	-0.27	Average
Lake Camelot	622	1117	54050	0.02	0.04	0.00	0.00	-1.56	0.47	0.47	0.29	-0.28	Average
Kewanee	623	7953	158601	0.05	0.03	0.00	0.01	-1.59	0.47	0.47	0.29	-0.28	Average
Dwight	624	18399	241994	0.08	0.20	0.02	0.06	-2.25	0.41	0.47	0.29	-0.28	Average
Elsah	625	3065	48136	0.06	0.05	0.00	0.01	-1.71	0.46	0.47	0.29	-0.29	Average
Aviston	626	776	14970	0.05	0.04	0.00	0.01	-1.64	0.46	0.47	0.29	-0.29	Average
Norwood	627	1627	30401	0.05	0.00	0.00	0.00	-1.56	0.47	0.47	0.29	-0.29	Average
Dunlap	628	237	13739	0.02	0.01	0.00	0.00	-1.56	0.47	0.47	0.29	-0.29	Average
Bishop Hill	629	12	2442	0.00	0.01	0.00	0.00	-1.59	0.47	0.47	0.29	-0.30	Average
Galva	630	6	170	0.04	0.00	0.00	0.00	-1.59	0.47	0.47	0.29	-0.30	Average
Fisher	631	2028	59536	0.03	0.06	0.00	0.01	-1.70	0.46	0.47	0.29	-0.31	Average
Beckemeyer	632	1303	10594	0.12	0.01	0.00	0.00	-1.64	0.46	0.47	0.29	-0.31	Average
Urbana	633	28014	442836	0.06	0.03	0.00	0.01	-1.70	0.46	0.47	0.29	-0.31	Average
Royal	634	126	1944	0.06	0.02	0.00	0.01	-1.70	0.46	0.46	0.29	-0.32	Average
Hopedale	635	3605	35276	0.10	0.13	0.01	0.05	-2.25	0.41	0.46	0.29	-0.32	Average
Byron	636	16110	161392	0.10	0.13	0.01	0.05	-2.26	0.41	0.46	0.29	-0.33	Average
Champaign	637	26317	1003629	0.03	0.01	0.00	0.00	-1.70	0.46	0.46	0.29	-0.34	Average
Oregon	638	17362	245347	0.07	0.17	0.01	0.05	-2.26	0.41	0.46	0.28	-0.34	Average
Jerseyville	639	520	29783	0.02	0.01	0.00	0.00	-1.71	0.46	0.46	0.28	-0.34	Average
Atwood	640	553	7639	0.07	0.08	0.01	0.02	-1.99	0.43	0.46	0.28	-0.34	Average

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Bondville	641	1	192	0.01	0.01	0.00	0.00	-1.70	0.46	0.46	0.28	-0.34	Average
Rantoul	642	29	1193	0.02	0.00	0.00	0.00	-1.70	0.46	0.46	0.28	-0.34	Average
Colfax	643	2829	36408	0.08	0.12	0.01	0.04	-2.23	0.41	0.45	0.28	-0.37	Average
Watson	644	1537	21041	0.07	0.05	0.00	0.01	-1.97	0.44	0.45	0.28	-0.38	Average
McNabb	645	847	9900	0.09	0.10	0.01	0.03	-2.23	0.41	0.45	0.28	-0.39	Average
Port Barrington	646	13282	206507	0.06	0.50	0.03	0.13	-3.36	0.32	0.45	0.28	-0.40	Average
Heyworth	647	5598	64611	0.09	0.09	0.01	0.03	-2.23	0.41	0.44	0.28	-0.41	Average
Effingham	648	8463	222894	0.04	0.03	0.00	0.00	-1.97	0.44	0.44	0.27	-0.42	Average
Teutopolis	649	620	32268	0.02	0.02	0.00	0.00	-1.97	0.44	0.44	0.27	-0.43	Average
Altamont	650	775	23628	0.03	0.01	0.00	0.00	-1.97	0.44	0.44	0.27	-0.43	Average
Morton	651	29351	380611	0.08	0.08	0.01	0.02	-2.25	0.41	0.44	0.27	-0.44	Average
Ivesdale	652	232	5871	0.04	0.12	0.00	0.02	-2.20	0.42	0.43	0.27	-0.44	Average
Towanda	653	3537	43020	0.08	0.06	0.01	0.02	-2.23	0.41	0.43	0.27	-0.44	Average
Greenview	654	223	7695	0.03	0.09	0.00	0.01	-2.12	0.42	0.43	0.27	-0.45	Average
Tallula	655	450	11072	0.04	0.06	0.00	0.01	-2.12	0.42	0.43	0.27	-0.45	Average
Metropolis	656	25682	235489	0.11	0.33	0.04	0.14	-3.70	0.29	0.43	0.27	-0.46	Average
Carrier Mills	657	1307	50721	0.03	0.06	0.00	0.01	-2.12	0.42	0.43	0.27	-0.47	Average
Carlock	658	831	23037	0.04	0.11	0.00	0.02	-2.23	0.41	0.43	0.27	-0.47	Average
Fox Lake	659	126181	1424372	0.09	0.31	0.03	0.11	-3.36	0.32	0.43	0.27	-0.47	Average
Oakford	660	233	6407	0.04	0.04	0.00	0.01	-2.12	0.42	0.43	0.27	-0.47	Average
Washington	661	25710	387483	0.07	0.06	0.00	0.01	-2.25	0.41	0.43	0.26	-0.48	Average
Joppa	662	1707	11879	0.14	0.23	0.03	0.13	-3.70	0.29	0.42	0.26	-0.49	Average
Standard	663	80	7786	0.01	0.22	0.00	0.01	-2.23	0.41	0.42	0.26	-0.49	Average
Bloomington	664	40699	948342	0.04	0.05	0.00	0.01	-2.23	0.41	0.42	0.26	-0.50	Average
Lexington	665	2571	24341	0.11	0.02	0.00	0.01	-2.23	0.41	0.42	0.26	-0.50	Average
Le Roy	666	1256	26869	0.05	0.03	0.00	0.01	-2.23	0.41	0.42	0.26	-0.51	Low
Pistakee Highlands	667	12732	160202	0.08	0.32	0.03	0.10	-3.36	0.32	0.42	0.26	-0.51	Low

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Normal	668	40635	1238923	0.03	0.03	0.00	0.00	-2.23	0.41	0.42	0.26	-0.51	Low
Forreston	669	1100	33672	0.03	0.05	0.00	0.01	-2.26	0.41	0.42	0.26	-0.52	Low
Twin Grove	670	1852	101427	0.02	0.04	0.00	0.00	-2.23	0.41	0.42	0.26	-0.52	Low
Hillcrest	671	251	32317	0.01	0.16	0.00	0.01	-2.26	0.41	0.42	0.26	-0.52	Low
Garden Prairie	672	1195	19581	0.06	0.14	0.01	0.03	-2.62	0.38	0.42	0.26	-0.52	Low
South Pekin	673	6	213	0.03	0.03	0.00	0.00	-2.25	0.41	0.41	0.26	-0.52	Low
Danvers	674	349	12343	0.03	0.01	0.00	0.00	-2.23	0.41	0.41	0.26	-0.53	Low
Adeline	675	732	18486	0.04	0.02	0.00	0.00	-2.26	0.41	0.41	0.26	-0.53	Low
Hudson	676	81	4885	0.02	0.00	0.00	0.00	-2.23	0.41	0.41	0.26	-0.53	Low
Stillman Valley	677	219	6899	0.03	0.01	0.00	0.00	-2.26	0.41	0.41	0.26	-0.54	Low
Mackinaw	678	161	6524	0.02	0.00	0.00	0.00	-2.25	0.41	0.41	0.26	-0.54	Low
Havana	679	3076	40799	0.08	0.10	0.01	0.03	-2.60	0.38	0.41	0.26	-0.54	Low
Gilberts	680	8605	128900	0.07	0.19	0.01	0.05	-2.89	0.36	0.41	0.25	-0.55	Low
Bath	681	3416	31576	0.11	0.76	0.08	0.32	-6.16	0.08	0.41	0.25	-0.56	Low
De Land	682	583	9253	0.06	0.13	0.01	0.03	-2.70	0.37	0.41	0.25	-0.57	Low
Monticello	683	12782	282907	0.05	0.17	0.01	0.03	-2.70	0.37	0.40	0.25	-0.57	Low
Fults	684	38	1228	0.03	1.00	0.03	0.12	-3.83	0.28	0.40	0.25	-0.58	Low
Cherry Valley	685	15922	430703	0.04	0.31	0.01	0.05	-2.98	0.35	0.40	0.25	-0.61	Low
Sandwich	686	7360	84172	0.09	0.07	0.01	0.02	-2.75	0.37	0.39	0.24	-0.61	Low
East Dundee	687	43655	234560	0.19	0.05	0.01	0.04	-3.04	0.35	0.38	0.24	-0.65	Low
Bay View Gardens	688	5890	46188	0.13	0.18	0.02	0.09	-3.65	0.29	0.38	0.24	-0.65	Low
Lakemoor	689	24835	383666	0.06	0.25	0.02	0.06	-3.36	0.32	0.38	0.24	-0.66	Low
Kirkland	690	4164	77437	0.05	0.15	0.01	0.03	-3.01	0.35	0.38	0.24	-0.67	Low
Kingston	691	4401	89461	0.05	0.16	0.01	0.03	-3.01	0.35	0.38	0.24	-0.67	Low
Mansfield	692	562	17081	0.03	0.02	0.00	0.00	-2.70	0.37	0.38	0.23	-0.69	Low
Genoa	693	4349	82843	0.05	0.13	0.01	0.03	-3.01	0.35	0.38	0.23	-0.69	Low
Bement	694	191	11168	0.02	0.02	0.00	0.00	-2.70	0.37	0.38	0.23	-0.69	Low
Algonquin	695	52494	909040	0.06	0.07	0.00	0.02	-2.89	0.36	0.37	0.23	-0.69	Low

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Huntley	696	17128	427970	0.04	0.10	0.00	0.02	-2.89	0.36	0.37	0.23	-0.70	Low
Island Lake	697	30618	602633	0.05	0.28	0.01	0.06	-3.36	0.32	0.37	0.23	-0.70	Low
Riverwoods	698	56233	529317	0.11	0.16	0.02	0.07	-3.51	0.31	0.37	0.23	-0.70	Low
Lockport	699	93236	1274937	0.07	0.18	0.01	0.05	-3.37	0.32	0.37	0.23	-0.72	Low
Rockford	700	216940	4594359	0.05	0.10	0.00	0.02	-2.98	0.35	0.37	0.23	-0.72	Low
Sycamore	701	20522	469498	0.04	0.09	0.00	0.02	-3.01	0.35	0.36	0.23	-0.74	Low
Loves Park	702	42252	1043663	0.04	0.07	0.00	0.01	-2.98	0.35	0.36	0.22	-0.75	Low
DeKalb	703	48188	752701	0.06	0.05	0.00	0.01	-3.01	0.35	0.36	0.22	-0.75	Low
Wheeling	704	162305	2780083	0.06	0.22	0.01	0.05	-3.51	0.31	0.36	0.22	-0.77	Low
Sauk Village	705	13573	249670	0.05	0.17	0.01	0.04	-3.37	0.32	0.35	0.22	-0.78	Low
Deer Creek	706	77	5486	0.01	0.03	0.00	0.00	-2.95	0.35	0.35	0.22	-0.78	Low
Frankfort	707	95411	1344750	0.07	0.13	0.01	0.04	-3.37	0.32	0.35	0.22	-0.78	Low
El Paso	708	46	1580	0.03	0.00	0.00	0.00	-2.94	0.35	0.35	0.22	-0.78	Low
Hinckley	709	711	30347	0.02	0.06	0.00	0.01	-3.01	0.35	0.35	0.22	-0.78	Low
Hoffman Estates	710	75695	3135653	0.02	0.06	0.00	0.01	-3.04	0.35	0.35	0.22	-0.79	Low
Cortland	711	229	6685	0.03	0.02	0.00	0.00	-3.01	0.35	0.35	0.22	-0.80	Low
Barrington Hills	712	31467	732184	0.04	0.10	0.00	0.02	-3.20	0.33	0.35	0.22	-0.80	Low
Shabbona	713	106	12481	0.01	0.02	0.00	0.00	-3.01	0.35	0.35	0.22	-0.81	Low
East Brooklyn	714	908	10143	0.09	0.22	0.02	0.08	-3.96	0.27	0.35	0.22	-0.81	Low
Tinley Park	715	62119	1235714	0.05	0.11	0.01	0.02	-3.37	0.32	0.34	0.21	-0.85	Low
Matteson	716	26166	702805	0.04	0.14	0.01	0.02	-3.37	0.32	0.34	0.21	-0.85	Low
Fox River Grove	717	10984	257288	0.04	0.11	0.00	0.02	-3.36	0.32	0.34	0.21	-0.86	Low
Highland Park	718	268306	3623461	0.07	0.10	0.01	0.03	-3.51	0.31	0.34	0.21	-0.86	Low
Frankfort Square	719	15102	402342	0.04	0.12	0.00	0.02	-3.37	0.32	0.34	0.21	-0.86	Low
Itasca	720	98129	1035847	0.09	0.12	0.01	0.04	-3.69	0.29	0.34	0.21	-0.86	Low
Morris	721	85668	854568	0.10	0.16	0.02	0.06	-3.96	0.27	0.33	0.21	-0.88	Low

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Mokena	722	39032	979195	0.04	0.08	0.00	0.01	-3.37	0.32	0.33	0.21	-0.88	Low
Richton Park	723	11456	366655	0.03	0.09	0.00	0.01	-3.37	0.32	0.33	0.20	-0.89	Low
Willow Springs	724	12698	306095	0.04	0.23	0.01	0.04	-3.69	0.29	0.33	0.20	-0.89	Low
Steger	725	3813	98868	0.04	0.06	0.00	0.01	-3.37	0.32	0.33	0.20	-0.90	Low
Orland Park	726	55288	1802403	0.03	0.07	0.00	0.01	-3.37	0.32	0.33	0.20	-0.90	Low
Homer Glen	727	55986	1664563	0.03	0.07	0.00	0.01	-3.37	0.32	0.33	0.20	-0.90	Low
Buffalo Grove	728	181367	2948296	0.06	0.08	0.00	0.02	-3.51	0.31	0.32	0.20	-0.91	Low
Bensenville	729	130274	1724298	0.08	0.11	0.01	0.03	-3.69	0.29	0.32	0.20	-0.91	Low
Wood Dale	730	68172	982648	0.07	0.11	0.01	0.03	-3.69	0.29	0.32	0.20	-0.93	Low
Deerfield	731	56491	942768	0.06	0.06	0.00	0.01	-3.51	0.31	0.32	0.20	-0.93	Low
Oak Brook	732	178839	2104811	0.08	0.08	0.01	0.03	-3.69	0.29	0.32	0.20	-0.93	Low
Barrington	733	27934	858182	0.03	0.10	0.00	0.01	-3.51	0.31	0.32	0.20	-0.93	Low
Crete	734	6380	312155	0.02	0.02	0.00	0.00	-3.37	0.32	0.32	0.20	-0.93	Low
University Park	735	2577	191001	0.01	0.01	0.00	0.00	-3.37	0.32	0.32	0.20	-0.93	Low
Park Forest	736	616	18016	0.03	0.00	0.00	0.00	-3.37	0.32	0.32	0.20	-0.93	Low
Valmeyer	737	1555	55148	0.03	0.34	0.01	0.04	-3.83	0.28	0.32	0.20	-0.94	Low
Roanoke	738	2528	61318	0.04	0.11	0.00	0.02	-3.65	0.29	0.31	0.19	-0.96	Low
Palatine	739	52014	2253104	0.02	0.06	0.00	0.01	-3.51	0.31	0.31	0.19	-0.96	Low
Deer Park	740	6178	237237	0.03	0.03	0.00	0.00	-3.51	0.31	0.31	0.19	-0.97	Low
Arlington Heights	741	28081	1296150	0.02	0.02	0.00	0.00	-3.51	0.31	0.31	0.19	-0.98	Low
Channahon	742	87429	673045	0.13	0.22	0.03	0.11	-4.85	0.19	0.31	0.19	-0.98	Low
Eureka	743	9167	226941	0.04	0.07	0.00	0.01	-3.65	0.29	0.31	0.19	-0.99	Low
Roselle	744	49004	837603	0.06	0.06	0.00	0.01	-3.69	0.29	0.30	0.19	-0.99	Low
Elmhurst	745	60652	953081	0.06	0.05	0.00	0.01	-3.69	0.29	0.30	0.19	-1.00	Low
Chicago	746	949685	12607345	0.08	0.04	0.00	0.01	-3.69	0.29	0.30	0.19	-1.00	Low
Northlake	747	18865	613959	0.03	0.09	0.00	0.01	-3.69	0.29	0.30	0.19	-1.00	Low
Congerville	748	861	8834	0.10	0.02	0.00	0.01	-3.65	0.29	0.30	0.19	-1.00	Low
Burr Ridge	749	51010	1064800	0.05	0.05	0.00	0.01	-3.69	0.29	0.30	0.19	-1.01	Low
Hinsdale	750	43135	707079	0.06	0.03	0.00	0.01	-3.69	0.29	0.30	0.19	-1.02	Low

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Brookport	751	1324	17803	0.07	0.03	0.00	0.01	-3.70	0.29	0.30	0.18	-1.02	Low
Hanover Park	752	17391	557431	0.03	0.05	0.00	0.01	-3.69	0.29	0.30	0.18	-1.02	Low
Schaumburg	753	151391	5017968	0.03	0.04	0.00	0.01	-3.69	0.29	0.30	0.18	-1.03	Low
Elk Grove Village	754	63360	1523853	0.04	0.03	0.00	0.01	-3.69	0.29	0.30	0.18	-1.03	Low
Kappa	755	158	2434	0.06	0.01	0.00	0.00	-3.65	0.29	0.30	0.18	-1.03	Low
Waterloo	756	4117	172964	0.02	0.06	0.00	0.01	-3.83	0.28	0.28	0.18	-1.08	Low
Maple Park	757	1530	62845	0.02	0.22	0.01	0.02	-4.04	0.26	0.28	0.18	-1.09	Low
Maeystown	758	17	1058	0.02	0.04	0.00	0.00	-3.83	0.28	0.28	0.17	-1.09	Low
Elgin	759	203715	2860745	0.07	0.09	0.01	0.03	-4.14	0.25	0.28	0.17	-1.10	Low
Carbon Hill	760	270	13999	0.02	0.13	0.00	0.01	-3.96	0.27	0.28	0.17	-1.10	Low
Mazon	761	471	15965	0.03	0.09	0.00	0.01	-3.96	0.27	0.28	0.17	-1.10	Low
Gardner	762	571	26782	0.02	0.10	0.00	0.01	-3.96	0.27	0.28	0.17	-1.11	Low
Belvidere	763	36453	528377	0.07	0.18	0.01	0.05	-4.51	0.22	0.27	0.17	-1.13	Low
South Wilmington	764	191	5690	0.03	0.01	0.00	0.00	-3.96	0.27	0.27	0.17	-1.14	Low
Bartlett	765	36147	857633	0.04	0.07	0.00	0.01	-4.14	0.25	0.26	0.16	-1.16	Low
Woodridge	766	108809	1363500	0.08	0.08	0.01	0.03	-4.37	0.23	0.26	0.16	-1.19	Low
Manito	767	519	3671	0.14	0.02	0.00	0.01	-4.21	0.25	0.26	0.16	-1.20	Low
Channel Lake	768	18882	247772	0.08	0.52	0.04	0.16	-6.00	0.10	0.25	0.16	-1.21	Low
Lemont	769	22755	513797	0.04	0.11	0.00	0.02	-4.37	0.23	0.25	0.16	-1.21	Low
Poplar Grove	770	1251	30626	0.04	0.07	0.00	0.01	-4.51	0.22	0.23	0.14	-1.29	Low
Timberlane	771	214	14777	0.01	0.05	0.00	0.00	-4.51	0.22	0.22	0.14	-1.33	Low
Capron	772	260	21009	0.01	0.02	0.00	0.00	-4.51	0.22	0.22	0.14	-1.34	Low
Big Rock	773	12737	172496	0.07	0.14	0.01	0.04	-5.06	0.18	0.22	0.13	-1.36	Low
Coal City	774	548	16491	0.03	0.13	0.00	0.02	-4.85	0.19	0.21	0.13	-1.39	Low
Long Lake	775	19158	321483	0.06	0.48	0.03	0.11	-6.00	0.10	0.21	0.13	-1.40	Low
Virgil	776	1595	48889	0.03	0.23	0.01	0.03	-5.06	0.18	0.21	0.13	-1.41	Low
Pingree Grove	777	2823	58913	0.05	0.12	0.01	0.02	-5.06	0.18	0.20	0.12	-1.44	Low

Town/City	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Floodplain Area Weighting Factor	Weighted Flood Loss Ratio	Loss Index	SoVI Score	SoVI Index	Flood Score	Flood Vulnerability Index	z-score	Flood Vulnerability Rating
Sleepy Hollow	778	3607	83419	0.04	0.13	0.01	0.02	-5.06	0.18	0.20	0.12	-1.45	Low
Diamond	779	234	14146	0.02	0.04	0.00	0.00	-4.85	0.19	0.20	0.12	-1.45	Low
Lake Catherine	780	7206	136799	0.05	0.48	0.03	0.10	-6.00	0.10	0.20	0.12	-1.45	Low
Prestbury	781	10093	262340	0.04	0.12	0.00	0.02	-5.06	0.18	0.19	0.12	-1.46	Low
North Aurora	782	16598	351762	0.05	0.09	0.00	0.02	-5.06	0.18	0.19	0.12	-1.47	Low
South Elgin	783	29021	634241	0.05	0.08	0.00	0.02	-5.06	0.18	0.19	0.12	-1.47	Low
Carpentersville	784	27476	678675	0.04	0.07	0.00	0.01	-5.06	0.18	0.19	0.12	-1.49	Low
West Dundee	785	17362	390149	0.04	0.06	0.00	0.01	-5.06	0.18	0.19	0.12	-1.49	Low
Campton Hills	786	34988	1462423	0.02	0.10	0.00	0.01	-5.06	0.18	0.19	0.11	-1.50	Low
Hampshire	787	12799	372778	0.03	0.07	0.00	0.01	-5.06	0.18	0.19	0.11	-1.50	Low
Fox Lake Hills	788	10326	151209	0.07	0.32	0.02	0.09	-6.00	0.10	0.18	0.11	-1.50	Low
Sugar Grove	789	12270	418056	0.03	0.06	0.00	0.01	-5.06	0.18	0.18	0.11	-1.51	Low
Lily Lake	790	4378	146022	0.03	0.04	0.00	0.00	-5.06	0.18	0.18	0.11	-1.52	Low
Elburn	791	2316	107256	0.02	0.05	0.00	0.00	-5.06	0.18	0.18	0.11	-1.52	Low
Burlington	792	1177	68931	0.02	0.04	0.00	0.00	-5.06	0.18	0.18	0.11	-1.53	Low
Lincolnshire	793	218359	2103939	0.10	0.19	0.02	0.08	-6.00	0.10	0.18	0.11	-1.54	Low
Third Lake	794	6977	154192	0.05	0.42	0.02	0.08	-6.00	0.10	0.17	0.11	-1.55	Low
Round Lake Park	795	20160	243472	0.08	0.22	0.02	0.07	-6.00	0.10	0.17	0.10	-1.57	Low
Wilmington	796	32850	489983	0.07	0.16	0.01	0.04	-5.73	0.12	0.16	0.10	-1.59	Low
Shorewood	797	45537	593324	0.08	0.13	0.01	0.04	-5.73	0.12	0.16	0.10	-1.60	Low
Hainesville	798	11272	285518	0.04	0.39	0.02	0.06	-6.00	0.10	0.16	0.10	-1.61	Low
Minooka	799	23310	255721	0.09	0.07	0.01	0.03	-5.61	0.13	0.15	0.10	-1.63	Low
Venetian Village	800	8519	221408	0.04	0.37	0.01	0.06	-6.00	0.10	0.15	0.09	-1.63	Low
Mettawa	801	66212	901033	0.07	0.19	0.01	0.06	-6.00	0.10	0.15	0.09	-1.63	Low
Lakewood Shores	802	8307	156338	0.05	0.14	0.01	0.03	-5.73	0.12	0.15	0.09	-1.66	Low
Preston Heights	803	7542	138023	0.05	0.13	0.01	0.03	-5.73	0.12	0.15	0.09	-1.66	Low

