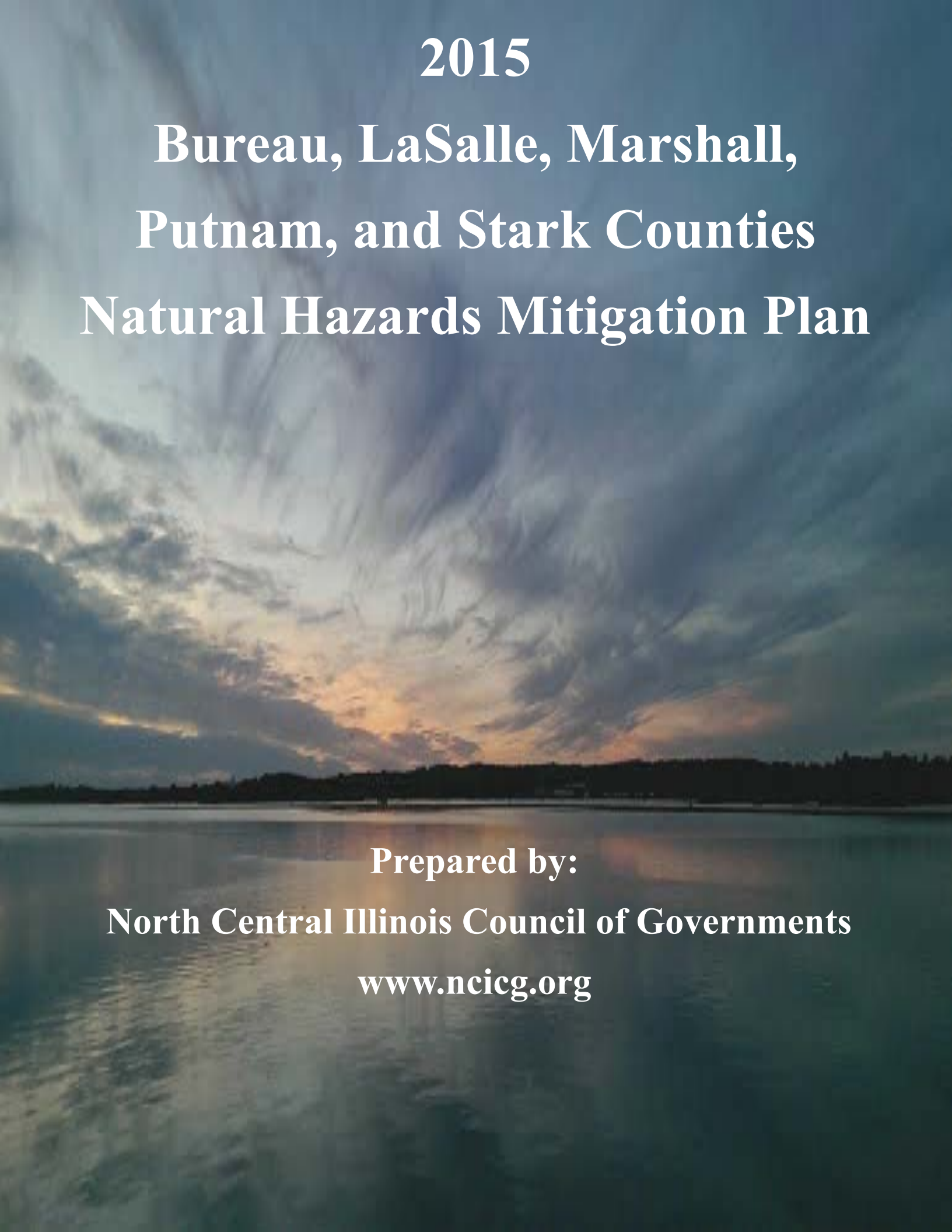
2015

Bureau, LaSalle, Marshall, Putnam, and Stark Counties Natural Hazards Mitigation Plan



Prepared by:

North Central Illinois Council of Governments

www.ncicg.org

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Bureau, LaSalle, Marshall, Putnam, and Stark Counties

Natural Hazards Mitigation Plan

Prepared by:

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Glossary of Terms and Acronyms:

BCEGS – Building Code Effectiveness Grading Schedule
BCR – Benefit Cost Ratio
BOCA – Building Officials and Code Administrators
CIP – Capital Improvement Plan
CRS – Community Rating System
DBS – Direct Broadcast Satellite
DMA 2000 – Disaster Mitigation Act of 2000
EAS – Emergency Alert System
EF-Scale – Enhanced Fujta Scale
EOP – Emergency Operations Plan
FCC – Federal Communications Commission
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map
HAZUS – Hazards United States (Software)
HMG – Hazard Mitigation Grant
IAFSM – Illinois Association for Floodplain and Stormwater Management
ICC – International Code Council
IDNR – Illinois Department of Natural Resources
IEMA – Illinois Emergency Management Agency

IPAWS – Integrated Public Alert and Warning System
ISO – Insurance Service Office
MFH – Multi-Family Housing
MH – Manufactured Housing
NCICG – North Central Illinois Council of Governments
NFIP – National Flood Insurance Program
NHMP – Natural Hazard Mitigation Plan
NOAA – National Oceanic & Atmospheric Administration
NPDES – National Pollution Discharge Elimination System
NWR – NOAA Weather Radio
NWS – National Weather Service
OSHA – Occupational Safety Hazard Administration
PPI – Program for Public Information
RLP – Repetitive Loss Properties
SBCCI – Southern Building Code Congress International, Inc.
SDARS – Satellite Digital Audio Radio Service
SFH – Single Family Housing
SFHA – Standard Flood Hazard Area
USEPA – United States Environmental Protection Agency
USGS – United States Geological Survey
US HUD – United States Department of Housing and Urban Development
WEA – Wireless Emergency Alerts

Executive Summary

The world's climate is changing. Extreme temperatures, stronger storms, increased precipitation, and rising sea levels indicate that climate change persists. Whether the changing conditions are caused by human-induced actions or simply part of the Earth's climate pattern, the reality is that natural hazards are wreaking havoc and creating disasters that are claiming lives, destroying property, and impacting ecosystems. Natural disasters happen everywhere. The impacts of changing weather patterns have been observed even Illinois. For example, Illinois recently recorded its wettest June since records originated in 1895. Dozens of communities have been forced to deal with flooding, some on a regular basis. Thunderstorms are occurring with greater strength, as well as tornadoes. The continued severe impacts of natural hazards necessitate government and public action to save lives and property. Born out of this understanding, communities engage in a process to create a Natural Hazards Mitigation Plan (NHMP) to identify strategies that will achieve the aforementioned objectives to build resiliency.

According to the Federal Emergency Management Agency (FEMA), the following four (4) steps are needed to begin a mitigation plan:

1. Build community partnerships.
2. Identify hazards and community vulnerability.
3. Prioritize hazards risk reduction actions.
4. Communicate successes.

For this Natural Hazards Mitigation Plan (NHMP) Bureau, LaSalle, Marshall, Putnam, and Stark Counties, along with 38 communities, created a partnership to identify regional and local goals to mitigate the impact of future disasters. Through a year-long planning process, each participant's hazards were identified and specific vulnerabilities were assessed. Ways to reduce damage from hazards were explored, community success stories were shared, and goals were drafted and prioritized.

Chapter 1: Introduction

This 2015 multi-jurisdictional NHMP is an update of two (2) existing NHMPs that expired in 2013. Chapter 1 explains the process that led to NCICG applying for mitigation funds on behalf of Bureau, LaSalle, Marshall, Putnam, and Stark Counties, and then encouraging communities to participate in the plan. The chapter explains the planning process, how the public was involved, and development of Community Risk Assessments (CRAs). The CRAs identify hazards that communities face, recent storm event descriptions, and future mitigation activities.

The impact of climate change and efforts to build resiliency are addressed in Chapter 1. Illinois Senator Sue Rezin's establishment of the Illinois Valley Flood Resiliency Alliance brings communities together to tackle the issue of flooding and is one (1) example of a regional approach to building resiliency.

Changes in development, progress in local mitigation, and changes in priorities are also addressed. While there have been little changes in development, there has been progress in local mitigation. Communities have completed storm sewer improvement projects, installed tornado sirens, and are enforcing floodplain management regulations to reduce the impact of riverine flooding. Mitigating urban flooding is now a significant priority of the region that is being addressed.

Chapter 1 explains that this plan fulfills the requirements for federal mitigation funding programs, qualifies for Community Rating System (CRS) credit, and provides the counties and the participating municipalities with a blueprint for reducing the impacts of the natural hazards.

Chapter 2: Hazard Profile

Chapter 2 identifies, explains, reviews, and analyzes the hazards below that have the potential to impact the region. Regional data on each hazard is presented and several examples of how these hazards have impacted communities are included in this chapter.

- Thunderstorms (includes lightning, hail, and tornadoes)
- Winter Storms
- Floods
- Earthquakes
- Drought
- Extreme temperatures (Heat and Cold)
- Landslides
- Wildfires

Landslides and wildfires are not common to the region, but a landslide in Streator in 2007 and a marsh grass fire near North Utica in 2012, which burned 200 acres, provide reasoning to examine their potential occurrence. The process of determining each community's risk is also described.

Chapter 3: Vulnerability Assessment

This chapter reviews how vulnerable each county is to the hazards identified in Chapter 2. The tables in the chapter illustrate the potential damage from the natural hazards. Potential safety, health, economic, and building damages are explained for each hazard. The number of critical facilities and Repetitive Loss Properties (RLPs) within the five (5) counties is presented. Note, data that was included in the 2008 NHMPs is utilized because of changes to the HAZUS software.

Chapter 4: Preventive Measures

Preventive measures are implemented to protect new and future construction from potential losses and damages. The measures that are reviewed in this chapter include:

- Building Codes
- Manufactured Housing Regulations
- Land Use Planning, Zoning, and Subdivision Regulations
- Floodplain Management
- Stormwater Management

The plan identifies building codes of each participating community and county. Some of the local governments have not adopted building codes and some local governments that have adopted codes may not enforce them for lack of resources. A regional discussion is recommended to identify how communities could share resources and provide building inspector training.

Participation in the National Flood Insurance Program (NFIP) requires that a floodplain management ordinance be adopted and enforced in a community. Most of this NHMP's participants are members of the NFIP. To ensure compliance with the program, communities must continue to enforce their floodplain management ordinances. The City of Ottawa and LaSalle County have gone above and beyond the requirements of the NFIP and have adopted policies and pursued mitigation activities to be a participant in the Community Rating System (CRS). As a result of their efforts, property owners with flood insurance in their jurisdiction save on flood insurance premiums.

Urban flooding is impacting communities across the region. Aging, deteriorating, undersized, and combined sewer systems are unable to handle increased flow associated with frequent heavy rain events. As a result, sewer and drain backups are occurring. The Illinois General Assembly passed the Urban Flood Awareness Act and tasked the Illinois Department of Natural Resources (IDNR) with exploring the prevalence of urban flooding, associated costs, and stormwater management policies. The report's recommendations are included in Appendix F of this plan.

Chapter 5: Property Protection

There are several property protection measures that can be pursued to reduce damages caused by natural hazards. Pursued measures often depend on location and financial resources.

The region has many critical facilities that are at risk of flooding. Most of these facilities are water treatment plants and wastewater treatment plants. Not all of the critical facilities are located in 100-year floodplains. Local governments need to care for and maintain their critical facilities in order to serve the public during emergencies. The importance of protecting critical facilities is examined through local examples of facilities that have been impacted by flooding.

Chapter 6: Flood Control

Floods are the most common and widespread disaster in the nation. In this chapter, items that can aid in the control of floods are addressed. They include:

- Conveyance System Maintenance

- Dredging and Erosion Control
- Dams and Reservoirs
- Levees and Floodwalls
- Open Space Preservation
- Ice Jam Mitigation

Many communities in the region expressed the need for additional dredging of the Illinois River. Silt and sediment that has settled on the riverbed is causing the river to rise more quickly, resulting in flooding. Dredging is a costly and timely mitigation activity and is not a long-term solution. Erosion control measures must be taken as well to address the root of the problem.

Chapter 7: Emergency Management

Emergency management measures protect people before, during and after a hazard event. The four (4) stages of emergency management, mitigation, preparedness, response, and recovery, are reviewed in this chapter.

Threat recognition systems as well as the entities responsible for tracking natural hazards are cited. The difference between a weather *watch* and *warning* is addressed along with the National Weather Service's new storm-based warning method.

The chapter examines multiple methods for the public to stay informed on disasters. Public and private emergency notification systems are reviewed. It became apparent through the planning process, that a regional discussion on the possibility of uniform guidelines for the activation of early warning sirens during severe weather is necessary. Communities have varying guidelines and policies on when sirens are to be activated. All communities and counties with sirens should adhere to Illinois law on testing early warning sirens only on the first Tuesday of the month at 10:00 a.m.

Chapter 8: Public Information

Ways to involve the public are addressed in this chapter. Public involvement is an important component of hazard mitigation. For mitigation activities it to be successful, community support and often financial resources (tax dollars) are needed. Outreach projects, information outlets, assistance measures, and public information program strategies are reviewed.

Chapter 9: Objectives and Plans

The regional goals and objectives, as identified through public meetings and the Mitigation Team, are presented in this chapter. The intent of these goals and objectives is to reduce the impact of natural disasters and to build resiliency. This NHMP will direct officials before, during, and after a natural hazard.

Chapter 10: Community Risk Assessments

Each community (and county) that participated in the 2015 Bureau, LaSalle, Marshall, Putnam, and Stark Counties NHMP will receive a copy their Community Risk Assessment report in Chapter 10. The Community Risk Assessment identifies the community's location and population, major storm events that have occurred since February 2008, the community's natural hazards risks, additional information about the community, and mitigation strategies for the community.

Chapter 1: Introduction

Background

Natural hazards affect every state. Certain hazards are more prominent in certain areas of the country. In the Southeast, hurricanes and tropical storms pose yearly risks. In the Pacific Southwest, the state of California is going through one (1) of the worst droughts on record. Every year, thousands of acres are consumed by wildfires in the western states; some fires are caused by humans, others are caused by lightning and dry conditions. Across the Plains States, Great Lakes Region, and Mississippi Valley tornadoes wreak havoc on small and large communities throughout the year. Every state is susceptible to natural disasters. Therefore, communities must be proactive and implement activities and policies that will help minimize the often tragic outcomes caused by natural hazards.

A Natural Hazard Mitigation Plan (NHMP) is a necessary component of emergency management. To have appropriate, effective, and efficient solutions to natural hazards, a well-prepared plan needs to be created, reviewed, and implemented through the best efforts of the community. Mitigation plans are long-term and do not prevent loss or damage from occurring. However, through implementation of mitigation goals and activities, local governments can reduce and eliminate the loss of human life and damage to public and private property caused by natural hazards.

The Disaster Mitigation Act of 2000 (DMA 2000) is federal legislation that emphasizes and gives opportunity for state, tribal, and local governments to closely coordinate hazard mitigation planning and implementation efforts. This Act establishes a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program (NHGP). Local mitigation plans must demonstrate that the proposed mitigation measures are based on a solid planning process that accounts for the risks and capabilities of the community.

A mitigation plan is required for governments to receive federal mitigation funds under Section 104 of the DMA 2000 (42 USC 5165). Plans must be community-specific to meet the prerequisite to receive pre-disaster funds from the Federal Emergency Management Agency (FEMA). An Interim Final Rule was published in the Federal Register in 2002, which established the planning and funding criteria for states and local communities. For the plan to receive FEMA approval, all the criteria must get a satisfactory or greater score and be adopted by the governing bodies of the jurisdictions involved. Once FEMA has approved the plan, it is considered active for five (5) years.

The following statement is from the 2013 Illinois Natural Hazards Mitigation Plan (INHMP):

> "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."

This plan will assist with the management and mitigation of natural disasters for the Counties of Bureau, LaSalle, Marshall, Putnam, and Stark, as well as the participating communities within these counties. The five-county NHMP fulfills the federal mitigation planning requirements, qualifies for Community Rating System (CRS) credit, and provides the participating counties and communities with an outline for reducing the impacts of natural hazards on people and property.

The Bureau, LaSalle, Marshall, Putnam, and Stark Counties NHMP is an update of two (2) previous plans: the 2008 Bureau, Marshall, and Stark Counties Natural Hazard Mitigation Plan and the 2008 LaSalle and Putnam Counties Natural Hazard Mitigation Plan. Both plans expired in 2013 and North Central Illinois Council of Governments applied for funding to update the plans. After consultation with the Illinois Emergency Management Agency, it was decided that the updated plan would include all five (5) counties. Although there have not been significant changes in development in the region, all of the counties have experienced the impact of flooding since 2008. The plan has a strong emphasis on flooding and measures that can be taken to reduce the loss of life and property caused by this hazard. Flooding mitigation activities remain the top priority of the plan. However, urban flooding and drainage issues are discussed more in depth. Through the planning process, it was identified that most communities have urban drainage and surface water flooding issues. Flooded roadways, overwhelmed sewer plants, and basement backups were common issues in the region. Communities identified specific mitigation projects that are needed to address these problems, but most communities have limited financial ability to carry out large-scale mitigation projects in the near future.

The plan addresses progress in local mitigation. This progress is identified in the Community's Risk Assessments. For example, the Village of DePue in Bureau County fulfilled

a mitigation activity by installing new early warning sirens. The City of Peru identified several sewer separation projects that will reduce basement backups. Several communities have also improved their ability to warn the public of approaching storms by utilizing CodeRed.

The impacts of climate change are also acknowledged throughout the plan. According to the United States National Climate Assessment, which summarizes the current and future impacts of climate change, increased precipitation and flooding have occurred over the past century in the Midwest, and the trend is expected to continue. While there are multiple impacts of climate change, the most recognizable impact in the NHMP region has been increased precipitation and its related flooding. Increased flooding has led to the need for states and communities to identify practices, policies, and activities that will build resiliency. The primary objective of the community-identified mitigation activities in this plan is to build resiliency.

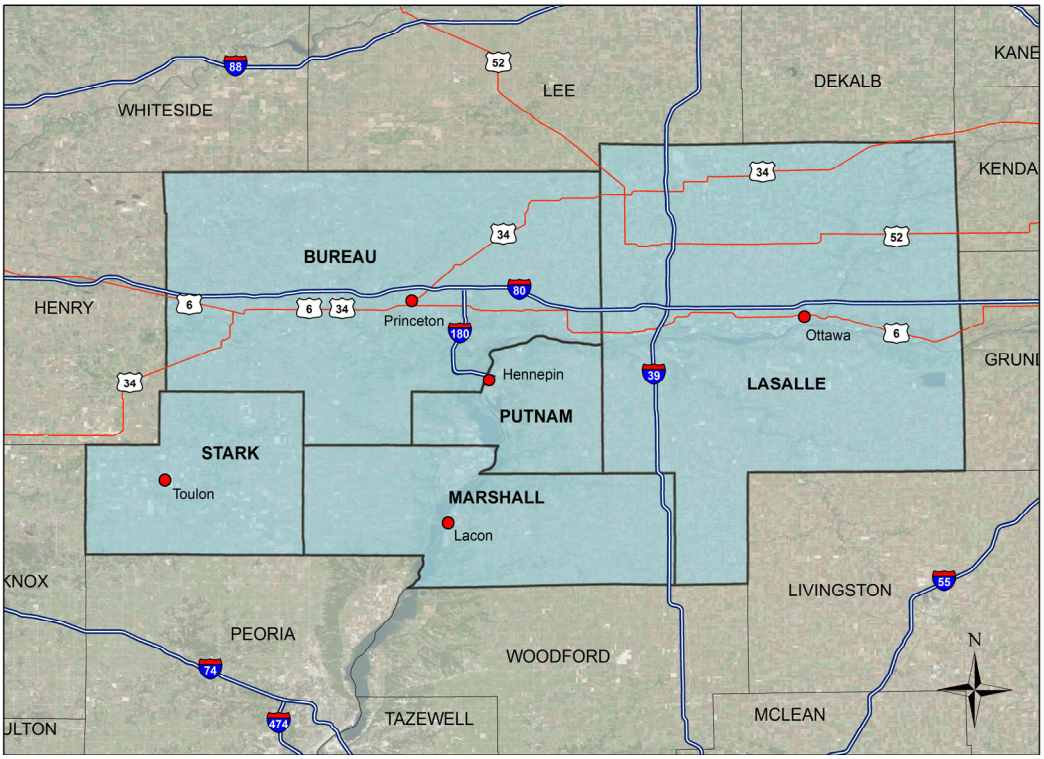
Existing plans, studies, reports, and technical information have been incorporated into this plan. The National Oceanic and Atmospheric - National Weather Service (NOAA NWS) storm database was utilized to show the quantity of weather events and damages. The Federal Emergency Management Agency's HAZUS software was used for assessing vulnerability. Repetitive loss property (RLP) data provided by the Illinois Emergency Management Agency (IEMA) is also incorporated. The Illinois Urban Flood Awareness Act Report is discussed in the plan and the report's recommendations are included in Appendix F. Other plans and technical information from sources including the Middle Illinois Regional Water Supply Study, the Illinois Valley Flood Resiliency Alliance, and community interviews are included in this NHMP.

This NHMP should be incorporated into other plans and documents, as necessary. The boards and councils of the participating communities should incorporate the NHMP into comprehensive plans that identify future land use and capital improvement plans that identify public infrastructure needs. Other plans that NHMP information should be incorporated into include:

- Emergency Operations Plans
- Zoning, Subdivision, and Floodplain Ordinances
- Economic Development Plans
- City Budgets
- Building Codes
- Other plans and documents deemed appropriate by the community or county

The 2015 Bureau, LaSalle, Marshall, Putnam, and Stark Counties NHMP addresses the following natural hazards that could affect the counties and communities covered under this plan: thunderstorms (including lightning, dangerous winds, hail, and tornadoes), floods, winter storms, drought, extreme temperatures (heat and cold), earthquakes, landslides, and wildfires.

Planning Area



Illinois is part of FEMA's Region V, which also includes Indiana, Michigan, Minnesota, Ohio, and Wisconsin. Bureau, LaSalle, Marshall, Putnam, and Stark Counties are located in the North Central Region of Illinois.

Bureau County is located in north central Illinois and is bordered by the Counties of LaSalle, Putnam, Marshall, Stark, Henry, Whiteside, and Lee. The county is part of the Ottawa-Peru, Illinois Micropolitan Statistical Area. The county seat of Bureau County is the City of Princeton.

LaSalle County is located in north central Illinois. LaSalle County is bordered by the Counties of Kendall, Grundy, Livingston, Woodford, Marshall, Putnam, Lee, and DeKalb. LaSalle County is included in the Chicago metropolitan area. The county seat of LaSalle County is the City of Ottawa.

Marshall County is located in north central Illinois and is surrounded by the Counties of LaSalle, Woodford, Peoria, Stark, Bureau, and Putnam. The county is part of the Peoria, Illinois Metropolitan Statistical Area. The county seat of Marshall County is the City of Lacon.

Putnam County is located in north central Illinois and is bordered by the Counties of LaSalle, Marshall, Stark, and Bureau. The county is part of the Peru-Ottawa, Illinois Micropolitan Statistical Area. The county seat of Putnam County is the Village of Hennepin.

Stark County is located in north central Illinois and is bordered by the Counties of Bureau, Marshall, Peoria, Knox, and Henry. Stark County is part of the Peoria, Illinois Statistical Area. The county seat of Stark County is the City of Toulon.

County Demographics

Based on 2010 United States Census data, 173,542 people reside within the counties that are covered by this NHMP. As indicated below, LaSalle County is the most urban of the counties and is the largest in both population and square miles. In LaSalle County, only 30% of the population lives in a rural area, but 96% of the county's land use is considered rural. In Bureau County, more than half (57%) of residents live in a rural area. Marshall, Putnam, and Stark Counties are 100% rural by U.S. Census definition. Accordingly, the Census Bureau's definition of rural is defined as everything (housing, population, and territory) outside of an urban area. An urban area is defined as a core of Census tracts or blocks which are densely populated and are separated from other core tracts and blocks by an area of non-urban land uses and low-density population.

County Demographics					
County	**Total Population**	**Rural Population**	**Percent Pop. Rural**	**County Square Miles**	**Percent County Rural**
Bureau	34,978	20,074	57%	869	99%
LaSalle	113,924	34,422	30%	1,135	96%
Marshall	12,640	12,640	100%	386	100%
Putnam	6,006	6,006	100%	160	100%
Stark	5,994	5,994	100%	288	100%

Mitigation strategies and activities will vary based on a jurisdiction's size and land use. For example, in urban areas, miles of impervious surfaces including roadways and parking lots create surface-water flooding issues. In rural areas, agricultural runoff is a major concern. The solutions to addressing both types of flooding will be different. Urban communities will likely be able to complete larger mitigation projects, while smaller, rural communities may not have the resources, staff, or funds available to complete such projects.

Participating Communities and Local Match

North Central Illinois Council of Governments (NCICG) applied on behalf of Bureau, LaSalle, Marshall, Putnam, and Stark Counties for a Hazard Mitigation Grant (HMG) to update the 2008 NHMPs in July 2013. The Council was invited to submit a full application in November 2013. All five (5) counties and several communities passed "Statement of Intent to Participate" resolutions prior to NCICG submitting the full application (see Appendix A: Resolutions). The Council was awarded an HMG grant and entered into a grant agreement with the Illinois Emergency Management Agency (IEMA) in April 2014. Per the requirements of the grant, the Council was tasked with securing a 25% match to the grant funds. Forty-three (43) communities, including Bureau, LaSalle, Marshall, Putnam, and Stark Counties, agreed to contribute $300 each to fund the 25% match. Their contribution indicated their willingness to participate in the plan. The following tables identify the counties, cities, and villages that participated and that are covered by the plan.

Community	Population
Bureau County	34,978 (Total)
Village of Buda	538
Village of Bureau Junction	322
Village of Cherry	482
Village of Dalzell	717
Village of DePue	1,838
Village of Neponset	473
Village of Ohio	513
City of Princeton	7,660
Village of Sheffield	926
City of Spring Valley	5,558
Village of Tiskilwa	829
Village of Wyanet	1,416

Community	Population
Marshall County	12,640 (Total)
City of Henry	2,464
City of Lacon	1,937
Village of Sparland	406
City of Toluca	1,414
Village of Wenona	1,056

Community	Population
Stark County	5,994 (Total)
Village of Bradford	768
Village of LaFayette	223
City of Toulon	1,292
Cityof Wyoming	1,429

Community	Population
LaSalle County	113,924 (Total)
City of Earlville	1,701
Village of Grand Ridge	560
Village of Kangley	251
City of LaSalle	9,609
Village of Leland	977
City of Marseilles	5,094
Village of North Utica	1,352
City of Oglesby	3,791
City of Ottawa	18,768
City of Peru	10,295
Village of Ransom	384
Village of Seneca	2,371
Village of Sheridan	2,137
City of Streator	13,710

Community	Population
Putnam County	6,006 (Total)
Village of Granville	1,427
Village of Hennepin	757
Village of Mark	555

Planning Process

The development of this plan followed an 11-step process. This basic process was derived (generally) by FEMA in their *"State and Local Mitigation: How-to Guide"*. The steps are as follows:

Mitigation Planning Process

- Step 1: Public Outreach
- Step 2: Build Team
- Step 3: Collect Public and Agency Input
- Step 4: Identify and Profile Hazards
- Step 5: Identify and Assess Problems
- Step 6: Draft Goals
- Step 7: Assess Mitigation Strategies and Discussion on Community Rating System
- Step 8: Create Plan Draft
- Step 9: Review Draft with Public
- Step 10: Adopt Plan
- Step 11: Implement Plan

The planning process kicked off in July and August of 2014 with public meetings in all five (5) counties. In September and October 2014, NCICG conducted initial community interviews with local officials and members of the community familiar with their natural hazards risks. The meetings were held at set locations in each county.

NCICG held follow up meetings in November and December 2014 with communities that had not attended the first meetings to ensure that all 64 communities and five (5) counties were informed and were given an opportunity to participate in the plan. In January 2015, public meetings were held to provide information on the plan's progress, the match requirement for the plan, and to identify regional goals.

Risk Assessment interviews were conducted in April 2015. These interviews were to confirm hazard information and to seek input on the community's or county's mitigation strategies. A public meeting was also held in April to discuss the plan's progress and to provide information about the Community Rating System (CRS).

In July 2015, NCICG held public meetings to present the updated plan. The plan was posted online at www.ncicg.org for the public, local officials, and others to review. The public was also given the opportunity to comment on the plan during the drafting stages and prior to plan approval by attending public meetings or by sharing comments with NCICG via email and

phone. Comments could be emailed to planning@ncicg.org or by calling NCICG at 815-433-5830.

Public Participation

Several public meetings were held throughout the planning process. Attendance sheets and PowerPoint presentations for each meeting are included in Appendix E: Public Meeting Documentation. The table on the following page identifies the purpose and accomplishments of each public meeting.

Public Meetings	
Date of Meeting	**Accomplishments**
24-Jul-14	Public kick-off meeting for Stark County. Informed the public about the purpose of the plan, how it would be updated, answered questions, and sought nominations for the Mitigation Team.
29-Jul-14	Public kick-off meeting for Marshall County. Informed the public about the purpose of the plan, how it would be updated, answered questions, and sought nominations for the Mitigation Team.
30-Jul-14	Public kick-off meeting for LaSalle County. Informed the public about the purpose of the plan, how it would be updated, answered questions, and sought nominations for the Mitigation Team.
6-Aug-14	Public kick-off meeting for Putnam County. Informed the public about the purpose of the plan, how it would be updated, answered questions, and sought nominations for the Mitigation Team.
7-Aug-14	Public kick-off meeting for Bureau County. Informed the public about the purpose of the plan, how it would be updated, answered questions, and sought nominations for the Mitigation Team.
28-Jan-15	Informed the public about the plan's progress and the local match requirement. Sought input on regional goals.
29-Jan-15	Informed the public about the plan's progress and the local match requirement. Sought input on regional goals.

22-Apr-15	A representative of Insurance Services Offices, Inc. informed the public and community officials about the benefits of the Community Rating System. NCICG updated attendees on the plan's progression and sought input on mitigation strategies.
15-Jul-15	Presentation of the draft meeting held in Lacon. Discussed the plan, answered questions, and provided information on how to provide feedback. Also provided information on grant opportunities.
16-Jul-15	Presentation of the draft meeting held in Spring Valley. Discussed the plan, answered questions, and provided information on how to provide feedback. Also provided information on grant opportunities.

Mitigation Team

The 2015 NHMP was developed under the guidance of a Mitigation Team. The Mitigation Team was created to provide information and assistance throughout the planning process. The team consisted of elected officials, zoning officials, floodplain managers, emergency management agency personnel, a fire chief, an environmental services director, and a local business owner. The Mitigation Team actively participated in the development of the plan. The Mitigation Team attended public and special meetings to provide input and guidance on the plan. The Mitigation Team recommended that NCICG submit the plan to the Illinois Emergency Management Agency (IEMA) for review at their meeting on July 30, 2015. Upon approval of the plan, the Mitigation Team has recommended that the participating communities formally adopt the NHMP.

The table below identifies individuals on the Mitigation Team.

NHMP Mitigation Team	
Bureau County	
Kris Donarski	Bureau County Zoning
Keenan Campbell	Bureau County EMA Director
LaSalle County	
Connie Brooks	LaSalle County EMA Director
Joseph Plankenhorn	Village of North Utica Business Owner
Mike Sutfin	City of Ottawa Building and Zoning
Mike Harsted	LaSalle County Environmental Services Director

Andy Bacidore	City of LaSalle Fire Chief
Marshall County	
Rich Koch	Marshall County EMA Director
Doug Wilson	City of Henry Mayor
Hank Zilm	City of Toluca Mayor
Les Hatton	City of Lacon Board Member
Putnam County	
Robert Cofoid	Putnam County EMA Coordinator
Kevin Coleman	Village of Hennepin - Village President
Brian Gonet	Village of Mark
Stark County	
Jason Musselman	Stark County EMA Director
Larry Hollis	City of Toulon Mayor

Community Risk Assessments

Each community (and county) that participated in the 2015 Bureau, LaSalle, Marshall, Putnam, and Stark Counties Natural Hazards Mitigation Plan has a Community Risk Assessment report in Chapter 10. The Community Risk Assessment identifies the following:

1. The community's location and population.
2. Major storm events that have occurred since February 2008.
3. The community's natural hazard risks.
4. Additional information about the community.
5. Mitigation strategies for the community.

Information used to develop the Community Risk Assessment was gathered through one-on-one interviews with community officials and staff, email correspondence, community surveys, local newspaper articles, and governmental websites. Example forms of the surveys are provided in Appendix B: Community Evaluation and Community Survey. Communities were asked to review their assessment and provide feedback. Their comments were noted and incorporated into the final report.

Mitigation Strategies and Priority

In the 2008 Natural Hazard Mitigation Plans, participating communities received a list of 27 action items and asked to choose at least two (2) items of importance to their community. After the action items were selected, the community had to prioritize the action items from a list of priorities rated A-E. These selections indicated each community's agreement to consider completing the action items selected. Once the action items were selected, the communities then

had to determine who was responsible for completing the tasks, how much the tasks cost, when they would be completed, and from what source the funding would come from.

Under the updated 2015 Bureau, LaSalle, Marshall, Putnam, and Stark Counties Natural Hazards Mitigation Plan, mitigation strategies (previously called action items) were derived by conducting community surveys and by having one-on-one interviews with municipal staff and local officials. Through a process of risk analysis, NCICG identified specific mitigation activities and policies for each of the plan's participating communities and then prioritized these strategies using the following criteria:

Priority	Description
A: Very High	Projects that will permanently eliminate damages or significantly reduce the probability of deaths and injuries. These projects will mitigate the community's most significant hazards.
B: High	Projects and/or activities that permanently reduce damages from the community's most significant hazards. They also reduce the possibility of death or injury.
C: Medium	Projects and/or activities that help alert or educate the public to the approach of a threat and/or the need for mitigation from any hazard.
D: Low	Projects and/or activities that will permanently or significantly reduce the probability of deaths and injuries from the community's less significant hazards.
E. Very Low	Projects and/or activities that *are needed to* reduce the effects of all natural hazards and organize for mitigation purposes.

The mitigation strategies are included in the Community Risk Assessments. Drafts of the assessments were sent to each community's contact person for review. Contact persons included elected officials, city planners, floodplain managers, emergency management directors, building and zoning officials, water operators, engineers, and others familiar with the community's hazards. They were asked to provide comments on the community's strategies and their prioritization. After NCICG received feedback, the strategies were updated. A list of community contacts is provided in Appendix G.

The prioritization of the mitigation strategies did not take into account a cost-benefit analysis. Many of the communities have limited financial capability to move forward with costly mitigation projects in the near future. However, there are several policies and activities that will only require staff time and should be pursued immediately. Therefore, a cost-benefit analysis needs to be completed to decide when the mitigation strategies should be implemented. The Federal Emergency Management Agency has created a cost-benefit analysis tool to calculate a benefit-cost ratio (BCR). Accordingly, "The BCR is a numerical expression of the cost effectiveness of a project. A project is considered to be cost effective when the BCR is 1.0 or greater, indicating the benefits of a prospective hazard mitigation project are sufficient to justify the costs." More information about the tool is available at http://www.fema.gov/benefit-cost-analysis.

Plan Management

The 2015 Bureau, LaSalle, Marshall, Putnam, and Stark Counties Natural Hazards Mitigation Plan will be reviewed on an annual basis. It is the responsibility of each plan participant to review the plan. Any goals that have been implemented will be noted and new goals will be added, if necessary. The plan may be reviewed at regular board and council meetings or special meetings will be held to review the plan. In any case, the public will be notified and encouraged to participate in the review. The public will be notified through various methods including public notices, public postings, and governmental websites. NCICG will assist with coordinating and facilitating meetings, if requested.

