EXECUTIVE SUMMARY

The Morrow County Emergency Management Agency/Office of Homeland Security spearheaded this effort to complete and update a comprehensive countywide Mitigation Plan. Their dedication to this mitigation planning effort is seen in the results of having full participation from the County as well as the incorporated jurisdictions.

Morrow County is subject to natural hazards that threaten life and health and have caused extensive property damage. To better understand these natural hazards and their impacts on people and property and to identify ways to reduce those impacts, the County's Emergency Management Agency (EMA) undertook this countywide Mitigation Plan.

Most mitigation activities need funding. Under the Disaster Mitigation Act of 2000 (DMA2K, 42 USC 5165), a mitigation plan is a requirement for Federal mitigation funds. Therefore, a mitigation plan will both guide the best use of mitigation funding and meet the prerequisite for obtaining such funds from the Department of Homeland Security's Federal Emergency Management Agency (FEMA). This Mitigation Plan meets the criteria as set forth by FEMA in the DMA2K and provides a community with a "comprehensive guide" for future mitigation efforts as they relate to the hazards that affect their community.

The initial Mitigation Plan was developed under the guidance of a Core Group of individuals from communities and agencies throughout Morrow County. The Core Group met four separate times during the planning process to discuss the hazards that affect the county, the problems associated with these hazards, potential mitigation alternatives to minimize the effect of these hazards and goals that they would like to see achieved within the county.

The update of the Mitigation Plan was developed under the guidance of a Mitigation Planning Committee formally comprised of the County Emergency Management Agency Director, a Mitigation Planning Consultant, and county planners and leaders. Throughout the process of updating the County Plan, these individuals were in direct contact with other County officials, community representatives, and State and local entities to gain their feedback on issues relating to the update.

Morrow County has experienced many natural disasters in the past one hundred years. The Core Group, as well as the Mitigation Planning Committee, evaluated these hazards and chose to address the following hazards based on their impact on human health and property damage: Wind Events (Strong and High Winds), Tornadoes, Severe Winter Storms (Blizzards, Heavy Snow, Cold/wind chill, Extreme Cold and Ice), Severe Summer Storms (Thunderstorms, Lightning, and Hail), Flooding, Dam Failure, Excessive Heat, and Drought.

With the hazards identified, a vulnerability assessment was completed for Morrow County. This assessment reviews how vulnerable the County is to property damage, threats to public health and safety, and adverse impact on the local economy. It also evaluates the location and likely damage to critical facilities and other structures from different scenarios of strikes by the eight (8) hazards.

The culmination of Morrow County's initial Mitigation Plan was an Action Plan for the communities to use to track progress on the implementation of their mitigation alternatives. The updated Plan incorporates any needed modifications, deletions and additions to the Action Plan.

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LIST OF ACRONYMS

BFE	Base Flood Elevation
BMPs	Best Management Practices
CAUV	Current Agricultural Use Value
CREP	Conservation Reserve Enhancement Program
DMA2K	Disaster Mitigation Act of 2000
EAS	Emergency Alert System
EMA	Emergency Management Agency
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EQIP	Environmental Quality Incentives Program
FACT	Friends of Alum Creek and Tributaries
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FMA	Flood Mitigation Assistance
GIMS	Geographical Information Management Systems
gpd	gallons per day
GPS	Global Positioning System
HMGP	Hazard Mitigation Grant Program
HUD	Housing and Urban Development
mi^2	square miles
Mitigation Plan	All Natural Hazards Mitigation Plan
mgd	millions of gallons per day
mph	miles per hour
MSL	mean sea level
NCEI	National Center for Environmental Information (formerly NCDC)
NCDC	National Climatic Data Center
NEC	National Electric Code
NFIP	National Floodplain Insurance Program
NOAA	National Oceanic Atmospheric Administration
NWS	National Weather Service
OBOA	Ohio Building Officials Administration
OBC	Ohio Building Code
ODOT	Ohio Department of Transportation
ODNR	Ohio Department of Natural Resources
OEMA	Ohio Emergency Management Agency
PDA	Preliminary Damage Assessment
PDM	Pre-Disaster Mitigation
PUCO	Public Utilities Commission of Ohio
SWCD	Soil and Water Conservation District
TRC	Technical Review Committee
USGS	United States Geographical Survey
WMSC	Water Management and Sediment Control

1.0

Introduction

1.0 INTRODUCTION

A mitigation plan addresses natural disasters that could affect a local community, whether it is flooding, tornadoes, high winds, winter storms, landslides 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 developing a mitigation plan, a community can identify their areas of risk, assess the magnitude of the risk and develop strategies and priorities to identify projects for reducing risk. Regular updating of this Plan is paramount in maintaining a current view of County conditions and issues relating to natural disasters and how these specific conditions and issues may change over time.

The Morrow County Commissioners supported developing both their initial All Natural Hazards Mitigation Plan (Mitigation Plan), as well as the Plan updates, with funds received from Ohio Emergency Management Agency (OEMA) and the Federal Emergency Management Agency (FEMA).

This planning effort was specifically designed to update the Morrow Co Pre-Disaster Mitigation (PDM) plan for the five (5) year period of 2018 to 2022.

As part of the Disaster Mitigation Act of 2000 (DMA2K, 42 USC 5165), communities that desire to remain eligible for Federal and State mitigation funds must have an approved mitigation plan in place.

According to the DMA2K, 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, if a township would like to take an active part by submitting a hazard mitigation project, then 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. Examples of eligible activities that could be supported by mitigation dollars include: relocation, acquisitions, elevation, dry-flood proofing, wet-flood proofing, lightning prediction systems, interoperable siren systems, stream restorations or any other activity potentially funded with mitigation dollars.

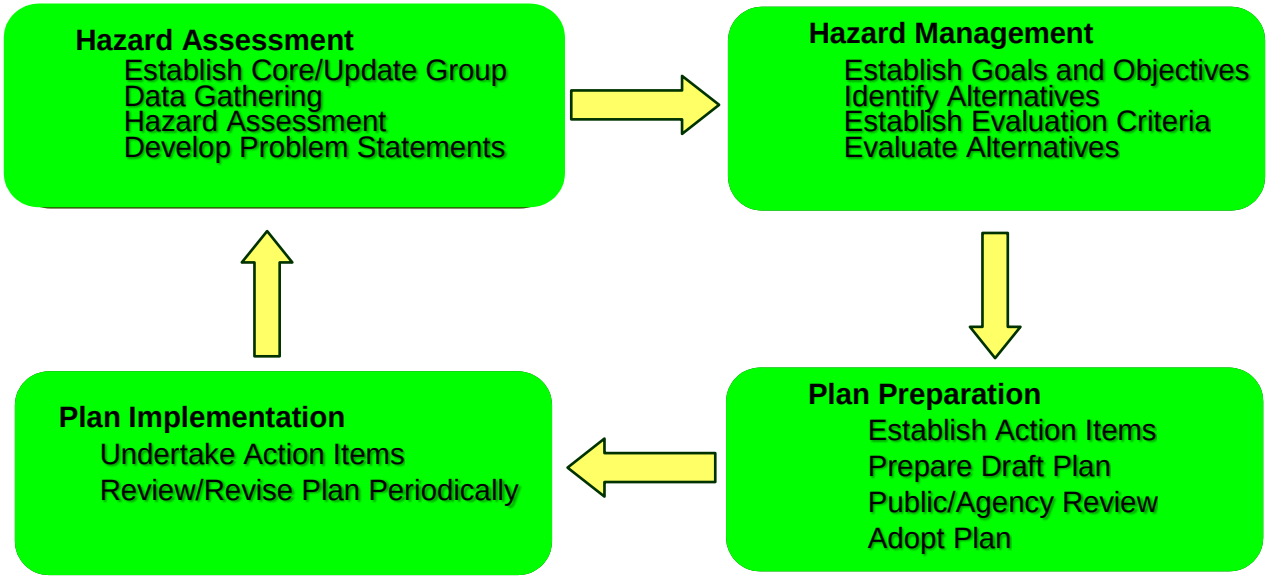
To proceed with the revision of a locally initiated Natural Hazard Mitigation Plan, the County selected as a planning model the **Ohio Natural Hazard Mitigation Planning Guidebook**, which was developed cooperatively by the Ohio Emergency Management Agency (OEMA) and the Ohio Department of Natural Resources (ODNR). The planning model for this effort incorporates the following components:

1. Introduction
2. County Profile

3. Mitigation Plan Process
4. Hazard Profile
5. Vulnerability Assessment
6. Goals and Actions
7. Mitigation Plan Maintenance and Schedule
8. Resolution to Adapt

Below is the typical Natural Hazard Mitigation Planning Process that was followed:

NATURAL HAZARD MITIGATION PLANNING PROCESS



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

- Participate in the scheduled mitigation planning meetings representing your community's interests
- Supply any historic information (background) on natural disasters for your community to the planning groups
- Review and comment on the most recent 2010 Plan Update
- Review and select mitigation activities developed by the planning groups for your community to implement
- Be an advocate for Final Adoption of the Mitigation Plan by your community

1.1 Planning Approach

In an effort to continue to meet the mission of protecting lives, property, economic viability and quality of life for the people of Morrow County, the County Commissioners desired to create the Morrow County Mitigation Plan for their community and its residents. Morrow County authorized the engineering firm EMH&T, Inc. to help them fulfill this task in the development of the initial Plan. With regard to this five-year Plan update, the County Commissioners contracted with a mitigation planning consultant, RFG Associates Inc., to assist in developing the 2018-2022 Mitigation Plan Update.

The approach undertaken in the creation of the Mitigation Plan for Morrow County can be described as both comprehensive and collaborative. The comprehensive approach includes following the interim final rule guidelines enacted under the DMA2K and FEMA suggested guidelines for the creation of a mitigation plan. Any additional items that Morrow County and the Core and Update Groups chose to address as part of the comprehensive analysis of their community were addressed as well.

The collaborative portion of creating the plan included working with the different agencies within Morrow County and coordinating with all participating jurisdictions. The County could not have a comprehensive plan without the coordination of several other agencies. Information was collected from agencies such as the Morrow County Emergency Management Agency (EMA), Morrow County Floodplain Administration, the Morrow County Planning Office and any other agencies that were involved in planning efforts for the County.

1.2 Participating Communities

Morrow County has seven incorporated areas within its borders: Cardington, Chesterville, Edison, Fulton, Marengo, Mount Gilead, and Sparta. These incorporated communities are considered as continuing partners in the Plan update process.

The Morrow County EMA, in coordination with their consultant, developed a comprehensive survey for villages unable to attend the first two meetings, to complete and return with mitigation planning information specific to their community if unable to attend the remaining meetings. Each of the incorporated jurisdictions was also contacted for involvement in the selection of mitigation alternatives. See Appendix A for a copy of the list of Committee Members and sign in sheets for each of the four (4) Planning meetings. Appendix A also includes the communications and survey that was sent, to each of the villages in case a representative was unable to attend the Core Group meetings. Informal discussions and various communications efforts were used as a part of the Plan Update to gain the participation of these incorporated areas.

The process to create the 2018 Mitigation Plan update started with the creation of a “Mitigation Planning Group” of decision makers and implementers. In order to lead the planning efforts effectively and on a countywide basis, other representatives were added. The Planning Group included individuals from the following departments and agencies:

Last name	First name	Title	Representing
Davis	Warren	Commissioner	Morrow County
Porter	Mike	Mayor	Mt. Gilead
Peyton	Susan	Mayor	Cardington
Coey	Jason	Mayor	Chesterville
Ackerman	Sandra	Mayor	Edison
Hickman	Terri	Mayor	Fulton
Baker	Micheal	Mayor	Marengo
Jarvis	Kottia	Mayor	Sparta
Dennison	Bart	Engineer	Morrow County
Farnsworth	Shane	Regional Planning	Morrow County
Gentile	Dave	Flood Plane Coordinator	Morrow County
Sparks	Jeff	Chief	Morrow County EMS
Young	Greg	Chief	Mt. Gilead Fire Dept
Barker	Dan	Administrator	Morrow County Soil & Water
Maceyko	Tim	Mobility Manager	MCTC
Vantrees	Ashira	Emergency Planner	MCHD

2.0

Community Information

2.0 COMMUNITY INFORMATION

As required by DMA2K, a community profile must be developed for Morrow County and any jurisdictions participating in this effort. Because of the multiple jurisdictions involved in this plan, this section presents a demographical as well as historical description, if available, of each jurisdiction that will be adopting this plan. This brief profile of each jurisdiction gives some insight as to what types of communities exist in the County and provides a better understanding of the effect natural hazards, to be discussed in later sections, may have on this population. In numerous cases, the communities themselves provided the information that follows.

2.1 County Profile

Morrow County is located in central Ohio, approximately 35 miles north of Columbus. It is bounded by Crawford and Richland counties to the north, Richland and Knox counties to the east, Knox and Delaware counties to the south and Delaware and Marion counties to the west. The County encompasses approximately 405.5 square miles of land. There are 16 townships in Morrow County.

The County is primarily rural in setting with the line dividing the foothills of the Allegheny Mountains and the prairie lands of the Midwest crossing through it. Morrow County has two major interchanges along Interstate 71 with access to U.S. Route 42 and U.S. Route 23. The county seat is located in the Village of Mount Gilead, which is the largest village in the County. The incorporated areas of Morrow County include, in order of descending population, Mount Gilead, Cardington, Chesterville, Edison, Fulton, Marengo, and Sparta.

Manufacturing, Healthcare and Social Assistance, and Retail Trade the leading industries in Morrow County. In 2014, the manufacturing sector was the largest employer in the County and also the largest source of payroll. According to the Census of Agriculture, in 2012 agricultural crop receipts were $93,344,000 and livestock receipts were $38,371,000 from 824 farms with a total of 167,736 acres of land. Hogs accounted for the largest livestock income and soybeans were the largest cash crop.

2.2 County History

The early settlers to Morrow County arrived shortly after the surveyors. They settled in the south and east sections of the County. The first settler is suggested as having arrived in 1806 from Knox County. The late formation of Morrow County attracted much attention from professional and business circles. This attention caused an increase in immigration. These new strangers made the small town of Mount Gilead adopt a new role of considerable importance.

The largest manufacturer of the time was a woolen mill previously built in 1806 by a group of shareholders. This mill later caught fire and was completely destroyed. A grist mill in the south of town was constructed in 1846 by Cooper and Son. The first tavern was built and kept by John Merrill. The first bank for Morrow County was opened in 1854. The two earliest papers were the *Union Register* and the *Sentinel.* The *Union Register* was Democratic in nature whereas the *Sentinel* catered to the Republicans.

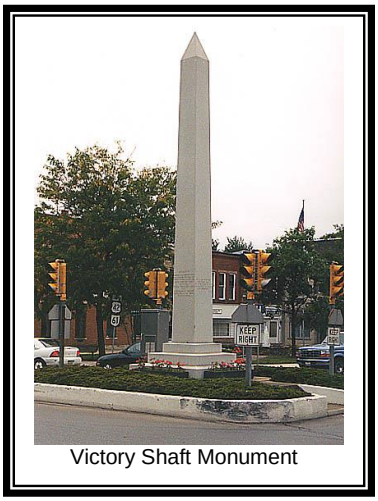
The Methodists were recorded as the first church society. Their society's existence was traced to dates earlier than the organization of the County. The first doctor was Dr. David Bliss who settled prior to 1820. Early schools were conducted in the poorest of conditions, in an overly small or dilapidated cabin. There were no official schoolhouses, teachers, or proper books. The first completed railroad through Morrow County was the Cleveland and Columbus Railroad. Johnny "Appleseed" Chapman is credited with the early beginnings of orchards in the County.

The Morrow County Historical Society was officially organized November 10, 1970. The objectives of the organization are "to preserve the records and artifacts of Morrow County and to cultivate an appreciation of and interest in its history. Membership in the Society is open to all persons interested in the interpretation and preservation of Morrow County History." Since 1972 the Society has maintained a museum in the old Pleasant Grove Church of Christ building on County Road 46, off State Route 19.

2.3 Jurisdictions

Mount Gilead

As of the Census of 2010, there are 3,660 people, 1,482 households, and 875 families residing in the Village of Mount Gilead. The population density is 1,079.6 people/mi². There are 1,658 housing units at an average density of 489.1 housing units/mi². In the Village, the population is spread out with 24.5% under the age of 18, 9.7% from 18 to 24, 25.5% from 25 to 44, 22.9% from 45 to 64, and 17.3% who are 65 years of age or older. The median age is 36.9 years. The median income for a household in the village is $38,023.


Victory Shaft Monument

Settlement began in the Village of Mount Gilead in 1817 when it was listed under the name of Whetstone, although it was generally called Youngstown. Jacob Young laid out the town of Mount Gilead on September 30, 1824. It was then known as Whetstone because of its proximity to Whetstone Creek. The State Legislature changed the name to Mount Gilead in 1832. It became an official village by an Act of Legislature on February 16, 1839 and the county seat of Morrow County in 1848, when the County was established. Its location is at the heart of a rich farming community found in central Ohio.

The platting of the Village of Mount Gilead was diversified since two public squares, which still exist today, were included. One square was known as the "south square" and was lesser known than the "north square," which contains a victory shaft monument in the middle of the square. This monument was erected in 1919 as a gift from the Federal Government to Morrow County citizens after World War I for purchasing more War Bonds per capita than any other county in the United States. (www.HeritagePursuit.com, Morrow County)

Cardington

As of the Census of 2010, there are 2,047 people, 792 households, and 527 families residing in the village. The population density is 1,018.4 people/mi². There are 911 housing units at an average density of 543.2 housing units/mi². In the Village, the population is spread out with 30.6% under the age of 18, 8.5% from 18 to 24, 27.8% from 25 to 44, 23.0% from 45 to 64, and 10% who are 65 years of age or older. The median age is 33.5 years. The median income for a household in the village is $30,500.

Forty years ago, it ranked in population below the Village of Woodbury, and was called a town only as a matter of courtesy. A straggling collection of dwellings at the east end of town, that in 1836, when the Village was incorporated, counted only six dwellings, with the saw and grist mills, and the Carding-Mill and two cabins at the west end, marked the site of Cardington. One street wound along the riverbank from the fjord at the site of Bunker's Mill to the Carding-Mill, and then on to the Delaware Road. Where Main crosses Marion Street, a "cat-tail swamp" barred the way, and a single tavern and store represented the hospitality and commercial enterprise of the place. Little remains now to show the changes that have been made since that day. Around the Village, some old structure is claimed as one of the landmarks of that time beneath its modern disguise. The old watermill, built in 1840 by Shunk & Wolfe, exists as the same old building, but containing such improvements in machinery that would likely confound the early proprietors.

Cardington is the one village through which the Cleveland, Columbus, Cincinnati, & Indianapolis Railway passes. It is situated in the southeast corner of the township of the same name, 98 miles southwest of Cleveland and 38 miles north of Columbus. A line drawn from Cincinnati, in the southwest corner of the State of Ohio, to Cleveland, in the northeast corner of the state, passes through the Village. Another line, drawn from the northwest corner of the State to Marietta in the southeast, will cross the first line in Cardington. Therefore, like the City of Duluth, "it is supposed to be so exactly in the center of the visible universe that the sky comes down at the same distance all around it." (www.HeritagePursuit.com, Morrow County)

Chesterville

As of the Census (US Factfinder 2016 data), there are 230 people in 79 households, residing in the village. The population density is 1,114.6 people/mi². There are 83 housing units at an average density of 643.7 housing units/mi². In the Village, the population is spread out with 36% under the age of 18, 8% from 18 to 24, 24% from 25 to 44, 25% from 45 to 64, and 25% who are 65 years of age or older. The median age is 39.5 years. The median income for a household in the village is $40,938.

Enos Miles, Sr., a schoolteacher and surveyor by profession came to Chester in the spring of 1815, and settled on what is known as the Smith Farm, just south of Chester Church. Two years later, he came to where Chesterville now stands, and bought the property owned by James Holt. He built his cabin in back of the “L”, formed by the wing of the hotel, carrying all the water he used from a spring near the William Denman place, until 1833. In 1833, a well was dug in the center of the square, from which the whole Village supplied their wants.

The Village was laid out in 1829 by a surveyor named Mr. Miles and J. C. Hickman doing the surveying. It was named Chesterville from the name of the township, but the local name of Miles Cross Roads.

A post office was established in 1837, with Enos Miles, Sr., as Postmaster. For some time the post office was located in the barroom of the hotel. However, there was considerable objection to that location. It was afterward moved to another room of the hotel, and later to one of the stores. The mail was carried from Marion to Mount Vernon, twice a week, on horseback, with the carrier generally stopping at Chesterville overnight. The desk shown was the original desk used by Enos Miles Sr., while he served as Postmaster.

Photo courtesy of the Ohio Memory Scrapbook

The Village was inaugurated in 1860. A petition signed by 51 names, asking the privilege of incorporation so the Village might be provided suitably with sidewalks, and more efficient means might be taken to secure property against fire, was presented to the county commissioners on August 22, 1859. This petition was granted in January 1860. (www.HeritagePursuit.com, Morrow County)

Edison

As of the Census of 2010, there are 446 people, 166 households, and 121 families residing in the village. The population density is 1,506.9people/mi². There are 192 housing units at an average density of 662.1 housing units/mi². In the Village, the population is spread out with 25.4% under the age of 18, 8.1% from 18 to 24, 26.8% from 25 to 44, 24.3% from 45 to 64, and 15.6% who are 65 years of age or older. The median age is 36.9 years. The median income for a household in the village is $36,667.

Edison, originally known as West Gilead, was founded by Luthor Mozier in 1851. Mozier donated parcels of land to build a depot that became part of the Cleveland, Columbus, Cincinnati, and Indianapolis Railroad. This railroad was established as a commerce link between these major cities. Such foresight allowed Edison to become a busy railway center that became a major shipping and receiving point for Morrow County and the surrounding areas. In 1880, the Shortline Railroad linked Mt. Gilead to Edison for passenger and freight service. This route is still in service and is responsible for moving large amounts of grain for Morrow County. (www.HeritagePursuit.com, Morrow County)

Fulton

As of the Census of 2010, there are 258 people, 105 households, and 65 families residing in the village. The population density is 1,720.0people/mi². There are 113 housing units at an average density of 753.3 housing units/mi². In the Village, the population is spread out with 27.5% under the age of 18, 5.1% from 18 to 24, 31.4% from 25 to 44, 22.5% from 45 to 64, and 13.6% who are 65 years of age or older. The median age is 35.7 years. The median income for a household in the village is $30,500.