Town/City	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Floodplain Area Weighting Factor	Weighted Flood Loss Ratio	Loss Index	SoVI Score	SoVI Index	Flood Score	Flood Vulnerability Index	z-score	Flood Vulnerability Rating
Libertyville	804	148925	1837285	0.08	0.16	0.01	0.05	-6.00	0.10	0.15	0.09	-1.66	Low
Winthrop Harbor	805	16169	347213	0.05	0.25	0.01	0.05	-6.00	0.10	0.14	0.09	-1.67	Low
Crest Hill	806	24872	410838	0.06	0.07	0.00	0.02	-5.73	0.12	0.14	0.08	-1.70	Low
Wauconda	807	45513	1019319	0.04	0.21	0.01	0.04	-6.00	0.10	0.13	0.08	-1.72	Low
St. Charles	808	49664	947241	0.05	0.05	0.00	0.01	-5.71	0.12	0.13	0.08	-1.72	Low
Forest Lake	809	5506	89827	0.06	0.14	0.01	0.03	-6.00	0.10	0.13	0.08	-1.73	Low
Geneva	810	16713	479889	0.03	0.07	0.00	0.01	-5.71	0.12	0.13	0.08	-1.73	Low
Wayne	811	6712	248014	0.03	0.09	0.00	0.01	-5.71	0.12	0.13	0.08	-1.73	Low
Peotone	812	3406	74123	0.05	0.06	0.00	0.01	-5.73	0.12	0.13	0.08	-1.73	Low
Romeoville	813	25992	1049360	0.02	0.12	0.00	0.01	-5.73	0.12	0.13	0.08	-1.73	Low
Grayslake	814	105228	1601269	0.07	0.13	0.01	0.03	-6.00	0.10	0.13	0.08	-1.73	Low
New Lenox	815	31567	828089	0.04	0.07	0.00	0.01	-5.73	0.12	0.13	0.08	-1.73	Low
Manhattan	816	5493	150070	0.04	0.07	0.00	0.01	-5.73	0.12	0.13	0.08	-1.74	Low
Round Lake	817	19348	436216	0.04	0.18	0.01	0.03	-6.00	0.10	0.13	0.08	-1.74	Low
Lisle	818	202874	2330308	0.09	0.17	0.02	0.06	-6.36	0.07	0.13	0.08	-1.75	Low
Batavia	819	32049	943149	0.03	0.04	0.00	0.01	-5.71	0.12	0.13	0.08	-1.75	Low
Lake Barrington	820	35671	1025190	0.03	0.21	0.01	0.03	-6.00	0.10	0.13	0.08	-1.75	Low
Elwood	821	1537	79896	0.02	0.08	0.00	0.01	-5.73	0.12	0.13	0.08	-1.75	Low
Crystal Lawns	822	1703	65811	0.03	0.06	0.00	0.01	-5.73	0.12	0.13	0.08	-1.75	Low
West Chicago	823	18404	942650	0.02	0.06	0.00	0.00	-5.71	0.12	0.13	0.08	-1.75	Low
Zion	824	30227	552769	0.05	0.13	0.01	0.03	-6.00	0.10	0.13	0.08	-1.75	Low
North Barrington	825	37078	1054196	0.04	0.21	0.01	0.03	-6.00	0.10	0.13	0.08	-1.75	Low
Fairmont	826	4804	121799	0.04	0.04	0.00	0.01	-5.73	0.12	0.13	0.08	-1.75	Low
Wadsworth	827	31926	509695	0.06	0.12	0.01	0.03	-6.00	0.10	0.13	0.08	-1.75	Low
Bolingbrook	828	121433	2316379	0.05	0.15	0.01	0.03	-6.05	0.09	0.12	0.08	-1.75	Low
Round Lake Beach	829	45510	720441	0.06	0.11	0.01	0.03	-6.00	0.10	0.12	0.08	-1.76	Low

Town/City	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Floodplain Area Weighting Factor	Weighted Flood Loss Ratio	Loss Index	SoVI Score	SoVI Index	Flood Score	Flood Vulnerability Index	z-score	Flood Vulnerability Rating
Beecher	830	4798	216859	0.02	0.05	0.00	0.00	-5.73	0.12	0.12	0.08	-1.76	Low
Vernon Hills	831	105093	1551957	0.07	0.10	0.01	0.03	-6.00	0.10	0.12	0.08	-1.76	Low
Park City	832	12757	301769	0.04	0.15	0.01	0.03	-6.00	0.10	0.12	0.08	-1.77	Low
Goofy Ridge	833	1567	16413	0.10	0.10	0.01	0.04	-6.16	0.08	0.12	0.07	-1.77	Low
Montgomery	834	37046	701552	0.05	0.16	0.01	0.03	-6.11	0.09	0.12	0.07	-1.77	Low
Tower Lakes	835	12187	372045	0.03	0.18	0.01	0.02	-6.00	0.10	0.12	0.07	-1.77	Low
Monee	836	1051	65109	0.02	0.01	0.00	0.00	-5.73	0.12	0.12	0.07	-1.77	Low
Volo	837	5128	109944	0.05	0.13	0.01	0.02	-6.00	0.10	0.12	0.07	-1.77	Low
Symerton	838	14	587	0.02	0.01	0.00	0.00	-5.73	0.12	0.12	0.07	-1.77	Low
Braidwood	839	224	39847	0.01	0.02	0.00	0.00	-5.73	0.12	0.12	0.07	-1.78	Low
Ingalls Park	840	401	9618	0.04	0.00	0.00	0.00	-5.73	0.12	0.12	0.07	-1.78	Low
Lake Villa	841	20960	764116	0.03	0.21	0.01	0.02	-6.00	0.10	0.12	0.07	-1.78	Low
Gages Lake	842	11536	138073	0.08	0.07	0.01	0.02	-6.00	0.10	0.12	0.07	-1.78	Low
Antioch	843	27879	763721	0.04	0.15	0.01	0.02	-6.00	0.10	0.12	0.07	-1.78	Low
Waukegan	844	106531	1613602	0.07	0.08	0.01	0.02	-6.00	0.10	0.12	0.07	-1.78	Low
Bannockburn	845	179761	2450292	0.07	0.07	0.01	0.02	-6.00	0.10	0.12	0.07	-1.79	Low
Gurnee	846	147440	2513901	0.06	0.08	0.00	0.02	-6.00	0.10	0.12	0.07	-1.79	Low
Long Grove	847	52445	1476623	0.04	0.13	0.00	0.02	-6.00	0.10	0.11	0.07	-1.80	Low
Round Lake Heights	848	9549	113667	0.08	0.05	0.00	0.02	-6.00	0.10	0.11	0.07	-1.80	Low
Kildeer	849	23627	862334	0.03	0.12	0.00	0.01	-6.00	0.10	0.11	0.07	-1.82	Low
Green Oaks	850	28537	582479	0.05	0.07	0.00	0.01	-6.00	0.10	0.11	0.07	-1.82	Low
Joliet	851	434367	3917483	0.11	0.11	0.01	0.05	-6.44	0.06	0.11	0.07	-1.82	Low
Beach Park	852	35698	777606	0.05	0.07	0.00	0.01	-6.00	0.10	0.11	0.07	-1.82	Low
Lake Forest	853	48645	1307750	0.04	0.08	0.00	0.01	-6.00	0.10	0.11	0.07	-1.82	Low
Hawthorn Woods	854	31821	1042601	0.03	0.09	0.00	0.01	-6.00	0.10	0.11	0.07	-1.83	Low
Naperville	855	337231	7921253	0.04	0.09	0.00	0.01	-6.05	0.09	0.11	0.07	-1.83	Low
Aurora	856	258203	4894371	0.05	0.08	0.00	0.02	-6.08	0.09	0.11	0.07	-1.83	Low
Mundelein	857	68189	1882025	0.04	0.07	0.00	0.01	-6.00	0.10	0.11	0.07	-1.83	Low

Town/City	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Floodplain Area Weighting Factor	Weighted Flood Loss Ratio	Loss Index	SoVI Score	SoVI Index	Flood Score	Flood Vulnerability Index	z-score	Flood Vulnerability Rating
Lake Bluff	858	15071	408422	0.04	0.07	0.00	0.01	-6.00	0.10	0.11	0.07	-1.83	Low
Lake Zurich	859	36785	1485270	0.02	0.09	0.00	0.01	-6.00	0.10	0.11	0.06	-1.84	Low
Lindenhurst	860	8490	328995	0.03	0.09	0.00	0.01	-6.00	0.10	0.11	0.06	-1.84	Low
North Chicago	861	33396	996385	0.03	0.07	0.00	0.01	-6.00	0.10	0.11	0.06	-1.84	Low
Old Mill Creek	862	3523	132058	0.03	0.08	0.00	0.01	-6.00	0.10	0.10	0.06	-1.84	Low
Grandwood Park	863	4269	275998	0.02	0.06	0.00	0.00	-6.00	0.10	0.10	0.06	-1.86	Low
Yorkville	864	26538	459762	0.06	0.02	0.00	0.00	-6.11	0.09	0.09	0.06	-1.89	Low
Oakbrook Terrace	865	37414	421210	0.09	0.07	0.01	0.03	-6.36	0.07	0.09	0.06	-1.89	Low
Plainfield	866	56731	1144500	0.05	0.16	0.01	0.03	-6.44	0.06	0.09	0.06	-1.90	Low
Warrenville	867	74368	1404432	0.05	0.11	0.01	0.02	-6.36	0.07	0.09	0.06	-1.90	Low
Villa Park	868	77401	667960	0.12	0.05	0.01	0.02	-6.36	0.07	0.09	0.05	-1.90	Low
Carol Stream	869	102355	2197329	0.05	0.11	0.00	0.02	-6.36	0.07	0.09	0.05	-1.92	Low
Willowbrook	870	55272	885420	0.06	0.08	0.00	0.02	-6.36	0.07	0.09	0.05	-1.92	Low
Forest City	871	59	3141	0.02	0.04	0.00	0.00	-6.16	0.08	0.09	0.05	-1.92	Low
Winfield	872	29534	600100	0.05	0.10	0.00	0.02	-6.36	0.07	0.09	0.05	-1.92	Low
Lombard	873	72797	1020175	0.07	0.07	0.00	0.02	-6.36	0.07	0.08	0.05	-1.92	Low
Mason City	874	59	13506	0.00	0.01	0.00	0.00	-6.16	0.08	0.08	0.05	-1.93	Low
Downers Grove	875	203825	3516606	0.06	0.07	0.00	0.02	-6.36	0.07	0.08	0.05	-1.94	Low
Darien	876	80237	1363344	0.06	0.06	0.00	0.01	-6.36	0.07	0.08	0.05	-1.95	Low
Willowbrook	877	15168	317149	0.05	0.07	0.00	0.01	-3.37	0.07	0.08	0.05	-1.95	Low
Bloomingdale	878	79112	1724656	0.05	0.07	0.00	0.01	-6.36	0.07	0.08	0.05	-1.95	Low
Addison	879	71157	1442344	0.05	0.06	0.00	0.01	-6.36	0.07	0.08	0.05	-1.95	Low
Glendale Heights	880	57180	1461233	0.04	0.06	0.00	0.01	-6.36	0.07	0.07	0.05	-1.97	Low
Wheaton	881	61337	1512898	0.04	0.04	0.00	0.01	-6.36	0.07	0.07	0.04	-1.97	Low
Glen Ellyn	882	19471	371128	0.05	0.03	0.00	0.01	-6.36	0.07	0.07	0.04	-1.97	Low
Westmont	883	31302	825724	0.04	0.03	0.00	0.00	-6.36	0.07	0.07	0.04	-1.98	Low

Town/City	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Floodplain Area Weighting Factor	Weighted Flood Loss Ratio	Loss Index	SoVI Score	SoVI Index	Flood Score	Flood Vulnerability Index	z-score	Flood Vulnerability Rating
Clarendon Hills	884	13218	206925	0.06	0.01	0.00	0.00	-6.36	0.07	0.07	0.04	-1.99	Low
Oswego	885	34304	554991	0.06	0.07	0.00	0.02	-7.15	0.00	0.02	0.01	-2.21	Low
Plano	886	8816	118178	0.07	0.05	0.00	0.02	-7.15	0.00	0.02	0.01	-2.22	Low
Plattville	887	622	29898	0.02	0.18	0.00	0.01	-7.15	0.00	0.01	0.01	-2.22	Low
Lisbon	888	1105	38626	0.03	0.11	0.00	0.01	-7.15	0.00	0.01	0.01	-2.23	Low
Millbrook	889	577	13323	0.04	0.03	0.00	0.00	-7.15	0.00	0.00	0.00	-2.26	Low
Newark	890	939	58029	0.02	0.04	0.00	0.00	-7.15	0.00	0.00	0.00	-2.27	Low
Boulder Hill	891	3857	75346	0.05	0.01	0.00	0.00	-7.15	0.00	0.00	0.00	-2.28	Low

Illinois Statewide Flood Hazard Assessment

(Appendix E – Jurisdictional Flood-Exposure, -Loss, and -Vulnerability Results for the Levees Fail Scenarios)

Town/City	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Loss Index	Floodplain Area Index	SoVI Score	SoVI Index	Levee Safety Index	Flood Score	Flood Vulnerability Index	Z Score	Flood Vulnerability Rating
Mound City	1	13772	32661	0.42	1.00	0.99	1.59	0.63	0.33	2.95	1.00	2.27	High
Cairo	2	79023	447935	0.18	0.40	0.99	4.75	1.00	0.33	2.73	0.91	1.86	High
Sauget	3	140104	588351	0.24	0.55	1.00	1.68	0.64	0.33	2.52	0.83	1.48	High
Fairmont City	4	49187	215179	0.23	0.53	1.00	1.68	0.64	0.33	2.50	0.82	1.44	High
Madison	5	117252	735051	0.16	0.36	1.00	1.68	0.64	0.33	2.33	0.76	1.12	High
Mounds	6	16790	70373	0.24	0.55	0.78	1.59	0.63	0.33	2.29	0.74	1.05	High
Brooklyn	7	6705	52431	0.13	0.28	0.99	1.68	0.64	0.33	2.24	0.72	0.96	Elevated
Venice	8	52721	300901	0.18	0.40	1.00	-0	0.44	0.33	2.16	0.69	0.82	Elevated
East St. Louis	9	282232	2755685	0.10	0.22	0.97	1.68	0.64	0.33	2.16	0.69	0.81	Elevated
East Carondelet	10	3952	25681	0.15	0.35	1.00	1.68	0.64	0.17	2.14	0.68	0.78	Elevated
Washington Park	11	36813	442926	0.08	0.17	1.00	1.68	0.64	0.33	2.14	0.68	0.78	Elevated
Alorton	12	19290	290334	0.07	0.13	1.00	1.68	0.64	0.33	2.10	0.67	0.71	Elevated
Centreville	13	40824	548886	0.07	0.15	0.97	1.68	0.64	0.33	2.09	0.66	0.68	Elevated
East Alton	14	198632	645940	0.31	0.72	0.73	-0	0.44	0.17	2.05	0.65	0.61	Elevated
Pontoon Beach	15	94420	773112	0.12	0.27	1.00	-0	0.44	0.33	2.04	0.64	0.59	Elevated
Prairie du Rocher	16	13810	66295	0.21	0.48	0.83	0.88	0.54	0.17	2.02	0.64	0.56	Elevated
Cahokia	17	125837	1372480	0.09	0.19	1.00	1.68	0.64	0.17	2.00	0.63	0.51	Elevated
Dupo	18	55373	476165	0.12	0.25	0.92	1.68	0.64	0.17	1.98	0.62	0.48	Average
Granite City	19	380798	3984201	0.10	0.20	1.00	-0	0.44	0.33	1.97	0.62	0.47	Average
Mitchell	20	9930	133522	0.07	0.15	1.00	-0	0.44	0.33	1.92	0.60	0.37	Average
Hartford	21	15849	123980	0.13	0.28	1.00	-0	0.44	0.17	1.88	0.58	0.30	Average
Rosiclare	22	12852	53684	0.24	0.55	0.25	3.91	0.90	0.17	1.87	0.58	0.28	Average
Brookport	23	22364	104126	0.21	0.49	1.00	-3.7	0.00	0.33	1.83	0.56	0.20	Average
Collinsville	24	172400	889822	0.19	0.44	0.41	1.68	0.64	0.33	1.83	0.56	0.20	Average
South Roxana	25	14226	146188	0.10	0.21	1.00	-0	0.44	0.17	1.81	0.55	0.17	Average
Caseyville	26	47826	477856	0.10	0.21	0.61	1.68	0.64	0.33	1.79	0.55	0.13	Average
Hull	27	27	1714	0.02	0.01	1.00	1.43	0.61	0.17	1.78	0.54	0.12	Average

Town/City	Rank	Total Losses ($Thousands)	Total Exposure ($Thousands)	Loss Ratio	Loss Index	Floodplain Area Index	SoVI Score	SoVI Index	Levee Safety Index	Flood Score	Flood Vulnerability Index	Z Score	Flood Vulnerability Rating
Roxana	28	46614	330065	0.14	0.31	0.85	-0	0.44	0.17	1.77	0.54	0.09	Average
Golconda	29	8806	51012	0.17	0.39	0.27	4.11	0.92	0.17	1.75	0.53	0.06	Average
New Athens	30	18539	95163	0.19	0.45	0.45	1.68	0.64	0.17	1.70	0.51	-0.04	Average
Wood River	31	141050	1085939	0.13	0.29	0.79	-0	0.44	0.17	1.68	0.50	-0.08	Average
Beardstown	32	96735	596147	0.16	0.37	0.75	-0.6	0.36	0.17	1.64	0.49	-0.14	Average
Fulton	33	60417	336342	0.18	0.41	0.58	-0.4	0.39	0.17	1.55	0.45	-0.31	Average
Milan	34	198222	910668	0.22	0.50	0.50	-0.6	0.36	0.17	1.54	0.45	-0.34	Average
New Canton	35	53	4133	0.01	0.00	0.74	1.43	0.61	0.17	1.52	0.44	-0.37	Average
Columbia	36	40357	349101	0.12	0.25	0.37	1.68	0.64	0.17	1.42	0.40	-0.54	Low
East Moline	37	136188	878160	0.16	0.35	0.54	-0.6	0.36	0.17	1.41	0.40	-0.56	Low
East Peoria	38	262134	1339751	0.20	0.45	0.29	-1.6	0.25	0.33	1.32	0.36	-0.72	Low
Rock Island	39	375380	1945704	0.19	0.44	0.27	-0.6	0.36	0.17	1.24	0.33	-0.89	Low
Alton	40	81295	447550	0.18	0.41	0.21	-0	0.44	0.17	1.22	0.32	-0.91	Low
Edwardsville	41	14806	444786	0.03	0.05	0.31	-0	0.44	0.33	1.12	0.29	-1.09	Low
Glen Carbon	42	7646	141969	0.05	0.10	0.23	-0	0.44	0.33	1.10	0.27	-1.15	Low
Galena	43	62928	325605	0.19	0.44	0.10	-0.9	0.33	0.17	1.04	0.25	-1.25	Low
Mount Carmel	44	20853	176728	0.12	0.26	0.18	-0.1	0.42	0.17	1.02	0.25	-1.28	Low
Harrisburg	45	66519	639258	0.10	0.22	0.43	-2.1	0.19	0.17	1.01	0.24	-1.31	Low
Maryville	46	2135	63494	0.03	0.05	0.15	-0	0.44	0.33	0.97	0.23	-1.37	Low
Kinderhook	47	23	557	0.04	0.07	0.07	1.43	0.61	0.17	0.91	0.20	-1.49	Low
Rosewood Heights	48	7316	87221	0.08	0.17	0.00	-0	0.44	0.17	0.78	0.15	-1.74	Low
Bethalto	49	4856	150569	0.03	0.05	0.05	-0	0.44	0.17	0.70	0.12	-1.88	Low
DeKalb	50	47843	750252	0.06	0.12	0.02	-3	0.08	0.17	0.39	0.00	-2.44	Low

Illinois Statewide Flood Hazard Assessment

(Appendix F – Locally Owned Essential and Critical Facilities within the 100-year Floodplain)

County	Jurisdiction	Facility Name	Facility Type
Adams	N/A	N/A	N/A
Alexander	Cairo	Emerson Elementary School	School
	Tamms	Egyptian Elementary, Middle, and High School	School
	McClure	Shawnee Elementary School South	School
	McClure	McClure Pre-school	School
	McClure	McClure/East Cape Fire Department	Fire Station
	Tamms	Tamms Fire Department	Fire Station
	Cairo	Cairo Auxiliary Fire Station	Fire Station
	Tamms	H and S Care Center	Care Facilities
	Cairo	Illinois American Water Company	Potable Water Treatment Facility
	Cairo	City of Cairo Sewage Treatment Plant	Waste Water Treatment Facility
	East Cape Girardeau	East Cape Girardeau Sewage Treatment Plant	Waste Water Treatment Facility
	Tamms	Village of Tamms Sewage Treatment Plant	Waste Water Treatment Facility
	Thebes	Village of Thebes Sewage Treatment Plant	Waste Water Treatment Facility
Bond	Panama	Panama STP	Waste Water Treatment Facility
Boone	N/A	N/A	N/A
Brown	N/A	N/A	N/A
Bureau	Bureau Junction	Bureau Junction STP	Waste Water Treatment Facility
	Sheffield	Sheffield STP	Waste Water Treatment Facility
	Tiskilwa	Tiskilwa STP	Waste Water Treatment Facility
	Walnut	Bureau Valley North	School
Calhoun	Kampsville	Kampsville STP	Waste Water Treatment Facility
	Kampsville	North Calhoun Fire Prot. District	Fire Station
Carroll	Milledgeville	212 Washington	Waste Water Treatment Facility
	Mount Carroll	Point Rock Park	Waste Water Treatment Facility
	Savanna	101 Main Street	Waste Water Treatment Facility
	Savanna	Savanna Fire Department	Fire Station
Cass	Virginia	Cass County Health Clinic	Care Facilities
	Virginia	Cass County Health Department	Care Facilities
	Chandlerville	Chandlerville Fire Department	Fire Station
	Chandlerville	Chandlerville Village Hall	Police Facility
Champaign	Broadlands	Heritage High School	School

