

Hazard Mitigation - 2019 5 Year Plan Update Clark County, Ohio



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Hazard Mitigation Plan – 2019

5-Year Plan Update

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List of Commonly Used Acronyms

ARC	American Red Cross
BFE	Base Flood Elevation
CCPD	Clark County Park District
CDBG	Community Development Block Grant
CRS	Community Rating System
CCBC	Clark County Board of Commissioners
CCHMC	Clark County Hazard Mitigation Committee
DMA2K	Disaster Mitigation Act of 2000
DSP	Dam Safety Program
EMS	Emergency Medical Services
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency
FD	Fire Department
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance Program
GIS	Geographic Information Systems
GPS	Global Positioning
HIRA	Hazard Identification & Risk Assessment
HMGP	Hazard Mitigation Grant Program
HUD	Housing and Urban Development
LHMP	Local Hazard Mitigation Plan
LU/LC	Land Use Land Cover
MCD	Miami Conservancy District
NCDC	National Climatic Data Center
NDMC	National Drought Mitigation Center
NFDRS	National Fire Danger Rating System
NFIP	National Flood Insurance Program
NID	National Inventory of Dams
NOAA	National Oceanic Atmospheric Administration
NRCS	National Conservation Resource Service
NWS	National Weather Service
OAC	Ohio Administrative Code
OBC	Ohio Building Code
ODH	Ohio Department of Health
ODNR	Ohio Department of Natural Resources
ODNR-FPM	Ohio Department of Natural Resources Flood Plain Management
ODOT	Ohio Department of Transportation
OFP	Ohio Flood Plain
Ohio EMA	Ohio Emergency Management Agency
OPWC	Ohio Public Works Commission

ORC	Ohio Revised Code
OSU	Ohio State University
PDM	Pre-Disaster Mitigation Grant Program
PDM-C	Pre-Disaster Mitigation Competitive Grant Program
SFHA	Special Flood Hazard Area
SHARPP	State Hazard Analysis Resource & Planning Portal
SHMD	State Hazard Mitigation Office
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WPCLF	Water Pollution Control Loan Fund
WRP	Wetlands Reserve Program
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Mitigation Plan Summary



The Clark County Emergency Management Agency (EMA) spearheaded this effort to complete the 5-year update process for the residents of Clark County.

Clark County is subject to natural hazards that threaten life and health as well as having caused extensive property damage. It is the intent of hazard mitigation activities to reduce their impacts on people and property. Through the countywide coordinated program, Clark County has developed this multi-jurisdictional mitigation plan that includes all-natural hazards the County is susceptible to as per Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Clark County continues to develop the best practices approach to obtain and utilize mitigation funding through a variety of means to provide the community quality hazard mitigation efforts.

This Mitigation Plan update was developed under the guidance of a Clark County Hazard Mitigation Committee (CCHMC) made up of individuals from communities and agencies throughout Clark County. The CCHMC met four separate times during the planning update process to review the current plan and to address hazards that affect the County, the problems associated with these hazards, discuss potential mitigation activities to minimize the effect of these hazards, and verify the current goals that they would like to see achieved within the County.

The Clark County, Ohio Hazard Mitigation Plan demonstrates how Clark County has successfully completed numerous hazard mitigation projects to reduce future damages, deaths, and injuries should disaster strike. The plan also addresses future mitigation activities needed to be done to further reduce future loss and to provide a framework where local governments, businesses, and county residents and visitors can ensure that positive mitigation planning activities are being carried out. It is the intent that future planned work will be carried out based on accurate information and the appropriate mitigation action items will be prudent investments for the taxpayers of Clark County.

As Clark County expands and changes, challenging vulnerabilities must be addressed. Clark County will face numerous hazards in the future, both natural and manmade, and these hazards can result in disasters that impact citizens, businesses, and all levels of government. By identifying hazards and taking appropriate steps to mitigate future vulnerabilities, growth and change can be done in a positive manner that will lessen the impact of future hazard events. Hazard mitigation can be defined as the sustained action taken to reduce or eliminate long-term risks to people and their property from hazards including natural or man-made disasters. Hazard mitigation planning is a positive process built on assessing the hazards and applying effective strategies to complete preventive measures. It involves multiple stakeholders from throughout the community and the state along with blending public and private sector goals, objectives, and actions.

The goals of this plan are to significantly reduce loss of life and injuries and minimize damage to structures and property from disasters. It is also intended to reduce disruptions

to society, better integrate hazard mitigation programs and policies, reduce the number of repetitive flood loss structures, and to promote education and outreach activities to create a culture of hazard mitigation for Clark County residents.

The Clark County Hazard Mitigation Plan currently is required to be updated every 5 years in order to remain eligible to receive public assistance for hazard mitigation fund grants. The 2019 plan updates are intended to address new conditions and laws and includes an update and status report of mitigation action items occurring within the previously FEMA Approved Plan that was adopted by the Clark County Board of Commissioners and the Municipalities.

Section 1 “Introduction” summarizes the Plan and describes the planning process and includes the documentation for adoption of the Plan by the Clark County Board of Commissioners and all of the participating municipalities.

Section 2 “Hazard Identification, Risk Assessment & Vulnerability” identifies the most prevalent hazards that have affected and may in the future affect Clark County. This section includes hazard history, determination of risk and vulnerability of buildings and infrastructure, and a discussion on County development trends and how that may affect future analysis.

Section 3 “Clark County Mitigation Strategy” addresses hazard mitigation goals, objectives, and action items to be effective in hazard mitigation.

Section 4 “Plan Maintenance Process” addresses how the Clark County plan will be evaluated and updated.

Appendix: Includes supporting documentation and information that complements the Clark County Hazard Mitigation Plan.

Introduction

A mitigation plan addresses natural disasters that could affect a local community, whether it is flooding, tornadoes, high winds, winter storms, severe thunderstorms or some other natural disaster. A mitigation plan is an administrative document that is issued to establish activities that should reduce or, when possible, eliminate long-term risk to human life and property. The plan will also provide a community with a “comprehensive guide” for future mitigation efforts as they relate to the hazards that affect their county. By updating and implementing mitigation activities into other planning documents, a community can develop strategies and implement projects for reducing risk.

The Clark County Board of Commissioners supported updating their All Natural Hazards Mitigation Plan (Mitigation Plan) with funds received from Ohio Emergency Management Agency (OEMA) and the Federal Emergency Management Agency (FEMA). There has been an on-going effort in publicizing the County’s activities in relation to mitigation and how the public can continue to get involved and support the County’s mitigation efforts.

The Clark County Hazard Mitigation Committee reaffirmed the following county hazards which includes but are not limited to:

Biological

- Invasive Plants, Pests and Infestations
- Epidemics

Geological

- Earthquakes

Meteorological

- Tornadoes, High Winds Events
- Flood, Flash Flood, Small Stream/Urban Flooding
- Winter Storms Including Sleet/Snow/Ice/Blizzard
- Severe Thunderstorm/Lightning/Hail
- Drought
- Extreme Temperatures (Hot/Cold)
- Dam/Levee Failure

Other Hazards

- Hazardous Materials Incidents
- Radiological Incidents

As part of the Disaster Mitigation Act communities that desire to remain eligible for Federal and State mitigation funds must have an approved mitigation plan in place and shall be updated every five years.

Incorporated jurisdictions within a county must participate as well as representatives from

the unincorporated areas. Townships are not required to participate because the County Commissioners can represent them on mitigation projects. However, a township may take an active part by submitting a hazard mitigation project and their participation in the planning effort is crucial. Local participation is “key” to the successful implementation of these mitigation plans.

If a community chooses not to participate in the mitigation planning effort, the community becomes ineligible for any future federal or state mitigation money. This mitigation money usually comes in the form of a grant such as the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) or the PDM Grant Program, which is to be used to implement mitigation strategies and activities.

The chart below shows examples of eligible activities that could be supported by mitigation dollars under the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation (PDM), and the Flood Mitigation Assistance (FMA) funding programs.

<u>Eligible Activities</u>	<u>HMGP</u>	<u>PDM</u>	<u>FMA</u>
1. Mitigation Projects	X	X	X
Property Acquisition & Structure Demolition	X	X	X
Property Acquisition & Structure Relocation	X	X	X
Structure Elevation	X	X	X
Mitigation Reconstruction	X	X	X
Dry Floodproofing of Historic Residential Structures	X	X	X
Dry Floodproofing of Non-Residential Structures	X	X	X
Generators	X	X	
Localized Flood Risk Reduction Projects	X	X	X
Non-Localized Flood Risk Reduction Projects	X	X	
Structural Retrofitting of Existing Buildings	X	X	X
Non-Structural Retrofitting of Existing Buildings and Facilities	X	X	X
Safe Room Construction	X	X	
Wind Retrofit for One- and Two-Family Residences	X	X	
Infrastructure Retrofit	X	X	X
Soil Stabilization	X	X	X
Wildfire Mitigation	X	X	
Post-Disaster Code Enforcement	X		
Advance Assistance	X		

	5 Percent Initiative Projects*	X		
	Miscellaneous/Other**	X	X	X
2.	Hazard Mitigation Planning	X	X	X
	Planning-Related Activities	X		
3.	Technical Assistance			X
4.	Management Costs	X	X	X

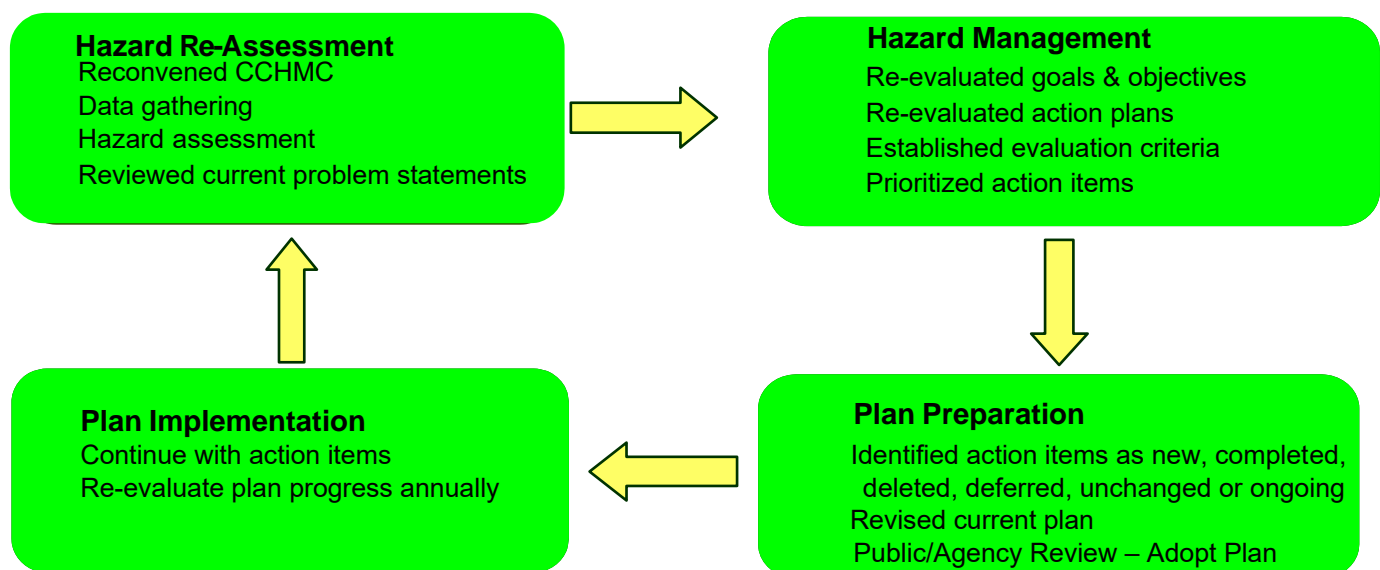
* FEMA allows increasing the 5% Initiative amount up to 10% for a Presidential major disaster declaration under HMGP. The additional 5% Initiative funding can be used activities that promote disaster-resistant codes for all hazards. As a condition of the award, either a disaster-resistant building code must be adopted or an improved Building Code Effectiveness Grading Schedule is required.

** Miscellaneous/Other indicates that any proposed action will be evaluated on its own merit against program requirements. Eligible projects will be approved provided funding is available.

When updating the Plan, the planning process also involved evaluating several approved FEMA mitigation planning efforts from around the county that the CCHMC approved for their content and set-up, which met the needs of Clark County as well as satisfied the requirement of the reviewers, OEMA and FEMA.

The following flow diagram shows the Natural Hazard Mitigation Planning update process that was followed:

NATURAL HAZARD MITIGATION PLANNING PROCESS



In addition to the aforementioned process, the CCHMC and the designated leaders of the group made sure that every community that participated in this planning effort was aware of their responsibilities as well as how they could best represent their community. Some suggestions that were incorporated into the initial invitation to participate in the natural hazard mitigation planning effort included:

- Participate in the Core Group planning meetings to represent your community's or organizations interests.
- Supply any information (background) on recent storm events, action item progress, new mitigation action items to be addressed for your community to the CCHMC.
- Review and comment on the updated Mitigation Plan.
- Review and confirm mitigation activities developed by the CCHMC for each community to implement.
- Be an advocate for Final Adoption of the Mitigation Plan by your community.

In an effort to continue to meet the mission of protecting lives, property, economic viability and quality of life for the people of Clark County, the County Commissioners desired to create the Clark County Mitigation Plan for their community and its residents. Clark County authorized the consulting firm of Mote & Associates, Inc. the task of assisting with the mitigation plan update process.

The collaborative efforts of updating the plan included working with the different agencies within Clark County and coordinating with all participating jurisdictions. The Clark County EMA appreciated the planning efforts of all participants.

Clark County currently has two incorporated cities and eight incorporated villages within its borders that were invited to participate in the planning update process. The process to update the Mitigation Plan started with establishing a "Mitigation CCHMC" of decision makers and implementers. The planning efforts were effective and lead on a countywide basis.

COUNTY OVERVIEW

- 1.1 Profile
- 1.2 Population
- 1.3 Climate, Geography and Environment
- 1.4 History
- 1.5 Incorporated Cities and Villages
- 1.6 Tourism and Points of Interest
- 1.7 Community Parks/Recreation Areas
- 1.8 Public Libraries and Education
- 1.9 Business and Industry
- 1.10 Residential Housing
- 1.11 Tax Value and Land Use
- 1.12 Workforce Labor Statistics
- 1.13 Documentation of the Planning Process

1.14 Local Planning Committee & Contact List

1.15 Plan Adoption by the Board of Commissioners

1.16 Plan Adoption List

1.17 Plan Adoption By Municipalities

1.1 Profile

Clark County is located in southwest Ohio. It is bounded by Champaign County to the north, Miami and Montgomery counties to the west, Greene and Madison counties to the south, and Madison County to the east. The County is comprised of 412 square miles of land. There are 10 townships in Clark County.



The County is semi-rural in setting and agricultural areas dominate the landscape. The urban component of the County is comprised of a series of cities, villages and unincorporated areas of development, activity centers, townships of varying population size, and transportation and greenway corridors. Interstate 70 runs west-east through the County, and U.S. Route 68 is the main north-south thoroughfare in the County. Other major highways include U.S. Route 40, State Routes 4, 41, 54, 56, 72, and 334.

The incorporated areas of Clark County include Catawba Village, Clifton Village, Donnelsville Village, Enon Village, New Carlisle City, North Hampton Village, South Charleston Village, South Vienna Village, Springfield City and Tremont City Village. According to the 2017 (Est) Census, the largest areas of population are Springfield (59,208), Springfield Township (11,828) and Bethel Township (12,058). The entire County population is an estimated 134,557.

The county seat is located in the City of Springfield. The three-member board of County Commissioners is elected at large in even-numbered years for the four-year overlapping terms and is the legislative and executive body of the County. The County Administrator is the Chief Administrative Officer of the County and leads the administration, enforcement and execution of the policies and resolutions of the board.

According to the Ohio Department of Development (ODOD), the County's major employers include Clark County Government, Community Mercy Health Partners, Assurant, Inc., Dole Fresh Vegetables, Navistar, Rittal Corporation, Springfield City Schools, Marathon/Super America LLC/Speedway, Springfield Masonic Community, Gordon Food Service, Yamada North America and Wittenberg University. Unfortunately, on July 7, 2015 NOV, Inc. (formerly a subsidiary of Robbins & Myers, Inc.) announced the shutting down of local operations affecting 150-200 employees. The company had been a part of Springfield for over 100 years.

Clark County: 134,557 (Estimated total for 2017)	0.4% loss from 2010 to 2017
138,333 (Total in 2010)	0.7% loss from 2000 to 2010
144,742 (Total in 2000)	

	<u>2000</u>	<u>2010</u>	<u>2017 Est.</u>
City of Springfield	65,358	60,608	59,208
City of New Carlisle	5,735	5,785	5,586
Village of Enon	2,638	2,415	2,377
Village of South Charleston	1,850	1,693	1,622
Village of North Hampton	370	478	463
Village of South Vienna	469	384	393
Village of Tremont City	349	375	364
Village of Catawba	312	272	265
Village of Clifton (pt)	49 (part)	48 (part)	48(part)
Village of Donnelsville	293	304	289

	<u>2000</u>	<u>2010</u>	<u>2017 Est.</u>
Bethel	12,934	12,440	12,058
German	N/A	7,112	6,903
Green	2,687	2,750	2,647
Harmony	3,079	3,193	3,078
Madison	946	850	828
Mad River	9,190	8,741	8,467
Moorefield	11,402	12,436	12,099
Pike	3,521	3,246	3,156
Pleasant	2,822	2,966	2,878
Springfield	12,424	12,237	11,828

1800	N/A	1910	66,435	2017 (Est)	134,557
1810	N/A	1920	80,728		
1820	9,533	1930	90,936		
1830	13,114	1940	95,647		
1840	16,882	1950	111,661		
1850	22,178	1960	131,440		
1860	25,300	1970	157,115		
1870	32,070	1980	150,236		
1880	41,948	1990	147,548		

1890	52,277	2000	144,742
1900	58,939	2010	138,333

<u>Population Breakdown 2010</u>	<u>Total</u>	<u>Percent</u>
Total Population	138,333	100.0%
White	119,440	86.3%
African-American	12,128	8.8%
Native American	351	0.3%
Asian	858	0.6%
Pacific Islander	51	0.0%
Other	33	0.0%
Two or More Races	3,509	2.5%
Hispanic (may be of any race)	3,805	2.8%

<u>Population Breakdown 2017 (Est.)</u>	<u>Total</u>	<u>Percent</u>
Total Population	134,557	100.0%
White	116,996	84.2%
African-American	12,104	8.8%
Asian	951	0.7%
Other*	551	3.0%
Two or More Races	3,955	0.0%
Hispanic (may be of any race)	4,469	3.3%

*Other category includes American Indian, Alaska Native, Native Hawaiian, and Other Pacific Islanders.

1.3 Climate, Geography and Environment

Clark County generally receives an average annual rainfall of 41 inches. Snowfalls in Clark County average approximately 19 inches. The number of days with any measurable precipitation is about 75. The average sunny days in Clark County are 179. The July average high temperature is around 84°F and the average low January temperature is 20° F. The comfort index which is based on humidity during the summer “hot” months is 48 out of 100, where higher is more comfortable. The US average on comfort index is 54.

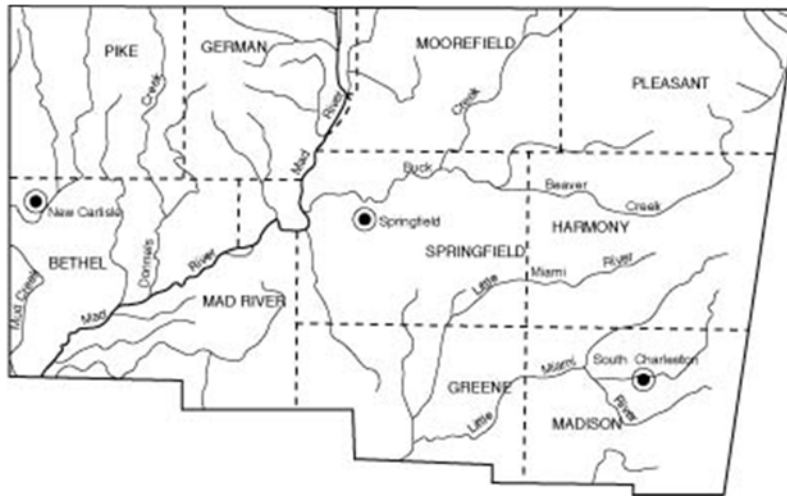
Clark County is composed of rolling till plains with local end moraines. The County contains 30 different soil types, the majority of which are poorly-drained clays and well-drained loams. The County is situated in the ecoregion known as the Eastern Corn Belt Plain. There are three distinct types of Eastern Corn Belt Plain topography located in Clark County. They are the Mad River Interlobate Area, Loamy High Lime Till Plains and Darby Plains. The majority of the County is comprised of Mad River Interlobate Area. This ecoregion is flanked by end moraines that once received concentrated outwash deposits that filled preglacial valleys. Abundant groundwater feeds its distinctive cold water streams that contain an abundance of riffle-inhabiting fish species. Originally, beech forest, mixed oak forest and extensive fresh water fens/wet prairies were common in this region. Today, extensive corn, soybean, dairy and livestock farms as well as urban activity flourish. Woodland still grows on steep sites and along riparian corridors and fresh water fens/wet prairies can also be found locally.

The western and southern portions of Clark County contain the ecoregion known as Loamy High Lime Till Plains. This ecoregion contains soils that developed from loamy, limy, glacial deposits of Wisconsinian age. These soils typically have better natural drainage than those of surrounding ecoregions. Beech forests, oak-sugar maple forests and elm-ash swamp forests once grew on the nearly level terrain. Today, corn, soybean and livestock production is widespread.

Darby Plains is the last ecoregion occupying Clark County and is located in the eastern portion of the County. This ecoregion once had a distinct assemblage of mixed oak forest, with many prairies occurring on its end moraines, gravel-filled pre-glacial valleys and seasonally wet areas. Today, tree density has diminished and very large and productive crop and livestock farms flourish on its level to undulating terrain.

Three different watersheds influence drainage in Clark County: the Mad River, Great Miami River and Little Miami River. Local waterways include the Mad River that enters Clark County from just west of the middle of the County’s northern boundary, and flows southerly leaving the County at the southwestern corner. Principal tributaries are Logonda/Buck Creek, Donnels Creek and Honey Creek. Beaver Creek is a large branch of Buck Creek. The Little Miami River rises in the southeast part of the county and leaves through the middle of the southern border. North Fork and Lisbon Fork are principal branches of the Little Miami River.

The Mad River basin accounts for about 80% of the drainage area in Clark County and has an area of approximately 656 square miles. The County's supply of surface water includes about 2,710 water acres in lakes and approximately 220 linear miles of streams. The following map details the generalized surface water locations in Clark County and was adapted from the Ohio Department of Natural Resources (ODNR) Division of Water river basin maps. (http://ohioline.osu.edu/aex-fact/0480_12.html).



1.4 History

Clark County was formed from Champaign, Madison and Greene counties on March 1, 1817. The County was named in honor of General George Rogers Clark. The first meeting of the Clark County Commission was held on April 25, 1818.

By 1795, a Pennsylvania native by the name of David Lowry was working out of Cincinnati for a General Anthony Wayne. Lowry's duties were to ". . . assist in carrying provisions for the Western Army (L.H. Everts & Co., 1875)." Upon the end of his services of duty to the Western Army, Lowry began working under Israel Ludlow surveying parts of Ohio. On one such excursion, Lowry and his party arrived in the area that was to become known as Broadford, on Mad River, near Enon. He and Jonathon Donnels were impressed by the land and set forth with intentions to settle it. In Cincinnati, they learned that the area they were interested in settling had been purchased by Patten Shorts. Shorts needed the locale surveyed. Jonathan Donnels offered his services and Shorts accepted. Donnels then purchased some of the land he had surveyed from Shorts for both himself and David Lowry. By the fall of 1795, they had made a settlement. Lowry settled at the mouth of a creek he named in honor of his friend, Donnels' Creek. Jonathan Donnels established himself further east near a large spring flowing from a hillside into the bottom land, down to Mad River. David Lowry and Jonathan Donnels were the first white men to settle Clark County.

Other settlers began arriving, including two men by the names of Kreb and Brown in 1796. The two men raised the first crop of corn in the vicinity of what was to become Springfield. David Lowry benefited from Kreb and Brown's initial harvest and in return Lowry hunted for them. By 1799, John Humphreys and Simon Kenton, along with six other families, traveled to Clark County from Kentucky. They built a fort near what would be Mad River Bridge, on the National Road, west of Springfield. *The History of Clark County, Ohio* by L.H. Everts & Co., 1875, W.H. Beers & Co., 1881.

Clark County/Springfield

Clark County and Springfield's early development was hastened by the National Road. During the mid-and-late 19th century, Springfield was dominated by industrialists including Oliver S. Kelly, Asa S. Bushnell, James Leffel, P. P. Mast and Benjamin H. Warder. Asa S. Bushnell built the Springfield, Ohio Bushnell Building^[10] where the patent attorney to the Wright Brothers, Harry Aubrey Toulmin, Sr., wrote the 1904 patent to cover the invention of the airplane. To promote the products of his agricultural equipment company, P. P. Mast started the Farm and Fireside magazine. Mast's publishing company - Mast, Crowell, and Kirkpatrick - grew to become Crowell-Collier Publishing Company best known for Collier's Weekly. In 1894, The Kelly Springfield Tire Company was founded.

At the turn of the 20th century Springfield became known as the "Home City." Several lodges including the Masonic Lodge, Knights of Pythias and Odd Fellows built homes for orphans and aged members of their order. Springfield also became known as "The Champion City"..a reference to the Champion brand of farm equipment manufactured by

the Warder, Bushnell & Glessner Company, which was later absorbed into International Harvester in 1902. International remains in Springfield as Navistar International, a producer of medium to large trucks.

In 1902 A.B. Graham, then the superintendent of schools for Springfield Township in Clark County, established a "Boys' and Girls' Agricultural Club." Approximately 85 children from 10 to 15 years of age attended the first meeting on January 15, 1902 in Springfield, Ohio, in the basement of the Clark County Courthouse. This was the start of what would be called the "4-H Club" within a few years, quickly growing to a nationwide organization. Today, the Courthouse still bears a large 4H symbol under the flag pole at the front of the building to commemorate its part in founding the organization. The Clark County Fair is the second largest fair in the state (only the Ohio State Fair is larger) in large part to 4H still remaining very popular in the area.

Springfield was the first city in the United States to have a black mayor, Robert Henry.

From 1916 to 1926, 10 automobile companies operated in Springfield. Among them: The Bramwell, Brenning, Foos, Frayer-Miller, Kelly Steam, Russell-Springfield and Westcott. The Westcott, known as the car built to last, was a six-cylinder four-door sedan manufactured by Burton J. Westcott of the Westcott Motor Car Company. Burton and Orpha Westcott however, are better known for having contracted the world-renowned architect Frank Lloyd Wright to design their home in 1908 at 1340 East High Street. The Westcott House, a sprawling two-story stucco and concrete house has all the features of Wright's prairie style including horizontal lines, low-pitched roof, and broad eaves. It is the only Frank Lloyd Wright prairie style house in the state of Ohio. The Westcott House Foundation managed the extensive 5 year, \$5.3 million restoration, the house was fully restored to its original glory in October 2005, when it officially opened to the public for guided tours.



Clark County Courthouse in downtown Springfield

Notable Sons & Daughters

Actress from the silent film era:	Lillian Gish
Actors/Actresses:	Justin Chambers and Alaina Reed Hall
Comedian/Actor:	Jonathan Winters
Screenwriter:	Christopher J. Waild
Author:	Dann Stupp
Photographer:	Berenice Abbott
Famous coach:	Randy Ayers
Major League Baseball players:	Dave Burba, Harvey Haddix, Brooks Lawrence, Will McEnaney, Rick White and Luke Lucas
Professional Basketball players:	Jason Collier and Wayne Embry
Musicians/Songwriters:	John Legend, Call Cobbs, Jr., Garvin Bushell, Tommy Tucker, Cecil Scott, Griffen House, Charles Thompson, Earle Warren and Bradley Kincaid

1.5 Incorporated Cities and Villages

Village of Catawba

The Village of Catawba is located in Pleasant Township in northeast Clark County along State Route 54. It is approximately 15 miles northeast of Springfield. The Village has a total land area of 0.3 mi². According to the Census Bureau as of July 1, 2017, there is an estimated 265 people and 112 housing units with 10 of those being vacant. 78.8% of the population is 18 years of age or older and 21.2% is under the age of 18.

The Village of Catawba was officially platted in 1835 and 1836 by Cass and Marsh. It was incorporated on June 6, 1868. A petition signed by 47 men had been presented to the County Commissioners requesting incorporation of the Village. One of the first grist mills in Catawba was built by William Hunter in 1819 located at the corner of Vernon Asbury Road and Neer Road on Buck Creek.

During the end of the Nineteenth century, a two-story school building called the McConkey Schoolhouse was built on the north side of North Street, just east of where North Street and School Street meet. Part of this building was demolished and a two-room brick school was added to the older room. It is used as an apartment building today.

In 1899, The Catawba Creamery Company was formed. Six men purchased a part of Lot ff26 of the Dawson and Marsh survey of Catawba from Newton S. Conway for \$150.00. It was transferred and recorded on August 1, 1899. The part of land purchased was a long narrow strip 185 feet long by 353-feet wide. The building that was erected was used for milk processing. The building was sold in December of 1900 and operated by a single owner. Over the next 20 years, it was used as a creamery, a residence and a pool room. In December of 1921, it was purchased by T. Milton Hunter. It is now known as the Country Church.

Village of Clifton

Clifton is a village located in Clark and Greene counties in Ohio along State Route 72. In Clark County, the Village occupies the south-central portion of the County in Green Township. It is approximately 11 miles south of Springfield. Clifton has a total land area of 0.2 mi². According to the Census Bureau as of July 1, 2017, there is an estimated 151 people and 74 housing units with 16 of those being vacant. 87.4% of the population is 18 years of age or older and 12.6% is under the age of 18.

The Shawnee Indians were one of the first populations to inhabit Clifton and its surrounding areas. Old Chillicothe, one of the leading Shawnee settlements in Ohio, was located 8.5 miles southwest of Clifton. The Cincinnati-Pittsburgh stagecoach road served the area and several enterprising settlers began establishing water-powered industries in Clifton Gorge. The Village of Clifton was laid out around the milling industry and prospered from the textile mill, grist mills and sawmills located along the Little Miami River.

The Clifton Mill is one of the largest water-powered grist mills still in existence. It was built in 1802, and was originally called Davis Mill after its founder, Owen Davis. The Davis Mill burned in the 1840s. Within a year, John Patterson built another mill at the same location. The Patterson Mill provided cornmeal and flour to soldiers during the Civil War. Unfortunately, this building was destroyed by fire in the late 1860s. The present building was built by the Armstrong Family in 1869. The Armstrong Family owned and operated the mill until 1889. Issac Preston bought the mill and three generations of his family operated it until 1948.



Clifton Mill

From 1948 until 1963, the old mill building was inactive. Robert Heller discovered the vacant mill while hiking through Clifton in 1962. Heller was an engineer and was intrigued by the mill's deteriorated condition and the prospect of restoring it to function on water power. Heller and his wife purchased and restored the mill. Clifton Mill has been a functioning mill ever since. Today it serves as a popular tourist attraction visited by many campers and hikers from nearby John Bryan State Park in Greene County. www.villageofclifton.com. In 2018, The Legendary Lights of Clifton Mill was named one of USA TODAY'S 10 Best Readers' Choice Travel Awards. For 31 years Clifton Mill has celebrated the Christmas season with a light display. The display has been featured in Midwest Living and Ohio Magazine and is one of the country's finest with over 4 million lights illuminating the mill, the gorge, the riverbanks, trees and bridges.

Village of Donnelsville

Donnelsville is located in the western portion of Clark County in Bethel Township along U.S. Route 40. It is approximately 7.5 miles west of Springfield. The Village has a total land area of 0.4 mi². According to the Census Bureau as of July 1, 2017, there is an estimated 289 people with 178 housing units with 17 of those being vacant. 73.8% of the population is 18 years of age or older and 26.2% is under the age of 18.

Donnelsville was platted in 1832 by Captain Abram Smith. It was incorporated in 1850. According to the Census of 1880, there were 232 inhabitants. The town consisted of a dry- goods store, two grocery and provision stores, a wagon and blacksmith shop and two cobbler shops. In 1819, the Methodist Episcopal Church was formed at the house of Jeremiah Leffel, who lived about two miles north of the village. The brick church was built shortly after the town was platted. The Lutheran Church was organized around 1830, and met for a number of years at the house of Jacob Snyder. A building was erected later, known as "Croft Church," and was located on the farm of George Croft.

An early perspective of the Village of Donnelsville in 1875 was given by an excerpt

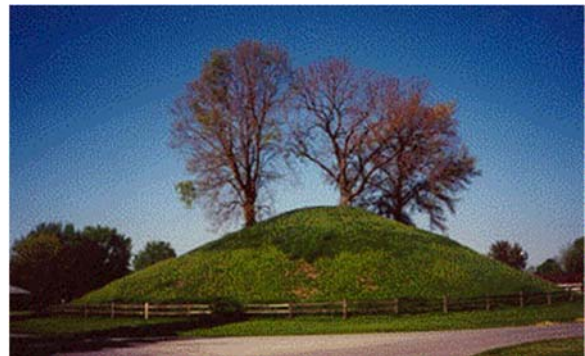
from *The History of Clark County, Ohio* by L.H. Everts & Co.: “Donnelsville has some very tasteful and pleasant private residences. A graded district school is held in a good and substantial two-story brick house.”

Village of Enon

Enon is a village located in the southwest portion of Clark County in Mad River Township. It is approximately nine miles southwest of Springfield. The Village has a total land area of 1.3 mi². According to the Census Bureau as of July 1, 2017, there is an estimated 2,377 people and 1,182 housing units with 16 of those being vacant. 83.1% of the population is 18 years of age or older and 16.9% is under the age of 18. Enon is the headquarters of the Speedway SuperAmerica gas station chain.

Three distinct groups of Native Americans made their homes in the Enon area prior to the arrival of the first white settlers. The Adena Native Americans were the first group to reside in the area. The second group was the Hopewells. The last group was the Shawnees who lived at Old Piqua, where George Rogers Clark Park is now located.

Enon is home to the second largest conical Adena burial mound located in the State of Ohio. It can be found east of downtown Enon on the former Knob Prairie Mound Farm. The mound was reportedly used by General George Rogers Clark in 1780 as a vantage point prior to the attack on the Shawnee Village of Picaway, located less than two miles to the north. It is listed on the National Register of Historic Places (NRHP) and is owned by the Village of Enon.



Adena Burial Mound in Enon

The first settlers in Mad River Township settled sometime prior to 1798. The name Enon means "abundance of springs." From 1817 to 1838, the area was a flourishing agricultural center. On May 19, 1838, the site of Enon was platted by Ezra Baker and Elnathan Corey and lots one through 60 were approved on June 18, 1838. The town of Enon was dedicated at the time the Springfield and Dayton Road was laid out. On March 15, 1850, Enon was incorporated. www.enonohio.com

City of New Carlisle

New Carlisle is located in the western portion of Clark County in Bethel Township. It is approximately 18 miles west of Springfield. The City has a total land area of 1.9 mi². According to the Census Bureau as of July 1, 2017, there is an estimated 5,586 people and 2,184 housing units with 214 of those being vacant. 67.8% of the population is 18 years of age or older and 32.2% is under the age of 18.

New Carlisle was platted in 1810 by William Reyburn. In 1812, the present plat was developed, and called Monroe. The name was changed to New Carlisle in 1828. The Census of 1880 recorded 872 inhabitants. Some of the early buildings in the City included the town hall, Odd Fellows' and Masonic buildings and five churches. New Carlisle was incorporated in 1832. An excerpt from *The History of Clark County, Ohio* by L.H. Everts & Co. describes the Village in 1875, explaining that, despite its rural location, New Carlisle was still a thriving Village:

“Though remote from railroads, Carlisle has a very fair general trade; there are two fine stocks of dry goods, two drug stores, five grocery and provision stores, one general stock of hardware and queensware, one merchant tailor and clothing establishment, a bakery and confectionery, two harness shops, two tin and stove stores, two furniture and cabinet shops, two hotels, one carriage factory, one wagon shop, five blacksmith shops, one cooper, one shoe store, two shoe manufactories, two livery and feed stables, one agricultural implement warehouse, two millinery establishments, one notion store, two meat markets and two nurseries. New Carlisle is surrounded by one of the most fertile grain-growing districts in the world. Some statistics, recently collected, show an almost incredible amount of wheat, corn, rye, barley, flax-seed, potatoes, hay, beef, pork, sheep, grass seeds produced in an area of four miles around the village. The soil is also well adapted to the growth of fruit trees, as is shown at the nurseries that adjoin the village, hundreds of thousands of which are shipped every year from this place and distributed all over the country; to both wholesale dealers and agents.”

On June 10, 1933, the infamous John Dillinger committed his first bank robbery taking \$10,000 from a bank that occupied a building at the southwest corner of Main and Jefferson Streets.

Village of North Hampton

North Hampton is located in the northwest portion of Clark County in Pike Township. It is approximately 10 miles northwest of Springfield. The Village has a total land area of 0.3 mi². According to the Census Bureau as of July 1, 2017, there is an estimated 463 people and 169 housing units with 13 being vacant. 77.6% of the population is 18 years of age or older and 22.4% is under the age of 18.

North Hampton was the first village established in Pike Township, and was platted by Peter Baisinger on January 13, 1829. The original number of lots was sixteen. In 1875, the population of the Village was close to 200. The first merchant of the Village was Joseph Smith, who later moved to Michigan in 1835. The first frame house of North Hampton was built by Smith in 1830. It measured 16-feet by 22-feet, and was used both as a store and dwelling. Other merchants of Pike Township were Bennett and Garlough, John Ramsey, John Davis, William Spence, Spence Brothers, Conklin, French Dickinson, Meranda and Heath, J. E. Fennimore, Jacob Overpack, Michael Hart man, J. P. Hockett, J. M. Austin, J. and W. Morningstar and Levi Wingert. The post office was established in 1835, with Daniel Raffensperger as the first postmaster. The Village was not incorporated until 1925. www.northhamptonohio.net

Village of South Charleston

South Charleston is located in the southeast portion of Clark County along State Route 41 and U.S. Route 42. South Charleston is situated in Madison Township. It is approximately 15 miles southeast of Springfield. The Village has a total land area of 1.3 mi². According to the Census Bureau as of July 1, 2017, there is an estimated 1,622 people and 800 housing units with 73 of those being vacant. 73.3% of the population is 18 years of age or older and 26.7% is under the age of 18.

In 1811, Phillip Hedrick and his wife were the first settlers near South Charleston, located on the north bank of the Little Miami River. Hedrick assisted Conrad Critz with platting South Charleston on November 1, 1815. The original plat contained eight squares of four lots each, and was surveyed by John T. Stewart. South Charleston was incorporated in 1833.

Some of the early merchants and business men of South Charleston included Charles Paist, Robert Evans, Maddox & Heiskell, Albert Munson and Thomas Norton. Clement Stickley operated a tannery on the western portion of South Charleston, near the residence of Henry Wilkinson, in 1825. A small schoolhouse was built measuring 12-feet by 18-feet. Christopher Lightfoot was the first teacher, conducting his first lesson in 1826. In 1848, the P. C. & St. L. Railroad was built, contributing to the growth and prosperity of South Charleston.

This growth and prosperity can be seen when looking at population figures from 1850 to 1880. In 1850, there were 413 people residing in South Charleston. From 1850 to 1870, the population steadily rose. By 1880, the population had more than doubled to 933 compared to the population of 1850. www.villageofsouthcharleston.net

Village of South Vienna

The Village of South Vienna is located in the eastern portion of Clark County in Harmony Township. It lies along State Route 54 and Interstate 70. It is approximately 11 miles east of Springfield. The Village has a total land area of 0.4 mi². According to the Census Bureau as of July 1, 2017, there is an estimated 393 people and 192 housing units with 17 of those being vacant. 78.6% of the population is 18 years of age or older and 21.4% is under the age of 18.