Community Risk Assessments will be reviewed annually. It is the responsibility of each plan participant to review their Community Risk Assessment and monitor implementation of their mitigation activities. Mitigation activities that have been implemented will be noted and recent disaster information will be updated. If the community has identified new mitigation strategies, they will be added to the assessment.

In 2020, this NHMP will expire. The Federal Emergency Management Agency requires the plan to be updated every five (5) years to be eligible for federal pre-disaster mitigation funds. It is the responsibility of each community to update the NHMP and to coordinate the update with the Illinois Emergency Management Agency. Communities and counties are not required to be part of a multi-jurisdictional plan. Single jurisdiction plans may be written. NCICG will inform communities of grant opportunities that are available to fund an update.

Climate Change

The impacts of climate change have been felt across the world. More precipitation, extreme drought conditions, rising sea levels, and stronger storms are signs of climate change. Scientists overwhelmingly believe that although natural climate changes occur, the warming of the earth and climate change over the past 50 years has been caused by human-induced emissions of heat-trapping gases. The United States National Climate Assessment examines the impact of climate change on the country by region. The assessment identifies six (6) key messages for the Midwest, which are listed below. The full report is available online at http://nca2014.globalchange.gov/.

Key Messages of the United States National Climate Assessment for the Midwest Region

1. In the next few decades, longer growing seasons and rising carbon dioxide levels will increase yields of some crops, though those benefits will be progressively offset by extreme weather events. Though adaptation options can reduce some of the detrimental effects, in the long term, the combined stresses associated with climate change are expected to decrease agricultural productivity.

2. The composition of the region's forests is expected to change as rising temperatures drive habitats for many tree species northward, the role of the region's forests as a net absorber of carbon is at risk from disruptions to forest ecosystems, in part due to climate change.

3. Increased heat wave intensity and frequency, increased humidity, degraded air quality, and reduced water quality will increase public health risks.

4. The Midwest has a highly energy-intensive economy with per capita emissions of greenhouse gasses more than 20% higher than the national average. The region also has a large and increasingly utilized potential to reduce emissions that cause climate change.

5. Extreme rainfall events and flooding have increased during the last century, and these trends are expected to continue, causing erosion, declining water quality, and negative impacts on transportation, agriculture, human health, and infrastructure.

6. Climate change will exacerbate a range of risks to the Great Lakes, including changes in the range and distribution of certain fish species, increased invasive species and harmful blooms of algae, and declining beach health. Ice cover declines will lengthen the commercial navigation season.

The report notes that climate change, in general, will continue to impact people, ecosystems, and infrastructure in the Midwest. The region has experienced multiple extreme rainfall events that have led to severe flooding.

Building Resilience

Climate change forces states and communities to identify ways to build resiliency. This NHMP identifies steps for the region and the participating communities to become more resilient to natural disasters. The region is also taking other steps to build resiliency. State Senator Sue Rezin of Illinois' 38 District has spearheaded a regional group, the Illinois Valley Flood Resiliency Alliance (IVFRA). Senator Rezin established the alliance in 2014 following record flooding losses in her district in April 2013. The alliance was created to improve coordination between communities, local governments, and emergency personnel prior to a flood. The alliance can serve as a model for communities across the country on how to improve their resiliency. The IVFRA is developing a regional resiliency plan and is assisting with an application for the National Disaster Resiliency Competition (NDRC).

National Disaster Resiliency Competition

The following language is scaled from the State of Illinois' National Disaster Resiliency Competition (NDRC) application. This application was a joint effort between multiple state agencies and several local partners including the City of Ottawa, Illinois Valley Flood Resilience Alliance, and North Central Illinois Council of Governments (NCICG).

Catalyzed by the update of the NHMP, the Mitigation Team, with the assistance of NCICG, seeks to build regional resilience to current and future hazards, stressors, and shocks by addressing each hazard. Flooding will be a focus, as all members of the region experience chronic flooding, particularly urbanized flooding associated with intense rainfalls that overwhelm existing stormwater infrastructure. Based on the philosophy that preparedness for

any disaster builds capacity to respond to *every* disaster, the ideas and concepts proposed also improve resilience more broadly. They are meant to improve the region's resilience to other threats such as tornadoes, extreme heat and drought, as well as chronic stresses like economic disinvestment or unemployment.

Resilience will be approached at both the community and regional scales. Working at both these scales will allow the region to build resilience in our most vulnerable communities, while also making transformative infrastructural and institutional changes that equip the region for a wide range of stressors and shocks, including climate change. The region's ideas and concepts can be divided into three (3) categories of work:

1. Detailed Resilience Plans – Currently, with the guidance of the Rockefeller Foundation, a resilience plan is being created for the Illinois Valley Resilience Alliance. This plan covers the base region of the NHMP. The plan is representative of typical characteristics found in the region across social, ecological, and built profiles. The plan will also include significant technical analysis, community engagement, and prioritization of solutions to maximize co-benefits.

2. Cross-jurisdictional coordination plans: The goal is to coordinate plans on a regional level in order to take a larger, statewide approach. Coordination of plans is meant to improve the level of innovation and quality within each, ensure that impacts are considered across jurisdictions, improve the state of practice for addressing resilience among the designers, and ultimately develop a template for resilience planning that can be used in other areas throughout the state.

3. A set of activities grouped into the Regional Resilience Framework - The framework includes data and modeling, planning, capacity-building, financial mechanisms, and policy and institutional changes, led by a variety of stakeholder groups.

Detailed Multi-Hazard Resilience Plans

There are four (4) target areas in Illinois that are part of the NDRC. The target areas include the City of Chicago, DuPage County, Cook County, and the State of Illinois. NCICG is assisting with the state application, which includes communities and counties in the NHMP region. Each target area is required to develop a Multi-Hazard Resilience Plan. These plans will allow for the development of innovative and lasting solutions for vulnerabilities that are shared with many other places within the state.

The State of Illinois in cooperation with the statewide partners will develop a detailed Multi-Hazard Resilience Plan between March and October 2015. The plan will result in recommendations for local capital investments and local policy or institutional changes. The state's plan will be prepared in cooperation with a design team of contractors, including

architects, landscape architects, engineers, urban planners, outreach specialists, and other technical experts.

Each Plan will examine existing conditions and vulnerabilities of community assets, bring technical experts and vulnerable communities together to jointly define goals, develop alternative methods to address opportunities and challenges, evaluate these alternatives against performance measures to maximize co-benefits, and recommend solutions (including, but not limited to capital investments) that best achieve the plan's goals.

The types of solutions that will be considered include:

1. *Leadership and Strategy*
    a. Amending state, county and municipal policies so that standards, incentives, easements, administrative procedures and enforcement are sufficient to support effective flood control, restore and protect natural areas, and facilitate buyouts where desirable.
    b. Sewer-shed buyouts - for those areas identified as being impacted by relatively small rainfall events, or located in "choke points" where stormwater often backs up, examine the purchasing of properties to eliminate flood risk and create new spaces for green infrastructure, grey infrastructure and restoration of natural systems.

2. *Infrastructure and Environment*
    a. Completing essential infrastructure projects, including repair of the Spring Valley waste water treatment plant, to improve the resiliency of critical infrastructure to the community and businesses while lessening the area's economic impact during events.
    b. Green infrastructure and restoring tree canopy, specifically widespread deployment of projects that infiltrate, intercept, delay, and detain rainwater before it can reach stormwater drains and pipes.
    c. Floodplain buyouts - pursue buyouts of properties that have been repeatedly flooded or substantially flooded or are at risk of damage as climate change effects precipitation patterns.

3. *Economy and Society*
    a. Improving the capacity and resilience of the transportation system during floods, severe storms, or blackouts, and roadway improvements that reduce the likelihood and impact of flood-related road closures.
    b. Developing an early flood warning system for Cairo and Brookport that can be replicated throughout the state, which would provide valuable information to the public reducing the likelihood of serious injuries, property damage, and disruptions to emergency services during floods.

4. *Health and Well-being*
    a. Conducting ongoing engagement, outreach and education on community hazards, building residents' awareness, and connecting organizations, businesses and agencies with watershed issues in continuing and innovative ways.
    b. Private property retrofits — achieved through RainReady, a community-centered program that helps assess how flooding has affected residents and supports stormwater retrofits on individual properties.

Regional Scaling and Replicability

Achieving regional benefits from the pilot studies described above will require cross-jurisdictional collaboration with the region. While the state will manage and administer the preparation of its own plan, it will coordinate closely with the other members of the statewide partners, recognizing that otherwise a disconnected approach may result.

The state's design team will regularly communicate with the design teams contracted by the other applicants. This will occur in small, focused settings, involving the applicants, design teams, and other groups by invitation. The applicants and the design teams will share findings, best practices, and lessons learned to help inform the results of other plans.

Each design team will also participate in regional educational and coordination efforts that involve researchers, climate scientists, groups who represent vulnerable populations, and many others. The planned Resilience Roundtables are one example of this regional coordination, and several of these will be focused on topics of interest to the design teams.

Regional Resilience Framework

Many of the plans and policies in the region's participating jurisdictions were developed based on incomplete assumptions of the current and future impacts of climate change. A comprehensive analysis of relevant plans, policies, and practices that influence the risk of all types of disasters will be done with the full input of stakeholders and members of the region's various workgroups. An initial list of policies, plans, and other institutional practices has identified the following potential areas of opportunity.

Policy and regulatory change: Through the Urban Flood Awareness Act, the state will propose recommended model stormwater ordinance provisions that will incorporate climate change trends and resilience. Innovative and effective design practices generated from the Detailed Multi-Hazard Resiliency Plans can also be integrated into infrastructure design standards.

The state also proposes to enact regulatory and policy changes to enable certain aspects of resiliency planning and design. The Illinois Department of Natural Resources (IDNR) will seek to implement certain recommendations of the ongoing Urban Flood Awareness Act, which covers areas outside of floodplains that suffer chronic flooding due to basement backups and

limited sewer capacity. The state plumbing code should also be amended to allow for the re-use of water. The impacts on urban flooding caused by climate change will be evaluated, which may include recommendation for the communities to adapt to climate change affects. A model storm water ordinance will be produced addressing the recommendations of the report.

Planning: The Mitigation Team proposes to integrate resilience into local plans and regulations, including comprehensive plans, zoning ordinances and development regulations, watershed plans, hazard mitigation plans, and capital improvement plans (CIPs). Integrating resilience within a comprehensive planning process allows interdependent solutions to be explored. Considering multiple topics at once will help also communities to prioritize competing needs that cross departmental responsibilities.

Economic and workforce opportunities: Public agencies and workforce development boards and intermediaries will train and connect the local workforce with on-the-ground projects. The workforce training providers will also explore the creation of workforce programs aimed at vulnerable populations who have lost jobs or income due to disaster, as well as identify key recovery jobs needed after various types of disasters to build a workforce and economy that is prepared for a range of potential hazards. In addition to addressing the "supply side" of trained workers, the region's efforts to increase the amount of green infrastructure will build demand for its construction and maintenance.

Capacity building and education activities: Achieving resilience requires capacity-building and education at many levels. To address vulnerable populations who are directly affected by flooding, the region will hold workshops through local partners that educate residents and businesses about flooding resilience strategies, connect them with funding opportunities, and increase preparedness for a range of hazards beyond flooding.

References

"FEMA's State and Local Mitigation: How-to Guide"

http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml. July 14, 2015.

Pryor, S. C., D. Scavia, C. Downer, M. Gaden, L. Iverson, R. Nordstrom, J. Patz, and G. P. Roberston, 2014: Ch. 18: Midwest. *Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 418-440. doi:10.7930/J0J1012N.

State of Illinois 2013 Natural Hazard Mitigation Plan

State of Illinois National Disaster Resiliency Competition Application

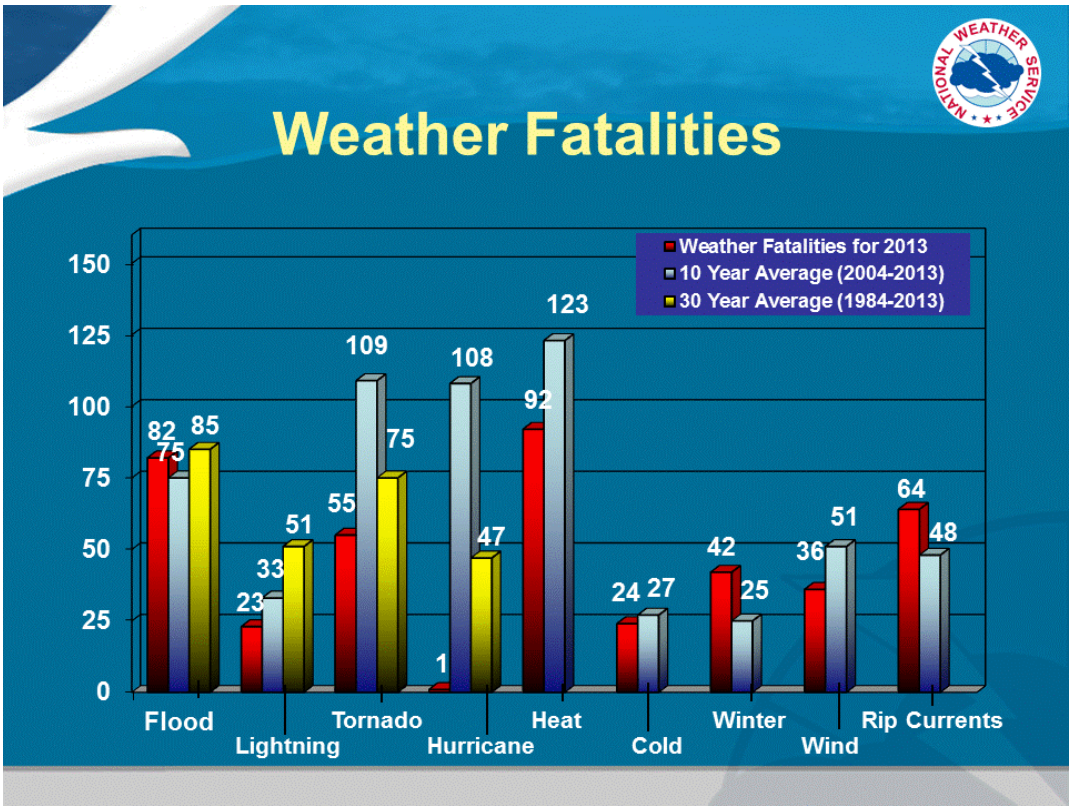
United States National Climate Assessment. http://nca2014.globalchange.gov/report. August 5, 2015.

Chapter 2: Hazard Profiles

This chapter presents the basic information on the hazards that are present in Bureau, LaSalle, Marshall, Putnam, and Stark counties. The possible hazards include: thunderstorms (which can produce lightning, hail, and tornadoes), winter storms, floods, earthquakes, drought, and extreme temperatures (heat/cold). Landslides and wildfires are unlikely to occur in the region, but are briefly discussed. Each hazard is identified and statistical data on storm events is presented.

Thunderstorms

Thunderstorms are dangerous because of the weather phenomenon that is associated with them. Thunderstorms have the capability to produce tornadoes, hail, flash flooding, and strong winds. Lightning occurs with all thunderstorms. The average thunderstorm is 15 miles in diameter and lasts 30 minutes. There is an estimated 16 million thunderstorms worldwide every year. Approximately 100,000 of the 16 million thunderstorms occur in the United States. On average, about 10,000 of those are classified as severe. The National Weather Service considers a thunderstorm severe if it produces hail at least one (1) inch in diameter, winds of 58 mph or stronger, or a tornado. In the United States, dozens of fatalities are caused each year by thunderstorms and their associated weather. The table below shows 2013, 10-year average, and 30-year average weather fatalities.



Source: http://www.nws.noaa.gov/om/hazstats/images/hazstat-chart13-lg.gif

The following table illustrates the thunderstorm and high wind occurrences in Bureau, LaSalle, Marshall, Putnam, and Stark counties from 12/31/1964 – 12/31/2014. A full list of detailed thunderstorm events, by jurisdiction, is provided in Appendix D: Storm Events Data.

Thunderstorms and High Wind					
12/31/1964 to 12/31/2014					
County	Quantity	Deaths	Injuries	Property Damage	Crop Damage
Bureau	159	0	0	2.5M	67.5K
LaSalle	275	0	3	844K	0
Marshall	106	0	3	1.8M	200K
Putnam	52	0	0	6.8M	2K
Stark	66	0	0	249K	200K
Total	658	0	6	12.19M	469.5K

Source: http://www.ncdc.noaa.gov/stormevents/

There are four (4) different types of thunderstorms. The four (4) types are single cell, multicell clusters, multicell lines or squall lines, and supercell. They are identified below according to the University of Illinois WW2010 Project (http://ww2010.atmos.uiuc.edu/%28Gh%29/guides/mtr/svr/type/home.rxml).

Single cell storms, also known as pulse storms, usually last for approximately 20-30 minutes. They generally do not cause severe weather.

A *multicell cluster* consists of a group of cells moving as a single unit. One cell denotes one updraft/downdraft couplet. There are several updrafts and downdrafts in proximity with a multicell storm. Each cell is in a different stage of the thunderstorm life cycle. As the multicell cluster develops, individual cells take turns at being the most dominant. New cells tend to form along the upwind (typically western or southwestern) edge of the cluster, with mature cells located at the center and dissipating cells found along the downwind (east or northeast) portion of the cluster.

A *squall line* or multicell line tends to form in long lines with a well-developed gust front at the leading edge of the line. An approaching multicell line often appears as a dark bank of clouds covering the western horizon.

A *supercell* is a thunderstorm with a deep rotating updraft (mesocyclone). They are the rarest thunderstorm but are extremely dangerous. Severe events almost always occur near the updraft/downdraft interface. These are typically in the rear of the storm but storms do have them in the front as well.

Lightning

Lightning is the flash of light produced by a discharge of atmospheric electricity. Lightning occurs during all thunderstorms and has the possibility of striking anywhere. Its generated outcome is created by the buildup and release of electrical energy between positively and negatively charged areas. Ascending and descending air within a thunderstorm separates these positive and negative charges. Every thunderstorm will have lightning.

A cloud-to-ground lightning strike begins as an invisible channel of electrically charged air moving from the cloud toward the ground. When one channel nears an object on the ground, a powerful surge of electricity from the ground moves upward to the clouds and produces the visible lightning strike.

According to the National Oceanic and Atmospheric Administration (NOAA), lightning causes an average of 33 fatalities and between 300 - 500 injuries nationally each year. The air near a lightning strike is heated to 50,000 degrees Fahrenheit. Fatalities have occurred while people were talking on the phone, playing golf, boating, bike riding, and mountain climbing. It is important to take shelter immediately when a thunderstorm occurs. Livestock and pets are also at risk of being struck by lightning.

The rapid heating and cooling of the air near the lightning channel causes a shock wave that creates thunder. The distance of a thunderstorm can be calculated by counting the number of seconds between a flash of lightning and the next clap of thunder. Divide the number by five (5) to determine the distance in miles to the lightning. For example, if there is 10 seconds between the lightning flash and the thunder (10 divided by 5 = 2), then the lightning is 2 miles away. Knowing that lightning can occur in front and behind a thunderstorm, even when there is little to no rain accompanying the storm, can help avoid a tragedy.

The following table shows the number of deaths, injuries, and damages caused by lightning in Bureau, LaSalle, Marshall, Putnam, and Stark counties. A lightning event was only recorded if deaths, injuries, and damages had been reported. In general, lightning events are not reported. A complete list of lightning events, by jurisdiction, in Bureau, LaSalle, Marshall, Putnam, and Stark counties is provided in Appendix D: Storm Events Data.

Lightning					
12/31/1964 to 12/31/2014					
County	Quantity	Deaths	Injuries	Property Damage	Crop Damage
Bureau	4	0	0	86K	0
LaSalle	14	0	8	158K	0
Marshall	2	0	0	390K	0
Putnam	Not Reported				
Stark	Not Reported	0	0	0	0
Total	20	0	8	634K	0

Source: http://www.ncdc.noaa.gov/stormevents/

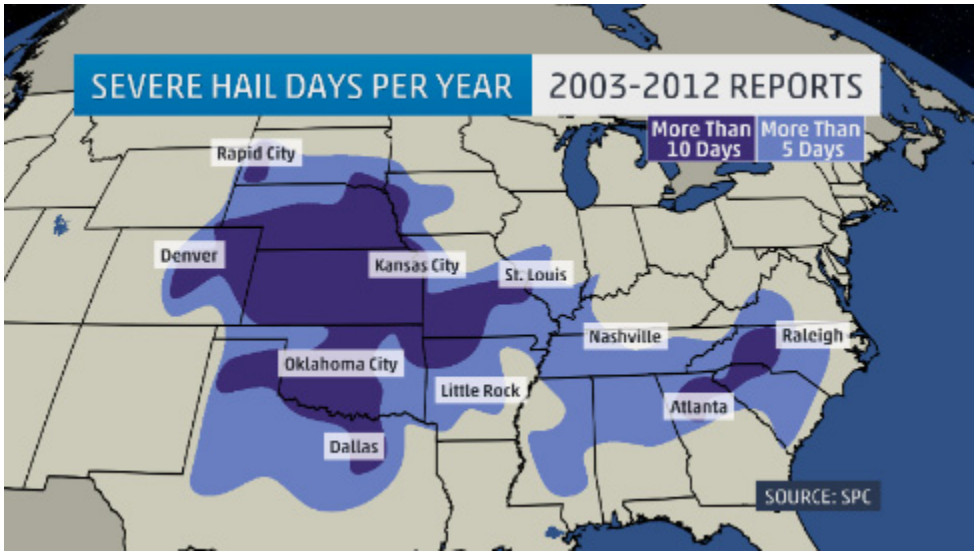
Hail

Hail is precipitation caused during thunderstorms when updrafts carry raindrops high into the atmosphere and they freeze into ice. Hail falls to the ground in the form of ice balls. When hail hits the ground, the weather event is considered a hailstorm. Hail is more likely to occur in the spring, when thunderstorms are more frequent. Hail can be found in the middle and upper portions of almost all thunderstorms. However, most either melts before hitting the ground, or being very soft, disintegrates in the violent thunderstorm interior. Large hailstones fall at speeds faster than 100 mph. Hail falls along paths known as hail swaths. These can be a few acres in area to 10 miles wide by 100 miles long. Wide hail swaths usually are associated with squall line thunderstorms.

Hail is difficult to measure due to the fact that it is only in its solid form for a few minutes before it begins to melt. The US National Weather Service recognizes a series of descriptor terms for various hailstone diameters, ranging from pea-sized to softball-size. The size of hailstones usually increases with the intensity of the storm cell from which they are produced. Large hail that is greater than two (2) inches, forms mostly in supercell thunderstorms.

Hail causes damage to structures and crops. The National Storm Damage Center reports that hail causes an estimated $2 billion annually in damages. Illinois ranked second for having the most hail damage in 2014, according to State Farm Insurance. The ranking only included State Farm policy holders, which total 82 million customers.

The probability and possibility of hail occurring in the participating counties is highly likely and unpredictable. However, severe hails storms are more frequent in the Central Plains States where on average there are more than 10 severe hail days per year. Severe hail refers to hail one (1) inch or greater in diameter.



Source: www.weather.com/storms/severe/news/top-ten-states-hail-claims-2014

Below is a table of the hailstorms in Bureau, LaSalle, Marshall, Putnam, and Stark counties that occurred between 12/31/1964 – 12/31/2014. Bureau County sustained the highest amount of property damage with 103 hail events that totaled $2.3 million. A detailed list of all storms, by jurisdiction, is included in Appendix D: Storm Events Data.

Hail Events							
12/31/1964 to 12/31/2014							
County	Quantity	Quantity 1-2 inches	Quantity over 2 inches	Deaths	Injuries	**Property Damage**	**Crop Damage**
Bureau	103	55	6	0	0	2.3M	427K
LaSalle	130	68	4	0	14	0	0
Marshall	45	25	1	0	0	0	0
Putnam	45	21	0	0	0	72K	12K
Stark	37	15	1	0	0	0	0
Total	360	184	12	0	14	3.02M	439K

Source: http://www.ncdc.noaa.gov/stormevents/

Tornadoes

A tornado is, according to the Glossary of Meteorology, a "A violently rotating column of air, in contact with the ground, either pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a funnel cloud." About 1,000 tornadoes are reported nationwide every year, the National Oceanic and Atmospheric Administration (NOAA) reports.

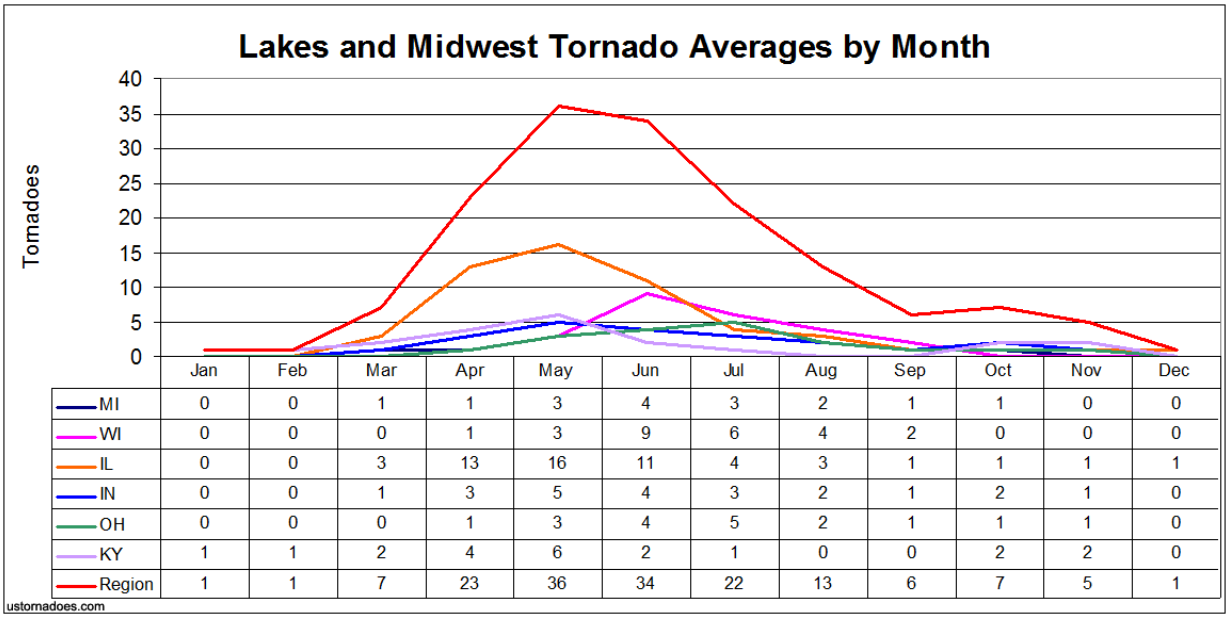
Tornadoes are classified using the Enhanced Fujita Scale (EF-Scale). The EF-Scale is a modified version of the Fujita Scale that Dr. Tetsuya Theodore Fujita introduced in 1971. Dr. Tetsuya wanted to be able able to classify tornadoes according to their intensity and area, and determine their wind speed by looking at damages. Due to weaknesses in the scale, scientists modified the scale to be more effective and consistent.

The use of the EF-Scale to determine a tornado's EF-rating begins with the 28 damage indicators (these can be found at http://www.spc.noaa.gov/efscale/ef-scale.html). Each indicator has a description of the typical construction that is within the indicator category. Once the damage indicator is determined the Degree of Damage must be figured. Each Degree of Damage is given an expected estimate of wind speed, a lower bound of wind speed and an upper bound of wind speed. The original Fujita scale was based on damages alone, while the Enhanced Fujita Scale takes other factors into consideration.

Fujita Tornado Damage Scale		Tornado Scale Comparison	Enhanced Fujita Tornado Damage Scale	
Scale	Wind Estimate (MPH)	Typical Damage	**Scale**	**Wind Estimate (MPH)**
F0	<73	Light Damage: Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; signboards damaged.	**EF0**	**65-85**
F1	73-112	Moderate Damage: Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.	**EF1**	**86-110**
F2	113-157	Considerable Damage: Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.	**EF2**	**111-135**
F3	158-206	Severe Damage: Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.	**EF3**	**136-165**
F4	207-260	Devastating Damage: Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.	**EF4**	**166-200**
F5	261-318	Incredible Damage: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yds); trees debarked; incredible phenomena will occur.	**EF5**	**>200**

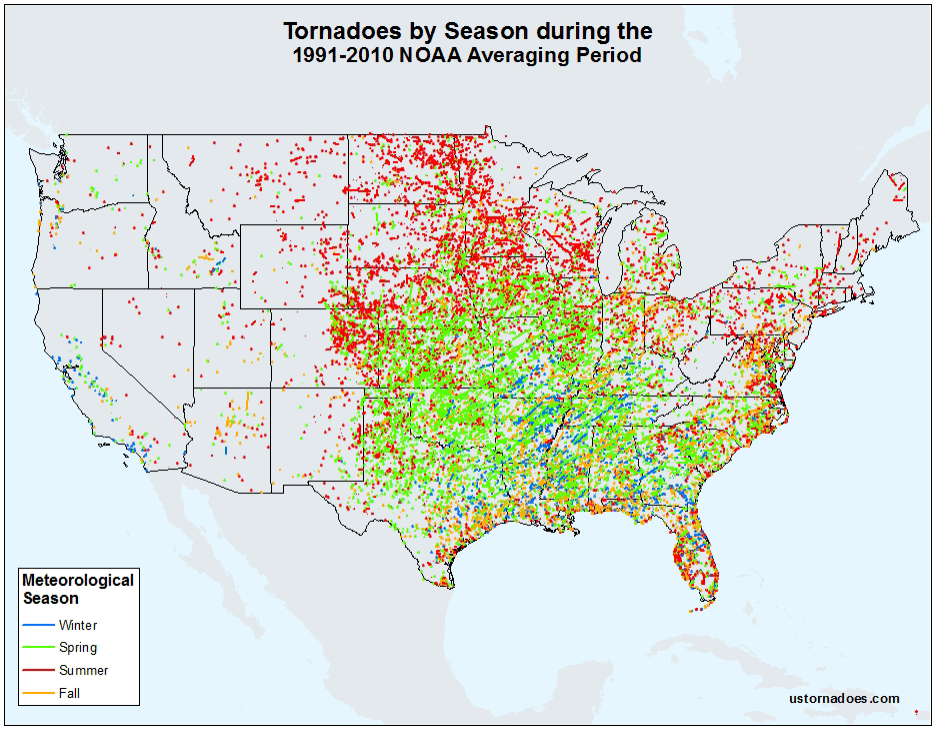
Source: http://www.spc.noaa.gov/efscale/ef-scale.html

Tornadoes occur more frequently in the spring and summer months, but can occur anytime of the year. Some parts of the United States experience tornadoes exclusively during one (1) season, while other areas experience tornadoes year-round. Ian Livingston, founder of USTornadoes.com, has analyzed the occurrence of tornadoes throughout the country. The peak period for tornadoes in the Lakes and Midwest region is between April and July, as shown on the graphic below.

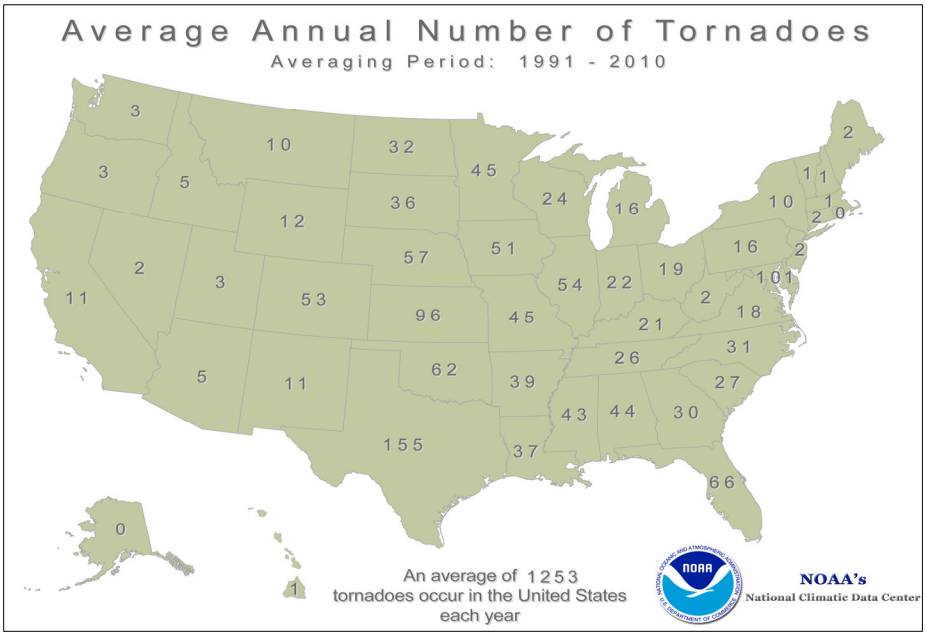


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MI	0	0	1	1	3	4	3	2	1	1	0	0
WI	0	0	0	1	3	9	6	4	2	0	0	0
IL	0	0	3	13	16	11	4	3	1	1	1	1
IN	0	0	1	3	5	4	3	2	1	2	1	0
OH	0	0	0	1	3	4	5	2	1	1	1	0
KY	1	1	2	4	6	2	1	0	0	2	2	0
Region	1	1	7	23	36	34	22	13	6	7	5	1

Tornadoes are more frequent in the meteorological seasons of spring and summer. The graphics below show that more tornadoes occur in the Plains States, the Mississippi Valley, and the Great Lakes Region than in the rest of the country. Florida also has a higher number of tornadoes every year. Illinois had an average of 54 tornadoes per year between 1991 and 2010 and ranked sixth (6th) for having the highest average of tornadoes annually.

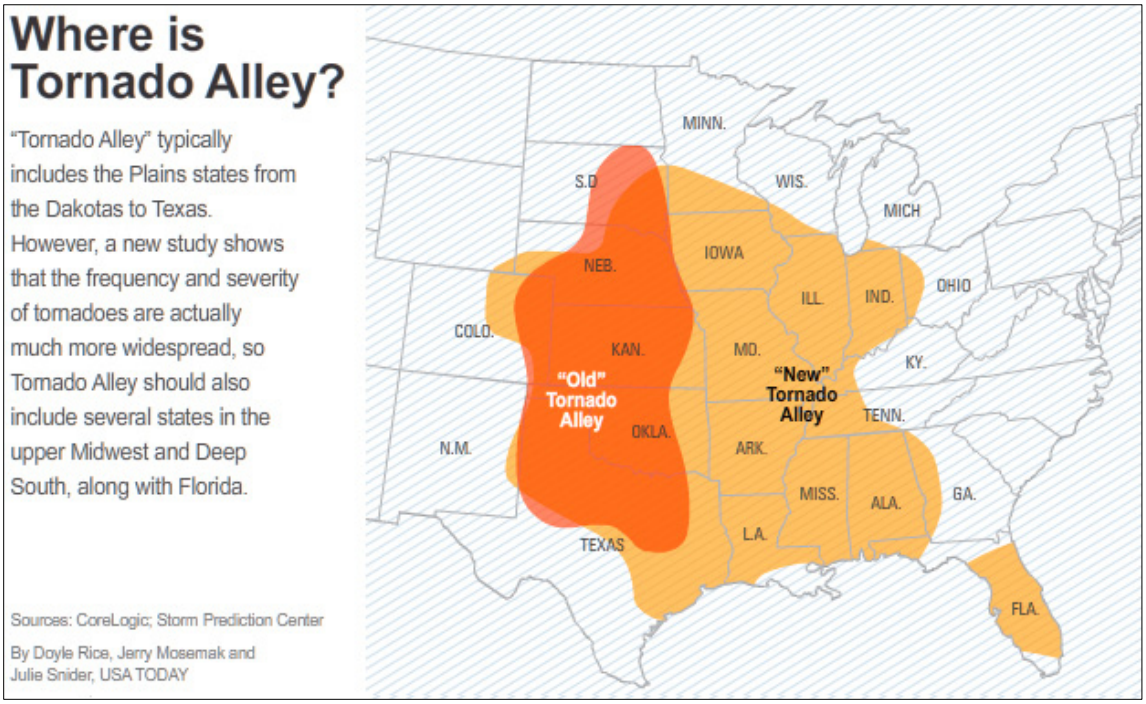


Source: USTornadoes.com



Source: http://www.ncdc.noaa.gov/climate-information/extreme-events/us-tornado-climatology

Tornadoes are thought to be more common in the central United States. Texas, Oklahoma, Kansas, and Nebraska are commonly referred to as Tornado Alley. But, the boundaries of Tornado Alley are debatable because of the high occurrence of tornadoes outside of those states. The National Oceanic and Atmospheric Administration (NOAA) defines Tornado Alley as, "The area from central Texas, northward to northern Iowa, and from central Kansas and Nebraska east to western Ohio…" Based on this description, the North Central Illinois region would be included in Tornado Alley. The graphic below illustrates the two (2) thoughts on the boundaries of Tornado Alley.



