## 2015

## Multi-Hazard Mitigation Plan

Floyd County, Indiana



## Multi-Hazard Mitigation Plan Floyd County, Indiana

Original Adoption Date: 2008 Updated: 2015

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## **Acknowledgments**

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### **Acronyms**

**AEGL - Acute Exposure Guideline Levels** 

ALOHA - Areal Locations of Hazardous Atmospheres

BFE - Base Flood Elevation

CAMEO - Computer-Aided Management of Emergency Operations

CAPI - Community Action Potential Index

CDP - Census Designated Place

CEMP - Comprehensive Emergency Management Plan

CRS – Community Rating System

DEM - Digital Elevation Model

DFIRM - Digital Flood Insurance Rate Map

DHS - Department of Homeland Security

DMA – Disaster Mitigation Act

EAP – Emergency Action Plan

EMA – Emergency Management Agency

EPA - Environmental Protection Agency

FEMA - Federal Emergency Management Agency

FIRM - Flood Insurance Rate Maps

GIS - Geographic Information System

Hazus-MH - Hazards USA Multi-Hazard

HUC - Hydrologic Unit Code

IDEM - Indiana Department of Environmental Management

IDHS - Indiana Department of Homeland Security

INDOT – Indiana Department of Transportation

IDNR - Indiana Department of Natural Resources

IGS – Indiana Geological Survey

MHMP - Multi-Hazard Mitigation Plan

NCDC - National Climatic Data Center

NEHRP - National Earthquake Hazards Reduction Program

NFIP - National Flood Insurance Program

NOAA – National Oceanic and Atmospheric Administration

NWS - National Weather Service

PPM - Parts Per Million

SPC – Storm Prediction Center

USACE – United States Army Corps of Engineers

USDA - United States Department of Agriculture

USGS - United States Geological Survey



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## **Executive Summary**

The Floyd County Multi-Hazard Mitigation Plan (MHMP) was developed to guide the county in a risk-based approach to preventing, protecting against, responding to, and recovering from disasters that may threaten the county's citizens, infrastructure, and economy. The plan is hazard- and community- specific. It documents historical disasters, assesses probabilistic disasters through Hazus-MH and GIS analyses, and addresses specific strategies to mitigate the potential impacts of these disasters.

This five-year update was a collaborative effort among the Floyd County Multi-Hazard Mitigation Planning Team, River Hills Economic Development District and Regional Planning Commission and The Polis Center of Indiana University Purdue University-Indianapolis. Floyd County and River Hills EDD & RPC have joined efforts in developing a hazard mitigation plan which protects and supports economic and community development in the county through effective hazard mitigation strategies:

- Historical hazards: Each hazard section within this plan documents the most current data about NCDC-reported hazards since the 2008 plan.
- Profile Hazards: The planning team revised the hazard priority rankings and plotted each hazard on a risk grid according to probability (y-axis) and potential impact (x-axis). County planning documents, e.g. Risk MAP reports, CEMP, hazard-specific reports, etc., were integrated into the plan update.
- Community profile: Demographics, social, and economic data, as well as existing and future land use descriptions were updated to reflect the current status of the county and its jurisdictions.
- NFIP: The plan includes the effective date of the DFIRM.
- Planning description: The new planning team and updated planning process were described and documented.
- Risk assessment: Hazus-MH and GIS analyses were updated using site-specific data from the county. Updated loss estimation is provided for tornadoes, floods, earthquakes, and hazardous materials releases.
- Mitigation: The team reviewed and updated mitigation goals, objectives, and strategies.



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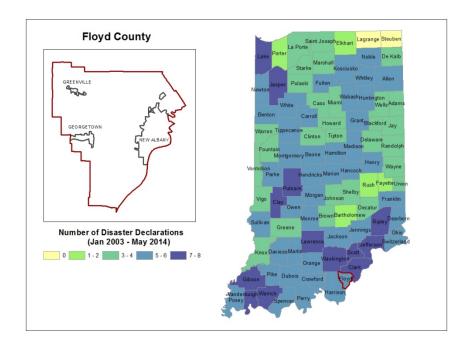
# Section

## Introduction

Hazard mitigation is defined as any sustained action to reduce or eliminate long-term risk to human life and property from hazards. The Federal Emergency Management Agency (FEMA) has made reducing hazards one of its primary goals. Hazard Mitigation Planning and the subsequent implementation of the projects, measures, and policies developed as part of this plan, is a primary mechanism in achieving FEMA's goal.

The federal Disaster Mitigation Act of 2000 requires jurisdictions to develop and maintain a Multi-Hazard Mitigation Plan (MHMP) to remain eligible for certain federal disaster assistance and hazard mitigation funding programs. Renewal of the plan every five years is required to encourage the continual awareness of mitigation strategies. In order for the National Flood Insurance Program (NFIP) communities to be eligible for future mitigation funds, they must adopt the MHMP. In the past decade, FEMA has declared 18 emergencies and disasters for the state of Indiana, as shown in Figure 1-1.

Figure 1-1: FEMA Disaster and Emergency Declarations for Indiana<sup>1</sup>



<sup>&</sup>lt;sup>1</sup> Federal Emergency Management Agency (FEMA), 2014



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In the event of a federally declared disaster, individuals, families, and businesses may apply for financial assistance to help with critical expenses. Assistance may be categorized as Individual Assistance (IA), Public Assistance (PA), or Hazard Mitigation Assistance (HM).

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The following types of assistance may be available in the event of a disaster declaration.

**Individuals & Household Program:** Provides money and services to people in presidentially declared disaster areas.

Housing Assistance: Provides assistance for disaster-related housing needs.

**Other Needs Assistance:** Provides assistance for other disaster-related needs such as furnishings, transportation, and medical expenses.

**Public Assistance:** Disaster grants assistance available for communities to quickly respond to and recover from major disasters or emergencies declared by the president.

**Emergency Work (Categories A-B):** Work that must be performed to reduce or eliminate an immediate threat to life, to protect public health and safety, and to protect improved property that is significantly threatened due to disasters or emergencies declared by the president.

**Permanent Work (Categories C-G):** Work that is required to restore a damaged facility, through repair or restoration, to its pre-disaster design, function, and capacity in accordance with applicable codes and standards.

**Hazard Mitigation Assistance:** Provides assistance to states and local governments through the Hazard Mitigation Grant Program (HMGP) to implement long-term hazard mitigation measures after a major disaster declaration.

Floyd County has received federal aid for one declared emergency and five disasters since 2004, listed in Table 1-1: FEMA-Declared Disasters and Emergencies for Floyd County (2004-2014). Three disasters have been declared since the last Floyd County MHMP was adopted in 2008.

Table 1-1: FEMA-Declared Disasters and Emergencies for Floyd County (2004-2014)

Disaster Number	Date of Incident	Date of Declaration	Disaster Description	Type of Assistance
EM-3197	12/21/2004- 12/23/2004	1/11/2005	Snow Storm	PA, HM
DR-1520	5/24/20046/25/2004	6/3/2004	Severe Storms, Tornadoes, Flooding	IA, PA, HM
DR-1573	1/1/2005- 2/11/2005	1/21/2005	Winter Storm, Flooding	IA, HM
DR-1795	9/12/2008 – 10/6/ 2008	9/23/2008	Severe Storms, Flooding	IA, PA, HM
DR-1828	1/26/2009 – 1/28/2009	3/5/2009	Winter Storm	IA, PA, HM
DR-1997	4/11/2011 – 6/6/2011	6/23/2011	Severe Storms, Tornadoes, Flooding	PA, HM

PA - Public Assistance program

IA – Individual Assistance program

HM – Hazard Mitigation Assistance (Hazard Mitigation Grant Program)



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## **Prerequisites**

The Floyd County Multi-Hazard Mitigation Plan 2015 Update meets the requirements of the Disaster Mitigation Act of 2000, which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act to require state, local, and tribal entities to closely coordinate mitigation planning and implementation efforts. It also meets the requirements of the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) grant program, Pre-Disaster Mitigation (PDM) grant program, and other National Flood Insurance Program (NFIP) grants.

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#### 2.1 Multi-Jurisdictional Plan Adoption

This plan represents a comprehensive description of Floyd County's commitment to significantly reduce or eliminate the potential impacts of disasters through planning and mitigation. Adoption by the local governing bodies within the county legitimizes the plan and authorizes responsible agencies to implement mitigation responsibilities and activities. To be eligible for federal mitigation funding, each participating jurisdiction must adopt the plan. After thorough review, the Floyd County Commissioners adopted the plan on <insert date adopted >. Additional adoptions are included in Appendix E.

#### 2.2 Jurisdiction Participation

Table 2-1 lists each jurisdiction and describes its participation status in the 2008 and 2015 update of the multi-hazard mitigation plan (MHMP).

**Table 2-1: Participating Jurisdictions** 

Jurisdiction Name	Jurisdiction Type	Participated in 2008 MHMP	Participated in 2015 MHMP Update	
Floyd County	County	Yes	Yes	
Georgetown	Town	Yes	Yes	
Greenville	Town	Yes	Yes	
New Albany	City	Yes	Yes	

The county also invited representatives from local businesses and organizations to participate in the plan. Table 2-2 lists additional team members with a description of their participation. The invitation to participate is included in Appendix A.



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The organizations which were invited included the American Red Cross, COADs/VOADs, health departments, major businesses, REMC operations and local media, among others.

**Table 2-2: Organizations Invited to Participate** 

Organization Name	Organization Type	Representative Name	Description of Participation
American Red Cross	Disaster Relief	Michael Crenshaw	Attended meeting
Floyd Memorial Hospital	Hospital	Andrew Williams	Attended meeting

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## **Planning Process**

The Floyd County Emergency Management Agency (EMA), River Hills Economic Development District and Regional Planning Commission, and The Polis Center (Polis) have joined efforts to develop this five-year multi-hazard mitigation plan update. The planning process consisted of the following tasks:

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#### **Task 1: Organize Resources**

The Floyd County EMA created a planning team to attend meetings, gather data and historical information, and participate in mitigation brainstorming sessions.

#### Task 2: Risk Assessment

The planning team identified the natural and technological hazards to include in this plan, and Polis developed hazard event profiles to address the possible magnitudes and severities associated with each hazard. The team then used local resources to inventory the county's assets and estimate losses.

#### **Task 3: Public Involvement**

The public was invited to attend a public input meeting and open house to learn about county emergency and disaster preparedness and review the hazard mitigation planning process in Floyd County. During the public input meeting, the public had the opportunity to review risk assessment results, and discuss and provide input on mitigation strategies. The EMA posted an announcement for the public input meeting on the county government website and distributed the announcement to jurisdictions, media outlets and other organizations which serve the public. Appendix A includes meeting minutes and the public meeting notice.

#### **Task 4: Develop Mitigation Strategies**

During the public input meeting, the 2008 MHMP and mitigation strategies or actions were reviewed. Important changes in the county, including population trends, growth of minority and special needs populations, and land development and usage were also discussed as these factors relate to hazard mitigation planning. The second half of the meeting was devoted to reviewing the status of 2008 mitigation actions and developing new mitigation strategies for the 2015 update with input from the public.



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#### Task 5: Complete the Plan

Polis compiled all of the planning team documentation and research with the risk assessment and mitigation strategies to produce a draft plan for review. The Floyd County planning team had multiple opportunities to review and revise the plan before submitting to the Indiana Department of Homeland Security (IDHS) and FEMA for approval.

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#### **Task 6: Plan Adoption**

The Floyd County EMA coordinated the effort to collect adoptions from each participating jurisdiction.

## 3.1 Planning Team Information

The planning team is headed by the Floyd County EMA. Other members of the planning team include representatives from various county departments, cities and towns, public and private utilities, and public safety and other organizations which respond to emergencies and disasters. Table 3-1 identifies the planning team members, organizations and jurisdictions represented.

Table 3-1: Multi Hazard Mitigation Planning Team Members in Attendance

Name	Organization	Jurisdiction
Terry Herthel	Floyd Co. Emergency Management Agency (EMA)	Floyd County
Tammy Markland	Floyd Co. Emergency Management Agency (EMA)	Floyd County
Chris Moore	Floyd County Stormwater Dept.	Floyd County
Richard Stiles	Town of Georgetown	Georgetown
Scott Wood	City of New Albany	New Albany
John Bruham	Town of Greenville	Greenville
Christina Black	Indiana University Southeast	New Albany
Chelsea Crump	River Hills EDD & RPC	Floyd County

All members of the planning team were actively involved in attending the MHMP meetings, providing available geographic information systems (GIS) data and historical hazard information, reviewing and providing comments on the draft plans, coordinating and participating in the public input process, and coordinating the county's formal adoption of the plan.

The planning team held two meetings to support the Floyd County MHMP Update process. The dates and goals of the meetings are highlighted below:

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Meeting 1, February 27, 2015 (Planning Team Meeting):

- Introduce/overview of project
- Review and update facility data
- Review and prioritize hazards
- Determine modeling scenarios
- Distribute 2015 mitigation strategies

Meeting 2, June 11, 2015 (Planning Team and Public Input Meeting):

- Introduction and overview for new attendees
- Review risk assessment
- Review draft plan
- Discuss 2008 and 2015 mitigation strategies
- Solicit public input

Following Meeting 2, the Regional Planning Committee members communicated county planning team members to complete final edits to the plan.

#### 3.2 Review of Existing Plans

Floyd County and the local communities utilize land use plans, emergency response plans, municipal ordinances, and building codes to direct community development. The planning process also incorporated the existing natural hazard mitigation elements from these previous planning efforts. The development of the plan utilized the following plans, studies, reports, and ordinances. The planning team and Polis reviewed the 2008 MHMP to determine which areas of the plan required updating. A description of updated sections is available in the Executive Summary.

Table 3-2 lists the plans, studies, reports, and ordinances utilized in the development of the 2015 MHMP Update.



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Table 3-2: Documents Utilized in the MHMP 2015 Update

Document Title	Year	Description	2015 Update Sections
Floyd County 2008 Multi-Hazard Mitigation Plan (MHMP)	2008	Federal Disaster Mitigation Act requirement	All sections
Cornerstone 2005-Land Use Update	2005	Comprehensive Planning	Sec. 4: County Profile Sec 5: Risk Assessment
EMA-Dissemination Plan-2014	2014	Outlines Communication Plans and Procedures During Emergencies	Sec 5: Risk Assessment
Floyd County Ordinances and Resolutions	1966- present	Compilation of county and local legislation and Floyd County Code of Ordinances	Sec 5: Risk Assessment Sec 6: Mitigation Strategies
KIPDA FY 2015-2018-Transportation Improvement Program TIP	2014	Outlines transportation planning in the county	Sec 4: County Profile Sec 4.6 Transportation Sec 4.9 Land Use Sec 5: Risk Assessment Sec 6: Mitigation Strategies

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#### 3.3 Review of Technical and Fiscal Resources

The MHMP 2015 Update planning team identified representatives from key federal, state and county agencies to assist in the planning process. Technical data, reports and studies were obtained from these agencies. A list of technical and fiscal resources and sources are summarized in Table 3-3.

Table 3-3: Technical and Fiscal Resources and Sources

Resources	Sources
Repetitive loss information	FEMA Region V
Digital flood maps, dam and levee information	FEMA Region V
GIS data, digital elevation models (DEM), earthquake modeling scenarios	Indiana Geological Survey
2008 Floyd County MHMP	Floyd County EMA
Critical Facility GIS data and GIS basemap data	Floyd County GIS Department
Community Action Potential Index (CAPI) data	FEMA
Economy and industry, land use and development planning	Floyd County Plan Commission
Buyout/Retrofitting information and planning data	Indiana Department of Homeland Security (IDHS)

#### 3.4 Public Involvement

The planning team invited the public to a meeting on June 11, 2015 in order to encourage the public to actively participate in the planning process. During this meeting the Polis Center reiterated the purpose of the plan and goals of the meeting. The draft plan was reviewed and mitigation strategies were discussed. Appendix A includes minutes from the meeting and a copy of the public meeting notice that encouraged community representatives and the public to participate in the hazard mitigation planning process.

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#### 3.5 Neighboring County and Community Participation

The Floyd County planning team invited neighboring counties and communities to review the draft plan and provide input on content, including mitigation strategies. Details of neighboring stakeholders' participation in the planning process are summarized in Table 3-4.

**Table 3-4: Neighboring County Participation** 

Participant Name	Neighboring Organization		Participation Description	
Greg Reas	Harrison County, IN	Harrison County EMA	Received a draft of plan for review, comment	
Desi Alexander	Washington County, IN	Washington County EMA	Received a draft of plan for review, comment	
Les Kavanaugh	Clark County, IN	Clark County EMA	Received a draft of plan for review, comment	

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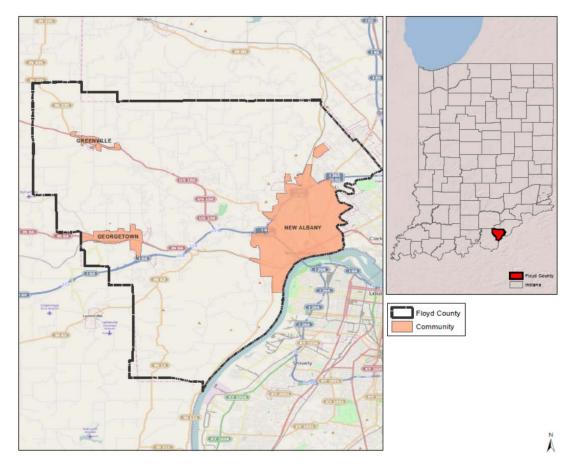
#### Section

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## **County Profile**

As shown in Figure 4-1, Floyd County is situated in southern Indiana along the Indiana-Kentucky state line. Floyd County adjoins three Indiana counties and Jefferson County, Kentucky. The Indiana counties and populations are: Harrison (pop. 75,120), Washington (pop. 28,064), and Clark (pop. 107,381)<sup>2</sup>. Jefferson County, Kentucky contains Louisville (pop. 746,580), northern Kentucky's largest city.

Figure 4-1: Floyd County, Indiana Location



New Albany is the largest of the Floyd County's (pop. 73,574) three incorporated communities or jurisdictions. Georgetown and Greenville are located in the northwest and western portions of the county. The unincorporated community of Galena was identified in 2010 as a census designated place (CDP) by



<sup>&</sup>lt;sup>2</sup> US Census Bureau, 2010 5-year estimates

the US Census. Among the five townships, New Albany is the largest containing 66% of the county's population in 2013. Franklin Township is the smallest, containing 1.8% of the county's population.

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New Albany's rich architectural legacy is preserved in four historic districts which contain 800 historically-significant structures. New Albany's Historic Preservation Commission oversees preservation of historic district buildings and landmarks, which are among Floyd County's most important cultural assets and valuable resources for the county's strong tourism industry. Another 82 properties in unincorporated areas of the county have also been identified as historically significant. Preseveration of Floyd County's rich historical landmarks is a significant consideration for hazard mitigation planning.

Floyd County is Indiana's second smallest county in land area,<sup>3</sup> encompassing 147.94 square miles.<sup>4</sup> Population density in the county is approximately 504 persons per square miles compared to New Albany's density of 2,411.2 persons per square miles. Although Floyd County is located within the densely-populated metro Louisville area, the county's population is characterized as rural.

New Albany and the adjacent Indiana communities of Clarksville and Jeffersonville (Clark County) join Louisville, Kentucky across the river in an area known as Falls Cities. New Albany is located at the foot of the Falls of the Ohio, a series of rapids and chute waterfalls over an immense bed of rock. Here, the river fell more than 26 feet within about two miles. Before canals, locks and dams were built, the Falls segment was the only non-navigable portion of the Ohio River along its 981-mile course. The rocky river bed contains one of the world's largest Devonian-era fossils beds which is preserved at the Falls of the Ohio State Park, Clarksville. In 2013, the combined population of the four Falls Cities communities was 719,636. On average, the urban areas contain 1,941.7 persons per square mile.

Another major natural feature dominating the Floyd County landscape is Floyds Knobs, a series of steep hills or "knobs" that span the county's eastern half. Floyd County's highest elevations are in the Floyd Knobs area where summits reach 800 to 1,000 feet above mean sea level (msl).

Nearly half of the county's population is concentrated in New Albany's 15-square mile area along the riverfront and approximately 40% of the population is spread across 134 square miles in rural locations or unincorporated communities. Along with the rural-located population, the densely-populated Falls Cities area is a primary focus of hazard mitigation planning in Floyd County. Natural geographic barriers such as major waterways or impassable terrain can restrict access to densely-populated, as well as rural areas during evacuations and other emergency operations.

Similar to neighboring riverfront counties, since its early settlement, Floyd County has been largely defined by the Ohio River. Although the river has propelled the county's economy, growth and development, it has caused catastrophic flood events. During the 1937 Ohio River Flood, New Albany was inundated with 60.8 feet of water. New Albany has since built flood walls To mitigate Ohio River flood events.



<sup>&</sup>lt;sup>3</sup> Kleber, John E. Ed. "The Encyclopedia of Louisville." University Press of Kentucky. Pg. 300. Books.google.com. Web. 2015.

<sup>&</sup>lt;sup>4</sup> US Census Bureau, 2010 5-year estimates

Floyd County and four other Indiana counties are included in the US Census Bureau's Louisville-Jefferson County, KY-IN Metropolitan Statistical Area (MSA), the nation's 43rd largest, as shown below in Figure 4-2. Commonly known as Kentuckiana or Louisville Metro, the MSA spans 12 counties in two states. According to the US Census Bureau, MSA population increased by 12.5% from 2000 to 2010 when the 2010 Census recorded a population of 1,307,647. The MSA covers 4,135.4 square miles which includes 476.7 square miles in urban areas. The MSA's population density is 2,040.1 persons per square miles.



Figure 4-2: Louisville-Jefferson County, KY-IN Metropolitan Statistical Area (MSA)

The county's numerous cultural and historic sites join business and industry as assets of economic significance to the county. These assets along with the county's abundant natural resources, densely-populated riverfront urban area, and its significant rural population are all key considerations for hazard mitigation planning.

## 4.1 Geography, Topography, and Climate

Floyd County is located along the Ohio River in the Norman Upland area of the southern Indiana physiographic region. The county's land area is primarily rural with rolling open expanses containing farm fields and pastures, and in the eastern half, dense woodlands and steep hills known as Floyds Knobs. The lowest points are along the Ohio River south of New Albany with elevations ranging from 350 to 450 feet above mean sea level. The county contains areas of karst sinkhole topography. The most notable landform is the Knobstone Escarpment which crosses the county's eastern and southern regions on New Albany's western outskirts. The escarpment or ridge extends 150 miles from central Indiana southward to the Ohio River, terminating south of Louisville, KY. The landform features steep hills or "knobs" including Floyd County's highest elevations of Spickert Knob at 950 feet above mean sea level (msl), Lost Knob (905 feet), and Bald Knob (854 feet), all northwest of New Albany.



Floyd County's climate is typical of southern Indiana. The Floyd County data shown in Figure 4-3 is from a weather station in the vicinity of New Albany in the Ohio River Valley. It's important to note that the variables of temperature, precipitation, and snowfall can vary greatly from one year to the next.

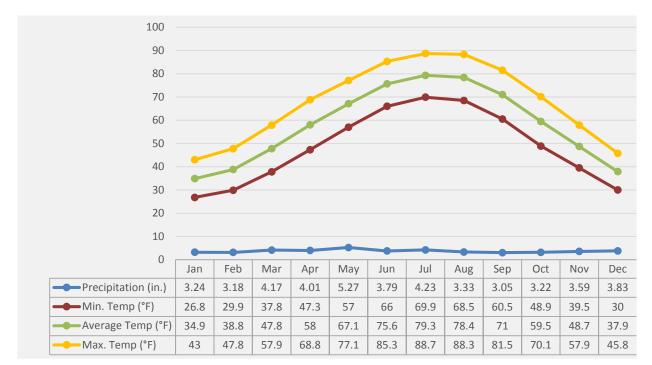


Figure 4-3 Floyd County Average Temperatures and Precipitation<sup>5</sup>

From the Ohio River Valley area in the south to the rolling open areas and the hilly Floyds Knobs region, weather can vary greatly among the geographic regions within the county. Winter temperatures can fall below freezing starting as early as October and extending as late as April. Typically, air temperatures reach a high point in July or August with averages of 79.3°F in July and 78.4°F in August. The coldest month is January with an average temperature of 34.9°F. During the data collection period of 1981 to 2010, annual precipitation averaged 44.91 inches a year in Floyd County while the US average was 37 inches. On average, Floyd County has 5.7 inches of snow a year.

The average wind speed is 9.6 miles per hour and generally comes from the Southwest. Summer humidity is moderate, ranging from 60% during the mid-afternoon and rising during the evening hours with dawn humidity around 80% during the summer months of July and August. The possibility for sunshine is 75% during the summer and 45% during the winter. Indiana is prone to strong thunderstorms that can produce strong winds, lightning, hail, and sometimes tornadoes. Historically, these storms can occur at almost any time throughout the year, but are most common in the spring and summer months.

<sup>&</sup>lt;sup>5</sup> Source: http://www.ncdc.noaa.gov/cdo-web/datatools/normals

#### 4.2 Demography

Among the demographic characteristics that are crucial to mitigation planning are population distribution among various age groups and genders, socio-economic characteristic, and population density. For Floyd County hazard mitigation planning, it's particularly important to analyze both the densely populated urban area of New Albany and the rural population which accounts for over 46% of the county's population. Floyd County's urban and rural populations along with the county's transportation networks, as well as the Ohio River, a natural feature that can restrict direct access are all important considerations in hazard mitigation planning.

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Of Floyd County's three incorporated communities, the county seat city of New Albany is by far the largest with 48.7% of the county's population. According to 2013 US Census Bureau estimates, the communities of Greenville and Georgetown together account for just 4.7% of Floyd County's population. In 2010, the three incorporated communities—New Albany, Georgetown, Greenville—reported a combined population of 39,756 according to the US Census Bureau. Table 4-1 shows the 2010 population of Floyd County communities, both incorporated and Galena, an unincorporated census designated place (CDP). Galena was identified by the US Census Bureau for the 2010 decennial census as a census designated place (CDP).

The US Census Bureau delineates CDPs as the statistical counterparts of incorporated places, such as cities, towns, and villages. The US Census Bureau states that CDPs are "delineated solely to provide data for settled concentrations of population that are identifiable by name but are not legally incorporated under the laws of the state in which they are located."

Table 4-1: 2010 Population of Floyd County Communities<sup>6</sup>

Community	2010 Population	% Total County Population
Floyd County (unincorporated)	33,838	46
Georgetown (town)	2,756	4.2
Greenville (town)	566	0.9
New Albany (city)	36,434	48
Galena (Census Designated Place)	1,180	1.6
Floyd County Total	73,594	

The combined 2010 population of Floyd County's incorporated jurisdictions and unincorporated CDP accounted for 56.6% of the county's population. The population characteristics of Floyd County's incorporated, as well as unincorporated CDP community are important considerations in hazard mitigation planning. Nearly half of the county's population is located in a densely-populated urban waterfront area. New Albany's population and density (2,411.2 persons per square miles) are important factors in developing effective hazard mitigation strategies for Floyd County. It's also important to



<sup>&</sup>lt;sup>6</sup> US Census Bureau, 2010 Census

consider that 44.3% of the county's population resides in a rural location or an unincorporated community.

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Floyd County's second and third most-populous townships are Georgetown Township (9,353) which contains the incorporated town of Georgetown and Lafayette Township (pop. 7,227). Floyd County's population trends over a 13-year period, from 2000 to 2013, are listed in Table 4-3. The most populous township, New Albany (pop. 48,897) covers a land area of 38.95 square miles and contains more than 22,000 housing units, according to 2010 US Census Bureau estimates. Its population and density are nearly four times larger than the next largest township, 26.72-square mile Georgetown Township which reported a population of 9,353 in 2010 and a density 361.7 persons per square mile.

Floyd County's minority population is predominantly Black or African American at 5.3% of the county's population in 2013<sup>7</sup>, compared to 9.5% of the state's population. The second largest minority group is Hispanic or Latino, who can be of any race, at 2.9% and the Asian population group comprises 1.1% of the county's population. With certain minority groups, proficiency in speaking the English language is a special needs population consideration and important in mitigation planning. Section 4-4 Special Needs Populations covers the non-English language speaking population among five special needs population groups in Floyd and the surrounding counties.

Among the socio-economic characteristics that are important in mitigation planning are poverty rates, a special needs factor covered in Section 4-4 Special Needs Populations, as well as household and housing characteristics. Floyd County's median household income at \$50,496 is slightly above the state's average of \$48,2488.

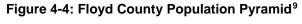
In 2013, Floyd County had 29,087 households which averaged 2.54 persons per household. In 2013, the median age of Indiana's population was 37.1 years while the median age in Floyd County was 39.2 years. Key population characteristics such as age, particularly groups that are 18 years and under and 65 years and over, are crucial to hazard mitigation planning because elderly and young people may require special accommodation.

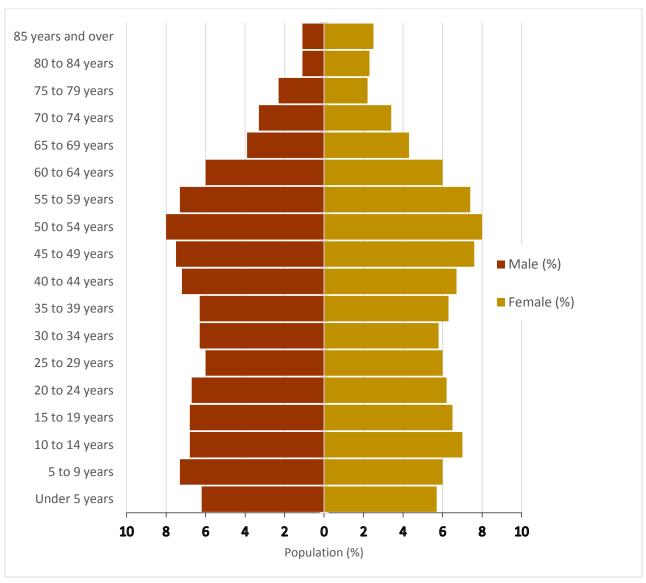
Figure 4-4 shows Floyd County's population pyramid, a visual profile of population distribution in the county by age and gender. For example, the increase in population for the 45 to 59 segments represents the tail end of the baby boom generation, which is defined as the population segment born between 1946 and 1964. This increase will continue to travel upward as this population group ages. Higher percentages in the 70 to 79 age segments usually reflect the increase in life expectancy.



<sup>&</sup>lt;sup>7</sup> US Census Bureau, Quickfacts, 2013 estimates

<sup>&</sup>lt;sup>8</sup> US Census Bureau, 2013 5-year estimates





Along with mortality rates, the population pyramid is useful in depicting fertility rates, and thus population growth, by looking at the percentage of the population in the age 5 and under segments. Floyd County's population pyramid shows relatively stable growth for the county with long life expectancy and low infant mortality.