County	Jurisdiction	Facility Name	Facility Type
	Urbana	Will 580	Communication Facility
	Champaign County	Prairie View Estates Water Treatment Plant	Potable Water Treatment Facility
	Fisher	Fisher Sewerage Treatment Plant	Waste Water Treatment Facility
	Mahomet	Sangamon Valley PWD STP	Waste Water Treatment Facility
Christian	Kincaid	Kincaid Sewerage Treatment Plant	Waste Water Treatment Facility
	Sangamon County	Panhandle Eastern-Sangamon Co	Natural Gas Facility
Clark	N/A	N/A	N/A
Clay	N/A	N/A	N/A
Clinton	Hoffman	Trinity Lutheran School	School
	Breese	Breese Fire Department	Fire Station
	Bartelso	Bartelso Sewerage treatment Plant	Waste Water Treatment Facility
	Carlyle	Carlyle Sewerage treatment Plant	Waste Water Treatment Facility
	Damiansville	Damiansville Sewerage treatment Plant	Waste Water Treatment Facility
	Germantown	Germantown Sewerage treatment Plant	Waste Water Treatment Facility
	Hoffman	Hoffman Sewerage treatment Plant	Waste Water Treatment Facility
	New Baden	New Baden Sewerage treatment Plant	Waste Water Treatment Facility
	Hoffman	Natural Gas Pipeline Co. of America	Natural Gas Facility
Coles	Mattoon	Mattoon STP	Waste Water Treatment Facility
Cook	Hanover	Anne Fox Elementary School	School
	Winnetka	Carleton W Washburne School	School
	Winnetka	Crow Island Elementary School	School
	Palos Heights	Elim Christian School	School
	Melrose Park	Grant Elementary School	School
	Lansing	Heritage Middle School	School
	Palos Heights	Incarnation Elementary School	School
	Dixmoor	Martin L King Elementary School	School
	Northfield	New Trier Township High School Northfield	School
	Des Plaines	North Elementary School	School
	Wheeling	Oliver W Holmes Middle School	School
	Chicago Ridge	Ridge Lawn Elementary School	School
	Dixmoor	Rosa L Parks Middle School	School
	Matteson	Sieden Prairie Elementary School	School

County	Jurisdiction	Facility Name	Facility Type
	Harvey	Whittier Elementary School	School
	Rolling Meadow	Willow Bend Elementary School	School
	Matteson	Sieden Prairie Elementary School	School
	Bellwood	Bellwood Fire Department	Fire Station
	Country Club Hills	City of Country Club Hills Fire & EMS	Fire Station
	Des Plaines	Des Plaines Fire Department	Fire Station
	Dixmoor	Dixmoor Fire Department	Fire Station
	Melrose Park	Melrose Park Fire Department	Fire Station
	Posen	Posen Fire Department	Fire Station
	Bellwood	Bellwood Police Chief	Police Facility
	Dixmoor	Dixmoor Village Police Department	Police Facility
	Bellwood	Memorial Park District Police	Police Facility
	Posen	Posen Village Police Department	Police Facility
	Stone Park	Stone Park Police Department	Police Facility
	Arlington Heights	ExxonMobil Oil Corporation Des Plaines	Oil Facility
	Mount Prospect	Union Oil Co. of California-Des Plaines	Oil Facility
	Chicago Heights	Natural Gas Pipeline Company of America	Natural Gas Facility
Crawford	Hutsonville	Hutsonville STP	Waste Water Treatment Facility
	Palestine	Palestine STP	Waste Water Treatment Facility
Cumberland	Greenup	Greenup Sewerage Treatment Plant	Waste Water Treatment Facility
De Witt	Farmer City	Farmer City Sewerage Treatment Plant	Waste Water Treatment Facility
	Clinton	Clinton Sanitary District Sewerage Treatment Plant	Waste Water Treatment Facility
Dekalb	N/A	N/A	N/A
Douglas	Villa Grove	Villa Grove High School	School
	Villa Grove	Villa Grove Elementary School	School
	Villa Grove	Villa Grove Jr. High School	School
	Tuscola	Bear Creek School	School
	Arthur	Arthur STP	Waste Water Treatment Facility
	Newman	Newman STP	Waste Water Treatment Facility
	Villa Grove	Villa Grove STP	Waste Water Treatment Facility
	Villa Grove	Villa Grove Police Department	Police Facility
	Villa Grove	Villa Grove Fire Department	Fire Station

County	Jurisdiction	Facility Name	Facility Type
Du Page	Downers Grove	Family Life Program	School
	Lisle	Lisle High School	School
	Roselle	Medinah Middle School	School
	Wheaton	Mont Child Development Day Care Center	School
	Glendale Heights	Reskin Elementary School	School
	Woodridge	St Scholastica Elementary School	School
	Downers Grove	Downers Grove Sanitary District	Waste Water Treatment Facility
	Woodridge	DuPage County Woodridge Sewage Treatment	Waste Water Treatment Facility
	Wayne	DuPage County-Cascade STP	Waste Water Treatment Facility
	Itasca	DuPage County-Nordic Park STP	Waste Water Treatment Facility
	Lombard	Glenbard Waste Water Authority-Lombard	Waste Water Treatment Facility
	Glendale Heights	Glendale Heights	Waste Water Treatment Facility
	Hanover Park	Hanover Park STP Number 1	Waste Water Treatment Facility
	Villa Park	Salt Creek Sanitary District	Waste Water Treatment Facility
	Lisle	Lisle Village Police Department	Police Facility
Edgar	N/A	N/A	N/A
Edwards	Browns	Browns Sewerage Treatment Plant	Waste Water Treatment Facility
Effingham	N/A	N/A	N/A
Fayette	Vandalia	Vandalia STP	Waste Water Treatment Facility
Ford	N/A	N/A	N/A
Franklin	Royalton	Royalton STP	Waste Water Treatment Facility
	West Frankfort	West Frankfort STP	Waste Water Treatment Facility
	Zeigler	Zeigler STP	Waste Water Treatment Facility
Fulton	Avon	Avon Water Treatment Plant	Waste Water Treatment Facility
	Banner	Banner Sewer Treatment Plant	Waste Water Treatment Facility
	Avon	Avon Sewer Treatment Plant	Waste Water Treatment Facility
	London	London Mills Sewer Treatment Plant	Waste Water Treatment Facility
Gallatin	N/A	N/A	N/A
Greene	Hardin	Hardin Waste Water Treatment Facility	Waste Water Treatment Facility
Gurrndy	Morris	Morris Sewage Treatment Plant	Waste Water Treatment Facility
Hamilton	N/A	N/A	N/A
Hancock	Dallas City	Dallas City STP	Waste Water Treatment Facility

County	Jurisdiction	Facility Name	Facility Type
Hardin	Elizabethtown	Elizabethtown Sewerage Treatment Plant	Waste Water Treatment Facility
Henderson	Carman	Gulf Port Police Department	Police Facility
Henry	Geneseo	WGEN 1500	Communication Facility
	Geneseo	WAXR CH 201	Communication Facility
	Geneseo	City of Geneseo Sewage Treatment Plant	Waste Water Treatment Facility
Iroquois	Wastseka	Nettie Davis Elementary	School
	Wastseka	Wanda Kendall Elementary School	School
	Gilman	Iroquois West Elementary School / Gilman	School
	Woodland	Woodland Elementary School	School
	Cissna Park	Cissna Park Sewer Treatment	Waste Water Treatment Facility
	Gilaman	Gilman-North Sewer Treatment	Waste Water Treatment Facility
	Wastseka	Watseka Sewer Treatment Plant	Waste Water Treatment Facility
	Wastseka	WGFA 1360	Communication Facility
	Wastseka	WGFA-FM CH 231	Communication Facility
Jackson	Jacob	Christ Lutheran School	School
	Grand Tower	Shawnee Elementary School North	School
	Gorham	Fountain Bluff FPA	Fire Station
	Gorham	Gorham Fire Department	Fire Station
	McClure	McClure-East Cape Girardeau Fire Protection District	Fire Station
	Grand Tower	Tower Rock Fire Protection District	Fire Station
	Carbondale	Carbondale Northwest Waste Water Treatment	Waste Water Treatment Facility
	Gorham	Gorham SD STP	Waste Water Treatment Facility
	Grand Tower	Grand Tower STP	Waste Water Treatment Facility
	Dowell	Sewer Lift Station	Waste Water Treatment Facility
	Carbondale	Carbondale WTP	Potable Water Treatment Facility
	Gorham	Kinkaid Water District Tower	Potable Water Treatment Facility
	Dowell	Dowell Village Police Department	Police Facility
	Gorham	Gorham Police Department	Police Facility
	Grand Tower	Grand Tower Police Department	Police Facility
	Grand Tower	Ameren Corporation Grand Tower Power Station	Electric Power Facility
Jasper	N/A	N/A	N/A

County	Jurisdiction	Facility Name	Facility Type
Jefferson	Mt. Vernon	Mount Vernon Wastewater Treatment Facility	Waste Water Treatment Facility
Jersey	Grafton	IL Youth Center – Pere Marquette	School
Jo Daviess	East Dubuque	KDTH 1370	Communication Facility
	Galena	Galena Sewage Treatment Plant	Waste Water Treatment Facility
	Hanover	Hanover STP	Waste Water Treatment Facility
Johnson	Belknap	Belknap Fire Department	Fire Station
	Belknap	Belknap WTP	Potable Water Treatment Facility
	Vienna	Vienna WTP	Potable Water Treatment Facility
Kane	Aurora	WKKD 1580	Communication Facility
	Dundee	East Dundee Police Department	Police Facility
Kankakee	Kankakee	Bishop McNamara High School	School
	Kankakee	Grace Baptist Academy	School
	Aroma Park	Aroma Fire Protection District	Fire Station
	Saint Anne	Sun River Terrace STP	Waste Water Treatment Facility
Kendall	Seward Township	WQAG719	Communication Facility
	Minooka	WNSK382	Communication Facility
	Seward Township	WPIK959	Communication Facility
	Oswego	WQEX644	Communication Facility
	Oswego	Oswego Tower and Pump House	Potable Water Treatment Facility
	Plano	Old Miss House	Potable Water Treatment Facility
	Plano	Plano Sewerage Treatment Plant	Waste Water Treatment Facility
	Oswego	Fox Metro Lift Station	Waste Water Treatment Facility
Knox	Watage	Watage North Sewerage Treatment Plant	Waste Water Treatment Facility
	Watage	Watage South Sewerage Treatment Plant	Waste Water Treatment Facility
La Salle	Ottawa	City of Ottawa Sewage Treatment Plant	Waste Water Treatment Facility
	Peru	City of Peru Wastewater Treatment Plant	Waste Water Treatment Facility
	La Salle	La Salle WWTP City of	Waste Water Treatment Facility
	Mendota	Mendota Sewage Treatment Plant	Waste Water Treatment Facility
	Seneca	Seneca WWTP	Waste Water Treatment Facility
	Sheridan	Sheridan STP	Waste Water Treatment Facility

County	Jurisdiction	Facility Name	Facility Type
	Mendota	Mendota WTP 1	Potable Water Treatment Facility
	Mendota	Mendota WTP 2	Potable Water Treatment Facility
	Ottawa	Ottawa WTP-Well 10	Potable Water Treatment Facility
	Peru	City of Peru Generating Station	Electric Power Facility
	Peru	Peru Municipal Light Plant	Electric Power Facility
	Utica	Utica Community FPD	Fire Station
	Utica	Utica Police Department	Police Facility
	Mendota	Mendota Police Department	Police Facility
	Earlville	Earlville Jr High & High School	School
	Earlville	Earlville Elem School	School
	Ottawa	Ottawa Township High School	School
	Seneca	Seneca High School	School
	Ottawa	Central Elem School	School
Lake	Gurnee	Gurnee Grade School	School
	Highland park	Highland Park Montessori	School
	Gurnee	Gurnee Village Police Department	Police Facility
	Round Lake	Round Lake Heights Police Dept.	Police Facility
	Gurnee	Gurnee Fire Dept.	Fire Station
	Waukegan	WKRC 1220	Communication Facility
	Waukegan	WXLC CH 272	Communication Facility
	Libertyville	Lake County Dept. of Public Works	Waste Water Treatment Facility
	Barrington	Port Barrington Shores	Waste Water Treatment Facility
Lawrence	Lawrence	Indian Refining LTD Partnership	Oil Facility
	Lawrence	American Western Refining LP	Oil Facility
	Lawrence	Texaco Refining MKTG	Oil Facility
	Lawrence	Birds-Pinkstaff WTP	Potable Water Treatment Facility
	Lawrence	Lawrenceville WTP	Potable Water Treatment Facility
	Lawrence	Lawrenceville Sewage Treatment Plant	Waste Water Treatment Facility
	Sumner	Sumner Sewage Treatment Plant	Waste Water Treatment Facility
Lee	Dixon	Dixon High School	School
	Nelson	Nelson Elem School	School
	Amboy	Amboy Fire Department	Fire Station

County	Jurisdiction	Facility Name	Facility Type
Livingston	Forrest	Prairie Central Upper Elementary	School
	Pontiac	Washington Elementary School	School
	Pontiac	Pontiac Jr. High School	School
	Dwight	Dwight WWTP	Waste Water Treatment Facility
	Fairbury	Rainbow Radio of Livingston	Communication Facility
Logan	Lincoln	IL American Water Company, Lincoln Water Treatment Plant	Potable Water Treatment Facility
Macon	Decatur	Sanitary District of Decatur	Waste Water Treatment Facility
Macoupin	Carlinville	Carlinville Sewerage Treatment Plant	Waste Water Treatment Facility
Madison	Maryville	Maryville Fire Department	Fire Station
	Marine	Marine Fire Protection District	Fire Station
	Troy	Troy Fire Protection District	Fire Station
	Alhambra	Alhambra Community Fire Protection District	Fire Station
	New Douglas	New Douglas Community Volunteer Fire Department	Fire Station
	St. Jacob	St. Jacob Township Fire Protection District	Fire Station
	Highland	Grant Fork Volunteer Fire Department	Fire Station
	Hamel	Hamel Community Fire Protection District	Fire Station
	Troy	Troy Police Department	Police Facility
	Maryville	Maryville Police Department	Police Facility
	Marine	Marine Village Police Department	Police Facility
	Hamel	Hamel Elementary School	School
	Alhambra	Alhambra Primary School	School
	Highlands	Grant Fork Upper Elementary School	School
	New Douglas	New Douglas Middle and Elementary School	School
	Granite City	Central Baptist School	School
	Troy	St. Paul Lutheran School	School
	Troy	Dewey Street Campus	School
	Troy	W.S. Freeman Elementary School	School
	Marine	Marine Elementary School	School
	St. Jacob	St. Jacob Elementary School	School
	Collinsville	Kreitner Elementary School	School
	East Alton	East Alton Middle School	School
	East Alton	Eastwood Elementary School	School

County	Jurisdiction	Facility Name	Facility Type
	Collinsville	Collinsville Waste Water Treatment Facility	Waste Water Treatment Facility
	Granite City	Granite City Waste Water Treatment Plant	Waste Water Treatment Facility
	Hamel	Hamel Sewerage Treatment Plant	Waste Water Treatment Facility
	New Douglas	New Douglas Sewerage Treatment Plant	Waste Water Treatment Facility
	Madison County	KMOX 1120	Communication Facility
	Wood River	KFNS 590	Communication Facility
	Madison County	KXEN 1010	Communication Facility
	Madison County	KSLG 1380	Communication Facility
Marion	Centralia	Centralia Water Treatment Plant	Potable Water Treatment Facility
	Central City	Central City Sewage Treatment Plant	Waste Water Treatment Facility
Marshall	Lacon	Lacon Sewerage Treatment Plants	Waste Water Treatment Facility
	Sparland	Sparland Sewerage Treatment Plants	Waste Water Treatment Facility
	Wenona	Wenona Sewerage Treatment Plants	Waste Water Treatment Facility
Mason	Bath	Bath Waste Water Treatment Plant	Waste Water Treatment Facility
Massac	Brookport	Brookport Waste Water Treatment Facility	Waste Water Treatment Facility
	Joppa	Electric Energy Incorporated	Electric Power Facility
	Mermet	WPWZ634	Communication Facility
	Joppa	WQIY354	Communication Facility
	Metropolis	WPHE985	Communication Facility
	Big Bay	KNNU475	Communication Facility
McDonough	N/A	N/A	N/A
McHenry	Algonquin	Village of Algonquin Sewerage Treatment Plant	Waste Water Treatment Facility
	McHenry	City of McHenry Sewerage Treatment Plant	Waste Water Treatment Facility
	Richmond	Richmond Sewerage Treatment Plan	Waste Water Treatment Facility
McLean	N/A	N/A	N/A
Menard	Tallula	Tallual Water Treatment Plant	Waste Water Treatment Facility
	Greenville	KAG909	Communication Facility
Mercer	N/A	N/A	N/A
Monroe	Columbia	The Bridges of Columbia	Care Facilities
	Belknap	Maeystown Water Treatment Plant	Potable Water Treatment Facility
	Columbia	Columbia Sewage Treatment Plant	Waste Water Treatment Facility

County	Jurisdiction	Facility Name	Facility Type
	Valmeyer	Valmeyer Sewerage Treatment Plant	Waste Water Treatment Facility
Montgomery	Coffeen	Coffeen Sewerage Treatment Plant	Waste Water Treatment Facility
	Panama	Panama Sewerage Treatment Plant	Waste Water Treatment Facility
	Litchfield	Litchfield WTP	Potable Water Treatment Facility
Morgan	Meredosia	Meredosia Fire Protection District	Fire Station
	Cambria	Cambria Volunteer Fire Department	Fire Station
	Arenzville	Arenzville Sewerage Treatment Plant	Waste Water Treatment Facility
	Jacksonville	Jacksonville Sewage Treatment Plant	Waste Water Treatment Facility
	Meredosia	North Jacksonville School	School
	Jacksonville	Meredosia-Chambersburg Elementary School	School
	Meredosia	Ameren Energy Generating Company Meredosia	Electric Power Facility
Moultrie	Arthur	Arthur Fire District	Fire Station
	Dalton City	Dalton City Sewerage Treatment Plant	Waste Water Treatment Facility
Olge	N/A	N/A	N/A
Peoria	Chillicothe	Chillicothe Community Fire Department	Fire Station
	Chillicothe	Chillicothe SD STP	Waste Water Treatment Facility
	Elmwood	Elmwood STP	Waste Water Treatment Facility
	Peoria	Greater Peoria SAN & DISP District	Waste Water Treatment Facility
	Peoria	The Salvation Army Child Care	School
	Bartonville	Central Illinois Light Company Edward	Electric Power Facility
	Kingston Mines	Kingston Mines Water Treatment Plant	Potable Water Treatment Facility
	Peoria	IL American Water-Peoria MN	Potable Water Treatment Facility
	Peoria	IL American Water-Peoria SAN	Potable Water Treatment Facility
	Peoria	Sheriff's Department- Civil Process	Police Facility
	Chillicothe	Chillicothe Police Department	Police Facility
Perry	N/A	N/A	N/A
Piatt	Atwood	Atwood Sewerage Treatment Plant	Waste Water Treatment Facility
	Bement	Bement Sewerage Treatment Plant	Waste Water Treatment Facility
	Monticello	Monticello Waste Water Treatment Plant	Waste Water Treatment Facility
Pike	Pearl	Pearl Volunteer Fire Department	Fire Station
	Nebo	Nebo Sewerage Treatment Plant	Waste Water Treatment Facility

County	Jurisdiction	Facility Name	Facility Type
Pope	N/A	N/A	N/A
Pulaski	Karnak	Karnak City Fire Department	Fire Station
	Mound City	Mound City Sewerage Treatment Plant	Waste Water Treatment Facility
	Karnak	Karnak Waste Water Treatment Plant	Potable Water Treatment Facility
	Karnak	Village of Karnak Police Department	Police Facility
Putnam	Hennepin	Hennepin PWD Sewerage Treatment Plant	Waste Water Treatment Facility
Randolph	Baldwin	Baldwin Waste Water Treatment Plant	Potable Water Treatment Facility
Richland	N/A	N/A	N/A
Rock Island	Andalusia	Andalusia Waste Water Treatment Plant	Waste Water Treatment Facility
	Moline	Moline South Treatment Plant	Waste Water Treatment Facility
	Moline	North Slope Treatment Plant	Waste Water Treatment Facility
	Carbon Cliff	Phoenix Program	School
	Moline	Butterworth Elem School	School
	Moline	Horace Mann Elem School	School
	East Moline	City of East Moline Water Plant	Potable Water Treatment Facility
	Moline	Mid-American Energy Company Moline COMBUS	Electric Power Facility
	Hillsdale	Hillsdale Fire Protection District	Fire Station
	Rock Island	Rock Island Fire Department	Fire Station
	Andalusia	Andalusia Fire Protection District	Fire Station
Saline	Harrisburg	West Side Primary School	School
	Harrisburg	Saline Care Center	Care Facilities
	Eldorado	Fountain View Nursing Home	Care Facilities
	Harrisburg	Brookstones Estates	Care Facilities
	Carrier Mills	Carrier Mills Sewerage Treatment Plant	Waste Water Treatment Facility
	Galatia	Galatia Sewerage Treatment Plant	Waste Water Treatment Facility
	Muddy	Muddy Sewerage Treatment Plant	Waste Water Treatment Facility
Sangamon	Auburn	Auburn Sewerage Treatment Plant	Waste Water Treatment Facility
	Dawson	Dawson Water Treatment Plant	Potable Water Treatment Facility
	Buffalo	Mechanicsburg-Buffalo WC	Potable Water Treatment Facility
Schuyler	Browning	Browning Fire Department	Fire Station
Scott	N/A	N/A	N/A

County	Jurisdiction	Facility Name	Facility Type
Shelby	N/A	N/A	N/A
St. Clair	Mascoutah	Summerfield Lebanon Mascoutah Water Treatment Facility	Potable Water Treatment Facility
	Lebanon	Lebanon Sewage Treatment Plant	Waste Water Treatment Facility
Stark	N/A	N/A	N/A
Stephenson	Freeport	Taylor Park Elementary School	School
	Cedarville	Cedarville Sewerage Treatment Plant	Waste Water Treatment Facility
	Freeport	Freeport Sewerage Treatment Plant	Waste Water Treatment Facility
	Orangeville	Orangeville Sewerage Treatment Plant	Waste Water Treatment Facility
	Pearl City	Pearl city Sewerage Treatment Plant	Waste Water Treatment Facility
Tazewell	East Peoria	City of East Peoria Wastewater Treatment	Waste Water Treatment Facility
	Deer Creek	Deer Creek Sewerage Treatment Plant	Waste Water Treatment Facility
	Green Valley	Green Valley Sewerage Treatment Plant	Waste Water Treatment Facility
	Hopedale	Hopedale Sewerage Treatment Plant	Waste Water Treatment Facility
	Minier	Minier Sewerage Treatment Plant	Waste Water Treatment Facility
	Pekin	City of Pekin Sewerage Treatment Plant Number 1	Waste Water Treatment Facility
	South Pekin	South Pekin Sewerage Treatment Plant	Waste Water Treatment Facility
	Washington	Washington Sewerage Treatment Plant	Waste Water Treatment Facility
	Pekin	WVEL 1140	Communication Facility
	East Peoria	Central Illinois Light Company	Electric Power Facility
	East Peoria	East Peoria High School	School
	East Peoria	Central Jr. High School	School
	East Peoria	Caterpillar Inc. East Peoria Fire Dept.	Fire Station
	East Peoria	East Peoria Fire Department	Fire Station
	East Peoria	East Peoria Police Dept.	Police Facility
Union	Jonesboro	Jonesboro Healthcare & Rehab	Care Facilities
	Wolf Lake	Shawnee Jr.- Sr. High- School	School
	Dongola	Dongola Elementary-High School	School
	Dongola	Dongola Pre-K	School
	Wolf Lake	Wolf Lake Pre-K	School
	Wolf Lake	Ware-Wolf lake Fire Protection District	Fire Station
	Wolf Lake	Ware-Wolf Lake Fire Department	Fire Station
	Wolf Lake	Shawnee Valley Water District	Potable Water Treatment Facility