Source: http://usatoday30.usatoday.com/weather/storms/tornadoes/story/2012-04-09/tornado-alley/54157872/1

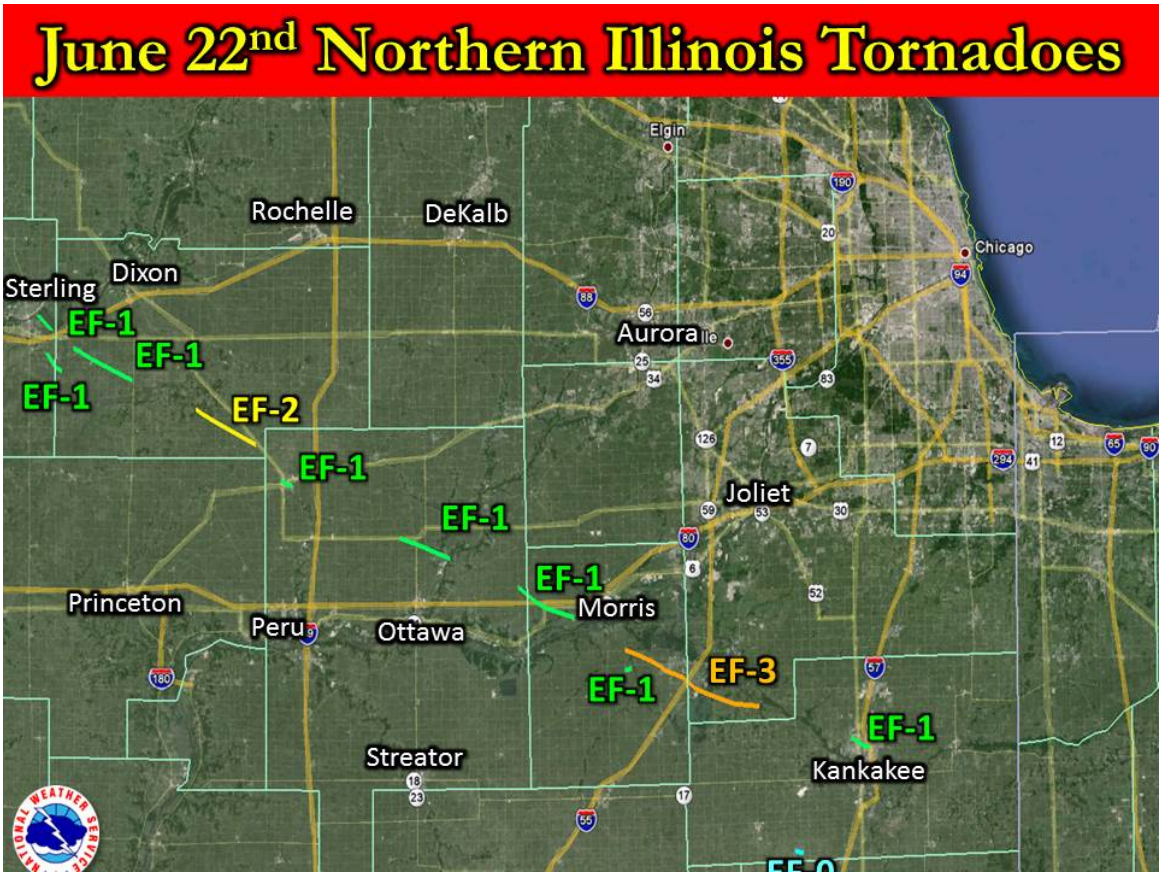
Since the October 2008 NHMP, there have been several tornadoes that have touched down in the region. Listed below are descriptions of each tornado.

- June 22, 2015 Tornado (Mendota): An EF-1 tornado with wind speeds up to 105 miles per hour struck down on the city's northwest side. Multiple trees snapped or were uprooted. No injuries or fatalities were reported with this tornado. The tornado was part of a long-lived, cyclic supercell storm that tracked across Whiteside, Lee, LaSalle, Grundy, Will, and Kankakee Counties and included a total of 12 tornadoes that caused 14 injuries. There were no fatalities with the tornadic outbreak.

- June 22, 2015 Tornado (Ottawa/ Wedron Area): An EF-1 tornado with wind speeds up to 90 miles per hour struck down eight (8) miles northwest of the City of Ottawa and tracked east to the unincorporated community of Wedron. Several large trees were snapped or uprooted. Approximately six (6) homes had minor damage with roof shingles

off. A small trailer next to a garage was picked up and thrown behind a house. No injuries or fatalities were reported with this tornado. The tornado was one (1) of the 12 tornadoes that was associated with the cyclic supercell storm on June 22.

- June 22, 2015 Tornado (Seneca/ Morris): An EF-1 tornado with winds up to 90 miles per hour struck down 5.6 miles north of the Village of Seneca and ended three (3) miles southwest of the City of Morris in Grundy County. Several large trees were snapped or uprooted and minor structural damage to outbuildings was reported. There were no injuries or fatalities reported with this tornado. The tornado was one (1) of the 12 tornadoes that was associated with the cyclic supercell storm on June 22.



Source: http://www.weather.gov/lot/22June2015#photo

- June 30, 2014 Tornado (City of Earlville): Strong thunderstorms moved across the Midwest as a result of two (2) separate derecho events. Straight-line winds with speeds of 80-110 miles per hour impacted the City of Earlville followed by an EF1 tornado around 8:16 P.M. that uprooted trees, damaged roofs, destroyed a garage, and heavily damaged a church. No fatalities or injuries were reported.

- November 17, 2013 Tornado (Village of Dana/ Village of Rutland): Weather conditions were ripe across the Midwest for tornadic activity. A series of supercell thunderstorms produced 10 tornadoes, including three (3) which were EF2 tornadoes. An EF2 tornado that began in Tazewell County tracked across Woodford County and entered LaSalle County one (1) half mile east of Illinois Route 251 north of the City of Minonk at 11:41 A.M. The tornado snapped several utility poles, destroyed outbuildings, and badly damaged a few homes. Maximum winds speeds reached 135 miles per hour.

- September 1, 2013 Tornado (Village of Baker- 4 miles south of the Village of Leland): Around 5:47 P.M. trained tornado spotters reported a brief EF0 tornado south of the Village of Leland. The tornado did not cause any damage, fatalities, or injuries.

- June 5, 2010 Tornado: A supercell storm moved east from Magnolia, Illinois in Putnam County where it had produced an EF0 /EF1 strength tornado. After lifting, a new tornado touched down near the Marshall and LaSalle County line due south. The tornado tracked along North 12th Road in LaSalle County knocking down trees and power lines. Minor structural damage was also reported. As the EF0/EF1 tornado continued to push east toward the City of Streator, it intensified to an EF-1/EF-2 strength tornado. As it moved through Eagle Pass Subdivision, trees were toppled, roofs were blown off, and several homes were badly damaged or destroyed. The most intense damage occurred along Hall Street near Southside Athletic Park. In all, 21 homes became uninhabitable and had to be destroyed, another 33 were uninhabitable and required major repair, and a total of 150 received some degree of damage. Damage totaled $7 million. Seventeen (17) direct or indirect injuries were reported as a result of the tornado. There were no fatalities. At its strongest, the tornado had winds up to 130 mile per and was one (1) half mile wide. The tornado traveled approximately 18 miles and lasted 22 minutes.

The table below identifies the number of tornadoes that have occurred in the past 50 years in the NHMP region. Property damage exceeded $28 million. An F2 tornado claimed the lives of eight (8) people in the Village of North Utica on April 20, 2004.

Tornadoes					
12/31/1964 to 12/31/2014					
County	Quantity	Deaths	Injuries	**Property Damage**	**Crop Damage**
Bureau	26	0	0	4.8M	38K
LaSalle	35	8	35	8.99M	0
Marshall	9	0	1	2.8M	0
Putnam	8	0	6	9.3M	0
Stark	9	0	0	2.5M	0
Total	87	0	42	28.39M	38K

Source: http://www.ncdc.noaa.gov/stormevents/

Dangerous Winds

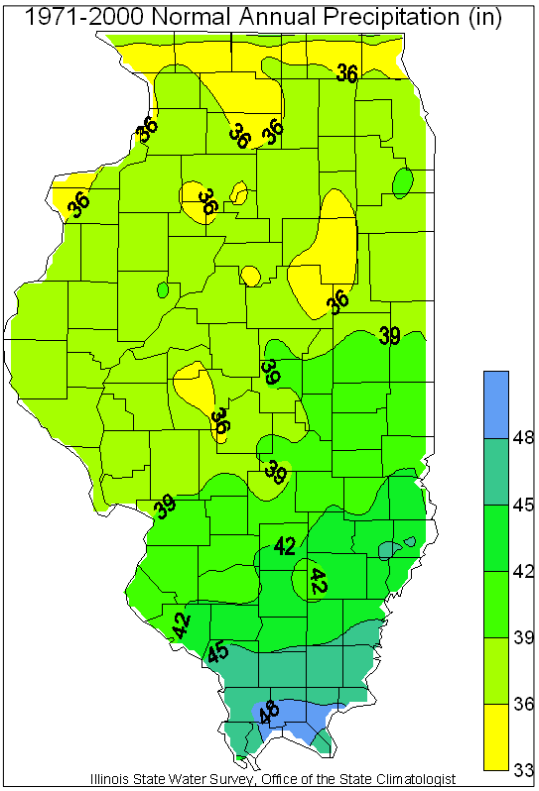
For this plan, high winds and thunderstorm winds are referred to as "dangerous winds." Dangerous winds are typically associated with the outflow generated by a thunderstorm downdraft and are classified as having speeds exceeding 50 – 60 miles per hour (mph), according to the National Severe Storms Laboratory (NSSL). Winds of this strength are often called "straight-line" winds. Speeds can reach up to 100 mph and produce damage across hundreds of miles. People are at a greater risk for injury and death as a result of flying debris such as trees and power lines during dangerous winds. Derecho events are also a cause of concern. Derechos are associated with widespread and long-lasting thunderstorms. Derechos can also produce winds in excess of 100 mph. The NSSL is studying models to better forecast derechos to providing advanced warning. A list of dangerous wind events by jurisdiction is included in Appendix D: Storm Events Data.

Heavy Rain and Flooding

The intensity and duration of rain precipitation determines the extent of flooding in an area. If rain occurs over a period of several days it will take longer for flooding to take place. When heavy rain occurs during a short period of time, flash flooding is common. On average, the region receives between 36 – 39 inches of precipitation annually. However, fluctuations occur. June 2015 was especially wet in Illinois. According to the Illinois Office of the State Climatologist, June 2015 was wettest on record with the state averaging 8.91 inches of precipitation. Record keeping dates back to 1895. Heavy rain has caused flooding of streams and rivers and has created frequent flash floods.

According to the National Severe Storms Laboratory (NSSL), a flood is defined as an overflowing of water onto land that is normally dry. The National Flood Insurance Program (NFIP) defines a flood as "a general and temporary condition where two (2) or more acres of normally dry land or two (2) or more properties are inundated by water or mudflow.

Floods are one (1) of the most destructive and widespread natural hazards in the United States. According to the National Oceanic and Atmospheric Administration (NOAA) 30-year flood loss damages averaged $8 billion per year and claimed an average of 82 lives per year. More deaths are caused by floods every year than by lightning, tornadoes, and hurricanes. Every state is at risk for floods to occur.



The Federal Emergency Management Agency has identified several types of floods. They are grouped into the following types:

- Riverine Flooding
- Urban Drainage
- Fluctuating Lake Levels
- Ground Failures
- Coastal Flooding and Erosion

Riverine flooding and urban drainage-related flooding are the most common types of flooding within the NHMP region.

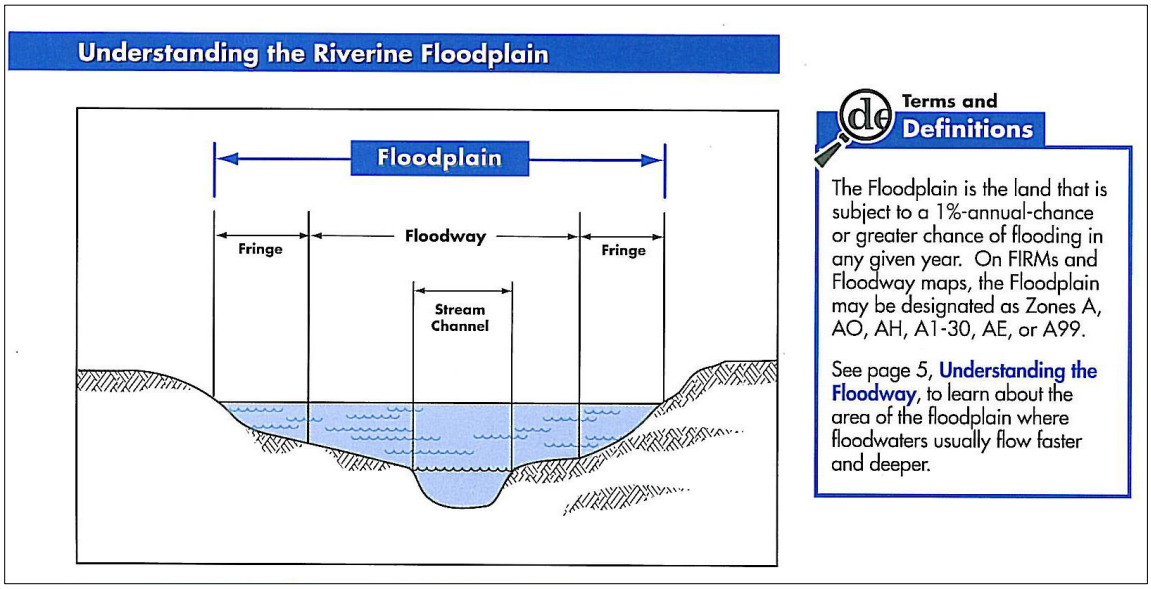
Riverine Flooding

Riverine flooding occurs when the channel of a creek, stream, or river reaches its capacity and overflows. Riverine flooding is the most common type of flooding in the United States. There are many small creeks and streams that run through the region, but the greatest threat of riverine flooding comes from the Illinois, Fox, Vermilion, and Spoon Rivers. Riverine flooding can occur in the form of overbank flooding, flash flooding, levee or dam failures, or ice jams.

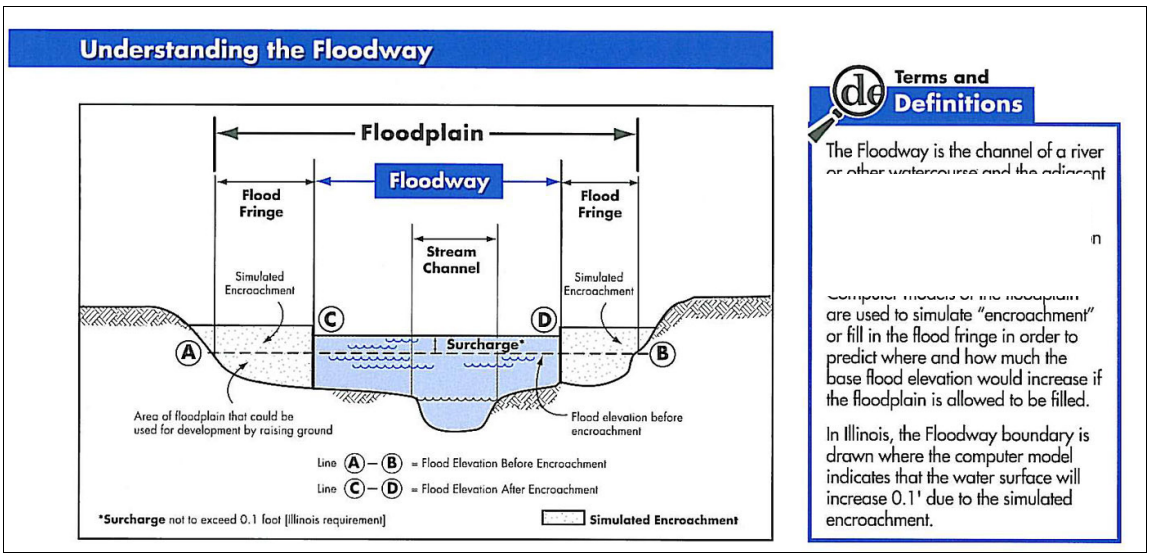
Overbank Flooding

Overbank flooding is the most common type of flooding. Overbank flooding is when a river, stream, or other watercourse reaches capacity and begins inundating the adjacent floodplain. A floodplain is the land adjacent to the stream or river known as a Special Flood Hazard Area (SFHA) that is subject to one (1) percent annual chance or greater

of flooding in any given year. A one (1) percent annual flood is also referred to as a 100-year flood and base flood. The Federal Emergency Management Agency identifies SFHAs on Flood Insurance Rate Maps (FIRMS) by labeling them according to zones. Please refer to Chapter 4: Preventive Measures for more information on FIRMS and SFHAs. Overbank flooding can be exacerbated by urban and agricultural drainage practices and land development. Land use practices upriver may have an adverse impact on communities downriver.



The floodway is the channel of a river or other watercourse and the adjacent land areas that are necessary for the base flood to flow through without increasing the water surface elevation more than a designated height.



Flash Flooding

According to the National Weather Service, the definition of a flash flood is "A rapid and extreme flow of high water into a normally dry area, or a rapid rise in a stream or creek above a predetermined flood level, beginning within six (6) hours of the causative event (e.g. intense rainfall, dam failure, ice jam)." The amount of time it takes for a flash flood to occur depends on topography and rain intensity. In some cases, there is little or no time to evacuate. Flash floods usually approach an area as a wall of fast moving water that carries rocks, mud, and other debris and can sweep away most things in its path. When a dam breaks it may produce the same effects as flash floods. Flash floods are more common in mountainous, sloping areas.

Levee and Dam Failures

A levee or dam failure can cause catastrophic flooding and destruction. The region has several levees and dams. Large dams in the region include the Marseilles Lock and Dam (Lock and Dam No. 5) in Marseilles, the Starved Rock Lock and Dam (Lock and Dam no. 6) east of North Utica, and the Dayton Dam, north of the City of Ottawa, on the Fox River. Construction was completed on Lock and Dam No. 5 and No. 6 in 1933 as part of the construction of the Illinois Waterway- a system of navigable waterways to link the Great Lakes to the Mississippi River. The Dayton Dam was constructed in 1928 as a hydroelectric power plant. The Dayton Dam is still in use today.

Dam and levee failures are usually caused when design capacity has been exceeded. Many of the nation's dams and levees are older and were designed to only provide limited flood protection. Some dams and levees may not have had designs at all. Poor maintenance is also a cause of their failure. Changes in regional precipitation and flood levels caused by climate change and land use development may cause a levee or dam to fail.

Human error can also be a factor. On April 18, 2013, several barges broke loose from a towing vessel attempting to enter the Marseilles Lock and struck the dam after one (1) of the barges allided with a concrete retaining wall. Due to strong flow on the river, seven (7) of the barges were pulled up against the dam and four (4) of them sank. The dam sustained an estimated $50 million in damages. The incident is believed to have prevented water flow and likely exacerbated flooding in the City of Marseilles. The incident is discussed in more detail in Chapter 5 under the "Critical Facilities" section.

On June 14, 2015, four (4) barges broke loose from a towing vessel that was pushing eight (8) barges southbound on the Illinois River. Two (2) of the barges were immediately recovered, but two (2) of them were forced up against the piers of the dam. The lock was temporarily closed. A preliminary investigation revealed minor damage to the dam and barges.

Ice Jams

Ice jams occur when a body of flowing water freezes and unfreezes creating large chunks of ice that impede water flow and cause flooding. In Northern communities, ice covers the rivers annually. Generally, the river's surface will breakup without causing problems.

Ice jams are hard to predict because they are site specific, are less common, and poorly documented. The rates of water rise can vary between feet per minute and feet per hour. Risks and damages can be as high as or greater than open water floods because cold temperatures cause other dangers and damages. Bridges are often victims of ice jams.

Ice Jam on Fox River at Dayton Dam
Picture courtesy of Mike Sutfin, City of Ottawa

The picture to the right was taken at the Dayton Dam along the Fox River north of the City of Ottawa. According to a 2011 Illinois State Water Survey study, the "Lower Fox River Watershed Discovery Report, the Fox River has had major ice jams over the past 25 years that have caused major damage to the river's shoreline, to houses on the river, boat docks, and bridges. On one (1) occasion, the Dayton Road Bridge was destroyed by an ice jam. In 2010, a major freeze resulted in an ice jam that was 20 feet thick in some areas and stretched 5.1 miles downriver from the dam. Ice jams have also caused flash flooding along the Fox River.

The following factors cause ice jams to form:

1. River geometries, weather characteristics, and floodplain land-use.
2. The area ice is conveyed to have less carrying capacity than the quantity of the ice transported to the area.
3. A tributary stream entrance to a larger river, lake, or reservoir where ice may be thicker and frozen. The broken ice from the stream will move until it cannot move anymore, collecting at the entrance and causing ice jams.
4. Obstructions such as trees or bridge pylons can cause ice jams.
5. Removal of dams and structural and operational changes in reservoirs.

Urban Drainage

Surface water flooding is a common issue throughout many of the communities and rural areas in Illinois. Surface water flooding occurs when rain falls too quickly for soils to absorb water or for it to evaporate. The result is pooling of stormwater and localized flooding. Different types of ground cover influence the severity of surface water flooding. Densely populated and urban areas have more impervious services such as streets, roadways, and parking lots that are designed to divert water as quickly as possible away from the area. With more impervious surfaces, there is less natural area for water to be absorbed, thus resulting in surface water flooding.

Urban drainage techniques are a major cause of surface water flooding. The philosophy behind urban drainage techniques is to eliminate excess water from a site as quickly as possible through a closed conveyance system. Public expectations demand that all water is gone from a site within minutes of a rainstorm. Unfortunately, this unrealistic demand is contributing to overwhelmed sewer systems, basement backups, downstream riverine flooding, and diminished groundwater supplies. As a result, there is a need for stormwater management practices enforced through ordinances. Stormwater management is covered in Chapter 4: Preventive Measures.

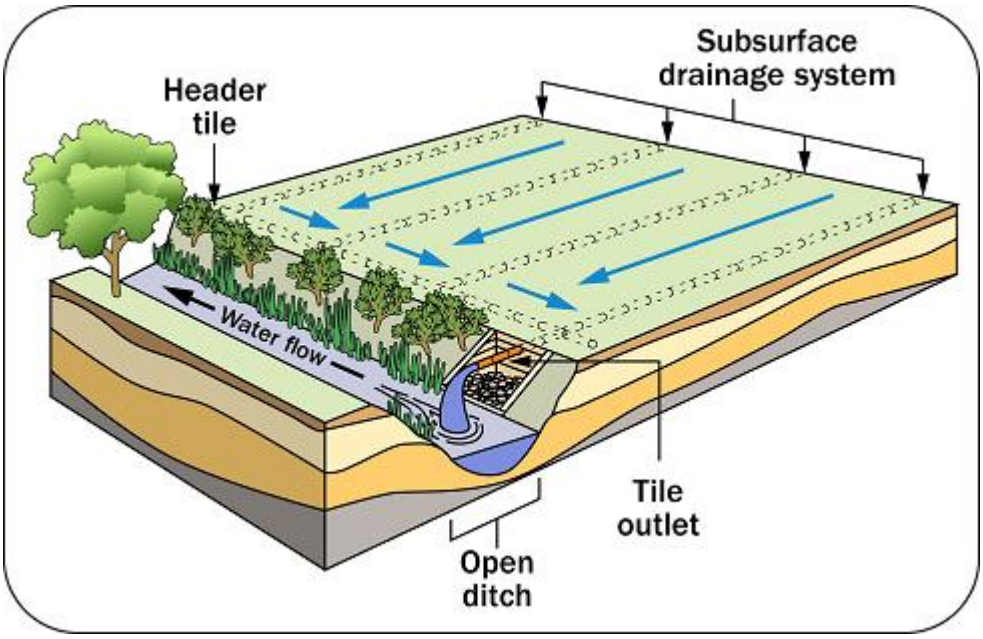
Basement Flooding and Backups

Most of the communities that participated in this NHMP reported that basement flooding occurs within their towns. One (1) community reported 567 basement backups during the April 2013 flood. It is important for homeowners to understand their insurance policies because the definition of flood varies by insurance company. Water that enters a basement through a sewer, drain, or failed sump pumps is not considered a flood according to insurance companies. Therefore, if a homeowner does not have a sewer and drain policy, their damage may not be covered.

Sanitary sewers cause basement flooding when they are overwhelmed by stormwater and groundwater that is entering the system. The terms used to describe groundwater and stormwater entering the sanitary sewer system are inflow and infiltration. Sources of inflow include downspouts, sump pumps, and foundation footings and drains. Inflow sources are direct points where water enters the system. They are often illegal according to local ordinances. Infiltration occurs when there are cracks and leaks in the sewer main. Addressing sources of inflow and infiltration is necessary, but is costly. Separating combined sewers and constructing new storm and sanitary sewers may cost millions. However, educating the public about these conditions and encouraging them to disconnect their illegal hookups from the sanitary sewer will reduce basement backups. Several communities offer programs to residents to share in the cost of installing ejector pumps that will eliminate basement backups. Most communities within the region are working to separate their sanitary and storm sewers.

Agricultural Drainage

The impact of agricultural drainage practices on rural communities is both complex and controversial. According to the United States Environmental Protection Agency (USEPA), agricultural drainage techniques are utilized to eliminate excess water in the soil to improve crop production. There are different types of drainage techniques: leveling land, constructing shallow ditches and waterways, and constructing surface inlets to subsurface drains. Subsurface drainage practices usually involve the installation of a network of field tiles, perforated tubing that allows water to seep in and be drained away from the field. The image on the following page shows a typical subsurface drainage system.



Source : http://www.yaharapridefarms.org/tile-drainage/

There is controversy on whether or not the use of subsurface agricultural drainage systems worsens flooding in nearby communities. There are also concerns about the impact of field tiling on wetlands and water quality. Several participating communities in this plan shared comments and concerns on the use of field tiles. North Central Illinois Council of Governments (NCICG) recommends that Bureau, LaSalle, Marshall, Putnam, and Stark Coutnies examine the impact of agricultural drainage systems and rural stormwater.

Flood Designations

Flood designations are based on statistical averages, not the number of years between floods. The term "100-year flood" means that during any given year there is a 1 in 100 chance that a large flood will occur. Climate change may cause large floods to occur in successive years or sporadically. The table to the right is an overview of the chance of a flood based on time periods and according to size. By definitions used in the National Flood Insurance Program (NFIP), the probability of a 10-year flood is 10 percent in any given year, and 1 percent for a 100-year flood in any given year.

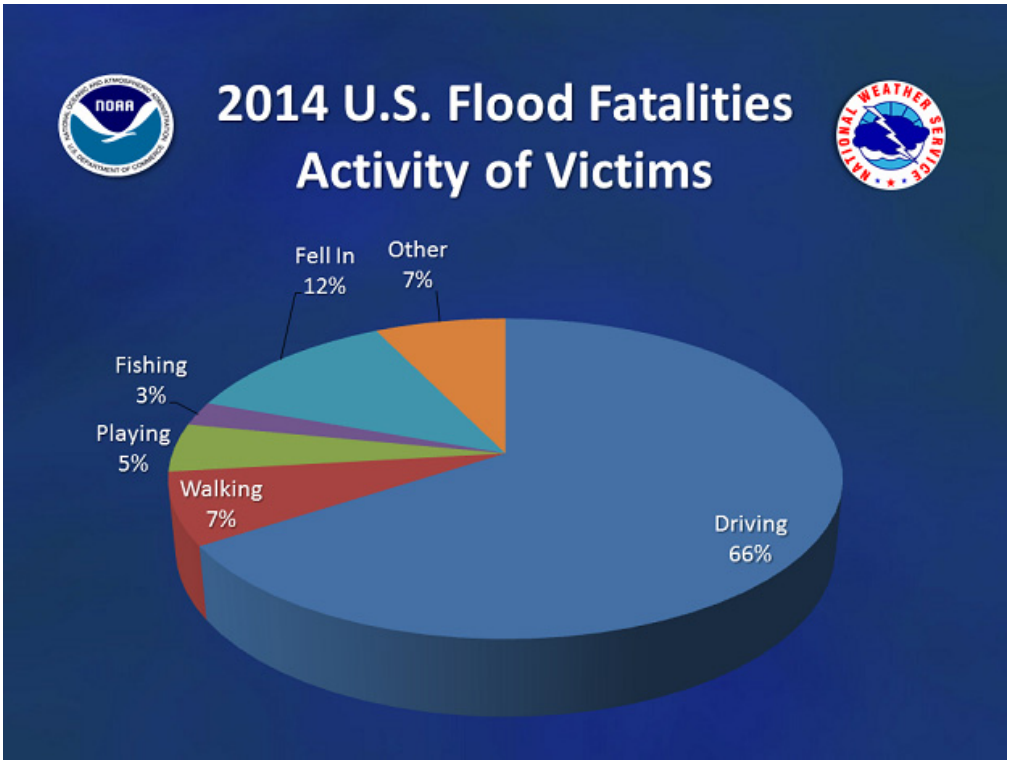
Chance of Flooding				
Time Period	Flood Size			
	10-year	25-year	50-year	100-year
1 year	10.0%	4.0%	2.0%	1.0%
10 years	65.0%	34.0%	18.0%	10.0%
20 years	88.0%	56.0%	33.0%	18.0%
30 years	96.0%	71.0%	45.0%	26.0%
50 years	99.0%	87.0%	64.0%	39.0%

The table on the following page shows the number of floods that have occurred in Bureau, LaSalle, Marshall, Putnam, and Stark counties and the number of injuries and deaths caused by each flood. The amount of property damage has also been included in the table. The

list of historic flood events for Bureau, LaSalle, Marshall, Putnam and Stark Counties is included in Appendix D: Storm Events Data.

Floods					
12/31/1964 to 12/31/2014					
County	Quantity	Deaths	Injuries	Property Damage	Crop Damage
Bureau	24	0	0	485K	0
LaSalle	69	1	5	86.9M	20K
Marshall	24	0	0	14M	0
Putnam	11	0	0	60K	0
Stark	20	0	0	14M	0
Total	148	1	5	116M	20K

Flooding Fatalities



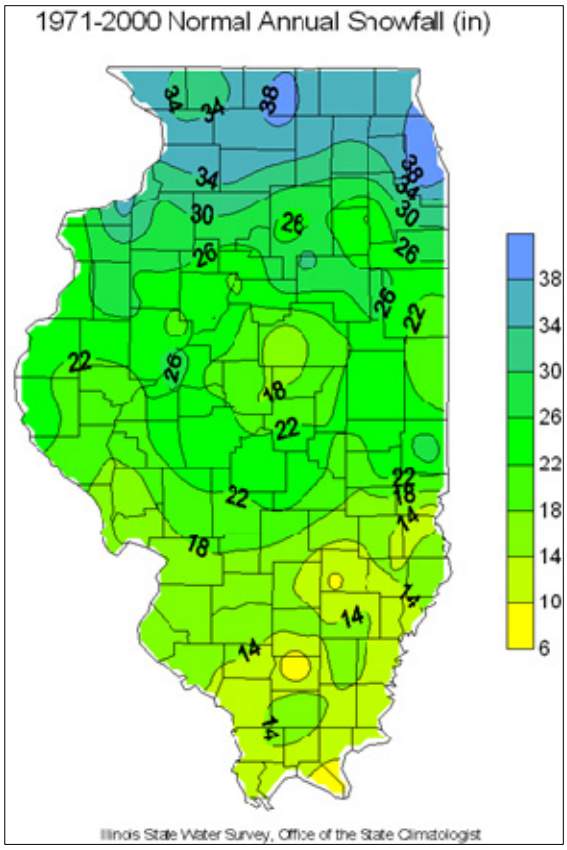
Source: National Weather Service

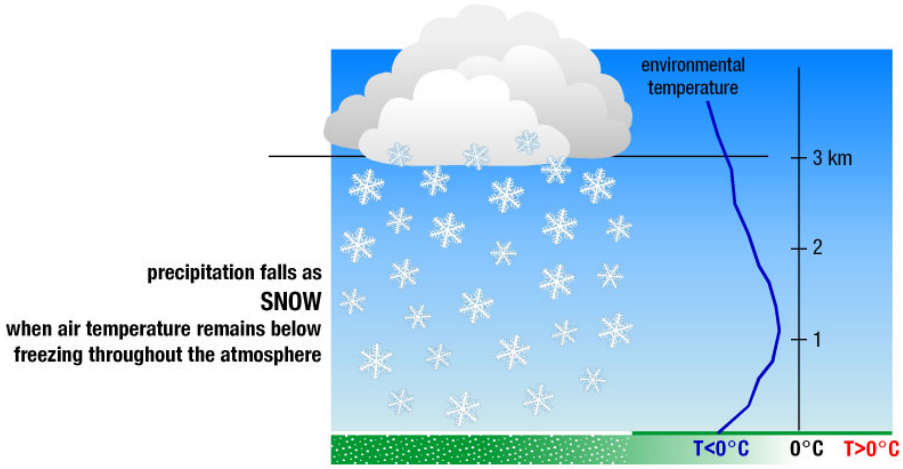
In the United States, 39% of flood fatalities happen when people attempt to drive their vehicles through flooded roadways. The next highest group of fatalities occurs when people are walking in or playing in flooded waters. Victims underestimate the power of water and often ignore signs closing off flooded roads and areas. It only takes six (6) inches of fast-moving water to knock a person down and only one (1) foot of water to move a small car. Two (2) feet

of water can move most vehicles. The majority of victims drown in their vehicles after being swept downstream. It is never safe to drive on flooded roads. The true extent of the flooding is not known by looking on the surface. Sink holes and washed out roads become unseen traps. The National Weather Service (NWS) encourages public education about avoiding flooded areas through its Turn Around, Don't Drown phrase. Information about usage of the phrase and producing warning signs is available at http://www.nws.noaa.gov/os/water/tadd/. Most flooding deaths are preventable.

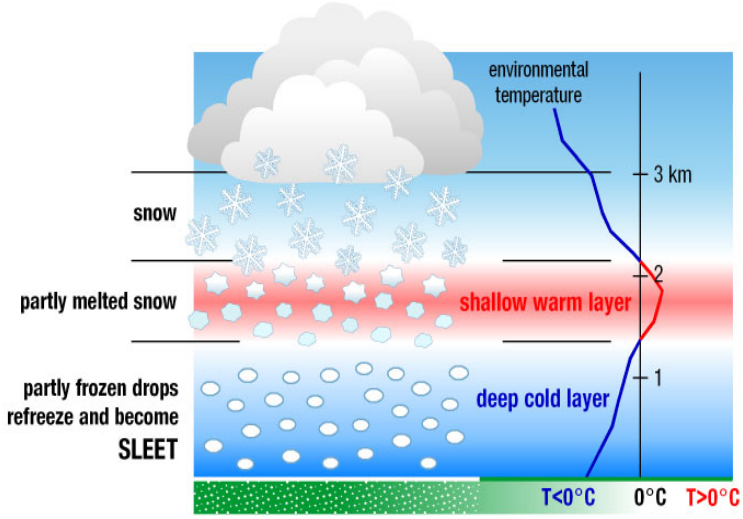
Winter Storm Events

In the last century, Illinois has had a severe storm every winter. According to the Illinois Emergency Management Agency (IEMA) there are three (3) categories of winter storms: blizzards, heavy snowstorms, and ice storms. Characteristics of blizzards include low temperatures, heavy snowfall, and winds of 35 miles per hour or greater. The combination of these events leads to low visibility. Heavy snowstorms produce six (6) inches or more of snow in 48-hours or less. Ice storms occur when moisture falls and freezes upon impact (freezing rain) creating dangerous roadways and causing trees to fall. The map below illustrates that Bureau, LaSalle, Marshall, Putnam, and Stark counties fall within the 26 - 34 inches of snow per year area.