Vienna was founded and platted in 1833 by John H. Dynes. A post office was established in the community in 1838, and was designated South Vienna. In 1850, a cholera epidemic devastated the Village and affected the population. South Vienna was considered a stock-raising and farming community. The first house erected was a log cabin situated in the west part of the Village. The second house erected was hewed log, and was built by Richard Watkins, of Champaign County. Emanuel Mayne built a two-story frame on the southeast corner of the Village which was eventually removed and replaced by a hotel. Caleb Barrett was the first merchant and began a business in 1834. The first tannery was constructed in the northwestern portion of the Village in 1837 by D. W. Hinkle. An accidental explosion of powder occurred on August 8, 1871, demolishing the brick storeroom of a local store and seriously

injuring nine people. The Village of South Vienna was not incorporated until 1901. www.southvienna.org

City of Springfield

Springfield is the county seat of Clark County. It is located in the center of the County, situated on the Mad River. The City has a total land area of 22.5 mi². According to the Census Bureau as of July 1, 2017, there is an estimated 59,208 people and 28,541 housing units with 4,010 of those being vacant. 76.3% of the population is 18 years of age or older and 23.7% is under the age of 18.

Springfield was incorporated as a city on March 21, 1850. J. M. Hunt was the first mayor of Springfield. He presided at the first meeting of the city council held May 18, 1850. The City Building was dedicated on February 13, 1890, and served the citizens until the current City Hall opened on June 2, 1979. The name "Springfield" was chosen because of the many springs and abundant waters located in and around the City.

In 1790, John Paul, a member of the Clark Expedition, returned to the area and built a home. He was believed to be the first settler to locate in what became Clark County. One of the County's early settlers was James Demint, who erected a cabin at the confluence of the Mad River and Lagonda (Buck) Creek in 1799. In 1801, a plat on the city was made on Demint's land by surveyor, James Dougherty. The same year, Griffith Foos built the first tavern which became a famous stagecoach stop. In 1804, the first post office was established for Springfield. Simon Kenton built a gristmill and distillery where the old International Harvester plant now stands.



City Hall

John Humphreys, John Ambler and others organized the first Presbyterian Church in Springfield. By 1806, the first Methodist and First Christian churches were organized. The first church building was erected in Springfield in 1810 and was free to all denominations. In 1817, George Smith published the first paper called *The Farmer*. The first presiding judge was Frederick Grimkie. Springfield Female Seminary began in 1851 and was led by the Reverend James L. Rogers. Wittenberg College was organized by the Lutheran denomination. It was patterned after Yale College, Connecticut, in having both collegiate and theological departments under the same board and faculty.

Several factors contributed to the rapid growth of Springfield. The Old National Road was completed through Springfield in 1839 and the railroads of the 1840s provided profitable business to the area. Agriculture, followed by industry, flourished. By the beginning of the Civil War, the two industries had joined to help Springfield become one of the world's leading manufacturers of agricultural equipment. International Harvester Company, now Navistar International, is the manufacturer of farm machinery and became the leading local industry after a native, William Whitely, invented the combined self-raking reaper and mower in 1856.

Over the years, Springfield has had three other nicknames: “Champion City” because the highly successful Champion reaper was produced here in the 1800s, “Home City” because the Masons, Odd Fellows and Knights of Pythias located retirement homes here around the turn of the century and “City of Roses” because by 1919, 33 greenhouses located in Springfield produced more roses than any other city in the world. www.ci.springfield.oh.us

Village of Tremont City

Tremont City is a village located in north central Clark County in German Township. It is approximately 7 miles north of Springfield. The Village has a total land area of 0.3 mi². According to the Census Bureau as of July 1, 2017 there is an estimated 364 people and 167 housing units with 13 of those being vacant. 74.9% of the population is 18 years of age or older and 25.1% is under the age of 18.

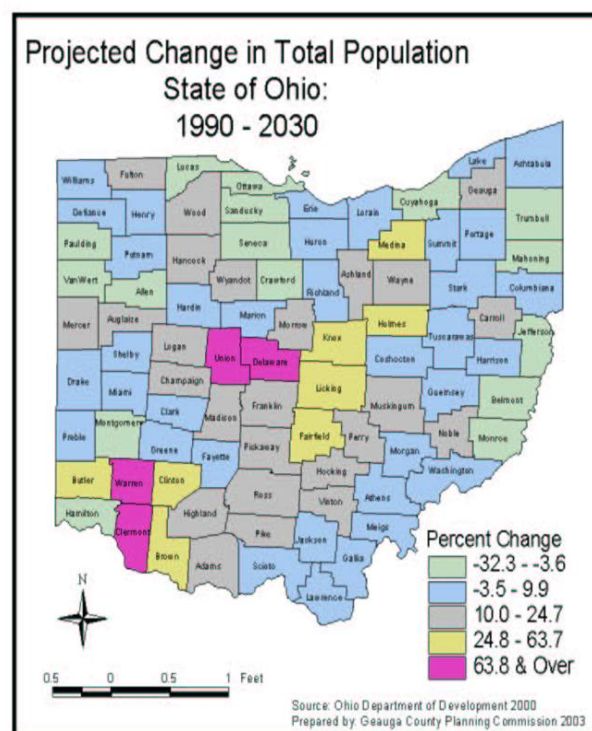
Originally platted as Clarksburg in 1838, Jacob Kiblinger initially built a saw and hemp mill in Section 8, upon Mad River in 1808 which was later to become the Village of Tremont City.

In 1836, upon the site of the Seitz Mill at Tremont, there was a small carding machine and that year John Ross erected a small distillery, both kind of neighborhood affairs. Ross began to plat off and sell lots and shortly thereafter it began to give a village-like appearance. The Post Office was established in 1839 with Dr. Laughlin as Postmaster. The name then was changed to Tremont as there was another town in Ohio named Clarksburg. This occurred in 1839 and the Village was actually incorporated in 1918. Several churches including a large Methodist Church were erected as well as the German Reformed Church.

State Population

The population in the State of Ohio in 2010 was 11,536,504 and is estimated to be 11,658,609 in 2017. It is projected to increase to 11,679,010 by 2040. Ohio is ranked the 7th most populous and 10th most densely populated in the country. It still has one of the lowest growth rates in the nation though, growing at a rate of just 0.67%, ranking Ohio 43rd in the country.

The projected percentage of population change by county in Ohio from 1990 to 2030 is reflected on the map in this section. Counties surrounding a major metropolitan area – Cincinnati, Columbus, and Cleveland – generally will experience higher growth rates. Counties in the north central and eastern region of the state are



projected to experience a decline.

County Population Projection

According to U.S. Census for 2017 (Estimate), the total population of Clark County is 134,557 which has decreased from 144,742 in 2000. Clark County is semi-rural in nature and is considered to be part of the Springfield-Dayton metropolitan area. The County's inhabitants per square mile compared to the State's inhabitants per square mile are 343.3 versus 257.4 respectively. The area of highest population density is the City of Springfield with 59,208 people.

The population of Clark County has steadily increased from 1820 to 1970. From 1980 to 2017 (Estimate), there has been a gradual decrease in population by 15,679 people. From 1960 to 1970, the population increased by 25,675 people, which was the largest net change experienced by the County. Clark County is expected to decrease in population to 129,900 by 2030 (from State of Ohio – Office of Research).

1.6 Tourism and Points of Interest

Crabill Homestead

The David Crabill House is of late Federal design. It is located in Moorefield Township, Clark County, Ohio, on the grounds of the Clarence J. Brown Dam and Reservoir. It is of the 1825-1830 style of architecture.

Baseball Hall of Fame

The Springfield/Clark County Baseball Hall of Fame was formed in 1959 to honor any person age 25 or over, or a team that has made a significant contribution to baseball in Clark County either, locally, regionally, or nationally. Induction ceremonies are held the second Saturday of January.

Daniel Hertzler House

The Pennsylvania Bank-style house is furnished in the pre-Civil War 1850's period style. The house was built by Daniel Hertzler - a wealthy mill owner, who legend has it, still haunts the house to this day.

Frank Lloyd Wright's Westcott House

Completed in 1908. The Westcott House is Frank Lloyd Wright's only Prairie Style home in Ohio. Located at 1340 East High Street, Springfield, The Westcott House underwent an inch-by-inch \$5.3 million restoration in 2005.

Governor Asa S. Bushnell Mansion

Listed with the National Historical Registry, this house was originally constructed as the personal home of two-term Ohio Governor Asa S. Bushnell, a major industrialist in Springfield and Clark County. Bushnell was president of Warder, Bushnell and Glessner Company, which later became International Harvester.

Heritage Center of Clark County

Located in historic downtown Springfield and built in 1890, the facility extends an entire city block and is now home to Clark County's "Smithsonian". Inside, you will find a research library and archives, museum, exhibition hall, and gift shop.

Knob Prairie Mound

Located on what was called Knob Prairie Mound Farm, the mound was reportedly used by General George Rogers Clark in 1780 as a vantage point prior to the attack on the Shawnee village of Picaway, located less than two miles to the north.

Ohio Historic National Road

Route 40 was recently designated as an All-American Road. The National Road runs straight through the heart of Springfield with many historical stops along the way, including a number of structures originally built to accommodate travelers in Conestoga wagons.

South Charleston Opera House

This historic Opera House, located within South Charleston's Renaissance Revival-style Town Hall, was built in 1879 and returned to active use in 1984. Known for its phenomenal natural acoustics, it has hosted countless musicians, singers and productions.

Springfield Museum of Art

Called "an oasis" and a "hidden gem", the Museum's permanent collections contain American art from the 1700's to present. On exhibit is work by well-known American artists and a significant collection of Ohio artists.

Madonna of the Trail

The "Madonna of the Trail" is the National Society Daughters of the American Revolution (NSDAR) memorial to the pioneer mothers of the covered wagon days. It can be seen adjacent to the entrance of Snyder Park.

The Gammon House

Built in the 1850's, the Gammon House was an Underground Railroad site. Originally owned by a black abolitionist named George Gammon, the famous stop features secret passages leading into the attic and a tunnel into the basement.

Davidson Interpretive Center

The Davidson Interpretive Center is located adjacent to George Rogers Clark Park, the site of the Revolutionary War Battle of Peckuwe. The center includes interpretive displays and educational programs.

D T & I Depot

The D T & I Depot, located in South Charleston, was built in the winter of 1878. This depot and railroad was once owned by Henry Ford to use as transportation to and from Detroit. Excursion train rides are offered once a year.

Pennsylvania House Museum

Located at 1311 Main Street, Springfield. Built in 1839, the Pennsylvania House was a popular and respected Inn along National Road. The 7,000 square foot Federal-style house originally had 26 rooms and several large barns.

County Festivals and Events

Fair at New Boston – Labor Day Weekend
Catawba Farm Festival
Clifton Gorge Music and Arts Festival
South Vienna Corn Festival
Springfield Summer Arts Festival
Holiday Lights at Clifton Mill
CultureFest
New Carlisle Festival of Flight
Clark County Fair – last week in July
Heritage of Flight parade and Festival- New Carlisle
Springfield Antique Extravaganza
Hot Rod's & Harley's
Wake on the Lake
South Charleston Heritage Days
Enon Apple Butter Festival
Thanksgiving Day Fountain 5K
Holiday in the City

Other Notable Points of Interest

Young's Jersey Dairy
Brandenberry Winery
Heritage Center Museum
Mother Stewart's Brewing Company
Millionaire's Row
Hollandia Botanical Gardens
Little Miami Scenic Trail
A. B. Graham Memorial Park
Lakeview Park
C.J. Brown Reservoir
Snyder Park
Heart of Ohio Antiques

1.7 Community Parks/Recreation Areas

Community Parks and Recreation Areas

Snyder Park Garden and Arboretum
Carelton Davidson Stadium
Clark County Fairgrounds
Gateway Learning Gardens
George Rogers Clark Park
H. G. Hartman Rock Garden
Lower Valley Pike Scenic Byway
Old Reid Park
National Trail Parks and Recreation District
Buck Creek State Park
South Charleston Community Park
Tremont City Veterans Memorial Park
Enon Beach Recreation Park
Mad River Gorge & Nature Preserve Climbing Area
Virgil A. Mabra Park
Rebert Pike Nature Park

Recreational Trails

Little Miami Scenic Trail – 78 miles of trail running from Springfield to the Little Miami Golf Center south of Milford.
Buck Creek Trail – in Springfield from Plum Street to Pumphouse Road to C.J. brown Reservoir.
Simon Kenton Trail – Center Street in Springfield to Urbana.
Prairie Grass Trail – London to South Charleston to Lilly Chapel.
Tecumseh Trail - New Carlisle 2.5 Miles
Derr Road Bike Lane
Villa Road Bike Path

Clark County Golf Courses

BPO Elks Lodge #51 Golf Course
Locust Hills
National Golf Links
Reid Park Golf Course
Rocky Lakes
Springfield Country Club
Sugar Isle
Windy Knoll Golf Course

Clark County YMCA

300 South Limestone Street, Springfield

1.8 Public Libraries and Education

Public Libraries

Clark County Public Library

Main Library – 201 South Fountain Avenue, Springfield

Enon Branch – 209 East Main Street, Enon

Houston Branch – 5 West Jamestown Street, South Charleston

Park Branch – 1119 North Bechtle Avenue, Springfield

Village Branch – 1123 Sunset Avenue, Springfield

New Carlisle Public Library

Education

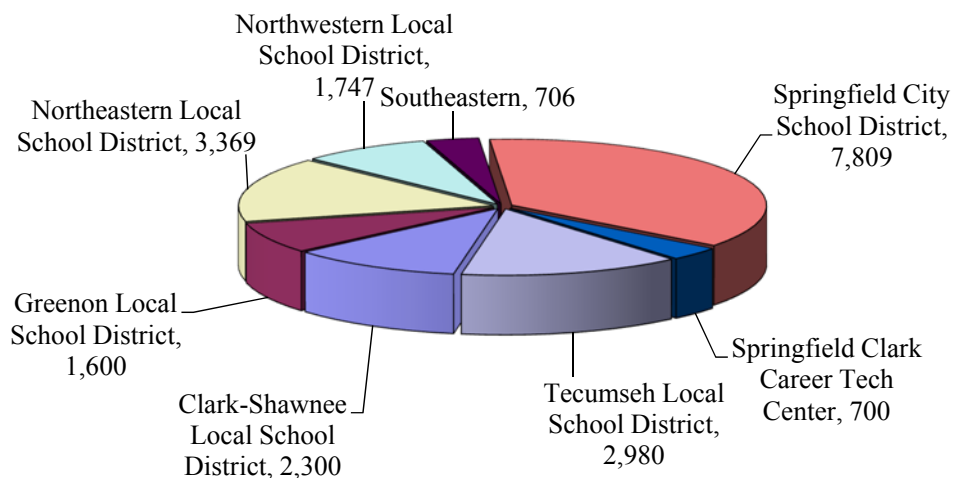
Clark County has six local public school districts, one city district and one career technology center.

Public School System

Approximate Enrollment as of 2018

Clark-Shawnee Local School District	2,300
Greenon Local School District	1,600
Northeastern Local School District	3,369
Northwestern Local School District	1,747
Southeastern Local School District	706
Springfield City School District	7,809
Springfield Clark Career Tech Center	700
Tecumseh Local School District	2,980

Total public-school enrollment: 21,211



The Clark County Education Services Center provides curriculum leadership and management to the County education system.

Private high schools include:

Catholic Central Schools
Emmanuel Christian Academy
Guilding Shepherd Christian School
Nightingale Montessori

Private elementary schools include:

Catholic Central Elementary – Lagonda Campus
Catholic Central Elementary – Limestone Campus
Catholic Central Schools
Derr Road KinderCare
Emmanuel Christian Academy
Enon Montessori
Guilding Shepherd Christian School
Maiden Lane Educare
Nightingale Montessori
Ridgewood School
Risen Christ Lutheran School
St. John S. Lutheran School & Child Care
Springfield Academy of Excellence
Springfield Christian School
Springfield Preparatory and Fitness Academy
Twin Oaks SDA Elementary School

Career related schools include:

Clark County Career Tech

Advanced education includes:

Wittenberg University
Clark State Community College

1.9 Business and Industry

Clark County is a blend of a strong agricultural and industrial county in southwest Ohio. Major farm products include soybeans, wheat, corn, hogs, livestock, poultry, beef, and dairy products. Clark County has approximately 62.7% of its land in crop and pasture land in 2017 and ranks 21st in the State in corn production and 35th in the State in soybean production and 21st in raising all cattle and calves.

In 2017 the total civilian labor force for all industrial sectors in Clark County was 63,800 with 60,700 employed and 3,100 unemployed. The unemployment rate in 2017 was 4.8%.

<u>Employment by Industry</u>	<u>Average Employment</u>
Private Sector	41,027
Goods-Producing	8,241
Natural Resources and Mining	468
Construction	1,052
Manufacturing	6,721
Service-Providing	32,786
Trade, Transportation and Utilities	9,570
Information	131
Financial Services	3,243
Professional and Business Services	4,491
Education and Health Services	8,408
Leisure and Hospitality	5,243
Other Services	1,699
Federal Government	554
State Government	154
Local Government	6,177

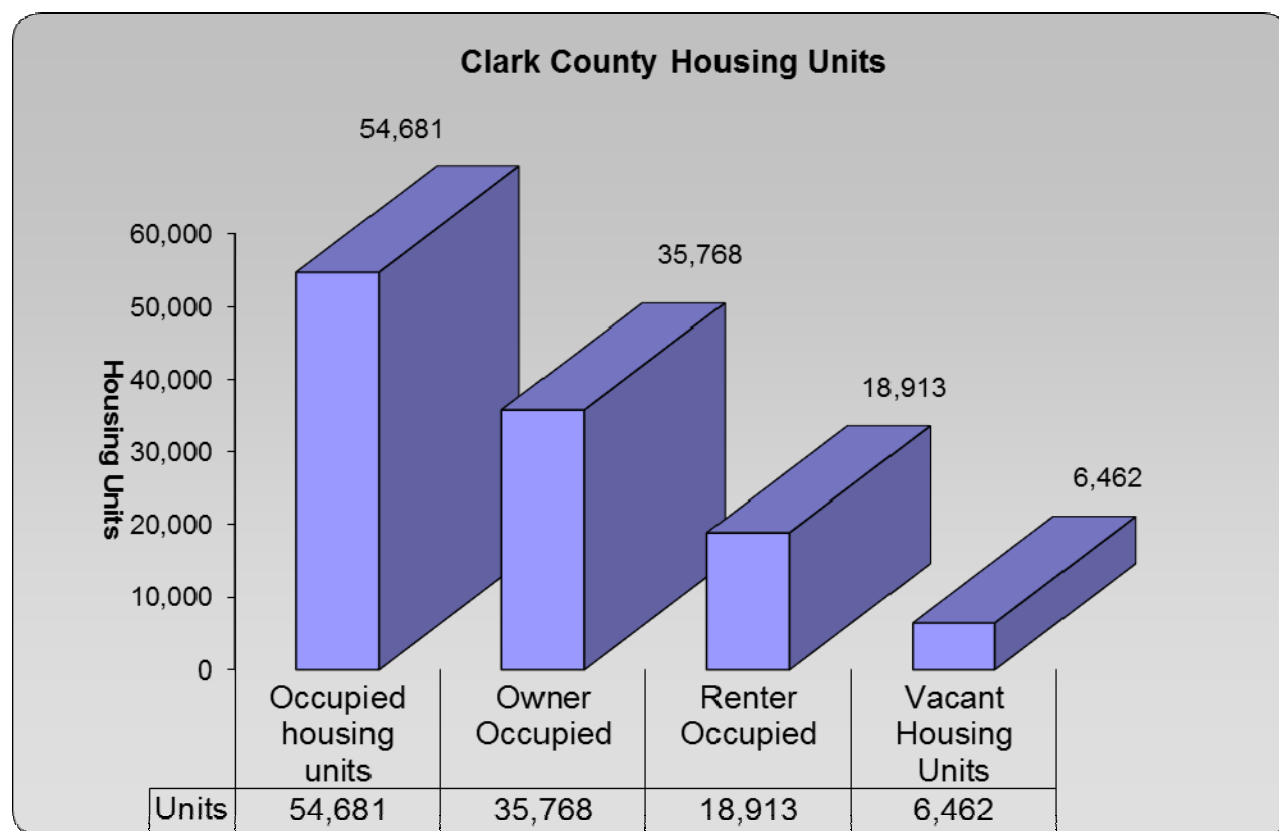
<u>Major Employers</u>	<u>Type</u>
Assurant, Inc.	Insurance
Clark County Government	Government
Community Mercy Health Partners	Service
Dole Fresh Vegetables	Manufacturing
Gordon Food Service	Trade
Marathon/Speedway SuperAmerica LLC	Trade
Mercy Medical Center	Service
Navistar	Manufacturing
Springfield City Schools	Government
Springfield Masonic Community	Service
Wittenberg University	Service
Yamada North America	Manufacturing

Total Active Business (2016): 2,374

The above information provided from Ohio Department of Development, Office of Policy, Research and Strategic Planning.

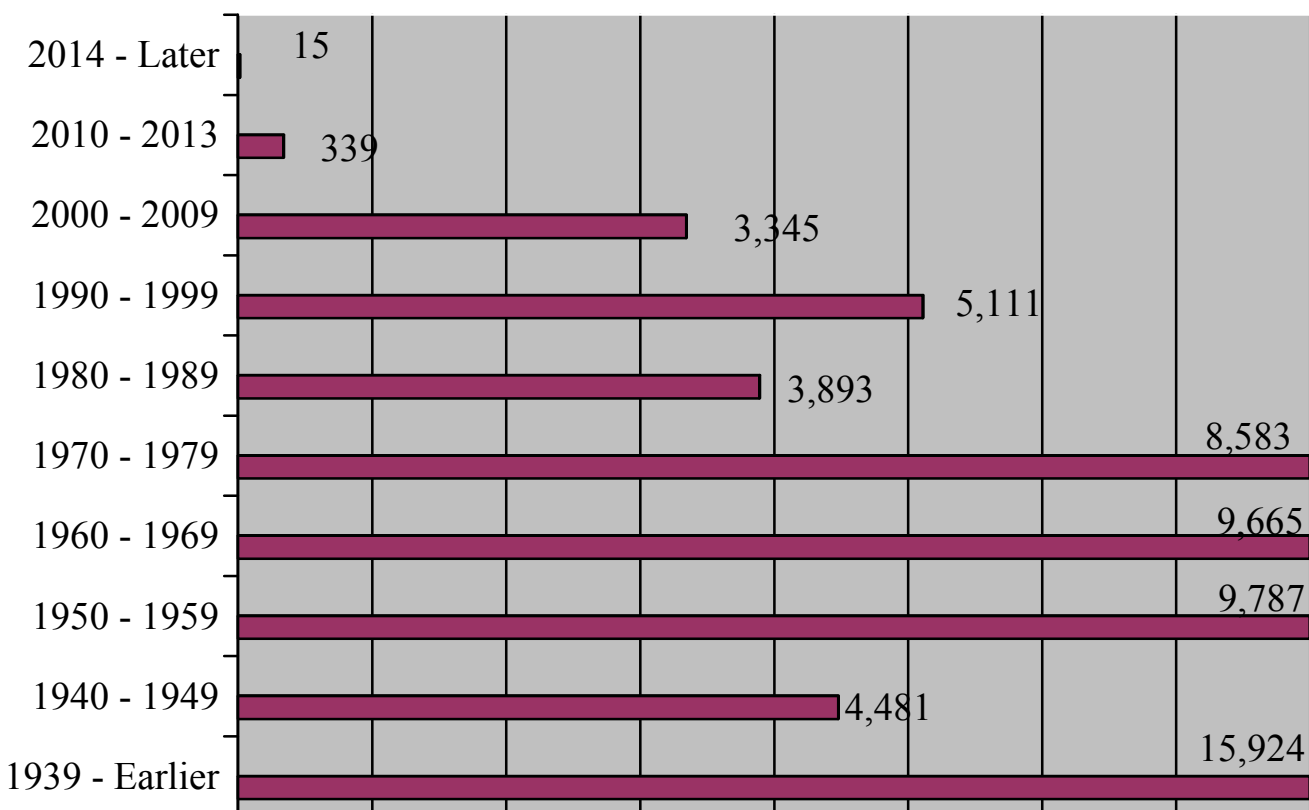
1.10 Residential Housing

<u>Housing Units</u>	<u>Number</u>	<u>Percentage</u>
Total Housing Units	61,143	100%
Occupied Housing Units	54,681	89.4%
Owner Occupied	35,768	65.4%
Renter Occupied	18,913	34.6%
Vacant Housing Units	6,462	10.6%



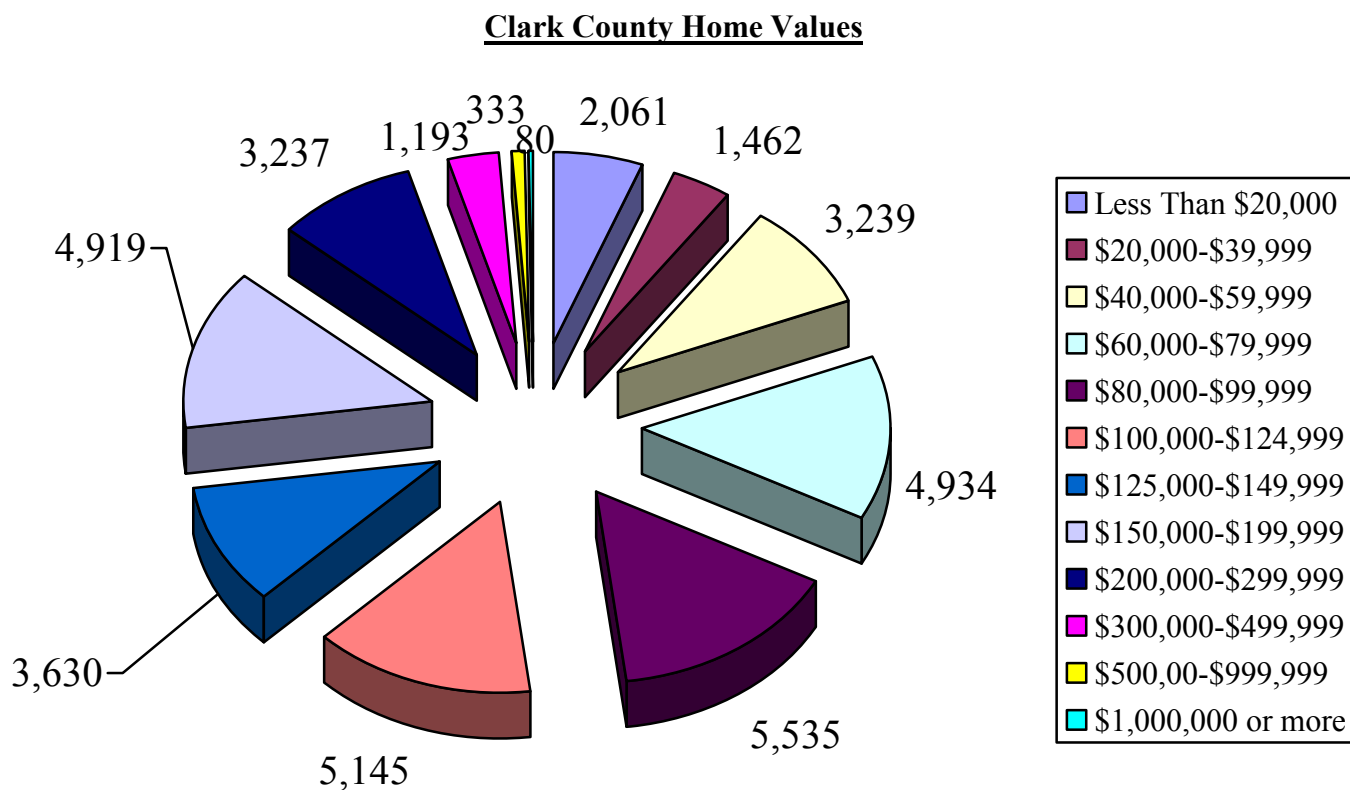
Residential Construction Data

<u>Year Structure Built</u>	<u>No. Built</u>	<u>Percent</u>
2014 & later	15	0.0
2010 to 2013	339	0.6
2000 to 2009	3,345	5.5
1990 to 1999	5,111	8.4
1980 to 1989	3,893	6.4
1970 to 1979	8,583	14.0
1960 to 1969	9,665	15.8
1950 to 1959	9,787	16.0
1940 to 1949	4,481	7.3
1939 or earlier	15,924	26.0

Residential Construction Data

Home Values

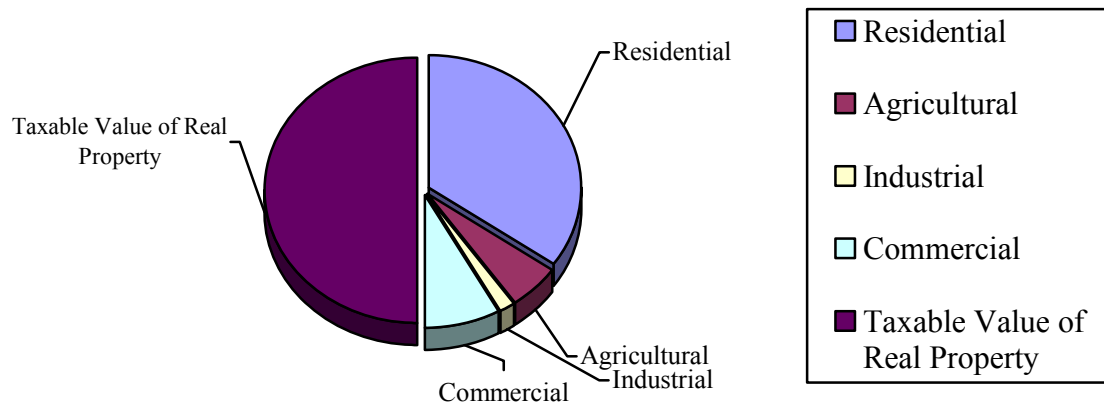
Value	No.	Percent
Specified Owner-Occupied Units	35,768	100.0
Less than \$20,000	2,061	5.8
\$20,000 to \$39,999	1,462	4.1
\$40,000 to \$59,999	3,239	9.1
\$60,000 to \$79,999	4,934	13.8
\$80,000 to \$99,999	5,535	15.5
\$100,000 to \$124,999	5,145	14.4
\$125,000 to \$149,999	3,630	10.1
\$150,000 to \$199,999	4,919	13.8
\$200,000 to \$299,999	3,237	9.0
\$300,000 to \$499,999	1,193	3.3
\$500,000 to \$999,999	333	0.9
\$1,000,000 or more	80	0.2



1.11 Tax Value and Land Use

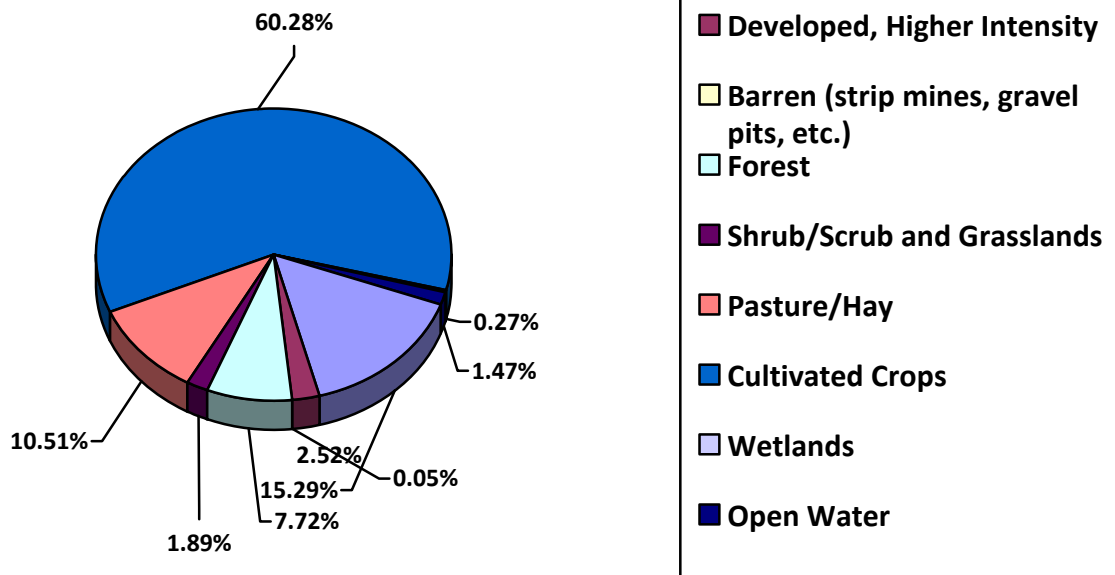
Taxes

	Value
Taxable value of real property	\$2,238,882,200
Residential	\$1,553,043,660
Agricultural	\$ 246,200,140
Industrial	\$ 82,631,670
Commercial	\$ 357,006,730
Mineral	\$ 0



Land Use/Land Cover (2016) in Acres

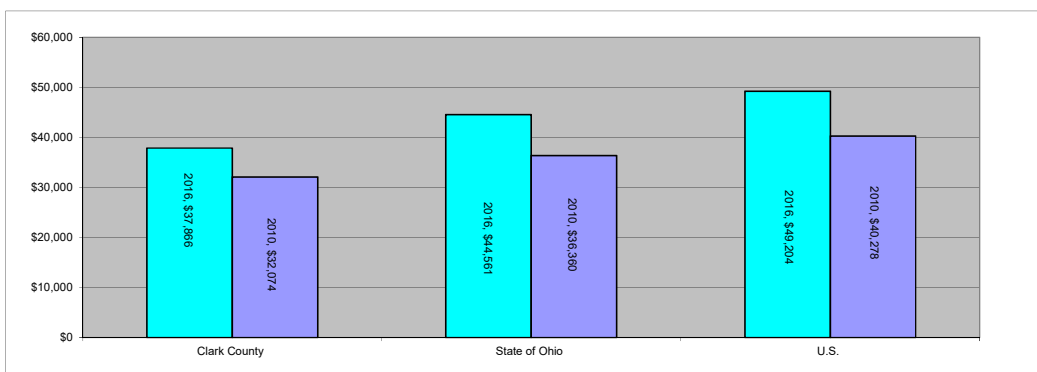
	<u>Percentage</u>
Developed, Lower Intensity	15.29%
Developed, Higher Intensity	2.52%
Barren (strip mines, gravel pits, etc.)	0.05%
Forest	7.72%
Shrub/Scrub and Grasslands	1.89%
Pasture/Hay	10.51%
Cultivated Crops	60.28%
Wetlands	0.27%
Open Water	1.47%



1.1 Clark County Workforce Labor Statistics

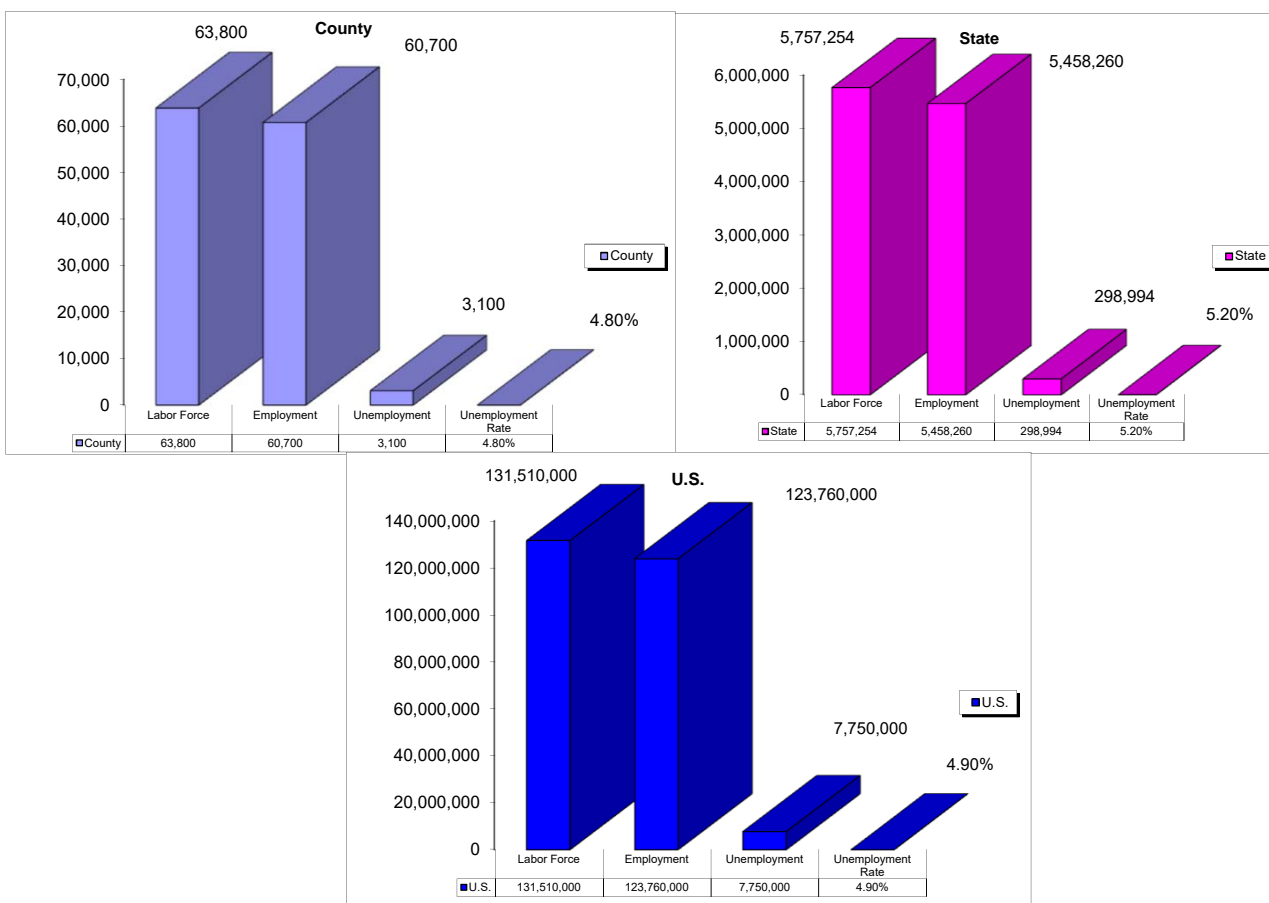
Income

Household Income Comparisons	Clark County	State of Ohio	U.S.
Per Capita Income 2010	\$32,074	\$36,360	\$40,278
Per Capita Income 2016	\$37,866	\$44,561	\$49,204



Labor Force and Employment

	CY 2016		
	County	State	U.S.
Labor Force	63,800	5,757,254	131,510,000
Employment	60,700	5,458,260	123,760,000
Unemployment	3,100	298,994	7,750,000
Unemployment Rate	4.80%	5.20%	4.90%



Source: Darke County Profiles - State of Ohio Office of Research

1.13 Documentation of the Planning Process

Organizing the Process

The planning process to update the Clark County Hazard Mitigation Plan was provided under the leadership of:

- Lisa D’Allessandris, Clark County Emergency Management Director/Committee Chairperson
- Ken Johnson, Clark County Emergency Management Deputy Director
- Mike Henderson, Mote & Associates, Inc.

The CCHMC members, through the planning process of November 2018 through April 2019, reviewed the current Clark County Hazard Mitigation Plan and addressed the county’s mitigation needs in order to:

- Put together a good cross representation of public, community, and stakeholders representing all of Clark County.
- Researched consensus on how to achieve a desired outcome of the county’s hazard mitigation challenges.
- Gain widespread support for directing the countywide financial, technical, and human resources towards an agreed upon course of action.
- Describe the planning process and intended outcome so that the description of the planning process serves a permanent record on how decisions were reached.
- Develop a strategy to reduce losses which have been developed by consensus in a methodical and reasonable way.