County	Jurisdiction	Facility Name	Facility Type
	Jonesboro	Anna and Jonesboro Water Commission	Potable Water Treatment Facility
	Jonesboro	Anna and Jonesboro Water Commission	Potable Water Treatment Facility
	Jonesboro	Ware Sanitary Corporation	Waste Water Treatment Facility
	Wolf Lake	Wolf Lake SAN Corp Sewerage Treatment Plant	Waste Water Treatment Facility
Vermilion	Georgetown	Georgetown Water Treatment Plant	Potable Water Treatment Facility
	Hoopeston	Hoopeston Sewage Treatment Plant	Waste Water Treatment Facility
	Belgium	Westville-Belgium SD Waste Water Treatment Plant	Waste Water Treatment Facility
Wabash	N/A	N/A	N/A
Warren	N/A	N/A	N/A
Washington	Okawville	Okawille WTP	Potable Water Treatment Facility
	Wamac	Wamac Sewerage Treatment Plant	Waste Water Treatment Facility
Wayne	Fairfield	Fairfield Water Treatment Plant	Potable Water Treatment Facility
White	Crossville	Crossville Sewerage Treatment Plant	Waste Water Treatment Facility
	Mill Shoals	Mill Shoals Sewerage Treatment Plant	Waste Water Treatment Facility
Whiteside	Prophetstown	Prophetstown Sewerage Treatment Plant	Waste Water Treatment Facility
Will	Joliet	Joliet East Wastewater Treatment Plant	Waste Water Treatment Facility
	Joliet	City of Joliet Eastside Sewerage Treatment Plant	Waste Water Treatment Facility
	Lockport	City of Lockport Sewerage Treatment Plant	Waste Water Treatment Facility
	New Lenox	Village of New Lenox Sewerage Treatment Plant Number 1	Waste Water Treatment Facility
	Joliet	Joliet Police DEPT	Police Facility
	Channahon	Channahon Junior High School	School
	Channahon	Three Rivers School	School
	Joliet	Premier Academy High School	School
	Joliet	Premier Academy	School
	Joliet	Will County Safe School	School
	Joliet	Premier High School	School
	Joliet	Premier Academy Middle School	School
	Lockport	ST Joseph Elementary School	School
	Joliet	ST Peter Lutheran School	School
	Romeoville	Robert C Hill ELEM School	School
	Frankfort	Indian Trail ELEM School	School
	Lockport	Citizens UTIL CO-DRBY Meadow	Electric Power Facility

County	Jurisdiction	Facility Name	Facility Type
	Joliet	Midwest Generation LLC	Electric Power Facility
Williamson	Johnston City	Williamson County Fire Department - Station #5	Fire Station
	Marion	Marion Water Tower 5	Potable Water Treatment Facility
	Herrin	Our Lady-Mount Carmel School	School
	Colp	Colp Sewage Treatment Plant	Waste Water Treatment Facility
Winnebago	REGO, LTD (facility owner)	WGEZ 1490	Communication Facility
	South Beloit	South Beloit Fire and Rescue	Fire Station
	Rockford	New Milford Fire Protection District	Fire Station
	South Beloit	South Beloit Police Department	Police Facility
	South Beloit	St. Peter Catholic School	School
	Rockford	John Nelson Elem School	School
Woodford	Eureka	Eureka Waste Water Treatment Plant	Waste Water Treatment Facility
	Roanoke	Roanoke STP	Waste Water Treatment Facility
	Washburn	Washburn STP	Waste Water Treatment Facility

Appendix G: Illinois Statewide Flood Hazard Assessment – 2015

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ORI GIN AL PA PER

Assessing Illinois's flood vulnerability using Hazus-MH

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Abstract in this study, we developed a flood vulnerability index to help planners screen the relative flood vulnerability across the entire state of Illinois at the county, jurisdictional, and census block scales. Our flood vulnerability index was comprised of a deterministic flood loss assessment using the Federal Emergency Management Agency's Hazus-MH multi-hazard loss estimation software, coupled with a parametric social vulnerability index developed from US Census data. The flood-vulnerability screening revealed that approxi- mately half (46 %; 8500 km^2) of Illinois's 18,500 km^2 special flood hazard areas (i.e., 100-year floodplain) had low flood vulnerability (i.e., few people affected, with little or no flood losses). This finding substantially reduces the area that Illinois planners may need to focus their mitigation efforts. The relative flood vulnerability across the three spatial scales evaluated in this study generally mirrored each other (i.e., counties with high flood vul- nerability had a substantial number of its jurisdictions and census blocks with high flood vulnerability). However, the census block-level analysis revealed that counties and a sub- stantial number of jurisdictions with moderate-to-low relative flood vulnerability often had pockets (one to a few census blocks) of high relative flood vulnerability. This suggests flood-vulnerability screening should be performed to at least the census block scale to ensure pockets of vulnerability are not overlooked. Jurisdictional flood loss ratios (flood losses proportional to total floodplain exposure) in Illinois were generally largest in rural

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and relatively unprotected floodplain communities located along the state's large rivers. This suggests the economic impacts related to riverine flooding would be more severe in these rural jurisdictions, relative to their economic base, and likely exceed the economic resources these communities could assemble for flood recovery. The jurisdiction flood- vulnerability screening results indicated the primary driver of flood vulnerability was different between urban and rural communities. In urban jurisdictions, social vulnerability was the main driver in flood vulnerability where in the rural jurisdictions flood losses tended to be the primary driver. This suggests different mitigation strategies will likely need to be employed in urban versus rural jurisdictions in order to reduce flood vulnerability.

Keywords Flood-vulnerability assessment · Flood vulnerability index · Mitigation · Hazus-MH · Illinois

1 Introduction

Flooding is the most costly hazard in the USA and worldwide. Between 1993 and 2013, flood losses recorded in the National Oceanic and Atmospheric Administration's (NOAA's) National Climatic Data Center (NCDC) database exceed $200 billion, with $5.5 billion of these in Illinois alone (NOAA 2014). While flooding cannot be prevented, the impacts of flooding can be ameliorated.

In order to reduce flood losses and other hazard-related damages, the US Congress passed the Disaster Mitigation Act of 2000 (DMA 2000). One of the primary goals of the DMA 2000 was to encourage communities to undertake proactive hazard mitigation planning. Hazard mitigation planning (HMP) entails the development of pre-disaster plans, with the goals of reducing the damages and costs from future natural disasters. The overarching goal of such planning is to reduce vulnerability and increase resiliency of communities across the USA (Godschalk 2003; FEMA 2011; Frazier et al. 2013).

DMA 2000 requires states and counties to prepare HMPs in order to be eligible to receive Federal Emergency Management Agency (FEMA) hazard mitigation funds (Berke and Godschalk 2009; Frazier et al. 2010, 2013). DMA 2000 has established minimum requirements for HMPs which emphasize physical exposure and the identification of relevant mitigation actions for each natural hazard identified in a jurisdiction. While the requirements for assessing physical exposure are a first good step, probabilistic loss assessment coupled with socioeconomic vulnerability assessment could be more effective in targeted scarce mitigation funding (Frazier et al. 2010, 2013). To move toward more comprehensive flood hazard assessment, this paper describes construction of a flood vulnerability index (FVI) using FEMA's natural hazard loss estimation software (Hazus-MH), which can be used to systematically assess flood hazard and socioeconomic vulnerability across multiple spatial scales (e.g., census block, jurisdictional, and county scales). The modeling framework presented in this paper is intended to help planners screen flood vulnerability among locations and jurisdictions in order to target areas for more detailed flood hazard or mitigation assessment.

1.1 Social vulnerability

Social vulnerability refers to the characteristics of a person or a group and the circumstances that influence their capacity to anticipate, manage, or recover from the effects of a hazard (Wisner et al. 2004). Social vulnerability is often most pertinent after a hazardous event, when the different patterns of distress and recovery are observed among particular groups within the population such as the aged, poor, and minorities (Cutter et al. 2000; Heinz Center 2000; Cutter and Finch 2007). Economic status is also important consideration because a lack of access to economic resources can limit the ability of some socioeconomic groups to respond adequately to a disaster (Phillips et al. 2005; Masozera et al. 2007). These groups are often underprepared for an emergency, often reside in more hazardous locations, in substandard dwellings, have fewest resources, and lack knowledge and/or political efficacy to assert access to resources for recovery (National Resource Council [NRC] 2006). Social vulnerability analysis (SVA) describes social characteristics, vulnerability to hazards, and the distribution of tangible hazard effects.

SVA generally begins with a qualitative characterization of the study area, followed by identification of vulnerability drivers, development of a quantitative vulnerability model, and communication of findings to stakeholders (Polsky et al. 2007; Tate 2012). The model development stage usually involves the development of a social vulnerability index (SVI). The purpose of a SVI is to simplify the multi-dimensional complexity into a single metric. Development of a SVI involves successive stages, including the selection of demographics indicators, normalization of indicators to a common reference, and summation to a final value (Tate 2013).

There are three common designs of SVIs: deductive, hierarchical, and inductive models (Tate 2013). Deductive models generally contain less than ten vulnerability indicators, which are normalized and aggregated to an index (i.e., Cutter et al. 2000; Montz and Evans 2001; Wu et al. 2002; Collins et al. 2009; Lein and Abel 2010). Hierarchical models employ generally between 10 and 20 indicators, which are separated into sub-indices that share a common underlying dimension of vulnerability (e.g., Vincent 2004; Chakraborty et al. 2005; Flanagan et al. 2011; Mustafa et al. 2011). Within hierarchical models, individual indicators are aggregated into sub-indices, and sub-indices combined to formulate the SVI (Tate 2013). Inductive models start with a large set of indicators (>20), which are reduced to a smaller subset of uncorrelated latent factors using a principal component analysis (PCA). These factors are then combined to build an SVI. Inductive models were made popular

by the "social vulnerability index" (commonly referred to as SoVI; Cutter et al. 2003) and are the basis for the majority of many recent SVIs (e.g., Rygel et al. 2006; Borden et al. 2007; Burton and Cutter 2008; Myers et al. 2008; Fekete 2009, 2011; Burton 2010; Finch et al. 2010; Schmidtlein et al. 2010; Tate et al. 2010; Wood et al. 2010; Cutter et al. 2013).

Despite the broad interest in the need to quantitatively model social vulnerability, there is a lack of consensus regarding the optimum method(s) for constructing SVIs (Tate 2012). The absence of consensus for formulating SVIs is largely attributable to the lack of an accepted external validation data set(s) (Tate 2012; Burton 2015). Recent work by Tate (2012, 2013) has focused on internal validation of SVIs using global sensitivity and uncertainty analyses. The results of the global sensitivity analysis revealed that hierarchical SVI design was found to be the most accurate, while inductive SVI design was the most precise. In addition, deductive SVI design was found to be the most sensitive to the choice of transformation method, hierarchical design was most sensitivity to selection of weighting scheme, and inductive model design was most sensitive to indicator set and scale of analysis. Tate's (2013) SVI uncertainty analyses revealed that SVI precision decreases with an increase in vulnerability rank.

1.2 Flood vulnerability and flood assessment vulnerability

In the literature, definitions and quantification of flood vulnerability have been proposed by several investigators (e.g., van der Veen and Logtmeijer 2005; Conner and Hiroki 2005; Balica et al. 2009, 2013; Karmakar et al. 2010). The goal of this investigation was to develop a framework from which to screen flood vulnerability over a large geographic region in order to help inform flood hazard assessment and mitigation efforts. The definition of flood vulnerability best suited to this investigation's goal is from Balica et al. (2013): "the extent to which a system is susceptible to floods due to exposure, a perturbation in conjunction with its ability to cope, recover, or basically adapt." This definition can be expressed mathematically as

$$\text{Flood Vulnerability} = \text{Exposure} + \text{Susceptibility} + \text{Social Vulnerability} \quad (1)$$

and serves as the tenet for development of our FVI. In this definition, exposure is defined as the estimated value of the buildings that are present in the areas potentially threatened by flooding. Susceptibility is defined as the probability of the human population affected and associated building stock damaged within the floodplain during a flood of a particular magnitude (Balica et al. 2009). Previous flood-vulnerability assessments can be grouped into two general approaches, deterministic and parametric. Deterministic approaches are those which use physically based modeling methods to estimate probability of a particular flood event and damage assessment models to quantify economic consequences which together provide an assessment of flood risk for a given area. Parametric approaches use readily available information, such as census and geospatial data (i.e., land cover, infrastructure, and precipitation) to develop a relative assessment of the flood vulnerability within a given area where the results rely on assumptions that cannot be validated from observed data (Balica et al. 2013). To parameterize Eq. 1, we developed a hybrid modeling framework in which we employ a deterministic modeling approach to estimate the physical flood hazard and a parametric model to estimate human vulnerability to the flood hazard using a SVI.

2 Methods

Our hybrid modeling framework evaluates relative flood vulnerability using a FVI at three spatial scales: census blocks, incorporated communities, and counties. Using the SFHA (B1 % annual chance flood) mapped on FIRMs, flood exposure and losses were estimated using FEMA's Hazus-MH flood loss modeling software. Census-based demographic data from Hazus-MH were employed to develop a parametric model (a SVI) from which to assess social vulnerability to flooding. Assessments of flood losses and social vulnerability were combined to produce a FVI to assess relative flood vulnerability across the state of Illinois.

2.1 Study region

Illinois is approximately 146,000 km^2 in size and is divided into 102 counties that contain

*1370 incorporated jurisdictions. The state is bounded by three large rivers: The Mississippi River on the west, the Ohio River along the south, and the Wabash River along the state's eastern boundary. Within Illinois, there are river systems with extensive floodplains, including the Illinois, Kaskaskia, Sangamon, Rock, and Green Rivers.

Floodplain management in Illinois is largely driven by compliance with the US National Flood Insurance Program (NFIP). The NFIP was established by the US Congress in 1968 to slow flood disaster relief costs by offering federal flood insurance to property owners pro- vided that their communities regulate future development in the special flood hazard areas (SFHA's; 100-year floodplain). The US Federal Emergency Management Agency (FEMA) has generated Flood Insurance Rate Maps (FIRMs) to delineate flood hazard areas, identify flood insurance rate zones, and in areas where detailed hydrologic and hydraulic modeling are performed, estimate flood water surface elevations (WSELs). On the FIRMs, three flood hazard types are depicted: (1) SFHAs (C1 % annual chance of inundation), (2) moderate flood hazard areas [C1.0 % (100 year) to B0.2 % annual chance (500 year) of inundation or area protected by accredited levees], and (3) areas in which flood hazards are minimal ([0.2 % annual chance of inundation or the flood probability is undetermined, but still possible; NRC 2009). The portion of the SFHA mapped across Illinois encompasses approximately 18,500 km^2 or 13 % of the state (Fig. 1).

In Illinois, 89 counties out of its 102 counties (78 %) participate in the NFIP. The counties which do not participate in the NFIP are rural counties generally concentrated in the south- central or southeastern portion of Illinois (Fig. 1). Of the 918 communities in Illinois evaluated by FEMA for flood hazard areas, 790 (86 %) participate in the NFIP. The 127 com- munities (14 %) which do not participate in the NFIP are generally small, rural communities located within the counties which do not participate in the NFIP (FEMA 2015).

In addition to the NFIP, FEMA also encourages communities to participate in its Com- munity Rating System (CRS). This voluntary incentive program encourages communities to exceed the minimum NFIP requirements for floodplain management. Depending on the rating class of a participating jurisdiction and location of the insured property within or outside a SFHA, the insurance premium for policy holders located within these communities receives a 5–45 % reduction in their insurance premium. Only 3 counties (\3%) and 13 communities (\1.5 %) participate in the CRS program in Illinois (FEMA 2012a).

Within Illinois's SFHA, 143 levee systems have been identified, which together protect 2400 km^2 of floodplain. Protection levels of Illinois's levees range from *10 to 2 % annual chance floods for agricultural areas up to 0.2–1 % annual chance floods for levees protecting more developed or urban areas (Fig. 1). Nearly all the levees with protection levels B1 %annual chance flood are FEMA accredited (Remo et al. 2013).

In the flood-vulnerability modeling approach described below (Sect. 2.2.3), effects of flood mitigation efforts through NFIP required land use restrictions are largely accounted for in general building stock (GBS). This is because the GBS model takes into account NFIP building regulations (FEMA 2012b). Areas protected by FEMA-accredited levees are explicitly accounted for in SFHA delineations and are presumed to be excluded from inundation for the B1 % annual chance flood. Given the low participation rate in FEMA's CRS program in Illinois and that flood damage reduction measures are only a small component of this program, the effect of this program on the flood losses is likely minimal.

2.2 Data sources

2.2.1 Floodplain maps

3 We compiled a SFHA data layer ([1.0 % annual chance floodplain) for the entire state of Illinois. This layer was compiled from two primary sources: (1) FEMA Digital Flood Rate Insurance Maps (DFIRMs) where available, or (2) digitized versions of the FIRMs where DFIRMs were not available. The DFIRMs were obtained from the FEMA Map Service.

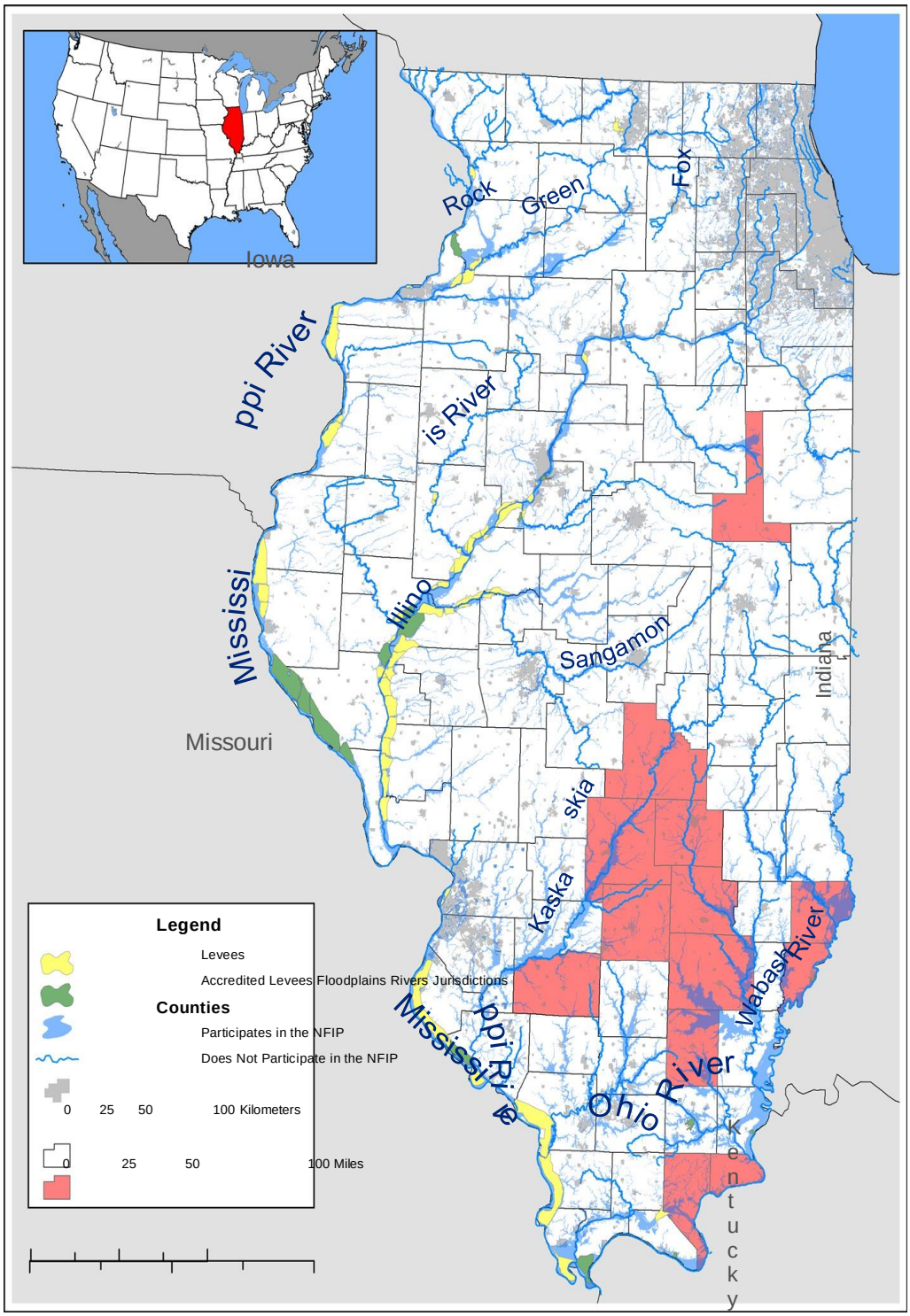


Fig. 1 Illinois special flood hazard area (SFHA; floodplains), levees, and major rivers. Levees systems shown in *green* are accredited by the Federal Emergency Management Agency and thus are not mapped within the SFHA on Flood Insurance Rate Maps

Center, and the digitized FIRMs were compiled and edited from the Illinois State Water Survey (ISWS 1996). At the time of this study, 77 out of 102 Illinois counties had effective DFIRMs, and three additional preliminary DFRIMs were available. DFIRMs are FIRMs which have been constructed in a GIS environment using orthoimagery, a digital elevation model (DEM), and flood data to map the SFHAs and other flood hazard delineations. The remaining 25 counties had either a FIRM or preliminary DFIRM depicting SFHA boundaries.

3.1.1 Digital elevation model

A DEM, which is used to characterize floodplain topography in the Hazus-MH flood loss model, was downloaded from the United States Geological Survey's National Map (USGS 2013). We used a 1/3-arc-second (≈10-m resolution) DEM for the flood loss analyses performed in this study. The DEM is used in the construction of a flood depth grid (FDG) which defines the area of potential flood inundation and its related flood depths to deter- mine flood losses (see Sect. 2.2.1 for additional details).

3.1.2 Demographic and building inventory data

Inventories within Hazus-MH include population, demographic, and infrastructure data. The demographic data contain information such as age, income, and race. These demo- graphic data were compiled from the 2000 US Census. Hazus-MH provides a national- level database of essential and critical facilities, transportation networks, utility networks, and a data model of building inventory [general building stock (GBS)] for users that do not wish to create their own databases. The Hazus-MH GBS includes data models based on property insurance data, experts' knowledge, and tax records (FEMA 2012b). Enhancing Hazus-MH's default inventory is desirable for more realistic flood loss estimates, but compiling such a detailed data set for all of Illinois was beyond the scope of this study. In previous studies, Hazus-MH using the default inventory has been shown to be capable of producing reasonable flood exposure and flood loss estimates for coarse regional assessments (Scawthorn et al. 2006; Remo et al. 2012).