<sup>&</sup>lt;sup>9</sup> US Census Bureau 2013 5-year estimates

#### 4.3 Population Change

The state of Indiana experienced a 6.63% increase in population from 2000 to 2010. <sup>10</sup> From 2010 to 2013, Indiana's change in population increased further by 1.9% creating a total change in population of 8.53% from 2000 to 2013. With a 5.3% increase in population from 2000 to 2010 and a 0.38% increase from 2010 to 2013, Floyd County's population increased by 5.68% meaning Floyd County's percent increase in population is below the average for the state of Indiana (8.53%) and the Louisville MSA (7.1%) during the same period. The population change in Floyd County is shown in Table 4-2.

Updated: 2015

Table 4-2: Population Change in Floyd County (2000-2013)

Community	2000 <sup>11</sup> Population	2010 Population	% Change 2000- 2010	2013 Population	% Change 2010- 2013	% of Floyd County Population (2013)
Georgetown	2,227	2,756	23.8	2,972	7.8	3.9
Greenville	591	566	-4.2	600	6.0	.8
New Albany	37,603	36,434	-3.1	36,513	.2	48.7
Galena (CDP) <sup>12</sup>	1,831	1,880	2.7	1,746	-7.1	2.3
Floyd County <sup>13</sup>	70,855	74,830	5.3	75,120	0.38	

During the three-year period ending in 2013, Georgetown led population gains among incorporated communities with an increase of 7.8%. New Albany lagged both Greenville and Georgetown in population growth during the 13-year period, reporting a 3.1% decline from 2000 to 2010 and a gain of just .2% from 2010 to 2013. While Greenville reported a population loss of 4.2% from 2000 to 2010, the town made a comeback by 2013, with a 6% gain over 2010. Similar to the county's largest city, New Albany Township's population gains have been modest, with a 1.2% increase from 2010 to 2013.

Migration trends inform hazard mitigation by highlighting areas of population growth and decline, revealing immigration and emigration patterns, and informing public officials of changes in such characteristics as net adjusted gross income (AGI) as a result of migration. Populations grow or decline through migration and natural increase, and often these two components offset each other. Because international migration data was not as consistent as domestic migration data, this plan only references net domestic trends.

According to STATS Indiana migration data for 2013, Floyd County registered a positive natural population increase of 207 (more people were born than died) and a net domestic migration of 669. The map in Figure 4-5 was generated with the Forbes American Migration Map tool and it shows Floyd County's migration patterns between 2005 and 2010 in terms of inbound and outbound domestic migration.

<sup>&</sup>lt;sup>13</sup> STATS Indiana, "Population Estimates for Indiana Counties." http://www.stats.indiana.edu/population/PopTotals/2010. Web. 2015



<sup>&</sup>lt;sup>10</sup> Census Viewer. "Population of Indiana: Census 2010 and 2000." http://censusviewer.com/state/IN. Web. 2015.

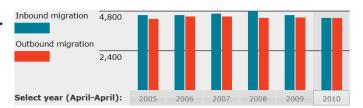
<sup>&</sup>lt;sup>11</sup> US Census Bureau, 2000 Census, 2010 5-year estimates, 2013 5-year estimates

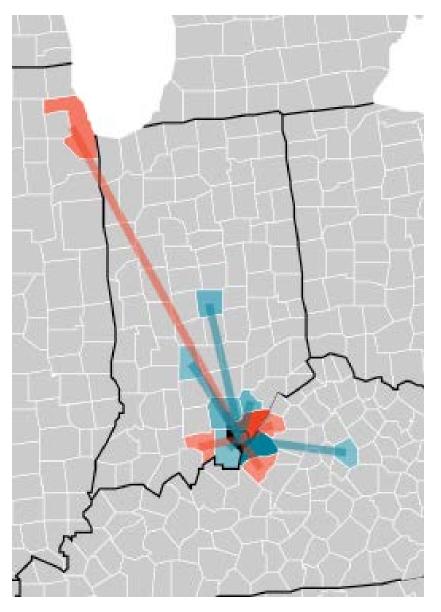
<sup>&</sup>lt;sup>12</sup> 2010 Census Designated Place, US Census Bureau

**Figure 4-5: Floyd County Migration Patterns** 

#### Floyd County (New Albany), Ind.

Population (2010): 74,578 Population (2005): 71,905 Inbound income per cap. (2010): \$19,900 Outbound income per cap. (2010): \$17,900 Non-migrant income per cap. (2010): \$26,000





Floyd is among 33 counties in the state that are projected to make gains of 0% to 5% by 2020. During the decade of 2010 to 2020, Floyd County is projected to increase its population by up to 5%.<sup>14</sup>

<sup>&</sup>lt;sup>14</sup> Indiana Business Research Center, Kelley School of Business, Indiana University, March 2012



#### 4.4 Special Needs Populations

Certain populations require special attention in mitigation planning because they may suffer more severely from the impacts of disasters. It's important to identify these populations and develop mitigation strategies to help the population groups become more disaster resilient. Although there are numerous types of vulnerable populations, Floyd County has identified five significant population groups with special needs: non-English language as a primary language, below poverty level, disability, age 65 years and over, and the population group with no high school diploma. In the event of a disaster or emergency, literacy as well as communication can be issues for the no high school diploma and non-English language speaking special needs groups.

Updated: 2015

Table 4-3 shows special needs groups as a percentage of the population in Floyd and in the four adjoining counties in Indiana and Kentucky.

Table 4-3: Floyd, Adjoining Counties Special Needs Populations<sup>15</sup>

County	Average	Non- English Speaking	All People Below Poverty Level	Disability	Age 65 and Over	No High School Diploma
Floyd County, IN	10.7	1.6%	13.3%	13.4%	13.2%	12.0%
Clark County, IN	11.26	2.1%	12.2%	15.1%	13.1%	13.8%
Harrison County, IN	11.52	2%	12.5%	16.4%	14.3%	12.4%
Jefferson County, KY	12.12	3.8%	16.7%	14.6%	13.6%	11.9%
Washington County, IN	13.34	.6%	15.1%	17.0%	14.1%	19.9%
State of Indiana	10.72	3.3%	15.4%	13.0%	13.3%	8.6%

#### **Explanation of Special Needs Indicators:**

Percent population speaking language other than English at home

Percent of all people whose income in the last 12 months is below poverty level

Percent of population with a disability within the civilian non-institutionalized population

Percent of population age 65 and over

Percent of population with 25 years old and over who have not received a high school diploma or an equivalent



<sup>&</sup>lt;sup>15</sup> US Census Bureau, 2013 5-year estimates

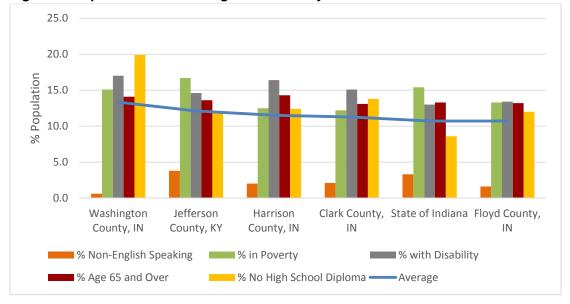


Figure 4-6: Special Needs Ranking Overall and by Indicator

With 13.4% of the county's population reporting disability, people with a disability are the largest and most significant special needs group in Floyd County. The population groups below poverty level (13.3%) and age 65 and over (13.2%) are the second and third-largest special needs populations in Floyd County. With the special needs populations averaging at 10.7% of the population, Floyd County has the smallest special needs population among the surrounding four counties.

Frequently, special needs population groups overlap. As an example, 9.3% of Floyd County's population is both age 65 and over and below poverty level. The most common disability for the age 65 and over age group is ambulatory difficulty, which accounts for 26.2% of the disabilities within the age group.

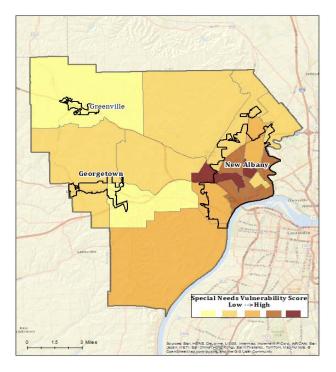
Floyd County's age 65 and over and disability groups also warrant special attention in mitigation planning. The age 65 and over population might require life-sustaining medication, electricity-operated medical equipment, and special mobility assistance. The age 65 and over population often require accessible temporary housing which can accommodate a variety of income levels. County emergency management personnel can help mitigate these vulnerabilities by participating in specialized training that focuses on the age 65 and over population and making resources available and thus empowering the public, as well as residential and healthcare facilities which serve these vulnerable populations. Examples of activities to improve emergency mitigation and preparedness for the age 65 and over population include, but are not limited to, the following:

- Evacuation exercises for communities and elder-care facilities.
- Public materials on when and how to shelter in place.
- Training for emergency shelter staff.
- Development of resource guides for seniors containing information on housing, medical, and basic needs services.
- Development of accessible media announcements and alerts.



Other factors important in mitigation planning include geographic areas with the highest vulnerability, as shown below.

Figure 4-7: Floyd County Vulnerability Score



While the vulnerability map and special needs population data are not definitive or conclusive, this information points to geographic areas and population groups that could benefit from further analysis in mitigation planning. The locations of vulnerable populations in Floyd County are based on census tracts. The scores for each tract are totaled to create the Special Needs Vulnerability Score. The score pertains to the degree of vulnerability (low to high) of the population in the tract.

#### 4.5 Economy and Industry

Following a similar trend as Indiana and the US, unemployment and poverty steadily began rising in Floyd County after 2008, but while unemployment in Indiana and the US peaked in 2011, unemployment in Floyd County reached it's highest point in 2012. During 2008, Floyd County's unemployment rate of 6.5% surpassed 6.4% in the US. As illustrated in Fugure 4-8, the unemployment rate in Floyd County was consistently lower than state and national levels from 2009 through 2013.

Figure 4-8 on the following page illustrates th key economic indicators of unemployment and poverty in Floyd County, the state, and in the US over a seven-year period ending in 2013. During the seven-year period, Floyd County's poverty rates were on average 2.64% lower than the state and national levels. Recently, the gap between Floyd County and Indiana poverty rates has been shrinking with a 3% difference in 2008, 2.7% in 2011, and 2.3% in 2013; however, the shrinking poverty gap is due to the fact that poverty in Floyd County is rising even faster than poverty rates in the state or nation.



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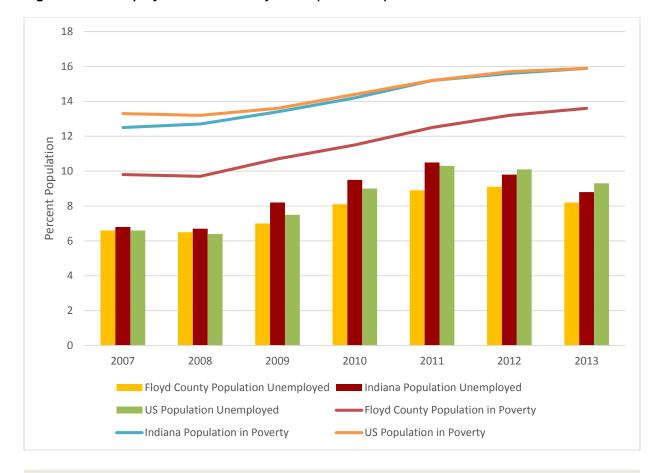


Figure 4-8: Unemployment and Poverty Rates (2007-2013)<sup>16</sup>

**Note:** unemployed data is for age 16 years and over, civilian labor force population. Poverty level includes all people whose income is below the poverty level in the past 12 months. Poverty level guidelines are issued by the US Department of Health and Human Services.

Since Floyd County's early settlement, its economic base has spread across two counties, Floyd and neighboring Clark County. For Floyd County, the county's primary economic driver is the riverfront city and county seat of New Albany. Business and industry in neighboring Clarksville and Jeffersonville in Clark County also contribute to Floyd County's economic base, just as New Albany is an economic driver for Clark County. The urban areas of these three communities merge along the Ohio River for a combined population of 101,529 according to 2010 US Census Bureau population estimates.

Although manufacturing has been an primary driver of the county's economy employing 17.7% of Floyd County's workforce, no single industry sector employs more than one-quarter of the civilian workforce (age 16 years and over), as shown in Table 4-4. The Education and healthcare services sectors employs largest share at 22.2% of the workforce. Tourism-related businesses continue to generate jobs, as well as income from sales and services with the arts, entertainment, accommodation, and food related services

<sup>&</sup>lt;sup>16</sup> US Census Bureau. American Community Survey 3-year estimates 2007-2013. Factfinder.census.gov



County Profile

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sector providing jobs for 9.6% of the county's workforce. The retail sector has the third-largest workforce, employing 4,008 or 11% of the county's civilian employed population age 16 and over.

Table 4-4: 2013 Floyd County Employment by Industry Sector 17

Industry Sector	Number of Employees	% of County Labor Force <sup>18</sup>
Agriculture, forestry, fishing and hunting, and mining	204	0.6%
Construction	2,305	6.3%
Manufacturing	6,435	17.7%
Wholesale trade	845	2.3%
Retail trade	4,008	11.0%
Transportation and warehousing, and utilities	2,063	5.7%
Information services	497	1.4%
Finance and insurance, and real estate and rental and leasing	2,368	6.5%
Professional, scientific, and management, and administrative and waste management services	3,241	8.9%
Educational services, health care and social assistance	8,087	22.2%
Arts, entertainment, and recreation, and accommodation and food services	3,502	9.6%
Other services, except public administration	1,503	4.1%
Public administration	1,301	3.6%
Civilian employed population 16 years and over	36,359	100.0%

Leading the healthcare sector and the county in number of employees is Floyd Memorial Hospital, New Albany which employs 1,700 in its workforce. The county's major employers according to number of employees in their workforces are listed in Table 4-5: Floyd County Major Employers.

<sup>&</sup>lt;sup>17</sup> US Census Bureau, 2013 5-year estimates

<sup>&</sup>lt;sup>18</sup> Workforce is the civilian employed population age 16 and over

Table 4-5: Floyd County Major Employers<sup>19</sup>

Employer (100 or More Employees)	Industry Category	Location	Number of Employees
Floyd Memorial Hospital	Hospitals	New Albany	1,700
Beach Mold & Tool Inc.	Plastics Products (mfrs)	New Albany	1,500
Indiana University Southeast	Schools-Universities & Colleges	New Albany	1,000
Samtec Inc.	Electronic Equip-Supply (mfrs)	New Albany	700
Hitachi Cable Indiana Inc.	Wire & Cable-Wholesale	New Albany	560
Discount Labels Inc.	Labels-Paper (mfrs)	New Albany	520
Fire King Security Group	Fire Protection Equipment- (mfrs)	New Albany	500
General Mills Inc.	Food Products-Wholesale	New Albany	500
Walmart Supercenter	Retail-Department Stores	New Albany	400
Humana Inc.	Healthcare-Customer Service	Greenville	373
Green Valley Care Center	Nursing & Convalescent Homes	New Albany	214
Charitable Resource Foundation	Call Centers	New Albany	200
Floyd County Coon Hunters Club	Clubs	New Albany	200
Insulated Roofing Contractors	Roofing Contractors	New Albany	200
Providence Adult Day Care	Day Care Centers-Adult	New Albany	185
Southern Indiana Rehabilitation Hospital	Rehabilitation Services	New Albany	175
Target	Retail-Department Stores	New Albany	160
Home Depot	Retail-Home Centers	New Albany	150
Rauch Inc.	Assembly & Fabricating (mfrs)	New Albany	138
Schuler Bauer Real Estate	Real Estate	New Albany	125
Volunteers of America	Social Service & Welfare Organizations	New Albany	110
Carton Craft Co.	Boxes-Paper (mfrs)	New Albany	105
Sonoco Products Co.	Packaging Containers (mfrs)	New Albany	102
Floyd County Corrections	County Gov't-Correctional Institutions	New Albany	101
Earth Exploration Co.	Retail-Internet & Catalog Shopping	New Albany	100
Applebee's	Restaurant-Full Service	New Albany	100
Autumn Woods Health Campus	Convalescent Homes	New Albany	100
Mt Tabor Elementary School	Schools	New Albany	100

Updated: 2015

<sup>&</sup>lt;sup>B</sup> Source: Indiana Department of Workforce Development Business Lookup Tool, information and data in the Business Lookup Tool from the Infogroup database©2015, data listed is for employers with 100 or more employees



Employer (100 or More Employees)	Industry Category	Location	Number of Employees
Nathaniel Scribner Middle School	Schools	New Albany	100
Product Specialties Inc	Manufacturers	New Albany	100
Sam's Food & Spirits	Restaurant-Full Service	New Albany	100
Squire Boone Village (retail)	Retail-Internet & Catalog Shopping	New Albany	100
St Jude Children's Research	Associations	New Albany	100
United Dynamics Inc. Structural	Foundation-Contractors	New Albany	100
Highland Hills Middle School	Schools	Georgetown	100

Updated: 2015

Since the 2008 Floyd County MHMP, several manufacturers in Floyd County have announced plans to expand facilities and add employees. In 2014, three New Albany manufacturers announced expansion plans that would create 50 jobs. Advance Fabricators Inc., Bruce Fox, Inc., and L&D Mail Masters Inc. currently employ more than 200 workers in the region.

Established in the mid-1970s, Advance Farbricators is a full-service engineering and fabrication company which expects to complete expansion of its current facility in New Albany Industrial Park by mid-year 2015. The manufacturer of custom recognition and brand building products Bruce Fox Inc. is expanding capacity at its McDonald Lane location over a five-year period. Bruce Fox plans to add 27 employees by 2018 to its current workforce of 97. L&D Mail Masters is expanding its operations and currently employs nearly 100 at its location on Security Parkway in New Albany.

One of Floyd County's top five major employers, Beach Mold & Tool, announced in 2015 an expansion that will add 160 jobs to its workforce by 2019. Beach Mold & Tool is constructing a new 140,000-square-foot warehouse next to its existing manufacturing facility in New Albany Industrial Park East. Launched in 1972, Beach Mold & Tool specializes in plastic injection molding and precision tools for automotive, medical and business technology manufacturers and suppliers. Beach Mold & Tool is among the top five employers with the largest workforces in Floyd County as listed in Table 4-6: Floyd County Major Employers.

In mitigation planning, it's important to consider a variety of employment characteristics, such as the proportion of employed to unemployed populations in the county. Also, the number of employees located at a business, educational institution, or facility's site is crucial to developing effective strategies for such hazard mitigation actions as evacuation and sheltering in place. In addition to the employee population, customer, patient, student, and other populations associated with businesses, schools and universities, and other facilities are important considerations in mitigation planning.

In 2013, the civilian-employed population age 16 years and over totaled 53,496 in Floyd County. Table 4-6 on the following page shows the percentage of the workforce (civilian employed population age 16 years and over) employed in various occupations.



Table 4-6: 2013 Floyd County Employment by Occupation<sup>20</sup>

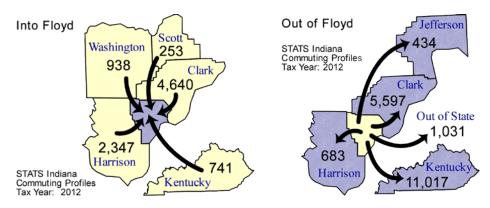
Occupation	Number of Employees	% by Occupation
Management, business, science, and arts occupations	12,179	33.5%
Service occupations	5,716	15.7%
Sales and office occupations	9,997	27.5%
Natural resources, construction, and maintenance occupations	2,876	7.9%
Production, transportation, and material moving occupations	5,591	15.4%
Civilian employed population age 16 years and over	36,359	100.0%

Along with transportation, manufacturing and production jobs accounted for 15.4% of the occupations. Jobs in management, business, science, and the arts comprise the largest share at 33.5% of the occupations in Floyd County. Sales and office occupations follow closely with a little over a quarter of the occupations in Floyd County at 27.5%.

#### 4.6 Commuting Patterns

County-to-county commuting patterns provide a gauge of the economical connectivity of neighboring communities. Figure 4-9 illustrates workforce commuting patterns in Floyd and surrounding counties.

Figure 4-9: Floyd County Inbound and Outbound Commuting Patterns<sup>21</sup>



The US Census reports that over 27% of US workers travel outside their residential county to travel to work. According to STATS Indiana 2012 data, approximately 49,772 persons live in Floyd County and work (implied resident labor force). Of these, 30,253 or 60.8% live and work in Floyd County. In 2012, the



<sup>&</sup>lt;sup>20</sup> US Census Bureau, 2013 5-year estimates

<sup>&</sup>lt;sup>21</sup> STATS Indiana, 2012

implied workforce totaled 39,913 persons<sup>22</sup>. Among the commuting workforce, 19,519 Floyd County residents work outside the county, compared to 9,660 who live in another county and work in Floyd County. County-to-county commuting patterns provide a gauge of the economical connectivity of neighboring communities.

Updated: 2015

In 2013, the average travel time to work in Floyd County was 22.5 minutes, slightly lower than the state average of 22.8 minutes, and the 24.3 minutes for commuters in the Louisville Metro MSA. Commuter safety is an important consideration in disaster mitigation and planning. Employers can help their employees prepare by encouraging the development of Commuter Emergency Management Plans, such as the template developed by FEMA. The FEMA template is available for download at http://www.fema.gov/media-library/assets/documents/90370.

#### 4.7 Transportation

Among the factors critical to both Floyd County's growth and development, as well as effective hazard mitigation planning is the transportation network. Floyd County's surface transportation network includes two railroads which provide freight service only (CSX and Norfolk Southern railroads). The Duncan Tunnel, Indiana's longest, was built in 1881 for a rail route between New Albany and Edwardsville through the steep rugged hills of Floyd's Knobs.

Floyd County roads include two interstate highways, I-64 and I-265, a national highway US-150, and state highways SR-62, SR-64, SR-111, and SR-311. According to INDOT, in 2013 Floyd County had 598.45 miles of roads with an annual traffic volume of 2,085,000 vehicles.<sup>23</sup> In 2013, interstate highways accounted for 25.75 miles and city streets totaled 351.68 miles.

The metro Louisville area, which includes Floyd County, has a well-developed network of interstate and state highways, Ohio River bridges, and state and local roads. Regionally, the Kentuckiana Regional Planning & Development Agency (KIPDA) takes the lead in facilitating a robust, forward-looking Transportation Improvement Program (TIP) for interstate as well as local-road projects. KIPDA provides a framework for prioritizing, scheduling, funding, and implementing projects. KIPDA is an association of local governments in a nine-county region of two Indiana counties (Floyd and Clark) and seven Kentucky counties providing regional planning, review and technical services in public administration, social services, transportation. KIPDA also operates community ride-sharing programs.

KIPDA's *Metropolitan Transportation Plan, Horizon 2035* in Appendix E is a planning document that reflects all surface transportation investments through the year 2035 in the Louisville/Jefferson County (KY-IN) Metropolitan Planning Area. According to KIPDA, "Transportation projects identified in the MPA are regionally significant and/or utilize federal transportation funds."

<sup>&</sup>lt;sup>23</sup> Source: INDOT Traffic Statistics 2014 Annual Average Daily Traffic (AADT) data for passenger cars and commercial vehicles.



<sup>&</sup>lt;sup>22</sup> STATS Indiana 2012

The Transportation Improvement Program (TIP) is a four-year, short-range fiscal programming document representing the first four years of KIPDA's Metropolitan Transportation Plan. The TIP also contains information about various funding sources and Federal funding requirements. Typically, the TIP is updated

Updated: 2015

Floyd County-specific projects the 2015-2018 TIP are listed below. For projects involving both Indiana counties (Clark and Floyd), refer to the KIPDA 2015-2018 TIP document in the Appendices. Floyd County Indiana 2015-2018 transportation projects include but are not limited to:

annually. The 2014 update produced the FY 2015-FY 2018 Transportation Improvement Program.

- Charlestown Road Corridor Complete Streets--Construction of sidewalks along Charlestown Road from Sunset Drive o County Line Road.
- **New Albany City-Wide Sign Replacement**--Replacement of signs to meet reflectivity requirements.
- Grant Line Road Pedway--Construction of pedestrian bicycle path and sidewalks along Grant Line Road from Beechwood Avenue to Cherokee Drive where it connects with existing pedway and sidewalk.
- **Grant Line Road**--Reconstruct Grant Line Road as a two-lane road (no additional travel lanes) from McDonald Lane south to Beechwood Avenue for a distance of 1.1 miles.
- I-64 Ohio River Bridge Rehabilitation Projects—Including repair, maintenance and painting of the Sherman Minton Bridge, maintenance and repair of the and Norfolk Southern railroad bridge.
- I- 64--Fracture critical inspections, including inspection of the Indiana approach to the Sherman Minton Bridge over the Ohio River.
- I- 64-- Pavement resurfacing from SR-62/SR-64 to the Kentucky state line.
- Signage Inventory Plan and Construction--Build a new sign inventory system, as well as upgrade
  existing warning, regulatory and guide signs to meet the US Federal Highway Administration's
  Manual on Uniform Traffic Control Devices (MUTCD) requirements through a low cost systematic
  safety improvement program.
- **Spring Street-Silver Street Intersection (New Albany)**—Safety Improvement, widen Spring Street to provide exclusive left-turn lanes. Install new signal system.
- State Street Corridor Improvements (New Albany)--Upgrade signalizations at 14 intersections along State Street from Main Street to I-265.
- Market Street/Spring Street (New Albany)--Upgrade and designate Market Street and Spring Street as two-way streets from SR-111 to State Street; also includes the two-way conversion of Elm Street, Pearl Street, and Bank Street, as well as the installation of landscaped medians, bicycle lanes, and railroad crossing improvement as well as traffic calming devices and sidewalks.



The Kentuckiana Regional Planning and Development Agency's (KIPDA) *Horizon 2035* plan is focusing on a range of transportation priorities and initiatives from relieving road traffic congestion and supporting freight movement through designated corridors and heavy haul routes, to alternate modes of transportation such as ride-sharing and pedestrian/bicycle modes.

Updated: 2015

KIPDA's ride-sharing program Ticket-to-Ride focuses on carpooling, school-pooling, bike-pooling, and vanpooling. In addition to the program's 80 vanpools currently serving Kentucky, Corydon and Madison, Indiana, service in Floyd and Clark Counties is being explored. In Clark and Floyd Counties, LifeSpan Resources provides transportation to older adults and persons with disabilities.

A growing area of interest and a high priority in transportation planning throughout the region is the pedway or bicycle and pedestrian trail system. *Horizon 2035* includes a variety of bicycle and pedestrian projects including bicycle lanes, multi-use paths, shared wide curb lanes, a signed route, bicycle parking and storage, and bicycle racks on buses.

The Ohio River Greenway, a regional planning effort by New Albany (Floyd County), Jeffersonville and Clarksville (Clark County) spans seven miles and links waterfront areas in the three communities. Plans call for connecting to Louisville's Riverwalk and trail system. In 2014, construction on a new Greenway segment in New Albany commenced and the city is working with Louisville and railroad officials on incorporating the K&I railroad bridge over the Ohio River into the segment. The K&I bridge connects to Louisville's Riverwalk. The Ohio River Greenway is a joint effort of the Ohio River Greenway Development Commission and the United States Army Corps of Engineers, Louisville District.

Among the most significant transportation projects launched since the 2008 MHMP is the Ohio River Bridges Project. The two project areas are Louisville Downtown Crossing with rehabilitation of more than 20 bridges and structures and a new I-65 bridge. The East End Crossing includes a new bridge and I-265 extension connecting the east side of Louisville, at Prospect, KY with Utica, IN in Clark County. The Downtown Crossings bridges and roads are scheduled for completion and open to traffic in December 2018 and the East End project completed and open to traffic in December 2017.

Since the 2008 MHMP, among the proposed local transportation projects is the New Albany Street Plan which was presented to the city in December 2014. The proposed plan includes organization of the downtown street network and design of all downtown streets. The plan is focusing on the city's historic core, from West 10th Street to Vincennes Avenue, from Culbertson Avenue to the Ohio River, and eastward to Silver Creek along its principal east-west corridors, and northward along State Street to Floyd Memorial Hospital.

Floyd County's transportation assets include two nationally-designated byways which as tourism, historical and cultural assets are important considerations in hazard mitigation planning. The Ohio River Scenic Byway along SR-62 in Floyd County is part of a 943-mile National Scenic Byway in Ohio, Indiana, and Illinois. Southern Indiana's 250-mile Indiana Historic Pathways Byway on SR-62 and US-150 in Floyd County was designated a National Scenic Byway in 2009.



# 4.8 Major Waterways and Watersheds

The surface water drainage of Floyd County lies within the Ohio River Basin. Floyd County crosses two watersheds, Blue-Sinking (HUC8 05140104) and Silver-Little Kentucky (HUC8 05140101).<sup>24</sup>. Both watersheds cross the states of Indiana and Kentucky. The watersheds and their HUC8 codes are listed in Table 4-7, and Floyd County's navigable waterways are listed in Table 4-8. Silver Creek is a major Ohio River tributary and forms Floyd County's eastern boundary with Clark County.

Updated: 2015

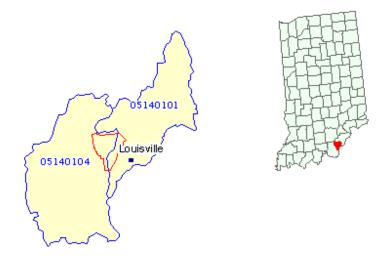
Table 4-7 Floyd County Navigable Waterways<sup>25</sup>

Navigable Waterway	Description
Ohio River	Navigable throughout the county.
Silver Creek	Navigable for 3 river miles from its junction with the Ohio River.

**Table 4-8 Floyd County Watersheds** 

Watershed	HUC8 Code
Blue-Sinking	05140104
Silver-Little Kentucky	05140101

Figure 4-8: HUC 8 Watershed of Floyd County<sup>26</sup>



The Blue-Sinking Watershed covers the western and southwestern portions of Floyd County. Eight Indiana counties and 795,000 acres are drained by the watershed. Silver-Little Kentucky Watershed drains four Indiana counties, Clark, Scott, Washington, and Floyd's eastern and southeastern regions.

<sup>&</sup>lt;sup>26</sup> US Environmental Protection Agency, Surf Your Watershed



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<sup>&</sup>lt;sup>24</sup> Source: EPA

<sup>&</sup>lt;sup>25</sup> Source: IDNR

# 4.9 Land-Use and Development Trends

Although the average farm in Floyd County is 77 acres, and far smaller than the state's average of 251 acres, the county is still largely characterized by its rural lifestyle and character, natural beauty and strong agricultural identity. More than 70% of Floyd County's 95,334.4 acres of land is assessed as agricultural, according to Floyd County and New Albany Township Assessors' data<sup>27</sup>. A significant portion of rural land though remains undeveloped, consisting of untillable or steep slope terrain, densely forested areas, and other undevelopable land. Expansive areas of open land give the county its distinctive spacious rural feel.

Updated: 2015

Residential, commercial, and industrial uses together account for nearly one-quarter of the land use in the county, according to the planning document, *Cornerstone 2005 -- Comprehensive Land Use Update*. Densely populated and residential areas are concentrated in the New Albany area, with pockets of residential development scattered throughout the county. Industrial development is primarily located in New Albany Township. Pasture and farm land is located near the waterways.

The Floyd County plan, *Cornerstone 2005 -- Comprehensive Land Use Update*, recognizes the preservation of Floyd County's rural character and natural beauty as planning priorities. According to the mediumrange plan with a 2020 time horizon, land use planning in Floyd County is based on "three principles paramount to meeting stated community values and managing anticipated growth over the next decade:"

- Preserve Open Space, farmland, natural beauty, and critical environmental areas.
- Strengthen and direct development towards existing communities
- Foster distinctive, attractive communities with a strong sense of place.