Involving the Public

The CCHMC held four public planning meetings from November 2018 through March 2019. A public hearing notice was also published on the Clark County EMA website and on Facebook, describing the countywide hazard mitigation planning process and encouraged the public to review and participate in the plan update process. The community leaders, City and Village officials were also invited to attend the monthly planning update work sessions as documented in the letters per Appendix A-2. The public monthly meetings were intended to educate the community about the benefits of hazard mitigation planning and seeking the input of citizens during the planning process. The following public planning work sessions were held at the conference room of the Clark County Emergency Management Agency which was centrally located in the county.

List of Public Planning Meetings

Meeting	Date	Purpose	Attending
1	November 28, 2018	Kick-off Meeting	Public / CCHMC
2	January 30, 2019	Planning Meeting	Public / CCHMC
3	February 27, 2019	Planning Meeting	Public / CCHMC
4	March 27, 2019	Planning Meeting	Public / CCHMC

In addition, public questionnaires were sent out to each municipality, community and township clerk.

Copies of the published planning article, public meeting minutes, agendas and questionnaires received can be found in Appendix A-2 at the end of this Plan.

On March 28, 2019, Lisa D'Allessandris, Clark County EMA Director, Mike Henderson and Susan Laux of Mote & Associates attended the joint quarterly meeting of county officials, municipal officials and township trustees which was held in Enon, Ohio at the Carriage Inn. A presentation was made to those in attendance to explain the 5-year Clark County EMA Plan updates and to allow those in attendance to participate and answer questions. The minutes and attendance sheet are included in the Appendix A-2.

Copies of the Draft Plan are available for review on the Clark County Emergency Management website: <http://www.clarkcountyohio.gov/index.aspx?NID=158>. Hard copies are available for review at the County Emergency Management Agency, 3130 East Main St. #1E, Springfield, Ohio, 45503, 937-521-2175.

Having a mitigation committee of community leaders and representatives of various agencies, businesses, agricultural and residents with many years of experience living and working in Clark County was a huge asset in the planning process. Their input led to spirited debate and helped the CCHMC identify problems the county had faced during past hazard events. Likewise, the committee also helped identify and promote all of the positive mitigation activities that have been completed by various agencies over the past several years. The completion of the initial Clark County Hazard Mitigation Plan was approved in 2006, updated in 2012 and again in 2019.

Community/Township Participation and Plan Involvement

Every Hazard Mitigation Committee member and community representatives contributed and participated to this Plan update. Some examples of how each community contributed to the success of the planning process are as follows:

Past Examples

- The County Engineer was able to provide his expertise and experience with areas of reoccurring flooding. These areas have been outlined in the plan. His expertise has been invaluable in how completing mitigation activities such as acquiring dedicated green space along the stream corridor, improved drainage ways, elevating reoccurring flooded roadways and bridge and stream improvements has prevented damages and interruptions throughout the county.
- The Northern Miami Valley Ohio Chapter – American Red Cross, County GIS Department and County EMA have all worked together to identify, map and coordinated emergency shelters where residents can go to seek shelter and safety in the event of a severe hazard occurrence.
- A participating member of the Clark County Combined Health District was able to describe the process of being prepared for health epidemics and special needs requirements and what could be expected should Clark County experience a future epidemic crisis.

- The County EMA partnering with multiple agencies have been able to put together an Emergency Shelter Plan for use for hazard and sheltering purposes.
- The EMA sent out a participation letter and survey to all communities encouraging participation and providing updated information regarding mitigation activities completed and in process within each community.
- Several of the smaller villages do not have Village Administrators or full-time staff that could participate on the Hazard Mitigation Committee. However, these communities contributed in the planning process through completing questionnaires as indicated in Appendix A-3. In addition, follow-up contact was made by the EMA office to various village officials and townships for their input. Other community volunteers such as First Responders were contacted by the Clark County EMA office and they participated by helping to update hazard information and risk assessment data for their respective Clark County community.
- The County GIS Department in conjunction with the Clark County EMA also put together a damage assessment app in ARC-GIS to track hazard incidents and damage assessments.
- The Cities of Springfield, New Carlisle, and Villages of Catawba, Clifton, Enon, North Hampton and Tremont City all reported on flooding issues that still need addressed (see 2.5 Flooding under Location). The County GIS department was able to assist in updating all of the county and community flood plain maps.
- The Village of Tremont City reported on completion of new tornado siren.
- The Village of North Hampton reported on success stories such as water tower, sewer pump stations and emergency generators for Northwestern Schools and Chateau Village Mobile Home Park. The removal of a residence on Saddlebrook Run out of the 100-year flood plain.
- South Charleston and Tremont City reported on large dead trees in right-of-ways that need removed.
- City and Villages reported on critical infrastructure changes in their communities.
- The Villages of Enon, North Hampton and South Vienna reported on a need for emergency back-up generators for their water treatment plant.
- Mad River, Moorefield, and German Townships reported on needs for tornado safe rooms.
- City of Springfield and Springfield Township reported on needs for a property in the 100-year flood plain to be acquired and demolished.
- Harmony Township reported on a need for a community safe room.

The CCHMC reviewed the existing planning documents, studies reports, and technical information to determine if all of the previous plan referenced documents are still pertinent if other new documents and planning mechanisms should be incorporated into the Plan.

Neighboring Community Involvement

The Clark County Emergency Management, in addition to the public announcement, also involved all of the neighboring counties' Emergency Management Agencies to participate in the planning process. Madison County EMA representatives attended some of the planning meetings. Copies of the invitations are included in Appendix A-4.

The Planning and Review Process

During the plan review and plan update process the Clark County Hazard Mitigation Committee evaluated each section of the 2012 plan, had spirited discussions, and made recommendations to complete the 2019 Clark County Hazard Mitigation Plan. Some of the planning documents referenced to assist the CCHMC in the planning process included:

- FEMA’s local Multi-Hazard Mitigation Planning Guidance
- The local Mitigation Plan Review Crosswalk
- The 2019 State of Ohio Enhanced Hazard Mitigation Plan
- Available planning documents from County and Local Municipalities including:
 - > HAZUS-MH – Flood Global Risk Report – July 19, 2017
 - > 2014 Discovery Appendix Update for Little Miami Watershed
 - > CJ Brown Reservoir Dam Break Inundation Extent
 - > 2018 Clark County Comprehensive Plan “Connect Clark County”

The CCHMC reviewed draft sections of the Plan and developed the mitigation strategy for the current Plan update process as outlined below:

1: Review of Initial Planning Process:

- Reconvened and expanded hazard mitigation committee and inform public
- Recommended update of the community profile.
- Review hazards to determine if there are any changes to be made or additional hazards to be added.
- Reviewed the following referenced Plans to ensure coordination:
 - Clark County Emergency Operations Plan.
 - 2018 Countywide Comprehensive Plan “Connect Clark County”, Zoning Plans, and Capital Improvement Plans.
 - Review most up-to-date countywide Floodplain Maps.
 - Review of Draft 2019 State Mitigation Plan.

2: Review of Risk Assessment Strategy Section:

- Determine if there is missing data or if more data is needed for future plan updates.
- Determine if change of conditions over the past five years warrants change of hazard priorities.
- Determine if other hazards should be added and profiled.
- Updated last 5 years of weather history.
- Review repetitive losses for the county.

3: Re-assessment of Hazard Vulnerability:

- Discussion on what has changed.
- Re-evaluate vulnerability of the hazards that can affect the County.
- Identify and incorporate the changes into the updated Plan.
- Analyze probability of future events.
- Evaluate County development trends.

- 4: Review 2012 Plan Goals and Objectives:
 - Discussion on what has changed in the last five years that may have affected vulnerability issues.
 - Identify and discuss new problems.
 - Review progress of current action items.
 - Verify if current strategy goals and objectives are accurate or if need revised.
 - Identify new action items and progress made on current action items.
 - Task out priority action items.
- 5: Evaluate Plan Maintenance Process:
 - Strengthen process to make it a stronger countywide collaborative effort.
 - Detail process on how the local government will incorporate the mitigation strategy into other planning mechanisms.
 - Review and modify process as necessary to continue public participation in the Plan.
 - Determine possible funding sources for mitigation action items and projects.
- 6: Draft a Revised Plan Document:
 - Review by stakeholders.
 - Modifications as recommended by stakeholders.
- 7: Plan Adoption:
 - Reviews by State Emergency Management Agency, Federal Emergency Management Agency, & FEMA.
 - Make recommended revisions as requested by State EMA and FEMA.
 - Formal adoption by the Clark County Board of Commissioners and all participating communities.

Community Plans

A summary of the known community documents to be incorporated included those shown in the following table:

Municipality Name	Population	Planning Commission	Zoning	Comprehensive Plans	Flood Plain Ordinance	Building Code - Residential	Building Code - Commercial	NFIP	5 Year Capital Improvement Plan
City of Springfield	59,208	•	•	•	•	•	•	•	•
City of New Carlisle	5,586	•	•	•	•	•	•	•	•
Village of Enon	2,377	•	•	•	•		•	•	
Village of South Charleston	1,622	•	•	•		•	•		
Village of North Hampton	463	•	•	•	•	•	•	•	
Village of South Vienna	393	•	•	•		•	•		
Village of Tremont City	364	•	•	•	•		•	•	
Village of Catawba	265	•	•	•		•	•		
Village of Clifton (pt)	48 (part)	•	•	•			•		
Village of Donnelsville	289	•	•	•		•	•		
Unincorporated areas of Clark County including all townships	63,942	•	•	•			•		

County or Local Plans referenced and to be a part of the Plan include:

- 2011 updated Clark County FIRM Maps
- Clark County Subdivision Regulations
- Clark County Open Space Plan for National Trail Parks and Recreation District.
- Clark County Farmland Preservation Report
- Watershed Planning Efforts
- Connect Clark County 2018 Comprehensive Plan
- Clark County 2018 Thoroughfare Plan
- Eastern Edge Corridor Plan

1.14 Local Planning Committee & Contact List

The Clark County Hazard Mitigation Planning Committee held four public meetings from November 2018 through March 2019 to guide and participate in the planning update process of the Clark County Hazard Mitigation Plan. The Committee consists of representatives from the following public and private sectors of Clark County.

- Clark County Emergency Management Agency
- Clark County Board of Commissioners
- City of Springfield
- Clark County Township Trustees Association
- Clark County Engineer's Office
- Fire Chief's Association
- Clark County Soil & Water Conservation
- Transportation Committee
- City of New Carlisle
- Clark County Administrator
- Clark County Flood Plain Manager
- Clark County Combined Health District
- Springfield News Sun Representative
- Ohio Department of Transportation
- Clark County Sheriff's Office
- Clark County Healthcare Representatives
- Clark County Community Development
- Ohio Emergency Management Agency
- Neighboring County EMA Officials

The Board of Clark County Commissioners, City and County Representatives and EMA officials had representatives or public officials present and participating on the Clark County Hazard Mitigation Planning Committee. In addition, participation from all smaller villages and communities were documented by:

- Responses received from letters and questionnaires sent to each community.
- Providing community action item update responses returned to the Clark County EMA.
- Receipt of updated community information provided by local fire department personnel, volunteers, or village officials.
- Participation by volunteers from the communities attending hazard mitigation meetings.
- Attendance and participation of the Clark County EMA presentation at the quarterly joint meeting of county, municipal and township representatives on March 28, 2019.

The following is 2019 Clark County Hazard Mitigation Members list. Copies of the community letters, questionnaires and responses can be found in Appendix A-3.

Clark County 2019 Hazard Mitigation Committee Member List
Updated as of 03-25-19

<i>Name</i>	<i>Representing</i>	<i>Phone Number</i>	<i>Email</i>
Bauer, Chuck	Clark Co. Utilities & Solid Waste	937-521-2581	cbauer@clarkcountyohio.gov
Combs, Mike	Clark County Sheriff's Office	937-521-2073	mcombs@clarkcountyohio.gov
Cooper, Michael	Clark Co. Commissioners Office	937-521-2031	mcooper@clarkcountyohio.gov
D'Allessandris, Lisa	Clark Co. EMA Director	937-521-2176	ldallessandris@clarkcountyohio.gov
Earl, Randy	American Red Cross	937-232-1065	randy.earl@redcross.org
Gray, Shayne	GIS Director	937-521-1885	sgray@clarkcountyohio.gov
Heck, Bryan	City of Springfield	937-324-7300	bheck@springfieldohio.gov
Henderson, Mike	Mote & Associates	937-548-7511	mhenderson@moteassociates.com
Hicks, Paul	City of Springfield 911	937-328-3525	phicks@springfieldohio.gov
Hutchinson, Jenny	Clark County Administrator	937-521-2010	jhutchinson@clarkcountyohio.gov
Johnson, Ken	Clark County EMA	937-605-2692	kjohnson@clarkcountyohio.gov
Kester, Mary	Mote & Associates	937-548-7511	mkester@moteassociates.com
McCoy, Holly	Madison Co. EMA	740-852-4200	hmccoy@co.madison.oh.us
McDermott, Leslie	City of Springfield	937-561-8153	lmcdermott@springfieldohio.gov
Overholser, Katie	Mercy Health	937-523-1463	koverholser@mercy.com
Patterson, Charles	Clark Co. Combined Health Dist.	937-390-5600	cpatterson@ccchd.com
Pitstick, Michelle	Clark Co. Combined Health Dist.	937-572-7498	mpitstick@ccchd.com
Reed, Samuel	OEMA	614-506-1296	
Reindel, Kyle	ODOT	937-497-6707	kyle.reindel@dot.ohio.gov
Rose, Jason	Village of Enon	937-864-7870	jason.rose@enon-oh.gov
Simpson, Chris	Clark County SWCD	937-521-3850	csimpson@clarkcountyohio.gov
Sims, Deb	Madison Co. EMA Director	740-852-4200	dsims@co.madison.oh.us
West, Kristie	Clark Co. Community Development	937-605-4571	kwest@clarkcountyohio.gov

The Board of County Commissioners, in and for Clark County, Ohio, met this 26th day of February, 2020 in regular session, pursuant to adjournment, in accordance with Section 121.22 O.R.C. (Sunshine Law), with the following members present, viz:

Melanie F. Wilt

Lowell R. McGlothin

Richard L. Lohnes

Resolution 2020-0146
EMAP file

Adopt All Hazard Mitigation Plan

Commissioner Lohnes moved, per the request of the Emergency Management Agency Director, to adopt the following plan:

Plan Name: All Hazard Mitigation Plan
Purpose: Community Adoption of Plan
Effective Date: January 27, 2020

WHEREAS, the Clark County Emergency Management Agency desires to be compliant with the Disaster Mitigation Act of 2000 (DMA2K) and 44CFR Section 201.6(d)(3). Said Act requires that a Hazard Mitigation Plan meeting program criteria be developed in order that the participating Clark County communities and unincorporated areas of Clark County will be eligible for future pre-disaster and post- disaster mitigation program funds (i.e. Hazard Mitigation Grant Program, Flood Mitigation Assistance Program, etc.).

FURTHER, the mitigation planning regulation at 44CFR Section 201.6(d)(3) states:

A local jurisdiction must review and revise its Hazard Mitigation Plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five (5) years in order to continue to be eligible for mitigation project grant funding.

WHEREAS, the Clark County Emergency Management Agency established the Clark County Hazard Mitigation Committee and they have, through an organized planning process, identified local problems and mitigation activities to help reduce hazards, damages, and loss of life during a natural hazard event. Public meetings were held and a Countywide Multi-Jurisdictional Hazard Mitigation Plan was prepared and submitted to the Federal Emergency Management Agency (FEMA) for review and was approved and ready for community adoption on January 27, 2020. Said Plan is on file at the office of the Clark County Emergency Management Agency and is hereby formally adopted.

WHEREAS, by adopted Resolution 2013-0669, the Clark County Emergency Management Agency has entered into an agreement, in the manner provided by law, under the Ohio Revised Code 5502.271, as amended, and has the power to coordinate and unify the comprehensive Emergency Management activities of the participants, thereof, including the various municipal corporations and unincorporated areas of Clark County, Ohio.

For the reasons stated in the preamble hereto, which is hereby made a part hereof, this Resolution is hereby declared to be an emergency measure and shall take effect and be in force from and after its

passage by the Clark County Board of Commissioners, and its adoption by the participating municipalities of Clark County.

Commissioner McGlothin seconded the motion and the roll being called for its passage, the vote resulted as follows:

Commissioner McGlothin, Yes; Commissioner Lohnes, Yes; Commissioner Wilt, Yes

I, Emily Carter, Acting Clerk to the Board of County Commissioners, do hereby certify that the above is a true and correct copy of a motion as recorded in the Journal of the Clark County Commissioners, under the date of February 26, 2020.



Emily Carter, Acting Clerk

copy: County Auditor
County Administrator
Requesting Department(s)

1.16 Plan Adoption List**Adoption by Multi-Jurisdictional**

It is anticipated the following public entities will adopt the final FEMA approved plan for the Clark County Multi-Jurisdiction Hazard Mitigation Plan.

**Multi-Jurisdictional Plan Participation
Clark County, Ohio**

Participating Jurisdiction	Position/Title	2012 Plan		2019 Plan		Date of Adoption
		Yes	No	Yes	No	
Incorporated Areas						
City of New Carlisle	Randy Bridge, City Manager	X		X		*
City of Springfield	Bryan Heck, City Manager	X		X		*
Village of Catawba	David Baker, Mayor	X		X		*
Village of Clifton (pt)	Alex Bieri, Mayor	X		X		02/17/2020
Village of Donnelsville	Robert Cornwell, Mayor	X		X		*
Village of Enon	Timothy Howard, Mayor	X		X		02/25/2020
Village of North Hampton	David Young, Mayor Brian Welbaum, President	X		X		*
Village of South Charleston	Trecia Waring, Village Manager	X		X		*
Village of South Vienna	Toni Keller, Mayor	X		X		*
Village of Tremont City	Tony E. Flood, Mayor	X		X		*
Unincorporated areas of Clark County including all townships	James Davidson, Township Trustee President	X		X		*
Clark County Board of Commissioners	Jennifer Hutchinson, County Administrator	X		X		02/26/2020

* Following Federal approval, the County and its participating jurisdictions intend to formally adopt the plan by Resolution of Ordinance

1.17 Plan Adoption by Municipalities**Municipal Resolution No. _____****A RESOLUTION ADOPTING THE CLARK COUNTY MULTI-JURISDICTIONAL
HAZARD MITIGATION 5 -YEAR PLAN UPDATE**

WHEREAS, Clark County has experienced severe damage from several natural hazards on many occasions in the past century, resulting in property loss, loss of life, economic hardship, and threats to public health and safety; and

WHEREAS, the Clark County Emergency Management Agency has established the Clark County Hazard Mitigation Planning Committee and they have, through an organized planning process, identified local problems and mitigation activities to help reduce hazards, damages, and loss of life during a natural hazard event; and

WHEREAS, the 5-Year Plan Update recommends many hazard mitigation actions that will protect the people and property affected by the natural hazards that face Clark County; and

WHEREAS, public hearings were held to review the Plan as required by law; and will hereby be implemented, monitored, evaluated, and updated annually by the Clark County Hazard Mitigation Committee. The Clark County Board of Commissioners will be the public authority to promote and oversee the continued maintenance of this Plan.

NOW, THEREFORE, BE IT RESOLVED by the Commission of the Village of _____, Clark County, Ohio, the majority of all members elected thereto concurring, that:

Section 1: The Clark County Hazard Mitigation 5-Year Plan Update is hereby adopted as an official Plan of Clark County, Ohio;

Section 2: The Clark County Emergency Management Agency has entered into an agreement, in the manner provided by law, under the Ohio Revised Code, as amended, and has the power to coordinate and unify the comprehensive emergency management activities of the participants, thereof, including the various municipal corporations and townships of Clark County, Ohio; and

Section 3: The respective County, Township, District, City, and Village officials identified in the strategy of the Plan are hereby directed to implement the recommended actions assigned to them. These officials will report annually on their activities, accomplishments, and progress to the Clark County Hazard Mitigation Committee under the direction of the Clark County Board of Commissioners. This report shall be submitted to the Clark County Board of Commissioners by February 28th of each year.

Section 4: This resolution shall take effect and be in force from and after the earliest period allowed by law.

Passed: _____

Attest: _____

Municipal Resolution No. 20-2-2

**A RESOLUTION ADOPTING THE CLARK COUNTY MULTI-JURISDICTIONAL
HAZARD MITIGATION 5-YEAR PLAN UPDATE**

WHEREAS, Clark County has experienced severe damage from several natural hazards on many occasions in the past century, resulting in property loss, loss of life, economic hardship, and threats to public health and safety; and

WHEREAS, the Clark County Emergency Management Agency has established the Clark County Hazard Mitigation Planning Committee and they have, through an organized planning process, identified local problems and mitigation activities to help reduce hazards, damages, and loss of life during a natural hazard event; and

WHEREAS, the 5-Year Plan Update recommends many hazard mitigation actions that will protect the people and property affected by the natural hazards that face Clark County; and

WHEREAS, public hearings were held to review the Plan as required by law; and will hereby be implemented, monitored, evaluated, and updated annually by the Clark County Hazard Mitigation Committee. The Clark County Board of Commissioners will be the public authority to promote and oversee the continued maintenance of this Plan.

NOW, THEREFORE, BE IT RESOLVED by the Commission of the Village of Clifton Clark County, Ohio, the majority of all members elected thereto concurring, that:

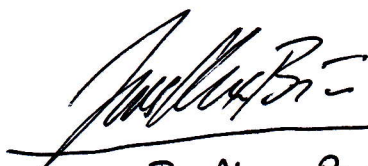
Section 1: The Clark County Hazard Mitigation 5-Year Plan Update is hereby adopted as an official Plan of Clark County, Ohio; and

Section 2: The Clark County Emergency Management Agency has entered into an agreement per Board of Clark County Commission Resolution 2013-0669, in the manner provided by law, under the Ohio Revised Code 5502.271, as amended, and has the power to coordinate and unify the comprehensive emergency management activities of the participants, thereof, including the various municipal corporations and townships of Clark County, Ohio; and


Section 3: The respective County, Township, District, City, and Village officials identified in the strategy of the Plan are hereby directed to implement the recommended actions assigned to them. These officials will report annually on their activities, accomplishments, and progress to the Clark County Hazard Mitigation Committee under the direction of the Clark County Board of Commissioners. This report shall be submitted to the Clark County Board of Commissioners by February 28th of each year.

Section 4: This resolution shall take effect and be in force from and after the earliest period allowed by law.

Passed 2/17/20


J. Alex Bieri, Mayor

Attest:


Sue Chasnov
Clerk-Treasurer

Emergency Resolution No. 2020 - 02

AN EMERGENCY RESOLUTION ADOPTING THE CLARK COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION 5-YEAR PLAN UPDATE

WHEREAS, Clark County has experienced severe damage from several natural hazards on many occasions in the past century, resulting in property loss, loss of life, economic hardship, and threats to public health and safety; and

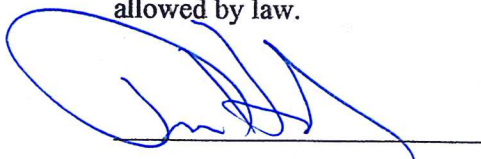
WHEREAS, the Clark County Emergency Management Agency has established the Clark County Hazard Mitigation Planning Committee and they have, through an organized planning process, identified local problems and mitigation activities to help reduce hazards, damages, and loss of life during a natural hazard event; and

WHEREAS, the 5-Year Plan Update recommends many hazard mitigation actions that will protect the people and property affected by the natural hazards that face Clark County; and

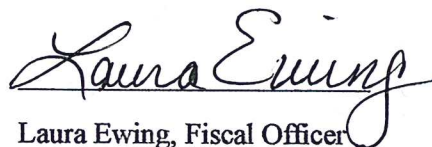
WHEREAS, public hearings were held to review the Plan as required by law; and will hereby be implemented, monitored, evaluated, and updated annually by the Clark County Hazard Mitigation Committee. The Clark County Board of Commissioners will be the public authority to promote and oversee the continued maintenance of this Plan.

NOW, THEREFORE, BE IT RESOLVED by the Council of the Village of Enon, Clark County, Ohio, that:

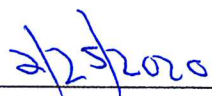
- Section 1: The Clark County Hazard Mitigation 5-Year Plan Update is hereby adopted as an official Plan of Clark County, Ohio;
- Section 2: The Clark County Emergency Management Agency has entered into an agreement per Board of Clark County Commission in the manner provided by law, under the Ohio Revised Code 5502.271, as amended, and has the power to coordinate and unify the comprehensive emergency management activities of the participants, thereof, including the various municipal corporations and townships of Clark County, Ohio; and
- Section 3: The respective County, Township, District, City, and Village officials identified in the strategy of the Plan are hereby directed to implement the recommended actions assigned to them. These officials will report annually on their activities, accomplishments, and progress to the Clark County Hazard Mitigation Committee under the direction of the Clark County Board of Commissioners. This report shall be submitted to the Clark County Board of Commissioners by February 28th of each year.
- Section 4: This resolution shall take effect and be in force from and after the earliest period allowed by law.



Timothy Howard, Mayor



Laura Ewing, Fiscal Officer



Date Passed

Hazard Identification, Risk Assessment & Vulnerability Analysis

- 2.1 Overview
- 2.2 Hazard Mitigation Summary
- 2.3 Identifying Assets
- 2.4 Tornado/High Wind Events
- 2.5 Flooding
- 2.6 Winter Events Including Storms, Heavy Snow, Frost/Freeze and Ice
- 2.7 Severe Summer Storms
- 2.8 Extreme Temperatures
- 2.9 Drought
- 2.10 Dam/Levee Failure
- 2.11 Invasive Plants, Pests Infestation
- 2.12 Epidemic
- 2.13 Earthquakes
- 2.14 Other Hazards – Radiological Accidents
- 2.15 Development Trends
- 2.16 Multi-Jurisdiction Risk Assessment

2.1 Risk Analysis Overview

Clark County is prone to many natural biological, geological and manmade hazards. Clark County has experienced considerable hazard events resulting in millions of dollars of damages, death and injuries (see Federal Public Assistance Grants Awarded Per Declared Disaster at the end of this section). The previous plan approval was reviewed and approved by FEMA on October 17, 2013.

The updates for Section 2 of this Plan draws data and analysis from different sources in order to analyze and mitigate impacts from the counties highest risk hazards.

The purpose of this plan document is to identify the number and frequency of disasters in Clark County and to update and better prepare and deal with them when they occur.

Hazard Assessment

In order to properly update the natural hazards to which Clark County may be susceptible, a three-step process was utilized. This three-step process was completed in order to re-confirm hazards for which Clark County should prepare, and potentially mitigate, in the future. The three steps are described in the following paragraphs.

Step 1 – FEMA’s database was researched to determine which hazards FEMA and the State of Ohio had documented as possible natural hazards, including future threats, for the State of Ohio. Several prevalent hazards that are within the Ohio Mitigation Plan include flooding, severe storms, tornadoes, high wind events and winter storms are also prevalent in Clark County.

Step 2 - The NCDC was reviewed and historic hazard information was evaluated for the local and county level. The NCDC website presented each type of hazard and the historic information associated with it for each county offering several hazard search parameters. These parameters included: droughts, flooding, hail, lightning, tornadoes, wildfires, winter storms, snow and ice, temperature extremes, thunderstorms and high winds.

Because NCDC information did not address earthquakes or dams and dam safety, or epidemics, other sources were reviewed for this data. The information pertaining to earthquake susceptibility was attained from the Ohio Seis data and the Ohio Earthquake Program Manager at OEMA. Dam and dam safety information was gathered from the ODNR’s Division of Dam Safety. Epidemic data was gathered from state and local department of health sources.

Step 3 - The Ohio and Clark County Hazard Analysis and Risk Assessments, were reviewed and the local risk assessment was updated based on the limited resources available. The Ohio Hazard Analysis and Risk Assessment was updated and documented for both natural and non-natural hazard event information.

Risk Assessment Ranking

The updated information compiled during the initial hazard assessment was provided to

the CCHMC for their review and assessment. The CCHMC re-evaluated all the hazards being considered and ranked them based on the number of historic events and cumulative damage that has occurred.

This section will cover:

- Identifying hazards
- Profiling hazards
- Identifying structures
- Addressing repetitive loss structures
- Overview of community's vulnerability
- Estimating potential losses
- Analyzing development trends
- Multi-Jurisdictional Risk Assessment

Identifying Hazards

Section 201.6(c)(2)(i) requires the risk assessment include a description of the type of all natural hazards that can affect Clark County. This section of the plan presents a list of manmade and potential natural hazards that may likely impact Clark County. Clark County is a mix of both urban and rural land use; however, it is vulnerable to a number of hazards that threaten its' communities, businesses, public entities, and environment. To determine the hazards that pose the greatest threat to the County, the Clark County Mitigation Committee updated the list of potential hazards by conducting a review of several key resources which include:

- Review of historical data on events that have occurred in the past.
- Review of 2012 Clark County Hazard Mitigation Plan data.
- Review of the State Hazard Mitigation Plan.
- Collaboration with community experts and agencies on different hazards including representatives from County Board of Commissioners, County EMA, County Engineer, County Health District, Cities and Village Officials, County Planning & Zoning, Community EMS Agencies, County GIS/Auditors Office, Public at Large, Northern Miami Valley Red Cross Chapter, and other state and local agencies.
- Review of past events and declared disasters.
- Newspaper articles and internet research.
- County Auditor data.

Profiling Hazards

Section 201.6(c)(2)(i) requires that the risk assessment shall include a description of the location and extent of all natural hazards that can affect Clark County including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate. The risk assessment relies upon information about past hazard events from published sources such as NOAA, USGS, USACE, Ohio EMA, ODNR, and Clark County Records, as well as other state and local agencies.

The risk assessment section for each hazard in this plan includes a description of the location or geographic area that would be affected and areas where it could occur; the extent of magnitude or severity of potential hazard events; the range of magnitude or severity expected of the hazard; past occurrences; and a discussion of probability of future hazard events.

Assessing Vulnerability of Clark County

Section 201.6(c)(2)(ii) requires a description of each jurisdiction's vulnerability to the hazards described and the description shall include an overall summary of each hazard and its impact on the community. The County Hazard Mitigation Committee determined which structures were considered critical facilities during a disaster. Critical facilities are defined as a facility whose use is necessary during response and recovery efforts following a disaster.

Addressing Repetitive Loss Structures

Section 201.6(c)(2)(ii) requires that the risk assessment also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods. Clark County has identified 11 repetitive loss structure located within Clark County. There have been no severe repetitive loss properties in Clark County.

Identifying Structures

Section 201.6(c)(2)(ii) of the risk assessment recommends inclusion of a description of vulnerability in terms of and analysis of the County's vulnerability to the hazards described in this paragraph (c)(2) based on estimates provided in local risk assessments. The County shall describe vulnerability in terms of the communities most threatened by the identified hazards and most vulnerable to damage and loss associated with hazard events. The methodology for this section varies by hazard due to available data and will be more thoroughly discussed within the results of the section for each hazard. Data for various building stock is still needed, but future resources and programming will become more readily available.

Estimating Potential Losses

Section 201.6(c)(2)(ii) of the risk assessment recommends inclusion of a description of vulnerability and analysis of potential losses to identified structures based on estimates. The methodology for this section varies by hazard due to available data and will be more thoroughly discussed within the section for each hazard.

Analyzing Development Trends

Section 201.6(c)(2)(ii) of the risk assessment recommends inclusion of descriptions of vulnerability in terms of providing a general description of land uses and development trends within each community participating in the plan. The County development is generally within the existing City of Springfield, City of New Carlisle and larger villages that have sanitary sewer and water which will support development. This is discussed in more detail within the analyzing development trends section.

Multi-Jurisdictional Risk Assessment

Section 201.6(c)(2)(ii) indicates that the risk assessment must assess each jurisdiction's risk where they vary from the risks facing the entire planning area. This requirement is addressed in detail within the section.

Update Summary

The risk assessment identified a comprehensive list of natural hazards. Developing this data was a collaborative process involving several county agencies. For the 2019 update, the existing analyzed hazards were reviewed for accuracy and availability of improved data.

Federal Public Assistance Grants Awarded Per Declared Disaster			
COUNTY: Clark			
DISASTER NUMBER	DISASTER TYPE	DECLARED	PUBLIC ASSISTANCE
DR421OH	Tornado	4/4/1974	\$12,196,287
DR90OH	Flooding	1/23/1959	\$1,434,684
DR-1580	Flood, Mud/Landslide Winter Storm	2/15/2005	\$146,794,339
EM-3250	Hurricane Katrina Shelter Operations	9/13/2005	\$2,499,103
EM-3198	Snow Storm	11/1/2005	\$11,116,398
DR-1805	Severe Wind Storm Associated with Tropical Depression IKE	10/24/2008	\$54,624,981
DR-4077	Severe Summer Storm Straight Line Winds	8/20/2012	\$26,455,532
DR-3055	Winter Storm	*	\$3,546,669

* Declared date could not be verified.

2.2 Hazard Identification Summary

The hazards evaluated by the Clark County Hazard Mitigation Committee included:

1. Droughts
2. Earthquakes
3. Floods – Flash & Riverine
4. Landslides (Not profiled)
5. Land Subsidence (Not profiled)
6. Invasive Species – Pests & Infestations
7. Severe Thunderstorms – Hail – Lightning
8. Winter Storms Including Sleet/Snow/Ice/Blizzard
9. Tornadoes – High Wind Events
10. Wildfires (Not profiled)
11. Extreme Temperatures
12. Expansive Soils (Not profiled)
13. Terrorism (Not profiled)
14. Hazardous Materials Incidents
15. Epidemics
16. Dam and Levee Failures
17. Radiological Accident

By review of the Plan, compilation of new updated hazard information occurring from 2012-2019, and through a series of planning sessions, the Clark County Hazard Mitigation Committee re-evaluated the prior list of hazards to the likelihood of future occurrence and the fact that many of the identified hazards are interrelated (i.e., thunderstorms may accompany high wind).

Planning documents reviewed and considered included:

- Connect Clark County – Contribute-Collaborate-Create
- Zoning Ordinances and Building Codes.
- Open Space Preservation Documents.
- Clark County Farmland Preservation Report.
- Subdivision Regulations.
- Manufacture of Homes Requirements.
- Flood Plain Regulations.
- Drainage Regulations.
- Natural Resource Protection Documents.
- Emergency Response Documents.
- Evaluation and Sheltering Documents.
- Field Control Documents.

Following this, the list of hazards was reduced to the hazards that are most likely to affect the county and are most likely to pose more serious threats.

For the purpose of ranking hazards affecting the County, in order of importance for mitigating their effects, the FEMA hazard index was assigned on a scale of priority for considering mitigation goals. This index takes into account the anticipated frequency of

occurrence, the specific consequences of impact, whether there has been a past declaration for that particular hazard. The process is somewhat subjective, but is intended to assist the Committee to help prioritize mitigation goals based on the potential frequency and likely extent of damage from hazards known to affect the County.

It is important to note that Hazard Identification Risk Assessments, HIRAs, are developed for different purposes. For the purposes of emergency planning and similar functions, the Clark County Hazard Mitigation Committee made updates to the current HIRA as resources would allow. It prioritized hazards utilizing criteria developed to facilitate emergency planning. These criteria include number of deaths and injuries, damage, impact on property, frequency and number of events, and number of disaster declarations. This method assigned a numerical value to vulnerability based on the criteria of impacts on businesses, people, and property. Previously, Ohio HIRA placed more emphasis on life safety issues versus the HIRA performed for the Clark County Hazard Mitigation purposes which place a similar high priority on property/facility damage. Both methods and results tended to closely mirror each other.

Once the hazard ranking was complete an assessment was conducted to narrow the field of hazards to the most likely to occur and impact the county. Several hazards were deleted from the list based on the unlikelihood of occurrence and the potential for a negligible impact on the county should they occur. These include landslides, land subsidence, wildfire and expansive soils. The eliminated hazards were deleted from the plan for the following reasons:

- Wildfires – There have been no wildfires in the NCDC database for Clark County.
- Landslides – Per ODNR Geofacts No. 8 Map of Areas Subject to Severe Slope Failure, Clark County is not identified as an identified county.
- Expansive Soils – The current Clark County Soils Report prepared by USDA does not indicate significant problems with expansive soil.
- Land Subsidence – There have been no reported issues in Clark County.
- Terrorism – Addressed under separate county planning documents.
- Hazardous Materials incidents addressed under separate county planning documents.

Other hazards were combined, as many of them are factors in larger hazards. The final hazard list for Clark County includes the following which are listed in order of importance below.

Meteorological Hazards

1. Tornado/High Wind Events
2. Flash & Riverine Flooding
3. Winter Storms Including Sleet/Snow/Ice/Blizzard
4. Severe Summer Storms Including Lightning/Hail
5. Extreme Temperatures
6. Drought
7. Dam/Levee Failure

Biological Hazards

8. Invasive Plants, Pests and Infestations

- 9. Epidemics
- Geological Hazard
- 10. Earthquakes
- 11. Radiological Accidents

This plan discusses each of the hazards in more detail. Technological hazards that may affect Clark County have not been addressed in this plan.

Table 2.2.a

Hazard Index Ranking				
Frequency of Occurrence	Catastrophic	Critical	Limited	Negligible
Very Likely	5 (Highest)	4 (High)	4 (High)	3 (Medium)
Likely	5 (Highest)	4 (High)	3 (Medium)	2 (Low)
Possible	4 (High)	3 (Medium)	2 (Low)	2 (Low)
Unlikely	3 (Medium)	2 (Low)	1 (Lowest)	1 (Lowest)
Highly Unlikely	2 (Low)	1 (Lowest)	1 (Lowest)	1 (Lowest)

Source: FEMA 1997

Table 2.2.b

Frequency of Occurrence	
<i>Highly Likely</i>	Near 100 percent probability in the next year.
<i>Likely</i>	Between 10 and 100 percent probability in the next year, or at least one chance in the next 10 years.
<i>Possible</i>	Between 1 and 10 percent probability in the next year, or at At least one chance in the next 100 years.
<i>Unlikely</i>	Less than 1 percent probability in the next year, less than One chance in the next 100 years.
<i>Highly Unlikely</i>	Little or no probability in the next 100 years.

Source: FEMA 1997

Table 2.2.c

Consequences of Impact	
<i>Catastrophic</i>	Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50 percent of property are severely damaged.
<i>Critical</i>	Multiple severe injuries, complete shutdown of critical facilities for at least 2 weeks, more than 25 percent of property severely damaged.
<i>Limited</i>	Some injuries, complete shutdown of critical facilities for more than a week, more than 10 percent of property severely damaged.
<i>Negligible</i>	Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.