2.3 Flood-vulnerability assessment

To capture both the economic and social aspects of flood vulnerability, we used Hazus-MH to quantify potential flood losses within the FEMA-mapped SFHAs and developed social vulnerability scores for the census block, jurisdictional, and county spatial scales. Screening of the relative flood vulnerability in Illinois census blocks, incorporated juris- dictions, and counties was accomplished by developing a FVI. The FVI developed for this study is comprised of both a flood loss index (FLI) to quantify the relative economic losses (flood losses normalized to estimate exposure) and a social vulnerability index to assess the relative socioeconomic condition of floodplain communities in order to evaluate their potential ability to recover from a large damaging flood. The general procedure for developing the FVI is shown in Fig. 2 and described in detail below.

2.3.1 Flood loss modeling

The flood loss modeling in this study was performed using Hazus-MH version 2.1, service pack 3. Hazus-MH is a geographic information system (GIS)-based risk assessment tool designed by FEMA in collaboration with the National Institute of Building Sciences. The Hazus-MH flood module assesses the impact of flooding based on FEMA and US Army Corps of Engineers (USACE) damage relationships. These relationships are applied to Hazus-MH infrastructure inventories to estimate losses for different flood scenarios (Schneider and Schauer 2006).

Hazus-MH allows modelers either to choose default settings ("Level 1" analysis) or else to provide increasingly detailed user-supplied data to improve the resolution and accuracy of loss estimates ("Level 2" or "Level 3" analyses).

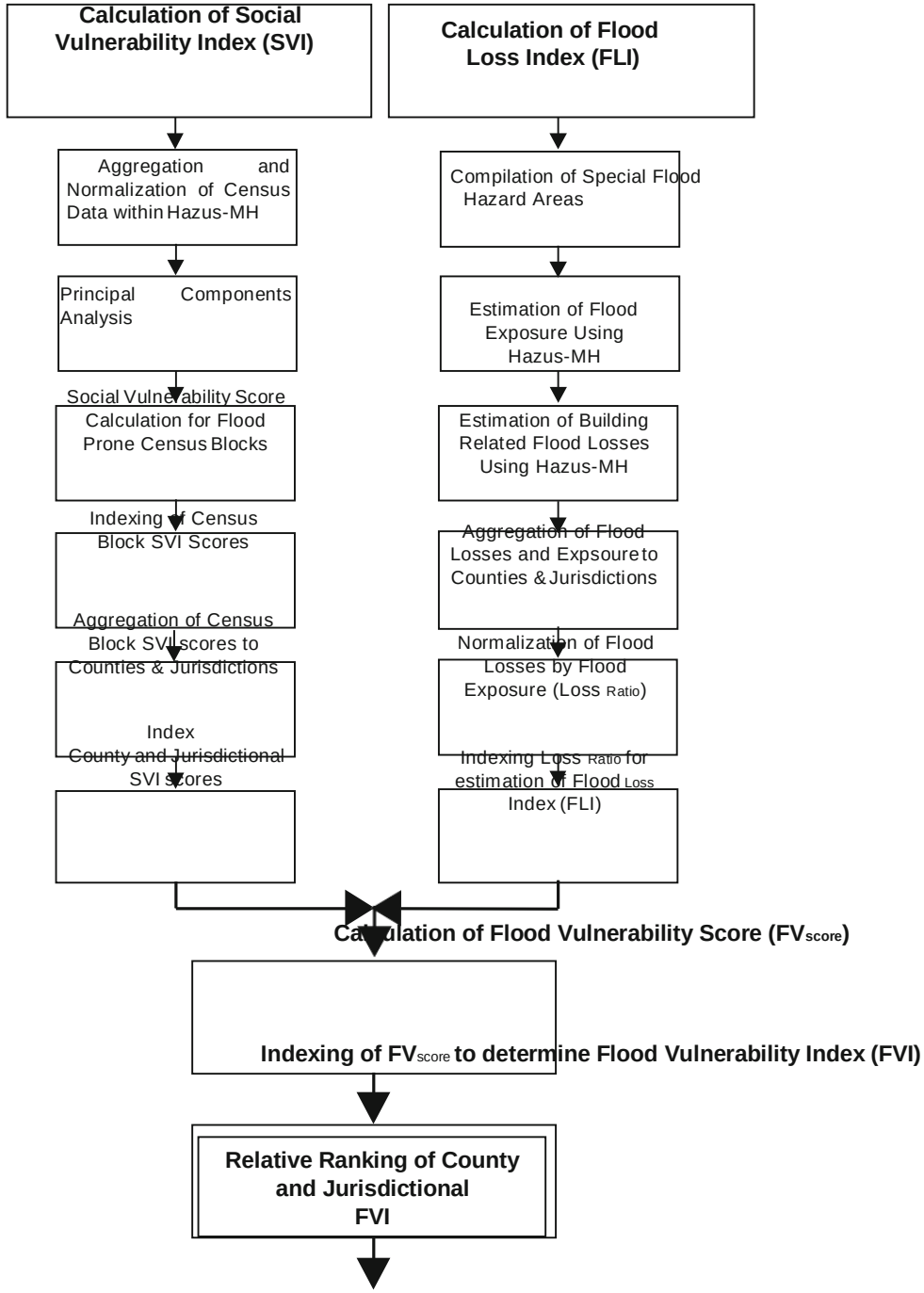


Fig. 2 Overview of the flood-vulnerability assessment framework

We performed Level 1 Hazus-MH flood loss analysis for the entire state of Illinois. Updating building and infrastructure data or performing hydrologic and hydraulic modeling to create a more detailed flood hazard assessment was beyond the scope of this project. For each county, we estimated the potential flood losses within the designated SFHA (1 % annual chance flood). For floodplain areas protected by FEMA-accredited levees, we assumed the levees performed as designed [i.e., no levee failure(s)]. It is important to point out that the flood scenario modeled here does not represent a realistic flood. It is highly unlikely that all rivers and streams in a given jurisdiction, let alone the whole state of Illinois, would simultaneously experience the 1 % ("100-year") flood. Hence, the flood losses presented here should be viewed as a standardized estimate of building-related flood losses, which allows for comparison of relative riverine flood hazard between Illinois's jurisdictions.

Hazus-MH requires the construction of a flood depth grid (FDG) to define the area of potential flood inundation and flood depth to determine damages using depth–damage curves. To construct the FDGs here, we employed Hazus-MH's enhanced quick look (EQL) tool. The data required to generate a FDG using the EQL tool are a polygon layer representing the extent of the flood, in this case FEMA's SFHA, and a DEM representing floodplain topography. In each county, we used the DFIRM or digitized FIRM map to delineate the SFHA boundary. A 1/3-arc-second (*10 m) DEM was used to depict floodplain topography. Hazus-MH default aggregate GBS data were used for the loss estimation. The aggregated GBS uses building valuations from Dun and Bradstreet (2006)

R.S. Means values. Consequently, all flood loss and flood exposure estimations presented in this paper are in 2006 dollars.

Hazus-MH flood losses reported in this study are for building-related losses only. Building-related losses include building damages, building inventory damages, and commercial inventory damages. These building-related flood loss estimates do not include damage to infrastructure (i.e., roads, bridges, and utilities), agricultural losses, or indirect economic losses (i.e., loss of business or industrial production). In addition, these flood loss and exposure estimates are based on full replacement cost (i.e., the estimated cost to replace the damaged portion of a building). Hence, the resulting flood loss estimates may be significantly higher than insured losses or loss estimates calculated using property assessment data. Insured losses and loss estimates using assessor data commonly use fair market values, which include depreciation of building values after initial construction.

2.3.2 Social vulnerability assessment

A community's wealth, race, class, and sociopolitical structures can influence the ability of a community to recover from a flood disaster, and geographic variations in these char- acteristics can be used to construct place-based metrics of disaster vulnerability (Ngo 2001; Tierney 2006; Burton and Cutter 2008; Cutter et al. 2013). The goal of this study was to develop a SVI informed by the social vulnerability literature (e.g., Cutter et al. 2003, 2013; Burton and Cutter 2008; Cutter 2010; Wood et al. 2010) and implemented using the socioeconomic data available within Hazus-MH.

To assess differences in socioeconomic factors among Illinois flood-prone jurisdictions, we developed a SVI using a mainly inductive modeling approach, employing socioeconomic data derived from the 2000 US Census and included within Hazus-MH (v 2.1). For the census blocks in Illinois which were at least partially located in the floodplain, we identified 27 vulnerability-relevant demographic parameters available within Hazus-MH from which to develop a SVI. We limited ourselves to these demographic parameters because they were readily available at a common spatial scale and covered the major vulnerability indicator categories (age, race, and wealth). To develop a relative SVI, we first consolidate the age, race, and wealth parameters. For this consolidation, we summed the number of persons under the age of 16 and over the age of 65 to create a single age parameter for each census block. We next consolidated six race classes into two race category parameters, white and nonwhite. The nonwhite race parameter was the sum of the number of Asian, Hispanic, Pacific Islander, Native American, and persons of other races (other than white) in each census block. The white race parameter was the sum of the number of white persons in each census bock. The household income levels (wealth parameter) were consolidated from nine to five categories. Next, we normalized the age, race, and general occupation parameters by total population within the census block (number of persons/total number of persons per census block). The income and housing parameters were normalized to the total number of households within a census block (number of households/total number of households per census block; see Table 1).

We next employed a principal component analysis (PCA) using the remaining 16 socioeconomic parameters to develop a smaller set of uncorrelated latent factors using SPSS (v19). Of the 16 parameters included in the PCA, eight explained 78.6 % of the variance within the assessed parameters. We selected these parameters (principle components) using a modified version of the "Kaiser's Rule" (Jolliffe 2002). The principle components with ratios exceeding 0.7 [a component's eigenvalue divided by the average eigenvalue (amount of joint variance)] were retained (Table 2; Wilks 2006).

The formulation of our SVI began with evaluating the eight socioeconomic parameters retained from the PCA (Table 2). Based on a review of the social vulnerability literature, directionality (positive for increasing and negative for decreasing social vulnerability) was assigned to each parameter. Elderly, youth, nonwhite race, and low income were associated positively with social vulnerability. High income and white race were associated negatively with social vulnerability (Cutter et al. 2003; Wood et al. 2010). For household income, we selected $40,000 as the break between positive and negative directionality, because the household poverty income level for most family sizes in Illinois is B$40,000 (US Census 2014).

The first step in the SVI formulation was to calculate the social vulnerability score (SV_{score}) for each census block in which a portion of the block was located within the SFHA:

$$SV_{Score} = \frac{pp1 + pp2 + \cdots var_x}{\text{number of parameters}} - \frac{np1 + np2 + \cdots var_x}{\text{number of parameters}} \quad (2)$$

where pp are the positive social vulnerability parameters and np are the negative social vulnerability parameters. Next, the general indexing formula (Wu et al. 2002; Karmakar et al. 2010) was applied to the SV_{scores} to calculate the SVI. In this formulation, VI_i is the respective vulnerability index and the index I_i corresponding to the SV_{score} for ith census block is calculated using the following equation, which normalizes the SV_{score} from 0.0 to 1.0:

$$VI_i = \frac{I_i - I_{min}}{I_{max} - I_{min}} \quad (3)$$

where I_{min} and I_{max} are the minimum and maximum SV_{score} and I_i is the SV_{score} for the ith block.

To assess the relative importance of each of the eight socioeconomic parameters in the formulation of the SVI, a sensitivity assessment was performed by withholding one of the parameters and comparing the result to the complete SVI formulation. The average of the percent difference between the complete SVI formulation and the SVI with a parameter

Table 1 The 27 socioeconomic vulnerability-relevant parameters from Hazus-MH's demographic database which were evaluated for use in the formulation of the SVI

Normalized parameter description	Consolidated parameters
Percentage of male population \16 years of age	Percent of population under 16 and greater than 65 years of age
Percentage of female population \16 years of age	Percentage of male population [65 years of age
Percentage of female population [65 years of age	older
Percentage of the population white	Percent white
Percentage of the population black	Percent nonwhite
Percentage of the population Asian	Percentage of the population Hispanic
Percentage of the population Pacific Islander	Percentage of the population Native American
Percentage of the population other race	
Percentage of the households with income of $0–$10K	Percentage of households earning $0–$20K
Percentage of the households with income of $10–$20K	
Percentage of the households with income of $20–$30K	Percentage of households earning $20–$40K
Percentage of the households with income of $30–$40K	
Percentage of the households with income of $40–$50K	Percentage of households earning $40–$60K
Percentage of the households with income of $50–$60K	
Percentage of the households with income of $60–$75K	Percentage of households earning $60–$100K
Percentage of the households with income of $75–$100K	
Percentage of the households with income over $100K	Percentage of households earning [$100K
Percentage of owner-occupied units	Percentage of renter-occupied units
Percentage of vacant homes	Percentage of the population working in commercial industry
Percentage of the population working in industrial industry	Percentage of homes owned
Percentage of vacant houses	Percentage of homes rented

The age, race, and occupation parameter classes were normalized to total population within a census block (number of persons/total number of persons in a census block), and the income and housing status parameters were normalized to the total number of households within an census block (number of house- holds/total number of households within a census block) withheld was used to assess the parameters effect on the SVI score. This sensitivity assessment was performed at each geographic unit analyzed in this study (i.e., census block, jurisdiction, and county levels; Table 3).

2.3.1 Flood vulnerability index calculation

The FVI was calculated for each census block, jurisdiction, and county in Illinois using the following procedure. First, the flood exposure ($Flood_{exposure}$) and flood loss

Table 2 The results of the principal component analysis

Parameter	Component	Eigenvalue	Percent of variance explained
Percent under 16 years of age and percent over 65 years of age	1	4.22	23.5
Percent of nonwhite people	2	2.08	11.6
Percent of white people	3	1.86	10.3
Percent of households earning $0–$20K	4	1.71	9.5
Percent of households earning $20–$40K	5	1.34	7.4
Percent of households earning $40–$60K	6	1.25	6.9
Percent of households earning $60–100K	7	0.96	5.3
Percent of households earning >$100K	8	0.74	4.1
Explained variance			78.6
Percent households owned	9	0.66	3.9
Percent household rented	10	0.65	3.8
Percentage of vacant homes	11	0.55	3.1
Percentage of vacant houses	12	0.45	2.6
Percentage of the population working in industrial	13	0.41	2.4
Percentage of the population working in commercial	14	0.36	2.1
Percentage of owner-occupied units	15	0.33	1.9
Percentage of renter-occupied units	16	0.27	1.6
Total variance explained			100.0

Bold denotes parameters retained for formulation of the

($Flood_{loss}$) estimates for the SFHA in each geographic unit were calculated using Hazus- MH (see flood loss modeling section above for details). Next, a flood loss ratio ($Loss_{ratio}$) was calculated to normalize flood loss estimation parameter for each geographic unit analyzed.

$$Loss_{ratio} = \frac{Flood_{loss}}{Flood_{exposure}} \quad (4)$$

Hazus-MH does not calculate flood exposure and losses at jurisdictional scales. In order to ascribe the flood exposure and flood loss estimates to a particular jurisdiction, we used the spatial join tool within Esri's ArcMap (v10.2) GIS software. The join tool summed flood exposure and flood loss estimates from the census blocks that were either fully or partly contained within each jurisdiction's boundaries. In order to account for the overlap of census blocks outside a jurisdictional boundary, a floodplain area weighting factor (FP_{wf}) was calculated by dividing the total area of the jurisdiction (JD_{area}) by the SFHA within the jurisdiction (FP_{area}; Eq. 5). FP_{wf} was then multiplied by the jurisdiction's loss ratio to calculate the weighted flood loss ratio ($WLoss_{Ratio}$; Eq. 6).

$$FP_{wf} = \frac{JD_{area}}{FP_{area}} \quad (5)$$

$$WLoss_{Ratio} = Loss_{Ratio} \times FP_{wf} \quad (6)$$

Table 3 The sensitivity assessment results for the social vulnerability index (SVI) at the census block, jurisdiction, and county scales

Spatial unit	Block			Jurisdiction			County		
SVI parameter	Ave. SVI value	SD of SVI values	Percent difference to complete SVI formulation (%)	Ave. SVI value	SD of SVI values	Percent difference to complete SVI formulation (%)	Ave. SVI value	SD of SVI values	Percent difference to complete SVI formulation (%)
Complete formulation	−0.14	0.11	–	0.27	0.13	–	0.41	0.19	–
Percent \16 years of age and percent ≥65	−0.20	0.12	12.8	0.25	0.13	7.7	0.19	0.41	4.6
Percent of nonwhite people	−0.13	0.09	6.7	0.35	0.13	39.0	0.48	0.20	26.6
Percent of white	0.07	0.07	25.5	0.34	0.14	35.6	0.48	0.20	27.2
Percent households earnings									
$0–$20K	−0.12	0.13	2.6	0.28	0.14	9.4	0.39	0.18	9.9
$20–$40K	−0.12	0.13	11.8	0.2	0.11	27.1	0.33	0.18	22.9
$40–$60K	−0.21	0.13	11.4	0.32	0.13	26.2	0.45	0.18	15.5
$60–100K	−0.21	0.13	19.8	0.26	0.12	9.6	0.33	0.18	21.4
≥$100K	−0.22	0.13	21.3	0.29	0.11	21.8	0.35	0.19	21.7

The results show the percent difference between the SVI and the SVI formulation with one of the parameters removed. This assessment revealed the race parameters were the most sensitive model parameters across each geographic unit analyzed. For the block and county units, percent white people was the most sensitive parameter and, at the jurisdiction unit, percent nonwhite people was the most sensitive parameter. Between the age and wealth parameters, the wealth parameters tended to be more sensitive, in general, than the age parameter

To assess a county's or jurisdiction's social vulnerability, we averaged the SV_{score} within each of the flood-prone census blocks in a given jurisdiction using an averaging spatial join.

For the county-scale analysis, we aggregated the census block flood exposure, losses, and SV_{score} values to the county scale using a spatial join tool within ArcMap. A sum spatial join was used to aggregate the Hazus-MH flood exposure and flood loss estimates to the county. The flood loss ratio for each county was then calculated using Eq. 4. An average spatial join was then used to aggregate the flood-prone census block SV_{score} to the county.

Next, Eq. 3 was applied to the $Loss_{ratio}$ or $WLoss_{ratio}$ to calculate the flood loss index (FLI) for the respective geographic unit under consideration. Then, the FLI and SVI were added together to calculate a flood vulnerability score (FV_{Score}) for each block, jurisdiction, and county.

$$FV_{score} = FLI + SVI \quad (7)$$

The FV_{score} was index using Eq. 3 to generate the FVI, so each census block's, juris- diction's, or county's flood vulnerability could be ranked.

3 Results

Of Illinois's 1367 incorporated jurisdictions, 899 jurisdictions included mapped SFHAs within their boundaries, and Hazus-MH flood loss modeling suggested that 895 of them would experience at least some flood losses if the 1 % chance annual flood were to occur.

3.1 Social vulnerability results

The social vulnerability assessment results suggest that Hudson Village, in McLean County, was one of the least socially vulnerable communities in Illinois. Venice City, located on the border between St. Clair and Madison Counties, was one of the most flood vulnerable jurisdictions in Illinois. The least and most socially vulnerable counties in Illinois were Kendall and Pulaski Counties, respectively (Supplemental Materials Appendices 1 and 2).

As outlined in Sect. 2, we tested the sensitivity of our SVI scores to incremental removal of each of the input parameters, and we completed this test for each of the spatial scales in the study (census blocks, jurisdictions, counties). This assessment revealed that the resulting SVI scores did change, in some cases substantially (up to 39 %). The race parameters were the most sensitive model parameters across each geographic unit analyzed. For the block and county units, percent white people was the most sensitive parameter and, at the jurisdiction unit, percent nonwhite people was the most sensitive parameter. Between the age and wealth parameters, the wealth parameters tended to be more sensitive, in general, than the age parameter (Table 3).

We also compared our county-level SVI to the widely cited Hazards and Vulnerability Research Institute's (HVRI) county-level social vulnerability index (SoVI) for the USA 2006–2010 (HVRI 2012). Despite the difference in the data employed and the formulations of the two indices,

the SoVI and SVI scores were generally in agreement (*80 %) in their relative vulnerability classification [i.e., high (top 25 %), medium (middle 50 %), low (bottom 25 %)] for Illinois counties.

3.2 Physical flood hazard assessment

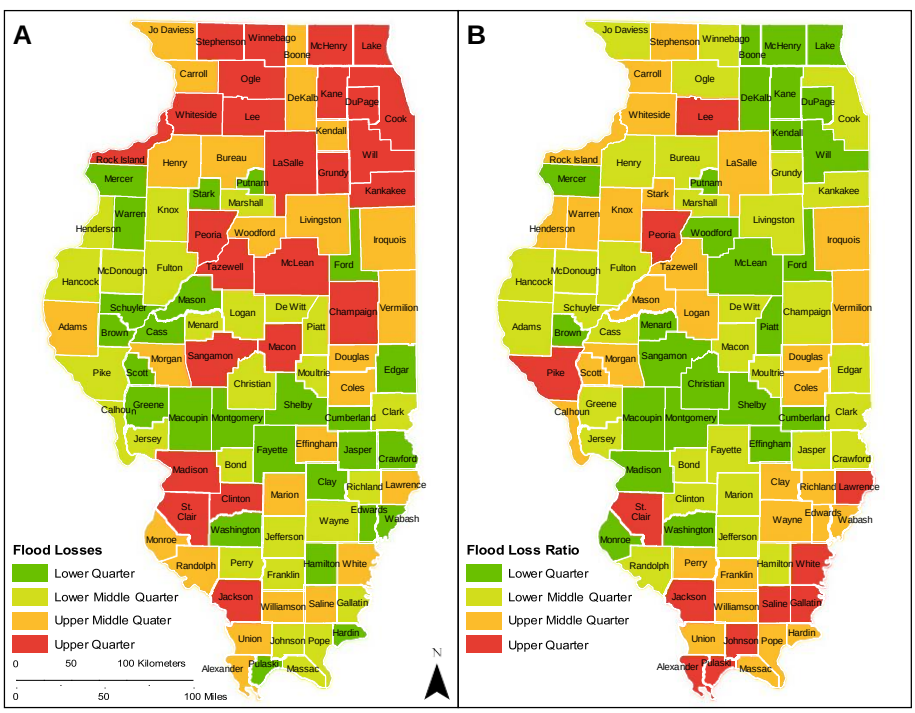
The building-related flood exposure within the full SFHA in Illinois was estimated here to be *$300 billion. The greatest concentration of this flood exposure was located in Cook and adjacent five counties: Dupage, Kane, Lake, McHenry, and Will. These counties contain the urban centers of the Chicago metropolitan area, and together they contain

*$191 billion or nearly 64 % of the flood exposure within Illinois's SFHA. The analyses of flood exposure at the census block and jurisdictional scales also showed the greatest exposure totals concentrated in Cook County and the surrounding areas (Supplemental Materials Appendices 1 and 2).

Total building-related flood losses within the full SFHA in Illinois were estimated here to be *$18 billion. Aggregated county-level losses ranged from a minimum of $2.7 million in Ford County up to $3.3 billion in Cook County (Fig. 3). At the jurisdictional level, flood losses ranged from less than a $1000 in Bondville up to $942 million in the city of Chicago. As with the flood exposure estimates, the largest flood losses were concentrated in and around the city of Chicago (Supplemental Materials Appendices 1 and 2).