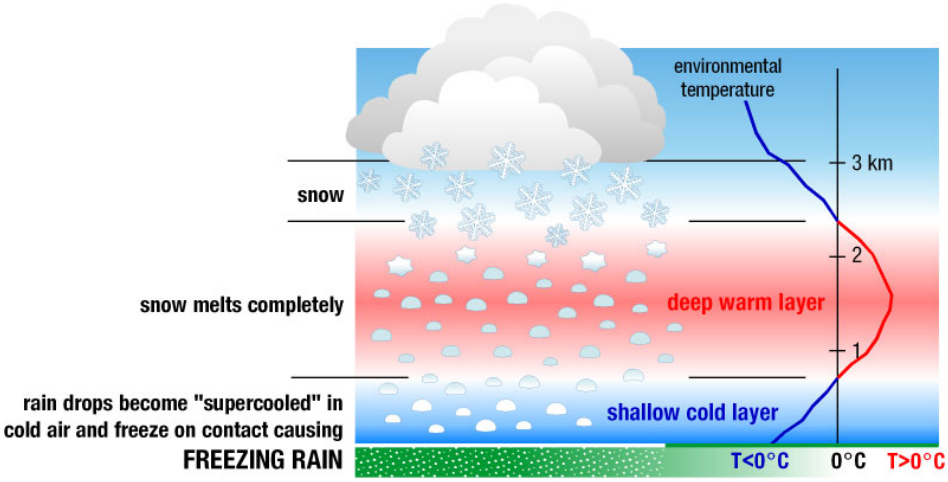


Precipitation falls as snow when air temperature remains below freezing in the atmosphere.



http://www.nssl.noaa.gov/primer/winter/ww_basics.html

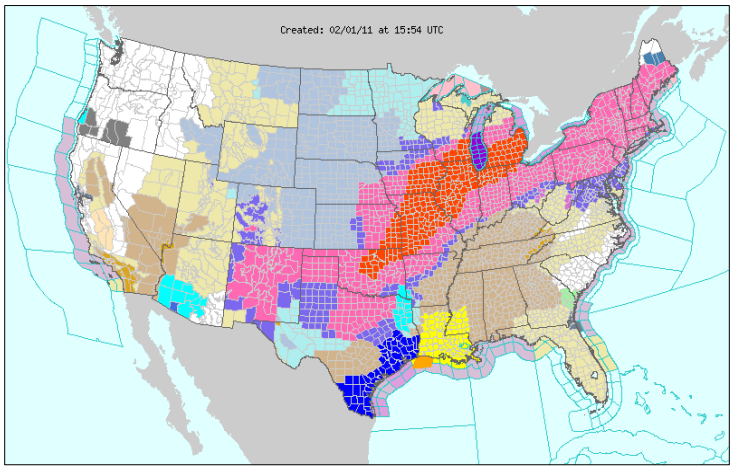
Sleet falls when snow partially melts in a warm layer of air and then refreezes in a layer of freezing air.



http://www.nssl.noaa.gov/primer/winter/ww_basics.html

Freezing rain occurs when snowflakes completely melt in a layer of warm air, then hit layer of supercooled air and freeze on contact.

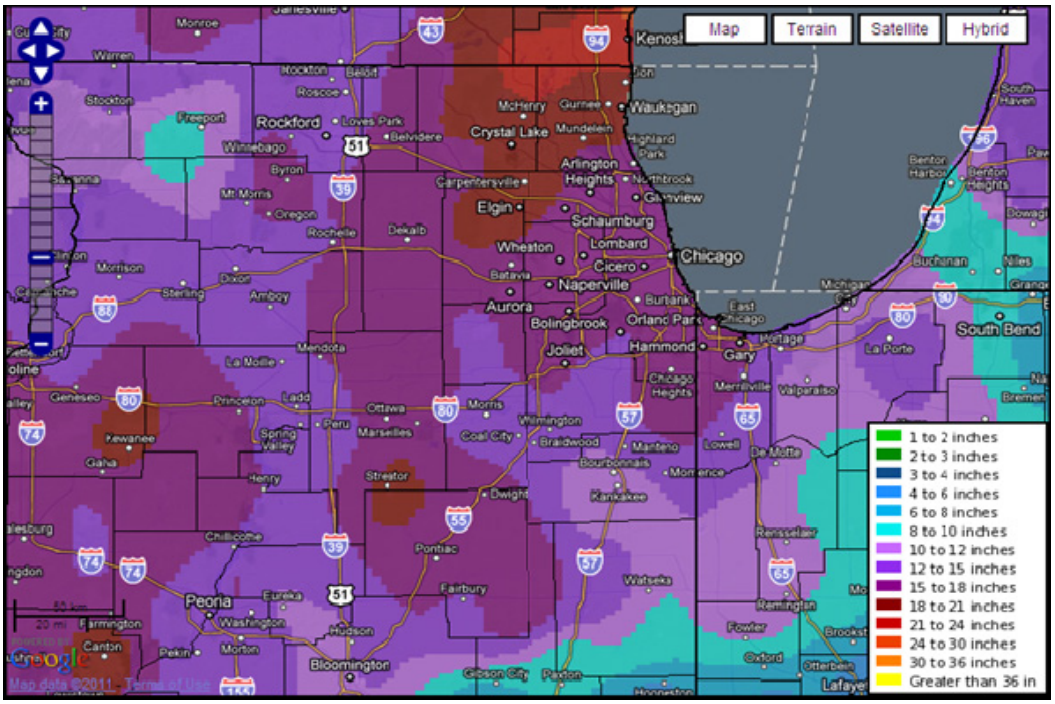
The region experiences winter storms on an annual basis, but between January 31 and February 2, 2011 Illinois and the region experienced one (1) of the worst winter storms on record. The winter storm stretched across a large section of the nation from New Mexico to Maine. The map below shows watches and warnings issued for the morning of February 1, 2011. Bureau, LaSalle, Marshall, Putnam, and Stark Counties were included in a blizzard warning (in red) issued by the National Weather Service.



Source: http://www.weather.gov/lot/2011blizzard#snowfall

The blizzard created dangerous weather conditions with wind gusts up to 50 – 60 miles per hour (mph), snow drifts up to 10 feet high, and snow totals in the region ranging from 10 – 21 inches.

The blizzard exhausted community stockpiles of salt and required overtime for the removal of snow to keep roadways safe. Former Illinois Governor Pat Quinn requested a declaration for public assistance for 60 counties, snow assistance for 43 counties, and hazard mitigation funds for all counties. On March 17, 2011 President Barack Obama declared a major disaster existed in Illinois under FEMA-1960-DR, Illinois, Severe Winter Storm and Snowstorm. Bureau, LaSalle, Marshall, Putnam, and Stark Counties were included in the declaration.



http://www.weather.gov/images/lot/pastevents/2011Blizzard/bliz2011-2pm.png

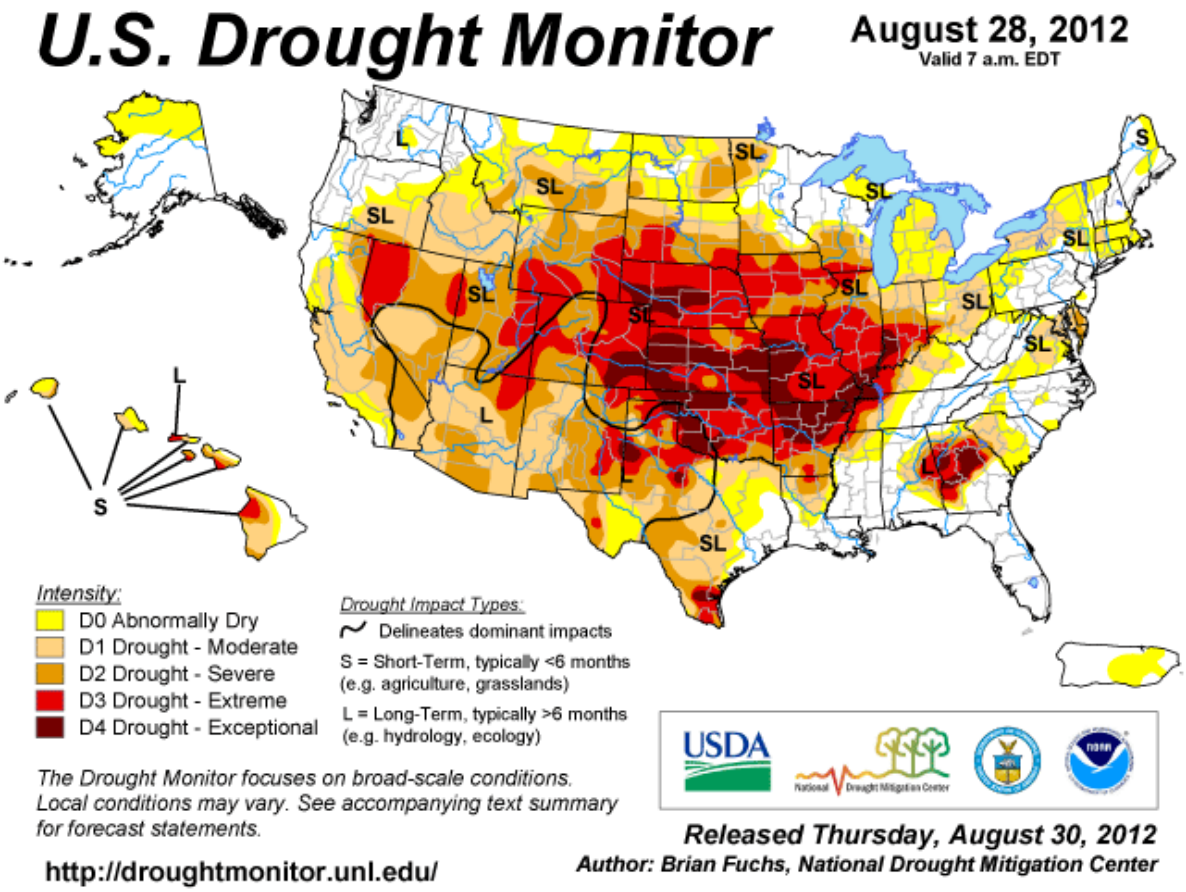
The table below shows the type and number of winter storms for Bureau, LaSalle, Marshall, Putnam, and Stark counties, and their associated deaths, injuries, and damage.

Winter Events						
12/31/1964 to 12/31/2014						
County	Storm Type	Quantity	Injuries	Deaths	Property Damage	Crop Damage
Bureau						
	Blizzard	4	0	0	0	0
	Frost/Freeze	7	0	0	0	198K
	Heavy Snow	13	0	0	5K	0
	Ice Storm	9	0	0	12K	0
	Winter Storm	40	0	0	5K	0
	Winter Weather	42	0	0	0	0
	Total	115	0	0	22K	198K
LaSalle						
	Blizzard	4	0	1	0	0
	Frost/Freeze	1	0	0	0	0
	Heavy Snow	9	0	0	0	0
	Ice Storm	1	0	0	2K	0
	Winter Weather	20	0	0	0	0
	Total	35	0	0	2K	0
Marshall						
	Blizzard	3	0	0	75K	0
	Frost/Freeze	1	0	0	0	0
	Heavy Snow	14	0	0	0	0
	Ice Storm	6	0	0	300K	0
	Winter Storm	17		0	0	0
	Winter Weather	3	0	0	0	0
	Total	44	0	0	375K	0
Putnam						
	Blizzard	4	0	0	0	0
	Frost/Freeze	7	0	0	0	66K
	Heavy Snow	10	0	0	0	0
	Ice Storm	8	0	0	60K	0
	Winter Storm	37	0	0	0	0
	Winter Weather	42	0	0	0	0
	Total	108	0	0	60K	66K
Stark						
	Blizzard	3	0	0	80K	0
	Frost/Freeze	1	0	0	0	0
	Heavy Snow	12	0	0	0	0
	Ice Storm	7	0	0	180K	0
	Winter Storm	17	0	0	0	0
	Winter Weather	3	0	0	0	0
	Total	43	0	0	260K	0

Drought

Drought is, generally, "a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector." Drought is difficult to define because it the severity of drought can vary across a region. Droughts are a normal, recurrent feature of climate. They affect both developed and developing countries. The entire region is at risk of drought in any given year.

Droughts have serious economic, environmental, and health impacts. California is enduring one (1) of the most severe droughts in the state's history and is under a State of Emergency with water restrictions in place for many water consumers. Illinois was impacted by a drought in 2012 that caused millions of dollars in damages to crops. The graphic below shows drought conditions on August 28, 2012.



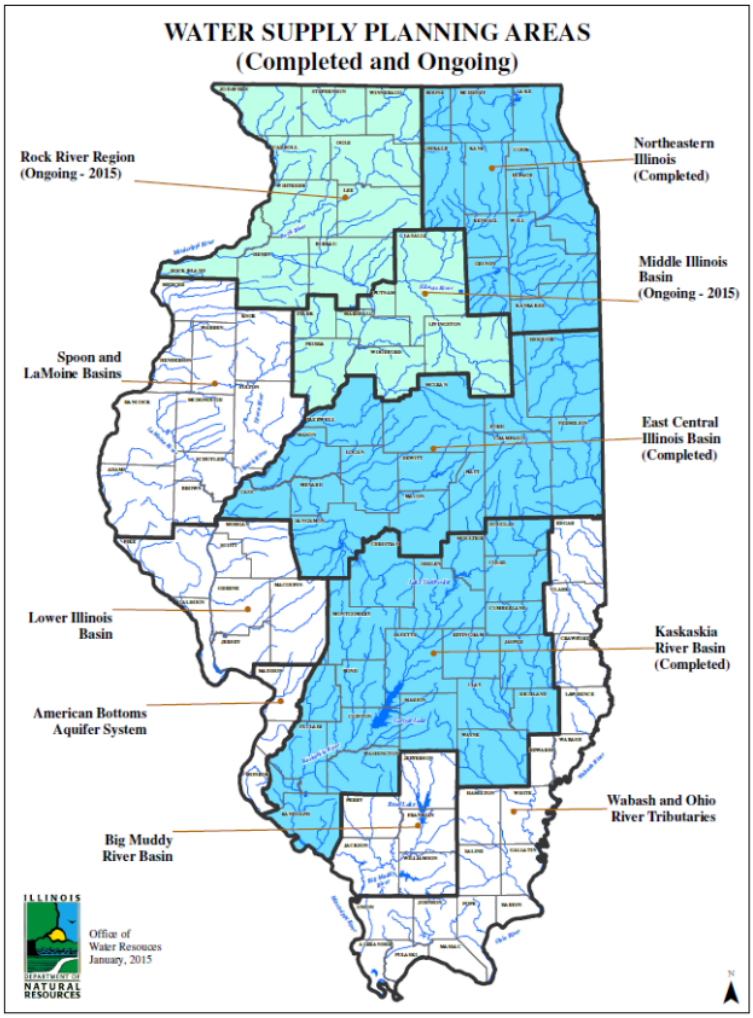
Bureau and Stark Counties reported crop damage totaling $37.3 million as a result of the drought. By August 2012, drought conditions impacted most of the state. Areas identified in red were enduring a severe drought. All of Stark County and parts of Bureau and Marshall were included in the severe drought area.

Climate change and population increases necessitate the need for water supply planning. The Prairie Research Institute and the Illinois State Water Survey predict that Illinois will need 20 - 50% more water in the coming decades. In 2006, former Governor Rod Blagojevich ordered the Illinois Department of Natural Resource (IDNR) to take the lead in studying regional and state water supplies. Two (2) regional pilot studies were launched others were added later.

LaSalle, Marshall, Putnam, and Stark Counties are part of the Middle Illinois Basin planning area. Bureau County is part of the Rock River Region planning area. Information on the Rock River Region study was not readily available. The Middle Illinois Basin study has been put on hold by the State of Illinois because of Illinois' financial crisis. It is essential that the study be completed for Illinois to be prepared for future water needs. The Middle Illinois Basin study will examine issues including, but not limited to the following:

- Increased industrial/municipal use of groundwater
- Water needs for agricultural use
- Water needs for mining use
- Limited quantity of groundwater
- Need for infrastructure upgrades

The graphic to the right identifies the water supply planning areas and the status of their studies. The state has put the planning studies on hold as a result of the financial crisis.

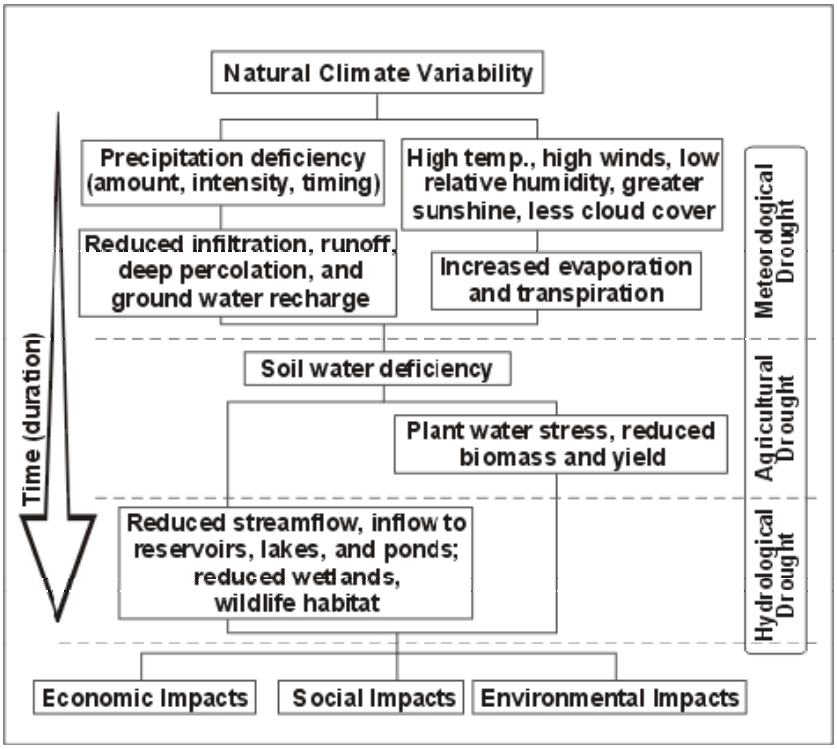


The table below shows the number of droughts since December 31, 1964 in Bureau, LaSalle, Marshall, Putnam, and Stark counties and the amount of damage that occurred to the crops due to the drought. The complete list of drought occurrences is available in Appendix D: Storm Events Data.

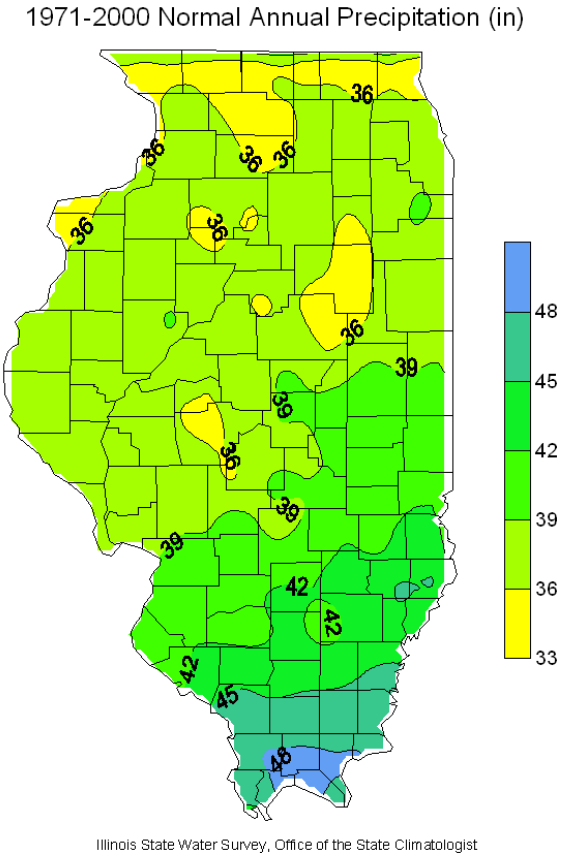
Drought					
12/31/1964 to 12/31/2014					
County	Quantity	Injuries	Deaths	Property Damage	Crop Damage
Bureau	15	0	0	0	34.4M
LaSalle	9	0	0	0	0
Marshall	7	0	0	0	21.4M
Putnam	15	0	0	0	6.03M
Stark	7	0	0	0	15.9M
Total	53	0	0	0	77.73M

No property damage was reported to the National Oceanic and Atmospheric Administration (NOAA) during this time period. However, crop damage totaled $77.3 million. Most crop damage occurred during the 2005 and 2012 droughts.

The following chart is an explanation and time scale for the different types of drought that can occur.



The following map illustrates the annual precipitation for the state of Illinois. Bureau, LaSalle, Marshall, Putnam, and Stark counties are in the 36 - 39 inches per year area with a couple areas below an average of 36 inches per year.



Extreme Temperatures (Heat and Cold)

Extreme temperatures are a hazard due to the stresses they can put on the human body. Extreme temperatures can be both heat-related or cold-related.

According to the Red Cross a heat wave is a "prolonged period of excessive heat and humidity." The heat index is "a number in degrees Fahrenheit that tells how hot it really feels when relative humidity is added to the actual air temperature. Exposure to full sunshine can increase the heat index by 15 degrees Fahrenheit." More than 100 heat-related deaths occur every year in the United States. The 10 year (2004 – 2013) average for heat related deaths was 123 fatalities.

The body cools itself by sweating. High humidity reduces this evaporation and hinders the body's effort to cool itself. The dew point temperature is a much more useful measure of the moisture content of the atmosphere than the commonly used relative humidity.

The following is a heat index chart. To understand the heat index: Select a temperature and a relative humidity percentage. Where they connect in the chart is the heat index.

Heat Index (Fahrenheit)

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

Lans Rothfusz, MIC at NWS Tulsa, OK, NOAA's National Weather Service, Jackson, KY Weather Forecast Office, http://www.crh.noaa.gov/jkl/?n=heat_index_calculator

Category	Heat Index	Possible heat disorders for people in high risk groups
Extreme Danger	**130 or higher**	**Heatstroke or sunstroke likely. Heatstroke possible with prolonged exposure and/or physical activity.**
Danger	**105-129**	**Sunstroke, muscle cramps, and/or heat exhaustion likely. Heatstroke possible with prolonged exposure.**
Extreme Caution	**90-105**	**Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure.**
Caution	**80-90**	**Fatigue possible with prolonged exposure and/or physical activity.**

Another heat index chart uses the dewpoint and temperature to figure the heat index.

Heat Index Chart (Temperature & Dewpoint)																
Dewpoint (° F)	**Temperature (° F)**															
	90	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**	**101**	**102**	**103**	**104**	**105**
65	94	95	96	97	98	100	101	102	103	104	106	107	108	109	110	112
66	94	95	97	98	99	100	101	103	104	105	106	108	109	110	111	112
67	95	96	97	98	100	101	102	103	105	106	107	108	110	111	112	113
68	95	97	98	99	100	102	103	104	105	107	108	109	110	112	113	114
69	96	97	99	100	101	103	104	105	106	108	109	110	111	113	114	115
70	97	98	99	101	102	103	105	106	107	109	110	111	112	114	115	116
71	98	99	100	102	103	104	106	107	108	109	111	112	113	115	116	117
72	98	100	101	103	104	105	107	108	109	111	112	113	114	116	117	118
73	99	101	102	103	105	106	108	109	110	112	113	114	116	117	118	119
74	100	102	103	104	106	107	109	110	111	113	114	115	117	118	119	121
75	101	103	104	106	107	108	110	111	113	114	115	117	118	119	121	122
76	102	104	105	107	108	110	111	112	114	115	117	118	119	121	122	123
77	103	105	106	108	109	111	112	114	115	117	118	119	121	122	124	125
78	105	106	108	109	111	112	114	115	117	118	119	121	122	124	125	126
79	106	107	109	111	112	114	115	117	118	120	121	122	124	125	127	128
80	107	109	110	112	114	115	117	118	120	121	123	124	126	127	128	130
81	109	110	112	114	115	117	118	120	121	123	124	126	127	129	130	132
82	110	112	114	115	117	118	120	122	123	125	126	128	129	131	132	133
Note: Exposure to full sunshine can increase HI values by up to 15° F																

http://www.ncdc.noaa.gov/oa/climate/conversion/heatindexchart.html

Extreme cold temperatures are also a hazard. The most susceptible people to cold temperatures are the elderly and infants. Overexertion in the winter can be dangerous because of the strain on the heart. Regardless of age, people should be aware and cautious of overextending themselves.

Wind can impact how cold it feels outside. Temperature and wind speed together produce a wind chill factor. "The wind chill is based on the rate of heat loss from exposed skin caused by the combined effects of the wind and cold. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature." The wind chill shows how cold the wind makes exposed flesh feel.

The following chart is a wind chill chart. Find the temperature and the wind speed. Where they connect in the middle is the wind chill.

NWS Windchill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
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	19	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

http://www.nws.noaa.gov/om/windchill/

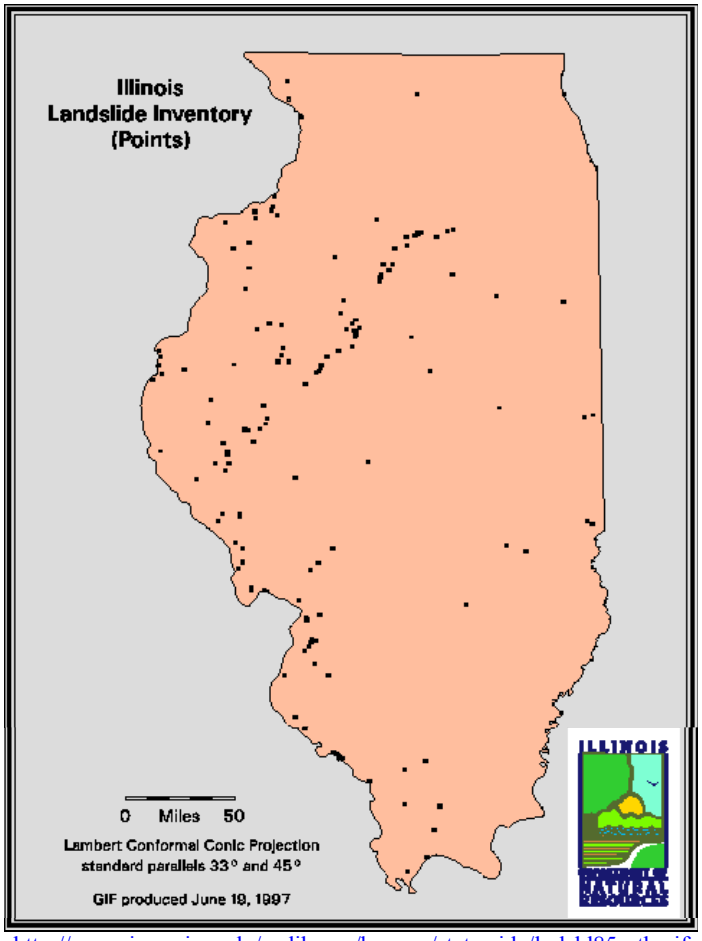
Extreme heat and cold can also be problematic for public water systems. Although water main breaks are thought to occur more frequently during the winter, they can happen anytime of the year. According to AccuWeather.com, prolonged hot and cold temperatures cause the ground to shift more abruptly, which leads to water main breaks. The age and condition of water mains can also play a factor. In the City of LaSalle, a long period of below freezing temperatures during the winter of 2013 - 2014 caused water main in a section of the city to burst. The water main was only about 18 inches below the ground. Dozens of homes went without water for up to two (2) months. The city provided water to the residents until the main was repaired. The entire region is at risk for extreme temperatures.

Landslides

Landslides constitute a major geologic hazard because they are widespread, occur in all 50 states and U.S. territories, and cause up to $1 - 2 billion in damages and more than 25 fatalities on average each year. Landslides commonly occur in connection with other major natural disasters such as earthquakes, volcanoes, wildfires, and floods.

According to the American Red Cross, landslides can move slowly and cause damage gradually or move very rapidly destroying property and taking lives suddenly. Gravity is the force that drives landslide movement. Factors that allow the force of gravity to overcome the resistance of earth materials are saturation by water, steepening of slopes by erosion or construction, alternate freezing or thawing, and earthquakes.

Debris flows, also referred to as mudslides or mudflows are common types of fast-moving landslides. These flows generally occur during periods of intense rainfall or rapid snowmelt. They continue flowing down hills and through channels, growing in volume with the addition of water, sand, mud, boulders, trees, and other materials. When the flows reach flatter ground, the debris spreads over a broad area.

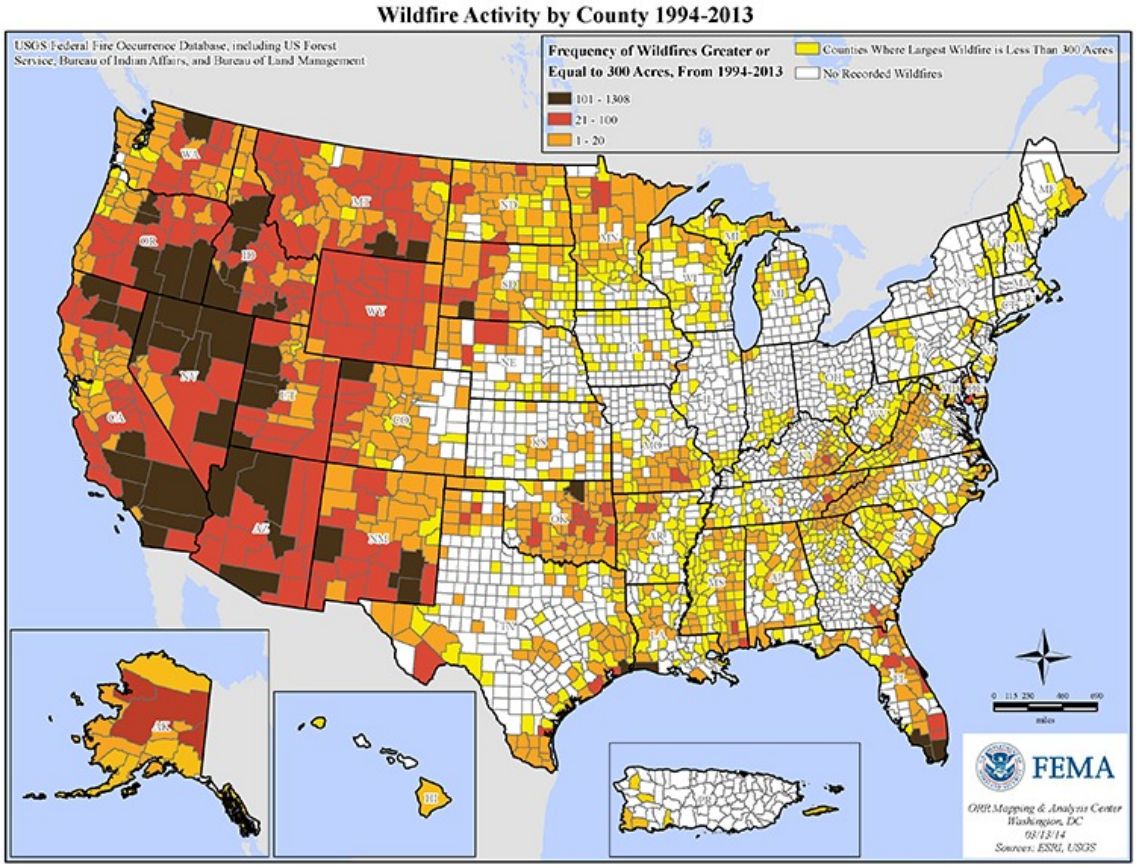


http://www.isgs.uiuc.edu/nsdihome/browse/statewide/lndsld85-ptb.gif

The probability for a landslide in Bureau, LaSalle, Marshall, Putnam, and Stark counties is undetermined. In the City of Streator in LaSalle County, a landslide occurred in March 2007 along the eastern bank of the Vermilion River, just south of the Main Street Bridge near the downtown. The landslide caused two (2) businesses to close. The city eventually bought out both properties. The city completed a riverbank slope protection project to control erosion and to protect 15 residential properties. Historically, in 1956 a flood damaged hundreds of structures in this area. A levee was later constructed along the west bank of the river to protect structures in the area.

Wildfires

The following map shows the locations that experienced wildfires greater than 300 acres, between 1994 – 2013, in the United States. No wildfires of this magnitude have occurred in the NHMP region. However, on September 11, 2012 a wildfire burned 200 acres of marsh grass and cattails along Dee Bennett Road in rural North Utica, Illinois in LaSalle County. The fire started when a yard waste burn pile got out of control. Wind gusts up to 25 miles per hour caused the fire to rapidly spread. The fire was extinguished after 12 hours and the help of 20 responding agencies. While wildfires occur frequently in the Western United States, the September 2012 fire shows that they can occur in Illinois and that people must be cautious when starting fires. The probability of wildfires in Bureau, LaSalle, Marshall, Putnam, and Stark Counties is undetermined



Source: http://www.community.fema.gov/connect.ti/AmericasPrepareathon/view?objectId=3221840

Earthquakes

The earth's outer surface is composed of tectonic plates. These plates constantly move away from, towards or past each other. The continents, which are part of these plates, also move. The sudden movement of the Earth caused by the abrupt release of accumulated strain along a fault in the interior is an earthquake. The released energy passes through the Earth as seismic waves, which cause the shaking. Seismic waves continue to travel through the Earth after the fault motion has stopped.

According to the United States Geological Survey (USGS), earthquake severity is measured by intensity and magnitude. Intensity is an observed effect of ground shaking on people, buildings, and natural features. Magnitude is based on the amplitude of the earthquake waves near the hypocenter of the earthquake recorded on instruments which have a common calibration. The magnitude of an earthquake is a value determined by an instrument, such as the seismograph.

The Richter scale was developed in 1935 by Charles F. Richter. It is a mathematical device that compares the size of earthquakes. On the Richter scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude of 5.3 might be computed for a moderate earthquake. The logarithmic basis of the scale presents each whole number increase in magnitude, a tenfold increase in measured amplitude. As an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value. The Richter scale does not express damage. The Richter scale has no upper limit. The largest known shocks have had magnitudes from 9.0 to 9.5.