Source: FEMA 1997

Table 2.2.d

Hazard Ranking Assessment				
Hazard	Past Federal Declarations	Frequency	Impact	Hazard Ranking
Natural Hazards				
Droughts	No	Possible	Limited	2
Earthquakes	No	Possible	Limited	2
Flash & Riverine Flooding	Yes	Very Likely	Critical	4
Landslides	No	Unlikely	Negligible	1
Land Subsidence	No	Unlikely	Negligible	1
Invasive Plants, Pests, & Infestations	No	Very Likely	Limited	4
Severe Thunderstorms	No	Very Likely	Critical	4
High Wind Events	Yes	Very Likely	Critical	4
Hailstorms	No	Likely	Limited	3
Lightning	No	Likely	Limited	3
Severe Winter Storms Including Sleet/Snow/Ice/Blizzard	Yes	Very Likely	Critical	4
Tornadoes	No	Very Likely	Critical	4
Wildfire	No	Possible	Limited	2
Extreme Temperatures	No	Likely	Negligible	2
Expansive Soils	No	Unlikely	Negligible	1
Terrorism	No	Possible	Catastrophic	4
Epidemics	No	Possible	Limited	3
Hazardous Materials Incidents	No	Likely	Limited/Critical	4/3
Dam & Levee Failures	No	Unlikely	Catastrophic	3
Radiological Accidents	No	Unlikely	Catastrophic	3

Table 2.2.e

HAZARDS TABLE		
Meteorological Hazard	How Identified	Why Identified
2.4	Review of past tornado events per NCDC event data	The county has been hit by at least 24 tornadoes since 1962, including an F5 tornado
Tornadoes / High Wind Events	Published data from newspaper articles and historical records	7 tornados reported in Clark County from 2012-2018
	Public meeting input/CCHMC meetings	Clark County is located in a 250 MPH zone IV wind speed map for community shelter design
	Past Hazard Mitigation Plan Data	Large number of vulnerable mobile homes and camping facilities within Clark County
	Web-based reporting	Numerous reports of Clark County tornado & high wind events.
2.5	Past Hazard Mitigation Plan Data	The county has experienced flash flooding, river, and stream flooding periodically since the 1913 flood
Flash & Riverine Flooding	Past flooding events identified	The county has several flood plain areas with structures located within them
	Review of latest county FIRM Maps	Several areas of poor development practices prior to the 1980's
	Review of NFIP repetitive loss properties in the county	Severe flooding June 1, 1997; Flooding of Mad River
	Record of past county problem areas	Severe flooding July 7, 2017/November 5, 2107
	Insurance data	Increased storm runoff – flooded interstate highways
	Public meeting input/ CCHMC meeting	Old and inadequate storm sewers, county, and private drainage systems
	Review of NCDC event data	Storm flooding, caused by log jams due to storm erosions, increased beaver population.
	ODNR Flood Plain Management publications	More frequent intense storms
2.6	Review of past history events/ NCDC events	Severe winter weather with blowing and drifting snow
Winter Storms Including Sleet/Snow/Ice/Blizzard	Input from county EMA office	Isolation of rural areas during storms
	Public meeting input/ CCHMC meetings	Hazards for responding emergency personnel
	Risk assessment data	1978 blizzard conditions experienced
		Many stranded motorists in past snow storms
		1996 Blizzard (worst since 1978 Blizzard)
		December 22, 2004 record snowfall
		Large percentage of elderly county residents

Biological Hazard	How Identified	Why Identified
2.7	Review of past severe storm events/NCDC data	Per NCDC 74 hail events from 1974-2018 causing \$34,000 property damage and \$54,000 in crop damage
Severe Summer Storms – Lightning & Hail	Public input from residents	Per NCDC 217 thunderstorms events 1964-2018 causing \$1.055M in property damages
	NCDC event data; Public input from CCHMC planning meetings	Frequency of storms in Clark County
	Clark County EMA records	Outdoor festival events with large, temporary increases of population
	Web-based information	September 2008 wind storm damage as a result of tropical storm Ike. \$16.7 million in property damage
		April 3, 2018 Severe thunderstorm/high winds & flooding caused road closures, power outages & 6 vehicles were trapped in water.
2.8	NCDC Event data	February 5, 2014 Severe cold wave affected Clark County. -10°F temperature with -36°F wind chill forced 40 persons to take shelter.
Extreme Temperatures	Past Hazard Mitigation Plan Data	July 20, 1999 – extreme heat – caused 13 State of Ohio deaths (10 in Cincinnati metro area – 3 in Dayton metro area)
	Input from CCHMC	
2.9	NCDC event data	2 Drought events in July & August of 1999
Drought	Past Hazard Mitigation Plan Data	Large rural agricultural base- 65% of land in Clark County is zoned agricultural use
	Input from CCHMC	Large economic impact with crop losses during drought conditions
		Increased potential for field & woodland fires

Geological Hazard	How Identified	Why Identified
2.10	ODNR, Division of Water	2 Class I Dams: CJ Brown Reservoir & Clark Lake Dam
Dam & Levee Failure	ODNR data for Class I, II & III Dams	2 Class II Dams: Lake Sylvan & South Vienna WWTP
	Inundation Study Report completed since last mitigation plan approval	Compliance with ODNR requirements
	Input from Clark County EMA	
2.11	ODNR, Division of Forestry	1999 Gypsy Moth infestation, 2007 Emerald Ash Borer
Invasive Plants, Pests & Infestation	Web-based information	1999 West Nile Virus
	Discussion and input from CCHMC	2011 Asian Long-horned Beetle (ALB)(found in Clermont County, Ohio)
		Bush Honeysuckle prevalent throughout much of Ohio
		Invasive species causes economic harm or environmental harm or harm to human health
		Major economic impacts to agriculture and woodlands
		Accelerated damage to aging sewers and building foundations due to aggressive root systems
		Threats to human health
		Increased maintenance to gardens, parks, and recreational areas
2.12	Clark County Health Department records – influenza deaths reported in 2019	1914 quarantine due to Scarlet Fever and Diphtheria
Epidemic	Web-based information	1918 influenza outbreak, 2019 influenza outbreak
		2009 H1N1 influenza clinics, 2019 Hepatitis outbreak
2.13	Review of known tremors	Although no known recent past damage, it is likely that future earthquake damage could result
Earthquakes	Published data from Ohio Building Code	
	Discussion and input from CCHMC	Micro Earthquake tremor felt 12/10/1980 centered Greene/Clark county Line
	Web-based information	

Geological Hazard	How Identified	Why Identified
2.14	Harmful affects caused by radiation exposure	Use of radiological materials in Clark County
Radiological Accidents		I-70 and I-675 heavily traveled transportation routes through Clark County

2.3 Identifying Assets

Clark County is susceptible to many different kinds of natural hazards as reviewed in the previous section of this plan. If a hazard event struck vacant land, there would not be much cause for concern. However, since Clark County has close to 134,557 residents and thousands of homes, businesses and critical facilities, the potential for damage and injury could be high, especially in higher populous areas such as Springfield, New Carlisle, and Northridge.

The Clark County Hazard Mitigation Committee reviewed and updated the existing critical facilities list through the assistance of the Clark County GIS Director. The Clark County Hazard Mitigation Planning Committee determined that the essential services facilities list included essential products and services to the general public and which is necessary to preserve the welfare and quality of life in the county. The maps in Appendix Section A-5 show critical facilities and essential services necessary to fulfill important public safety, emergency response, or disaster recovery functions. These essential facilities include major north/south highways St. Rt. 4, St. Rt. 68 and Interstate 675 and major east/west highway U.S. Route 40 and Interstate 70. Other state highways include St. Rt. 41, 42, 54, 56, 72, 235, 334, 369, 571, and 794.

2.3.1 List of Essential Services/Critical Facilities Identified

The Clark County Hazard Mitigation Committee determined that critical facilities and essential services are public or private entities that provide essential and critical services to the general public. These services are necessary to preserve and protect the welfare and quality of life for Clark County residents. They maintain the quality of life in the County and fulfill the public safety, emergency response, and/or disaster recovery operations.

Categories of Critical Facilities

1. Agriculture
2. Churches
3. Commercial Assets
4. Communications
5. Dams
6. Emergencies Services
7. Energy, Electricity
8. Energy, Natural Gas
9. Extended Care Facilities
10. Fire & EMS
11. Flooding/Repetitive Loss
12. Government Facilities
13. Law Enforcement
14. Public Health
15. Public Institutions
16. Schools
17. Telecommunications
18. Transportation, Airport

- 19. Transportation, Highway
- 20. Transportation, Railway
- 21. Water
- 22. Water/Wastewater

The Clark County Emergency Management Agency in partnership with the Clark County GIS Department identified and updated the critical facilities and essential services throughout Clark County's cities, villages and unincorporated areas. Due to confidentiality reasons the critical facilities list has not been included with this document.

2.4 Tornadoes/High Wind Events

Overview

A windstorm is a storm with high winds or violent gusts sometimes called wind shears or micro bursts, but with little or no rain.

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 300 mph or more. Damage paths can be in excess of one (1) mile wide and 50 miles long.

Tornadoes can range in size from massive to small. The majority of them are small and can occur at any time of the day or night and any time of the year. It is difficult to profile the risk of tornadoes. Therefore, estimations must be made based on past history and occurrences. Tornadoes are measured by damage scale for their wind capability.

The duration of tornadoes vary. Most tornadoes have wind speeds of less than 110 mph, are approximately 250 feet across, and travel a few miles before dissipating. The most extreme tornadoes can attain wind speeds of more than 300 miles per hour, stretch more than 2 miles across, and stay on the ground for dozens of miles. A tornado can strike a structure and it can be damaged or destroyed in just a matter of a few minutes.

In 1971, Dr. T. Theodore Fujita of the University of Chicago devised a six-category scale to classify U.S. tornadoes into six damage categories, called F0-F5. F0 describes the weakest tornadoes and F5 describes only the most destructive tornadoes. The Fujita tornado scale (or the “F-scale”) has subsequently become the definitive scale for estimating wind speeds within tornadoes based upon the damage caused by the tornado. It is used extensively by the National Weather Service (NWS) in investigating tornadoes, by scientists studying the behavior and climatology of tornadoes, and by engineers correlating damage to different types of structures with different estimated tornado wind speeds.

The devastating tornadoes in Jarrell, Texas on May 27, 1997 and Moore/Oklahoma City on May 3, 1999 demonstrated to many engineers, emergency managers and meteorologists that the wind estimates in the original F-scale may be too high. Their findings are described in the FEMA document #342: “Building Performance Assessment Team Report, Midwest Tornadoes of May 3, 1999, Observation, Recommendations and Technical Guidance”.

The enhanced Fujita tornado scale or EF-scale was unveiled by the NWS to the public and the full meteorological community early in 2006. On February 1, 2007, the Enhanced Fujita scale replaced the original Fujita scale in all tornado damage surveys in the United States. It is important to note that, despite the improvements, the EF-scale still remains a set of *wind estimates* based on 8 levels of damage to 28 different types of structures and vegetation.

Below is a table comparing the estimated winds in the original F-scale and the operational EF-scale that is currently in use by the NWS.

The Enhanced Fujita Tornado Scale

Fujita Scale			Operational EF-Scale	
F Number	Fastest ¼-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85
1	73-112	79-117	1	86-110
2	113-157	118-161	2	111-135
3	158-207	162-209	3	136-165
4	208-260	210-261	4	166-200
5	261-318	262-317	5	Over 200

Damages one might expect from the varying intensities are as follows:

- F-0 (Gale) Light damage to trees and buildings
- F-1 (Weak) Moderate damage to trees and buildings, roofs peeled off, mobile homes disturbed
- F-2 (Strong) Considerable damage to trees and buildings, roofs torn off frame houses, mobile homes destroyed, large trees down
- F-3 (Severe) Severe damage to trees and buildings, roofs and walls torn off well-constructed buildings, trees uprooted, trains overturned
- F-4 (Devastating) Devastating damage, well-constructed houses leveled, large missiles generated
- F-5 (Incredible) Incredible damage, strong houses lifted off foundations and carried considerable distances to disintegration, trees debarked, automobiles fly through the air and become missiles

Ohio and Clark County have a significant history of deadly tornadoes. On the following pages, a chart provides data regarding the known tornado events to occur in Clark County which typically have a higher frequency in the spring and summer months but can occur anytime, such as evidenced by the Jan. 13, 1976 F-1 tornado occurring in Clark County.

Past Occurrences

Clark County has had 24 tornadoes from 1962 to 2018, according to the NCDC. These tornadoes caused \$3.795 million worth of property damage and injured 11 people. The tornado that occurred in 1974 was part of the outbreak that included the

Xenia tornado, as discussed previously. The tornado that occurred in Clark County caused \$2.5 million in property damage.

The locations of the 24 tornadoes are not localized to one area of Clark County. Only two of the tornadoes touched down in highly populated areas. The first tornado, occurring in 1965, touched down within the corporate limits of Springfield. The second tornado, occurring in 1976, touched down within the corporate limits of New Carlisle. Fortunately, they were both rated F1 on the Fujita Scale and caused only \$25,000 worth of property damage each.

Several recent tornado events occurring within Clark County included:

On Friday April 15, 2006 strong winds also caused damaged at Shrine Road Mobile Home Park. More than a dozen mobile homes were damaged and one family was trapped inside their home until emergency crews arrived.

On May 5, 2007 an F-0 tornado touched down along Moorefield Road, just to the east of State Route 4. Trees were either uprooted or snapped off towards their tops with additional large limbs down from other trees. Some minor structural damage occurred as well along the 250 yard damage path. The tornado was rated EF-0 with top wind speeds of 70 mph.

On May 8, 2008 an EF-0 tornado briefly touched down near Selma. A shower produced a persistent wall cloud, funnel clouds and several brief tornado touchdowns along a frontal boundary aligned along Interstate 70 in southwest Ohio. Damage was reported as minimal.

On Sept. 7, 2010 several mobile homes were damaged from strong winds at Shrine Road Mobile Home Park. The homes sustained blown off siding, damaged awnings, and a tree fell onto a roof.

On April 27, 2011 an F-0 tornado touched down near a cemetery where several trees were snapped or uprooted in this area. Further to the northeast, an RV dealership on the east side of New Carlisle experienced damage when a roof was partially lifted off the building. Two-by-four roof support beams were driven into the ground. In this same area, large debris was blown into a public pool complex. Snapped trees and power poles were also found in this area. Maximum estimated wind speeds based on damage were around 70 miles per hour. Property damage was limited to \$25,000.

On May 23, 2011 an F-1 tornado North of Villa caused concrete blocks to be lifted onto a roof, convergence was noted in a wheat field south of a farm house, four power poles were knocked down, and one house had insulation pulled out of it due to the tornado. The maximum estimated wind speeds based on damage was around 90 miles per hour. Property damage was limited to \$15,000 & and crop damage was limited to \$3,000.

In 2017, Clark County had the most tornadoes reported for a single year with a total of 5, with an estimated \$530,000 in damages. No deaths or injuries were reported.

On April 5, 2017 an EF0 tornado southwest of Enon caused damage to a home and farm buildings along Dayton-Springfield Road. While numerous homes in the area sustained tree damage and lightweight debris damage, the majority of the damage was from straight-line winds estimated at 70 mph. There was no evidence of tornadic winds making direct contact with the ground nor debris found on downwind sides of buildings. There was damage to a farm home and barns where large sections of roofing material was peeled off and lofted, the garage door was blown inward. Two combines located in one of the outbuildings were pushed downwind, with the outbuilding itself collapsed. The maximum wind speed was 75-80 mph with an estimated \$30,000 in damages.

Also, on April 5, 2017 another EF0 tornado occurred 6 miles west of Springfield that caused widespread wind damage in the Tecumseh Trails Subdivision and along North Tecumseh Road north of New Carlisle Pike. Several homes sustained roof and tree damage indicative of 75 to 80 mph winds. The tornado caused an estimated \$50,000 in damages.

On May 24, 2017 an EF1 tornado touched down near Park Layne and then continued into southeast Miami County. The tornado caused damage to commercial buildings and trees on the western side of Park Layne which was consistent with maximum winds of 100 mph. Additional tree and minor roof damage occurred to the northwest along Bellefontaine Road. There was an estimated \$250,000 in damages.

Also, on May 24, 2017 an EF0 tornado caused an estimated \$100,000 in damages to the community of Crystal Lakes.

On November 5, 2017 an EF1 tornado touched down near South Vienna between Ritchie Drive and I-70, where a semi-trailer was overturned. Ritchie Brothers Auctioneers had some siding removed and a hole in their roof. Multiple tree limbs were down across E. North Street and N. East Street in South Vienna with some minor structural damage to roofs. Several trees were snapped around half way up the trees with at least three trees uprooted towards the eastern city limits. A garage was slightly shifted off of its foundation, and a tractor with a trailer attached was tipped on its side as well as a barn on the same property having major damage to its walls and roof. The estimated maximum wind speed was 95 mph causing an estimated \$100,000 in damages.

The following charts indicate past history of high winds and tornado events in Clark County.

Clark County Tornadoes - Past Occurrences					
Date	Location	Magnitude	Damage Amount	Number of Injuries	Deaths
7/20/1962	Countywide	Unknown	\$2,500	0	0
3/17/1965	Countywide	F1	\$25,000	0	0
5/26/1968	Countywide	F1	\$2,500	0	0
2/26/1971	Countywide	F1	\$25,000	1	0
5/10/1973	Countywide	F3	\$2,500	4	0
4/3/1974	Countywide	F5	\$2.5M	0	0
4/3/1974	Countywide	F2	\$250,000	0	0
8/3/1974	Countywide	F0	\$25,000	0	0
1/13/1976	Countywide	F1	\$25,000	0	0
4/20/1986	Countywide	F1	\$250,000	6	0
6/18/1992	Countywide	F0	0,000	0	0
6/18/1992	Countywide	F1	0,000	0	0
5/8/1996	Bethel Twp	F0	\$10,000	0	0
5/15/2007	Springfield	EF0	\$20,000	0	0
5/8/2008	Selma	EF0	\$1,000	0	0
4/27/2011	New Carlisle	EF0	\$25,000	0	0
5/23/2011	Villa	EF1	\$15,000	0	0
4/02/2015	New Carlisle Airport	EF0	\$1,000	0	0
4/05/2017	Enon	EF0	\$30,000	0	0
4/05/2017	Rock Way	EF0	\$50,000	0	0
5/24/2017	Crystal Lakes	EF0	\$100,000	0	0
5/24/2017	Park Layne	EF1	\$250,000	0	0
11/05/2017	South Vienna	EF1	\$100,000	0	0
4/03/2018	Cortville	EF1	\$85,000	0	0
			3.795M	11	

From the above chart, the known tornado magnitude breakdown in Clark County is as follows:

Clark County Tornadoes - Magnitude Breakdown (1962 to 2018)					
Unknown	1		EF0	7	
F0	3		EF1	4	
F1	6		EF2	0	
F2	1		EF3	0	
F3	1		EF4	0	
F4	0		EF5	0	
F5	1				

The known reported tornado damage occurring since 1962 is approximately \$3.795 million dollars.

Clark County, Ohio High Wind Events Data Summary from the National Climatic Data Center						
Year	Date of Reported High Wind Events	Type	Deaths	Injuries	Estimated Property Damage	Crop Damage
1997	4/6/1997	High Wind	0	0	0	0
2000	12/11/2000	High Wind	0	0	0	0
2002	3/9/2002	High Wind	0	0	20K	0
2003	5/11/2003	High Wind	0	0	0	0
2003	11/12/2003	High Wind	0	0	40K	35K
2006	12/1/2006	High Wind	0	0	10K	0
2008	9/14/2008	High Wind	0	0	16.7M	0
2009	2/11/2009	High Wind	0	0	0	0
2009	12/9/2009	High Wind	0	0	0	0
2016	4/3/2016	High Wind	0	0	2K	0
TOTALS:			0	0	16.772M	35K
Sources: From NOAA, NCDC Event Period 01/01/1950 – 12/31/2018						

Probability of Future Events

Between 1962 and November 2018, Clark County has experienced 24 tornadoes. This is an average of 1 every 2.3 years. The percentages, based on magnitude to date, have been:

Clark County Tornadoes Magnitude Percentages (1950 to 2018)						
Unknown	1	4.20%		EF0	7	29.20%
F0	3	12.50%		EF1	4	16.66%
F1	6	25.00%		EF2	0	0.00%
F2	1	4.20%		EF3	0	0.00%
F3	1	4.20%		EF4	0	0.00%
F4	0	0.00%		EF5	0	0.00%
F5	1	4.20%				

The percentages of tornadoes by season to strike Clark County since 1962 have been:

Spring:	March 21 – June 20	18	75%
Summer:	June 21 – September 20	2	8%
Fall:	September 21 – December 20	1	4%
Winter:	December 21 – March 20	3	13%

The paths of the tornadoes have occurred throughout the County including northern, central, and southern portions, so no part of the County is exempt from a tornado strike.

Vulnerability Analysis & Loss Estimation

Methodology – Based on the magnitude and the past history, there is a likelihood of the occurrence of an EF-3 or stronger tornado striking Clark County. These relative ratings were determined by review of actual tornado occurrences since the 1974 F-5 tornado.

Mobile homes, camping trailers, temporary shelters, and poorly constructed buildings are more vulnerable to tornado and high wind damage. Clark County has been fortunate there have been no reported deaths from tornadoes; however, there have been 11 injuries reported in 3 separate tornado events. In addition, there have been two deaths reported during high wind events on December 11, 2000 and March 9, 2002. Based on the frequency of occurrence, Clark County has been assigned into a medium risk category.

Clark County has 2,352 mobile home units built without wind-resistant construction standards and would suffer catastrophic destruction as the result of a strike by an EF-2 or stronger tornado. According to past history reports, severe winds have damaged or overturned numerous mobile homes in Clark County. On a statewide basis, Ohio does not have building codes that address wind resistance for most types of residential dwellings.

By using Clark County Real Estate housing and commercial real estate data, an EF-3 tornado was used as a benchmark to determine potential tornado loss damages.

The entire county is vulnerable and susceptible to be struck by a tornado, even though a large percentage of the county area is rural and agricultural. Certainly, the most devastating and damaging would be for an EF-5 category tornado to hit one of the larger

cities including Springfield and New Carlisle. With the 1974 F-5 Plattsville tornado, history tells us the damage can be significant and quite severe. Since 1962, there has been one F-3 category tornado to hit the County. In adjacent Greene County, the F-5 Xenia tornado was 32 miles long resulting in 36 deaths. In overlaying this same destructive path over a portion of Springfield, it is therefore conceivable the damage could even be significantly greater than the City of Xenia tornado. This is due to several factors, mainly that Springfield has a population of about 5 times that of Xenia, and there are considerably more structures and critical facilities that could be affected. The following estimated potential losses indicate the possible damage that could occur if an F-5 tornado was to strike a similar path across the City of Springfield.

Because the occurrence is moderate, the damage of businesses and residences is considered to be of moderate damage. The property damage from the past 24 tornado events with magnitude ranging from EF-0 – EF-5 has been \$3,795,000 with no deaths and two injuries. The worst event was an F-5 tornado on April 3, 1974, causing \$2,500,000. Based on today's dollar value the cost if a similar event was to occur in Clark County would be \$5,212,101 in property damages. Due to the infrequencies of tornadoes in Clark County, the County is at moderate risk relating to property damage and low to moderate risk for loss of life. It is anticipated that a tornado would be a localized event affecting a limited area of the County.

In reviewing the vulnerability to the County for straight-line windstorm damage to the County, no one area is more susceptible to property damage from high winds. However, some physical factors may affect the amount of damage such as large trees may become uprooted and limbs and trees may fall across houses. Features such as open fields may affect the wind intensity on a structure in which case mobile homes become especially vulnerable to windstorms.

Based on NCDC past wind events, there have been 10 high wind events since April 6, 1997, causing \$16,772,000 in property damages with 0 deaths and 0 injuries. There was also \$35,000 in crop damages. That is about an average of one wind event every 1.75 years. These damages are more than 4 times the amount of property damage suffered from the total County tornadoes.

The worst single windstorm event to strike Clark County in terms of property damage was in September 2008 when the remnants of Tropical Storm Ike caused \$16,700,000 in damages with no deaths or injuries reported. A high wind event can be a localized event affecting areas of the County; or, as in the case with the remnants of Tropical Storm Ike in 2008, it can be a countywide event which can affect the entire County. The anticipated economic losses anticipated for future county high wind events can range from light damage to moderate damages with injuries and loss of life possible.

The following is a loss estimate scenario should an F-5 strike the City of Springfield. Damages would be significantly greater than the historic 1974 Plattsville tornado due to the population difference and size of the city. An F-5 tornado striking the City of Springfield would take into account:

1. Approximately 44.0% of the county residents reside in the City of Springfield.
2. Approximately 8% of the Clark County real estate value is susceptible to an F-3 tornado if it were to hit the heart of the county seat of Springfield, Ohio.
3. A tornado in this location would affect approximately 10% of the county population and almost 8% of the total county employment.

Source: Clark County Auditor GIS Division and Average Clark County Real Estate Values, 2018 Clark County Census, Ohio Department of Development (2017).

Vulnerability & Loss Estimate of EF-5 Tornado Clark County, Ohio			
Municipality	Tornado Risk	Estimated Future Loss	Historical Loss
Plattsville	Medium	-----	April 3, 1974 2.5 million
Springfield	Medium	336.05 million	-----

Assessing Vulnerability – Estimated Potential Losses – Tornadoes

<u>No. of Structures</u>	<u>Type of Structure/Facility</u>	<u>Est. Value of Structural Losses</u>	<u>Est. No. of Affected Residents</u>	<u>Est. No. of Jobs Temporarily Lost</u>
<i>Downtown Business District & adjoining residential and industrial areas including:</i>				
25	Buildings	11 million		250
50	Businesses	22 million	---	60
8	City Buildings/Fire/Rescue	5.5 million		40
1	Courthouse	2.75 million		60
1	Public Safety Building	2.0 million		40
1	Regional Medical Center	5.5 million		200
1	Emergency Operations Facility	1.1 million	---	20
4	Medical Clinics	4.4 million		40
2	Nursing/Retirement Home Complexes	5.5 million	180	150
8	Industrial Complexes	27.5 million	---	400
3	Hazardous Material Sites	13.2 million		80
10	Elementary Schools	55 million	---	500
5	Private Schools	27.5 million	---	250
3	Middle Schools	16.5 million	---	150
1	High School	2.2 million		100
1	Learning Center	5.5 million		15

1	Academy School	1.1 million		25
1	Technology School	5.5 million		100
1	University	16.5 million		200
200	Residences - Destroyed	22 million	500	---
300	Residences - Moderate Damage	13.2 million	750	---
600	Residences – Minor Damage	6.6 million	1500	---
15	Apartment Complexes–Mod. Damaged	16.6 million	900	15
1	Wastewater Plant – Mod. Damaged	2.2 million	---	10
2	Mobile Home Parks	1.1 million	100	2
2	City Park – Moderate Damage	1.1 million	---	10
	Transportation Systems	20 million	---	100
	<ul style="list-style-type: none"> • Highways • Railways • Bus • Airports 			
---	Utility Damages	33 million	---	100
	<ul style="list-style-type: none"> • Potable Water System • Wastewater/Stormwater • Natural Gas • Crude Transmission • Electrical Power • Communications 			
<hr/>		<hr/>		
1,247	Totals	336.05 million	3,930	3,067

2.5 Flooding

Overview

Floods occur when streams or waterways overflow their banks and spill onto adjoining floodplain land areas. Loss of life and property can result when structures are placed in floodplain areas. Prolonged periods of rainfall, frozen ground, inadequate snow melt, and soil conditions affect West Central Ohio every year. Floods are one of the most prevalent hazards in the United States. Nationwide, hundreds of floods occur each year, making it one of the most common hazards in all 50 states and U.S. territories. Every several years serious flooding occurs along one or more of Ohio's rivers and streams. The history of flooding within Clark County indicates that flooding can occur at any time of the year. Most injuries or deaths occur when people are swept away by flood currents. Most damage results from inundation of sediment-filled water and the flooding locations.

Risk Assessment

Several factors determine the severity of floods including intensity and duration of rainfall. A large amount of rainfall over a short time span can create flashflood conditions especially where soil is saturated or frozen on large areas of impermeable surfaces.

Several methods of research identified flooding as a hazard in Clark County, including review of recently updated FIRM maps, reviews of newspaper coverage, reviews of past disaster declarations, discussions with local officials, and public input. The following internet sites were also used to gain information on flooding:

- Association of Dam Safety Officials
- Federal Emergency Management Agency
- Flood Risk and Map Information
- Floodplain Management Association
- General Flood Information
- Latest Hydrological Information (Flooding, Droughts, Snow Conditions and Water Supply)
- Regional River Forecast Centers
- State Floodplain Managers
- United States Army Corps of Engineers (USACOE)
- USGS Streamflow Data Historical

Flooding is an important issue for the residents and business owners of Clark County. Whether it was flash floods or riverine flooding events that have occurred in the past, lives have been disrupted or lost and damage has been extensive. Areas that are prone to flooding in Clark County are within the watersheds of the Mad River, Great Miami River and Little Miami River. Beaver Creek, Buck Creek, Chapman Creek, Donnels Creek, Honey Creek, Mill Creek and Moore Run are all tributaries of these watersheds and also are prone to flooding. Many of the Clark County's communities have structures that are located within the floodplains of these rivers and tributaries as indicated on the FIRM floodplain maps.

Riverine flooding is usually caused by a significant amount of rainfall over a period of days and can be worsened by snow-melt conditions. Riverine flooding is very likely to continue striking these same areas. Areas near the paths of the Mad, Great Miami and Little Miami Rivers and tributaries are particularly low-lying areas. Local officials have enacted regulations to prevent future building and limited appropriate development in these areas. When a severe storm produces a large amount of rainfall in a short time flash flooding may occur. The intensity is generally great but the duration of time is relatively short. Because the majority of Clark County is of relatively flat or gently rolling topography, Clark County is not as vulnerable to flash flooding as is the case in southern and eastern Ohio.

Clark County lies within the Great Miami and Little Miami basins and small portions of the County's eastern boundary lie in the Scioto River Basin. The drainage pattern reflects the influence of the Little Miami, North Fork Little Miami and Mad Rivers. The Mad River is the master stream of the main drainage system entering the County west of Bowlusville and flows southwest through the County. The County's larger streams have cut through glacial drift to the lower courses of bedrock. Steep limestone walls line the Mad River valley beginning in the Springfield area while the Little Miami River has cut a narrow gorge through limestone at Clifton.

Small stream and urban flooding are usually a widespread event, as storm sewer systems, small streams, ditches, retention and detention ponds overflow their banks. City sewers may back up and inundate sump pumps and overload drains. Basements and low lying yard areas are subject to this type of flooding. Drainage problems may also occur on the back side of levees when rainfall capacities exceed the capacity of pumps or other features designed to drain the areas that are protected by the levees.

In the rural portions of Clark County flooding can occur due to broken field tile. Rural flooding can also occur when rainfall exceeds the design capacities of the drainage system. Open fields, past channelization, and removal of woodlands along streams have allowed faster and increased stream runoff. Drainage structures can also become covered and clogged by field debris including corn shocks and soybean residue after harvest as a result of the no-till policies. Roads and bridge structures can also impede the natural flow of water. Log jams along the rivers and streams of Clark County can also affect flooding conditions within the County.

Extensive floodplains are found along Mad River, Little Miami River, North Fork of the Little Miami, as well as many of the related tributaries such as Buck Creek. Floodplains are particularly extensive along the Mad River northwest of Springfield and around I-70 and south to the county line. The County's floodplain regulations manage development and the placement of fill within the 100-year floodplain as mapped by the National Flood Insurance Program (NFIP).

Due to severe flooding in the 1950's a new reservoir and dam was constructed through the United States Corp of Engineers.

Before the 1960's it was generally the philosophy to get the water off the land as quickly as possible and the government invested much effort constructing dams, levees, reservoirs and flood control projects but with little success of controlling the flooding. From the 1960's forward it was realized that it is a natural process of water to utilize the rivers and overflow their banks into the floodplains. Erosion control, floodplain management, quality water management, agricultural responsibility, wetlands, wildlife habitat and recreational use programs became the focus of how to manage the flooding issues of the rivers and streams.

The Little Miami River is designated a state and national scenic river. Its length is about 105 miles. The portion in Clark County is located in Green and Madison Townships, and the Little Miami headwaters are located east of South Charleston.

The Little Miami is the first river in Ohio to be designated a state scenic river and a national scenic river. More than 87 species of fish, 36 species of mussels (including five endangered species) and breeding birds reside along the river. Exceptional water quality supports diverse populations of macro invertebrates.

Many residents of Clark County recognize the important benefits and natural factors of preserving floodplains to be used for natural flood and erosion control, water quality management, wildlife habitat, ground water resources, and agricultural production. The County has in place floodplain management ordinances in most of its communities with the intent to reduce future flood damage.

Clark County received updated FEMA Flood Maps and most all flood prone communities are eligible to be in the National Flood Insurance Program (NFIP). The Clark County Communities currently participating in the NFIP include: The Clark County cities of Springfield and New Carlisle and the villages of Clifton, Enon, North Hampton and Tremont City and the unincorporated areas of Clark County are listed as participating in the National Flood Insurance Program (NFIP). Those communities that participate in the NFIP are eligible to receive financial assistance but is the intent of the program to reduce future flood damage within a community through flood plan management ordinances, and provide an insurance alternative to federal disaster relief. The villages of Catawba, Donnelsville, South Charleston and South Vienna currently do not participate in the NFIP, but have been encouraged to do so.

Special Flood Zone (100-year Floodplain)

Flood Insurance Rate Maps (FIRM) show areas delineated to be special flood hazards. The Base Flood Elevation (BFE) refers to the elevation associated with a special flood zone, or a flood with a 1% chance of occurring in any given year. Areas within a special flood zone area, also known as the 100-year floodplain, have an elevation lower than the BFE and are categorized into zones. Zone "A" is the flood insurance rate zone that corresponds to a special flood zone area that is determined in the Federal Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or depths are shown within this zone. Zone "AE" is the flood insurance rate zone that corresponds to a special flood zone area that is determined in the Federal Flood Insurance Study by detailed methods. In most instances, BFEs derived from the detailed hydraulic analyses are shown at selected intervals within

this zone.

Clark County has special flood zone floodplains identified within the County. The best way to combat a disaster happening within these special zone flood hazard areas is through public awareness. Much of Clark County is in compliance with state floodplain management standards and most cities and villages participate in the National Flood Insurance Program (NFIP). The County has been involved since July 2, 1987. Those Villages that do not participate include Village of Catawba, Village of Donnelsville, South Charleston, and South Vienna. The following chart gives the incorporated jurisdictions that participate in the NFIP and the date in which they entered the program.

<u>PARTICIPATING MADISON COUNTY COMMUNITIES</u>			
<u>CID #</u>	<u>COMMUNITY</u>	<u>REG-EMER DATE</u>	<u>CURRENT EFFECTIVE MAP DATE</u>
390678	Clifton, Village of	July 8, 1980	March 17, 2011
390795	Enon, Village of	April 17, 1987	February 17, 2010
390062	New Carlisle, City of	September 1, 1986	February 17, 2010
390679	North Hampton, Village of	September 24, 1984	February 17, 2010
390063	Springfield, City of	December 4, 1985	February 17, 2010
390064	Tremont City, Village of	August 13, 1997	February 17, 2010
390732	Unincorporated Areas of Clark County	July 7, 1987	February 17, 2010

The following chart indicates the non-participating communities and status of non-participation.

<u>NON-PARTICIPATING MADISON COUNTY COMMUNITIES</u>	
<u>COMMUNITY</u>	<u>STATUS OF NON-PARTICIPATION</u>
Catawba, Village of	No 100-year flood plain areas within community
Donnelsville, Village of	EMA Director is encouraging the community to participate*
South Charleston, Village of	EMA Director is encouraging the community to participate*
South Vienna, Village of	No 100-year flood plain areas within community

* See Action Item list #CW23 in Section 3.6.

Repetitive Loss

Recurrence interval, or frequency of occurrence, is defined as the average number of years between storms of a given intensity. Recurrence intervals commonly used in technical studies and design are 2, 10, 25, 50 and 100 years. Recurrence interval addresses how often a flood of a specific depth is expected to occur. Structures located within areas of a higher recurrence interval should be considered at higher risk and should be prioritized higher as it relates to mitigation.

In most counties there are areas that periodically suffer damages from floods. Repetitive loss structure is a term that is usually associated with the National Flood Insurance Program (NFIP). This is a structure, covered by a contract of flood insurance under the NFIP, that has suffered flood damage on two or more occasions over a 10-year period ending on the date when a second claim is made, in which the cost to repair the flood damage, on average, equals or exceeds 25% of the market-value of the structure at the time of each flood loss event. For the Community Rating System (CRS) of the NFIP, a repetitive loss property is any property which the NFIP has paid two or more flood claims of \$1,000 or more in any given 10-year period since 1978. A repetitive loss structure is important to the NFIP since structures that flood frequently put a strain on the flood insurance fund. It should also be important to a community because residents' lives are disrupted and may be threatened by the continual flooding. They are known as "repetitive loss" properties. Repetitive loss properties are defined as properties with structures that have had two or more insurance claims within a 10 year period. The following table indicates the total repetitive flood properties along with the number and amount of losses incurred within Clark County. There have been no severe repetitive loss properties noted for Clark County.

Community Name	Comm Nbr	Total RL Structures	Losses	Occupancy	Building Payment	Contents Payment	Total Paid	SRL Indicator
CLARK COUNTY*	390732	1	2	SINGLE FMLY	\$67,627.85	\$10,029.11	\$77,656.96	0
CLARK COUNTY*	390732	1	5	OTHR-NONRES	\$133,471.58	\$6,719.25	\$140,190.83	0
CLARK COUNTY*	390732	1	3	SINGLE FMLY	\$10,015.38	\$0.00	\$10,015.38	0
CLARK COUNTY*	390732	1	2	SINGLE FMLY	\$17,832.68	\$0.00	\$17,832.68	0
CLARK COUNTY*	390732	1	3	SINGLE FMLY	\$13,353.66	\$0.00	\$13,353.66	0
CLARK COUNTY*	390732	1	2	OTHER RESID	\$38,574.31	\$0.00	\$38,574.31	0
CLARK COUNTY*	390732	1	3	SINGLE FMLY	\$73,099.10	\$14,606.11	\$87,705.21	0
NEW CARLISLE, CITY OF	390062	1	2	SINGLE FMLY	\$3,473.58	\$471.56	\$3,945.14	0
SPRINGFIELD, CITY OF	390063	1	3	SINGLE FMLY	\$18,637.78	\$4,229.16	\$22,866.94	0
SPRINGFIELD, CITY OF	390063	1	3	OTHR-NONRES	\$7,386.74	\$1,300.46	\$8,687.20	0
SPRINGFIELD, CITY OF	390063	1	2	SINGLE FMLY	\$2,748.63	\$0.00	\$2,748.63	0

Location

Sources of information used to determine flood locations in Clark County are FEMA, Floodplain maps and studies, NOAA data information provided by the Ohio Department of Natural Resources, Division of Soil & Water Resources, State Hazards data, Clark County's agencies such as City and County Engineers, local newspaper articles and past historical data. The primary source is the Flood Hazard Boundary Map (FHBM) and the Flood Insurance Rate Map (FIRM). The maps generally identify 1%-annual chance flood elevations and boundaries for a stream or river reaches into community. The FIRM will include flood elevation information for various flood frequencies and may also delineate floodway boundaries.

Flooding occurs throughout Clark County. See Flood Maps at the end of this section which indicate the designated floodplains within each Clark County Community and the unincorporated areas of Clark County.

In addition to the 100-year flood map locations, frequent reported flooding areas of Clark County include:

City of Springfield:

Street and intersections

1. Crossing Mill Run @ East, York & Burt Streets
2. North St. between Fountain and Fisher
3. Wickford Drive between Canterbury and Floral
4. Oakdale between Belmont and Magnolia – Catch basin back-up only

Bethel Township:

1. Spangler Road
2. Lower Valley Pike

Mad River Township:

1. Old Mill Road
2. Green Meadows Drive and Arnold Avenue
3. Sunny Vista Drive
4. West Enon Drive

Other Flood Areas:

1. Village of Tremont City – broken down culverts throughout Village
2. Log jams on various rivers and streams
3. Columbus-Cincinnati Road, Tillie Lane, and Mitchell Road
4. Village of Enon – Main Street, Green Vista & Coronado Trail
5. Village of North Hampton – undersized culvert on State Route 41 west of Asbury Church
6. Village of Clifton – aging storm drain infrastructures especially along Jackson St.