Flood loss ratios were calculated in order to normalize losses to total building infrastructure exposure. As Fig. 3 shows, the flood loss ratio provides a different perspective on flood risk than flood exposure and flood loss estimates. When normalized to total exposure (total infrastructure within the SFHA), Cook and surrounding counties have average (0.05) to slightly below average ratios. Unlike the raw flood exposure and flood loss values, the highest flood loss ratios were outside of the Chicago area. The counties with the largest

Fig. 3 Flood losses by Illinois county (a); flood loss ratio (flood losses/flood exposure) by county (b)



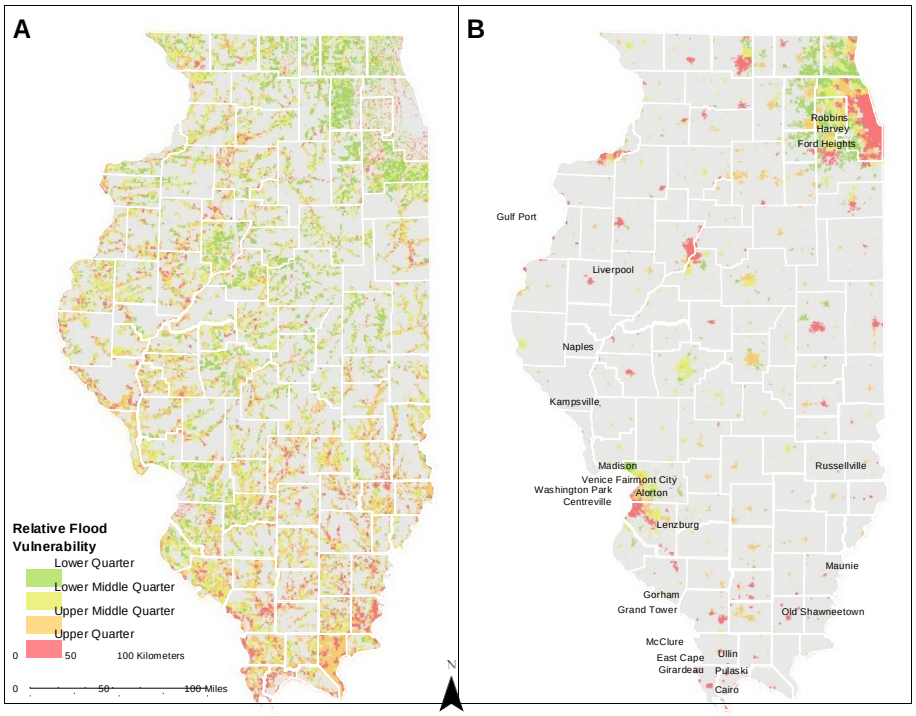


Fig. 4 Relative flood vulnerability by Illinois census block (a); relative flood vulnerability by Illinois incorporated jurisdiction (b). Jurisdictions with the highest flood vulnerability (top 1 %) are labeled

flood loss ratios are Lee, Peoria, Tazewell, White, and Pulaski Counties. These counties have large expanses of floodplain along larger rivers such as the Illinois, Rock, Green, Ohio, and Wabash. Jurisdictions with high flood loss ratios tend to be small river towns that lack large accredited levees or other structural protection (Fig. 4).

3.3 Flood vulnerability

The flood vulnerability analysis performed revealed nearly half (8530 km^2, or 46 %) of Illinois's SFHA (18,500 km^2) had low flood vulnerability (few people affected, with only minor flood losses). The flood vulnerability results here also suggest that Hudson Village, in Kane County, was one of the least flood vulnerable jurisdictions, and Madison City in St. Clair County was one of the most flood vulnerable jurisdiction in Illinois (Fig. 4). The least and most flood vulnerable counties in Illinois were Brown and Pulaski, respectively (Supplemental Materials Appendices 1 and 2).

4 Discussion

The FVI developed here is useful as an initial screening tool to identify areas of low, elevated, or high relative flood vulnerability. The flood-vulnerability assessment performed in this study provides a picture of relative flood vulnerability across the entire state of Illinois at three different scales of analysis (county, jurisdiction, and census block). Within

FEMA's SFHAs, the estimated building-related flood exposure is ~$300 billion. Sixty- four percent ($191 billion) of Illinois' building-related flood exposure is concentrated within the six counties which include and surround the city of Chicago. The building- related flood losses within the SFHA are estimated to be $18.4 billion.

Unlike the flood losses, which are concentrated around Chicago, the communities in Illinois with the largest relative flood loss ratios (flood losses proportional to total flood- plain exposure) were the rural jurisdictions located along Illinois's larger rivers. This suggests that the economic impacts related to riverine flooding would be more severe in these rural jurisdictions, relative to their total economic base, and it may be inferred, relative to the economic resources those communities could muster for flood recovery and reconstruction. This result is similar to the Cross (2001) finding that smaller communities often have a higher proportion of their populations vulnerable to natural hazards.

Three spatial scales of analysis were undertaken in this flood vulnerability analysis. The county and/or jurisdiction scales are the common spatial resolution for flood risk assess- ments performed in support of hazard mitigation plans (Frazier et al. 2013; Remo et al. 2013). In addition to these scales of flood risk assessment, we also evaluated flood vul- nerability at the census block scale. While the results of the flood vulnerability analysis at these three scales mirrored one another (i.e., counties with high flood vulnerability had a substantial number of its jurisdictions and census blocks relatively ranked as highly vul- nerability to flooding), the census block assessment revealed pockets (a small number of census blocks) of potential high flood vulnerability in all counties and a substantial number of jurisdictions with low-to-moderate flood vulnerability. This result suggests aggregation of flood risk or vulnerability assessments to the county or even the jurisdictional scale can potentially mask areas which have substantial flood vulnerability.

The jurisdictional flood vulnerability analyses revealed potential flood losses were a more substantial driver of flood vulnerability in rural floodplain communities than in urban jurisdictions. In urban jurisdictions such as Chicago and East St. Louis, social vulnerability was responsible for the relatively high FVI scores. This finding suggests that different mitigation strategies may have to be employed to reduce flood vulnerability in these communities. For example, in rural, relatively unprotected floodplain communities, partial or full community relocations may be required to substantially reduce flood vulnerability, while targeted buyouts may be sufficient to substantially reduce flood vulnerability in generally better protected urban floodplain communities.

4.1 Limitations of the flood-vulnerability assessment

In this and any similar studies, flood loss estimates and social vulnerability indicators are associated with broad uncertainty. Evaluation of modeling results is difficult, because external validation of regional flood loss models for hypothetical flood scenarios [i.e., specific return period(s)] is rarely possible, and social vulnerability has tangible symptoms, but no metric exists to directly measure it (Tate 2012). In the sections below, we discuss the specific sources of uncertainty in the flood-vulnerability assessment here.

4.1.1 Uncertainty in flood exposure and flood loss estimates

A variety of uncertainty and sensitivity analyses has been undertaken on the Hazus-MH flood loss model (e.g., URS Group 2007; Ding et al. 2008; Association of State Floodplain Managers [ASFPM] 2009; 2010a, b; Tate 2014). Tate (2014) showed that flood loss estimates can vary by up to a factor of three, and uncertainty generally increased with increased spatial resolution (FEMA 2012b). The primary sources of uncertainty in Hazus- MH flood exposure and flood loss estimates are related to: (1) the quantification of the flood hazard; (2) the use of the national-level infrastructure data for the building inventory; and (3) the assumption of an even distribution of inventory across each census block.

In this study, we chose to quantify the flood hazard using the SFHA because it was the only flood hazard definition readily available for the entire state of Illinois. National-level infrastructure data provided with Hazus-MH are coarse approximations of structure, contents, and inventory replacement values for a specific census block and maybe sustainably different than local values (FEMA 2012b). In addition, the Hazus-MH infrastructure data model assumes that buildings are evenly distributed throughout each census block which is attributed with being a substantial source of uncertainty. In Illinois, previous research has shown that building-related loss estimates can average up to 50 % greater than loss estimates using individual structure data with assessed values for regional-level assessments (Remo et al. 2012). Hence, the flood exposure and flood loss values presented in this study should be seen as coarse estimates useful for comparative purposes.

4.1.2 Uncertainty in the social vulnerability i n d e x

US Census of Population and Housing (2000) data contained within Hazus-MH were used to calculate the SVI in this study. Two main issues arise with using these data for such an analysis. The first is the age of the data. It has been approximately 15 years since these data were collected. Changes in populations and housing have changed over this period, increasing the uncertainty in the SVI values here. The second issue is that the US Census Bureau has long recognized chronic data collection error as a result of undercounts and overcounts (Clark and Moul 2003). The undercounts have historically been the greatest with racial and ethnic minorities, children, renters, and migrant farm workers, the home- less, and undocumented immigrants (Hannah 2001; Passel 2005).

Other sources of uncertainty in the social vulnerability analysis performed here include interaction between variables and compensability. The assumption of no interaction between variables in a social vulnerability analysis can be an issue because the magnitude of several vulnerability dimensions can vary relative to socioeconomic status (Phillips et al. 2005; Elliot and Pais 2006). Compensability occurs when high levels of one indicator mask a high value of another indicator. For example, the elderly in different circumstances can either be highly vulnerable or less vulnerable depending on income. In addition, some indicators will likely have greater significance than others depending on the hazard and its magnitude (Tate 2013).

A. 4.2 Future flood-vulnerability assessment research

In this study, we developed a flood-vulnerability assessment framework to evaluate the spatial distribution of relative flood vulnerability across a large region and at multiple spatial scales. As indicated above, there are significant uncertainties and consequently room for improvement in the FVI developed here. The index was intended as a screening tool; it was not intended to be an absolute measure of flood vulnerability or mitigation potential. How- ever, the modeling framework developed here allows for the use of improved data and the addition of assessment tools which could lead to improved modeling in the future that could better assess the mitigation potential of individual communities or areas.

Future improvements to the flood-vulnerability assessment performed here should begin with a global sensitivity and uncertainty analyses of the FVI construction and its associated the FVI methodology (Hall et al. 2005; Tate 2014). Given the large spatial scale of this study and the consequent resource needs, no comprehensive global sensitivity and uncertainty analyses were attempted here. However, global sensitivity and uncertainty analyses of the individual components of our flood vulnerability model are currently a focus of ongoing research.

Other improvements to the flood-vulnerability assessment performed here could include a more comprehensive assessment of the flood hazard and improvements to the Hazus-MH general building stock. The addition of a realistic annualized flood loss assessment would increase the resolution of the flood hazard assessment. However, the hydrologic and hydraulic analyses required to realistically estimate annualized flood losses for the entire state of Illinois would be substantial undertakings. The Hazus-MH flood loss estimations could be improved by applying dasymetric mapping techniques (Sleeter 2008; Mennis 2009) or updating the GBS with local tax assessors' data. Applying dasymetric techniques to the census block-level data could potentially help reduce the uncertainty related to current assumption of uniform distribution of building stock. Updating the GBS with assessor data can improve measures of the number of buildings, building values, and other pertinent building parameters (i.e., square footage, number of stories, and foundation type; FEMA 2012b; Tate 2014).

Future studies should further investigate the spatial patterns of flood vulnerability. We only looked at broad spatial trends in flood vulnerability due to the limitations with the data and methods applied in this study. Future studies, with presumably higher fidelity of flood vulnerability, may have the potential to infer more information and insights about spatial relationships between the physical and socioeconomic divers of flood vulnerability.

Another consideration for future flood-vulnerability assessments is integrating future changes in flood risk. Executive Order (EO) 13690 issued by President Obama in January 2015 established a new Federal Flood Risk Management Standard (FFRMS). The new standard amends the previous EO 119988 issued in 1977 and aims to reduce the risk and cost of future flood disasters by ensuring that Federal investments in and affecting floodplains meet higher flood risk standards. The new standard requires agencies, when using federal funds, to use utilize best available, actionable hydrologic and hydraulic data and methods that integrate current and future changes in flooding based on climate science or substantially exceed the current (100-year flood level) standard (i.e., use the 500-year flood level or add more than 2 feet to the 100-year flood level). models (indices). Such analyses would be useful in evaluating the effects of epistemic uncertainty in our flood-vulnerability assessment and limiting uncertainty in

5 Conclusions

The purpose of this flood-vulnerability assessment was to develop a reconnaissance tool to aid planners in screening for vulnerability over a large geographic region, so that resources can be focused on areas with the greatest need. We found that 46 % (8530 km^2) of Illinois's 18,500 km^2 SFHA had low flood vulnerability (i.e., few people affected, with little or no flood losses), reducing by *half the area which Illinois planners may need to focus their mitigation efforts. The relative flood vulnerability across the three spatial scales evaluated in this study generally echoed each other (i.e., counties with high flood vulnerability had a substantial number of its jurisdictions and census blocks with high flood vulnerability). However, comparison of these analyses also revealed that counties and a substantial number of jurisdictions with moderate-to-low relative flood vulnerability often had pockets (one to a few census blocks) of high relative flood vulnerability. This suggests flood-vulnerability screening should be performed to at least the census block scale to ensure all areas with substantial flood vulnerability might be identified.

Jurisdictional flood loss ratios (flood losses proportional to total floodplain exposure) were generally largest in rural and relatively unprotected floodplain communities located along Illinois's large rivers. This suggests the economic impacts related to riverine flooding would be more severe in these rural jurisdictions, relative to their economic base. Given the relative severity of flooding impacts on these rural communities, the damages would likely exceed the economic resources these communities could amass for flood recovery and rebuilding.

The jurisdictional level analysis revealed that flood losses were a more substantial driver of flood vulnerability in the rural floodplain communities than in urban communities. In urban areas with high FVI scores, social vulnerability was responsible for the high flood vulnerability scores. This suggests different mitigation strategies or mitigation efforts may be required to reduce flood vulnerability in these respective community types.

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Appendix H: Illinois Planning Process Documentation - 2018

2018 Illinois Natural Hazard Mitigation Plan Update
Planning Committee Members

Last Name	First Name	Organization	Address	City	State	Zip	Work Phone	Email Address
Al-Basha	Sam	IEMA	1035 Outer Park Drive	Springfield	IL	62704	217-785-9942	Sam.m.Al-Basha@illinois.gov
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Sprague	Hal	Center for Neighborhood Technology, Water Policy Manager	17 North State Street, Suite 1400	Chicago	IL	60602	773-269-4046 Cell:847-204-4170	hal@cnt.org
Sreekumar	Sheela	IEMA	1035 Outer Park Drive	Springfield	IL	62704	217-785-9988	Sheela.Sreekumar@illinois.gov
Stanley	Heather	National Weather Service	1362 Route 10	Lincoln	IL	62656	217-732-3089	Heather.stanley@noaa.gov
Swanson	Greg	Capital Development Board	401 S. Spring St.	Springfield	IL	62706	217-524-2426	Greg.Swanson@illinois.gov

Tanton	Rusty	IEMA	2200 S. Dirksen Pky	Springfield	IL	62703	217-524-6678	Rusty.Tanton@illinois.gov
White	David	IDOC	950 Kings Highway	East St. Louis	IL	62223	618-920-3184	David.White@Illinois.gov
Werthmann	Andrew	The Pew Charitable Trusts	1012 Chauncey Street	Eau Claire	WI	54701	715-495-2451	andwerth@gmail.com
Wortman	David	IL Dept of Commerce	501 E Monroe	Springfield	IL	62794	217-558-4200	david.wortman@illinois.gov
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Zolnierek	Jim	Illinois Commerce Commission	527 East Capitol Ave	Springfield	IL	62701	217-785-5278	jim.zolnierek@illinois.gov

February 22, 2017

ILLINOIS NATURAL HAZARD MITIGATION PLAN UPDATE MEETING SIGN-IN SHEET

Meeting Date: February 22, 2017 **Facilitators: Ron Davis and Jared Owen**

Name	Company	Phone	E-Mail
Diane Hoots	CMS	217-557-6446	Diane.hoots@illinois.gov
Jared Owen	IEMA	217-785-9942	Jared.owen@illinois.gov
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Sally McConkey	IL State Water Survey		sally@illinois.edu
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Roger Lauder	IEPA		Roger.lauder@illinois.gov
Mike Cosmi	MWRD	1-312-751-3092	Michael.cosme@mwrd.org

ILLINOIS NATURAL HAZARD MITIGATION PLAN UPDATE
AGENDA
February 22nd, 2017 10:00 AM to 12:00 PM
1035 Outer Park – 4th Floor Conference Room
Springfield, IL 62704

I. Thank You and Introductions

II. Purpose of Meeting

Goal for Update

- Identifies steps to protect citizens and their property from harm and can speed up recovery
- Saves taxpayer's money by analyzing cost effective methods for damage reduction
- Establishing policies that can prevent future damages
- Required Nov. '04 by FEMA to access Federal funds for mitigation and some Public Assistance.
- Makes your agency eligible for mitigation funds by participating in the process

III. Status Report from IEMA

Disaster History

- Illinois Federal Disaster Declaration History (2013-2016)
  - **4116**: April, 2013 Severe Storms and Flooding Events with 40 Counties Declared – IA Costs totaled $338,689,600, PA Costs totaled $30,364,620 (after all that is said and done, Mitigation received nearly $30M in Hazard Mitigation funds for projects and plans)
  - **4157**: November, 2013 Severe Storms and tornadoes with 15 counties declared for IA – IA costs were $5,720,524. Leaving about $850k for mitigation dollars

Risk Assessment Update

- Hazard Profiles

  Hazards the plan will consider:

  Floods (Riverine, Flash, Aquifer, Sewer backup, Subterranean)
  Earthquakes
  Tornadoes and Severe Storms (High Winds, Lightning, Hail)
  Severe Winter Storms
  Extreme Heat
  Drought
  Less common disasters: Landslides, Wildfires, Karst, and Dam Failure

- 2010 Census Data – will remain unchanged
- NCDC Database, USGS, National Inventory of Dams, National Levee Database
- Climate Change- Grant for Plan
  - The mitigation planning regulations require consideration of the probability of future hazard events as part of the risk assessment. This was reinforced in 2011 through FEMA's Climate Change Adaptation Policy which directs FEMA programs and policies to integrate considerations of climate change adaptation. It should be noted that this is not a change in the Code of Federal Regulations, which has always required consideration of the probability of future hazard events. It is however a new emphasis.

Local Planning Update-Goals

Total Population Covered by Hazard Mitigation Plan	10,349,662	80.35% of Illinois Population
Benchmark	12,880,580	100% of Illinois Population
# of Counties developing HMP	26	25.49% of Counties in Illinois
Population developing HMP	1,627,117	12.63% of Illinois Population

Update of Statewide Mitigation Projects - Ron
Risk Map Update - Sally

IV. Major Changes *(and policy)* since 2013 that would impact the current Mitigation Plan

- State Mitigation Plans are now updated every 5 years instead of 3
- 2 CFR Part 200 (GATA)
- State Mitigation Plan Review Guide - FEMA

V. Capability Assessments for State Agencies/Departments

Review and Update
Mitigation activities in your Agency/Department
Mitigation Success Stories in your Agency/Department

VI.

Tasks	Who Can Assist
• Complete Agency Capability Assessment	All
• State Mitigation Priorities	All
• Identify Critical/Essential Facilities	All
• Provide technical guidance in area of agency expertise	All
• Review Mitigation Strategy Section	All
• List mitigation activities in your Agency/Department	All
• Mitigation Success Stories	All

VII. Future Meetings: May 17th 10:00AM to 12:00PM

Illinois State Hazard Mitigation Planning Update Meeting
Supporting Agency Representation
February 22nd, 2017 – 1035 Outer Park Drive, Springfield, Illinois 62704

Agency:	Representative:	Date:	Time:	Email:
Central Management Services	Diane Hoots	2/22/2017	10:00AM-11:45AM	Diane.Hoots@illinois.gov
Illinois Emergency Management Agency	Jared Owen	2/22/2017	10:00AM-11:45AM	jared.owen@illinois.gov
Illinois Emergency Management Agency	Vera Small	2/22/2017	10:00AM-11:45AM	vera.small@illinois.gov
Illinois Emergency Management Agency	Curtis Caldwell	2/22/2017	10:00AM-11:45AM	Curtis.Caldwell@Illinois.gov
Illinois Emergency Management Agency	Sandra Hulbert	2/22/2017	10:00AM-11:45AM	Sandra.hulbert@illinois.gov
Illinois Emergency Management Agency	Michelle Keefer	2/22/2017	10:00AM-11:45AM	Michelle.keefer@illinois.gov
Illinois Emergency Management Agency	Ron Davis	2/22/2017	10:00AM-11:45AM	Ron.davis@illinois.gov
Illinois Department of Corrections	David White	2/22/2017	10:00AM-11:45AM	david.white@doc.illinois.gov
Illinois Department of Corrections	Mike Chappell	2/22/2017	10:00AM-11:45AM	mike.chappell@doc.Illinois.gov
National Weather Service	Chris Miller	2/22/2017	10:00AM-11:45AM	Chris.miller@noaa.gov
American Red Cross	Valerie Goodwin	2/22/2017	10:00AM-11:45AM	valerie.goodwin@redcross.org
Illinois Department of Public Health	Tricia Patterson	2/22/2017	10:00AM-11:45AM	tricia.patterson@illinois.gov
Illinois Department of Insurance	Brett Gerger	2/22/2017	10:00AM-11:45AM	brett.gerger@illinois.gov
Illinois State Climatologist	Jim Angel	2/22/2017	10:00AM-11:45AM	jimangel@uiuc.edu
Illinois State Water Survey	Sally McConkey	2/22/2017	10:00AM-11:45AM	sally@illinois.edu
Capital Development Board	Greg Swanson	2/22/2017	10:00AM-11:45AM	greg.swanson@illinois.gov
Illinois Environmental Protection Agency	Roger Lauder	2/22/2017	10:00AM-11:45AM	roger.lauder@illinois.gov
Federal Emergency Management Agency	Steve Greene	2/22/2017	10:00AM-11:45AM	steven.greene@fema.dhs.gov
Illinois State Geological Survey	Bob Bauer	2/22/2017	10:00AM-11:45AM	bauer@isgs.uiuc.edu
Center for Neighborhood Technology	Hal Sprague	2/22/2017	10:00AM-11:45AM	hal@cnt.org
Metropolitan Water Reclamation District	Rick Fisher	2/22/2017	10:00AM-11:45AM	FisherR@mwrd.org
Metropolitan Water Reclamation District	Mike Cosme	2/22/2017	10:00AM-11:45AM	Michael.cosme@mwrd.org

Individuals unable to attend – All meeting documents were e-mailed for review and input

Illinois Department of Commerce and Economic Opportunity	Rajiv Narielwala		E-Mailed Document	rajiv.narielwala@illinois.gov
Illinois Commerce Commission	Bryan Pemble		E-Mailed Document	bpemble@icc.illinois.gov
Illinois Department of Transportation	Tom Korty		E-Mailed Document	Thomas.Korty@illinois.gov
Illinois Historic Preservation Agency	Rachel Leibowitz		E-Mailed Document	Rachel.leibowitz@illinois.gov
Illinois Department of Natural Resources	Paul Osman		E-Mailed Document	Paul.osman@illinois.gov
Illinois State Board of Education	Jeff Aranowski		E-Mailed Document	jaranows@isbe.net
Illinois Department of Human Services	Amy Dickenson-Ferguson		E-Mailed Document	Amy.Dickenson-Ferguson@illinois.gov
US Army Corp of Engineers	Chris Haring		E-Mailed Document	Christopher.p.haring@usace.army.mil
IL Emergency Services Management Assoc	Ron Graziano		E-Mailed Document	President@iesma.org

Meeting Date - December 5, 2017

State Hazard Mitigation Planning Committee Meeting

SIGN IN SHEET

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ILLINOIS NATURAL HAZARD MITIGATION PLAN UPDATE
AGENDA
December 5th, 2017 10:00 AM to 11:00 PM
1035 Outer Park – 4th Floor Conference Room
Springfield, IL 62704

I. Thank You and Introductions

II. Purpose of Meeting
Goal for Update

VII. Status Report from IEMA
- Illinois Capability Assessments
- State INHMP Grant Update

VIII. Mitigation Strategy Update
- Goals and Actions

IX.