Fulton, one of the smallest villages in Morrow County, known as Lincoln Center until 1881, was incorporated in 1949. It was originally the site of a stone quarry from 1867 to 1920, with its location enhanced by the Toledo and Ohio Central Railway. The original town grew to feature a railway depot, a town hall, a hotel, a restaurant, two churches, a millinery shop and a school. Fulton's first general store offered community residents everything from toothpicks to Jackson cars. If the general store did not have something in stock, it could be ordered and received within a week from Columbus or Cleveland. (www.HeritagePursuit.com, Morrow County)

Marengo

As of the Census of 2010, there are 342 people, 133 households, and 92 families residing in the village. The population density is 2,011.8 people/mi². There are 148 housing units at an average density of 870.6 housing units/mi². In the Village, the population is spread out with 31.0% under the age of 18, 8.4% from 18 to 24, 27.1% from 25 to 44, 22.9% from 45 to 64, and 10.5% who are 65 years of age or older. The median age is 31.8 years. The median income for a household in the village is $35,625.

The town of Marengo received its name from Mrs. Freeman, wife of Isaac P. Freeman. Mrs. Freeman had been reading the history of the wars waged by Napoleon Bonaparte including the account of the battle at Marengo in Northwestern Italy, which was fought on June 14, 1800. The postal authorities consented to that suggested name, and henceforward the locality has been known as Marengo. The casting of the railroad bed in 1872 gave reasonable ground for anticipation of a village materializing in Marengo and a few residences were built.

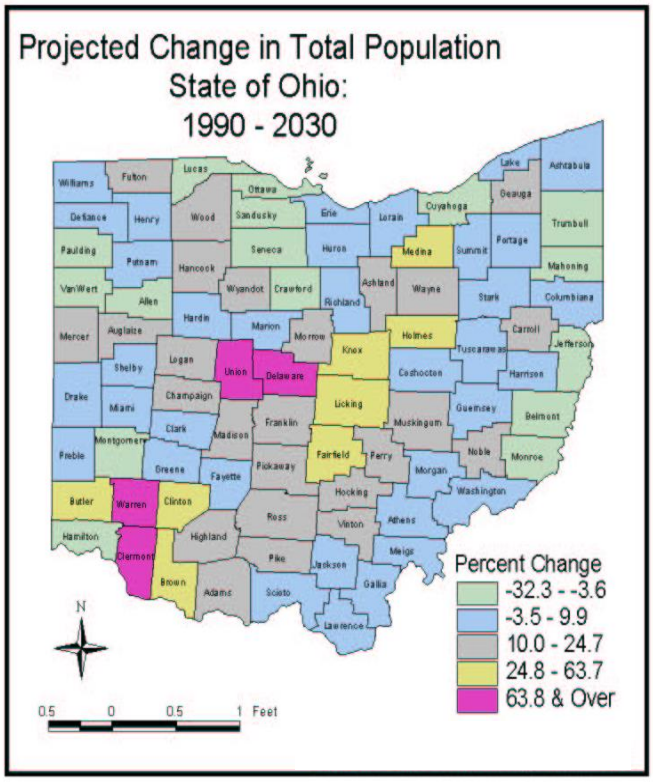
Sparta

As of the census of 2010, there are 161 people, 65 households, and 46 families residing in the village. The population density is 1,788.9 people/mi². There are 75 housing units at an average density of 844.4 housing units/mi². In the Village, the population is spread out with 25.5% under the age of 18, 6.8% from 18 to 24, 26.0% from 25 to 44, 27.3% from 45 to 64, and 14.3% who are 65 years of age or older. The median age is 40.6 years. The median income for a household in the village is $28,750.

Sparta was known as Bloomfield until 1837. The Village of Sparta was incorporated in 1869.

2.4 Census Information

2.4.1 State Population



The State of Ohio's population in 2010 was 11,536,504 and it is projected to climb to 12,317,613 by 2030, an increase of 8.5%. However, it appears that the rate at which Ohio's population is growing is diminishing.

Several factors may be contributing to this decline. The birth to death ratio is much smaller than in faster growing states, with Ohio expected to have 4.4 million births and 3.6 million deaths. Net migration is a factor as well. Ohio may gain approximately 247,000 people through in-migration but may lose about 758,000 people through out-migration.

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.

2.4.2 County Population Projection

According to U.S. Census figures, the 2010 total population of Morrow County was 34,827, with 28,006 residents living in unincorporated areas and 6,821 residents living in villages. The US Census Fact Finder shows 2016 population grew to 35,036.

The population of Morrow County has increased and decreased over the last 100 years. From 1900 to 1930, there was a 18.9% decrease in the population. In the decade beginning with the year 1930, the population began a gradual increase through 1990. The largest change in population since 1930 was from 1970 to 1980 when the population increased by 24.0%. Since 1960, the population has grown by 63%. From 1991 to 2002, net migration numbers indicate that more people moved into the County than moved out of the County. Morrow County is expected to keep growing over the next three decades with an increase of 22% expected between the year 2000 and 2030. Please refer to Table 2-1 for more demographic information.

Table 2-1
Total Populations-Census

Year	Total Population	Year	Total Population
1800	NA	1910	16,815
1810	NA	1920	15,570
1820	NA	1930	14,489
1830	NA	1940	15,646
1840	NA	1950	17,168
1850	20,280	1960	19,405
1860	20,445	1970	21,348
1870	18,583	1980	26,480
1880	19,072	1990	27,749
1890	18,120	2000	31,628
1900	17,879	2010	34,827

2.5 County Land Use and Future Land Use

2.5.1 Topography

The line dividing the foothills of the Allegheny Mountains and the prairie lands of the Midwest passes through Morrow County. The western one-third of the County is level, while the eastern two-thirds of the County are gently rolling. Most of the drainage in the County is directed to the Scioto River, but the eastern portions are drained into the Muskingum River. Two major streams in Morrow County are Big Walnut Creek and Alum Creek.

Morrow County contains four major drainage basins including the Olentangy River, Big Walnut Creek, Kokosing River, and Clear Fork River. Whetstone Creek, Morrow County's largest creek, empties into the Olentangy River. Tributaries leading to Whetstone Creek drain most of the western part of the County and include Claypole Run, Mitchell Run, Shaw Creek, Mud Run, Big Run, Pugh Ditch, Sam's Creek, and East Branch. The northern tip of the Big Walnut Creek basin flows to by Alum Creek and Big Walnut Creek. Two tributaries of Alum Creek that originate in Morrow County are Indigo Creek and Bunkey Run. Big Walnut Creek's tributaries in Morrow County include Reynolds's Run, Mill Creek, Castro Run, and Hayes Ditch. The Kokosing River basin in Morrow County is drained by South Branch and Sylvester Run, which flow to the Kokosing River. A portion of the Clear Fork Reservoir is also located in the Morrow County. Some tributaries of Cedar Creek, which eventually joins the Clear Fork River, also flow from Morrow County.

2.5.1.1 Watersheds

Olentangy Watershed Alliance

Olentangy was a name given to this river in 1833 by a legislative act that was attempting to restore Native American names to certain rivers in the state. The word Olentangy literally means 'River Of Red Face Paint'. This name actually belonged to Big Darby Creek further to the west, where Wyandotte of the Columbus area got their red face paint. The Olentangy River should have been

named the Whetstone River. Both Native Americans and early settlers used the black Ohio and Olentangy shale found along the river for whetstones to sharpen their tools.

Currently, the Olentangy River flows 88.5 miles from its headwaters in the Crawford and Richland Counties through Marion and Morrow counties into Delaware and ending in Franklin County at the confluence with the Scioto River in downtown Columbus.

The Olentangy River has a drainage area of 536 square miles. Twenty-two miles of the Olentangy River was designated as the state Scenic River by the ODNR in 1973. It was one of the first rivers to be designated in Ohio. The designation runs from the Delaware Dam to Wilson Bridge Rd in Worthington.

Upper Big Walnut Creek Watershed

The Upper Big Walnut Creek Watershed is approximately 190 square miles encompassing portions of five Central Ohio counties, including Delaware, Franklin, Knox, Licking and Morrow. The entire Upper Big Walnut Creek Watershed drains to Hoover Reservoir, the largest raw drinking water source for the City of Columbus covering over 3100 acres in water. Hoover Reservoir supplies the public drinking water to 575,000 Columbus residents.

Kokosing Watershed

Draining an area of 482 square miles from a total of five counties, the Kokosing River watershed somewhat resembles the shape of the United States. The headwaters begin in Morrow and Richland counties. The majority of the river runs through the central part of Knox County almost splitting it in half. However, some tributaries do reach to the north just into Ashland County. An average fall of 8.5 feet per mile takes the Kokosing River from an elevation of 1,308 mean sea level (MSL) at the source in Morrow County just east of Mount Gilead to 819 MSL at the mouth in Coshocton County. The Kokosing River's main tributaries are the North Branch, draining 96.6 square miles, and Jelloway Creek, draining 74.2 square miles. Traveling some 57 miles from its headwaters, the Kokosing enters Coshocton County and joins the Mohican River to form the Walhonding River.

Alum Creek Watershed

Alum Creek originates near the village of Cardington in Morrow County. The creek flows through the communities of Kilbourne, Westerville, and Columbus. Alum Creek junctions with Big Walnut Creek south of Columbus. The Alum Creek Watershed has a drainage area of 85 square miles (54,345 acres). The entire watershed consists of 107 miles of streams and contains the Alum Creek Reservoir (3305 acres) and Westerville Reservoir (954 acres).

Alum Creek Reservoir was completed on Alum Creek in 1976. This lake was constructed by the U.S. Army Corps. of Engineers for water supply, recreation, and flood protection.

Clear Fork Reservoir Watershed

The Clear Fork basin, which encompasses approximately 218 square miles, stretches into the northeastern corner of the county. The major lake in this basin is Clear Fork Reservoir, which lies in both Morrow and Richland Counties, and covers about 997 surface acres. Clear Fork basin stretches eastward across northern Richland County and southern Ashland County, where it joins the Black Fork to form the Mohican River.

2.5.2 Land Use

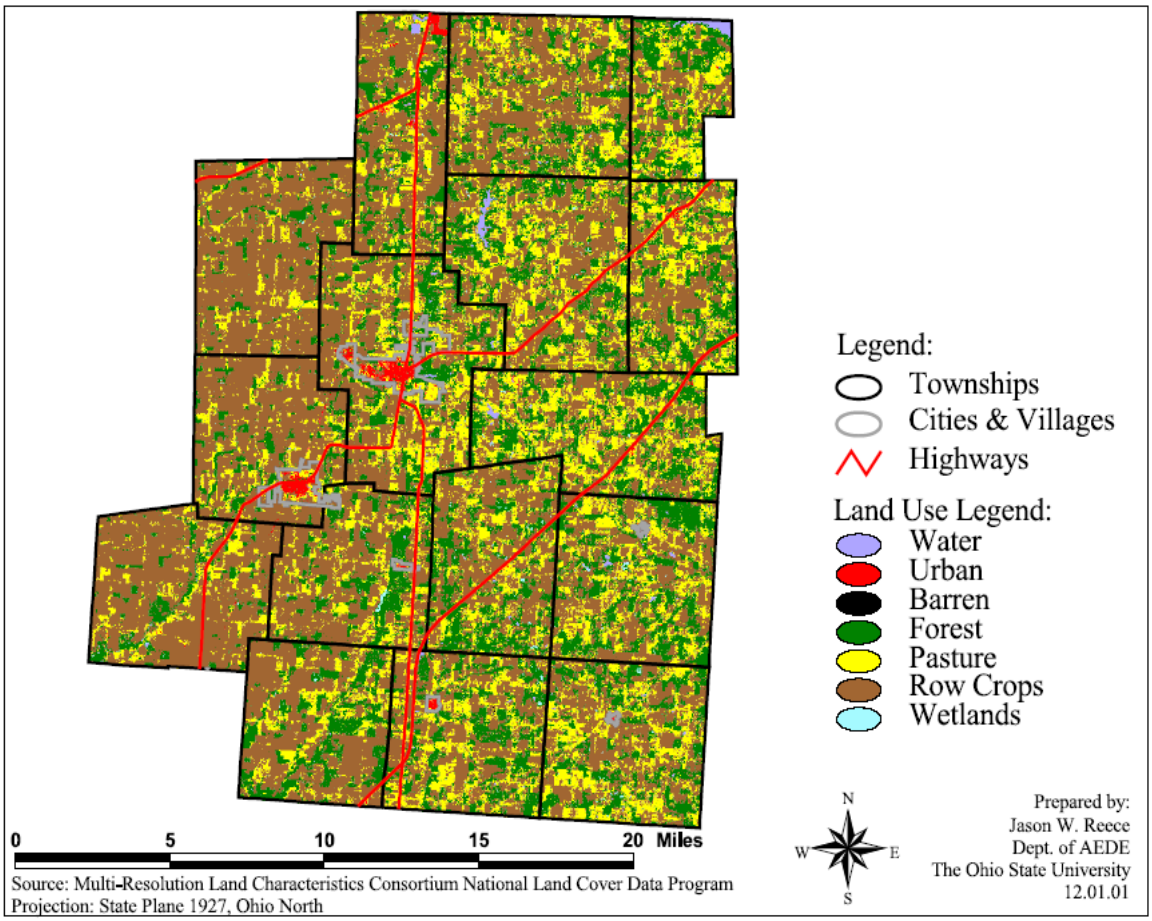
Morrow County, developed a Comprehensive Land Use Plan in 2012. It was adopted by the County Commissioners on November 7, 2012. The Plan covers Economic Development, Industry, Commercial, Community Housing, Community Facilities, Civic Infrastructure, Utility Infrastructure, and Agriculture/Recreational activities. The County also developed a Zoning Resolution, adapted by the County on August 24, 2009 (effective date Nov 28, 2009). Both of these documents were referenced and utilized while preparing this Hazard Mitigation Plan update.

The Board of Morrow County Commissioners has previously established the Morrow County Farmland Preservation Task Force in December 1998. The *Farmland Preservation Report* published by the Task Force evaluated past and current agricultural statistics in order to measure the overall changes experienced in Morrow County. The mission of the Task Force was to determine the extent of farmland loss in the County and to make recommendations for future policy to help maintain a vibrant agricultural economy.

Morrow County contains approximately 258,000 land acres, of which 71 percent is farmland. According to the *Farmland Preservation Report,* Morrow County's land in farms was actually stable between 1982 and 1992 (178,000 acres and 179,000 acres respectively). However, between 1992 and 1998, the total land in farms decreased approximately 9,000 acres to 170,000 acres in 1998. This reduction occurred during 1992 and 1993. Total acres in farms have remained stable, with slight fluctuations, since 1993.

As estimated by the Soil Conservation Service, the County's water acreage consists of approximately 558 acres of lakes, including 178 acres of Clear Fork Reservoir, nine private lakes and ponds that range in size from five to 30 acres, as well as the 200-acre private Candlewood Lake, and approximately 575 smaller ponds. Morrow County also contains approximately 295 linear miles of major streams and rivers according to the Ohio Department of Natural Resources' (ODNR's) Division of Water. In addition, 10 miles of county maintained ditches and numerous miles of privately maintained ditches are used for land drainage. This availability of water lends itself to many uses by both communities and individuals.

The following is a map detailing Morrow County's land use from the early 1990's.



2.5.3 Future Land Use

Morrow County adapted a new land use plan in 2012. The 2012 Morrow County Comprehensive Land Use Plan, can be found at www.morrowrpc.org/ The plan addresses the following categories:

- Economic Development
- Industrial Development
- Commercial Development
- Community Housing
- Entrepreneurial Goals
- Community Facilities
- Utility Infrastructure
- Civic Infrastructure
- Environmental Tasks

2.6 County Utilities

2.6.1 Electric, Gas and Phone Utilities

The electric power for Morrow County is provided by four utilities: Consolidated Electric Co-Op, Ohio Edison, Marion Electric and Ohio Power. Columbia provides the County with its gas energy. Phone companies that service Morrow County include Sprint and Verizon North. See the following links for utility service area maps maintained by the Public Utilities Commission of Ohio (PUCO).

https://www.puco.ohio.gov/emplibrary/files/Util/GIS/Electric_Service_Areas_Size_A.pdf

https://www.puco.ohio.gov/emplibrary/files/Util/GIS/Telephone_Maps/Ohio_ILECS_and_Exchanges_Size_A.pdf

2.6.2 Water and Wastewater Utilities

Ground water is a major water source for rural households in Morrow County. Approximately 80 percent of all households obtain their water from private wells. Based on an estimated usage of 75 gallons per person per day, 1,661,000 gallons per day (gpd) from private wells are used. Additional private water uses include industry (140,000 gpd) and livestock use (283,000 gpd), mostly from groundwater supplies. The remaining 20 percent of households use public water supplies with ground water as the source.

Two of Morrow County's larger villages operate their own water treatment facilities. Morrow County's largest public water system is located in the Village of Mount Gilead, which uses five wells for its supply. Mount Gilead treats this well water at its own water treatment plant. The Village of Cardington receives its water from seven wells in Marion County, and treats the water in its own facility.

The smaller villages within Morrow County do not operate their own water treatment facilities. The villages of Chesterville, Sparta, Marengo and Edison receive treated water from Del-Co Water Company, Inc. In addition, Morco, a water supply company whose water source is in Delaware County, also sells treated water to the residents of various rural communities in southern Morrow County including the Villages of Chesterville, Sparta, Fulton, and Marengo.

The Thomas E. Steward Water Treatment Plant located in western Knox County is the only ground water plant of the Del-Co Water Company system and has a capacity of four million gpd. This plant serves customers in Morrow and Marion Counties, and a portion of north central and northeastern Delaware County. The map in Appendix B shows the area serviced by the Del-Co Water Company. The municipalities within the blue shaded area are not served by Del-Co Water Company and include the City of Delaware, Sunbury, Cardington and Ashley.

In addition, all of the incorporated jurisdictions within Morrow County operate their own wastewater treatment facilities. The most recent projects involving these treatment facilities are described herein.

In November 2002, construction of a new 60,000 gpd wastewater treatment plant was completed for the Village of Chesterville. This project included site development work and construction of a cast in-place plant and masonry equipment building, including all associated process piping and equipment. In addition to the wastewater treatment plant, a new sanitary sewer collection system was installed throughout Chesterville. This project included the installation of approximately 16,000 lineal feet of 6", 8" and 10" sanitary sewer lines, two lift stations and 120 house connection laterals.

In May 2004, the Morrow County Development Chamber of Commerce recognized the work of the Morrow County Development Director with the Fulton, Chesterville and Sparta communities' wastewater treatment projects. The Development Director applied for the Community Development Block Grant Housing Improvement Program on behalf of Morrow County, which resulted in grant funding from the State of Ohio totaling $2,218,700.

3.0

Countywide All Natural Hazards Mitigation Planning Process

3.0 COUNTYWIDE ALL NATURAL HAZARDS MITIGATION PLANNING PROCESS

3.1 Mission Statement

At the beginning of the planning process, a mission statement was drafted to establish a clear goal for the Planning Group. The Planning Group approved the following as its Mission Statement.

"The mission of the All Natural Hazard Mitigation Plan Core Group is to develop a working document that fulfills the mandates of the Federal Disaster Mitigation Act of 2000, and satisfies the requirements of FEMA and the Ohio EMA, as well as meets the needs of all of Morrow County. Further, by researching and planning for future natural hazards and implementing appropriate mitigation techniques, all of Morrow County can save lives and protect property, reduce the cost of disasters and provide for a rapid and efficient recovery by coordinating response efforts, and increasing the educational awareness of natural hazard events and their effects on the people, property, and resources of all of Morrow County."

3.2 Notification Process

The incorporated jurisdictions of the County, as well as other agencies that work within the County, were notified of the mitigation planning process. The Morrow County EMA Office created a master list of jurisdictions they felt necessary to participate in this planning effort. The comprehensive list was reviewed to ensure that all the appropriate agencies as well as jurisdictions would be invited to participate in this effort. Individuals representing a wide array of political subdivisions, as well as agency and private businesses, were notified of the mitigation planning update process. This comprehensive list of invited participants is in Appendix A.

Prior to commencing this planning process, in addition to contacting the Planning Group, Morrow County notified the general public regarding this mitigation planning process. Morrow County also posted all Hazard Mitigation Planning Meetings on their website (http://www.morrowcountyohio.org) and issued a press release on 10/19/17 to the Morrow Co Sentinel for the 10/26/17 final draft plan public review meeting. The Morrow County EMA Director was the contact source and his contact information was provided. See Appendix A for copies of these correspondences.

3.3 Groups

The Planning Group was the original planning unit for the initial planning project. All Planning Group members were involved for the entire planning process. They were the decision makers and implementers. The purpose of the Planning Group was to provide information to the various entities of Morrow County that have a stake, either directly or indirectly, in the Mitigation Plan. They provided feedback, input, and review as the process of the initial Mitigation Plan development was completed, leading to a better quality and more inclusive scope of the Mitigation Plan that everyone could acknowledge and adopt, truly implementing a Countywide plan.

Obtaining support from the whole community requires a comprehensive approach to preparing any Mitigation Plan. Identifying those persons, community leaders, and government agencies with the knowledge and authority to help the community organize a plan was key to the planning

effort. Establishing a group of leaders was necessary to give this task validity. The Planning Group included individuals from multiple agencies, county departments and incorporated jurisdictions as previously listed in Section 1.2. Please see Appendix A for a complete list of participants.

3.4 Plan Update Group Meetings

There were three (3) Planning Group meetings, and one community meeting for public comment on the Draft Mitigation Plan. These meetings are detailed below.

3.4.1 Determination of Hazards - Meeting 1-Kick-Off Update Meeting 8/3/17 (Planning Group)

The kick-off meeting presented the Planning Group with the process to be followed in the update of the Mitigation Plan. Overall goals of the plan for Morrow County were discussed and the Planning Group began a process to determine which hazards to focus on. This included a Hazard Identification and Risk Assessment (HIRA) based on historic disaster events data from the National Center for Environmental Information (NCEI) (formally the National Climatic Data Center (NCDC)), a summary of NCEI data prepared by the Consultant, and planning committee member insights about local hazard events. The initial list of critical hazards was established looking at the National Center for Environmental Information (NCEI) tables that illustrated which hazards in Morrow County have produced the largest amount of damage based on human or monetary losses. The Planning Group also used the collective knowledge they had coupled with the vast amount of local experience and history to determine which hazards to address in their Mitigation Plan. This resulted in a listing of hazards including Wind Events, Severe Winter Storms, Severe Summer Storms, Flooding, Tornadoes, Drought, Excessive Heat, and Dam Failure.