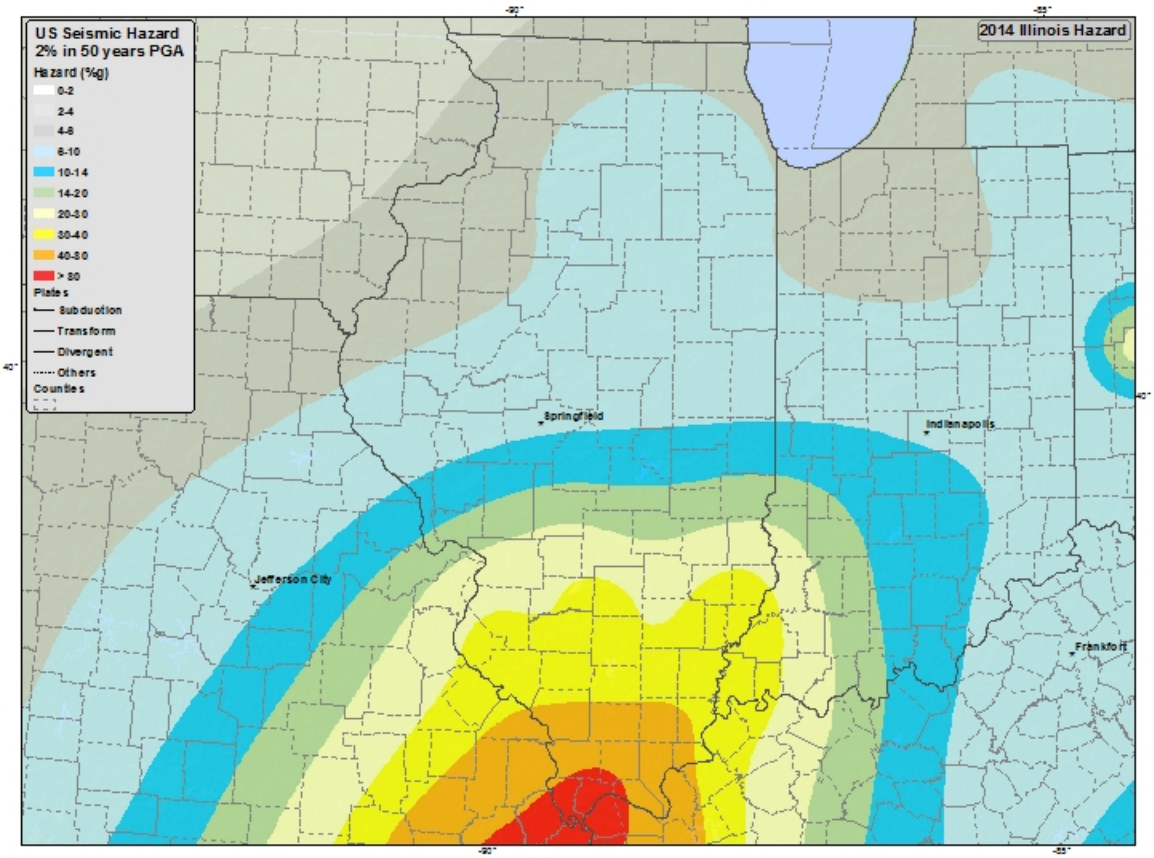
Earthquakes with magnitude of approximately 2.0 or less are usually called microearthquakes. Microearthquakes are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of approximately 4.5 or greater, of which there are several thousand annually, are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes are usually, on average, 8.0 or higher. One great earthquake of such size occurs somewhere in the world each year.

The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses, such as people awakening, movement of furniture, damage to chimneys, and total destruction. The intensity scale currently used in the United States is the Modified Mercalli (MM) Intensity Scale, developed in 1931. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It is an arbitrary ranking based on observed effects. Generally, the maximum observed intensity occurs near the epicenter.

The Modified Mercalli (MM) Intensity Scale is described below.

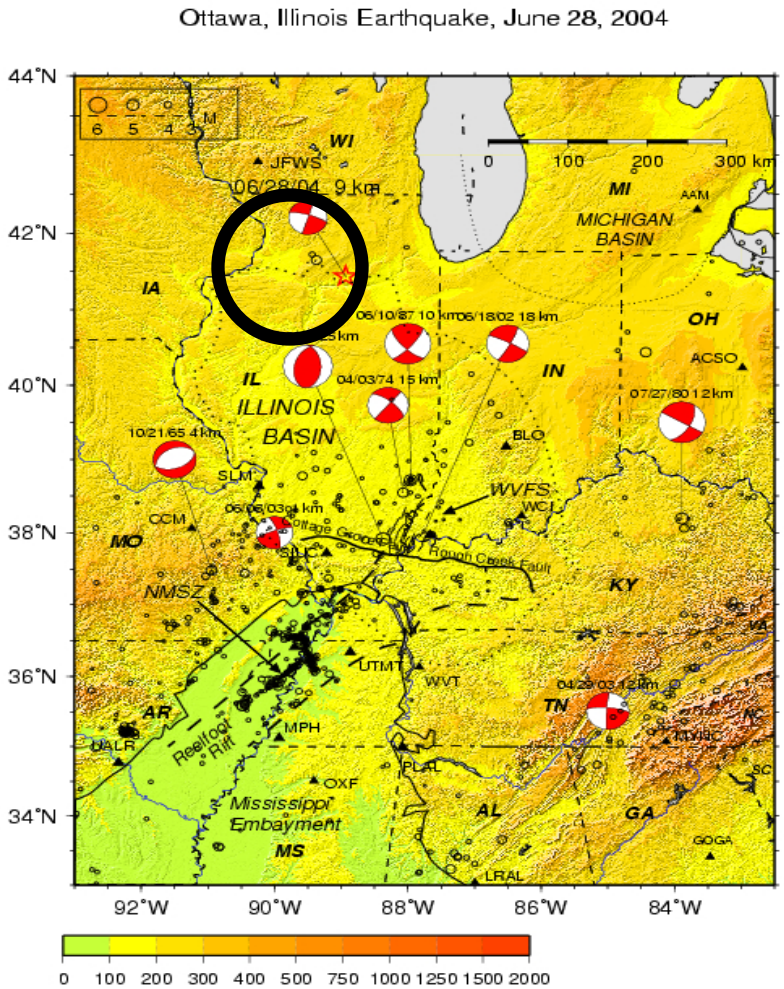
Earthquake Measurement Scales		
Mercalli	**Richter**	**Felt Intensity**
I	0-4.3	Not felt except by a very few under especially favorable conditions.
II		Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III		Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
IV	4.3-4.8	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V		Felt by nearly everyone; many awakened. some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	4.8-6.2	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII		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.
VIII	6.0-7.3	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chmineys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
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.
X		Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rail bent.
XI	7.3-8.9	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.

2014 Illinois Seismic Hazard Map – USGS



The map above shows that southern Illinois has a high risk of experiencing an earthquake. Southern Illinois is part of the New Madrid Seismic Zone, which also includes parts of Arkansas, Kentucky, Missouri, and Tennessee. The New Madrid Zone is the most active earthquake region in the United States east of the Rocky Mountains. The zone stretches 125 miles long and has multiple fault lines. Four (4) of the largest earthquakes ever recorded in United States history occurred within the zone between 1811 and 1812 with magnitudes greater than 7.0. The possibility of future earthquakes of this size is not known. The USGS records earthquake data, but cannot predict future earthquakes.

The map below of Illinois illustrates the epicenter of a 4.2 - 4.5 magnitude earthquake that occurred on June 28, 2004 in Ottawa, Illinois (LaSalle County). According to the USGS Earthquake Summary, the earthquake was felt in Indiana, Iowa, Michigan, Missouri, and Wisconsin.



Won-Young Kim. Lamont-Doherty Earth Observatory of Columbia University.
June 28, 2004 Ottawa, Illinois Earthquake.

Since 1811, the earthquakes in the United States have resulted in the deaths of more than 3,400 people. Fires, landslides, and tsunamis caused many of those deaths. In fact, over 350 deaths were caused by tsunamis that followed the earthquakes.

Natural Hazard Risk Levels

The color-coded boxes at the top of each Community Risk Assessment report indicate the community's risk level for potential natural hazards. The process of determining the community's risk level was similar to that used by the State of Illinois for the state's 2013 Natural Hazard Mitigation Plan (see Appendix C: Illinois Hazard Rating Process). The process for this NHMP considers four (4) categories to determine risk: Historical/Probability, Vulnerability, Severity of Impact, and Population. Each category is assigned a numerical value that is determined by the following:

- The number of times that a disaster has occurred in the past 50 years.
- The percentage of people that live in an area that could be impacted by a disaster.
- The likely severity of the impact in terms of fatalities, injuries, damage.
- Current population and future population projections.

The total value of the four (4) categories determines the risk rating for each natural hazard. The "Key" below shows the total numerical values for each color and risk level.

Key	
Risk	Total
Low	0-12
Guarded	13-24
Elevated	25-36
High	37-48
Severe	49-60+

The National Oceanic and Atmospheric Administration's (NOAA's) storm events database was utilized to determine the risk level for each hazard. Storm data from December 31, 1964 – December 31, 2014 was used for the analysis. Storm data for Bureau, LaSalle, Marshall, Putnam, and Stark Counties is included in Appendix D: Storm Events Data. NOAA's storm database is available at http://www.ncdc.noaa.gov/stormevents /. The following tables identify the natural hazard risks for each community.

Bureau County Risk Assessment								
Communities	**Tornadoes**	**Floods**	**Winter Storms**	**Extreme Temps.**	**Dangerous Winds**	**Lightning**	**Drought**	**Hail**
Bureau County	Elevated	Guarded	High	Elevated	Severe	Guarded	Elevated	Elevated
Buda	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Bureau Junction	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Cherry	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Dalzell	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
DePue	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Neponset	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Ohio	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Princeton	Guarded	Guarded	High	Elevated	Severe	Guarded	Elevated	Elevated
Sheffield	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Spring Valley	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Tiskilwa	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Wyanet	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded

LaSalle County Risk Assessment								
Communities	**Tornadoes**	**Floods**	**Winter Storms**	**Extreme Temps.**	**Dangerous Winds**	**Lightning**	**Drought**	**Hail**
LaSalle County	Elevated	Elevated	High	Elevated	High	Guarded	Elevated	Elevated
Earlville	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Grand Ridge	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Kangley	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
LaSalle	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Leland	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Marseilles	Guarded	Guarded	High	Elevated	High	Guarded	Elevated	Guarded
North Utica	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Oglesby	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Ottawa	Guarded	Guarded	High	Elevated	High	Guarded	Elevated	Elevated
Peru	Guarded	Guarded	High	Elevated	High	Guarded	Elevated	Elevated
Ransom	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Seneca	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Sheridan	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Streator	Guarded	Guarded	High	Elevated	High	Guarded	Elevated	Elevated

Marshall County Risk Assessment								
Communities	**Tornadoes**	**Floods**	**Winter Storms**	**Extreme Temps.**	**Dangerous Winds**	**Lightning**	**Drought**	**Hail**
Marshall County	Guarded	Elevated	High	Elevated	High	Guarded	Elevated	Guarded
Henry	Guarded	Guarded	High	Elevated	High	Guarded	Elevated	Elevated
Lacon	Guarded	Guarded	High	Elevated	High	Guarded	Elevated	Guarded
Sparland	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Toluca	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Wenona	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded

Putnam County Risk Assessment								
Communities	**Tornadoes**	**Floods**	**Winter Storms**	**Extreme Temps.**	**Dangerous Winds**	**Lightning**	**Drought**	**Hail**
Putnam County	Guarded	Guarded	High	Elevated	High	Guarded	Elevated	Elevated
Granville	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Hennepin	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Mark	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded

Please continue to the next page.

Stark County Risk Assessment								
Communities	**Tornadoes**	**Floods**	**Winter Storms**	**Extreme Temps.**	**Dangerous Winds**	**Lightning**	**Drought**	**Hail**
Stark County	Guarded	Elevated	High	Elevated	High	Guarded	Elevated	Elevated
Bradford	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Lafayette	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded
Toulon	Guarded	Guarded	High	Elevated	High	Guarded	Elevated	Elevated
Wyoming	Guarded	Guarded	High	Elevated	Elevated	Guarded	Elevated	Guarded

Conclusions

Bureau, LaSalle, Marshall, Putnam, and Stark Counties are at risk of experiencing the impacts of several natural hazards including tornadoes, floods, winter storms, extreme temperatures, dangerous winds, lightning, drought, and hail. Although not frequent, the region has experienced wildfires, landslides, and earthquakes. By having a greater understanding of the forces behind natural disasters, mitigation activities can be pursued to save lives and reduce or prevent property destruction.

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Chapter 3: Vulnerability Assessment

Assessing the vulnerability of a community is a necessary step in the NHMP process. Planning must be based on a reasonable assessment of hazards and the damages that may accompany them. Many factors are used to determine the vulnerability of structures. Bureau, LaSalle, Marshall, Putnam, and Stark Counties have over 173,000 residents; therefore, there are thousands of people, homes, businesses, and other properties that have the potential to be damaged from a natural hazard. This chapter reviews the vulnerability of the counties' public health and safety, property damage, and the adverse impact on the local economy. All the counties have to pay close attention to the impacts on health, safety, property, and the economy.

Hazards create many damages. Direct damages are those caused immediately by the event. Indirect damages are disruptions in asset operations and community functions. Secondary hazards are caused by the initial hazard event, such as a landslide that is caused by an earthquake.

The methodology used to determine vulnerability is as follows:

1. Select and inventory categories of property subject to damage.
    A. Determine five (5) categories
    B. Use Census 2000 and HAZUS software to compute totals.
2. Determine how the hazard can affect safety, health, buildings, and the economy.
3. Determine the average cost of buildings per square foot as well as the replacement costs for structures.

    Note: This is an average cost per square foot for the general category of building. This information is from the HAZUS software.
4. Calculate the impact

Note: Since the 2008 plans, HAZUS software has changed to be more site-specific and disaster-specific. Aggregated data was either unavailable or in a different format. Therefore, data from the previous plan was utilized.

Properties

Five (5) categories of buildings were assessed to determine the vulnerability to property damage in Bureau, LaSalle, Marshall, Putnam, and Stark Counties.

1. Single Family Housing – A popular housing structure chosen because many residents own and live in single-family housing.
2. Manufactured Housing – A very vulnerable housing structure chosen due to the risks from natural hazards.
3. Multi-family Structures – Chosen because many people live in apartments and their vulnerability needs to be assessed as much as single family housing.

4. Economic Establishments (including retail, commercial, and factory) – Natural hazards can affect the economy, which in turn affects everyone, so the vulnerability needs to be assessed.
5. Non-Residential Structures (including all critical facilities) – This category was selected because a general assessment of costs to the rest of the structures within a community will help to prepare for losses. Critical facility costs are a necessary need for a community to start and continue aid in a disaster situation.

Assessing these categories of structures allows for determination of the relative vulnerability of properties from the hazards facing the five (5) counties.

The number of buildings in categories 1-4 is shown in the following table.

Buildings in Bureau, LaSalle, Marshall, Putnam, and Stark Counties					
County	**Single Family Homes**	**Manufactured Homes**	**Multi-family Structures**	**Economic Establishments**	**Total**
Bureau	13005	574	1743	557	**15879**
LaSalle	36818	2535	7063	2107	**48523**
Marshall	5231	277	406	189	**6103**
Putnam	2504	199	185	70	**2958**
Stark	2333	138	254	70	**2795**
	59891	**3723**	**9651**	**2993**	**76258**

The tables on the following pages show the number of critical facilities within the five-county area. Included are communities that opted not to participate in this plan, however, the information is imperative to determining potential dollar losses.

Please continue to the next page.

Critical Facilities										
	Public Safety									
City	Medical Care Facilities	Police Stations	Fire Stations	Emergency Centers	Schools	Utilities	Nuclear Power Plant	DAMS	Hazardous Materials	Total
Arlington			1							1
Bradford			1			1				2
Buda										0
Bureau Co								13		13
Bureau Junction										0
Camp Grove			1							1
Cherry			1		1	1				3
Dalzell			1		1	1				3
DePue		1	1		1	2				5
Dover						1				1
Hollowayville										0
Henry		1	1	1	2	4			3	12
LaMoille		1	1		2	1				5
Lacon		2	1	1	1	1				6
Ladd		1	1			1			1	4
La Rose						1				1
Magnolia						1				1
Malden			1		1	1				3
Manlius			1		1	1				3
Marshall Co								4		4
Mineral										0
Neponset		1	1		1				1	4
New Bedford										0
Ohio			1		2	1				4
Princeton	1	2	1	1	8	6			2	21
Seatonville			1			1				2
Sheffield		1	1			1				3
Sparland						2				2
Spring Valley	1	1	1		3	1			2	9
Stark Co								3		3
Tiskilwa			1			1				2
Toluca		1				1				2
Toulon		1	1			1				3
Varna					1					1
Walnut		1	1		1	1				4
Wenona		1	1	1	2	1				6
Wyanet			1		1	1				3
Wyoming			1		2	1			1	5
Total	2	15	24	4	31	36	0	20	10	142

Critical Facilities										
	Public Safety									
City	Medical Care Facilities	Police Stations	Fire Stations	Emergency Centers	Schools	Utilities	Nuclear Power Plant	DAMS	Hazardous Materials	Total
Cedar Point						1				1
Dana			1							1
Earlville		1	1		1	1				4
Grand Ridge		1	1							2
Granville		1	1			1				3
Hennepin		1	1	1	1	3			2	9
LaSalle City	2	1	1	5	6	5			2	22
LaSalle Co								14		14
Leland		1	1		2					4
Leonore			1							1
Lostant			1							1
Marseilles		1	2		2	3	1		1	10
McNabb		1								1
Mendota	1	1	1		5	4			2	14
Naplate			1							1
Oglesby		1	1		3	3			1	9
Ottawa	1	3	2	1	14	7			3	31
Peru	1	1	1	1	6	5			4	19
Putnam Co		2	5		4	7		4	8	30
Ransom			1			1				2
Rutland			1			4				5
Seneca		1	2	1	2	1			1	8
Serena			1						1	2
Sheridan		1	2		2	1				6
Standard			1							1
Streator	1	1	2	1	12	5			5	27
Tonica	1		1		1	1				4
Utica		1	1		1	2				5
Total	10	20	34	10	62	55	1	18	30	240

The following sections assess how the hazard can affect safety, health, the economy, and structures.

Floods

Safety:

Threats to life and safety can be avoided if people evacuate before floodwaters reach their homes or flood their evacuation routes. Forewarning is required if people are to leave their homes and reach their evacuation routes before floodwaters halt their passage. The National Weather Service's river level predictions and gages along the Illinois River should allow for ample time of notification to the public. However, smaller streams rise so rapidly during heavy storms that prediction equipment may only be able to give residents enough time to get to higher ground or prediction equipment may not be available.

People often put themselves in harms way during a flood. People mistakenly think a washed out bridge is still there or that their vehicle will not wash away on a flooded roadway. Six (6) inches of fast moving water can knock a person off his or her feet and two (2) feet of moving water can carry away a vehicle.

Health:

Three (3) types of health issues accompany floods. They are listed below:

1. The water itself, in floods, is a mix of dirt, oils, industrial and agricultural chemicals, as well as other point and non-point source pollutants. It can contain numerous hazardous and toxic elements.
2. The residual pools of water after the floodwaters have receded become stagnant and breed mosquitoes, molds, and mildews.
3. Post-traumatic stresses of having your home and irreplaceable valuables destroyed. For those in the floodplain, there is the chance of floods reoccurring and a chance of more loss and damages.

The public must be advised to stay out of flooded waters. An immediate threat is the possibility of drowning. Polluted water also has the possibility to cause infections and other serious ailments and diseases.

Economy:

According to the Community Rating System (CRS) Report for Congress, some of the economic consequences of flooding are:

1. The cost of emergency services accepted by state and local governments.
2. Reductions in government revenue, such as sales tax and property tax revenues, due to business interruption or business destruction.
3. Dollar value of flood-related deaths, bodily injury and mental anguish suffered by victims.
4. Post-disaster outlays by the federal government, such as loans and direct financial assistance to individuals for emergency housing, food, and clothing.

Economic impacts because of floods can be difficult to measure. Businesses may have to close, inventories and product could be compromised, and employees may not be able to get to work or be facing flood issues of their own. Clean up and flood-fighting costs are the responsibility of the community and can be costly. Agricultural losses can be substantial. Flooded agricultural tracts can cause a total loss of a farmer's crop.

Structures:

Floods can cause interior and structural damage to residential and commercial buildings. Interior damage occurs from residues and contaminants that are left when water recedes. Structural damage occurs from the velocity of water flow and the debris that comes with the flood. Materials will also deteriorate from long exposure to water and to moist air. Woods, wallboards, and floors can warp from being wet and then drying out.

Repetitive Loss Properties (RLPs)

Flooding is the most common natural disaster in the United States. The Community Rating System (CRS) defines a Repetitive Loss Property (RLP) as a property that has received two (2) flood insurance claim payments for at least $1,000 each since 1978. The following tables identify the communities that have RLPs and provide cumulative totals of payments made to property owners following flood losses. The best way to mitigate RLPs is to demolish or relocate structures on the property outside of the standard flood hazard area (SFHA). Through Congressional action, the Federal Emergency Management Agency (FEMA) was given authority to raise flood insurance premiums beginning on April 1, 2015. The legislation allows FEMA to increase premiums up to 18% annually until the full actuarial rate of flood insured properties is met. A significant portion of flood insurance claims are for RLPs. The higher premiums will encourage property owners to take action to mitigate the impact of flooding.

The table below identifies payments for both RLPs and Mitigated Properties. More than $4.6 million has been paid out in flood insurance claims to RLP owners across Bureau, LaSalle, Marshall, and Putnam Counties.

Repetitive Loss County Summary

For the State of Illinois - Data as of 06/30/2015

County Name	Community Name	Community Number	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
Bureau County	Bureau County *	170729	10,847.84	9,441.65	20,289.49	6,763.16	3	1
	Cherry, Village Of	170011	10,130.58	0	10,130.58	5,065.29	2	1
	DePue, Village Of	170012	2,197.44	2,014.00	4,211.44	2,105.72	2	1
	Princeton, City Of	170014	0	26,179.79	26,179.79	5,235.96	5	1
La Salle County	La Salle County *	170400	2,166,603.13	330,950.20	2,497,553.33	29,382.98	85	32
	La Salle, City Of	170401	24,703.76	12,300.00	37,003.76	18,501.88	2	1
	Mendota, City Of	170403	38,943.62	0	38,943.62	4,867.95	8	3
	North Utica, Village Of	170822	525,785.62	12,429.99	538,215.61	29,900.87	18	7
	Ottawa, City Of	170405	1,565,037.35	306,330.30	1,871,367.65	17,993.92	104	37
	Peru, City Of	170406	314,100.74	55,832.11	369,932.85	14,228.19	26	6
	Sheridan, Village Of	170802	210,399.80	23,055.34	233,455.14	38,909.19	6	3
	Streator, City Of	170408	7,908.47	0	7,908.47	1,977.12	4	1
Marshall County	Marshall County *	170994	16,746.22	4,513.21	21,259.43	10,629.72	2	1
	Henry, City Of	170456	191,231.76	26,206.76	217,438.52	18,119.88	12	3
	Sparland, Village Of	170459	74,562.42	650	75,212.42	6,267.70	12	5
Putnam County	Putnam County *	170993	390,190.14	70,822.97	461,013.11	9,604.44	48	16

Note: The data contained on this report contains Repetitive Loss Properties as well as Mitigated Properties (Properties that are no longer repetitive).

The table below identifies payments for RLPs only. Mitigated properties are not included on the table. The table shows that the number of RLPs has decreased in several communities. The City of Ottawa has dropped from 37 to 10 RLPs. LaSalle County has dropped from 32 to 24 RLPs and Putnam County has dropped from 16 to 10 RLPs.

Repetitive Loss County Summary

For the State of Illinois - Non-mitigated Records Only - Data as of 06/30/2015

County Name	Community Name	Community Number	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
Bureau County	Bureau County *	170729	10,847.84	9,441.65	20,289.49	6,763.16	3	1
	Cherry, Village Of	170011	10,130.58	0	10,130.58	5,065.29	2	1
	DePue, Village Of	170012	2,197.44	2,014.00	4,211.44	2,105.72	2	1
	Princeton, City Of	170014	0	26,179.79	26,179.79	5,235.96	5	1
La Salle County	La Salle County *	170400	1,880,954.14	288,457.20	2,169,411.34	31,903.11	68	24
	Mendota, City Of	170403	38,943.62	0	38,943.62	4,867.95	8	3
	North Utica, Village Of	170822	525,785.62	12,429.99	538,215.61	29,900.87	18	7
	Ottawa, City Of	170405	534,236.70	199,825.89	734,062.59	21,590.08	34	10
	Peru, City Of	170406	314,100.74	55,832.11	369,932.85	14,228.19	26	6
	Sheridan, Village Of	170802	112,500.68	11,348.24	123,848.92	30,962.23	4	2
	Streator, City Of	170408	7,908.47	0	7,908.47	1,977.12	4	1
Marshall County	Marshall County *	170994	16,746.22	4,513.21	21,259.43	10,629.72	2	1
	Henry, City Of	170456	191,231.76	26,206.76	217,438.52	18,119.88	12	3
	Sparland, Village Of	170459	41,272.32	0	41,272.32	6,878.72	6	3
Putnam County	Putnam County *	170993	251,616.49	59,358.06	310,974.55	9,717.95	32	10

Note: The data contained on this report contains Repetitive Loss Properties only. It does not include Mitigated Properties.

Community	Non-Mitigated Repetitive Loss Properties
Bureau County	1
Village of Buda	0
Village of Bureau Junction	0
Village of Cherry	1
Village of Dalzell	0
Village of DePue	1
Village of Neponset	0
Village of Ohio	0
City of Princeton	1
Village of Sheffield	0
City of Spring Valley	0
Village of Tiskilwa	0
Village of Wyanet	0

Community	Non-Mitigated Repetitive Loss Properties
LaSalle County	24
City of Earlville	0
Village of Grand Ridge	0
Village of Kangley	0
City of LaSalle	0
Village of Leland	0
City of Marseilles	0
Village of North Utica	7
City of Oglesby	0
City of Ottawa	10
City of Peru	6
Village of Ransom	0
Village of Seneca	0
Village of Sheridan	2
City of Streator	1

Community	Non-Mitigated Repetitive Loss Properties
Marshall County	1
City of Henry	3
City of Lacon	0
Village of Sparland	3
City of Toluca	0
Village of Wenona	0

Community	Non-Mitigated Repetitive Loss Properties
Putnam County	10
Village of Granville	0
Village of Hennepin	0
Village of Mark	0

Community	Non-Mitigated Repetitive Loss Properties
Stark County	0
Village of Bradford	0
Village of LaFayette	0
City of Toulon	0
Cityof Wyoming	0

Local Drainage Problems

Health and Safety:

Local drainage problems, such as septic system flooding, can be a safety and health problem if not fixed. Septic systems flooding can create a bacteria infected area. Repetitive flooding of sewage or water creates an easier chance for mold, mildew, and other bacteria and disease to occur.

Prompt attention to basements that have been impacted by water is necessary to prevent homeowners from being susceptible to disease. Homeowners should also avoid entering flooded basements when electricity is on. An electrical charge may be flowing through the water, especially if the furnace has been compromised or if wall outlets are underwater. Contacting an electrician is advised.

Economy:

The cost of constructing new storm sewer or maintaining the current storm sewer system can be a strain on many communities. Even when storm sewer projects are urgent, budgetary constraints may make it unaffordable for a community to address drainage issues. Damage to residential and commercial structures can have a large impact on the economy.

Structures:

The flooding of lower portions of buildings, such as basements, is possible with insufficient drainage. Damage to structure, as well as contents can occur. Local drainage affects buildings similarly to overbank flooding. Several communities in the region have issues with stormwater drainage and most are working to address these issues. However, residents must help. They must be advised to disconnect their sump pumps, downspouts, and drainage tiles from both sanitary and storm sewer systems. Installing ejector pits and overhead sewers can prevent basement backups as well. The public should also be advised not to build in or fill in drainage easements/ditches.

Thunderstorms

Health and Safety:

Remove dead or rotting trees and branches that could fall and cause injury or damage during a severe thunderstorm. Flying debris is a hazard during a thunderstorm. Secure outdoor objects that could blow away or cause damage.

Economy:

Thunderstorms and their effects have the capability to halt transportation and utilities. Downed power lines and power surges can cause havoc and lack of power to thousands of consumers. Straight-line winds cause more wind damage annually than tornadoes.

Buildings:

Manufactured homes are the most vulnerable to damage from thunderstorms. Straight-line winds can push over manufactured homes or knock them off their foundations. Wind and water damage can cause losses on any structure. Flying debris and hail cause damage to windows, siding, and roofs.

Lightning

Safety:

Lightning is unpredictable and can strike where rain is not present. An individual's chances of being struck by lightning are estimated to be 1 in 600,000, but could be reduced even further by following safety precautions. Most lightning deaths and injuries occur when people are caught outdoors in the summer months during the afternoon and evening. Taking coverage inside a home, building, or hard top automobile (not a convertible) will reduce one's risk of being struck. Showering or bathing during thunderstorms is not advised. Plumbing and bathroom fixtures can conduct electricity.

Health:

Lightning strike victims carry no electrical charge and should be attended to immediately. If a victim has a pulse and is breathing, look for other possible injuries. Check for burns where the lightning entered and left the body. Also be alert for nervous system damage, broken bones, and loss of hearing and eyesight. If there is no pulse administer CPR, when trained.

Economy:

Unplug appliances and other electrical items and turn off air conditioners. Power surges from lightning can destroy a home's electrical system and start a fire.

Structures:

Buildings usually have lightning rods or backup generators, which recover quickly or take over when power fails. Unprotected buildings and land have the potential to burn from a lightning strike.

Hail

Health and Safety:

The greatest danger from hail is impact at a high velocity. Hail can vary in sizes as small as a pea to as large as a grapefruit. Large hail can fall at speeds over 100 MPH. If outdoors cover your head by any means possible.

Economy:

Hail causes damage to structures, automobiles, livestock, and crops. The damage to buildings and recovery will vary depending on the extent of damage. Crop damage can also be very high depending on the extent and area of a hail event. Livestock can be killed or injured by hail.

Structures:

Hail can cause damage to vehicles, usually broken or shattered windows and dents in the body. Hail can inflict damage to roofs, windows, and siding. Damage will vary depending on the size of the hailstone.

Tornadoes

Safety:

Safety is not guaranteed during a tornado. Flying debris (such as trees, house parts, or vehicles) is a serious hazard. It is extremely dangerous to be located outside, in a vehicle, or in a manufactured or mobile home during a tornado. Vehicles tend to get rolled by tornadoes and mobile homes, even if tied down, get destroyed. Stronger tornadoes can remove houses from their foundations and miss other houses completely.

After a tornado, be aware of new safety issues created by the disaster. Watch for washed out roads, unsafe and unstable buildings, contaminated water, gas leaks, broken glass, damaged electrical wiring, and downed power lines.

Health:

After a tornado, be careful of further injuring yourself or the injured. Only move someone if they are in danger of further injury. If an unconscious person must be moved, stabilize the neck and back first. Care for yourself. Make sure to get plenty of fluids, food, and rest. Washing hands when working with people and debris will help to halt disease and infection as well.

Economy:

Most of the economic impact is to infrastructure and utilities. There is also a cost to clean up and debris removal. The total cost of damaged caused by tornadoes can be in the millions. It may take years for an economy to fully recover from a tornado.

Structures:

Tornadoes may strike quickly with little or no warning. With or without warning, freak accidents happen. All buildings are vulnerable; the following three (3) structures are more likely to suffer damage:

1. Mobile or manufactured homes.
2. Homes on crawlspaces.
3. Buildings with large spans, such as shopping malls, factories and gymnasiums.

At one (1) time, it was thought that tornadoes created a vacuum that caused houses to explode. Researchers now know that this "vacuum" has no effect on the destruction caused by tornadoes. Gravity must be taken into account for the structure to be sound, but too often designers rely on gravity for structural stability. Tornadoes, however, counteract gravity. Research has shown that a tornado exerts an upward force on a building up to 10 times as strong as the force of gravity.

A 1999 FEMA study concludes that many residential building failures could have been avoided with better construction, materials, and connections. The tornado assessment teams saw significant damage to hundreds of single-family homes, multi-family housing and manufactured homes. The building failures resulted from wind-borne debris and high winds that often produced forces on buildings not designed to withstand such forces.

Winter Storms and Extreme Cold

Health and Safety:

According to National Weather Service about 70% of injuries during winter storms result from vehicle accidents, and about 25% of injuries result from being caught out in the storm.

Frostbite is a severe reaction to cold exposure that causes freezing in the deep layers of skin and tissue. Frostbite can cause permanent damage. It is recognizable by a loss of feeling and a waxy-white or pale appearance in fingers, toes, nose, or ear lobes. It usually occurs on the body's extremities.

Hypothermia occurs when the body temperature drops to less than 95 degrees Fahrenheit. Symptoms of hypothermia include uncontrollable shivering, slow speech, memory lapses, frequent stumbling, drowsiness, and exhaustion. According to the Occupational Safety and Health Administration (OSHA), victims of hypothermia are often:

1. Elderly people and infants with inadequate food, clothing, or heating.
2. People who remain outdoors for long periods, such as the homeless or hunters.

3. People who drink alcohol or use illicit drugs.
4. People with predisposing health conditions such as cardiovascular disease, diabetes, and hypertension.
5. People that take certain medication.
6. People in poor physical condition or who have a poor diet.

OSHA lists some of hazards that are associated with working in winter storms, which also can affect people in general whether working, or not. These include:

1. Driving accidents due to slippery roadways.
2. Carbon monoxide poisoning.
3. Slips and falls due to slippery walkways.
4. Hypothermia and frostbite due to the cold weather exposure.
5. Being struck by falling objects such as icicles, tree limbs, and utility poles.
6. Electrocution due to downed power lines or downed objects in contact with power lines.
7. Falls from heights (e.g. falls from roof or skylights while removing snow).
8. Roof collapse under weight of snow (or melting snow if drains are clogged).
9. Burns from fires caused by energized line contact or equipment failure.
10. Exhaustion.
11. Dehydration.

Economy:

Snow and ice affect transportation and utilities. Utilities can be weighed down by ice and snow. Tree limbs also become weighed down and collapse on wires, homes, and businesses. If there is no power businesses are unable to open.

Keeping roads open to the residents, travelers, and the public is a great expense to communities. If roads close during or after storms it has an effect on local businesses as well as outlying businesses.

Winter storms will impact retail sales and housing activity but there is an impact on payrolls because many people become temporarily out of work by a major snow event. There are significant impacts that are not consistently measured because they are more indirect. These effects can have national and global economic implications.

Structures:

The accumulation of snow can cause roofs to collapse. The winters in Illinois have a tendency to be cold and harsh. General building and construction of homes now consider snow, ice, and extreme cold. Buildings are insulated far more and much more than in the past, which helps the Northern Midwest climate where winter storms are prevalent. Extreme temperatures have caused water towers to freeze and water main breaks to occur in the region. If a water tower freezes, a community may be forced to truck in water to provide for residents. During the

winter of 2013 – 2014, extreme cold temperatures caused a water main break in the City of LaSalle. Water was trucked in and provided to residents for up to two (2) months.

Drought and Extreme Heat

Safety:

Communities can help their residents understand the dangers of drought and extreme heat by doing the following:

1. Publish a special section with emergency information on extreme heat including dangers of sunburn, heat exhaustion, heat stroke, and other possible conditions
2. Localize the information by including the phone numbers of local emergency services offices, the American Red Cross, and hospitals.
3. During a drought, explain ways that individuals can conserve water and energy in their homes and their workplaces.
4. Be aware of special steps farmers can take to establish alternative water supplies for their crops.
5. Have programs through the local school system to encourage children to think of those persons who require special assistance such as elderly people, infants or people with disabilities during severe weather conditions.

During extreme heat, people should remain out of the sun as much as possible. Remaining indoors is best. Spending the warmest part of the days in public buildings with air conditioning is recommended. Checking on others, who don't have air conditioning, can also be a life-saving measure.

Health:

Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat. Heat kills by pushing the human body beyond its limits. Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. People living in urban areas may be at greater risk from the effects of a prolonged heat wave than those living in rural areas because more densely-populated areas are hotter.

Economy:

Water and electricity use will go up during a heat wave or drought. Water bans, such as those forbidding the watering of lawns, are a reasonable means to conserve water.

Drought and heat waves can have a major affect on the agricultural sectors. Crops suffer from lack of water and relief from extreme heat. If crops are affected there is a ripple affect throughout the economy with supplies and price fluctuations.