Past Occurrences

In March of 1913, the Miami Valley witnessed a natural disaster unparalleled in the region's history. Three storms converged on the state, dumping 9 to 11 inches of rain March 23-25 on ground already saturated from the melting of ice and snow of a hard winter. A 90-percent runoff rate caused the Great Miami River and its tributary streams to overflow. Every city along the river was inundated with floodwaters. More than 360 people lost their lives; property damage exceeded \$100 million (nearly \$2 billion in today's value). In the wake of this tragedy, Miami Valley citizens rallied to initiate plans to prevent future flooding. Some 23,000 citizens contributed more than \$2 million to begin a comprehensive flood protection program on a valley-wide basis. The result was an unflinching flood protection system of five dry dams – Germantown, Englewood, Lockington, Taylorsville, and Huffman – and levees that has protected the Miami Valley, including Clark County, from severe riverine flooding by the Great Miami River since 1922. An

independent group of experts in flood control says the Miami Conservancy District (MCD) offers a level of protection rarely seen in the United States. But aging infrastructure will require major reinvestment. MCD engineers have calculated the 1913 flood to be more than a 500-year event and up to a 1,000-year event. The success of the Miami Conservancy District has served as a model to reduce flood risk and damages throughout Clark County and the Miami Valley area.

According to a NCDC Storm Event Record, dated June 1, 1997, from May 31 – June 2, 1997 heavy rainfall caused the Mad River at Springfield to reach a crest of 12.0 feet around 9:00 P.M. on June 1, 1997. Flood stage is at 11.0 feet. Extensive flooding and damages were reported. On January 5th and 6th of 2005 the area received two to four inches of rain in a 24-hour period which increased flooding problems as the ground was already saturated from recent heavy snow melt. Numerous creeks and streams throughout the County were out of their banks. Nearly \$585,000 in property damages was reported within Clark County.

The table below indicates the flooding event history in Clark County since 1996.

Clark County, Ohio Flooding Data Summary from the National Climatic Data Center					
Year	Date of Reported Flood Events	Deaths	Injuries	Estimated Property Damage	Crop Damage
1996	4/29/1996	0	0	\$3,000	0
1997	6/1/1997	0	0	\$10,000	0
1997	6/1/1997	0	0	\$0	0
1997	6/2/1997	0	0	\$5,000	0
1998	5/7/1998	1	0	\$50,000	0
2000	6/16/2000	0	0	\$1,000	0
2000	6/16/2000	0	0	\$2,000	0
2000	10/5/2000	0	0	\$3,000	0
2001	5/16/2001	0	0	\$0	0
2001	6/11/2001	0	0	\$5,000	0
2001	7/29/2001	0	0	\$0	0
2001	8/30/2001	0	0	\$0	0
2002	6/5/2002	0	0	\$0	0
2002	6/13/2002	0	0	\$10,000	0
2002	6/13/2002	0	0	\$0	0
2002	9/27/2002	0	0	\$0	0
2002	11/10/2002	0	0	\$0	0
2003	5/10/2003	0	0	\$0	0
2003	7/8/2003	0	0	\$0	0
2003	7/8/2003	0	0	\$0	0
2003	7/31/2003	0	0	\$0	0
2003	8/2/2003	0	0	\$0	0
2003	8/7/2003	0	0	\$0	0
2004	1/4/2004	0	0	\$0	0

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2004	1/4/2004	0	0	\$0	0
2004	6/11/2004	0	0	\$0	0
2005	1/5/2005	0	0	\$20,000	0
2005	1/11/2005	0	0	\$10,000	0
2005	6/30/2005	0	0	\$0	0
2007	3/2/2007	0	0	\$2,000	0
2007	3/14/2007	0	0	\$3,000	0
2008	6/4/2008	0	0	\$10,000	0
2010	7/12/2010	0	0	\$2,000	0
2011	3/5/2011	0	0	\$5,000	0
2011	5/11/2011	0	0	\$20,000	0
2011	5/11/2011	0	0	\$2,000	0
2011	5/11/2011	0	0	\$2,000	0
2011	5/11/2011	0	0	\$2,000	0
2011	5/11/2011	0	0	\$2,000	0
2011	5/11/2011	0	0	\$20,000	0
2011	12/05/2011	0	0	\$1,000	0
2012	5/04/2012	0	0	\$0	0
2012	6/17/2012	0	0	\$0	0
2013	12/22/2013	0	0	\$0	0
2014	5/21/2014	0	0	\$0	0
2014	5/21/2014	0	0	\$0	0
2014	5/21/2014	0	0	\$1,000	0
2014	5/21/2014	0	0	\$1,000	0
2014	5/21/2014	0	0	\$1,000	0
2014	5/22/2014	0	0	\$200,000	0
2015	6/20/2015	0	0	\$0	0
2015	7/18/2015	0	0	\$0	0
2016	7/22/2016	0	0	\$0	0
2016	7/29/2016	0	0	\$0	0
2016	8/28/2016	0	0	\$0	0
2017	7/06/2017	0	0	\$0	0
2017	8/11/2017	0	0	\$0	0
2017	11/05/2017	0	0	\$0	0
2017	11/05/2017	0	0	\$0	0
2017	11/05/2017	0	0	\$5,000	0
2017	11/05/2017	0	0	\$30,000	0
2017	11/05/2017	0	0	\$0	0
2018	2/25/2018	0	0	\$0	0
2018	4/03/2018	0	0	\$0	0
2018	4/04/2018	0	0	\$3,000	0
2018	6/08/2018	0	0	\$0	0
2018	6/09/2018	0	0	\$0	0
2018	6/19/2018	0	0	\$0	0
	TOTALS	0	0	\$431,000	0
Sources: NOAA, NCDC Event Period 01/01/1950 – 12/31/2018					

Floods

According to the NCDC, there have been 68 flood events recorded from 1950 to 2018, causing \$431,000 in damages.

March 1913 – Devastation befell Ohio and Indiana in 1913 when a flood hit that began on March 23rd. It rained for five days straight causing streams and rivers throughout Ohio to rise. By the third day, levees were overtopped and flooding occurred. Tons of mud and debris covered streets, homes and businesses throughout the state. In Ohio, it was of such magnitude that it rendered no less than 175,000 people homeless and damage estimated at \$300,000. This total would be the equivalent of \$5,456,746 today. Death tolls reported in Ohio reached 437 and in Indiana reached 496.

August 1995 – On August 8, 1995, thunderstorm rains of one to four inches within eight hours fell on saturated ground and caused flooding of numerous roads, streams and some basements. In Clark County and west of Springfield, 30 to 50 people were evacuated from the Forest Lake Campground due to streams overflowing their banks. Roads remained closed into the late morning hours of August 9. There was \$100,000 in property damage reported for this event.

Heavy rains reported on May 21, 2014, over 5” reported over a 2-hour period causing serious flash flooding in Medway, Bethel Township including the closure of Interstate 70 and State Route 235. The results of this flash flood event included:

- Bethel Township fire department performed search and rescue evacuations for Laynecrest Manor; a 50-unit apartment complex totaling over 100 people.
- A Red Cross shelter was established at Medway Methodist Church for residents needing respite and temporary overnight accommodations which continued until May 24, 2014, at 1200 hours.
- A disaster recovery center for residents was established that is comprised of American Red Cross of Clark and Champaign Counties (ARC), Job & Family Services (JFS), Clark County Combined Health District (CCCHD), Clark County Emergency Management Agency (EMA), and Laynecrest Property Management Company. (See Clark County EMA Emergency Center After Action Report in Appendix.

On July 7, 2017, heavy rain caused flooding in Springfield and Mad River Townships. There was one evacuation, road closures and reported septic overflow.

On November 5, 2017, countywide flooding was experienced with what was determined to be a 200-year event. Many road closures, debris removal with 20 people effected. High water was reported on Spangler Road at Union Road and I-675 going into Medway/Osborn Road and Springfield Road North of Ohio 235. Interstate 70 was closed in both directions between Ohio 235 and Interstate 675. Flooding was reported at the Springfield Meadows Mobile Home Park in German Township. High water buckled a foundation on Holly Drive in Springfield.

Probability of Future Events

It is important to establish the probability of occurrence of flooding so the County and its communities can make informed decisions about the sustainability of future development within land areas and to determine the feasibility of proposed mitigation projects.

Typically, FEMA Flood Insurance surveys, FIRM maps, and information are useful tools. Many of the Clark County communities that have 100-year flood zones within their communities participate in the NFIP Program whereby the floodplain maps identify the areas that have a 1% annual chance of being equaled or exceeded in any given year. Smaller floods occur more frequently than larger floods. Therefore, a 10-year flood or 25-year flood has a much greater chance of occurring than a 100-year flood. The following is a table of flood probability.

Flood Occurrence	Chance of Occurrence in Any Given Year
10 years	10%
25 years	4%
50 years	2%
100 years	1%
500 years	.2%

There are several other possible data sources for determining the area affected by a particular probability flood event. The Ohio Department of Natural Resources, Division of Soil and Water Resources, is the State's repository for flood hazard information and has copies of flood hazard information generated by various federal, state, local, and private entities. The State of Ohio Floodplain Management Program maintains current copies of all FEMA; FIS's and flood maps in the State.

Vulnerability Analysis & Loss Estimation

The flood vulnerability assessment for the County focused on each community's assets that are located in the 100-year floodplain. While greater and smaller floods are possible, this Plan's estimate of property damages from flooding are limited to the 100-year floodplain events.

All of the structures in the floodplain were identified using the most recent County's GIS data and Flood Insurance Rate Maps (FIRM). At this time no base flood elevations (BFE) or depth of flooding elevations were calculated. Within this plan individual parcels have not been coordinated with parcel ID and tax information.

The total residential and commercial structures in the floodplain by municipality and surrounding area are as follows:

Clark County Flood Zone Structure Count**Clark Co. (unincorporated) Flood Map**

Residential	1576
Multi-Family Residential	22
Commercial	102
<i>TOTAL</i>	<i>1700</i>

Village of Catawba Flood Map

Residential	0
Multi-Family Residential	0
Commercial	0
Unincorporated Residential	0
<i>TOTAL</i>	<i>0</i>

Village of Clifton Flood Map

Residential	0
Multi-Family Residential	0
Commercial	0
Unincorporated Residential	0
<i>TOTAL</i>	<i>0</i>

Village of Donnelsville Flood Map

Residential	10
Multi-Family Residential	0
Commercial	0
Unincorporated Residential	0
<i>TOTAL</i>	<i>10</i>

City of New Carlisle Flood Map

Residential	25
Multi-Family Residential	1
Commercial	9
Unincorporated Residential	0
<i>TOTAL</i>	<i>35</i>

Village of North Hampton Flood Map

Residential	6
Multi-Family Residential	0
Commercial	0
Unincorporated Residential	2
<i>TOTAL</i>	<i>8</i>

Village of South Charleston Flood Map

Residential	17
Multi	0
Commercial	1
Unincorporated Residential	0
<i>TOTAL</i>	<i>18</i>

Village of South Vienna Flood Map

Residential	0
Multi-Family Residential	0
Commercial	0
Unincorporated Residential	0
<i>TOTAL</i>	<i>0</i>

City of Springfield Flood Map

Residential	164
Multi-Family Residential	1
Commercial	73
Industrial	0
Unincorporated Residential	0
<i>TOTAL</i>	<i>238</i>

Village of Tremont Flood Map

Residential	21
Multi-Family Residential	1
Commercial	3
Industrial	0
Unincorporated Residential	0
Unincorporated Commercial	0
<i>TOTAL</i>	<i>25</i>

Village of Enon Flood Map

Residential	155
Multi-Family Residential	7
Commercial	10
Industrial	0
Unincorporated Residential	0
TOTAL	172

Clark County Flood Zone Structure Count Totals

Residential Total	1974
Multi-Family residential	32
Commercial	198

Based on flood information from the NCDC, flooding events in Clark County has caused \$431,000 in property damage from 1950 through 2018. This is an average of \$6,338 per year in property damages. This includes the years 1950-1995, 1999, 2006, and 2009 in which no property losses were recorded.

Loss of contents has been included based on the values shown in the table below. A value for loss of use or “down time” of the buildings has not been included in this estimate. The amount of residential population displaced from a flood disaster would be approximately 4,500 residents. At risk structures in areas prone to urban and small stream or flash flooding (and that are not within the 100-year Flood Plain) have not been mapped or included in the vulnerability analysis.

Contents Value as a Percentage of Structure Value

Occupancy Class	Value (%)
Residential	50%
Commercial	100%
Industrial/Utility	150%
Medical Facilities	150%
Emergency Services	150%
General Government	100%
Schools/Libraries	100%
Colleges/Universities	150%
Religion/Non-profit	100%
Shelters	100%
Agricultural	100%

The above values are as recommended by FEMA guidance documents.

The flood vulnerability count showed that a total of 2,204 structures are located in the 100-year floodplain (1%-annual-chance). Approximately 1,974 of these structures are single family residences, 32 are multi-family; 198 of these are commercial. There are a total of 61,143 residential housing units in Clark County. Therefore, about 3% of the total housing stock is located within the 100-year floodplain. Content losses as a percentage of the property damage value were included. The entire County collectively has approximately \$198,802,680 in total building exposure to flooding for 1%-annual-chance event. Property Damage Value was provided by county GIS/Auditor based on 2019 property values, not including land value. A total of 2,204 structures can be expected to be damaged. Approximately six critical facilities could be impacted. The overall estimated losses including residential, commercial, industrial, agricultural, utility structure losses and content losses are estimated to be \$198,802,680.

See table on following sheet:

Clark County Flood Zone Structure Count with Potential Damages*					
Flood Zone Property Values	Flood Zone Structure Count	Property Classification	Property Damage Value***	Contents **	Total
Clark County Unincorporated					
	1576	Residential	\$55,113,250.00	\$27,556,625.00	\$82,669,875.00
	22	Multi-Residential	\$6,989,320.00	\$3,494,660.00	\$10,483,980.00
	102	Commercial	\$17,140,910.00	\$17,140,910.00	\$34,281,820.00
Total Structure Count	1700	Total Potential Damages			\$127,435,675.00
Catawba					
	0	Residential	\$0.00	\$0.00	\$0.00
	0	Multi-Residential	\$0.00	\$0.00	\$0.00
	0	Commercial	\$0.00	\$0.00	\$0.00
Total Structure Count	0				\$0.00
Clifton					
	0	Residential	\$0.00	\$0.00	\$0.00
	0	Multi-Residential	\$0.00	\$0.00	\$0.00
	0	Commercial	\$0.00	\$0.00	\$0.00
Total Structure Count	0	Total Potential Damages			\$0.00
Donnelsville					
	10	Residential	\$126,430.00	\$63,215.00	\$189,645.00
	0	Multi-Residential	\$0.00	\$0.00	\$0.00
	0	Commercial	\$0.00	\$0.00	\$0.00
Total Structure Count	10	Total Potential Damages			\$189,645.00

Flood Zone Property Values	Flood Zone Structure Count	Property Classification	Property Damage Value***	Contents **	Total
Enon					
	155	Residential	\$6,769,600.00	\$3,384,800.00	\$10,154,400.00
	7	Multi-Residential	\$599,220.00	\$299,610.00	\$898,830.00
	10	Commercial	\$418,910.00	\$418,910.00	\$837,820.00
Total Structure Count	172	Total Potential Damages			\$11,891,050.00
New Carlisle					
	25	Residential	\$672,880.00	\$336,440.00	\$1,009,320.00
	1	Multi-Residential	\$132,230.00	\$66,115.00	\$198,345.00
	9	Commercial	\$983,490.00	\$983,490.00	\$1,966,980.00
Total Structure Count	35	Total Potential Damages			\$3,174,645.00
North Hampton					
	6	Residential	\$154,720.00	\$77,360.00	\$232,080.00
	0	Multi-Residential	\$0.00	\$0.00	\$0.00
	2	Commercial	\$463,000.00	\$463,000.00	\$926,000.00
Total Structure Count	8	Total Potential Damages			\$1,158,080.00
South Charleston					
	17	Residential	\$696,160.00	\$348,080.00	\$1,044,240.00
	0	Multi-Residential	\$0.00	\$0.00	\$0.00
	1	Commercial	\$13,530.00	\$13,530.00	\$27,060.00
Total Structure Count	18	Total Potential Damages			\$1,071,300.00
South Vienna					
	0	Residential	\$0.00	\$0.00	\$0.00
	0	Multi-Residential	\$0.00	\$0.00	\$0.00
	0	Commercial	\$0.00	\$0.00	\$0.00
Total Structure Count	0	Total Potential Damages			\$0.00

Flood Zone Property Values	Flood Zone Structure Count	Property Classification	Property Damage Value***	Contents **	Total
Springfield					
	164	Residential	\$12,735,260.00	\$6,367,630.00	\$19,102,890.00
	1	Multi-Residential	\$2,291,970.00	\$1,145,985.00	\$3,437,955.00
	73	Commercial	\$15,275,650.00	\$15,275,650.00	\$30,551,300.00
	0	Industrial	\$0.00	\$0.00	\$0.00
Total Structure Count	238	Total Potential Damages			\$53,092,145.00
Tremont City					
	21	Residential	\$433,340.00	\$216,670.00	\$650,010.00
	1	Multi-Residential	\$14,620.00	\$7,310.00	\$21,930.00
	3	Commercial	\$59,100.00	\$59,100.00	\$118,200.00
Total Structure Count	25	Total Potential Damages			\$790,140.00
* Based on properties located within the 100 year Flood Zone (1%-annual-chance)					
** Utilizing FEMA Guidance Documents					
*** Values provided by County GIS/Auditors Office – Updated 2019					

Presidential Disaster Declaration

One Presidential Disaster Declaration DR-1580 was issued for the severe storms and flooding that struck 32+ Ohio Counties including Clark County on December 22, 2004 – February 1, 2005.

Mapping

See the Clark County Floodplain Maps which indicate the graphical representation for floodplain hazards. The Flood Maps are found in the Appendix Section A-5.

2.6 Winter Events Including Storms, Heavy Snow, Frost/Freeze and Ice

Overview

One or more of the following characterizes a winter storm: heavy snow, ice storms, strong winds, extreme cold; and, at certain times, blowing and drifting snow as well as blizzards.

Winter Storms

A winter storm encompasses several types of storm systems that develop during the late fall to early spring. It deposits any of the following types of precipitation: snow, freezing rain, or ice. Blizzards and ice storms are subcategories of winter storms. A winter storm watch indicates that severe winter weather may affect an area. A winter storm warning indicates that severe winter weather conditions are definitely on the way. Typically, the average mean snow depth for Clark County is 24-36 inches.

Blizzards

A blizzard warning signifies that large amounts of falling or blowing snow and sustained winds of at least 35 mph are expected for several hours. In order to be classified as a blizzard, as opposed to merely a winter storm, the weather must meet several conditions. The storm must decrease visibility to a quarter of a mile for three consecutive hours, include snow or ice as precipitation, and have wind speeds of at least 35 mph. A blizzard is also characterized by low temperatures.

Ice Storms

An ice storm is defined as a weather event containing liquid rain that falls upon cold objects creating 1/4-inch thick or more accumulation of ice buildup. This ice accumulation creates serious damage such as downed trees and power lines leaving people without power and communication. It also makes for extremely treacherous road conditions.

Occasionally, snow will fall after an ice storm has occurred. With the ice cover, it is nearly impossible to determine which travel areas to avoid. When traveling by car this snow-covered ice causes accidents and when walking it causes people to fall, possibly sustaining injuries.

Several methods of research identified winter storms as a hazard in Clark County, including reviews of newspaper coverage, reviews of past disaster declarations, interviews with local officials, and reviewing the NOAA/NCDC Clark County weather events.

A severe winter storm could affect the entire county at the same time, virtually bringing all county operations to a stand still. Clark County is highly vulnerable to the wide-ranging effects of snowstorms, blizzards, ice storms, sleet, and severe cold snaps. This type of hazard creates a difficult emergency response effort due to adverse road conditions which impede or prohibit vehicle movement. Since Clark County has over 915 miles roadway within the county, severe winter storms can have a large impact on the

county. Much of the land is rural and slightly rolling which can make for dangerous conditions when blowing and drifting snow occurs.

Research indicates that all of Clark County is equally susceptible to winter storms. Driving is treacherous during winter storms as roadways freeze and become covered with snow and slush. During severe winter storms, heavy snow may cause property damage and power outages. Also, the aforementioned adverse driving conditions may lead to additional property damage. According to a FEMA Winter Storm Fact Sheet, the leading cause of death during winter storms is from automobile and other transportation accidents. Roads are sometimes blocked stranding some rural residents from the incorporated areas where medical and other emergency services are centered. Heavy snowfall and blizzards can trap motorists in their cars. Attempting to walk for help in a blizzard can be a deadly decision. Disorientation and confusion come very quickly in blowing snow.

Health hazards generated from severe winter storms include frostbite and hypothermia. Frostbite is a severe reaction to cold exposure that can permanently damage its victims. A loss of feeling and a white or pale appearance in fingers, toes, or the nose and ear lobes are symptoms of frostbite.

Hypothermia is a condition brought on when the body temperature drops to less than 55 degrees Fahrenheit. Symptoms of hypothermia include uncontrollable shivering, slow speech, memory lapses, frequent stumbling, drowsiness, and exhaustion.

Research indicates that winter storms are the third leading weather threat in Ohio. The storms of 1950 and 1978 were of a duration that required extensive mass sheltering or statewide response and recovery efforts. According to the NOAA/NCDC from the period of January 2, 1996 – December 31, 2018, 100 winter events have affected Clark County.

Risk Assessment

Location

Winter storms are generally considered to be non-spatial hazards. It is difficult to determine the exact location of damages that may result from a winter storm event. This hazard affects the entire county and generally the entire county receives 24-26 inches of snowfall annually. During a winter storm event it is not unusual for different areas of the county to receiving varying amounts of snowfall however for many storms snowfall amounts can be about the same countywide.

Past Occurrences

The following is a summary analysis of the Clark County Hazard Mitigation Committee's hazard research findings for severe winter storms: Clark County is approximately 27 miles wide east to west and 17 miles from north to south. As a result, winter weather conditions can vary from one end of the County to the other.

Severe winter storms in Clark County can produce ice, snow, freezing rain, cold temperatures, and wind. Severe winter storms impact highway safety and has a destructive impact on trees, power lines, and utility services. Extreme periods of cold can

have an adverse effect on water lines and water systems. Power outages and drifting and blowing snow, common to the rural parts of Clark County, can have widespread impacts to the residents of Clark County. Destructive snow and ice storms occur on an annual basis. Most county schools have five adverse weather days included in their normal school schedule.

Past history indicates Clark County, and much of Ohio, felt the winter storm effects of the November 25, 1950 blizzard; April 13, 1957 ice storm; January, 1978 blizzard; March 9, 1994 snow storm; and January 2, 1996 and December 22, 2004 snow storm. The 1978 blizzard was the most devastating recent winter storm event. It swept through Clark County on January 25 and 26, 1978 and virtually shut down the entire County.

In Clark County, there were 100 winter events on the NCDC website from January 2, 1996 through December 31, 2018 causing \$526,000 in property damage and \$540,000 in crop damage. There were no deaths or injuries reported.

From January 6 through January 7, 1995, much of the southwest and Miami Valley regions of Indiana, which included Clark County, received 1/4 to 1/2 of an inch glaze of freezing rain and sleet. A freezing rain, sleet, and snow mix occurred towards the end of the event. It was the first major winter storm of the season. Traffic accidents were widespread and brought some roads to a standstill. Although no direct fatalities occurred, at least four fatalities were the result of traffic accidents. Twenty-six injuries occurred from falls on the ice. Of these injuries, 16 injuries were reported in Hamilton County, four in Butler County, four in Ross County, one in Warren County and one in Montgomery County. Localized power outages resulted from downed trees and wires. Property damage reported for this event totaled \$400,000.

From January 21 through January 22, 1995, southwest, west central, parts of Central, and parts of northwest Indiana experienced an extended period of snow accumulation which totaled three to six inches. Northwest winds caused blowing and drifting snow and made travel on secondary roads difficult and dangerous. Several power outages were reported from downed wires due to wind and snow. A woman was found dead after apparently falling and freezing to death in Lucas County. In Butler County, an elderly woman also was found dead of exposure on her front porch after apparently falling. Six injuries were reported due to falls. Numerous traffic accidents were reported resulting from treacherous road conditions. Property damage incurred totaled \$500,000.

From January 6 through January 8, 1996, a massive low-pressure system produced the fastest total accumulation of snow at the Greater Cincinnati/Northern Kentucky airport. The airport, which normally receives 23 inches for an entire season, measured 14.3 inches of snowfall for this event. The heaviest snow fell near the Ohio River in the extreme south. Whiteouts occurred in west central areas of Ohio. In Fayette County, the airport reported a wind gust to 56 mph during the height of the storm. Many homes and businesses had their roofs collapse or partially collapse from the weight of the new snow combined with the snow from a storm earlier in the week. A 47-year-old man died of exposure under an overpass in Miami County. A 76-year-old man died of exposure on his front porch in Montgomery County. There was \$14.3 million in property damage

reported for this event. The ice storms that occurred in December 2004 through February 2005 interrupted an eight-year period in which Clark County did not suffer any property or crop damage due to winter weather. However, each of the events caused high property losses. The intensity of the ice storms that hit the area results in a high susceptibility to property damage due to winter weather.

On February 21, 2011, an ice storm hit the Ohio Valley beginning late in the evening of January 31st. Low pressure traced from Texas to the lower Great Lakes region, and strengthened as it crossed the Ohio Valley. The precipitation over northern portions of the region began as a snow and sleet mix and changed over to freezing rain, while along and immediately south of the I-70 corridor was all freezing rain. An estimated quarter million power outages were blamed on the storm which brought upwards of a half inch to inch of ice, along with several inches of sleet accumulation to central and west central Ohio and the Whitewater Valley of Indiana. Warmer temperatures southeast of the I-71 corridor led to little if any freezing precipitation. Overnight, ice melted east of I-75 as temperatures in the warm sector ahead of the cold front rose well into the 40s and reached 50 degrees in some locations.

The following table summarizes the winter storms including ice events that have occurred in Clark County:

Clark County, Ohio						
Winter Events Including Storms, Heavy Snow, and Ice Events 1996-2018						
Year	Date of Reported Winter Storm Events	Type	Deaths	Injuries	Estimated Property Damage	Crop Damage
1996	1/2/1996	Winter Storm	0	0	\$25,000	\$0
1996	1/6/1996	Winter Storm	0	0	\$500,000	\$0
1996	1/11/1996	Heavy Snow	0	0	\$1,000	\$0
1996	3/6/1996	Ice Storm	0	0	\$0	\$0
1996	3/19/1996	Winter Storm	0	0	\$0	\$0
1997	1/24/1997	Ice Storm	0	0	\$0	\$0
1999	1/1/1999	Winter Storm	0	0	\$0	\$0
1999	1/7/1999	Winter Storm	0	0	\$0	\$0
1999	1/13/1999	Winter Storm	0	0	\$0	\$0
1999	3/9/1999	Heavy Snow	0	0	\$0	\$0
2000	1/19/2000	Heavy Snow	0	0	\$0	\$0
2000	12/13/2000	Ice Storm	0	0	\$0	\$0
2002	3/26/2002	Winter Storm	0	0	\$0	\$0
2003	2/15/2003	Winter Storm	0	0	\$0	\$0
2004	1/25/2004	Winter Storm	0	0	\$0	\$0
2004	3/16/2004	Winter Storm	0	0	\$0	\$0
2004	12/22/2004	Winter Storm	0	0	\$0	\$0
2005	1/21/2005	Winter Storm	0	0	\$0	\$0
2005	12/8/2005	Winter Storm	0	0	\$0	\$0
2005	12/15/2005	Winter Storm	0	0	\$0	\$0

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2007	2/6/2007	Heavy Snow	0	0	\$0	\$0
2007	2/13/2007	Heavy Snow	0	0	\$0	\$0
2007	4/06/2007	Frost/Freeze	0	0	\$0	\$540,000
2007	12/4/2007	Winter Weather	0	0	\$0	\$0
2007	12/7/2007	Winter Weather	0	0	\$0	\$0
2008	1/1/2008	Winter Weather	0	0	\$0	\$0
2008	2/20/2008	Heavy Snow	0	0	\$0	\$0
2008	3/7/2008	Winter Storm	0	0	\$0	\$0
2008	12/19/2008	Winter Weather	0	0	\$0	\$0
2009	1/10/2009	Ice Storm	0	0	\$0	\$0
2009	1/14/2009	Heavy Snow	0	0	\$0	\$0
2009	1/27/2009	Heavy Snow	0	0	\$0	\$0
2009	12/19/2009	Winter Weather	0	0	\$0	\$0
2010	1/7/2010	Winter Weather	0	0	\$0	\$0
2010	2/5/2010	Heavy Snow	0	0	\$0	\$0
2010	2/9/2010	Heavy Snow	0	0	\$0	\$0
2010	2/15/2010	Winter Weather	0	0	\$0	\$0
2010	2/26/2010	Winter Weather	0	0	\$0	\$0
2010	3/25/2010	Winter Weather	0	0	\$0	\$0
2010	12/12/2010	Winter Weather	0	0	\$0	\$0
2010	12/16/2010	Winter Weather	0	0	\$0	\$0
2011	1/20/2011	Winter Weather	0	0	\$0	\$0
2011	2/1/2011	Ice Storm	0	0	\$0	\$0
2011	2/24/2011	Winter Weather	0	0	\$0	\$0
2012	1/02/2012	Winter Weather	0	0	\$0	\$0
2012	1/19/2012	Winter Weather	0	0	\$0	\$0
2012	1/20/2012	Winter Weather	0	0	\$0	\$0
2012	2/10/2012	Winter Weather	0	0	\$0	\$0
2012	2/14/2012	Winter Weather	0	0	\$0	\$0
2012	12/26/2012	Blizzard	0	0	\$0	\$0
2012	12/28/2012	Winter Weather	0	0	\$0	\$0
2013	1/25/2013	Winter Weather	0	0	\$0	\$0
2013	1/31/2013	Winter Weather	0	0	\$0	\$0
2013	3/05/2013	Winter Storm	0	0	\$0	\$0
2013	3/24/2013	Winter Weather	0	0	\$0	\$0
2013	12/06/2013	Winter Storm	0	0	\$0	\$0
2013	12/14/2013	Winter Weather	0	0	\$0	\$0
2013	12/16/2013	Winter Weather	0	0	\$0	\$0
2014	1/02/2014	Winter Weather	0	0	\$0	\$0
2014	1/17/2014	Winter Weather	0	0	\$0	\$0
2014	1/18/2014	Winter Weather	0	0	\$0	\$0
2014	2/04/2014	Winter Storm	0	0	\$0	\$0
2014	2/14/2014	Winter Weather	0	0	\$0	\$0
2014	3/02/2014	Winter Weather	0	0	\$0	\$0
2014	11/16/2014	Winter Weather	0	0	\$0	\$0
2014	11/22/2014	Winter Weather	0	0	\$0	\$0
2015	1/05/2015	Winter Weather	0	0	\$0	\$0
2015	1/11/2015	Winter Weather	0	0	\$0	\$0

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2015	1/25/2015	Winter Weather	0	0	\$0	\$0
2015	2/04/2015	Winter Weather	0	0	\$0	\$0
2015	2/14/2015	Winter Weather	0	0	\$0	\$0
2015	2/15/2015	Winter Weather	0	0	\$0	\$0
2015	2/20/2015	Winter Weather	0	0	\$0	\$0
2015	2/21/2015	Winter Weather	0	0	\$0	\$0
2015	3/01/2015	Winter Storm	0	0	\$0	\$0
2015	3/23/2015	Winter Weather	0	0	\$0	\$0
2016	1/10/2016	Winter Weather	0	0	\$0	\$0
2016	1/12/2016	Winter Weather	0	0	\$0	\$0
2016	1/20/2016	Winter Weather	0	0	\$0	\$0
2016	2/08/2016	Winter Weather	0	0	\$0	\$0
2016	2/14/2016	Winter Weather	0	0	\$0	\$0
2016	2/15/2016	Winter Weather	0	0	\$0	\$0
2016	2/24/2016	Winter Weather	0	0	\$0	\$0
2016	12/11/2016	Winter Weather	0	0	\$0	\$0
2016	12/13/2016	Winter Weather	0	0	\$0	\$0
2017	1/05/2017	Winter Weather	0	0	\$0	\$0
2017	1/29/2017	Winter Weather	0	0	\$0	\$0
2017	2/08/2017	Winter Weather	0	0	\$0	\$0
2017	3/13/2017	Winter Weather	0	0	\$0	\$0
2017	12/09/2017	Winter Weather	0	0	\$0	\$0
2017	12/24/2017	Winter Weather	0	0	\$0	\$0
2017	12/29/2017	Winter Weather	0	0	\$0	\$0
2018	1/12/2018	Winter Weather	0	0	\$0	\$0
2018	1/15/2018	Winter Weather	0	0	\$0	\$0
2018	2/06/2018	Winter Weather	0	0	\$0	\$0
2018	3/07/2018	Winter Weather	0	0	\$0	\$0
2018	3/20/2018	Winter Weather	0	0	\$0	\$0
2018	4/01/2018	Winter Weather	0	0	\$0	\$0
2018	4/06/2018	Winter Weather	0	0	\$0	\$0
2018	11/14/2018	Ice Storm	0	0	\$0	\$0
TOTALS:			0	0	\$526,000	\$540,000

All of the 134,557 Clark County residents and 61,143 households are assumed to be at equal risk from a winter event as are the approximate 60,000 buildings in the county which are estimated to be valued at 11,982 (in millions of dollars). Damage to crops is less likely to occur during the winter months and there has only been one occurrence since April 6, 2007.

Probability of Future Events

Winter events have occurred for many years and most likely will continue to occur in the future in Clark County. From January 2, 1996 – December 31, 2018 there have been approximately 99 severe winter events in Clark County according to NOAA/NCDC records. That equates an average to about 4.5 winter storm events per year. In any given year it is possible to have considerably more snow and ice events and each winter will vary in snowfall depths of accumulating snow and ice. Future events may be affected by global climate changes but the outcome of these trends is unknown at this time. In terms

of probability, Clark County has about a 5% chance of exceeding the 24-26 inch average snow depth.

Vulnerability and Loss Estimation

Methodology

The 22-year winter storm losses for Clark County (January 1996 – December 2018) provided the basis for estimating vulnerability. To yield the per capita 22-year damage total for Clark County, the total damage for this period was divided by the 2017 (Est.) census population. That figure divided by twenty-two, resulted in the annual per capita damage figure for severe winter storms for Clark County.

Results

From January 2, 1996 – December 31, 2018 loss estimates for winter storms in Clark County totaled \$526,000 dollars in property damage plus \$540,000 in crop damage for a total of \$1,066,000 in damages. There were no deaths or injuries reported. Dividing these damages over the 22-year period equates to an approximate average loss of \$48,454 per year for its 134,557 residents. Therefore, the average cost to each resident per year was approximately \$0.36.

2.7 Severe Summer Storms

The National Weather Service classifies a thunderstorm as severe if it has wind gusts greater than 58 mph, hail that is $\frac{3}{4}$ inches in diameter or produces a tornado. Severe thunderstorms can lead to flash flooding, straight-line winds of 100 to 150 mph, damaging hail and tornadoes. A typical thunderstorm is 15 miles in diameter and lasts for 20 to 30 minutes. On average, 100,000 thunderstorms occur in the United States each year with 10% (10,000) classified as severe.

All thunderstorms are dangerous despite the fact that they are generally localized in a small geographical region. It is important to note that every thunderstorm produces lightning, which is responsible for more deaths annually than hurricanes or tornadoes.

Lightning is a major threat during a thunderstorm because it is very unpredictable and it can strike as far as 10 miles away from the actual rainfall area. On average, 62 people are killed from lightning strikes each year with the majority of deaths occurring when people did not seek inside shelter during the storm. Many more injuries occur and some may result in long-term, debilitating symptoms such as memory loss, sleep disorders, attention deficits, irritability, depression and muscle spasms.

Severe summer storms traditionally precede an approaching cold air mass. In the northern hemisphere, the spin of the earth naturally produces weather patterns affecting North America, which travel from west to east across the continent. Key components to the formation of storms are a low-pressure zone, high pressure zone and the jet stream.

Thunderstorms develop when large differences exist between adjacent zones combined with significant water vapor. As warm air begins to lift, it eventually starts to cool and condensation takes place. When the moisture condenses, heat is released which further aids in the lifting process. If enough instability is present in the atmosphere, this process will continue long enough for storm clouds to form, which supports lightning and thunder. As water droplets rise into the colder air, they can freeze. When the velocity of wind becomes great enough, the ice pellets are repeatedly lifted and dropped in the storm adding layers of ice with each cycle. Once the wind cannot support the weight of the ice pellet, it falls to the ground in the form of hail.

The National Climatic Data Center considers summer storms as “high wind events” when surface winds meet or exceed approximately 58 mph. However, wind may even exceed 100 mph with wind gusts even stronger.

Risk Assessment

Location:

According to NOAA/NCDC, there were 217 thunderstorm/wind events recorded from April 3, 1964 through June 9, 2018 in Clark County. All areas of Clark County have been affected by severe storms.

Some of the more intense severe storms recorded include:

- **September 14, 2008** – Strong winds of 40 to 50 miles per hour were sustained for several hours. A 61 mph gust was recorded southwest of Springfield. Widespread damage occurred across the region, from trees being blown down on powerlines, to significant crop losses and structural damage. The remnants of hurricane Ike raced northeast through the midwest and merged with a frontal boundary across the lower Ohio Valley Sunday morning. Abundant sunshine promoted deep mixing of the atmosphere, and warm, dry air aloft translated down to the surface. Gusty winds in excess of 70 mph persisted for a period of several hours, causing significant damage and widespread power outages. Property damage received in Clark County was estimated at \$1,600,000.
- **January 30, 2008** - A roof was blown off a mobile home in Medway causing \$10,000 in damages. A line of severe thunderstorms along a strong cold front produced wind damage across southern and western Ohio.
- **April 27, 2011** – A line of storms moved through during the morning hours of April 27th. Numerous trees were reported down, an awning and door were ripped off a building, and roof and siding damage occurred to a residence due to damaging thunderstorm winds resulting in \$15,000 in damages.
- **May 23, 2011** –A quasi-linear convective system moved across an unstable airmass and produced widespread severe weather. Several utility poles were down, a barn was blown off of its foundation, and minor damage occurred to a house and an apartment due to damaging thunderstorm winds. Property damages were reported to be \$70,000.
- **April 3, 2018** – Severe thunderstorms struck Clark County. High winds and flooding was experienced throughout the County. A sink hole and road closures was experienced. There were power outages and 6 vehicles trapped in water.
- **June 9, 2018** – Severe storms hit Moorefield Township with power outages, uprooted trees, and road closures experienced.

Past Occurrences

The following NOAA/NCDC tables indicate thunderstorm/wind events, hail events, and lightning events that have occurred in the past throughout Clark County. Those listed are ones that had injuries, deaths, or property damage. Those that had no damage reports, injuries or deaths have not been listed.