The 2010 Morrow Co Hazard Mitigation Plan had included the following Hazards:

1. Severe Storms (Winter, Snow, Ice)
2. Severe Storms (Thunderstorms/High Winds/Lightning, Hail)
3. Flooding
4. Tornadoes
5. Droughts (Severe)
6. Stream Bank Erosion
7. Earthquakes

Based on the data review, and the lack of evidence to support these natural hazards as a local concern, Stream Bank Erosion and Earthquakes were removed from the prior Plan hazard list. As the entire County has fewer than six (6) buildings of greater than 3 stories (excluding agricultural structures), earthquakes were not of local concern. Further, there is no historic data identifying any issues with either hazard.

The 2018 Morrow Co Hazard Mitigation Plan includes the following Hazards:

1. Wind Events
2. Severe Winter Storms
3. Severe Summer Storms
4. Flooding
5. Tornadoes
6. Drought
7. Excessive Heat
8. Dam Failure

The committee then used HIRA weight factors of Probability, Impact, Geographic Location, Warning Time, and Duration to weigh the hazards for priority ranking. The Consultant collected the scores and would tabulate the results for Meeting #2.

Appendix H includes the historic National Climatic Data Center (NCDC) event data and event data summary. Appendix B includes the HIRA methodology, and Weighted HIRA Scoring and Hazard Priorities summary for Morrow County.

Additionally, by the end of the first meeting, Planning Group members had exchanged contact information, identified some additional data which needed to be collected for the plan, established a priority list of hazards and discussed the general process and timeline of the project.

Please see Appendix C for Meeting 1 Sign in sheet, Agenda, and other materials as presented.

3.4.2 Determination of Problem Statements and Overall Goals – Meeting 2 9/7/17 Update Meeting (Planning Group)

The second meeting of the Planning Group focused on reviewing and approving the weighted HIRA Hazard Priority Scoring and reviewing prior plan progress and accomplishments.

Based on the review of member scores on the weighted HIRA factors (see Summary in Appendix B), the Planning Committee approved the following prioritization for Morrow Co Natural Hazards for the 2018-2022 Plan:

1. Wind Events
2. Tornadoes
3. Severe Winter Storms
4. Severe Summer Storms
5. Flooding
6. Dam Failure
7. Excessive Heat
8. Drought

Please see Appendix C for Meeting 2 Sign in sheet, Agenda, and other materials as presented. Appendix D provides written input (survey format) from each participating jurisdiction.

3.4.3 Wrap-Up- Meeting 3 10/5/17 Update Meeting (Planning Group)

The final meeting with the Planning Group focused on the discussion of the final mapping products, as well as the mitigation alternatives and completed matrices. The multi-hazard maps were reviewed for any errors or omissions. The results of the matrices were reviewed by the Planning Group for approval.

Each individual community was also encouraged to identify an alternative or alternatives that they wanted to support and implement within their community.

The remaining steps in the mitigation planning process were reviewed, which included setting a date for a public meeting.
Please see Appendix C for Meeting 3 Sign in sheet, Agenda, and other materials as presented.

3.5 Review of Current/Expiring Plan

During meetings 2 and 3, Planning Group reviewed each Action Item in the current/expiring plan. The EMA staff had color coded each Action as green-completed, yellow-underway, or red-not accomplished.

Priority	Hazard Type	Mitigation Action	Start Date	End Date	Lead Agencies	Resources	Status	Remarks
1	Winter Storms	Provide an alternate power source, such as back-up generators, for those critical populations and critical facilities that must have continuous power to preserve and protect human health	Jan. 2011	Dec. 2016	MCEMA	Additional funding sources and existing budget	Deferred	25% complete
2	Winter Storms	The County wants to better coordinate with the other communities on sharing all available resources to better prepare	Jan. 2011	Dec. 2016	MCEMA	Existing budget	On-going	
3	Winter Storms	accessibility to the Village of Fulton and provide an alternate route so during a winter storm residents can receive the medical attention and supplies needed to survive	Jan. 2011	Dec. 2016	MCEMA	MCEMA	Deferred	
3.1	Winter Storms	Provide large scale evacuation centers for the Villages of Fulton and Sparta residents to seek safety. Provide evacuation centers with generators and necessities for survival in case of a prolonged winter event.					Deleted	Re-evaluated and found to be fiscally unfeasible
4	Severe Weather	Provide NOAA radios for every critical facility and educate residents on the radios for receipt of potential life saving information	Jan. 2011	Dec. 2016	MCEMA	Existing budget & additional funds as obtained	Deferred	90% complete
5	Severe Weather	Develop and educational outreach program for County residents on the dangers associated with severe storms and the resulting clean-up activities as well as where to seek safety from severe storms	Jan. 2011	Dec. 2016	MCEMA	Existing budget	On-going	
6	Severe Weather	Work with local media for better coverage of the entire County and providing public service announcements	Jan. 2011	Dec. 2016	MCEMA	MCEMA	On-going	
7	Severe Weather	Develop and distribute public education flyers to County residents covering the use of lightning rods and the benefits of installation	Jan. 2011	Dec. 2016	MCEMA	Existing budget	On-going	
7.1	Severe Weather	Morrow County lacks an adequate outdoor warning system throughout the County. Therefore, the County wants to install and interoperable, multi-purpose siren system that would alert residents of approaching severe weather					Completed	Completed in 2010
7.2	Severe Weather	Morrow County lacks the coverage of the Doppler Radar through NOAA. The County wants to Coordinate with NOAA to expand the coverage area of the Doppler Radar to include Morrow County					Completed	Completed in 2008
8	Flooding	Establish procedures and locations for excess debris and yard waste to better manage clean up and disposal during and after an emergency	Jan. 2011	Dec. 2016	MCEMA & Local jurisdictions		Completed	
9	Flooding	Develop a Public Service Announcement educating the citizens of the potential harm associated with filling in waterways and ditches	Jan. 2011	Dec. 2016	MCEMA		Completed	
10	Flooding	The County event to better coordinate with utility companies on the placement of lines in easements in the community	Jan. 2011	Dec. 2016	MCEMA & Local jurisdictions	Existing budget	On-going	
11	Flooding	Develop and educational outreach program for County residents on the dangers associated with flooding and the resulting clean-up activities as well as where to seek safety from flood waters and not to drive through flood water	Jan. 2011	Dec. 2016	MCEMA	Existing Budget	On-going	
11.1	Flooding	Morrow County lacks response vehicles that can navigate in off-road conditions. Therefore, the County wants to obtain 4-wheel drive emergency response vehicles for first responders					Deleted	Re-evaluated and found not to be mitigation oriented
11.2	Flooding	Morrow lacks an adequate, updated mapping system. Therefore the County wants to define and update floodplain maps					Completed	Completed in 2006
12	Flooding	Morrow County needs to establish building codes for the incorporated and unincorporated areas	Jan. 2011	Dec. 2016	MCEMA		Deferred	10% Completed

Priority	Hazard Type	Mitigation Action	Start Date	End Date	Lead Agencies	Resources	Status	Remarks
13	Flooding	The County wants to continue to work residential, commercial and industrial development communities to help with flooding issues, including erosion and sediment control and maintenance of waterways	Jan. 2011	Dec. 2016	MCEMA, local jurisdictions and MC Development Office	Existing Budget	On-going	
14	Tornadoes	Provide an alternate power source, such as back-up generators, for critical facilities serving as tornado shelters that must have continuous power to preserve and protect human health	Jan. 2011	Dec. 2016	MCEMA & local communities		Completed	Completed in 2011
14.1	Tornadoes	Evaluate the need for Tornado Network Shelter and seek the funding for the shelters to be used throughout Morrow County					Deleted	
14.2	Tornadoes	Morrow County lacks the mechanical equipment necessary for disaster clean up. The county feels that obtaining such equipment for post-disaster clean up would speed up the clean up process					Deleted	
14.3	Tornadoes	Seek funding for multi-use emergency operation center (EOC) shelters throughout the County which provide protection from severe weather for County residents and at-risk populations such as mobile home parks and campgrounds where citizens could seek shelter					Deleted	
14.4	Tornadoes	Morrow County lacks an adequate outdoor warning system throughout the County. Therefore, the County wants to install and interoperable, multi-purpose siren system that would alert residents of approaching severe weather					Completed	Completed in 2010
14.5	Tornadoes	Morrow County lacks the adequate means to alert residents of approaching severe weather. The County want to seek funding to implement a reverse 911 system that would alert residents in their homes of possible tornadoes						
15	Drought	Develop and distribute a Public Service Announcement on trash burning regulations for the entire county to educate residents of the dangers of open burning especially during drought conditions	Jan. 2011	Dec. 2016	MCEMA	Existing budget	On-going	
16	Stream Bank Erosion	Coordinate with all watershed groups on techniques and means of preventing and controlling stream bank erosion throughout the County	Jan. 2011	Dec. 2016	MCEMA	Existing budget	On-going	
17	Earthquake	Develop and distribute a public education flyer to the County residents concerning the dangers of earthquakes and their rights to purchase earthquake insurance	Jan. 2011	Dec. 2016	MCEMA	Existing budget	On-going	

From there, the Committee reviewed each Action to confirm its status. Based on Appendix C, the current actions were evaluated and determined to be as follows:

COMPLETED *Action Completed (Green), no need to continue in the next Five (5) Year Plan:*
2010 Priority Projects:
7.1: Severe Weather: Outdoor multipurpose siren system
7.2: Severe Weather: Coordinate Doppler Weather to include Morrow Co
8.0: Flooding: Procedures for debit cleanup during and after emergencies
9.0: Flooding: PSA s about dangers of filling in waterways and ditches
11.2: Flooding: Update flood plain maps
14.0: Tornadoes: Backup generators for shelters
14.4: Tornadoes: Outdoor multipurpose siren system

ONGOING *Action Not Totally Completed (Yellow), but needs to be continued in the next Five (5) Year Plan.* 2010 Priority Projects:
2.0: Winter Storms: County coordination with other communities to share resources
3.1: Winter Storms: Provide large scale evacuation centers for Villages of Sparta and Fulton
5.0: Severe Weather: Educational outreach program for residents (Code Red)
6.0: Severe Weather: Work with local media for more PSAs
7.0: Severe Weather: Public education re use and benefits of lightning rods
10.0: Flooding: County coordination with utility companies for utility easements
14.5: Tornadoes: Resident alert system re tornadoes
15.0: Drought: PSAs about the dangers of open burning during drought conditions

Each of these Actions were at least 25% completed over the past five (5) years, but were deemed important to continue in the plan. In each case, there was a discussion about why the Action was not achieved, and what could be done to better assure success over the next five (5) years. Some of the language was modified, typically with more specific outcomes, to better focus on success.

CANCELLED *Action Not Totally Completed (Yellow and Red) and is deleted as not practical to accomplish or no longer necessary.* 2010 Priority Projects:
11.0: Flooding: Educational outreach about the dangers of flooding (repetitive, covered by 9.0)
11.1: Flooding: Need for 4-wheel drive emergency vehicles (reevaluated and found not to be mitigation oriented)
12.0: Flooding: Establish building codes for incorporated/unincorporated areas (not feasible)
13.0: Flooding: Work with residential and commercial property owners on erosion and sediment control. “Erosion Hazard” has been eliminated from the plan. This action is no longer necessary.
14.3: Tornadoes: Emergency operations shelters for residents (repetitive, combined with 3.1)
16.0: Stream Bank Erosion: Coordinate all watershed groups (Hazard has been eliminated from the updated plan)
17.0: Earthquake: Public information about the dangers of earthquakes. (Hazard has been eliminated from the updated plan)

DEFERRED *Action Not Completed (Red), but needs to be continued in the next Five (5) Year Plan*. 2010 Priority Projects:
1.0: Winter Storms: Provide alternative power sources for critical facilities
3.0: Winter Storms: Provide an alternative route to the Village of Fulton for emergency supplies and medicine
4.0: Severe Weather: Provide NOAA radios for every critical facility
14.1: Tornadoes: Seek funding for tornado shelters throughout Morrow Co
14.2: Tornadoes: County to secure equipment for disaster cleanup

The revised Five (5) Year Plan reflects these decisions on each current/expiring plan Actions. Further, numerous additional Action Items were developed and included in the revised Five (5) Year Morrow County Plan.

3.6 Public Update Meeting 10/26/17 (Planning Group and Public Meeting)

A public meeting was held on October 26, 2017 to review the planning process with the general public. This meeting was also used to address comments and questions concerning the Draft Mitigation Plan. The local media attended and covered this public meeting.

Public participation is extremely important and valuable during any phase of mitigation planning, including during the Plan update phase. To assure the opportunity for citizens to review and comment on the draft Plan Update, the Planning Group will include the draft Plan Update on the Morrow County EMA website. A copy of the draft Plan will also be made available in the MCEMA office. A time frame of 14 days was provided for public comments and questions. Any comments or questions received during this period would be addressed and acted upon by the Planning Group prior to forwarding the final draft Plan Update version to the Ohio and Federal Emergency Management agencies for their review.

No comments or questions were received from the public during this public comment period.

3.7 Plan Finalization

Upon incorporation of all comments into the Hazard Mitigation Plan, the plan will be prepared and submitted to the State of Ohio Emergency Management Agency (OEMA) for initial review and comment. The plan will then be further revised and submitted to the State of Ohio Emergency Management Agency and Federal Emergency Management Agency for formal review and approval. Each incorporated jurisdiction, as well as any township choosing to adopt this Hazard Mitigation Plan as a separate entity from the County, will also receive a digital copy of the plan.

4.0

Hazards Profile

4.0 HAZARD PROFILE

Morrow County has experienced many natural disasters in the past one hundred years. These disasters have ranged from tornadoes and blizzards, to flooding and droughts. The purpose of this document is to identify the number and frequency of disasters in Morrow County to better prepare and deal with them when they do occur. The following sections describe the process of determining upon which hazards to focus, general background information on each hazard as well as hazard events that have occurred in Morrow County.

4.1 Initial Hazard Assessment

In order to properly evaluate the natural hazards to which Morrow County may be susceptible, a three-step process was utilized. This three step process was completed in order to "narrow-down" the hazards for which Morrow 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 during the initial planning phase to determine which hazards FEMA had documented as possible natural hazards, including future threats, for the State of Ohio. Several hazards that are listed on FEMA's website include flooding, severe storms, tornadoes and winter storms.

Step 2 - Data was collected from the National Center for Environmental Information (NCEI) (formally the National Climatic Data Center (NCDC)), a summary of NCEI data was prepared by the Consultant, and Planning Group member insights were sought out regarding local hazard events. (See Appendix H.)

The initial list of critical hazards was established looking at the National Center for Environmental Information (NCEI) tables that illustrated which hazards in Morrow County have produced the largest amount of damage based on human or monetary losses. The Planning Group also used the collective knowledge they had coupled with the vast amount of local experience and history to determine which hazards to address in their Mitigation Plan. This resulted in a listing of hazards including Wind Events, Severe Winter Storms, Severe Summer Storms, Flooding, Tornadoes, Drought, Excessive Heat, and Dam Failure. Stream Bank Erosion and Earthquakes were eliminated from the prior hazard plan list, as there was no data to support these hazards as a priority concern for Morrow County. Based on data, Wind Events, Drought, and Dam Failures were added. As NCEI information did not address dam failures, other sources were contacted for this data. The Ohio Department of Natural Resources (ODNR) provided dam information.

Step 3 - Based on the review of member scores on the weighted HIRA factors (see Summary in Appendix B), the Planning Committee approved the following prioritization for Morrow Co Natural Hazards for the 2018-2022 Plan:

1. Wind Events
2. Tornadoes
3. Severe Winter Storms
4. Severe Summer Storms
5. Flooding
6. Dam Failure
7. Excessive Heat
8. Drought

While Stream Bank Erosion and Earthquakes has been identified Morrow County hazards on the prior 2010 Hazard Mitigation Plan, they were eliminated from this plan. In the case of Stream Bank Erosion, there was no data, historic or present, to support the need for this hazard category to be included in the plan. Earthquakes were not included in this 2018 update plan for similar reasons. NOAA-NCEI research found no incidents of any area earthquakes. Additionally, the potential measures to mitigate earthquake damage, notably changes to the Ohio Basic Building Code, were not deemed practical or feasible by rural Morrow County.

The Planning Committee also did not include landslides or wildfires as hazards of concern in Morrow Co. Neither was included in the initial county hazard mitigation plan or any subsequent updates.

According to the Ohio State Hazard Mitigation Plan and most recent HIRA, Morrow Co is not identified as a county prone to subsidence or landslides. Further the local Planning Committee was not aware of any data that shows this to be a source of concern in the county. Resulting, landslides have not been added to the county hazard list.

Similarly, wildfires have not been added to the county hazard list. NOAA data reports zero reported wildfire event in the county from 1950 to 2018. The Ohio State Hazard Mitigation Plan included Morrow Co in their Region 1 wildfire assessment and also shows the county as a “low risk” wildfire area. Again, based on this data driven analysis, wildfires were not included as a hazard of local concern.

4.2 Risk Assessment Ranking

The research compiled during the initial Hazard Identification and Risk Assessment (HIRA) was provided to the Planning Committee for their review and assessment. The committee evaluated all the hazards being considered and ranked them using the five (5) HIRA Hazard factors (Probability, Impact, Geographic Extent, Warning Time, Duration) at their meeting on September 7, 2017. The Planning Committee confirmed and verified this rating at their second meeting on October 5, 2017. The full Weighted HIRA Scoring and Hazard Priorities Summary is included in *Appendix B.*

Morrow County’s highest risk natural hazards were identified as follows:

Natural Hazard	**HIRA Score –Risk Factor RF Rating**	**Comments**
Wind Events	4.05	Strong and High Winds
Tornadoes	3.50	
Severe Winter Storms	3.45	Blizzards, Heavy Snow, Cold/wind chill, Extreme Cold and Ice
Severe Summer Storms	3.40	Thunderstorms, Lightning and Hail

Flooding	3.30	
Dam Failure	3.00	Dams separated from Flooding
Excessive Heat	2.60	New to hazard list
Drought	2.40	

The prior plan Hazard priorities were:
1. Severe Storms-Winter
2. Severe Storms-Summer
3. Flooding (included Dams)
4. Tornadoes
5. Droughts
6. Stream Bank Erosion (eliminated for lack of data)
7. Earthquakes (eliminated for lack of adverse event data)

Data to support event history has been secured from the National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI), Ohio Dept. of Natural Resources (ODNR), and from the National Integrated Drought Information System (Drought.gov). These data sets are included in *Appendix H.*

A more detailed description of each hazard follows, providing an overview of the hazard, Extent, Historical Occurrences, and Frequency/Probability of Occurrence.

4.3 Wind Events- High and Strong Winds

Morrow Co has experienced a number of wind events, causing considerable damage over the past 21 years of NCEI records, and has rated Wind Damage mitigation as its top priority.

4.3.1 Extent

According to NOAA, High Winds are defined as 1-minute average surface winds of 35 kt. (40 mph) or greater lasting for 1 hour or longer, or wind gusts to 50kt (58 mph) or greater regardless of duration. Strong Winds are defined on the Beaufort Scale as reaching speeds of 47-54 mph and are capable of causing minor structural damage to buildings.

4.3.2 Historical Occurrences

The following chart shows a breakdown of the events in this category based on NOAA-NCEI data from 1996 to 2017.
NOAA printouts supporting the following chart are included in *Appendix B.*

Event Type	No of Events	$ Damage	Injuries	Deaths	Crop Damage Events	$ Value of Crop Damage
High Winds	24	$3.58 m	0	0	1	$800,000
Strong Winds	3	$ 35,000	0	0	0	0
Totals	**27**	**3.615 m**	**0**	**0**	**0**	**$800,000**

The most damaging storms occurred on 12/11/2000 $100,000 damage, 10/4/2002 $100,000 damage, 9/14/08 $2.5 million damage and $800,000 crop damage, 2/11/09 $300,000 damage, 12/9/09 $150,000 damage, and 1124/14 $100,0000 damage.

4.3.3 Frequency/Probability of Future Occurrence

Morrow County has a significant history of wind event occurrences. According to the NCEI, 27 High and Strong Wind Events have occurred in Morrow County since 1996. However, no events were recorded prior to 1996, which means Morrow County has at least one (1) wind event affect their County every year for the past 21 years. These winter storms in Morrow County have caused significant property damage and crop totaling $4.42 million over a 21 year period, which is an average of $210,238 per year. Based on historical information since 1994, the County can expect to endure at least one (1) wind events in any given year, with significant damage also expected.

4.4 Tornadoes

Tornadoes are produced from the energy released during a thunderstorm, but account for only a tiny fraction of the overall energy generated. What makes them particularly dangerous is that the energy is concentrated in a small area, perhaps only 100 yards across. Not all tornadoes are the same and science does not yet completely understand how a portion of a thunderstorm's energy becomes focused into something as small as a tornado.

Tornadoes occur mostly in the central plains of North America, east of the Rocky Mountains and west of the Appalachian Mountains. They occur primarily during the spring and summer – the tornado season comes early in the south and later in the north according to the seasonal changes in relation to latitude – usually during the late afternoon and early evening. They have been known to occur in every state in the United States and every continent on the earth, any day of the year, and at any hour. The damaging strong winds generated from tornadoes can reach 300 mph in the most violent tornadoes, causing automobiles to become airborne, ripping ordinary homes to shreds, and turning broken glass and other debris into lethal missiles. The biggest threat to living creatures, including humans, during tornadoes is flying debris and being tossed about in the wind. Contrary to previous belief, it is not true that the pressure in a tornado contributes to damage by making buildings "explode."

According to the National Weather Service (NWS), the development of Doppler radar has made it possible, under certain circumstances, to detect tornado winds with radar. However, spotters

remain an important part of the system to detect tornadoes, because not all tornadoes occur in situations where the radar can "see" them. Citizen volunteers comprise what is called the SKYWARN (www.skywarn.org) network of storm spotters, who work with their local communities to watch out for approaching tornadoes to ensure that appropriate action is taken during tornado events. Spotter information is relayed to the NWS, who operates the Doppler radars and issues warnings, usually relayed to the public by radio and TV, for communities ahead of the storms.
The NWS utilizes all the information they can obtain from weather maps, modern weather radars, storm spotters, monitoring power line breaks, as well as additional sources for issuing tornado warnings. Although the process by which tornadoes form is not completely understood, scientific research has revealed that tornadoes usually form under certain types of atmospheric conditions. Those conditions can be predicted, but it is not yet possible to predict in advance exactly when and where they will develop, how strong they will be, or precisely what path they will follow.