Like other Indiana counties, the number of farms and the average farm size in Floyd County have been declining since 2007. Over a six-year period ending in 2012, the average farm in the county shrunk from 86 acres to 77 acres. Total farm acreage in the county though declined slightly, from 23,997 acres in 2007 to 21,463 acres in 2012.

According to the Cornerstone land use update, 70% of the county's acreage is in agricultural land use, residential usage accounts for 51,085 acres or 23.6%, and just .4% of the land is used for industrial development. Table 4-9 on the following page lists land usage from the 2005 land use update.

Floyd County Parks are in the midst of creating a new park on Charlestown Road in New Albany Township (outside of the city jurisdiction).

<sup>&</sup>lt;sup>27</sup> Cornerstone 2005 -- Comprehensive Land Use Update



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Table 4-9 Floyd County 2005 Land Use Update<sup>28</sup>

Land Use	Acres	Total
Floyd County Land Area	95,334	
Floyd County Plan Commission land area	73,974	100%
Agricultural	51,805	70.0%
Residential	17,461	23.6%
Commercial	376	.5%
Industrial	292	.4%
Semi-Public	4,040	5.5%

The Cornerstone 2005 plan projects population growth using two scenarios. By 2020, Floyd County's population is expected to increase by 12% to 21%. The demand for residential, commercial, and industrial land is also expected to rise by 4,000 to 5,000 acres. <sup>29</sup>

Updated: 2015

Among the gateway areas which are expected to experience residential, as well as business growth and development is the Edwardsville gateway area located along US-62, the Ohio River Scenic Byway and the I-64 corridor. The Edwardsville Gateway Master Plan 2011 calls for streetscapes in the community, signage, identification of a pedestrian bikeway, and adjusting vehicular traffic circulation. The area is a key gateway to local and regional tourism resources, including the Horseshoe Southern Casino along the Ohio River in Harrison County.

In addition to the 2005 Cornerstone plan, other Floyd County-specific documents which contain land use, development and growth projections include the 2006 Floyd County Economic Development Plan. Areas which are expected to experience growth and development include SR-150/I-64, the SR-62/Edwardsville gateway, and SR-64/I-64. These areas are expected grow with businesses that serve local residents as well as highway traffic, including restaurants, gas stations, convenience stores, general-merchandise discount and big-box retailers.

The New Albany Parks and Recreation Department Master Plan 2008-2013 anticipates an 80-acre expansion of park system land with new or expanded small parks, linear greenways, and regional parks. In 2015 two new parks opened, a large sports facility, The Daisy Lane Water Park, and River Run Family Water Park.

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<sup>&</sup>lt;sup>28</sup> Floyd County and New Albany Township Assessors

<sup>&</sup>lt;sup>29</sup> Cornerstone 2005 -- Comprehensive Land Use Update

### Section

5

# **Risk Assessment**

The goal of mitigation is to reduce the future impacts of hazards including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation must be based on sound risk assessment. A risk assessment involves quantifying the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people. This assessment identifies the characteristics and potential consequences of a disaster, how much of the community could be affected by a disaster, and the impact on community assets. A risk assessment consists of three components: 1) Hazard Identification, 2) Vulnerability Assessment, and 3) Risk Analysis and Hazard Profiling.

Updated: 2015

# 5.1 Identifying Hazards

# **5.1.1 Existing Plans**

To facilitate the planning process, the planning team reviewed existing plans and data including the 2008 Flood County Multi-Hazard Mitigation Plan and the current effective FEMA Flood Insurance Flood Maps (FIRMs). The 2008 Floyd County Multi-Hazard Mitigation Plan identified the following principal hazards ranked from most to least severe:

- 1) Flooding
- 2) Tornado
- 3) Severe Storms
- 4) Winter Storms
- 5) Hazardous Material Release
- 6) Ground Failure
- 7) Fire
- 8) Earthquake

In 2015, the planning team updated the county's top hazards to:

- 1) Flooding
- 2) Tornado
- 3) Severe Storms
- 4) Hazardous Material Release
- 5) Winter Storm
- 6) Earthquake
- 7) Ground failure
- 8) Fire



# 5.1.2 Historical Hazards Records

To assist the planning team, historical storm-event data from the past seven years was compiled from the National Climatic Data Center (NCDC). The NCDC Storm Events Database includes events related to tornadoes, severe storms, floods, winter storms, droughts, and extreme temperatures. NCDC records are estimates of damage reported to the National Weather Service from various local, state, and federal sources. These estimates, however, are often preliminary in nature and may not match the final assessment of economic and property losses related to given weather events. The NCDC data included 107 reported events (Figure 5-1) in Floyd County between January 1, 2008 and January 31, 2014.

Updated: 2015

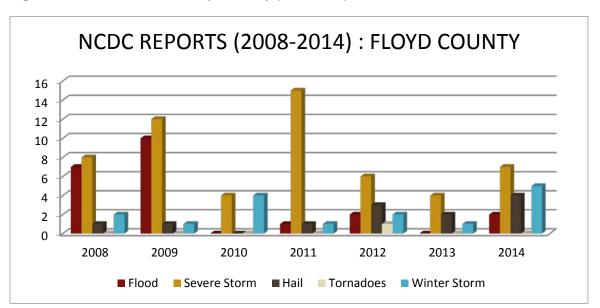


Figure 5-1: NCDC Events in Floyd County (2008-2014)

# 5.1.3 Hazard-Ranking Methodology

During Meeting #1, held on February 27, 2015, the planning team reviewed historical hazard information and participated in a risk analysis exercise to rank hazards by community and severity of risk. The hazards are ranked using the Calculated Priority Risk Index (CPRI) criteria. The CPRI is calculated through four categories: (1) probability, (2) impact, (3) warning time, and (4) duration.

The team calculated the probability rating (Highly Likely, Likely, Possible, or Unlikely) of each hazard, based on the number of events that have occurred in the county since the previous Floyd County Multi-Hazard Mitigation Plan. Throughout the planning process, the MHMP team had the opportunity to update the NCDC data with more accurate local information. For example, the NCDC records often list the locations of hazards, such as floods, under the county, not accounting for how the individual communities were affected. In such situations, the probability rating assigned to the county was applied to all jurisdictions within the county.



Team consensus also was important in determining the probability of hazards not recorded by NCDC, for example, dam and levee failure, earthquakes, and hazardous materials spills. The probabilities for these hazardous events were determined by the planning team's estimation, derived from local experience and records, of the number of events that have occurred since the previous plan.

Updated: 2015

After improving the NCDC data with additional local data, the team determined each hazard's potential impact on the communities (Catastrophic, Critical, Limited, or Negligible). The impact rating captures the potential magnitude and severity of the hazard. Table 5-1 lists the criteria used to determine both probability and impact.

Table 5-1: Guidelines for Determining Probability and Impact

PROBABILITY	IMPACT
Highly Likely	Catastrophic
	>Incident results multiple fatalities
	>Damage to critical infrastructure and property over a large area of community
10+ events in 10 years	>Up to 50% of community facilities are damaged, destroyed, or inaccessible
	>Complete shutdown of community facilities and loss of services for more than 2 weeks; community operations must be cancelled or relocated for an extended period of time.
Likely	Critical
	>Incident results in a number of minor injuries, limited serious injuries
	>Damage to critical infrastructure and property over a moderate area of community
6-9 events in 10 years	>Up to 25% of community facilities are damaged, destroyed, or inaccessible
	>Complete shutdown of community facilities and loss of services for 2 weeks; some community operations must be cancelled or relocated temporarily
Possible	Limited
	>Incident results in a number of minor injuries, limited serious injuries, and few, if any, fatalities
	>Damage to critical infrastructure and property over a small area of community
2-5 events in 10 years	>Up to 25% of community facilities are damaged, destroyed, or inaccessible
	>Complete shutdown of community facilities and loss of services for 1-2 weeks; some community operations must be cancelled or relocated temporarily
Unlikely	Negligible
	>Incident results in only minor injuries and no fatalities
	>Damage contained to a single incident scene and immediate area
0-1 events in 10 years	>Less than 10% of community facilities are damaged, destroyed, or inaccessible
	>Complete shutdown of community facilities and loss of services for 24 hours of less; community operations may be cancelled or relocated temporarily

The overall hazard risk is calculated determined by weighting each CPRI category, and then combining them for a total value. Table 5-2 lists the CPRI categories and assigned weight values.

Table 5-2: CPRI Categories and Weighting

.45 Probability	.30 Magnitude/Severity	.15 Warning Time	.10 Duration
4 - Highly Likely	4 - Catastrophic	4 - Less Than 6 Hours	4 - More Than 1 Week
3 - Likely	3 - Critical	3 - 6-12 Hours	3 - Less Than 1 Week
2 - Possible	2 - Limited	2 - 12-24 Hours	2 - Less Than 1 Day
1 - Unlikely	1 - Negligible	1 - 24+ Hours	1 - Less Than 6 Hours

Updated: 2015

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CPRI VALUE = [(PROBABILITY X .45) + (MAGNITUDE X .30) + (WARNING TIME X .15) + (DURATION X .10)]

Table 5-3 identifies the CPRI values for each hazard facing Floyd County.

Table 5-3: Floyd County CPRI and Hazard Ranking

Hazard	Probability	Magnitude/ Severity	Time Warning	Duration	Risk Index Priority
Flood	4 Highly Likely	2 Limited	3 6-12 Hours	3 - Less Than 1 Week	3.15
Tornado	4 Highly Likely	2 Limited	4 < 6 Hours	1 - Less Than 6 Hours	3.1
Thunderstorms/ High Winds/Hail/Lightning	4 Highly Likely	2 Limited	4 < 6 Hours	1 - Less Than 6 Hours	3.1
Transportation Hazardous Material Release	4 Highly Likely	1 Negligible	4 < 6 Hours	2 - Less Than 1 Day	3
Winter Storms	4 Highly Likely	1 Negligible	3 6-12 Hours	3 - Less Than 1 Week	2.95
Earthquake	2 Possible	2 Limited	4 < 6 Hours	2 - Less Than 1 Day	2.3
Ground Failure/ Landslide	2 Possible	1 Negligible	4 < 6 Hours	2 - Less Than 1 Day	2.1
Fire	2 Possible	1 Negligible	4 < 6 Hours	1 - Less Than 6 Hours	2
Droughts/ Extreme Heat	2 Possible	1 Negligible	1 24+ Hours	4 - More Than 1 Week	1.85

The planning teams plotted each hazard on a risk grid according to probability (y-axis) and potential impact (x-axis). The following figure describes the methodology of plotting hazards by risk. In this example, an earthquake has a medium probability of occurring but a significant potential impact, while a tornado has a high probability of occurring in a given year with a significant potential impact.

Figure 5-2: Risk Grid Methodology

#### **PROBABILITY**

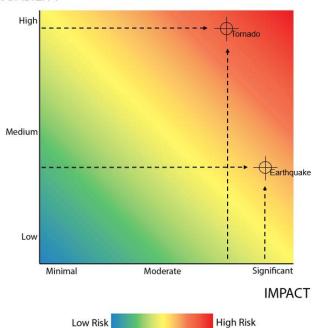
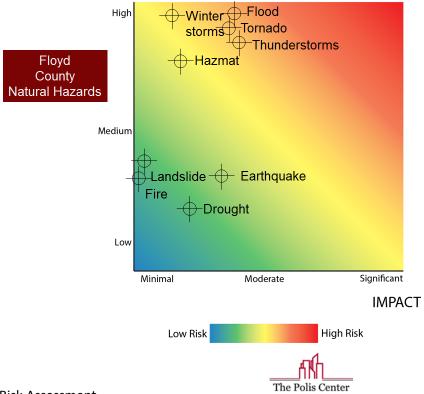


Figure 5-2 illustrates the risk grid methodology. In this example, a tornado has a high probability (y-axis) and a significant impact (x-axis), so overall; Indiana is at high risk for a tornado.

Floyd County listed flooding, tornadoes, hazardous material release and winter storms as the highest-risk disasters. Figure 5-3 illustrates the county's risk for each hazard.

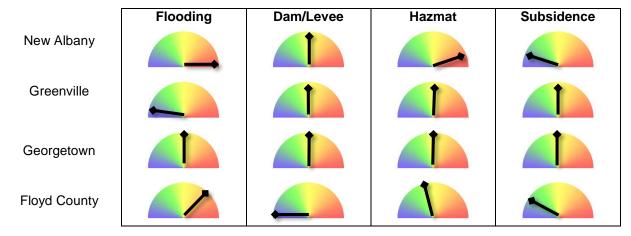
Figure 5-3: Floyd County Risk Matrix

#### **PROBABILITY**



While some hazards are widespread and will impact communities similarly, e.g. winter storms, others are localized leaving certain communities at greater risk than others. For instance, New Albany is located on the Ohio River and Georgetown is located along the Georgetown Creek. As a result, these locations are more vulnerable to flooding than some of the other communities. The following diagrams illustrate each community's risk to flooding, dam/levee failure, hazmat incidents, and ground subsidence.

Figure 5-4: Community Risk to Flooding and Hazmat Events



# 5.1.4 GIS and Hazus-MH Modeling

FEMA's Pre-Disaster Mitigation (PDM) program is designed to provide assistance to local communities to develop and implement their hazard mitigation plan, thereby reducing risk to property and lives. The initial multi-hazard mitigation plan (MHMP) for Floyd County, Indiana was submitted to FEMA and approved in 2008. Existing Hazus-MH technology was used in the development of the vulnerability assessment for flooding and earthquakes. With the implementation of new technology and locally available parcel datasets, more accurate results are now available. Multi-hazard mitigation plan updates may document significant variances from the original MHMP.

For this analysis, Hazus-MH generated a combination of site-specific (flood) and aggregated loss (earthquake) estimates. Aggregate inventory loss estimates, which include building stock analysis, are based upon the assumption that building stock is evenly distributed across census blocks/tracts. With this in mind, total losses tend to be more reliable over larger geographic areas than for individual census blocks/tracts. Site-specific analysis is based upon loss estimations for individual structures. For flooding, analysis of site-specific structures takes into account the depth of water in relation to the structure.

Hazus-MH also takes into account the actual dollar exposure to the structure for the costs of building reconstruction, content, and inventory. Damages, however, are based upon the assumption that each structure will fall into a structural class, and structures in each class will respond in a similar fashion to a specific depth of flooding. Site-specific analysis also is based upon a point location rather than a polygon; therefore the model does not account for the percentage of a building that is inundated.

It is important to note that Hazus-MH is not intended to be a substitute for detailed engineering studies. Rather, it is intended to serve as a planning aid for communities interested in assessing their risk to flood,



earthquake, and hurricane-related hazards. This documentation does not provide full details on the processes and procedures completed in the development of this project. It is only intended to highlight the major steps that were followed during the project.

Updated: 2015

# 5.2 Assessing Vulnerability

The Indiana Department of Homeland Security, through IndianaMap, provided parcel boundaries to The Polis Center, and the Indiana Department of Local Government and Finance provided the Floyd County assessor records. Polis revised the Hazus-MH default data tables to reflect these updates prior to performing the risk assessment in order to improve the accuracy of the model predictions.

The default Hazus-MH data has been updated as follows:

- The Hazus-MH general building stock (to include building count, building square footage, content
  and structure exposure), Hazus-MH critical facilities, and Hazus-MH essential facilities have been
  updated based on the most recent available data sources. Hazus-MH critical and essential point
  facilities have been reviewed, revised as necessary, and approved by local subject matter experts.
- The essential facility updates (schools, medical care facilities, fire stations, police stations, and EOCs) have been applied to the Hazus-MH model data. Hazus-MH reports of essential facility losses reflect updated data.

# 5.2.1 Identify Facilities

**CRITICAL FACILITIES** are buildings that are deemed economically or socially viable to the county. Floyd County has the following categories of critical facilities.

- Transportation Systems 2 airports, 1 railroad, 1 port facilities necessary for transport of people and resources including airports, highways, railways, and waterways.
- Lifeline Utility Systems 9 wastewater treatment plants, 3 potable water systems, 45 communications facilities vital to public health and safety including potable water, wastewater, oil, natural gas, electric power, and communication systems.
- High Potential Loss Facilities 10 dams failure or mis-operation may have significant physical, social, and/or economic impact to neighboring community including nuclear power plants, high hazard dams, and military installations.
- Hazardous Material Facilities 44 hazardous materials facilities involved in the production, storage, and/or transport of corrosives, explosives, flammable materials, radioactive materials, and toxins.

Floyd County's critical facilities are listed and mapped in Appendix C.



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**ESSENTIAL FACILITIES** are defined as those that are vital to the county in the event of a hazard. These include emergency operations centers, police departments, fire stations, schools, and care facilities. Essential facilities are a subset of critical facilities.

Table 5-4 identifies the essential facilities that were verified, added or updated for the analysis. Floyd County's essential facilities are listed and mapped in Appendix C.

Table 5-4: Essential Facilities of Floyd County

Category	Number of Facilities
Care Facilities	50
Emergency Operations Centers	1
Fire Stations	14
Police Stations	4
Schools	23
Total	92

# 5.2.2 Building Replacement Costs

The total building exposure for Floyd County is identified in Table 5-5 along with the estimated number of buildings within each occupancy class. These counts and costs were derived from the county assessor and parcel data.

**Table 5-5: Building Exposure** 

General Occupancy	Estimated Total Buildings	Total Building Exposure (\$)
Agricultural	850	\$145,305,473
Commercial	1,161	\$600,923,703
Education	30	\$39,381,515
Government	70	\$149,732,712
Industrial	249	\$292,024,593
Religious/Non-Profit	305	\$266,397,576
Residential	26,486	\$4,576,101,358
Total	29,151	\$6,069,866,930

# 5.3 Profiling Hazards

# 5.3.1 Tornadoes

Tornadoes can occur at any time during the day or night and within any month of the year. The unpredictability of tornadoes makes them one of Indiana's most dangerous hazards. Their extreme winds are violently destructive when they touch down in the region's developed and populated areas. Current estimates place the maximum potential velocity of tornados at about 300 miles per hour, but higher and lower values can occur. A wind velocity of 200 miles an hour will result in a wind pressure of 102.4 pounds per square foot of surface area—a load that exceeds the tolerance limits of most buildings.

Updated: 2015

Tornadoes are defined as violently-rotating columns of air extending from thunderstorms to the ground. Funnel clouds are rotating columns of air not in contact with the ground; however, the violently-rotating column of air can reach the ground very quickly and become a tornado. If the funnel cloud picks up and blows debris, it has reached the ground and is a tornado. Tornadoes are classified according to the Enhanced Fujita tornado intensity scale shown in Table 5-6.

Table 5-6: Enhanced Fujita Tornado Rating<sup>30</sup>

Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
EF0 Gale	65-85 mph	6-17 yards	0.3-0.9 miles	Light damage, some damage to chimneys, branches broken, sign boards damaged, shallow-rooted trees blown over.
FE1 Moderate	86-110 mph	18-55 yards	1.0-3.1 miles	Moderate damage, roof surfaces peeled off, mobile homes pushed off foundations, attached garages damaged.
EF2 Significant	111-135 mph	56-175 yards	3.2-9.9 miles	Considerable damage, entire roofs torn from frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted.
EF3 Severe	136-165 mph	176-566 yards	10-31 miles	Severe damage, walls torn from well- constructed houses, trains overturned, most trees in forests uprooted, heavy cars thrown about.
EF4 Devastating	166-200 mph	0.3-0.9 miles	32-99 miles	Complete damage, well-constructed houses leveled, structures with weak foundations blown off for some distance, large missiles generated.
EF5 Incredible	Over 200 mph	1.0-3.1 miles	100-315 miles	Foundations swept clean, automobiles become missiles and thrown for 100 yards or more, steel-reinforced concrete structures badly damaged.

<sup>&</sup>lt;sup>30</sup> Source: NOAA Storm Prediction Center, <a href="http://www.srh.noaa.gov">http://www.srh.noaa.gov</a>



### **Previous Occurrences for Tornadoes**

There has been one tornado reported to NCDC in Floyd County since January 2008 and a total of 8 in the past 50 years. In January of 2012, a cold front swept southeast of the Ohio River during the early afternoon hours. Unseasonably warm and moist air fueled a squall line that moved from southeast Missouri, through southern Illinois and ultimately into southern Indiana. An EF -1 tornado with estimated 95-100 mph winds touched down in Floyd Knobs causing approximately 10,000 dollars in damage. NCDC reported tornado activity in Floyd County is documented in Table 5-7 and Figure 5-5 below.

Updated: 2015

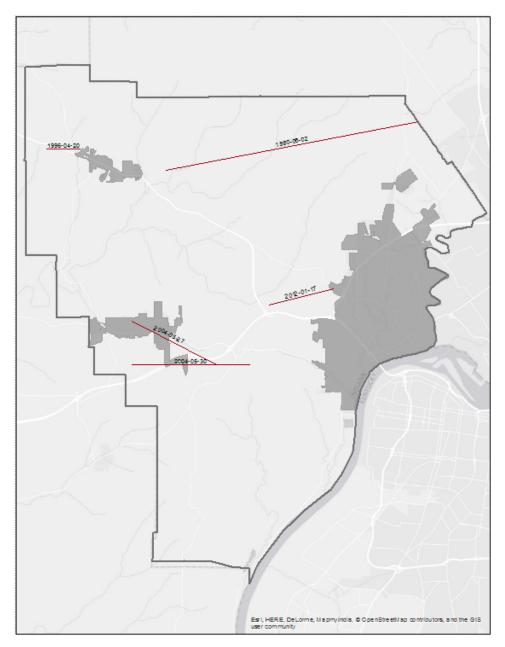
#### New Albany Tornado- March 23, 1917

In March of 1917, the city of New Albany experienced an F4 tornado that devastated the city killing 47 and injuring more than 300. The storm began around 3pm on March 28, 1917 with blankets of rain that hid the presence of any funnel cloud or tornado. The tornado moved in an almost straight path east-northeast through the North side of New Albany for 3 and ½ miles when it traveled over the Ohio River and into Kentucky. More than 300 homes were destroyed leaving 2500 people homeless and doing more than 1 and ½ million dollars in damage.

Table 5-7: Floyd County NCDC-Reported Tornadoes - 20 Years

Location or County	Date	F-Scale	Deaths	Injuries	Property Damage	Crop Damage
Floyd	6/2/1990	F3	0	7	\$2,500,000	\$0
Floyd	6/6/1990	F0	0	0	\$3,000	\$0
Floyd	5/14/1995	N/A	0	0	\$0	\$0
New Albany	5/18/1995	N/A	0	0	\$0	\$0
Greenville	4/20/1996	F2	0	1	\$250,000	\$0
Georgetown	5/27/2004	F1	0	0	\$500,000	\$0
Georgetown	5/30/2004	F0	0	0	\$0	\$0
Floyd Knobs	1/17/2012	F1	0	0	\$10,000	\$0

**Figure 5-5: Floyd County Tornado Tracks** 



# **Geographic Location for Tornado Hazard**

The entire county has the same risk for tornadoes because they can occur at any location.

#### **Hazard Extent for Tornadoes**

The historical tornadoes generally moved from west to east across the county. The extent of the hazard varies in terms of the extent of the path and the wind speed. Tornadoes can occur at any location within the county.



#### **Risk Identification for Tornadoes**



Based on historical information, the probability of a tornado in Floyd County is high and the potential impact of a tornado is significant; therefore the overall risk of a tornado in Floyd County is high.

Updated: 2015

### **Vulnerability Analysis for Tornadoes**

Tornadoes can occur within any area in the county; therefore the entire county population and all buildings are vulnerable to tornadoes. To accommodate this risk, this plan will consider all buildings within the county as vulnerable.

#### **Essential and Critical Facilities**

All essential and critical facilities are vulnerable to tornadoes. These facilities will encounter many of the same impacts as any other building within the jurisdiction. The impacts will vary, based on the magnitude of the tornado, but can include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, and loss of facility functionality (e.g., a damaged police station will no longer be able to serve the community).

### **Building Inventory**

The same risks to facilities are shared by other buildings within the county. The impacts can include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, and loss of building function (e.g., damaged home will no longer be habitable causing residents to seek shelter).

#### Infrastructure

During a tornado, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. Because the county's entire infrastructure is equally vulnerable, it is important to emphasize that many of these structures could become damaged during a tornado. The potential impacts to these structures include broken, failed, or impassable roadways, broken or failed utility lines (e.g., loss of power or gas to community), and railway failure from broken or impassable railways. Bridges could fail or become impassable, causing risk to traffic.

#### GIS Tornado Analysis

#### 2008 Tornado Analysis

For the 2008 MHMP, an F4 tornado was modeled running in the south part of Floyd County through Floyd Knobs and New Albany. The analysis estimated that 1549 buildings (primarily residential) would be damaged with losses totaling \$256 million (within the .3 mile buffer zone).



The following analysis is an example scenario to gauge the anticipated impacts of a tornado in the county in terms of numbers and types of buildings and infrastructure.

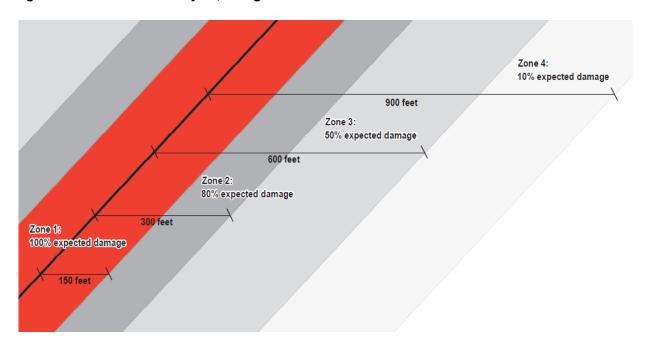
GIS overlay modeling was used to determine the potential impacts of an F4 tornado. The analysis used a hypothetical F4 tornado path. The modeled path ran for over 4.5 miles travelling through the center of New Albany. The selected widths were modeled after a recreation of the Fujita-Scale guidelines based on conceptual wind speeds, path widths, and path lengths. There is no guarantee that every tornado will fit exactly into one of these six categories. Table 5-8 depicts tornado damage curves as well as path widths.

Table 5-8: Tornado Path Widths and Damage Curves

Enhanced Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF5	2,400	100%
EF4	1,800	100%
EF3	1,200	80%
EF2	600	50%
EF1	300	10%

Within any given tornado path there are degrees of damage. The most intense damage occurs within the center of the damage path with a decreasing amount of damage away from the center of the path. This natural process was modeled in GIS by adding damage zones around the hypothetical tornado path. Figure 5-6 and Table 5-9 describe the zone analysis.

Figure 5-6: F4 Tornado Analysis, Using GIS Buffers





Once the hypothetical route is digitized on a map, several buffers are created to model the damage functions within each zone.

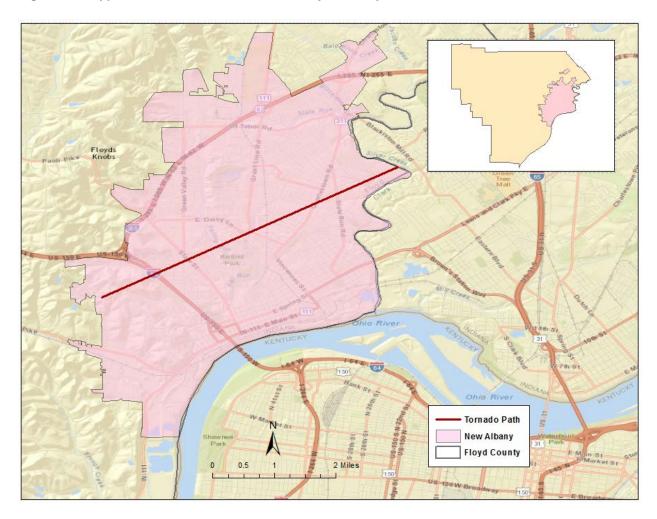
An F4 tornado has four damage zones. Total devastation is likely to occur within 150 feet of the tornado path (the darker-colored Zone 1). The outer buffer is 900 feet from the tornado path (the lightest colored Zone 4), within buildings will be damaged by approximately 10%.

Table 5-9: F4 Tornado Zones and Damage Curves

Fujita Scale	Zone	Buffer (feet)	Damage Curve
F-4	4	600-900	10%
F-4	3	300-600	50%
F-4	2	150-300	80%
F-4	1	0-150	100%

The hypothetical tornado path is depicted in Figure 5-7 and the damage curve buffers are in Figure 5-8.

Figure 5-7: Hypothetical F4 Tornado Path in Floyd County





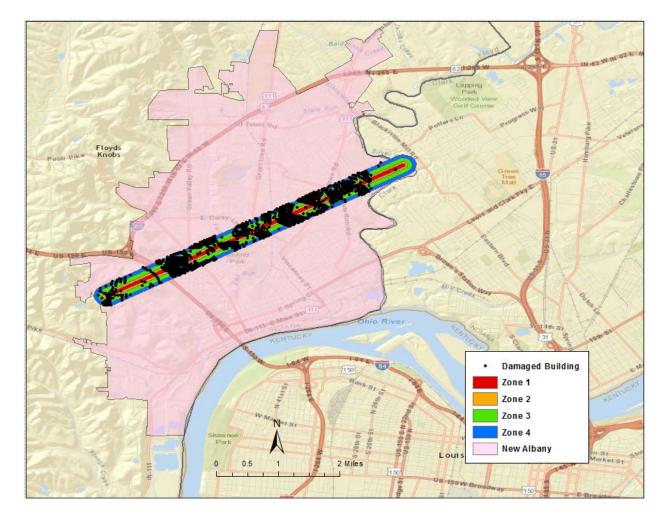


Figure 5-8: Modeled F4 Tornado Damage Buffers in Floyd County

The results of the analysis are depicted in Table 5-10. The GIS analysis estimates 1549 buildings could be damaged. The estimated potential building losses would be \$256 million. The building losses are an estimate of building costs multiplied by the percentages of damage. The overlay was performed against parcels provided by Floyd County (through IDHS and IndianaMap) that were joined with Assessor records showing property improvement.

The Assessor records often do not distinguish parcels by occupancy class when the parcels are not taxable; therefore, the total number of buildings and the building replacement costs for government, religious/non-profit, and education may be underestimated.

Table 5-10: Estimated Building Losses by Occupancy Type

General Occupancy	Buildings Damaged	Building Losses (\$)
Agricultural	1	\$272,600
Commercial	72	\$30,636,453
Government	7	\$97,217,546
Industrial	21	\$15,144,952
Religious	22	\$5,532,876
Residential	1,426	\$107,552,168
Total:	1,549	\$256,356,595

Updated: 2015

# **Essential Facility Damage**

Damaged Essential Facilities				
New Albany Fire Station #5				
Villages at Historic Silvercrest The				
Caretenders				
Fresenius Medical Care Floyd County				
Floyd Memorial Hospital and Health Services				
Floyd Memorial Home Health Services				
Floyd County WIC Program				
Lincoln Hills of New Albany				
Fairmont Elementary School				
Slate Run Elementary School				

# Future Development Trends and Vulnerability to Future Assets/Infrastructure for Tornado Hazard

Due to the unpredictability of this hazard, all buildings and infrastructure in Floyd County are at risk of damage including temporary or permanent loss of function. For tornadoes, it is not possible to isolate specific essential or non-essential facilities that would be more or less likely to be located in a tornado impact zone.