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Clark County, Ohio Summer Storm Events Data Summary from the National Climatic Data Center						
Year	Number of Reported Summer Storm Events	Type	Deaths	Injuries	Estimated Property Damage	Crop Damage
1964	4/03/1964	Tstm/Wind	0	0	\$0	\$0
1965	6/22/1965	Tstm/Wind	0	0	\$0	\$0
1965	6/22/1965	Tstm/Wind	0	0	\$0	\$0
1965	7/09/1965	Tstm/Wind	0	0	\$0	\$0
1968	6/26/1968	Tstm/Wind	0	0	\$0	\$0
1969	5/10/1969	Tstm/Wind	0	0	\$0	\$0
1969	8/09/1969	Tstm/Wind	0	0	\$0	\$0
1971	6/25/1971	Tstm/Wind	0	0	\$0	\$0
1976	3/05/1976	Tstm/Wind	0	0	\$0	\$0
1976	3/26/1976	Tstm/Wind	0	0	\$0	\$0
1980	7/05/1980	Tstm/Wind	0	0	\$0	\$0
1980	7/09/1980	Tstm/Wind	0	0	\$0	\$0
1980	8/11/1980	Tstm/Wind	0	0	\$0	\$0
1981	4/28/1981	Tstm/Wind	0	0	\$0	\$0
1981	6/13/1981	Tstm/Wind	0	0	\$0	\$0
1982	4/03/1982	Tstm/Wind	0	0	\$0	\$0
1982	5/27/1982	Tstm/Wind	0	0	\$0	\$0
1982	5/31/1982	Tstm/Wind	0	0	\$0	\$0
1982	6/15/1982	Tstm/Wind	0	0	\$0	\$0
1982	6/15/1982	Tstm/Wind	0	0	\$0	\$0
1982	8/24/1982	Tstm/Wind	0	0	\$0	\$0
1982	8/24/1982	Tstm/Wind	0	0	\$0	\$0
1983	7/23/1983	Tstm/Wind	0	0	\$0	\$0
1983	7/23/1983	Tstm/Wind	0	0	\$0	\$0
1984	6/18/1984	Tstm/Wind	0	0	\$0	\$0
1984	9/13/1984	Tstm/Wind	0	0	\$0	\$0
1985	4/05/1985	Tstm/Wind	0	0	\$0	\$0
1985	6/11/1985	Tstm/Wind	0	0	\$0	\$0
1985	7/05/1985	Tstm/Wind	0	0	\$0	\$0
1985	7/05/1985	Tstm/Wind	0	0	\$0	\$0
1986	3/10/1986	Tstm/Wind	0	0	\$0	\$0
1986	5/15/1986	Tstm/Wind	0	0	\$0	\$0
1989	6/03/1989	Tstm/Wind	0	2	\$0	\$0
1989	6/27/1989	Tstm/Wind	0	0	\$0	\$0
1989	6/27/1989	Tstm/Wind	0	0	\$0	\$0
1990	7/09/1990	Tstm/Wind	0	0	\$0	\$0
1990	8/28/1990	Tstm/Wind	0	0	\$0	\$0

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Clark County, Ohio Summer Storm Events Data Summary from the National Climatic Data Center						
Year	Number of Reported Summer Storm Events	Type	Deaths	Injuries	Estimated Property Damage	Crop Damage
1991	5/16/1991	Tstm/Wind	0	0	\$0	\$0
1992	6/18/1992	Tstm/Wind	0	0	\$0	\$0
1992	7/16/1992	Tstm/Wind	0	0	\$0	\$0
1994	4/27/1994	Tstm/Wind	0	0	\$5,000	\$0
1994	8/20/1994	Tstm/Wind	0	1	\$50,000	\$0
1995	3/09/1995	Tstm/Wind	0	0	\$0	\$0
1995	5/24/1995	Tstm/Wind	0	0	\$10,000	\$0
1995	6/21/1995	Tstm/Wind	0	0	\$10,000	\$0
1995	6/26/1995	Tstm/Wind	0	0	\$4,000	\$0
1995	6/26/1995	Tstm/Wind	0	0	\$4,000	\$0
1995	7/13/1995	Tstm/Wind	0	0	\$3,000	\$0
1995	7/13/1995	Tstm/Wind	0	0	\$8,000	\$0
1995	7/26/1995	Tstm/Wind	0	0		\$4,000
1996	4/29/1996	Tstm/Wind	0	0	\$2,000	\$0
1996	4/29/1996	Tstm/Wind	0	0	\$2,000	\$0
1996	5/10/1996	Tstm/Wind	0	0	\$5,000	\$0
1996	6/18/1996	Tstm/Wind	0	0	\$5,000	\$0
1996	7/07/1996	Tstm/Wind	0	0	\$4,000	\$0
1996	7/07/1996	Tstm/Wind	0	0	\$3,000	\$0
1996	11/07/1996	Tstm/Wind	0	0	\$5,000	\$0
1997	1/05/1997	Tstm/Wind	0	1	\$75,000	\$0
1997	5/18/1997	Tstm/Wind	0	0	\$5,000	\$0
1997	7/02/1997	Tstm/Wind	0	0	\$5,000	\$0
1997	7/27/1997	Tstm/Wind	0	0	\$3,000	\$0
1998	5/19/1998	Tstm/Wind	0	0	\$5,000	\$0
1998	5/29/1998	Tstm/Wind	0	0	\$3,000	\$0
1998	6/12/1998	Tstm/Wind	0	0	\$5,000	\$0
1998	6/19/1998	Tstm/Wind	0	0	\$10,000	\$0
1998	7/19/1998	Tstm/Wind	0	0	\$10,000	\$0
1998	8/25/1998	Tstm/Wind	0	0	\$5,000	\$0
1998	11/10/1998	Tstm/Wind	0	0	\$3,000	\$0
1999	5/06/1999	Tstm/Wind	0	0	\$5,000	\$0
1999	7/09/1999	Tstm/Wind	0	0	\$5,000	\$0
1999	7/26/1999	Tstm/Wind	0	0	\$3,000	\$0
1999	10/13/1999	Tstm/Wind	0	0	\$5,000	\$0
2000	4/20/2000	Tstm/Wind	0	0	\$50,000	\$0
2000	4/20/2000	Tstm/Wind	0	0	\$5,000	\$0

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2000	5/10/2000	Tstm/Wind	0	0	\$3,000	\$0
2000	6/02/2000	Tstm/Wind	0	0	\$3,000	\$0
2000	6/14/2000	Tstm/Wind	0	0	\$1,000	\$0
2000	6/14/2000	Tstm/Wind	0	0	\$2,000	\$0
2000	6/16/2000	Tstm/Wind	0	0	\$2,000	\$0
2000	6/16/2000	Tstm/Wind	0	0	\$2,000	\$0
2000	7/03/2000	Tstm/Wind	0	0	\$25,000	\$0
2000	8/09/2000	Tstm/Wind	0	0	\$5,000	\$0
2000	8/09/2000	Tstm/Wind	0	0	\$5,000	\$0
2000	9/20/2000	Tstm/Wind	0	0	\$5,000	\$0
2000	11/09/2000	Tstm/Wind	0	0	\$10,000	\$0
2001	4/09/2001	Tstm/Wind	0	0	\$0	\$0
2001	6/11/2001	Tstm/Wind	0	0	\$5,000	\$0
2001	6/15/2001	Tstm/Wind	0	0	\$5,000	\$0
2001	7/01/2001	Tstm/Wind	0	0	\$3,000	\$0
2001	8/30/2001	Tstm/Wind	0	0	\$0	\$0
2001	10/24/2001	Tstm/Wind	0	0	\$5,000	\$0
2002	5/01/2002	Tstm/Wind	0	0	\$6,000	\$0
2002	5/02/2002	Tstm/Wind	0	0	\$6,000	\$0
2002	5/02/2002	Tstm/Wind	0	0	\$3,000	\$0
2002	5/12/2002	Tstm/Wind	0	0	\$5,000	\$0
2002	7/29/2002	Tstm/Wind	0	0	\$0	\$0
2003	4/05/2003	Tstm/Wind	0	0	\$0	\$0
2003	7/04/2003	Tstm/Wind	0	0	\$10,000	\$0
2003	7/06/2003	Tstm/Wind	0	0	\$2,000	\$0
2003	7/06/2003	Tstm/Wind	0	0	\$3,000	\$0
2003	7/06/2003	Tstm/Wind	0	0	\$15,000	\$0
2003	7/08/2003	Tstm/Wind	0	0	\$12,000	\$0
2003	7/08/2003	Tstm/Wind	0	0	\$4,000	\$0
2003	7/21/2003	Tstm/Wind	0	0	\$3,000	\$0
2003	8/27/2003	Tstm/Wind	0	0	\$6,000	\$0
2003	8/27/2003	Tstm/Wind	0	0	\$15,000	\$0
2003	8/27/2003	Tstm/Wind	0	0	\$0	\$0
2004	5/24/2004	Tstm/Wind	0	0	\$3,000	\$0
2004	6/15/2004	Tstm/Wind	0	0	\$3,000	\$0
2005	6/05/2005	Tstm/Wind	0	0	\$3,000	\$0
2005	6/30/2005	Tstm/Wind	0	0	\$3,000	\$0
2005	6/30/2005	Tstm/Wind	0	0	\$3,000	\$0
2005	8/11/2005	Tstm/Wind	0	0	\$8,000	\$0
2005	8/20/2005	Tstm/Wind	0	0	\$3,000	\$0
2006	4/02/2006	Tstm/Wind	0	0	\$5,000	\$0
2006	4/14/2006	Tstm/Wind	0	0	\$12,000	\$0
2006	5/25/2006	Tstm/Wind	0	0	\$12,000	\$0

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2006	7/11/2006	Tstm/Wind	0	0	\$15,000	\$0
2006	7/14/2006	Tstm/Wind	0	0	\$3,000	\$0
2006	8/03/2006	Tstm/Wind	0	0	\$2,000	\$0
2006	12/01/2006	Tstm/Wind	0	0	\$7,000	\$0
2007	5/15/2007	Tstm/Wind	0	0	\$2,000	\$0
2007	6/26/2007	Tstm/Wind	0	0	\$0	\$0
2007	7/10/2007	Tstm/Wind	0	0	\$2,000	\$0
2007	8/08/2007	Tstm/Wind	0	0	\$2,000	\$0
2007	8/16/2007	Tstm/Wind	0	0	\$4,000	\$0
2007	8/16/2007	Tstm/Wind	0	0	\$4,000	\$0
2008	1/09/2008	Tstm/Wind	0	0	\$3,000	\$0
2008	1/30/2008	Strong Winds	0	0	\$10,000	\$0
2008	6/04/2008	Tstm/Wind	0	0	\$3,000	\$0
2008	6/15/2008	Tstm/Wind	0	0	\$10,000	\$0
2008	6/15/2008	Tstm/Wind	0	0	\$3,000	\$0
2008	6/21/2008	Tstm/Wind	0	0	\$2,000	\$0
2008	6/25/2008	Tstm/Wind	0	0	\$10,000	\$0
2008	6/25/2008	Tstm/Wind	0	0	\$10,000	\$0
2008	7/08/2008	Tstm/Wind	0	0	\$2,000	\$0
2009	8/10/2009	Tstm/Wind	0	0	\$35,000	\$0
2009	8/19/2009	Tstm/Wind	0	0	\$12,000	\$0
2010	4/05/2010	Tstm/Wind	0	0	\$0	\$0
2010	6/15/2010	Tstm/Wind	0	0	\$1,000	\$0
2010	8/04/2010	Tstm/Wind	0	0	\$2,000	\$0
2010	9/07/2010	Tstm/Wind	0	0	\$15,000	\$0
2010	10/26/2010	Tstm/Wind	0	0	\$2,000	\$0
2011	4/27/2011	Tstm/Wind	0	0	\$15,000	\$0
2011	5/23/2011	Tstm/Wind	0	0	\$3,000	\$0
2011	5/23/2011	Tstm/Wind	0	0	\$3,000	\$0
2011	5/23/2011	Tstm/Wind	0	0	\$70,000	\$0
2011	5/25/2011	Tstm/Wind	0	0	\$3,000	\$0
2011	7/11/2011	Tstm/Wind	0	0	\$5,000	\$0
2011	7/29/2011	Tstm/Wind	0	0	\$2,000	\$0
2011	9/03/2011	Tstm/Wind	0	0	\$4,000	\$0
2012	6/17/2012	Tstm/Wind	0	0	\$2,000	\$0
2012	6/29/2012	Tstm/Wind	0	0	\$20,000	\$0
2012	6/29/2012	Tstm/Wind	0	0	\$1,000	\$0
2012	7/01/2012	Tstm/Wind	0	0	\$1,000	\$0
2012	7/01/2012	Tstm/Wind	0	0	\$20,000	\$0
2012	7/01/2012	Tstm/Wind	0	0	\$2,000	\$0
2012	7/01/2012	Tstm/Wind	0	0	\$10,000	\$0
2012	7/01/2012	Tstm/Wind	0	0	\$0	\$0
2013	5/31/2013	Tstm/Wind	0	0	\$1,000	\$0

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2013	6/13/2013	Tstm/Wind	0	0	\$1,000	\$0
2013	6/22/2013	Tstm/Wind	0	0	\$3,000	\$0
2013	6/23/2013	Tstm/Wind	0	0	\$3,000	\$0
2013	7/10/2013	Tstm/Wind	0	0	\$1,000	\$0
2013	7/10/2013	Tstm/Wind	0	0	\$1,000	\$0
2013	7/20/2013	Tstm/Wind	0	0	\$1,000	\$0
2013	10/31/2013	Tstm/Wind	0	0	\$5,000	\$0
2013	11/17/2013	Tstm/Wind	0	0	\$1,000	\$0
2013	12/21/2013	Tstm/Wind	0	0	\$5,000	\$0
2014	2/20/2014	Tstm/Wind	0	0	\$1,000	\$0
2014	5/21/2014	Tstm/Wind	0	0	\$1,000	\$0
2014	5/21/2014	Tstm/Wind	0	0	\$25,000	\$0
2014	5/21/2014	Tstm/Wind	0	0	\$1,000	\$0
2014	6/16/2014	Tstm/Wind	0	0	\$5,000	\$0
2014	6/19/2014	Tstm/Wind	0	0	\$3,000	\$0
2015	4/10/2015	Tstm/Wind	0	0	\$1,500	\$0
2015	7/13/2015	Tstm/Wind	0	0	\$10,000	\$0
2015	7/19/2015	Tstm/Wind	0	0	\$0	\$0
2015	7/19/2015	Tstm/Wind	0	0	\$1,000	\$0
2015	7/19/2015	Tstm/Wind	0	0	\$10,000	\$0
2015	8/03/2015	Tstm/Wind	0	0	\$10,000	\$0
2016	5/12/2016	Tstm/Wind	0	0	\$5,000	\$0
2016	6/15/2016	Tstm/Wind	0	0	\$2,000	\$0
2016	6/15/2016	Tstm/Wind	0	0	\$1,000	\$0
2016	6/15/2016	Tstm/Wind	0	0	\$1,000	\$0
2016	7/13/2016	Tstm/Wind	0	0	\$500	\$0
2016	7/13/2016	Tstm/Wind	0	0	\$3,000	\$0
2016	7/13/2016	Tstm/Wind	0	0	\$500	\$0
2016	8/16/2016	Tstm/Wind	0	0	\$1,000	\$0
2016	8/28/2016	Tstm/Wind	0	0	\$500	\$0
2016	8/28/2016	Tstm/Wind	0	0	\$500	\$0
2016	9/10/2016	Tstm/Wind	0	0	\$500	\$0
2016	9/10/2016	Tstm/Wind	0	0	\$500	\$0
2017	1/10/2017	Tstm/Wind	0	0	\$1,000	\$0
2017	4/05/2017	Tstm/Wind	0	0	\$500	\$0
2017	4/05/2017	Tstm/Wind	0	0	\$5,000	\$0
2017	4/05/2017	Tstm/Wind	0	0	\$5,000	\$0
2017	6/19/2017	Tstm/Wind	0	0	\$3,000	\$0
2017	7/21/2017	Tstm/Wind	0	0	\$1,000	\$0
2017	7/21/2017	Tstm/Wind	0	0	\$1,000	\$0
2017	7/21/2017	Tstm/Wind	0	0	\$1,000	\$0
2017	7/21/2017	Tstm/Wind	0	0	\$3,000	\$0
2017	7/22/2017	Tstm/Wind	0	0	\$2,000	\$0

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2017	8/17/2017	Tstm/Wind	0	0	\$1,000	\$0
2017	11/05/2017	Tstm/Wind	0	0	\$3,000	\$0
2017	11/05/2017	Tstm/Wind	0	0	\$2,000	\$0
2018	3/01/2018	Tstm/Wind	0	0	\$2,000	\$0
2018	3/01/2018	Tstm/Wind	0	0	\$3,000	\$0
2018	5/30/2018	Tstm/Wind	0	0	\$1,000	\$0
2018	6/09/2018	Tstm/Wind	0	0	\$2,000	\$0
2018	6/09/2018	Tstm/Wind	0	0	\$500	\$0
2018	6/09/2018	Tstm/Wind	0	0	\$1,000	\$0
2018	6/09/2018	Tstm/Wind	0	0	\$3,000	\$0
2018	6/09/2018	Tstm/Wind	0	0	\$1,000	\$0
2018	6/09/2018	Tstm/Wind	0	0	\$6,000	\$0
2018	6/09/2018	Tstm/Wind	0	0	\$15,000	\$0
2018	6/09/2018	Tstm/Wind	0	0	\$15,000	\$0
Totals:			0	4	1.055M	4.00K

Clark County, Ohio Hail Events Data Summary from the National Climatic Data Center						
Year	Date of Reported Hail Events	Type	Deaths	Injuries	Estimated Property Damage	Crop Damage
1974	4/03/1974	Hail	0	0	\$0	\$0
1980	5/11/1980	Hail	0	0	\$0	\$0
1980	7/09/1980	Hail	0	0	\$0	\$0
1982	6/08/1982	Hail	0	0	\$0	\$0
1982	6/15/1982	Hail	0	0	\$0	\$0
1982	6/15/1982	Hail	0	0	\$0	\$0
1982	6/15/1982	Hail	0	0	\$0	\$0
1990	7/20/1990	Hail	0	0	\$0	\$0
1990	9/29/1990	Hail	0	0	\$0	\$0
1994	3/24/1994	Hail	0	0	\$0	\$0
1994	6/6/1994	Hail	0	0	\$0	\$50,000
1995	7/26/1995	Hail	0	0	\$0	\$4,000
1996	6/14/1996	Hail	0	0	\$0	\$0
1997	5/18/1997	Hail	0	0	\$0	\$0
1998	5/13/1998	Hail	0	0	\$0	\$0
1998	5/19/1998	Hail	0	0	\$0	\$0
1998	6/26/1998	Hail	0	0	\$0	\$0

Clark County, Ohio Hazard Mitigation Plan

1999	6/11/1999	Hail	0	0	\$1,000	\$0
2000	5/31/2000	Hail	0	0	\$0	\$0
2000	5/31/2000	Hail	0	0	\$0	\$0
2000	7/14/2000	Hail	0	0	\$0	\$0
2000	7/28/2000	Hail	0	0	\$0	\$0
2001	4/09/2001	Hail	0	0	\$0	\$0
2001	4/09/2001	Hail	0	0	\$0	\$0
2001	5/15/2001	Hail	0	0	\$0	\$0
2001	5/15/2001	Hail	0	0	\$0	\$0
2001	5/24/2001	Hail	0	0	\$0	\$0
2001	6/19/2001	Hail	0	0	\$0	\$0
2002	5/02/2002	Hail	0	0	\$2,000	\$0
2002	5/02/2002	Hail	0	0	\$2,000	\$0
2002	5/02/2002	Hail	0	0	\$2,000	\$0
2002	6/05/2002	Hail	0	0	\$0	\$0
2002	11/10/2002	Hail	0	0	\$0	\$0
2002	11/10/2002	Hail	0	0	\$0	\$0
2003	4/20/2003	Hail	0	0	\$0	\$0
2003	4/20/2003	Hail	0	0	\$0	\$0
2004	5/21/2004	Hail	0	0	\$0	\$0
2004	5/30/2004	Hail	0	0	\$5,000	\$0
2004	5/30/2004	Hail	0	0	\$0	\$0
2005	6/28/2005	Hail	0	0	\$10,000	\$0
2005	9/19/2005	Hail	0	0	\$0	\$0
2005	11/08/2005	Hail	0	0	\$0	\$0
2006	1/02/2006	Hail	0	0	\$0	\$0
2006	10/4/2006	Hail	0	0	\$5,000	\$0
2008	2/17/2008	Hail	0	0	\$1,000	\$0
2008	6/4/2008	Hail	0	0	\$3,000	\$0
2008	6/4/2008	Hail	0	0	\$3,000	\$0
2009	6/02/2009	Hail	0	0	\$0	\$0
2009	6/02/2009	Hail	0	0	\$0	\$0
2010	7/18/2010	Hail	0	0	\$0	\$0
2010	9/16/2010	Hail	0	0	\$0	\$0
2011	4/27/2011	Hail	0	0	\$0	\$0
2011	5/10/2011	Hail	0	0	\$0	\$0
2011	5/10/2011	Hail	0	0	\$0	\$0
2011	5/11/2011	Hail	0	0	\$0	\$0
2011	5/11/2011	Hail	0	0	\$0	\$0
2011	5/11/2011	Hail	0	0	\$0	\$0
2011	7/11/2011	Hail	0	0	\$0	\$0

Clark County, Ohio Hazard Mitigation Plan

2011	7/11/2011	Hail	0	0	\$0	\$0
2012	4/26/2012	Hail	0	0	\$0	\$0
2012	4/26/2012	Hail	0	0	\$0	\$0
2012	7/26/2012	Hail	0	0	\$0	\$0
2012	7/26/2012	Hail	0	0	\$0	\$0
2013	4/10/2013	Hail	0	0	\$0	\$0
2013	7/23/2013	Hail	0	0	\$0	\$0
2013	7/23/2013	Hail	0	0	\$0	\$0
2013	8/21/2013	Hail	0	0	\$0	\$0
2014	5/11/2014	Hail	0	0	\$0	\$0
2014	5/13/2014	Hail	0	0	\$0	\$0
2014	5/14/2014	Hail	0	0	\$0	\$0
2014	5/21/2014	Hail	0	0	\$0	\$0
2015	4/09/2015	Hail	0	0	\$0	\$0
2016	5/29/2016	Hail	0	0	\$0	\$0
2017	2/24/2017	Hail	0	0	\$0	\$0
2017	4/05/2017	Hail	0	0	\$0	\$0
2018	1/22/2018	Hail	0	0	\$0	\$0
Totals			0	0	\$34,000	\$54,000
Sources: From NOAA, NCDC Event Period 01/01/1950 - 12/31/2018						

Clark County, Ohio Lightning Events Data Summary from the National Climatic Data Center						
Year	Date of Reported Events	Type	Deaths	Injuries	Estimated Property Damage	Crop Damage
1996	5/10/1996	Lightning	0	2	0	0
2001	6/11/2001	Lightning	0	0	0	0
2001	8/30/2001	Lightning	0	0	0	0
2003	8/4/2003	Lightning	0	1	0	0
Totals			0	3	0	0
Sources: From NOAA, NCDC Event Period 01/01/1950 – 12/31/2018						

Probability of Future Events

Severe summer storms have occurred in the past and will continue to occur in Clark County. There have been a total of 4 lightning events, 76 hail events, and 217 thunderstorm/wind events in Clark County from April 3, 1964 through June 9, 2018. Based on the above data, Clark County, Ohio can expect on average at least 4 severe summer storm events each year along with smaller thunderstorm events. Based on Ohio historical data, Ohio has received 23 presidential declarations from summer storm events for June 1997 through December 2018. All of the 134,557 Clark County residents and 56,000 households are assumed to be at equal risk from a severe summer storm as are the approximate 60,000 buildings in the county which are estimated to be valued at 11,982 (in millions of dollars).

From this information, it is very probable future damaging summer storm events will occur. In any given year Clark County has about a ten percent chance of having a series of severe summer storms more intense than usual.

Vulnerability Analysis & Loss Estimation

According to NOAA/NCDC information, Clark County severe thunderstorms/winds have caused \$1.055 million in damages from April 3, 1964 through June 9, 2018. In addition, lightning and hail events have caused an additional \$34,000 in property damage and \$54,000 in crop damage.

Methodology

The 54-year severe summer storm losses for Clark County (April 3, 1964 – June 9, 2018) provided the basis for estimating vulnerability. To yield the per capita 54-year damage total for Clark County, the total damage for this period was divided by the 2017 (Est.) census population. That figure divided by fifty-four years, resulted in the annual per capita damage figure for severe summer storms for Clark County.

Results

From April 3, 1964 – June 9, 2018 reported loss estimates for thunderstorms/wind in Clark County totaled \$1.089 M dollars in property damage. There were zero deaths and 4 injuries reported. Dividing these damages over the 54-year period equates to approximate average losses of \$21,241 per year for its 134,557 residents. Therefore, the average cost to each resident per year was approximately \$0.16.

2.8 Extreme Heat and Cold

Overview

Extreme weather generally includes unexpected, unpredictable and unusual severe cold or heat based on historical data. Typically, it is within the most universal 10% of extreme temperature. In recent cases, some extreme temperatures have been attributed to global warming.

Heat Wave: Are periods of hot weather that, unlike other weather events, it is not as visible as other extreme events such as flooding, tornados and hurricanes and earthquakes. Extreme hot and cold weather can damage crops, dehydrate populations for both plants and animals, cause heat cramps, heat expansion and heat stroke. Dry soil can also be more susceptible to erosion, difficult for crop growth, livestock and detrimental to habitats. It can create pollution in the air and to the ozone. Power outages can also occur due to excessive demand on electrical systems due to increase air conditioning use.

Extreme heat is defined as three (3) or more consecutive days with daytime temperatures of 90 degrees F or higher and nighttime temperatures no lower than 85 degrees F, accompanied by high humidity and causing a significant amount of medically treated heat-related illnesses or deaths.

Several methods of research identified extreme heat as a minor hazard in Clark County, including searches of Internet sites such as:

- Extreme Heat Fact Sheet
www.fema.gov
- General Heat Wave Information
www.nfpa.org
- Ohio Winter Health & Safety Tips
www.weathersafety.ohio.gov
- National Weather Service
www.nws.noaa.gov
- The National Oceanic & Atmospheric Administration
www.noaa.gov

Cold Wave: A cold wave is a weather event relation to cooling of the air and as used by the National Weather Service. It is usually a rapid fall in temperatures within a 24-hour period requiring a substantial increase in protection to agriculture, industry, commerce and social activities. Death can occur to humans, wildlife, livestock and when accompanied by ice and heavy snow, food and water can become difficult to reach or

find. Humans can be inflicted with frostbite, hypothermia and when exposed for extended periods of time, it may result in the loss of limbs, damage to internal organs and death. Extreme cold weather can also cause damage such as frozen pipes, frost heave can occur damaging buildings or fire hydrants may be froze and unavailable for fighting structural fires. Cold weather can also cause damage or kill plants due to heavy frost or freeze. Clark County has 60.28% of its land area in cultivated crops so freeze or heavy frost can be very damaging to spring plantings.

Risk Assessment

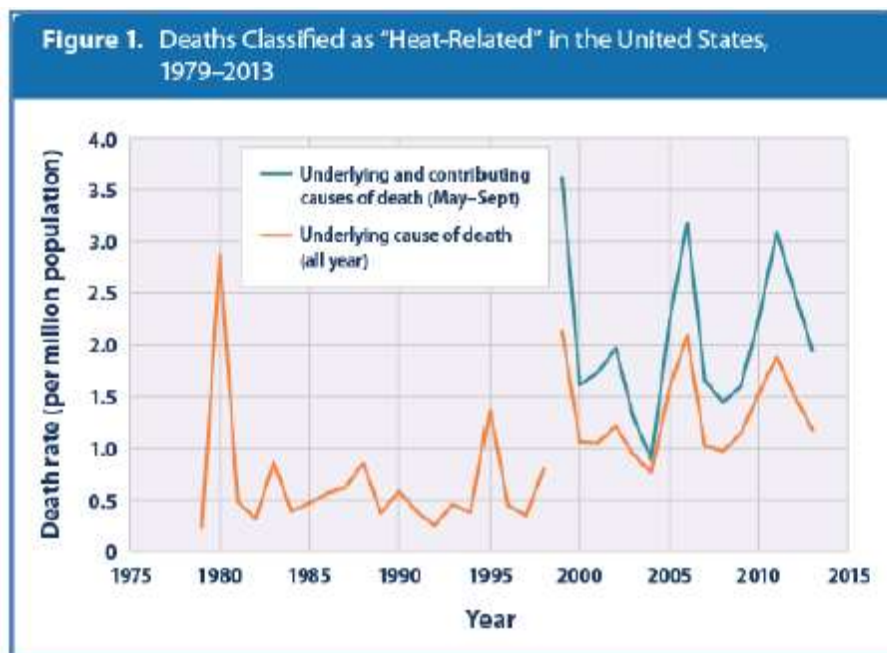
Extreme Heat:

Extreme heat is a hazard usually found in more desert regions than Clark County, Ohio. However, extreme heat can and has been a hazard in Ohio, causing heat strokes to occur to residents and proving detrimental to crops. The highest reported temperature in Ohio through the year 2016 was 113 degrees Fahrenheit, and was reported in Gallipolis on July 21, 1934. The recorded high temperature in Dayton, Ohio for that event was 104 degrees. Estimates of deaths occurring in Ohio during the week of July 20 – 26, 1934 were about 160.

A study released by Centers for Disease Control & Prevention (CDC) from 1999 – 2009 indicated 7,233 heat related deaths occurred in the United States. An analysis of 2012 data indicated heat deaths are on the rise. A 2-week excessive heat period in 2012 resulted in 32 deaths in 4 states. More than 40% of all heat related deaths occurred in Arizona, California and Texas. Most occur more frequently to males and among adults 65 and older.

Between 1979 – 2014, the death rate as a direct result of exposure to heat (underlying cause of death) generally hovered at 0.5 – 1 deaths per million people, with spikes in certain years. Overall since 1979, more than 9,000 Americans have died from heat-related causes according to death certificates (per EPA climate change indicators).

Health hazards related to extreme heat include sunburns, heat cramps, heat exhaustion, and heat stroke. In a normal year according to USCB 2004, approximately 358 Americans die from extreme heat and 680 Americans die from extreme cold. In August 2007, seven out of eight of the first eight days of August exceeded 90 degrees according to the archived climate data at the Wilmington, Ohio, Branch of the National Weather Service. Young children, the elderly, and those who are sick or overweight are more likely to become victims. According to the 2010 Census, approximately 28% of the total population in Clark County is between the ages of 45 and 64.



*This figure shows the annual rates for deaths classified as "heat-related" by medical professionals in the 50 states and the District of Columbia. The orange line shows deaths for which heat was listed as the main (underlying) cause. * The blue line shows deaths for which heat was listed as either the underlying or contributing cause of death during the months from May to September, based on a broader set of data that became available in 1999.*

* Between 1998 and 1999, the World Health Organization revised the international codes used to classify causes of death. As a result, data from earlier than 1999 cannot easily be compared with data from 1999 and later.

Data source: CDC, 2015^{10,11}

Extreme Cold:

Extreme cold is a hazard that when exposed for prolonged time the body begins to lose heat faster than it can be produced. The result of this loss of heat is hypothermia, or abnormally low body temperature. Low body temperature affects the brain making the victim unable to carry out normal movement or clear thinking. Children and elderly are generally at greater risk during periods of extreme cold. Clark County residents are encouraged to check on friends, family and elderly neighbors.

During 2015-2017, death rates attributed to excessive cold or hypothermia increased steadily by age among those aged ≥ 15 years in both metropolitan and non-metropolitan counties. The rate for those ≥ 85 years reached 3.8 deaths per 100,000 in metropolitan counties and 7.3 in non-metropolitan counties. The lowest rates were among those aged 15-24 years (0.2 in metropolitan counties). In each category death rates were lower in metropolitan counties and higher in non-metropolitan counties.

Victims of risk from hypothermia are often the following:

- older adults with inadequate food, clothing or heating;

- babies sleeping in cold bedrooms;
- people who remain outdoors for long periods like the homeless, hikers, hunters, etc.;
- people who drink alcohol or used illicit drugs.

Signs of hypothermia include:

- shivering;
- exhaustion – feeling tired;
- confusion;
- fumbling hands;
- memory loss;
- slurred speech;
- drowsiness.

Frostbite is a type of injury caused by freezing and leads to a loss of feeling and color in the areas it effects. Frostbite can permanently damage the body and severe cases can lead to amputation. Be prepared by taking along a first aid kit or emergency resuscitation (CPR) course is a good way to prepare for health problems related to cold weather.

In a summary of 2015 Weather events, fatalities, injuries and damage costs reported by the National Weather Service (NWS) and the National Climatic Data Center, extreme heat and cold for the 50 United States, Puerto Rico, Guam and The Virgin Islands were as follows:

<u>Extreme Temperatures</u>	<u>Fatalities</u>	<u>Injuries</u>	<u>Property Damage</u> (In millions of dollars)	<u>Crop Damage</u> (In millions of dollars)	<u>Total Dollars</u> (In millions of dollars)
Cold	53	3	2.84	0	2.84
Heat	45	640	0	0	0

Location

No one geographical area of Clark County is more susceptible to temperature extreme cold waves and heat waves. However, the affects can vary greatly depending on climate control availability.

Past Occurrences

The summer of 1934 ranks as the hottest in Ohio since temperature records began in 1883. The average summer temperature of 75.7 degrees for June, July, and August broke the old record set in 1901 and was 5% above normal. In 2003, which was a hotter than normal year, the average summer temperature was 73.18 degrees. The record low for the area occurred in 1977 at -21°F on January 17th, -25°F on January 18th and 19th in 1994. In 2014 a reading of -10°F was recorded on January 6th.

Historic cold weather temperatures affected Clark County January 30, 2019 as a frigid, powerful polar vortex reduced temperatures to a deep freeze across the County. The temperatures and wind chills for several days ranged from -25°F to -35°F according to local meteorologists.

Several area schools were closed as a result of the bitter cold temperatures. Warming centers were announced and opened in Springfield, New Carlisle and North Hampton, as well as the community room at the National Trail Parks & Recreation District offices. The Springfield Soup Kitchen also operated as a warming center.

The cold temperatures had an adverse effect on outdoor workers in the area including Ohio Edison on Belmont Avenue. Mail carriers were also out doing regular mail delivery using hand and foot warmers as the temperatures dropped below zero.

According to a NOAA/NCDC Event Record, the last part of July 1999 was very hot and humid across the state with temperatures reaching into the 90s most days and above 100 for a few days. The dew points and overnight lows were in the 70s through much of the period. The excessive heat contributed to 10 deaths in the Cincinnati metro area. The following tables summarize Temperature Extremes and Heat Waves experienced in Clark County.

Clark County Extreme Heat and Cold Events 1995-2019							
Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Countywide	02/01/1996	Cold/Wind Chill	N/A	0	0	\$20,000	\$0
Countywide	07/20/1999	Heat	N/A	0	0	\$0	\$0
Countywide	04/06/2007	Frost/Freeze	N/A	0	0	\$0	\$540,000
Countywide	06/28/2012	Heat	N/A	0	0	\$0	\$0
Countywide	07/01/2012	Heat	N/A	0	0	\$0	\$0
Countywide	01/30/2019	Extreme Cold/Wind Chill	N/A	0	0	\$0	\$0
Countywide	07/19/2019	Excessive Heat	N/A	0	0	\$0	\$0
Countywide	07/20/2019	Excessive Heat	N/A	0	0	\$0	\$0
TOTALS:				0	0	\$20,000	\$540,000

Source: National Climatic Data Center (NCDC)

- February 1, 1996 Through February 5, 1996 – Cold/Wind Chill Event – Southern Ohio Extreme Cold Spell Including Clark County.

Arctic high pressure brought the coldest air of the season to the Ohio Valley. Cincinnati broke its record low on the 4th with a temperature of 11 below zero. Cincinnati also experienced its record low maximum temperatures of 7 and 6 degrees on the 3rd and

4th respectively. The extreme cold was entrenched for 5 days, freezing and bursting numerous water pipes. There were at least 2 house fires indirectly related to the cold weather, as space heaters, which were thawing frozen water lines, caught on fire. On the 5th, six thousand customers were without power near Portsmouth as over usage caused outages. AAA motor club had an extremely high number of calls during this cold wave when cars would not start.

- July 20, 1999 Through July 31, 1999 – Heat Event

The last part of July was very hot and humid across the state with temperatures reaching into the 90s most days and above 100 for a few days. The dew points and overnight lows were in the 70s through much of the period. The excessive heat contributed to 10 deaths in the Cincinnati metro area and 3 in the Dayton metro area.

- April 6, 2007 Through April 8, 2007 – Frost/Freeze

Unseasonably warm temperatures for an extended period of time in March allowed much of the Ohio Valley to begin its agricultural growing season early. In early April, a cold snap with low temperatures dropping into the low 20s threatened agriculture interests across the region. The initial estimate of 16.74 million in crop damage was split evenly between 31 Ohio counties. (\$540,000 for Clark County damages)

- June 28, 2012 Through June 30, 2012 – Heat Event

A very warm airmass moved into the region during late June. This airmass brought a prolonged period of above normal temperatures, record heat, and dangerous heat indices to much of southwestern Ohio, southeastern Indiana, and northern Kentucky. Many locations across southwestern Ohio experienced heat indices over 100 degrees Fahrenheit on June 28 and 29. On June 30, heat indices generally rose to 90 to 95 degrees, which was compounded by widespread power outages in the area from the June 29 derecho.

- July 1, 2012 Through July 7, 2012 – Heat Event

An ongoing heat wave continued from late June into early July. Areas still affected by power outages caused by the June 29 derecho were especially impacted. Ongoing daily heat continued into early July across southwestern Ohio. Although heat indices were not as high as late June, heat indices in the area generally ranged from 90 to 100 degrees Fahrenheit each day through July 7.

- January 30, 2019 Through January 30, 2019 – Extreme Cold/Wind Chill

An arctic airmass was pushed into the Ohio Valley behind a cold front. Sub-zero temperatures reached the lower teens in some areas and combined with wind gusts of 30 to 45 mph, creating wind chills from 20 to 40 below zero. The wind chill in Springfield dropped to 37 below zero.

- July 19, 2019 Through July 19, 2019 – Excessive Heat

With a combination of high temperatures in the 90's and added humidity, heat index values across the region reached into the triple digits. Temperatures in the 90's and dewpoints in the upper 70's to near 80 degrees created heat index values in excess of 105 degrees.

- July 20, 2019 Through July 20, 2019 – Excessive Heat

With a combination of high temperatures in the 90's and added humidity, heat index values across the region reached into the triple digits for a second day in a row. Temperatures in the middle to upper 90's combined with dewpoints in the upper 70's to create heat index values that exceeded 105 degrees for a second day in a row.

Probability of Future Events

From 1999 through July 20, 2019 NOAA/NCDC has recorded eight extreme temperature weather events. There were three heat events, two excessive heat events, two extreme cold/wind chill event and one frost/freeze event recorded. The probability of such events occurring is about one extreme temperature event about once every three years.

Vulnerability Analysis & Loss Estimation

Based on historical available data, the costliest extreme weather event to occur in Clark County was the Frost / Freeze Event April 6, 2007. Approximately \$540,000 in damages occurred as a result of that hazard event. Many crops in the area had to be replanted.

Extreme heat wave can also cause damages and buckling to pavement, affect proper operation of vehicles and is particularly hard on the elderly and to workers that labor in an outside atmosphere.

While in Clark County there has been no reports per the NOAA Storm Database, deaths and injuries have occurred across the State of Ohio during these extreme temperature events. There has been a total of 57 deaths and one injury associated with similar events across the United States. Potential property damage is estimated to be \$20,000 due to cold/wind chill while crop losses is estimated to be \$540,000 due to frost/freeze damage to crops.

Property damage reported per the NOAA Data base in Clark County for temperature extremes is estimated to be \$20,000, or an average of \$2,500 per event and an estimated \$540,000 in crop damage losses, or an average of \$77,143 per event.

Based on the 8 Extreme Heat & Cold Events for Clark County occurring between 1999 & 2019, one can expect to experience these temperature extremes once every three years.

2.9 Drought

A drought is a period of abnormally dry weather, which persists long enough to produce a serious hydrologic imbalance. It is a normal occurrence that results in a water shortage that can affect land use, economy, geology and water sources.

Several methods of research identified drought as a hazard in Clark County, including discussions with CCHMC representatives. Drought information was obtained from the following Internet sites.

- United States Department of Agriculture
www.usda.gov
- United States Geological Society
www.usgs.gov
- National Oceanic Atmospheric Administration (NOAA)
www.noaa.gov
- Ohio Department of Natural Resources

Drought is a relative term and is used in relation to who or what is being affected by the lack of moisture. Droughts can be categorized in four (4) types – each one affecting the other.