According to the NWS, there are some "surprises" every year, when tornadoes form in situations that do not look like the right conditions in advance, but these are becoming less frequent. Once a tornado is formed and has been detected, warnings can be issued based on the path of the storm producing the tornado, but even these cannot be perfectly precise regarding who will, or will not, be struck
Although the number of tornadoes in Ohio does not rank high compared to other states in the United States, the State does average around 14 tornadoes a year. Ohio's peak tornado season runs from April through July, with most tornadoes occurring between 2 p.m. and 10 p.m. Even though June has been the month with the most tornado occurrences, many of the State's major tornado outbreaks have taken place in April and May. However, history has shown that tornadoes can occur during any month of the year and at any time of the day or night.

4.4.1 Extent

Tornadoes are considered the most violent atmospheric phenomenon on the face of the earth, with their strength being measured by the Fujita Scale. This scale is the mechanism used to determine the potential type of tornado that may have affected a particular community. It is based on velocity of wind and the type of damage the tornado caused.
The following table can be found at http://www.spc.noaa.gov/faq/tornado/f-scale.html.

Scale	Wind Estimate (MPH)	Typical Damage
F0	Less than 73	Light Damage: Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over
F1	73-112	Moderate Damage: Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads

F2	113-157	Considerable damage: Roofs torn off frame homes; mobile homes demolished, boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground
F3	158-206	Severe damage; Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown
F4	207-260	Devastating damage: Well-constructed housed leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated
F5	261-318	Incredible damage: Strong frame housed leveled off foundations and swept away; automobile-sized missiles fly though the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur

4.4.2 Historical Occurrences

Many F0 and F1 tornadoes have touched down in Ohio, but Ohio has also been struck by some of the most destructive F5 tornadoes ever, including the April 3, 1974 tornado which devastated Xenia, killing over 30 people and destroying 2,000 buildings.
Morrow County has experienced 116 tornadoes since 1965 according to NOAA-NCEI, which have caused over $33.565 million in damage as well as killing 4 persons and injuring 92 more. On average, three (3) tornadoes occur in the county every 10 years.

There have been (7) F2, (1) F3, and (0) F4 documented tornados within the county in the past 52 years including:

4/11/1965- An F2 tornado injured 22 and caused $2.5 Million in damage.
5/13/1970- An F2 tornado injured 5 and caused $2,500 in damage.
5/14/1970- An F2 tornado injured 7 and caused $250,000 in damage.
5/10/1973- An F2 tornado resulted in no death or injuries, but $2,500 in damage.
7/5/1980- An F2 tornado injured 1 person and caused $25,000 in damage.
6/13/1981- An F3 tornado killed 4, injured 56, and caused $25 million in damage.
11/15/1989- An F2 tornado resulted in no deaths or injuries, but caused $2.5 million in damage.
6/11/1990- An F2 tornado injured 1 persons and caused $2.5 million in damage.

4.4.3 Frequency/Probability of Future Occurrence

Morrow County has a significant history of tornado occurrences. According to the NOAA-NCEI, there have been 16 tornadic events recorded in the county over the past 52 years. These figures suggest that the probability of future occurrences is quite high at a 31% (16

events/52years) chance of happening in any given year, as well as the likelihood of severe damage based on significant population growth in the county.

4.5 Severe 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.

Extent

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 covered, 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.

Historical Occurrence

According to the NOAA-NCEI, Morrow County has had 33 winter storm occurrences since 1996. These storms have caused over $11.419 million in damage and two (2) injuries.
Data which supports the following chart is include in *Appendix H.*

The following chart shows a breakdown of the events in this category based on NOAA-NCEI data from 1996 to 2017.

Event Type	No of Events	$ Damage	Avg Loss per Event	Injuries	Deaths	Crop Damage Events	$ Value of Crop Damage
Blizzards	0	$0	$0	0	0	0	0
Winter Storm	19	$6.329 m	$333,105	2	0	0	0

Heavy Snow	4	$ 170,000	$ 42,500	0	0	0	0
Ice Storm	3	$4.895 m	$1.632 m	0	0	0	0
Extreme Cold/Wind Chill	4	$0	$0	0	0	0	0
Cold/Wind Chill	3	$ 25,000	$ 8,333	0	0	0	0
Totals	**33**	**$11.419m**		**2**	**0**	**0**	**$0**

Frequency/Probability of Future Occurrence

Based on the above 33 documented Severe Winter Storm events in the NOAA data base, over the past 21 years (1996-2017), the probability of future occurrences is 1.57 (33/21), or the likelihood of about 1.5 Severe Winter Storm events in any given year. The historic data also suggests that these events, while frequent, do not typically result in any significant property injury, or loss of life. Average property loss is $346,030 per event. Ice storms appear to be the most expensive event, but a single ice storm on 1/05/2007 accounted for $4.8m of the 4.895m total damages (98%).

4.6 Severe Summer Storms –Thunderstorm, Lightning, Hail

Hazards that fit into the severe weather category include thunderstorms, lightning and hail. One of the biggest problems associated with severe weather is the lack of public education and awareness. Severe storms can do damage, but are often the precursor for much more severe weather to follow. One example is the direct association of tornadoes with thunderstorms.

A severe thunderstorm warning is issued when a severe thunderstorm has been sighted or indicated by weather radar. At this point, danger is imminent and citizens should move to a safe place, turn on a battery-operated radio or television, and wait for the "all clear" by the authorities.

Severe storms are also associated with other hazards such as tornadoes and severe flooding. Since tornadoes and flash flooding are spawned by thunderstorms, people should review what action to take under a tornado warning or a flash flood warning when a "severe thunderstorm warning" is issued. When thunderstorms are forecasted to bring heavy rains (which can cause flash flooding), strong winds, hail, lightning and tornadoes, people should get inside a sturdy building and stay tuned to a battery operated radio for weather information. People should also be aware that lightning and high winds are also major threats during thunderstorms. Straight-line winds are often responsible for most of the wind damage associated with a thunderstorm. These winds are often confused with tornadoes because of similar damage and wind speeds. However, the strong and gusty winds associated with straight-line winds blow roughly in a straight line unlike the rotating winds of a tornado.

Lightning kills between 75 and 100 people a year. It is the second largest killer of natural hazard events, exceeded only by floods. Lightning strikes can happen anywhere and affect anyone. Only 10% of lightning strikes result in death, leaving the rest with various degrees of disability, most being central nervous system issues.

Hail is a type of precipitation composed of balls or irregular lumps of ice. It occurs when super cooled water droplets (remaining in a liquid state despite being below the freezing point, 0 °C/32 °F) in a storm cloud collide with some solid object, such as a dust particle or an already forming hailstone. Hail often forms in strong thunderstorms, often along a cold front, where the layer of air on top is much colder than that on the bottom. The smaller hailstones can bounce up and down between the warm and cold layers due to updrafts and gravity. The longer the stones bounce around, the larger they grow. These strong, severe, or even supercell thunderstorms can also produce hail in the summer months, even without a cold front. Hailstones, while most commonly only a few millimeters in diameter, can sometimes grow to several inches or occasionally even bigger. Such large hailstones can do serious damage, notably to automobiles, skylights, and glass-roofed structures. Pea or golf ball-size hailstones are not uncommon in severe storms. Rarely, massive hailstones have been known to cause concussions or to kill people by causing head trauma.

4.6.1 Extent

Severe storms in Morrow County quantitatively have the highest likelihood of occurring on a yearly basis. According to the NOAA-NCEI, 100 summer storm events including thunder storms, lightning, and hail were documented for Morrow County since 1950.

A severe thunderstorm watch is issued by the National Weather Service (NWS) when the weather conditions are such that damaging winds of 58 mph or more, or hail 3/4 of an inch in diameter or greater, are likely to develop. Citizens should locate a safe place in the home and tell family members to watch the sky and listen to the radio or television for more information.

Lightning kills 75-100 people a year. It is the second largest natural hazard killer, exceeded only by floods. Lightning strikes can happen anywhere and affect anyone. Only 10% of lightning strikes result in death, leaving the rest with various degrees of disability, most being central nervous system issues.

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Hail often forms in strong thunderstorms, often along a cold front, where the layer of air on top is much colder than that on the bottom. The smaller hailstones can bounce up and down between the warm and cold layers due to updrafts and gravity. The longer the stones bounce around, the larger they grow. These strong, severe, or even supercell thunderstorms can also occur in summer, even without a cold front.

Hailstones, while most commonly only a few millimeters in diameter, can sometimes grow to several inches or occasionally even bigger. Such large hailstones can do serious damage, notably to automobiles, skylights, and glass-roofed structures. Pea or golf ball-size hailstones are not uncommon in severe storms. Rarely, massive hailstones have been known to cause concussions or to kill people by causing head trauma.

4.6.2 Historical Occurrences

The following chart shows a breakdown of the events in this category based on NOAA-NCEI data from 1950 to 2017.

NOAA printouts supporting the following chart are included in *Appendix H.*

Event Type	No of Events	$ Damage	Injuries	Deaths	Crop Damage Events	$ Value of Crop Damage
Thunderstorms	108	$3.351 m	1	0	0	$0
Lightning	3	$ 35,000	1	0	0	$0
Hail	50	$ 187,000	0	0	0	$0
Totals	**161**	**$3,573,000**	**2**	**0**	**0**	**$0**

Severe summer storms in Morrow County have caused over property damage with estimated total losses of over $3,573,000 million over a 60 year period. Two (2) injuries, no deaths, and no documented crow damage resulted from these events.

While there are numerous thunderstorm events, events resulting in over $50,000 in damages, or any injuries, include:

6/24/94 County-wide $50,000 in damages
9/25/94 Sparta $50,000 in damages
5/24/95 Unionville 1 injury and $40,000 in damages
6/27/98 Mt Gilead $50,000 in damages
8/25/98 County-wide $50,000 in damages
9/20/00 Mt Gilead $75,000 in damages
7/08/03 (2 events) County-wide $100,000 in damages
5/21/04 County-wide $100,000 in damages
8/19/04 County-wide $50,000 in damages
6/29/12 Climax $2million in damages

According to the NCEI, only three (3) significant lightning events have occurred in Morrow County since 1950. On August 25, 1998, a lightning strike blew the tops off two 6,000 gallon oil tanks. Only 150 gallons spilled and a small fire was quickly extinguished. On June 24, 2000, lightning struck a 40-year old woman near the Mid-Ohio Sports Car Course. The woman was outdoors standing near a metal fence when the lightning struck. The woman sustained serious injuries and was hospitalized. In 2005, lightning struck an oil tank near Iberia causing it to explode and costing an estimated $15,000 in damages. The total cost of all three (3) events was $35,000 with one (1) injury.

According to the NCEI, 50 events relating to hail have been recorded for Morrow County since 1950. Of those events, 10 events were reported to have caused property damages, ranging from $4,000 to $50,000. Nine of the events described hail the size of quarters and one (1) incident reported golf ball size hail.

4.6.3 Frequency/Probability of Future Occurrence

Severe summer storms for Morrow County quantitatively have the highest likelihood of occurring on a yearly basis. According to the NCEI, 161 summer storm events including thunderstorms, lightning and hail were documented for Morrow County since 1950. Severe summer storms in Morrow County also have caused cumulative property and crop damage with estimated total losses of $3,573,000 million over a 67 year period, which is a yearly average of $58,328.

4.6.4 Frequency/ Probability of Occurrence

Based on 161 events over the past 67 years, the probability of future occurrences is 2.4 (161/67), or the likelihood of over two (2) events in any given year.

4.7 Flooding

Floods are a naturally recurring event for a river or stream, and are caused by weather phenomena and events that deliver more precipitation to a drainage basin that can be readily absorbed or stored within the basin. Flooding is a localized hazard that is a result of heavy or continuous rainfall exceeding the absorptive capacity of soil and the flow capacity of rivers and streams. Floods can be generally considered in two categories: flash floods, the product of heavy localized precipitation in a short time period over a given location; and riverine floods, caused by precipitation over a longer time period and over a given river basin.

Flash floods occur within a few minutes or hours of heavy amounts of rainfall, from a dam or levee failure, or from a sudden release of water held by an ice jam. Flash floods can destroy buildings and bridges, uproot trees, and scour out new drainage channels. Heavy rains that produce flash floods can also trigger mudslides. Most flash flooding is caused by slow-moving thunderstorms, repeated thunderstorms in a local area, or by heavy rains from hurricanes and tropical storms. Although flash flooding occurs often along mountain streams, it is also common in urban areas where much of the ground is covered by impervious surfaces. Roads and buildings generate greater amounts of runoff than typical forested land. Fixed drainage channels in urban areas may be unable to contain the runoff that is generated by relatively small, but intense, rainfall events.

Riverine flooding refers to periodic flooding of lands adjacent to non-tidal rivers and streams. It is a natural and inevitable occurrence. When stream flow exceeds the capacity of the normal watercourse, some of the above-normal stream flow spills over onto adjacent lands within the floodplain. Riverine flooding is a function of precipitation levels and water runoff volumes within

the watershed of the stream or river. The recurrence interval of a flood is defined as the average time interval, in years, expected to take place between the occurrence of a flood of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

Flooding is an important issue for the residents and business owners of Morrow County. Whether it was riverine flooding or flash flooding events that have occurred in the past, lives have been disrupted or lost and damage has been extensive.

Areas of special flood hazards are defined as land in a flood plain that is subjected to a 1% or greater chance of flooding in any given year. Areas of special flood hazard are designated by the Federal Emergency Management Agency (FEMA). Flood Insurance Rate Maps (FIRM) determine the Base Flood Elevation (BFE) for the areas. BFE is defined by the Morrow County Flood Plain regulations as "the water surface of the base flood in relation to a specified datum, usually the National Geodetic 14 Vertical Datum of 1929 or the North American Vertical Datum of 1988 and usually expressed in Feet Mean Sea Level (MSL)."

Morrow County has special flood hazard areas identified within the county. All unincorporated and incorporated areas in Morrow County are in compliance with state floodplain management standards and participate in the National Flood Insurance Program (NFIP). Mt. Gilead and the Village of Cardigan also participate in NFIP.

Flood Plain Maps within the county were most recently updated in 2012. The floodplain regulations related to the NFIP were reviewed and updated by the Morrow County Department of Development between 2008 and 2010, with an effective date of December 17, 2010. The Morrow County Planning and Zoning, per adopted regulations, monitors and enforces floodplain regulations for all areas of the county. This monitoring and enforcement is to ensure development does not occur in the floodplain in a way that will be a detriment to any citizen of Morrow County.

4.7.1 Repetitive Loss Properties

In most counties there are areas that periodically suffer damages from floods. 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.

According to FEMA-FPM, there are no repetitive loss properties within Morrow County. However, there are likely repetitive loss properties in Morrow County that are not reported by insurance companies because these properties are not insured.

4.7.2 Extent

Unlike flash flooding, the 100-year river flood has less likelihood of occurring, but will impact a larger population. The streams and rivers within the floodplain will flood their 100-year

floodplains on an average of once every 100 years. Newer data suggests more frequent flooding than the once per 100 year or once per 500 year events.

4.7.3 Historical Occurrence

Past floods are indications of what can happen in the future, but mitigation plans are based on the risk of future flooding. Flood studies interpret historical records to determine the statistical potential that storms and floods of certain magnitude will recur. Such events are measured by their recurrence interval. 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 100 years and 500 years. Recurrence interval addresses how often a flood of a specific depth will be expected to occur. Structures located within areas considered at higher risk should be prioritized higher as it relates to mitigation.

According to the NOAA-NCEI, Morrow County has experienced 16 flood and flash flood events since 1996. These floods have caused over $4.617million in damage, $515,000 in crop damage, and no deaths or injuries. Most of this $4.617 million ($3.472m 75.2%), was caused by flash flooding. This data is include in *Appendix H.*

The most significant recent flooding events include:

6/27/1998 Flash Flood Event 1 $1.5 million property damage, $250,000 crop damage, and no deaths or injuries
6/27/1998 Flash Flood Event 2 $1.5 million property damage, $225,000 crop damage, and no deaths or injuries
6/28/1998 Flash Flood $100,000 property damage, no deaths or injuries
8/28/2004 Flash Flood $200,000 property damage, no deaths or injuries
1/1/2005 Flood $500,000 property damage, no deaths or injuries
2/28/2011 Flood $300,000 property damage, no deaths or injuries
7/9/2013 Flood $300,000 property damage, no deaths or injuries
5/7/2002 Flood $25,000 property damage, no deaths or injuries
7/17/2001 Flash flood $1.470 million property damage, no deaths or injuries
8/17/1997 Flash flood $100,000 property damage, no deaths or injuries
6/1/1997 Flash flood $450,000 property damage, no deaths or injuries

4.7.4 HAZUS-MH Flood Risk Report of Morrow Co

The HAZUS-MH Flood Global Risk Report was conducted on October 18, 2017 and is included in this report as *Appendix E*. The finding of this report are included in Section 5 Vulnerability: Flooding.

4.7.5 Frequency/Probability of Future Occurrence

Based on 16 flood and flash flood events over the past 21 years (1996-2017), the probability of future occurrences is .76 (16/21), or the likelihood of 75% chance of a flood events in any given year.

4.7.6 Floodplain Management

Each participating community in the NFIP program has a Designated Floodplain Administrator (DFPA) that serves as the jurisdiction's Floodplain Administrator per resolution or ordinance. Each Floodplain Administrator is generally the person actively administering the floodplain management program in the community, although there may be others to assist.

The participating NFIP communities have current floodplain standards and regulations included in zoning, building codes and subdivision regulations. If necessary, special purpose regulations are adopted by formal resolution or ordinance. These codes and regulations are enforced by each jurisdiction's Floodplain Administrator who also conducts floodplain monitoring. Mitigation efforts on new and improved structures are controlled through building permits and other applications submitted to each political jurisdiction having authority over new and improved building construction covered under their individual floodplain standards and regulations.

Each of these jurisdictional regulations/ordinances meets the current NFIP requirements. None of these jurisdictions are a part of the Community Rating System (CRS).

Continued Compliance with the National Flood Insurance Program

Morrow County Communities Participating in the National Flood Program

CID	Community Name	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Reg-Emer Date
390868	Morrow County	08/04/78	04/01/92	06/02/09	04/01/92
390652	Village of Cardington	03/29/74	11/02/84	06/02/09*	11/02/84
390424	Village of Mt. Gilead	04/05/74	08/19/87	06/02/09	08/19/87

***** No Elevation Determined

Morrow County Communities Not Participating in the National Flood Program

CID	Community Name	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Sanction Date
390747	Village of Edison	04/18/75	06/02/09	06/02/09	04/18/76
390932	Village of Fulton		06/02/09	06/02/09	06/02/10
390873	Village of Marengo		06/02/09	06/02/09	06/02/10

Since Edison, Fulton, and Marengo do not have a Designated Floodplain Administrator, the Morrow County Planning Commission continues to work with these villages to encourage them to join and participate in the NFIP.

4.8 Dam Failures

A dam is an artificial barrier usually constructed across a stream channel to impound water. Timber, rock, concrete, earth, steel or a combination of these materials may be used to build the dam. In Ohio, most dams are constructed of earth. Dams must have spillway systems to safely convey normal stream and flood flows over, around, or through the dam. Spillways are commonly constructed of non-erosive materials such as concrete. Dams also have a drain or other water-withdrawal facility to control the pool or lake level and to lower or drain the lake for normal maintenance and emergency purposes.

Most dams in Ohio are small and are constructed by farmers and other private individuals for water supply, recreation, swimming and fishing. Numerous other, usually larger, dams are built by cities and industry to form reservoirs for water supply or liquefied waste storage. Ownership of dams is diverse and maintained by both public and private interests.

The federal government owns and operates over 30 dams for flood control, recreation and water supply. The state of Ohio has more than 100 dams, primarily located in-state park and wildlife areas for recreational purposes. Flood control and some water supply are provided by dams owned by watershed conservancy districts.
The oldest dams in Ohio were constructed over 150 years ago to create water supply reservoirs for a network of navigational canals. Buckeye Lake Dam, built in about 1825 as part of the canal system and located in Licking and Fairfield counties, is the oldest dam in the state. The highest dam in Ohio is located in Jefferson County and is 240 feet high.

History of Dam Safety in Ohio

Construction of dams in Ohio dates back to the early 1800 when reservoirs such as Buckeye Lake and Grand Lake St. Mary's were built to supply water to the canal system, which provided a means of transportation for agricultural trade and commerce. Dam construction continued at a modest pace for about the next 100 years with relatively few dams built by private entities. In the early part of the nineteenth century, several large municipally-owned dams and reservoirs were built for public water supply. Severe floods also prompted the formation of conservancy districts which constructed dams for flood control.

Although the true forerunner of current dam safety laws in Ohio was enacted in 1963, legislation pertaining to the construction of dams was enacted as early as 1937. This early set of laws aimed to encourage construction of dams for the storage of water in response to recent drought periods in Ohio and the "dust bowl" days on the Great Plains. The regulatory agency

responsible for the enforcement of these early laws was the Division of Conservation and Natural Resources in the State Department of Agriculture.

Due to the availability of large earthmoving equipment after World War II, Ohio saw a significant increase in the number of dams built by individuals and private companies. Although the water storage and recreational capabilities provided by these dams were important benefits, concern about the adequacy of design and construction was prompted by the loss of life and property damage resulting from dam failures, which led to a greater interest in dam safety.

The ODNR's Division of Water has been involved in dam safety since 1963. During this year, the first Ohio law requiring construction permits for building new dams was enacted. 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 Corp 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.

4.8.1 Extent

The Corps contracted with the Division of Water to inventory roughly 4,500 non-federal dams in Ohio.

According to Ohio Administrative Code Rule 1501:21-13-01, dams are classified as follows:

Class I: A dam shall be placed in Class I when failure of the dam would result in probable loss of human life. Dams having a storage volume greater than 5,000 acre-feet or a height of greater than 60 feet shall be placed in Class I.

Class II: Dams having a storage volume greater than 500 acre-feet or a height of greater than 40 feet shall be placed in Class II. A dam shall be placed in Class II when failure of the dam would result in at least one of the following conditions, but loss of human life is not envisioned:

(a) Possible health hazard, including but not limited to, loss of a public water supply or wastewater treatment facility.

(b) Probable loss of high-value property, including but not limited to, flooding of residential, commercial, industrial, publicly owned, and/or valuable agricultural structures, structural damage to downstream Class I, II, or III dams, dikes or levees, or other dams, dikes or levees of high value.

(c) Damage to major roads, including but not limited to, interstate and state highways and roads which provide the only access to residential or other critical areas such as hospitals, nursing homes or correctional facilities as determined by the Chief of ODNR's Division of Water.

(d) Damage to railroads, or public utilities.