Tasks	Who Can Assist
• Complete Agency capability Assessment	All
• State Mitigation Priorities	All
• Identify Critical/Essential Facilities	All
• Provide technical guidance in area of agency expertise	All
• Review Mitigation Strategy Section	All
• List mitigation activities in your Agency/Department	All
• Mitigation Success Stories	All

VII. Future Meeting January 2018

Notes from 12.5.17 meeting – IEMA 2018 IL Natural Hazard Mitigation Plan Update

Introductions:

Scott Clarke
American Red Cross
State Purchasing Liaison
Steve Greene
FEMA Region V
Illinois Indiana and Ohio
Paul Osmond
Floodplain Program Manager
Bill Milner
Surveillance engineer
Harvey Henson
SIU campus Professor
Chris Miller
NWS
Ron Davis
State Hazard Mitigation Officer
Curtis Caldwell, Manager
Mitigation and Infrastructure Section
Vera Small
IEMA
Gary Johnson
USGS
Urban Hydrologic Collection Program Manager
Robert Rapp
Illinois Department of Insurance
Disaster Contact
Tricia Patterson
Public Health
Diane Hoots
CMS
Sam: Section 201 - Set up by setting goals, and then we can adjust the policies as we go through the process. They are measurable. What actions need to be done to complete? Sam & Sheela are working on 7 chapters in the plan from 2013. Sheela did the first 2 chapters. We cannot do chapters 3 and 4 until agencies assessment forms are received to update the strategies from 2013 to 2018. Sam sent assessment form and strategies via email. We need to do this together.
Ron: If you know of any other agencies to contact, please let us know. For example: SIU Carbondale. Please contact Sam. We need all the feedback and help to send Sheela or Sam. If anyone needs assistance please let us know.
Curtis: This is the state's plan. Capture any mitigation in the state to fit into goals. We are here as a moderator to make this happen. Anything you can provide to our agency would be much appreciated.
Sam: We have a deadline and a timeline. We need a lot of assistance to make this happen. It is a group effort.
Ron: Expand your vision – i.e. Harvey Hensen is in charge of earthquakes. Where do you store records? So many people store important documents in their basements. Stuff gets destroyed and lost. Court systems store DNA evidence in basements and it gets destroyed.
Diane Hoots: State offices storage rooms flood so often. Natural Resources and Corrections were involved a few years ago. The water reservoir went to a level where there was a water shortage situation. They did special work with lowering pumps. Would that count as drought? Corrections

would be a good contact to have.
Scott Clarke: Capital of CDB didn't meet earthquake standards. This has good information on how many buildings have been constructed. The State's architect and locals' schools that want construction go through CDB. Jeff Aronosky is a contact person. Liaison is George Tankersly. A building in the Chicago Metro Area is where the building was at. How did it get so far before stopping construction? Within the past 30 days this was a big news story. The building was North of I80. Contact the Office of State Fire Marshall for fire education and underground storage tanks. They work with others on fire safety education, etc. Since the adoption of electronic, any records that may have been destroyed are now electronic. Some agencies are not required to maintain electronic records. You won't get federal payments or benefits if records are not electronic.
Ron: If you can think of other non- profits or businesses that would be good to be involved with this, please let us know. We welcome input. You can't just have government people around the table. We want to expand it.
Scott: There are things with insurance that could be done. Insurance companies could give benefits to those that have generators. This might ultimately be a cost reduction for the owner. Good strategy to talk about their own benefit strategies.
Robert Rapp: South Carolina organizations have crash cars that crash into barriers. Insurance companies have the same type: fortified home programs have done a lot of work regarding hurricanes with strapping. If you give 4,000 more, your home can survive Cat 4 hurricane in South Carolina. This is very impressive.
Ron: There are books on how to build homes better that are put in libraries.
Robert: We have links on our Department of insurance website. There is a lot of research on hurricanes and forest fires.
Bill Milner: IHDS is the same organization.
Diane: ATT and Verizon are good contacts for communication structures regarding tornados and earthquakes in terms of strengthening their infrastructure. We depend on the communication structure.
Sam: Power generators keep coming back into the conversation. Health facilities need to install back-up generators.
Scott: There are some regulations that require generators. There are some long term facilities that do not require generators. Pipes freeze and cause building damage. Premiums can go down up to 50% to encourage the public to do mitigation. I.e. replacing roof, etc.
Ron: Regarding hail resistant roofing. They won't give an incentive.
Scott: Demonstrate how you can say Illinois is a leader in mitigation for insurance companies.
Tricia: Hospitals are required to have generators. Long-term facilities don't have to have generators.
Scott: Some facilities are grandfathered in. If before 1984, you don't have to have HVAC. After that year, you are required to have heating in patient room.
Ron: Hospitals did not have back- up generators years ago.
Tricia: This includes dialysis and certain kinds of clinics. Emergency Prepare plan went into effect in November. Provider types should be implemented.
Scott: Residents now have to have sprinkler systems. State says they are going to require this now. List things we have demonstrated Illinois has done. Fire Marshal's office may have more info.
Bill: Trump eliminated floodplain.
Sam: Schuyler County concern – health care facility. They had 22 inches of snow. Their main concern is how to take care of the patients? They also have concerns about expanding facility and install back up power generators.
Ron: No luck with legislation. Another hospital access route was though a floodplain. It flooded every 5 years. They are looking to us for another access route to be built.
Tricia: Questions regarding IDOT. Tom retired. New contact is Steve Jackson or maybe Amy. Gene Felcher started last week. He is the liaison.
Sam: We have lots to share and talk about. Throughout update process keep in mind what the goals set and how to meet and achieve the goals by setting objectives. The 4 goals are protecting citizens in Illinois from natural disasters, build and support, improve coordination, and increase public awareness mitigation planning.

Tricia: Private sector: The majority of state occupied buildings are leased facilities and not state owned. If something happens, the person responsible is the landlord. We need information on property management and requirements for landlords.
Curtis: Could there be a query sent out possibly? Tricia can get information regarding property management.
Tricia: Secretary of State, Attorney General, and Treasury Offices we don't manage. You might ask who to talk to in the executive branch of the correctional facilities and parole offices.
Scott: Illinois Veterans Home in Chicago is what I was talking about. The contract engineer used Chicago building code. It was not caught until it was too late. Even in Chicago, the building was held to mitigation standards.
Sam: We are looking for feedback from agencies or support agencies to help us with the plan. If you know of anyone who can help us, please let us know. This is a task involved timeline and we need all of your help to accomplish. Our next meeting is January 17, 2018. We will have sections for your review at that time. We need your assistance at this time. Team work.
Curtis: We need capability assessment forms, review mitigation strategy, and a list of successful stories to complete chapter 3 and 4. Sally is working on that. We will provide chapter 1 & 2 send it to you for review and then we will send to Steve Greene, FEMA, for final review. There is a schedule of the plan on the website. Chris Miller will help us with weather studies. Sally will help with success stories. Maybe we can get more money from FEMA
Steve: I would rather have 1000 questions ahead of time than last minute questions. Roads, bridges, parks, hazard mitigation, PDM, FMA gets shut off and then it goes local.
Ron: Jim Angel –Regarding the climate change article. How we do our predictions is looking at the past. I.e. once every 20 years. We need to think how are these things changing and what other impact do they have? Most are convinced that climate change is going on. What does that mean? People understand the impacts better.
Bill: There is no quantitative data for rainfall. Use past historical rainfall.
Gary: Compute flood frequency analysis used in literature. Jim Angel's is updated according to rainfall. Rearview exercise is again going on now. His is looking forward.
Chris: 2014 focused on Midwest report will include that and that assumptions have to be made. Climate looks at the past to see where we are going and determines models for future predictions. Many people's research shows increasing rain but temperature wise has some debate. In the 1950s there was rapid increase of rain. Take that, make assumptions in main stem river, and how is that added for rainfall.
Gary: It is not possible without high quality stream gages to supply data that compute 100 year floodplains. We have support from DNR. We have to have good long-term data. We have to have documentation of what flooding was and good systematic data collection. We have high confidence reporting on the flood of 2013 and how it got to this level. Please think about that when talking about collecting data. We have to have it. Programs to collect data are really important and very expensive.
Ron: There is more rain flooding in urban areas. Think about that in terms of facilities.
Steve: Changing future conditions=climate change – Wisconsin and Maryland incorporated this into their plan. Part of the new state mitigation plan is changing future conditions. The 2016 risk assessment portion refers to changing future conditions. This must be addressed as this is a requirement.
Bill: Call it a climate change.
Chris: IDOT completed a study with climate change and how it will impact their roadways, runways, etc. They hired a contractor and are in the final stages. Jim Angel supplied a ton of information. It is not finalized yet. Gene Felcher and Tom.

Ron: Are there any other new requirements?
Steve: We need more inclusive ICC rural electric coop voice at table adoption by highest elected official. Mitigation program consults have been doing only new requirements. Program requirements stayed the same as 2013. Plane review guide is a little more condensed and easier to review. The enhanced plan asks for more on the grant side. For example: Funding for disaster mitigation grant is an extra 5%. The standard state is 15% PA and IA. Enhanced would be 20%. There is no more money for managing, only for spending on projects. The plan would have to talk more HMHA side grants to prove and

demonstrate to meet enhanced guidance requirements. Also, planning and implementing plan and showing case how it's being utilized around state would be required. Only 12 states are enhanced including Iowa Missouri, Florida, Wisconsin and Ohio.
Ron: $0 no disaster in 3 years
Bill: We have become better at planning. There are no mitigation funds because we are good.
Ron: Regarding the enhanced plan, my boss said do not do it.
Steve: There is a lot of work to become an enhanced state. You would be managing a program above what you are doing now.
Ron: My old boss was here and spoke of a rumor about trying to get rid of the program. He said if you turn it in with mistakes, it would be thrown out of the program.
Steve: There is a lot of work to become an enhanced state. Region 7 has a lot of merit. Nebraska said they don't get a lot of disasters.
Curtis: We don't get any more money to do additional management regardless if you are an enhanced state or not.
Ron: We can pay 100% salary but they won't let us hire anyone. We lost 40 million dollars. They won't let us pursue.
Scott: We should enhance MAE center data. Earthquake information is based on building not there anymore. Midamerica Earthquake Center, U of I in Champaign, IL.
Ron: National Science Foundation funded the first 5 years and then may have closed up.
Scott: This is stale data with respect to building still exist.
Tricia: 2016 & 2017 tackling new programs, grant – Mae center
Steve: Any questions? For a good example of an approved state plan, look at Wisconsin. The state assets are recorded decent. Page wise, it is 800-1000 pages long. Katie Summers is thorough and runs a tight ship. It was just approved a year ago in 2016. It is all 5 years now. Indiana just started on theirs for 2019.
Sam: We have a lot of data to gather.
Ron: National climatic data center info 2014. Is there a better source?
Chris: National center for environmental information. Data should be up to date.
Sheela: Would appreciate more quantitative data.
Curtis: FEMA would get different data.
Chris: A lot of that has to do with old records. Headquarters has us go through all that data to verify. Some data was incorrectly entered. Old records had to be digitized. Bad dates and bad amounts but it should be rectified. East Peoria had a record 1900 snowfall. How accurate was that? We are trying to weed out some of that. NCEI updates rainfall daily. Maybe you are looking at wrong webpage. Regarding storm data and wind damage, they changed some of that stuff and goes back to 1995. Tornado data goes back to 1950. We found some incorrect tornado data. The local hazard mitigation is dealing with Andrea Bostwick, who had some questions. The longitude and latitude were put in incorrectly. The tornado was off 15 miles. The tornado prior to mid 70's was entered in later. The 1950's data was put in the database by the 1970's. Dr. Ted Figita. He did the nuclear regulatory division and how to build a tornado structure for a nuclear facility.
Robert Rapp: A good source to know about is the Oklahoma Department of Insurance. They put together every February a meeting called tornado summit. It is a good 2-day seminar. The NAIC funds 1 person to go to the summit.
Steve: Paul said some states are better preventing. FEMA has plans to stop or lower disasters. He looks at plan usability. Even the best and greatest plan needs to be laid out right so locals can easily find information.
Scott: You've got to be good and follow through on the state's plan. Some don't do anything with it. Make sure mitigation funding is behind the scenes. If you don't fund properly, you're not going to do what's intended.
Steve: Take consideration that the locals may be implementing. State priorities are something that your plan highlights.
Sam: The next meeting is 1.17.18 at the same time 10:00 a.m.
Robert: Are you looking for our agency response? So you need the assessment strategies and feedback sooner rather than later.

Sam: We are reaching out to agencies to discuss options and strategies.
Scott: The utility regulator, Illinois Commerce Commission, was referenced at the last power outage exercise. We need more protection of utilities. We should include utility companies regarding smart grid exercise. We need to protect their systems and our utility usage.

Porter, Tammy

From:	Porter, Tammy
Sent:	Friday, January 12, 2018 3:51 PM
To:	Amy Dickinsen-Ferguson; Bill Milner; Blaine Kinsley; Bob Bauer; Brett Gerger; Chris Miller; Christopher Haring; Curtis Caldwell; David White, Lieutenant; David Wortman; Diane Hoots; Gary Johnson; Gene Beyer (gene.beyer@illinois.gov); Gene Felchner; Greg Swanson; Hal Sprague; Harvey Henson; James Randal Angel (jimangel@illinois.edu); Jared Dubnow; Jeff Aranowski; Lisa Graff; Michael Comse; Mike Chappell; Paul Osmond; Rachel Leibowitz; Richard Fisher; Robert Moore; Robert Rapp; Ron Davis; Ron Graziano; Sally McConkey; Sam Al-Basha; Sandra Hulbert; Scott Clark; Sheela Sreekumar; Steve Greene; Thomas Korty; Tricia Patterson; Valerie Goodwin; Vera Small
Cc:	Caldwell, Curtis; Al-Basha, Sam; Sreekumar, Sheela
Subject:	Planning Meeting 2018 Illinois Hazard Mitigation Plan
Attachments:	Agenda _ Planning Committee Meeting January 17 2017.doc; Capabilities Assessment Form.doc; Hazard Rating Summary Sheet 1.12.18.pdf; Mitigation Strategies From 2013 Plan.docx; Power Point Presentation 01-17-18.pptx; Power Point plus Hazard Rating Summary Handout.pdf; Illinois Hazard Rating Process 2018.docx

Dear Planning Committee Members,

We are working on the "2018 Illinois Natural Hazard Mitigation Plan" which is the five year update of the "2013 Illinois Natural Hazard Mitigation Plan". Your feedback and assistance are critical to the completion and adoption of the Plan within the time frame. If you think that I missed any one, feel free to forward this email correspondence to extend the invitation.

We would like to invite you to the next Planning Committee meeting scheduled from *10 -11 am on January 17, 2018.*

Meeting location is:

IEMA
1035 Outer Park Drive
4th Floor Conference Room
Springfield, IL 62704
Phone: 888-494-4032
Access Code: 4735182782

Attached, you will find the following:

1) **Agenda Meeting**
2) **Capabilities Assessment Form**

Meeting Date - 1.17.18 2018

INHMP Planning Committee Meeting
Notes from 1.17.18

Introductions of all attending:
Sam Al-Basha, IEMA
James Randal Angel, IL State Climatologist
Curtis Caldwell, IEMA
Scott Clark, American Red Cross
Dawn Cook, Tazewell County EMA
Ron Davis, IDNR
John Dwyer, Champaign County EMA
Gene Felchner, IDOT
Diane Hoots, CMS
Sandra Hulbert, IEMA
Sally McConkey IL State Water Survey
Reid McClintock, IDI
Chris Miller, NWS
Bill Milner, IDNR
Paul Osman, IDNR
Tricia Patterson, IDPH
Jon Pressley, IEMA
Robert Rapp, IDI
Vera Small, IEMA
Sheela Sreekumar, IEMA
Heather Stanley, NWS
Greg Swanson, CDB
Rusty Tanton, IEMA
David White, IDOC
Andrew Werthmann, Pew Charitable Trusts
Yeric Yarrington, IEPA

Attending Via Telephone:
Bob Bauer, IL State Geological Survey
Michael Cosme, MWRD
Richard Fisher, MWRD
Steve Greene, FEMA

Meeting Notes:

Sam: Some of you responded on Chapters 1 & 2. Today we received additional comments.

Sheela: Chapter 1 & 2 are done. We are leaving it open for comments from Jim Angel, Sally McConkey and Steve Greene with FEMA. The status of Chapter 1 & 2: We had to add U.S. Army Corps of Engineers and the U.S. Geological Survey. We have started working on Chapter 3 which is basically analysis done by IEMA in 2004. We got the information from the NCEI website. The Hazard Rating Process is completed and the Data Sheet is updated. We changed the names, but the range is the same. The summary sheet was done based on the historical probability and severity of impact. This is how the hazard rating has been done. We updated from 2013 to 2017. The data has been updated and calculated based on formulas.
Sam: The plan needs to be updated in 2 Sections: Mitigation Strategies and Assessment. These went out to the committee and we have had a slow response. We need this for us to complete the next phase of the plan. Regarding strategies, keep in mind the goals of the plan. They did not change.

Objectives are to protect and enhance lives, help local agencies, support, and to be protected against natural hazards. Here is what we are trying to achieve. So far we have 12 or 13 planning committee members that have responded, which is about 50%. We need the other 50% to respond. We need you to submit the assessment forms. This is critical for the next phase of Chapters 3 and 4 of this plan. The deadline is set for February 23, 2018. Please make sure you have submitted the reports as soon as you can. FEMA is involved and we need to get approval from FEMA. February 13, 2018 is our next meeting. In the last plan, we had a list of state owned facilities.
Diane: I will provide a list. CMS does not have GIS software. We have street addresses and a lot of rural properties. I have a report listing almost all state facilities. There are some that have opted out of the report. The latest copy is an excel document.
Sally: GIS limits the references. You might have to pay.
Paul: We actively collect floor elevations. We can tell you if there will be flooding in buildings. I.e. 4 days from now there will be 4 feet of water in the emergency room.
Sally: I'll give you my card and we can start geo referencing them. Not a GIS space map. The map is updated manually.
Sheela: The previous plan was based on SIU Carbondale, which is not done yet this year. There is a whole section based on that study. Are there any suggestions?
Paul: We don't know what that is: Flood Vulnerability Report.
Curtis: We don't have to change that this time around.
Sally: So many different things to look at.
Sam: We can rename the study. Are there any suggestions?
Sally: I will get ahold of him and try to interpret it.
Sam: Please submit the assessment form to update the strategies. Steve, is there anything you want to add or suggestions?
Steve: I'm good right now.
Sam: Where do we go from here? Chapters 3 and 4 are coming with deadlines. Are there any suggestions that you want to share with us? We need success stories for the later part of the section.
Curtis: We are looking for the capabilities section by the deadline, but please send your success stories as soon as possible.
Sam: Reach out to the local agencies and send us success stories. That would be very helpful. They do not have to be state funded. They can be anything to help us with the mitigation plan, any type of reach out program, or anything that has been done.
Ron: Climate Change Issue – We are not clear on what other agencies are doing. There was a big climate change 20 years ago. We need talk more about mitigation climate change. This group focused more on the results of climate change. If some of you have, let us know.
Paul: We need a list of action items to address climate change. We've never done one iota to put this forward. Let's address it, instead of talking about it.
Sam: Maybe we should have a committee.
Jim: We've had 2 meetings about climate change on campus.
Paul: State agencies are supposed to meet. This should be a primary thing.
Sam: This is something to include in future meetings.
Paul: Illinois is #1 in the nation for greater reduction of repetitive loss. We have the fewest number of claims on new structures, which is a success story.
Sam: Thank you Paul.
Scott: I wonder if we've assessed our critical vendors and if their facilities are in floodplains? Say we are very reliant on "X" company, and if that company is not viable in a flood or an earthquake, we need to take corporate action. We need to find alternative vendors that we could use. Who are the top critical vendors for the state?
Diane: We can't keep track of that anymore. Every agency is going off doing their own thing.
Scott: Start with the State Comptroller's Office to look at the top 15 payments of vendors. I.e. If we lost them, we couldn't feed the inmates or have certain medical testing.
Diane: I used to work for the Comptroller's office. Regarding some of the vendor's highest payments, those vendors probably aren't that critical in an emergency situation. In the Comptroller's office, that vendor might be listed differently, unless you have the vendor and FEIN number.
Sam: Does The Red Cross have any certain way to keep track of this?
Scott: We keep track of our own vendors. If something was only made by 2 vendors, and we could no longer get "X" test, then that would be a concern from a mitigation standpoint.
Dawn Cook: Critical facilities should be somewhere in the group plan.
Scott: This is one more thing to look at.
Diane: State Agencies have contingency plans. Critical vendors should be on those plans.
Sam: Can we have access?
Diane: No at the right agency and paygrade, someone could get that information.

Jim: Regarding the same project and looking at climate change, one other thing other groups talk about is vulnerable populations. Heatwaves get hot, but it's the poor and minority groups that have the worst impacts. Is there any thought on groups that are more vulnerable? Sam Dorvich is working with CDC regarding the vulnerability of heatwaves. Rural populations have lower access to healthcare. Some are very poor with no air conditioning and are sitting in trailers in the sun. Sam Dorvich is working on a project on a per capita basis downtown Chicago.
Diane: In the wintertime, warming centers are needed. The list is huge for Chicago for warming and cooling centers. Such centers needed in rural areas as well.