### 5.3.2 Flood Hazard

Flooding is a significant natural hazard throughout the United States. The type, magnitude, and severity of flooding are functions of the amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry of the catchment, and flow dynamics and conditions in and along the river channel. Floods in Floyd County can be classified as one of two types: Flash floods or riverine floods. Both types of floods are common in Indiana.

Updated: 2015

Flash floods generally occur in the upper parts of drainage basins and are generally characterized by periods of intense rainfall over a short duration. These floods arise with very little warning and often result in locally intense damage, and sometimes loss of life, due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of rushing water can upend a person; another 18 inches might carry off a car. Generally, flash floods cause damage over relatively localized areas, but they can be quite severe in the areas in which they occur. Urban flooding is a type of flash flood. Urban flooding involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Flash floods can occur at any time of the year in Indiana, but they are most common in the spring and summer months.

Riverine floods refer to floods on large rivers at locations with large upstream catchments. Riverine floods are typically associated with precipitation events that are of relatively long duration and occur over large areas. Flooding on small tributary streams may be limited, but the contribution of increased runoff may result in a large flood downstream. The lag time between precipitation and time of the flood peak is much longer for riverine floods than for flash floods, generally providing ample warning for people to move to safe locations and, to some extent, secure some property against damage. Riverine flooding on the large rivers of Indiana generally occurs during either the spring or summer.

#### **Previous Occurrences for Flooding**

The NCDC database reported 17 flood events in Floyd County since 2008. In April 2014, series of convective episodes along a stationary boundary brought repeated heavy rains to Southern Indiana. Widespread 36-hour rainfall totals exceeded 5 inches across southern Indiana. This rain event led to flooding in New Albany that resulted in \$10,000 in damages.



Table 5-11: Floyd County NCDC-Reported Flood Events (2008-2014)

Location	Date	Туре	Death	Injuries	Property Damage	Crop Damage
Edwardsville	3/18/2008	Flash Flood	0	0	\$ -	\$ -
New Albany	4/4/2008	Flood	0	0	\$ -	\$ -
New Albany	6/26/2009	Flash Flood	0	0	\$ -	\$ -
Floyds Knobs	6/26/2009	Flash Flood	0	0	\$ -	\$ -
New Albany	8/4/2009	Flash Flood	0	0	\$ -	\$ -
New Albany	8/4/2009	Flash Flood	0	0	\$ -	\$ -
New Albany	8/4/2009	Flash Flood	0	0	\$ -	\$ -
Edwardsville	8/4/2009	Flash Flood	0	0	\$ -	\$ -
Edwardsville	8/10/2009	Flash Flood	0	0	\$ -	\$ -
Georgetown	9/20/2009	Flash Flood	0	0	\$ -	\$ -
New Albany	9/20/2009	Flash Flood	0	0	\$ -	\$ -
New Albany	10/9/2009	Flash Flood	0	0	\$ -	\$ -
Floyds Knobs	4/23/2011	Flood	0	0	\$ -	\$ -
Blackiston Mill	5/29/2012	Flash Flood	0	0	\$ -	\$ -
New Albany	9/5/2012	Flood	0	0	\$ -	\$ -
Parkwood	4/4/2014	Flash Flood	0	0	\$ -	\$ -
New Albany	4/4/2014	Flash Flood	0	0	\$10,000	\$ -

Updated: 2015

### **Geographic Location for Flooding**

Most riverine flooding occurs in the spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Severe thunderstorms may cause flooding during the summer or fall, but tend to be localized.

Flash floods, brief heavy flows in small streams of normally dry creek beds, also occur within the county. Flash flooding is typically characterized by high-velocity water, often carrying large amounts of debris. Urban flooding involves the overflow of storm drain systems and is typically the result of inadequate drainage following heavy rainfall or rapid snowmelt.

In Floyd County, New Albany has the greatest overall exposure to flooding with 303 residential units in the 1% annual chance flood risk area (AKA 100 year floodplain). There are 11 residential units located within the floodplain in Georgetown; and 0 within the floodplain at Greenville.



## **Hazard Extent for Flooding**

The Federal Emergency Management Agency (FEMA) provided the Digital Flood Insurance Rate Map (DFIRM) that identifies studied streams. The Special Flood Hazard Area (SFHA), which represents the modeling of the 1%-annual-chance flood, was used in the analysis to identify specific stream reaches for analysis.

Updated: 2015

Flood hazard scenarios were modeled using GIS analysis and Hazus-MH. The existing DFIRM maps were used to identify the areas of study. Planning team input and a review of historical information provided additional information on specific flood events.

#### **Risk Identification for Flood Hazard**



Based on historical information, the probability of a flood is high, and the potential impact of a flood is significant; therefore the overall risk of a flood in Floyd County is high.

### **Vulnerability Analysis**

#### 2008 Flood Analysis

For the 2008 MHMP, a Hazus-MH analysis of the 100-year flood was modeled. That analysis estimated that 334 buildings would be damaged with losses totaling \$83.9 million. Better data collected for the 2015 plan update resulted in a more accurate estimation of damage, which is described in the following section.

The planning team analyzed vulnerability to flooding with an enhanced Hazus-MH analysis and an analysis of community participation in the National Flood Insurance Program (NFIP). It is important to note that the losses to buildings, particularly essential facilities and state-owned properties, extend beyond physical damage. The economic and social impacts associated with loss of governmental, public safety, and health care infrastructures are far more significant for a community. When assessing the cost of building construction, it is important for government agencies to consider these impacts.

#### Hazus-MH Analysis

Hazus-MH was used to generate a flood depth grid for a 100-year return period based upon the DFIRM boundary and a 1/3 ArcSecond DEM provided by the Indiana Geological Survey. Hazus-MH was then used to perform a user-defined facility analysis of Floyd County. This was accomplished by creating points representing building locations that were generated from IDLGF-provided assessor data linked to parcel data provided by the county (through IDHS and IndianaMap). These data were then analyzed to determine the depth of water at the location of each building point and then related to depth damage curves to determine the building losses for each structure.



Hazus-MH estimates the 1%-annual-chance flood (AKA 100-year flood) would damage 597 buildings

Updated: 2015

county-wide at a cost of \$67.6 million. In the modeled scenario, New Albany sustained the most damage with 508 buildings damaged at a cost exceeding \$137 million. The total estimated numbers and cost of damaged buildings by community are given in Tables 5-12 and 5-13. Figure 5-9 depicts the Floyd County buildings that fall within the 1% annual chance flood risk area (AKA 100-year floodplain). Figures 5-10 through 5-12 highlight damaged buildings within the floodplain areas in each flood prone jurisdiction.

Table 5-12: Number of Buildings Damaged by Community and Occupancy

	Total			Building Occupancy Class				
Community	Buildings Damaged	Agriculture	Commercial	Education	Govt	Industrial	Religious	Residential
Floyd County (Unincorporated)	97	19	6	0	1	4	1	66
New Albany	508	15	43	0	8	15	8	419
Greenville	0	0	0	0	0	0	0	0
Georgetown	41	9	2	1	0	0	1	28

Table 5-13: Cost of Buildings Damaged by Community and Occupancy

	Total \$	Building Occupancy Class						
Community	Losses	Agriculture	Commercial	Education	Govt	Industrial	Religious	Residential
Floyd County (Unincorporated)	\$15,793,610	\$3,126,170	\$1,654,470	\$0	\$1,770	\$1,219,400	\$979,400	\$8,812,400
New Albany	\$137,161,961	\$2,761,580	\$40,002,760	\$0	\$960,150	\$3,651,764	\$6,764,260	\$60,546,409
Greenville	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Georgetown	\$6,997,118	\$1,170,840	\$455,430	\$245,120	\$0	\$0	\$179,330	\$4,496,398

Critical

Critic

Damaged Buildings 100 Year DFIRM Boundary

Figure 5-9: Floyd County Buildings in Floodplain (1% Annual Chance Flood)



Figure 5-10: New Albany Flood-Prone Areas (1% Annual Chance Flood)

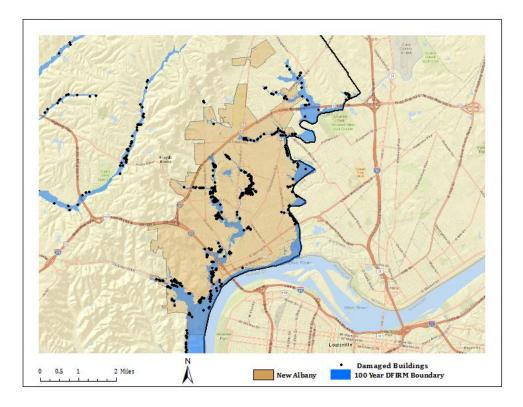
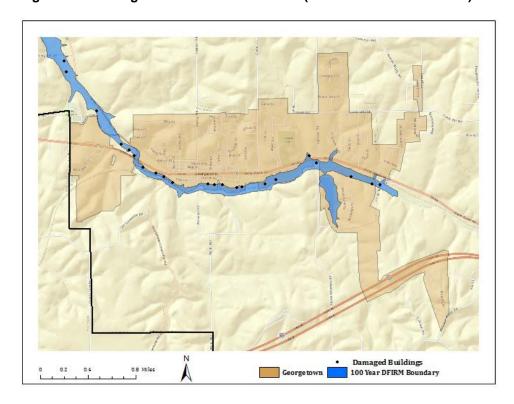


Figure 5-11: Georgetown Flood-Prone Areas (1% Annual Chance Flood)





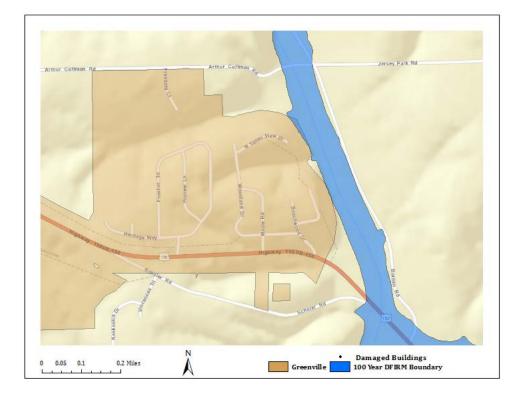


Figure 5-12: Greenville Flood-Prone Areas (1% Annual Chance Flood)

## **Hazus Analysis of Essential Facilities**

An essential facility will encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility and loss of facility functionality (e.g. a damaged police station will no longer be able to serve the community).

Hazus estimates that five essential facilities in Floyd County could sustain damage. Four care facilities including the Christine Kleinert Institute and Surgery Center, Kort Rehab at Home, Blue River Services INC., and Lincoln Hills of New Albany located around New Albany are within the flood boundary. In addition, New Chapel Fire Station #2 located just outside of New Albany is also located within the flood boundary as shown in Figure 5-13 through 5-16.



Figure 5-13: Flood-Prone Essential Facilities



Figure 5-14: Flood-Prone Essential Facilities





Figure 5-15: Flood-Prone Essential Facilities



Figure 5-16: Flood-Prone Essential Facilities





# Overlay Analysis of Critical Facilities

A critical facility will encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility and loss of facility functionality (e.g. a damaged waste water facility will no longer be able to serve the community).

Updated: 2015

As shown in Figures 5-17 through 5-19, the results of the overlay analysis indicate that a total of five critical facilities in Floyd County could sustain damage. In New Albany, the waste water treatment plant, and two hazardous materials sites are in the flood boundary. Also in New Albany, the Transmontaigne which includes a rail facility, a hazmat facility and an electric facility is located within the flood boundary.

Figure 5-17: Flood-Prone Critical Facilities





Figure 5-18 Flood-Prone Critical Facilities



Figure 5-19 Flood-Prone Waste Water Facility





### Flood Dangers to Vulnerable Populations

Certain populations require special attention in the event of a disaster. As previously noted, New Albany has a high number of flood prone buildings. This community is also located in an area with a high Special Needs Vulnerability Score. This particular census tract has a relatively higher proportion of the population with special needs when compared to the rest of the county. The tract which includes New Albany has 10.2% of its residents living in poverty and 14.5% aged 65 years or older. These populations will need particular attention in the event of a disaster. Figure 5-20 compares the 1% Annual Chance Flood Area with those areas of the county which have a higher Special Needs Vulnerability Scores.

Special Needs Vulnerability Score Low----> High 1% Chance Annual Flood

Figure 5-20: Flood Dangers to Special Needs/Vulnerable Populations

Risk Assessment The Polis Center 61

# **NFIP Analysis**

FEMA provides annual funding through the National Flood Insurance Fund (NFIF) to reduce the risk of flood damage to existing buildings and infrastructure. These grants include Flood Mitigation Assistance (FMA), Repetitive Flood Claims (RFC), and the Severe Repetitive Loss (SRC) program. The long-term goal is to significantly reduce or eliminate claims under the NFIP through mitigation activities.

Updated: 2015

FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the National Flood Insurance Program (NFIP), which has suffered flood loss damage on two occasions during a 10-year period that ends on the date of the second loss, in which the cost to repair the flood damage is 25% of the market value of the structure at the time of each flood loss.

The Indiana State NFIP Coordinator and FEMA Region V were contacted to determine the location of repetitive loss structures. FEMA Region V reported 12 unmitigated repetitive loss structures in Floyd County: 3 in the unincorporated county, 8 in New Albany, and 1 in Georgetown. Table 5-14 lists repetitives losses and other claims data by community.

Table 5-14: NFIP Claims Data

Community	% of Community in SFHA	Number of Insurance Claims/Losses	Value of Insurance Claims/Pymts	Number Repetitive Losses	Repetitive Losses in Dollars
Floyd County Unincorporated	7.58%	44	\$773,769.00	5	\$260,261
New Albany	16.36%	124	\$1,789,775.00	9	\$645,521
Georgetown	6.05%	4	\$6,151.00	1	\$6,151

Table 5-15: Comparison of Building Exposure to Insured Buildings

Community	Buildings in 100-yr Floodplain	Exposure of Buildings in Floodplain	Number of Policies	Insured Value of Policies	Approximate Percent of Buildings Insured	Percent of Exposure Insured
Floyd County Unincorporated	96	\$15,745,370	75	\$14,748,500	78%	94%
New Albany	508	\$114,416,923	180	\$32,272,200	35%	29%
Georgetown	41	\$6,999,668	3	\$313,500	7%	4%

Table 5-16 identifies each community and the date each participant joined the NFIP.

Table 5-16: Additional Information on Communities Participating in the NFIP

Community	Participation Date
Floyd County	1/27/1978
New Albany	2/15/1974
Georgetown	12/28/1973

The NFIP'S Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions, meeting the three goals of the CRS: 1) reduce flood losses; 2) facilitate accurate insurance rating; and 3) promote the awareness of flood insurance. Floyd County and its incorporated areas do not participate in the CRS.

Updated: 2015

# Future Development Trends and Vulnerability to Future Assets/Infrastructure for Flooding

The Floyd County Comprehensive Plan discourages new construction in the defined floodplains through the implementation of floodplain ordinances. The Comprehensive Plan also encourages the conservation of natural areas including wetlands and floodplains by limiting development in those areas.

# 5.3.3 Earthquake Hazard

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free, causing the ground to shake.

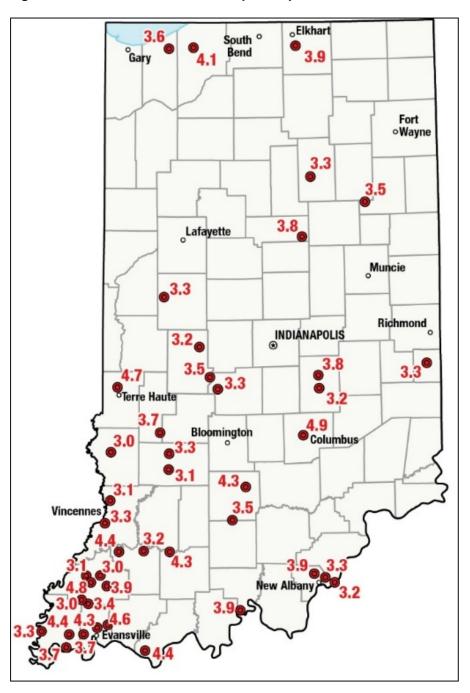
Ninety-five percent of earthquakes occur at the plate boundaries; however, some earthquakes occur in the middle of plates, as is the case for seismic zones in the Midwestern United States. The most seismically active area in the Central United States is referred to as the New Madrid Seismic Zone. Scientists have learned that the New Madrid fault system may not be the only fault system in the central US capable of producing damaging earthquakes. The Wabash Valley Fault System in Indiana shows evidence of large earthquakes in its geologic history, and there may be other currently unidentified faults that could produce strong earthquakes. Figure 5-21 depicts Indiana's historical earthquake epicenters. Tables 5-17 and 5-18 provide guidance on how to interpret the modified Mercalli intensity scale.

Ground shaking from strong earthquakes can collapse buildings and bridges; disrupt gas, electric, and communication (e.g. phone, cable, Internet) services; and sometimes trigger landslides, flash floods, and fires. Buildings with foundations resting on unconsolidated landfill and other unstable soil, and trailers or homes not tied to their foundations are at risk because they can be shaken off their mountings during an



earthquake. When an earthquake occurs in a populated area, it may cause deaths, injuries, and extensive property damage.

Figure 5-21: Indiana Historical Earthquake Epicenters<sup>31</sup>





<sup>&</sup>lt;sup>31</sup> Indiana Geological Survey

**Table 5-17: Abbreviated Modified Mercalli Intensity Scale** 

Mercalli Intensity	Description
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
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. Vibrations similar to the passing of a truck. Duration estimated.
IV	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	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	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
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.
Х	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Updated: 2015

Table 5-18: Earthquake Magnitude vs. Modified Mercalli Intensity Scale

Earthquake Magnitude	Typical Maximum Modified Mercalli Intensity
1.0 - 3.0	I
3.0 - 3.9	11 - 111
4.0 - 4.9	IV - V
5.0 - 5.9	VI - VII
6.0 - 6.9	VII - IX
7.0 and higher	VIII or higher



## **Previous Occurrences for Earthquake Hazard**

At least 43 earthquakes, M3.0 or greater, have occurred in Indiana since 1817. The last such event was a M3.1 centered just north of Vincennes on May 10, 2010. A M3.8 earthquake occurred near Kokomo in December later that same year with approximately 10,390 individuals submitting felt reports to the USGS.

Updated: 2015

### **Geographic Location for Earthquake Hazard**

The majority of seismic activity in Indiana occurs in the southwestern region of the state. Earthquakes originate just across the boundary in Illinois and can be felt in Indiana. The M5.2 Mt. Carmel event on April 19, 2008 was felt by residents in Indiana, Kentucky, and many more states across the central US.

### **Hazard Extent for Earthquake Hazard**

The extent of an earthquake is countywide. One of the most critical sources of information that is required for accurate assessment of earthquake risk is soils data. Soils along rivers and other bodies of water have higher water tables and higher sand content. As a result, these areas are more susceptible to liquefaction and land shaking. Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking as a result of water filling the space between individual soil particles. This can cause buildings to tilt or sink into the ground, slope failures, lateral spreading, surface subsidence, ground cracking, and sand blows.

### **Risk Identification for Earthquake Hazard**



Based on historical information, the probability of an earthquake is medium, and the potential impact of an earthquake is moderate; therefore the overall risk of an earthquake in Floyd County is medium.

#### **Vulnerability Analysis for Earthquake Hazard**

This hazard could impact the entire jurisdiction equally; therefore the entire county's population and all buildings are vulnerable to an earthquake and can expect the same impacts within the affected area. To accommodate this risk, this plan will consider all buildings within the county as vulnerable.

#### **Facilities**

All facilities are vulnerable to earthquakes. These would encounter many of the same impacts as any other building within the county. These impacts include structural failure and loss of facility functionality (e.g., a damaged police station will no longer be able to serve the community). Names and locations of essential and critical facilities, as well as community assets, are in Appendix C.



## **Building Inventory**

Impacts similar to those discussed for the facilities can be expected for the other buildings within the county. These impacts include structural failure and loss of building function that could result in indirect impacts (e.g., damaged homes will no longer be habitable, causing residents to seek shelter).

Updated: 2015

#### Infrastructure

During an earthquake, the types of infrastructure that could be impacted include roadways, runways, utility lines/pipes, railroads, and bridges. Because an extensive inventory of the infrastructure is not available to this plan, it is important to emphasize that any number of these structures could become damaged in the event of an earthquake. The impacts to these structures include broken, failed, or impassable roadways and runways; broken or failed utility lines (e.g., loss of power or gas to community); and railway failure from broken or impassable railways. Bridges also could fail or become impassable, causing traffic risks and ports could be damaged which would limit the shipment of goods. Typical scenarios are described to gauge the anticipated impacts of earthquakes in the county in terms of numbers and types of buildings and infrastructure.

#### Hazus-MH Earthquake Analysis

#### 2008 Earthquake Analysis

For the 2008 MHMP, a Hazus-MH analysis of several earthquake scenarios including a 7.1 magnitude earthquake centered in the Wabash Valley, a 5.5 magnitude earthquake with the epicenter in Floyd County, a 500-year return period event, and an annualized earthquake loss. Similar to the flood and tornado models, the 2015 analyses revealed more accurate building damages and losses because the quality and completion of data collected was significantly better than in 2008.

The Polis team reviewed existing geological information and recommendations for earthquake scenarios and ran three modeling scenarios—two deterministic and one probabilistic.

The deterministic scenarios included a 7.7-moment magnitude epicenter along the New Madrid fault zone and a 7.1-moment magnitude epicenter along the Wabash Valley Fault zone.

Additionally, the analysis included a probabilistic scenario. This type of scenario is based on ground-shaking parameters derived from US Geological Survey probabilistic seismic hazard curves. The probabilistic scenario was a 500-year return period scenario. This analysis evaluates the average impacts of a multitude of possible earthquake epicenters with a magnitude that would be typical of that expected for a 500-year return period. These analysis options were chosen because they are useful for prioritization of seismic reduction measures and for simulating mitigation strategies.

Modeling a deterministic scenario requires user input for a variety of parameters. One of the most critical sources of information required for accurate assessment of earthquake risk is soils data. Fortunately, a National Earthquake Hazards Reduction Program (NEHRP) soil classification map exists for Indiana. NEHRP soil classifications portray the degree of shear-wave amplification that can occur during ground shaking.



The Indiana Geological Survey supplied the soils map used for the analysis. FEMA provided a map for liquefaction potential that was used in the Hazus-MH analysis.

Updated: 2015

An earthquake depth of 10.0 kilometers was selected for all deterministic scenarios based on input from IGS. Hazus-MH also requires the user to define an attenuation function unless ground motion maps are supplied. Because Indiana has experienced smaller earthquakes, the decision was made to use the Central Eastern United States (CEUS) attenuation function.

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The probabilistic scenario was based on ground-shaking parameters derived from US Geological Survey probabilistic seismic hazard curves. The probabilistic scenario was a 500-year return period scenario. This analysis evaluates the average impacts of a multitude of possible earthquake epicenters with a magnitude that would be typical of that expected for a 500-year return period. These analysis options were chosen because they are useful for prioritization of seismic reduction measures and for simulating mitigation strategies.

## Results for 7.7 Magnitude- New Madrid, Kentucky Earthquake Scenario

Hazus estimates that the damages incurred from the 7.7 magnitude New Madrid earthquake scenario would be county-wide in scope.

## **Building Damages**

Hazus estimates that 60 buildings in Floyd County would be at least moderately damaged. This is less than 1% of all the buildings. The model also estimates that none of the buildings would be damaged beyod repair.

The model estimates that the aggregate building related losses would total over \$7.01 million; 3% of the estimated losses would be related to the business interruption of the region. Residential occupancies would sustain the largest level of loss – 67% of the total.

Table 5-19: New Madrid Scenario - Building Damage by Occupancy

	None		Slight		Moderat	te	Extensiv	е	Complete	е
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	839	2.96	10	1.39	1	1.47	0	0.76	0	5.42
Commercial	1,123	3.96	35	4.91	3	4.62	0	1.56	0	10.67
Education	29	0.10	1	0.12	0	0.08	0	0.01	0	0.00
Government	68	0.24	2	0.24	0	0.22	0	0.11	0	0.00
Industrial	241	0.85	7	1.03	1	0.96	0	0.60	0	8.08
Other Residential	1,368	4.82	50	7.03	7	12.62	0	15.25	0	6.54
Religion	296	1.04	9	1.19	1	1.25	0	0.48	0	0.84
Single Family	24,411	86.03	601	84.09	46	78.78	2	81.23	0	68.45
Total	28,376		715		59		2		0	

Updated: 2015

Table 5-20: New Madrid Scenario - Building Losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Los	ses						
	Wage	0.00	0.00	0.01	0.00	0.00	0.01
	Capital-Related	0.00	0.00	0.00	0.00	0.00	0.01
	Rental	0.03	0.01	0.01	0.00	0.00	0.05
	Relocation	0.08	0.01	0.01	0.00	0.01	0.11
	Subtotal	0.12	0.02	0.02	0.01	0.01	0.18
Capital Stoc	k Losses						
	Structural	0.59	0.08	0.10	0.05	0.08	0.91
	Non_Structural	2.63	0.64	0.58	0.28	0.50	4.62
	Content	0.48	0.12	0.28	0.18	0.23	1.29
	Inventory	0.00	0.00	0.00	0.01	0.00	0.01
	Subtotal	3.70	0.85	0.96	0.51	0.81	6.83
	Total	3.81	0.86	0.98	0.52	0.83	7.01

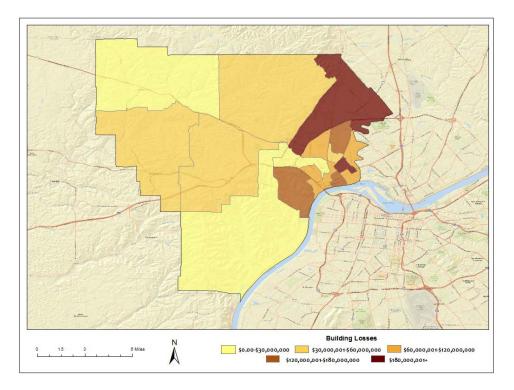


Figure 5-22: New Madrid Scenario - Building Losses in Thousands of Dollars

### **Essential Facility Damage**

Before the earthquake, the county had an estimated 2,674 medical care facility beds available for use. On the day of the earthquake, the model estimates that 2,189 beds (82.0%) would be available for use by patients already in these facilities along with those injured by the earthquake. After one week, 90.0% of the beds would likely be back in service.

Table 5-21: New Madrid Scenario - Essential Facility Damage

		# Facilities						
Classification	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1				
Hospitals	50	0	0	50				
Schools	23	0	0	23				
EOCs	1	0	0	1				
PoliceStations	4	0	0	4				
FireStations	14	0	0	14				



## Results for 6.8 Magnitude- Mt. Carmel, Illinois Earthquake Scenario

Hazus estimates that the damages incurred from the 6.8 magnitude Mt. Carmel earthquake scenario would be county-wide in scope.

Updated: 2015

#### **Building Damages**

Hazus estimates that about 114 buildings in Floyd County would be at least moderately damaged. This is less than 1% of all the buildings. The model also estimates that none of the buildings would be damaged beyod repair.

The model estimates that the aggregate building related losses would total \$12.8 million; 3% of the estimated losses would be related to the business interruption of the region. Residential occupancies would sustain the largest level of loss – over 67% of the total.

Table 5-22: Mt. Carmel Scenario - Building Damage by Occupancy

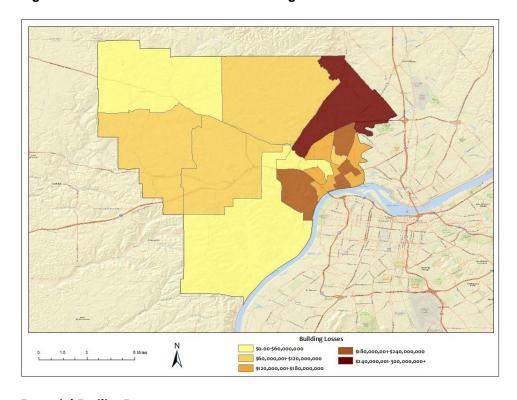
	None		Slight		Moderat	te	Extensiv	е	Complete	• )	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	
Agriculture	831	2.98	18	1.47	2	1.44	0	0.77	0	2.29	
Commercial	1,097	3.94	58	4.79	5	4.93	0	2.32	0	6.41	
Education	28	0.10	1	0.12	0	0.09	0	0.01	0	0.00	
Government	67	0.24	3	0.24	0	0.23	0	0.13	0	0.20	
Industrial	235	0.85	13	1.04	1	1.02	0	0.64	0	3.47	
Other Residential	1,332	4.79	80	6.64	13	11.37	1	15.81	0	16.32	
Religion	290	1.04	14	1.16	1	1.25	0	0.64	0	0.58	
Single Family	23,947	86.05	1,022	84.53	88	79.68	3	79.67	0	70.72	
Total	27,827		1,209		110		4		0		

Table 5-23: Mt. Carmel Scenario - Building Losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Los	ses						
	Wage	0.00	0.00	0.01	0.00	0.01	0.02
	Capital-Related	0.00	0.00	0.01	0.00	0.00	0.01
	Rental	0.06	0.01	0.01	0.00	0.00	0.09
	Relocation	0.16	0.02	0.01	0.01	0.01	0.21
	Subtotal	0.22	0.03	0.05	0.01	0.02	0.33
Capital Sto	k Losses						
	Structural	1.05	0.15	0.18	0.09	0.15	1.62
	Non_Structural	4.81	1.16	1.03	0.52	0.88	8.40
	Content	0.94	0.23	0.50	0.35	0.41	2.43
	Inventory	0.00	0.00	0.00	0.02	0.01	0.03
	Subtotal	6.81	1.54	1.71	0.97	1.45	12.47
	Total	7.03	1.57	1.75	0.98	1.47	12.80

Updated: 2015

Figure 5-23: Mt. Carmel Scenario - Building Losses in Thousands of Dollars



## **Essential Facility Damage**

Before the earthquake, the county had an estimated 2,674 medical care facility beds available for use. On the day of the earthquake, the model estimates that 2,038 beds (76.0%) would be available for use by patients already in these facilities along with those injured by the earthquake. After one week, 87.0% of the beds would likely be back in service.



Table 5-24: Mt. Carmel Scenario - Essential Facility Damage

		# Facilities				
Classification	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1		
Hospitals	50	0	0	50		
Schools	23	0	0	23		
EOCs	1	0	0	1		
PoliceStations	4	0	0	4		
FireStations	14	0	0	14		

### Results for Probabilistic 500-Year Earthquake Scenario

The results of the probabilistic 500-year analysis are depicted in Tables 5-25 and 5-26 and Figure 5-24. Hazus-MH estimates that approximately 45 buildings will be at least moderately damaged. This is less than 1% of all the buildings. The model also estimates that none of the buildings would be damaged beyod repair.

Updated: 2015

The model estimates that the aggregate building-related losses would total over \$6.87 million; 2% of the estimated losses would be related to the business interruption of the region. Residential occupancies would sustain the largest level of loss – 65% of the total.