Class III: Dams having a height of greater than 25 feet, or a storage volume of greater than 50 acre-feet, shall be placed in Class III. A dam shall be placed in Class III when failure of the dam

would result in at least one of the following conditions, but loss of human life or hazard to health is not envisioned.
(a) Property losses, including but not limited to, rural buildings not otherwise listed as high-value property in paragraph (A) of this Rule and Class IV dams, dikes and levees not otherwise listed as high value property in paragraph (A) of this Rule. At the request of the dam owner, the Chief of ODNR's Division of Water may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property.
(b) Local roads including but not limited to roads not otherwise listed as major roads in paragraph (A) of this rule.
Class IV: When failure of the dam would result in property losses restricted mainly to the dam and rural lands, and not loss of human life or hazard to health is envisioned, the dam may be placed in Class IV. Dams which are twenty-five feet or less in height and have a storage volume of fifty acre-feet or less, may be placed in Class IV. No proposed dam shall be placed in Class IV unless the applicant has submitted the preliminary design report required by Rule 1501:21-5-02 of the Administrative Code. Class IV dams are exempt from the permit requirements of Section 1521.06 of the Revised Code pursuant to paragraph (A) of Rule 1501:21-19-01 of the Administrative Code.
(www.dnr.ohio.gov/water/dsafety/whatdam.htm)
There are more than 50,000 dams identified in Ohio. A great majority of these dams are small and do not fall under the jurisdiction of Ohio's Dam Safety Laws.

According to the ODNR, Morrow County has 63 dams within its boundaries. The number of dams and their classifications are as follows:

- Class I - 4
- Class II - 9
- Class III - 4
- Total Dams 63

4.8.2 Historic Occurrence

Morrow County does not have a significant history of dam failure. The State of Ohio Dam Safety Program is in place to monitor and provide dam owners in Morrow 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. This regulation is accomplished through periodic inspection, new dam construction permits, and regulation of improvements, maintenance and operation of existing dams.

4.8.3 Frequency/Probability of Future Occurrence

The probability of future dam failure occurrences is quite 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. One reason that the County would not expect to suffer severe damage is because most of the County is sparsely populated.

With the events of the “close call” dam failure in California this past year (heavy rains following years of drought conditions), dam failure was “top-of-mind” for the Morrow Co. Planning Committee, and they have developed clear Actions to be more proactive with this potential hazard.

4.9 Excessive/Extreme Heat

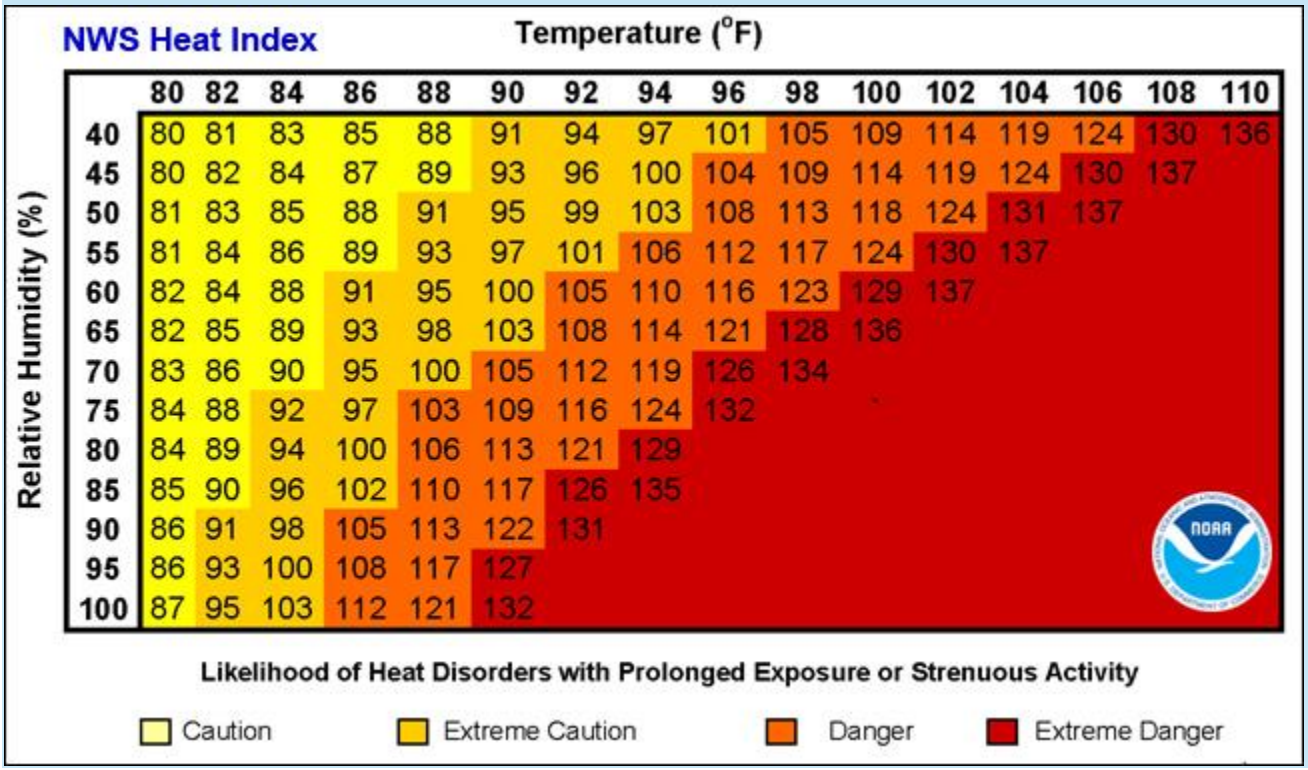
Heat-related deaths and illness are preventable yet annually many people succumb to extreme heat. Extreme heat caused 7,415 heat-related deaths in the United States from 1999 to 2010. Extreme heat kills more people than hurricanes, floods, tornadoes and lightning combined, according to the National Weather Service. In 2001, 300 deaths were caused by excessive heat exposure.

People suffer heat-related illness when their bodies are unable to compensate and properly cool themselves. The body normally cools itself by sweating. But under some conditions, sweating just isn't enough. In such cases, a person's body temperature rises rapidly. Very high body temperatures may damage the brain or other vital organs.

A number of factors affect the body's ability to cool itself during extremely hot weather. When the humidity is high, sweat will not evaporate as quickly, preventing the body from releasing heat quickly. Other conditions related to risk include age, obesity, fever, dehydration, heart disease, mental illness, poor circulation, sunburn, and prescription drug and alcohol use.

4.9.1 Extent

Because heat-related deaths are preventable, people need to be aware of who is at greatest risk and what actions can be taken to prevent a heat-related illness or death. The elderly, the very young, and people with mental illness and chronic diseases are at highest risk. However, even young and healthy individuals can succumb to heat if they participate in strenuous physical activities during hot weather. Air-conditioning is the number one protective factor against heat-related illness and death. If a home is not air-conditioned, people can reduce their risk for heat-related illness by spending time in public facilities that are air-conditioned. The following National Weather Service (NWS) Heat Index chart shows the scale of magnitude and extent of heat and humidity including “Caution”, “Extreme Caution”, “Danger” and “Extreme Danger.”



The Heat Index is a measure of how hot it really feels when relative humidity is factored in with the actual air temperature. To find the Heat Index temperature, look at the Heat Index Chart above or check our Heat Index Calculator. As an example, if the air temperature is 96°F and the relative humidity is 65%, the heat index--how hot it feels--is 121°F. The red area without numbers indicates extreme danger. The National Weather Service will initiate alert procedures when the Heat Index is expected to exceed 105°-110°F (depending on local climate) for at least 2 consecutive days.
NWS also offers a Heat Index chart for area with high heat but low relative humidity. Since heat index values were devised for shady, light wind conditions, **exposure to full sunshine can increase heat index values by up to 15°F.** Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

4.9.2 Historical Occurrence

There have been No excessive heat emergencies in Morrow Co, or damage, injuries or deaths as per the NOAA-NCEI data base. The data is included in *Appendix H.*

4.9.3 Frequency/Probability of Future Occurrence

Based on zero (0) documented heat emergency events in the NOAA-NCEI data base, over the past 67 years (1950-2017), the probability of future occurrences is 0%

Still, the Planning Committee believes that climate change impact on weather patterns could alter these historic trends in short order. This plan identifies specific actions to prepare our community for future heat emergencies. The Planning Committee assumes one (1) heat emergency event per year.

4.10 Drought

A drought is a period of abnormally dry weather that persists long enough to produce a serious hydrologic imbalance (i.e., crop damage, water supply shortage, etc.) The severity of the drought depends upon the degree of moisture deficiency, the duration and the size of the affected area. The worst drought in 50 years affected 35 states during the long, hot summer of 1988, when some areas had been suffering from lack of rainfall since 1984. Rainfall totals in 1988 throughout the mid-west, Northern Plains and the Rockies were 50% to 85% below normal. Crops and livestock died, and some areas became desert. Forest fires began over the Northwest that left 4,100,000 acres destroyed by autumn.

Droughts as a Precursor to Other Disaster

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.

Fire fighters talk of the fire triangle in terms of the heat of combustion, fuel and oxygen all being necessary for fire to occur. Wild land fire fighters are concerned with the wild land fire triangle of fuel (grass, brush, forests, crops, etc.), terrain (open flat lands, steep slopes and everything conducive to wild land fire spread) and weather (hot, dry, windy conditions are typical wild land fire weather).
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.
Morrow County has nearly 160,000 acres of farmland that could be susceptible to drought induced fires.

Urban/Rural Fire Interface

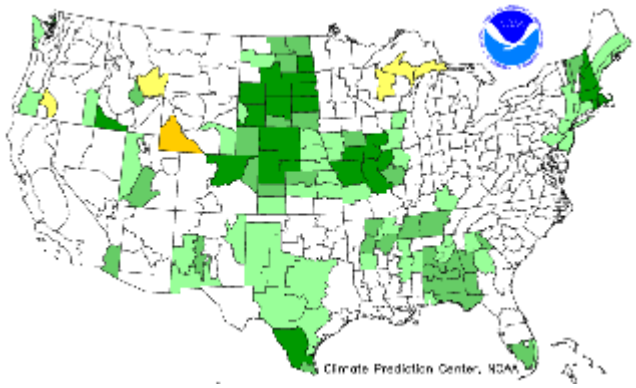
The wildland-urban interface can be defined as the zone where structures and other human developments meet or intermingle with undeveloped lands. Topography plays a major role in how fast a wildfire spreads. Steep slopes are the greatest topographical influence on fire behavior. As the steepness of a slope increases, fires spread more quickly. A fire will spread twice as fast on a 30% slope than it will on level ground. This fast speed is due to the fact that a fire starting at the bottom of a slope has a longer upslope run with more available fuel in its path. Unlike most hazards, the threat of a drought tends to be dismissed because of the relatively long time a drought takes to have damaging effects.

4.10.1 Extent

NOAA considers drought one of the most costly weather related events. Their website, www.drought.gov , indicates that the 37 years from 1980 to 2017, the US had nine (9) major drought events, each reaching or exceeding $1 billion in damages (mostly crop related). Injury and death are not prevalent in these events.

To measure the scale of magnitude for drought, the Palmer Drought Severity Index (PDSI) is a good tool. It provides a 10 point classification scale based on an algorithm using the factors of temperature, precipitation, and soil moisture content (Available Water Content-AWC).

The Palmer Drought Severity Index (PDSI)



4.0 or more	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

PDSI Classifications

The Palmer Drought Severity Index (PDSI) has been used the longest for monitoring drought.

The PDSI allows for a categorization of various levels of wetness and dryness that are prominent over an area. Palmer values may lag emerging droughts by several months; are less well suited for mountainous land or areas of frequent climatic extremes; and are complex.

4.10.2 Historical Occurrence

According to the NOAA-NCEI (*Appendix H)* Morrow County has experienced five (5) droughts of significance since 1999 (past 18 years), with no recorded deaths or injuries. These drought events include:

8/1/1996 Drought which caused no reported property or crop damage, loss of life or injury
6/1/1999 Drought which caused no reported property or crop damage, loss of life or injury
7/1/1999 Drought which caused no reported property or crop damage, loss of life or injury
8/1/1999 Drought which caused no reported property or crop damage, loss of life or injury
9/1/1999 Drought which caused no reported property or loss of life or injury. $5 million crop damage was reported.

4.10.3 Frequency/Probability of Future Occurrence

The odds of future occurrences based on this information are very minimal. As we group the 6/1/99 to 9/1/99 records as one event, the probability of a future Drought is .11 (2/18 years) of a drought occurring in any given year.

Still, with the impact of Climate Change being so unpredictable, the Morrow Co. Core Group Committee considered drought a real concern to include in this plan, and be better prepared for in the future.

5.0

Vulnerability Assessment

5.0 VULNERABILITY ASSESSMENT

Morrow 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 Morrow County has close to 36,000 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 the Village of Mount Gilead.

This chapter reviews how vulnerable Morrow County is to property damage and threats to public health and safety. This chapter also reviews how hazards may have an adverse impact on the economy. The potential for property damage is measured in dollars based on historical events of the past and damage incurred from those events.

A four-step process was followed to estimate the cost to Morrow County of the hazards reviewed in the Hazard Profile section (Section 4.0) of this report. This process was documented on a per hazard basis. The steps that were used are as follows:

Step 1: Inventory critical facilities and structures susceptible to property damage.
Step 2: Determine potential dollars lost based on various levels of damage on different categories of structures.
Step 3: Evaluate the impact on infrastructure and general population.
Step 4: Evaluate property damage, loss of life and economic losses.

5.1 Critical Facilities

During the initial planning phase, members of the Planning Committee from each of the communities were asked to compile a list of critical facilities pertaining to their community. Please refer to Appendix G for a complete list of these critical facilities. The facilities identified by the Planning Committee continue to be considered as "critical" as verified by the Plan Update Group.

Table 5-1
Critical Facilities in Planning Area

Property	Count
Utilities	4
Water Plants	2
Wastewater Plants	4
Medical Facilities	1
Emergency Services	8
Schools	15
Nursing Homes/Senior Facilities	4
Municipal/Government	8
Places of Assembly	6
Airport	1
Total Critical Facilities	53

5.2 Potential Dollars Lost

The second step of the vulnerability assessment during the initial planning phase was to calculate the impact of the given hazards in terms of property damage and loss of their use. Averages and typical situations were used. This approach does not predict which facilities will be hit by which hazard, but it does provide a general estimate of the level of damage that would be expected based upon available data.

First, the value of the property being damaged was determined based on average value of a facility within that category. Typical values of the structures were determined using data received from the County Auditor's Office.

Contents value was calculated as a percentage of the structure's value. The Table 5-2 shows the relative value of the typical contents to the typical structure type. These ratios were taken from FEMA guidance documents. These values continue to be valid considerations as concurred by the Planning Committee.

Table 5-2
Contents Value as a Percentage of Structure Value

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

Second, three levels of physical damage were evaluated for each category of structure. These levels have a percentage of damage associated with each. The dollars lost for each level, however, may be underestimated since there may be some downtime associated with closing a business for an extended period of time.

- **Minor damage:** Many structures exposed to a storm or other hazard will suffer only minor to moderate damage. For example, a hurricane may just damage the roof and windows of some structures. For this calculation, 5% of the structure's value was used. Because the structure stays substantially intact, no contents losses were considered.

- **Moderate damage:** This category represents more serious damage, such as a collapsed wall or floodwater over the first floor of a building. Moderate damage is calculated as 40% of the structure's value plus 40% of the content's value.

- **Major damage:** This category is used when a building is demolished or heavily damaged. An example of the former is a house leveled by a tornado. An example of the latter is floodwater more than 1.5 feet over the lowest floor (i.e., over the electrical outlets). The average dollar figure for this category is 75% of the structure's value and 75% of the contents' value.

Table 5-3 shows the calculated dollar losses for each level of damage per facility type. The type of facility as listed was limited to that information available from the County Auditor's Office. The County's Auditor felt the appraisal values were too low for this estimate. Therefore, the Auditor contacted each of the different type of entities to retrieve insured structure values, which were then used to determine potential dollar losses.

Table 5-3
Physical Potential Dollar Losses

Property	# Units	Average Value	Minor Damage	Moderate Damage	Major Damage
Residential	14,085	$150,000	$7,500	$90,000	$168,750
Commercial	375	$180,000	$9,000	$144,000	$270,000
Medical (Nursing Homes/Private Hospitals)	4	$18,500,000	$925,000	$18,500,000	$34,687,500
Emergency Facilities (Police, Fire Stations)	9	$900,000	$45,000	$900,000	$1,687,500
General Government (Municipal buildings, town halls, etc.)	9	$7,250,000	$362,500	$5,800,000	$10,875,000
Schools/Libraries	18	$1,100,000	$55,000	$880,000	$1,650,000

5.3 Vulnerability Data Collection

Prior to beginning the initial assessment of a community's vulnerability to hazards, local sources of information were researched including comprehensive plans, land use plans, land development regulations and flood regulations, to determine if a county previously addressed its vulnerability to any particular hazard. In most cases, local plans and regulations did not yet exist or were very minimal in addressing natural hazard situations and building parameters.

Therefore, other state and national sources of detailed information were used. One of these resources was the National Center for Environmental Information (NCEI) formally the National Climatic Data Center (NCDC). The NCEI is the world's largest active archive of weather data. The NCEI produces numerous climate publications and responds to data requests from all over the world. The NCDC (and its predecessor NCDC) has long served the Nation as a national resource for climate information. The NCEI's data is used to address issues that span the breadth of this Nation's interests. As climate knows no boundaries, the NCEI works closely with scientists and researchers world-wide to develop both national and global data sets that have been used by both government and the private sector to maximize the resource provided by our climate and minimize the risks of climate variability and weather extremes. The NCEI's climate data have been used in a variety of applications including agriculture, air quality, construction, education, energy, engineering, forestry, health, insurance, landscape design, livestock management, manufacturing, recreation and tourism, retailing, transportation, and water resources management among other areas. The NCEI's data and products fulfill needs ranging from building codes to power plant and space shuttle design.

Because the state and national agencies are not always privy to the local knowledge, some information extracted from their libraries may not be comprehensive or complete. Therefore, the Plan Update Committee utilized the resources described above as well as their experience and knowledge with verification from the local EMA directors to prioritize the hazards determined to affect the county the most and assess them according to local concerns.

5.4 Vulnerability Assessment by Hazard

5.4.1 Wind Events

As noted in the Hazard Profile, Morrow Co has a high incidence of Wind Events. From 1996 to 2017, there were 27 events in the County causing $3,615,000 in property damage and $800,000 in crop damage. The County has rated Wind Damage as its top priority.

5.4.1.1 Infrastructure Impact

Because Wind Events are random in nature, no one area of the County is more susceptible to infrastructure damage than another area. Since the occurrence of strong and high winds is fairly high within Morrow County, the effect on the infrastructure can be great, given the density of development within any effected area. Trees may become uprooted, limbs detached and blown into structures and structures may be completely destroyed.

Wind Events	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Infrastructure Impact	53	3 units	21 units	40 units
		$4.5m	$36.36m	$68.175

*Property and Contents

5.4.1.2 Population Impact

Because Wind Events can occur countywide or in a specific location, the entire County population is susceptible and should be prepared. The sensitive populations will be the most susceptible to high and strong winds and should prepare for such events, by knowing where to seek immediate shelter.

5.4.1.3 Property Damage

According to the NCDC, there have been 27 Wind Events in Morrow County reported since 1996, with total property losses of $3.615 million. The worst property damage losses were recorded in the years 2000, 2002, 2008, 2009 and 2014. The average loss for each of these five (5) years was $790,000.

Wind Events	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Residential Property Impact	14,085 units	704 units	5,634 units	10,564 units
		$800,000	$76,827,000	$ 269,697,000

*Property and Contents

5.4.1.4 Loss of Life

Wind Events have not resulted in any injuries or loss of life, as reported in the NOAA-NCEI data from 1996-2017.

5.4.1.5 Economic Losses

The economic losses a community suffers during a Wind Event can be significant, but usually the impact is for a few days or weeks. Residents and business owners can focus pretty quickly on cleanup during Wind Events. If power lines are effected, prolonged power outages may cause some businesses to close for an extended period of time leading to loss of revenue. In communities with hazard trees, these trees have the potential to damage homes and businesses if branches crack off and fall.

Wind Events	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Commercial/Industrial Property Impact	375	19 units	150 units	281 units
		$171,000	$21,600,000	$75,870,000

*Property and Contents

Prioritization Rankings
Wind Events within Morrow County received the following priority rankings during the HIRA assessment:

Probability of Occurrence: 1.5
Anticipated Impact: .9
Anticipated Geographic Extent: 1
Warning Time: .4
Duration: .25
Calculated Risk Factor: 4.05

5.4.2 Tornadoes

As determined by the Planning Group, Morrow County has a moderate to low risk of incurring damage from tornadoes. See *Appendix H* for the tables extracted from the NCEI that show the number of reported events since 1950.

5.4.2.1 Infrastructure Impact

Because tornadoes are random in nature, no one area of a county is more susceptible to infrastructure damage than another. In Morrow County, the occurrence of tornadoes is moderate with eight (8) F-2 or F-3 events occurring since 1965. Since the occurrence of tornadoes is moderate, the effect on the infrastructure will also be moderate with many houses or businesses needing some type of repair. On occasion, a structure may be destroyed completely but a high frequency of this extent of damage will not be expected.

Tornadoes	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Infrastructure Impact	53	3 units	21 units	40 units
		$4.5m	$36.36m	$68.175m

*Property and Contents

5.4.2.2 Population Impact

Tornado occurrences are random in nature. Therefore, the entire Morrow County population is susceptible and should be prepared. The populations located in mobile home parks and camp grounds should take particular care to seek adequate permanent shelter with approaching severe weather.

Since tornadoes typically present localized hazards, several homes may need repair, but typically homeowners will have insurance to cover these expenses will not suffer long term financial hardship.

5.4.2.3 Property Damage

According to the NCEI, there have been 16 tornadoes in Morrow County reported since 1965 with magnitudes ranging from EF0 to EF3. These tornadoes caused total property losses of $33.565 million. However, this total included the 1981 EF3 tornado that completely destroyed the Village of Cardington, causing $25.0 million in property damage. The average loss for the other 15 recorded events from 1965 to 1996 was $649,231.

With the exceptions of the years 1965 ($2.5 million in damage), 1981 ($25.0 million in damage), 1989 ($2.5 million in damage) and 1990 (2.5 million in damage),the County has not seen many property damaging on an annual basis. Since the most recent tornado that caused any property damage hit the County in 1990 there is a low impact relative to property damage.