Structures:

There are measures that can be taken to keep houses and buildings cool. These measures include:

1. Properly installing window air conditioners.
2. Having properly insulated air conditioning ducts.
3. Installing weather strips and seals around windows and doors.
4. Installing awnings and drapes to keep sunlight out.
5. Properly installing attic and wall insulation.

Damages normally do not occur to buildings because of drought or extreme heat or humidity.

Earthquakes

Safety:

FEMA has some recommendations to ready your house for an earthquake. They are as follows:

2. Fasten shelves securely to walls and place large or heavy objects on lower shelves.
3. Hang heavy items such as pictures and mirrors away from beds, couches, and anywhere people sit.
4. Repair defective electrical wiring and leaky gas connections. These are potential fire risks. Be sure to brace overhead light fixtures.
5. Repair any deep cracks in ceilings or foundations. Get expert advice if there are signs of structural defects.

Precautions to take if you feel an earthquake begin are, as suggested by FEMA:

1. Get under something sturdy and hold on
2. Cover neck or head with something soft
3. If outside remain outside away from trees, buildings, and utilities
4. If inside, remain inside and get under something sturdy and hold on
5. Stay away from windows, walls and anything that could fall or collapse

Health:

After an earthquake, be careful of further injuring yourself or the injured. Only move someone if they are in danger of further injury. If an unconscious person must be moved, stabilize the neck and back first. Care for yourself. Make sure to get plenty of fluids, food, and rest. Washing hands when working with people and debris will help to halt disease and infection as well.

Economy & Structures:

Most of the economic impact is to infrastructure and utilities. There is also a cost to clean up and debris removal.

Local Area Assessment

The following tables are the square footages of the buildings in Bureau, LaSalle, Marshall, Putnam, and Stark Counties. The table is divided by the five (5) categories of property.

Bureau County Sq. Ft.	
SFH	17,922,171
MH	621,595
MFH	1,611,849
Economic Establishments	903,960
Non-Residential Structures	2,907,760

LaSalle County Sq. Ft.	
SFH	50,487,600
MH	2,692,890
MFH	7,001,520
Economic Establishment	2,670,800
Non-Residential Structure	9,547,600

Stark County Sq. Ft.	
SFH	3,195,468
MH	146,678
MFH	245,146
Economic Establishments	171,140
Non-Residential Structures	474,810

Putnam County Sq. Ft.	
SFH	3,489,577
MH	212,885
MFH	181,967
Economic Establishment	137,480
Non-Residential Structure	438,770

Marshall County Sq. Ft.	
SFH	7,245,682
MH	293,672
MFH	395,061
Economic Establishments	167,890
Non-Residential Structures	622,290

The table below is the average mean cost per square foot for the different housing/ building types in Bureau, LaSalle, Marshall, Putnam, and Stark Counties. The information was gathered from FEMA's HAZUS software.

Building	Mean cost/ Sq. Ft.
Single Family Housing	$88.90
Manufactured Housing	$61.47
Multi-Family Structures	$93.67
Economic Establishments	$85.07
Non-residential Structures	$105.17

The following tables are the estimated average replacement costs for the different types of buildings within Bureau, LaSalle, Putnam, and Stark Counties. The information was gathered from FEMA's HAZUS software.

Replacement Costs Bureau County						
Residential	Commercial	Industrial	Agricultural	Religion	Government	Education
$1,830,491,000	$202,365,000	$36,499,000	$25,317,000	$16,312,000	$4,266,000	$33,594,000
Replacement Costs LaSalle County						
Residential	Commercial	Industrial	Agricultural	Religion	Government	Education
$5,437,320,000	$758,656,000	$132,480,000	$91,131,000	$49,497,000	$14,953,000	$19,256,000
Replacement Costs Marshall County						
Residential	Commercial	Industrial	Agricultural	Religion	Government	Education
$721,522,000	$46,150,000	$7,786,000	$7,221,000	$6,311,000	$935,000	Not Available
Replacement Costs Putnam County						
Residential	Commercial	Industrial	Agricultural	Religion	Government	Education
$336,529,000	$19,559,000	$4,088,000	$14,046,000	$3,221,000	$620,000	$4,979,000
Replacement Costs Stark County						
Residential	Commercial	Industrial	Agricultural	Religion	Government	Education
$325,467,000	$25,140,000	$2,890,000	$13,415,000	$5,672,000	$734,000	$3,778,000

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Chapter 4: Preventive Measures

Preventive measures are designed to protect new and future construction and development from hazards and potential losses. Preventive measures include:

- Building Codes
- Manufactured Housing Regulations
- Land Use Planning, Zoning, and Subdivision Regulations
- Floodplain Management
- Stormwater Management

Building Codes

Building codes are the primary measure for protecting new properties from damage by hazards. When properly designed and constructed, the average building can withstand the impacts from the aforementioned hazards. Hazard protection standards should be incorporated into the local building codes for all new and renovated buildings.

The Building Code Effectiveness Grading Schedule (BCEGS) assesses the building codes in effect in a particular community and how the community enforces its building codes, with special emphasis on mitigation of losses from natural hazards. The idea is to lessen the losses and the costs of insurance by maintaining and enforcing an appropriate building code.

The BCEGS program assigns each municipality a BCEGS grade of 1 to 10. One (1) is the most exemplary commitment to building code enforcement. The Insurance Services Office (ISO) develops advisory rating credits that apply to ranges of BCEGS classifications (1-3, 4-7, 8-9, 10). ISO gives insurers BCEGS classifications, BCEGS advisory credits, and related underwriting information. ISO began implementing the program in states with high exposure to wind (hurricane) hazards, then moved to states with high seismic exposure, and then continued through the rest of the country.

The founders of the International Code Council (ICC) are the Building Officials and Code Administrators International, Inc. (BOCA), the International Conference of Building Officials (ICBO), and the Southern Building Code Congress International, Inc. (SBCCI). Since the early part of the 20th Century, these nonprofit organizations developed the three (3) separate sets of model codes used throughout the United States. In 1994, as needs changed, the nation's three (3) model code groups responded by creating the ICC and by developing codes without regional limitations.

The International Code Council develops codes used to construct residential and commercial buildings, including homes and schools. Most United States cities, counties, and states that adopt codes choose the International Codes developed by the International Code Council. Code enforcement officials, architects, engineers, designers, and contractors can now work with a consistent set of requirements throughout the United States. Enforcement of an adopted code will lead to higher quality construction.

Many of the participating communities have adopted some version of a building code. However, a lot of communities do not fully enforce their building codes for lack of resources or for not knowing how to enforce the building code. NCICG recommends that a regional group be formed to identify how the communities and counties can share resources and provide building inspector training. Sharing building inspectors might be more cost-effective for smaller communities that may have only a few new structures being built each year. All communities are encouraged to adopt a code, even if only to provide standards for new development. Building codes are meant to ensure structures are built to a certain standard of quality that protects the longevity of the structure and people's lives. The following tables identify the building codes for the participating communities. If left blank, information was not available for the community.

Bureau County	
Community	**Codes**
Bureau County	2006 or later International Building Code and 2008 National Electrical Code. Limited resources to enforce. The county does not have a building inspector.
Village of Buda	
Village of Bureau Junction	No Codes
Village of Cherry	No Codes
Village of Dalzell	Has a code- Year not provided
Village of DePue	Minimal codes in place- Year not provided
Village of Neponset	Minimal codes in place- Year not provided
Village of Ohio	
City of Princeton	2003 International Residential Code and 2005 National Electrical Code
Village of Sheffield	Bureau County Building Codes- Year not provided
City of Spring Valley	Has a code- Year not provided
Village of Tiskilwa	No Codes
Village of Wyanet	Bureau County Building Codes- Year not provided

LaSalle County	
Community	**Codes**
LaSalle County	International Residential Code 2003; Portions of International Building Code 2003; International Fire Code 2003; International Mechanical Code 2003; International Fuel Gas Code 2003; and National Electrical Code 2002
City of Earlville	International Building Code 2003
Village of Grand Ridge	Has a code- Year not provided
Village of Kangley	No Codes
City of LaSalle	International Building Code 2003 and National Electrical Code 2002

Village of Leland	International Building Code 2001- Only setbacks enforced
City of Marseilles	International Building Code 2003
Village of North Utica	
City of Oglesby	International Building Code 2003
City of Ottawa	International Residential Code 2012; International Building Code 2012; International Energy Conservation Code 2012; 2014 National Electrical Code; All new structures inspected
City of Peru	International Building Code 2003
Village of Ransom	No Codes
Village of Seneca	International Building Code 2003
Village of Sheridan	National Electrical Code 1999; International Mechanical Code 2000; Illinois State Plumbing Code 2004; International Building Code 2000; International Residential Code 2000
City of Streator	International Building Code 2012

Marshall County	
Community	**Codes**
Marshall County	No Codes
City of Henry	Has codes- Year not provided- New buildings not inspected due to limited resources.
City of Lacon	No Codes
Village of Sparland	No Codes
City of Toluca	Has codes- Year not provided- New buildings not inspected due to limited resources.
Village of Wenona	Buildings are inspected for wiring and plumbing only

Putnam County	
Community	**Codes**
Putnam County	International Building Code 2009- Buildings inspected
Village of Granville	Building codes included in ordinance-1965
Village of Hennepin	National Fire Protection Association 2001 Building Code
Village of Mark	Building codes included in ordinance- 2005 - Buildings inspected

Stark County	
Community	**Codes**
Stark County	No Codes
Village of Bradford	No Codes
Village of LaFayette	No Codes
City of Toulon	No Codes
City of Wyoming	No Codes

Manufactured Housing Regulations

A manufactured home is constructed according to a specific building code to ensure proper design and safety. They are constructed in accordance with the United States Department of Housing and Urban Development (HUD) Code. The United States Congress laid the foundation for the HUD Code in the National Manufactured Housing Construction and Safety Standards Act of 1974. According to the Manufactured Housing Institute, the reasons for this act are as follows:

1. The interstate shipment of homes from the plant - to the retailer - to the home site meant that the manufacture, ordinarily, did not know in advance which code would apply.

2. States were not able to effectively and uniformly regulate manufactured home construction and safety issues.

In its legislation, Congress directed the secretary of HUD to establish appropriate manufactured home construction and safety standards that "...meet the highest standards of protection, taking into account existing state and local laws relating to manufactured home safety and construction."

Local governments cannot require additional standards on construction. They can, however, regulate location of the structures and their on-site installation. Installation regulations are the number one (1) way to have mitigation against wind damage, which is a large concern for manufactured housing.

The Illinois Department of Public Health enforces the Mobile Home Park Act, the Illinois Manufactured Housing and Mobile Home Safety Act, and the Illinois Mobile Home Tiedown Act. These state codes were enacted for the protection of people and property, there are not, as of yet, any requirements for storm shelters in manufactured housing areas. The department regulates these codes unless the community is a home rule community.

It is important to protect the residences of these homes as much as it is those of non-manufactured housing. Even with tie downs, residents should seek more secure shelter during severe weather. A prearranged location should be selected, whether it is a friend's house, a relative's house, or a nearby building with a basement or tornado shelter.

Land Use Planning, Zoning, and Subdivision Regulations

Planning and zoning directs development. Zoning controls where development should or should not occur, such as in floodplains and/or floodways. Development should coincide with proper land uses. Land uses should be compatible with the natural land conditions.

Comprehensive Plans

Comprehensive plans (also called comprehensive land use plans) are used to encourage where future growth and development should occur within a community. The process of developing a comprehensive plan involves identifying the strengths, weaknesses, opportunities, and threats of the community. The public is highly encouraged to participate in the process along with key stakeholders such as elected officials, municipal staff, business owners, associations, and institutions. Natural hazards are usually not addressed within comprehensive plans. However, North Central Illinois Council of Governments (NCICG) has incorporated natural hazards into their most recent plans the organization has completed for the Village of DePue and the City of Marseilles. The plans have a significant focus on flooding, as both communities are located on the Illinois River and are greatly impacted by riverine flooding.

There were 43 jurisdictions (38 communities/ five counties) that participated in the 2014 NHMP. Only 16 of the jurisdictions have comprehensive plans that were completed in 2000 or later. An estimated 17 communities don't have plans at all. Several communities did not indicate whether they have plans. Although costly, communities should complete a plan to learn more about their community and to direct future growth. Directing growth includes deciding where future industry, commercial, residential, institutional, and recreational development should be located.

The Village of DePue, Bureau County, updated their Comprehensive Plan in 2014. The plan includes information on flooding.

The following tables show which participating communities have adopted comprehensive plans. If left blank, information was not available for the community.

Bureau County	
Community	**Comprehensive Plan Year**
Bureau County	2014
Village of Buda	
Village of Bureau Junction	
Village of Cherry	No Plan
Village of Dalzell	No Plan
Village of DePue	2014
Village of Neponset	
Village of Ohio	
City of Princeton	2015
Village of Sheffield	1971
City of Spring Valley	1970
Village of Tiskilwa	1966
Village of Wyanet	No Plan

Marshall County	
Community	**Comprehensive Plan Year**
Marshall County	No Plan
City of Henry	1989

LaSalle County	
Community	**Comprehensive Plan Year**
LaSalle County	Adopted 1999/ Updated 2014
City of Earlville	1993
Village of Grand Ridge	
Village of Kangley	No Plan
City of LaSalle	2014
Village of Leland	1989
City of Marseilles	2014
Village of North Utica	2002
City of Oglesby	2009
City of Ottawa	2014
City of Peru	
Village of Ransom	No Plan
Village of Seneca	2008
Village of Sheridan	Adopted 2000/ Updated 2006
City of Streator	2014
City of Lacon	2007
Village of Sparland	No Plan

City of Toluca	Have a plan/ Year not available
Village of Wenona	No Plan

Putnam County	
Community	**Comprehensive Plan Year**
Putnam County	2010
Village of Granville	No Plan
Village of Hennepin	2001
Village of Mark	No Plan

Stark County	
Community	**Comprehensive Plan Year**
Stark County	
Village of Bradford	No Plan
Village of LaFayette	No Plan
City of Toulon	
Cityof Wyoming	2009

Zoning Ordinances

Zoning ordinances regulate development by dividing a community into different areas, such as residential, commercial, or industrial. Each area has regulations and standards for development. Zoning ordinances and codes allow for a community to control development and growth. The ordinances will specify such regulations as lot size, easements, and frontage. They should coincide with the future land use recommended in the future land use plan. Zoning is a primary tool in the implementation of those proposed land uses.

Zoning ordinances can be used to prevent development from occurring in hazardous areas. The public's well-being is a key component of zoning ordinances. For example, the City of Princeton in Bureau County states that the purpose of their zoning ordinance is, "To promote the public health, safety and general welfare of existing and future residents of the City of Princeton…" (Section 14-1-6).

A community can control development by not extending infrastructure to areas outside of its boundaries or within certain zones. Designating areas for acquisition by the city to maintain them as open space, parks, and recreation areas will also prevent building in floodplains.

Subdivision Regulations

Subdivision regulations establish minimum standards for subdivision development. They govern the development of large vacant tracts of land that a developer plans to split into individual lots. Subdivision regulations set the standards for infrastructure, whereas zoning ordinances define where different types of development are allowed.

Subdivision regulations can include the following hazard protection standards:

1. Requiring that the final plat show all hazardous areas.
2. Setting minimum road widths and cul-de-sac radius for emergency vehicles.
3. Require power and or phone lines to be buried.
4. Establish minimum water pressure for firefighting.
5. Require road ways to be at a certain flood levels.

Floodplain Management

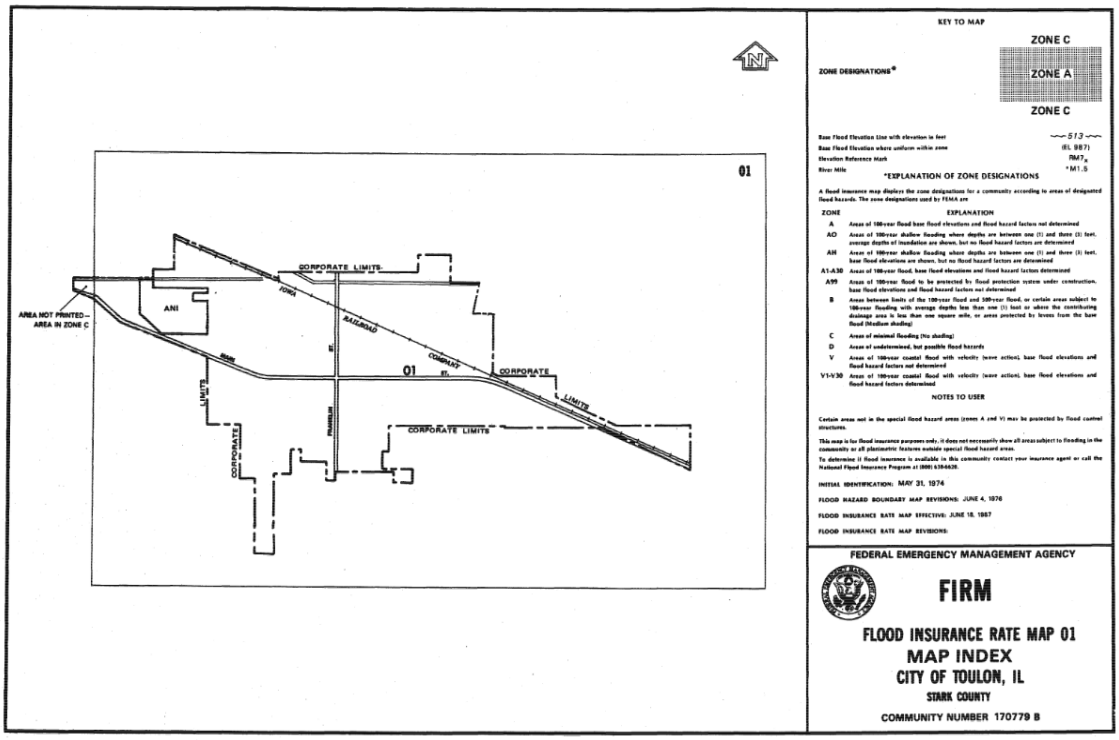
Development in floodplains poses risks to people and property. Floodplain management regulations can reduce risks by prohibiting new development in floodplains and/or requiring existing structures to be demolished, retrofitted, or relocated following a flood. Buying out structures from floodplains is the best way to reduce flooding-related risks. If new development is permitted in floodplains, requirements for compensatory storage and building structures above the base flood elevation (BFE) should be enforced. Floodplains should be returned to open space, if possible. Creating parks is another option for floodplains because there are often few or no structures in parks; the floodplain will still be able to fulfill its purpose; and the open space will provide recreational benefits to the community. Restoring floodplains to their natural functions of controlling flooding and erosion, filtering water, and supporting natural habitat will save lives and prevent destruction of property. Any community that participates in the National Flood Insurance Program (NFIP) must maintain and enforce floodplain regulations.

The Illinois Association for Floodplain and Stormwater Management (IAFSM) administers the Certified Floodplain Manager (CFM) Program. The local permit official must pass a test and receive continuing education. Communities with Certified Floodplain Managers (CFMs) have a better understanding of the activities and policies that are needed to reduce the impact of flooding. IAFSM promotes the general interest of floodplain and stormwater management and strengthens the cooperation of local, state, and federal agencies to find innovative solutions to managing the state's floodplain and stormwater management systems.

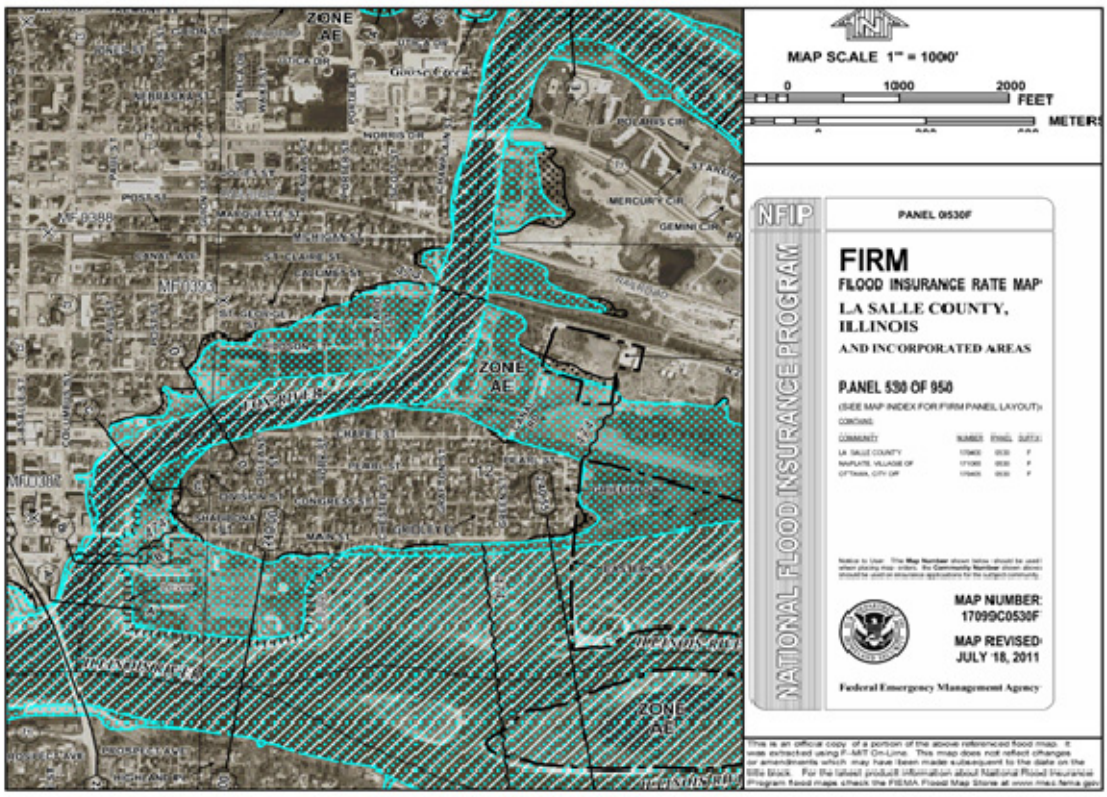
Flood Insurance Rate Maps

Floodplain maps are created by FEMA and are necessary to enforce floodplain management regulations. The map is called a Flood Insurance Rate Map (FIRM). Each community is given a FIRM and a Flood Insurance Study that explains how the map was prepared. FEMA is working to digitize all its maps at the present time. Bureau, LaSalle, Marshall, and Putnam Counties have access to digital FIRMs. However, Stark County's maps have not been digitized. Until 2008, Stark County had never been included in a federal disaster declaration. Stark County does not have a high risk of flooding, has a small population, and has only a few flood insurance policies. While the Illinois Office Water Resources has a goal of providing digital maps for every county in the state, Stark County's maps have not been digitized due to the county's low flood risk.

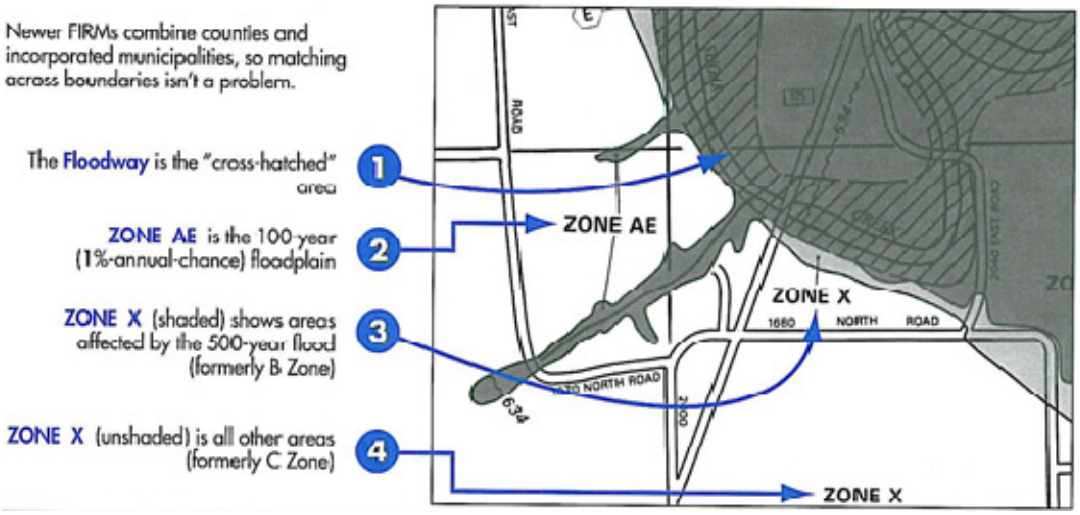
The FIRM below is of the City of Toulon. Stark County's flood maps have not been digitized because of the low risk of flooding in the county.

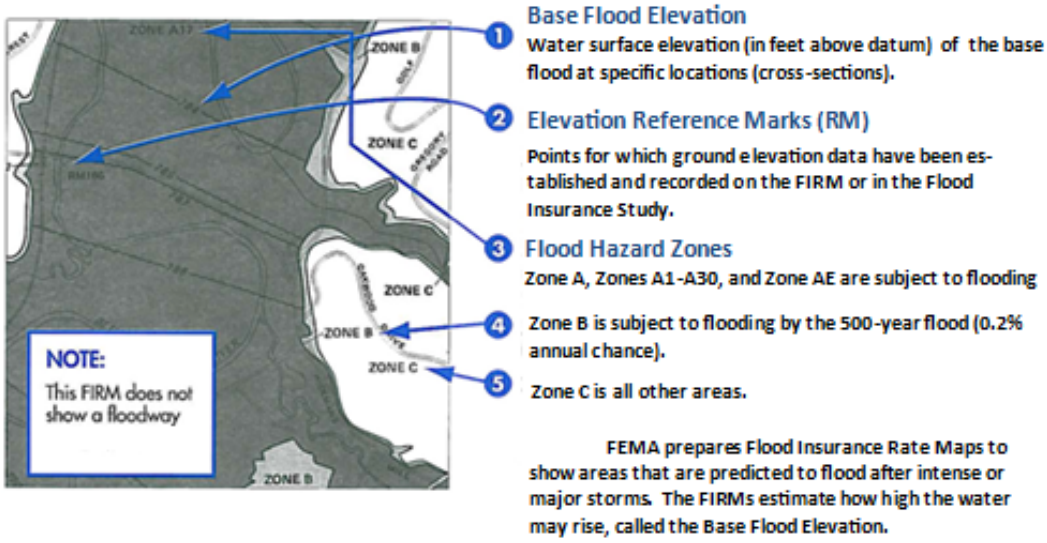


Shown below is a digital FIRM for the City of Ottawa in LaSalle County.



The following illustrations explain FIRMs.





Illinois has minimum requirements for development in the floodplain. State permits are required for floodway development. The Illinois Department of Natural Resources (IDNR) requires local governments to enforce floodplain development codes. FEMA maps the urban areas and rural areas where the stream drains 10 square miles or more. The urban fringes have moved into some of these areas with no regulation.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a federal program that allows property owners in participating communities to purchase flood insurance in exchange for their community implementing floodplain management regulations and policies. According to the Federal Emergency Management Agency (FEMA),

"The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the Federal Government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the Federal Government will make flood insurance available within the community as a financial protection against flood losses."

Floodplain management regulations are the cornerstone of participation in the NFIP. Communities that participate in the NFIP are required to adopt and enforce floodplain management regulations. These regulations are adopted and enforced to prevent future flood damages and losses.

In Illinois, most communities have adopted the State of Illinois Model Ordinance that goes above and beyond NFIP minimum standards. In addition, the State of Illinois floodway regulations are much more restrictive than NFIP minimums. The following table shows that most communities in the NHMP region participate in the NFIP. The communities that do not participate in the program do not have floodplains or structures at risk of flooding. The Village of Kangley in LaSalle County is working to become a member of the NFIP. To ensure future NFIP compliance, the participating communities will continue to enforce their floodplain management regulations and zoning ordinances. Each community will continually monitor activities in the floodplain to ensure that all activities are within the codes and regulations and will not have an adverse impact on other property owners.

National Flood Insurance Program Participants		
County	**Community**	**NFIP Participant**
Bureau	Bureau County	X
Bureau	Buda, Village of	X
Bureau	Bureau Junction, Village of	X
Bureau	Cherry, Village of	X
Bureau	Dalzell, Village of	X
Bureau	DePue, Village of	X
Bureau	Neponset, Village of	No Floodplain
Bureau	Ohio, Village of	No Floodplain
Bureau	Princeton, City of	X
Bureau	Sheffield, Village of	X
Bureau	Spring Valley, City of	X
Bureau	Tiskilwa, Village of	X
Bureau	Wyanet, Village of	X
LaSalle	LaSalle County	X
LaSalle	Earlville, City of	X
LaSalle	Grand Ridge, Village of	No Floodplain
LaSalle	Kangley, Village of	Pending

LaSalle	LaSalle, City of	X
LaSalle	Leland, Village of	No Homes at Risk
LaSalle	Marseilles, City of	X
LaSalle	North Utica, Village of	X
LaSalle	Oglesby, City of	X
LaSalle	Ottawa, City of	X
LaSalle	Peru, City of	X
LaSalle	Ransom, Village of	No Floodplain
LaSalle	Seneca, Village of	X
LaSalle	Sheridan, Village of	X
LaSalle	Streator, City of	X
Marshall	Marshall County	X
Marshall	Henry, City of	X
Marshall	Lacon, City of	X
Marshall	Sparland, Village of	X
Marshall	Toluca, City of	X
Marshall	Wenona, City of	X
Putnam	Putnam County	X
Putnam	Granville, Village of	No Floodplain
Putnam	Hennepin, Village of	X
Putnam	Mark, Village of	X
Stark	Stark County	X
Stark	Bradford, Village of	X
Stark	Lafayette, Village of	X
Stark	Toulon, City of	X
Stark	Wyoming, City of	X

It is important to understand that standard homeowner's insurance policies do not cover flooding. Homeowners must purchase a separate flood insurance policy. Local agents offer flood insurance policies, but the FEMA determines the rates based on the location's risk. Any house can be covered by NFIP policies as long as the community participates in the NFIP. Separate policies must be obtained for the structure and for the contents. Flood insurance does cover landscaping or items outside of the house. Renters may buy content insurance even if there is no structural coverage from the owner.

In Illinois more damage occurs to contents than to structures, but both flood insurance and homeowner's insurance are recommended. Flood insurance, generally, only covers damage incurred. There may be additional costs to bring a damaged building up to the current code. Each company has different amounts of coverage, deductibles, and arrangements. A separate sewer and drain policy or endorsement is required to cover basement flooding caused by water entering drainage pipes, toilets, or other points of entry. Homeowners are advised to discuss

their insurance policies with their insurance agents to ensure their assets are properly covered not only from flooding, but from other natural hazards.

Flood insurance is only one (1) type of insurance that can protect property owners from the costs associated with natural disasters. Insurance policies are beneficial post-disaster, but they do not mitigate the impacts of disasters. Property owners must implement activities that will reduce their risks.

Community Rating System

The Community Rating System (CRS) is a voluntary incentive program for National Flood Insurance Program (NFIP) participating communities. The CRS encourages community floodplain management activities that exceed the minimum NFIP requirements. Communities that participate in the CRS reward their residents with reduced rates on flood insurance premiums. The three (3) goals of the CRS are to reduce and avoid flood losses to insurable property, to strengthen and support the NFIP by generating and contributing data for accurate actuarial rating of flood insurance, and to foster a comprehensive approach to floodplain management that considers not only flood insurance, but planning, open space protection, and public information activities.

The CRS identifies 19 creditable activities organized under four (4) categories or series. Each activity is assigned evaluation measures and a corresponding score. A community is rated on the total number of points generated during a particular evaluation. Credit is given to communities when their activities advance the goals of the CRS. Eligible floodplain management activities fall under the following series:

1. ***Public Information Activities (300 Series)*** – Credit is given for informing the public about their flood hazards, their need for flood insurance, and actions the public can take to minimize flood damage.

2. ***Mapping & Regulator Activities (400 Series)*** – Credit is given for mapping areas not shown on the Flood Insurance Rate Map (FIRM). Credit is also given for activities that protect natural floodplain functions, managing stormwater, and enforcing higher regulatory standards. These activities provide increased protection to new development.

3. ***Flood Damage Reduction Activities (500 Series)*** – Credit is given for completing projects that will reduce the damage of flooding in flood-prone areas. Activities include retrofitting and relocating structures, development of a comprehensive flood management plan, and proper maintenance of drainage systems.

4. ***Warning and Response (600 Series)*** – Credit is given for activities, such as flood warning and response programs, that will protect lives and property during a flood. Credit is also given for maintenance of levees and dams and programs that prepare for their potential failure.

Most communities enter the CRS with a class 9 or 8 rating, which entitles residents who live in the standard flood hazard area (SFHA), also known as the 100-year floodplain, to a 5% or 10% discount on flood insurance premiums. The class 1 rating requires the most credit points and awards the highest premium reduction, of a 45% discount. As of March 2014, 1,296 communities in the nation participated in the CRS, but only one (1) of the communities, Roseville, California, had achieved a class 1 rating. In Illinois, 59 communities participate in the CRS with an average class level of 6.6.

CRS Classes, Credits, and Premium Discounts			
CRS Class	Credits	Premium Discount	
		In SFHA	Outside SFHA
1	4,500 +	45%	10%
2	4,000 - 4,499	40%	10%
3	3,500 - 3,999	35%	10%
4	3,000 - 3,499	30%	10%
5	2,500 - 2,999	25%	10%
6	2,000 - 2,499	20%	10%
7	1,500 - 1,999	15%	5%
8	1,000 - 1,499	10%	5%
9	500 - 999	5%	5%
10	0 - 499	0%	0%
SFHA- Standard Flood Hazard Area			
Source: www.fema.gov			

Two (2) jurisdictions in the NHMP region participate in the CRS- the City of Ottawa, which has a class 5 rating, and LaSalle County, which has a class 8 rating. CRS ratings are not permanent. Communities must continue to implement activities to receive the reduced insurance rates.

As of July 2013, the United States Government Accountability Office reported that NFIP owed the United States Treasury $24 billion. Congress passed the Biggert Waters Flood Insurance Reform Act of 2012 as a means to reduce that debt by increasing flood insurance premiums. The Homeowner Flood Insurance Affordability Act of 2014 amended and replaced Biggert Waters to slow rate increases. However, on April 1, 2015, the new rates went into effect. Under the new law, rates can be increased up to 18% annually until the actuarial rate of insuring the homeowner's property is met. Therefore, participation in the CRS is a regional goal because it is the only way for homeowners who choose to live in a floodplain to save on flood insurance premiums.

As part of the planning process, NCICG held a public meeting on April 22, 2015 to inform communities in the region about the CRS program. A representative of the Insurance Services Offices of Peru, Illinois provided an overview of the program and identified the program's requirements and benefits. There are many reasons the CRS program is important, beyond reducing insurance premiums for residents. The benefits include:

1. Enhanced public safety, reduction in damage to property and public infrastructure, avoidance of economic disruption, reduction of human suffering, and protection of the environment.
2. Participants have the opportunity to evaluate their flood program against a nationally recognized benchmark.
3. Technical assistance is available in designing and implementing some activities at no cost.
4. The program provides an incentive to maintain flood programs.
5. Implementing some CRS activities allows communities to qualify for federal assistance.