Table 5-25: Probabilistic 500-Year Scenario-Damage Counts by Building Occupancy

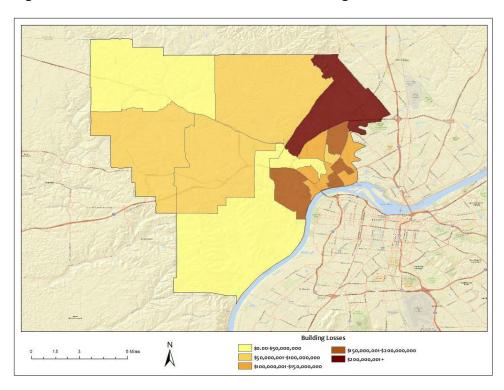
	None		Slight		Moderat	te	Extensiv	'e	Complet	e )	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	
Agriculture	842	2.95	7	1.23	0	1.04	0	0.34	0	0.00	
Commercial	1,130	3.96	29	4.94	2	4.58	0	1.57	0	21.11	
Education	29	0.10	1	0.11	0	0.08	0	0.01	0	0.00	
Government	68	0.24	1	0.25	0	0.24	0	0.12	0	0.00	
Industrial	242	0.85	6	1.06	0	1.01	0	0.67	0	32.60	
Other Residential	1,378	4.83	42	7.06	6	12.99	0	17.66	0	5.12	
Religion	298	1.04	7	1.15	0	1.02	0	0.37	0	0.00	
Single Family	24,522	86.01	503	84.21	35	79.05	1	79.25	0	41.17	
Total	28,509		597		44		2		0		

Table 5-26: Probabilistic 500-Year Scenario-Building Losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Los	ses						
	Wage	0.00	0.00	0.01	0.00	0.00	0.01
	Capital-Related	0.00	0.00	0.00	0.00	0.00	0.00
	Rental	0.02	0.01	0.01	0.00	0.00	0.04
	Relocation	0.06	0.01	0.00	0.00	0.00	0.08
	Subtotal	0.08	0.01	0.02	0.01	0.01	0.13
Capital Stoo	ck Losses						
	Structural	0.47	0.07	0.08	0.04	0.06	0.73
	Non_Structural	2.47	0.63	0.58	0.30	0.50	4.49
	Content	0.57	0.14	0.32	0.21	0.27	1.51
	Inventory	0.00	0.00	0.00	0.01	0.01	0.02
	Subtotal	3.52	0.85	0.98	0.56	0.83	6.74
	Total	3.60	0.86	1.00	0.57	0.84	6.87

Updated: 2015

Figure 5-24: Probabilistic 500-Year Scenario-Building Losses in Thousands of Dollars



### **Essential Facility Damage**

Before the earthquake, the county had an estimated 2,674 medical care facility beds available for use. On the day of the earthquake, the model estimates that 2,217 beds (83.0%) would be available for use by patients already in these facilities along with those injured by the earthquake. After one week, 91.0% of the beds would likely be back in service.



Table 5-27: Probabilistic 500-Year Scenario - Essential Facility Damage

		# Facilities						
Classification	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1				
Hospitals	50	0	0	50				
Schools	23	0	0	23				
EOCs	1	0	0	1				
PoliceStations	4	0	0	4				
FireStations	14	0	0	14				

# Future Development Trends and Vulnerability to Future Assets/Infrastructure for Earthquake Hazard

Updated: 2015

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Due to the unpredictability of this hazard, all buildings and infrastructure in Floyd County are at risk of damage including temporary or permanent loss of function. For earthquakes, non-reinforced structures are more vulnerable to damages. New development vulnerability will be minimal due to new construction codes coupled with the low earthquake probability.

## 5.3.4 Severe Thunderstorm Hazard

Severe thunderstorms are defined as thunderstorms with one or more of the following characteristics: strong winds, large damaging hail, or frequent lightning. Severe thunderstorms most frequently occur in Indiana during the spring and summer but can occur any month of the year at any time of day. A severe thunderstorm's impacts can be localized or can be widespread in nature. A thunderstorm is classified as severe when it meets one or more of the following criteria.

- Hail of diameter 0.75 inches or higher
- Frequent and dangerous lightning
- Wind speeds equal to or greater than 58 miles an hour

#### Hail

Hail is a product of a strong thunderstorm. Hail usually falls near the center of a storm; however, strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, resulting in damage in other areas near the storm. Hailstones range from pea-sized to baseball-sized, but hailstones larger than softballs have been reported on rare occasions.

There have been 12 NCDC reported hail events in Floyd County since January 1, 2008 and these are outlined in Table 5-28.

Table 5-28: Floyd County Hail Events (2008-June 1, 2014)

Location	Date	Diameter
Floyds Knobs	2/6/2008	1.00 in.
New Albany	4/10/2009	0.75 in.
Blackiston Mill	4/9/2011	0.75 in.
Greenville	3/2/2012	1.00 in.
Blackiston Mill	3/14/2012	1.00 in.
Georgetown	4/28/2012	1.75 in.
Floyds Knobs	4/16/2013	1.00 in.
Georgetown	4/17/2013	1.00 in.
Floyds Knobs	5/10/2014	1.00 in.
St Joseph	5/21/2014	1.00 in.
New Albany	5/21/2014	1.25 in.
Floyds Knobs	10/6/2014	1.00 in.

## Lightning

Lightning is a discharge of atmospheric electricity from a thunderstorm. It can travel at speeds up to 140,000 mph and reach temperatures approaching 54,000 degrees. Lightning often is perceived as a minor hazard; in reality, lightning causes damage too many structures and kills, or severely injures numerous people in the United States. It is estimated that there are 16 million lightning storms worldwide every year.

There have been 1 lightning occurance reported to the NCDC in Floyd County since January 2008. This occurance occurred on August 10, 2009 in Floyds Knobs and caused \$15,000 in property damages.

## **Severe Winds (Straight-Line Winds)**

Straight-line winds from thunderstorms are a fairly common occurrence across Indiana. Straight-line winds can cause damage to homes, businesses, power lines, and agricultural areas, and may require temporary sheltering of individuals who are without power for extended periods of time.

#### **Previous Occurrences for Thunderstorm Hazards**

The NCDC database reported 41 severe storms in Floyd County since January 1, 2008 as shown in Figure 5-26 A storm system in February 28, 2011 contained winds in excess of 60 MPH. This storm caused \$5,000 in property damage when a Wal-Mart in New Albany sustained roof damage from the winds of this storm.



Updated: 2015

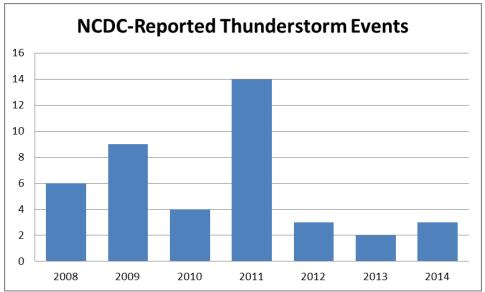


Figure 5-25: Floyd County Storms Events Reported to NCDC (2008-Jan 1, 2015)

## **Geographic Location for Thunderstorm Hazard**

The entire county has the same risk for occurrence of thunderstorms. They can occur at any location within the county.

#### Hazard Extent for Thunderstorm Hazard

The extent of the historical thunderstorms varies in terms of the extent of the storm, the wind speed, and the size of hail stones. Thunderstorms can occur at any location within the county.

#### Risk Identification for Thunderstorm Hazard



Based on historical information, the probability of severe thunderstorms is high, and the potential impact is moderate; therefore the overall risk of a severe thunderstorm in Floyd County is medium to high.

## **Vulnerability Analysis for Thunderstorm Hazard**

Severe thunderstorms are an equally distributed threat across the entire jurisdiction; therefore the entire county's population and all buildings are vulnerable to a severe thunderstorm, and the same impacts can be expected within the affected area. This plan will therefore consider all buildings within the county as vulnerable.



<sup>\*</sup> NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. These estimates, however, are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event.

#### **Facilities**

All facilities are vulnerable to severe thunderstorms. These facilities will encounter many of the same impacts as any other building within the jurisdiction including structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of building functionality (e.g., a damaged police station will no longer be able to serve the community). Names and locations of critical and essential facilities, as well as community assets, are provided in Appendix C.

Updated: 2015

## **Building Inventory**

Impacts similar to those discussed for the facilities can be expected for the other buildings within the county. These impacts include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of building functionality (e.g., a damaged home will no longer be habitable, causing residents to seek shelter).

#### Infrastructure

During a severe thunderstorm, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. Because the county's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these structures could become damaged during a severe thunderstorm. The impacts to these structures include impassable roadways; broken or failed utility lines (e.g., loss of power or gas to community); or railway failure from broken or impassable railways. Bridges could fail or become impassable, causing risk to traffic.

# Future Development Trends and Vulnerability to Future Assets/Infrastructure for Thunderstorm Hazard

Due to the unpredictability of this hazard, all new buildings and infrastructure in Floyd County are at risk of damage including temporary or permanent loss of function. For hailstorms, thunderstorms, and windstorms, it is not possible to isolate specific essential or non-essential facilities that would be more or less vulnerable to damages. NCDC data for the past ten years reports property damage of \$117,000, or an average of \$11,700 in property damage per year. These totals derive mainly from storms in 2006 and 2007. It should also be noted that property owners often do not report damages caused by the events recorded by the NCDC. Therefore, damages to property should be expected to be significantly higher than the stated range.

### 5.3.5 Winter Storm Hazard

Severe winter weather consists of various forms of precipitation and strong weather conditions. This may include one or more of the following: freezing rain, sleet, heavy snow, blizzards, icy roadways, extreme low temperatures, and strong winds. These conditions can cause human-health risks such as frostbite, hypothermia, and death.



## Ice (Glazing) and Sleet Storms

Ice or sleet, even in the smallest quantities, can result in hazardous driving conditions and can be a significant cause of property damage. Sleet can be easily identified as frozen raindrops. Sleet does not stick to trees and wires. The most damaging winter storms in Indiana have been ice storms. Ice storms are the result of cold rain that freezes on contact with objects having a temperature below freezing. Ice storms occur when moisture-laden gulf air converges with the northern jet stream, causing strong winds and heavy precipitation. This precipitation takes the form of freezing rain, coating power lines, communication lines, and trees with heavy ice. The winds then will cause the overburdened limbs and cables to snap, leaving large sectors of the population without power, heat, or communication. Falling trees and limbs also can cause building damage during an ice storm. In the past few decades, numerous ice-storm events have occurred in Indiana.

Updated: 2015

#### **Snowstorms**

Significant snowstorms are characterized by the rapid accumulation of snow, often accompanied by high winds, cold temperatures, and low visibility. A blizzard is categorized as a snowstorm with winds of 35 miles an hour or greater and/or visibility of less than one-quarter mile for three or more hours. The strong winds during a blizzard blow about falling and already existing snow, creating poor visibility and impassable roadways. Blizzards have the potential to result in property damage.

Indiana has been struck repeatedly by blizzards. Blizzard conditions not only cause power outages and loss of communication but can also make transportation difficult. The blowing of snow can reduce visibility to less than one-quarter mile, and the resulting disorientation makes even travel by foot dangerous, if not deadly.

#### **Previous Occurrences for Winter-Storm Hazard**

Winter weather hazards are prevalent natural events that can be expected to occur every winter in Indiana. The winter of 2013-2014 ranked among the coldest on record throughout the Midwest. The National Weather Service reported this season as "one of the coldest and snowiest winter seasons on record and certainly one of the most extreme winter seasons in several decades." NOAA's National Climatic Data Center stated that the period from December 2013 through February 2014 was the 34<sup>th</sup> coldest for the contiguous 48 states since 1895.

Table 5-29 documents the NCDC reported winter storm events since 2008. While there have been relatively few winter storms over this timeframe, it should be noted that precipitation types vary significantly throughout the course of each storm. Each type of precipitation carries its own dangers which are combined when multiple types occur in an individual storm.



Table 5-29: Floyd County Winter Storm Events (2008-January 31, 2014)

Date	Туре	Deaths	Injuries	Property Damage	Crop Damage
2/11/2008	Winter Storm	0	0	\$0	\$0
2/21/2008	Ice Storm	0	0	\$0	\$0
3/7/2008	Heavy Snow	0	0	\$0	\$0
1/27/2009	Winter Storm	0	0	\$0	\$0
2/6/2010	Heavy Snow	0	0	\$0	\$0
2/9/2010	Heavy Snow	0	0	\$0	\$0
2/10/2010	Cold/wind Chill	1	0	\$0	\$0
2/15/2010	Heavy Snow	0	0	\$0	\$0
12/15/2010	Ice Storm	0	0	\$0	\$0
1/20/2011	Heavy Snow	0	0	\$0	\$0
3/4/2012	Heavy Snow	0	0	\$0	\$0
12/28/2012	Heavy Snow	0	0	\$0	\$0
12/6/2013	Heavy Snow	0	0	\$0	\$0
1/21/2014	Heavy Snow	0	0	\$0	\$0

Updated: 2015

## **Geographic Location for Winter-Storm Hazard**

Severe winter storms are regional in nature. Most of the NCDC data are calculated regionally or in some cases statewide.

#### Hazard Extent for Winter-Storm Hazard

The extent of the historical winter storms varies in terms of storm location, temperature, and ice or snowfall. A severe winter storm can occur anywhere in the jurisdiction.

#### Risk Identification for Winter-Storm Hazard



Based on historical information, the probability of a winter storm is high, and the potential impact is moderate; therefore the overall risk of a winter storm in Floyd County is medium to high.

### **Vulnerability Analysis for Winter-Storm Hazard**

Winter-storm impacts are distributed equally across the entire jurisdiction; therefore the entire county is vulnerable to a winter storm and can expect the same impacts within the affected area.

#### **Facilities**

All facilities are vulnerable to a winter storm. These facilities will encounter many of the same impacts as other buildings within the jurisdiction including loss of gas or electricity from broken or damaged utility



lines, damaged or impassable roads and railways, broken water pipes, and roof collapse from heavy snow. Names and locations of critical and essential facilities, as well as community assets are in Appendix C.

Updated: 2015

## **Building Inventory**

The impacts to other buildings within the county are similar to the damages expected to the facilities. These include loss of gas or electricity from broken or damaged utility lines, damaged or impassable roads and railways, broken water pipes, and roof collapse from heavy snow.

#### Infrastructure

During a winter storm, the types of infrastructure that could be impacted include roadways, runways, utility lines/pipes, railroads and bridges. Since the county's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these structures could become damaged during a winter storm. Potential impacts include broken gas and/or electricity lines or damaged utility lines, damaged or impassable roads, runways and railways, and broken water pipes. Additionally, aerial navigations aids in Floyd County, including components of the national air traffic control system, could be damaged or destroyed possibly impacting nationwide air travel.

# Future Development Trends and Vulnerability to Future Assets/Infrastructure for Winter Storm Hazard

Because winter-storm events are regional in nature, future development will be impacted equally across the county. Any new development within the county will remain vulnerable to these events.

#### 5.3.6 Hazardous Materials Release Hazard

The state of Indiana has numerous active transportation lines that run through many of its counties. Active railways transport harmful and volatile substances between our borders every day. The transportation of chemicals and substances along interstate routes is commonplace in Indiana. The rural areas of Indiana have considerable agricultural commerce, creating a demand for fertilizers, herbicides, and pesticides to be transported along rural roads. Finally, Indiana is bordered by two major rivers and Lake Michigan. Barges transport chemicals and substances along these waterways daily. These factors increase the chance of hazardous material releases and spills throughout the State of Indiana.

The release or spill of certain substances can cause an explosion. Explosions result from the ignition of volatile products such as petroleum products, natural and other flammable gases, hazardous materials/chemicals, dust, and bombs. An explosion potentially can cause death, injury, and property damage. In addition, a fire routinely follows an explosion, which may cause further damage and inhibit emergency response. Emergency response may require fire, safety/law enforcement, search and rescue, and hazardous materials units.

#### **Previous Occurrences for Hazardous Materials Hazard**

Floyd County has not experienced a significantly large-scale hazardous material incident at a fixed site or during transport resulting in multiple deaths or serious injuries. However, there have been minor releases



that have put local firefighters, hazardous materials teams, emergency management, and local law enforcement into action to try to stabilize these incidents and prevent or lessen harm to Floyd County residents.

Updated: 2015

## **Geographic Location for Hazardous Materials Hazard**

Interstate 64 is the main east/west route in the county and runs along the southern edge of New Albany. State Road 62 also travels in a general east/west line and passes through the southern portion of Floyd County. Other east/west routes are State Road 64 which runs through Georgetown and US 150 which cuts across the northern part of the county through Galena. State Road 111 travels in a general north/south direction and passes through New Albany.

There is one major rail line that runs through Floyd County. A Southern Railway line runs east and west in the southern part of Floyd County along State rd. 64. There are also some minor lines that run through the eastern part of Floyd County.

In addition, Floyd County is bordered on the south by the Ohio River with the city of New Albany sitting on the river's edge. The US Army Corps of Engineers reported that over 200 tons of cargo were shipped on the Ohio River in 2012, including many toxic chemicals and other hazardous substances.

#### **Hazard Extent for Hazardous Materials Hazard**

The extent of the hazardous material (referred to as hazmat) hazard varies in terms of the quantity of material being transported as well as the specific content of the container.

#### **Risk Identification for Hazardous Materials Release**



Based on historical information, the probability of a hazardous materials release is medium to high, and the potential impact is significant; therefore the overall risk of a hazardous materials release in Floyd County is medium/high.

## **Vulnerability Analysis for Hazardous Materials**

Hazardous material impacts are an equally distributed threat across the entire jurisdiction; therefore the entire county is vulnerable to a hazardous material release and can expect the same impacts within the affected area. The main concern during a release or spill is the population affected. This plan will therefore consider all buildings located within the county as vulnerable.

#### **Facilities**

All facilities within the county are at risk. These facilities will encounter many of the same impacts as any other building within the jurisdiction including structural failure due to fire or explosion and loss of function of the facility (e.g., a damaged or chemically-contaminated police station will no longer be able



to serve the community). Names and locations of critical and essential facilities, as well as community assets, are in Appendix C.

Updated: 2015

## **Infrastructure Components**

During a hazardous material release, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads and bridges. The release or spill of certain substances can cause an explosion. Explosions result from the ignition of volatile products such as petroleum products, natural and other flammable gases, hazardous materials/chemicals, dust, and bombs. An explosion potentially can cause death, injury, and property damage. In addition, a fire routinely follows an explosion, which may cause further damage and inhibit emergency response.

## **GIS Hazardous Materials Release Analysis**

### 2008 Hazmat Analysis

For the 2008 plan, a chlorine release in New Albany at the Transmontaigne location was modeled. That analysis estimated that 14,056 buildings would be impacted at a potential loss of over \$2.1 billion. The planning team identified a different path for the 2015 plan update which is described in the following section.

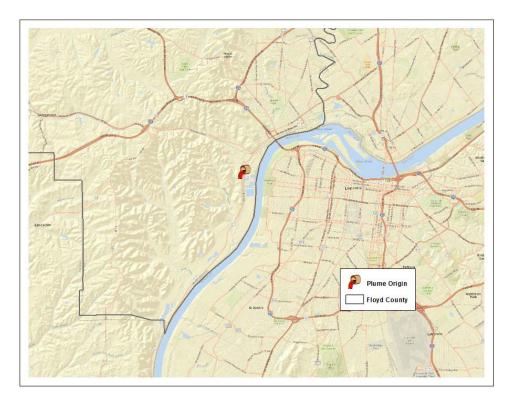
The US EPA's ALOHA (Areal Locations of Hazardous Atmospheres) model was utilized to assess the area of impact for an ammonia spill along highway 111 and River Rd in New Albany.

Ammonia is a colorless gas with a pungent odor. Ammonia is lighter than air and is easily liquefiable due to the strong hydrogen bonding. It does not burn readily or sustain combustion Ammonia is commonly used as a fertilizer and is applied to soil to help increase crop yields. It is also commonly used as a household cleaner for glass, porcelain, and stainless steel. When in small amounts, ammonia does not generally cause problems for humans and other mammals however, ammonia is highly toxic to fish and aquatic animals. <sup>32</sup>Source: CAMEO

ALOHA is a computer program designed especially for use by people responding to chemical accidents, as well as for emergency planning and training and is used in this hazardous materials release analysis. For this scenario, moderate atmospheric and climatic conditions with a slight breeze from the north were assumed. The target area was chosen by the planning team at Meeting #1. The geographic area covered in this analysis is depicted in Figure 5-27.



Figure 5-26: Location of Chemical Release



The ALOHA atmospheric modeling parameters, depicted in Figure 5-28, were based upon the actual conditions at the location when the model was run including a north wind of 3 miles per hour. The temperature was 52.5°F with 58% humidity and clear skies. The modeled source of the chemical spill was a tanker with a diameter of 8 feet and a length of 33 feet (12,408 gallons). The model incorporated a tank that was 100% full with ammonia in its liquid state at the time of its release.

This modeled release was based on a leak from 2.5 feet-diameter hole. According to the ALOHA parameters, approximately 1,070 pounds of material would be released per second.



#### Figure 5-28: ALOHA Plume Modeling Parameters

```
SITE DATA:
  Location: NEW ALBANY, INDIANA
  Building Air Exchanges Per Hour: 0.36 (sheltered single storied)
 Time: April 22, 2015 0954 hours EST (using computer's clock)
CHEMICAL DATA:
  Chemical Name: AMMONIA
                                            Molecular Weight: 17.03 g/mol
  AEGL-1 (60 min): 30 ppm
                             AEGL-2 (60 min): 160 ppm AEGL-3 (60 min): 1100 ppm
  IDLH: 300 ppm
                      LEL: 150000 ppm
                                            UEL: 280000 ppm
  Ambient Boiling Point: -28.7° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%
ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 miles/hour from N at 3 meters
  Ground Roughness: urban or forest
                                            Cloud Cover: 5 tenths
  Air Temperature: 52.5° F
                                            Stability Class: B
 No Inversion Height
                                            Relative Humidity: 58%
SOURCE STRENGTH:
  Leak from hole in horizontal cylindrical tank
  Flammable chemical escaping from tank (not burning)
  Tank Diameter: 8 feet
                                            Tank Length: 33 feet
 Tank Volume: 12,408 gallons
Tank contains liquid
                                            Internal Temperature: 52.5° F
 Chemical Mass in Tank: 32.2 tons
                                            Tank is 100% full
 Circular Opening Diameter: 2.5 feet
 Opening is 12 inches from tank bottom
Release Duration: 1 minute
 Max Average Sustained Release Rate: 1,070 pounds/sec
     (averaged over a minute or more)
  Total Amount Released: 64,400 pounds
  Note: The chemical escaped as a mixture of gas and aerosol (two phase flow).
THREAT ZONE:
 Model Run: Heavy Gas
 Red : 1.3 miles --- (1100 ppm = AEGL-3 [60 min])
Orange: 2.4 miles --- (160 ppm = AEGL-2 [60 min])
  Yellow: 4.2 miles --- (30 ppm = AEGL-1 [60 min])
```

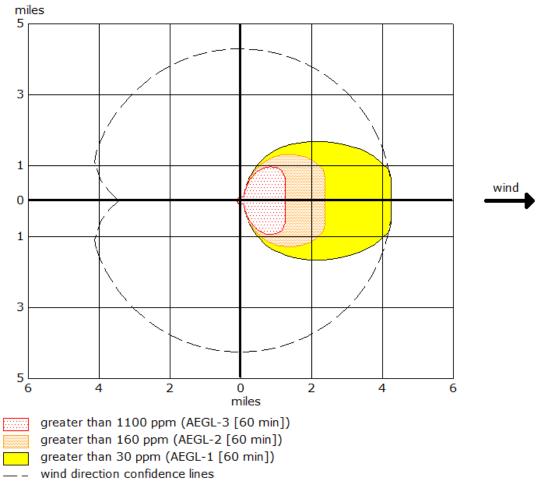
Acute Exposure Guideline Levels (AEGLs) are intended to describe the health effects on humans due to once-in-a-lifetime or rare exposure to airborne chemicals. The National Advisory Committee for AEGLs is developing these guidelines to help both national and local authorities, as well as private companies, deal with emergencies involving spills or other catastrophic exposures.

- AEGL 1: Above this airborne concentration of a substance, it is predicted that the general
  population, including susceptible individuals, could experience notable discomfort, irritation, or
  certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient
  and reversible upon cessation of exposure.
- AEGL 2: Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
- AEGL 3: Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.



According to the ALOHA parameters, approximately 1,070 pounds of material would be released per second. The image in Figure 5-29 depicts the plume footprint generated by ALOHA.





As the substance moves away from the source, the level of substance concentration decreases. Each color-coded area depicts a level of concentration measured in parts per million (ppm). For the purpose of clarification, this report will designate each level of concentration as a specific zone. The zones are as follows:

- **Zone 1** (AEGL-3): The red buffer (>=1100ppm) extends approximately 3.5 miles from the point of release after one hour.
- **Zone 2** (AEGL-2): The orange buffer (>=160 ppm) extends more than six miles from the point of release after one hour.
- **Zone 3** (AEGL-1): The yellow buffer (>=30 ppm) extends more than six miles from the point of release after one hour.
- Confidence Lines: The dashed lines depict the level of confidence in which the exposure zones will be contained. The ALOHA model is 95% confident that the release will stay within this boundary.



The image in Figure 5-30 depicts the plume footprint generated by ALOHA and overlaid with ArcGIS. The modeling program, however, does not account for terrain. In portions of southern Indiana, the terrain is very hilly. Because ammonia vapor is a very heavy gas, the vapor cloud will follow the contours of the land rather than flowing over the hills as depicted below.

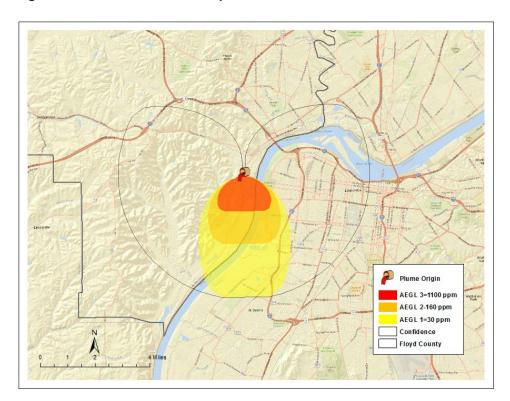


Figure 5-28: ALOHA Plume Footprint Overlaid in ArcGIS

The Floyd County Building Inventory was added to ArcMap and overlaid with the plume footprint. The Building Inventory was then intersected with each of the four footprint areas to classify each point based upon the plume footprint in which it is located. Figure 5-31 depicts the Floyd County Building Inventory after the intersect process.



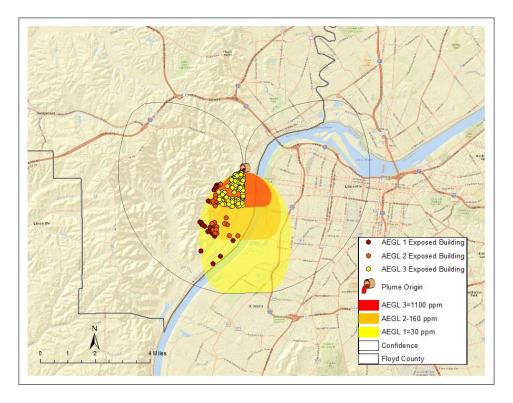


Figure 5-29: Floyd County Building Inventory Classified By Plume Footprint

### **Results**

By summing the building inventory within all AEGL zones (Zone 1: 30 ppm, Zone 2: 160 ppm, and Zone 3: 1100 ppm), the GIS overlay analysis predicts that as many as 165 buildings and 413 people could be exposed. The population is estimated based on 2.5 people per residence.

## **Building Inventory Exposure**

The results of the analysis against the Building Inventory points are depicted in Tables 5-30 through 5-33 Table 5-30 summarize the results of the chemical spill by combining all AEGL zones.

Table 5-30: Estimated Exposure for all Zones (all ppm)

General Occupancy	Populations	Building Counts	Building Exposure
Agricultural	0	15	\$3,521,518
Commercial	0	2	\$218,910
Government	0	1	\$70,050
Industrial	0	1	\$165,230
Religious	0	1	\$716,320
Residential	363	145	\$20,805,767
Total:	363	165	\$25,497,795



Tables 5-31 through 5-32 summarize the results of the chemical spill for each zone separately. Values represent only those portions of each zone that are not occupied by other zones.

Table 5-31: Estimated Exposure for Zone 3 (1100 ppm)

General Occupancy	Populations	Building Counts	Building Exposure		
Agricultural	0	7	\$1,379,848		
Commercial	0	0	\$0		
Government	0	0	\$0		
Industrial	0	0	\$0		
Religious	0	0	\$0		
Residential	260	104	\$14,505,137		
Total:	260	111	\$15,884,985		

Table 5-32: Estimated Exposure for Zone 2 (160 ppm)

General Occupancy	Populations	Building Counts	Building Exposure		
Agricultural	0	5	\$1,361,270		
Commercial	0	2	\$218,910		
Government	0	1	\$70,050		
Industrial	0	0	\$0		
Religious	0	1	\$716,320		
Residential	60	24	\$4,368,926		
Total:	60	33	\$6,735,476		

Table 5-33: Estimated Exposure for Zone 1 (30 ppm)

General Occupancy	Populations	Building Counts	Building Exposure		
Agricultural	0	3	\$780,400		
Commercial	0	0	\$0		
Government	0	0	\$0		
Industrial	0	1	\$165,230		
Religious	0	0	\$0		
Residential	43	17	\$1,931,704		
Total:	43	21	\$2,877,334		

# **Essential Facilities Exposure**

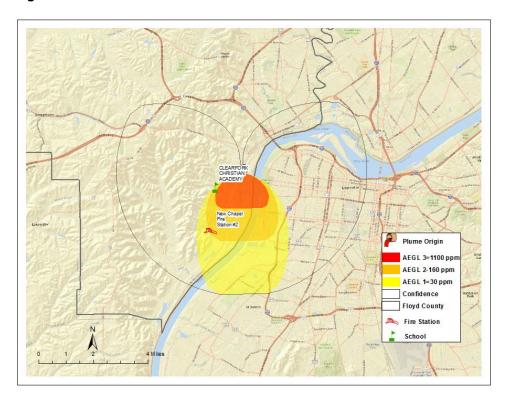
There are two essential facilities within the limits of the chemical spill plume. The affected facilities are identified in Table 5-34. Their geographic locations are depicted in Figure 5-32.

Updated: 2015

**Table 5-34: Essential Facilities within Plume Footprint** 

Damaged Essential Facilities					
New Chapel Fire Station #2					
Clearfork Christian Academy					

Figure 5-30: Essential Facilities at Greatest Risk



#### Hazmat Dangers to Vulnerable Populations

Certain populations require special attention in the event of a disaster. The particular scenario modeled involves an ammonia vapor plume along highway 111 in New Albany. These communities are also located in area with a high Special Needs Vulnerability Score. This particular census tract has a relatively higher proportion of the population with special needs when compared to the rest of the county. Specifically, this census tract has a high proportion of its population in these groups – 10.2% living in poverty, 14.5% aged 65 years or older, and, additionally, 17.3% of its population has a disability. These populations will need particular attention in the event of a disaster. Figure 5-33 compares the ALOHA-generated plume with those areas of the county which have a higher Special Needs Vulnerability Scores.