Tornadoes	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Residential Property Impact	14,085	704 units	5,634 units	10,564 units
		$800,000	$76,827,000	$269,697,000

*Property and Contents

5.4.2.4 Loss of Life

Since 1965, there have been 92 injuries and four (4) recorded deaths due to tornadoes. Twenty-two injuries occurred during an EF2 tornado that struck Morrow County in 1965. In addition, 56 injuries and four deaths occurred as a result of an EF3 tornado that struck the County in 1981. Because only six (6) of the 16 tornadoes that have struck the County caused injury or death, the potential for injury and death is moderate. Since the population of the County is forecasted to slightly increase, the potential for injury and/or loss of life will also slightly increase. One of the biggest problems associated with tornadoes is the lack of public education and awareness, especially since tornadoes do not happen that frequently. Citizens are not aware of the warnings and dangers associated with severe weather and tornadoes and thus may not be prepared.

5.4.2.5 Economic Losses

Due to the infrequency of tornado events in Morrow County, the overall impact on the economy is moderately low. However, Morrow County sustained major damage from four (4) of the recorded events. Thus, the overall economic impact may be considered moderate. If a tornado were to touch down, the majority of the economic losses would be localized versus countywide. It is very unlikely that a Presidential Disaster Declaration would occur, therefore the all clean-up costs would be funded locally. If a Presidential Disaster Declaration is granted to the County, federal money may not cover the entire amount of damage. Therefore, the County and local governments must find the additional money needed to complete the clean-up process. Morrow County has only been included in a Presidential Disaster Declaration for two tornadoes that hit in 1965 and 1981.

Tornadoes	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Commercial/Industrial Property Impact	375	19 units	150 units	281 units
		$171,000	$21,600,000	$75,870,000

*Property and Contents

Prioritization Rankings
Tornadoes within Morrow County received the following priority rankings during the HIRA assessment:

Probability of Occurrence: .9
Anticipated Impact: 1.2
Anticipated Geographic Extent: .6
Warning Time: .4
Duration: .4
Calculated Risk Factor: 3.5

5.4.3 Severe Winter Storms

Morrow County is located in the north central portion of the State on the southern edge of the "snow belt" making it moderately to highly susceptible to winter storms, which encompass Blizzards, Ice Storms and extremely cold temperatures. See *Appendix H* for the tables extracted from the NCEI that show the number of reported events since 1996.

5.4.1.1 Infrastructure Impact

Because the area receives a moderate to large amount of snowfall, all of the structures erected in Morrow County are susceptible to damage if not designed to the proper snow loading parameters.

Severe Winter Storms	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Infrastructure Impact	53	3 units	21 units	40 units
		$4.5m	$36.36m	$68.175m

*Property and Contents

5.4.1.2 Population Impact

Because winter storms occur countywide, the entire County population is susceptible and should be prepared. The sensitive populations will be the most susceptible to the deep snows and extreme temperatures and should prepare for such events prior to the winter months.

Motorists should be aware of declared snow emergencies and seek safety before becoming stranded. Residents may become trapped in their homes, without utilities or other services. One village within Morrow County is especially susceptible to the effects of heavy snow. During a winter storm, the Village of Fulton has only one main route and needs an alternate route because it is impossible for residents to get the medical attention and supplies needed to survive due to roadway blockage.

5.4.1.5 Property Damage

According to the NCEI, there have been 33 winter storm events, including extreme cold, in Morrow County reported since 1996, with total property losses of $11.419 million. The average loss for each of these 33 events was $346,030. From 1996 to 2017, there were seven (7) extreme cold temperature events that caused $4.4 million in property damage. The year 1996 proved to be the most costly regarding cold temperatures, with losses totaling $3.4 million.

Severe Winter Storms	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Residential Property Impact	14,085	704 units	5,634 units	10,564 units
		$800,000	$76,827,000	$269,697,000

*Property and Contents

5.4.1.6 Loss of Life

Since 1996, there have been NO recorded deaths and two (2) recorded injuries due to severe winter storms and extremely cold temperatures. Due to the number of winter events affecting Morrow County and being located along the “snow belt”, the potential for death and injury is high. Since the population of the County is forecasted to slightly increase, the potential for injury and/or loss of life will also slightly increase. One of the biggest problems associated with winter storms and extreme cold is the lack of public education and awareness. Citizens are not aware of the warnings and dangers associated with severe weather, such as driving on ice and snow and medical conditions relative to frost bite and hypothermia.

5.4.1.5 Economic Losses

The economic losses a community suffers during a Severe Winter Storm is high. Residents and business owners turn their efforts from work and running a business to digging themselves out of the snow. If power lines become burdened with snow and snap, prolonged power outages may cause some businesses to close for an extended period of time leading to loss of revenue. In

communities with hazard trees, these trees have the potential to damage homes and businesses if branches loaded with snow crack off and fall.

Residents often cannot rely on federal assistance for the total damages incurred. Since January 1, 1964, the President of the United States has declared Morrow County a federal disaster area on only two (2) occasions due to damage suffered by winter storms. If a Presidential Disaster Declaration is granted to the County, federal money may not cover the entire amount of damage. Therefore, the County and local governments must find the additional money needed to complete the clean-up process.

Severe Winter Storms	# Units	5% of Units Minor Damage*	40% of Units Moderate Damage*	75% of Units Major Damage*
Commercial/Industrial Property Impact	375	19 units	150 units	281 units
		$171,000	$21,600,000	$75,870,000

*Property and Contents

Prioritization Rankings
Severe Winter Storms within Morrow County received the following priority rankings during the HIRA assessment:

Probability of Occurrence: 3.5
Anticipated Impact: .9
Anticipated Geographic Extent: 1
Warning Time: .25
Duration: .3
Calculated Risk Factor: 3.45

5.4.2 Severe Summer Storms

Morrow County is highly susceptible to severe storms, which encompass thunderstorms, lightning, and hail. See *Appendix H* for the tables extracted from the NCEI that show the number of reported events since 1950.

5.4.2.1 Infrastructure Impacts

Since severe summer storms are random in nature, the impact on Morrow County's infrastructure is not limited to a certain area as with river flooding. Homes and businesses all throughout the County are susceptible to thunderstorms, lightning and hail. Shingles are blown from rooftops and hail may dent siding or break windows. Lightning strikes may be more damaging to structures that are not grounded with lightning rods. Trees may become uprooted and limbs detached and blown into structures. Winds also cause severe damage to mobile home parks and camp grounds if units are not properly tied down.

Utilities and municipal plants may also be damaged during severe storms. Debris, such as tree limbs, blown into utility lines may cause downed power lines. Wastewater plants may also be adversely affected with blown limbs and debris clogging the tanks and filters.

Severe Summer Storms	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Infrastructure Impact		3 units	21 units	40 units
		$4.5m	$36.36m	$68.175m

*Property and Contents

5.4.2.2 Population Impacts

Because severe storms are random in nature, the entire Morrow County population is susceptible and should be prepared. The populations located in mobile home parks and campgrounds should take particular care to seek adequate shelter with approaching severe weather. Since 1950, there have been No deaths and only two (2) injuries resulting from Severe Summer Storms.

5.4.2.3 Property Damage

According to the NCEI, there have been 161 severe storm events in Morrow County reported since 1958, with total property losses totaling $3.573 million and NO crop damage. There have been 10 Severe Summer Storm events from 1994 to 2017 which resulted in $50,000 or more in damages. The greatest of these was the 2012 Climax event, which resulted in $2 million in damages.

Severe Summer Storms	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Residential Property Impact	14,085	704 units	5,634 units	10,564 units
		$800,000	$76,827,000	$269,697,000

*Property and Contents

5.4.2.4 Loss of Life

Since 1950, there have been two (2) recorded injuries and NO deaths due to severe summer storms. Due to the severity of the storms affecting Morrow County, the potential for death and injury is moderate. One of the biggest problems associated with severe summer storms is the lack of public education and awareness. Citizens are not aware of the warnings and dangers associated with severe weather.

5.4.2.5 Economic Losses

The economic losses a community suffers during a severe summer storm event can be high. In communities with hazard trees, these trees have the potential to destroy homes and businesses

if uprooted. Fallen branches may also cause severe damage. Residents and business owners then turn their efforts from work and running a business to clean up efforts.

With the insured house value at $150,000, damage costs from storms would accumulate quickly. Residents often cannot rely on federal assistance for the total damages incurred.. If a Presidential Disaster Declaration is granted to the County, federal money may not cover the entire amount of damage. Therefore, the County and local governments must find the additional money needed to complete the cleanup process.

Severe Summer Storms	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Commercial/Industrial Property Impact	375	19 units	150 units	281 units
		$171,000	$21,600,000	$75,870,000

*Property and Contents

Prioritization Rankings
Severe Summer Storms within Morrow County received the following priority rankings during the HIRA assessment:

Probability of Occurrence: 1.2
Anticipated Impact: 1.05
Anticipated Geographic Extent: .6
Warning Time: .3
Duration: .25
Calculated Risk Factor: 3.4

5.4.5 Flooding

Flooding is a site specific hazard. Therefore, floodplains are an important planning consideration. A floodplain is any land area susceptible to inundation by floodwaters from any surface water source. Floodplains are measured in terms of the amount of storm water that it takes to cover a given area of land. These storm events are measured in frequency of occurrence, such as 5-year, 100-year and 500-year, with the standard measurement being the 100-year storm or floodplain. The 100-year floodplain is the land area having a 1 in 100 chance of flooding in any given year, but the statistics can be misleading. In reality, the 100-year storm or flood could occur two, three, or several years in a row (unlikely but possible), because the 100-year flood is a statistical probability and not a predictable recurrence. Statistically, the 100-year flood has a 25% chance of occurring during the typical 30-year lifespan of a home mortgage.

Any development within floodplains can impact the direction, flow and level of the watercourse during periods of high water or flooding. In other words, if fill material is placed or a house constructed in a floodplain, it will alter the boundaries of the floodplain downstream of that area. This alteration happens because structures or fill utilize valuable space that would otherwise act as a natural retaining area for floodwaters to spread and slow. Not only does development in the floodplain increase dangers downstream, developments within the floodplain are at higher risk of

damage due to flooding. This damage includes fill material and debris from destroyed structures upstream colliding with structures in the floodplain downstream of an affected area. Many bridges are washed out in floods because river borne debris clog their free-flow area.

Infrastructure Impact

Based on the Morrow Co HAZUS-MH Flood Risk Report (see *Appendix E*) conducted on 10/18/17, Essential Facilities Exposure to damage is shown on the following table.

Classification	Total	At Least/Moderate	At Least/Substantial	Loss of Use
Fire Stations	4	0	0	0
Hospitals	1	0	0	0
Police Stations	4	0	0	0
Schools	18	0	1	0

HAZUS-MH Expected Damage to Essential Facilities, Morrow Co Ohio Table 5

Population Impact

Based on the NCEI data published from 1996 through June 2017 time period, Morrow County's citizens have had to endure 16 flooding situations, including flash floods and river floods. Flash floods affect a specific area over a short period of time and a smaller population than river floods. On occasion, a life may be lost because of water rising very quickly in this short time. Unlike flash flooding, the 100-year river flood has a less likelihood of occurring but will impact a larger population. The streams and rivers within the floodplain will flood their 100-year floodplains on and average of once every 100 years. The populations occupying at-risk structures located in the floodplain shown on the Multi-hazard Map will be affected by this flood. The HAZUS-HM assessment concluded that up to 80 people will seek temporary shelter in public shelters, and that 184 households will be displaced by flooding

Property Damage

Based on information retrieved from the NCEI river flooding in Morrow County has accounted for $4.617 million in damages from 1996 through 2017. The most significant events occurred in June 1998 where flooding accounted for $3.1 million in damages throughout the county. 75.2% of all flood related damages were caused by Flash Flooding.

Based on the Morrow Co HAZUS-MH Flood Risk Report (see *Appendix E*), there are approximately eight (8) total structures considered to be at-risk, representing 85% of the total number of buildings in the HAZUS scenario. It was also estimated that NO buildings will be completely destroyed by flooding.

The HAZUS-MH assessment concludes that $634,792 of buildings are exposed by Morrow Co flooding as shown on the following chart.

Occupancy	Exposure ($1,000) Study Region	Percent of Total
Residential	506,436	79.8%
Commercial	46,290	7.3%
Industrial	58,915	9.3%
Agricultural	4,113	0.6%
Religion	9,830	1.5%
Government	5,583	0.9%
Education	3,625	0.6%
Total	**634,792**	**100%**

HAZUS-MH Building Loss Exposure, Morrow Co Ohio Table 1 and 2

Based on past damages of events, a flood is likely to cause **minor property damage** in Morrow County.

Loss of Life
The NCEI has NO death or injuries occurring due to flooding within the county. During flash floods, water rises very quickly and may catch citizens by surprise. Homeowner's may not be prepared for the rising waters and the need to seek safety quickly. Motorists often think that they can drive through ponded water and risk getting stuck in the flooded area. Due to the frequency of flash flooding in Morrow County, the risk to human life is high but can be reduced by educating the County's residents.

Economic Loss
The economic losses a community suffers during a flood event can be high. Productivity decreases as residents miss work to tend to the damage incurred at their homes. Some inventory within a business itself may be lost if the owner was not prepared and the facility not flood proofed prior to a flood event. Small businesses may suffer so much damage that they are unable to reopen. Contractors and clean up companies may reap the benefits of the damage but not enough to offset the overall losses to the economy.

Based on the Morrow Co HAZUS-MH Flood Risk Report (see *Appendix E*), the following table shows the potential Build and Business interruption losses associated with the calculated scenario (millions of dollars).

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	5.79	0.82	0.29	0.26	7.16
	Contents	2.52	2.02	0.62	1.24	6.40
	Inventory	0	0.03	0.09	0.02	0.15
	Subtotal	**8.31**	**2.87**	**1.0**	**1.52**	**13.71**

Business Interruption						
	Income	0	0.01	0	0	0.02
	Relocation	0	0	0	0	0.01
	Rental Income	0	0	0	0	0
	Wage	0	0.01	0	0.03	0.03
	Subtotal	**0**	**0.02**	**0**	**0.03**	**0.06**
	Total	**8.31**	**2.89**	**1.0**	**1.55**	**13.76**

HAZUS-MH Building/Business Interruption Loss Exposure, Morrow Co Ohio Table 6

Based on past damages of events, a flood is likely to cause **minimal economic losses** in Morrow County.

Prioritization Rankings
Flooding within Morrow County received the following priority rankings during the HIRA assessment:

Probability of Occurrence: 1.2
Anticipated Impact: .9
Anticipated Geographic Extent: .6
Warning Time: .3
Duration: .3
Calculated Risk Factor: 3.3

5.4.6 Dam Failure

Dam failure is a new hazard identified in the plan, which requires proactive measures to protect property and loss of life in Morrow Co. The County has 63 total ODNR registered dams.

Infrastructure Impact
Inundation areas below the dams are most at risk for infrastructure damage. This plan identifies the need to study and quantify this risk.

Population Impact
As above, the inundation areas present the highest risk for loss of life. As some notice will be likely of a pending dam failure, the plan includes the development of evacuation plans and increased public awareness regarding inundation zones.

Property Damage
Property damage could be significant in the inundation zones in the event of a dam failure. The County will study and quantify these risks over the next few years.

Given the defined geographic nature of dam failure caused property damage, such an event is likely to cause **minor property damage** in Morrow County.

Loss of Life
Given the anticipated lead time proceeding any potential dam failure, residents should be able to safely evacuate. Potential Loss of life is considered minimal given these conditions.

Economic Losses
Until the inundation zones are studied and quantified, there is no rational way to quantify the potential property damage or economic impact of a specific dam failure. Over the next few years, this data should be available for such calculations and risk assessments.

Again, given the defined geographic nature of dam failures, such an event would likely cause **minor economic losses** in Morrow County.

Prioritization Rankings
Dam Failure within Morrow County received the following priority rankings during the HIRA assessment:

Probability of Occurrence: .3
Anticipated Impact: 1.2
Anticipated Geographic Extent: .8
Warning Time: .4
Duration: .3
Calculated Risk Factor: 3.0

5.4.7 Excessive/Extreme Heat

Heat-related deaths and illness are preventable yet annually many people succumb to extreme heat. Extreme heat caused 7,415 heat-related deaths in the United States from 1999 to 2010. Extreme heat kills more people than hurricanes, floods, tornadoes and lightning combined, according to the National Weather Service. In 2001, 300 deaths were caused by excessive heat exposure.

Infrastructure Impact
While excessive heat may cause some softening of asphalt roadways, the real infrastructure threat is overheating of critical facilities, including motors at water and sewer plants, and electrical generation/distribution facilities. Such system failures will cause broad impact across the population effected. Potential loss of water and electricity (AC) could result.

Population Impact
Heat emergencies will most dramatically impact vulnerable populations, including the elderly**.** Because heat-related deaths are preventable, people need to be aware of who is at greatest risk and what actions can be taken to prevent a heat-related illness or death. The elderly, the very young, and people with mental illness and chronic diseases are at highest risk. However, even young and healthy individuals can succumb to heat if they participate in strenuous physical activities during hot weather. Air-conditioning is the number one protective factor against heat-related illness and death. If a home is not air-conditioned, people can reduce their risk for heat-related illness by spending time in public facilities that are air-conditioned. The loss of electricity and limited potable water create the greatest threats to the population during a heat emergency.

Property Impact
The most likely impact on property will be on crop production. Extreme heat can ruin crops, or deprive them of the water they need. There could also be spoilage of food and goods that require refrigeration, if electrical service is interrupted. Residential, commercial and industrial property will see minimal impact from heat emergencies.
Based on past damages of events, a heat emergency is likely to cause **minor property damage** in Morrow County.

Loss of Life
Again, vulnerable populations, particularly the elderly, could be dramatically impacted by a heat emergency including death. This Hazard Mitigation plan addresses preparation planning to reduce the likelihood of such an outcome.

Economic Loss
Heat emergencies can cause work slowdowns, crop damage and spoilage of refrigerated goods. As such an event would likely be county wide, the following chart attempts to quantify these potential losses.

Heat Emergencies	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Agricultural Property Impact	1990 units (farms)	96 units	796 units	1,493 units
		$497,280	$32,988,628	$116,013,565

*Contents only

Based on past damages of events, a heat emergency is likely to cause **minor economic losses** in Morrow County.

Prioritization Rankings
Excessive Heat within Morrow County received the following priority rankings during the HIRA assessment:

Probability of Occurrence: .3
Anticipated Impact: .9
Anticipated Geographic Extent: 1
Warning Time: .1
Duration: .3
Calculated Risk Factor: 2.6

5.4.8 Drought

As seen in the hazard profile and as determined by the Planning Committee, Morrow County has a low risk of incurring damage from droughts. Due to the non-site specific nature of this hazard, the best way to deal with preparing for future events is to consider historical occurrences. This information was obtained from the NCEI, and is shown in *Appendix H*.

5.4.5.1 Infrastructure Impact

Because droughts are non-site specific hazards, the effects of a drought should be evaluated countywide. By themselves, droughts and temperature extremes do not damage developed property. However, over the long run, certain soils can expand and contract resulting in some 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 Morrow County's infrastructure will be very low.

5.4.5.2 Population Impact

Since droughts are non-site specific, the entire Morrow County population could be affected by the hot, dry conditions. The overall impact that droughts and extreme heat have on the County population is very low since only five (5) events have been recorded by the NCEI. These events spanned several months in only three separate years. However, many communities throughout the County depend on wells for their water supply. These communities need to be more aware of the potential for their water supply to be disrupted. In addition, the County residents, especially the sensitive populations, should still be aware of the dangers of extreme heat, such as heat exhaustion and heat stroke.

5.4.5.3 Property Damage

According to the NCEI, there have been five (5) droughts in Morrow County reported since 1999. The drought of 1999 was the most significant drought, lasting four months. However, no recorded property or crop damage, or death or injuries have ever been reported in Morrow County, as a result of drought conditions.

With Morrow County being a farming community, there is potential for crop damage due to droughts. However, this potential is low based on the number of drought occurrences in the County.

Other than agricultural losses calculated below under economic impact, no residential property damages are likely to be caused by drought.

5.4.5.4 Loss of Life

Since 1993, there have been 18 recorded deaths and 75 injuries due to extreme heat in northern Ohio. Because the number of deaths and injuries occurred only in one year, 1995, Morrow County's overall potential for death and injury is low. Citizens still need to be educated on the dangers of extreme heat. Because drought conditions are not prominent, citizens tend to not be aware of the warnings and dangers associated with conditions like heat exhaustion and heat stroke and thus may not be prepared.

5.4.5.5 Economic Losses

Due to the infrequency of drought and extreme temperature events in Morrow County, the overall impact on the economy is very low. However, if a drought does occur, the economic losses would be countywide hitting the farming community the hardest. It is very unlikely that a Presidential Disaster Declaration would occur, therefore the all mitigation costs would be funded locally.

Drought	**# Units**	**5% of Units Minor Damage***	**40% of Units Moderate Damage***	**75% of Units Major Damage***
Agricultural Property Impact	1990 units (farms)	96 units	796 units	1,493 units
		$497,280	$32,988,628	$116,013,565

Prioritization Rankings
Drought within Morrow County received the following priority rankings during the HIRA assessment:

Probability of Occurrence: .9
Anticipated Impact: .3
Anticipated Geographic Extent: 1
Warning Time: .1
Duration: .1
Calculated Risk Factor: 2.4

6.0

Goals

6.0 GOALS
Morrow County Mitigation Action Plan Matrix

The following chart shows the nine (9) Goals, and 25 Action Items which are intended to address and mitigate the loss of property and life as a result of Natural Hazards in Morrow County over the next five (5) years (2018-2022).

Action Plan Prioritization: The Planning Committee established these Action Items by reviewing historic data, reviewing the prior Plan, and by adding their own expertise into the decision making. The top 20 priorities in this plan were identified by the Planning Committee and are shown on the plan. Actions were determined by the Planning Committee to have the greatest impact preventing the loss of life and property.