Stormwater Management

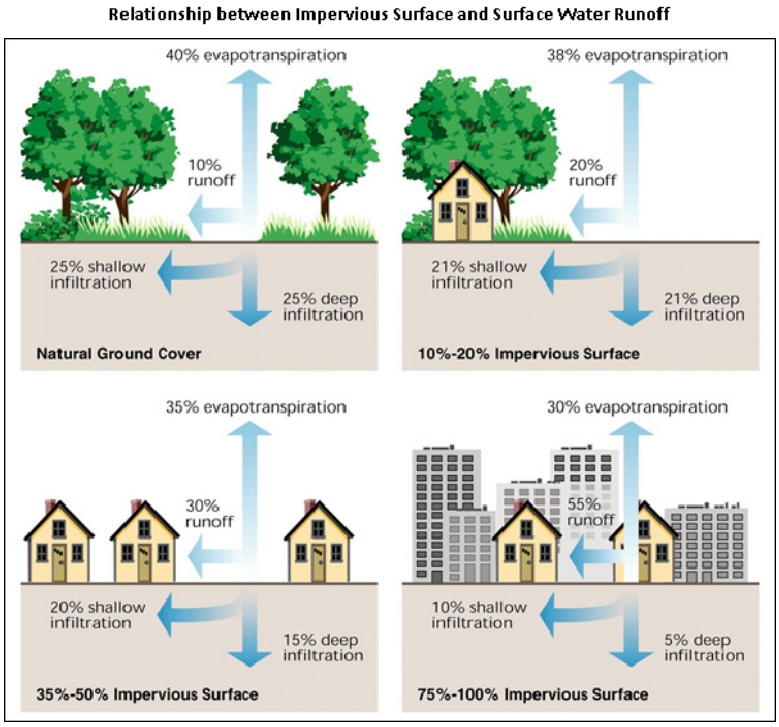
Stormwater is precipitation that accumulates during and immediately following a storm event. Stormwater management is the term given to the functions associated with planning, designing, constructing, maintaining, financing, and regulating the facilities that collect, store, control, and/or convey stormwater.

Stormwater management is important because unplanned development can contribute to flooding hazards. When urban development replaces natural ground cover stormwater runoff is increased. Streets and rooftops shed more water than natural ground cover. Drainage ditches and storm sewers make the travel of runoff quicker towards streams and rivers. This can aggravate downstream flooding, overload the drainage system, and impair the water quality.

The graphic on the following page shows that with natural ground cover there is less runoff, greater evapotranspiration, and a higher infiltration rate. Evapotranspiration is the sum of evaporation of water from soils and plants to the atmosphere. Infiltration is the natural process whereby water is absorbed by soils. When there is more impervious surface, less water is subject to evapotranspiration and infiltration and there is more runoff.

Retention and detention of stormwater is an important aspect of stormwater management. Stormwater management requirements are generally found in subdivision ordinances. The regulations make developers guarantee that the post-development runoff is not greater than the pre-development runoff.

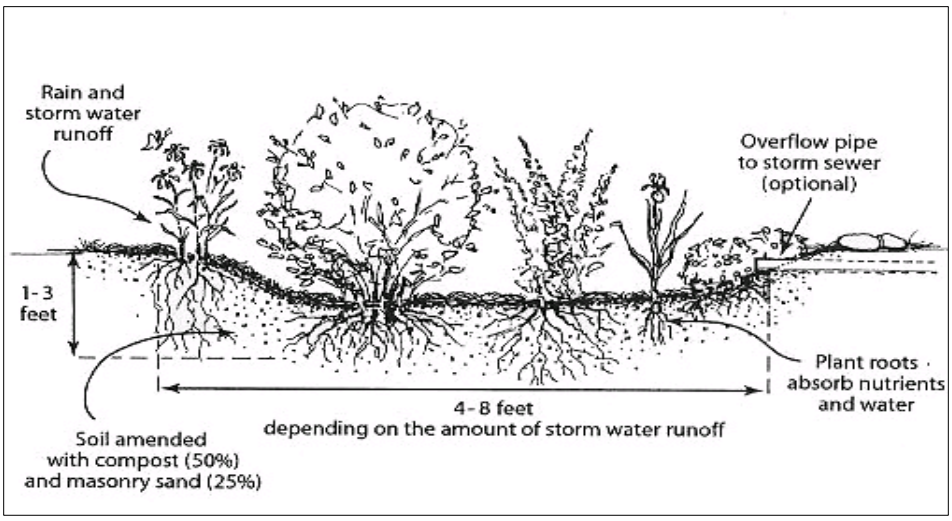
Improving the quality of the stormwater runoff that flows into rivers is also important. Non-point source pollutants are carried into the receiving streams. Non-point source pollutants include lawn fertilizers, sediment, oils from street surfaces, pesticides, and farm chemicals. Point source pollutants come from municipal and industrial wastewater surfaces. Point sources also include pipes or man-made ditches.



Source: http://www.learnc.org/lp/editions/mudcreek/6394

Stormwater management water quality measures are known as best management practices. The use of such measures as drainage ways and retention and detention basins is incorporated into new developments to reduce non-point source pollutants from entering the water system. These measures hold stormwater runoff and clean it through filtration. Examples include green roofs and rain gardens.

The following is a portrayal of a rain garden and its inner workings.



Source: Mecosta Conservative District

Sedimentation is a large source of water pollution. Farmland and construction sites are large contributors of sedimentation in stormwater runoff. Sedimentation tends to fill in channels and lakes where the water from streams slows down. Due to the build up of sediments, the drainage channels become less able to carry flood flows. Minimizing erosion and capturing sediment before it leaves the site helps maintain water quality. Sediment basins and wetlands are two (2) means of capturing sediments.

The National Pollution Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters. The Illinois Environmental Protection Agency (IEPA) is responsible for administering the state's stormwater program. The State of Illinois's stormwater requirements are the same as the Federal NPDES requirements. The program requires all construction sites disturbing more than one (1) acre, industrial sites, and all designated municipal separate storm sewer systems to obtain permit coverage.

Urban Flood Awareness Act

Most of the communities within the NHMP region have urban flooding issues. Basement and sewer backups were common occurrences. The region is not unique in having urban flooding issues. Communities and counties across the state and nation are experiencing urban flooding more frequently. Recognizing the impact of urban flooding, the State of Illinois is working to achieve a better understanding of why urban flooding is occurring and how it can be mitigated.

The Urban Flood Awareness Act was passed by the Illinois General Assembly and became effective on August 3, 2014. Under the Act, the Illinois Department of Natural Resources (IDNR) was tasked with preparing a comprehensive report that examined "the extent cost, prevalence and policies related to urban flooding in Illinois and to identify resources and technology that may lead to mitigation of the impact of urban flooding." Each of Illinois' 102 counties has been subject to urban flooding. Urban flooding, as defined by the Act, is "The inundation of property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers."

Between 20047 – 2014, there were at least $2.3 billion in documented flood damages in Illinois, of which $1.2 billion were for private claims that often represented basement flooding and sewer backups. Urbanization, climate change, and deteriorating infrastructure are contributing factors to urban flooding. The report identifies 33 recommendations that have been categorized by responsible entities (the Illinois General Assembly, Illinois Congressional Delegation, Local Government, and State Government). Topics covered under the recommendations include, but are not limited to, funding for programs, data collection efforts, public education, coordination with communities and government agencies, and infrastructure improvements, and local regulations. Working with other state agencies, IDNR is also developing a draft state model stormwater ordinance. The plan's recommendations are included in Appendix F: Urban Flood Awareness Act Report Recommendations.

Conclusions

The preventive measures discussed in this chapter are designed to protect new and future construction and development from hazards and potential losses.

Building codes are an effective measure for protecting new buildings from natural hazard damages. Incorporating hazard protection standards into local building codes is an ideal way to persuade developers and citizens into protecting themselves.

Subdivision regulations establish standards for development. They are useful in controlling safety standards and for including preventive measures and property protection measures.

Floodplain regulations are designed to protect people and property. Floodplain regulations must be enforced if the community participates in the National Flood Insurance Program (NFIP). Communities that implement policies and activities that go above and beyond the requirements of the NFIP are eligible to join the Community Rating System (CRS). The CRS rewards residents with lower insurance premiums when their communities implement such activities and policies.

All five (5) counties have citizens that live in manufactured homes. The federal government sets the standards for these homes. Local governments cannot require additional standards but can regulate where manufactured homes are located. Regulating location is a measure to protect the population from potential hazards.

Creating and updating comprehensive plans is a feasible way to direct development into areas that are not prone to natural hazards. Zoning ordinances can also be used to protect property from hazardous areas. Both planning tools can be used to designate floodplain areas for acquisition to become open space or parks.

Stormwater management is imperative because development outside the floodplain can increase flooding hazards. Reiterating the need for open space preservation, new development can increase surface water runoff and flooding.

Recommendations

- Adopt and enforce a building code to ensure that new structures are built with safety in mind.
- Develop a building inspector training program and develop a process to allow communities, particularly, smaller communities, to share building inspectors.
- Adopt a region-wide flood damage prevention ordinance that puts forth higher regulatory standards.
- Prohibit the construction of all structures including homes, businesses, and critical facilities in a floodplain.

- Regulate location and installation of manufactured housing.
- Use plans, zoning ordinances, and land-use measures to preserve existing open space and designate new open space.
- Adopt a comprehensive land use plan or update the community's existing plan.
- Encourage residents to discuss their insurance coverage with their agents to ensure they are adequately protected.

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Chapter 5: Property Protection

Property protection measures are used to protect property that is in danger from damage caused by natural hazards. Property owners are responsible for implementing protective measures at their own cost, but government assistance may be available depending on the project, timing, and community's financial state. Educating the public and supporting implementation of property protection measures are important roles of the local government. Local governments also have a responsibility to ensure that their critical facilities are protected and capable of being used following a disaster. Flooding is the primary natural hazard concern of the region. The property protection measures below are reflective of this concern.

Barriers

A barrier is a type of property protection measure designed and used to keep surface floodwaters from reaching a building. A flood protection barrier can be built of dirt, soil, concrete or steel. Dirt and soil barriers are called berms, while concrete and steel barriers are called floodwalls. Design is imperative to prevent flooding on properties that were previously flood-free. The barriers need to take into consideration still water. If water sits, leaks are a possibility. Proper drains and sumps, as well as pipes, may need to be installed.

Berms are susceptible to erosion and can settle to lower than the original height. Berms require a lot of land and need to be maintained to provide proper protection. The standard build is three (3) horizontal feet for each vertical foot (3:1 slope). A professional engineer should be consulted for the construction of a berm. Barriers should be as far from buildings as possible to reduce seepage and hydrostatic pressure. Floodwalls must also be constructed with sound engineering and design. All barriers are susceptible to cracks and weakening from moving water. Insurance is still advised because failure is always a possibility. Basement protection berms are another barrier option. Construction of low walls around stairwells or the use of backfill can protect basements and the lower floors of split-level homes.

The construction of both private and publicly-owned and maintained barriers will require consultation with the appropriate governmental agencies to ensure sound construction, to guarantee that the barrier will not result in an adverse impact on other property owners, and to ensure that there will not be an impact on the environment.

Relocation

The best way to protect a structure in a floodplain is to move it to a location outside of a floodplain. Any structure can be moved, but the heavier the structure, the heftier the cost. The easiest structures to move are small houses on crawlspaces. Buildings on slab, buildings with fireplaces, and buildings with masonry walls are very costly to move. Relocation within a large lot is a good option if the property owner has buildable land outside of the floodplain. Some structures are not worth the expense to move compared to the cost of flood insurance or repairing after a flood. However, structures located in floodplains are often required to be brought into compliance with the community's zoning ordinance, which may be costly.

Communities can acquire (by cost) properties that cannot be relocated. The Federal Emergency Management Agency (FEMA) provides financial assistance to communities through three (3) programs for property acquisition, relocation, and demolition. These programs include the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grants, and the Flood Mitigation Assistance Program. More information about these programs is available at http://www.fema.gov/hazard-mitigation-assistance.

When multiple structures are acquired or relocated, the property is often converted to a park or open space. The City of Ottawa's Fox River Park on the city's east side is the result of the community's efforts to remove structures that were located in the floodplain and flooded repetitively. The city used local, state, and federal funds to remove 84 structures from the floodplain.

Retrofitting (Modifying)

Retrofitting is the modifying of a structure to reduce or prevent damage from natural hazards. Retrofitting may be done to protect a structure from flooding, high winds, heavy snow, or other natural hazards.

Elevation

Elevation is the raising of a structure above the base flood level (100-year flood level). The area below the raised building can be either filled in or left with openings so the floodwater can flow freely underneath the structure. The type of elevation structure depends on the condition of the building, the floodplain regulations, and the owner's finances. New structures in floodplains require, by law, to be elevated. An already existing structure can be raised while a new foundation is constructed under the house. Many homeowners are concerned with the appearance that elevation will cause to their home. The new foundation can be covered by landscaping or backfill.

When flood elevations are not excessive, a crawl space can be constructed. A crawl space must not be below grade and must have permanent openings. The openings can be covered by plastic to keep insects and animals out, but must be able to open without human intervention if floodwater reaches the building. Any method of elevation must allow floodwaters to enter and exit without damaging the buildings structure.

Using fill as an elevation method is another proper means. If fill is used, it does not mean the house is out of a floodplain, basements are still not allowed. Stilts, poles, and piles are used when there are high flood levels and a house must be raised several feet to be above the base flood elevation.

Floodproofing

Floodproofing is a combination of structural and non-structural additions, changes, and adjustments to structures, which reduce or eliminate risk of flood damage to real estate or improved real property. Dry or wet floodproofing techniques may be used to protect property.

Dry floodproofing techniques are used for sealing a building to prevent floodwaters from entering as well as making them structurally resistant to flood water pressure. All areas that are below the flood protection level are to be made watertight. Buildings with basements are not appropriate for dry floodproofing. Within the floodplain, dry floodproofing on non-residential buildings is permitted, but dry floodproofing on residential buildings is only permitted as long as the building is not "substantially damaged" or "substantially improved" as defined by floodplain management ordinances and local zoning codes. Dry floodproofing is a very difficult and expensive floodproofing measure.

Wet floodproofing is the process of permanently removing or elevating everything that could be damaged by a flood. If the flood levels are not high, furnaces and laundry appliances can be raised on blocks or platforms. Water is then let inside the structure to allow pressure to be relieved from the foundation walls. Small floodproofing efforts can result in large savings when a flood occurs.

Earthquake Modifications

The relatively low occurrence of strong earthquakes in the region means less expensive earthquake measures can be taken to keep property safe. Tying down appliances, water heaters, and furnaces, as well as installing flexible utilities, can be an inexpensive way to protect a home or business. Critical facilities may have to take extra measures for protection to ensure functionality is not an issue during and after any disaster.

Tornado, High Wind, and Thunderstorm Modifications

The construction of shelters or safe rooms is recommended to provide protection from tornadoes and high winds. Interior rooms can be reinforced and modified to be safe rooms. Securing walls, roofs, and foundations is also a means for protecting against wind damage. Large openings should be secured and sealed as well. The decision to build a shelter or safe room is often a financial decision. However, saferooms and shelters have saved many lives. The likelihood of a tornado occurring should also be taken into consideration.

There are many ways to protect against the damages that could occur from thunderstorms. Having lightning rods, storm shutters, and roof materials that are more resistant to hail damage are outside modifications that can protect the building from damage. Requiring hurricane clips to be installed during new construction can help prevent damages caused by high winds and tornadoes. Hurricane clips and ties hold a structure's trusses to its walls. Burying utility lines can also be a significant modification for protection. Inside modifications include using surge suppressors to protect electronics and appliances. Generators and backup power batteries to provide needed power are also suggested.

Winter Storm Modifications

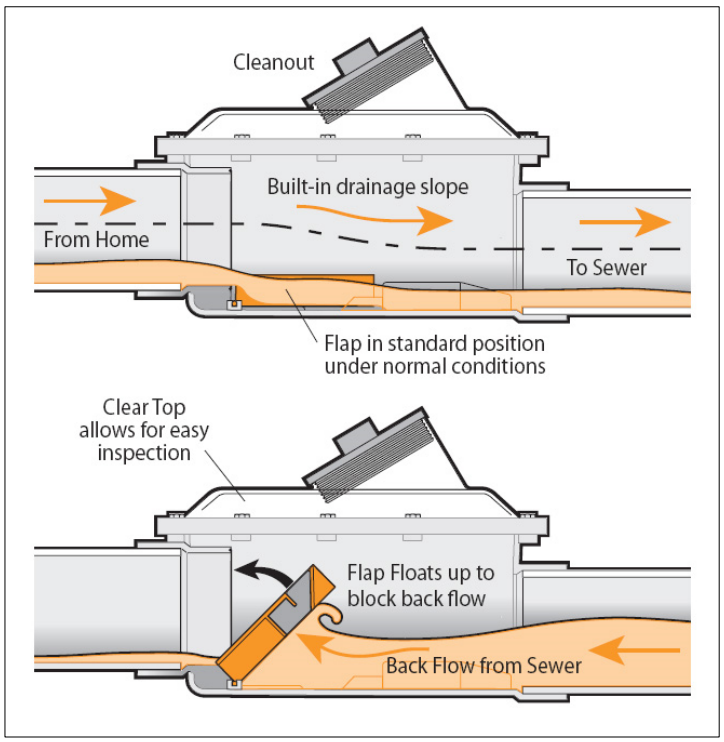
Winter storm protection measures should be highly considered where winter storms are prominent. Insulating buildings and locating water lines to interior spaces is recommended. Sealing windows with plastic or storm windows and modifying roofs to shed heavy snow loads is suggested. Higher pitched roofs prevent the buildup of snow. Snow guards can also be used on roofs to prevent roof avalanches. Warm clothes, alternative heat sources, food, water and batteries should be kept in an emergency kit.

Sewer Backup Protection

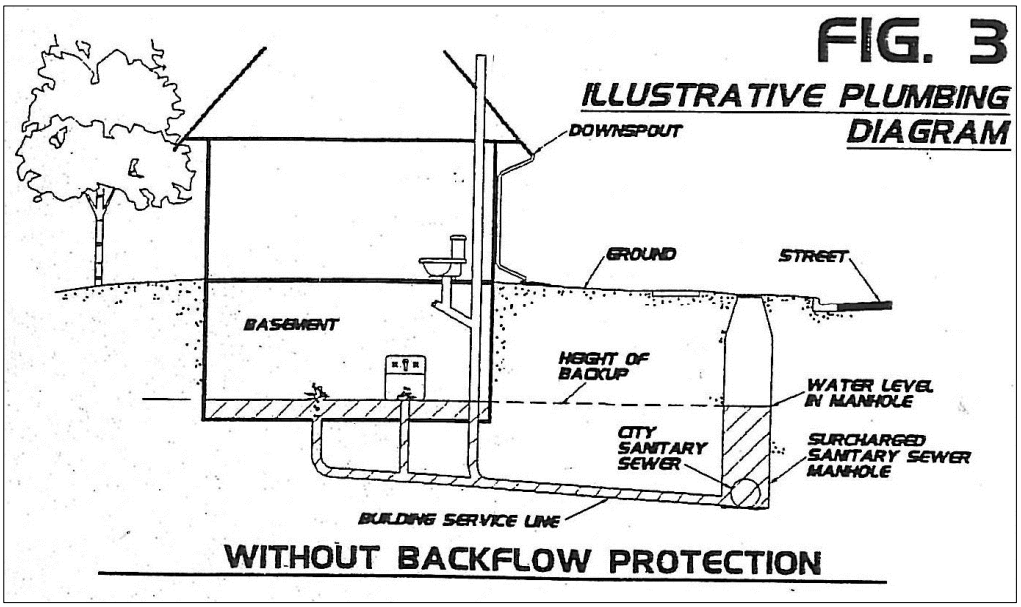
Many measures can be taken to prevent damage from basement backups. Some measures can be achieved through modifications completed by the homeowner. Some measures should be accomplished through the hiring of a professional. Flooding can cause sewage from sanitary sewer lines to back up into houses through drainpipes. The damage from this is difficult to repair as well as a major health concern top the building occupants.

Backwater valves are a good way to protect from this hazard. They are designed to temporarily block drain pipes and prevent flow into the house. Backwater valves can have simple to complex designs and should be installed by a professional plumber. The graphic below shows how a backwater valve operates.

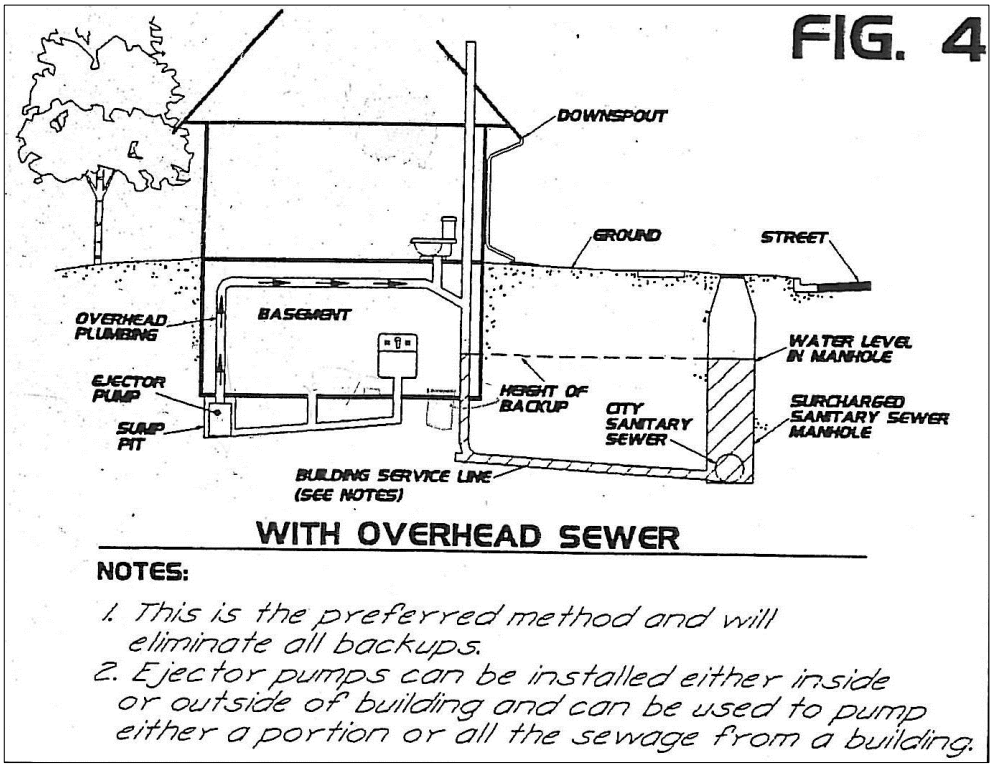
Backwater Valve Operation



Source: www.squareoneinsurance.ca/backwater-valve



Overhead sewers can also be installed to avoid sewage overflow. These are expensive and require maintenance. An ejector pump is installed under the basement floor to intercept sewage flowing from below-grade fixtures and floor drains. Instead of immediately discharging water into the sanitary sewer, the ejector pump forces the water up through overhead plumbing and then out, eliminating basement backups.



Another way to stop sewer backups is to plug the drain where it enters into the house. Floor drain plugs can be purchased for minimal cost at a hardware store. A floor drain plug with

a float will allow water to leave, but will halt water from entering. As the water rises, the float plugs the drain. Floor drain stand-pipes have the same basic effect, keeping water in the pipe, and are also inexpensive. However, pressure can eject the plugs and cause the pipes to burst.

Urban Forestry

High wind, snow, and ice can cause trees to fall on structures, utilities, vehicles, and anything else in their path, including people and animals. Urban forestry programs prevent some damage by encouraging the planting of hardier trees and ensuring their continued maintenance. Trees that do not grow fast or to great heights should be planted under and along utility areas. After storms, trees need to be checked, pruned, and maintained. A trained urban forester or arborist should inspect all damaged trees to determine if they should be saved or removed.

An urban forestry plan should be properly written and enforced. It should reduce liability, alleviate extent of fallen limbs by wind and ice, and provide guidance on pruning and caring for trees. Such a plan guides a community to become a Tree City USA. The Arbor Day Foundation administers Tree City USA, a national program that provides cities and towns across the United States with a foundation for community forestry management. There are four (4) standards a community must comply with to be a Tree City USA. They include:

1. Creating a tree board or forestry department to be legally responsible for the care of all trees on city or village-owned property.
2. Adopting a local tree ordinance that provides clear guidance for planting, maintaining, and removing trees on city or village-owned property.
3. Spending a minimum of $2 per capita annually on the planting of, care for, and removal of trees on city or village-owned property.
4. Observing Arbor Day and issuing a proclamation to celebrate community successes and recognize the community's efforts.

There are three (3) communities in the region that participate in Tree City USA. They include:

- The City of Henry in Marshall County (member for 17 years) – Population 2,464
- The City of Princeton, in Bureau County (member for 25 years) – Population 7,660
- The City of Ottawa in LaSalle County (member for 15 years) – Population 18,768

The variation in community size is an excellent example that any community can be a part of Tree City USA. Stark County does not have any Tree City USA participants at this time.

Critical Facilities

A critical facility is any building, which is necessary to the health and welfare of the population and, if impeded by disaster, would negatively impact the quality of life and services provided by a jurisdiction. Damage to critical facilities could impact the delivery of vital services, cause greater damage to other sectors of the community, and/ or put special populations at risk. Examples of critical facilities where mitigation needs should be assessed include: emergency services facilities (such as fire and police stations), schools, hospitals, retirement homes and senior care facilities, major roads and bridges, critical utility sites (telephone switching stations or electrical transformers), and hazardous material storage facilities (chemicals, petrochemicals, hazardous or toxic substances).

The table below shows that several of the participating communities have critical facilities that are at risk flooding. Most of the critical facilities are water treatment plants (WTP) and wastewater treatment plants (WWTP). Not all of the facilities are located in a special flood hazard area (SFHA) 100-year floodplain.

Critical Facilities at Risk of Flooding

County	Community	Facility
Bureau	DePue	WWTP/WTP/Village Hall
Bureau	Princeton	WWTP (Not in a 100-Year Floodplain)
Bureau	Spring Valley	WWTP (Being Rebuilt)
Bureau	Tiskilwa	WWTP
LaSalle	County	Highway Department/ Nursing Home
LaSalle	LaSalle	South WWTP/ Well Fields
LaSalle	Marseilles	WWTP (Not in a 100-Year Floodplain)
LaSalle	North Utica	WWTP/ Village Hall
LaSalle	Ottawa	WWTP/ High School/ River Rescue/ OSF Medical Center
LaSalle	Peru	Eastside WWTP/ Electrical Substation
LaSalle	Seneca	WWTP
LaSalle	Sheridan	WWTP (Not in a 100-Year Floodplain)
LaSalle	Streator	WWTP/ Public Works Barn
Marshall	Henry	Public Works Building/ Well #3 (Elevated)
Marshall	Lacon	WWTP/ Lift Station/ Wells
Marshall	Sparland	WWTP/ Lagoon/ Village Hall/ Public Works Building/ Post Office
Marshall	Toluca	WWTP/ Lift Station

Source: Community Interviews

Critical Facility: Ottawa Central Intermediate School

In both 2008 and 2013, communities along the Illinois River experienced record flooding that damaged critical infrastructure. Federal disaster declarations were declared for both weather events. They included the following declarations:

- FEMA 4116 Flood Declaration for weather between 4/16/13 – 5/5/13 (Bureau, LaSalle, Marshall, Putnam, and Stark Counties were included.)

- FEMA 1800 Severe Storms and Flooding for weather between 9/13/08 – 10/5/08 (LaSalle and Bureau Counties were included.)

Both disasters resulted in millions of dollars in damages to critical infrastructure in communities throughout the region and provided reasoning for mitigation activities. The flooding of Ottawa's Central Intermediate School in 2008 offers an example about the impact and response to the loss of a critical facility.

Ottawa's former Central Intermediate School was located in a floodplain. The September 2008 flood was the 11th time the school had flooded in 20 years. The property flooded again in April 2013 after the school had been condemned.

Ottawa's Central Intermediate School was located in a floodplain directly west of the confluence of the Illinois and Fox Rivers. The property was prone to flooding, but in 2008 water entered the crawl space and first level of the building. When waters receded, the extent of the damage was not immediately known. But, as the building was drying out, it became evident that it would cost a substantial amount of money to repair and renovate the building. The building was filled with mildew and mold. Asbestos floor tiling throughout the building would also have to be removed if the building were to be saved. Upon inspection in February 2009, the Illinois Department of Public Health condemned the building and declared it "substantially damaged." The school district eventually leased a former Walmart building to house students. After the building was condemned, the school district considered its options; renovating the building, adding to existing facilities in the district, staying at the interim facility (Wal-Mart), or building a new school. Renovation would have cost $25

million and all repairs to the building would have had to comply with the city's floodplain ordinances. The district also considered building a $7 – 10 million levee, but state and federal permitting wasn't a guarantee. There would also be the cost of remediating contaminated soil on the property, which decades ago was an industrial site. Adding to the existing facilities in the district, would require the purchase of land, likely through eminent domain, because of the lack of property. The cost was estimated at $24 million, not including land purchases and the possibility of lengthy court proceedings. Staying at the former Walmart building was also considered, but the district did not own the building; it was not in the district's jurisdiction and; it would require major renovations and additions. The final option was to build a new school on land near Shepherd Middle School on the south side of the city well out of the floodplain. The district decided to pursue the final option.

In February 2010, voters approved a referendum to sell $18.5 million in building bonds to construct a new school. The Federal Emergency Management Agency (FEMA) committed $6.9 million to the project. The bonds were sold to make up the difference of funding that was not guaranteed at the time. The district later received a total of $5.4 million from FEMA, the Illinois Emergency Management Agency, and their insurance company. The new school was constructed and opened in January 2012.

After five (5) years of negotiations, the school district and the City of Ottawa came to a resolution on the future of the former school site. The city paid $1.00 for the building and $375,000 for the 16 acres that surrounded it. The city received a $2 million federal grant for demolition of the building in addition to $914,000 for buyouts of homes in the "Flats" along the Fox River. In April 2013, the region had another 100-year flood that broke records. The abandoned school was once again flooded confirming that the community made the correct decision about leaving the building. The former school was demolished in September 2013. In 2014, the City of Ottawa adopted a comprehensive land use plan that presented ideas for the property to be turned into a water front park that could include a marina, amphitheater, and recreational complex on the west edge of the property.

Other examples of critical facilities that have been severely impacted by natural disasters include the flooding of the City of Spring Valley's waste water treatment plant and damage sustained to the Marseilles Lock and Dam, both occurring during the 2013 flood. The City of Spring Valley's waste water treatment plant was completely inundated. The city received more than $9 million to rebuild the plant from the State of Illinois. The plant is currently being constructed and should be operational in the spring of 2017. Total construction of the plant is expected to cost $11 million.

Critical Facility: Marseilles Lock and Dam

On April 18, 2013, several barges broke loose from their towing vessel and struck the Marseilles Dam. A National Transportation Safety Board brief found that the accident likely worsened flooding.

Less than five (5) years after a record-breaking flood of 2008, the City of Marseilles was once again subject to severe flooding. Marseilles recorded 6.55 inches of rain at their waste water treatment plant from April 8 – 18, 2013. On the evening of April 18, a towing vessel pushing 14 barges was approaching the Marseilles Lock from the east. The vessel was attempting to enter the Marseilles Canal (not to be confused with the abandoned Illinois and Michigan Canal). Despite the assistance of three (3) other towing vessels, the barge was unable to pass through the canal because of strong cross currents. Several barges broke loose, of which seven (7) hit the dam and four (4) sank. Five (5) of the eight (8) gates on the dam were damaged and water flow was impeded. The levee on the north bank of the Illinois River behind the elementary school was breached. As a result, 1,500 residents were evacuated and 200 homes, along with the elementary school, were flooded. A lift station being constructed to alleviate flooding issues from 2008 was also flooded.

According to a National Transportation Safety Board brief, the probable cause of the incident was the decision by all parties involved to go forward with moving the barges during high water at significant risk. Effective communication between the dam lockmaster and the captain of the Dale A. Heller tugboat about the actual positioning of the dam's gates before and during transit contributed to the accident. Flooding in the city of Marseilles was likely exacerbated by the mishap, the report finds. Damage to the dam and barges totaled $54 million.

From the examples above, it is clear that protecting the region's critical infrastructure must be a top priority. Replacing, repairing, and relocating critical infrastructure costs millions of dollars. The region must adopt higher regulatory standards and work with all levels of government to identify activities that will reduce the impact of natural disasters.

Conclusions

Property protection measures are recommended to lessen the impact of natural hazards. Local governments should consider modifying and insuring any and all critical facilities.

Protecting critical facilities is necessary to maintain order and ensure help is available during and after a disaster.

Barriers, relocation, retrofitting (elevation, floodproofing, earthquake modifications, tornado shelters, winter storm modifications, thunderstorm modifications), sewer backup protection, and urban forestry programs are all recommended property protection measures. These measures should be researched and their cost-effectiveness evaluated on a community level basis.

Protection of critical facilities must be a top priority for the region. There are multiple critical facilities at risk that if damaged, would cost millions of dollars to repair or reconstruct.

Recommendations

- Inform owners of properties in floodplains of the requirements for renovating, repairing, or rebuilding.
- Consult with a licensed engineer and appropriate state agencies when implementing mitigation activities in a floodplain.
- Encourage the installation of backwater valves and overhead sewers to eliminate basement backups.
- Become a Tree City USA.
- Evaluate critical facilities and identify which property protection measures are most feasible.

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Chapter 6: Flood Control

To begin this chapter, it is important to reiterate the devastation caused by floods. Floods are the most common and widespread natural disaster in the nation. Although flooding causes devastation, it is a natural process. Floods have shaped the landscape, provided habitat for flora and fauna, and contributed to the rich soils prevalent in the NHMP region.

Source: The Village of DePue (April 2013)

Flood control projects are designed to keep floodwaters away from specific areas. They are also known as structural projects. Flood control projects are usually designed by engineers and managed or maintained by public works staff. Knowing why floods occur in a specific area and the actions a community has taken to prevent damage is important when implementing new flood control projects. Controlling floodwaters is a difficult task. The sections in this chapter identify measures that can be implemented for flood control.

Conveyance System Maintenance

A conveyance system includes all of the facilities necessary to collect and transfer stormwater to a receiving body of water. Conveyance systems consist of both natural and manmade facilities. The United States Environmental Protection Agency (EPA) defines a conveyance system as part of a municipal separate storm sewer under the Code of Federal Regulations (CRF) 122.6 (8). The code provides the following definition:

> (8). *Municipal separate storm sewer* means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters,

ditches, man-made channels, or storm drains):(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;(ii) Designed or used for collecting or conveying storm water;(iii) Which is not a combined sewer; and(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Conveyance system maintenance is an ongoing process that is necessary to reduce flooding. Debris and pollutants need to be removed from catch basins, storm water inlets, and other structures within the system. Local governments are responsible for maintaining public conveyance systems. Private landowners are responsible for maintaining drainage systems on their property. Preventive maintenance is more cost effective than allowing the system to fail.

Best management practices suggest the following maintenance actions:

1. Regularly inspecting all conveyance system facilities and addressing any deficiencies or issues.
2. Regularly inspecting conveyance systems for illegal dumping and discharging.
3. Documenting system issues and citizen complaints.

Dredging and Erosion Control

Sedimentation is the process of sand and silt washing downstream and settling. It is a natural process, but can be exacerbated by agricultural and industrial practices as well as new development. Sedimentation raises the channel bottom and forms sandbars and islands. This results in the flow of the water being slowed and the displacement of water, which causes flooding. Sedimentation also impacts water quality because of pollutants and contaminates that are carried with the sand and silt. Wildlife and aquatic species are threatened by sedimentation. Furthermore, sedimentation can impact commerce. Many agricultural and mining companies rely on navigable waterways for the efficient movement of goods.

Sedimentation can be addressed by dredging and controlling erosion. According to the National Ocean Service, "Dredging is the removal of sediments and debris from the bottom of lakes, rivers, harbors, and other water bodies." Dredging reduces flooding, improves wildlife and aquatic habitat, and is essential for river commerce. However, dredging is expensive. A feasibility study is necessary to determine if dredging is the most cost-effective measure. Engineering specifications will also be required by a licensed engineer. Dredging in Illinois is subject to permitting by the Illinois Department of Natural Resources Office of Water Resources, the Illinois Environmental Protection Agency, and the United States Corps of Engineers.

Dredging is only a band-aid approach. If the cause of sedimentation is not resolved, it will reoccur. Controlling erosion will reduce sedimentation. Erosion projects use both natural

elements such as trees and mulches, as well as manmade materials such as riprap and sediment trap. Site-specific best management practices for erosion control have the following positive effects:

1. Improved water quality by reducing sediment, nutrients, and other pollutants from entering the waterways.
2. Reducing the need for dredging in the future.
3. Possible habitat restoration.
4. Possible flood reduction.
5. Increased biodiversity.