Agricultural Drought – Moisture deficiency seriously injurious to crops, livestock, or other agricultural commodities. Parched crops may wither and die. Pastures may become insufficient to support livestock. Effects of agricultural droughts are difficult to measure because there are many other variables that may impact production during the same growing season.

Hydrological Drought – Reduction in stream flow, lake and reservoir levels, depletion of soil moisture, and a lowering of the groundwater table. Consequently, there is a decrease in groundwater discharge to streams and lakes. A prolonged hydrological drought will affect the water supply.

Meteorological Drought – The amount of dryness and the duration of the dry period. Atmospheric conditions that result in deficiencies of precipitation change from area to area.

Socioeconomic Drought – Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply. The supply of many economic goods, such as water, forage, food grains, fish, and hydroelectric power depends on weather. Due to variability of climate, water supply is sufficient in some years but not satisfactory to meet human and environmental needs in other years. The demand for economic goods is increasing as a result of increasing population. Supply may also increase because of improved production efficiency and technology.

Measuring Drought

The Standardized Precipitation Index (SPI) is a way of measuring drought that is different from the Palmer drought index (PDI). Like the PDI, this index is negative for drought, and positive for wet conditions. But the SPI is a probability index that considers only precipitation, while Palmer's indices are water balance indices that consider water supply (precipitation), demand (evapotranspiration) and loss (runoff).

The Palmer Drought Severity index (PDSI) is a soil moisture algorithm. The PDSI was developed by W.C. Palmer in 1965. It is a highly recognized method to measure drought. Many U.S. government agencies and states rely on the PDSI to trigger drought relief programs and responses. (See following chart)

Palmer Drought Severity Index Classifications	
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 to -2.99	Moderate Drought
-3.0 to -3.99	Severe Drought
-4.0 or less	Extreme Drought

The Palmer Index is typically calculated on a monthly basis, and a long-term archive of the monthly PDSI values for every climate division in the United States exists with the National Climatic Data Center from 1895 through the present. Weekly Palmer Index values are calculated for climate divisions. The State of Ohio currently has ten (10) climate divisions.

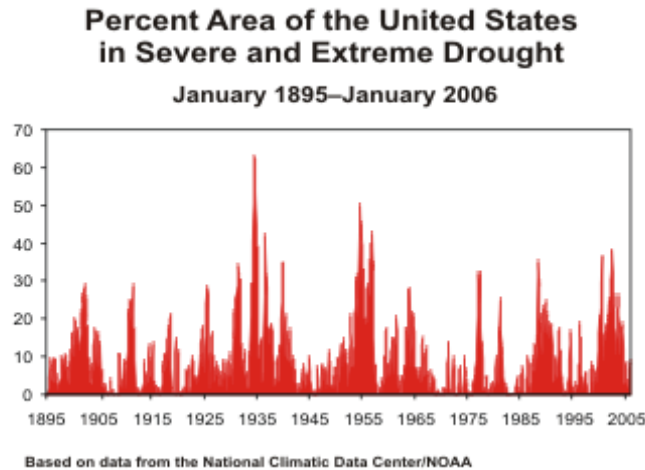
Location

Typically in extreme drought conditions the location of damages that will result from an extreme drought event will affect the entire county.

Risk Assessment

Using Palmer Drought Severity Index data, the National Drought Mitigation Center indicated the most extreme drought in the recent past in the United States occurred in July 1988 when 36% of the country experienced severe drought conditions. The worst ever drought recorded was during July 1935 with 65% of the United States experiencing

extreme drought conditions. Rainfall totals throughout the Midwest were 50-85% below normal.



Past Occurrences

Unlike most hazards, the threat of drought tends to be dismissed because of the relatively long time a drought takes to have damaging effects.

Since severe drought events would be countywide, the entire County population of 134,557 persons would be affected by hot, dry conditions. The overall impact that drought has on the Clark County population is low, except for possible special drinking water demands. But the overall impact on the Clark County assets of crops and animals is moderate. According to the NCDC, two events of extreme drought were recorded between 1995 and 2018. These events were in July and August of 1999. No monetary damage, deaths or injuries were recorded for these events.

Number of Years with Severe or Extreme Drought between 1896 to 1995									
% area of basin/region	>0%	>10%	>25%	>33%	>50%	>66%	>75%	>90%	>100%
Ohio	67	51	34	28	16	12	9	4	3

Rural counties are susceptible to wild land fires especially during drought conditions. When most people think of wild fires, the first thing that comes to mind is the devastating and disastrous western fires that are quite prevalent during the summer months.

With more people than ever living, working, traveling and recreating in the urban/urban interface, the odds of wild land fires are increasing. Causes of wild land fires include the careless burning of debris, household trash and cigarettes, lightning, equipment and vehicles, railroad accidents, electrical fires, and arson.

During an average year in Ohio, an estimated 15,000 wildfires and natural fuel fires occur. Typically, a reported 1,000 wild land fires burn an average between 4,000 to 6,000 acres in Ohio each year.

Clark County, Ohio Drought Event History (1995 – December 2018)

Summer 1999 Drought- July and August

- As much as 50% of crops were considered a total loss in some areas of the county.

Summer 2002

- Severe crop loss due to drought conditions.
- County received federal agricultural funds for losses.

September 23, 2010 Drought Conditions & High Winds

- Clark County field on fire with crops destroyed near the community of Pitchen.
- One house and barn destroyed on Fourman Road in nearby eastern Darke County.
- 2 areas of a field burned in Miami Township, Montgomery County.
- Field fires in nearby Madison County.

Probability of Future Events

Based on historical drought in Southwest Ohio, the probability of a future drought occurrence is likely with an event probable in the next 3 to 4 years and a major drought every 20 to 25 years. Per table 2.2d the frequency of occurrence is possible with limited impact for a low hazard ranking

Vulnerability Analysis

Because drought is a non-site specific hazard, the effects of a drought would be felt countywide. There are no documented critical facilities, buildings or infrastructures that are considered at-risk as it relates to a drought with exception of wells or well fields for water treatment plants which may be affected during extreme drought conditions.

By itself, a drought does not damage developed property. However, over a long period of time, certain soils can expand and contract resulting in some minor structural damage to buildings. A small percentage of buildings in areas with such soils suffer minor damage during their “useful lives.” Therefore, the overall impact on the County’s infrastructure would be extremely low.

Clark County is within the top 10% of the State’s leading agricultural counties in terms of gross receipts for grain and livestock. A drought can have a large impact on the agricultural economic stability of the County. The most recent 2002 summer drought like conditions indicates the County is very much affected in several ways. In addition to economic loss of reduced crop yields, droughts lead to problems with irrigation and increase the potential for field and grass fires. The significantly less rainfall also can leave reservoirs, water tables and farm ponds significantly lower. Some farmers use their

ponds for livestock watering which can cause significant issues. Damages are not immediately noticed, such as the damages to trees, shrubbery and wildlife.

Drought impacts large areas and crosses jurisdictional boundaries. All existing and future buildings, facilities and populations are exposed to this hazard and could potentially be impacted. However, drought impacts are mostly experienced in water shortages and crop/livestock losses on agricultural lands and typically have no impact on buildings.

Estimated Potential Losses

Drought can have a devastating effect on the Clark County economy. During the 2002 drought, crop yields were cut as much as 50% in comparison to the yields of 2000 and 2001. A moderate countywide drought would affect the 785 farms including the 673 male and 112 female principle farm operators.

Based on this recent historic data, a loss of one half the crop yields due to drought in Clark County could result in 50% less farm revenue during a year of moderate drought.

In 2017, Clark County ranked twenty-first in the State for production of corn at a yield of 11,400,000 bushels at an average of 198.6 bushels per acre. Clark County also ranked 21 in the state for cattle/calf production at 19,000. The market value of agricultural products sold from Clark County farms in 2012 was:

Crop Sales:	\$116,745,000	80%
Livestock Sales:	<u>\$ 28,398,000</u>	<u>20%</u>
Total Value of Products Sold: \$145,143,000*		

With an approximate 15% increase in farm receipts since 1977 a 50% loss in yearly crop receipts for the entire county during a severe drought growing season would result in an estimated loss of \$58,372,500 in crop receipts for Clark County. The above cost estimate does not take into account any losses to livestock, wildlife or shrubbery as these losses are unknown at this time.

*Source: 2012 Census of Agriculture USDA

https://www.nass.usda.gov/Publications/AgCensus/2012/Online_Resources/County_Profiles/Ohio/cp39023.pdf

2.10 Dam/Levee Failure

Overview

Dam failures are often referred to as disasters. A dam is a barrier built across a waterway to control the flow or raise the level of water. Most dams are constructed of earth. Dams must have a spillway system to safely convey normal stream and flood flows over, around or through the dam. A dam failure occurs when the barrier constructed across the waterway fails or otherwise does not obstruct or restrain the flow of water, which can rapidly result in a large area of completely inundated land.

A levee is an artificial barrier together with appurtenant works that will divert or restrain the flow of a stream or other body of water for the purpose of protecting an area from inundation by flood water.

Dam and Levee Failure

The Ohio Department of Natural Resources (ODNR), Division of Water Dam Safety Program has been involved in dam and levee safety since 1963. During this year, the first Ohio law requiring construction permits for building new dams was enacted. Dams and levees provide the citizens of Ohio with essential benefits such as water supply, flood control, recreations and irrigation. While dams have multiple benefits, they also represent a risk to public safety and economic infrastructure if they are not properly maintained. Over the past three years, the Ohio Department of Natural Resources has made reducing this risk and improving dam safety a top priority. Each year Dam Safety engineers and staff conduct more than 350 detailed inspections of dams on a five-year schedule. These inspections are completed along major watersheds to gain field efficiencies and to inter-relate hydrology of dams in a watershed. Reports detailing necessary repair and maintenance are then provided to the owner. Dam Safety then seeks compliance as necessary for any deficiencies noted. In addition, following the failure of several dams in northeast Ohio during the severe flood of 1969, the General Assembly revised the law to include periodic inspections of existing structures. Inspections were required to help assure that the continued operation and use of a dam, dike or levee does not pose a hazard to life, health, or property. In 1972, the failure of Buffalo Creek Dam in West Virginia, which caused great loss of life and severe property damage, led to the enactment of the National Dam Safety Act. This law, administered by the U.S. Army Corps of Engineers, called for an inventory of dams in the United States and the inspection of those dams that could create the most hazards if they failed. The Corps contracted with the Division of Water to inventory roughly 4,500 non-federal dams in Ohio.

Dam experts highly recommends each Class I and Class II dam have an Emergency Action Plan (EAP). Whenever people live in areas that could be flooded as a result of failure or operation at a dam, there is a potential for loss of life and danger to property. The general purpose of an Emergency Action Plan is to save lives and reduce property damage. An Emergency Action Plan generally contains 6 basic charts.

- Notification Flow Chart
- Emergency Detection, Evaluation, and Classification
- Responsibilities
- Preparedness
- Inundation Maps
- Appendices

The dam owner is responsible for the development of the EAP. Emergency Management Agencies will use the information in a dam owner's EAP and facilitate their responsibilities. State and local emergency management authorities will generally have a plan in place, either a Local Emergency Operations Plan or a Warning and Evacuation Plan. Public awareness is a critical component of emergency planning as many people may not know they live or work near a dam. Public Awareness of an EAP will enhance its effective implementation.

Because of the importance of the implementation of an EAP, the Clark County Mitigation Committee has included mitigation action items to obtain EAP's and inundation studies for all Class I and Class II dams in the county in addition to having a mitigation action plan to rehabilitate high hazard potential dams in the county.

Risk Assessment

Several methods of research identified dam failure as a hazard in Clark County. There are about 75,000 dams in the United States, the majority of which are privately owned. Others are owned by state and local authorities, public utilities, and federal agencies. They impound about 600,000 miles of river or about 17% of all rivers in the nation. The benefits of dams are numerous; they provide water for drinking, navigation, and agricultural irrigation, and save lives by preventing or reducing floods. General information on dam failures was obtained from the following sources, and Internet sites.

- Ohio Department of Natural Resources Division of Water
www.dnr.state.oh.us/water
- HAZUS Instruction and Technical Information
www.fema.gov/hazus

Because numerous dams exist in Clark County, the Clark County Hazard Mitigation Committee chose to profile this hazard in the Clark County Hazard Mitigation Plan.

Dams are man-made structures designed to obstruct or restrain waters that may cause downstream flooding. These structures are generally made with concrete or earthen materials. The failure of these dams, although a man-made structure, would result in a natural event of flooding. There are

Height of Dam	
Class I	Greater than 60 feet
Class II	Greater than 40 feet
Class III	Greater than 25 feet
Class IV	Less than or equal to 25 feet

currently 22 total known dams in Clark County. Of those dams, two are Class I, two are Class II, and four are Class III. Other dams are shown in the Appendix. Dams are classified under two conditions, height and storage, as illustrated in the charts at right. The height of a dam is defined as the vertical dimension (as measured from the natural

Storage Volume	
Class I	Greater than 5000 acre-feet
Class II	Greater than 500 acre-feet
Class III	Greater than 50 acre-feet
Class IV	Less than/equal to 50 acre-feet

streambed at the downstream toe of a dam to the low point along the top of the dam). The storage volume of a dam is defined as the total volume impounded when the pool level is at the top of the dam immediately before it is overtopped. According to the Ohio Department of Natural Resources, the damage predicted by a dam failure coincides with the class of the dam. The potential downstream hazards are defined as the resultant downstream damage should the dam fail, including probable future development.

The potential downstream hazards are broken into four (4) classes.

POTENTIAL DOWNSTREAM HAZARDS	
Class I	Probable loss of human life, structural collapse of at least one residence or one commercial or industrial business.
Class II	Disruption of a public water supply or wastewater treatment facility, release of health hazardous industrial or commercial waste, or other health hazards. Flooding of residential, commercial, industrial, publicly owned structures and high-value property. Damage or disruption to major roads including but not limited to interstate highways, and the only access to residential or other critical areas such as hospitals, nursing homes, or correctional facilities. Damage or disruption to railroads or public utilities. Damage to downstream class I, II, or III dams or levees, or other dams or levees of high value. Damage to dams or levees can include, but is not limited to overtopping of the structure.
Class III	Property losses including but not limited to rural buildings, and Class IV dams and levees not otherwise listed as high-value property. Damage or disruption to local roads including but not limited to roads not otherwise listed as major roads listed in Class II above.
Class IV	Losses restricted mainly to the dam and rural lands and loss of life is not probable.

Uncontrolled floodwaters are one of the most powerful and destructive forces in nature. Dams that are not designed to withstand major storms may be destroyed, increasing flood damage downstream.

The potential for damage due to dam failures increases along with the increased number of residential and commercial development downstream of dams. In many cases, existing dams will need to be modified to keep downstream areas safe from disasters resulting from catastrophic flooding.

Location

Clark County contains several dams which could present the possibility of considerable flood damage to the residents and businesses located near or downstream from the dams. In many cases, the dams are less than five miles away from the nearest community.

There are two Class I dams in the county, both of which are located near the City of Springfield; both are public recreation dams. Clarence J Brown Reservoir is located along Buck Creek and Clark Lake Dam is located along Sinking Creek. There are two Class II Dams in the County at the following locations: Sewage treatment plant lagoon at the Village of South Vienna Wastewater Treatment Plant and Lake Sylvan, a privately owned 42-acre recreational lake located in Harmony and Pleasant Townships. In addition, there are four Class III dams located throughout the County. All are privately owned except the Hosterman Lake Dam is owned by the Clark County Park District.

There are three types of failures of earthen dams: overtopping, seepage, and structural failure. Overtopping failures result from the erosive action of water on the embankment. Erosion is due to uncontrolled flow of water over, around, and adjacent to the dam. Earth embankments are not designed to be overtopped and therefore are particularly susceptible to erosion. Once erosion has begun during overtopping, it is almost impossible to stop.

All earth dams have seepage resulting from water percolating slowly through the dam and its foundation. Seepage must, however, be controlled in both velocity and quantity. If uncontrolled, it can progressively erode soil from the embankment or its foundation, resulting in rapid failure of the dam. Erosion of the soil begins at the downstream side of the embankment; (either in the dam proper or the foundation) progressively works toward the reservoir, and eventually develops a “pipe” or direct conduit to the reservoir. Seepage can cause slope failure by creating high pressures in the soil pores or by saturating the slope.

Structural failures can occur in either the embankment or the appurtenances. Structural failure of a spillway, lake drain, or other appurtenance may lead to failure of the embankment. Cracking, settlement, and slides are the more common signs of structural failure of embankments. Large cracks in an appurtenance or the embankment, major settlement, and major slides will require emergency measures to ensure safety, especially if these problems occur suddenly.

The three types of failures previously described are often interrelated in a complex manner. For example, uncontrolled seepage may weaken the soil and lead to a structural failure. A structural failure may shorten the seepage path and lead to a piping failure. Surface erosion may result in structural failure and so on.

Minor defects such as cracks in the embankment may be the first visual sign of a major problem which could lead to failure of the structure. Officials experienced in dam design and construction should evaluate the seriousness of all deficiencies.

The following table lists the Class I, II and III dams in Clark County along with names, classifications, and owners.

CLASS I, II, AND III DAMS			
Name of Dam	Classification of Dam	Owner of Dam	Emergency Action Plan Completion As of
Clarence J Brown Reservoir Dam	Class I	Corps of Engineers	July 2017
Clark Lake Dam	Class I	ODNR	October 2016
Lake Sylvan	Class II	Private	-
South Vienna WWTP	Class II	Village of South Vienna	-
Wenrick Lake Dam	Class III	Private	-
Hosterman Lake Dam	Class III	Clark County Park District	-
The Van Dyke Lake Dam	Class III	Private	-
South Vienna Lake Dam	Class III	Private	-

The following table lists other dams in Clark County:

OTHER DAMS			
Name of Dam	Classification of Dam	Owner of Dam	Emergency Action Plan Completion As of
Hay Lake Dam	Other	Private	-
Eastwood Dairy Silage	Other	Private	-
Eastwood Dairy Manure Pond Dam	Other	Private	-
Farm Pond Dam	Other	Private	-
Hatfield Pond Dam	Other	Private	-
Clark County Sportsman Lake Dam	Other	Private	-
Low Head Dam	Other	Ohio Edison Company	-
Smith Pond Dam	Other	Private	-
Saunders Lake Dam	Other	Private	-
Grenat Pond Dam	Other	Private	-
Agle Pond Dam	Other	Private	-
Haddix Pond Dam	Other	Private	-
Pond North of Thrasher St. in Springfield	Other	Unknown	-
Pond in Green Twp. North of Bullenbarger Rd.	Other	Unknown	-

Clark County Low Head Dams: Clark County has 5 low head dams all on Buck Creek located in the Upper Great Miami Watershed.

- (1) Waterway: Buck Creek – Dam at Buck Creek State Park Northeast of Springfield
- (2) Waterway: Buck Creek – Low head dam below earthen dam at Buck Creek State Park Northeast of Springfield off Old Road Park.
- (3) Waterway: Buck Creek – Dam at Cliff Park/Veterans Memorial Park off Fountain Street in Springfield, Portage River right.
- (4) Waterway: Buck Creek – Dam at Snyder Park east of Plum Street in Springfield Portage River left at railroad trestle.
- (5) Waterway: Buck Creek – Dam adjacent to International Harvester Manufacturing Plant.

Levees: Lower Mad River Watershed, East Fork Buck Creek, Buck Creek below Beaver Creek to Mad River, Jackson Creek, Mad River below Nettle Creek to above Chapman Creek.

Protection of: 19 acres (2 miles) on the Mad River next to the Wenrick Wetlands protected by B-W Greenway (Mad River below Donnels Creek to above Mad River). Also, 96 acres along Beaver Creek, 601 acres along Mud Run. Extensive flood plains are found along Mad River and many of the related tributaries, such as Buck Creek. Flood plains are particularly extensive along the Mad River, southwest of Springfield along I-70 and south of the Clark County line. Expected residential/commercial development along East Fork Buck Creek, Sinking Creek, Beaver Creek, Jackson Creek and Mud Run. These current levees mostly protect farm ground.

Probability of Future Occurrence

Clark County does not have a history of any dam failure. The State of Ohio Dam Safety Program is in place to monitor and provide dam owners in Clark County pertinent information to support their dam's maintenance requirements. The Dam Safety Program regulates the construction, operation, and maintenance of Ohio's dams, dikes, and levees to protect life and property from damages due to failure. Each year dam safety engineers and staff conduct more than 350 detailed inspections of dams on a 5-year schedule to help prevent failures. Periodic inspections, new dam construction permits, and regulation of improvements, maintenance and operation of existing dams are provided through the Dam Safety Program. The probability of future dam failure occurrences is considered to be low, however, the likelihood of severe damage if a Class I or potentially a Class II Dam were to fail is determined on a case by case basis and more detail study and data is needed at this time.

Vulnerability Analysis & Loss Estimation

There are two Class I Dams in Clark County, all of which are located near the City of Springfield. The County has prepared a dam break inundation extent map for the Class I Clarence J Brown Reservoir Dam (see Appendix A-8) to determine the vulnerability should a dam failure occur. Based on current information, the chances of a dam failure within the County are anticipated to be low to moderate.

A HAZUS_MH: Flood Global Risk Report for 100-year flood event was prepared in July 2017, which includes CJ Brown Reservoir inundation area as well as Clark Lake Dam inundation area. See Appendix A-6 for copy of HAZUS Flood Global Risk Report for Clark County.

Mapping

See the Clark County Dam Failure Map for a graphical representation of the hazard areas with regard to dam locations and failure. See Appendix A-9.

2.11 Invasive Plants, Pests & Infestation

Overview

According to a review of information provided by ODNR Wildlife Division, Clark County is subject to both insect and plant evasive species. Although there are over 3,000 species of plants known to occur in Ohio, about 75% are native or have occurred in Ohio before the time of Europeans (1750).

Some of those that have invaded Ohio displace native plants and disrupt woodlands, prairies, wetlands, and natural areas.

Those plants that typically have been the most invasive for Clark County residents include:

- Bush Honeysuckle
- Garlic Mustard
- Multiflora Rose
- Autumn Olive
- Callery Pear (Bradford Pear)

These nuisance plants spread quickly and force out native spring wildflowers. Other non-native plants impact the County's wetlands. The wildlife depends on native plants for food and cover, so invasive species are problematic.

According to the ODNR Division of Forestry, one of the most prevalent invasive insect species is the Emerald Ash Borer. It is an Asian wood-boring beetle and affects all species of native ash trees found in Ohio. In 2003, it was first found in northwest Ohio feeding on ash trees. The Emerald Ash larvae were active just below the bark and feeding on the living part of the tree, preventing the tree's ability to move water and nutrients through its system. Other invasive species to affect Clark County include the Gypsy Moth Caterpillars and Spider Mites.

Most recently found in southwest Ohio is the Asian Longhorned Beetle (AJB) which attacks broadleaf trees, particularly maples.

An infestation is to spread or swarm in or over in a troublesome manner. Also, to live in or on as a parasite.

According to reviews of online information provided by the Ohio Division of Forestry, Clark County is subject to an infestation primarily of gypsy moths. The impact of gypsy moths includes economic losses through timber mortality, loss of recreational opportunities in severely defoliated areas, and nuisances from gypsy moth caterpillars. Other infestations that could possibly occur in Clark County include Asian long horned beetles (pictured in Figure 1.1), mosquitoes known to be



Figure 1.1

infected with the West Nile Virus, and spider mites, as was the case in 1999.

The probability of an infestation hazard event actually occurring in Clark County is relatively low, with only moderate risk associated with it. Infestation is most likely to occur in the 30,720 acres of forested or the 174,337 acres of farmland and will likely cause no damage to structural assets. Infestation is considered as a hazard in Clark County due to the high percentage of agricultural and forestland in the county.

The Asian Long-Horned Beetle (ALB) has been discovered in Southwest Ohio east of Cincinnati by the U.S. Department of Agriculture. Ohio is the 5th state to detect ALB. These beetles attack a wide variety of broadleaf trees particularly Maples.

Invasive species are defined as:

1. Non-native (or alien) to the ecosystem under consideration, and
2. Whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Invasive species can be plants, animals, and other organisms (e.g., microbes). Human actions are the primary means of invasive species introductions.

There are about 60 species of invasive plants identified in Ohio. Invasive species can cause economic and environmental damages in communities. Clark County is currently participating in a 22 county Woodland Invasive Species Program launched to promote healthier forests. Invasive Bush Honeysuckle is one of the most prevalent invasive species in Clark County. Invasive species plants are usually characterized by fast growing, rapid vegetation spread, and efficient speed dispersal and germination. Since these plants are not native to Ohio, they lack the natural predators and disease which would naturally control them in their native habitats.

Past Occurrences

Invasive species have been around since the settlers of the 1750's. Movement of people and transportation has made the spread of invasive species more prevalent. The Emerald Ash Borer was introduced in the U.S. in the 1990's from wood packing material from China, first being discovered in Lower Michigan, spreading to Ohio, Maryland, Pennsylvania, northern Indiana, and Chicago.

Probability of Future Events

Invasive species will continue to affect Ohio. With the increase in worldwide trade and the fast modes of transportation, the invasive species will continue to occur.

Just as the Asian Longhorned Beetle has recently been discovered in southwest Ohio, new species of unwanted pests will come. The importance of controlling the natural environment native to Clark County will require local, state, nationwide, and international cooperation to avoid unwanted infestations of invasive species.

The probability of intense invasive species affecting the county is high as indicated under the Hazard Identification Section Table 2.2a.

Vulnerability Analysis & Loss Estimation

Clark County is vulnerable to the numerous types of invasive species hazards as identified but they would not directly cause loss to structures or loss of life to county residents. However, the invasive species cause the highest exposure of losses in the form of invasive species infiltrating into adjoining crop land. In addition, tree losses are incurred by land owners combating invasive species such as the Emerald Ash Borer. Monetary losses occur in attempts to identify, isolate and remove infected trees. It is estimated in Ohio alone there are five billion ash trees that could become infected with the Emerald Ash Borer. Removal and proper handling of the trees will be costly in itself. Pesticides have to be applied yearly for invasive species control and are labor intensive and costly. It is estimated these treatments alone will be substantial for County residents. Because most of the eradication programs are mainly being performed by private landowners precise figures are not available for Clark County.

In 2017, at the Mad River Gorge and Nature Preserve, the Clark County Park District was awarded an \$800,000 grant from the Clean Ohio Fund to remove invasive species, excessive trash, repair erosion and damage to vegetation and trail disturbance.

Publicly, twenty-two of Ohio's Counties are participating in a "Woodland Invasive Species Program" through the Ohio Department of Agriculture to promote healthier woodlands and forests. Clark County is currently participating in this program. One million dollars in landowner assistance funds and technical advice is available to landowners to help remove these non-native species.

Typically, the rural woodland areas of the County are more at risk for the plant invasive species and the remainder of the County is at an equal risk for tree borers. Therefore, Clark County's rural areas are at a moderate risk and the municipal areas are at a lesser risk for infestations/invasive species.

2.12 Epidemic

An epidemic is a disease, usually contagious, that recurs in a community and attacks a large number of people at the same time. The potential impacts of an epidemic are illness or fatalities, disruption or closing of schools, or the force closure of businesses and industrial operations.

Several methods of research identified epidemics as a hazard in Clark County including discussions with the local Health Department and Ohio Department of Health. Epidemic is a natural hazard risk in Clark County. The probability of an epidemic striking Clark County is relatively low. However, the risk associated with this hazard is very high.

An epidemic has the potential to affect the entire county, but is more probable to occur in densely populated areas, such as the City of Springfield, City of New Carlisle and especially at facilities containing large numbers of occupants. Many commercial and industrial sites contain many facilities at which a large work force is employed. A potential epidemic is of particular concern at these facilities.

Epidemics can develop with little or no warning and quickly erode the capacity of local medical providers. A fast-developing epidemic can last several days and extend into several weeks. In some extreme cases, they can last for several months. An epidemic can occur at any time of the year, but the warm summer months when bacteria and microorganism growth are at their highest present the greatest risk.

Epidemic versus Pandemic

An **epidemic** is a classification of a disease that appears as new cases in a given human population, during a given period, at a rate that substantially exceeds what is “expected”; based on recent experience (the number of new cases in the population during a specified period of time is called the “incident rate”).

A **pandemic** is an epidemic that spreads across a large region (for example a continent), or even worldwide.

Simply put, when an epidemic gets out of hand it is called a pandemic. This has two fine distinctions:

Geographical spread – An epidemic that is not localized to a city or a small region but spans a larger geographical area can be called a pandemic.

Incident rate – An epidemic may be localized to a small region but the number of people affected may be very, very large compared to what is “expected”. In this case, it can be called a pandemic even if its geographical spread is not very large. For example, let us say that a disease has an “expected” rate of infection of 15%. When 40% of the population of a state is infected, we have an epidemic on our hands. When 75% of the population is infected, it has reached pandemic proportions.

Location

Clark County comprises the City of Springfield (county seat), City of New Carlisle, 8 other incorporated villages, and 10 townships for a total of 134,557 residents. Many of the places where large numbers of people would gather include factories, health care facilities, schools, or well-attended events such as the Clark County Fair. The total area of Clark County is approximately 400 square miles. It is the third smallest county in the state based on land area. It is likely that an epidemic would impact the City of Springfield, the largest communities, or the school systems.

Risk Assessment

One objective way to assess the health status of a community is to measure it in terms of mortality (rates of death within a population) and morbidity (rates of the incidence and prevalence of disease). Mortality may be represented by crude rates or age-adjusted rates (AAM) or by cause (disease – cancer and non-cancer or injury – intentional, unintentional). Morbidity may be represented by age-adjusted (AA) incidence of cancer and chronic disease.

Chronic conditions which in many cases can be mitigated or prevented entirely by behavior changes are the primary reason that Clark County has a higher adult death rate than the State of Ohio. Cardiovascular diseases are the biggest killers of Clark County residents, and the community suffers more than the State of Ohio's overall rate or the rates of peers. Other chronic diseases like diabetes and emphysema are also more prevalent here. The Clark County Combined Health District conducts community outreach programs and facilities support groups to address this trend.

The preponderance of chronic conditions is accompanied by the fact that Clark County endures higher fatality rates from many types of cancer. This is particularly true in the case of the yearly incidence of lung cancer.

Table 'A' below is a snapshot of the Clark County's health outcomes from the 2018 Annual Report of Clark County Combined Health District.

Clark County also experiences higher rates for injury death than does the State of Ohio. The motor vehicle traffic related death rate is particularly high at 16.9 per 100,000 people, more than Ohio's 10.3 and the rates of its peer counties. A seat belt survey most recent results show that Clark County at a 61% usage rate for all occupants; a 62% usage rate for drivers and a 57% usage rate for the passenger. The Safe Communities Coalition is a program funded by the Ohio Department of Public Safety to reduce the number of injuries and fatalities on local roadways and to achieve a better understanding of motor vehicle-related injuries associated costs within the Clark County community. This Coalition is comprised of local and state law enforcement agencies, public health entities, Fire and EMS, local governments, schools, businesses and advocacy organizations.

The Clark County Combined Health District (CCCHD) prides itself in responding to public health emergencies in a timely manner. By working with other key agencies CCCHD is able to coordinate effective responses to common area epidemics such as the

West Nile Virus, H1N1 Influenza, Hepatitis A outbreak and other health concerns. By taking part in mock emergencies and emergency training exercises the CCCHD is prepared for all types of hazard emergencies.

Clark County Health Snapshot				
Measure/Indicator	County	Trend	State	U.S.
Health Outcomes				
Cancer mortality, Breast (rate per 100,000)	29.5	-*	22.2	20.2
Cancer mortality, Lung (rate per 100,000)	51.0	-*	48.2	39.4
Cancer mortality, Overall (rate per 100,000)	186.4	-*	174.3	157.1
Diabetes (%)	14.1	-*	11.1	10.7
Homicide (rate per 100,000)	7.0	*	5.9	5.5
Infant Mortality (rate per 1,000 live births)	8.2	-*	7.2	5.9
Injury Deaths (rate per 100,000)	93.2	-*	61.2	45.3
Low birthweight (%)	8.7	-*	8.5	8.2
Poor physical health days (in last 30 days)	4.3	-*	4.0	3.9
Preterm Birth (%)	11.8	*	10.3	9.6
Stroke Deaths (rate per 100,000)	65.9	-*	40.6	37.5
Suicide (rate per 100,000)	15.4	-*	13.3	13.0
Health Behaviors				
Adult Obesity (%)	35.4	-*	30.6	29.2
Adult Smoking (%)	28.6	*	22.0	16.5
Alcohol-impaired driving deaths (%)	42.0	-*	34.0	30.0
Gonorrhea incidence (rate per 100,000)	205.2	-*	176.8	145.8
Excessive drinking (%)	13.4	*	18.1	16.6
Motor vehicle crash deaths (rate per 100,000)	16.9	-*	10.3	11.5
Physical inactivity (rate per 100,000)	36.6	-*	26.4	25.2
Substance Abuse/Mental Health				
Depression (%)	16.4	-	18.5	17.1
Drug poisoning deaths (per 100,000)	39.9	-*	26.2	14.6
Fentanyl & related drugs overdose deaths (per 100,000)	20.2	*	9.0	2.6
Heroin poisoning overdose deaths (per 100,000)	13.8	-*	10.9	3.5
Prescription Opioid overdose deaths (per 100,000)	9.8	*	5.9	4.0
Access to Clinical Care				
Dentists (ratio)	2040:1	↓*	1656:1	1480:1
Diabetic screening (% HbA1c)	49.3	-	57.4	57.5
Mammography screening (%)	80.9	*	73.7	72.7
Mental health providers (ratio)	1152:1	-*	561:1	470:1
Primary care physicians (ratio)	2230:1	↑*	1307:1	1320:1
Uninsured (%)	14.2	*	7.6	11.8

Pop.: 136,175

Top Causes of Death
Health Disease
Lung Cancer
Heart Attack

Diabetes
Deaths and % >
OH & US

Driving Deaths >
OH & US for
crash deaths &
alcohol-impaired

Injury Deaths >
Increasing and
OH & US

Stroke Deaths
Rates are
increasing and
> OH & US

Socio-Economic/Demographic				
Children in poverty (%)	27.8	*	22.1	21.2
Hispanic (%)	3.1		3.5	17.3
African-American (%)	8.2		12.1	12.3
Population that is 65 and older (%)	17.8	*	14.5	16.0
Population below 18 years of age (%)	22.9	-	23.0	22.3

* = Rate or percent is higher than the state and national rate or percent.

U = Unavailable, unreliable, or suppressed due to small numbers.

Children
 Infant & child
 mortality rates
 increasing and >
 OH & US

Table 'A'

Past Occurrences

The history of epidemics in Clark County is as follows:

- 1913 – Flood
- 1918, 1957, 1968, 2009 - Pandemics
- 1949 – The Clark County Fair was ordered cancelled or postponed by the Board of Health due to a Polio Myelitis outbreak.
- 1949 – Health Department cooperated with the Clark County Tuberculosis and Health Association in sponsoring mass chest x-ray screening program.
- 1950, 1978, 2011 – Blizzard and/or Ice
- 2009 – H1N1 Influenza clinics were held
- 2018 – Hepatitis A, Statewide community outbreak

Probability of Future Events

Locally recorded pandemics have affected Clark County as early as 1918 (and most likely prior to that date). There is clear precedence set that Clark County will continue to experience epidemic hazard events in the future. While they may not occur frequently based on past history, an epidemic most likely will occur within the next 20-25 years. Per table 2.2d the frequency of occurrence is likely with limited impact for a medium hazard ranking.

Vulnerability and Loss Estimation

The epidemic hazard has the potential to affect the health and welfare of all of its 138,333 residents. The causes of illness and death will differ in a population depending on the age, sex, race and socioeconomic status of individuals within a population. As indicated below, chronic diseases, particularly heart disease, stroke, diabetes, and cancer, along with unintentional injuries such as poisonings, motor vehicle traffic crashes, and falls, accounted for the majority of all the deaths in Clark County during 2016. These leading causes of death result in extended pain and suffering for the individuals and a decreased quality of life. The diseases on this list are the primary causes of disability and contribute heavily to the burden of health care costs not only for residents of Clark County but for all Ohioans. No dollar costs associated with the medical treatment or expenses of these epidemics are available at this time.

Average Annual Number of Deaths and Average Annual Age-adjusted Mortality Rates (per 100,000 population) among Clark County Residents:

- Approximately 1,588 residents died during 2016.
- The leading cause of death for residents was heart disease during 2016.
- Cancer was the second leading cause of death for Clark County residents an average of 177.8-186.0 deaths per 100,000 residents each year, while chronic lower respiratory diseases was the third leading cause of death for Clark County residents during 2016.
- Drug overdose rates in 2016 for Clark County was 109, making it the 3rd largest number of drug overdose deaths in the State of Ohio in 2016.
- Epidemics are hazards that may affect people due to disease.

2.13 Earthquakes

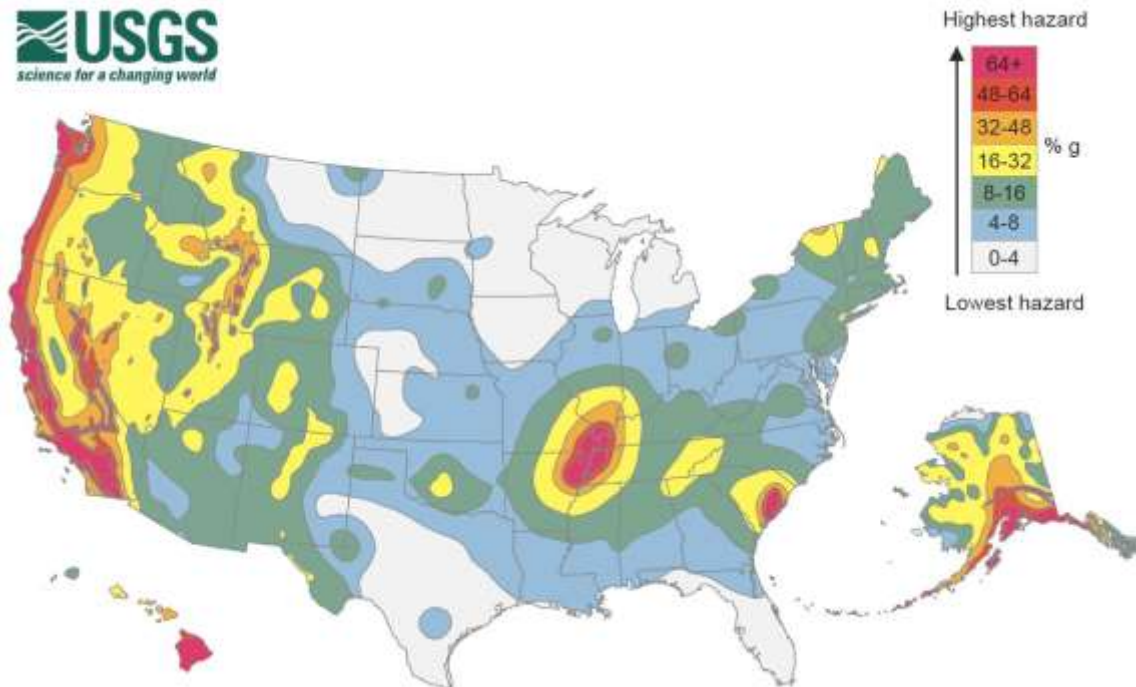
Overview

An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the Earth's tectonic plates. The severity of these effects is dependent on the amount of energy released from the fault or epicenter. The effects of an earthquake can be felt far beyond the site of its occurrence. They usually occur without warning and after just a few seconds can cause massive damage and extensive casualties. Common effects of earthquakes are ground motion and shaking, surface fault ruptures, and ground failure.

Earthquakes are one of nature's most damaging hazards, and are more widespread than is often realized. The area of greatest seismic activity in the United States is along the Pacific Coast in the states of California and Alaska; however, as many as 40 states can be characterized as having moderate earthquake risk.