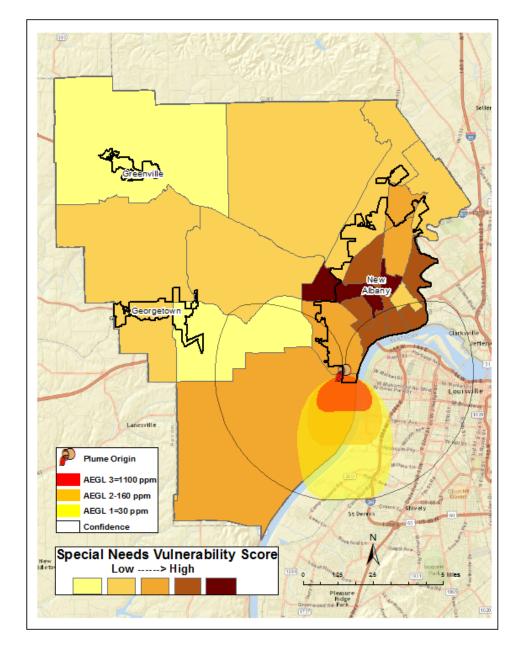


Figure 5-31: Hazmat Dangers to Special Needs/Vulnerable Populations

# **Future Development Trends and Vulnerability to Future Assets/Infrastructure for Hazardous Material Release Hazard**

Due to the unpredictability of this hazard, all buildings and infrastructure in Floyd County are at risk of damage including temporary or permanent loss of function.



## **5.3.7 Extreme Temperatures**

Extreme temperatures—both hot and cold—can have significant impact on human health and safety, commercial businesses, agriculture, and primary and secondary effects on infrastructure (e.g. burst pipes, power failures, etc.). Weather conditions described as extreme heat or cold vary across different areas of the country, based on the range of average temperatures within the region.

Updated: 2015

#### **Severe Cold Hazard Definition**

What constitutes an extreme cold event, and its effects, varies by region across the United States. In areas unaccustomed to winter weather, near freezing temperatures are considered "extreme cold." Extreme cold temperatures are typically characterized by the ambient air temperature dropping to approximately 0 degrees Fahrenheit or below.

Exposure to cold temperatures—indoors or outdoors—can lead to serious or life-threatening health problems, including hypothermia, cold stress, frostbite or freezing of the exposed extremities, such as fingers, toes, nose, and earlobes. Certain populations—such as seniors age 65 or older, infants and young children under five years of age, individuals who are homeless or stranded, or those who live in a home that is poorly insulated or without heat (such as mobile homes)—are at greater risk to the effects of extreme cold.

Extremely cold temperatures often accompany a winter storm, so individuals may also have to cope with power failures and icy roads. Although staying indoors can help reduce the risk of vehicle accidents and falls on the ice, individuals are susceptible to indoor hazards. Homes may become too cold due to power failures or inadequate heating systems. The use of space heaters and fireplaces to keep warm increases the risk of household fires, as well as carbon monoxide poisoning.

The magnitude of extreme cold temperatures is generally measured through the Wind Chill Temperature (WCT) Index. Wind Chill Temperature is the temperature that is felt when outside and is based on the rate of heat loss from exposed skin by the effects of wind and cold. As the wind increases, the body is cooled at a faster rate causing the skin's temperature to drop.

In 2001, the NWS implemented a new WCT Index, designed to more accurately calculate how cold air feels on human skin. The index, shown in Figure 5-34, includes a frostbite indicator, showing points where temperature, wind speed, and exposure time will produce frostbite in humans.



45 26

26

25

25

19 12

19 12

18

17 10

5

-2 -9

-3 -10

-3

-11

Frostbite Times 30 minutes

Figure 5-32: NWS Wind Chill Temperature Index



-31 -38

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)

-16 -23

-19 -26 -33

-17

Each National Weather Service Forecast Office may issue the following wind chill-related products as conditions warrant:

-37

-40

-44

-45

-48 -55

-51 -58

-52 -60

10 minutes 5 minutes

-69 -76

- Wind Chill Watch: Issued when there is a chance that wind chill temperatures will decrease to at least 24° F below zero in the next 24-48 hours.
- **Wind Chill Advisory**: Issued when the wind chill could be life threatening if action is not taken. The criteria for this advisory are expected wind chill readings of 15° F to 24° F below zero.
- **Wind Chill Warning**: Issued when wind chill readings are life threatening. Wind chill readings of 25° F below zero or lower are expected.

## **Summary Vulnerability Assessment**

Excessive cold affects mostly humans, particularly special needs populations, and animals. These events may be exacerbated by power loss. For this planning effort, it was not possible to analyze the number of lives or amount of property exposed to the impacts of extreme cold.

#### **Previous Occurrences for Extreme Cold**

There have been 1 previous occurrence for extreme cold reported to the NCDC in Floyd County since January 2008. This occurance was February 10, 2010 in Floyds Knobs.

Updated: 2015

## **Geographic Location for Extreme Cold Hazard**

Extreme cold events are regional in nature. All areas of the state are vulnerable to the risk of excessive cold.

#### Hazard Extent for Extreme Cold Hazard

Extreme cold events typically occur in the winter months. The extent of extreme cold varies in terms of the Wind Chill Temperature and duration of the event.

#### **Risk Identification for Extreme Cold Hazard**



The planning team determined that although the probability of an excessive cold hazard is low in Floyd County, the impact of such an event is minimal to moderate, resulting in an overall calculated risk of moderately low.

## **Vulnerability Analysis for Extreme Cold Hazard**

Extreme cold can result in damages to buildings, utilities, and infrastructure, due to the strong winds that often accompany these events. Additionally, extreme cold events often lead to severe short and long term health conditions, or even death. Extreme cold events can occur within any area in the county; therefore, the entire county population and all buildings are vulnerable to extreme cold hazards.

#### **Extreme Heat Hazard Definition**

Temperatures that hover 10 degrees Fahrenheit or more above the average high temperature for a region, and last for several weeks, constitute an extreme heat event (EHE). An extended period of extreme heat of three or more consecutive days is typically referred to as a heat wave. Most summers see EHEs in one or more parts of the U.S. East of the Rocky Mountains. They tend to combine both high temperatures and high humidity; although some of the worst heat waves have been catastrophically dry.

Prolonged exposure to extreme heat may lead to serious health problems, including heat stroke, heat exhaustion, or sunburn. Certain populations—such as seniors age 65 or older, infants and young children under five years of age, pregnant women, the homeless or poor, the overweight, and people with mental illnesses, disabilities, and chronic diseases—are at greater risk to the effects of extreme heat. Depending on severity, duration, and location, EHEs can also trigger secondary hazards, including dust storms, droughts, wildfires, water shortages, and power outages.



Criteria for EHE typically shift by location and time of year, and are dependent on the interaction of multiple meteorological variables (i.e. temperature, humidity, cloud cover.) While this makes it difficult to define EHEs using absolute, specific measures, there are ways to identify conditions. Some locations evaluate current and forecast weather to identify conditions with specific, weather-based mortality algorithms. Others identify and forecast conditions based on statistical comparison to historical meteorological baselines, e.g. the criterion for EHE conditions could be an actual or forecast temperature that is equal to or exceeds the 95th percentile value from a historical distribution for a defined time period.

Heat alert procedures are based primarily on Heat Index Values. The Heat Index—given in degrees Fahrenheit—is often referred to as the apparent temperature and is a measure of how hot it really feels when the relative humidity is factored with the actual air temperature. The National Weather Service Heat Index Chart can be seen in Figure 5-35.

Figure 5-33: National Weather Service Heat Index<sup>33</sup>

NOAA's National Weather Service																	
	Heat Index																
							Te	empe	rature	e (°F)							
		80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
	40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
	45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
Humidity (%)	50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
£	55	81	84	86	89	93	97	101	106	112	117	124	130	137			
igi	60	82	84	88	91	95	100	105	110	116	123	129	137				
E I	65	82	85	89	93	98	103	108	114	121	128	136					
Η	70	83	86	90	95	100	105	112	119	126	134						
Relative	75	84	88	92	97	103	109	116	124	132							
l at	80	84	89	94	100	106	113	121	129								
ĕ	85	85	90	96	102	110	117	126	135								
	90	86	91	98	105	113	122	131									
	95	86	93	100	108	117	127										
	100	87	95	103	112	121	132										
Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity																	
		Caution Extreme Caution								Dange	r	<b>E</b>	xtreme	Dang	er		

<sup>&</sup>lt;sup>33</sup> Source: Office of Atmospheric Programs. (2006). Excessive Heat Events Guidebook. Unites States Environmental Protection Agency. Washington, D.C.



Each National Weather Service Forecast Office may issue the following heat-related products as conditions warrant:

Updated: 2015

- Excessive Heat Outlooks- issued when the potential exists for an EHE in the next 3-7 days. An Outlook provides information to those who need considerable lead time to prepare for the event, such as public utility staff, emergency managers, and public health officials.
- Excessive Heat Watches- issued when conditions are favorable for an EHE in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain. A Watch provides enough lead time so that those who need to prepare can do so, such as city officials who have excessive heat mitigation plans.
- Excessive Heat Warnings/Advisories- issued when an EHE is expected in the next 36 hours. These products are issued when an excessive heat event is occurring, is imminent, or has a very high probability of occurring. The warning is used for conditions posing a threat to life or property. An advisory is for less serious conditions that cause significant discomfort or inconvenience and, if caution is not taken, could lead to a threat to life and/or property.

## **Summary Vulnerability Assessment**

Excessive heat affects mostly humans, particularly special needs populations, and animals. These events may be exacerbated by power loss. For this planning effort, it was not possible to analyze the number of lives or amount of property exposed to the impacts of extreme heat.

#### **Previous Occurrences for Excessive Heat**

Although the NCDC database does not include any reported past occurrences of excessive heat, residents of Floyd County should be prepared for such an event in any given year.

### **Geographic Location for Excessive Heat Hazard**

Excessive heat events are regional in nature. All areas of the state are vulnerable to the risk of excessive heat.

#### **Hazard Extent for Excessive Heat Hazard**

Excessive heat events typically occur in the summer months. The extent of excessive heat events varies in terms of the Heat Index and duration of the event. The duration will vary although it could span up to several months.

### **Risk Identification for Excessive Heat Hazard**



The planning team determined that although the probability of an excessive heat hazard is low in Floyd County, the impact of such an event is minimal to moderate, resulting in an overall calculated risk of moderately low.



## **Vulnerability Analysis for Excessive Heat Hazard**

Extreme heat may lead to severe short and long term health conditions, or even death. Extreme heat events are widespread and can occur within any area in the county; therefore, the entire county population and all buildings are vulnerable to extreme heat hazards. The elderly are particularly vulnerable to the effects of extreme heat; approximately 14.5% of Floyd County's population is aged 65 or over. A secondary hazard that may be produced by extreme heat is drought.

Updated: 2015

# Future Development Trends and Vulnerability to Future Assets/Infrastructure for Excessive Heat Hazard

Unlike other natural hazard events, extreme heat events leave little to no physical damage to communities; however, they can lead to severe short and long-term health conditions, or even death. Extreme heat events can also impact environmental and economic vulnerabilities as a result of water shortages and drought.

## 5.3.8 Drought Hazard

The meteorological condition that creates a drought is below normal rainfall. However, excessive heat can lead to increased evaporation, which will enhance drought conditions. Droughts can occur in any month. Drought differs from normal arid conditions found in low rainfall areas. Drought is the consequence of a reduction in the amount of precipitation over an undetermined length of time (usually a growing season or more).

There are several common types of droughts including meteorological, hydrological, agricultural, and socioeconomic. Figure 5-36 describes the sequence of drought occurrence and impacts of drought types.

- Meteorological: Defined by the degree of dryness (as compared to an average) and the duration
  of the dry period. These are region-specific and only appropriate for regions characterized by
  year-round precipitation.
- Hydrological: Associated with the effects of periods of precipitation shortfalls (including snow) on surface or subsurface water supply, e.g. stream flow, reservoir and lake levels, and groundwater. Impacts of hydrological droughts do not emerge as quickly as meteorological and agricultural droughts. For example, deficiency on reservoir levels may not affect hydroelectric power production or recreational uses for many months.
- Agricultural: Links characteristics of meteorological or hydrological drought to agricultural impacts. An agricultural drought accounts for the variable susceptibility of crops during different stages of crop development from emergence to maturity.
- **Socioeconomic:** Links the supply and demand of some economic good, e.g. water, forage, food grains, and fish, with elements of meteorological, hydrological, or agricultural droughts. This type of drought occurs when demand for an economic good exceeds supply as a result of weather-related shortfall in water supply.



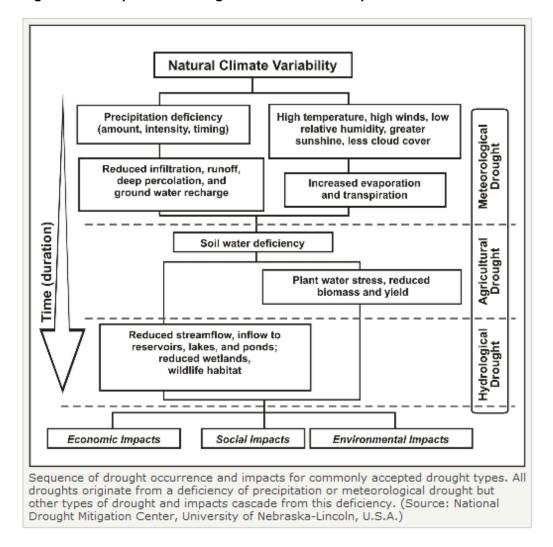


Figure 5-34: Sequence of Drought Occurrence and Impacts

Drought is a climatic phenomenon that occurs in Floyd County. The meteorological condition that creates a drought is below-normal rainfall. Excessive heat, however, can lead to increased evaporation, which will enhance drought conditions. Droughts can occur in any month. Drought differs from normal arid conditions found in low-rainfall areas. Drought is the consequence of a reduction in the amount of precipitation over an undetermined length of time (usually a growing season or more).

In the past decade, the U.S. has continued to consistently experience drought events with economic impacts greater than \$1 billion; FEMA estimates that the nation's average annual drought loss is \$6 billion to \$8 billion. For Indiana alone, the National Drought Mitigation Center reported hundreds of drought impacts from June 2010 through October 2010 ranging from water shortage warnings to reduced crop yields and wild fires.

The severity of a drought depends on location, duration, and geographical extent. Additionally, drought severity depends on the water supply, usage demands made by human activities, vegetation, and agricultural operations. Drought brings several different problems that must be addressed. The quality



and quantity of crops, livestock, and other agricultural assets will be affected during a drought. Drought adversely can impact forested areas, leading to an increased potential for extremely destructive forest and woodland fires that could threaten residential, commercial, and recreational structures.

Updated: 2015

Drought conditions are often accompanied by extreme heat, which is defined as temperatures that hover 10°F or more above the average high for the area and last for several weeks. Extreme heat can occur in humid conditions when high atmospheric pressure traps the damp air near the ground or in dry conditions, which often provoke dust storms.

The Palmer Drought Severity Index (PDSI), developed by W.C. Palmer in 1965, is a soil moisture algorithm utilized by most federal and state government agencies to trigger drought relief programs and responses. The PDSI—shown in Table 5-36—is based on the supply-and-demand concept of the water balance equation, taking into account more than just the precipitation deficit at specific locations. The objective of the PDSI is to provide standardized measurements of moisture, so that comparisons can be made between locations and periods of time—usually months. The PDSI is designed so that a -4.0 in South Carolina has the same meaning in terms of the moisture departure from a climatological normal as a -4.0 does in Indiana.

**Table 5-35: Palmer Drought Severity Classifications** 

Classification Rating	Classification Description				
4.0 or greater	Extremely Wet				
3.0 to 3.99	Very Wet				
2.0 to 2.99	Moderately Wet				
1.0 to 1.99	Slightly Wet				
0.5 to 0.99	Incipient Wet Spell				
0.49 to -0.49	Near Normal				
-0.5 to -0.99	Incipient Dry Spell				
-1.0 to -1.99	Mild Drought				
-2.0 to2.99	Moderate Drought				
-3.0 to -3.99	Severe Drought				
-4.0 or less	Extreme Drought				

## **Previous Occurrences for Drought Hazard**

Although the NCDC database reports numerous drought events that affected Indiana in the past five years, there are no reports of drought directly impacting Floyd County.

Updated: 2015

## **Geographic Location for Drought Hazard**

Droughts are regional in nature. All areas of the United States are vulnerable to the risk of drought.

#### **Hazard Extent for Drought**

Droughts can be widespread or localized events. The extent of droughts varies both in terms of the extent of the heat and range of precipitation.

## **Risk Identification for Drought Hazard**



The planning team determined that although the probability of drought hazard is low in Floyd County, the impact of such an event is minimal to moderate, resulting in an overall calculated risk of moderately low.

## **Vulnerability Analysis for Hazard**

Droughts affect mostly humans, particularly special needs populations, and animals. These events may be exacerbated by power loss. For this planning effort, it was not possible to analyze the number of lives or amount of property exposed to the impacts of drought.

Drought impacts can be an equally distributed threat across the entire jurisdiction; therefore the county is vulnerable to this hazard and can expect the same impacts within the affected area. The entire population and all buildings have been identified as at risk.

#### **Facilities**

All facilities included in this plan are vulnerable to drought. These facilities will encounter many of the same impacts as any other building within the jurisdiction, which should involve only minor damage. These impacts include water shortages, fires as a result of drought conditions, and residents in need of medical care from the heat and dry weather. A complete list of essential and critical facilities and their locations is included as Appendix C.

## **Building Inventory**

The other buildings within the county can all expect the same impacts similar to those discussed for the essential and critical facilities. These impacts include water shortages, fires as a result of drought conditions, and residents in need of medical care from the heat and dry weather.



#### Infrastructure

During a drought the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. The risk to these structures is primarily associated with a fire that could result from the hot, dry conditions. Since the county's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these infrastructure components could be impacted during a drought.

Updated: 2015

# Future Development Trends and Vulnerability to Future Assets/Infrastructure for Drought Hazard

Future development will remain vulnerable to these events. Typically, some urban and rural areas are more susceptible than others. For example, urban areas are subject to water shortages during periods of drought. Excessive demands of the populated area place a limit on water resources. In rural areas, crops and livestock may suffer from extended periods of heat and drought. Dry conditions can lead to the ignition of wildfires that could threaten residential, commercial, and recreational areas.

Because droughts are regional in nature, future development will be impacted across the county. Although urban and rural areas are equally vulnerable to this hazard, those living in urban areas may have a greater risk from the effects of a prolonged heat wave. According to FEMA, the atmospheric conditions that create extreme heat tend to trap pollutants in urban areas, adding contaminated air to the excessively hot temperatures and creating increased health problems. Furthermore, asphalt and concrete store heat longer, gradually releasing it at night and producing high nighttime temperatures. This phenomenon is known as the "urban heat island effect".

Local officials should address drought hazards by educating the public on steps to take before and during the event—for example, temporary window reflectors to direct heat back outside, staying indoors as much as possible, and avoiding strenuous work during the warmest part of the day.

#### 5.3.9 Landslide Hazard/Ground Failure

According to the USGS, the term ground failure is a general reference to landslides, liquefaction, lateral spreads, and any other consequence of land shaking that affects ground stability. For ground failure this plan will only address land subsidence and landslides.

Landslides are a serious geologic hazard common to almost every state in the United States. It is estimated that nationally they cause up to \$2 billion in damages and from 25 to 50 deaths annually. Globally, landslides cause billions of dollars in damage and thousands of deaths and injuries each year.

The term landslide is a general designation for a variety of downslope movements of earth materials. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide movement include: saturation by water, steepening of slopes by erosion or construction,



alternate freezing or thawing, earthquake shaking, and volcanic eruptions. There are three main types of landslides that occur in Indiana: 1) rotational slump, 2) earthflow, and 3) rockfall.

Updated: 2015

#### **Land Subsistence**

Southern Indiana has a network of underground caves formed by what is known as karst landscape. According to the Indiana Geological Survey, karst landscapes usually occur where carbonate rocks (limestone and dolostone) underlie the surface. Freely circulating, slightly acidic water in the soil slowly dissolves the bedrock causing karst formations. These karst formations have the potential to collapse under the weight of the ground above them creating a sinkhole. Ground failure of this nature is known as land subsidence. Any structures built above a karst formation could potentially be subject to land subsidence and collapse into a resulting sinkhole.

#### Landslides

A landslide is a rapid movement of surface land material down a slope. The main causes of landslides include:

- Earthquake or other significant ground vibration
- Slope failure due to excessive downward movement, gravity
- Groundwater table changes (often due to heavy rains)

Preventive and remedial measures include modifying the landscape of a slope, controlling the groundwater, constructing tie backs, spreading rock nets, etc.

The USGS claims that landslides are a significant geologic hazard in the United States causing \$1-2 billion in damage and over 25 fatalities per year. The expansion of urban and recreational development into hillside areas has resulted in an increasing number of properties subject to damage as a result of landslides. Landslides commonly occur in connection with other major natural disasters such as earthquakes, wildfires, and floods.

Although landslides may not be preventable, their effect on people and property can be mitigated. Mitigation includes any activities that prevent an emergency, reduce the chance of an emergency happening, or lessen the damaging effects of unavoidable emergencies. Investing in preventive mitigation steps now such as planting ground cover (low growing plants) on slopes, or installing flexible pipe fittings to avoid gas or water leaks, will help reduce the impact of landslides and mudflows in the future.<sup>34</sup>

#### **Previous Occurrences for Landslide/Ground Failure**

While there have been no major incidents involving landslide or ground failure in Floyd County, minor events have occurred throughout the area.

<sup>34</sup> http://earthquake.usgs.gov/learn/glossary/?termID=105



### **Geographic Location for Landslide/Ground Failure**

Floyd County is located directly over an area of karst landscape which covers much of south-central Indiana. As a result, sinkholes and caves which are associated with a karst landscape are scattered throughout the county. The regional locations of karst landscape are included in Figure 5-37 below.

Figure 5-35: Regional Karst Map

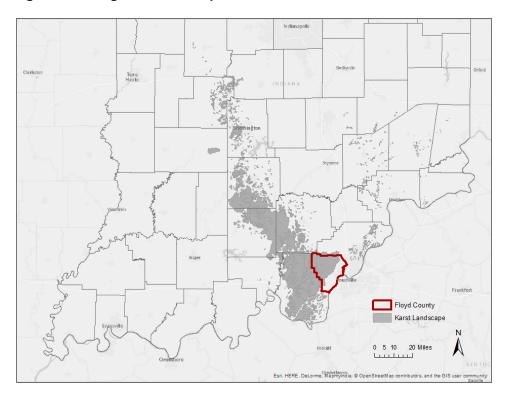


Figure 5-38 illustrates the intersection of populated areas and karst in Floyd County. As can be seen, multiple communities in Floyd County lie above known areas of karst. These communities stand a greater risk for subsidence events than do the other communities.

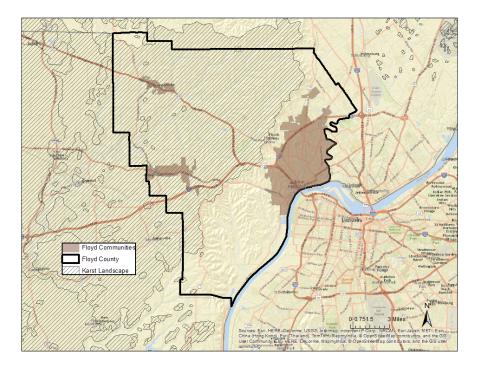


Figure 5-36: Karst Landscape and Populated Areas in Floyd County

#### Hazard Extent for Landslide/Ground Failure

The extent of the ground failure hazard is closely related to development near the regions that are at risk. The extent will vary within these areas depending on the potential of elevation change, as well as the size of the underground structure. The hazard extent of ground failure is spread throughout the county in various concentrated areas.

#### Risk Identification for Landslide/Ground Failure



Based on historical information, the probability of ground failure is medium. In Meeting #1, the planning team determined that the potential impact of a ground failure event is minimal; therefore, the overall risk of ground failure for Floyd County is low.

#### **Vulnerability Analysis for Landslide/Ground Failure**

Because of the difficulty predicting which communities are at risk of ground failure, the entire population and all buildings have been identified as at risk. As a result this plan will consider all buildings as vulnerable. The existing buildings and infrastructure of Floyd County are discussed in types and number below.

#### **Facilities**

Any facility built above karst landscape or near a steep slope could be vulnerable to land subsidence. An essential or critical facility will encounter many of the same impacts as any other building within the



affected area. These impacts include damages ranging from cosmetic to structural. Buildings may sustain minor cracks in walls due to a small amount of settling, while in more severe cases the failure of building foundations causes cracking of critical structural elements. Table 5-37 lists the types and numbers of all the essential facilities in the area. Critical and essential facilities are included in Appendix C.

Updated: 2015

Table 5-36: Essential Facilities of Floyd County

Category	Number of Facilities
Care Facilities	50
Emergency Operations Centers	1
Fire Stations	14
Police Stations	4
Schools	23
Total	92

#### **Building Inventory**

The buildings within the county can all anticipate the same impacts, similar to those discussed for critical facilities. These impacts include damages ranging from cosmetic to structural. Buildings may sustain minor cracks in walls due to a small amount of settling, while in more severe cases the failure of building foundations causes cracking of critical structural elements.

#### Infrastructure

In the area of Floyd County affected by land subsidence, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. The risk to these structures is primarily associated with land collapsing directly beneath them in a way that undermines their structural integrity. Since all infrastructure in the affected area is equally vulnerable, it is important to emphasize that any number of these items could become damaged as a result of significant land subsidence. The impacts to these items include broken, failed, or impassable roadways; broken or failed utility lines (e.g. loss of power or gas to community); and railway failure from broken or impassable railways. In addition, bridges could fail or become impassable causing risk to traffic.

# Future Development Trends and Vulnerability to Future Assets/Infrastructure for Landslide/Ground Failure

All future communities, buildings, and infrastructure will remain vulnerable to ground failure in the areas of Floyd County where karst landscape features exist and in areas of significant elevation change. In areas with higher levels of population, the vulnerability is greater than in open areas with no infrastructure demands.

Karst-related subsidence or landslides may affect several locations within the county; therefore buildings and infrastructure are vulnerable to subsidence. Continued development will occur in many of these areas.



#### 5.3.10 Fire Hazard

#### **Hazard Definition for Fire Hazard**

The Floyd County Comprehensive Hazard Analysis has identified four major categories of fires within the County.

Updated: 2015

#### **Tire Fires**

The State of Indiana generates thousands of scrap tires annually. Many of those scrap tires end up in approved storage sites that are carefully regulated and controlled by Federal and State officials. However, scrap tires are sometimes intentionally dumped in unapproved locations throughout the State. Floyd County has no approved location for tire disposal and storage, but the number of unapproved locations cannot be readily determined. These illegal sites are owned by private residents who have been continually dumping waste and refuse, including scrap tires, at those locations for many years.

Tire disposal sites can be fire hazards, in large part, because of the enormous number of scrap tires typically present at one site. This large amount of "fuel" renders standard firefighting practices nearly useless. Flowing and burning oil released by the scrap tires can spread the fire to adjacent areas. Tire fires differ from conventional fires in the following ways:

Relatively small tire fires can require significant fire resources to control and extinguish. Those resources often cost much more than Floyd County government can absorb compared to standard fire responses.

There may be significant environmental consequences of a major tire fire. Extreme heat can convert a standard vehicle tire into about two gallons of oily residue that may leak into the soil or migrate to streams and waterways.

#### **Structural Fires**

Lightning strikes, poor building construction, and building condition are the main causes for most structural fires in Indiana. Floyd County has a few structural fires each year County wide.

#### Wildfires

Approximately 35% to 55% of Indiana's land base is heavily wooded or forested. When hot and dry conditions develop, forests may become vulnerable to devastating wildfires. In the past few decades an increased commercial and residential development near forested areas has dramatically changed the nature and scope of the wildfire hazard in Floyd County. In addition, the increase in structures resulting from new development is a strain to the effectiveness of the fire service personnel in the County.

#### **Arson**

It is important to note that arson is a contributing factor to fire-related incidents within the County.



#### **Summary Vulnerability Assessment**

Any future development will be vulnerable to these events.

#### **Previous Occurrences for Fire Hazard**

There have not been many major structural fires with a significant number of deaths or injuries.

#### **Geographic Location for Fire Hazard**

Fire hazards occur countywide and therefore affect the entire County. The heavily forested areas in the County have a higher chance of widespread fire hazard.

Updated: 2015

#### **Hazard Extent for Fire Hazard**

The extent of the fire hazard varies both in terms of the severity of the fire and the type of material being ignited. All communities in Floyd County are affected by fire equally.

#### Risk Identification for Fire Hazard



Based on historical information, the probability of a fire hazard is low to medium and the impact is minimal; therefore the overall risk of a fire hazard in Floyd County is low.

### **Vulnerability Analysis for Fire Hazard**

This hazard impacts the entire jurisdiction equally; therefore, the entire population and all buildings within the County are vulnerable to fires and can expect the same impacts within the affected area.

#### Critical Facilities

All critical facilities are vulnerable to a fire hazards. A critical facility will encounter many of the same impacts as any other building within the jurisdiction. These impacts include structural damage from fire and water damage from efforts extinguishing fire.

#### **Building Inventory**

Impacts to the general buildings within the County are similar to the damages expected to the critical facilities. These impacts include: structural damage from fire and water damage from efforts to extinguish the fire.

#### Infrastructure

During a fire the types of infrastructure that could be impacted include: roadways, utility lines/pipes, railroads, and bridges. Since the County's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these items could become damaged during a fire. Potential impacts include structural damage resulting in impassable roadways and power outages.



# **Future Development Trends and Vulnerability to Future Assets/Infrastructure for Fire Hazard**

Updated: 2015

Fire hazard events may occur anywhere within the County, because of this future development will be impacted. Areas in Floyd County where this is particularly applicable are where the bulk of the growth is occurring. Current trends indicate that growth is occurring predominately towards the western area of New Albany along the major thoroughfares; I-64, I-264, IN 62, and IN 64.





6

## **Mitigation Strategies**

The goal of mitigation is to reduce the future impacts of a hazard including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Mitigation actions and projects should be based on a well-constructed risk assessment, provided in Section 5 of this plan. Mitigation should be an ongoing process, adapting over time to accommodate a community's needs.

Updated: 2015

## 6.1 Community Action Potential Index (CAPI)

FEMA Region V mitigation planners developed the Community Action Potential Index (CAPI) in 2013 as a tool to prioritize communities for Risk MAP initiatives and mitigation activities. CAPI includes a number of indicators that, when weighted, sum to a total score for each community in the state. This helps federal and state planners determine which communities would be most likely to advance mitigation strategies through the Risk MAP program.

CAPI currently includes index scores for every Indiana community, a total of 661. Of those communities, slightly more than half (325) have been deployed, which means that Risk MAP activities have occurred or are in the process of occurring. All of Floyd County's communities are currently deployed.