Several communities in the NHMP region identified the need for dredging of the Illinois River. According to the United States Army Corps of Engineers,

> "Annual maintenance dredging of the Illinois Waterway 9-foot Channel Project is generally required at 5 to 15 sites, and the volume of material dredged is approximately 250,000 cubic yards per year. Due to the large sediment load carried by the waterway and continually changing flows, specific dredging locations and quantities to be dredged vary from year-to-year."

The River is dredged, but only to maintain a nine (9) foot navigation channel. Dredging of the entire Illinois Waterway (271 miles) would cost millions of dollars.

Dams and Reservoirs

Reservoirs temporarily store floodwaters behind dams or in detention basins. Reservoirs are usually called artificial lakes. A dam is an artificial barrier that has the ability to impound water for the purpose of storage or water control. This barrier can be used as a means of reducing flooding. Dams have been designed and built in the United States for decades. Dams are expensive to build and maintain. The devastation that would occur if a dam were to fail is great for both people and the environment. Reservoirs reduce the amount of runoff before it flows downstream. When floodwaters have subsided the reservoir can be emptied by releasing the water or pumping it out. Reservoirs are more efficient in valleys where high volumes can be stored where room is available, or on smaller rivers where there is less water to store.

Levees and Floodwalls

Levees (made of earth) and floodwalls (made of concrete) are, generally, embankments whose primary purpose is to provide flood protection from seasonal high water. Some levees were designed to protect critical facilities, while others were built as part of lock and dam systems to control water levels on navigable waterways. The Federal Emergency Management Agency (FEMA) defines a levee as "A manmade 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 provide a level of protection from temporary flooding."

Urban levees provide protection from flooding in communities, while agricultural levees provide protection from flooding in lands used for agricultural purposes. No levee system provides full protection from flooding. Levees and floodwalls tend to give a false sense of security.

There are five (5) main types of levees:

1. Mainline and tributary – parallel the main channel and its tributaries.
2. Ring – encircle an area in all directions.
3. Setback – backup to an existing levee that has become endangered.
4. Sublevees – constructed for the purpose of under seepage control.
5. Spur – Project from the main levee and direct erosive river currents riverward.

Levee Certification and Accreditation

The Federal Emergency Management Agency (FEMA) is responsible for determining the flood risk associated with levees. To that end, FEMA accredits levees that have been certified. For a levee to be certified, the levee owner must work with a registered professional engineer who will certify that the levee meets federal requirements set forth by 44 CFR, Section 65.10, that the data is accurate to his or her knowledge, and that the analysis was completed correctly with sound engineering practices in mind. A certified levee meets the criteria to protect an area against a 1% annual flood (100-year flood). However, a levee certification does not warrant or guarantee a levee's performance. FEMA will accredit a certified levee if the levee provides adequate protection and there is a sound operation and maintenance plan. Areas behind certified levees are shown on a Flood Insurance Rate Map (FIRM) as having a moderate risk of flooding. Therefore, mandatory flood insurance is not required. Areas behind non-certified areas are shown to have a high risk and are required to have flood insurance.

Open Space Preservation

Preventing new development in floodplains and other hazard prone areas is the best way to minimize future damage to life and property. Protecting open spaces, natural areas, wetlands, forests, and greenways provides numerous ecological, economical, and societal benefits. America has vast open space and natural areas, but every day 6,000 acres of open space are lost. Annually, two (2) million acres of open space is lost to new development, according to LandScope America. LandScope America is an online conservation tool developed by NatureServe and the National Geographic Society used to educate conservationists and the public on how they can protect these lands.

Open space preservation is a mitigation activity that can lessen the impact of flooding. As more land is converted to residential, commercial, and industrial development, water is diverted to other areas and the natural process of infiltration does not occur. Water rushes off of impervious surfaces and causes surface water flooding. Open spaces are not confined to floodplains. Parks, golf courses, and greenways also provide the same benefits of open spaces. In more urban areas, green infrastructure projects can provide similar benefits to open spaces.

Green infrastructure should be incorporated into the design of new development. Plans and ordinances can be created and devised to protect lands for open space through many means such as acquisitions, easements, zones, setbacks, and frontage. When open spaces are protected and green infrastructure projects are implemented, communities benefit by reducing costs associated with flood damage, providing recreational areas for residents, and safeguarding wildlife.

The Illinois Open Land Trust Act (1999) recognizes the benefit of conservation efforts that protect Illinois' open spaces. The law recognizes that these lands provide a source of recreation for Illinoisans, promote public health, and are critical for wildlife habitat. To that end, the law enables the Illinois Department of Natural Resources (IDNR) to provide financial assistance to local governments that have significant conservation and recreation attributes. The Illinois Open Land Trust Program is administered by the IDNR and exists for the acquisition of lands for natural areas to "enhance Illinois' natural environment, create a system of open spaces and natural areas, and improve the quality of life and provide recreational opportunities for citizens of this State now and in the future" (P.A. 91-220, eff. 7-21-99).

Wetlands are considered open space and should be protected. According to the Illinois Department of Natural Resources (IDNR), wetlands associated with riverine systems have many important functions, which include:

1. Acting as a floodway, transporting pulses from upstream to downstream.
2. Draining back into a stream when water levels are below normal maintaining the flow.
3. Reducing flood velocity (vegetation slows water).
4. Reducing sedimentation.
5. Having microorganisms entrap and break down chemicals while using excess nutrients to enhance growth.

The table below shows that wetlands lower the flow rates.

Percent change in flow rates of streams for every one (1) percent of watershed present as wetland.

REGION	PEAKFLOW	FLOODFLOW	LOWFLOW
Statewide	3.7% decrease	1.4% decrease	7.9% increase
Northern	7.9% decrease	2.3% decrease	15.0% increase
Central	5.9% decrease	4.5% decrease	5.5% increase
Southern	0.8% decrease	No Change	15.9% increase

Source: Demissie and Kahn 1993

Ice Jam Mitigation

Ice jams form when a body of flowing water freezes and unfreezes creating large chunks of ice that impede water flow. Ice jams damage public infrastructure and cause flooding. Once an ice jam has formed, there are a few options to mitigate its impact. Ice weakening, drilling holes, dusting, blasting, excavation may be possible, but cost prohibitive and dangerous. The best way to prevent damages caused by ice jams is to enforce the community's building codes, zoning ordinances, and floodplain management regulations. Removing structures in floodplains and preventing future construction will reduce the ice jam's impact.

Conclusions

Floods are the most common and widespread natural disasters. Flood control measures include conveyance system maintenance, dredging, dams, reservoirs, floodwalls, and levees.

Many communities in the region expressed the need for dredging of the Illinois River to reduce flooding. Dredging is the removal of sediment that has settled on the riverbed. The United States Army Corps of Engineers conducts regular dredging on the River, but only to ensure a nine (9) foot clearance for ships. Dredging is costly and requires several permits. Additionally, dredging will not prevent future sedimentation. Erosion control measures must be taken to address to root of the problem.

Open space preservation is a mitigation activity that can lessen the impact of flooding. As more ground cover is turned into impervious surface, less water is naturally absorbed through infiltration and evapotranspiration. As a result, there is more surface water runoff. Protecting open spaces is a means of flood mitigation, but it also offers recreational opportunities and wildlife habitat benefits.

Recommendations

- Work with the United States Army Corps of Engineers on ongoing projects within the jurisdictions.
- Maintain drainage systems to ensure proper function.
- Identify problem areas where ice jams may form and know available options.
- Monitor existing dams, levees, and floodwalls.
- Use best management practices for erosion control.
- Use zoning to maintain or increase the amount of open space in the region.

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Chapter 7: Emergency Management

Emergency management is defined as "a process to reduce loss of life and property and to protect assets from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery," according to the Federal Emergency Management Agency.

Emergency management measures should protect people during and after disasters. Emergency management programs should involve departments at the municipal and county levels. The Illinois Emergency Management Agency (IEMA) coordinates programs at the state level. Every county that participated in this plan has an emergency management agency. Each agency provides coordination with multiple agencies during and after emergency and disaster situations. They help communities become better prepared for handling future disasters through planning, training, drills, and exercises. Protecting lives and property is at the forefront of each agency's mission. The excerpt below provides an overview of the LaSalle County Emergency Management Agency.

> "The LaSalle County Emergency Management Agency works with public safety response partner agencies, community organizations, government and non-government/not-for-profits to save lives, protect property, preserve functioning civic government, and to maintain and support economics for survival and recovery from disasters. Our goal is to keep our followers informed, offer training, provide volunteer opportunities, link you to preparedness resources for your personal use, and post relevant meeting calendars/information."

The following sections in this chapter explain the process of mitigation, preparedness, response, and recovery.

Mitigation

Mitigation is action taken to reduce the impact of something. When referring to emergency management, mitigation efforts are taken to minimize the loss of life and property when disasters occur. This is achieved through risk analysis, which results in information that provides a foundation for mitigation activities. This plan is the result of risk analysis that was completed through research, one-on-one interviews, and community surveys. The information that was gathered shaped the mitigation strategies.

Recognizing the risk of natural hazards and the conditions that cause these hazards is imperative to being able to warn the local population of an impending threat. The hazards are discussed in Chapter 2 of this NHMP. A threat recognition system can enable officials to warn the public in a timely manner.

Thunderstorms and Tornadoes

The National Weather Service (NWS) detects and predicts thunderstorms and tornadoes.

Floods

Recognizing the threat of floods is done by measuring rainfall, soil moisture, and stream flows upstream of the community. A flood recognition system predicts the time and height of the flood crest.

On large rivers, measuring and calculating the threat of floods is done by the NWS. NOAA Weather Radio delivers natural hazard threat predictions for rivers. On smaller streams, local communities need river and rainfall gages to establish their own flood recognition system. Flash flood alerts are issued by the NWS.

Drought and Extreme Heat

The NWS is the main agency that predicts and warns for drought and extreme heat events. High temperatures and lack of precipitation can often be predicted days in advance to give people enough forewarning to prepare. The website www.drought.gov can be accessed to monitor current drought conditions, forecasts, and to learn how drought is affecting the community.

Winter Storms and Extreme Cold

The NWS is the main agency that predicts and warns for winter storms. Winter storm predictions can be forecasted in advance and warnings can, generally, be delivered in a timely fashion giving people time to prepare.

Ice Jams

The NWS issues advisories, but cannot predict the thickness of an ice jam or its potential flooding impact.

Earthquakes

There is no warning system for earthquakes. The United States Geological Survey (USGS) documents and records the location and strength of earthquakes, but cannot predict future earthquakes. Some areas of the world are more prone to earthquakes.

Landslides

The USGS Landslide Hazards Program monitors selected landslides and hillsides at various locations across the United States to have a better understanding of the physical processes and conditions that trigger their occurrence. Geologists, scientists, and other experts are working to develop methods to predict landslides.

Wildfires

The NWS issues Fire Weather Watches and Red Flag Warnings when weather conditions have a high probability to support or cause wildfires.

Preparedness (Warning)

After the threat is determined, the public is warned. If a warning is given within sufficient time, measures to prepare can be taken. Being prepared can help reduce fear, anxiety, as well as the loss of life and property, that accompany disasters. People should be aware of

what to do before, during, and after disasters. An individual should be prepared to care for themselves for at least three (3) days.

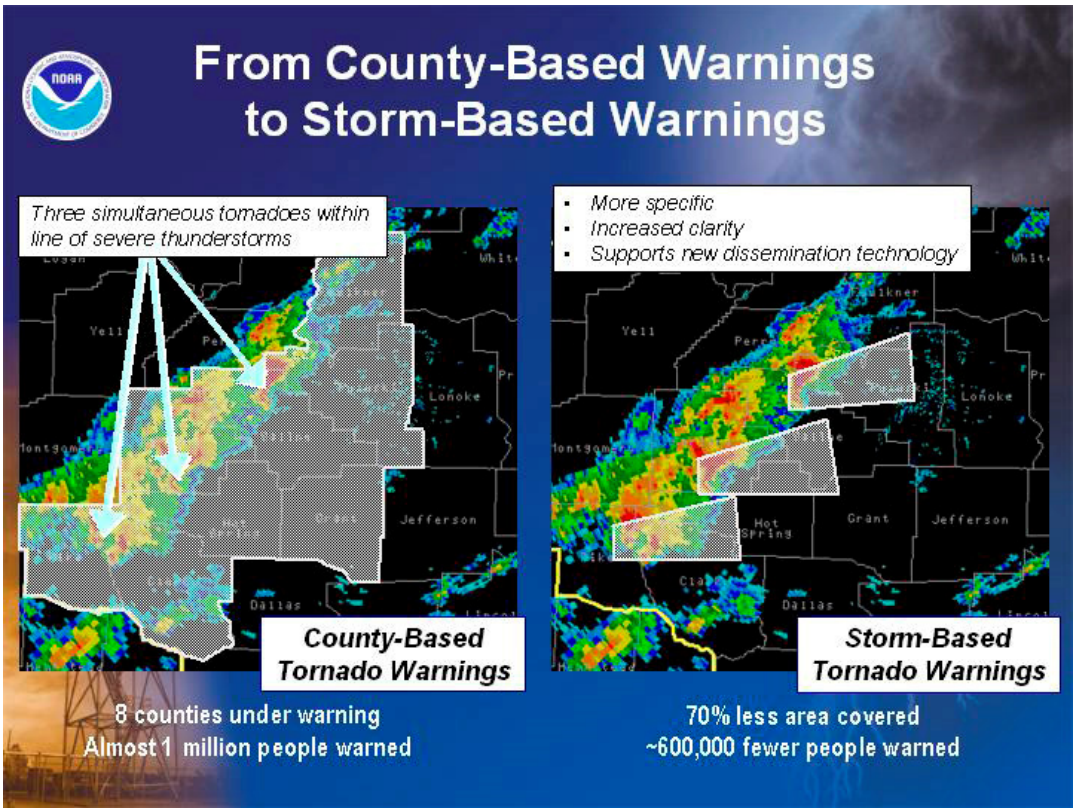
The NWS issues notices to the public using two (2) levels of notification.

***Watch**: A natural hazard is possible. The conditions for a winter storm, a flood, a thunderstorm, and/or a tornado are ideal. Tune into weather radio for information.*

***Warning**: A natural hazard has started or been observed. A natural hazard is occurring. If advised to take shelter or find higher ground, do so.*

Storm-Based Warnings

Prior to 2007, the National Weather Service (NWS) issued tornado warnings based on geopolitical boundaries, usually counties. The NWS determined that a more precise method was needed to identify where a tornado was located and heading. The NWS now issues storm-based warnings that are defined by polygons that indicate the specific threat area of a tornado. This reduces the overall area that is warned of a tornado.[1] For example, under the prior method when a tornado warning was issued all areas within a county were included in the warning. Under the new method, specific locations that are threatened are identified. The storm-based warning method is now used for all tornado, severe thunderstorm, flood, and marine hazard warnings. The graphic below shows the difference between the old and new methods used for issuing warnings.



Source: www.noaanews.noaa.gov/stories2007/images/storm-based-warnings.jpg

The storm-based warning method allows warnings for specific areas to be issued to the public through radio, television, navigation systems, electronic highway signs, and traditional and mobile phones.

IPAWS and CodeRed

Warnings and watches are issued to the public through the Federal Emergency Management Agency's Integrated Public Alert and Warning System (IPAWS). IPAWS uses a single interface to disburse alerts and warnings via the Emergency Alert System (EAS), NOAA Weather Radio (NWR), Wireless Emergency Alerts (WEA), and other public alerting systems. The LaSalle County Emergency Management Agency is authorized to use IPAWS. Residents do not have to sign up to receive IPAWS messages, but their phone must be equipped with IPAWS technology. Newer phones are being made with IPAWS technology. IPAWS delivers messages based on the mobile phone user's location.

Private companies have also developed emergency notification systems to alert the public of dangerous weather. Several local governments in the region subscribe to CodeRed, a notification system developed by Emergency Communications Network, a Florida-based company. Residents are required to sign up for alerts after their local government has subscribed to the service to receive alerts. CodeRed only sends text messages that are specific to the user's home location. Residents may also sign up to receive phone calls and email alerts. CodeRed offers different levels of notification services to communities. The technology can be used to send the public both emergency and non-emergency notifications, such as a road closing or a garbage pickup delay.

Emergency Alert System and NOAA Weather Radio

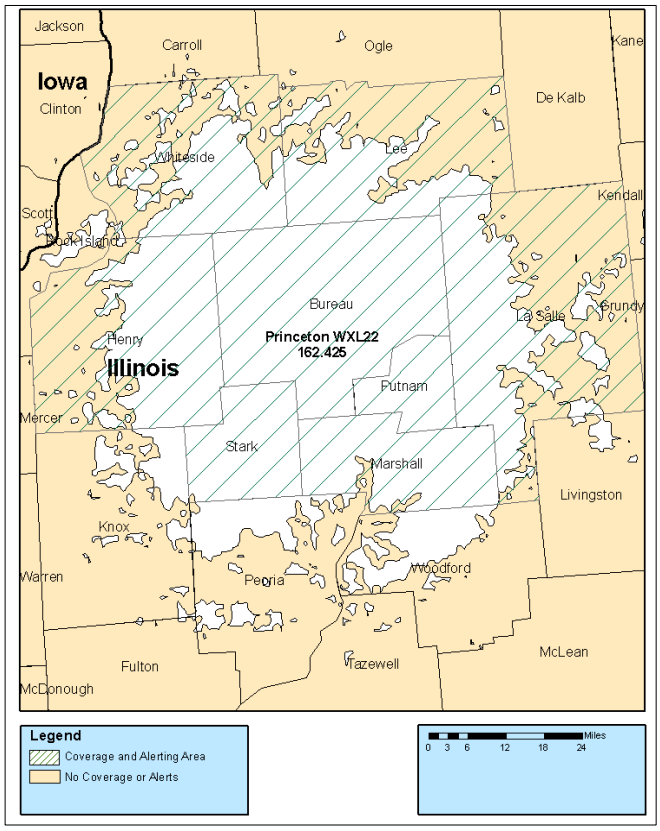
The purpose of the Emergency Alert System (EAS) is to provide the President of the United States direct access to the American people during a national emergency. Accordingly, the Federal Communications Commission (FCC) states,

> "The Emergency Alert System is a national public warning system that requires broadcasters, cable television systems, wireless cable systems, satellite digital audio radio service (SDARS) providers, and direct broadcast satellite (DBS) providers to provide the communications capability to the President to address the American public during a national emergency."

The FCC, National Weather Service, and the Federal Emergency Management Agency implement the EAS on the federal level. The EAS is also used at the state and local level to alert the public of dangerous weather and other emergency situations.

NOAA Weather Radio (NWR) is one (1) means that the public can receive alert messages. NWR is a nationwide network or radio stations that continuously broadcasts weather information from the nearest National Weather Service office. In conjunction with federal, state, and local emergency managers, as well as public officials, NWR broadcasts post-event

information for all hazards including environmental (chemical spills) and public safety (telephone outages). NWR broadcasts forecasts, watches, warnings, and other hazard information around the clock every day of the week. NWR is provided as a public service, which includes over 940 transmitters. NWR requires a special radio receiver. Residents should be informed about the value of purchasing a NOAA weather radio. A battery operated NOAA weather radio could save their lives during a disaster. NOAA weather radios are available for purchase online and at retail stores, including many pharmacies.



The graphic to the left shows the coverage area from the NWR service out of Princeton, Illinois Bureau County. The frequency is 162.425. Regional broadcasts can also be found on the following frequencies: 162.400, 162.425, 162.450, 162.475, and 162.525.

Source: www.nwr.noaa.gov

Outdoor Warning Sirens

In 1950, President Harry S. Truman created the Civil Defense Administration by executive order and Congress passed the Civil Defense Act. The act supported states and communities with purchasing civil defense equipment, such as sirens, to alert the public of a nuclear attack. The use of the sirens to alert the public of tornadoes came about following the end of the Cold War Era. Today, many communities still rely on these sirens to alert the public of tornadoes.[1]

Most communities in the NHMP region have outdoor warning sirens; however, they have various policies on when they are tested and activated during a storm event. For example, some

[1] Coleman, T., Elliot, J.B., Knupp, K., Peters, B., & Spann, J. (2011). The History (and Future) of Tornado Warning Dissemination in the United States. *American Meteorological Society*, 567 – 582. doi: 10.1175/2010BAMS3062.1

communities only set off early warning sirens when a tornado or funnel cloud has been spotted by a trained weather spotter and/or the National Weather Service (NWS) has issued a tornado warning while some communities also set off the sirens when the NWS has issued a severe thunderstorm warning that has damaging winds, heavy, rain, or hail. The various policies have led to public confusion about the seriousness of the storm event. The issue of when sirens should be activated is an ongoing debate amongst public officials and emergency personnel across the country. The public's safety is of utmost importance, but the more often sirens are activated, the more likely the public will grow confused about their use.

Several communities have various policies on when their sirens are tested. Communities in the region, generally, test their sirens on the first Tuesday of the month, but the time may vary. One (1) community sets its sirens off every Sunday at 6:00 p.m. In several communities the siren(s) are activated on a daily basis at noon, 5:00 or 6:00. In days past, sirens served as the shift, lunch, or dinner bell, but now the daily sounding of sirens is more of a tradition. Illinois law dictates when testing of outdoor warning sirens is to occur. Section 12 of the Illinois Emergency Management Agency Act states:

> "The testing of disaster warning devices including outdoor warning sirens shall be held only on the first Tuesday of each month at 10 o'clock in the morning or during exercises that are specifically and expressly approved in advance by the Illinois Emergency Management Agency (Source: P.A. 92-73, eff. 1-1-02.)."

NCICG recommends that all communities that have early warning sirens within Bureau, LaSalle, Marshall, Putnam, and Stark Counties adhere to Illinois law and only test sirens at 10:00 a.m. on the first Tuesday of each month.

NCICG also recommends a regional discussion on the implementation of best practices for activating early warning sirens during storm events.

NCICG recognizes that various jurisdictions are responsible for sounding the early warning sirens and that some counties do not own or operate any sirens. However, from a planning perspective, regional guidelines could lessen confusion and ultimately, save lives. Local officials, emergency personnel, the Illinois Emergency Management Agency, and the public should be invited to participate in the discussions.

Continued public education about early warning sirens can save lives. The public must be made aware that sirens are only meant to be heard while outside.

During the risk analysis phase of this plan, several communities identified the need to purchase a siren or additional sirens to provide full coverage to their residents. It is recommended that communities without sirens or those that have gaps in coverage purchase sirens. Additionally, some tornado sirens are capable of being activated remotely; however, others require manual activation, which could put the person responsible for activation at risk of injury or death. Communities without remote capabilities are encouraged to assess the feasibility of updating their siren systems.

StormReady Communities

StormReady is a program of the National Weather Service that was started in 1999. StormReady helps community leaders and emergency managers strengthen local safety programs. It was designed to help local communities be more prepared with communication and safety skills before and during a natural hazard event. To be StormReady a community must:

1. Establish a 24-hour warning point and emergency operations center.
2. Have more than one (1) way to receive severe weather warnings and forecasts and to alert the public.
3. Create a system that monitors weather conditions locally.
4. Promote the importance of public readiness through community seminars.
5. Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.

Bureau and LaSalle Counties have met all of the requirements to be StormReady.

Response

After a disaster, a community should respond with actions that prevent or reduce damage and injury. An emergency action plan assures that all the bases are covered. Emergency action plans are developed along with other agencies. According to state law, every county must have an Emergency Operations Plan (EOP). Bureau, LaSalle, Marshall, Putnam, and Stark Counties have plans in place. They should be updated annually.

Listed below are brief descriptions of FEMA's *Emergency Response Action Steps*:

1. *Disaster Alert* – Provide assistance to those in need. People come first.
2. *Safety First* – Remain calm, alert staff to potential dangers.
3. *Getting started off-site* – Create a team big enough for the work, assign tasks, and notify emergency personnel.
4. *Documentation* – Make visual, written, and voice records.
5. *Damage Assessment* – Notify insurance representative or risk manager, look for threats to safety.
6. *Salvage Priorities* – Determine order of salvage priority by group not item.
7. *Historic Buildings* – Contact historic preservation agencies, FEMA, and engineers before cleanup. Follow Secretary of Interiors Standards for Treatment of Historic Properties.

Recovery

Protection of critical facilities is imperative before, during, and after a disaster. It is the responsibility of the community to make sure critical facilities are protected and are able to be

used in support of emergency response efforts. There should be an emergency plan in place in case a critical facility is damaged during a natural hazard. Hospitals, nursing homes, and public health facilities are required, by the State of Illinois, to have emergency response plans and to exercise the plans.
Ensuring that the public's basic needs of food, shelter, and water are met should be a top priority during the recovery process. Imperative steps in the recovery process include:

1. *Aiding the injured* - check for injuries; remember not to move seriously injured people unless they are in danger of death or further injury.
2. *Think of your health* – be aware of exhaustion and stress from the situation; be sure to eat food and drink plenty of water.
3. *Be aware of safety issues* – watch for broken glass, gas leaks, contaminated buildings, and damaged electrics.
4. *Check for damage* – check for structural damage to home (if there are concerns, wait for a building inspector to check the home before entering); watch for poisonous and dangerous animals while moving debris.
5. *Keep records* – Take pictures if possible for your records and insurance.

Some organizations that can help are:

1. American Red Cross.
2. Salvation Army.
3. Local volunteer organizations, relief groups, and churches.
4. Crisis counselors (for some major disasters FEMA, State, and/or local governments may provide counselors).

Conclusions

Emergency management consists of mitigation, preparedness, response, and recovery. Bureau, LaSalle, Marshall, Stark, and Putnam Counties have emergency management agencies that assist with these activities. All of the agencies have Emergency Operations Plans in place for when a disaster occurs.

The National Weather Service (NWS) is the primary organization responsible for issuing weather watches and warnings. It is important for the public to know the difference between watches and warnings. The public is alerted to severe weather through multiple platforms including IPAWS and CodeRed. NOAA weather radios are one (1) of the best ways to stay on top of weather information.

Communities should adhere to state law on the testing of early warning sirens. A regional discussion on the development of a uniform policy for the activation of sirens during a storm event is needed. Communities without sirens or those that lack coverage should purchase sirens to protect the public.

The NWS now issues storm-based warnings that identify the specific areas in a storm or tornado's path. The new method replaces county-based warnings and reduces the coverage area of warnings.

Responding to the needs of people who have been inured is the first response following a disaster. Once the situation has been stabilized, further assessment of the damage is needed. An Emergency Operations Plan can guide the response and recovery process. Ensuring that the public's basic needs are met is a top priority. There are many organizations that can assist a community following a disaster.

Recommendations

- Encourage the public to purchase NOAA weather radios.
- Adhere to state law on the testing of early warning sirens.
- Have a regional discussion on the development of a uniform policy on when sirens should be activated during storm events.
- Educate the public about the purpose of the sirens.

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Chapter 8: Public Information

Informing the public about natural hazards is an important step to gain support for mitigation activities. When the public is informed, they will be able to make educated decisions that will reduce property damage and protect their lives. Such decisions might include: constructing a safe room when building a new house to protect against tornadoes; relocating after a flood; or installing an overhead sewer system to eliminate basement backups. The public should also be invited to participate in mitigation planning activities and discussions. Mitigation projects are often costly and use tax payer dollars for their implementation and construction. The public may be more willing to support mitigation activities when they understand the needs of the whole community and how they will directly benefit from the proposed projects.

Outreach Projects

Outreach projects are designed to inform the public about hazards and encourage them to take their own steps and precautions to protect themselves. Safety, health, and property protection measures must be included in outreach activity projects. Outreach programs are effective on the national level, but are more effective on the local level because people often have experienced the impacts of a natural disaster or know someone who has been impacted.

Effective outreach projects include; promoting websites that provide local information on natural hazards and mitigation activities; the use of home mailings, such as sending important information with utility bills; and the use of newspapers, radio, and television. Natural hazards information should also be made available at public libraries to ensure all residents have access to project materials. The success of any outreach project relies on the ability to effectively distribute information to the public in an understandable format. Outreach projects should clearly define actions that the public can take to reduce and eliminate risk.

Program for Public Information

Communities that are part of the National Flood Insurance Program's Community Rating System (CRS) may receive credit for public information activities that educate the public about their flooding risks and ways to protect their property and lives. Conducting outreach projects, providing map information to the public, and utilization of multiple communication platforms (websites, radio, television, newspapers, etc.) are only a few the activities that are eligible for credit. Communities that create and adopt a Program for Public Information (PPI) receive bonus credit for implementing public information activities.

According to NFIP, "A Program for Public Information (PPI) is an ongoing local effort to identify, prepare, implement, and monitor a range of public information activities that meet specific local needs." The objective of a PPI is to change public behavior by informing residents about their flooding risks and telling them what they should do to protect their lives and property from those risks. The City of Ottawa in LaSalle County is in the process of completing a PPI.

In order to receive CRS credit, the PPI must be developed in a seven-step process that involves the public. The process includes:

1. Establishing a PPI Committee: The committee is charged with guiding the process and facilitating discussions and decisions. At least half of the members on the committee must be from outside of the government. A local insurance agency and bank/lender must also be represented on the committee. The City of Ottawa created the Ottawa Flood Commission to guide the process. The commission consists of the required members in addition to emergency responders, local developers, non-profit organizations, and others who have been impacted by flooding.

2. Assess the Community's Public Information Needs: Identifying the community's flooding problems, assessing what actions have been taken to address flooding, and determining the target audience is the next step. The City of Ottawa has taken great strides to eliminate their risk to riverine flooding. However, urban flooding has presented new challenges for the city. The PPI is targeted toward individuals who own structures in the city's floodplains and those who have and continue to be impacted by urban flooding, including basement backups. The commission has also made an inventory of actions that have been taken to minimize the impact of flooding. A list of organizations and their outreach efforts has also been compiled.

3. Formulate Message: Once the target audiences have been identified, a message must be formulated. The message must clearly state what the public should do and provide direction on where to seek additional information. The City of Ottawa is currently formulating its PPI messages. Educating the public about the importance of understanding their insurance coverage, especially the need for flood insurance and an additional policy for sewer and drain backups, will be a focus of the city's messages. The city will be launching a new website, www.ottawafloods.org that will provide information about flooding and protective measures.

4. Identify Outreach Projects to Convey the Messages: The PPI will identify the projects that will be implemented to reach the target audience and covey the message. A timeline for project implementation and the responsible person(s) for their implementation must be included.

5. Examine other Public Information Initiatives: To receive additional CRS credit, the PPI should also include information on other activities the community is implementing and their purpose. Such activities may include providing additional information to the public about drainage system maintenance, flood warning and response, or hazard disclosure.

6. Prepare the PPI Document: The commission's work and findings must be recorded in a formal written document and adopted by the community's governing body.

7. Implement, Monitor, and Evaluate the Program: The projects identified in the PPI document must be implemented, monitored, evaluated, and revised when necessary. Communities only receive CRS credit for implementing the identified projects. Credit is not given for going through the process of developing a PPI.

Assistance

Providing natural hazard mitigation information to the public is necessary in order for individuals to protect their lives and property. Informed residents and business owners may be aware of the hazards and steps they can take to protect their assets, but they may not be comfortable with starting complex mitigation projects. Local building department staffs can help to guide residents in the right direction and can assist residents with permits when necessary. Building and zoning departments will also be able to explain which activities are permissible in a floodplain.

Conclusions

Educating the public about natural hazards and their risks can save lives and protect property. Communities can inform the public through implementing outreach projects. Websites, libraries, newspapers, and radio are a few of the outlets that can be used to inform the public. The effectiveness of public outreach campaigns relies on the ability to effectively convey messages to the public. Reaching various socioeconomic, age, and other groups will require different communication methods. Communities that are part of the Community Rating System can receive additional credit for developing a Program for Public Information (PPI). The PPI is developed to encourage individuals living in a floodprone area to take action to protect their lives and property. Local zoning and building officials can provide assistance to the public on how to get started with protecting their assets.

Recommendations

- Inform property owners, businesses, renters, and local officials about hazards and how to protect themselves before, during, and after an event.
- Make natural hazard information available through various communication methods.
- Assist residents and business owners in gathering information to hazard-proof their properties.

References

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Chapter 9: Regional Goals

Regional Goals

It is important to go through the process of setting goals and defining expectations to give communities a point of reference, a point of direction, and a completion point. The goals listed below were developed with community input. The public and local leaders/stakeholders were invited to attend public meetings in January 2015 to share their ideas on how to improve the region. The goals identified in this section are regional goals that the participating communities should work towards implementing together. Each community has individual needs that are addressed in their Community Risk Assessment. The list below should be updated annually to reflect projects and activities that have been implemented and new needs.

Goal 1: Protect the lives, health, and safety of the citizens through education about natural hazards.

1. Work together as a region to share resources and to create opportunities for the public to be engaged and informed about the risks of natural hazards and mitigation activities.
2. Utilize various communication methods including, but not limited to, social media, mobile alerts, print, and radio to inform residents about natural hazards and mitigation activities.
3. Educate the public on the importance of purchasing a NOAA weather radio. Consider a cost-sharing program.
4. Participate in regional activities (such as the Illinois Valley Flood Resiliency Alliance and the Middle Illinois Basin Regional Water Supply Study) and encourage the public to be involved.
5. Engage in a regional discussion on the implementation of best practices for activating early warning sirens during storm events.
6. All communities with early warning sirens should adhere to Section 12 of the Illinois Emergency Management Agency Act which states that the testing of outdoor early warning sirens shall only be held at 10:00 A.M. on the first Tuesday of each month, unless expressively approved in advance by the Illinois Emergency Management Agency.
7. Encourage participation in the Community Rating System to lower flood insurance premiums for residents.

Goal 2: Reduce the loss of public and private property, especially critical facilities and infrastructure, through proper planning and by completing mitigation projects.

1. Work with a local regional planning agency to identify available planning and funding resources.
2. Seek FEMA funding for buyouts (property acquisition) to reduce the number of structures in the floodplain.
3. Prohibit the construction of all structures including homes, businesses, and critical facilities in a floodplain.
4. Adopt a region-wide flood damage prevention ordinance that puts forth higher regulatory standards.
5. Install, expand, or update early warning tornado sirens in every community.
6. Utilize Geographic Information System (GIS) mapping to identify critical facilities, potential hazard areas, etc. while developing and carrying out mitigation strategies.

Goal 3: Protect and preserve the region's rivers and floodplains, including, but not limited to the Illinois River, Fox River, Vermilion River, and Spoon River in order to reduce loss from flooding.

1. Increase the number of Certified Floodplain Managers (CFM) in the region.
2. Develop a greenways plan that can help preserve the floodplain from development.
3. Adopt property protection measures and/or flood control measures to maintain channel depth and proper stream flow.
4. Consider the use of property protection measures and/or flood control measures to maintain storm water infrastructure.

Goal 4: Manage future development to mitigate the impact of natural hazards.

1. Adopt and enforce a building code to ensure that new structures are built with safety in mind.
2. Develop a regional building inspector training program and develop a process to allow communities, particularly smaller communities, to share building inspectors.
3. Encourage developers to build weather safe rooms during new construction.
4. Consider implementation of subdivision ordinances that include concepts such as underground electrical service and storm water management facilities.

Goal 5: Identify and evaluate specific projects in each of the five (5) counties to achieve hazard mitigation.

1. Work with other communities in the region when considering mitigation projects.
2. Continue to identify local flooding problems and identify and implement solutions.
3. Compile a list of potential problems in your community and work to rank them in order of urgency.

Goal 6: Implement strategies that will improve economic resiliency.

1. Encourage businesses to participate in disaster preparedness and recovery planning activities.
2. Complete critical infrastructure projects that will reduce or eliminate the economic impact of natural disasters.
3. Develop partnerships with area businesses and non-profit organizations and develop strategies that will help communities strengthen their ability to recover following disasters.