Although most people do not think of Ohio as an earthquake-prone state, according to the Ohio Department of Natural Resource (ODNR) Geological Survey, the state has recorded at least 200 earthquakes in Ohio since 1976. Most of these events caused no damage or injury. Fifteen earthquakes have resulted in property damage. Several methods of research identified earthquakes as a hazard in Clark County, including the USGS Hazards Earthquake Program.

According to the USGS, Clark County is listed in the 4-8% g hazard range in regards to earthquakes (see map below).



Earthquake activity in Clark County would probably stem from an event in the New Madrid Seismic Zone. Ohio is on the periphery of the New Madrid Seismic Zone. An area in Missouri and adjacent states was the site of the largest earthquake sequence to occur in historical times in the continental United States.

The table to the right is the Modified Mercalli Scale, which is the general relationship between epicentral Modified Mercalli intensities and magnitude. Intensities can be highly variable depending on local geologic conditions. The Mercalli Scale is a semi-quantitative linear scale, whereas the Richter Scale is a quantitative logarithmic scale. The Richter Magnitude Scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. It is illustrated in the table to the right. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded between the various seismographs. Adjustments are located for the variation in the distance between the various seismographs and the epicenter of the earthquake. On the Richter scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude.

Modified Mercalli Scale		Magnitude Scale
I	Detected only by sensitive instruments	1.5
II	Felt by few persons at rest, especially on upper floors; delicately suspended objects may swing	2
III	Felt noticeably indoors, but not always recognized as earthquake; standing autos rock slightly, vibrations like passing truck	2.5
IV	Felt indoors by many, outdoors by few, at night some awoken; dishes, windows, doors disturbed; standing autos rock noticeably	3
V	Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects	3.5
VI	Felt by all, many frightened and run outdoors; falling plaster and chimneys, damage small	4
VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; noticed by drivers of autos	4.5
VIII	Panel walls thrown out of frames; walls, monuments, chimneys fall; sand and mud ejected; drivers of autos disturbed	5
IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken	5.5
X	Most masonry and frame structures destroyed; ground cracked, rails bent, landslides	6
XI	Few structures remain standing; bridges destroyed, fissures in ground, pipes broken, landslides, rails bent	6.5
XII	Damage total; waves seen on ground surface, lines of sight and level distorted, objects thrown up into air	7
		7.5
		8

Severity	Scale	
	Magnitude	Mercalli
Mild	0-2.9	I-III
Moderate	2.9-4.1	IV-V
Intermediate	4.1-5.4	VI-VII
Severe	5.4-7.3	VIII-X
Catastrophic	7.3 +	XI-XIII

Risk Assessment

Many of the buildings in Clark County are three stories or less. However, in the City of Springfield which has a population of greater than 100,000 people, damage and injuries from a major earthquake could be significant. The damage experienced here would most likely be significantly less than a larger, metropolitan area. Residentially most of the houses in Clark County are wood or wood frame and brick veneer. A few of the older houses are of solid brick masonry which would be more susceptible to damage.

Several of the older downtown districts such as found in the City of Springfield, the City New Carlisle, Village of Enon, and the Village of South Charleston have non-reinforced brick structures and would be considerably more vulnerable to damage.

Other vulnerable facilities would be some of the underground gas, water piping, sewage systems, and communication systems. A substantial earthquake may also affect performance of water wells.

Many of the industrial buildings in the County are of pre-engineered steel design with braced steel frames which would be less vulnerable to damage. However, the older masonry industrial structures could receive significant damage from a large earthquake event. All of the school districts in Clark County who have newly constructed schools within the past ten years are designed to current earthquake standards.

Clark County has approximately 31.24 miles of interstate highways, 98.66 miles of state highways and 308 miles of county roadways and 424 miles of township roadways with approximately 235 county bridges. Infrastructure can be very vulnerable to earthquake damage. Fortunately for the Clark County residents, the County Engineers 2017 Annual Report indicates the County replaced or performed major rehabilitations on 75 of the 235 County bridges.

The most risk to the County from an earthquake are the non-reinforced brick and concrete block masonry structures, the hazardous materials facilities, water, sewer, and natural gas pipelines, and public and private property structures. Also, at risk from earthquakes is a dam failure. The largest risk would be from the two Class I dam areas which include the properties below Clarence J. Brown reservoir, and the properties along Buck Creek which include downtown Springfield.

A moderate to severe earthquake in the County would disrupt critical services which are essential to the lifeline of the community. Disruption of county transportation, industry, and business when stopped could have a tremendous economic impact on the County.

The impact would be that possible death and injury could occur from falling equipment, buildings, downed power lines, and impaired natural gas lines. Fire threats and debris costs would also be factors to be considered.

Past Occurrences and Locations

Ohio is on the periphery of the new Madrid Seismic Zone. At least 15 moderate sized earthquakes have caused minor to moderate damage in Ohio. There have been no deaths and only a few minor injuries reported. Clark County has been the epicenter of only one small earthquake since recording began in 1776. It occurred on Oct. 4, 1980 near the southern County line. It had a magnitude of 2.0. However, neighboring Shelby County, to the northwest of Clark County, and some of the other counties surrounding Shelby County have been some of the most active earthquake areas in Ohio. Numerous earthquakes in this area have occurred since 1875. Earthquakes in 1930, 1931 and 1937 caused minor to moderate damage. The March 2 and March 9, 1937 (4.5 Richter magnitude) caused significant damage in the nearby community of Anna in Shelby County. See Earthquake Epicenters in Ohio and Adjacent Areas Map at the end of this section. Other recent earthquake epicenters have been in northern Mercer County in 2004, 2005, and two in Allen County in 2006. Clark County has experienced, since 1950, only a few periodic earthquake tremors that are of a magnitude to be felt. The most recent Ohio earthquakes have been in Northeast Ohio and Southeast Ohio. In Lake County, December 20, 2018 at Fairport Harbor and at Waterford in Washington County on November 24, 2018.

Probability of Future Events

In Ohio and the Eastern United States there is a perception that destructive earthquakes happen elsewhere but not here, even though the 2011 5.8 magnitude earthquake in Central Virginia prove the fact that strong earthquakes can occur in the Eastern United States.

Because at least 200 earthquakes with a magnitude 2.0 or greater with epicenters in Ohio have occurred since 1776, it is anticipated one can expect future earthquake events here. The probability of a future event has been developed based on the USGS past occurrences map located in this section. The measurement used in this estimation is based on the chance of ground shaking over time. From past history, future earthquake events are likely to occur in Ohio. To date the state has not experienced any loss of life due to earthquakes. Damages are commonly limited to older structures that have not been built to earthquake design standards which have been incorporated into the building codes over the past 20 years.

Seismic activity in Ohio is concentrated in, but not confined to three areas of the state – Western, Northeastern and Southeastern Zones. The most active is the Western Ohio Seismic Zone which includes Clark County.

Auglaize County, located in the Ohio Western Zone, and portions of adjacent counties have had 40 felt earthquakes since 1875 and have experienced the most severe damage.

Northeastern Ohio has experienced more than 80 felt earthquakes since 1836. Most have been seismic and caused little or no damage.

Southeastern Ohio has been the epicenter location for at least 25 earthquakes above the magnitude 2.0 since 1776.

There have been 40 felt earthquakes in Western Ohio since 1776. Fifteen out of these 40 events have caused minor to moderate damage. Based on this historical data, it is probable that every 16 years western Ohio may expect a minor to moderate felt earthquake event. Seismologist, Robin K. McGuire has stated that “major earthquakes are a low probability, high consequence event.” Because of the high consequences, geologists, emergency planners and other government officials have taken a great interest in understanding the potential for earthquakes in the Eastern United States, including Ohio and in educating the population as to the risk in their areas.

Vulnerability Analysis & Loss Estimation

Vulnerability Analysis

The geographic size of Clark County is 402.42 square miles and contains 44 census tracts. It is estimated that there are over 55 thousand households and an estimated 57 thousand buildings in Clark County which have an aggregate total replacement value of 15,813 (in millions of dollars). Approximately 92% of the buildings (and 75% of the building value) are associated with residential housing.

The replacement value of the transportation and lifeline systems is estimated to be 1,962 and 1405 (in millions of dollars), respectively. They include 7 transportation systems, 6 utility systems that include potable water, wastewater, natural gas, crude and refined oil, electric power and communications, 229 kilometers of highway, 169 bridges, and 12,569 kilometers of pipes. The full inventory is attached in the HAZUS-MH: Earthquake Event Report for Clark County in Appendix A, Section A-6.

The critical facilities are divided into (2) groups: essential facilities and high potential loss facilities. Essential facilities include hospitals, medical clinics, schools, fire and police stations, emergency operations facilities. Clark County has 2 hospitals with a total bed capacity of 430 beds, 64 schools, 22 fire stations, 8 police stations and 0 emergency operation facilities.

With respect to high potential loss facilities include: dams, levees, military installations, nuclear power plants, and hazardous materials sites.

There are 0 dams identified within the inventory. The inventory also includes a total of 26 hazardous material sites within the City of Springfield. There are 0 military installations and 0 nuclear power plants.

Excess debris is also generated by earthquake events and debris must be removed. Generally, the debris is divided into 2 categories: a) “brick and wood” b) Reinforced concrete/ steel. This is due to different types of materials handling equipment being needed.

Emergency Shelters are needed to house those residents displaced from their homes. Using the HAZUS-HM Earthquake Event Report, it is estimated 1,235 people will be displaced and 831 people out of the total county population of 134,557 will seek temporary shelter.

A full HAZUS-MH: Earthquake Event Report for Clark County is included and can be found in Appendix A, Section A-6.

Earthquake Loss Estimation

Transportation and Utility Lifeline Loss

Estimated to be 3,367 (in millions of dollars), this includes inventories of over 229 kilometers of highway, 169 bridges, and 12,569 kilometers of pipe. There are seven (7) transportation systems that include highways, railways, light rail, bus and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude and refined oil, electric power and communications.

Transportation System Economic Loss

Inventory Value	1,962.50 (in millions of dollars)
Economic Loss	<u>16.80 (in millions of dollars)</u>
	1,979.30 (in millions of dollars)

Utility System Economic Loss

Inventory Value	1,405.76 (in millions of dollars)
Economic Loss	<u>204.62 (in millions of dollars)</u>
	1,610.38 (in millions of dollars)

Building Related Loss Estimates would be as follows

Building inventory of 57 thousand buildings for a total replacement value of 15,813 (in millions of dollars).

Single Family	795.77 (in millions of dollars)
Other Residential	236.82 (in millions of dollars)
Commercial	601.43 (in millions of dollars)
Industrial	177.29 (in millions of dollars)
Others	<u>170.50 (in millions of dollars)</u>
	1,981.81 (in millions of dollars)

Economic Loss

The total economic loss for the earthquake is 2,203.23 (in millions of dollars) which includes building and life line related losses based on the regions inventory.

Critical Facility Damage

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential

loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 2 hospitals in the region with a total bed capacity of 430 beds. There are 64 schools, 22 fire stations, 8 police stations and 0 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 0 dams identified within the inventory. Of these, 0 of the dams are classified as “high hazard”. The inventory also includes 26 hazardous material sites, 0 military installations and 0 nuclear power plants.

Debris Generation

The model estimates that a total of 0.57 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 48.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to any estimated number of truckloads, it will require 22,840 truckloads @ 25 tons/truck) to remove the debris generated by the earthquake.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows:

Severity Level 1: Injuries will require medical attention but hospitalization is not needed.

Severity Level 2: Injuries will require hospitalization but are not considered life-threatening.

Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.

Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 A.M., 2:00 P.M. and 5:00 P.M. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 A.M. estimate considers that the residential occupancy load is maximum; the 2:00 P.M. estimate considers that the educational, commercial and industrial sector loads are maximum; and 5:00 P.M. represents peak commute time.

Full details of the HAZUS-MH: Earthquake Event can be found in the full report found in Appendix A, Section A-6.

2.14 Radiological Accident

Overview

Radiological accidents can occur wherever radiological materials are used, stored, or transported and are caused by several factors. Nuclear power plants, hospitals, universities, research laboratories, industries, major highways, railroad, or shipping yards could be the site of a radiological accident.

The Ohio Emergency Management Agency has a Radiological Branch Department and team that has the capability of responding to a nuclear radiological emergency on a 24-hour basis. This team has the capability to respond to radiological incidents affecting the State of Ohio. The team also has the ability to provide training and hosts annual classes for emergency response groups working in the State Emergency Operators Center and in the field.

Communities located on major transportation routes, such as Clark County (I-70, I-675, US Rt. 40) should develop and prepare an emergency plan for handling transportation accidents involving radiological materials.

Risk Assessment

Radioactive materials are composed of atoms that are unstable. An unstable atom gives off its excess energy until it becomes stable. The energy emitted is radiation.

The process by which an atom changes from an unstable state to a more stable state by emitting radiation is called radioactive decay or radioactivity.

Radioactive materials are dangerous because of the harmful effect of certain types of radiation on the cells of the body. The longer a person is exposed to the radiation, the greater the risk.

People receive some radiation exposure each day from the sun, radioactive elements in the soil and rocks, household appliances like television sets and microwave ovens, and medical and dental x-rays.

Radiation cannot be detected by sight, smell, or any other sense.

There are three ways to minimize risk:

Distance – The more distance between you and the source of the radiation, the less radiation you will receive. In a serious nuclear accident, local officials will likely call for an evacuation, thereby increasing the distance between you and the radiation.

Shielding – Like distance, the more heavy, dense materials between you and the source of the radiation, the better. This is why local officials could advise you to remain indoors if a radiological accident occurs. In some cases, the walls in your home would be sufficient shielding to protect you.

Time – Most radioactivity loses its strength fairly quickly. Limiting the time spent near the source of radiation reduces the amount of radiation you will receive. Following a radiological accident, local authorities will monitor any release of radiation and determine when the threat has passed.

Past Occurrences

Large scale accidents include:

- Fukushima Daichi Nuclear Disaster (2011)
- Chernobyl Disaster (1986)
- Three Mile Island Accident (1979)
- SL-1 Accident (1961)
- Zahns Corner Middle School, Piketon, Ohio (2019)

In Columbus Ohio a radiological accident occurred from 1974-1976 over a 22-month period at Riverside Methodist Hospital when continuing calibration of a Cobalt 60 Teletherapy Unit was based on an erroneous decay curve resulting in overexposure rising from 10% in the first five months to 50% twenty-two months after calibration. The Physicist who did the calibrations falsified records to conceal the error. Of the 426 patients treated in the 16 months before identification of the problem, 300 died within one year of their pre-treatment cancer. Eighty-eight survived but had immediate severe complications related to the irradiated sites. Ten deaths have been attributed to “overexposure”.

Vulnerability Analysis & Loss Estimation

According to 2018 Ohio Department of Transportation information, there are 2,914,218 total vehicle miles traveled daily in Clark County. Many of these miles traveled are long the I-70 East/West corridor. A radiological transportation accident could be possible along this busy thoroughfare but is not highly likely.

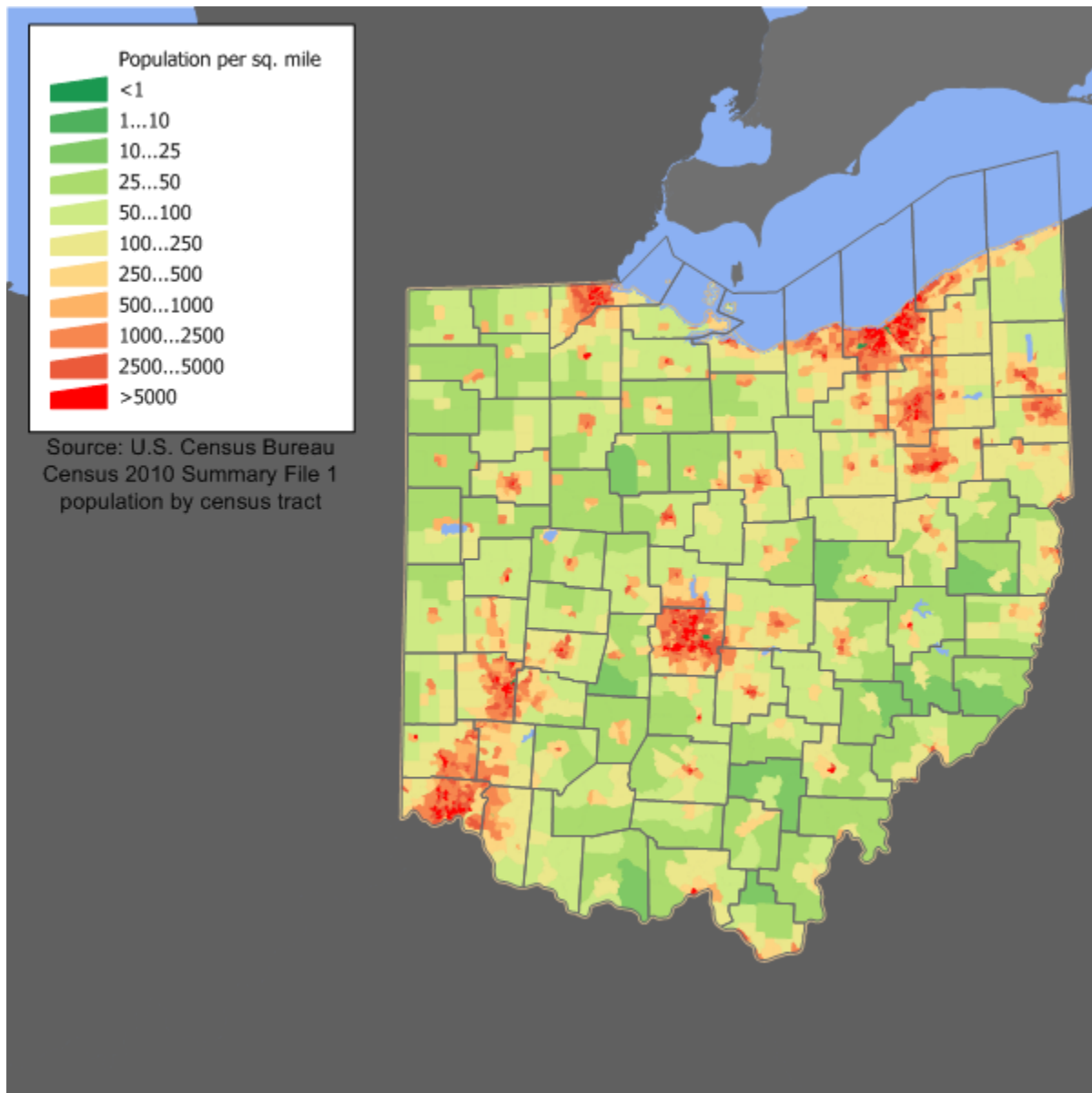
Protection from radioactive materials comes from distance and shielding, such as heavy metal that absorbs radiation. Radioactive materials are harmful and effect the cells of the body. A radiation accident could allow radiation to contaminate the environment. Radiation cannot be detected by sight, smell, or any other sense. Radioactive accidents can occur anywhere that radioactive materials are used, stored, or transported. Operators of facilities and transport and disposal of radioactive waste are closely regulated by a variety of federal and local organizations, so the likelihood of an incident is remote. The nuclear energy industry contributes far less than 1% of the average person’s exposure to radiation.

No loss estimation in dollars has been determined for a radiological accident for Clark County. However, it is the desire of the Clark County Hazard Mitigation Committee for the County to be prepared should such an event occur.

2.15 Development Trends

County Population Projection

According to U.S. Census for 2017, the estimated population of Clark County is 134,557. Clark County is semi-rural in nature and is considered to be part of the Springfield-Dayton metropolitan area. The area of highest population density is the City of Springfield with an estimated 59,208 people.



**Table 2-1
POPULATION
TABLE**

Year	Total Population	Year	Total Population
1800	NA	1920	80,728
1810	NA	1930	90,936
1820	9,533	1940	95,647
1830	13,114	1950	111,661
1840	16,882	1960	131,440
1850	22,178	1970	157,115
1860	25,300	1980	150,236
1870	32,070	1990	147,548
1880	41,498	2000	144,742
1890	52,277	2010	138,333
1900	58,939	2017	134,557
1910	66,435		

A Clark County demographic profile is also available on the ODOD's website and provides more specific information for Clark County and its political jurisdictions.

(<http://www.odod.state.oh.us/osr/profies/pdf/>.)

County Land Use and Future Land Use - Topography

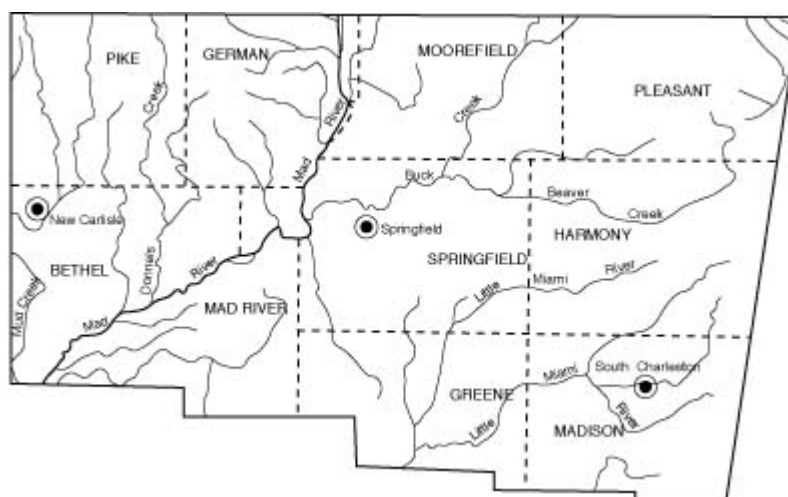
Clark County is composed of rolling till plains with local end moraines. The County contains 30 different soil types, the majority of which are poorly-drained clays and well-drained loams. The County is situated in the ecoregion known as the Eastern Corn Belt Plain. There are three distinct types of Eastern Corn Belt Plain topography located in Clark County. They are the Mad River Interlobate Area, Loamy High Lime Till Plains and Darby Plains. The majority of the County is comprised of Mad River Interlobate Area. This ecoregion is flanked by end moraines that once received concentrated outwash deposits that filled pre-glacial valleys. Abundant groundwater feeds its distinctive cold-water streams that contain an abundance of riffle-inhabiting fish species. Originally, beech forest, mixed oak forest and extensive fresh water fens/wet prairies were common in this region. Today, extensive corn, soybean, dairy and livestock farms as well as urban activity flourish. Woodland still grows on steep sites and along riparian corridors and fresh water fens/wet prairies can also be found locally.

The western and southern portions of Clark County contain the ecoregion known as Loamy High Lime Till Plains. This ecoregion contains soils that developed from loamy, limy, glacial deposits of Wisconsinian age. These soils typically have better natural drainage than those of surrounding ecoregions. Beech forests, oak-sugar maple forests and elm-ash swamp forests once grew on the nearly level terrain. Today, corn, soybean and livestock production is widespread.

Darby Plains is the last ecoregion occupying Clark County and is located in the eastern portion of the County. This ecoregion once had a distinct assemblage of mixed oak forest, with many prairies occurring on its end moraines, gravel-filled pre-glacial valleys and seasonally wet areas. Today, tree density has diminished and very large and productive crop and livestock farms flourish on its level to undulating terrain.

Three different watersheds influence drainage in Clark County: the Mad River, Great Miami River and Little Miami River. Local waterways include the Mad River that enters Clark County from just west of the middle of the County's northern boundary, and flows southerly leaving the County at the southwestern corner. Principal tributaries are Logonda/Buck Creek, Donnels Creek and Honey Creek. Beaver Creek is a large branch of Buck Creek. The Little Miami River rises in the southeast part of the county and leaves through the middle of the southern border. North Fork and Lisbon Fork are principal branches of the Little Miami River.

The Mad River basin accounts for about 80% of the drainage area in Clark County and has an area of approximately 656 square miles. The County's supply of surface water includes about 3,791 water acres in open water and approximately 220 linear miles of streams. The following map details the generalized surface water locations in Clark County and was adapted from the Ohio Department of Natural Resources (ODNR) Division of Water river basin maps (http://ohioline.osu.edu/aex-fact/0480_12.html).



County Land Use

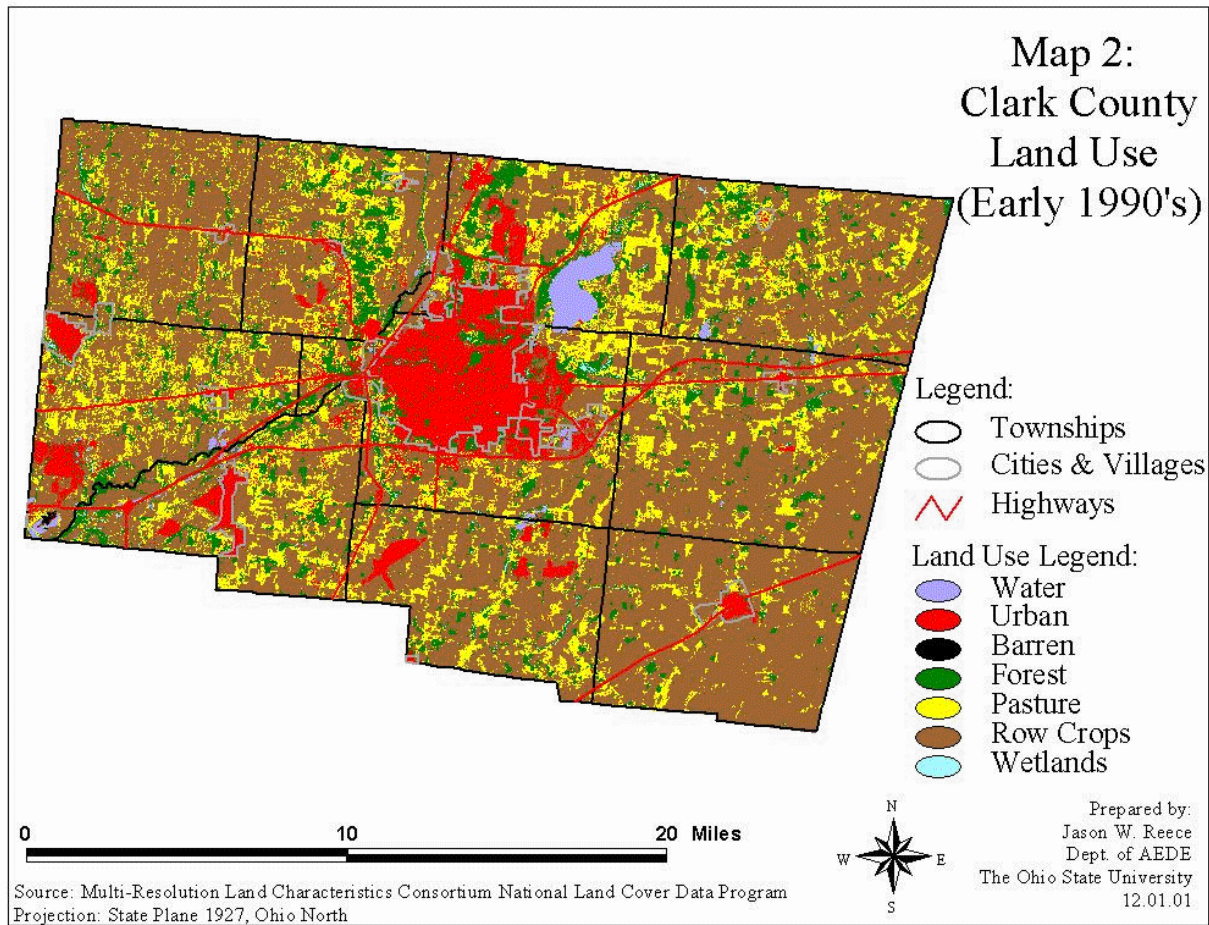
Clark County consists of 257,920 acres. The chart below depicts the breakdown by type of land use/cover.

Table 2-3
Existing Land Use Clark County: 2017

Community	Acres	Percent (%)
Urban (Residential/Commercial/Industrial/Transportation/ Urban Grasses)	46,167	17.90
Cropland	155,268	60.20
Pasture	27,081	10.50
Forest	19,911	7.72
Open Water	3,791	1.47
Wetlands	696	.27
Shrub/Scrub and Grassland	4,874	1.89
Barren (Strip Mines, Gravel Pits, etc.)	129	0.05

Source: Ohio Department of Development Ohio County Profiles – Office of Research

The following map illustrates Clark County's land use from the early 1990's.



Future Land Use and Opportunities for Success

Clark County in 2018 adopted a new Comprehensive Plan titled “Connect Clark County Contribute-Collaborate-Create”. The plan is not intended to guide development parcel-by-parcel but rather communicates the overarching-built form characteristics for character areas that support the goals, objectives and actions in the plan that relate to the physical environment.

Challenges the County must overcome include:

- Population loss
- Medium household income in decline
- Funding challenges
- Underutilized land and weak aesthetics in certain locations
- Poor housing stock
- Limited connectivity
- Lack of cooperation between entities

Assets to build future growth and prosperity include:

- Strategic location
- Agricultural heritage
- Historic villages and neighborhoods
- Natural and recreational assets
- Growing educational attainment
- Diverse economic base
- Affordable housing
- Network of innovators
- Focused community

There are 78 actions and 23 objectives that make up the new Comprehensive Plan. Some of the objectives are to utilize vacant lots, maintain industrial base and preserve agricultural land and open space for recreation purposes, corridor enhancement, downtown strengthening, economic growth and community stabilization are all opportunities for community investment and future success.

Electric, Telephone and Gas

The electric power for Clark County is provided by four utility companies. Ohio Edison is the principal subsidiary of DPL Incorporated, an AES Company. Ohio Edison is a subsidiary of First Energy Corporation. The third company providing service to Clark County is South Vienna Municipal Electric. The Pioneer Electric Cooperative services the Northwest corner of Clark County.

The primary phone company that services Clark County is AT&T of Ohio.

The natural gas transmission system for Clark County is provided by Columbia Gas of Ohio.

Water and Wastewater

Clark County has 84 public water systems. These systems serve communities ranging from small mobile home courts to the City of Springfield.

Groundwater is the only source used by public water systems in Clark County and approximately 23% of all households have a private well.

The Clark County Utilities Department was established by the Board of Clark County Commissioners in 1958 and provides water and sanitary sewer services to areas of Clark and surrounding Counties.

To serve customers, the Clark County Utilities Department operates a public water well field in Park Layne and runs Southwest Regional Wastewater Treatment Plant in Medway. The Department also purchases water and sewer treatment services from the City of Springfield and water services from the Village of Enon and North Hampton.

The Department has a service center, located in Medway, to operate the water distribution and sewer collection systems.

Nearly all of the municipalities have central sanitary sewer service in Clark County. Catawba, New Carlisle, South Charleston, South Vienna and Springfield all operate their own wastewater treatment plants. The County manages a portion of the Village of Enon's wastewater treatment plant. North Hampton is serviced by the wastewater treatment plant located in New Carlisle. The Villages of Harmony and Tremont City do not have wastewater treatment plants and rely on private on-site septic systems.

According to the Clark County Combined Health District, for 2018 there were 71 private sewage systems final permits issued. In addition, there were 70 new well permits and 16 well alteration permits filed with the Clark County Combined Health District.

2.16 Multi-Jurisdiction Risk Assessment

In evaluating the countywide risk assessment to determine where jurisdiction risks may vary from the entire planning area, the following hazards distinctions were noted:

- Flooding
- Landfill Sites
- Water Aquifers
- Flooding
- Tornadoes and Windstorms
- Public Utilities
- Transportation Corridors
- Airport Traffic

Landfill Sites

Prior to 1995, the Clark County residents waste was disposed at the Tremont City Landfill Site. However, in 1995 the landfill was closed because of on-site contamination of groundwater.

The Tremont City Landfill Site is located at 3108 Snyder-Domer Road, Tremont City, Clark County, Ohio. The site lies approximately 300 feet north of Chapman Creek. The entire site is approximately 80 acres and is divided into three areas: the former waste transfer facility comprised of 14 acres, the closed sanitary landfill comprised of 58 acres and the closed industrial waste disposal/chemical waste landfill comprised of 8.5 acres. The former waste transfer facility was permitted in 1977 as a hazardous waste treatment facility and subsequently underwent clean closure pursuant to Ohio EPA's hazardous waste rule requirements in 1985 when operations ceased. The sanitary landfill was permitted as a solid waste disposal facility in 1969. The sanitary landfill was closed under Ohio EPA's solid waste rules in 1995 and is currently engaged in post-closure monitoring and undertaking corrective actions pursuant to those rules. This process is being overseen by Ohio EPA's Division of Solid and Infectious Waste Management and the Clark County Combined Health District. The industrial waste area, also known as the barrel fill area, closed under a Resource Conservation Recovery Act (RCRA) issued in 1979. The industrial waste area is discussed in further detail in the following paragraphs.

The U.S. EPA and Ohio EPA's Division of Emergency and Remedial Response launched an investigation of the closed Tremont City Landfill Site in 1999 in response to a citizen's petition filed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or the "Superfund" Law) by a local environmental advocacy group called the Citizens for Water. The agencies conducted a three phase investigation including gathering baseline data, collecting groundwater, surface water, landfill leachate and gas, soil and sediment samples, testing residential wells, conducting a geophysical survey and evaluating the landfill cap design and integrity. The agencies concluded that contamination existed at the site which migrated from the disposal areas and affected environmental media including groundwater, soils and sediments.

The agencies are currently focusing their attention on the barrel fill area. The barrel fill area was operated from 1976 to 1979 as a drum and barrel disposal area. Historical records indicate that 51,500 drums of industrial wastes were disposed in this area.

These drums and other bulk liquids and sludge, estimated at 304,000 gallons, were placed in a series of cells or trenches that were excavated to a depth of 15 to 25 feet within the glacial till. These disposal cells were then covered with soil. Potentially hazardous waste streams include paint sludges, glues, resins, asbestos and ink sludges.

As of October 2011, the U.S. EPA approved the Record of Decision that outlined EPA's plan for cleaning up waste and contaminated soil at the Tremont City Barrel Fill Site. EPA's final cleanup plan is to:

- Dig up all contaminated soil and waste from 50 waste cells in the barrel fill site.
- Consolidate hazardous and non-hazardous solid waste and soil in a specially built waste cell on the property.
- Move liquid waste to an off-site facility for treatment and disposal.
- Construct a cap over the new waste cell.
- Slope the bottom of the waste cell to collect and remove liquids.
- Build a special underground barrier called a slurry wall around the waste cell along with a liquid collection system.
- Monitor ground water.

The estimated cost of the cleanup is \$28 million. The cleanup will protect people and the environment over the long-term, comply with state and federal regulations, can be implemented, and is cost-effective as an alternative for excavating the contaminated soil and waste.

Water Aquifers

An aquifer is any rock or sediment with spaces that hold water, and through which significant quantities of water move. The water contained in these underground spaces is called groundwater. Although groundwater can flow freely through large underground spaces, more often it seeps slowly through the intricate small pores of rock or sediment. Examples of aquifers include: sand and gravel layers (i.e., buried river systems and flood plains); fracture systems in brittle rocks (i.e., granite or quartzite); and fracture systems or solution cavities in easily dissolved rocks, such as limestone. Aquifers have connected pores or open fractures through which fluid may flow.

The quantity of groundwater that is available to Ohio residents varies in different areas of the State. Some areas of the State have aquifers that can produce over 500 gallons per minute and are the source of water for many of Ohio's cities and villages. In many portions of the State development is focused around such aquifers. Other aquifers may only be able to produce 1 or 2 gallons per minute and can only provide water to small businesses and individual residences. Southern Ohio has very few aquifers that can support cities and villages, so any contamination that enters those aquifers could threaten the economy of the whole region.

In Ohio, 97% of all cities, villages, schools, businesses and industry rely on groundwater as their source of drinking water, process water and irrigation water. More than 3,282,000 people are provided groundwater by community public water systems, and more than 700,000 people have their own wells to meet all their water needs.

In Clark County, the potential for groundwater pollution is high. *According to the Groundwater Pollution Potential of Clark County, Ohio Report No. 38*, published by the Ohio Department of Natural Resources, Division of Water, Ground Water Resources Section, the problem areas include areas along the Mad River stretching the entire length of the County, portions of Beaver Creek in Springfield and Harmony Townships, Buck Creek in portions of Springfield Township, Moorefield and Pleasant Townships and Sinking Creek in portions of Harmony and Pleasant Townships.

The need for protection and management of ground water resources in Ohio has been clearly recognized. About 42% of Ohio citizens rely on ground water for drinking and household use from both municipal and private wells. Industry and agriculture also utilize significant quantities of ground water for processing and irrigation. In Ohio, approximately 700,000 rural households depend on private wells; over 6,500 of these wells exist in Clark County.

The characteristics of the many aquifer systems in the state make ground water highly vulnerable to contamination. Measures to protect ground water from contamination usually cost less and create less impact on ground water users than clean-up of a polluted aquifer. Based on these concerns for protection of the resource, staff of the Division of Water conducted a review of various mapping strategies useful for identifying vulnerable aquifer areas. They placed particular emphasis on reviewing mapping systems that would assist in state and local protection and management programs. Based on these factors and the quantity and quality of available data on ground water resources, the DRASTIC mapping process (Aller et al., 1987) was selected for application in the program.

Considerable interest in the mapping program followed successful production of a demonstration county map and led to the inclusion of the program as a recommended initiative in the Ohio Ground Water Protection and Management Strategy (Ohio EPA, 1986). Based on this recommendation, the Ohio General Assembly funded the mapping program. A dedicated mapping unit has been established in the Division of Water, Water Resources Section to implement the ground water pollution potential mapping program on a county-wide basis in Ohio.

The purpose of the ODNR report and map is to aid in the protection of our ground water resources. This protection can be enhanced by understanding and implementing the results of this study and by evaluating an area's potential for ground water pollution. The mapping program identifies areas that are more or less vulnerable to contamination and displays this information graphically on maps. The map and report can be combined with other information to assist in prioritizing local resources and in making land use decisions.

Under Ohio Revised Code, local jurisdictions having established wellhead protection areas may regulate development outside of their corporation limits to ensure groundwater protection. The following describes each wellhead protection area and the potential for contamination as determined by the Ohio Department of Natural Resources, Division of

Water.

1. **Springfield** – The Springfield Wellhead Protection Area is situated in the vicinity of the US 68 and SR 72 interchange and has a medium high to high pollution potential.
2. **New Carlisle** – The New Carlisle Wellhead Protection Area is situated in the north and northeast quadrants of the city following SR 235 to the north and has a medium pollution potential.
3. **Fairborn** – The Fairborn Wellhead Protection Area is situated south of SR 4 along Osborn Road and has a high pollution potential.
4. **Dayton** - The Dayton Wellhead Protection Area is situated northeast of the I-70 and I-675 interchange and has a high pollution potential.
5. **Enon** – The Enon Wellhead Protection Area is situated around the I-70 and Enon Road interchange and has a high pollution potential.

Flooding

Only certain cities and villages are considered to have a portion of their residents located within a 100-year flood plain. These cities are more susceptible than other areas of the County and include the portion of the cities of Springfield and New Carlisle and the villages of Enon, North Hampton and Tremont City.

Tornadoes and Windstorms

Several mobile home parks and campgrounds are located throughout Clark County. Past history has shown that mobile homes and camping trailers can be more vulnerable to windstorms and can sustain greater damages than traditional housing stock.

Public Utilities

The entire County does not have centralized city sanitary sewer and water provided. Therefore, the more populated areas of Clark County are more vulnerable should there be a water or sanitary system failure.

Transportation Corridors

The heavily traveled I-70 corridor and the areas of the County with operating rail systems tend to be more vulnerable from transportation accidents, hazardous chemical spills and threat to loss of life. This is due to the greater volume of traffic than the other roadways throughout the County.

Airport Traffic

Wright Patterson Air Force Base in Bethel and Mad River Townships and the Springfield Airport in Springfield and Green Townships have special zoning restrictions due to the airport traffic in these locations. The risks from air traffic may be greater within these airport zoning designated areas.