Key: Were "ALL" is noted under Targeted Jurisdictions and Comments, "ALL" represents the following jurisdictions in Morrow County OH:

1. Village of Cardington	9. Canaan Township	17. North Bloomfield Township
2. Village of Chesterville	10. Cardington Township	18. Perry Township
3. Village of Edison	11. Chester Township	19. Peru Township
4. Village of Fulton	12. Congress Township	20. South Bloomfield Township
5. Village of Marengo	13. Franklin Township	21. Troy Township
6. Village of Mount Gilead	14. Gilead Township	22. Washington Township
7. Village of Sparta	15. Harmony Township	23. Westfield Township
8. Benninton Township	16. Lincoln Township	

Goal	Priority	Action Item	Start/End Dates	Responsible Party (key)	Resources	Target Jurisdiction and Comments	Status
1. ALL Hazards: **1.1 Reduce health and safety risks during future natural disasters**	**12**	**1.1.1 Emergency Notification:** **Investigate new public notification options including media, social media, property tax and utility billing insets**	June 2018/ Dec 2018 Then one (1) outreach event every spring	MCEMA County IT Local utility companies	Existing Budget	ALL	
	1	**1.1.2 Secure Emergency Generators for critical priority locations**	Jan 2019/ Dec 2022	MCEMA	FEMA, CDBG, OEMA, OPWC grant funding	Water Waste Water Shelters/Cooling Stations at Highland HS and Cardington HS 2-Portable generators for flexibility to meet a variety of needs	
	5	**1.1.3 Enhance and expand existing CODE RED system of notification by increasing sign-ups, and links with local websites**	June 2018/ Dec 2018	MCEMA Realtors Chamber of Commerce Local governments Local media Corridor signage	$25,000/year From 911	ALL	
	Low	**1.1.4 Support and build - up 211 system**	June 2019/ Dec 2019	Delaware/ Morrow Health Point MCEMA	Existing Budget	ALL	

Goal	Priority	Action Item	Start/End Dates	Responsible Party (key)	Resources	Target Jurisdiction and Comments	Status
	7	**1.1.5 Update/replace MCEMA website**	June 2018/ Sept 2018	MCEMA County IT	Existing Budget	ALL	
	18	**1.1.6 Continue efforts to supply Emergency Weather Radios to critical facilities**	June 2018/ June 2022	MCEMA	EMPG or EMA grant	ALL	
	2	**1.1.7 Integrate emergency shelter capacity at the new MCTC Transportation Center and at Station 6**	Jan 2018/ June 2023	MCEMA MCTC County Commissioners Morrow Co EMS Big Walnut JFD	FEMA and OEMA grants	Chesterville Mt. Gilead Cardington	
2. Wind Events **2.1 Increase public awareness and reduce vulnerability during future wind events**	**11**	**2.1.1 Coordinate with utility companies and local jurisdictions for tree maintenance**	Ongoing	MCEMA Utility Companies ODOT County Engineer Local public works	Existing Budget	ALL	
	4	**2.1.2 Repair, upgrade and expand warning sirens in Morrow Co**	June 2018/ Dec 2019	MCEMA	FEMA, CDBG and OEMA grant funding	Fix Sparta siren Add sirens in Chesterville and Edison	

Goal	Priority	Action Item	Start/End Dates	Responsible Party (key)	Resources	Target Jurisdiction and Comments	Status
3. Tornadoes 3.1 Reduce public vulnerability during future tornado events	**3**	**3.1.1 Seek funding to support two (2) tornado Community Safe Rooms in the County (new MCTC Transportation Center and at Station 6)**	Jan 2018/ June 2023	MCEMA MCTA County Commissioners	FEMA and OEMA grants	Chesterville Mt. Gilead	
	3	**3.1.2 Seek funding for Residential Safe Rooms in high risk neighborhoods**	Jan 2019/ June 2023	MCEMA MCTA County Commissioners	FEMA, OEMA, CDBG	ALL	
	Low	**3.1.3 Promote State Tornado Awareness Week**	Annually each March	MCEMA	Existing Budget	ALL	
	8	**3.1.4 Coordinate equipment available for cleanup/update Resource Guide**	June 2018- Dec 2018	MCEMA	Existing Budget	ALL	
	9	**3.1.5 Preplan, model emergency response for large public gatherings**	Sept 2018- June 2019	MCEMA Local Jurisdictions	Existing Budget	Cardinal Center- Bennington and Peru Townships Mid-Ohio Sports Car Course- Troy	
4. Severe Winter Storms 4.1 Improve preparation for	**13**	**4.1.1 Improve coordination with other communities by sharing salt, storage and**	June 2018/ June 2019	MCEMA Local jurisdictions County Commissioners	Existing Budget	Cardington, Chesterville, Edison, Fulton, Marengo, Mt. Gilead, Sparta	

severe winter storms		**equipment during emergencies**		County Engineer			
	Low	**4.1.2 Develop an alternative route to Village of Fulton for medical and resource delivery**	June 2020/ June 2022	MCEMA County Engineer	Existing Budget ODOT	Village of Fulton	
Goal	**Priority**	**Action Item**	**Start/End Dates**	**Responsible Party (key)**	**Resources**	**Target Jurisdiction and Comments**	**Status**
5. Severe Summer Storms 5.1 Reduce public vulnerability during future Severe Summer Storm events	**12,1,5, 18, 2**	**Actions 1.1.1, 1.1.2, 1.1.3, 1.1.6 and 1.1.7 address Severe Summer Storms**	As per each Action Item	As per each Action Item	As per each Action Item	ALL	
6. Flooding 6.1 Educate the public regarding flood safety to reduce injury and loss of life	**14**	**6.1.1 Develop an educational outreach program focusing on flood safety during and after events**	Jan 2021/ June 2021	MCEMA Co Planning Office	Existing Budget	ALL	
	19	**6.1.3 Provide training for County and local staff to effectively use new ESRI-GIS mapping tools**	June 2018/ Dec 2018	MCEMA County Engineer	Existing Budget	ALL	
	10	**6.1.4 Monitor and maintain list of all Morrow County communities to assure full participation in NFIP**	Ongoing annually	MCEMA	Existing Budget	Mt Gilead, Cardington, Fulton, Chesterville annexed property	

	6	**6.1.5 Relocate County Salt Storage out of flood plain**		MCEMA County Engineer	OEMA and EPA grants	Mt Gilead	
	17	**6.1.6 Work to acquire, demolish, and or retrofit all flood –prone properties in Morrow Co**	Jan 2019/ ongoing	MCEMA Co Planning Office	FEMA Mitigation grants	ALL	
Goal	**Priority**	**Action Item**	**Start/End Dates**	**Responsible Party (key)**	**Resources**	**Target Jurisdiction and Comments**	**Status**
7. Dam Failure 7.1 Educate and prepare the public for dam failures to reduce loss of life and property	**15**	**7.1.1 GIS Class I and II dams and their potential inundation zones**	Jan 2019/ Dec 2019	ODNR-Dam Safety County Engineer MCEMA Co Planning Office	Existing Budget	City of Galion Mt Gilead Village of Edison Townships: Congress, Washington, Gilead, Cardington, Chester, Peru, and Franklin	
	Low	**7.1.2 Develop an education program for property owners (residential and commercial), including evacuation plans, targeted to inundation areas**	Jan 2020/ Dec 2020	MCEMA Co Planning Office	Existing Budget	City of Galion Mt Gilead Village of Edison Townships: Congress, Washington, Gilead, Cardington, Chester, Peru, and Franklin	

8. Excessive Heat **8.1 Identify and serve vulnerable populations to reduce injury and loss of life during heat emergencies**	**16**	**8.1.1 Identify vulnerable populations in the County and identify Cooling stations for their safety**	Sept 2019/ March 2020	MCEMA American Red Cross Local fire departments Seniors on Center Morrow Co Hospital Bennington Glen Nursing Home	Existing Budget	ALL	
	Low	**8.1.2 Link Excessive Heat (Heat Emergencies) with the Co Emergency Operations Plan (EOP)**	Jan 18-Dec 2020	MCEMA	Existing Budget	ALL	
Goal	**Priority**	**Action Item**	**Start/End Dates**	**Responsible Party (key)**	**Resources**	**Target Jurisdiction and Comments**	**Status**
9. Drought **9.1 Educate and prepare county residents and businesses to minimize drought impacts**	**20**	**9.1 Develop and distribute PSAs on trash burning regulations for the County to reduce fires during drought conditions**	Jan 2019/ April 2020 Then ongoing each Spring and Fall	MCEMA Local fire departments	Existing Budget	ALL	
	Low	**9.2 Coordinate with SBA and USDA for commercial and agricultural assistance following drought events**	Ongoing as needed	MCEMA Chamber of Commerce Farm Bureau Local Media	Existing Budget	ALL	

Resources for Implementing the Approved Plan

Grant funding may be available to assist in the implementation of a number of the Plan Action Items. These grant programs include the following:

HMGP: The Hazard Mitigation Grant Program (HMGP) is authorized by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Act, as amended. The key purpose of HMPG is to ensure that the opportunity to take critical mitigation measures to reduce the risk of loss of life and property from future disasters is not lost during the reconstruction process following a disaster. HMPG is available, when authorized under the Presidential major disaster declaration, in areas of a State requested by the Governor.

PDM: The Pre-Disaster Mitigation (PDM) program is authorized by Section 203 of the Stafford Act, 42 USC 5133. The PDM program is designed to assist States and local communities to implement a sustained pre-disaster natural hazard mitigation program to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding from future disaster declarations.

FMA: The Flood Mitigation Assistance (FMA) program is authorized by Section 1366 of the National Flood Insurance Act (NFIA) of 1968, as amended with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP).

SHARPP: The State Hazard Analysis Resource and Planning portal (SHARPP) has additional resources listed in the Grants section under Other Mitigation Grants. Go to: http://ohiosharpp.ema.state.oh.us/OhioSHARPP/Grants.aspx#otherMitigationGrants for more information.

7.0

Hazard Mitigation Maintenance and Schedule

7.0 HAZARD MITIGATION PRACTICES

As required by the DMA2K, this Mitigation Plan summarizes policies, plans, regulations, programs and projects that Morrow County has implemented or is planning to implement in the future that affect growth and how the county can achieve and maintain sustainability and disaster resiliency. These administrative controls and activities are separated into six categories as determined by FEMA which are referred to as hazard mitigation activities. The following sections describe these general categories, as well as plans and activities that the communities are implementing now or plan to implement in the future.

7.1 Property Protection

Protection measures are usually undertaken by property owners on a building-by-building or parcel basis. They help reduce a building's susceptibility to flood damage.

7.1.1 Acquisition

Acquisition of a property and removing any structures eliminates the potential for harm to residents and businesses. After any structures are removed, the land is usually converted to public use, such as a park, or allowed to revert to natural conditions.

7.1.2 Relocation

Relocation is moving a building to higher ground, either within the same property boundary or to a separate property. The building should always be moved to an area not susceptible to flooding.

7.1.3 Retrofitting

Retrofitting a flood-prone structure entails installing flood protective measures on a specific structure or group of structures. Some of the more common examples of retrofitting and flood proofing are elevating a flood-prone building above the flood level, creating barriers around a flood-prone structure, dry flood proofing a structure to make it water-tight and wet flood proofing to intentionally allow flood waters to enter and yet reduce water pressure on the structure.

Retrofitting structures for other hazards is also possible. Structures affected by high winds can possibly be mitigated by securing a roof structure with adequate fasteners or tie downs can mitigate damage that may occur. Another retrofit is to strengthen garage doors, windows and other large openings. For tornadoes, constructing underground shelters or safe rooms can save lives. Burying power lines is a retrofit measure that addresses the winds from tornadoes, thunderstorms and ice that accompany winter storms.

To date, Morrow County has not implemented any property protection measures within the county.

7.2 Preventive Measures

7.2.1 Planning and Zoning

7.2.1.1 Comprehensive Planning

Comprehensive plans and land use plans specify how a community should be developed (and where development should not occur). Through these plans, uses of land can be tailored to match the land's hazards. Comprehensive planning reflects what a community wants to see happen to their land in the future. A comprehensive plan can look 5, 10, or even 20 years into the future to help a community plan and shape how they envision their community. However, planning is only one part of the puzzle and usually has limited authority. Tied with zoning, comprehensive planning can be more effective.

The Morrow County Commissioners approved their Comprehensive Land Use Plan on November 7, 2012.

7.2.1.2 Zoning

A zoning ordinance regulates development by dividing the community into zones or districts and establishing the type of development allowed within each district. The floodplain can be designated as one or more separate zoning districts in which development is prohibited or allowed only if it is not susceptible to flood damage. Some districts that are appropriate for floodplains are those designated for public use, conservation or agriculture. Zoning works best in conjunction with a comprehensive plan or "road map" for future development and building codes.

Building codes provide some of the best methods of addressing all the hazards in this plan. They are the prime measure to protect new property from damage by high winds, tornadoes, earthquakes, hail, and winter storms. When properly designed and constructed according to code, the average building can withstand the impact of most of these forces.

Thirteen of the sixteen townships are zoned in Morrow County, by either adopting their own zoning regulations or by adopting the County zoning regulations. Townships that are zoned under the County zoning regulations include: Bennington, Canaan, Congress, Gilead, Harmony, North Bloomfield, and Washington.

7.2.1.3 Open Space Preservation

Open space preservation is a technique that can be used to not only preserve floodplains but to preserve lands that may be crucial to controlling runoff that adds to flood problems. Existing undeveloped areas can be preserved as open space through zoning ordinances. Lands that ought to be set aside as open space but are already being put to other uses can be converted to public ownership (acquisition) or to public use (easement). Once the land is owned by the county, municipality, or state, buildings and other development that are subject to flood damage can be removed or prohibited. Open space lands and easements do not always have to be purchased outright. Developers can be required to dedicate land to the public for a park and/or to provide easements for flood flow, drainage, or maintenance.

There are no locally adopted/implemented programs for farmland protection or open space preservation at this time for Morrow County. However, Mount Gilead State Park, Mount Gilead Campground, Dogwood Valley Campground and Hidden Lakes serve as park and recreation facilities outside of Morrow County's incorporated areas.

7.2.1.4 Subdivision Regulations

Subdivision regulations govern how land will be broken up into individual lots. These regulations set construction and location standards for the infrastructure built by the developer, including roads, sidewalks, utility lines, storm sewers, storm water retention or detention basins, and drainage ways.

Morrow County developed and adopted its "Subdivision Regulations," which became effective January 1, 1991. These regulations were enacted in accordance with the Ohio Revised Code Chapter 711. The regulations are divided into four articles including the Title of General Provisions, Administrative Language Definitions, Procedure and Approval Process and Site Design and Construction Standards.

Morrow County established a Regional Planning Commission in 1969 which consists of 23 members representing townships, villages and other community agencies to regulate the development of subdivided areas.

7.2.1.5 Building Codes

Building codes provide some of the best methods of addressing all the hazards in this plan. They are the prime measure to protect new property from damage by high winds, tornadoes, earthquakes, hail, and winter storms. When properly designed and constructed according to code, the average building can withstand the impact of most of these forces.

Morrow County currently enforces the Ohio Building Officials Administration (OBOA) Residential Code and the Ohio Building Code (OBC) commercial code. The County also enforces the National Electric Code (NEC).

7.2.1.6 Manufactured Homes

Previously, the location and installation of manufactured and mobile homes were regulated at the local level of government, with the construction and fabrication standards being set by the United States Department of Housing and Urban Development (HUD). All mobile type homes constructed after 1976 must comply with HUD's National Manufactured Home Construction and Safety Standards. These standards apply uniformly across the country and it is illegal for a local unit of government to require additional construction requirements.

The installation of manufactured homes in Morrow County is currently regulated by Senate Bill 102 which became effective on August 6, 2004. This bill created the Ohio Manufactured Homes Commission to regulate the installation of manufactured housing, which includes mobile and manufactured homes, and vests it with the exclusive authority to regulate manufactured housing installers, the installation of manufactured housing and manufactured housing foundations and support systems. The bill set forth that municipal corporations and other political subdivisions are preempted from regulating and licensing installers and regulating and inspecting the installation of manufactured housing and manufactured housing foundations and support systems. The Commission has exclusive power to adopt rules of uniform application throughout the state to govern the installation of manufactured housing, the inspection of manufactured housing, the inspection of manufactured housing foundations and support systems, the training and licensing of manufactured housing installers, and the investigation of complaints concerning manufactured housing installers. No political subdivision of the state or any other department or agency of the state may establish any other standards.

The Commission must establish standards by rule that govern the installation of manufactured housing, with the minimum standards being the model standards the Secretary of the United States Department of HUD adopts. The standards established by the Commission must be consistent with, and not less stringent, than the standards adopted by the Department of HUD. The Commission has the exclusive authority to make rules regarding "blocking" and "tiedowns" of mobile and manufactured homes. Permanent foundations to which a mobile or manufactured home may be affixed must also be approved by the Commission.

7.2.1.7 Floodplain Regulations

Communities that adopt and enforce a floodplain management ordinance, to regulate new development within the floodplains, can significantly reduce the effects of flood damage. Communities typically adopt minimum standards that are recommended by FEMA. The objective of these regulations is to ensure that development will not aggravate existing flooding conditions and that new buildings will be protected from flood damage. Zoning and open space preservation work to keep damage-prone development out of hazardous or sensitive areas while floodplain development regulations impose construction standards on what is allowed to be built in the floodplain.

Morrow County Flood Damage Prevention Regulations

Morrow County further enhanced the Morrow County Flood Damage Prevention Regulations on September 24, 2004 by amending the current standards required to participate in the NFIP. The purpose of the Morrow County Floodplain Damage Prevention Regulations is to regulate permissible activities and regulate land uses in the floodplains and flood hazard areas of the County.

Mount Gilead Flood Damage Prevention Ordinance

Mount Gilead updated their *Flood Damage Prevention Ordinance* in 1996. The purpose of this ordinance was to establish regulations and standards for buildings in flood hazard areas identified by FEMA, to enable residents of incorporated areas of Mount Gilead to receive flood insurance subsidized by the federal government.

All of Morrow County is in compliance with state floodplain management standards and participates in the NFIP as previously discussed in Section 4.5.1. Morrow Co, Mount Gilead and Cardington actively participate in the NFIP. Chesterville, Edison, Fulton, Marengo, and Sparta are also eligible to participate in the program. However, according to the most recent information from FEMA, these villages have not contacted officials from the NFIP expressing their desire to participate.

7.2.1.8 Drainage Regulations

In order to protect a County's natural resources a community can implement regulations such as County Water Management and Sediment Control Regulations. The purposes of these regulations are to protect the County's water resources by ensuring that the proper storm water and erosion and sediment control measures are in place. Erosion and sediment control measures are called Best Management Practices (BMPs), and when installed and maintained correctly, they help prevent soil from leaving the site. Storm water control measures ensure that the volume of storm water runoff remains the same as before development occurs.

Some examples of what can go into a County Water Management and Sediment Control Ordinance are as follows:

- Submit a Water Management and Sediment Control (WMSC) Plan for proposed commercial, industrial, or residential development sites on parcels greater than five acres.
- Submit an abbreviated plan for sites on parcels less than five acres and part of a larger plan of development.
- Submit a plan for residential dwellings only if a village, township, or city zoning requires them to do so. They must check with the appropriate community for this information.
- Comply with the regulations whether or not a plan is required. All county residents are responsible for being familiar and complying with the regulations.

A designated agency should inspect sites to ensure that the regulations are being followed correctly. The designated agency should also work diligently to review plans and perform site inspections to ensure that these erosion and sediment control measures are in place.

Morrow County currently does not have official drainage regulations in place. However, when correcting an existing drainage problem which involves more than one land owner, the owners

may mutually agree to cooperate to provide the necessary drainage improvements. The Ohio County Ditch Law provides for the mutual agreement procedure, which is used frequently in Ohio. The mutual agreement procedure provides for plans to be filed with the county clerk, along with information on the proposed costs, review by the county engineer and placement of the improvement in a permanent maintenance program conducted by the county government. This procedure is one of the simplest mechanisms to make a drainage improvement involving one or more landowners.

Currently, the Morrow County Engineer's Office maintains 11 ditches throughout the County through a Ditch Petition Process. There are three (3) landowners that are affected by this process and receive benefits from this service. These landowners work closely with the County Engineer's Office.

Morrow County also has a Technical Review Committee (TRC) that consists of the Soil and Water Conservation District (SWCD), Health Department, Engineer, Zoning and Planning. The TRC meets as needed to discuss single lot development and drainage in Morrow County.

7.3 Natural Resource Protection

7.3.1 Wetlands Protection

7.3.1.1 Riparian Buffer/Wetland Protection

Riparian area refers to the vegetated area next to a watercourse often thought of as the floodplain and its connected uplands. Riparian buffers can protect water resources from non-point source pollution and provide bank stabilization, flood storage and aquatic wildlife habitat. They can be a natural resource management tool used to limit disturbance within a certain distance of a water course to maintain streamside vegetation. Some communities in the State of Ohio have proceeded to adopt riparian buffer overlays and zoning ordinances to reap the benefits of such protection.

Currently, there are no wetland protection programs implemented in Morrow County. The Morrow County Soil and Water Conservation District adheres to the Federal and State Minimum Standards as they become available for wetland protection issues.

7.3.1.2 Urban Forestry

Eighty percent of Ohioans live and/or work within urban areas. The quality of life for them and their families is dependent upon the urban environment. Healthy trees enhance this environment by promoting clean air and water, increasing property values, reducing erosion and storm water runoff, providing wildlife habitat, moderating temperature, lessening energy demands, and offering year-round enjoyment.

Ohio's Urban Forestry Program was created in 1979 within the ODNR to promote trees and other vegetation as tools to enhance the quality of life within cities and villages. The purpose of the Urban Forestry Program is to provide community officials and allied agencies with the organizational and technical ability to effectively manage the trees along streets, within parks, and on public grounds. Through a statewide network of regional urban foresters, the program helps communities manage their urban forest resources to meet their local needs.

Trees are particularly subject to damage by tornadoes, wind, ice and snow storms. Downed trees and branches break utility lines and damage buildings, parked vehicles, and anything else beneath them. An urban forestry program can reduce the damage potential of trees. A properly written and enforced urban forestry plan can reduce liability, alleviate the extent of fallen trees and limbs caused by wind and ice build-up, and provide guidance on repairs and pruning after a storm. Such a plan helps a community qualify to be a Tree City USA.

Ohio has been the Tree City USA national leader for over 30 years. As of May 2017, there are 243 Tree Cities USA in Ohio. Counties are not eligible for the program but can implement the credited activities. Mount Gilead and Cardington are the only two incorporated areas of Morrow County that are Tree City USA communities.

7.3.1.3 Flood Compensation Banking

A flood compensation bank is a detention basin that is used for floodplain encroachment compensation or for flood storage in which the basin's volume may be purchased to mitigate the effects of new development. A development may purchase storage volume from a bank to compensate for floodplain encroachment or to satisfy storm water detention requirements provided the basin is within the appropriate zone of influence.

A countywide flood compensation banking process has not been implemented to date.

7.3.2 Watershed Planning Efforts

Five different watersheds influence drainage in Morrow County: Olentangy Watershed, Upper Big Walnut Watershed, Alum Creek Watershed, Clear Fork Watershed and Kokosing Watershed.

There currently are no watershed planning efforts in Morrow County.

7.3.2.1 Habitat Restoration

In urbanized watersheds, some stream and/or rivers suffer the effects of increased erosion and water quality problems because of the amount of development that is occurring in a given area. Bioengineering techniques can help prevent further degradation and also provide water quality and habitat benefits.