Table 6-1 lists the Indiana communities with the highest CAPI scores (highest possible score is 131). The higher the score, the higher the potential risk the community faces in the event of a disaster. But also, a high score indicates that the community has the potential to move mitigation activities forward. For example, communities that participate in the NFIP's Community Rating System and/or have approved local mitigation plans will be assigned a higher CAPI score.

Table 6-1: Indiana Communities with Highest CAPI Scores

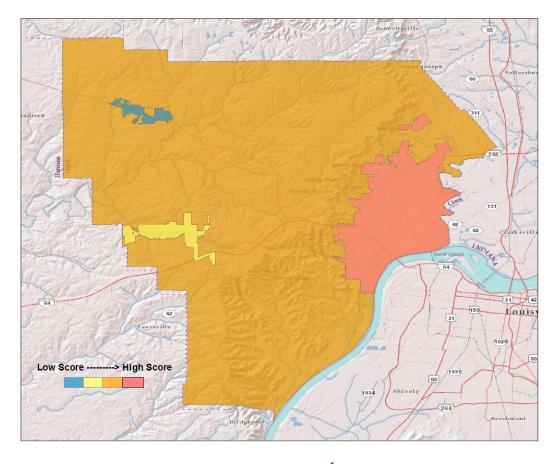
County Name	Community	Deployed?	CAPI Score
Marion	City of Indianapolis	Yes	92.24
Vanderburgh	Vanderburgh County	No	85.14
Allen	City of Fort Wayne	No	83.62
Bartholomew	City of Columbus	Yes	83.20
Hamilton	City of Noblesville	Yes	79.43

Table 6-2 lists Floyd County communities' high risk factors as well as their composite CAPI scores. The arrows illustrate how the community compares to the state average. As shown below in Table 6-2 and Figure 6-1 on the following page, the City of New Albany has the highest CAPI score.

Table 6-2: Floyd County Communities' CAPI Scores

Community Name	Tot CAF Sco	ΡI		% nmunity in SFHA	Ins	urance claims \$		rance ms #	Repetitive loss \$		Repetitive loss #		Repetitive loss % I		Assi	ividual stance · Capita
New Albany	<b>A</b> 5	3.92		16.36		\$1,789,775.00		124		\$606,125.75		8	$\blacksquare$	1.53		
Floyd County	<b>A</b> 5	50.82	•	7.58		\$773,769.00		44	•	\$77,022.49	<b>A</b>	3	•	-		
Georgetown	<b>A</b> 3	84.89	$\blacksquare$	6.05		\$6,151.00	<b>&gt;</b>	4		\$6,150.62	$\blacksquare$	1	<b>&gt;</b>	24.82		
Greenville	▼ 1	3.03	•	0.00	•	\$0.00	•	0	$\blacksquare$	\$0.00	•	0	•	44.84		
KEY:																
Better than State Average ▼																
Worse than S	tate Ave	erage														

Figure 6-1: CAPI Scores for Floyd County and Jurisdictions





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### 6.2 Plans and Ordinances

Floyd County enforces several ordinances, listed below in Table 6-3, that are relevant to emergency management and disaster planning.

Updated: 2015

Table 6-3: Floyd County Plans and Ordinances

Community	Ordinance/Year
	Floyd County Zoning Ordinance, 2006
Flavel Carrette	Floyd County Comprehensive Land Use Plan, 2005
Floyd County	Floyd County Thoroughfare Plan, 2007
	Floyd Co Emergency Information Dissemination, 2014
New Albany	New Albany Code of Ordinances (includes Zoning and Subdivision Control), 2014
Coorgotown	Georgetown Code of Ordinances (includes Zoning and Subdivision Control), 1995
Georgetown	Georgetown Comprehensive Plan, 1995
Greenville	Town of Greenville Comprehensive Plan, 2009

The Floyd County Zoning Ordinance, amended in April of 2014, applies to all land within the county limits of Floyd County, Indiana, excluding the legally established planning jurisdiction of the cities and towns within Floyd County as well as any critical infrastructure which is located on property owned by a government entity. This ordinance also enforces compliance to all structures, land and streams within the SFHA. The purpose of this ordinance is to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions. As of production of this document, Floyd County is updating it's Comprehensive Plan (2025 Cornerstone Plan).

## **6.3 Mitigation Goals**

The MHMP planning team members understand that although hazards cannot be eliminated altogether, Floyd County can work toward building disaster-resistant communities. Following are a list of goals, objectives, and actions. The goals represent long-term, broad visions of the overall vision the county would like to achieve for mitigation. The objectives are strategies and steps that will assist the communities in attaining the listed goals.

#### Goal 1: Lessen the impacts of hazards to new and existing infrastructure, residents, and responders

<u>Objective A</u>: Retrofit critical facilities and structures with structural design practices and equipment that will withstand natural disasters and offer weather-proofing.

<u>Objective B</u>: Equip public facilities and communities to guard against damage caused by secondary effects of hazards.

Objective C: Minimize the amount of infrastructure exposed to hazards.

<u>Objective D</u>: Evaluate and strengthen the communication and transportation abilities of emergency services throughout the community.

Objective E: Improve emergency sheltering in the community.

#### Goal 2: Create new or revise existing plans/maps for the community

Objective A: Support compliance with the NFIP.

<u>Objective B</u>: Review and update existing, or create new, community plans and ordinances to support hazard mitigation.

Updated: 2015

<u>Objective C</u>: Conduct new studies/research to profile hazards and follow up with mitigation strategies.

# Goal 3: Develop long-term strategies to educate community residents on the hazards affecting their county

Objective A: Raise public awareness on hazard mitigation.

Objective B: Improve education and training of emergency personnel and public officials.

## 6.4 Mitigation Actions and Projects

Upon completion of the risk assessment and development of the goals and objectives, the planning committee was provided a list of the six mitigation measure categories from the *FEMA State and Local Mitigation Planning How to Guides*. The measures are listed as follows:

- **Prevention:** Government, administrative, or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, structural retrofits, storm shutters, and shatter-resistant glass.
- Public Education and Awareness: Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- Natural Resource Protection: Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- Emergency Services: Actions that protect people and property during and immediately after a
  disaster or hazard event. Services include warning systems, emergency response services, and
  protection of critical facilities.
- **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.



MHMP members were presented with the task of individually listing potential mitigation activities using the FEMA evaluation criteria. The MHMP members presented their mitigation ideas to the team. The evaluation criteria (STAPLE+E) involved the following categories and questions.

Updated: 2015

#### Social:

- Will the proposed action adversely affect one segment of the population?
- Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?

#### Technical:

- How effective is the action in avoiding or reducing future losses?
- Will it create more problems than it solves?
- Does it solve the problem or only a symptom?
- Does the mitigation strategy address continued compliance with the NFIP?

#### Administrative:

- Does the jurisdiction have the capability (staff, technical experts, and/or funding) to implement the action, or can it be readily obtained?
- Can the community provide the necessary maintenance?
- Can it be accomplished in a timely manner?

#### **Political:**

- Is there political support to implement and maintain this action?
- Is there a local champion willing to help see the action to completion?
- Is there enough public support to ensure the success of the action?
- How can the mitigation objectives be accomplished at the lowest cost to the public?

#### Legal:

- Does the community have the authority to implement the proposed action?
- Are the proper laws, ordinances, and resolution in place to implement the action?
- Are there any potential legal consequences?
- Is there any potential community liability?
- Is the action likely to be challenged by those who may be negatively affected?
- Does the mitigation strategy address continued compliance with the NFIP?

#### **Economic:**

- Are there currently sources of funds that can be used to implement the action?
- What benefits will the action provide?
- Does the cost seem reasonable for the size of the problem and likely benefits?
- What burden will be placed on the tax base or local economy to implement this action?
- Does the action contribute to other community economic goals such as capital improvements or economic development?
- What proposed actions should be considered but be "tabled" for implementation until outside sources of funding are available?

#### **Environmental:**

- How will this action affect the environment (land, water, endangered species)?
- Will this action comply with local, state, and federal environmental laws and regulations?
- Is the action consistent with community environmental goals?



Implementation of the mitigation plan is critical to the overall success of the mitigation planning process. The first step is to decide, based upon many factors, which action will be undertaken first. In order to pursue the top priority first, an analysis and prioritization of the actions is important. Some actions may occur before the top priority due to financial, engineering, environmental, permitting, and site control issues. Public awareness and input of these mitigation actions can increase knowledge to capitalize on funding opportunities and monitoring the progress of an action.

Updated: 2015

The planning team prioritized mitigation actions based on a number of factors. A rating of high, medium, or low was assessed for each mitigation item and is listed next to each item in Table 6-5. The factors were the STAPLE+E (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) criteria listed in Table 6-4.

Table 6-4: STAPLE+E Planning Factors

S – Social	Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.
T – Technical	Mitigation actions are technically most effective if they provide a long-term reduction of losses and have minimal secondary adverse impacts.
A – Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P – Political	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.
L – Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
E – Economic	Budget constraints can significantly deter the implementation of mitigation actions. It is important to evaluate whether an action is cost-effective, as determined by a cost benefit review, and possible to fund.
E – Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, comply with federal, state, and local environmental regulations, and are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

## 6.5 Multi-Jurisdictional Mitigation Strategy and Actions

As a part of the multi-hazard mitigation planning requirements, at least two identifiable mitigation action items have been addressed for each hazard listed in the risk assessment and for each jurisdiction covered under this plan.

Each of the four incorporated communities, within and including Floyd County, was invited to participate in a brainstorming session in which goals, objectives, and strategies were discussed and prioritized. Each participant in this session was armed with possible mitigation goals and strategies provided by FEMA, as well as information about mitigation projects discussed in neighboring communities. All potential strategies and goals that arose through this process are included in this section.

Updated: 2015

This section includes a comprehensive list of all mitigation strategies from the 2008 plan, action items from the 2013 Risk MAP Resilience Report, as well as new strategies developed for the 2015 update. We categorized the progress of each strategy using the following symbols and guidelines.



Mitigation action has been identified and prioritized. Funding has not yet been secured.



Mitigation action is in early phase of implementation. Community has identified source of funding and submitted project proposal. Implementation will begin once funding is secured.



Mitigation project is in progress or ongoing. Funding and/or resources are available to complete it.



Mitigation project is complete.

Table 6-5 on the following pages lists completed strategies followed by incomplete and new mitigation strategies in order of priority. Assuming funding is available, it is the intention that high priority strategies will be implemented within one year of plan adoption, medium priorities will be implemented within three years, and low priorities will be implemented within five years.

The Floyd County Emergency Management Agency will be the local champion for the mitigation actions. The County Commissioners and the city and town councils will be an integral part of the implementation process. Federal and state assistance will be necessary for a number of the identified actions.

**Table 6-5: Floyd County Mitigation Strategies and Projects** 

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
			☑ Tornado		River Hills RPC	
New construction of comprehensive EMA facility and shelter to allow Intergovernment communications and relief efforts  Originally developed as a high priority action item in 2008 MHMP.		Action completed  In 2012 the EMA and EOC relocated to a new facility at the Pineview Government Center.	<ul> <li>☑ Flood</li> <li>☑ Earthquake</li> <li>☑ Thunderstorm</li> <li>☑ Winter Storm</li> <li>☑ Hazmat</li> <li>☑ Drought</li> <li>☑ Subsidence</li> </ul>	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County Commissioners Floyd County Planning Department.	
			⊠ Dam/Levee			
Identification of floodplains and structures			□ Tornado 図 Flood		IDNR	
within the floodplain; Establish mitigation actions based on the types of structures identified and funds available  Originally developed as a high priority action item in 2008 MHMP		Action completed  New flood maps (DFIRMs) are finished.	□ Earthquake □ Thunderstorm □ Winter Storm □ Hazmat □ Drought □ Subsidence □ Dam/Levee	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County EMA Floyd County Planning Department	
Identify plans for shelters  Originally developed as a high priority action item in 2008 MHMP		Action completed  The Red Cross maintains an updates a list of sheltering options for residents of Floyd and surrounding counties.	<ul> <li>☑ Tornado</li> <li>☑ Flood</li> <li>☑ Earthquake</li> <li>☑ Thunderstorm</li> <li>☑ Winter Storm</li> <li>☑ Hazmat</li> <li>☑ Drought</li> <li>☑ Subsidence</li> <li>☑ Dam/Levee</li> </ul>	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Red Cross Floyd County EMA Floyd County Planning Department.	Floyd County EMA

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Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Harden existing critical facilities (fire houses, schools) Originally developed as a medium priority action item in 2008 MHMP		Action completed  Since the 2008 MHMP, a new hardened fire station has been finished. Most of the critical facilities in Floyd are currently equipped with backup generators.	<ul> <li>☑ Tornado</li> <li>☐ Flood</li> <li>☑ Earthquake</li> <li>☑ Thunderstorm</li> <li>☐ Winter Storm</li> <li>☐ Hazmat</li> <li>☐ Drought</li> <li>☐ Subsidence</li> <li>☐ Dam/Levee</li> </ul>	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	MHMP Team River Hills Regional Planning Commission Floyd County Commissioners Floyd County Planning Department.	IDHS/FEMA
Lime Ridge Dam on Richland Creek - Greenville Res (flood study needed on high hazard dam)  Originally developed as an action item for the 2012 Risk MAP Resilience Report		Action completed  This dam, located on the Greenville Resvoir, has been removed. The dam has been opened and water lowered to a level safe for downstream homes.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Georgetown ☐ Greenville ☐ New Albany ☑ Floyd County	Floyd County EMA	FEMA (PDM)
Flood study of Blackiston Run (reach of Blackiston Run to SR 111 downstream to confluence of Rail Run; multiple residential basements flood)  Originally developed as an action item for the 2012 Risk MAP Resilience Report		Action completed  This 30 acre flood study has been completed.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Georgetown ☐ Greenville ☐ New Albany ☑ Floyd County	Floyd County Public Works	FEMA

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Erosion control on unstudied reaches of Jacobs Creek (need to extend limit of study on Jacobs Creek and Jay Run upstream to SR 111 due to development pressure)  Originally developed as an action item for the 2012 Risk MAP Resilience Report	HIGH	New action; funding not secured  This is an area where warning signs and education are vital to public safety in the area.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Georgetown ☐ Greenville ☐ New Albany ☑ Floyd County	Floyd County Public Works	FEMA (HMGP)
Flood Overtopping Road at Oaks Rd and SR 64 (study needed to determine mitigation options)  Originally developed as an action item for the 2012 Risk MAP Resilience Report	HIGH	New action; funding not secured  This is an area where flash flooding is a recurring problem and warning signs and education are vital to public safety.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Georgetown ☐ Greenville ☐ New Albany ☐ Floyd County	INDOT	FEMA (HMGP)
Flood Study of Lazy Creek south of I64)  Originally developed as an action item for the 2012 Risk MAP Resilience Report	HIGH	New action; funding not secured  This is an area where warning signs and education are vital to public safety in the area	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Georgetown ☐ Greenville ☐ New Albany ☑ Floyd County	Floyd County Public Works	FEMA (HMGP)

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Dam removal at Georgetown Lake (remnants of dam causing flood hazard)  Originally developed as an action item for the 2012 Risk MAP Resilience Report	HIGH	New action; funding not secured  This dam remains a hazard and should be considered a high priority.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☑ Dam/Levee	<ul><li>☑ Georgetown</li><li>☐ Greenville</li><li>☐ New Albany</li><li>☐ Floyd County</li></ul>	Georgetown Public Works	Private sector
Install air and water quality monitors – in particular for the City of New Albany and Rubbertown in Kentucky  Originally developed as a high priority action item in 2008 MHMP	HIGH	Pending action; funding not secured  Rubbertown, located south of the county, is a chemical production plant. The planning team would like to keep this as a high priority and include water monitors.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☑ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	MHMP Team River Hills Regional Planning Commission Floyd County Commissioners Floyd County Planning Department.	EPA
Identify and publicize evacuation routes  Originally developed as a high priority action item in 2008 MHMP	HIGH	Funding proposed; not yet secured  The County EMA has developed evacuation routes. They have not yet been approved or implemented so this should be considered in progress.  This mitigation strategy is particularly important for Georgetown and New Albany with current rerouting issues due to the I65 bridge work.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	<ul><li>☑ Georgetown</li><li>☐ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County EMA Floyd County Highway Department.	Floyd County

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Ensure constant water supply and uninterrupted service  Originally developed as a high priority action item in 2008 MHMP	HIGH	New action; funding not secured  Substantial generators are required to pump large amounts of water.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☒ Drought ☐ Subsidence ☐ Dam/Levee	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County Commissioners  Floyd County Planning Department  Floyd County Storm Water	Local Utilities
HAZMAT Transportation Flow Study  Originally developed as a high priority action item in 2008 MHMP	HIGH	Funding proposed; not yet secured  Floyd County is in the process of securing of a commodity flow study. County leaders are particularly concerned with the significant amount of crude oil transported via rail through the County.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☑ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Georgetown ☐ Greenville ☐ New Albany ☑ Floyd County	MHMP Team Floyd County Commissioners Floyd County EMA	IDHS
Review and adjust storm water maintenance and management procedures  Originally developed as a high priority action item in 2008 MHMP	HIGH	Funding secured; action in progress  Storm water maintenance is constant issue in Floyd County and the planning team will keep this an ongoing strategy.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County Planning Department  Local Water Companies.	Local Funding Floyd County

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Procurement of road barricades/signage, installation of fixed swing gates on flood prone roadways  Originally developed as a high priority action item in 2008 MHMP	HIGH	Funding proposed; not yet secured  Currently the EMA has a grant request pending to address this strategy so remains in progress.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County  EMA  Floyd County Planning Department.	Floyd County Highway Department
Initiate programs to educate the public on road safety during flooding.  This is a new strategy developed for the 2015 MHMP	HIGH	New action; funding not secured  In support of the previous strategy, the team would like to include this education component as a priority.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County EMA  Local Fire Departments Volunteers	Local Police Departments Volunteers FEMA
Community outreach/education  Originally developed as a high priority action item in 2008 MHMP.	HIGH	Funding secured; action in progress  Since 2008 Floyd County has provided public education regarding disaster preparedness. Floyd County sees this as an ongoing process.	<ul> <li>☑ Tornado</li> <li>☑ Flood</li> <li>☑ Earthquake</li> <li>☑ Thunderstorm</li> <li>☑ Winter Storm</li> <li>☑ Hazmat</li> <li>☑ Drought</li> <li>☐ Subsidence</li> <li>☐ Dam/Levee</li> </ul>	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	River Hills Regional Planning Commission Floyd County Commissioners Floyd County Planning Department	Local Funding Volunteers

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Mass notification system  Originally developed as a high priority action item in 2008 MHMP	HIGH	Funding proposed; not yet secured  Floyd County currently uses Nixel for their mass communications. Recognizing the limitations of this system, the EMA would like to keep this action as a high priority as they continue to pursue other options for mass communication. Floyd County schools maintain their own communication system.	<ul> <li>☑ Tornado</li> <li>☑ Flood</li> <li>☑ Earthquake</li> <li>☑ Thunderstorm</li> <li>☑ Winter Storm</li> <li>☑ Hazmat</li> <li>☑ Drought</li> <li>☑ Subsidence</li> <li>☑ Dam/Levee</li> </ul>	☐ Georgetown ☐ Greenville ☐ New Albany ☑ Floyd County	MHMP Team  River Hills Regional Planning Commission  Floyd County  Commissioners  Floyd County Planning Department.	Local Funding E911 Funding
Flood overtopping St Route 311 at Uphill Run (at Cobblers Crossing)  Originally developed as an action item for the 2012 Risk MAP Resilience Report	HIGH	New action; funding not secured  This is an area of frequent flash flooding and an example (see previous strategy) of where warning signs are vital to the safety of those using this road.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Georgetown ☐ Greenville ☐ New Albany ☑ Floyd County	Floyd County Highway Department	FEMA
Build a second exit for the Blackstone subdivision  This is a new strategy identified for the 2015 MHMP	HIGH	New action; funding not secured  The Tucker Road bridge is the only exit/entrance into this growing group of homes. The neighborhood needs a secondary access.	<ul> <li>☑ Tornado</li> <li>☑ Flood</li> <li>☑ Earthquake</li> <li>☑ Thunderstorm</li> <li>☑ Winter Storm</li> <li>☑ Hazmat</li> <li>☐ Drought</li> <li>☐ Subsidence</li> <li>☐ Dam/Levee</li> </ul>	☐ Georgetown ☐ Greenville ☐ New Albany ☐ Floyd County	Floyd County Highway Department	Floyd County Highway Department

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Develop a public awareness plan to educate residents on non-hospital alternatives in the event of a disaster or emergency  This is a new strategy identified for the 2015 MHMP	MEDIUM	New action; funding not secured  Floyd County Memorial Hospital reports a significant number of people without a medical emergency come to the hospital during local disasters. Floyd Memorial serves three counties and is not equipped to have a large influx of non-medical visitors.	<ul> <li>☑ Tornado</li> <li>☑ Flood</li> <li>☑ Earthquake</li> <li>☑ Thunderstorm</li> <li>☑ Winter Storm</li> <li>☑ Hazmat</li> <li>☑ Drought</li> <li>☐ Subsidence</li> <li>☐ Dam/Levee</li> </ul>	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County Memorial Hospital Red Cross Floyd County EMA	Floyd County Memorial Hospital Red Cross
Subdivision regulations to require buried utilities  Originally developed as a high priority action item in 2008 MHMP.	MEDIUM	Funding secured; action in progress  The Storm Water Department reports this as an ongoing project.	<ul> <li>☑ Tornado</li> <li>☑ Flood</li> <li>☐ Earthquake</li> <li>☑ Thunderstorm</li> <li>☐ Winter Storm</li> <li>☐ Hazmat</li> <li>☐ Drought</li> <li>☐ Subsidence</li> <li>☐ Dam/Levee</li> </ul>	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County Commissioners Floyd County Planning Department.	Private Utilities
Tie-down anchors for mobile homes and large propane tanks  Originally developed as a high priority action item in 2008 MHMP.	MEDIUM	Pending action; funding not secured  The Pines is the only mobile home park of significant size in the County so the planning team would like to keep this strategy.	<ul> <li>☑ Tornado</li> <li>☑ Flood</li> <li>☑ Earthquake</li> <li>☑ Thunderstorm</li> <li>☐ Winter Storm</li> <li>☐ Hazmat</li> <li>☐ Drought</li> <li>☐ Subsidence</li> <li>☐ Dam/Levee</li> </ul>	⊠ Georgetown     ⊠ Greenville     ⊠ New Albany     ⊠ Floyd County	Floyd County Commissioners Floyd County Planning Department	Local Funding FEMA

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Additional gauging on waterways and flood prone areas  Originally developed as a medium priority action item in 2008 MHMP	MEDIUM	Funding secured; action in progress  Additional gauges would benefit the County so this will be an ongoing process. In particular a gauge is needed at the ditch adjacent to Floyd Memorial Hospital.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County EMA IDNR	USGS
Install inertial shutoff valves on gas lines in critical facilities  Originally developed as a high priority action item in 2008 MHMP	MEDIUM	Pending action; funding not secured  This is of particular concern to Floyd Memorial Hospital where large tanks are stored outside in an area prone to rock slides.	☐ Tornado ☐ Flood ☑ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	<ul><li>☑ Georgetown</li><li>☐ Greenville</li><li>☐ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County Local Utilities Floyd County Memorial Hospital	Floyd County Memorial Hospital Local Utilities
Initiate a study to determine the feasibility of relocating large gas and chemical tanks at the hospital  This is a new strategy identified for the 2015 MHMP	MEDIUM	New action; funding not secured	☐ Tornado ☐ Flood ☑ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	<ul><li>☑ Georgetown</li><li>☐ Greenville</li><li>☐ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County Memorial Hospital Local Utilities	Floyd County Memorial Hospital Local Utilities

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Little Indian Creek bank erosion mitigation (analysis of erosion to determine mitigation action)  Originally developed as an action item for the 2012 Risk MAP Resilience Report	MEDIUM	New action; funding not secured  The study of the mitigation requirements are in progress.	□ Tornado □ Flood □ Earthquake □ Thunderstorm □ Winter Storm □ Hazmat □ Drought □ Subsidence □ Dam/Levee	☐ Georgetown ☐ Greenville ☐ New Albany ☑ Floyd County	Floyd County Planning Department	FEMA
Acquire 30 acres to be used as watershed storage for Blackiston Run  This is a new strategy identified for the 2015 MHMP	MEDIUM	New action; funding not secured  The creek was modified in 2010, but flooding remains a concern. Water storage is needed to avoid residential flooding.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Georgetown ☐ Greenville ☐ New Albany ☐ Floyd County	Floyd County Storm Water	
Culvert and bridge improvements on Interstate 265 (locations include Rail Run, Slate Run, Falling Run, Fork Run, Green Run)  Originally developed as an action item for the 2012 Risk MAP Resilience Report	MEDIUM	Funding determined; not yet secured  This bridge improvement is listed as a requirement of the Floyd County Drainage Plan. A completed study determined this to be a \$1.6 million dollar project.	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Georgetown ☐ Greenville ☑ New Albany ☐ Floyd County	INDOT	INDOT

Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Fluvial Erosion Hazard study on McAlpine Dam Originally developed as an action item for the 2012 Risk MAP Resilience Report	MEDIUM	New action; funding not secured  This area runs adjacent to Clark County and mitigation plans should involve Clark County leaders.	□ Tornado □ Flood □ Earthquake □ Thunderstorm □ Winter Storm □ Hazmat □ Drought □ Subsidence □ Dam/Levee	<ul><li>☐ Georgetown</li><li>☐ Greenville</li><li>☒ New Albany</li><li>☐ Floyd County</li></ul>	New Albany Planning Commission	US Army Corp of Engineers
Develop a database of vulnerable populations  This is a new strategy identified for the 2015 MHMP	MEDIUM	New action; funding not secured  This not considered a high priority since police and fire departments have local knowledge of the special needs populations in their	<ul> <li>☑ Tornado</li> <li>☑ Flood</li> <li>☑ Earthquake</li> <li>☑ Thunderstorm</li> <li>☑ Winter Storm</li> <li>☑ Hazmat</li> <li>☐ Drought</li> <li>☐ Subsidence</li> <li>☑ Dam/Levee</li> </ul>	<ul><li>☑ Georgetown</li><li>☑ Greenville</li><li>☑ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County Health Department Red Cross	Red Cross
Initiate a study to determine alternatives to mitigate the frequent flooding at Floyd Memorial Hospital.  This is a new strategy identified for the 2015 MHMP	MEDIUM	New action; funding not secured	☐ Tornado ☐ Flood ☐ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	☐ Georgetown ☐ Greenville ☑ New Albany ☐ Floyd County	Floyd Memorial Hospital	Local Funding FEMA

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Mitigation Action	Priority	Status	Hazard	Community	Collaborator(s)	Funder(s)
Obtain generators for rural health facilities  This is a new strategy identified for the 2015 MHMP	MEDIUM	New action; funding not secured	<ul> <li>☑ Tornado</li> <li>☑ Flood</li> <li>☑ Earthquake</li> <li>☑ Thunderstorm</li> <li>☑ Winter Storm</li> <li>☑ Hazmat</li> <li>☑ Drought</li> <li>☑ Subsidence</li> <li>☑ Dam/Levee</li> </ul>	☐ Georgetown ☐ Greenville ☐ New Albany ☑ Floyd County	Floyd County Health Department	Local Funding FEMA
Establish an Earthquake Plan  Originally developed as a high priority action item in 2008 MHMP	LOW	Pending action; funding not secured  Although the chances of a significant earthquake in Floyd County are minimal, county leaders recognize the potential for indirect damages. In the event of an earthquake radio communication would be initiated.	☐ Tornado ☐ Flood ☑ Earthquake ☐ Thunderstorm ☐ Winter Storm ☐ Hazmat ☐ Drought ☐ Subsidence ☐ Dam/Levee	<ul><li>☑ Georgetown</li><li>☐ Greenville</li><li>☐ New Albany</li><li>☑ Floyd County</li></ul>	Floyd County EMA ISGS	USGS

**Section** 

7

## **Plan Maintenance**

## 7.1 Monitoring, Evaluating, and Updating the Plan

Relevant data, information, maps, and tables developed for this local mitigation plan will be integrated as appropriate into other planning efforts to include zoning, floodplain management, and land use planning. Many of the planning team members, representing the county as well as participating jurisdictions, will integrate these data as part of their roles as floodplain enforcers, zoning officers, and community administrators.

Updated: 2015

Throughout the upcoming planning cycle, Floyd County Emergency Management Agency and the MHMP planning committee will monitor, evaluate, and update the plan on an annual basis.

Additionally, a meeting is proposed to be held in June of 2019 to address the next five-year update of this plan. Members of the planning committee are readily available to engage in email correspondence between annual meetings. If the need for a special meeting, due to new developments or a declared disaster occurs in the county, the team will meet to update mitigation strategies. Depending on grant opportunities and fiscal resources, mitigation projects may be implemented independently by individual communities or through local partnerships.

The committee will then review the county goals and objectives to determine their relevance to changing situations in the county. In addition, state and federal policies will be reviewed to ensure they are addressing current and expected conditions. The committee will also review the risk assessment portion of the plan to determine if this information should be updated or modified. The parties responsible for the various implementation actions will report on the status of their projects, and will include which implementation processes worked well, any difficulties encountered, how coordination efforts are proceeding, and which strategies should be revised.

Updates or modifications to the MHMP during the planning process will require a public notice and a meeting prior to submitting revisions to the individual jurisdictions for approval. The plan will be updated via written changes, submissions as the committee deems appropriate and necessary, and as approved by the county commissioners.

The GIS data used to prepare the plan was obtained from existing county GIS data as well as data collected as part of the planning process. This updated Hazus-MH GIS data has been returned to the county for use and maintenance in the county's system. As newer data becomes available, this updated data will be used for future risk assessments and vulnerability analyses.

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## 7.2 Implementation through Existing Programs

The results of this plan will be incorporated into ongoing planning efforts since many of the mitigation projects identified as part of this planning process are ongoing. Floyd County and its incorporated jurisdictions will update the zoning plans and ordinances as necessary and as part of regularly scheduled updates. Each community will be responsible for updating its own plans and ordinances.

Updated: 2015

### 7.3 Continued Public Involvement

Continued public involvement is critical to the successful implementation of the MHMP. Comments from the public on the MHMP will be received by the Floyd County EMA director and forwarded to the MHMP planning committee for discussion. Education efforts for hazard mitigation will be ongoing through the Floyd County EMA. The public will be notified of any periodic planning meetings through notices in the local newspaper. Once adopted, a copy of this plan will be available on the Floyd County website, in each jurisdiction and in the Floyd County EMA Office.