Scott: The CDC has a map that shows vulnerable areas in Cook County which are 32% electricity dependent. If we had power failure with people who depend on oxygen or cpap machines, this is very concerning. Medicaid services shows medical beneficiaries dependent on electricity. Scott will send the link to the index and you put the zip code in. This includes mobility and cognitive impairments.
Sam: Is there any other feedback on which direction to go?
Jim: The CDC's most recent project is being worked on by Sam Dorvich.
Sam: Are there any other suggestions? We need all of the comments on Chapters 1 & 2 back.
Ron: One of those plans no one looks at. We need to find a way to make it part of people's actions. Do some of the stuff to try to incorporate these things. Get money from the Federal Government. Do look at some ways to do something about this. I've been on the Planning Committee since the first one. If 100 year floodplain expands, it gets bigger. DNR urban flooding is more now than in the past. Different results are received from climate change. The results are starting to hit us now.
Paul: The loss risk is evolving. We need to start thinking of how to address this. It would be nice if there was a one page summary action sheet for each state showing the actions each state is taking.
Gene: Does the plan identify where mitigation dollars are spent? After 400 pages, it all runs together. Back to Paul's comment, if the state's strategy is included in the plan, how do we go forward in foreseeable future?
Rusty: Here is what we can also do. Education outreach identifies places to work on in future. Urban and public health disease factors maybe something to look at.
Gene: We should not only be buying out homes of people, State facilities should be addressed as well. I've only heard of homes or private property.
Richard Fisher via phone: One thing we associate with mitigation is going back to look at facilities. This relates to climate issues. They were constructed for flooding at a different time with different standards. We should be reviewing designs seeing if reservoirs typically specific standard for that time are addressed in mitigation. Climate change could affect this. Our reservoirs operate to max capacity and they could be used to enhance.
Paul: That's something simple that could go into plan structures that are 30, 40, and 50 years old.
Richard via phone: They were presented for a rainfall event.
Sally: Regarding the urban flooding report, the storm sewers were designed for rainfall. It flooded once every 10 years, but now it is actually happening every 6 years. Look at the age development during that time period to see if they are up to standard. We need a list of recommendations to consider and evaluate. Vulnerability. There are a lot of assessment tools. If we know the current building standard does not facilitate current rainfall, this plan could be for sewer system runoff rather than the one in the past.
Paul: Legislative and State Agency items are on the list and we are checking those off. Before it was only 10 counties. Encourage communities to use new rainfall. That's a precise action we are checking off as success stories.
Michael: Success Stories – We did a lot of media releases in back of Cook County, we updated 1 of 16. Green infrastructure, reservoir, expanding some of our reservoirs. In Phase II, some success stories may help you out.
Ron: Most people look at the plan as a need to get public assistance and mitigation funds. Check those two off. That is all the people at IEMA care about. Regarding talking to legislatures or journalists, we can't do it. They are not going to let you. We talked about setting up to learn about climate change a lot more. We wanted to but didn't have the resources.
Sam: Can we increase our efforts?
Ron: I did a presentation regarding climate change and I was told by upper management to take it out.
Sam: Should we have more emphasis on this section of the plan?
Ron: They need pressure from above them.
Tricia: Do disease outbreaks qualify as a natural disaster?
Sam: I don't know if we can include it. Maybe if it is in the same direction, we could include a section?
Tricia: We certainly address it, but is a disease a natural disaster?
Steve via phone: I'm trying to remember if this was addressed in 2013. If I remember right, there is a subsection that talks about Tier II hazards and maybe infectious diseases. Some states like Ohio include it in risk assessments. I don't remember. I'll have to check. If you think it's a hazard that impacts the state, analyze it and include it.
Ron: If an earthquake knocks out the water supply, illness will develop. If the plan goes from 400 pages to 800 pages, something needs to be looked at.

Steve: Public health diseases or agriculture along those lines?
Tricia: Public health.
Sam: Plan how far you want to take it. It is a different summary.
Ron: We should have an executive summary and make it 4 or 5 pages long. These are our top priorities. If you have it in 400 pages, you have it done well.
Gene: We are using that plus threat hazards combined historically. Where the state's most current threats are, use both of those as to where we put mitigation money.
Sam: Going back to the update where we are and where we are going.
Ron: Historical data. Ron Moore NRD said how we are doing the plan is driving backwards and not looking into future. You do get speculative. Incorporate flood rainfall data.
Paul: We are not totally speculative. We took all that data to get real patterns and real ideas to solve it.
Sam: Actions are how we make sure.
Paul: We need to have an executive summary and actions.
Sheela: Most just show continuing status.

Sam: We need a list of actions/phases to take for each agency.
Sally: What is the intent of plan? Open up a county plan. They have drawn vulnerability out of the state's plan. Thinking of vulnerability. Another goal of services. Let's talk about actions including all critical facilities and hospitals. Lots of suggestions to think about.
Robert Rapp: What is the intent or overall goal? Public assistance, individual, or both?
Curtis: Approval by FEMA provides assistance by the state. We want to look at those facilities that are vulnerable to see if hazards exist so they will not be affected as severely.
Robert Rapp: Individuals?
Curtis: We assist thousands of people and have reduced damage in Illinois. We don't have the level of severity as Missouri has. It does affect even the private homes because of the strategy.
Paul: The county plan may not show up in the state's plan.
Sam: There is no proposed legislation. Why? We have county adopted plans no one is using to implement.
Scott: Regarding city or county adopted ordinances, we won't build in flood section. Hope our plan looks at saving lives and reducing property damage. There should be a section on action steps: legislative, policy, suggestions for local business, and public structures.
Paul: Illinois doesn't have building codes for the state. West Virginia and Arkansas have building codes and Illinois doesn't.
Scott: Illinois executive order requires state buildings to meet seismic standards. He was on Illinois seismic zone IEMA had. Lots of political issues. Valid to have.
Greg Swanson: They haven't adopted a building code, that's why getting it enforced. Code had to be used within 200 miles of building site agreed to by builder and owner. Pick a code within 200 miles. You have to agree on the code.
Scott: I don't think we should say it's politically not going to happen and we shouldn't list it. We should list it and what we think ought to be done.
Sam: Section to be adopted.
Greg Swanson: Regarding seismic, there are lateral forces for wind but no seismic. Chicago won't adopt international code because they have their own code. Chicago is the exception. Who is going to enforce this? The county doesn't have the manpower to enforce.
Sam: Are there any other comments or directions? We need feedback on these form assessments before the 23rd of February. The next meeting is scheduled February 13, 2018. Next week we will send reminder to send in the forms to those that haven't filled them out. See you February 13, 2018. Thank you for coming and being part of the group.

Print

January 17, 2018 State Hazard Mitigation Planning Committee Meeting

SIGN IN SHEET

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January 17, 2018 State Hazard Mitigation Planning Committee Meeting

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January 17, 2018 State Hazard Mitigation Planning Committee Meeting

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January 17, 2018 State Hazard Mitigation Planning Committee Meeting

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January 17, 2018 State Hazard Mitigation Planning Committee Meeting

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January 17, 2018 State Hazard Mitigation Planning Committee Meeting

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2018 INHMP Update Meeting February 13, 2018 Notes

Attending in Person:
Sam Al-Basha, IEMA
Curtis Caldwell, IEMA
Scott Clark, American Red Cross
Ron Davis, IDNR
Gene Felchner, IDOT
Diane Hoots, CMS
Bill Milner, IDNR
John Pressley, IEMA
Vera Small, IEMA
Sheela Sreekumar, IEMA
Heather Stanley, NWS
Greg Swanson, CDB
Ron Davis, IDNR

Attending via Telephone:
Dawn Cook IESMA
Bob Bauer, ISGS
Sally McConkey, ISWS
Hal Sprague, CNT

Meeting Notes:

Thank You for coming and Introductions

Sam: We have Chapters 1 and 2 done. We are still looking for success stories and need feedback. We would like local level success stories. We started Chapter 3 service assessment and are halfway through the Chapter. We are ready for Chapter 4.

Sheela: Hazard analysis and risk assessments have been updated and are done. The maps are updated. Dr. Jonathan William Remo sent 2015 HAZUS MH studies and the plan has been updated based on that. The 2015 used the same HAZUS MH estimated flood loss reported in the 2013 plan but used a more spatially explicit Social Vulnerability Index than 2013, census block level Vs county level SoVI (social vulnerability Index).

Sam: We are moving forward with Chapter 3. We have put part one out there and part two is coming up in the next few weeks. In the section about dams, we are working with Diane getting this section of the plan done. We are looking into the other parts like infrastructure and landslides.

Hal: I should have made this a priority. I am sorry. We are conducting an urban flooding awareness act study and following up on that study to try to implement some of the recommendations. The mitigation plan is a very appropriate place to use the results from that study. Is there any possibility to add some language now addressing urban flooding?

Sam: We will add a section on that. It is not final yet. We can use a case study and include a section of that study. Send it to Sam or Sheela.

Diane: He's already trying to implement some of the recommendations. He could send some success stories.

Sam: Definitely, we can update that. Was it done recently?

Hal: It was done in June 2015. Would it be okay to summarize for a minute? In a nutshell, the study used a completely novel kind of way looking at flood risks CNT of Cook County 2014 rather than looking at a floodplain map and determining where flooding is likely to occur. Plains through disaster relief, private insurance companies and map those claims paid out aggregated out by zip codes. The map shows where most of the claims were paid. One way is where the most flooding is occurring. This is an incomplete picture. It is different than a floodplain map. More than half of them were nowhere near the floodplain. Following that IDNR did a study 2014-2015 that used the same approach using national flood insurance data for the entire state. They used all insurance company data aggregated census block with both data bases. Their mapping showed more than 92% of the claims were outside of any mapped floodplain. Urban areas have more flat areas and old sewer infrastructure. The damage is occurring in basements and other areas because the infrastructure is inadequate. They sometimes don't meet the FEMA disaster hazard mitigation scenario. A lot of people have property damage and are not eligible for a reaction from IEMA or FEMA because they are not in the floodplain. How do we incorporate those concepts of urban flooding and disaster relief planning? In addition to people with medium size storms in urban area and have the same type of damage repetitively, there is no program that helps them. The definition does not include people who have repeat flooding.

Sam: Thank you for update. The section regarding dams, we collected two different numbers last week. Some of these structures are not listed within the state as owned or dams.
Gene: What is the parameter on dams? Just curious. Dams for private lakes?
Sam: We went by type: concrete or different not listed as others. Could be in both categories.
Gene: Looking in from the outside, the more parameters you put on it, the more accurate it will be.
Curtis: Does DNR have information to include?
Bill : We have information on the ones where people have to get a permit.
Sam: Does 1500 include the private ones?
Gene: Water resources involving permitting or inspecting. Those would be the ones from the outside looking in to be made aware of first and document first. Primary water supply functions infrastructure.
Sam: The numbers vary a lot.
Ron: Give Bill Mauer a call. Sit and talk through it.
Heather: I wouldn't discount the smaller dams from a weather standpoint. Flooding in Christian County ended up in Taylorville. The dam was not topped. All of that water was going to the south and happening upstream. Not seeing the floor. There were also reports from Rochester. It made no sense. It was that Dam. Don't discount the smaller dams.
Scott: Do Levees meet the definition for dams?
Sheela: We have another section on Levees..
Scott: Blend the small levee. I would think it's not on your list. Structures holding water back is something we want to track. With not a lot of enforcement, this will end up causing a lot of damage to others properties.
Hal: DNR is proposing a change of regulation for levee height increases. In part, this will loosen the rules as to when the district can increase the height of the levee. You also increase the base of the levee which increases the original flooding. The Mississippi River has several places they raised the height of the levee. There is a bill in Springfield to prevent that from happening and to maintain the existing regulations. It is detrimental to flooding.
Sally: Thank you Hal. National thinking is not to increase the height but look at alternative levees. Levee wars between Missouri and Illinois are not solid policy.
Hal: Looser rules increase the size of the levee.
Sally: Higher levees are not good policy. For the state looking at hazard mitigation, we should have controlled overflow places, not higher levees.
Ron: Levees are a good tool in the tool kit. We don't want to get into wars with other states. It increases elevation, flooding and causes problems. Pressure is being received from state representatives. This is politically motivated not policy motivated.
Sally: This is the classic pressure push and pull economic development and is not looking at good solid policy. We need good floodplain management and innovative ways to reduce impact to our communities and our environment.
Sam: Regarding the Influenza issue, the last time this was included in this part of the chapter. Should we let the CDC handle this? For national disaster, leave it out. We can put a reference that public health is handling this section. I've been in contact with Trisha Patterson, IDPH.
Diane: Good point.
Sam: Regarding Infrastructure, we haven't gotten far on that topic. From bridges hospital, it is the same from the last plan except updated, not many changes. There are still infrastructure ongoing issues for us.
Ron: At the last meeting, we discussed Influenza and how climate change impacted. You might want to include that.
Scott: Before you take it out, Illinois has an Ebola plan and a Zika virus plan. How would the state respond if it occurs? Regarding international arrivals, we should monitor symptoms of people before they get out of the airport. There might be all kinds of contagious outbreaks like Ebola and Sars virus. The state should look at ways to monitor people coming in with illness signs at the airport. Most plans are responding to events.
Diane: Regarding non-human illnesses, we are such an agriculture state. Agriculture has to prevent illnesses by testing animals that come in which indirectly affects humans. It's an economic threat. It's a virus.
Ron: In the past, we haven't included influenza.
Sam: Once it's a health issue, CDC takes over. Maybe we can include a reference.
Ron: I don't know if public health does preventative.
Diane: Agriculture does. They do have mitigation practices for animals.
Scott: They saw some actions like Ebola and provided notice to the hospitals.
Diane: O'Hare has a place to screen people.
Ron: They might think we are stepping on their toes.
Sheela: Health hazards as a result of natural hazards
Sam: National disaster is something we will touch on for the plan. Next time, we will discuss more.
Scott: There should be a mitigation plan for health diseases and animal diseases. We could cross reference their plans. The state as a whole has to mitigate economy. Humans eat the food. Negotiate this with public health.
Sam: Have other mitigation available for response. Regarding landslide, we don't have much done yet. That's where we are on Chapter 3.
Bob Bauer: We do the research part. I turned in to you a section on landslides.
Sam: We have that. Thank you Bob.
Bob Bauer: Let me know if you need contacts regarding landslides.
Sam: Yes, Thank you. This is a critical part of Chapter 4. The assessments are all in. They have been incorporated in the plan. We have two responses from state agencies. Last week out of 2013 plan, we took the sections that applied to each agency and emailed you to take a look and see

if they are still ongoing or need updated. We need this feedback from you to get past Chapter 4. We may send another email. If you are not able to help us with this section, maybe someone else from your agency can help. We need it. I don't want to get on my knees and beg, but we need your help. If you know someone that can help, we can schedule a meeting. We sent email last week and sent sections. The next part is follow up with phone calls to get help on this section. The next meeting is March 8, 2018. Next phase is strategies which need updates. We are now open for discussion. Is there anything
we need to do? We are making progress. We are maybe 50% done. Without you, we cannot move forward much. Any questions or comments?
Sheela: DNR is working as a supporting agency to a lot of other agencies. That is why DNR received lot of e-mails.
Ron: We were out of town.
Hal: I have questions on the agency contact form.
Sam: We made that form out last week. Take the strategies and look to see if applicable to your agency. Then, see if it needs updated or changed. If you know someone at your agency to further help us with this section, please use the contact form. The section itself is a multiagency project working together. It's a joint effort. We met with Gene on this strategy. He has good ideas. Is the strategy in progress or completed?
Gene: Some tasks we have completed as a group. Some people may have completed their own piece and others may be ongoing. When I look at different pieces in the chart, I'm coming in late for the ones that are multi agency. Some have incorporated GIS with 5 or 6 different agencies involved. When we did this in 2013, did all these agencies sit at a table to meet? The last plan we met individually and merged together the information.
Ron: The same format has been used for years. People weren't using GIS at that point. It was pretty standard.
Sheela: If the agency is still using that, it's ongoing.
Curtis: You could add how you are using it for decision making. Are you still using GIS for decision making? We could report on specifically how it's being used.
Gene: Some of these are elements are never finished. It's an ongoing process. 2018 still has a lot of ongoing or continuing. Include what we are doing.
Sheela: Some of the goals accomplished are going on there.
Sam: Are there new goals?
Curtis: DNR uses flood engineer maps. Put in there what GIS is used for.
Bill: Some in 2008.
Gene: Send multi agency data to Sam and Sheela. That would make it easier.
Sam: We need all your help.
Curtis: Don't forget all the success stories. We could use some from IESMA.
Sam: On your big assessment regarding all of DNR, did they reach out to you?
Ron: They responded, but they never got back. They seem to think we should do it.
Ron: Let me check with her.
Sam: The deadline is tomorrow Ron.
Curtis: We need your strategies, success stories, and any activities.
Sam: We need to get Chapter 4 done. Submit as soon as possible. Chapter 3 and 4 are the core. We cannot do much without you.
Gene: See if they are still valid.
Curtis: If we don't receive information back from you, we will assume all is the same.
Sam: We need your strategies as soon as possible. There is no way out of this. We will be calling you. If you don't want to meet us, we will walk to your office.
Gene: All we have to do is let you know if everything is the same. The strategies are all the same, continuing, and all still relevant. The people that put the list together did a good job.
Sam: Make sure they are still valid and list any new ones you want to add. We need to hear from you by the end of the week. Remember FEMA is waiting for us. Any questions? The next meeting is scheduled Thursday March 8, 2018. Please submit everything by Friday.
Sheela: We have a timeline.
Sam: We hope to see you in march.
Gene Felchner: I have questions after the meeting.
Sam: Thank you for coming.

Information from Diane Hoots, CMS prior to the meeting:

Junior Colleges Liaison: Susan Drone
IDOT right of ways
IDNR right of ways waterways
ITHA toll highway - nothing
IPA Illinois power agency - no idea
Nothing leased
State universities, we don't own that
No local schools like Springfield High
ISBE liaison, Jeff Aranowski could probably get a list of schools. The name of the principal and phone number should be on the website.

February 13, 2018 State Hazard Mitigation Planning Committee Meeting

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David Wortman	Illinois Department of Commerce	david.wortman@illinois.gov
Yeric Yarrington	IEPA	yeric.yarrington@illinois.gov

2018 INHMP Update Planning Committee Meeting March 8, 2018

Attending in Person:
Sam Al-Basha, IEMA
Curtis Caldwell, IEMA
Mike Chappell, IDOC
Scott Clark, ARC
Alex Fonteyn, ARC
Rachel Leibowitz, IDNR Historic Preservation
Bill Milner, IDNR
Jon Pressley, IEMA
Vera Small, IEMA
Sheela Sreekumar, IEMA
Heather Stanley, NWS
Rusty Tanton, IEMA

Attending via Telephone:
Bob Bauer, ISGS
Steve Greene, FEMA
Hal Sprague, CNT

Meeting Notes:

Sam: Introductions. Thank you for coming. This is our fourth meeting. The purpose of today's meeting is to discuss the current status of the 2018 Illinois Natural Hazard Mitigation Plan (INHMP) and to let you know where we are in this process. The last time we met, we were working on Chapter 3 and had made some progress on Chapter 4. All of the agencies participated in the capabilities assessment forms. We had 100% participation. For Chapter 3 and Chapter 4, we need the mitigation strategy forms. We only have 25% that have responded. We need you to submit the mitigation strategy forms. We need to have them in order to move forward with Chapter 4. When we left the last meeting, I said I would come to your office. We need the forms and your input. Once we receive them all, we will merge them together. This is a slow process moving forward from chapter to chapter. Chapter 3 is based on IDNR information. We updated the section on dams. There are 1516 dams in Illinois. We updated the mine Section in Chapter 3. We agreed as a committee to include but not go too deep on influenza. We will include brief paragraphs along with a response plan by the State of Illinois. We will include a link to the state plan. This is not a national disaster. We can reference the IEMA website, the state plan, and the CDC link. The landslide section is updated and done. Back to mine section, Bob on the phone updated this information. Everything is updated in the plan. The data ranges from 1999-2017 on the mines. Regarding state facilities, Diane from CMS provided all of the information. We have a pdf that is not easy to work with. If you have access to a map, please share with us. Regarding critical infrastructure, most of the information from 2013 will be almost the same. This is where we are at in Chapter 3. We are keeping our promises with Steve and will try to get Chapter 3 to Steve by tomorrow or Monday.
Strategies is where we need to update on new strategies and objectives to address the goals of the plan.
There are 4 goals to keep in mind:

GOAL 1: Maintain and enhance the State of Illinois' capacity.
GOAL 2: Build and support local capacity and commitment to continuously become less vulnerable.
GOAL 3: Improve coordination and communication with other relevant entities.
GOAL 4: Increase public understanding, support, education and demand for hazard mitigation planning.

We have received 25% of the mitigation strategies. We need your response, feedback, and input. We need your mitigation strategies to complete this chapter. We took out the strategies by each agency and sent you 2013's mitigation strategies. We all have plans in place. Just share with us if it is the same.
Yesterday, we had a conference call with FEMA. On every call we have with FEMA, this plan is the number one priority for IEMA and the state. We need your input to get this done and we need your success stories. Most of you have access to local communities and you come across local stories we can use. Please help us out with your local success stories. Provide us anything you can think of.
Steve, do you want to share anything with us?
Steve: Not right now. Sit down and start working on those comments for the second half of Chapter 3. That is the heavy lift. Make sure it's sound and your local plan authors will use for the local level. Get the other section completed and we will continue to review that chapter. Keep building on the risk assessment.
Sheela: Do you want to talk about the mitigation strategy forms?

Steve: Looking at the actions, a lot of them relate to outreach and coordination. This time, go back and take a look at outreach and coordination actions that you can combine to reduce repetition.
Sam: Decide what's completed. That is really success stories. Update these actions. Maybe share with us the data or the progress. That's all I have for an update. IDNR Historic is now part of IDNR.
Rachel: We need to coordinate. There's really one response from IDNR for all of the programs.
Sam: Ron suggested to keep everything the same for all IDNR.
Rachel: I don't know if DNR ever stated all this. I'm trying to understand what you are looking for. State law is reactive law. We have no authority over private property in the state unless there is state funding or licensing. If you place a roof on private house, we will evaluate if there are different priorities. I'm trying to understand. I don't see the information in the forms you have sent so far. Not a very good response. To repeat it is foolish. I don't know the extent Ron wants to put in on the information.
Sam: Ron said DNR actions will be the same. That covers you and that's DNR's fault on how to take it. Actions are the same as us. Any ideas all the issues with the floods going on?
Curtis: It's going down at this point.
Sam: Anything you need to cover, update, or address? We can reach out. We are not the experts. This is a five-year update. It used to be updated every three years, but now it is every five years. This is a lot to cover.
Curtis: If you have any questions, or need any help on the strategies, please let us know.
Sam: I'm sitting with Gene to help one on one to work on the process. October is the deadline for us to get this done, completed, adopted, and signed by the governor. The internal date to complete everything is June or July. That's our date. By October 21, 2018, this must be adopted and in place. If not in place, FEMA will not give any funding. FEMA is very supportive. Thank you Steve.
Steve: No problem.
Sam: Any questions for us? Is there anything you think we are not doing and should do? We can send you Chapter 3 next week.
Sheela: Chapter 3 is Risk Assessment.
Sam: We will send you an email by next week. We will address any problems. We cannot proceed without the forms. This is very time consuming. It looks easy, but it's not. It involves all the state agencies. We need your help and cannot do it without you. Curtis, do you have anything to add?
Curtis: We just need the strategies. If they need tweaking, that's fine. Just let us know.
Mike: Who do you need response from?
Sam: We can share who has responded.
Sheela: We have received only 5.
Curtis: Is Ron working on DNR?
Sam: Ron has been very helpful. Ron is the icon of mitigation. The next icon is Rusty. Definitely without Rusty, we would not be this far.
Curtis: Sam is our new Mitigation Officer.
Sam: Thank you. Yes, effective March 1st. I'm not there yet, but I promise I will be. This side of mitigation is all new. It's a whole different game. My background is Engineering. Hopefully, that will help. I need your help and support. This is the number one thing for the agency. Any questions for me? It seems like this group is becoming smaller. The weather is getting nicer. We still need your help on this plan. Any questions? On the phone? Thank you Steve and Bob. Thank you for participating today. The next planned meeting is Wednesday, April 18, 2018. See you next month.

March 8, 2018 State Hazard Mitigation Planning Committee Meeting

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