Biotechnical practices use vegetative or other natural materials to achieve stream management objectives, usually erosion control. One of the chief advantages of biotechnical practices is that they help restore natural stream features, like in-stream habitat and streambank vegetation. The materials used for biotechnical practices are generally less expensive than for more traditional approaches, but installation is more labor intensive and they may require more frequent maintenance.

The ODNR has published a *Stream Management Guide #10*. This Guide is one of a series of Ohio Stream Management Guides covering a variety of watershed and stream management issues and methods of addressing stream related problems. It maps and briefly describes some of the many projects that have been constructed in Ohio using biotechnical practices, including the installation date.

There currently are no bioengineering techniques that have been performed on streams and rivers in Morrow County.

7.3.2.2 Watershed Groups

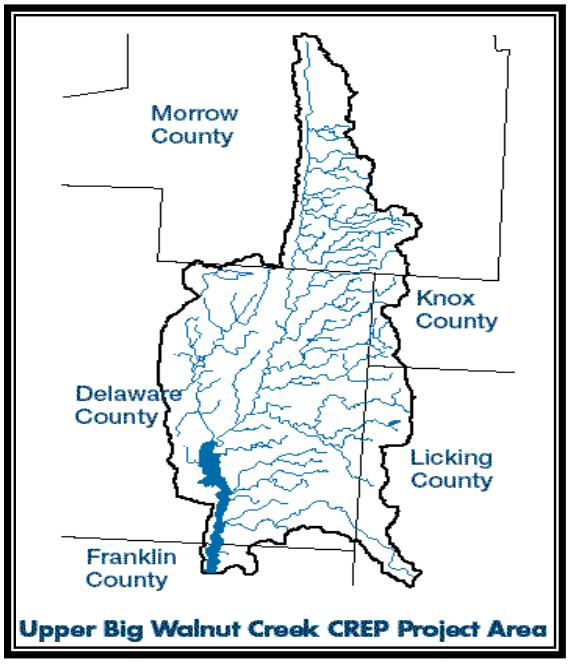
Friends of Alum Creek and Tributaries (FACT)

The Friends of Alum Creek are committed to finding ways to preserve and protect Alum Creek as a natural area while providing citizen access for environmentally responsible recreation, educational opportunity, and citizen enjoyment at many levels.

7.3.3 Conservation Reserve Enhancement Program

The Conservation Reserve Enhancement Program (CREP) is a local, state, federal and private partnership to create 3,500 acres of filter strips, riparian buffers, wildlife habitat, wetlands and tree plantings to reduce chemical and sediment runoff in Hoover Reservoir and its watersheds, which includes a portion of Morrow County.

The CREP compensates landowners who voluntarily take cropland out of production and establish conservation practices. Over the six-year initiation phase of this project, the landscape of the watershed will change as filter strips, riparian buffers and tree plantings are established. The different "look" will mean less chemical and sediment runoff is entering ditches, streams and Hoover Reservoir, aquatic and upland wildlife areas are improved, and a productive farm community will continue to prosper. The map below shows the project area in CREP.



7.3.4 Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) was reauthorized in the Agricultural Act of 2014 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

7.3.5 Plans, Studies, Reports and other Technical Information used in this Plan

The development of this Plan involved the review of numerous plans, studies, reports, regulations and other technical information. These included:

- Morrow County Comprehensive Land Use Plan (2012)
- Morrow Co Natural Hazard Mitigation Plan (2010)
- All available Zoning and related regulations from participating jurisdictions
- Morrow County Emergency Operations Plan

- US Census data
- ODNR- Division of Water, list of Morrow Co regulated dams (Class 1-3)
- Farmland Preservation Report-Morrow County
- Ohio Public Utilities Commission data (see 2-11 links)
- National Center for Environmental Information (NCEI- formerly NCDC) for historic event data
- National Integrated Drought Information System
- National Weather Service (NWS) heat index and Morrow County data
- National Oceanic and Atmospheric Administration (NOAA)- Morrow County drought data
- National Oceanic and Atmospheric Administration (NOAA)-Palmer Drought Severity Index
- National Flood Insurance Program (NFIP) Morrow Co flood plain regulations
- FEMA Repetitive Flood Loss data, Morrow County
- HAZUS-MH Flood Risk Report-Morrow County
- Morrow County EMA- Critical Facilities List
- Morrow County Auditor's Office for property count and valuation data
- Morrow County Engineers Office: Township roads with high water list

7.4 Emergency Services

Emergency Services protect people before, during, and after a disaster. A good emergency management program addresses all hazards, natural and man-made. It involves the active participation and involvement of all County's departments and municipalities. Emergency services include:

- Threat Recognition
- Warning
- Response
- Evacuation and Sheltering
- Post-Disaster Recovery and Mitigation
-

7.4.1 Threat Recognition

The first step in responding to a hurricane, flood, tornado, or other natural hazard knows when weather conditions are such that an event could occur. With a proper and timely threat recognition system, adequate warnings can be disseminated.

7.4.2 Warning

After there is a potential hazard recognized following steps must be taken to notify the public of its possible onset. Early and specific warnings allow more people the ability to set protection procedures in motion.
The National Weather Service issues notices to the public using two levels of notification:

Watch: conditions are right for flooding, thunderstorms, tornadoes or winter storms.
Warning: a flood, tornado, etc. has started or has been observed.

A more specific warning may be disseminated by the community in a variety of ways. The following are the more common methods:

- Commercial or public radio or TV stations
- The Weather Channel
- Cable TV emergency news inserts
- Telephone trees/mass telephone notification
- NOAA Weather Radio
- Tone activated receivers in key facilities
- Outdoor warning sirens
- Sirens on public safety vehicles
- Door-to-door contact
- Mobile public address systems
- E-mail notifications

Morrow County has nine (9) outdoor warning systems located throughout the county. Warning signals for Morrow County siren systems are configured to follow the FEMA guidance on the use of a certain signal to warn people of an enemy attack, and a different signal to notify them of a peacetime disaster. These warning signals are activated in the following ways:

- Sound an attack warning as a 3-minute steady tone. The attack-warning signal shall mean that an actual attack against the country has been detected and protective action should be taken immediately.
- Sound an attention or alert warning as a 3-minute steady sign from sirens, horns, or other devices. This signal may be used as authorized by local government officials to alert the public to peacetime emergencies.
- Sound a third distinctive signal for other purposes such as a local tornado occurrence. This signal is a steady tone for three minutes in the event of a tornado warning.

An estimated 15 weather alert radios or Plectron Units are located in various public institutions, private homes and businesses throughout Morrow County. In some areas, only the central office may have a weather alert radio. For example, one school is designated as the “central office.” When a warning is received, this, “central office,” notifies all other schools in the district. Additionally, warning sirens, radio broadcasts and public address systems may be used to provide warnings within, and to, schools, nursing homes, industries and along the places of public assembly, which include the County’s fairgrounds and the Mid-Ohio Raceway.

In addition, several radio stations sound emergency alerts to Morrow County. The following are the Emergency Alert System (EAS) stations serving Morrow County, with their call letters and location information:

- WMNR-AM, Marion, Ohio
- WVNO-FM, Mansfield, Ohio
- WNCO-FM, Ashland, Ohio

Morrow County has also invested in the Code RED, an emergency notification system the county subscribes to, which allows residents to sign up for free to get real time notices from the National Weather Service regarding severe weather in the area.

7.4.3 Response

The protection of life and property is the most important task of emergency responders. Concurrent with threat recognition and issuing warnings, a community should respond with actions that can prevent or reduce damage and injuries.

Typical actions and responding parties include the following:

- Activate the emergency operations center (emergency preparedness)
- Close streets or bridges (sheriff or public works)
- Shut off power to threatened areas (utility company)
- Pass out sand and sandbags (public works)
- Hold children at school/releasing children from school (school superintendent)
- Open evacuation shelters (Red Cross)
- Monitor water levels (engineering)
- Establish security and other protection measures (police/sheriff)

An emergency operations plan ensures that all bases are covered and that the response activities are appropriate for the expected threat. These plans are developed in coordination with the agencies or offices that are given various responsibilities.

The Morrow County EOP is a requirement of the Ohio Revised Code, Section 5502.271. The purpose of this EOP is to predetermine, to the extent possible, actions to be taken by the governmental jurisdictions of Morrow County to prevent avoidable disasters and respond quickly and adequately to emergencies in order to protect the lives and property of the residents of Morrow County.

The EOP is designed to work for all types of natural and man-made disasters. The document has a Basic Plan which defines and identifies areas of potential risk, lists people and organizations involved in response situations, and discusses plan development and maintenance.

The Basic Plan is augmented with annexes that describe the details of various aspects of emergency response. Some examples of these annexes include Direction and Control, Notification and Warning, Law Enforcement, Medical, Anti-Terrorism, and Resource Management.

The plan contains guidelines with respect to roles and responsibilities. The Emergency Operations Center (EOC) is responsible for directing and controlling the conduct of emergency operations from that center, or from an alternate facility during emergencies. The EOC, in coordination with the Incident Commander at the site, will be the point of contact for all operating/responding departments and agencies, other counties and the State.

The Morrow County Red Cross chapter provides assistance to people in need, free of charge, every single day. The Red Cross' Disaster Action Team responds to local disasters that affect those in Morrow County. Trained teams provide emergency services to those affected by a house fire, flooding, or other emergencies in which families cannot return to their home.

7.4.4 Evacuation and Sheltering

7.4.4.1 Evacuation

There are five key components to a successful evacuation:

1. Adequate warning
2. Adequate routes
3. Traffic control
4. Knowledgeable travelers
5. Care for special populations (i.e. handicapped, prisoners, school children)

In Morrow County, the Incident Commander will be determined at the site of the emergency by the fire service organization having jurisdiction at the scene. The Incident Commander is the highest ranking official of the organization having jurisdiction at the site and is responsible for determining the need for an evacuation during an event. The Incident Commander is responsible for appointing a Fire and Rescue Coordinator who will act as a liaison between the EOC and the Incident Command Center and aids in evacuation operations.

7.4.4.2 Shelter

Shelter is required for those who cannot get out of harm's way. Typically, the Red Cross will staff a shelter and ensure that there is adequate food, bedding and washing facilities. Shelter management is a specialized skill. Managers must deal with problems like scared children, families that want to bring their pets and the potential for an overcrowded facility.

Morrow County Red Cross officials are directly responsible for organizing shelter services with the administrative and logistical cooperation and support from organizations from both the government and private sectors as may be required by the type of situation. Support services are coordinated by the Morrow County EMA. A shelter facilities list is available in the Morrow County EOP.

7.4.5 Post-Disaster Recovery and Mitigation

After a disaster, communities should undertake activities to protect public health and safety and facilitate recovery. Appropriate measures include:

- Patrol evacuated areas to prevent looting
- Provide safe drinking water
- Monitor for diseases
- Vaccinate residents for tetanus
- Clear streets
- Clean up debris and garbage

Throughout the recovery phase, everyone wants to return to their daily routines. The problem is when recovery efforts are being instituted; people may be performing a quick fix that returns them to their daily routines faster. However, it is imperative that during this recovery phase every effort should be made to think about how to prevent repeated damage from happening if another disaster were to strike. Some efforts include:

- Advise residents through public information activities to advise residents about mitigation measures they can incorporate into their reconstruction work

- Evaluate damaged public facilities to identify mitigation measures that can be included during repairs
- Acquire substantially or repeatedly damaged properties from willing sellers,
- Plan for long term mitigation activities, and
- Apply for post-disaster mitigation funds.

In Morrow County, responsibility for damage assessment ultimately lies with the elected officials of the county, city, villages and townships. Damage assessment officials must be trained in order to provide fast and accurate information to the EOC so that effective response and recovery efforts may be utilized.

A primary responsibility of the County's EMA is to gather all the county, city, village and township damage assessments, consolidate them and forward them to the OEMA in accordance with established timeframes.

7.5 Flood Control

Flood control projects have traditionally been used by communities to control or manage floodwaters. They are also known as "structural" projects that keep flood waters away from an area as opposed to "non-structural" projects, like retrofitting, that do not rely on structures to control flows.

7.5.1 Flood Control Measures

The most common type of measures that keep flood waters away from an area are reservoirs and dams, diversion channels, levees and floodwalls, and flood compensation banking.

7.5.1.1 Reservoirs and Dams

Reservoirs and dams impound water to reduce the amount of water that reaches an area at one time. A reservoir holds high flows behind a dam or in a storage basin. Water is released at a controlled rate. Reservoirs and dams are generally perpendicular to a stream or river.

Morrow County has three dams located within its borders and a location map is available in the Emergency Operations Plan.

7.5.1.2 Diversion Channels

A diversion is a new channel or overflow weir that sends floodwater to a different location, thereby reducing flooding along a watercourse. During normal flows, the water stays in the old channel. During flood flows, the stream spills over to the diversion channel.

7.5.1.3 Levees and Floodwalls

Levees and floodwalls restrain the flow of the stream or river. During a flood, the stream or river flow is not reduced; only confined. Levees and floodwalls are generally parallel to the flow of the stream.

7.5.2 Drainage Maintenance

Man-made ditches and storm sewers help drain areas where the surface drainage system is inadequate, or where underground drainage ways may be safer or more practical. Particularly appropriate for depressions and low spots that will not drain naturally, drainage and storm sewer improvements are designed to carry the runoff from smaller, more frequent storms. There are three types of drainage improvements that are usually pursued to reduce storm water flooding: putting drainage ways in underground pipes, channelization, and removing obstructions caused by stream crossings, such as culverts and bridges with small openings. Because drainage ditches and storm sewers convey water faster to other locations, improvements are only recommended for small local problems where the receiving stream or river has sufficient capacity to handle the additional volume and flow of water. To reduce the cumulative downstream flood impacts of numerous small drainage projects, additional detention or run-off reduction practices should be provided in conjunction with the drainage system improvements.

Currently, the Morrow County Engineer's Office maintains 11 ditches throughout the County through a Ditch Petition Process.

7.6 Public Information

A successful hazard mitigation plan program involves both the public and private sectors. Public information activities advise property owners, renters and businesses about hazards and ways to protect people and property from these hazards. These activities can motivate people to take the steps necessary to protect themselves and others. Information can initiate voluntary mitigation activities at little or no cost to the government. Property owners mitigated their flooding problems long before there was government funding programs.

7.6.1 Outreach Projects

Outreach projects are the first step in the process of orienting property owners to the hazards they face and the concept of property protection. They are designed to encourage people to seek out more information in order to take steps to protect themselves and their properties. Research has proven that outreach projects work. However, awareness of the hazard is not enough; people need to be told what they can do about the hazard, so projects should include information on safety, health and property protection measures. Research has also shown that a properly run local information program is more effective than national advertising or publicity campaigns. Therefore, outreach projects should be locally designed and tailored to meet local conditions.

Currently, there are no outreach programs instituted in Morrow County.

7.6.2 Real Estate Disclosure

Many times after a natural disaster, people say they would have taken steps to protect themselves if only they had known they had to purchase a property that is exposed to a natural hazard. By reaching out to residents in a community to become informed as to what hazards are a potential in the community, the community has armed them with information that they did not have previously. This knowledge allows them to make an informed decision on purchasing insurance to cover their potential losses.

7.6.2.1 Federal law

Federally regulated lending institutions must advise applicants for a mortgage or other loan that is to be secured by an insurable building whether the property is in a floodplain as shown on the Flood Insurance Rate Map. If so, flood insurance is required for buildings located within the floodplain if the mortgage or loan is federally insured. However, because this requirement has to be met only 10 days before closing, often the applicant is already committed to purchasing the property when he or she first learns of the flood hazard.

7.6.2.2 State law

The State of Ohio's Department of Commerce has a Residential Property Disclosure Form pursuant to section 5302.30 of the Revised Code and rule 1301:1-4-10 of the Administrative Code. It is to be completed by the owners who want to sell their property. Under a good faith stipulation, they are to note any areas of the house that may be dangerous which include being in a floodplain/Lake Erie Coastal Erosion Area, whether there are drainage/erosion problems, and if there are zoning/code violations.

Morrow County's and surrounding areas' multiple listing service does not include a listing of whether a property is in a flood zone or wetland. Disclosure practices are left up to the individual broker or agent.

7.7 MITIGATION PLAN MAINTENANCE AND SCHEDULE

Once the Mitigation Plan is approved by the State of Ohio and FEMA by the second quarter of 2018, the existing Mitigation Planning Committee, initiated by the Morrow County Emergency Management Agency, and made up of representatives of all county jurisdictions, will focus on implementing, monitoring, and evaluating the plan. Monitoring and evaluation of this plan involves the ongoing process of compiling information on the outcomes from the implementation of the mitigation action items.

At the initial meeting the committee will review the goals and action items to make sure that they are being successfully completed or are on track to be completed. The committee will assess if the county's vulnerability to hazards has decreased from the mitigation actions. Other issues that will be assessed by the committee are the redundancy of mitigation strategies, technical, legal or coordination problems associated with implementation, and any funding issues that may arise.

The committee will meet at least twice per year, or as needed. The success of the Mitigation Plan will depend upon the efforts of this committee to become involved with other planning efforts in the community such as the development of future land-use plans, capital improvement plans, zoning ordinances, floodplain regulations, building codes, and subdivision regulations, etc. created by county jurisdictions.
By becoming involved in these planning processes and plan's development, the goals and actions of this Mitigation Plan will be successfully embedded in everyday planning and development practice in Morrow County and each hazard will be addressed and mitigated.

Communities will be able to use the plan for a variety of activities, including implementing specific mitigation projects, as well as, implementing changes in the daily operation of the local government.

To ensure the success of an ongoing program, it is critical that the plan remains relevant to the County's growth and development. Thus, it is important for the County to conduct periodic evaluations and make revisions as needed, as well as, incorporate changes into other planning documents in the County.

The public will be involved on a continuous basis. Public involvement will be accomplished by establishing a website link http://morrowcountyohio.gov/www/index.php/2013-01-11-19-24-05/emergency-management-agency whereby the mitigation action items that are slated for development that current year will be highlighted. The public will be encouraged to participate in the continued development of the mitigation plan. There will also be a formalized press release developed for their annual review process.

7.8. RESOLUTION OF ADOPTION

The Morrow County Commissioners, and the jurisdictions listed in Section 2 will pass Resolutions of Support and/or Ordinance for the Morrow County Mitigation Plan after contingent approval from the Ohio Emergency Management Agency as well as The Federal Emergency Management Agency. Copies of the adopted ordinances and/or resolutions that jurisdictions pass are provided in Appendix I.

Appendix

A. Meeting Notices
B. HIRA
C. Meeting Agendas, Sign In Sheets, other meeting materials
D. Community Surveys
E. HAZUS-MH Floods
F. Maps
G. Critical Facilities List
H. Historic Occurrence Data (NOAA-NCEI)
I. Resolutions of Adoption

General References

- "State and Local Mitigation Planning How-To Guide: Understanding Your Risks, Identifying Hazards and Estimating Losses," FEMA Document #386-2, August 2001.
- "Natural Hazards Mitigation Plan," St. Tammany Parish, Louisiana, March 2004.
- "Countywide All Natural Hazards Mitigation Plan," Licking County, Ohio, November 2003.
- www.fsa.usda.gov – Farm Service Agency
- www.dnr.state.oh.us – Ohio Department of Natural Resources (ODNR)
- www.dnr.state.oh.us/forestry/Urban/ - ODNR's Urban Forestry Program
- www.census.gov – Main US Census website
- www.odod.ohio.gov/research/Productlisting.html - Ohio Department of Development
- www.ncdc.noaa.gov – National Climatic Data Center
- http://geohazards.cr.usgs.gov – Earthquake Info
- http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms – NCDC storm events database
- http://edcsgs9.cr.usgs.gov/glis/hyper/guide/1_250_lulcfig/states/OH.html - State of Ohio Land Use Cover
- www.omunileague.org/ohiocities.htm - Links to websites for Ohio Cities and Villages
- www.fema.gov/library/drcys.shtm - Federally Declared Disasters by Calendar Year.
- www.ccao.org/1008.htm - Links to Ohio County Websites
- www.naco.org/Template.cfm?Section=Home – National Association of Counties
  http://www.tornadoproject.com/alltorns/ohtorn2.htm#P – Tornados by state
- http://www-agecon.ag.ohio-state.edu/programs/exurbs/c - Land use info
- http://neic.usgs.gov/neis/ - United States Geological Survey National Earthquake Information Center
- http://maps.epa.gov – United States Environmental Protection Agency Enviromapper
- http://www.epodunk.com/counties/oh_county.html - Ohio county info
- http://www.city-data.com – United States city data
- http://en.wikipedia.org/wiki/ - Free encyclopedia information for Ohio communities.
- http://www.crh.noaa.gov/iwx/program_areas/climate/TornadoMaps/main.html - Historical pathways of tornados in Ohio counties
- http://www.drought.noaa.gov/ - NOAA Drought information center
- http://www.drought.unl.edu/dm/monitor.html - Drought monitor map
- www.wowworks.com/wowcity/ohcounty.htm - State, regional, county, city and community guide
- www.osuedc.org/profiles/pdf - Ohio State University Extension Data Center
- http://ohioline.osu.edu/ - Ohio State University Extension College of Food, Agriculture and Environmental Sciences
- www.nass.usda.gov/census/ - United States Census of Agriculture
- www.puc.state.oh.us – Public Utilities Commission of Ohio
- www.drelocation.com/ohio - Relocation services
- www.oh.nrcs.usda.gov – United States Department of Agriculture National Resource Conservation Service
- http://pubs.usgs.gov/fs/ - U.S. Geological Survey Fact Sheets

- www.naturalhazards.org - Natural Hazards Education and Research Cooperative (NHERC)
- http://www.legislature.state.oh.us/ - Manufactured Home regulations
- http://mitigationplan.org – Hazard Mitigation Planning
- http://www.hazmap.nctcog.org/risk_assessment/Chapter11.asp

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- http://www.mountgilead.net/ Mount Gilead Website
- http://cardingtonohio.com/community.htm Cardington Website
- http://www.heritagepursuit.com/Morrow/MorFront.htm
- http://www.fema.gov/cis/oh.pdf Federal Emergency Management Agency Federal Insurance Administration
- http://oh.water.usgs.gov/reports/Abstracts/ofr.89-376.html U.S. Geological Survey Fact Sheets
- Ohio's Drainage Laws An Overview Bulletin 822 Mechanisms For Drainage Improvement.htm
- http://www.ohiodnr.com/dnap/sr/kokosing.htm Kokosing Watershed
- http://www.delawareswcd.org/Watershed/olentangy.htm Olentangy Watershed
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