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## **APPENDICES**

Appendix A: Meetings

Appendix B: Newspaper Articles and Public Meeting Announcement

Updated: 2015

Appendix C: List and Locations of Floyd County Facilities

Appendix D: Historical Disaster Photographs

Appendix E: Transportation Plan Mitigation Projects

Appendix F: THIRA Checklist

Appendix G: Adopting Resolutions

## Updated: 2015

# Appendix A

Meetings



#### FLOYD COUNTY MHMP MEETING #1, FEBRUARY 27, 2015

	NAME	TITLE	COMMUNITY	TOTAL HOURS INVESTED (Include transportation, research, and 1.5 hours for this meeting)
_	Janny Maraland	DOM ASS+	Floyd co. Ena	
		Chantable Knancial Specialist	River-Hills EDDIR	PC 1.5 hrs
	SCOTT WOOD	PLANNING DIRECTOR	NEW ALBAHY	2.0 HZS
	John Braham	Greenville, IN	Greenville	1,5 hrs
	Richard Stiles	Town of Georgetown Public Works Director	Georgetown	2.0 hrs
-	TERRY HERTHEL	Director	FLOYD Co. EMA	
	Chais Moore	Floyd County GIS Director	Floyd County	2.0 has
	ChristinaBloo	GIS intern-IUS	,	
				,

#### MEETING#1MINUTE FLOYD COUNTY MULTI-HAZARD MITIGATION PLAN February 27, 2015 -11:00AM

Updated: 2015

John Buechler, Director of Geoinformatics, The Polis Center, introduced himself and his associate, Kavya Beerval Ravichandra, GIS Analyst, and went on to explain that the County's Multi-Hazard Mitigation Plan (MHMP) has expired and needs to be updated. Mr. Buechler then asked participants to introduce themselves. Representatives from the following communities were present: Georgetown, Greenville, and New Albany. Also in attendance were representatives from the Floyd County Emergency Management Office, the Floyd County Stormwater Department, and River Hills Economic Development District and Regional Planning Commission. Mr. Buechler discussed the meeting's agenda and shared background information on The Polis Center. He then explained that the Floyd County MHMP was adopted in 2008. Floyd County needs this plan in order to access future funds from FEMA and that all communities must participate to access funds as well.

Mr. Buechler stated that this meeting is the first of three meetings, and that during this first meeting, the committee will review critical facilities data and profile and prioritize hazards. During the second meeting, the committee will review risk assessment results and brainstorm mitigation strategies. A portion of the second meeting will be open to the public. Mr. Buechler explained that after the second meeting, The Polis Center will take all comments and ideas and prepare a report. The committee will meet for a third time to review the plan, before it is sent to FEMA for approval.

Mr. Buechler shared a tentative schedule with the participants. The second meeting is expected to be held by June and the draft plan should be finished and submitted to FEMA by the end of this summer.

Mr. Buechler described the equation to be used to determine risks and prioritize hazards, and explained that they would be putting together a risk profile for each community. Risks could include rain, hail, earthquake, etc and be unique to each community. Mr. Buechler shared Floyd County's history of disasters since 2008, which include 92 severe weather reports and three federal disaster declarations.

The committee looked at the risk profile graph pulled from the last MHMP. Terry Herthel, Floyd County EMA, stated that he felt that Earthquake should be above landslide on the graph. He explained that there have been discussions about the likelihood of earthquakes more and more lately. Ms. Ravichandra asked if he would like for her to move the impact to moderate. Mr. Herthel stated that yes, it should be moved a little to the right. He also felt that Hazmat should be moved both up and over due to future crude oil transportation by railroad through the county.

Scott Wood, New Albany, asked if thunderstorms included straight line winds. He stated that in 2009, Hurricane lke caused a great number of trees to fall down.

Richard Stiles, Georgetown, questioned why Hazmat was on the graph being that it was not a natural hazard. Mr. Buechler replied that it isn't a natural hazard, but that it can be considered an accidental technological hazard. The same goes for fire, as it doesn't always occur due to natural causes.Mr. Stiles added that the Wastewater Treatment Plant (WTP) in Georgetown only has one entrance. The entrance has rail lines across it, which has often blocked access both in and out of the plant. If there was an accident on the rail, it could potentially cut us off from the WTP.

Mr. Buechler responded that the situation is definitely a mitigation project. Mr. Stiles agreed and commented that a secondary access road is needed. Mr. Beuchler stated that it should definitely be added to the plan. These are the type of things that will be further discussed during the second meeting. Ms. Ravichandra took note of this comment. Mr. Buechler asked if there were any other comments. Chris Moore, Floyd County Stormwater Department, asked if forest fires could be considered under Fire on the chart. Mr. Herthel added that the county experienced forest fires several years ago for days at a time. Mr. Buechler commented that they would include larger forest fires under this category. Mr. Buechler asked if there were any other comments. Mr. Woods stated that the County is also on the approach and departure of one of the world's busiest commercial airports at Sandifer Field with the UPS world hub located there. We don't know what's flying in the belly of the airplanes. Ms. Ravichandra took note of this comment. Mr. Buechler asked if there were any other comments. There were none. Ms. Ravichandra handed out a list of Jurisdiction Hazards to each participant. Mr. Buechler explained that The Polis Center looked at topography, roads, railroads, dams, etc. to come up with this list. The committee then looked



over the corresponding Jurisdiction Hazards slide and suggested adjustments to New Albany's risk profile. Mr. Woods stated that Flooding should definitely be kept at a High level. However, Levee Failure should be adjusted to a medium level, because the Army Corps has been requiring inspection of levees and flood walls and we were recently approved. He added that Hazmat should stay at a high level due to rail, air and river transportation. We have a fuel storage facility located in the southwestern part of the city and they are heavily regulated by IDEM. We also have some risk of sludge failure at the Gallagher Coal Fire Plant. Mr. Herthel added that the factories across the river are always a threat, as we are right in the path of any kind of cloud or release. Next, the committee suggested adjustments to Greenville's risk profile. John Braham stated that there was a new sewer plant that should be considered in the plan. Ms. Ravichandra made note of this. Mr. Herthel noted that the Dam/Levee Failure on the chart referred to the one on Boils Road, and that it is in the process of being removed due to the threat to Wind Dance Farms. It should be taken out by next year. The committee then suggested adjustments to Georgetown's risk profile. Mr. Stiles stated that the entire southern boundary is in a flood zone. The utilities shop is also located in a flood zone. As far as Hazmat is concerned, he added that State Road 64 runs through the town and 1-65 passes to the south. More importantly, the Norfolk Southern Railway runs the entire length of the town and derailments have occurred inside the boundaries of the town in the past. Mr. Stiles reiterated that the railroad also cuts off access to the WTP. Georgetown has very hilly terrain in some areas and there is currently an issue with the retaining walls on Hwy 64.Mr. Buechler asked if there were a lot of ground failures going on here. Mr. Stiles responded that ground failures are imminent.Mr. Buechler asked that Mr. Stiles circle this area on the map in the back of the room. Mr. Woods added that New Albany has steep terrain as well, and that ground failures occurred in the past. Mr. Herthel asked if they had experienced problems on Spring Street Hill as well. Mr. Woods stated that yes, they have experienced erosion and sheet failure. Mr. Moore asked if there was also a Silver Creek flood boundary along the eastern side of the city. Mr. Woods explained that there are low points throughout the city that experience flash flooding. Mr. Buechler asked that Mr. Woods mark these areas on the map. Mr. Buechler asked if there were any more comments. There were none. Mr. Buechler directed the attendees to a map of the county. He explained that critical facilities and care facilities have been plotted on the map. The Polis Center can add any community assets that the committee sees fit. These assets can include industry, government facilities, historical facilities, etc. The committee members were also asked to circle any other hazards that were previously discussed. Mr. Buechler stated that the Polis Center will create a model of hazard scenarios. The scenarios will include a flood, earthquake, tornado, and hazmat situation.

Updated: 2015

Mr. Buechler tasked each community with completing the following items before the next meeting: 1) review the 2008 mitigation strategies handout, 2) gather articles, photos, count/\$damage summaries, etc. related to hazards since the last update and 3) document on handout strategies implemented since the last update as well as ideas for new strategies that could be implemented. Mr. Buechler added that all participants needed to keep up with hours worked on these tasks.

Mr. Buechler asked if anyone in attendance had any further questions or comments. There were none. Mr.

Buechler thanked everyone for coming. The meeting was adjourned at 12:30 pm (local time).

Minutes Prepared by: Chelsea Crump, River Hills EDD & RPC

#### Floyd County Multi-Hazard Mitigation Plan Public Meeting Announcement

The Floyd County Hazard Mitigation Steering Committee will host a public information and strategy planning session at 11:00AM on Thursday, June 11, 2015 at the Pineview Government Center, Room 102, 2524 Corydon Pike, New Albany, IN 47150.

Over the last several months, a planning committee consisting of community members has worked with The Polis Center at Indiana University-Purdue University Indianapolis (IUPUI) to develop a Multi-Hazard Mitigation Plan for Floyd County. Once the plan is completed, the committee will submit it to FEMA for approval. The committee will also work to develop funding for any mitigation activities that are identified.

The steering committee is interested in receiving public input on the plan. Anyone who has questions or would like to provide input should contact Tammy Markland, Floyd County Emergency Management, (812)948-5454. hspaxlp

#### **MEETING #2 MINUTES**

Updated: 2015

## FLOYD COUNTY MULTI-HAZARD MITIGATION PLAN UPDATE

June 11, 2015 - 11:00AM (local time)

John Buechler, The Polis Center, introduced himself, and went on to explain that he and his staff pulled together information from the Floyd County Emergency Management Agency, River Hills Economic Development District and Regional Planning Commission, and the local jurisdictions to draft the first five chapters of the Floyd County Multi-hazard Mitigation Plan (MHMP) update. Christine Schmitz, The Polis Center, passed out a copy of the draft plan and the 2008 Mitigation Strategies spreadsheet to each participant.

Mr. Buechler informed the room that during the meeting they would briefly go over the draft plan and work on Chapter 6: Mitigation Strategies. He also explained the purpose of updating the plan as well as funding opportunities. Mr. Buechler stated that each participant's time spent on the planning process should be documented and would count towards the match (\$5,000).

Mr. Buechler asked participants to introduce themselves: Mike Crenshaw, American Red Cross; Andrew Williams, Floyd Memorial Hospital; Terry Herthel, Floyd County EMA; Tammy Markland, Floyd County EMA; Chris Moore, Floyd County Stormwater Department; Christina Black, Floyd County Stormwater Department; and Chelsea Crump, River Hills EDD & RPC.

Mr. Buechler gave a brief explanation of the remaining steps for the MHMP update plan. Jurisdictions should get any comments or updates to the Polis Center within two weeks. The Polis Center will complete the final draft and the planning committee can review it at the third meeting in approximately 4 – 6 weeks. Mr. Buechler stated that the Polis Center would make needed updates and then send the plan to FEMA for conditional approval. Once approval is received from FEMA, the plan will go to each jurisdiction board for adoption by resolution.

Mr. Buechler then went on to review the first five chapters of the draft MHMP plan, which includes:

- Information on jurisdiction, community and neighboring county participation
- A profile of Harrison County
- Risk assessment information
- Historical hazards records
- Guidelines for determining probability and impact
- Previous hazards and their rankings
- Modeled disasters: tornado, flood, earthquake, and hazmat
- Karst Map

Mr. Buechler stated that it would be beneficial for the participants to share the draft plan at their next board meetings to receive input. Mr. Williams stated that Floyd Memorial Hospital had a district meeting the following day. Mr. Buechler asked that he share the plan at the meeting for feedback.

Mr. Crenshaw asked how the Polis Center determined the areas for the disaster models. Mr. Buechler responded that the planning team chose the disaster locations at the last meeting.



Mr. Buechler asked the participants to take a few minutes to look over the 2008 Mitigation Strategies spreadsheet and discuss any changes or additions that should be included. Ms. Crump stated that she would reach out to the local jurisdictions that were not present to get input on the plan and strategies.

Updated: 2015

Mr. Moore said that he would like to create a flash flood awareness program for the County and put up warning signs in areas that are prone to flash flooding during heavy rains.

Mr. Herthel added that the County is currently working on grants for swing gates in certain areas due to river flooding.

Ms. Schmitz asked if flash flood awareness was a high priority. Both Mr. Moore and Mr. Herthel replied that it should be.

Mr. Williams explained that the hospital's parking lot floods about once a year. In the past, water has actually risen to the door handles of the cars. Mr. Buechler asked if the hospital was prone to flash flooding. Mr. Williams responded that no, the hospital doesn't flood. However, he experienced another issue during Hurricane Ike, which was an influx of people looking for assistance. Mr. Williams stated that it would be beneficial to see a mitigation strategy that involves education and training on hazmat situations for both the hospital staff and the public.

Mr. Buechler asked if any facilities need back-up generators or transfer switches. Mr. Williams stated that the hospital purchased generators for several of the rural health facilities in areas that don't have hospitals. Mr. Herthel added that the water companies need large generators to run their pumping stations, and the ones brought in from the Army weren't sufficient. Therefore, the water companies have resorted to renting them when needed.

Mr. Buechler asked if anyone else had any comments. Mr. Moore stated that the County had a project in 2010 that involved the expansion of a local creek called Blackiston Run to relieve the flooding of several homes in the area. He added that the area still needs about 30 square acres of storage to complete the project.

Ms. Crump asked if the County had a need for drainage improvements. Mr. Moore commented that they are constantly picking up tree limbs, repairing pipes, cleaning out catch basins, etc as part of the stormwater management plan.

Ms. Crump asked if improved fire fighting capability would be something that could be included as a mitigation strategy. Mr. Buechler responded yes. Ms. Crump explained that the 2013 Needs Assessment for the County lists a need for improved fire fighting and EMS capability as a high priority.

Mr. Herthel explained that EMS capability is still lacking. Mr. Williams added that there are no hazmat units in the area. Mr. Herthel said that they are in the process of signing a mutual aid agreement between Floyd County EMA and the Louisville Metro EMA. This will give insurance coverage (workers comp) to Louisville Metro EMA if they send responders to Floyd County.

Mr. Buechler stated that he would like to go over each of the 2008 Mitigation Strategies. The planning committee discussed the following:

- Community outreach/education: still in progress and should remain a high priority



 Reverse 911: have a system in place that is free to the County, but still interested in acquiring Reverse 911

Updated: 2015

- New construction of comprehensive EMA facility: Floyd County EMA moved to the Pineview Government Center in 2012 (complete)
- Subdivision regulations to require buried utilities: leave in plan, but move down to medium priority
- Tie-down anchors for mobile homes and large propane tanks: only major mobile home park in County is on Grantline Road and so move down to a medium priority
- Identification of floodplains and structures within the floodplain: County has new flood flood maps (complete)
- Review and adjust stormwater management procedures: ongoing activities
- Procurement of road barricades/signage, installation of fixed swing gates on flood prone roadways: will add public education and break into two separate strategies
- Additional gauging on waterways and flood prone areas: keep as a medium priority
- Identify and publicize evacuation routes: developed routes for New Albany and Georgetown and are in progress of being adopted
- Ensure constant water supply and uninterrupted service: discussed need for larger generators at water plants
- HAZMAT transportation flow study: yes, stay as a high priority and conduct a study on crude oil being transported on the rail system
- Identify plans for shelters: Red Cross has list of shelters, but County should expand on shelter plan to include transportation strategies
- Establish an earthquake plan: County would most likely not be impacted directly, but would serve as support for other communities
- Install inertial shutoff valves in gas lines in critical facilities: yes, all oxygen tanks are located outside of the hospital
- Harden existing critical facilities: a new fire house was built and most fire stations now have back-up generators (complete)
- Install air-quality monitors: yes, and install water quality monitors as well (due to algae plumes)
- Flood study on high hazard dam (Lime Ridge): the dam was removed and water levels lowered (complete)
- Little Indian Creek bank erosion mitigation: yes, still erosion there
- Flood overtopping Route 311 at Uphill Run: flash flooding area discussed previously
- Flood study of Blackiston Run: discussed previously
- Erosion control on Jacobs Creek: yes, still there
- Flood overtopping road at Oaks Road and SR 64: flash flooding discussed previously
- Flood study of Lazy Creek: yes, still valid
- Extend flood study of Middle Creek: has not been completed
- Dam removal at Georgetown Lake: yes, still experience flooding issues
- Culvert and bridge improvements on Interstate 265: identified in drainage plan, but needs to be expanded (INDOT project)

The group also discussed that a secondary access point and a bridge expansion was needed at North Tucker road.

Mr. Buechler asked if anyone in attendance had any questions or comments. There were none.



Mr. Buechler reminded everyone to send in any additional comments over the next few weeks as well as to continue tracking all time spent on the project. The committee will meet again in approximately 4-6 weeks to finalize the draft plan and submit it to FEMA for approval.

Mr. Buechler thanked everyone for coming. The meeting was adjourned at 12:25 pm (local time).

Minutes Prepared by: Chelsea Crump, River Hills EDD & RPC

June 11, 2015 Floyd County Multi-Hazard Mitigation Plan Meeting #2

Name	Organization	Jurisdiction
Mike Crenshaw	American Red Cross	Floyd County
Andrew Williams	Floyd Memorial Hospital	Floyd County
Terry Herthel	Floyd County EMA	Floyd County
Chris Moore	Floyd County Storm Water Dept.	Floyd County
Christina Black	Floyd County Storm Water Dept. (IUS GIS Intern)	Floyd County
Chelsea Crump	River Hills EDD & RPC	Floyd County

# Appendix B

### **Newspaper Articles and Announcements**

Updated: 2015



#### Parts of Southern Indiana come to halt after heavy snow

Posted: Thursday, March 5, 2015 7:56 pm

**Associated Press** |

Parts of southern Indiana have ground to a halt after as much as 10 inches of fresh snow fell.

The National Weather Service had an unofficial report of 10.5 inches of snow having fallen New Salisbury in Harrison County by late Thursday morning. The weather service says 8-12 inches of snow fell in a band along the Ohio River, including southern Indiana, and 5-9 inches fell farther north.

Updated: 2015

Clark, Floyd and Harrison counties issued travel warnings, the most severe travel status, urging motorists to refrain from all travel. Most government buildings were closed there.

Indiana State Police say they handled more than 550 calls during a 31-hour period ending at 7 a.m. Thursday. They included 160 crashes, with one fatality and 32 others involving injuries, and 175 slide-offs.

The winter storm blanketed the Northeast on Thursday after zipping across much of the South, leaving hundreds of drivers and their passengers stranded on highways in Kentucky and thousands without power in West Virginia.

By Thursday afternoon, a strong cold front moving across the eastern U.S. had dumped more than 20 inches of snow on parts of Kentucky, and conditions worsened in the Northeast as snow started to pile up, reaching 11.5 inches and counting in the northern Maryland community of Lineboro.

The massive snow in Kentucky left hundreds of people stranded on two major highways and National Guard members delivering them food or driving them to warming centers.

Authorities say that hundreds of drivers were stuck on two major highways in Kentucky, where snow totals topped 2 feet in some places. Many had to spend the night in their vehicles.

The National Guard was sent out to check on the people who were stuck, deliver them food and water and, in some cases, take them to warming centers.

Source: www.tribstar.com/news/indiana\_news/parts-of-southern-indiana-come-to-halt-after-heavy-snow/article\_16748caa-2ce6-5a61-b408-3ed941b25c22.html

# Ind. communities declare state of emergency after snow, ice

Updated: 2015

UPDATED 3:51 PM EST Dec 07, 2013

NEW ALBANY, Ind —The Indiana Department of Homeland Security has declared states of emergency in Floyd, Orange and Crawford counties, urging drivers to stay off the roads.

Conditions continued to get worse in communities north of Floyd County.

Jesiah St. Pierre drove through the weather into Floyd County all the way from Georgetown, Ky.

"The roads are actually better than they were in the Louisville area. I mean, there was ice everywhere," said St. Pierre.

During the day snow plows did their best to clear the way for drivers in the Hoosier state, but they couldn't prevent dozens of accidents up and down Interstate 65.

Tow truck driver Joe Sage said he was slammed starting at 4 a.m. Friday. "I mean, just one after another. They're not slowing down very much until they run off the road. So it's busy out there, the roads (are) bad and just keeps getting worse," said Sage.

Road conditions created a nightmare commute from Scottsburg to Seymour for Rick Lucas. "It took me about an hour and a half to get here this morning," said Lucas.

Tim Goodpastor said he has at least 7 inches of snow near his house in Jackson County. He stocked up on fuel to power his generator because he's sure the winter storm will knock out his power. "For whatever reason, we're not in the hills of the wilderness, but ours seems to go out," said Goodpastor.

Not everyone looks at the winter weather as a nuisance. Twelve-year-old Stone Cockerham and his sister, Kailene Cockerham, love the snow. "They canceled school and you can make snowmen, have a snowball fight and just have fun, build forts and stuff like that," Stone Cockerham said.

Lucas couldn't disagree more. "I hate winter a little more every year," he said.

Source: http://www.wlky.com/news/local-news/indiana-news/ind-communities-declare-state-of-emergency-after-fridays-snow-ice/23367948

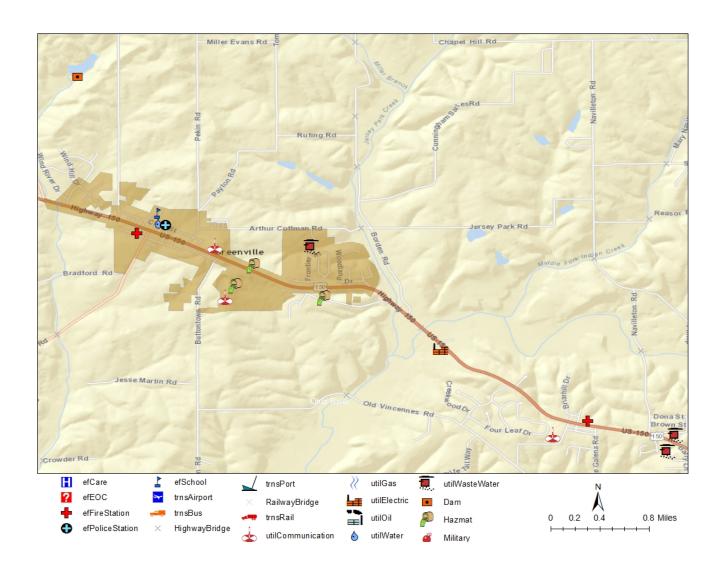


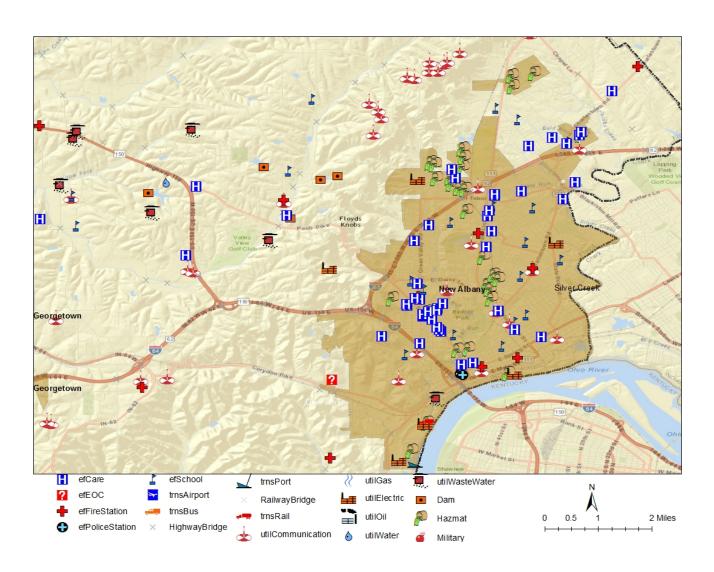
## **Appendix C**

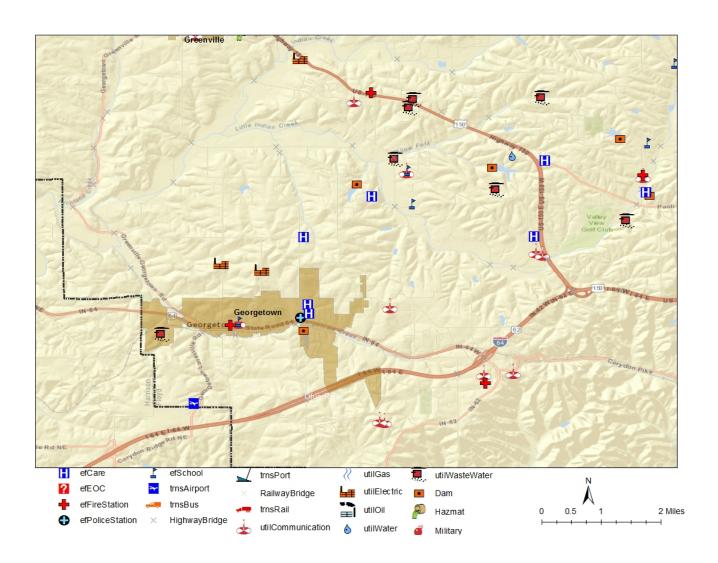
### **Locations of Floyd County Facilities**

Updated: 2015







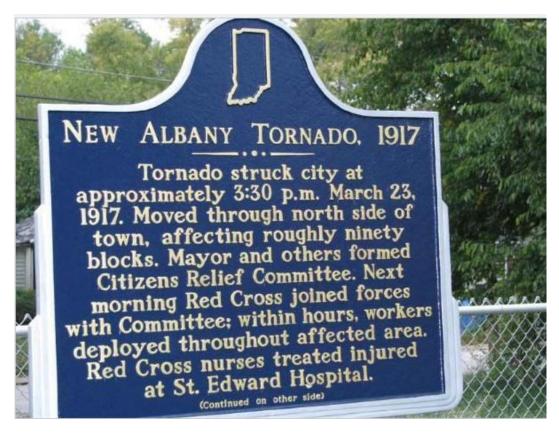


## **Appendix D**

## Historical Disaster Photographs



Appendices The Polis Center 148



Source: http://www.waymarking.com/gallery/image.aspx?f=1&guid=a38f52bd-af1b-4107-893b-9e79eb1381cb

New Albany Disaster Services team



Source: http://corps.salvationarmyindiana.org/newalbany/new-albany-salvation-army-assists-with-bedford-tornado-response/



Straight line winds blew down this tree at Slate Run Elementary School in New Albany

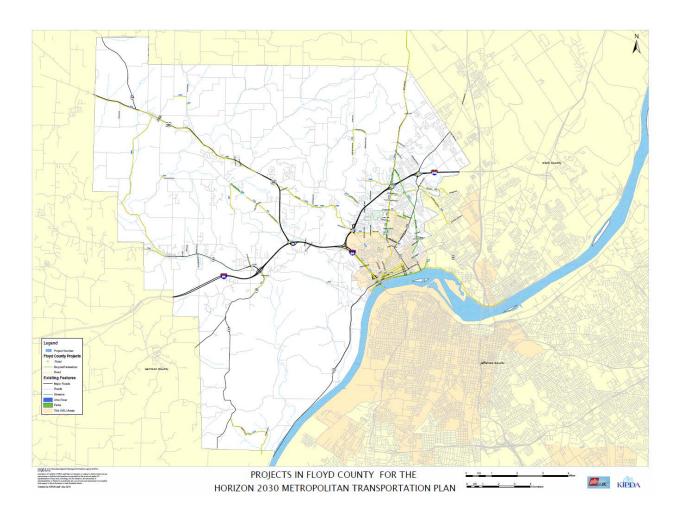
Source: crh.noaa.gov

## **Appendix E**

### Metropolitan Transportation Plan for Floyd County

Updated: 2015





## **Appendix F**

Threats and Hazard Identification and Risk Assessment Checklist (THIRA)

Updated: 2015



Please check any of the following threats of concern to your county.

Man-Made International Threats	Natural Hazards	
International Terrorism	Severe Storms	
☐ Al-Qa'ida	☑ Wind	
☐ Al-Qa'ida in the Arabian Peninsula (AQAP)	☑ Lightning	
□ Islamic State of Iraq and the Levant (ISIL)	☑ <b>′</b> Hail	
☐ Hezbollah	☐ Derecho	
☐ Al-Shabaab	☐ Tropical Cyclone Remnants	
☐ Boko Haram	☑ Flash Flood	
☐ Homegrown Violent Extremists	☑ Major Flood	
Domestic Terrorism	☑ Tornado	
☐ White Supremacists	Winter Storm	
☐ Separatist Groups	☑ Heavy Snow	
☐ Anarchists	☐ Blizzard	
□ Environmental Extremists	☐ Lake Effect Snow	
☐ Animal Rights Extremists	☑ Ice Storm	
☐ Lone Offenders	▼ Temperature Extremes	
□ Other Violent Offenders	☐ Drought	
	Earthquake	
Technological Hazards	✓ Magnitude 5.0 and Higher	
Technological mazaras	☐ Magnitude 4.9 and Lower	
☐ Communication Systems Failure	☐ Animal Disease Outbreak	
Transportation	Human Disease Outbreak	
☑ Highway Transportation Incident	Invasive Species	
	☐ Plant	
X Rail Transportation Incident	☐ Animal	
■ Marine Transportation Incident	☐ Insect	
Hazardous Materials	□ Wildland Fire	
M Hazardous Materials Transportation Incident	☐ Geomagnetic Storm	
☑ Hazardous Materials Fixed-Facility	☐ Ground Failure	
☐ High Hazard Dam Failure		
Major Levee Failure	Other Hazards Not Listed	
☑ Public Utility Failure	☐ Click here to enter text.	
☐ Explosion	☐ Click here to enter text.	
☐ Large Fire/Conflagration	☐ Click here to enter text.	
☑ Pipeline Transportation Incident		
☐ Structural Collapse	Please list your top 5 hazards of concern	
	<ol> <li>Click here to enter text.</li> </ol>	
	<ol><li>Click here to enter text.</li></ol>	
	<ol><li>Click here to enter text.</li></ol>	
	<ol><li>Click here to enter text.</li></ol>	
	<ol><li>Click here to enter text.</li></ol>	

# Appendix G

## **Adopting Resolutions**



Resolution #	
_	

#### ADOPTING THE FLOYD COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, Floyd County recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHEREAS, Floyd County participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Floyd County Commissioners hereby adopt the Floyd County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Floyd County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS	Day of	, 2015.
County Commissioner Chairm	an	
County Commissioner		
County Commissioner		
County Commissioner		
	 Attested by	: County Clerk



## Resolution #\_\_\_\_\_ ADOPTING THE FLOYD COUNTY MULTI-HAZARD MITIGATION PLAN

Updated: 2015

WHEREAS, the City of New Albany recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHEREAS, the City of New Albany participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the City of New Albany hereby adopt the Floyd County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Floyd County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS	Day of, 2015
City Mayor	
City Council Member	
City Council Member	
City Council Member	
	 Attested by: City Clerk

The Polis Center

## Resolution #\_\_\_\_\_ ADOPTING THE FLOYD COUNTY MULTI-HAZARD MITIGATION PLAN

Updated: 2015

WHEREAS, the Town of Georgetown recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHEREAS, the Town of Georgetown participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Town of Georgetown hereby adopt the Floyd County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Floyd County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS	Day of	, 2015.
Town President		
Town Council Member		
 Town Council Member	·	
 Town Council Member		
	 Attested b	y: Town Clerk



ADOPTED THIS

#### Resolution # ADOPTING THE FLOYD COUNTY MULTI-HAZARD MITIGATION PLAN

Updated: 2015

WHEREAS, the Town of Greenville recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHEREAS, the Town of Greenville participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Town of Greenville hereby adopt the Floyd County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Floyd County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Indiana Department of Homeland Security and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS	Day of	, 2015.
Town President	<del></del>	
 Town Council Member		
Town Council Member	<del></del>	
 Town Council Member		
 Attested by: Town Clerk		

